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Invited Speaker Highlight Papers

1

IS THE ULTRASONOGRAPHY A SAFE ALTERNATIVE IN THE PERFORMANCE OF A SACRAL PLEXUS BLOCK?

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Background: It is possible to accomplish surgical anesthesia and postoperative analgesia of the entire lower limb including hip joint, thigh, knee joint, leg, and ankle joint/foot using a sacral plexus block (SPB) combined with a paravertebral lumbar plexus block (LPB).

Our clinical indications of a SPB are (a) surgical anesthesia of the hip joint with a combined SPB and LPB, when general or neuraxial anesthesia is inappropriate, (b) postoperative analgesia after hip joint surgery when systemic medication is contraindicated, (c) post-block neuropathy (paresthesia, dysesthesia, or paralysis in the nerve territories of the terminal nerves of the sacral plexus) due to intraneural injection of local anesthetic, (d) accidental vascular perforation with hema
toma formation, and (e) rectal perforation (bowel dysfunction, fever, pain).

The safety goals of the SPB are (a) accurate perineural deposition of local anesthetic (b) avoid overdosing of local anesthetic (c) avoid intraneural, intravascular, or neuraxial injection of local anesthetic (d) avoid vascular or rectal perforation.

Historically, the parasacral block was preceded by proximal sciatic nerve blocks. The earliest technique was a subgluteal approach to block the entire sciatic nerve. It was followed up by Gaston Labats trans
gluteal sciatic nerve block oftentimes blocking the entire sacral plexus. Labats approach was later modified by Alon Winnie improving the success rate. The parasacral approach to block the sacral plexus was originally de
dscribed by Mansour as a blind, landmark based technique in 1993. Sacral plexus blockade with nervestimulation guidance has later been proved to be very effective.

Ultrasound-guided regional anesthesia (UGRA) combined with nervestimulation has been used to perform SPB. The authors recommended to attempt identifying the lateral border of the sacral bone and follow the posterior border of the ischial bone to identify the medial and lateral borders of the greater sciatic foramen. However, they did not assign a systematic and unequivocal approach to identify the guiding bone structures. The authors attempted to identify the gluteal arteries and the piriformis muscle - and the sacral plexus.

A new, effective ultrasound guided technique to block the sacral plexus - the so-called Parasacral Parallel Shift (PSPS) - has recently been published in British Journal of Anaesthesia. The PSPS approach employs the iliac bone with the sciatic notch as a characteristic and easily identifiable proxy marker pointing out an accurate roadmap to the target sacral plexus. Actually, the PSPS is an elaboration of the original technique described by Mansour. He too used the iliac bony landmark: when the inserted needle did hit the iliac bone above the rim of the sciatic notch, the needle was “walked off” the bone into the greater sciatic foramen. The PSPS is a visual, ultrasonographic “walking off” the iliac bone.

The iliac bony landmark and its delineation is very easy to identify with this approach allowing a steep learning curve and high success rate without much practice.

In our hands the PSPS has become an easy to perform and attractive alternative to other proximal approaches to block the sciatic nerve - e.g. in lower limb amputated patients with severe neuropathy or vascular disease, it is sometimes much easier to identify the sacral plexus sonographically with the PSPS technique compared to translgluteal or subgluteal visualization of the sciatic nerve.

It has not been possible to identify the piriformis muscle ultrasonographically before the introduction of the PSPS technique. The piriformis muscle was consistently identified in the patient cohort included in the original description of the PSPS technique.

The performance of a SPB should be based on a combination of anatomical surface landmarks, electrical nervestimulation, and ultrasound-guidance. The safety measures are: (1) direct real-time 2D sonographic visualization of the target nerve, the needle and the needle tip, the perineural spread of local anesthetic, and the surrounding anatomical structures (sacrum, ischial and iliac bone, piriformis muscle, intestines with peristaltics, pulsating arteries, compressible veins), (2) color doppler visualization of blood vessels and combination with low pulsed repetition frequency to visualize the spread of local anesthetic during injection (3) inplane insertion of the block needle allowing continuous and simultaneous realtime visualization of the needle, the needle tip, the target sacral plexus, and the surrounding anatomical structures (4) appropriate motor response to electrical nerve stimulation (5) hydrolocation with dextrose (not saline) until the endpoint of visually verified accurate perineural and extravascular spread of the local anesthetic is obtained (6) combination of ultrasound and nervestimulation (7) supervised training based on a formal certification programme.

Ultrasound-guidance for SPB is a relatively new technique and the few papers describing ultrasound-guided SPB all combine ultrasound and nervestimulation, and they are all observational studies based on small case series with limited potential for drawing valid conclusions about safety of combined ultrasound and nervestimulation compared to ultrasound or nervestimulation alone. Whether the new ultrasound-guided techniques can compare favorably with the 94 % success rate of using nerve stimulation alone, as reported by Ripart et al., remains to be investigated in a well designed prospective randomized clinical trial. None of the above mentioned studies have examined the efficacy of the ultrasound-guided SPB prior to surgery. They all combined SPB and LPB, and it cannot be ruled out whether the effectiveness of the procedure for surgical anesthesia was due to the SPB or the LPB or the combination.

Conclusion: The iliac bony landmark and the target structures are easy to identify with the suggested PSPS approach allowing a steep learning curve and resulting in a high success rate even after a short period of practice. The combined ultrasound and nervestimulation technique is presumably more effective and more safe compared to nerve stimulation alone.

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2

INITIATION OF LABOR ANALGESIA: CSE OR CONVENTIONAL EPIDURAL ANALGESIA

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Introduction: Almost two decades have passed since the introduction of combined spinal epidural (CSE) labor analgesia (19,35,50). CSE analgesia has gained worldwide acceptance and is an established method of labor pain relief (54,117,126,134,135,164). Numerous (>280 trials, performing a literature search using CSE, combined spinal epidural analgesia and labor as search terms, were identified) studies compared CSE with conventional epidural, evaluated various intrathecal drug combinations or reported side-effects of CSE.

Obstetric anaesthetists are divided when questioned on the place of CSE in labor analgesia. Some advocate it as the technique of choice, others reserve CSE for a limited number of indications (34,80,129,131,142). In a recent Cochrane review, it was concluded that CSE offers little benefit as compared to conventional epidural analgesia (151). However, it was acknowledged that CSE produces faster analgesia, results in less need for rescue analgesia and is associated with less urinary retention. Apart from a slight increase in the incidence of pruritus, these beneficial effects were not associated with more complications. This Cochrane review can be criticized. First, a number of well performed studies were excluded from analysis. Secondly, a number of outcomes were not considered in the analysis such as one-sided analgesia, epidural catheter reliability, anesthetist intervention rate, local anesthetic consumption and the occurrence of fetal heart abnormalities. Finally, very different types of CSE were used in the various studies. They were all considered to be a generic procedure and analyzed combined.

This manuscript reviews the available literature, including those trials that were ignored by the Cochrane review, and draws conclusions regarding the place of CSE in the management of labor pain. This review will evaluate efficacy and safety of CSE and make comparisons with conventional epidural analgesia, advise on the ideal spinal drug combination and give recommendations regarding maintenance of epidural analgesia once the spinal component wears off.

Characteristics of labor pain relief: CSE vs conventional epidural.

Onset time of analgesia.

Arguably the most obvious advantage of the CSE technique is the rapid and spectacular onset of effective analgesia (151). Consistently, effective labor analgesia is accomplished within 4 - 6 minutes following the intrathecal injection of drugs (1,19,35,36,37,58,73,74,104,121,152,159,166,167). Following conventional epidural analgesia, initial analgesia is usually achieved between 15 and 25 minutes (104).

It is important to note, however, that although the onset time of epidural analgesia might be reasonable, a wide inter-patient variability exists with respect to onset time of analgesia depending on parity, stage of labor and other relevant obstetric and non-obstetrical factors. Especially during late labor, analgesia following an epidural injection is often delayed. With CSE, onset time is short in all patients irrespective of the stage of labor and other factors.

Quality of pain relief: VAS scores, satisfaction and anesthetist intervention rate.

Several trials demonstrated lower VAS scores for labor pain with CSE as compared to epidural analgesia (36,62,77,154). However, other comparative trials could not demonstrate a difference in VAS scores for pain (69,104,132).

No trials report higher VAS scores with CSE. Most likely especially during the first 30 to 60 minutes VAS scores are lower when patients are treated with CSE.

Veris and co-workers demonstrated that less patients reported unilateral analgesia with CSE as compared to conventional epidural analgesia (167). Interestingly, Hess et al. investigated the factors associated with breakthrough pain during neuraxial labor analgesia and found that patients treated with conventional epidural analgesia experienced more recurrent breakthrough pain as compared to CSE treated women (71). Goodman et al. in a prospective study however failed to corroborate the latter study (62).

The presence of a dual puncture may facilitate the passage of epidurally administered drugs during maintenance of analgesia to the cerebrospinal fluid. At least in animals such an effect has been reported (155). In patients, Leighton et al. also reported that epidural bupivacaine blocked more dermatomes when administered following an initial dural puncture as compared to epidural bupivacaine administered without prior dural puncture (87). Leighton et al. used a 24 and 27G spinal needle. Cappiello and co-workers performed a study in which the dura was perforated with a 25G Whitacre needle without administration of spinal drugs (22). The control group had no dural puncture. In both groups analgesia was initiated with an epidural local anesthetic/opioid mixture. Patients treated with a dural puncture had better sacral spread, shorter onset of analgesia and better quality pain relief. Thomas et al. performed a similar study using a 27G Whitacre needle and could not find a difference between patients treated with or without a dural puncture (156).

Sonic needle size may be important.

Local anesthetic consumption.

Local anesthetic requirements are significantly reduced with CSE as compared to low dose conventional epidural techniques (36,37,77,162,167). Discussion remains whether this is the result of the omission of the initial epidural bolus or that also during labor a dose sparing effect persists. The presence of the dual hole and the facilitated passage of epidurally administered local anesthetics could offer part of the explanation.

Duration of initial analgesia.

Spinai analgesia typically lasts for 90 - 150 minutes, but a wide variety exists depending on administered spinal drugs and pain modulating factors such as parity, stage of labor, speed of labor, etc... (19,27,43,49,73,95,116,118,150,168). In ideal circumstances using multi-drug combinations, spinal analgesia lasts for more then 4 hours (43,116). Many authors continue the search for long lasting spinal analgesia, hoping that single shot spinal analgesia would ultimately be achieved. Despite extensive research, disappointingly, no more (and often less) then 50% of patients deliver during initial spinal analgesia (168).

Epidural catheter reliability.

Following initial spinal analgesia, bilateral analgesia and sensory changes occur, making testing of the epidural catheter difficult. The epidural catheter cannot prove itself and many may question the reliability of the catheter to achieve a bilateral analgesia once the spinal dose is worn off. However various investigators noted that the reliability of epidural catheters following CSE was similar or increased as compared to stand alone epidural catheters (22,38,86,98,107,109,156,161).

There was less need for epidural catheter replacement and there was less unilateral analgesia requiring catheter manipulation.

When using a CSE technique, a perfect midline approach is required to identify the subarachnoid space and consequently more epidural catheters reliably are positioned into the epidural space (161). Thomas et al. interestingly noted that when no cerebrospinal fluid was obtained following attempted CSE, subsequently much more epidural catheters required replacement as compared to those catheters placed when cerebrospinal fluid was noted (156).

Failed spinal component.

Failure to identify the spinal space and produce good spinal analgesia is reported in 0-18% of patients (156). As with every technique failure may occur, but in these instances the epidural catheter can still be used to provide analgesia. Failure of the spinal component indicates that the epidural needle is not perfectly situated on the midline and is a risk factor for subsequent epidural catheter failure (156).

Complications of neuraxial labor analgesia.

Pruritus.

This is the most common side effect of intrathecal opioids, occurring in almost all patients (36,68,162,167). In the most recent Cochrane review, pruritus was more frequent following CSE and was reported to be the only complication occurring more frequently with CSE (152). It usually develops...
shortly after analgesia. It is mild and hardly ever requires antipruritic therapy. Since patients hardly ever require therapy and seldom report pruritus as a reason for dissatisfaction, pruritus is no reason to refrain from using CSE and intrathecal opioids.

Nausea

Nausea and vomiting are very rare complications during CSE and conventional epidural analgesia. No differences in the incidence of nausea have been reported when comparing the two techniques, except in the retrospective trial by Miro et al. who reported more nausea and vomiting in patients treated with epidural analgesia (98). We must remember that nausea is a part of the birth process especially during induced labour.

Hypotension

As with any neuraxial technique, hypotension can occur following labour analgesia. Both CSE and conventional epidural analgesia have been associated with usually mild hypotension, which is easily treated (110). Hypotension following the spinal injection is transient and occurs within the first 30 minutes following initiation of analgesia (99,149,167). In clinical, routine practice it is important to avoid the supine position. Although opioids do not produce sympatholysis, hypotension is observed with pure intrathecal opioid analgesia (26,91,102,138). When local anaesthetics are combined, hypotension seems to be more pronounced, but clinically usually easily treated (102).

Intrathecal opioids have caused hypotension in 5% of patients with severe hypertension and this author can not recommend it’s routine use based on his personal experience with this drug. Hypotension can be severe and is often protracted requiring prolonged supportive vasopressor therapy (27,125).

Respiratory depression.

Several case reports have demonstrated that lipid soluble opioids may induce respiratory depression (10,52,63,67,73,76,90,120,124). In some, but not all, cases respiratory arrest occurred in relatively short stature women who had received parenteral or epidural opioids prior to the spinal injection. Fortunately, respiratory depression occurred typically within the first 30 minutes and was easily treated and reversed using naloxone. In one patient chest compressions and resuscitation was required (124). Ferrouz et al. performed a retrospective chart analysis and reported 1 respiratory arrest in over 5000 CSE performed with 10 mg spinal sufentanil (52). As this complication is rare, most authors advocate vigilance and advise to use lower doses of intrathecal opioids then those initially used on empirical grounds (5).

Other complications related to excessive rostral spread of opioids and local anaesthetics have been described and advise: aphaon, aphaigia, dysphagia, altered levels of consciousness, high sensory block, transient swallowing difficulties, etc... (32,41,53,65,83,145). Also sudden hypoglycemia has been described (40,78).

Central nervous system infections.

Some authorities claim that the risk of central nervous system infections is increased secondary to the breach of the dura (16). However, Camann and Birnback both agree that at the moment there is no scientific evidence indication that CSE epidural is associated with more infectious problems than epidural analgesia (13,20). Indeed several case reports of meningitis or epidural abscess have been reported following CSE anesthesia in obstetric patients (7,15,25,66,128,167), but also with simple spinal anesthesia and conventional epidural techniques central nervous system infections have been reported (11,45,103,136). Most authors, however, agree that strict aseptic techniques are of vital importance to prevent serious infections.

Neurologic complications.

As with any regional technique the potential for nerve damage is present. Several case reports in pregnant women of damage to the conus medullaris have been reported when using CSE (137). Especially with CSE it is imperative to perform the block as low as possible since the conus medullaris might extend below the L2 vertebral body. Up to 5% of parturients can have a conus which extends lower than the L2 vertebral body (24). To avoid conus damage, careful attention to the correct interspace is required. It has been clearly demonstrated, using radiography and ultrasound, that most anesthetists, using anatomical landmarks, are 1 to 4 interspaces away from where they think to be (24,170). Identification of the correct interspace is therefore of prime importance. Ultrasound may be useful, especially in obese patients, to identify or confirm the correct interspace (24).

Post dural puncture headache (PDPH).

Since CSE includes a dural puncture, there is a theoretical risk of post-dural puncture headache (PDPH). This is a devastating complication in an otherwise healthy mother, keen on taking care for her newborn child. However the use of small-gauge atraumatic spinal needles (26-29 G) has dramatically decreased the problem. From the available literature it seems that PDPH occurs in no more than 1% of patients. Furthermore the incidence is not increased as compared to conventional epidural analgesia (13,36,38,47,84,91,98,100,109,110,160,161). Norris et al. reported that unintentional dural puncture with the epidural needle occurs much more frequent when using conventional epidural analgesia as compared to CSE (110) Rarely the spinal needle itself is responsible for PDPH. Usually a dural tap with either the Tuohy needle or the epidural catheter causes postural headache. It is also worthwhile to mention several reports advising to insert the epidural catheter in the subarachnoid space following an accidental dural tap. The incidence of PDPH and bloodpatching seems reduced when the epidural catheter is threaded intradurally (30,111,143,148,160).

Motor block.

For many years, strategies to reduce the incidence and severity of motor block, associated with epidural analgesia, have been designed. Lower concentrations of local anaesthetic solutions, the addition of opioids and other adjuvant drugs, the introduction of patient controlled epidural analgesia and the use of newer local anaesthetic agents have been instrumental in reducing problematic motor block. Low dose epidurals are successfully used to allow laboring women to maintain mobility whilst being completely pain free (37,100). With CSE it is easier to provide effective analgesia with no or very minute doses of local anaesthetics. As already described, CSE decreased total local anaesthetic consumption (36,37,162) and decreased the occurrence of motor block compared to standard epidural techniques (36,37,100,162). Some authors have questioned the safety of walking during labor and neuraxial analgesia. However, several authors demonstrated that with CSE motor function and balance remained intact, whilst low dose epidurals induced clinically detectable dural column deficits (17,44,127).

Although reduced motor block and ambulation during neuraxial analgesia are certainly feasible, controversy concerning the benefits of ambulation remains (17,51). Several trials demonstrated that ambulation during labor does not affect the outcome of labor (100), whilst others did note a beneficial effect of ambulation. In patients without epidural analgesia, ambulation halved the operative delivery rate (4). Ambulation also reduced the length of the second stage of labor (60). In the COMET trial mobile techniques of labor analgesia were associated with an improved labor outcome (37,38).

Fetal heart rate changes.

Abnormal fetal heart rate recordings and fetal bradycardia are worrisome side effects that may follow any type of effective labor analgesia. Wong et al. reported more abnormal cardiotocographic readings following CSE as compared to systemic analgesia (173). Some authors reported that this complication could be more common following intrathecal opioids than following conventional epidural analgesia (28,29,72,79). Clarke et al. were the first to describe in detail the association between intrathecal opioids, uterine hyperactivity and fetal bradycardia in the absence of maternal hypotension (28). Since then several non-randomized trials have evaluated the incidence of fetal heart rate changes following either intrathecal opioids and conventional epidural analgesia (106,122,161,163). Nielsen et al. and Eberle et al. did not observe an increased incidence of fetal heart rate abnormalities, whilst all other non-randomised reports noted at least a doubling of the incidence of worrisome fetal heart rate changes (5).

Mardirosoff et al. performed a meta analysis of several prospective trials comparing intrathecal opioid analgesia with non-intrathecal opioid analgesia with respect to fetal bradycardia (93). These authors concluded that intrathecal opioids were associated with significantly more fetal heart rate abnormalities. Vercauteren suggested that the incidence of fetal bradycardia depended on the dose of the intrathecal opioid (165). Van de Velde et al. performed a prospective, randomized trial specifically designed to evaluate the effects of intrathecal opioids on the incidence of worrisome fetal heart rate changes (162). These authors concluded that high doses of intrathecal opioids increased the incidence of fetal heart rate abnormalities despite a reduced incidence of hypotension. Similar results were published by Nicolet et al. (105). These authors also indicated that older age and higher VAS scores prior to analgesia were risk factors associated with fetal heart rate abnormalities after CSE. Gaiser suggested that the risk of abnormalities in the fetal heart rate is increased when the fetal head is not engaged or when decelerations are already present prior to initiation of analgesia (56). The presumed mechanism of opioid induced non-reassuring fetal heart rate tracings is uterine hyperactivity caused by rapid analgesia and as a result a rapid decrease in maternal circulating catecholamines.

Testing the epidural catheter following CSE.

Since epidural catheters can inadvertently be misplaced in either the cephalic spinal fluid or in an epidural vein, anaesthetists have been using test
doses to verify the correct position of the catheter. Unfortunately, test doses are neither sensitive nor specific (33,108). Furthermore epinephrine containing test doses can induce motor impairment and thus complicate amputation during labor (31). Some authors also suggested that an epinephrine containing test dose has potential adverse effects on uteroplacental perfusion (92). As a result several authors suggested to abandon routine testing of the epidural catheter, since adequate analgesia confirms the correct position of the catheter without prior testing (14).

With CSE, analgesia occurs rapidly and testing the functionality of the epidural catheter is not possible until the initial spinal dose wears off. Many authors consider the fact that the reliability of the epidural catheter is uncertain during this period as a major disadvantage. Their concern is related to the possibility that the catheter may be dysfunctional when an emergency cesarean section is required. Especially in high risk pregnancies this is considered a major drawback. However, it is important to note that even with a well tested epidural catheter, we can never be absolutely sure that several hours later the catheter remains correctly positioned. Even with conventional epidural catheters fractioned dosing or a de novo test dose are required the moment the catheter is used for the injection of high doses of local anesthetics.

A second concern involves the fact that some authors do not want to initiate epidural analgesia immediately after the spinal dose. Only when the epidural catheter is formally tested once the spinal dose has worn off, the catheter is used throughout labor. As a result most patients will experience breakthrough pain. However, several authors initiate an epidural infusion immediately following the initial spinal dose (55). With low volume, low dose techniques, the risk of total spinal analgesia or toxic side effects is minimal. These doses cannot produce systemic toxicity or total spinal analgesia even when direct intravascular or intrathecal injection occurs. However if a continuous epidural infusion or patient controlled epidural analgesia does not produce adequate analgesia, one must consider an intravascular position of the catheter.

Conclusions: CSE analgesia is a very popular technique for labor pain relief. A recent Cochrane review suggests that CSE produces much faster analgesia than conventional epidural analgesia. Although various authors limit the use of the technique to specific indications, a wide variety of indications has been described by different authors. As a result, almost all patients fall in one of these categories. CSE analgesia provides rapid, highly effective analgesia with minimal motor block, reduced local anesthetic doses and perhaps an improved obstetric outcome. Maternal satisfaction is improved. An important advantage of the CSE technique is the enhanced epidural catheter reliability. PDPH and infections do not occur more frequently as with conventional epidural analgesia. Non reassuring fetal heart rate tracings occur significantly more frequent following high doses of intrathecal opioids. Occasionally, respiratory depression, following high doses of opioids intrathecally, can occur.

This author strongly recommends using CSE as the standard technique of labor analgesia.

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recommended to be careful. Thus, it is important that the anesthesiologist maintain adequate contact with the patient in order to get such information and to immediately take the appropriate measures.

4 MATERIALS USED FOR PERIPHERAL NERVE BLOCKS AND IN ULTRASOUND GUIDED REGIONAL ANESTHESIA

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Background and Objectives: In an editorial, Harrop-Griffiths cited the well known statement, “Regional anesthesia always works-provided you put the right dose of the right drug in the right place” [1]. Over the past several decades, different techniques and materials have been used to inject the right drug into the right place. These methods include pure surface landmark-based techniques, in combination with palpation or fascia click phenomena, eliciting motor responses of muscles innervated by the respective nerves, and direct visualization of the nerves with ultrasound [2]. Among all methods used for nerve identification, ultrasound guidance is the most popular. Ideally, the excitement of ultrasound guided regional anesthesia (UGRA) is based on the simultaneous depiction of the (a) target nerves, (b) the needle, and (c) the local anesthetic spread (LA). This summary provides a brief description of current materials used for UGRA, including:

1. actual needle designs for optimal ultrasound depiction;
2. sterile coverings for the probe;
3. preparation of the insertion site;
4. conduction of the ultrasound probe and skin.

Methods: Literature search, personal communication, and experience.

Results:

1. Needles

Whereas the reliability of the nerve depiction primarily depends upon the operator and, to some degree, on the ultrasound machine, and the location of both the target and the patient, needle design has a great impact on needle depiction. A recent study investigated needle visibility for 12 needles commonly used for PNB [3]. It has been shown, that needle shaft visibility dramatically decreased with steep angles (≤45°). Nine of the 12 needles did not reach acceptable visibility in a porcine model that resembled clinical conditions.

More recent developments in needle designs aim to optimize shaft visualization during needle advancement. These innovations include modifications of the needle tip and the shaft, including indentations (recesses). Examples of newer types of needles include the SonoPlex® needle (Pajunk Medical Produkte GmbH, Geisingen, Germany) (Fig. 1) and the Stimuplex® needle (B. Braun Melsungen AG, Melsungen, Germany) (Fig. 2). The technical basis for the improved visibility of these needles lies in their ability to increase ultrasound wave reflection towards the probe, due to their recesses. Intersections free of indentations are helpful in judging whether or not the needle is depicted completely when using in-plane techniques, which involves advancing the needle from the side of the probe and depicting the entire needle in the ultrasound plane. When using the in-plane technique, enhanced needles significantly increase needle-shaft visibility [4, 5].

Enhanced needles represent a significant step towards the long-awaited, improved visibility when using the in-plane technique. However, it is important to note that these types of needles might carry an inherent risk for false needle tip identification when used with the out-of-plane technique. This is due to the increased echogenicity of the shaft, which can lead to tip-misinterpretation. Techniques for reliable needle-tip identification must be applied, such as depicting the open tip of a facet-tip-needle with the bevel up. A comprehensive overview of needle-types, concepts, and the strategies used to optimize needle visualization is provided in [6].

2. Probe covers

Sterile covering of the probe is obligatory for ultrasound-guided interventions. Furthermore, a non-sterile probe masking is recommended for each ultrasound examination to avoid potential ping-pong infections when using the same ultrasound machine for examinations on different patients. A variety of companies provide adequate covers for all kinds of ultrasound probes (curved, sector, and linear-arrays) in different sizes (examples of these are provided in the lecture). An optimal acoustic coupling is necessary for proper transmission of the ultrasound wave between the probe and coverage. Non-sterile gel is probably the agent most frequently used for coupling. For example, the set of CIVCO Medical Solutions (CIVCO Solutions, Kalona, Iowa, USA) includes a 20 mg package of sterile gel packed with the probe cover and elastic bands for tight fixation of the cover on the probe in [7]. The remaining sterile gel can be used for acoustic coupling of the cover to the skin (see also Section 4). Austrian-based SaferSonic, (Ybbs, Austria) offers a cover with a rubberized surface (Fig. 3 and [8]) and the company also makes coupling agents for ultrasound probe covers.

Condom-like covers are available in different sizes and can be used for linear transducers, as well. The usefulness of sterile gloves for ultrasound probe covering has been a long-standing debate and will not be discussed here. Note that, although the transducer and the conducting cable can be completely covered, cleaning and disinfection of the complete ultrasound system is necessary before using it with another patient. For example, leakage and microscopic contaminations were described for condoms used for vaginal examinations [9].

3. Materials to prepare the intervention site

A pre-packed set is advisable for cleaning and preparation of the insertion site. This could include, for instance a sterile drape, used as a base for spreading the equipment, sterile syringes, used for the local anesthetic, a sterile, small beveled needle for skin infiltration, sterile pads, sterile swabs for skin cleansing, a box for disinfectants (and sharp needles), and a sterile fenestrated drape. Sets can also contain the preferred needle to be used for the PNB. For ultrasound-guided interventions a fenestrated drape, with a gap large enough for the ultrasound probe and for scanning along the area of interest, is recommended. While completely diaphanous drapes enable the practitioner to inspect the body’s external landmarks, they are usually made of...
plastic and cannot absorb gel, local anesthetic, or blood. Thus, two-component drapes with a diaphanous inner circle surrounded by absorbent paper are recommended. Perforation lines are helpful when catheters are placed. They also enable the practitioners to increase the scanning area while partially poaching the drape.

4. Materials for ultrasound conduction

Attenuation of ultrasound waves between probe cover and skin is profound when no acoustic coupling is performed (analog to coupling between transducer and cover). Since ultrasound-guided PNBs are based on good visibility, it is important to use the best acoustic coupling agent. Gel provides excellent properties for ultrasound wave transmission. Sterile gel (e.g., Aquasonic®, Parker Laboratories Inc., Windmolen, Netherlands) is frequently used for PNBs. However, when using gel, the potential risk exists of displacing gel from the skin into the patient’s tissue [10, 11]. During fine-needle-aspiration of thyroid tissue, gel was displaced, making two of the 14 cytological specimens unusable due to gel-artifacts [12]. Currently, the impact of gel transmission is unknown. The material data safety sheet of Parker Laboratories’ Aquasonic®-gel, states that, “hazardous polymerization will not occur,” and “there no conditions to avoid” [13]; however, a clear statement is lacking that verifies whether or not Aquasonic® 100 is also produced for interventions.

Installagel® (Farco-Pharma, Cologne, Germany) is another medium for conducting the probe to the skin. Installagel® is a gel used to disinfect mucous membranes and it is also used as a local anesthesia. It contains lidocaine hydrochloride, hydroxybenzoate (paraben, acts as a preservative), and chlorhexidine. Therefore, it is contraindicated in patients with known allergies to either amide-type LA or parabens. Chlorhexidine may cause skin irritations or anaphylaxis [14]. However, Installagel® has been especially designed for numerous minor surgical interventions (probing, catheterization, intubation, and endoscopy) to prevent iatrogenic injuries of hollow organs.

Lubricano® (Farco-Pharma, Cologne, Germany), which consists of hydroxyethylcellulose and water, is also designed for medical procedures, but it has no local anesthetic properties. Anaesthetists should be aware of the systemic absorption of the lidocaine fraction exists with Installagel® [15]. In outpatient cystoscopy, no significant difference in the analgesic effect between Instillagel® and a non-anesthetic gel has been observed [16]. Keeping in mind the company’s listed indications for Installagel® and Lubricano® (see above), all these represent procedures where mucosal (micro-) lesions frequently occur with displacement of the gel. Up to now, no data exists that describes the potential side effects of using Installagel® or Lubricano® for PNBs or vascular access. Theoretically, Lubricano® has the safer profile over Installagel®.

Sterile saline or LA can also be used for acoustic coupling. The charm of LA is based on the instant availability during the procedure: the physician or the nurse only needs to spread a few drops of LA while holding the needle or while using an immobile technique, respectively. If nerve stimulation is combined with UGRA, a dextrose-saline mixture is recommended [17]. Furthermore, local anesthetics exert a certain bactericidal activity [18-20]. However, the gel allows better sliding maneuvers compared to saline or LA. Thus, practitioners who are not proficient with UGRA should perform proper examinations prior to needle insertion. Skin disinfectant is not recommended as a conducting agent because the major ingredient, alcohol, has neurotoxic properties and may damage some probe covers.

Conclusion: UGRA necessitates materials different from those previously used for PNB. Enhanced ultrasound needles provide increased visibility in critical puncture angles. Special probe covers offer adequate sterile conditions and pre-packed sets with modified drapes enable the ability to scan the area of interest. Different conducting agents for ultrasound wave transmission are available; however, to date, the risks of possible displacement into the tissue or the nerves are not known.

References:


5 ACUTE PHANTOM LIMB PAIN: WHAT IS THE BEST NEURAL BLOCKADE?

B. Borghi, M. D’Addabbo, R. Borghi. Italy

Phantom limb syndrome (PLS) is a postamputation syndrome characterized by pain in the stump, phantom pain, and phantom sensations, involving from 30% to 90% of amputees. The syndrome onsets in the early postoperative period in 75% of the cases with an average duration of 7 years after limb amputation. Risk factors include preamputation pain, loss of dominant upper limb, bilateral amputation, lower limb amputation, proximal amputation, the presence of stump pain, and depression.

Many different therapies have been evaluated, still at the present time none has been found to be highly effective.

Central and peripheral neural blocks have been proposed for prevention and treatment of phantom limb syndrome. Although the precise mechanism for the development of phantom pain syndrome is still unclear, there’s an increasing evidence that the abnormal sprouting of nociceptive and mechanoreceptive fibers in the cut nerves after the amputation has an essential role in determining those permanent structural changes in the dorsal horn of the spinal cord and in cerebral cortical structures (causing increased excitability of dorsal horn neurons, reduction in the inhibitory processes and activation of abnormal supraspinal impulses) observed in the amputee patients with phantom limb syndrome.

Epidural analgesia before and after amputation has been evaluated in several studies for the prevention of phantom limb studies. Epidural analgesia was started from 1 to 3 days before amputation, in relation to the preamputation pain is considered to be an important risk factor for the development of phantom limb pain, and continued up to 3 days after the intervention.

Earlier studies showed promising results. In a observational study, reported the absence of phantom limb pain 1 year after the amputation, and reported a lower incidence of phantom pain and phantom sensations at 6 months after surgery in the preoperative epidural group. Katsumi-Lipaiti et al. compared preoperative epidural analgesia with bupivacaine and morphine for 3 days before amputation and continued for 3 days after surgery to postoperative epidural analgesia for 3 days after surgery with preoperative group showing a significantly lower incidence of phantom pain at the 6-month follow-up evaluation. Still in two later controlled, randomized and blinded trials, no difference was found between epidural analgesia started about 24 hours before the operation and postoperative systemic opioid analgesia and reported a lower incidence of phantom pain and phantom sensations at 6 months after surgery in the preoperative epidural group.

In conclusion, according to the existing literature, neural blockades, both central and peripheral, are very little useful in treating phantom limb syndrome when they’re used in a classical way and limited only to the early postoperative period.

Only in our recent study, the perineural local anesthetic infusion was evaluated for a longer period. The first experience, with an prolonged period of high concentration (0.5% ropivacaine 5 ml/h) local anesthetic infusion was a patient amputated 10 cm below knee for complex regional pain syndrome (already presenting an intrathecal morphine pump system for pain control), who developed almost immediately after surgery a severe (VAS pain score 100 mm) phantom limb syndrome. After failure of other therapies (continuous spinal infusion of morphine 0.3 mg/day, oral gabapentin 300 mg twice daily, sertraline 50 mg/day, diazepam) a perineural sciatic catheter was placed on day II and, after an initial bolus dose of 0.5% ropivacaine 10 ml, a continuous infusion of 0.5% ropivacaine 5 ml/h was started.

In less than 6 hours phantom limb pain and sensations disappeared (with no recurrence for all the hospital stay). Patient was instructed how the correctly manage the local anesthetic infusion at his home and discharged with the catheter system in situ and an elastompheric pump. An high concentration of ropivacaine (0.5%) was used with the idea to allow the patient to frequently discontinue infusion so that he could reload the elastompheric pump less often at home but already before the first day the interruption of infusion even for few hours caused pain to reappear. With the agreement of the patient and considering the absence of side effects, the pump was constantly kept open infusing 0.5% ropivacaine at 5 ml/hour infusion rate.

The infusion was stopped every 7 days to evaluate the presence of phantom pain in absence of the local anesthetic effect. In the first evaluation periods phantom pain gradually decreased (VAS 70 mm at 1 week, VAS 40 mm at 2 weeks, VAS 0 mm at 4 weeks after infusion). After 4 weeks of infusion the patient reported no phantom pain and sensations and the infusion was stopped. The patient reported no recurrence of phantom pain at 6, 12, 24, 36 month follow-ups.

So in the sequent observational study, 62 patients undergoing lower limb amputation received a 0.5% ropivacaine 5 ml/h infusion through a perineural catheter for a median duration of 30 days (range 4-83 days). According to the amputation level (foot, below-knee, above knee, hip amputation) the patients received a sciatic nerve block (27 pts), a combined femoral-sciatic block (31 pts) or a combined lumbar plexus-sciatic block (4 pts).

Perineural catheters were maintained after the discharge from the hospital and managed in an outpatient setting by local Analgesic Therapy Centers.

Patients were instructed to discontinue local anesthetic infusion every 7 days for a 48 hours period. In this period they evaluated the presence of stump and phantom pain through a verbal rating scale (VRS, 0=no pain, 1=mild pain, 2=moderate pain, 3=severe pain, and 4=intolerable pain) and the presence of phantom sensations (any unpleasant sensation in the absent limb except pain interfering with daily activities). If in the evaluation period the patient experienced no or mild (both stump or phantom) pain and no relevant phantom sensations the local anesthetic infusion was stopped; otherwise infusion was restarted till the next evaluation period. This study protocol was successfully completed by 38 patients, partially by 20 (catheter removed with no relevant pain but relevant phantom sensations) and not completed at all by four patients (catheter removed despite significant pain).

After 1 year from the amputation only the 4 patients (6%) who completed the protocol reported a significant (VRS>1) phantom pain. Three of them received a local anesthetic infusion after amputation for a short period (from 4 to 7 days with the catheter accidentally removed or removed by patient request). Only one of them received a long-lasting local anesthetic infusion (5 weeks). The other 58 patients (94%) who completed the protocol and did not report significant pain (VRS<1) at the end of the local anesthetic infusion did not report phantom pain in the following follow-up evaluations (till 1 year) showing no rebound effect after the discontinuation of perineural local anesthetic administration.

These observational findings suggest that the abnormal activity of peripheral fibers in cut nerves that leads to that structural changes in spinal cord and cerebral cortical centers, causing the phantom pain, may outlast the early postoperative period; a perineural local anesthetic infusion prolonged for the weeks following the amputation might block this late abnormal peripheral activity and prevent the phantom limb syndrome. Further studies are needed to evaluate the best duration of the infusion, the possible appearance of local anesthetic toxicity symptoms after a long period infusion (in the observational study no patients reported toxicity symptoms) and to compare prolonged peripheral neural blockades to standard therapies in preventing phantom limb syndrome.

In conclusion, according to the existing literature, neural blockades, both central and peripheral, are very little useful in treating phantom limb syndrome when they’re used in a classical way and limited only to the early postoperative period.

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postoperative period (first 3 days). Peripheral neural blockades, prolonged for the weeks after the amputation even after the hospital discharge in an outpatient setting, could represent the new solution to the still unsolved problem of phantom limb pain.

References:

6. CONTROVERSIES IN LIPID RESUSCITATION

G. Weinberg USA

Introduction: Despite its apparent success in a large number of case reports for a variety of drug overdoses, there remains a number of key questions regarding the efficacy and proper use of intravenous lipid emulsion (ILE) in treatment of local anesthetic systemic toxicity (LAST), and other lipophilic drug overdoses. These issues are divided into several major topics.

Mechanism: The original description of lipid resuscitation recognized several possible potential mechanisms for lipid reversal of bupivacaine toxicity. Though a partitioning effect or ‘lipid sink’ is now considered one of the major mechanisms of ILE, Weinberg et al. speculated in 1998 that a metabolic benefit of ILE might result from reversal of the inhibition by bupivacaine of fatty acid mitochondrial transport. Given that fatty acids are the heart’s preferred fuel under normal aerobic conditions, they postulated that this effect could contribute to bupivacaine-induced cardiac toxicity by rapidly shutting down the flow of fatty acid substrates into the mitochondrial matrix. If the inhibition is competitive, then flooding the cytoplasm with fatty acids during ILE could reverse this block, thereby reversing that component of the LAST-induced cardiac toxicity. Recent data from the Eghbali lab supports this hypothesis in experiments showing that inhibition of fatty acid beta oxidation reduces efficacy of ILE in bupivacaine-induced LAST. However, reports of ILE reversal of symptoms of CNS LAST argue against a purely metabolic effect since neural tissue does not normally depend on fatty acid metabolism to support oxidative phosphorylation. Moreover, recent case reports suggest that ILE can reverse clinical signs of toxicity caused by a wide-range of agents. It is doubtful that each of these chemically and pharmacologically diverse compounds exert identical, specific effects on mitochondrial metabolism, making a generic effect more likely. Given that every drug reversed by ILE to date is highly lipophilic, further credence is due a sequestering effect where partitioning of drug into the lipid bulk phase reduces tissue concentration at molecular sites of toxicity. Still further mechanisms are highly likely to be in effect and several will be discussed in greater detail, including direct cardiovascular effects, non-lipid dependent metabolic effects, and lipid signaling (non-metabolic) effects. Additional basic laboratory study will be required to identify all the mechanisms of ILE, and elucidate when, in what context and to what degree they each contribute.

Efficacy: Given that the only clinical evidence for ILE is from case reports, and that prospective, randomized clinical trials are neither ethical nor practical, it is entirely legitimate to question the current level of evidence available for it. However, two mitigating factors favor the validity of clinical benefit derived from ILE: animal data and systematic analysis. Laboratories using rodent and canine models of lipoid resuscitation have shown benefit of ILE in local anesthetic, calcium channel and tricyclic overdoses among others, in comparison to conventional therapy, including vasopressor therapy for LAST. However, several laboratories have failed to show a clear benefit when ILE is compared either to saline control or combination of pressors, epinephrine and vasopressin. Notably, the animal model in each of these negative studies was swine. While pigs are generally considered a good model for resuscitation due to similarities in coronary anatomy, it is possible that such a benefit does not extend to modeling toxic cardiomyopathy or ILE in particular. Several potential explanations will be presented to account for such apparent discrepancies in the various laboratory models of ILE. Jamaldin et al published a systematic analysis of successful case reports of ILE to date. They concluded that in aggregate the evidence in support of a beneficial effect of ILE in LAST was convincing and concluded that its use in that setting is appropriate. This interpretation of the data agrees with that of several professional societies, including AAGBI, ASRA and AHA that have come to the same conclusion. Nevertheless, the limits of ILE have not been sufficiently clarified and we must caution that it is not a panacea. Moreover, its use in treatment of other lipophilic drug overdoses while promising must also be subjected to careful scrutiny. It is likely that a robust comprehensive registry of ILE could aid in identifying the best conditions for its use.

Protocol and Timing: Among the key scientific priorities in this field is to identify an optimal regimen for lipid administration during ILE-based resuscitation. Currently the recommended protocol is based on data from...
laboratory models of bupivacaine-induced LAST and clinical experience and are incomplete since various delivery regimens have not been compared. In addition, if the contributions of the mechanisms underlying ILE were completely understood the efficacy of each regimen could be compared by mathematical modeling. An example of predictive modeling of a specific clinical event will be presented. Finally, there is the most common question clinicians ask regarding lipid infusion, “When should I use ILE during a toxic event”? There is currently no definitive answer, though views on this have evolved since the first case report of successful ILE by Rosenblatt et al in 2006. Early approaches were very conservative, recommending ILE as a last resort. Repeated success in a variety of clinical scenarios, especially LAST, have led to recommendations that ILE be considered much earlier in the toxic sequence. The current recommended protocol and its use in likely clinical scenarios will be presented.

References:

7 REFINEMENTS IN TECHNIQUES OF REGIONAL ANESTHESIA USING ULTRASOUND

S.H. Renes The Netherlands.

Nerve blocks have been used since the end of the 19th century: in 1885 Halsted blocked the brachial plexus with a solution of cocaine under direct surgical exposure. At present, regional anesthesia has become a well established technique of anesthesia and brachial plexus block has evolved into one of the most utilized regional anesthesia techniques. In 1978 ultrasound was first described in regional anesthesia to facilitate supraclavicular brachial plexus block performance. Since the last decade the use of ultrasound to visualize the nerves, the needle and the spread of local anesthetic has become increasingly popular in regional anesthesia.

In this ESRA Research Grant Lecture several refinements in techniques of regional anesthesia using ultrasound are presented.

Ultrasound-guided low-dose interscalene brachial plexus block reduces the incidence of hemidiaphragmatic paresis.


Interscalene brachial plexus block is associated with 100% incidence of hemidiaphragmatic paresis as a result of phrenic nerve block. In a prospective randomized controlled trial the incidence of hemidiaphragmatic paresis following ultrasound-guided interscalene brachial plexus block performed at the level of C7 root level was determined. Initial volume of ropivacaine 0.75% was 6 mL; block success or failure determined a 1-mL decrease or increase for the subsequent patient, respectively. A continuous infusion of ropivacaine 0.2% at a rate of 6 mL/hr was started 2 hrs after completion of surgery. Based on the results, the minimum effective volume of ropivacaine 0.75% associated with a significantly reduced in the incidence of hemidiaphragmatic paresis as a result of phrenic nerve block. In a prospective randomized controlled trial the incidence of hemidiaphragmatic paresis following ultrasound-guided interscalene brachial plexus block both using 10 mL of ropivacaine 0.75% was determined. Ven- tilatory function was significantly reduced in the nerve stimulation group compared to the ultrasound-guided group. None of the patients in the ultrasound group showed paresis of the hemidiaphragm (95% confidence interval 0.00 to 0.14), whereas in the nerve stimulation group paresis of the hemidiaphragm occurred in 53% of the patients. Based on the results, ultrasound-guided interscalene brachial plexus block using 20 mL ropivacaine 0.75% is not associated with hemidiaphragmatic paresis.

Ultrasound guided continuous phrenic nerve block for persistent hiccups.


Phrenic nerve block can be performed and repeated if necessary for persistent hiccups. An ultrasound-guided phrenic nerve block with catheter was performed in a patient with persistent postoperative hiccups. Injection of local anesthetic stopped the hiccups. After discontinuation of the infusion of local anesthetic, the hiccups recurred. Continuous infusion of the local anesthetic was restarted and after discontinuation 24 hrs later no further hiccups occurred. Ultrasound-guided phrenic nerve block with catheter is feasible and avoids repeated phrenic nerve block when hiccups reoccur.

In-plane ultrasound-guided thoracic paravertebral block: a preliminary report of 36 cases with radiological confirmation of catheter position.


In a prospective study the feasibility and success-rate of a transverse in-plane ultrasound-guided continuous thoracic paravertebral block was evaluated. Ultrasoundographically the transverse process of the thoracic vertebra and the rib were visualized where after an intercostal ultrasound view was obtained. An in-plane needle insertion approach from lateral to medial was used while spread of local anesthetic was observed. Block success-rate was 100%. In all patients correct radiologic thoracic paravertebral catheter position was confirmed. An in-plane transverse ultrasound-guided thoracic paravertebral block using the described technique is feasible and has a high success-rate.

Ipsilateral brachial plexus block and hemidiaphragmatic paresis as side-effect of high thoracic paravertebral block.


Two patients are described with an ipsilateral brachial plexus block and concomitant Horner syndrome after a high continuous thoracic paravertebral block at level T2-3. One patient also developed an ipsilateral hemidiaphragmatic paresis, an adverse effect not reported before. Radio- logic examination revealed a limited thoracic cephalad spread of the radio-opaque dye and a laterally ascending spread from the thoracic paravertebral space towards and around the brachial plexus. Brachial plexus block can occur by a route parallel to a nerve connecting the second intercostal nerve and the ventral ramus of T1 nerve, i.e. Kunz’s nerve. Hemidiaphragmatic paresis was attributed to ascending spread of local anesthetic towards the area where the phrenic nerve bypasses the subclavian artery and vein.
ULTRASOUND-GUIDED BILATERAL DUAL TRANSVERSUS ABDOMINIS PLANE BLOCK


Background and aims: The purpose of this abstract is to describe some characteristics of the bilateral dual transversus abdominis plane (BD-TAP) block. Some of these characteristics have already been published\(^1\), some new findings have been published for publication in other context\(^2\), or have been presented in part at the American Society of Regional Anesthesia and Pain Medicine (ASRA) congress, Las Vegas, May 2011. Finally, some data presented herein are preliminary in nature or will be presented at other venues at the European Society of Regional Anaesthesia (ESRA) congress, Dresden, September 2011\(^3\).

Methods: In one study, a cohort of twenty-five consecutive patients were assessed in the postoperative phase following major abdominal surgery, where the BD-TAP blocks were administered as escape treatment for pain in the post anaesthesia care unit (PACU)\(^4\). The BD-TAP block was considered only if the patients had abdominal painVAS ≥ 2, when other methods had failed or were contraindicated. The effect of the BD-TAP blocks on such postoperative pain management was recorded in this cohort study. Following this initial cohort, three subsequent randomized controlled trial (RCT) studies were conducted. These RCT studies included twelve, ten and eight healthy volunteers, respectively. All subjects were enrolled in the studies after responding to an announcement on a Danish website, designed for the recruitment of subjects to scientific studies. The first of these studies examined whether the BD-TAP block negatively affected the pulmonary function of the patients. We examined whether the application of a BD-TAP block would affect forced expiratory volume in 1 sec (FEV\(_1\)), forced vital capacity (FVC) and maximum expiratory pressure (MEP). The last two RCT studies describe (i) the temporal distribution of injected local anesthetic (LA) by quantifying and qualifying the spread of LA over time by magnetic resonance imaging (MRI) of the BD-TAP block and the classical TAP block, and (ii) the venous serum concentrations of ropivacaine in a six hour period following administration of a fixed volume of 60 ml of ropivacaine 0.375% (225 mg in total).

Results: Twenty-one patients (84%) did not require any i.v. opioids in the following 6 h. Sixteen patients (64%) were recruited in this initial cohort, three subsequent randomized controlled trial (RCT) studies included twelve, ten and eight healthy volunteers, respectively. All subjects were enrolled in the studies after responding to an announcement on a Danish website, designed for the recruitment of subjects to scientific studies. The first of these studies examined whether the BD-TAP block negatively affected the pulmonary function of the patients. We examined whether the application of a BD-TAP block would affect forced expiratory volume in 1 sec (FEV\(_1\)), forced vital capacity (FVC) and maximum expiratory pressure (MEP). The last two RCT studies describe (i) the temporal distribution of injected local anesthetic (LA) by quantifying and qualifying the spread of LA over time by magnetic resonance imaging (MRI) of the BD-TAP block and the classical TAP block, and (ii) the venous serum concentrations of ropivacaine in a six hour period following administration of a fixed volume of 60 ml of ropivacaine 0.375% (225 mg in total).

All patients and volunteers received the BD-TAP blocks in the PACU under standard monitoring. Blocks were performed under aseptic conditions using a SonoSite S-Nerve (SonoSite\(^4\)) apparatus, Bothell, WA, USA) apparatus and a linear high-frequency ultrasound transducer (6-13 MHz, HLX38) covered with a sterile sheath (Flexisoft\(^5\)). All blocks were applied using an in-plane technique in a medial to lateral direction at all four sites of injection. A 21-gauge, 90 mm long needle was used (Polymedic\(^6\)) ultrasound needle 30\(^\circ\) bevel, SAS, France).

Results: In the initial cohort study the 25 patients reported a reduction of their maximum pain at rest (VAS 0-10) from a mean of 8.2 (range, 6-10) to a mean of 2.2 (range, 0-6) (P< 0.001)\(^7\). Twenty-one patients (84%) did not require any i.v. opioids in the following 6 h. Sixteen patients (64%) were mobilized within 6 h following the blocks. In the RCT crossover study examining the effect of the BD-TAP block on the pulmonary function, we found that the block had no clinically or statistically significant influence on the pulmonary function as measured with FEV\(_1\), FVC and MEP\(^8\).

The majority of the primary results from the last two RCT studies employing MRI to visualize spread of LA over time and measuring s-ropivacaine levels are presented in more detail elsewhere at the ESRA congress, Dresden 2011\(^4\). However, the general trend when quantifying and qualifying the spread of LA over time can be visualized in Figure 2.

With the solitary large volume classical-TAP (30 ml) block it was evident that even after 6 hours duration the LA did not spread cephalad to the intercostal TAP plexus. Preliminary measurements on one of the typical MR images show that the distance between the most cephalad tip of the well-defined LA pool to the lateral border of the rectus abdominis muscle (where the apleonemus are formed) change from 5 cm at 30 minutes to 3 cm at 360 minutes following the block procedure. Further, on the other side of the abdomen where the unilateral dual TAP block was placed, the distance on the same MR image measured between the two pools of LA (high and low) change from 7.2 cm at 30 minutes to 2.7 cm at 360 minutes following the block procedure. Degree of dermatomes anesthetized in general confirmed this spread pattern. In addition, preliminary results analysing venous serum-ropivacaine levels following blocks with a fixed volume and amount of ropivacaine (60 ml of 0.375% = 225 mg) never exceeded the potential toxic level of 2.2 mg/l total ropivacaine\(^7\). Figure 3 depicts the exponential tendency curve calculated from the direct measured venous serum concentrations in one patient with a R\(^2\) value of 0.99, indicating an almost perfect fit to the expected pharmacokinetic model.

Conclusions: We conclude that the BD-TAP block may be a useful adjunct to the multimodal analgesia regime after abdominal surgery as rescue analgesia after failure of other methods. The particular timing of BD-TAP block placement and its use in elective surgery still remains an issue of debate. When placed preoperatively, the abdominal wall easily presents itself ultra-sonically, making blocks easy to perform, but the instilled injectate may be washed away by surgical incisions. Both arguments may reduce the duration of effective postoperative analgesia. Placing the blocks postoperatively, however, may be more technically difficult because of oedema and abdominal wall disruptions, again affecting block efficiency adversely.
The rectus abdominis, external and internal oblique and transversus abdominis muscles are the most important accessory expiratory muscles and mainly active in forced expiration. Our studies have also led us to conclude that, in a selected population, the collated effects on the abdominal wall muscles of a BD-TAP block (in theory anaesthetizing all the thoracolumbar nerves from Th6 to L1) did not have a measurable adverse effect on pulmonary function, as assessed by FEV1, FVC and MEP. Future studies should investigate if these encouraging results are reproducible in patients with limited pulmonary function.

There has been some controversy as to how effective the various forms of TAP blocks have been to provide complete analgesic coverage of the abdominal wall. Our novel studies quantifying and qualifying the spread of LA over time by MRI of the BD-TAP block and the classical TAP block seem to support the need to anaesthetize both the upper intercostal TAP plexus (Th6-Th9) and the lower classical TAP plexus (Th10-Th12). Even with a large volume classical lower TAP block (30 ml) the LA did not spread cephad to the intercostal TAP plexus after 6 hours. On the other hand, with the administration of a unilateral dual TAP block (a combination of a medial intercostal TAP block (15 ml) and a classical lower TAP block (15 ml)) we could image a marked distribution of LA both at the intercostal TAP plexus and at the lower classical TAP plexus. Degree of dermatomes anaesthetized confirm this spread pattern.

Finally, none of our patients or volunteers experienced any adverse toxic side effects from the administration of the LA in the abdominal wall. We conclude that serum concentrations of ropivacaine following the administration of a total of 225 mg in our preliminary analyses did not reach toxic levels during a 6-hour trial. However, other studies have recently found that TAP blocks using 3 mg/kg ropivacaine produce venous plasma concentrations that are potentially neurotoxic. This difference may in part be explained by a more heterogeneous population of patients in terms of age, abdominal wall anatomy and sex than our study in healthy male volunteers. Nevertheless, more studies are needed in this crucial area concerning patient safety.

References:
8. Why does a US-guided TAP block not work? R. Blanco, T. Parras Maldonado Spain. Ultrasound (US) guidance for nerve localization during peripheral nerve blockade has gained considerable popularity worldwide. Much of this popularity is attributable to several important advantages of real-time sonographic visualization compared with traditional nerve localization techniques. The transversus abdominis plane (TAP) block is a technique of locoregional anesthesia recently introduced to control the postoperative pain of procedures that involve incisions of the anterior abdominal wall.

A substantial component of the pain experienced by patients after abdominal surgery is derived from the abdominal wall incision. The abdominal wall consists of three muscle layers, the external oblique, the internal oblique, and the transversus abdominis, and their associated fascial sheaths. The central abdominal wall also includes the rectus abdominis muscles and its associated fascial sheath. The TAP block blocks the sensorial afferent nerves localized between the transversus abdominis muscle and the internal oblique muscle. The local anaesthetic is delivered blindly or under direct visualization in this plane. This plane contains the thoracolumbar nerves originating from T6 to L1 spinal roots which supply sensation to the anterolateral abdominal wall.

Data obtained after different types of surgical operations 1-5 show to be effective in reducing morphine consumption (reducing the side effects from it) and improving postoperative pain relief in several clinical settings. The TAP block is comparable to morphine for postoperative analgesia. The TAP block reduces the requirement of postoperative opioid use, increases time to first request for further analgesia, provides more effective pain relief, and reduces opioid-associated side effects.

The TAP block was first described in 1993 for the management of surgical abdominal pain, but TAP blocks were formally documented by Raffi in 2001. Since then several anatomical approaches to the TAP have been described. The technique was initially described using a blind approach in the flank, via the iliolumbar triangle of Petit, bounded inferiorly by the iliac crest, posteriorly by the latisimus dorsi, and anteriorly by the external oblique muscles. The blunt technique uses a double-loss of resistance as the needle is advanced through the external and internal oblique fascia layers. A single-pop technique through the Triangle of Petit highlighting entrance into the plane. A second pop is felt when the needle passes through the transversus abdominis muscle. Although it is not yet clear as to what the actual spread of the block is. As with all blind approaches to regional anesthesia, the TAP block relies on imprecise endpoints; namely two pops felt as the needle traverses both the external and internal oblique muscles. This “double pop” technique has been validated in cadaveric, radiological, and clinical studies. Failure to recognize these pops may result in needle advancement deep to the transversus abdominis muscle and into the peritoneal cavity.

Since then, ultrasound-guided approaches have been described. The standard or “posterior” approach involves injecting local anaesthetic into the TAP midway between the iliac crest and the costal margin, typically depositing local anaesthetic between the anterior and middle axillary lines. Studies in cadavers and healthy volunteers suggest that a 20 ml solution spreads from the iliac crest to the costal margin and ensures a complete sensory blockade of the abdominal wall. However, others cadaveric studies, involving the ultrasound-guided injection 20 ml of aniline have suggested that the T10-L1 nerve roots can be reliably blocked using the technique.

More recently, a “subcostal” injection has been described, in which local anaesthetic is delivered into the same anatomical plane, but using an insertion point near the xiphoid process, and a needle path parallel to the costal margin. This subcostal approach may have a better effect on higher incisions, but it does extend down to the pubis with occasional sparing of L1 in some patients. It has been proposed that this approach offers superior analgesia for incisions superior to the umbilicus.
Although this technique is apparently safe, it may be difficult, especially in obese patients because of failure to identify the landmark of the triangle of Petit. Anterior abdominal wall identification of the needle TAP block may be generally safe, but complications may occur such as liver trauma in those with hepatomegaly. Thus, despite the initial description of the block using the blind technique, it appears prudent to recommend the use of ultrasonography to make a more precise and safer approach.

Ultrasonic guidance facilitates visualization of the three muscle layers of the anterior abdominal wall, identification of the transversus abdominis fascial plane and intraperitoneal cavity, this means it facilitates the detection of structures best avoided during TAP block such as the peritoneum, intrabdominal organs, and the twelfth rib. The block needle can be reliably placed in the correct plane under direct vision, apart from that injectate spread within the plane can be observed.

Some reasons TAP block could fail are for example obesity, performance of the TAP block requires visualization of muscle layers of the abdominal wall, and obesity is likely to increase the technical challenges in performing the block. Patient age is a recognized predictor of opioid requirements, pain after intra-abdominal surgery is caused in part by the incision (parietal pain) and in part from trauma to intra-abdominal structures (visceral pain). While a neuraxial technique has the potential to provide analgesia for both sources of pain, abdominal wall field block techniques can only treat the parietal component of postoperative pain, leaving visceral pain to be treated by other means. Their incisions extended above the umbilicus to facilitate surgical access. The TAP block via the standard flank approach is recognized not to be effective above the umbilicus. It is possible that larger volumes of more dilute local anaesthetics may provide more cephalad spread. Alternatively, the use of subcostal TAP blocks with or without standard TAP blocks may be effective.

It has been identified 23 randomized controlled trials, including 1674 patients, that compared US guidance with and without peripheral nerve stimulation with peripheral nerve stimulation alone or anatomical landmark techniques. It was evaluated pain severity, sensory block, opioid consumption, and time to first analgesic request. We uncovered no significant differences between US guidance and traditional nerve localization techniques for any other related outcome. US guidance was not found to be inferior compared with traditional nerve localization techniques for any outcome.

Among the most promising of these emerging trends is US-guided transversus abdominis plane (TAP) blocks for analgesia in lower abdominal procedures including obstetric, gynecologic, and general surgery procedures. A number of studies have already demonstrated a significant reduction in acute pain in favor of TAP blocks compared with systemic or neuraxial opioids after caesarean delivery, open appendectomy, and laparoscopic cholecystectomy. However, no study has compared real-time US-guided infiltration of the transversus abdominis fascial plane to the traditional blind landmark approach.

An early meta-analysis showed a significant difference in the time before morphine was first requested and amount of opioid consumed; it is consistent with the individual studies after abdominal surgery and laparoscopic cholecystectomy. There was also a statistically significant lower pain score among the TAP block group at 6 hours postoperatively. At all other time points documented, no statistical significance was found, differing from earlier randomized studies that documented a more favorable outcome among the TAP groups in patients undergoing total abdominal hysterectomy and after cesarean delivery.

Factor et al. analyzed the paper by Costello in which they conclude that TAP block does not improve post-caesarean delivery analgesia when used as part of a multimodal analgesic regimen. It has been shown fluid distension between the internal oblique muscle and a fascial layer overlying the transversus abdominis muscle. However, Rozen et al. have demonstrated in a cadaver study that the nerves supplying the anterior abdominal wall lie deep to the fascia between the internal oblique and the transversus abdominis muscles. It therefore seems that Costello, may have deposited the local anesthetic in the wrong location, that is, above, and not below this fascial plane. Primary failure, rather than lack of clinical efficacy, may therefore account for their results. Future studies evaluating the TAP block should incorporate an objective assessment of block success.

It has been performed a randomized placebo-controlled trial comparing bilateral ultrasound-guided TAP blocks (2 x 20 mL 0.5% ropivacaine or 0.9% saline) in adult female patients undergoing midline laparotomy for known or presumed gynecological malignancy. In this study, they were unable to demonstrate a statistically significant improvement in any of our prespecified outcome criteria in patients given TAP blocks via a standard posterior approach in addition to optimal multimodal analgesia. This suggests that multimodal analgesia strategies (with or without abdominal wall local anesthesia) may not be sufficient to provide excellent pain control after extensive intra-abdominal surgery.

The extent of dermatomal block post transversus abdominis plane block is described in adults as T7-L1; other authors argue extent above T10 is infrequent. A paediatric guideline recommends this block for upper and lower abdominal surgery using 0.2 mL/kg. Ultrasound-guided transversus abdominis plane blocks performed by supra-iliac approach and novice operators produced lower abdominal sensory blockade in children of usually 3 to 4 dermatomes, and should be offered for lower abdominal surgery only, as only 25% had upper abdominal block extension. The optimal local anesthetic dose/volume, duration of effect and utility for these blocks in relation to peripheral and neuraxial blockade needs clarification.

Conclusions: Potential advantages include that it is a simple and effective analgesic technique, appropriate for surgical procedures where parietal pain is a significant component of postoperative pain. For surgical procedures that induce both parietal and visceral pain, other techniques could be more appropriate such as local anesthetic instillation combined with infiltration. There is insufficient evidence at this time to define the effects of US guidance compared with traditional nerve localization techniques on acute pain and related outcomes for interventional acute pain management. Further studies are required to determine whether the procedural and technical efficiencies afforded by US guidance will ever translate into measurable improvements in acute pain outcomes.

It has been proposed that larger studies, particularly those comparing the technique with alternatives such as wound catheters, neuraxial techniques, and wound infiltration are required to further elucidate the role of TAP blocks. A further important point is that direct comparison with gold standard analgesic techniques for each surgical procedure has not yet been performed.

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11 LOW DOSE SPINAL ANESTHESIA FOR CESAREAN SECTION TO PREVENT SPINAL INDUCED HYPOTENSION

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Spinal induced hypotension is a common problem during Caesarean delivery. It can cause serious maternal and foetal morbidity. Various strategies to prevent hypotension are only partially successful. The present review will focus on the usefulness and efficacy of low dose spinal anaesthesia to prevent maternal hypotension while maintaining good anaesthetic conditions. The Caesarean section rate increases (1). Spinal anaesthesia is the anaesthetic technique of choice in elective and unplanned situations (1). Spinal induced hypotension remains the most important side effect occurring in 20 to 100 % of women (2,3,4). Hypotension causes maternal discomfort (nausea and vomiting) (2) and impairs utero-placental perfusion, resulting in foetal acidemia (5,6). The severity and duration of the hypotensive episode determines the extent of the fetal acidemia (7). Various strategies have been described to prevent hypotension: left uterine displacement, prophylactic IV fluid loading using both crystalloids and colloids, maternal leg wrapping and prophylactic ephedrine or phenylephrine infusions. Unfortunately, despite these strategies, spinal induced hypotension remains a common problem in patients undergoing Caesarean delivery (2,3,8-15). A recent meta-analysis showed that none of these interventions have been shown to eliminate the need to treat maternal hypotension during spinal anaesthesia (16). Furthermore, prophylactic management has side effects such as iatrogenic pulmonary oedema reactive hypertension and prophylactic beta sympathomimetic induced foetal acidosis (15,17). Apart from reflex bradycardia, phenylephrine can cause maternal arrhythmias. Lai et al. recently described a case of ventricular bigeminy seconds after starting a phenylephrine infusion, which reverted spontaneously to sinus rhythm when the phenylephrine infusion was stopped (18).

There is some evidence available in the literature indicating that reducing the spinal dose of bupivacaine can produce effective anaesthesia with less haemodynamic side-effects. The present review will put this evidence into perspective.

Haemodynamic effects of low dose spinal anaesthesia.

Fan et al. evaluated the effects of different spinal doses of bupivacaine (20). A CSE was performed in 80 healthy, term parturients who underwent elective Caesarean deliveries. All patients received 1000 ml of Ringers solution. Patients were randomized to 4 groups of intrathecal hyperbaric bupivacaine with varying dose: group A received 2.5 mg, group B 5 mg, group C 7.5 mg and group D 10 mg. An epidural catheter was then inserted into the epidural space. If after 15 minutes a block to pinprick to level T4 was not reached additional epidural local anaesthetic was administered. Hypotension was defined as a systolic blood pressure (SBP) below 90 mmHg or a 30% decrease in SBP from baseline. If hypotension occurred ephedrine was administered per 5 or 10 mg intravenously. Very little hypotension was observed in groups A and B, while the incidence of hypotension was 35% in group C and 50% in group D. Significantly less ephedrine was required in groups A, B and C as compared to group D. The incidence of nausea and vomiting was higher in the patients treated with 7.5 and 10 mg of bupivacaine. There was also more maternal dyspnea in the group treated with 10 mg bupivacaine.

Ben David et al. randomised 32 patients to two study groups: In one group isobaric bupivacaine 10 mg was intrathecally administered; in the second group 1 mg of isobaric bupivacaine was given intrathecally combined with 25 microgram of fentanyl (20). Hypotension was defined as a decrease of SBP below 95 mmHg or a 25% decrease from baseline. If hypotension occurred boluses of 5 mg ephedrine were given. In all patients good quality anaesthesia was noted, although some patients in the 5 mg group noted some discomfort at the time of delivery. However, the only reason for complaint and not being fully satisfied with anaesthesia was nausea and vomiting which only occurred in the 10 mg group. The incidence of nausea and vomiting, the incidence of hypotension and the average dose of ephedrine required to treat hypotension were also much higher in the bupivacaine 10 mg group as compared to 5 mg bupivacaine combined with fentanyl.

Vercauteren and co-workers published three trials in which they evaluated the incidence of hypotension following CSE anaesthesia with 6.6 mg of hyperbaric bupivacaine and 3.3 microgram sufentanil (21,22,23). CSE was performed with the patients sitting. All patients received 5 mg of prophylactic ephedrine, 1000 ml of Ringer’s solution and 500 ml of hydroxyethylstarch solution prior to spinal anaesthesia. Hypotension was defined as a SBP < 90 mmHg. Hypotension occurred for both studies combined in only 8 out of 102 patients (8%). This is probably the lowest incidence reported by any previous author. The same group recently compared low dose CSE anaesthesia with plain levobupivacaine, bupivacaine and ropivacaine, all three combined with sufentanil and confirmed that low dose CSE anaesthesia is able to preserve maternal haemodynamics in most women (24).

More recently, Choi et al. compared single shot spinal anaesthesia, using 9 mg of hyperbaric bupivacaine with 20 microgram of fentanyl, with CSE anaesthesia using 6 mg hyperbaric bupivacaine with 20 microgram fentanyl intrathecally (25). Prophylactic Ringer’s solution was given intravenously. Hypotension was defined as a systolic blood pressure decrease of more than 20% from baseline or a decrease below 95 mmHg. Hypotension was treated with ephedrine. Significantly more patients in the high dose spinal group experienced hypotension and this resulted in a significantly higher proportion of patients in nausea and vomiting.

At our institution, we also performed a randomised comparison of patients treated with CSE using either 6.5 or 9.5 mg of hyperbaric bupiva-caine combined in both groups with 2.5 microgram of sufentanil (26). Patients in the 9.5 mg group experienced more pronounced and longer hypotensive periods as compared to the 6.5 mg group. The mean lowest recorded systolic pressure was higher in the 6.5 mg group (102 ± 16 vs 88 ± 16 in the 9.5 mg group; p < 0.05). More patients in the 9.5 mg group experienced hypotension compared to the 6.5 mg group (68% vs 16%, p < 0.05). In the 9.5 mg group 15 patients required pharmacological treatment for hypotension, compared to 5 in the 6.5 mg group.

Chen et al performed a dose-response study of spinal hyperbaric ropi-vacaine in 60 parturients scheduled for elective Caesarean section (27). The patients were randomized to four groups and received intrathecally, using a CSE technique, 10.5, 12.15 or 15 mg of hyperbaric ropivacaine following a...
fluid load with 1000 mL of Ringer's lactate solution. The rate of hypotension was significantly correlated to the dose of ropivacaine. McNaught et al. evaluated the effect of ultra-low dose spinal anaesthesia as part of a combined spinal-epidural technique for elective Caesarean deliveries (28). Forty-four women were randomized in a double-blinded trial to 2 groups. The first group received intrathecal hyperbaric bupivacaine 3.75 mg in combination with 25 mcg fentanyl, 0.1 mg morphine and an epidural test dose of 3 ml lidocaine 1.5%. The second group received 9 mg of hyperbaric bupivacaine with the same adjuvants and test dose. Hypotension was defined as a systolic pressure < 80% of baseline and was treated with boluses of 5 mg of ephedrine IV. The haemodynamic parameters and block profile were measured every 2.5 minutes until delivery of the baby and every 5 minutes thereafter until the end of surgery. There was significantly less hypotension in the low-dose group with less ephedrine use and faster motor recovery. The same authors reported four cases of Caesarean section in severe preclampsia using low dose CSE anaesthesia with stable maternal haemodynamics (29). Kaya et al studied the combined effect of low-dose spinal bupivacaine with or without colloid preload or wrapping of legs to normal dose spinal bupivacaine on reduction of maternal hypotension during Caesarean section (30). They randomised 120 patients into 4 groups. The first group received 10 mg of bupivacaine intrathecally with 500 ml of Ringer's lactate. The second group received a low dose spinal with 4 mg of bupivacaine plus 25 mcg of fentanyl and 500 ml of Ringer's lactate solution. The third group received the same low dose spinal with 500 ml hyperbaric bupivacaine and the fourth group received low dose spinal with colloid preloading and wrapping of the lower extremities. Hypotension was reduced from group one to four from 26% to 70, 47 and 23% respectively. Low-dose spinal therefore reduced hypotension and this was further reduced by colloid preloading and leg wrapping. Recently, Ghazi and Raja published a letter on their experience with low dose CSE and concluded that the incidence of maternal hypotension and the need for vasoressors was reduced in women undergoing operative delivery (31). Langesaeter et al. published an excellent trial measuring not only invasive blood pressures, but also cardiac output in women undergoing CSE anaesthesia with a high (10 mg) or a low (7.5 mg) dose of hyperbaric bupivacaine combined with sufentanil. The best hemodynamic profile was recorded in the low dose CSE treated patients (32). McNaught and Stocks recently published a review on the topic of low dose spinal anaesthesia and epidural volume extension (33). They concluded that epidural saline can extend a spinal block. They also found that the CSE technique itself results in a higher sensory level of the block. This is explained by a change in epidural pressure when the epidural space is identified with the Tuohy needle, as negative epidural pressure is neutralised by the open connection to atmospheric pressure resulting in a reduction in dural sac volume, similar to injection of fluid. These authors concluded that low dose spinal anaesthesia is effective in reducing maternal haemodynamic instability. It seems clear from these trials that hypotension occurs less frequent, is less severe and requires less pharmacological treatment when lower spinal doses are administered intrathecally as compared to higher, more generally accepted doses.

Quality of anaesthesia. Many anaesthetists would worry that lowering the spinal dose would reduce the quality of anaesthesia and increase the incidence of pain during Caesarean section (34). Indeed Fan et al. and Ben-David et al. reported more breakthrough pain with bupivacaine doses of 5 mg or less (19,20). However, Vercauteren et al. and Choi et al. using between 6 and 7 mg of bupivacaine combined with opioids, reported excellent anaesthetic conditions (21,22,23,25). However, these authors used a CSE technique and could give epidural top-ups if required or they could anticipate pain if surgery was unexpectedly prolonged. In their review of the literature, McNaught and Stocks did conclude that the technique of using low intrathecal doses has an increased risk of intra-operative pain, shorter duration of effective anaesthesia with a slower onset (33).

In our trial, epidural supplementation was required in approximately 20% of patients treated with 6.5 mg bupivacaine versus only 8% in patients treated with 9.5 mg bupivacaine (26). If additional epidural anaesthesia was required this only occurred if surgery was prolonged after 60 minutes from the start of the spinal injection. Since we are using low spinal doses (5.5 - 6.5 mg bupivacaine with sufentanil) routinely as part of a CSE technique, we now know that if the uterus is not closed approximately 45 minutes after start of the CSE, epidural supplementation will be required and an epidural top-up (5 - 8 ml of bupivacaine 0.75% with sufentanil) is given prophylactically. We only very rarely have to supplement the initial spinal dose with epidural local anaesthetic within one hour of the spinal injection. We also very rarely observe complete motor block. Indeed many authors report on faster motor recovery (25, 33).

We recently evaluated the use of low dose CSE (~ 7 mg hyperbaric bupivacaine with sufentanil 2 µg) in routine clinical practice in our teaching hospital. Pain and discomfort occurred in approximately 10% of patients which is a similar incidence as with normal dose spinal anaesthesia where Kinsella reported a 6% spinal anaesthesia failure rate (35,36).

Conclusion: It is clear from prospective trials that lowering the spinal dose improves maternal haemodynamic stability. Doses of intrathecal bupivacaine between 5 and 7 mg are sufficient to provide effective anaesthesia. However complete motor block is seldom achieved and adequate anaesthesia is limited in time. As a result an epidural back-up catheter is a must. In my clinical practice, experience learns us that a dose between 5.5 and 6.5 mg combined with opioids provides reliable anaesthesia from start of the spinal injection for 60 - 70 minutes. If the uterus is not closed after 45 minutes an epidural top-up is given to prevent breakthrough pain.

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12. LOOKING FOR THE DEVELOPMENT OF PARESTHESIAS IN THE SUBARACHNOID AND EPIDURAL ANAESTHESIA. A CLINICAL AND ANATOMICAL ANALYSIS

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Background and aims: When we do neuroaxial anesthetic blocks it is frequent to contact and in some cases to cause some trauma to the axons with the tip of the needle. This initiates depolarization of the axons that the patient describes as electric shocks in the dermatomes innervated. We call these paresthesias.

In this article we describe the origin and consequences of paresthesias and we discuss changes in the technique that might reduce the incidence.

Introduction: The contact of a needle tip with a nerve is enough stimuli to trigger a response, a mechanical paresthesia (1-2). It is not clear if the trauma only leads to a sensory excitation or if it is able to induce also a motor response. Neither is it known which axons are activated to spread the stimulus that the patient describes as paresthesia. One author pointed at the nervi nervorum, but this hypothesis has little support, since the nervi nervorum are unmynelinated afferent fibers with a slow conducting speed and we expect a fast transmission in a mechanical paresthesia (3).

The paresthesia begins with a mechanical stimulus along the axon. The disruption of the axon's membrane can cause an excitatory stimulus due to the ionic changes produced by the altered barrier that maintains the concentrations on both sides of the plasmolema (3). However, this mechanism was poorly considered by Hogan (3). He thinks that paresthesias can be initiated without any damage. It is possible by contacting a motor nerve root without being aware of the trauma. In this case, the patient would not notice a paresthesia or even a motor response, due to the fact that an insufficient number of muscle fibers were activated to induce a muscle movement (3). The electrophysiological mechanisms involved in a paresthesia caused by a needle trauma have been little studied. With electromyography, action potentials can be registered and analyzed in nerves stimulated with a needle tip: bursts of action potentials of different intensity and duration, depending on the degree of lesion. On the other hand, the chronic paresthesia that persists after nerve damage has been described extensively.

A paresthesia is a response to an abnormal pattern of activity with ectopic impulses generated from asynchronous discharges of high frequency bursts in different sensorial units, resulting in an abnormal perception (4). The source of this ectopic activity is located at the centre of the fibers, where in normal physiological conditions action potentials are not generated (5). In normal conditions, the nodal region is responsible for the transmission of the action potentials, whereas the internodal region determines the membrane action potential.

The mechanisms responsible for the action potentials (6-7) can be resumed in two:

1. Activation of persistent Na+ channels. These channels are activated by membrane potentials more hyperpolarized than those of inactivated Na+ channels (by approximately 15 mV). They remain active or with slow
inactivation, enough to result in Na+ currents to cause an unstable membrane and to initiate repeated action potentials.

2. Activation of regenerative K+ currents. These currents occur at inter-

nodal regions, as response to a state of hyperpolarisation and tend to stabilize the membrane (8-9).

The abnormal activation of these currents in a normal nerve could be responsible for chronic paresthesias caused by a previous trauma or lesion followed by an ischemic phenomenon (10-11). This results in bursts of high frequency action potentials in regions where previously was impossible to occur.

Paresthesias in subarachnoid anesthesia: We obtain paresthesias frequently when we do a lumbar puncture either with diagnostic, therapeutic or anesthetic purposes. The incidence varies between 4.5 and 18% according to different factors (12-13), although this is difficult to assess because most of the times is not reflected in the clinical history. For the same reason, it is difficult to know the consequences of these paresthesias, because patients do not have usually a follow up after discharge. Systematic electrophysiological studies in these patients after discharge would help to assess the consequences, and although in some cases are performed, it is not standard procedure, since it is not indicated.

Another approach to this problem is by reviewing cases of patients who had a lumbar puncture and present paresthesias and neurological deficits, in a Hospital and during a determined period. This number varies between 0.3 and 1.7 / 1.000 according to two studies (14-15). However, considering that complications are infrequently published, this number is lower that the real incidence.

Looking at retrospective studies, particularly in cases of multicenter studies with a large number of anesthesiologists involved, paresthesias are usually underestimated and despite the high incidence, they are not considered potentially harmful and therefore are not included in the clinical history.

Phillips (16) in 1969 found paresthesias in 93 cases of a total of 10,440 spinal anesthetics (0.9%). Horlocker (15) in 1997 described the occurrence of paresthesias in 298 patients from 4,767 of spinal anesthesia (6.3%) with 4 patients who presented persistent paresthesias. Horlocker postulated for the first time in 1997 the statistical association between paresthesia and neurological deficit. Auroy (17) also in 1997 and after review of 40,640 cases who had spinal anesthesia, found 19 radiculopathies, 12 of which had paresthesia during the lumbar puncture and 2 cases experienced pain during the injection of local anesthetic.

Neurological deficits after subarachnoid anesthesia occur not only from direct trauma to de nerves but also from intraneural administration of the local anesthetic (18-19). Other factors that may contribute are spinal cord ischemia, injection of wrong medication with neurotoxic effects or formation of hematomas in the cauda equina.

Origin of paresthesias: The majority of paresthesias are caused by puncture to the nerves of the cauda equina, rather than by inadverted injection within the conus medullaris (18).

A lumbar puncture should be done below the level of the conus medullaris (20). The problem to consider is the variability in the lower limit of the conus within the spinal canal. On the other hand, the line between both iliac crests, also called Tuffier’s line, does not correspond to a fixed point at lumbar level (21-22). When this line is used to do an epidural or spinal puncture, there could be an error up to one vertebral level that added to the individual variability of the position of the conus medullaris, it is possible to do an inadvertent puncture to the conus medullaris, if the chosen level was L2-L3.

If the paresthesia is due to a trauma, the consequence varies depending on the size of needle, type of tip of needle and how deep enters within the nerve root. Probably the damage is greater when the roots are tense or when the needle is introduced careless, but since we can not see the structures inside the spinal canal, it is nor possible to determine how big are the nerves that we touch. With 25 G needles or even smaller sizes the nerve penetration is possible (23). However this possibility is not easy to occur “in vivo”, unless there is some tension on the nerves due to the hyperflexion of vertebrae or in the case of a nerve root puncture next to the foraminal orifice, where there is little space to displace the nerve. This latter option is possible when the nerve is directed laterally in the dural sac and advanced to the antero-lateral space where the nerve roots are located.

It is difficult to pierce a nerve root “in vivo”. These tend to move aside when the needle is advanced slowly and carefully.

Morphology and distribution of nerve roots: At the cauda equine level the diameter of nerve roots varies between 0.5 and 2.3 mm.

Posterior roots are bigger than anterior roots (23). The size of anterior roots increase from 1.1 to 1.8 mm at lumbar level, and decrease from 1.9 to 0.5 mm in the sacral region. Posterior nerve roots at lumbar level have a diameter of 1.3 to 2.1 mm and in the sacral region 2.3 to 1 mm. It is al L2-S1 where the nerves reach the biggest size (23).

Axes are organized in bundles that remind the fascicles of peripheral nerves, although they are not fascicles, but grouped axon not separated by perineural cells (23). The total amount of myelinic axons within the nerve root may vary between 4,500 and 7,900 axons.
follows a pattern (18-19, 27). This depends on the location of the intervertebral foramina and the distance among them.

Motor and sensorial nerve roots, are independent structures with a macroscopic origin at the nerve roots, from 7 to 8, coming out the posterior-lateral region of the spinal cord in case of sensorial roots and from 4 to 6 located anterior-lateral in case of the anterior roots. When they leave the spinal cord or the conus medullaris they run together, although independently until reaching the internal orifice of the dural sac, located anterior-laterally. The motor and sensorial roots are centrally located distal to the conus medullaris.

When we analyze histological sections of the dural sac at different levels, from the second lumbar level down, a nerve root runs progressively more laterally within the dural sac (24-26). The location of nerve roots is more anterior-lateral as they get closer to the exit in the internal orifice of dural sac.

At lumbar level, the trabecular arachnoid contributes to keep the different nerve roots together (28-30) allowing some displacement with different changes in position of the patient (31-32).

When we analyze each vertebral level with anatomic sections or by MRI images, some nerve roots present greater possibility to cause paresthesias than others. It is more likely to contact nerves in the posterior part of the dural sac with the needle tip and the nerves that can be reached by the needle at every vertebral level change as they modify their position from L2 to L5.

When we do a lumbar puncture, the needle enters the dural sac and crosses some millimetres without the presence of nerve roots. As we advance it, we can contact the nerves in the posterior aspect of the dural sac that would correspond to centrally located nerves if the needle follows a sagittal plane or more lateral nerves if the needle is diverted from the sagittal plane. In patients without pathology of the spine, paresthesias may appear due to the inadequate position of the patient, usually associated with some rotation of the spinal column (19).

Also, as the needle crosses different tissues, the tip can be deflected. The use of introducers decreases this deflection (33-35). This deflection is greater in case of bevelled needles compared to needles with pencil tip and in needles with smaller diameter. Bevelled needles of 22G or 25G could be deflected 1 mm for every cm of tissue that they cross. In case of combined epidural-subarachnoid technique the deflection is reduced due to the use of a Tuohy needle.

In patients with spine pathology, there is a greater chance to cause paresthesias. In case of scoliosis there is some rotation of vertebral bodies. In these patients, a puncture perpendicular to the skin plane can direct the needle to the lateral part of the dural sac, possibly causing paresthesias (36).

The MRI helps to observe how the flexion of the spinal column associated to the loss of the lumbar lordosis causes anterior displacement and strain of the roots of the cauda equina.

Paresthesias can be referred to right or left lower legs or the perineal region. Phillips (16) described 71 cases of paresthesias in the right leg, 16 in the left and 6 in the perineum.

The paresthesia is very unpleasant for the patient and it is recommended to be avoided, mainly because the possible consequences.

Reconstruction of MRI images: We constructed 3D images of the cauda equina with MRI to verify their position within the spinal canal. With this technique we can see which roots are exposed to the trauma by the needle tip during a lumbar puncture at each vertebral level (37-38).

With this program, we can rotate the image and looking at different angles we can see which approach is the best to decrease the possibility of nerve damage when doing a lumbar puncture, at a sagittal plane (classical medial approach) or paramedial approach (oblique plane).

Axons, intra-radicular vessels and intraneural injections: It is difficult to determine the number of axons injured, separated or ripped by the needle tip when we reach them. Most of then are affected by compression and less frequently by cutting or sectioning.

Since there are vessels (small capillaries, arteries or veins) inside and at the surface of the nerve roots, we have to consider that a trauma can cause intraneural haematomas. The process of reabsorption, inflammatory cascade and repair can determine the presence of local fibrosis and therefore alteration of conduction in some axons.

The size of the needle, its tip and lateral or distal orifice are important not only to cause a lesion but also to avoid injection of medication inside the nerve. With needles 22G to 27G is difficult to do an intraneural injection. However, it is possible with a 29G needle.

Position during the lumbar puncture: It is necessary to consider the anatomic details related to the location of nerve roots within the dural sac when doing a lumbar puncture in the different positions, trying to direct the needle to the area where the is less chance to find nerve roots.
We usually do the technique in the sitting or lateral decubitus position. The sitting position is easier, since we avoid rotation of the spine as may occur in the lateral position (39-40).

In patients with scoliosis or in those inter hips distance, greater than the distance between shoulders, it is also possible an inadvertent rotation of the spine, especially in the lateral decubitus position. Patients predisposed to vagal reactions do better in the lateral position.

In the sitting position we cause paresthesias less frequently compared to the lateral decubitus and further less when the feet are placed on a high stool, with flexed knees. This position determines an anterior displacement of the roots within the dural sac leaving a greater posterior space to introduce the needle.

Paresthesias and transient radicular irritation syndrome: It is possible to cause other problems apart from paresthesias when injecting medication if we do not withdraw the needle 2 to 3 mm. The trabecular arachnoid forms covers around nerve roots (28-30).

Injection of local anesthetic inside the covers can cause a delay in the distribution of the liquid and therefore it is possible that nerves are exposed to a higher concentration of local anesthetic for several minutes, longer than usual (6,7).

Paresthesias with the epidural technique: The consequences of paresthesias are different if the trauma with the needle is produced on nerve roots inside the dural sac compared to the damage of motor or sensorial roots when they are grouped in the dural cuff.

From the clinical point of view, the first situation is associated with some CSF leakage, whereas the second is not. Nerve roots inside the dural sac have a diameter of 0.5 to 1 mm and nerve roots in the dural cuff form a group with a thickness of 6 to 8 mm. Nerve roots inside the dural sac have more mobility; however, the displacement inside the dural cuff is limited. Paresthesias on the dural cuff can be caused by deflection of the epidural or spinal needles on the lateral epidual space or simply because rotation of the spine.

Nerve roots inside the dural cuff, motor and sensorial, are surrounded by adipose cells (41-42). Considering the size of the dural cuff and its limited mobility it is easy to understand that a paresthesia on this structure could be more harmful.

It is also easier to do an intraneural injection within the dural cuff with all types of needles.

Conclusions: With the aim to reduce the presence of paresthesias, intradural blocks should be done at the more caudal level possible depending on the type of surgery.

Considering the distribution of nerve roots in the dural sac there is a higher probability to cause a trauma to the roots at L2-L3 vertebral level and a lower chance at L5-S1 level. Also the probability is higher if the needle advances in the lateral position of the dural sac and lower in the medial plane.

In case of patients with acute rotation of the spine or scoliosis, it would be convenient having an x-ray of the spine to identify the angle and plane of entry. The higher we do the injection, the more probability to cause paresthesias.

In patients under general anesthesia, as is the case of pediatric patients, it is a subject of great controversy, since the presence of paresthesias is difficult to notice and it is easier to cause trauma to the nerves.

The position of the patient also influences the presence of paresthesias. They appear more frequently in the lateral decubitus position compared to the sitting. When we obtain paresthesias we should withdraw the needle and verify the leakage of CSF. In case of doubt, start from the beginning.

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Paresthesias and transient radicular irritation syndrome: It is possible to cause other problems apart from paresthesias when injecting medication if we do not withdraw the needle 2 to 3 mm. The trabecular arachnoid forms covers around nerve roots (28-30).

Injection of local anesthetic inside the covers can cause a delay in the distribution of the liquid and therefore it is possible that nerves are exposed to a higher concentration of local anesthetic for several minutes, longer than usual (6,7).

Paresthesias with the epidural technique: The consequences of paresthesias are different if the trauma with the needle is produced on nerve roots inside the dural sac compared to the damage of motor or sensorial roots when they are grouped in the dural cuff.

From the clinical point of view, the first situation is associated with some CSF leakage, whereas the second is not. Nerve roots inside the dural sac have a diameter of 0.5 to 1 mm and nerve roots in the dural cuff form a group with a thickness of 6 to 8 mm. Nerve roots inside the dural sac have more mobility; however, the displacement inside the dural cuff is limited. Paresthesias on the dural cuff can be caused by deflection of the epidural or spinal needles on the lateral epidual space or simply because rotation of the spine.

Nerve roots inside the dural cuff, motor and sensorial, are surrounded by adipose cells (41-42). Considering the size of the dural cuff and its limited mobility it is easy to understand that a paresthesia on this structure could be more harmful.

It is also easier to do an intraneural injection within the dural cuff with all types of needles.

Conclusions: With the aim to reduce the presence of paresthesias, intradural blocks should be done at the more caudal level possible depending on the type of surgery.

Considering the distribution of nerve roots in the dural sac there is a higher probability to cause a trauma to the roots at L2-L3 vertebral level and a lower chance at L5-S1 level. Also the probability is higher if the needle advances in the lateral position of the dural sac and lower in the medial plane.

In case of patients with acute rotation of the spine or scoliosis, it would be convenient having an x-ray of the spine to identify the angle and plane of entry. The higher we do the injection, the more probability to cause paresthesias.

In patients under general anesthesia, as is the case of pediatric patients, it is a subject of great controversy, since the presence of paresthesias is difficult to notice and it is easier to cause trauma to the nerves.

The position of the patient also influences the presence of paresthesias. They appear more frequently in the lateral decubitus position compared to the sitting. When we obtain paresthesias we should withdraw the needle and verify the leakage of CSF. In case of doubt, start from the beginning.


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Introduction: In this article I will cover the development of ultrasound imaging in anaesthesia, the evolution of needle-guidance and the sources of error when performing these techniques. I will also discuss the principals of three-dimensional ultrasound imaging and how this may fit into the requirements of our specialty including use in regional anaesthesia.

Two-dimensional ultrasound imaging in anaesthesia: More than thirty years ago, La Grange described the successful placement of 61 supraclavicular blocks with a 98% success rate and no complications using Doppler ultrasound to identify the subclavian artery. The evolution of handheld ultrasound devices over the last ten years has brought this technology into the hands of clinical anaesthetists. We have seen a huge interest and expansion the use of ultrasound-guided techniques in that time. The evidence base and utilisation of ultrasound to identify anatomy and guide needle placement during regional nerve blocks is now well established. Reduced requirements of local anaesthetic volume have been demonstrated as well as reduced block onset time, increased block duration, comfort and superiority over landmark and electrical stimulation approaches. The technique has also been promoted as the gold standard for regional anaesthesia and recommended for both elective and emergency central venous cannulation.

Ultrasound images are presented as a single two-dimensional (2-D) plane producing an image slice of approximately 1 mm thickness of a variable and adjustable depth. Nerves and vessels may be viewed in short axis or long axis and needles guided towards them viewed in-plane or out-of-plane with respect to the ultrasound beam.

Safety issues when using ultrasound for needle-guidance: The evidence for safety of ultrasound-guidance during regional anaesthesia is limited. This situation is likely to continue, as the frequency of complications after peripheral nerve blocks is low regardless of the insertion technique employed. Ultrasound is extremely sensitive for detecting intra-neural injection of local anaesthetic and the visual confirmation of spreading fluid during local anaesthetic injection means that the operator can immediately detect intraneural injection. The use of ultrasound also increases safety during central venous access, but complication rates may still be as high as five per cent.

Complications incurred during ultrasound-guided needle techniques: The commonest errors made during ultrasound-guided needle insertion is overshoot, usually as a result of poor imaging of the inserted needle, this is in turn exacerbated by a poor probe handling technique. Puncture of vessels and nerves with injection of local anaesthetic have all been described when using ultrasound during regional anaesthesia. The major reason for safety of ultrasound-guidance during regional anaesthesia is limited. This situation is likely to continue, as the frequency of complications after peripheral nerve blocks is low regardless of the insertion technique employed. Ultrasound is extremely sensitive for detecting intra-neural injection of local anaesthetic and the visual confirmation of spreading fluid during local anaesthetic injection means that the operator can immediately detect intraneural injection. The use of ultrasound also increases safety during central venous access, but complication rates may still be as high as five per cent.

13 3-D ULTRASONOGRAPHY FOR PERIPHERAL NERVE BLOCKS: IS THIS THE FUTURE?

N. Bedforth

Introduction: In this article I will cover the development of ultrasound imaging in anaesthesia, the evolution of needle-guidance and the sources of error when performing these techniques. I will also discuss the principals of three-dimensional ultrasound imaging and how this may fit into the requirements of our specialty including use in regional anaesthesia.
Three-dimensional ultrasound imaging has now become available on portable or ‘hand-held’ machines, which make the use of 3-D more feasible in the theatre environment. Although its application has been described in other specialties and during central venous access, there is little experience with 3-D ultrasound in regional anaesthesia. Three-dimensional ultrasound imaging has been used to visualise nerves and perform spatial mapping of the brachial plexus 

The use of ultrasound in anaesthesia in general, and regional specialties, the theatre environment. Although its application has been described in other specialties

Three and four-dimensional image acquisition: A 3-D ultrasound image is created by the capture of a data set (by scanning a volume of interest) that is then displayed retrospectively as a static image. The quality of the resulting image depends, in part, upon the acquisition speed. A slow acquisition speed yields more scanned slices and more volume data points (but requires a static object) producing a superior image which is then displayed retrospectively. Faster acquisition speeds can produce a continuously updating image of the newly acquired volume, creating the impression of a moving structure (but at the cost of a reduction in image quality). This ‘live’ imaging is variously termed live 3-D or 4-D imaging (where time is the fourth dimension). This can allow performance of needle-guidance in real-time. Three dimensional ultrasound machines will only achieve acquisition speeds of approximately four volumes per second during live imaging. This results in visible pauses between displayed frames and a rather jerky image. However, others will operate at 16 volumes (or more) per second, and this gives a much smoother on-screen picture.

Image capture: Three dimensional ultrasound probes may be standard linear array, mechanically steered array or matrix array. Standard linear probes need to be manually scanned over the area of interest; the machine will then assimilate the gathered frames into a 3-D image. Mechanically steered arrays work by mechanically oscillating the array within the probe back and forth through an arc, thus scanning in two planes. These types of transducers often produce high-frequency ultrasound and therefore high-resolution images. During 4-D (live) scanning, the display frame rate is approximately half that of current 2-D systems, resulting in a jerky on-screen image. Matrix arrays consist of rows of piezoelectric crystals that emit ultrasound in multiple planes. As the images are generated electronically, the scanning head does not move and the probes are smaller and lighter to use. The display frame rate is faster than a mechanically steered array transducer, which leads to a smoother displayed image. These probes were designed for echocardiography, and thus operate at lower frequencies (approximately 2-7 MHz), producing lower resolution images while allowing deeper penetration.

Multiplanar 3-D ultrasound imaging: Four-dimensional (live) multiplanar imaging produces up to three orthogonal (perpendicular) planes of view simultaneously (Fig 1). Transverse (X or short axis) and longitudinal (Y or long axis) views can be obtained using conventional 2-D ultrasound by rotating the probe through ninety degrees. A third view, unobtainable using conventional 2-D ultrasound, is effectively parallel to the transducer surface, thus the operator may effectively look down upon the area of interest. This view has been termed the Z-axis or coronal view, although it is not a true anatomical coronal plane depending on where the probe is placed. The point of intersection of the three planes is often marked on each image by a marker dot on the display. The marker dot may be moved by the operator, allowing the creation of a target during needle-insertion.

Multiplanar imaging is the most similar to conventional 2-D imaging. Simultaneous short and long axis views of the imaged volume provide the operator with more information on the visualised structures, needle and injected fluid spread. The needle is seen approaching the target in short and long axis simultaneously. The Z-axis or coronal view presents an image ‘through’ the standard short and long axis planes at an adjustable depth. This means that if the needle is visualised in this view, but not in the other two standard views, it must have already crossed the central plane of the target (at the adjustable depth of the Z-axis) and has overshot the target. This may then provide extra feedback to reduce the risk of needle overshoot.

Volumetric 3-D ultrasound imaging: The whole volume of interest can be reconstructed (rendered) and then displayed as a thick slice, cube or pyramid (depending on the transducer type). The volume can then be displayed in surface form or in a transparent manner. The visibility of structures (as with any ultrasound image) will depend on the acoustic impedance of those structures. Solid structures surrounded by fluid provide an excellent interface for ultrasound and high quality images of the surface of the structure can be produced. Obstetrics has taken advantage of this property to produce excellent ‘commercial’ images of the fetus in-utero. Some penetration of the fetus is also possible to demonstrate bone and vascular structures. Doppler flow imaging is possible during real time 3-D imaging. This ability to produce a rendered image originally evolved from computer graphics engineering, with many of the computer algorithms producing these images originating from the Disney film studio Pixar during production of animated films. Real time volumetric imaging (4-D) therefore potentially allows us to guide a needle to an exact point within a volume displayed in real-time.

Potential advantages of four-dimensional needle-guidance: To date the published experience with three-dimensional imaging for needle-guidance is limited to individual reports of use during vascular access and other procedures. The few case reports published thus far suggest potential for 3-D imaging during regional anaesthesia, but they also have highlighted the deficiencies in live image quality and with the available transducers. Improved spatial awareness during needle insertion may lead to lower complications during regional anaesthesia or vascular access. Better visualisation of fluid spread patterns could potentially increase block success rates or allow reduction in local anaesthetic volume requirements.

Summary: The use of ultrasound in anaesthesia in general, and regional anaesthesia in particular, is now widespread and has a large evidence base. Three-dimensional ultrasound imaging has been used in a number of specialties, but has thus far found few routine indications. Further developments in technology should see improvements in live image quality and enable the production of transducers more suited to our requirements. Ultrasound machines with three-dimensional capability will become smaller, more affordable and available. We should then see whether three-dimensional ultrasound has a place in the performance of regional anaesthesia.

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DOES THE COMBINATION OF NEURAXIAL REGIONAL TECHNIQUES AND GENERAL ANAESTHESIA IMPROVE OUTCOME?

B. Fischer

Major surgery causes significant postoperative pain and other morbidity. Effective analgesia is both a humanitarian and clinical goal and there is good evidence that epidural analgesia is superior to opioid-based analgesia [1,2]. For this reason alone it may be considered to be the only option. Br J Anaesth 2007:32;516-21

14 Epidural Benefits: “Epidural analgesia with local anaesthetics has the greatest theoretical potential to affect major outcomes and has been the most thoroughly investigated technique” [1]. However, many of the studies have limitations (underpowered, very large numbers needed to treat, failure to control inclusion criteria, variable end point criteria etc.) making it difficult to compare different studies. The CORTRA study [8], demonstrated a significant reduction in mortality in the central neuraxial group compared to the GA group but the methodology and statistical analysis were soon criticised. The MASTER trial [9], by contrast, found that epidural infusions offered no benefits other than good analgesia and some respiratory protection. In turn, this trial was also subject to detailed criticism. The lack of consistent data and uncertainty over adverse events has seen a decline in the use of perioperative epidurals, even in those patients who might well benefit from them, both in the UK [10] and other countries [11]. The available randomised studies do not have large enough patient numbers to demonstrate a clear difference in mortality and morbidity [12] and there is no convincing evidence of improvement in outcome [13]. A recent review conveys the same message, although there are some positive effects that may prove to be clinically relevant. A reduction in the incidence of chronic pain, better functional recovery in the early postoperative period and, possibly, a reduction in the recurrence rates for some types of cancer are suggested in some studies but adequately powered prospective studies are required to confirm or refute these findings [14].

Despite this uncertainty, epidurals remain the mainstream technique for major thoraco-abdominal surgery, including cardiac surgery. A recent edition of Anesthesiology published 3 papers on thoracic/ major thoraco-abdominal surgery, including cardiac surgery. A recent edition of Anesthesiology published 3 papers on thoracic/ major thoraco-abdominal surgery, including cardiac surgery. A recent edition of Anesthesiology published 3 papers on thoracic/ major thoraco-abdominal surgery, including cardiac surgery. A recent edition of Anesthesiology published 3 papers on thoracic/ major thoraco-abdominal surgery, including cardiac surgery.

14 Epidural Risks: There is a similar large but confused database concerning the risks of regional anaesthesia because some studies do not distinguish between temporary and permanent harm. Serious permanent nerve damage associated with regional anaesthesia is rare; the mean incidence of permanent damage is approximately 1:10,000, although the range varies between 1:100 and 1:1000.
different sub-sets of patient groups (1:3,600 for elderly surgical patients - 1:25,000 in obstetric patients) [20-23]. The NAP3 data confirmed that differ-
ent sub-sets of patients are subject to differing risk, which means that we
can now offer patients a validated source of information regarding risks
associated with central neuraxial block in a variety of clinical settings and
separated into different categories of complication.

What are the alternatives??: Given the potential for rare but serious
adverse events associated with epidurals, we need good data to define best
practice and have safe and effective systems in place to maximise benefits and
minimise risks [24]. Epidurals are technically demanding to perform and
maintain in the early postoperative period. Given the improvements in peri-
operative care and the recent developments in enhanced recovery after sur-
gery programmes (ERAS) there is a move away from epidurals towards other
regional techniques. TAP blocks are a popular option, as are wound catheter
infusions but they have yet to be compared with epidurals and found to offer
significant benefits [25]. Similarly, there are limited published data about
Local Infiltration Analgesia regimens for major joint arthroplasty, although
they are widely used clinically [26]. As surgical techniques evolve and set
new standards of recovery, rehabilitation and mobilization, anaesthetic tech-
niques must adapt and evolve to keep pace. Importantly, these new techniques
should be subject to critical analysis to ensure that any perceived benefits could
be compared with standard therapies. Within a properly functioning
perioperative care programme epidurals continue to offer significant outcome
benefits for appropriate surgical procedures (thoraco-abdominal mainly). For
other procedures, such as hip and knee arthroplasty, epidurals are no longer
recommended for routine patient care [27,28], as changing surgical and an-
esthetic practice means that the evidence from older studies does not reflect
the standard against which all other analgesic regimens for major surgery must
be compared both for efficacy of analgesia and the impact on outcome from
surgery. Only then can the real advantages of novel analgesic and rehabilitation
therapies be compared with the accepted standards of current practice.

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lower extremity surgery. Epidural analgesia has been widely used, but has
many side effects and complications such as nausea-vomiting, pruritus,
dizziness, hypotension, urine retention and respiratory depression(1).

15 ARE THERE STILL INDICATIONS FOR LUMBAR
NEURAXIAL TECHNIQUES IN ORTHOPAEDICS?
A. Yılmazlar Turkey.
Sufficient analgesia is very important in the postoperative period after major
lower extremity surgery. Epidural analgesia has been widely used, but has

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Advances in surgical approach and the postoperative analgesia - reha-
ilitation protocols have decreased the duration of hospitalization.
Epidural analgesia with the use of thromboprophylaxis carries the risk of
epidural and spinal hematoma, so the timing of catheter insertion and removal
must be carefully planned.
Regional blocks provide a better acute outcome rather than systemic opioids.
Oral, intramuscular or intrathecal opioids do not provide sufficient postoperative
analgesia. It has been reported that regional anesthesia and analgesia may im-
prove both major and minor outcomes. However, Wu et al examined 35878 total
knee arthroplasty patients and concluded that epidural analgesia was not asso-
ciated with a lower incidence of morbidity and mortality(2).
The role of the epidural technique in patient outcome is unclear(3-5) as sev-
eral recent large, randomized, controlled trials have failed to show any
major advantages of epidural technique.
The advantages of epidural analgesia have to be balanced against the risks
and costs. In patients undergoing lower extremity surgery, less invasive and
less expensive perineural techniques may be just as effective as the epidural
technique. Richman et al demonstrated that continuous peripheral blocks
provided superior analgesia, reduced opioid consumption, and reduced opi-
oid related side effects such as nausea-vomiting, pruritus, dizziness, hypo-
tension, urine retention and respiratory depression, with the exception of the
effect on morbidity and mortality(6).
Nowadays, peripheral blocks have become more widely used. Continuous
or bolus femoral nerve block, sciatic nerve block, popliteal block are the most
common approaches in lower extremity surgery. Fast track multimodal an-
algesia with a local infiltration analgesia technique has also come into more
popular usage in recent years. This multimodal analgesia enables immediate
patient mobilization and earlier discharge from the hospital.
Peripheral blocks provide only surgical side analgesia rather than bilat-
eral, so the patient can be mobilised earlier.
On the other hand, newer anticoagulation strategies for arthroplasty
present a potentially increased risk of epidural hematoma, so there is
movement away from using epidural analgesia. This concern has opened the
door for other regional blocks including epiduralextended-release morphine
combined with peripheral nerve block.
Urinary retention and muscular weakness, and an unpleasant numbness of
a large part of the lower extremity are often reported after epidural analgesia.
Opioid analgesics cause sedation, nausea-vomiting and urinary retention.
Non-selective Cox-inhibitors may cause gastrointestinal bleeding, renal
complications, and epidural hematoma. So, an alternative method for post-
operative pain relief is a multimodal wound infiltration technique including
periarticular local anesthetic infiltration (7).
There is no absolute evidence of the superiority of one analgesia method
over another in reducing complications and improving long time results after
lower extremity surgery. Future studies are needed to show us whether we
should abandon epidural analgesia.

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16 ULTRASOUND AND BLOCKS IN CHILDREN: AN ADVANCED UPDATE
C. Ecoffey France.
There is no doubt that ultrasonography offers advantages in nearly all re-
gional anesthetic techniques compared with conventional, landmark-based
infiltration and/or nerve blockade techniques. The concept of direct visu-
alization of all involved anatomical structures and the observation of the
spread of local anesthetic by ultrasonography is convincing.
1. History of ultrasound regional anesthesia
A significant problem in regional anesthesia is that a large number of
techniques still do not achieve a success rate of close to 100%. Indeed, the
key to successful regional anesthesia has always depended on the accuracy of
needle and local anesthetic placement in relation to the nerve structures to be
blocked. In 1994, Kapral introduced ultrasound guidance into regional an-
esthesia (1). Few years later, Marhofer introduced this technique into pedi-
atrie regional anesthesia practice (2, 3).
2. Advantages of ultrasound regional anesthesia
The advantages of ultrasound guidance in peripheral and neuraxial blocks
are the following:
- The correct needle and/or catheter placement as close to the target as
possible was obtained due to direct visualization of the target and adjacent
structures; the possibility of visualizing the nerve structures as well as
important nearby anatomical structures (e.g. vessels, pleura and peritone-
um) most likely reduces the incidence of inadvertent complication due to
misplacement of the tip of the blocking needle;
- The spread of local anesthetic administered around the nerve and its
roots can be visualized, reducing the doses needed (table). Indeed, ultrasound
guidance allows the anesthesiologist to reposition the needle in the case of
maldistribution of the local anesthetic; indeed, Eichenberger et al. found a
95% median effective dose for an ular nerve block with 1% mepivacaine
to be as low as 0.11 ml/mm² nerve, corresponding to a total volume of 0.7
ml to achieve an effective ular nerve block (4);
- It is possible to avoid the most common complications, such as intravas-
cular injection, dura mater puncture, hematoma formation, and to minimize
the risk of nerve injury (5); however, Because serious complications luckily
are very rare following peripheral nerve blockade in infants and children
(6), it is unlikely that even large-scale studies will prove ultrasound guid-
ance to be superior to other approaches with regards to the rate of com-
lications. However, it does not seem reasonable to expect that the use of
ultrasound should result in an increased rate of complications and, thus,
currently one may at least consider ultrasound guidance as neutral regard-
ing the incidence of complication.
- The advantages also include also a faster onset and a prolong duration of
blocks.Finally, ultrasound measurements can even result in suggestions to
modify established block techniques, such as intraneural injection. Ultrasound
guidance is rapidly becoming the gold standard for regional anesthesia. There
is an ever-growing weight of evidence, matched with improving technology,
to show that the use of ultrasound has significant benefits over conventional
techniques.
3. Ultrasound-guided vs. ultrasound-assisted nerve blockade
A distinction should be made between ultrasound-guided and ultrasound-
assisted nerve blockade. A block procedure is ultrasound-guided if it in fact is
possible to visualize the target nerve structure and subsequently see the
spread of local anesthetic in relation to the target nerve. This is mainly the
case for a number of peripheral nerve blocks. With regards to central nerve
blocks these techniques can be used, but we need an assistant to hold the
probe.At the opposite, there are also a number of peripheral nerve blocks that
should be ultrasound assisted, e.g. rectus sheath, transverse abdominis plane
and paravertebral blocks. Despite not being able to actually identify the target
nerves with these blocks, ultrasound assistance will visualize important an-
atomical structures such as the pternum and the pleura, thereby producing
better control of the block procedure. The visualization of the pternum and
4. Importance of proper education and training

The Achilles’ heel of ultrasound-guided regional anesthesia is that anesthetists are far more familiar with nerve stimulation and loss of resistance. Nonetheless, the use of ultrasound to locate nerves is increasingly used in pediatric patients. However, using this technique to identify the nerve is not a replacement for a good understanding of the anatomy.

New data have emerged suggesting that the novice ultrasonographer makes repeated errors, the two most common being failure to visualize the needle during advancement and unintentional movement of the probe (7). For this reason, the American Society of Regional Anesthesia (ASRA) and the European Society of Regional Anesthesia (ESRA) created a Joint Committee; the result was a document “to recommend to members and institutions the scope of practice, the teaching curriculum, the fellowship program and the options for implementing the medical practice of ultrasound guided regional anesthesia services” (8, 9), both for practicing anesthetists and for trainees in anesthesia. Indeed, training in the use of ultrasound-guided techniques is not easy. Dedicated efforts must be made to allow the education of at least key individuals to attend focused training, so that these people can start to use and teach these techniques in their own institutions.

In conclusion, the use of new technologies, such as ultrasound-guided regional anesthesia, has shown some promise toward increasing the safety profile of these already safe techniques. Thus, very reassuring data support the continued use of regional anesthesia in infants and children.

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Regional anesthesia for cardiac surgery: Escalating costs and changing profiles of cardiac surgery patients requires continuous modification of perioperative management strategies. Regional anesthesia plays a role in many fast track anesthesia protocols, including anesthesia for cardiac surgery.

Regional anesthesia techniques for cardiac surgery include continuous local anesthetic infiltration, intrapleural local anesthetics, intercostal and paravertebral nerve blocks and intrathoracic/epidural techniques. Although appropriate studies are lacking, it is assumed that, compared to intravenous opioids, only intrathecal and epidural anesthesia provides equipotent analgesia. In addition to excellent analgesia and a reduction in respiratory complications, thoracic epidural anesthesia (TEA) induced sympatheticism improvements the endogenous stress response, and reduces the myocardial oxygen demand and infarct size. The use of TEA in cardiac surgery, however, remains controversial because the insertion of an epidural catheter in patients requiring full heparinization may lead to an epidural hematoma and permanent neurological injury if not detected and evacuated promptly.

In addition, TEA induced sympatheticism has recently been shown to decrease left ventricular contractility and to abolish the positive inotropic response of the right ventricle to an acute increase in afterload(1-2).

The use of TEA in cardiac surgery has regained new interest in the last two years. A number of randomized controlled trials and meta-analyses have been published recently. Last year, Bigi et al. published a meta-analysis including 2366 patients. They concluded that epidural analgesia improved outcome after cardiac surgery, indicated by reduced incidence of acute renal failure, time on mechanical ventilation and a reduction in the composite endpoint mortality/infarction(3).

In 2011, Svircevic et al. subsequently have reported a randomized controlled trial in 654 elective cardiac surgical patients who were randomized to combined general anesthesia (GA) and TEA versus GA. Thirty day and 1-year survival free from myocardial infarction, pulmonary complications, renal failure and stroke were not different in both regimens (4). A meta-analysis investigating the effects of adding a TEA to general anesthesia for cardiac surgery, including a total of 28 randomized controlled trials with a total of 2700 patients concluded that the addition of a TEA reduced the incidence of supraventricular arrhythmias and respiratory complications but had no effect on mortality, myocardial infarction or stroke(5).

Specifically in patients undergoing OPCAB surgery, Captuo et al showed that the addition of TEA to GA reduces the incidence of postoperative arrhythmias and improves pain control and overall quality of recovery, allowing earlier extubation and hospital discharge(6).

In conclusion, the addition of TEA to GA for cardiac surgery enhances postoperative analgesia and reduces postoperative ventilation times but is labour intensive and has a high clinical risk and failure rate without a clear effect on clinical outcome. The actual and potential risks and benefits of a TEA during cardiac surgery should be taken into account for every individual patient.

Awake cardiac surgery: Awake cardiac surgery with the use of only TEA has been suggested as an alternative to GA for both low and high risk on- and off pump procedures via lower or full median sternotomy or minimal invasive approaches using a small thoracotomy. Several manuscripts have already reported awake cardiac surgery to be safe and feasible if all preventive measures and international guidelines are taken into account to avoid epidural hematoma. Conversion rates to GA have been reported between 0 and 10% due to inadequate analgesia or respiratory difficulties.

Besides a growing number of case reports, few studies have compared anesthesia techniques including sole TEA for cardiac surgery (mainly due to ethical and medical considerations). In addition, few data are available on postoperative outcomes after awake cardiac surgery.

In 2005, Kessler et al have compared GA with combined GA and TEA and sole TEA for OPCAB surgery. They reported all anesthetic techniques to be equally safe, but the combination GA + TEA appeared to be most comprehensive (7).

A comparable study by Pizacek et al in 2011 found all three anesthetic methods equivalent in terms of early and late postoperative outcome (including 3-year mortality) except for a lower incidence of atrial fibrillation in the awake TEA group (8).

Very recently, Watanabe et al reported a favourable surgical outcome and postoperative recovery after day case awake off-pump cardiac surgery in 72 patients with severe pre-operative comorbidities, including cerebrovascular impairment or severe pulmonary disease (9).

Conclusion: A final ranking of available anesthesia techniques for cardiac surgery remains difficult. General anesthesia without TEA is the established...
technique and should be used whenever contraindications for epidural catheters apply. The decision which technique is used in an individual patient should be made on an individual basis regarding both the patient and the anesthesiologist’s personal preference. Although it is the author’s opinion that systemic anticoagulation hampers the use of epidural techniques, it is not unimaginable that for few patients, GA+TEA and even sole TEA may be preferred.

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18 Tourniquet Pain and Its Management: Still Many Unanswered Questions
Z. Koscielniak-Nielsen Denmark.

Limb surgery is often performed under ischaemic conditions provided by pneumatic tourniquet (1,2). An inflated tourniquet may result in feeling of extremity heaviness and a dull pain usually either at the site of tourniquet or proximal to it. This pain commonly occurs during intravenous regional anesthesia (IVRA), but may also appear during otherwise well-functioning conditions (3). It leads to hypertension and may be so severe that it necessitates conversion to general anaesthesia.

In un-anaesthetized volunteers moderate to severe pain occurs under the cuff immediately after it’s inflation. Pain intensity falls within few minutes and gradually increases again within 20-40 min to intolerable levels (4). A possible reason for the initial pain is compression of the skin under the cuff, while nerve and muscle ischemia seems to be major causative factors for the secondary severe pain (4). This, as well as anaerobic metabolites, probably activate the unmeylinated C-fibers, which may still function under ischaemic conditions (5). Cuff deflation usually results in the immediate pain relief, although reperfusion of the extremity may produce transient, high-intensity burning or tingling.

Various methods and/or drugs have been used to reduce tourniquet induced pain. For the upper extremity surgery a subcutaneous infiltration of local anaesthetics (LA) under the cuff is probably one of the oldest (6). Eutectic mixture of local anaesthetic agents (EMLA) has also been used (7) and found as successful as the subcutaneous LA infiltration (8). Increasing the width of the cuff and decreasing the inflation pressure also reduced peak pain intensity, although the pain increased more rapidly in volunteers with a wide cuff (9). Forearm tourniquet was better tolerated than the conventional upper arm tourniquet (10). Alkalization of mepivacaine for brachialplexus blocks has been recommended for patients with expected long tourniquet times (11). Alfa-2 adrenergic agonists, such as clonidine (12) and dexmedetomidine (13) in doses between 75 and 150 mcg improved tourniquet tolerance during lidocaine IVRA and decreased hypertension. The addition of ketorolac or lornoxicam, but not fentanyl to LA decreased intensity of tourniquet pain during IVRA (14-16). Ketamine 0.1 mg/kg was also used in combination with lidocaine to reduce tourniquet pain in IVRA and turned out to be more potent than clonidine, but resulted in psychomimetic side-effects in almost half of the patients (5). Even premedication with 10 mg of melatonin p.o. improved tourniquet tolerance during hand surgery in IVRA (17). During spinal anaesthesia the additions of 15 mcg adrenaline, 150 mcg clonidine, or 0.3 mg morphine to bupivacaine solution have all been found to minimize the incidence of tourniquet pain.

Conclusions: Tourniquet pain is still a problem during regional anaesthesia. Wider cuffs, lower inflation pressures, LA infiltration, EMLA application and/or various LA additives are used to combat it. If the pain becomes severe it is probably best to anaesthetize the patient.

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19 INTRAVENOUS REGIONAL ANESTHESIA: CURRENT INDICATIONS & CLINICAL PRACTICE

A. van Zundert

The intravenous regional anesthesia technique is especially popular in North and Latin America and Great-Britain. Not only anesthesiologists, but also clinicians working at the accident and emergency department frequently use this method of anesthesia.

History: Two history articles at the occasion of the centennial of intravenous regional anesthesia (IVRA) or Bier's block have been produced a few years ago. Bier observed that when local anesthetic was injected i.v. between two tourniquets on a limb, a rapid onset of anesthesia occurred in the area between the tourniquets. The technique became popular in the 1960s when Holmes reintroduced the technique. Today, the technique is slightly modified, using either a single or preferably a double tourniquet at one site and injecting local anesthetic as distal as possible to the cuff. The double tourniquet is used to increase safety and to reduce tourniquet pain in the awake patient, but the downside is that there is a potential for confusion and accidental deflation of the wrong cuff, which may lead to toxic systemic levels of local anesthetics.

IVRA - Technique: The IVRA technique is technically easy; does not require specific anatomical knowledge and results in a high (>96%) successful anesthetic with a low incidence of side-effects. IVRA is a reliable, simple and safe method of providing anesthesia for minor surgical procedures to the upper and lower extremities if it is administered by experienced clinicians. Before the procedure the patient should be starved and monitored as usual, while informed consent needs to be obtained. The patient's blood pressure should be measured. The equipment for IVRA includes the use of a pneumatic tourniquet (checked for leaks and proper function) and a pressure gauge; Esmarch bandage or exsanguinater; local anesthetic solution; and full resuscitation equipment and drugs ready at hand. A 22-G canula is placed i.v. as distal as possible in the arm to be anesthetized (e.g. in the dorsum of the patient's hand). The smaller gauge i.v. catheter should be used to prevent oozing after the removal of the catheter. The catheter should be firmly taped in place to prevent its dislodgment during the exsanguinations with the Esmarch bandage or the injection procedure. Venous access is established in the opposite arm to allow administration of fluids or drugs if necessary. The double tourniquet (two tourniquets of 6 cm wide) or a single one (14 cm wide) is applied on the arm with generous layers of padding, ensuring that no wrinkles are formed and the tourniquet edges do not touch the skin. The arm is exsanguinated with an Esmarch or rubber bandage properly applied from distal to proximal (keep the arm above the level of the heart), requiring an assistant. The distal tourniquet is inflated 100 mm Hg higher than the patient's systolic blood pressure (suggestions are made to use 250 mm Hg for the upper extremity, 300 mm Hg for the lower extremity, and 230 mm Hg for obese patients). The proximal tourniquet is inflated to the same level of pressure. After ensuring inflation, the distal cuff is deflated. The Esmarch bandage is then unwrapped and the extremity is checked for color (palp skin) and arterial occlusion (absence of the arterial pulse [radial for arm/dorsal pedis for leg]), before the local anesthetic is injected. A standard volume for injection into the upper limb is 40 ml (max 50 ml in a fit large adult - and 30 ml in a small or frail patient) and should be administered slowly (3 ml/sec). Surgical anesthesia is usually achieved within 15 min. At that time, the distal tourniquet can then be inflated adequately and the proximal one deflated to relieve tourniquet pain (check the function of the distal tourniquet before releasing the proximal tourniquet). After 20 minutes the level of the local anesthetic drug is fixed within the tissues and is unavailable for immediate release into the systemic circulation. Full cuff deflation (preferably not before 30 after the start of IVRA) should be performed in cycles with deflation/inflation times of less than ten seconds until the patient no longer exhibits signs and symptoms of systemic toxicity (tingling lips, tinnitus, drowsiness, bradycardia, hypotension, ECG abnormalities, fitting and loss of consciousness). Maximum blood levels of local anesthesia occur within ten minutes of cuff deflation and all patients should be monitored closely for 20 minutes following tourniquet release. If severe CNS local anesthetic toxicity occurs, appropriate resuscitation guidelines should be followed (oxygen, thiopental-propofol, intralipid), the airway should be protected and if needed endotracheal intubation and ventilation should be instituted. Continue to monitor ECG, blood pressure and pulse oximetry for 20 minutes after deflation of cuff. The release of the tourniquet will result in a rapid resolution of anesthesia/analgesia. Instructions for adequate pain relief should be instituted immediately (e.g. the surgeon can infiltrate local anesthetic before the release of the tourniquet to prevent a sudden, oncoming pain; also other pain relief methods apply). Insufflation times are limited to a maximum of 1.5 to 2 hours. The tourniquet is typically placed on the upper arm. A forearm tourniquet has been proposed to reduce the total dose of local anesthetic and perhaps reduce the tourniquet discomfort, although the upper arm tourniquet remains the most commonly used. IVRA of the lower extremity is basically the same as for the upper extremity but the tourniquet pressure must be higher (180-230 mm Hg) and the ratio and volume of local anesthetic has to be increased (e.g. 60 ml). An increase in the occurrence of tourniquet pain can be seen. Tourniquets may be applied to the thigh (two tourniquets about 9 cm wide) or one at the calf (below the fibula head) and one at the thigh.

IVRA - choice of local anesthetic solution: The drug of choice is preservative free 0.5% prilocaine, 3-6 mg/kg, because it has less systemic toxicity and is partially taken up in the lungs before reaching the systemic circulation. Prilocaine is the least toxic local anesthetic and has the largest therapeutic index. The usual dose of prilocaine is 200 mg (20 ml) without epinephrine. However one often uses prilocaine 1% as it is often the only solution available and stability is not guaranteed if diluted. In countries where prilocaine is not available, 0.5% lidocaine at a dose of 3 mg/kg is used for IVRA of the arms and 0.2-0.25% lidocaine for IVRA of the legs. The maximum recommended dose is 250 mg lidocaine (50 ml 0.5% solution). If prilocaine is used for IVRA of the legs, a larger volume must be injected (e.g. 60 ml), keeping in mind that the maximum recommended dose is 400 mg (e.g. 80 ml 0.5% prilocaine) in adults. Other local anesthetics have been used for IVRA, but they do not provide superior analgesia or more rapid onset of block. Severe toxic reactions and death have been reported with bupivacaine and lignocaine. The use of lidocaine has been marketed relatively and was as effective as 0.5% prilocaine, but with prolonged postoperative analgesia. Several additives to local anesthetics were tried out (pethidine 1 mg/kg; muscle relaxants, ketamine, clonidine 150 μg; NSAIDS), resulting in improved analgesia and prolonged postoperative analgesia, but may show side effects. The addition of epinephrine should be avoided and plain local anesthetics should be used. Prilocaine can cause methemoglobinemia. Usually it goes clinically unnoticed, unless prilocaine doses in excess of 600 mg are used.

IVRA - Mechanism of action: Although the exact mechanism of action for IVRA is not clearly understood, there appears to be multiple and complimentary mechanisms for producing analgesia and anesthesia. Ischemia, asphyxia, hyperthermia and acidosis play an important role. Peripheral nerve endings of the upper and lower extremities are nourished by small blood vessels. The injected local anesthetic diffuses into the small veins surrounding the nerves, followed by the vasa nervorum and capillary plexus of the nerves, leading to a core to mantle conduction block in the nerves of the area. The local anesthetics diffuses into the small nerves in the skin, blocking conduction. This holds true for as long as the concentration of the local anesthetic in the venous patients. Tients relatively high. The tourniquet itself also produces ischemia, and contributes to the analgesic action of the local anesthetic by blocking nerve conduction and motor endplate function. Analgesia to pinprick can be obtained after 20 min tourniquet alone (without injecting local anesthetic), although the speed of onset and the density of anesthesia are much better with the injection of a local anesthetic.

IVRA - Indications: IVRA for surgical interventions on the hand, forearm or elbow not exceeding one hour is a well accepted technique by patients and
surgeons. The operations include manipulation of forearm fractures, excision of ganglia and palmar fasciectomy. It is particular useful for tendon grafting as it allows the surgeon to observe movement and tension of the grafted tendon (after deflating the tourniquet) before closing the wound. IVRA for surgical interventions on the foot ankle, or lower leg is also possible. IVRA still deserves it place in regional blocks of the extremities, as scheduled surgery, with a high degree of safety, effectiveness and efficiency.

Conclusion: IVRA is an excellent regional anesthesia technique for surgery of the extremities, and can also be successfully used in pain therapy, such as in reflex sympathetic dystrophy (CRPS). It is widely recommended and applied in patients undergoing ambulatory procedures, for both urgent as well as scheduled surgery, with a high degree of safety, effectiveness and efficiency. IVRA still deserves it place in regional blocks of the extremities, despite progress made in upper and lower extremity blocks using ultrasound and nerve stimulation techniques.

TABLE 1. Advantages and disadvantages of intravenous regional anesthesia

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>- technical simplicity; easy to administer</td>
<td>- limited time of surgical anesthesia (only use in short procedures lasting &lt; 90 min)</td>
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<tr>
<td>- speed of onset and rapid recovery</td>
<td>- difficulty in providing a bloodless surgical field</td>
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<tr>
<td>- reliability (in the absence of local infection and with adequate equipment)</td>
<td>- potential of systemic local anesthetic toxicity (sudden cardiovascular collapse or seizures may occur if local anesthetic is released into the circulation too early)</td>
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<tr>
<td>- low incidence of block failure</td>
<td>- potential of nerve damage secondary to direct compression by tourniquet</td>
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<tr>
<td>- muscle relaxation for the surgeon</td>
<td>- surgery on or above elbow and knee is poorly tolerated</td>
</tr>
<tr>
<td>- safe technique when used appropriately</td>
<td>- patient may experience tourniquet pain after 20-30 min</td>
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<tr>
<td></td>
<td>- poor postoperative analgesia</td>
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INTRA-VEINOUS REGIONAL ANESTHESIA FOR EXTREMITIES SURGERY: DO WE HAVE TO USE ADJUVANT SUBSTANCES?

M. Vercauteren, M.B. Breebaart Belgium

Intravenous Regional Anesthesia (IVRA) was discovered more than 100 years ago by August Bier. Meanwhile little has changed with respect to the technique. Its effects result from the local anesthetic in the first place but also in a later phase being related to nerve compression and ischemia. By using a double tourniquet the patient will feel movement and tension of the graft while deflating the tourniquet. The patient may experience tourniquet pain after 20-30 min. Many centers still use the commonly recommended 40ml Lidocaine 0.5% (i.e. 200mg) as catastrophes have been reported with other more toxic substances and concentrations.

IVRA has some advantages such as the presence of a tourniquet which orthopedic surgeons would require anyhow. By its simplicity IVRA may be considered as a technique for the dummies resulting in confidence among patients and anesthesiologists. It is particularly useful for tendon grafting and for some patients and anesthesiologists. It is widely recommended and applied in patients undergoing ambulatory procedures, for both urgent as well as scheduled surgery, with a high degree of safety, effectiveness and efficiency. IVRA still deserves its place in regional blocks of the extremities, as scheduled surgery, with a high degree of safety, effectiveness and efficiency. IVRA has some advantages such as the presence of a tourniquet which orthopedic surgeons would require anyhow. By its simplicity IVRA may be considered as a technique for the dummies resulting in confidence among patients and anesthesiologists. It is particularly useful for tendon grafting and for some patients and anesthesiologists. It is widely recommended and applied in patients undergoing ambulatory procedures, for both urgent as well as scheduled surgery, with a high degree of safety, effectiveness and efficiency. IVRA still deserves its place in regional blocks of the extremities, as scheduled surgery, with a high degree of safety, effectiveness and efficiency.
The reason why nitroglycerin might be effective in IVRA is that it may have analgesic effects mediated by the GABA receptor. Despite the numerous studies performed in search of the ideal adjuvant substance or local anesthetic, the actual literature is quite controversial. A delay of postoperative pain appearance expressed in minutes or 1-2 tablets of an analgesic less during the first 24 hrs cannot be considered as clinically relevant. There is a lack of dose-finding reports and studies looking at the safety when injecting similar doses in a restricted environment and studies including a control group in which the substance to be tested is also administered systematically. As opposed to neuraxial techniques and fortunately only few authors have mixed more than two substances. Faster onset and few minutes delay in recovery of sensory and motor function may not be clinically relevant. When respecting a sufficient time interval until the most distal tourniquet is inflated may also significantly affect the onset and severity of tourniquet pain, more than the addition of an adjuvant. The most promising substances for IVRA for surgery or Complex Regional Pain Syndrome (not the focus of this review) at the present time may be ketorolac and dexmedetomidine (even more than clonidine) as these drugs may cause more side-effects when given intravenously but even intravenous systemic or local (wound) administration may offer quite comparable or intermediate effects. Opioids and other less frequently used adjuvants are rather disappointing with regards to their clinically relevant benefit despite statistical significant differences in comparison with the use of the local anesthetics alone.

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Truncal Blocks
- Transversus Abdominis Plane Block
- Iliinguinal/Iliohypogastric nerve block
- Thoracic Paravertebral blocks
- Intercostal nerve blocks

Central Neuroaxial Blocks

Children are also among the victims of trauma and they should not be undertreated (7-10). Most of the blocks can be performed also in pediatric age group. Sedation and an analgesic need should be considered before performing regional anesthesia in this age group.

Standardized monitoring including ECG, NIBP, SpO2 should be applied to all patients. Clinician should be aware of the fact that all possible complication of the specific block including local anesthetic systemic toxicity may be seen also in the emergency department and he/she should be ready to treat these complications (11). Oxygen, suction, and resuscitation equipment and supplies should be readily available in the area that blocks are performed. Intralipid should also be available in the ED.

Although ultrasound use has changed the practice of regional anesthesia, nerve stimulation can be used to verify the target neural tissue and also should also be considered as a safety measure in order to avoid complications like intraneural injection.

In conclusion to improve pain management in emergency departments pain should be regularly assessed with an intention to treat. Regional anesthesia techniques can efficiently block axonal transmission in peripheral nerves and prevent nociceptive signals from reaching the central nervous system. There is a large armamentarium of regional anesthesia techniques which can be selected and performed according to patients need. Close collaboration of anesthesiology and emergency medicine departments would improve regional anesthesia practices in emergency departments and improve standard of patient care.

References:
Therefore, every anesthesiologist who provides emergency medical relief should be able to perform all regional anesthesia procedures and be capable in using all nerve localizing techniques. In conclusion, after a major disaster with destruction of all medical infrastructure, extended medical relief is necessary to fulfill the continuous demand for medical help. Even with minimal equipment, supplies and facilities, help can be provided. The preferred anesthetic technique is peripheral nerve blocks. In the standard equipment for medical disaster relief, material for performing nerve blocks should be included. Regional anesthesia skilled anesthesiologists should be available to perform this task.

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24 HIP SURGERY: EPIDURAL, SPINAL OR GENERAL COMBINED WITH PERIPHERAL NERVE BLOCK? P. Tarkkila Finland.

The true role of regional anesthesia in the postoperative outcome after total hip arthroplasty (THA) remains to be established. It has been suggested that good analgesia has beneficial effect on functional rehabilitation and lowering the incidence of chronic postoperative pain. However, these positive effects have not been convincingly demonstrated. It is very difficult to separate the effect of regional anesthesia from other analgesia methods or patient rehabilitation methods. Also, the superiority of one anesthesia or analgesia method over another in reducing major complications and improving the long-time results after THA is still controversial partly due to heterogeneity in study designs, and small numbers of patients participating in the studies. Terminology also is variable as idioms like comprehensive, pre-emptive, multimodal analgesic regimen (1) or procedure-specific analgesic combinations within well-defined rehabilitation paradigms (2) are used. If regional anesthesia is used for the THA operation it is possible that blood loss may be reduced when compared with general anesthesia (3,4), although this difference has not been reached in all studies. Cost of spinal anesthesia for THA has been shown to be significantly lower than general anesthesia (5). In one study, combined spinal/epidural blockade prevented protein loss on the first postoperative day showing the anticitabolic effect of regional anesthesia (6). Since the introduction of modern thromboprophylaxis, the beneficial effect of regional anesthesia on thromboembolic complications has not been proven. Regional anesthesia has been shown to prolong the time for the first analgesic and provide better analgesia in early postoperative phase. Also, the regional anesthesia patients have less nausea and vomiting than the patients after general anesthesia (7,8). Postoperative delirium after hip arthroplasty is common in the elderly and associated with adverse outcomes like longer hospitalization. In one small study, after joint surgery, there was a tendency of better cognitive outcome with epidural anesthesia compared with general anesthesia (9). However, in a larger study, the anesthesia method (general, spinal/epidural or combined anesthesia) had no influence on the incidence of early postoperative delirium (10). Peripheral blocks have become more and more popular for postoperative analgesia after THA. New techniques such as using ultrasound during insertion of the block and disposable simple pumps have helped this tendency. Different types of peripheral blocks are used for this purpose. Posterior lumbar plexus nerve block (11), continuous psoas compartment block (12,13) and continuous “3-in-1” block (14), have been providing effective postoperative analgesia at rest and during physiotherapy. On the other hand femoral block does not seem to be as efficient. The use of epidural analgesia has at the same time diminished due to potential systemic side effects and complications such as nausea, vomiting, pruritus, dizziness, and hypotension. Epidural analgesia also warrants hospitalization as patients with epidural analgesia needs vigilant monitoring. Alternations in the surgical approach and the initiation of rapid rehabilitation protocols have decreased the duration of hospitalization. Also, due to risk of epidural hematoma associated with the use of thromboprophylaxis and epidural analgesia its use has deteriorated recently. The optimal time for continuous local anesthetic infusion is not known. Also the optimal concentration of local anesthetics for peripheral blocks may vary between different nerves (15). The complication profile of peripheral neural blocks also needs studies as, for instance, use of femoral block or lumbar plexus block have been reported to cause an increased risk of falling leading even to periprosthetic fractures (11,12). A fast-track multimodal therapy approach (16), or periarticular multimodal drug infiltration (LIA, Local infiltration analgesia) technique has become more popular in recent years. Local infiltration analgesia is infiltrated around the hip and repeated doses are administered through an intra-articular catheter for 24 h. Local anesthetic infiltration is only a part of the technique and this multimodal approach to patients makes immediate mobilization and earlier discharge from hospital possible (17). Maybe, this explains why the positive results of LIA have not been seen in all the studies (18,19). In a recent review, Kehlet and Andersen concluded that there is little evidence to support the use of the LIA technique in hip replacement either intraoperatively or with a post-operative wound infusion catheter technique, provided that multimodal, oral non-opioid analgesia is given (20). Intrathecal morphine is an old and cheap method of postoperative analgesia after THA. Side-effects like nausea and vomiting have restricted its use. However, with modern anti-emetic prophylaxis methods, subarachnoid morphine might be the most cost efficient analgesia method after THA as recommended for instance by the

References:
After completion of the femoral nerve block, the patient is angle through the skin with the bevel oriented 5 mA. Then a 22G catheter is introduced 3 cm beyond the needle tip. A loss of resistance is usually felt as the needle penetrates the periosteum. Diluted local anesthetics are suitable, but may result in catheter infusion is always initiated following an initial bolus (15 to 20 ml) operation. Before the anesthesia induction, a continuous femoral nerve catheter infusion is always initiated following an initial bolus (15 to 20 ml) through the catheter. Diluted local anesthetics are suitable, but may result in a more pronounced motor blockade. One of the advantages of continuous femoral nerve catheter infusion is the ability to titrate the dose to the patient’s needs. 

References:


25 KNEE SURGERY: EPIDURAL, SPINAL OR GENERAL COMBINED WITH FEMORAL NERVE BLOCK OR COMBINATION OF BLOCKS?

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The four applicable anaesthesia techniques in knee surgery are:
- Combined epidural anesthesia + femoral nerve block
- Combined spinal anesthesia + femoral nerve block
- Combined general anesthesia + femoral nerve block
- Combined sciatic nerve block + femoral nerve block

Femoral nerve block: The femoral pulse is located at the level of the inguinal crease with the patient in the supine position. The site of introduction of the needle is 1 cm lateral from the femoral arterial pulse. Under strict aseptic conditions, a 5 cm insulated introducer Thous needle connected to a nerve stimulator is inserted at a 45° angle through the skin with the bevel oriented cephalad. A loss of resistance is usually felt as the needle penetrates the fascia iliac. The position of the needle is adjusted to produce a motor response with a current < 5 mA. Then a 22G catheter is introduced 3 cm beyond the needle tip.

General anesthesia: Many patients (and surgeons) still prefer general anesthesia because they are unaware of events during the operation. Improving postoperative pain control accelerates normalization of activities of daily living and function that may otherwise persist for weeks after an elective knee operation. Before the anesthesia induction, a continuous femoral nerve catheter infusion is always initiated following an initial bolus (15 to 20 ml) through the catheter. Diluted local anesthetics are suitable, but may result in a more pronounced motor blockade.

Spinal and epidural anesthesia: The indication for central neuraxial blocks (spinal anesthesia, epidural anesthesia) in orthopaedic surgical patients include almost all patients undergoing knee procedures. In this group of patients, in whom a central neuraxial block is virtually uniformly indicated, it is most often a patient’s specific contraindication that will modify the anesthetic prescription.

Sciatic block: After completion of the femoral nerve block, the patient is turned laterally for placement of a sciatic perineural catheter using a gluteal approach. After negative aspiration for blood, 5-7 ml of saline is injected slowly, then a 22 G catheter is introduced 3 cm beyond the needle tip.

References:


26 THROMBOSIS PREVENTION AND REGIONAL ANESTHESIA, NEW DATA

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The majority of surgical patients requiring regional anesthesia is at risk for thromboembolism and receives a thromboprophylactic agent. Moreover, a raising population of parturient women undergoing epidural labour...
anesthesia also require antithrombotic therapy.  

Central blockade techniques are at risk of serious occurrences such as spinal or peridural hematoma, while peripheral blocks are at risk of bleeding and perineural hematoma.  

Although regional anesthesia is described as reducing risk of deep venous thrombosis (DVT) pharmacological thromboprophylaxis should be a main concern during execution of central and peripheral blocks to avoid serious occurrences. The incidence of venous thromboembolic events (VTE) is grossly underestimated, because often the patient is not symptomatic or misdiagnosed. Nevertheless, thromboembolism still represents a common complication in the perioperative period and pulmonary embolism is considered the first cause of death in hospitalized patients.

In six European Countries, the incidence of symptomatic VTE has been estimated to occur at an annual frequency of over 450,000.  

Even if International Guidelines have been recently revised, their clinical application still remains inappropriate.  

This has been illustrated by the ENDORSE study, conducted in 70,000 hospitalized patients. Among the patients who were considered at high risk for VTE, prophylaxis was administered in only 59% of those undergoing surgery and in 40% of the medical patients. Therefore, the need to reduce the discrepancy between the official Guidelines and clinical practice still exists, due to the importance of each medical and surgical specialty and the relative risk of VTE. During the last decades, our increased comprehension of VTE and the limitations of available anti-thromboembolic drugs have generated an increasing interest toward new therapeutic approaches and molecules. In this regard, the factor Xa direct inhibitor, Rivaroxaban, as well as thrombin direct inhibitor, Dabigatran, are the first in a long list of new drugs that will soon be available for oral thromboprophylaxis in patients undergoing major orthopedic surgery, or undergoing major cardiac surgery. These new molecules are a considerable alternative to low molecular weight heparins (LMWHs) and to vitamin K antagonists (VKAs), as they are comparable in safety and efficacy to the gold standard. Moreover, they represent a solution for many of those problems still unsolved with previous drugs. However, clinical data for these new drugs is still supported by a few scientific studies, and actual recommendations are still below a strong level of evidence. In particular current guidelines recommend an upholding of at least 36 hrs before central blockade in patients with ongoing treatment with Fondaparinux, while in patient receiving the first dose a delay of 6 hrs should be waited before the central blockade. Rivaroxaban requires a minimum of 18hrs delay before central blockade or catheter manipulation in patient with ongoing treatment, while patients undergoing central blockade should wait at least 6hrs before Rivaroxaban treatment start, and at least 24hrs if the procedure has been bloody or traumatic. Dabigatran is still not recommended for usage within central blockade procedures. The suggested time interval between discontinuation of thienopyridine therapy and neuraxial blockade is 7-14 days for ticlopidine and 7 days for clopidogrel. In patients receiving NSAIDS, neuraxial techniques are not recommended with the concurrent use of other medications affecting clotting mechanisms, such as oral anticoagulants, while there is no added significant risk for the development of spinal hematoma in patients undergoing epidural or spinal anesthesia while in therapy with NSAIDS alone. A decrease in the incidence of symptomatic events of VTE has been registered in the last 40 years. Authors mainly attribute this to the systematic prescription of prophylaxis in surgical patients. Nevertheless, it seems more likely that current minimally invasive surgical and techniques, as well as the more appropriate perioperative pain management allowing earlier recovery and mobilization, have also played a role in the reported decreasing incidence of VTE. The optimum use of LMWHs has been extensively investigated, especially with respect to the minimization of the associated increased risk of bleeding observed with other non-surgical procedures such as surgery and the performance of neuraxial blocks. With respect to the new anticoagulants, significant consideration should also be given to study these drugs in the same setting. Actually, ASRA suggests to apply to peripheral nerve blocks the same recommendations regarding neuraxial techniques. However, irrespective of the drugs, it should be recognized that an increased number of evidence supports the concept that the use of peripheral blocks represents a safer alternative to the use of neuraxial blocks in surgical patients benefiting from the combination of regional anesthesia and thromboprophylaxis.

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RISKS OF POSTOPERATIVE NEUROPATHIC PAIN

D. Li, J-P. Estebe USA

Perioperative nerve injury (PNI) can result in functional impairment and chronic neuropathic pain. Several large retrospective studies estimate that the overall incidence of PNI has been on the decrease since 2000. However, the true incidence remains unclear and is likely under-reported. The most common mechanism of PNI is nerve ischemia (stretching, compression, or direct injury). Although the symptoms may resolve over time, some require more than one year to achieve maximal neurologic recovery. Causes for PNI are multifactorial.

A number of pre-existing comorbidities have been associated with the development of PNI. These conditions include diabetes, tobacco use, hypertension, hyperlipidemia, vascular disease, and thyroid diseases. Other comorbidities likely related to PNI are obesity, cachexy, and pregnancy. Furthermore, asymptomatic patients with spinal stenosis or cervical spinal abnormalities are at increased risk for PNI. In orthopedic patients, the presence of valgus deformity, flexion contract, and rheumatoid arthritis are also considered risk factors for developing PNI. Preoperative factors such as hypovolemia, hypotension, dehydration, anemia and hypoxemia can also increase the incidence of PNI. Additionally, the presence of anticoagulation further contributes to the occurrence of PNI.

Surgical positioning and types of surgery are both related to the incidence of PNI. Lithotomy, lateral, prone and sitting positions have been shown to increase PNI. Significant number of patients developed persistent postsurgical pain after undergoing neurosurgery, cardiac [6], general and orthopedic surgeries, especially with in the setting of prolonged surgical duration.

Laparoscopic surgery has been associated with PNI secondary to extreme patient positioning leading to compression and stretching of the nerves and prolonged operative times. The most frequently injured nerves are the ulnar nerve, brachial plexus and peroneal nerve; but iliosinguinal, iliohypogastric, obturator and genitofemoral nerves can also be involved with some abdominal surgical approach.
Persistent postoperative pain is a frequent phenomenon after orthopedic surgeries. A recent study found that 44% of total knee arthroplasty (TKA) and 48% of total hip arthroplasty (THA) patients reported persistent postoperative pain 3 to 4 years after their surgeries (15% severe pain and 6% extreme pain). Moreover, 13% of the patients with persistent pain after TKA and 5% of those after THA had pain that was likely neuropathic in origin. During TKA, the incidence of PNI is as high as 10%. The risk is significantly higher among patients undergoing bilateral procedures. The incidence of neuropathy after THA varies significantly between 0.3% and 4%, which may reflect the wide range of surgical approaches. The electromyographic abnormalities are present in 70% of the cases, which confirms that clinical examination alone underestimates PNI. Common peroneal, posterior tibial, sciatic, femoral nerves are most likely to be involved; but superior gluteal or obturator nerves are also at risk. Other surgical factors that increase the risk of PNI during THA are shortening of the leg (≥4cm), usage of cement, congenital dislocation, hemorrhage, and prolonged surgical duration. A large majority of nerve injuries have been reported to occur with the use of lateral decubitus position and subsequent traction during shoulder surgeries. In the beach-chair position, head and neck malpositioning and arterial hypotension. While a large needle diameter is needed to facilitate catheter insertion, the risk of PNI can be reduced with the use of blunt needles as opposed to the long beveled needles, but this is still debated. The risk of clinically significant PNI after RA is evaluated between 0.1% and 0.004%. However, the severity of neurologic disturbance due to surgery is difficult to evaluate; given this difficulty some authors estimate the incidence of transient neurologic symptoms to be between 8 to 10%. Due to its anatomy, ulnar nerve compression at the level of the elbow represents the second most frequent compression neuropathy after carpal tunnel syndrome. Pain after surgery is usually perceived as nociceptive pain. Both surgical trauma and opioids are known to induce hyperalgesia. Some of the current analgescics used in the treatment of chronic neuropathic pain demonstrate proven efficacy in reducing pain intensity, opioid consumption, and opioid-related adverse effects after surgery. For example, gabapentinoids such as pregabalin and gabapentin have their efficacy confirmed by meta-analysis.

The risk of developing PNI after neuraxial (epidural more than spinal) anesthesia is reported to be higher than after peripheral nerve blocks, but this is still debated. The risk of clinically significant PNI after RA is evaluated between 0.1% and 0.004%. However, the severity of neurologic disturbance due to surgery is difficult to evaluate; given this difficulty some authors estimate the incidence of transient neurologic symptoms to be between 8 to 10%. The risk of PNI is not increased while using regional anesthesia (RA) for orthopedic procedures as illustrated by a recent study on RA for TKA. It is proposed that ultrasound (US) guidance could decrease the risk of intraneural injection. The estimated incidence of unintentional intraneural injection under neurostimulation (US) is greater than 80%, while the incidence under US seems to be significantly reduced to 1.7%. Moreover, intraneural injection under US is immediately detected and terminated in 50% of the cases.

The risk of PNI can be reduced with the use of the blunt needles as opposed to the long beveled needles, but not to the short short beveled needles. While a large needle diameter is needed to facilitate catheter insertion, the larger needle gauge can elicit a more pronounced nerve injury in the case of nerve perforation. The use of local anesthetics with lower concentration likely reduces the risk of neurotoxicity. However careful attention to adjutants and “recipes” must be made as there is an absence of definitive neurotoxicity evaluation. The risk of PNI due to peripheral nerve catheter remains debated. In order to avoid the formation of hematoma, management of anticoagulation must be adjusted with the timing of the insertion and removal of catheters.

28

POTENTIAL INFLUENCE OF THE POSTOPERATIVE ANALGESIA REGIMENS ON CANCER-RELATED OUTCOME

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for opioids (6). It has also been investigated the effect of serum from breast cancer surgery patients who received different analgesic techniques on breast cancer cell function in vitro. A propofol/paravertebral anaesthesia-analgesia has been compared with sevoflurane general anaesthesia with opioid analgesia, measuring effects on proliferation and migration of breast cancer cells in vitro. Serum from patients receiving propofol/paravertebral anaesthesia was able to inhibit proliferation, but not migration, of ER-MDA-MB-231 cells in vitro, to a greater extent than that from patients receiving sevo- flurane/opioid anaesthesia-analgesia. So it seems that anaesthetic technique could alter the serum molecular milieu affecting breast cancer cell function, possibly by altering anesthetic and opioid drug administration and resultant pain scores (7). In an other paper patients with invasive prostatic carcinoma undergoing open radical prostatectomy had either general anaesthesia-epidural analgesia or general anaesthesia-opioid analgesia. It has been observed a lower risk of recurrence of GA-EA compared with the GA - opioids group; it seems that regional anesthesia and analgesia may help to preserve immune function by attenuating the surgical stress response, decreasing anesthetic requirement, and diminishing the need for opioids. A long-term survival after resection of colon cancer has been observed in a group undergoing general anaesthesia with epidural analgesia supplementation. Epidural analgesia had no effect on survival of patients with metastases. (8) Regional anesthesia might improve the long term prognosis of malignant melanoma patients after inguinal lymph node dissection, with a better cumulative survival over 10 years after spinal anesthesia (9). There still is no clear evidence whether a simple change in anesthetic practice could affect patient survival. Several multicenter prospective randomized controlled trials are underway, testing the hypothesis that local or metastatic recurrence after several types of cancer surgery will be decreased in patients undergoing a regional anesthetic/analgesic technique in comparison to those receiving general anesthesia.

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29 INTRATHECAL DRUG DELIVERY SPECIFIC APPROACH SPEAKER: DR. SAM ELDABE UK
S. Eldabe
The use of implanted devices for the intrathecal administration of drugs to relieve intractable pain has been practiced for nearly three decades. The advantage of the intrathecal route is that, compared to systemic administration, an equivalent, or better, analgesic effect can be obtained with lower doses and therefore less severe side effects. In addition, the direct access to the intrathecal space allows the use of drugs that cannot be administered by another route because of either systemic inactivation or inability to cross the blood brain barrier. Yet, despite increasing popularity, there is a paucity of high quality clinical studies, resulting in an ongoing controversy regarding the efficacy of intrathecal drug delivery in general and the best flow profile for pain patients. A recent clinical observation has prompted us to investigate the effects of the flow rate and flow pattern on the analgesic effect reported by patients in receipt of long term intrathecal drug delivery via an implanted programmable pump. In this case a patient who received a small bolus of intrathecal bupivacaine morphine reported good pain relief when no pain relief was reported by the same patient to a much larger dose of bupivacaine morphine mixture delivered by continuous infusion. Animal experiments conducted using flows similar to those delivered by programmable intrathecal infusion device have shown that intrathecal drug distribution into the CSF and spinal cord is limited to 2 cm around catheter tip when delivering a slow infusion within the clinically utilised flow rates. Increasing the flow rate from 20ncl/hr to 1000ncl/hr or the administration of the drugs as bolus resulted in a much wider distribution of the study drugs bupivacaine and bupivacaine in the CSF and spinal cord parynxema. The findings were the same regardless of the drug used. The author concluded that the position of the catheter tip was crucial in the case of drugs given by slow continuous flow and that continuous infusions were associated with a higher risk of development of intrathecal granulomas as a result of exposure of the spinal meninges to high drug concentrations.

A randomised blinded crossover study using double and quadruple the flow rate of the intrathecal volume while delivering the same dose of drug per day has shown no improvement in analgesia between the groups with an increased flow rate. Similar results have been reported for patients suffering from CRPS associated dystonia with intrathecal baclofen.

An industry sponsored study using a Patient activated device that allows patients to deliver boluses from the ITDD using predetermined bolus size and lockout period much like the iv PCA concept have shown an improvement in pain scores and patient satisfaction with the analgesia. While some adverse events were reported from the use of the bolus device (PTM) most of these were related to the administration of concomitant oral analgesics and the failure to reduce the dose of oral analgesia.

In conclusion both animal studies and human point to a much wider distribution of the drugs in the CSF when these are administered by bolus rather than by slow continuous infusion. In patients who are refractory to treatment by intrathecal infusion bolus administration either by complex continuous infusion or through the use of PTM should be considered.

Further reading:

30 RADIOFREQUENCY TECHNIQUES IN THE MANAGEMENT OF CANCER PAIN
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Introduction: Pain in patients with cancer can be refractory to pharmacological treatment or intolerable side effects of pharmacological treatment may seriously disturb patients’ quality of life. Recently the use of interventional pain management techniques has gained in interest. Instead of being considered the fourth consecutive step following the World Health organization’s pain treatment ladder, judicious use of carefully selected techniques for a particular type of pain may reduce the need for strong opioids and their side effects.

The guidelines on the management of pain in patients with cancer of the Dutch association of anaesthesiologists (NVA), the society of Dutch comprehensive cancer centers VIJK and the Dutch Institute for Health Care
Improvement (CBO), have recommended the use of certain interventional techniques at earlier stages, possibly even at the stage where opioid treatment is first being considered. However, all interventional pain management techniques impose a certain burden on the patient, which must be taken into account when considering these treatment options. In addition, correct performance of these techniques requires one or more days of hospitalization. This information must be communicated to the patient to allow an informed decision making.

Cervical cordotomy for the management of unilateral pain with limited life expectancy. Unilateral oncologic pain situations situated below the shoulder or dermatome C5, such as may occur with pancoast, pleural mesothelioma or invasion of the brachial or lumbar plexus, may be eligible for treatment with cordotomy, if they prove refractory to other techniques.

Cordotomy involves creating a lesion of the spinothalamic tract at the C1-C2 level of the spinal cord with the aim of relieving unilaterally localized pain below the level of dermatome C5. The technique was first described by Mullan in 1963. Although the treatment was originally applied for non-oncologic pain, because of the potential side-effects, it is now mainly reserved for the management of patients with refractory pain due to cancer whose maximum life-expectancy is 1 year. (Landelijke richtlijnwerkgroep Pijn bij kanker 2008)

Patient selection: Unilateral refractory pains due to cancer located under the dermatome C5 are eligible for treatment with cordotomy. The best results are obtained for the treatment of neuropathic pain and incident pain, occurring by some form of strain. Visceral pain, especially abdominal pain, is not an indication for cordotomy. It is also important to assess whether pain elsewhere in the body is well-controlled. The patient must be informed that successful cordotomy may unmask other pain.

Clinical neurologic examination results obtained before and after treatment should be compared to identify any neurologic deficits. This includes pain perception and/or temperature perception on both sides, as well as motor function.

Cordotomy is currently reserved for the management of oncologic pain, thus all causes of unilateral pain of non-oncologic, neurologic, osteogenic or myofascial origin must be excluded.

Evidence
The effects of cordotomy on patients have been described in one non-randomized study and a number of observational studies. A study comparing cordotomy with subarachnoid phenolization found that both techniques yielded similar pain control at lower opioid dosages. Seven of the 10 cordotomy patients developed pain on the contralateral side of the body, while 4 of the 10 patients developed complications which resulted in functional deterioration. Since 1990, 6 case series have been described in which a total of 677 patients with cancer were treated with unilateral cordotomy. The authors reported considerable or even complete pain reduction in 82-98% of the patients, while opioid consumption was reduced by 50%. The number of patients treated in the treatment of unilateral pain.

A number of patients (31-88%) experience recurrence of the pain, which can usually be effectively treated with opioids. Two studies described 3 patients who survived for considerably longer than 2 years. These patients did not develop neuropathic pain as a result of the procedure. However, this number is too small to allow conclusions about the long-term safety of cordotomy. A recent report describes a patient who survived 5 years after right sided cervical cordotomy. Sensory dysfunction was observed in the left side of the body, but no motor neuron or autonomic dysfunction was observed. There was limited influence on the patient’s daily activities.

Cordotomy is only used for cancer patients suffering severe pain which is refractory to pharmacologic treatment. The Dutch CBO guidelines for the treatment of pain from cancer recommend that these therapeutic options should only be considered for patients with a limited life expectancy (1 year). The immediate results of the treatment are evaluated by applying the pin prick test to the patient’s thorax. We recommend regular evaluation of the pain (at least weekly). In view of the complexity of the pain syndrome and the risk of other (masked) pains becoming manifest, we recommend that the pharmacologic treatment be adjusted on the basis of the patient’s complaints.

There have been contradictory reports about the value of bilateral cordotomy to relieve pain due to cancer. Amano et al. found that 95% of the 60 patients who had a bilateral cordotomy reported (virtually) complete pain reduction, versus 82% of the patients who had a unilateral cordotomy. In this study, however, both groups were suffering from bilateral pain. By contrast, Sanders et al. found no advantage of bilateral cordotomy, whereas the risk of complications appeared greater.

Computer tomography-guided radiofrequency treatment was also described for ablation of the upper spinal cord pain pathways. Of a series of 55 patients, 42 underwent a unilateral cervical cordotomy. Patients reported initial and 6 months pain relief of 98% and 80% respectively. Another series of 207 patients treated with CT-guided cordotomy over 20 years reports an initial success rate of 92.5%. The success rate was higher in patients suffering pain due to malignancies. In this group cordotomy was achieved in 83%. Bilateral cordotomy was successfully applied in 12 cases.

Side effects and complications
The localization of the tractus spinothalamicus lateralis and the size of the thermolesion relative to the spinal cord, explain the risk of damage to adjoining nerve tracts. Reported complications include paresthes (up to 10%), bladder dysfunction (up to 15%) and respiratory depression (up to 10%), as well as head and neck pain and dysesthesias. These side-effects proved to be permanent in a number of cases. In addition, there is a risk of other, previously masked pains becoming manifest, or of developing "mirror pain", that is, pain on the contralateral side. The incidence of such pain syndromes is between 9 and 63%. Interestingly, none of the studies reported neurogenic pain due to the treatment. The risk of major complications is larger with bilateral cordotomy.

Recommendations: Cordotomy may be considered for patients with unilaterally localized refractory oncologic pain below the level of dermatome C5, with a maximum life expectancy of 1 year, who obtain insufficient relief from conventional treatment.

Cordotomy should only be carried out at centers where staff have extensive experience with this treatment.

Other nerve blocks
Plexus celiacus block or nerve splanchicus block are recommended for the management of upper abdominal pain due to cancer. Pelvic pain due to cancer can be managed with plexus hypogastricus block. Neurolytic blocks or for this targets in patients with cancer pain are the first choice. The radio-frequency blocks of the nerve splanchicus have been documented in non-cancer patients.

Conclusion: The most important application of radiofrequency for the management of pain in patients with cancer is cervical cordotomy.

The use of radiofrequency lesions at the level of the nerve splanchicus or plexus hypogastricus may be considered, but neurolytic techniques or for this targets in patients with cancer pain are the first choice.

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31 NEUROPATHIC PAIN

L. Nikolajsen, S. Haroutunian Denmark.

Definition and epidemiology IASP previously defined neuropathic pain as "Pain initiated or caused by a primary lesion or dysfunction in the nervous system". A new definition, proposed by Treede et al. (2008), which states "Pain arising as a direct consequence of a lesion or disease affecting the somatosensory system" was recently accepted by IASP with minor changes. Currently, neuropathic pain is defined as "Pain caused by a lesion or disease of the somatosensory nervous system" (IASP website, accessed June 2011).

The information on neuropathic pain prevalence is not very accurate, mainly due to inconsistency in diagnostic criteria across the studies. However epidemiological data suggest that up to 6-8% of general population may suffer from neuropathic pain, or at least from pain with neuropathic features (Torrance et al. 2006; Bouhassira et al. 2008; Smith & Torrance 2011).

Assessment Clinical examination is a crucial part of the diagnostic process of neuropathic pain, aiming at finding possible abnormalities relating to a lesion of the somatosensory system. Sensory testing is the most important part of this examination and includes testing of touch, vibration, pinprick, cold and warmth. Tactile testing may be assessed by a piece of cotton wool, vibration sense by a 128-Hz tuning fork, pin-prick sensibility by a wooden stick and thermal sense by warm and cold objects (e.g. metal thermorollers) (Cruccu et al. 2010; Haanpaa et al. 2011). Quantitative sensory testing can be used along with bedside testing, whenever possible, to provide independent verification of sensory signs. Importantly, no gold standard is available to label a specific pain as "neuropathic".

The best way to measure the intensity of neuropathic pain is by using a Visual Analog Scale (VAS) or the 0-10 Numerical Rating Scale (NRS). These are also recommended to assess the effect of treatments on neuropathic pain intensity in research and clinical practice (Haanpaa et al. 2011).

Different questionnaires have been developed in order to further assess the neuropathic component of the pain, or monitor treatment outcomes of neuropathic pain. Several validated questionnaires exist and can be used (e.g. DN4, S-LANSS, PainDETECT, SF-MPQ, NPS and NPSI), however consensus is lacking on a single preferred tool.

A 4-stage probability grading system for neuropathic pain has been proposed, that can be useful both for clinical and research purposes (Treede et al. 2008). The probability grading is based on i) neuroanatomical distribution of pain, ii) relevant medical history to indicate possibility of somatosensory nerve damage, iii) clinical examination to determine the presence of negative and positive sensory signs, and iv) further diagnostic tests (e.g. brain imaging or skin biopsy). The probability grading may assist in more accurate diagnosis of neuropathic pain, but its feasibility has not yet been tested in clinical trials.

Clinical characteristics Neuropathic pain consists of a series of different diseases and conditions ranging from nerve compression as a consequence of neuropathies, neuropathies due to metabolic disorders such as diabetes to diseases of the CNS such as stroke and multiple sclerosis. In addition to a long list of different causes of neuropathic pain, these pains also differ in anatomical location and can be localized anywhere from the peripheral nervous system to the highest centers in the brain (Jensen et al. 2009).

Neuropathic pain is not one single disease but constitutes a heterogeneous group of diseases and lesions that produce a common syndrome characterized by pain within a territory that has lost its normal afferent input to the CNS. An essential element in neuropathic pain is the combination of sensory loss and the paradoxical presentation of hypersensitivity in the painful area (Jensen et al. 2009).

In general, a neuropathic pain syndrome is, therefore, characterized by:

(1) Pain in a neuroanatomical area with partial or complete sensory loss.

(2) The presence of stimulus-independent ongoing types of pain.

(3) The presence of stimulus-dependent evoked types of pain (alldynia, hyperalgesia).

(4) Aftersensations (pain outlasting the period of stimulation).

(5) Abnormal summation of pain (increased pain following repetitive stimulation).

Management: Treatment of neuropathic pain can be challenging. Medical treatment include antidepressants (TCAs e.g. amitriptyline and nortriptyline and SNRIs e.g. duloxetine and venlafaxine), anticonvulsants (pregabalin, gabapentin, lamotrigine, carbamazepine, phenytoin, valproate and others), topical agents (local anesthetics or capsaicin), systemic local anesthetics (intravenous lidocaine and oral mexiletine), weak opioids (e.g. tramadol) or strong opioids (e.g. morphine, oxycodone, methadone). For evidence-based review on neuropathic pain management see other references (Dworkin et al. 2007; Finnenup et al. 2010).

Non-pharmacological treatment modalities (e.g. acupuncture, TENS, physical therapy) have shown inconsistent results, and currently no method is recommended as first line therapy for neuropathic pain.

References:


S. Eldabe

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Further Reading:


23 COMBINATION OF SCS AND PNS: WHEN AND HOW TO MEASURE EFFECTIVENESS?

T. Goroszeniuk

The modern form of SCS and PNS was introduced into clinical practice almost simultaneously in 1965 (1) and 1967(2), following the publication of the gate theory of pain (3).

SCS has progressively gained ground and its use has expanded through the development of a percutaneous technique, despite some initial regresses in 1970s (4). PNS characterised a slow development with less than 500 cases all surgical, reported in literature until 1999 when the publication of a percutaneous lead placement targeted at GON by Weiner and Read (5) stimulated a rapid expansion of PNS with many new techniques and indications to follow.

PNS terminology has not been established as yet, despite recent editorials and a clear need for standardisations (6, 7, 8).

There are several components of PNS, starting from single nerve stimulation (9,10), which was the main indication since the conception of the technique, and the new attractive additions including brachial (11) and lumbar plexus stimulation (12), paravertebral plexus stimulation (13) and the stimulation of the sympathetic chain at lumbar(14) and splanchnic levels (15).

However, simple peripheral percutaneous stimulation targeted at the site of pain, which has proved to be quite effective, has attracted much attention and gained instant approval amongst neuromodulators due to its simplicity and effectiveness (16, 17). Again, the terminology for this technique has not been formalised and Subcutaneous Target Stimulation (STS), Peripheral Subcutaneous Field Stimulation (PSFS) and Subcutaneous Electrical Nerve Stimulation (SENS) are in use (6, 7, 8, 18, 24). There are numbers of patients implanted for various conditions including neuropathic scar pain (16, 17), post-herpetic neuralgia, (19) abdominal pain (20), back pain (21), fracture scapula (22), intractable angina (23), and others. The largest study to date is the recent Austrian publication (24).

Due to its simplicity and effectiveness this technique has been considered an ideal addition to SCS, where standard central stimulation cannot provide sufficient coverage of the painful area.

In theory, a combined SCS/PNS (of any description) approach can offer the possibility of synergistic benefits and expanded stimulation coverage in selected cases. However, the data presently available is very limited.

Recently, Navarro and Krames introduced the concept of axial stimulation, providing a more scientific angle for this approach (25).

The measurement of effectiveness in a combined SCS/PNS approach is similar to assessment for a single neuromodulation application, with the exception that the dual technique requires selective differentiation and assessment of efficiency of the individual components of implanted systems.

A correct patient selection with a full psychological assessment is mandatory. Some larger neuromodulation centres can offer a very comprehensive assessment of efficiency of the individual components of implanted systems.

A correct patient selection with a full psychological assessment is mandatory. Some larger neuromodulation centres can offer a very comprehensive pre-implantation programme and this has been playing an important part in the successful outcomes of neuromodulation treatment (26).

Following a satisfactory patient selection and a positive approval from pre-implantation programme, a standard stimulation trial is required, usually lasting one week, but in some countries a longer period is mandatory (27).

The aim of the preliminary stimulation trial is to cover the target area with paraesthesia and subsequently provide a patient with substantial pain relief. However this principle has been challenged recently with the introduction of...
high frequency stimulation devices where no perceived sensation is during trial or permanent implantation (28). With a successful preliminary trial of SCS/PNS, which is characterised by sufficient coverage and a minimum 50% of pain reduction achieved, a permanent system implantation would be considered. 

The aim of the single or combined neuromodulation technique is to provide a sustained pain relief. As pain is a multidimensional perception, measurement of combined SCS and PNS is as challenging as in the single neuromodulation application. Pain assessment via a visual or numerical scale is well established and widely adopted. However, it has been criticised frequently. Despite many reservations, this method is still the most used in pain assessment as it is easy to apply, very convenient and reflects reasonably well on post-implantation status (29). 

A reduction in a pharmacotherapy regime, especially during the advanced stages of treatment is also an excellent measure of a positive outcome (30, 31).

Clinically important improvements in functional capacity and health-related quality of life, and satisfaction with treatment are playing an important role in the assessment of the effectiveness of the neurostimulation modality (30, 31), with return to work being used as a gauge in some cases.

The measurement of effectiveness should be carried out at regular intervals, or when required. This largely depends on the local policies.

The combined SCS/PNS technique looks very attractive and promising. It has already expanded the field of neuromodulation and in some cases improved quality of treatment. With more information and better collection of data, a refinement of the technique and an expansion of indication will follow.

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34 PERIPHERAL NERVE FIELD STIMULATION VERSUS PERIPHERAL NERVE STIMULATION: WHAT IS THE APPROACH?

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Background and aims: This session will discuss the differences between PNS and PNFS.

Methods: Literature Review

Results: Peripheral nerve field stimulation (PNFS) is a rather new concept which has arisen largely due to the failure of conventional spinal cord stimulation to cover areas such as the lower back. In spite of the fact that advances in spinal cord stimulation software, steereability, functionality and programmability are ever improving, engineers have not yet been able to adequately overcome the size and location of the sensory homunculus for the back. Under stimulation of dorsal roots, abdominal stimulation or other problems create formidable problems. Even tripolar stimulation only achieve good back coverage part of the time. Field stimulation involves placing an electrode array, usually a wide-spaced multiple contact lead is chosen, such that larger areas can be stimulated, often with more than one lead. This type of stimulation involves surface mapping/drawing of the painful areas, and essentially the surgeon attempts to fill the area (field) as much as possible with electrode contacts. The nerves targeted in field stimulation are un-named, often arising above the muscular layer and deep to the subcutaneous tissue. That they are un-named merely means that the nerves are smaller, but perhaps no less important. In other cases, e.g. occipital nerve stimulation, supraorbital nerve stimulation, ilioinguinal nerve stimulation, saphenous nerve stimulation, and some others, the nerve that is targeted is close enough to the surface that a neural contact is not required, and merely being close is good enough to effect a paresthesia in the desired territory.

Peripheral nerve stimulation (PNS), conversely, requires that the targeted nerve be activated by an electrode array which is placed extremely close to the nerve. These peripheral nerves are largely in the extremities, and include the ulnar, radial, median, sciatic, femoral, posterior tibial and common peroneal nerves in the extremities, as well as more distal branches of same. When considering PNS, the internal fascicular arrangement is extremely important, which is not the case with PNFS wherein the nerves are distal sensory branches. With larger nerves, motor or mixed fascicles may be activated at the same time as the desired sensory fascicles, often causing painful contractions. In some cases with poor placement, the threshold for activation of sensory versus motor fascicles is extremely small, which can lead to patient dissatisfaction or worse failure of the treatment. Further, lead migration is a much larger issue even than SCS, because peripheral nerves within their neurovascular fascial compartments often translate (move) several millimeters in different directions with movement of the extremity.

What is clear is that these are different treatments which are not competing. It may be true that in some syndromes, SCS plus PNFS is the best therapy. For example, a patient may have thigh pain due to a needle stick injury causing a femoral neuropathic pain syndrome that also manifests pain in the saphenous distribution. Adding a second lead near the tibial plateau to stimulate the saphenous field may synergize with the PNS lead placed higher next to the femoral nerve. Finally, in some cases SCS plus PNS may be preferred by patients. Taking the same example as above, a patient with a femoral needle stick injury (femoral neuropathic pain) that secondarily develops CRPS with more global extremity involvement may be helped most by the combination of SCS to capture more of the extremity, plus the use of PNS to differentially capture the area of injury. Some of these concepts are beginning to be tested, and other remain untested.

35 THE AGE AS MAIN VARIABLE

P. De Negri Italy.

Pharmacokinetic and pharmacodynamics changes as well as polypharmacy and co-morbidities may alter significantly the effect of pharmacological treatment with advancing age.

The proportion and number of older adults is substantial and increasing worldwide. An important consideration in treating older adults is aged heterogeneity; older people are the most heterogeneous of any age group on a wide variety of physical, psychological, social, and functional characteristics. On one end of the spectrum of health care are people with few or no medical problems, physically active and with minimal age-related decline in function. For them, treatment options are generally the same as for younger people. At the other end of the spectrum are frail or vulnerable individuals, with multiple medical problems, taking multiple medications, physically inactive, and functionally disabled. Between these ends of the spectrum there are a large number of people who include in the so called usual aging. Aging is not a single entity but a collective term representing the sum of cumulative local effects at the molecular, cellular and tissue level. Although a clear definition of aging is not possible, several characteristics are recognized. The more consistent is the time-related loss of functional units, the smallest structures capable of performing the specific physiological activities characteristic of the organ of which they are part (i.e. nephrons, alveoli or neurons). A further characteristic is the alteration of some of the regulatory processes providing functional integration between cells and organs. Aging is not solely a progression of functional decline but produces anatomical and physiological changes which might lead to decapsulation of the relevant system when they progress beyond a threshold. Aging is associated with a progressive reduction in total body water and in extracellular volume with a relative increase in body fat. Aging produces major cardiovascular changes; both renal plasma flow and glomerular filtration rate decline with age affecting the clearance of many drugs. Acid-base balance is maintained under physiological conditions but a reduced response to stress is revealed by the inability to deal with acid loads. Advancing age is associated with a progressive reduction in liver volume and liver blood flow and consequently with a reduction in first-pass metabolism. As a result, the bioavailability of drugs undergoing extensive first-pass metabolism can be significantly reduced. Changes in body composition, hepatic and renal function are responsible for an increase in the volume of distribution and a reduced clearance of liposoluble drugs while water soluble drugs tend to have smaller volumes of distribution resulting in higher serum levels in older people. All these changes lead to a prolongation of plasma elimination half-life. The aging process is characterized by structural and functional changes affecting all organ systems and results in reduced homeostatic capacity and altered response to receptor stimulation. Significant pharmacodynamic changes coupled with age-related decline in CNS function also occur, determining an increase sensitivity to drugs. There is a predictable age-related decline in cytochrome P-450 function and, combined with the polypharmacy that much of the elderly population experiences, this may lead to a toxic reaction of medications. Furthermore, in elderly patients the volume of CSF may be reduced, resulting in high CSF concentrations of the local anesthetic, which may contribute i.e. to the faster onset of analgesia and motor blockade. Pitkanen et al. (6) did not observed effect of age on the plasma concentrations of intrathecal bupivacaine. The higher peak plasma concentration in older patients may be due to an age-dependent speeding of the initial absorption rate of bupivacaine from the subarachnoid space into the general circulation or, more likely, to the marked decrease in the total plasma clearance. The terminal half-life of bupivacaine was not altered by age. The amount of drug that reaches the sites of action may be greater in older than in younger patients, so that even if the concentration at the sites of action decreases at the same rate, the absolute concentration at these sites is higher in older patients. The older adult due to increased pharmacodynamic sensitivity combined with age-related changes in central nervous system, presents an increased risk of an amplified response to central nervous system-active drugs. The implication of these age-related changes in pharmacokinetics and pharmacodynamics is that older adult patients require more careful dosing (usually lower), titration (usually slower), and monitoring compared with younger patients. The heterogeneity of older adults population explains why some older patients will not tolerate usual adult doses but others will tolerate and need the same dosing as a younger person.
of ziconotide-morphine has thus a shorter duration of stability - 15 days vs. 40 days for ziconotide-hydromorphone. New combined preparations should therefore include a powered opioid where oxygen is removed by use of nitrogen. The combinations ziconotide-clonidine and ziconotide-baclofen seem to be more stable than ziconotide-bupivacaine and a triple mixture ziconotide-clonidine- morphine (11).

Baclofen has been used in the treatment of children with cerebral palsy or among adults with severe spasticity, but the drug has also antinoiceptive effects even at doses that produce no motor block and in patients with no spasticity (12). Combinations of baclofen and morphine or clonidine are more effective than each drug alone in clinical as well as animal studies (12,13). In case series combinations of ziconotide and baclofen have improved pain relief and reduced the need for opioids (14). On the other hand, IT baclofen carries a risk of serious injury and even death from sudden cessation of the drug. A mixture of baclofen and clonidine is stable within implantable pumps for 14 weeks.

Midazolam facilitates the inhibitory action of GABA on neuronal transmission, enhances the antinociceptive effect of opioids (15) and acts synergistic with bupivacaine for postoperative analgesia. In small case series patients with chronic non-cancer pain reported excellent pain relief with the combination midazolam-clonidine (16). The safety data on toxicity are conflicting, but in rats intrathecal administration of midazolam has produced histological alterations.

IT gabapentin has analgesic and antihyperalgetic effects. Spinally, it acts via voltage-dependent calcium ion channels and decreases the release of glutamate and aspartate at the postsynaptic dorsal horn. Supraspinally, it acts on the inhibitory descending noradrenergic and cholinergic system. In morphine-tolerant rats gabapentin enhances the effect of morphine (17). So far, there are no clinical safety data on intrathecal administration.

Intrathecal administration of the NMDA receptor antagonist ketamine has shown long term antinociceptive effects and relief of cancer related neuropathic pain. The enantiomer S- ketamine is considered less neurotoxic than the racemic mixture (18), but preclinical data have demonstrated injury to the spinal cord even after exposure to S- ketamine (cell shrinkage, vacuolation and gliosis) (19). IT ketamine can therefore not be recommended until more safety data are available.

IT administration of adenosine is known to provide potent analgesia. Interestingly, the antihypersensitivity activity of morphine is dependent on the A1 adenosine receptor activation (20). Moreover, a combination of the opioidic fentanyl and morphine has been found to increase the spinal release of adenosine (21). Whether coadministration of adenosine can enhance the antinociceptive effect of morphine is not established, and the risk of neurotoxicity is yet to be studied.

Neostigmine is a cholinesterase inhibitor and elicits NO release in the spinal cord (17). It may also act by inhibiting the c-fos expression. Clinical safety data for long term use are not available, but in preclinical studies the combination of clonidine and neostigmine has produced neurotoxic effects.

Coadministration of morphine and am lodipine (L- type calcium channel blocker) has in preclinical studies prevented hypersensitivity and seems to prevent opioid tolerance (22). The effect may be explained by a decreased release of excitatory neurotransmitters. So far, however, clinical safety data are not available.

Long term administration of morphine increases the CSF concentration of pro-inflammatory cytokines (Fractalkine), and an IL1 receptor antagonist (IL-1Ra) has been found to prevent opioid induced hyperalgesia, allodynia and tolerance (1). Intrathecal ketorolac (NSAID), however, does not seem to relieve chronic pain or increase the effect of intrathecal bupivacaine (23).

References:

WWW: http://www.blackwell-synergy.com/loi/ner

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TECHNICAL UPDATE: AXIAL AND RADICULAR PAIN-RECENT ADVANCES IN SPINAL PAIN MAPPING, EPIDURAL DECOMPRESSION AND NEUROSTIMULATION


The array of diagnostic and therapeutic options available to interventional spinal specialists has expanded dramatically over the past several decades. As is often the case in periods of rapid development of clinical technologies, the variety of available options appears to have outstripped our understanding of the best application of these technologies. In this manuscript, we offer a technical update for the application of both diagnostic and therapeutic modalities. We begin with a brief description of diagnostic spinal pain mapping, and proceed to therapeutic epidural decompression and neurostimulation.

Introduction: Specialists in the interventional treatment of spinal pain have commonly approached the problem as one of localization: for segmental level, and in relation to the anterior, middle, and posterior spinal columns. Localization techniques have included selective injection of the medial branch or spinal root, or diagnostic blockade and the diagnostic use of flexible (steerable) epiduroscopy, which have lead to increased importance for conceptualizing the localization of pain generators as in the anterior verses posterior epidural space, or distinguishing dermatomal verses sclerotomal pain patterns with stimulation. Similarly, technological changes including epiduroscopic access, lasers, and novel electrode designs in spinal cord stimulation require adjustments in our algorithm. These have lead to a number of therapeutic techniques beyond serial injection, such as neuromodulation of the medial branch and spinal root, or laser ablation of the disc. Patients’ with ongoing refractory symptoms but no progressive neurological deficit have been considered for neurostimulation therapy.

Spinal Pain Mapping - Posterior and Middle Column

Diagnostic injection of the medial branch or spinal root has relied on patient reporting of the short or long-term effects of local anesthetic and corticosteroid. This has been arbitrarily interpreted as the perceived benefit by the patient for the first few hours or days (anesthetic phase), versus an extended relief lasting days to weeks (corticosteroid phase). This presumes that physical exam, history, and analysis of the structural imaging (e.g. xeroradiographs, MRI, CT Scan) targeted the “correct” medial branches or spinal roots to begin with. A complete discussion of the limitations of this approach is beyond the scope of this report, however the often overlapping facet and root presentations, the inter-patient differences in pain reporting, the potential lack of correlation between the patients symptoms and their structural imaging, and the time required for multiple, separate medial branch and spinal root procedures is not insignificant. Thus, to better clarify these issues in one operative setting, pain mapping of these and other targets has been described (7, 25, 36, 37, 39, 41, 57). This approach is typically performed with an awake, conversant patient using radiofrequency (RF) stimulating
needle(s) prior to selectively injecting and measuring the anesthetic and corticosteroid phase responses (Figures 1-3). Benefits include the ability to document an additional intraoperative “stimulation phase” reproducing (or not) “concordant sensory paresthesia in the normal painful region(s)”. This is very helpful in differentiating radicular from segmental pain patterns, and objectively comparing the clinical importance of multiple different medial branch and spinal root targets in the same procedure. Limitations include the need for multiple needle sticks, the anatomic disruption of these targets in postoperative states, and the possibility of simultaneously stimulating structures with overlapping neural innervation. Historically, patients with concordant RF needle stimulation and anesthetic phase responses from medial branch block have been treated with radiofrequency neurotomy (21, 22, 28); while those with concordant RF needle stimulation and anesthetic phase responses to spinal root block have been treated with pulsed radiofrequency (PRF), a form of neuromodulation (2, 16, 49, 51, 55). Patients with positive corticosteroid phase responses of a few weeks or months duration have been treated with serial blockade, particularly if those blocks do not exceed the expected average neurotomy or pulsed radiofrequency therapeutic duration. Individual RF needle stimulation mapping has recently been augmented with epidural catheter stimulation mapping of the dorsal ganglion and spinal root.

FIGURE 1. Radiofrequency needle mapping, root block, and lesion. Left L4 selective nerve root block. 50 Hz sensory stimulation produced “concordant” paresthesia mapping to the painful dermatome. A block with Marcaine and Celestone followed this.


FIGURE 4. Navigator epidural directional catheter used for “mapping”, blocks, and pulsed radiofrequency (with permission Vertical Srl, Italy).

FIGURE 5. Navigator catheter. A: Adjustable tip is demonstrated for maneuverability in the epidural space. B-D: X-rays showing catheter entry and maneuverability into each foramen (with permission Vertical Srl, Italy).
Advantages include, 1.) the ability to target multiple roots ipsilaterally or bilaterally with one epidural cannulation, 2.) the proximal nature of the dorsal root to the posterior primary ramus, spinal root, medial branch and sinuvertebral nerve, and 3.) the ability to expand upon the intra-operative stimulation phase with contrast epidurography before administering the block. Post-injection anesthetic and corticosteroid phase responses can still be documented, or if clinically indicated, bypassed in favor of immediate PRF neuromodulation (2, 16, 49, 51, 55). Furthermore, epidurographic filling defects may alert the practitioner to the presence of adhesions in the posterior epidural space (30, 46, 52). The primary difficulty with this approach centers around cannulating and navigating the patient with epidural obstruction, including fibrosis.

**Spinal Pain Mapping - Middle and Anterior Column**

Posterior Epidural Space
Fibrosis within the posterior epidural space was initially treated with chemical adhesiolysis under fluoroscopy, and then augmented with an endoscopic camera allowing better penetration of the injectate through scar (27, 31). Coined epiduroscopy, the ability to visualize the acute and chronic inflammatory changes in the posterior epidural space was limited by the original low definition optics and poor directability of the catheters (15, 23, 47). Although reports noted some benefit with epiduroscopic, chemical adhesiolysis,
scar could still be seen tethering or compressing the roots after treatment and often require repeat injection (27, 52). The desire for a more definitive posterior epidural scar and neural decompression subsequently led to the development of multi-port, directional catheter technology through which improved, high-definition endoscopes and working tools can be placed (32-35). Those working tools include dilators, stimulating catheters, balloons, and quantum molecular resonance fibers.

(Figures 6-10). Reports documenting the application of these tools to both map and treat disc disruption or the inflammation and scarring after traditional surgery have begun to emerge. These reports specifically detail the percutaneous posterior epiduroscopic neural decompression used to simultaneously diagnose and treat these changes (32-35).

**Anterior Epidural Space**

A more recent but parallel development to posterior epidural endoscopic neural decompression has been anterior epidural endoscopic disc and neural decompression. Initially described by Rothstein, others have begun to apply, validate, and expand this approach (12, 25, 39, 40, 43-45). This technique employs the same advanced technologies described above, with the noteworthy addition of an expanded sacral laminotomy and release of the filum terminale in order to facilitate access to the anterior epidural disc-nerve interface.

**FIGURE 11.** Example of directional multiport flexible catheter and endoscope. (Figure 11). With this approach, disc herniation or extrusion, annular tear, acute neovascularization, and chronic scar tethering may be directly diagnosed and treated.

**FIGURE 12.** Anterior epidural endoscopic anatomy and pathologies including epidural fat, nerve root, herniated nucleus pulposus, extruded nucleus pulposus with root impingement, annular disruption and tears, epidural inflammatory changes, including neovascularization and scar tethering (with permission from Journal of Neurosurgical Review, Supplement 1 (42)).

and will continue to advance the minimally invasive intraspinal pain mapping and endoscopic visualization.

**Neurostimulation:** Since its introduction, neurostimulation has been a valuable therapeutic tool for the treatment of spinal pain refractory to blocks, radiofrequency lesions, or decompression therapies. This value has evolved from single cylindrical to multicolumn surgical electrodes driven by advanced programming platforms in order to map the prerequisite axial or appendicular paresthesia (1, 4-6, 8-11, 13, 26, 38, 50, 53, 54).

**FIGURE 13.** Electrode designs used in spinal cord stimulation (with permission Saint Jude Medical, Plano Texas).

(Figure 13) Historically dependent on the awake patient, paresthesia mapping was most commonly focused for refractory radiculopathic pain with cylindrical electrodes prone to migration (24). With the advent of intraoperative neurophysiologic mapping however, more stable surgical electrodes can now be placed accurately with the patient asleep (3, 36, 37, 41). With the recent introduction of percutaneous surgical arrays (Epiducer®, St. Jude Medical, Plano, Texas), the interventional spinal specialist will have the ability to map and place surgical paddle constructs in awake patients (48, 56).

**Conclusion:** The diagnostic and therapeutic options available to the interventional spinal specialist continue to evolve. A brief description of a number of recent advances in diagnostic spinal pain mapping, therapeutic epidural
decompression, and neurostimulation has been outlined in this technical update. These minimally invasive strategies show promise for axial and appendicular spinal pain patients.

References:
The intervertebral disc can be a source of low back pain. The anatomical basis is the presence of nociceptive afferents in the annulus fibrosus that can be activated by structural alterations of the disc. For discogenic pain to be treated, a valid diagnosis is required. Unfortunately, there is no scientifically validated diagnostic method for discogenic pain. Clinical examination cannot differentiate discogenic pain from pain arising from other structures of the spine. Imaging techniques, including magnetic resonance imaging (MRI), poorly correlate with patients’ symptoms [7].

Provocation discography, also known as disc stimulation, consists in injecting contrast medium into the disc, with mainly two aims: 1) to evaluate the pain reaction to stimulation of a structure that is suspected to be the pain generator; 2) to study the morphology of the disc [3]. If the pressure induced by the injection evokes the typical pain of the patient and the disc is morphologically altered, that specific disc is expected to be the source of pain. Conversely, a disc whose stimulation does not induce typical pain is unlikely to be the origin of the patient’s symptoms. The main positive feature of discography is the fact that a subjective pain response is coupled with the objective evaluation of morphological changes.

Discography has a major drawback. Being a provocative test, it is exposed to the risk of false positive responses: the patient may react with a typical pain provocation even if the disc is not the primary source of pain [2]. In this case, discography would not truly reflect intradiscal mechanical hyperalgesia, and factors other than disc pathology would account for the positive pain provocation.

There are several possible explanations for a false positive response. One of them is the expectation that an injury of the tested disc is the cause of pain: the pressure induced by the injection of the contrast medium may be perceived as painful by patients who expect that that disc is the origin of their symptoms. Similar reactivities might be expected in patients with anxiety, and indeed psychosomatic symptoms seem to be a risk factor for false positive responses [2]. There are means of dealing with these confounding factors. Patients can be blinded to the level tested, so that they are not aware of whether a suspected this is tested. This implies the use of negative controls, i.e. testing discs that are not suspected to be the source of pain. The evidence for a true positive response at the suspected disc is strong, if a negative provocation after stimulation of another disc is observed, particularly if the patient is blinded to the level tested. While the practice of negative controls is very useful to minimize the risk of false positive responses, a cohort study found that discs that were subjected to discography displayed accelerated degeneration, compared to discs of a control group that received no discography [1]. This study had the important limitation that the allocation to the groups was not randomized, but the findings still raise concerns on the use of negative controls for discography. Further investigations are needed to clarify the long-term effects of this procedure.

An additional reason for a false positive response is the use of excessive injection pressures, which can evoke pain after stimulation of a healthy disc. The application of high injection pressures is avoided by measuring the intradiscal pressure during injection by means of a manometer. Using this method, discography is basically the assessment of an intradiscal pain threshold, which can be defined as the stimulation intensity at which a clear increase in the typical pain is evoked. It is assumed that pain provocation at low pressures is suggestive for discogenic pain, since such pressures would not cause pain if the disc was not sensitized by a pathological condition. Conversely, evoking pain with high injection pressures would be associated with the risk of a false positive response, since such pressures would evoke pain also after stimulation of healthy tissues.

Based on this concept, a study tried to infer the number of false positive responses to discography by evaluating the number of positive responses obtained in healthy volunteers [4]. As expected, the study found that the false positive rate increased with increasing intensity of the applied pressure. An additional factor was the intensity of the evoked pain: no subject had a pain intensity more than 5 after provocation (score 0-10). The authors concluded that the false positive rate is expected to be very low when low injection pressures evoke pain with an intensity of at least 6.

This study had a main limitation: because healthy volunteers were tested, it could not take into account the role of facilitated central nociceptive processes in the response to discography. It is well known that muscularkeletal
pain conditions are associated with a hypersensitivity state of the central nervous system, probably resulting from neuroplastic changes [5]. This hypersensitivity may lead to pain after stimulation of healthy structures. The potential implication for provocative tests is obvious. A typical pain provocation, even at low injection pressures, may not necessarily mean that the disc is the source of pain. Pain could originate primarily from another structure of the low back, and the positive response to disc stimulation would result from an enhancement of the central processing of an innocuous sensory input.

Theoretically, the concept of central hypersensitivity strongly challenges the validity of discography. However, a recent study that addressed this issue did not confirm this concern [6]. The study analyzed the correlation between results of provocation discography and parameters of central hypersensitivity, i.e. pressure pain thresholds after stimulation of the toe, of a painful and a non painful point of the low back. For each point, pain detection and pain tolerance threshold were assessed, resulting in 6 correlation analyses between assessments of central hypersensitivity and intradiscal pain threshold. A significant correlation with intradiscal pain threshold was found for pressure pain detection threshold at the toe (regression coefficient: 0.03, P = 0.05) and pressure pain tolerance thresholds at the non-painful point at the back (0.02, P = 0.024). Pain tolerance threshold at the toe was a significant predictor for intradiscal pain threshold only in a multiple linear regression (0.036, P = 0.027). The results indicate that central hypersensitivity may be a determinant of intradiscal pain thresholds, thereby affecting the results of discography. However, the inconsistent results in terms of statistical significance and the very low correlation coefficients indicate that the quantitative impact of central hypersensitivity on the results of discography is probably very low and clinically questionable. For instance, a reduction in pressure pain detection threshold of 100 kPa, reflecting a high degree of hypersensitivity, would imply a reduction in intradiscal pain threshold by 3 psi, which is clinically barely detectable. Thus, the data of this study do not support a major impairment of the diagnostic value of discography by central hypersensitivity. Clearly, it should be considered that we can not measure neuronal hypersensitivity in humans, and the currently available tests represent only indirect citability in humans, and the currently available tests represent only indirect.

In conclusion, provocation discography is a measure of intradiscal mechanical hyperalgesia. However, confounding factors can lead to false positive responses, thereby impairing its diagnostic value. Because no reference standard for the diagnosis of discogenic pain is available, the rate of false positive responses can not be quantified. The influence of expectation or psychosomatic disorders can be minimized by blinding patients to a multiple-level discography, including a negative control. However, some concerns on the long-term consequences of this practice apply. Central hypersensitivity may reduce the intradiscal pain threshold, but its influence on the diagnostic value of discography seems to be minimal.

References:


39 PARAVERTERBAL BLOCKADE IS AN ALTERNATIVE TO THORACIC EPIDURAL- PRO

N.B. Scott

Several recent meta-analyses and PRCT’s have demonstrated that paravertebral nerve blockade (PVB) has been shown to be a suitable alternative to thoracic epidural analgesia (TEA) in a variety of surgical specialties. During this same period there has been much interest in avoiding TEA because of the potential for rare but serious complications from this approach. However, there is a paucity of literature in the form of PRCTs that directly compare the two techniques and the available data is insufficient to recommend any superiority of one technique over the other.

This lecture will review the literature on the topic and discuss the variability inherent in PRCTs that must be controlled to prevent wrong conclusions. A more rational approach to the choice of regional anesthesia than choosing either one or the other for major surgery is suggested.

Bibliography:


COMBINATION OF ULTRASONOGRAPHY AND NERVE STIMULATION IMPROVES SAFETY OF REGIONAL ANESTHESIA

Y. Gurkan, Turkey

Two main expectations from ultrasound guidance were to improve block success rate and also to improve the safety profile of regional anesthesia. Although ultrasound use has made a major change in the way we practice regional anesthesia, ultrasound technology is not fool proof. It is a highly technical skill and user dependent technology. Image optimization is a must to get the best and most reliable images. Anisotropy is still a common problem especially during deep blocks. Yet there are many artifacts and interpretation errors that necessitate an experienced and qualified user. An artifact is any perceived distortion, error, or addition caused by the instrument of observation (1).

Common artifacts are listed below:
- Acoustic: error in presentation of ultrasound information;
- Anatomic: error in interpretation
- Optical illusion: error in perception;
- Other: electrical noise.

The research article by Sites et al. (2) clearly showed that many practitioners make errors during ultrasound guided blocks. Most common ones are listed below:
- failure to recognize the maldistribution of local anesthetic,
- failure to recognize the needle tip before injection,
- poor choice of needle-insertion site and angle, preventing needle visualization.

Current literature already proved that all possible complications of regional anesthesia could still be experienced with ultrasound guidance (3). Many articles have shown that intraneural injections have been performed unintentionally (4, 5).

Although there is an ongoing discussion on the definition of intraneural injection, current practice recommends that intraneural injection should be avoided. There is enough evidence that using nerve stimulation, currents < 0.2 mAmp indicate intraneural injection (6). Therefore nerve stimulation devices provide additional information that cannot be provided by ultrasound. Nerve stimulator provides functional information regarding nerve blocks. Although ultrasound use is relatively new for most of us, most of the anesthesiologists are familiar with the use of nerve stimulators.

To improve patient safety instead of relying on only one parameter which is far from being perfect/ideal I recommend that all monitoring facilities should be used together. Monitoring should include standard monitoring (ECG, NIBP, SPO2), ultrasound - visual guidance-, and nerve stimulation that provides functional information. Besides monitoring, all resuscitative measures should be readily available in locations where nerve blocks are performed.

In conclusion ultrasound guidance should be added to other monitoring and guidance methods instead of replacing all other monitoring means.

References:

ALL OBESE PATIENTS IN LABOR SHOULD RECEIVE AN EPIDURAL CATHETER? PRO-CON DISCUSSION. THE CON POINT OF VIEW

J.R. Ortiz-Gómez, F. Palacio-Abizanda, I. Fornet-Ruiz, E. Monge-Cid, Spain

The prevalence of obesity among parturients is increasing, so it is likely that anesthetists will be exposed to an increasing number of such patients requiring regional anesthetic techniques for childbirth. On the other hand, epidural anesthesia has been proposed to avoid the inherent risks associated with general anesthesia.

Objectives: the purpose of this review is to highlight the main risks of epidural catheter placement in obese pregnant women, so an individualized adequate decision could be taken.

Background: regional analgesia and/or anesthesia is not free of complications in obese pregnant patients. Technical difficulties with increased incidence of accidental epidural venous puncture and dural puncture have been described. There is also a high epidural failure rate, greater risk of catheter mobilization and dose adjustment difficulties. Ultrasound appears to be a useful clinical adjunct to locate the midline for epidural needle insertion, however, not everybody has adequate equipment or skills in its use.

Adverse effects of epidural such as maternal hypotension, respiratory failure (high level extension of sensory block), risk of neuropathy and neuraxial bleeding may be also increased in obese parturients. Fluid therapy should be managed carefully in order to avoid fluid overload and acute heart failure.

Conclusion: a carefully individual preanesthetic assessment is advocated for all obese pregnant women in labor.

Objectives: To highlight the main risks of epidural catheter placement in obese pregnant women, so an individualized adequate decision could be taken.

Methodology: This review article has used a search strategy starting with classic texts of Anesthesia, Obstetric Anesthesia and afterwards in an extended review of articles included in MEDLINE (years 1962-2011), basically using PubMed and Ovid-PubMed Access with the keywords (MeSH) cesarean section, epidural, epidural complications, general anesthesia, labor, maternal mortality, obstetrical anesthesia, obesity, obesity morbidity, pregnancy, regional anesthesia, obstetrics, pregnancy, pregnant, gestation and anesthesia. Other databases included those of evidence based medicine were consulted, using the same thesaurus terms: Web of Knowledge, UpToDate, Clinical Evidence, Tripdatabase and the Cochrane Library Plus. For the web search we used the Google search engine.

After selecting the articles of apparent relevance we proceeded to obtain the full text for a discussion prior to its citation in the article. The key objective was to conduct a comprehensive and critical literature review that would draw up guidelines for action in epidural analgesia and/or anesthesia in obese parturients.
Author's declaration: The authors wish to declare at the beginning of this article that what is presented below is NOT a guide to apply obligatorily to all pregnant patients with obesity who request an epidural. Patients must be assessed individually and their history should be carefully reviewed. In the case of obese patients, especially with high obesity and/or morbid obesity, a great number of circumstances must be considered. In this article we expose the reasons that might make you decide NOT to practice an epidural to an obese pregnant woman because the risk-benefit balance is tilted to the risk side, so it means that a labor pain relief epidural may involve more risks for this patient than its application. We must remember too, that our refusal as anesthesiologists to perform an epidural analgesia does not imply that other techniques can provide pain relief alternative to that same patient.

**Introduction:** Obstetric anesthesia practice has experienced two major changes over the last several decades: increased use of neuraxial anesthesia and analgesia and ever increasing patient obesity. Obesity is a growing healthcare problem worldwide, which also affects the pregnant population. Obesity occurs with increasing frequency during pregnancy. Obesity increases the maternal, fetal and neonatal risks. Also, the anesthesiologist is confronted with significantly more problems when the parturient is overweight or obese. It is very important to remember we must consider the complete risks of the obese parturient\(^2,2\) (table 1), not only those referred to the epidural placement.

<table>
<thead>
<tr>
<th>Health risks associated with obesity, Perioperative issues.</th>
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<tbody>
<tr>
<td><strong>Cardiovascular</strong></td>
<td>• Coronary artery disease • Heart disease • Hypertension • Hyperlipidemia • Deep vein thrombosis • Type II diabetes mellitus</td>
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<tr>
<td><strong>Respiratory</strong></td>
<td>• Asthma • Obesity hyperventilation syndrome • Obstructive sleep apnea • Risk of hypoxia</td>
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<td><strong>Digestive</strong></td>
<td>• Gastroesophageal reflux • Esophagitis • Risk of aspiration • Fatty liver</td>
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<td><strong>Musculoskeletal</strong></td>
<td>• Degenerative joint disease • Osteoarthritis</td>
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<td><strong>Infection</strong></td>
<td>• Cellulitis • Panniculitis • Post-operative wound infections</td>
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<tr>
<td><strong>Anesthetic</strong></td>
<td>• Placement of intravascular access and regional anesthesia may be more difficult • Increased risk of difficult or failed intubation • The risk of excessive blood loss is increased • Risk of neonatal depression • There may be specific equipment needs • Pharmacodynamics for drug therapy may be altered • Obesity increases the probability of both elective and emergency cesarean delivery</td>
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We use to define obesity in order to body mass index values. The World Health Organization\(^8\) defined body mass index (BMI) as the individual’s body weight divided by the square of his or her height, measured in kg.m\(^2\). This parameter classifies patients in severely underweight if BMI is less than 16.0, underweight (from 16.0 to 18.5), normal (from 18.5 to 25), overweight (from 25 to 30), obese class I (from 30 to 35), obese class II (from 35 to 40), and obese class III (over 40).

Some authors have made some modifications to the WHO definitions. The surgical literature breaks down “class III” obesity into further categories whose exact values are still disputed\(^3\). Any BMI ≥ 35 or 40 is severe obesity. A BMI of ≥ 35 or 40-44.9 or 49.9 is morbid obesity. A BMI of ≥ 45 or 50 is super obesity.

As Asian populations develop negative health consequences at a lower BMI than Caucasians, some nations have redefined obesity, so the Japanese have defined obesity as any BMI greater than 25\(^18\) while China uses a BMI of greater than 28\(^11\).

There is no current agreement on appropriate BMI ranges for pregnant women.

Anesthesia-related complications are more frequent in obese parturients. Most authors and opinion leaders agree that regional anesthesia is the preferred technique for Cesarean section in obese patients, and that efforts to place early labor epidural analgesia should be optimized in order to be able to avoid general anesthesia when unplanned Cesarean section is required\(^2\). However, other authors, as Bamgbade et al.\(^12\) described different results in a prospective observational study of 1477 caesarean deliveries the impact of obesity on perioperative outcomes in parturients undergoing cesarean delivery. They found the prevalence of obesity was 54.3%, including 7.2% morbidly obese. About 61% of parturients who underwent caesarean delivery because of failure to progress in labor or previous caesarean were obese. The overall prevalence of co-morbidity was 10.2% of whom 57.3% were obese. Neuraxial anesthesia was used in 73.4% and general anesthesia in 26.6%, similar in obese and non-obese. The epidural failure rate was 4.3% and the spinal failure rate 2.9%. Difficulty in performing neuraxial anesthesia was greater in obese patients (P=0.004). There was no association between obesity and laryngoscopy grades. Patient satisfaction was similar in the obese and non-obese groups. Postoperative complications were minimal and similar in both groups.

Despite of all articles previously published, we analyze in this article, several points that should be evaluated individually before placement of an epidural for labor pain relief.

1. **Technical difficulties:**

   Obesity is an ever-increasing problem in obstetrical anesthesia and a regional technique is generally preferred to general anesthesia. However locating the epidural space and obtaining the appropriate sensory level with local anesthetic present unique challenges to the anesthetist. Anatomical and physiological differences exist between the morbidly obese and the rest of the population\(^1\). Technical difficulties are the first problem concerning the epidural placement in an obese pregnant woman. We should examine carefully the patient, looking for palpable bone structures and landmarks. Although a better indicator than weight alone, BMI is an imperfect measure of obesity and does not describe many factors that might contribute to difficulty, such as adipose distribution. Sometimes the obesity is basically abdominal and the back is relatively preserved, so we must touch and examine the lumbar zone. Obesity obscures the anatomical landmarks necessary for facile epidural space localization. The presence of adipose tissue, and the pregnancy-induced softening of the soft tissues and ligaments, may increase the false-positive rate when identifying the epidural space by the loss-of-resistance technique.

   Obesity effects on difficulty appear to be mediated through increasing tendencies toward poorly palpable spinous processes and inadequate back flexion. Some authors found higher failure rates of epidural anesthesia/analgesia in obese pregnant patients\(^4,14\) while others described that some obese patients have surprisingly easy neuraxial block placements\(^15\). When approaching any neuraxial anesthetic in a pregnant patient, and especially in the obese parturient, back flexion and landmark palpation predict neuraxial technique difficulty.

   Investigations in no obstetric and mixed populations have indicated that palpation of bony landmarks is the key factor in predicting difficult neuraxial techniques\(^16-18\).

   The best predictors of neuraxial technique difficulty in pregnant patients were back flexion and ease of palpation of bony landmarks. Obesity per se, as measured by current BMI, did not directly predict difficulty but did predict back difficulty palpation and reduced flexion. Establishing neuraxial anesthesia in obese patients presents many unique problems for the anesthetist\(^13\). These include deciphering the midline and interspace, fat pockets resulting in false positives when using loss-of-resistance techniques to locate the epidural space, altered drug distribution\(^14\), an increased incidence of accidental dural puncture\(^15\) and epidural venous puncture\(^16\) and also an epidural failure rate up to 42% (compared to 6% in no obese patients)\(^14\). The realization of this technique can be extended in time and be very uncomfortable and painful for the patient.

   Sometimes it is not possible to feel the lumbar or low thoracic vertebral interspaces and hence locate the point of insertion of the epidural needle. Some Hospitals employed ultrasound to facilitate epidural catheter insertion, but there are still institutions where such equipment is not available, or may be also that any anesthesiologists have not enough sufficient experience\(^20\) in incorporating ultrasound into their routine practice for epidural catheter placement.

   Ultrasounds should be a very useful clinical adjunct in identifying lumbar anatomical landmarks including spinous processes (hence the midline), the vertebral interspace and even also estimate the depth of the epidural space\(^21\). A strong correlation between the depth of the epidural space measured by ultrasound and the depth of that measured with the needle in obese pregnant patients has been reported\(^24-26\).

   Ultrasongraphy has been used in a variety of ways to assist epidural needle placements. The longitudinal paramedian plane and the paramedian approach have been used for imaging and needle placement, respectively. The paramedian approach of the vertebral column is considered to provide better ultrasound images than the transverse midline approach of the interspaces.
Duramater and ligamentum flavum, because there is a larger ultrasound permeable window in the longitudinal paramedian plane. 

Morbidly obese parturients have been described using ultrasound approach for epidural placement in obese parturients, or even if you are, but you have no adequate equipment, consider that you are going to performance a ‘blind’ technique, where longer procedures are common, and higher rates of failure and complications have been reported. 

Previous studies have demonstrated a correlation between the distance from the skin to the lumbar epidural space with the BMI in a mixed population consisting of obese and no obese parturients. The mean depth to the epidural space from the skin has been described as being in the range of 4.6–5.3 cm; however Balki et al. found that in obese women, the epidural space is even deeper, with a mean of 6.6 cm (range 4.5–8.5 cm). The depth to the epidural space was more than 8 cm in only 17% of the patients. Thus, it seems appropriate to use a standard needle to identify the epidural space in the majority of obese women, unless the ultrasound predicts a depth of more than 8 cm. 

Increased incidences of accidental epidural venous puncture and dural puncture have been described. The prevalence of post dural puncture headache, however, is fortunately low in the morbidly obese. A lower frequency of epidural venous cannulation was noted when this procedure was performed in the lateral recumbent head-down position (4.8%) than in the lateral recumbent horizontal (11.6%) or sitting position (18.3%). Frequency of accidental subarachnoid puncture did not differ significantly (2.5%, 2.6%, and 3.7%), respectively. 

Although these seems to be unusual complications, broken catheters and even broken needles have been reported during epidural puncture in obese patients. There is also an epidural failure rate up to 42% (4%). That is according to previously published data, if we do not have the means (ultrasound) or skills using them to improve our technique, the possibility of complications or failures during the epidural puncture in obese parturients is approximately one of every two patients. 

Of all the factors examined, the quality of landmarks was the most significant independent predictor of difficulty as measured both by first-level success and number of attempts. There is a positive association between BMI and transforaminal epidural depth, but not with age, sex, race, oblique angle, or intervertebral level. Longer needles than 8 cm are sometimes required (17% of obese parturients). Fetal monitoring by external cardiotocography can be impossible and the need to apply a scalp electrode may interrupt proceedings. In one survey, 42% of initial epidurals failed in obese women, compared to 6% in no obese. As a result the need to re-site was common. In another study, more than one attempt was required in almost 75% of obese women and more than three attempts in 14%, while accidental dural puncture was also more common in obese. It is true that ultrasound may be helpful in identifying the spinous processes and vertebral interspaces, although even this requires expertise. 

2. Increased risk of cesarean section in obese parturients: 

It has been described that cesarean delivery was significantly more frequent in the morbidly obese than in controls (47.4% vs. 20.7%) in the control group. However other authors reported no differences between obese and non-obese parturients in rate of caesarean deliveries, co-morbidities and indications for delivery or anesthesia complications. The incidence of cesarean sections is very variable among different countries, hospitals and even obstetricians. Therefore, this statistic has been used as an argument to recommend the routine use of prophylactic epidural catheter in obese parturients. However we must remember that a great number of obese parturients can possible have increased respiratory demand due to increased abdominal adipose tissue, which may affect the feto-maternal and feto-neonatal outcomes. 

3. Time employed for epidural placement: 

The epidural placement in obese patients can be difficult, so in case of real emergency, epidural should not be the ideal technique due to possible increased consumption of time to performance it. 

4. Mobilization of the catheter: 

The risk of epidural catheter dislodgement is increased in obese parturients. Sliding of skin over the subcutaneous tissue has been proposed as an important factor in epidural catheter migration. It has been suggested that threading an epidural catheter at least 4 cm within the epidural space diminishes the chance of catheter dislodgement when positioning an obese patient (BMI > 30 kg/m2). When positioning a morbidly obese parturient, the extent of back tissue movement and consequent catheter displacement is difficult to quantify. Some authors therefore elect to insert the catheter well beyond the recommended 4-5 cm. If surgical anesthesia should not be achieved, we did have the catheter can be extracted several centimeters. 

Even in presence of a successful epidural, there is a potential risk for mobilization of the catheter during changes of position of the obese patient, which requires insertion into the epidural space more than the recommended 4-5 cm, increasing thereby the possibility of lateralized effect, and the failure of the technique if cesarean section is needed. 

5. Dose adjustment difficulties: 

Higher levels of epidural blocks have been found in obese obstetric patients, suggesting they may require less local anesthesia. Pharmacodynamics for drug therapy may be altered because obese patients have a larger volume of distribution for lipophilic drugs, but a decrease in lean body mass and tissue water, compared to no obese controls. These changes predispose obese patients to both subtherapeutic and toxic responses to medications. 

Local anesthetic requirements in obese patients for both epidural anesthesia and labor analgesia have been shown to be lower than in the no obese population. Possible causes include the reduced volume of epidural and intrathecal spaces secondary to increased abdominal pressure. Increased incidences of accidental epidural venous puncture and labor analgesia have been shown to be lower than in the no obese population. 

6. Maternal hypotension: 

Increased abdominal adipose tissue, special anatomical characteristics of the neuraxis and augmented drug effect in these patients, there is an increased potential for secondary hypotension to epidural block, which may affect the feto-welfare despite of reducing the total dose administered. To achieve a good dose adjustment in these patients is often difficult, and the final drug effect ranges from moments of overdose with periods of underdoing. There are reports that indicate the wide variability in dosage and sensitivity to spinal anesthetics, and suggests that further research is needed in this area. 

7. Respiratory failure: 

Sometimes, local anesthetic effect may spread too much, with the undesired potential respiratory worsening in case of higher sensory level than T8, because of enhanced basal pulmonary pathophysiological changes. Higher initial level of block has been described in obese parturients.
8. Neuropathy:
  The frequent association with risk factors such as diabetes and obesity makes the obese parturient more susceptible to develop neuropathies, especially if the epidural puncture was traumatic.

9. Neuraxial bleeding:
  Morbidly obese pregnant women present huge challenges for anesthetists. There are numerous sources of advice and recommendations that cannot be ignored, which all agree that trainees without supervision should not anaesthetize morbidly obese patients. In obese parturients, multiple attempts at catheter placement are common. Perlow and Morgan noted that 74.4% of morbidly obese parturients needed more than a single attempt, and 14% needed more than three attempts for successful epidural placement. Rat et al. described also that obese parturients were more likely to experience multiple epidural attempts (28% vs. 0%, p < 0.001), complications in labor (32% vs. 6%, p < 0.001) and pediatric involvement (26% vs. 3%, OR for 95% confidence interval is 1.5-20.8).

Some authors have emphasized the importance of avoiding traumatic neuraxial block procedures. For example, the Norwegian Association of Anesthesiologists' guidelines for central blockade in patients with potential bleeding problems specifically mention a competent and "atraumatic" anesthesia technique. It has also been suggested that operator expertise may relate to the incidence of minor neuraxial hemorrhagic events and emphasize "atraumatic" technique for patients receiving antithrombotic medications.

Owens et al. reviewed six reports of spinal hematomas after spinal anesthesia. In the five cases for which comments were available, four of the five were termed "difficult tap."

The obese parturient has the possibility of difficult epidural puncture or vascular complications. These patients are at high risk of thromboembolic disease, so it is frequent to see treatments with low molecular weight heparin or anticoagulant drugs. The anesthesiologist should pay particular attention their timing of administration in order to determine the safe moment to perform the epidural and especially when to remove the catheter.

10. Acute heart failure:
  Patients with long-standing obesity with development of cardiomyopathy may be at potential risk of acute heart failure if the anesthesiologist is not extremely careful with the fluid therapy (avoid fluid overload).

11. Airway management:
  An early epidural technique has been advocated as a way to avoid airway management in a patient with possible difficulty of intubation and/or ventilation. However the high initial failure rate necessitates critical block assessment and catheter replacement when indicated, and in a large series Bambgade et al. did not find an association between obesity and laryngoscopy grades. These results, suggest that the relationship between obesity and difficult intubation may be overestimated. We emphasize again the necessity of an individual physical examination and assessment of the obese pregnant woman.

Finally, we must say that the anesthesiologist has always to be prepared even with the use of a neuraxial technique for potential need for conversion to general anesthesia.

Summary: Epidural anesthesia has been proposed in obese pregnant patients to avoid the inherent risks associated with general anesthesia, but it is not free of complications. Technical difficulties with increased incidence of accidental epidural venous puncture and dural puncture have been described. There is also a high epidural failure rate, greater risk of catheter mobilization and dose adjustment difficulties. Ultrasound appears to be a useful clinical adjunct to locate the midline for epidural needle insertion, however, not everybody has adequate equipment or skills in its use.

Adverse effects of epidural such as maternal hypotension, respiratory failure (high level extension of sensory block), risk of neuropathy and neuraxial bleeding may be also increased in obese parturients. Fluid therapy should be managed carefully in order to avoid fluid overload and acute heart failure. A carefully individual preanesthetic assessment is advocated for all obese pregnant women in labor.

References:


42 GENERAL ANESTHESIA FOR C-SECTION SHOULD INCLUDE AN OPIOID PRIOR TO DELIVERY OF THE FETUS? PRO – CON DISCUSSION. THE CON POINT OF VIEW


Background: The traditional anesthetic technique for cesarean section avoids administration of opioids prior to delivery of the fetus, in order to avoid neonatal depression.

Objectives: The purpose of this review is to highlight the main risks of administering opioids prior to fetus delivery so an individualized adequate decision could be taken.

Methodology: This review article has used a search strategy starting with classic texts of Anesthesia, Obstetric Anesthesia and afterwards in an extended review of articles included in MEDLINE (years 1962-2011), basically using PubMed and Ovid-PubMed Access with the keywords (MeSH) alfentanil, cesarean section, fentanyl, general anesthesia, labor, maternal mortality, obstetrical anesthesia, opioid, pregnancy, remifentanil, obstetrics, pregnancy, patient, gestation and anesthesia. Other databases included those of evidence based medicine were consulted, using the same thesaurus terms: Web of Knowledge, UpToDate, Clinical Evidence, Tripdatabase and the Cochrane Library Plus. For the web search we used the Google search engine.

After selecting the articles of apparent relevance we proceeded to obtain the full text for a discussion prior to its citation in the article. The key objective was conduct a comprehensive and critical literature review concerning the convenience of administration of opioids prior to fetus delivery, which would draw up guidelines for action during the general anesthesia in cesarean sections.

Author’s declaration:

The authors wish to declare at the beginning of this article that what is presented below is NOT a guide to apply obligatorily to all cesarean sections. Patients should be assessed individually and their history should be carefully reviewed. In this article we expose the reasons that might make you decide NOT to administer opioids prior to fetus delivery during a C-section because the risk benefit balance is tilted to the risk side, so it means that opioids use for pain treatment may involve more risks for the fetus than its delay.

Introduction:

After review of articles previously published, we analyze in this article several points that should be evaluated individually before administration of opioids prior to fetus delivery (umbilical cord clamping) during general anesthesia.

1. Is the general anesthesia really needed?

The patient assessment should be complete and individualized. We must determine in first place why a general anesthesia is needed. Usually, regional anesthesia is the most common method of anesthesia for delivery because it is safer for the mother than general anesthesia (risk of failed intubation and pulmonary aspiration of gastric contents) and also allows the mother to be awake and immediately interacts with her baby.

If a regional anesthesia can be performed, this discussion about the convenience of opioids prior to fetus delivery is finished.

The reasons to use of general anesthesia have fallen dramatically in the past few decades and now accounts for only about 5 percent of cesarean deliveries in the United States and United Kingdom 1.

The choice of regional or general anesthesia is influenced by a variety of other factors, such as the urgency of the procedure, maternal hemodynamic status, and physician and patient preference. The anesthetic plan for cesarean delivery should take into account the well being of two patients: the mother and the fetus.

Either regional or general anesthesia is an acceptable approach to providing anesthesia for cesarean delivery.

A Cochrane revision reported in 2007 that no significant difference was seen in terms of neonatal Apgar scores of six or less and of four or less at one and five minutes and need for neonatal resuscitation with oxygen, so they concluded that there is no evidence from this review to show that regional anesthesia is superior to general anesthesia in terms of major maternal or neonatal outcomes 2.

2. “If works – Don’t touch it”:

Opioids are routinely omitted at the induction of general anesthesia for cesarean delivery because of concerns about neonatal respiratory depression. So, the first thing we think about this discussion is may be: if the anesthesiologists had performed cesarean section during many years without administrating opioid prior to fetus delivery, why should we now change a theoretically well-functioning technique?

3. Why should we administer opioids prior to fetus delivery?

When a new technique is proposed to be used instead another, it is necessary to establish which benefits we are going to obtain or which adverse effects we can avoid.

In the present situation, the reasons in favor of opioid administration prior delivery of the fetus are (table 1):

- Provide analgesia for the impending noxious stimuli of surgery
- Avoid plasma increased concentrations of catecholamines during tracheal intubation
- Reduce the risk of awareness with recall following anesthesia
- Attenuates the hemodynamic and catecholamine (“stress”) response to tracheal intubation
- Provides preemptive analgesia to reduce postoperative pain

3.1. Opioids are an integral component of general anesthetic techniques for major surgery. They are usually given during the induction of anesthesia to provide analgesia for the impending noxious stimuli of surgery.

3.2. The early administration of opioids also allows a reduction in the dose of other anesthetics because of synergistic drug interactions 3.

3.3. Attenuates the hemodynamic and catecholamine (“stress”) response to tracheal intubation 4 and may provide preemptive analgesia to reduce postoperative pain 5.

However, induction of anesthesia tends to reduce maternal blood pressure. And opioid administration can increase maternal hypotension. Fetal oxygenation depends upon placental perfusion; thus, a decrease in maternal blood pressure assessed individually and their history should be carefully reviewed. In this article we expose the reasons that might make you decide NOT to administer opioids prior to fetus delivery during a C-section because the risk benefit balance is tilted to the risk side, so it means that opioids use for pain treatment may involve more risks for the fetus than its delay.

The authors wish to declare at the beginning of this article that what is presented below is NOT a guide to apply obligatorily to all cesarean sections. Patients should be assessed individually and their history should be carefully reviewed. In this article we expose the reasons that might make you decide NOT to administer opioids prior to fetus delivery during a C-section because the risk benefit balance is tilted to the risk side, so it means that opioids use for pain treatment may involve more risks for the fetus than its delay.
should depend on the clinician’s experience with a specific drug (nifedipine, hydralazine, labetalol, methyldopa or magnesium sulphate). 7.

3.4. In obstetric anesthesia, the reasons in favor of opioids given at the induction of general anesthesia are that opioids have both fetal and maternal benefits. The uterine vascular bed during late pregnancy is considered to be maximally vasodilated, but responsive to stimuli causing vasoconstriction. 8. An increase in maternal concentrations of catecholamines can decrease uterine blood flow and this may adversely affect the neonate, 9,10.

Plasma concentrations of catecholamines increase after tracheal intubation in pregnant women having cesarean delivery, and uterine blood flow is decreased by 20%–35% 11-13. Preventing this increase in catecholamines may thus be beneficial for placental perfusion.

Another proposed benefit is the reduction of umbilical artery catecholamine concentrations in neonates when the mothers receive opioids prior to delivery. However there is some controversy over the significance of catecholamine concentrations at delivery, because increased concentrations of umbilical catecholamines are thought to be a response to the fetal stress associated with delivery, so an increased concentration of catecholamines in the neonate may be beneficial because it provides better adaptability for extrauterine life. Umbilical concentrations of catecholamines after general anesthesia are much smaller than after vaginal delivery or cesarean delivery under regional anesthesia, and this may be a factor in the poorer neonatal outcome after general anesthesia. 14.

This aspect remains controversial, because great concentrations of catecholamines have been found with fetal acidoses and hypoxia after forceps and breech deliveries, 15, a sign of fetal stress. Thus, a lower concentration of catecholamines could imply that the fetus has not been exposed to excessive stress.

3.5. Many anesthesiologists administer 100 percent oxygen prior to delivery of the fetus, especially in cases of no reassuring fetal heart rate tracing. Anesthesia is maintained using low concentrations of nitrous oxide (25 to 50 percent) and inhalation anesthetics (e.g., isoflurane or sevoflurane 0.25 to 0.5 MAC [minimum alveolar concentration]) until delivery of the baby (if nitrous oxide is not used, then higher concentrations of inhalation agents are necessary). So, obstetric anesthesia has increased risk of awareness with recall following anesthesia, because low doses of anesthetics are used to reduce drug transfer to the fetus. Administering an amnestic agent, such as a benzodiazepine, during the time of anesthesia induction, can minimize intraoperative recall. Inhalation anesthetics also provide amnesia.

There are several contributing factors that should favor the existence of awareness with recall following anesthesia 16-21 (table 2).

Concomitantly factors that favor the existence of awareness with recall following anesthesia

Anesthetic underdosing Mistake or failure in the delivery of anesthesia, inadequate anesthesia, critically ill patients where it is judged unsafe to administer sufficient anesthesia and/or underappreciated specific patient’s needs.

Technical issues Equipment malfunction, human error, difficult intubations (presumably due to insufficient anesthesia during prolonged intubation attempts).

Total intravenous anesthesia Total intravenous anesthesia is associated with a higher risk for awareness with recall compared to inhalational anesthesia.

Resistance to anesthesia Genetic (previous history of awareness, mutations of the melanocortin-1 receptor gene) or acquired factors (induction or inhibition of cytochrome P450).

Anesthesia-related medical risks Trauma surgery, cardiac surgery and cesarean delivery.

Neuromuscular blockade The use of neuromuscular blocking agents is associated with both increased risk and severity of AWR.

4. Evaluating the physical status of the mother and the fetus: are opioids really needed?

A complete individualized pre-anesthetic assessment is necessary for all parturients. Ideally, pregnant women should meet with an anesthesiologist antepartum or in the early intrapartum period, whether or not a cesarean is planned. This meeting allows the patient to ask specific questions regarding anesthesia, and it also permits the anesthesiologist to identify medical problems that may have important implications for the anesthetic plan.

When an obstetric general anesthesia is performed, despite of the indication the anesthesiologist must know the fetal status. All anesthetic induction and maintenance agents cross the placenta and may result in neonatal depression if used in large doses or if the infant is delivered after eight minutes of induction 22.

From a maternal perspective, transient increases in arterial pressure are unlikely to have any significant effect in healthy women. Thus, the use of opioids to attenuate the “stress” response is probably not of great clinical benefit to the mother except for those with significant hypertensive or other cardiovascular disease. Opioids administered at the induction of anesthesia may still be useful for the mother because of preemptive analgesia, synergistic effects with other anesthetics, and decreased risk of early awareness.

However (a very big however) these benefits of maternal stress response attenuation may be obtained at a great cost, because opioids cross the placenta and may induce early neonatal depression.

Different articles have been published using different opioids or doses. Usually, these articles have a low number of patients included, so careful evaluation should be made before general application. Sometimes, the reported results are even contradictory. In example, Dann et al. observed no neonatal depression following 0.010 mg.kg-1 alfentanil IV during induction of general anesthesia for Cesarean section in 21 healthy term parturients, and successfully suppressed the hypertensive response to intubation 23. However, the same regimen, in 24 pre-eclamptic preterm parturients, was not as effective in suppressing the hypertensive response to intubation and was associated with considerable neonatal respiratory depression with only three newborns initiating spontaneous ventilation without assistance 24.

Czosny et al. used alfentanil 0.010 mg.kg-1 one minute before the induction of anesthesia and described that neonates in the alfentanil group had greater umbilical arterial oxygen tensions (27.8 vs. 22.6 mm Hg), slightly reduced Apgar scores (both P < 0.05) but similar Neurologic and Adaptive Capacity Scores but one neonate in the alfentanil group required naloxone 25.

Chun et al. has been used in a diabetic patient with recent myocardial infarction 26 and in a patient with pulmonary hypertension 27 during induction for cesarean section and neonatal respiratory depression requiring naloxone administration was observer in both cases.

Alfentanil (13.5 g.kg-1 28, 35 g.kg-1 29 and 125 g.kg-1 30) IV has been administered during induction of general anesthesia for Cesarean section in three different parturients with severe cardiac disease 28-30. The two higher doses caused neonatal respiratory depression with low Apgar scores requiring naloxone and temporary tracheal intubation 29, 30. The lower dose resulted in a vigorous newborn, but prophylactic naloxone was administered immediately after delivery 28.

5. Is remifentanil the solution to this problem?

Remifentanil has been proposed in these cases due to its pharmacodynamic profile, characterized by a rapid onset of action and short latency to its peak effect. Its rapid hydrolysis by non-specific blood and tissue esterases to an inactive metabolite results in very short duration of action. The context sensitive half-life is 3-4 min and the elimination half-time ranges from 10 to 20 min. Most of an IV dose is excreted in the urine as the carboxyphilic acid metabolite. Its metabolism is independent of renal and hepatic function and there is no accumulation during repeat bolus injection 31.

Remifentanil crossed the placenta with an umbilical venous/maternal arterial concentration ratio of 0.73 and an umbilical arterial/umbilical venous concentration ratio of 0.60 32, but is metabolized rapidly in the fetus and thus should not produce neonatal depression 33.

There are few trials reporting the use of remifentanil prior to fetus delivery, and the small number of patients included in them does not allow definitive conclusions. Further studies are needed.

Ngan-Kee at al. 32 in healthy pregnant women reported after a single remifentanil bolus of 1 µg.kg-1 that two neonates in the remifentanil group (n=20) were considered clinically depressed at birth and were given a single dose of naloxone. Drusici et al. 34 described in healthy pregnant women significantly higher Apgar scores at 1 (P<0.05) and 5 min (P<0.01) in control group, and that mean umbilical pH values were within normal range but significantly higher also in control group compared with the remifentanil group (bolus 0.5 µg.kg-1 before induction followed by a continuous infusion at 0.15 µg.kg-1.min-1 until peritoneal incision). Three neonates in remifentanil group (n=21) required intubation but recovered at 5 min without naloxone.
Remifentanil has been also used in parturients with previous diseases. Palacio et al. 35 using a single bolus of 1 \( \mu \text{g} \cdot \text{kg}^{-1} \) before induction reported twelve cases (placenta abruptio \((n=1)\), subarachnoid hemorrhage \((n=1)\), HELLP Syndrome \((n=2)\) and preeclampsia \((n=8)\) without neonatal depression. Remifentanil has been also used at induction of general anesthesia in mothers with conditions that include cardiac disease 36-41, neurologic disease such as an acoustic neuroma 42 where the neonate received supplemental oxygen but not required naloxone (remifentanil infusion at 0.2-1.0 \( \mu \text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1} \)), and in a large intracranial epidermoid cyst 43, liver disease with neonatal chest wall rigidity and respiratory depression following the use of remifentanil for cesarean delivery 44.

Palacio et al. 35 concluded that bolus injection of 1 \( \mu \text{g} \cdot \text{kg}^{-1} \) of remifentanil might be useful for maintaining maternal hemodynamic stability in high-risk obstetric cases. Given the risk of neonatal depression, this resource should be used selectively and the means for neonatal resuscitation should be available.

6. The real urgency factor:

For scheduled cesareans, the rapidity of anesthetic induction is less of a concern, so all-anesthetic options are available. If the cesarean must be performed urgently (e.g., no reassuring fetal heart rate pattern), an anesthetic technique that can be rapidly administered is preferred. If the cesarean is a true emergency, the time required to achieve anesthesia and facilitate a rapid delivery may be of critical importance to the well being of the fetus and/or mother.

Most practitioners agree that inducing general anesthesia is the most reliable means of quickly achieving operative anaesthesia for cesarean. In a true emergency cesarean section, with a diagnosed (or suspected) loss of fetal well-being, the administration of lipophilic opioids, such as fentanyl, alfentanil or sufentanil, with extremely rapid placental transfer and peak umbilical venous blood levels occurring within 5 minutes after an intravenous bolus administration to the mother, may not be a good idea, because the premature or sick neonate may be more sensitive to the depressant effect of opioids than the healthy full term neonate.

The total time elapsed from the anesthetic induction to the fetal delivery is very important too. Brief times will likely be accompanied with less possibility of maternal intraoperative recall and with less probability of fetal depression due to the anesthetic drugs effect than long induction to delivery times.

7. Are you sure to use opioids? Then, be prepared.

If anesthetics result in neonatal depression, appropriate resuscitative measures, including respiratory assistance, should be instituted until the effects abate. Alternatively, specific reversal agents for opioids and/or benzodiazepines may be administered to the neonate. Although anesthetics may result in temporary neonatal depression, there is no evidence of any long-term effects.

Personnel other than the surgical team should be immediately available to assume responsibility for resuscitation of the depressed newborn as the anesthesiologist and obstetrician are responsible for the mother, and may not be able to leave her to care for the newborn, even when a regional anesthetic is functioning adequately 45.

Summary: The traditional anesthetic technique for cesarean section avoids administration of opioids prior to delivery of the fetus, in order to avoid neonatal depression. Changing this in favor of opioids administration should be accompanied with greater benefits than not using them, for both the mother and the fetus. Different opioids and doses have been evaluated with no conclusive results that can be extrapolated to the general population.

Using opioids in anesthetic induction in healthy pregnant women seems to be devoid of significant devices. In women with serious diseases where maintain hemodynamics is a key point, remifentanil could be an option, but sometimes with the cost of neonatal depression, so a carefully individual preanaesthetic assessment is advocated for pregnant women before administration opioids prior to fetus delivery during cesarean section.

References:


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Complex regional pain syndrome was first described by Silas Weir Mitchell, an American civil war physician. He combined the Greek words kausos (heat) and algos (pain) to describe the typical burning pain seen in his patients. (1) Over the ensuing years, many other names for the syndrome have been used including: Sudeck’s atrophy; shoulder-hand syndrome; reflex sympathetic dystrophy (RSD); and the current complex regional pain syndrome (CRPS) which encompasses both the previous causalgia and RSD. A recent excellent review of the subject by Bruehl (2) outlines some of the current thoughts about CRPS from a mechanistic/pathophysiologic perspective. This pathophysiologic is represented in multiple areas of the central nervous system and periphery. In the central nervous system (CNS) there is decreased limb representation in the somatosensory cortex and evidence of “wind-up” (a state of hyperalgesia through the sensitization of wide dynamic range neuronal pools in the spinal cord). (2) Peripherally, there is evidence of upregulation of adrenergic fibers on nociceptors and increased adrenergic receptor sensitivity coupled with a decrease in nociceptor neurite density. (3) Upregulation of glial production of inflammatory cytokines, (e.g. interleukin 6, tumor necrosis factor-alpha) and decreased interleukin-10 (anti-inflammatory “good cytokine”) levels coupled with other inflammatory peptides (substance P, bradykinin, cCGRP) contribute to a state of peripheral sensitization. (2) Newer criteria for CRPS, “the Budapest criteria” were developed to attempt to improve the sensitivity and specificity for making the correct diagnosis. (4) The basic features of the “Budapest criteria” include: 1) Pain out of proportion to the inciting event; 2) One symptom in three of four from the following categories: a) Sensory (report of hyperesthesia/allodynia); b) Vasomotor (temperature asymmetry, skin color changes; c) Sudomotor (edema and/or sweating changes; d) Motor/Trophic changes (decreased range of motion, motor dysfunction, weakness, tremor, dystonia). 3) Additionally, one sign must be noted in at least two of the following areas: a) Sensory; evidence of hyperalgesia and/or allodynia; b) Vasomotor (temperature asymmetry, skin color changes; c) Sudomotor (edema and/or sweating changes; d) Motor/Trophic changes (decreased range of motion, motor dysfunction, weakness, tremor, dystonia). 4) The absence of coexisting conditions: a) Non-inflammatory; b) Non-neurological; c) Non-traumatic; d) Non-iatrogenic. 5) This is a refresher course on current knowledge with critical aortic stenosis: a series of four cases. Int J Obstet Anest. 2004; 13(3): 183-7.


Procedural Management of CRPS

Sympathetic blocks have been one of the major techniques advocated by anesthesiologists for several decades, both for diagnostic and therapeutic reasons. (6) In the upper extremity, stellate ganglion block is introduced early in the course of the disease. Many authors have employed a series of blocks to attempt to extinguish the symptoms and signs, principally the burning pain, vasomotor and sudomotor findings. The sympathetic nervous system may or may not be involved, and thus the procedure is often performed for diagnostic reasons. Previous descriptions have called this sympathetically-independent pain. (7) Stellate ganglion block is most commonly performed at either the C6 (Chassaignac’s tubercle) or C7 transverse process via an anterior paratracheal injection. Recently other techniques have been described, including both ultrasound (US)-guided (8,9) and oblique fluoroscopically-guided approaches. (10) Paratracheal techniques were common in decades past, which were usually “blind” techniques, where surface landmarks were used to find the cricoid cartilage at C6 and retrace the great vessels and sternocleidomastoid muscles laterally. Needle entry was immediately medial to the retracting palpating fingers, with the needle tip touching the medial aspect of Chassaignac’s tubercle which was then withdrawn a few millimeters. (6) Utilizing a fluoroscopic technique, the needle is advanced to strike the medial aspect of the anterior medial aspect of the transverse process at either C7 or C6 near its junction with the anterior aspect of the vertebral body. The clinician then observes the spread of contrast dye to ensure optimal spread; prior to final injection, usually containing a local anesthetic plus epinephrine. Computed tomography has also been described, but although more accurate, may expose the operator and patient to increased radiation (11). The oblique approach, wherein the needle is targeted similar to a transfemoral epidural, but near the anterior aspect of the uncinate process using fluoroscopic guidance (10) is thought to increase patient and operator comfort due to the fact that the anterior neck is not manipulated. Ultrasound (US) has made interventionists aware of the possibility of vascular trespass, and may explain past complications which were always attributed to vertebral artery injection, but may involve other vessels. (9, 12) Kapral and colleagues (8) performed a study comparing guided and non-guided injection of the stellate ganglion (US) They noted an increased incidence of hematoma in the surface- landmark block patients as compared to those receiving ultrasound guidance. The authors suggested that US-guided injection might improve safety. Narouze et al. (9) noted that US-guidance sometimes demonstrates the inferior thyroid artery in the field of the injection, making vascular injury possible. Notably severe complications including seizures, hematomas, and death have been previously reported (13-20). In addition to technical problems, the fact remains that stellate ganglion blocks are poorly validated for the treatment of CRPS. For example, one small trial showed that both patients treated with saline and local anesthetic blocks had early good responses. However, their patients that received local anesthetics had longer analgesic responses (reversal of allodynia) for 3 days and 18 hours versus 19.9 hours in the saline treated group. (21) In another trial, 33 patients received anterior para-tracheal blocks of the stellate ganglion. Of this group only 23 developed a greater than 1.5°C temperature increase. 48% of patients had incomplete sympatholysis, and only 7 patients that had adequate evidence of sympatholysis had pain relief. (22) Spinal Stimulation for CRPS

There is reasonably good evidence that spinal cord stimulation (SCS) may have a role in the treatment of CRPS. From a pathophysiological perspective, animal models suggest that SCS may work in CRPS via two mechanisms minimally. First an intact sympathetic nervous system seems important at stimulation levels to influence the sympathetic nervous system. (23) Second, studies by Croom et al. (24) suggested the role of endogenous peptides released in response to SCS, such as calcitonin-related gene peptide (CGRP) were important to the analgesia from SCS and could be reversed by CGRP antagonist. (24) In terms of disability reversal, a study by Harke et al. (25) followed up on 29 patients that received SCS for CRPS. Patients had universal responses from sympathetic blockade prior to placement of SCS. At average followup of 36 months, 12/16 upper extremity patients had improved group strength, reduction of deep pain and allodynia, and improved disability. Kemler et al. (26, 27) have perhaps generated the most controversial studies with those those physicians performing SCS. They studied 54 patients, all of whom had previous surgical sympathectomies. 36 patients received SCS plus physical therapy (PT) while 18 received only PT. Due to exclusions, only 31 patients in the SCS were compared to 13 patients in the PT group. Both pain scores (P<0.001) and global perceived effect at 6 months (p<0.01) were improved in the SCS group as compared to the PT alone group. Later analysis of the study patients at 5 years showed that early results had become less favorable, and improvements in the pain scores in the SCS + PT group were no longer statistically significant (27). Notably, however, another publication by the same authors noted that 90% of those who have an implant responded to the SCS therapy and 95% of patients would do it again. (28) Conclusions: CRPS is a difficult disease, with ongoing diagnostic difficulties and equally uncertain treatments. Refinements in the criteria for diagnosis (Budapest previous criteria) and more precise applications of existing therapies, e.g. sympathetic blockade and spinal cord stimulation offer the clinician some hope. In the future, as further study elucidates the pathophysiology more clearly, it is likely that better therapies will be developed.

References:
increase in pulmonary capillary permeability. Additional laboratory studies and clinical trials are needed to further elucidate the mechanism and assess the potential clinical applicability of local anesthetic attenuation of various forms of acute lung injury.

Retrospective studies indicate that regional anesthesia is associated with a lower incidence of tumor recurrence following resection of breast8 or prostate cancer9. In both studies, general anesthesia was supplemented with either regional anesthesia (in the breast cancer studies, paravertebral block; in prostate resection, epidural anesthesia) or opioids. Therefore, these findings could be ascribed either to reducing the theoretical negative effects on immune surveillance caused by volatile anesthetics /opiotes/pain/sympathetic stimulation or direct, beneficial effects of exposure to local anesthetic. Forget and De Kock10 recently reviewed data indicating that sympatho-modulation by local anesthetics can improve natural killer cell function and immune surveillance. Yardeni et al11 studied the effects of intravenous lidocaine in patients undergoing transabdominal hysterectomy and found these patients experienced less postoperative pain, lower pro-inflammatory cytokine levels and evidence of improved lymphocyte response to phytohemagglutinin stimulation that did controls. In an attempt to understand the immunomodulatory effects of local anesthetics at a molecular level, Votta-Vellis et al12 studied ropivacaine in cultured human lung cancer cells and found that ropivacaine inhibits Src-induced ICAM phosphorylation and reduces MCP stimulation that did controls. In an attempt to understand the immunomodulatory effects of local anesthetics at a molecular level, Votta-Vellis et al13 studied ropivacaine in cultured human lung cancer cells and found that ropivacaine inhibits Src-induced ICAM phosphorylation and reduces MCP activation. They further postulate that these anti-inflammatory effects could reduce or mitigate the conditions required for cancer metastasis. It is very exciting to consider the possibility that use of regional anesthesia or intravenous infusion of local anesthetic could be an effective measure to reduce post-operative cancer recurrence.

These are just a few of the novel and diverse biological effects of local anesthetics that have the potential for clinical translation. Stay tuned for inevitable future developments.

References:
interindividual variability in pain sensitivity and response to analgesic medications. Sensitive patients deserve specific treatment. This distinction is also of critical importance to evaluate the efficacy of these specific treatments. A simple way to detect these patients at the preoperative visit is to fulfill the “Kalkman” score, a validated risk scale based on patient’s history and the type of surgery (Table 1) (1,2).

### TABLE 1:

Preoperative prediction of severe postoperative pain according to Kalkman et al. (1)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex: female</td>
<td>1 pt</td>
</tr>
<tr>
<td>Age: 30 years or less</td>
<td>2 pts</td>
</tr>
<tr>
<td>Pain before surgery</td>
<td>2 pts</td>
</tr>
<tr>
<td>Obstetric anesthesia</td>
<td>1 pt</td>
</tr>
<tr>
<td>Obesity (BMI &gt; 30)</td>
<td>1 pt</td>
</tr>
<tr>
<td>High level of anxiety at preoperative visit</td>
<td>1 pt</td>
</tr>
</tbody>
</table>

The risk intense postoperative pain is important when the score is 4/15

Perioperative risk factor for cancer recurrence

Other authors have developed more sophisticated tools to detect «at risk» patients. They elaborated testing based on experimental pain. In this regard, psychophysical measures exploring “static” pain parameters (pain thresholds, magnitude estimation of suprathreshold nociceptive stimuli, and tolerance) have been regularly reported to predict the intensity of acute postoperative pain in the early phase of an injury (3). Nevertheless, these measures of response to an acute, phasic, experimental stimulus are less indicative of the complex pain modulation process that occurs after surgery. Some aspects of such modulation can be quantified by using the “dynamic” psychophysical measures of temporal summation and evocation of diffuse noxious inhibitory control, a measure recently reported to predict the risk of CPSP after thoracotomy (4). In contrast with the Kalkman’s score, these tests are time and resources consuming therefore not easy to perform in daily clinical practice.

Once these “sensitive” patients are detected at the preoperative visit, the anesthetists may help these patients to prepare themselves to surgery and postoperative pain. One way is to assist the patients to face the psychological stress associated with surgery and its consequences. We already mention that preoperative anxiety plays an important role in the intensity of postoperative pain and anxious/catastrophising personalities are factors recognized to favour CPSP (5). Techniques to alleviate these “negative mental status” such as auto-hypnotic conditioning may certainly help (6). It deserves, however, confirmation by prospective studies.

Another way are the preoperative “prehabilitation” programs such has been used for fast-track procedures including, among others, exercise rehabilitation (7).

Moreover, light physical exercise may induce an “inflammatory pre-conditioning” that protects against exacerbated inflammatory stress consecutive to surgery (8).

These two approaches implicate that the pre-operative visit by the anesthetists occurs several weeks before surgery and that specialized facilities are available.

6-Restif AS: Self-hypnosis, a resource for children undergoing painful treatment. Soins Ped Pueric 2010; 254; 37-9

### 46 REGIONAL ANAESTHESIA AND ORGAN PROTECTION

A. Gottschalk Germany:

Regional anaesthesia - epidural anaesthesia as well as peripheral nerve blocks - has been shown to provide superior analgesia compared to other analgesic regimes [2, 6]. Additionally now the question arises which effects regional anaesthesia has with respect to organ protection and long term outcome of patients after surgery. However, whereas several studies have been published evaluating the effects of epidural anaesthesia on organ protection no sufficient evidence exists concerning organ protective effects of peripheral nerve blocks.

Studies concerning organ protective effects have been performed with respect to the cardiac, pulmonary and gastrointestinal system. Experimental studies were able to show that thoracic epidural anaesthesia is able to reduce the activation of the sympathetic nerve system [8]. This effect may reduce the postoperative stress response as well as the activation of the coagulation system. Thoracic epidural anaesthesia has been shown to reduce the incidence of myocardial infarction in patients undergoing vascular surgery [1]. Singh et al were able to show that epidural anaesthesia in patients undergoing inguinal vascular surgery is able to reduce the incidence of cardiovascular, respiratory and gastrointestinal complications and myocardial infarction [9].

Results after coronary bypass surgery are inconsistent.

Thoracic and abdominal surgery results in a relevant impairment of pulmonary function [10]. Several studies were able to show that thoracic epidural anaesthesia is able to reduce postoperative pulmonary complications like atelectasis and pneumonia, and is able to improve lung function and oxygenation. Protective effects of epidural anaesthesia with respect to the development of pneumonia have been shown recently [5]. Additionally duration of postoperative ventilation and need of reintubation were reduced, lung function and oxygenation could be improved.

Concerning the gastrointestinal system use of epidural anaesthesia results in a reduced duration of postoperative ileus and gastrointestinal dysfunction especially after abdominal surgery and improves oral intake [3]. These positive effects of epidural anaesthesia are a milestone in the development of “fast-track-surgery” concepts.

No effects of regional anaesthesia on postoperative cognitive dysfunction has been detected by now [4].

Due to methodological problems the evaluation of the influence of regional anaesthesia on mortality rates after surgery is difficult to perform as a huge number of patients is necessary to include. Until today meta-analyses and retrospective analyses have been published demonstrating a slight reduction in mortality rate [7, 11, 12]. These results should be interpreted with extreme caution as the differences are quite small and prospective randomised studies are still missing.

Thoracic epidural anaesthesia has been shown to improve cardiac, pulmonary and gastrointestinal function. These effects should be used intensively in multimodal concepts to improve patients’ outcome. Results concerning influences of epidural anaesthesia on mortality rates remain inconsistent.

### References:


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E64

47 WHICH IS THE BEST ANALGESIC SOLUTION FOR LABOUR ANALGESIA?

S. Sahin Turkey

Labour analgesia should dramatically reduce pain of labor, allow parturient to participate in birthing experience, cause minimal motor block to allow ambulation with minimal effects on fetus and progress of labour. The technique has gained popularity late 1960's and undergone refinement to enhance optimal labour analgesia. Labour analgesia techniques can be chosen among any of the different methods that are; continuous epidural analgesia, patient controlled epidural analgesia (PCEA), combined spinal-epidural analgesia (CSE), intermittent epidural bolus injections, spinal opioids or continuous spinal analgesia. In spite of the greater number of choices, generally, the number of drugs used is limited. There is significant study variation in terms of finding the ideal regimen and the variety mostly comes from different combinations of local anesthetics, opioids and some adjuvant drugs. Generally, doses for opioid and local anesthetic mixtures have been chosen arbitrarily. The ideal local anesthetic for labour analgesia should have rapid onset with minimal motor block, minimal risk of maternal toxicity, negligible effects on uterine activity and utero-placental perfusion, limited uteroplacental transfer and long duration of action. The analgesic efficacies and potency ratios are well studied in obstetric anesthesia literature. Epidural bolus injections or infusion of low concentrations of local anesthetics such as bupivacaine, ropivacaine and levobupivacaine may provide excellent analgesia without significant motor block. Up to now, many drug combinations are being used to provide the best analgesic method. The ideal dose is unknown, if the dose is too little, pain relief will be inadequate and if it is too large, side effects may occur. The goal must be producing analgesia while minimizing side effects. Bupivacaine is the drug that is studied the most and it has been used in many different doses ranged from 0.0625% to 0.25%. Generally, 0.125% of bupivacaine mixed with 1 or 2 micrograms of fentanyl or sufentanil is the choice in many studies. Different analgesic solutions for labour will be reviewed.

48 MUSCULOSKELETAL PAIN: BASIC CENTRAL MECHANISMS

M. Curatolo Switzerland

It is well-known that tissue damage can induce profound changes in the central processing of nociceptive stimuli [31]. Extensive animal research has revealed several mechanisms that underlie these central modifications [15; 31; 32]. The common result is a state of hyperexcitability of the central nervous system, which can lead to pain after innocuous sensory stimuli, exaggerated pain sensation after moderately painful stimuli and enlargement of the referred pain areas [13]. In the area of musculoskeletal medicine, such manifestations are likely to have clinical relevance. For instance, they can be determinants of exaggerated pain with physical activities, which is a major cause of disability.

The basic mechanisms that underlie neuroplastic changes are difficult to investigate in humans, since no direct measurements from neural structures can be made. Central hypersensitivity can be investigated in humans by quantitative sensory tests. The basic principle is to apply a stimulus to a healthy tissue and record the pain response. A pain reaction after a stimulation that does not cause pain under normal conditions is suggestive for central hypersensitivity. Methods that do not rely only on the subjective pain perception are also available. They include recordings of the electromyographic response (the nociceptive reflex) [30], electromyographic assessments (somatosensory evoked potentials) [12] and brain imaging techniques [11]. Using these methods, central hypersensitivity has been detected in different chronic musculoskeletal pain syndromes [6], such as chronic low back pain [11; 20; 26], neck pain after whiplash injury [7], knee osteoarthritis [2] and fibromyalgia [3].

The receptive field is the size of peripheral tissue that is innervated by a single spinal neuron. Animal investigations have documented an expansion of the cell population of the dorsal horn following peripheral lesions [14]. Expansion of receptive fields is likely one of the determinants of hyperalgesia at areas outside the injured region (secondary hyperalgesia) and enlargement of the pain areas, which are clinically relevant phenomena. Recently, a model that could assess for the first time the size of receptive fields in humans using spinal reflexes was developed [23]. Using this method in chronic pelvic pain, it could be demonstrated for the first time that patients with chronic pain display an expansion of nociceptive reflex fields [24]. This finding was confirmed by a preliminary analysis of a recently completed case-control study in patients with chronic low back and neck pain (Neziri et al, unpublished).

Spinal cord hyperexcitability elicited by trauma or inflammation is influenced by descending facilitatory and inhibitory pathways [8]. Descending controls allow a “top-down” influence on spinal processing and form a link between higher brain functions and the level of pain transmission [29]. The efficiency of this system can be examined in humans by conditioned pain modulation (CPM): typically, pain after application of a nociceptive stimulus
is attenuated by the application of an additional noxious stimulus to a remote body region, reflecting diffuse endogenous inhibition [9]. CPM is impaired in patients suffering from fibromyalgia [18], tempo-mandibular disorder [17] and osteoarthritis of the hip [19].

Although alterations in central pain processing are recognized as important pathophysiological mechanisms of pain, research on their clinical relevance is still at his birth. All investigations cited above have compared groups of patients with groups of healthy subjects. However, statistically significant differences between groups do not tell us which patients display such alterations, and to what extent. In this context, it is important to recognize that the degree of altered pain processing is highly variable among patients. A recent investigation on more than 500 patients demonstrated that about 25% of patients with chronic pain display widespread central hypersensitivity or altered CPM (Schliessbach et al, unpublished). Thus, these phenomena are likely to have different importance in different patients.

An important translational step is the detection of disturbances in central sensory process in individual patients. This requires the development of diagnostic tools that are reliable and have sufficient validity. Furthermore, normative values of the tests have to be defined. Translational research is progressing in this field. Normative values for different pain tests have been published [22; 25], and the reliability of several quantitative sensory tests has been investigated [1; 4; 5; 10; 21].

One further important area is the prognostic value of central hypersensitivity. Two investigations of the same group evaluated patients after a whiplash injury in the acute phase and 6 months after injury. Both studies showed that those patients with persistent moderate or severe symptoms at 6 months had displayed, soon after injury, widespread hypersensitivity [27; 28]. Therefore, the presence of central hypersensitivity may be an indicator of negative prognosis. A peripheral lesion may induce plasticity changes leading to central hypersensitivity in a subset of individuals. Such hypersensitivity would facilitate the transition from acute to chronic pain and disability. There is some evidence that central hypersensitivity in whiplash patients represents a negative factor for the efficacy of rehabilitation programmes [16]. If further studies confirm this finding, measuring central hypersensitivity could assist the clinician in the selection of patients who are more likely to respond to rehabilitation programmes.

Finally, another relevant area of future translational research is the development of mechanism-based interventions. If central hypersensitivity is a clinically relevant phenomenon, its treatment is expected to lead to improved patient’s outcome. This requires not only the quantification of central hypersensitivity in individual patients, but also the identification of treatment strategies that specifically target this phenomenon. This would offer the perspective to select patients for targeted treatment on the basis of a previous assessment of the nociceptive system.

In summary, part of patients with chronic musculoskeletal pain displays a central hypersensitivity state that is likely to contribute to pain and disability. The concept of altered central pain processing is finding its way to clinical practice. Further studies are needed to develop diagnostic tools for disturbances in central pain processing, evaluate their clinical relevance and establish therapeutic strategies to prevent and treat these disorders.

References:


49

WHY ARE MANUSCRIPTS REJECTED BY JOURNALS?

J. Neal USA

Minimal Requirements

A statement that specifically identifies the authors’ Institutional Review Board (IRB) and attests that all subjects have provided their written informed consent must appear at the beginning of the methods section. Case reports must be accompanied by written permission from the patient or guardian to publish the report. Like most major anesthesiology journals, RAaP requires that specific conditions be met concerning the off-label use of drugs administered near the neuraxis or peripheral nerves.1,2 Any clinical study from the United States must be registered at www.clinicaltrials.gov; international manuscripts are encouraged to enroll with this or similar registries. Once a manuscript is accepted, publication cannot proceed until the journal has received Copyright Transfer Agreements from all authors. Authors are strongly encouraged to design, present, and submit their manuscripts in accordance with preferred styles of reporting. For instance, randomized controlled trials are ideally present in CONSORT format.3 Systematic reviews and meta-analysis should conform to the PRISMA Statement or similar construct for this type of report. Observational studies should follow the STROBE format.4

Writing the Manuscript

Introduction

The introduction serves to describe to the reader why you performed your study and why it is important. Use the introduction to frame the issue you wish to address by placing the problem in perspective, briefly describing what others have reported, and pointing out the unanswered questions that you wish to resolve. This entire process must be accomplished in one or two brief paragraphs. The introduction is not the discussion, just the framework. The final sentence or paragraph of the introduction should clearly state your hypothesis and ideally will define the primary and secondary outcomes that you have studied.

Materials and Methods

Begin this section with statements regarding IRB approval, registry information, and/or any HIPAA-related issues. A similar statement is required from your Animal Use Committee in the case of animal experimentation. In this first paragraph, state that patients or their guardians gave their written informed consent to participate in the study. The early sentences of this section should also classify your study—randomized controlled trial, double blind, extended case series, retrospective, etc. What follows should be a description of how you performed the study, in enough detail that a subsequent investigator could repeat your experiment. When describing your methods, pay particular attention to consistency in units of measure. For example, use mg/kg or mcg/kg, but not both. The final paragraph of your methods section describes conventions you have selected to describe statistical findings and the statistical tests used. It is in this final paragraph that you describe how you determined your sample size or power analysis. Importantly, state clearly whether your power analysis applies only to the primary outcome, or also includes some of the secondary outcomes.

Discussion

Inexperienced authors often have difficulties crafting a good discussion. This section is your opportunity to summarize your findings, explain why they are important, and to compare and contrast them to previously published investigations on the same topic. Take special care not to conclude more from your data than is really supported by it; that is, avoid overgeneralization. If you conjecture why a result has occurred or what future value your results may bring, clearly label these statements as speculative. Similarly, a case report or a study of 30 patients in no way allows you to comment about the safety of your technique with regards to a complication that for example only occurs in 1/150,000 anesthetics.

The overall structure of the discussion session is important. Your first paragraph should summarize your findings. Next, discuss their importance and their relationship to previous work in the field. Add a paragraph or two that address the limitations of your study (retrospective, lack of blinding, inadequate power for a secondary outcome, etc). Finally, conclude with a paragraph that states your primary result and what the next investigatory step should be. Particular care should be made to state essentially “results of this study apply to the specific conditions of this study, and may not necessarily be extrapolated to other scenarios”. In regional anesthesia, a good example of this concept is implying that results from neuraxial studies apply to peripheral nerve blocks.

Your Manuscript Was Rejected. What Now?

Any author who submits enough manuscripts will have a few rejected, particularly early on in their career. Sometimes the rejection is based on fatal flaws in the study, such as inadequate power or obvious potential for bias. When this occurs, learn from what the reviewers have told you, pick yourself up, and design a better study next time with the help of their insight and suggestions. However, some rejections simply mean that the reviewers did not feel your study was of sufficient priority to gain publication in their journal; or the science was passable, but your presentation was inadequate. When this occurs, seek publication in another journal, but not before you seriously consider the reviewer comments and use them to make appropriate improvements to your manuscript. Just re-submitting the same manuscript to a different journal is risky. It will be just your luck that one of the peer reviewers from the second journal also reviewed your paper for the first one. Probably nothing leads faster to a reviewer’s recommendation to reject than “I reviewed this manuscript for another journal and the authors have not changed a thing.” Many editors are willing to tender a previously rejected manuscript to a second round of peer review, assuming that 1) the re-submission has undergone a substantial revision and is significantly different that the previously rejected version (for example, enrolling more patients to gain adequate power); and 2) the authors disclose that this represents re-submission of previously rejected work.

Top 10 Reasons Manuscripts Get Rejected (in no particular order)

1. Lack of originality
2. Failure to state and follow through with a clear hypothesis
3. Failure to properly power the study (inadequate sample size)
4. Poor presentation—disorganized, illogical flow of thoughts
5. Absence of IRB approval and written informed consent of the subjects
6. Overgeneralization—concluding more than the data support
7. Poor study design—failure to control bias, provide a control group, etc.
8. Poor study design—inappropriate selection of statistical tests
9. Discussions that insist on presenting as fact issues that are clearly conjecture
10. Failure to reference previous relevant, or even contradictory, work

Suggested References:

50 BARIATRIC SURGICAL TECHNIQUES AND ITS IMPLICATIONS UNDER RA

J. Raeder,1,2 Norway

Both in developed and developing countries the total number and percentage of obese people in the population are increasing, as is their life expectancy. Basically, bariatric surgery either reduces the patients’ ability to eat a high volume of food (gastric reduction, gastric banding) or reduce the absorption of nutrition (gut reduction, partial gut by-pass) or both combined. Thus the bariatric procedures are either by laparoscopy or (more rarely) by laparotomy. Ambulatory care is evolving for bariatric procedures of medium invasiveness (e.g., gastric banding) in some places, although most clinics do the somewhat more extensive, but effective and increasingly popular combined gastric reduction+gut bypass, followed by 1-3 nights stay in hospital.

Also, obese patients do present for all kinds of surgery, not just bariatric, and their suitability and options of anesthesia needs to be assessed also in such situations. Although the obese have reduced physiologic reserves, both cardiovascular and respiratory; obesity per se is not usually a major risk factor or reason for being turned down for surgical, even ambulatory, care. Rather, non acceptance has to do with the overall problems presented by obesity, namely the frequent co morbidity, the type of surgery planned, as well as practical aspects such as weight limits on the operating table and trolleys. Useful preoperative tests are ECG, spirometry, resting blood gas while breathing room air, pulmonary radiograph, and a functional test, such as walking a flight of stairs.

More frequent co morbidities in the obese population include: diabetes mellitus, hypertension, gastroesophageal reflux, arthritis, musculoskeletal pain, sleep apnea syndrome, and, in more severe cases, pulmonary hyperventilation and atelectasis or heart failure. Some of these co morbidities may be reversed or significantly improved by a successful bariatric operation.

Body mass index (BMI= weight/(height × height)) is the most common way of classifying obesity, although it is an underestimate for short people and an overestimate for those who are very tall, muscular or heavily built. Normal BMI is in the 20-30 kg/m² range. Obesity is 30-35 kg/m²; usually not associated with any special anesthetic precautions. Bariatric surgery is usually offered only when BMI is above 35 (morbidly obese); as the procedures carry a low, but still present, mortality. Even when bariatric surgery is successful, there are still side effects, which may be irreversible and life long (abdominal pain, diarrhea, malabsorption syndromes etc.

General anesthetic preparations in morbidly obese patients. As with all patients, cessation of smoking 3-5 weeks before scheduled surgery improves respiratory function, and this is especially valuable in the obese because they are more prone to airway problems than others.

Especially when intra-abdominal procedures (laparoscopy, laparotomy) are planned, it is a good safety measure to advise the patient to reduce, even minimally, their weight in the weeks ahead of surgery, by adopting a high protein, low carbohydrate diet. This is because most obese people have an enlarged and fragile fatty liver. By diet and weight reduction for a period of weeks the liver shrinks and becomes less fragile. This is important as it facilitates surgical access to the abdomen and reduces the risk of liver tear or bleeding.

Gastro-esophageal reflux disease occurs in about 20-30% of obese patients, and they may be at risk for perioperative regurgitation of stomach acid into the airways. A good way of reducing both the amount and acidity of the gastric contents is to use a proton pump inhibitor (e.g., omeprazole). The first dose should be taken at least a few hours before surgery, but best practice is to give it the evening before and then again on the morning of surgery. If this has not occurred, some sips of fluid antacid (sodium citrate) prior to anesthetic induction may be an alternative solution, although this is only effective on fluid pH and not volume. Half sitting position during induction will reduce the hazard of airway aspiration in these patients.

In patients with suspected sleep apnea and planned general anesthesia or opioid use, the optimal strategy is to carry out overnight polysomnography well in advance of surgery, and to fit the patient with a CPAP device so they can become familiar with using it. Patients with a CPAP device should be urged to bring it with them on the day of surgery, for use in the PACU; its use is mandatory for the first few nights at home.

In patients with respiratory problems, especially COPD, it may be useful to refer them preoperatively to a physiotherapist to clear their chest and be taught how to cough, breathe, and mobilize the lungs after surgery.

As to fasting rules, the speed of gastric emptying in obese patients is similar to that in lean patients. Thus, if no physiologic cause of gastrointestinal obstruction or slowing is evident, they should have nothing to eat (including milk) for the six hours before surgery and no clear fluids in the last two hours. Some preoperative tablets may be allowed to be taken with a few sips of water up to one hour ahead of anesthetic induction.

Premedication

Due to the increased incidence and risk of airway obstruction in obese patients, they should generally not have anxiolytic or opioid premedication. If there is a strong indication, a benzodiazepine may be used, but the patients should then not be left alone, but be observed or have pulse oximetry. Establishing an iv line is safe practice, because midazolam or diazepam can then be carefully titrated and also because rapid injection of the benzodiazepine antagonist, flumazenil, is then an option if needed. Opioid premedication should only be used when needed for preoperative pain, and then in small doses with subsquent continuing monitoring.

Still, the time for premedication, one to two hours ahead of surgery, may be a good time to give other drugs that will benefit the patient: oral analgesics (paracetamol, NSAID/coxib), prophylactic antibiotics or anti thrombotic medication. As obese have an increased propensity to thrombosis, pulmonary embolism and wound infections, drug prophylaxis will more frequently be indicated in the obese than in the lean, but still depends upon the type of surgery.

Choice of anesthetic technique

Loco-regional anesthesia is the preferred technique for the obese, whenever possible to do. An axillary plexus approach or a spinal injection is usually feasible, whereas other blocks may be more difficult with fat tissue obscuring normal anatomy. Skilled use of ultrasound technology may be a major step forward in these patients, as nerve structures may be quite clearly located in the liver and then guided with the ultrasound. Still, it is important for the surgeon to infiltrate the wound areas with local anesthetic to reduce postoperative opioid consumption. The use and effect of intra-peritoneal local anesthetic deposit is more controversial. Still, anything that can minimize the need for anesthesia for bariatric surgery

As these procedures are upper-intra-abdominal procedures, loco-regional techniques are usually not sufficient for adequate anesthesia. Thus, general anesthesia is preferred, usually with endo-tracheal intubation and controlled ventilation. Still, it is important for the surgeon to infiltrate the wound areas and surrounding structures with local anesthetic to reduce postoperative opioid consumption. The use and effect of intra-peritoneal local anesthetic deposit is more controversial. Still, anything that can minimize the need for...
postoperative opioids is beneficial and may include: paracetamol, NSAID/oricoxib and glucocorticoid.

For general anesthesia, a method with optimal, rapid emergence is favorable in order to ensure a rapid transfer from controlled ventilation to an awake state with regained airway reflexes and respiratory ability. Our favorite is to induce anesthesia with propofol and remifentanil and single shot non-depolarising curare in half sitting position after proper pre-oxygenation with PEEP. Maintenance will be with desflurane in medium dose to ensure sleep and remifentanil adjusted to surgical stress. Also important is to apply anti-emetic prophylaxis, typically with a combination of 5-HT3 blocker, glucocorticoid and a low dose of a neuroleptic drug.

**Literature:**


### 51 OPTIMAL THORACIC EPIDURAL ANALGESIA

**H.M. Norum Norway:**

**Introduction:** Thoracic epidural analgesia (TEA) is an effective, widely used technique for pain relief after major abdominal and thoracic surgery. The method is considered the gold standard for post thoracotomy analgesia. TEA may, however, be associated with dose dependent adverse effects. An optimal TEA, on the other hand, is targeted and achieved by depositing a mixture of low concentrations of drugs with different, but synergistic analgesic properties in a procedure defined, optimal segmental siting in the thoracic epidural space. This minimizes drug doses and dose related adverse effects.

**Indications for TEA:** After major thoracic and upper or major abdominal surgery, optically conducted TEA may offer excellent pain relief and sympathetic with a minimum of side effects. Also, pain arising from multiple rib fractures in trauma can be relieved by optimal TEA, with minimal risk of adverse effects.

In addition to relieving acute postoperative and posttraumatic pain, reducing the risk of chronic postoperative pain is a separate indication for TEA. TEA for established chronic pain is beyond the scope of this presentation.

There are absolute and relative contraindications to TEA, and these will be discussed.

**Outcomes associated with TEA:** Compared to systemic opioids for pain relief, TEA reduces pulmonary morbidity, duration of postoperative ileus, urine retention, postoperative protein catabolism, and duration of postoperative mechanical ventilation and the need for care in an intensive care or high dependency unit. TEA reduces mortality in trauma patients suffering multiple rib fractures.

**Techniques for TEA:** Optimal thoracic epidural analgesia is provided by an continuous infusion through an epidural catheter.

The awake patient could be placed in a sitting or lateral decubitus position, and a thorough examination of the patient’s back and identification of anatomical landmarks, including the midline, the scapular spine and the inferior tip of the scapula which correspond to T3 and T7 respectively, should be undertaken before proceeding to a strictly aseptic epidural catheterization.

As the thoracic spinous processes have a caudal angulation, most pronounced for the upper and mid-thoracic vertebrae, epidural entry may be difficult from a midline approach. The paramedian approach is less influenced by this and therefore my favourite. Identification of the epidural space is done by a loss of resistance to saline injection, which compared to the hanging drop technique, carries less risk of dural puncture, and can be performed with the patient in a lateral decubitus position (preferred by me). Compared to loss of resistance to saline, the loss of resistance to air injection for identification of the epidural space is associated with more frequent dural puncture and failure to thread the epidural catheter. Also, venous air embolism and pneumoencephalus may complicate the loss of resistance to air technique. Air in the epidural space may predispose to postepidural paraesthesia from spinal nerve root or cord compression. Thus, loss of resistance to saline should be the preferred technique. After threading the epidural catheter, an epinephrine test dose is recommended to reduce the risk of unintended intravascular or subarachnoid catheter placement.

Ultrasound may be used to facilitate epidural catheter placement, either as real-time imaging to guide the insertion of the catheter into the epidural space, or as a pre-puncture scan to identify the midline, interspinous spaces and the epidural space before a conventional procedure is performed.

**Segmental level for TEA:** For an optimal TEA, segmental level of epidural catheter insertion should be carefully chosen, to correspond to the innervations of the structures exposed to trauma or surgery. By targeting the epidural infusion, dose dependent side effects of TEA should be minimized. Given by the cranial to caudal widening of the epidural space, spread of epidural drug solution is predominantly caudal from a high-thoracic epidural, whilst spread from a low-thoracic epidural would be cranial as well as caudal.

Suggested levels of catheter insertion are listed in the table below (Table 1).

<table>
<thead>
<tr>
<th>Surgical procedure</th>
<th>Segmental level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoracotomy</td>
<td>T4-T7</td>
</tr>
<tr>
<td>Upper laparotomy</td>
<td>T7-T10</td>
</tr>
<tr>
<td>Major abdominal surgery</td>
<td>T8-T12</td>
</tr>
<tr>
<td>Lower laparotomy</td>
<td>T10-L1</td>
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<tr>
<td>Nephrectomy</td>
<td>T8-T10</td>
</tr>
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It is of capital importance to select the correct level of thoracic epidural catheter insertion, not only to ensure pain relief at rest and on movement, but also to avoid side effects associated with lumbar epidurals. These include impaired leg mobility and urinary bladder function, compensatory coronary artery constriction and possibly increased frequency of postoperative myocardial ischemic events.

**Epidural drug solutions:** For an optimal TEA, a well balanced, three component epidural drug solution should be used. By adding opioid to a local anaesthetic, pain relief from a TEA is markedly improved. Adding epinephrine to a local anaesthetic combined with a lipophilic opioid, for instance fentanyl, further increases the pain relief provided by the thoracic epidural solution. Opioids, local anaesthetics and epinephrine have synergistic analgesic effects.

Opioids act within the dorsal horn of the spinal cord after crossing the meninges.

Lipophilic opioids, like fentanyl and sufentanil, accumulate in the epidural fat when administered epidurally. From the epidural fat, lipophilic opioids are absorbed into the plasma as well as into the cerebrospinal fluid(CSF), and after epidural infusion, analygetically relevant plasma concentrations of lipophilic opioids are found, but not when epinephrine (adrenaline) is co-administered. Hydrophilic opioids, like morphine and hydromorphone, do not accumulate in the epidural fat. Compared with lipophilic opioids, they have a slow onset, but longer duration of action. The hydrophilic opioids spread cephalad with the CSF to a much greater extent than the lipophilic opioids. Therefore the risks of respiratory depression, somnolence, and facial pruritus are higher for hydrophilic than for lipophilic epidural opioids.

Epinephrine induces vasoconstriction in the epidural space and therefore reduces vascular uptake of a lipophilic opioid and local anaesthetic from the epidural space.

Epinephrine also, being a spinal cord α2 agonist, has a separate analgesic effect in the spinal cord dorsal horn. Other spinal cord α2 agonists, like clonidine, cause too much sedation to be clinically attractive for post-operative pain relief.

Local anaesthetics administered epidurally block afferent and efferent signals to and from the spinal cord. Bupivacaine, ropivacaine, and levobupivacaine are widely used. Either may be used, as the doses used for an
optimal TEA are small, reducing risk of cardiotoxicity from bupivacaine to a very minor concern.

Named after its inventor, the "Breivik epidural solution", is familiar to European anaesthesiologists and contains bupivacaine 1mg/ml, fentanyl 2 μg/ml and epinephrine 2 μg/ml. Typical infusion rates for an TEA placed at the correct segmental level are 5-10 ml/hr, and extra bolus doses of 5 ml may be initiated by the patient when needed, up to twice an hour.

Complications to TEA: Hypotension, urine retention, motor blockade, and pruritus are minor side effects seldomly seen with a well balanced triple component epidural solution infused at a segmental level corresponding to the location of the trauma or surgery.

Infrequent, but devastating neurological complications from direct neurological injury, bleeding or infection in the spinal canal, may occur with TEA.

Bleeding in the spinal canal may cause formation of an epidural hematoma, which may lead to permanent neurological sequelae, as catastrophic as paraplegia. Incidence of epidural haematoma as frequent as 1:3100 has been reported for postoperative lumbar and thoracic epidural analgesia.

Neurological complications, like meningitis and spinal abscess formation, caused by infections associated with postoperative epidural analgesia are less frequent than neurological complications from spinal bleeding. Infectious complications may, however, also cause permanent sequelae.

Strict monitoring for neurological complications from postoperative epidural analgesia is mandatory, and timely intervention based on radiological findings may prevent development of permanent sequelae. For spinal canal bleeding, the most effective treatment is decompressive laminectomy performed within 12 hours after onset of symptoms.

Contraindications to TEA: Thoracic epidural analgesia, as any neuraxial block, is contraindicated in sepsis or central nervous infection, and conditions with raised intracranial pressure. Relative contraindications include diseases of the vertebral column, ongoing immunosuppression, impaired consciousness and disturbed haemostasis. To minimize the risk of spinal bleeding associated with TEA, adherence to guidelines for neuraxial blocks in disturbed haemostasis should be strict. The need for a thorough evaluation by the clinician of the potential benefits of an optimal TEA versus the increased risk of bleeding in disturbed haemostasis is emphasized in the guidelines.

Monitoring of TEA: A protocol for monitoring is prerequisite for safe and effective TEA. With robust monitoring, a patient with optimal TEA may be dismissed from the high dependency unit and cared for on a normal ward once a well functioning postoperative pain relief regimen has been established. The monitoring regimen should include evaluation of sensory and motor blockade every 4 hours and daily inspection of the epidural catheter and its insertion site. Increasing motor blockade or back pain may be signs of spinal complications. In the awake patient, TEA does not warrant a transurethral catheter, but the patient should be asked for diuresis and scanning for post void residuals may be useful.

Conclusion: Optimal thoracic epidural analgesia provides excellent pain relief after major thoracic and abdominal surgery as well as for rib fractures in trauma. With a mixture of local anesthetic, lipophilic opioid and epinephrine, each in a low concentration, synergism of the drugs' different analgesic properties is achieved. Analgesia is effective, as the low dose epidural mixture is infused continuously into a procedure defined segmental level of the thoracic epidural space. Dose dependent side effects are reduced to a minimum. Optimal thoracic epidural analgesia reduces perioperative morbidity, risk of chronicisation of postoperative pain and mortality after multiple rib fractures. Monitoring for thoracic epidural analgesia should follow a protocol and aim at ensuring effective analgesia and early detection of signs of potential complications.

Suggested readings:


Nordic guidelines for neuraxial blocks in disturbed haemostasis from the Scandinavian society of Anaesthesiology and Intensive Care Medicine.


52 SAFETY OF EPIDURAL ANAESTHESIA

E. Moka, E. Argyra, I. Siafaka Greece.

Introduction: Every patient wishes to receive anaesthesia care that is safe, in other words, free from risk, not involving danger or mishap and guaranteed against failure. Anaesthesiologists usually present a more realistic view to the patient. The personal view of the hoped-for care will be one in which the clinical outcome is satisfactory and achieved without complications, since performance has not deviated from the ideal. By this standard, most deviations are trivial or easily corrected by a perfect process, whereas patient outcome and a reasonably stress-free life for the clinician are objectives for all anaesthesiologists [1]. Safety of an anaesthetic technique is characterized by avoidance of complications, minimal percentages of associated risks and numerous primary and secondary beneficial endpoints, balanced against the inevitable consequences of method-related dangers. Consequently, prior to any conclusion regarding safety, reliable evidence must be established for both sides of the anaesthetic technique benefit-and-risk equation [2, 3].

Epidural anaesthesia-anaesthesia (EAA) has a long and distinguished history. For many clinicians, it remains an attractive option and a leading anaesthetic-analgesic modality applied in the perioperative environment [4, 5]. In regard to the benefit side, there is widespread conviction among anaesthesiologists that EAA offers significant advantages in certain settings, especially those involving abdominal and thoracic operative procedures [4, 6]. EAA is highly effective for controlling acute pain after surgery or trauma to the chest, abdomen, pelvis or lower limbs, with its salutary effects providing an added therapeutic benefit postoperatively. It has been instituted in various subpopulations, including cardiothoracic, vascular, paediatric and obstetric patients, with optimistic and promising results. Usually, the combination of excellent pain relief, associated with minimal side-effects, results in high patient satisfaction, when compared with other methods of analgesia [4, 6-8]. However, the controversy around EAA still continues, particularly with regard to its true impact on postoperative morbidity and mortality, as well as its safety, mostly due to the fear of rare, but potentially life-threatening or catastrophic complications [3, 6, 9]. Controversies represent the debate and dialogue that ensue when clinicians examine the issue of best practice. Taking into account the other ("darker") side of the benefit-and-risk equation, unfortunately, the fear of complications is still held with almost equal intensity, compared to the enthusiasm which initially extends EAA beneficial.
Complications and Safety of EAA: Aetiology - Evaluation

EAA complications [2, 6, 9-12, 22], may happen in the whole perioperative period, including the postoperative one and can be the direct or indirect result of the following:

- the technique itself: usually related to direct or indirect trauma by needle/catheter insertion and/or catheter presence in the epidural space
- the untoward effects of local anaesthetics/adjuvant drugs instilled
- local and systemic toxicity results of drugs infused
- fatal drug errors
- untoward effects resulting from the anticipated or unanticipated physiologic consequences of local anaesthetic blockade
- poor/lack of management of physiologic responses and/or adverse effects (arterial hypotension-fatal cardiovascular collapse)
- intraoperative technical problems/equipment failure
- ignorance regarding complications’ anticipation/recognition of precipitating factors
- delayed complications’ diagnosis
- non-application/delayed application of complications’ preventive measures
- lack of experience/education/audit/monitoring
- human/behavioural/operator/patient factors

EAA complications have been recognized over 100 years ago and the database concerning such risks is large but confusing. Studies are scarce, and their results difficult to compare. Due to their rarity, definite studies on EAA risks remain problematic and the quoted ranges of complications for severe adverse events still vary widely, because the study methodologies vary, much of the data are retrospective, and the distinction between permanent and temporary disability is not always clear. Many complications are known through case reports, and in rare events may not be even recognized within the patient population. Retrospective observational studies/surveys and case reports are important sources for evaluation, providing valuable information on incidence and possible associations with confounding factors. Observational data are often clinically relevant, can have a profound influence on clinical practice when a consensus of opinions is formulated, but, unlike randomized controlled trials, lack a control group, making it difficult to calculate an accurate incidence of risk. Because the enormous number of patients needed to perform prospective studies exceeds feasibility, it is important that retrospective studies try to minimize the inherent weakness of such study designs. Underreporting is common in retrospective studies, causing underestimation of risk [2, 3, 6, 9, 10, 14, 22].

Complications and Safety of EAA: Incidence

Fortunately, literature data are reassuring, suggesting that EAA blocks carry a low incidence of major complications, many of which may resolve in up to six months [13]. Anaesthesiologists’ vigilance has enabled early recognition of these diverse and, in some cases, extremely rare complications, so that corrective action can be taken to prevent permanent harm. Nonetheless, permanent disabling injuries following EAA are not so rare that we can ignore the issue. We are obliged to raise the specter of permanent injury to patients in our discussions, despite its uncommon incidence [2, 3, 6, 9, 14].

In the perioperative setting, overall permanent disability following EAA has been reported, in large populations, with some of the best information available coming from Europe, US and Australia [5, 6, 13, 23-28]. Prior to examination of studies reporting should not forget the Poisson’s Law regarding distribution of rare events. Actually, it is a statistical model for situations where the probability of an event to occur is very low, but the opportunity for such an occurrence is very high. According to this law, when an event has occurred in a sample size of “n” patients, the sample size associated with a 95% probability to have a new occurrence is “3n”. If no adverse event occurred in a population of “n” patients, it can only be conducted that the real incidence does not exceed “3/n” [5].

Moen V et al published a huge retrospective study involving 450.000 epidurals (including 200.000 in obstetric cases) administered in Sweden in a ten-year period. Major EAA complications reported were 1.37/10.000 patients (1/7.258 in general, 1/2.500 in obstetric population and 1/3.600 in all patient groups). The incidence of epidural haemorrhage was 1/2,000,000 (approximately 0.45/10.000), being lower in the obstetric patients (1/200.000) and much higher in patients subject to knee arthroplasty (1/3.600) [23]. Auroy et al provided some information on this topic, through two studies from France. Even though their data are prospective and large numbers are involved, information is conflicting and studies were not randomized. After 30,413 epidurally performed, 19 serious events were noticed, including 6, 5 and 1 cases of neurological injury, radiculopathy and paraplegia respectively, with the incidence of permanent neurological injury being calculated as 0.32/10.000 patients [24, 25]. According to Aromaa et al, based on the claims related to regional anaesthesia, 9 serious complications were associated with the 170.000 EAA administered in Finland, from 1987-1993 (0.52/10.000 patients) [26]. In the UK, Christie and McCabe retrospectively recorded 12 major complications after 8.100 peroperative epidurals (1 in 675)
in one hospital. This approximates to 148/100.000 epidurals. As nine patients made a full recovery, permanent injury was seen in 3 in 8.100 (37/100.000, 95% CI 7.6-108) [29]. Cameron and colleagues reported similar results, from a retrospective, single-hospital series, from Australia, with two vertebral canal haematomas and six epidural abscesses following 8.210 “acute pain” epidurals. One laminectomy was required and there were no cases of permanent neurological injury. Percentages of vertebral canal haemato ma (24/100,000, 95% CI 1.6-18), abscess (73/100,000, 95% CI 7.6-108), lam inectomy (12/100,000, 95% CI 0.6-2.4) and permanent neurological harm (6/100,000, 95% CI 0.1-6.8) are again broadly consistent with those from previous studies [30]. In a recent prospective survey, conducted in UK, with denominator (procedures performed) and nominator (complications) data validation through national databases, severe complications following 293,050 EAA have been calculated in events/100.000 epidurals, with [95% CI]. Permanent injury after EAA is reported to be 4.2 [2.9-6.1]/100.000, with incidence of 17.4 [7.2-27.8]/100.000 and 0.6 [0.3-4]/100.000 in the perioperative and obstetrical setting respectively [13].

Subgroup analysis from various studies has shown that elderly, female and orthopaedic patients carry a considerably higher risk of untoward side-effects and are more exposed to complications, compared to the obstetric or general population [13, 23, 27, 31]. Perioperative hypotension, potential coagulation disorders, blood in the needle, pain on injection and difficult block may be considered as alarm events [6]. Cardiovascular collapses [27] and wrong route drug injection errors [32] have still to be considered. Severe neurologic events are more often reported in the perioperative period and are mainly related to spinal haematoma (0.1-2.4/10.000), epidural abscess (0.23-7.3/10.000) and permanent or transient traumatic neurological injury (0.17-2.10/10.000) [13, 23-30, 33-35]. Based on the lessons learned from the ASA Closed Claims Analysis, haematoma, chemical injury and abscess represent 2%, 7% and 3% of spinal cord claims injury respectively, with paraesthesia during needle insertion and/or drug injection and multiple attempts to perform the block being the most important associated factors. These data also suggest that nerve injury now surpasses brain damage as the second leading injury associated with anaesthesia claims [2, 36]. In the following paragraphs, in regard with EAA safety only major complications leading to potential disability will be analyzed.

Adverse Events due to Insertion of Needle/Catheter in the Epidural Space

Dural Puncture

Dural puncture occurs in 0.3-1.23% of epidural placements, potentially resulting in a post-dural-puncture-headache (PDPH). Rarely, subdural haematoma, leading to neurological deterioration has been described after dural puncture; its incidence may be less with loss of resistance to saline than to air [2, 11, 12, 33, 37]. There is also a risk of pneumocephalus if air is used, which can result in serious complications. The use of saline may again help to reduce the incidence of this and other complications that have been associated with loss of resistance to air. Using saline also decreases the risk of post-epidural paraesthesia and venous air embolism. In addition, accidental pleural puncture during epidural catheter insertion has been described, as has haemothorax. There is currently a large body of evidences suggesting that liquid must be used instead of air for loss of resistance technique [11, 12, 38].

Direct Trauma

Direct trauma to the spinal cord, conus medullaris, spinal nerve roots or peripheral nerves ascribed to the needle or catheter is extremely rare, but has been reported, followed by sensory loss and less frequently motor deficits. As needle or catheter is advanced in the epidural space, intrinsic spinal cord lesions may happen, possibly due to direct trauma during the procedure and subsequent injection of fluid into the spinal cord, producing localized hydromyelia [2, 12, 39]. Auroy et al found five cases of radiculopathy following 30.413 epidurals. In each of these patients, pain or paraesthesia was noted on needle insertion or drug administration, with the radiculopathy being in the same distribution as the associated paraesthesias, suggesting a traumatic mechanism [24, 25]. Pathology of the spine may be a risk factor and the impact of spinal stenosis (often asymptomatic) has been recently pointed out, warranting further attention [5, 39, 40, 41]. Recent reports demonstrate that either multimodal causes [42], or a preexisting pathology of the spine [43] may be responsible for such complications, arising in temporal but not necessarily causal relationship to EAA [6].

To avoid nerve trauma, careful technique and accurate anatomic knowledge are advised. Literature reports highlight the problem and are fueling the ongoing discussion and debate as to whether patients should remain awake during EAA, to respond to painful stimuli, thus serving as possible indicators of accidental cord trauma or unrecognized nerve injury. Epidural catheterization is most frequently performed in the awake patient [26]. Should there be risk of neurologic damage and/or unrecognized nerve trauma, it should be stopped if the patient complains of pain. In most adults, spinal cord terminates at L1 vertebral body; however, in some it may terminate above or below this landmark. The ability of the clinician to correctly identify lumbar spinous interspaces has been questioned, using MRI. Only 29% of the interspaces were correctly identified, with 51% of clinicians being at a higher vertebral level than anticipated and with the spinal cord terminating below L1 in 19% of subjects. Oblique lateral entry into the ligamentum flavum may direct the needle into the dural cuff region, resulting in potential nerve trauma and unsegmental paresthesia. This should alert the clinician against persisting with further needle insertion or catheter threading [2, 4-6, 10-12, 22, 44, 45].

Traumatic injury when performing EAA also raises the question about technical skills. A learning curve exists and manual skills improve with increasing experience. It is considered that residents show significant improvement over baseline after 25 EAA, whereas at least 60 procedures have to be performed before obtaining a 90% success rate [46]. Some new methods of training, such as video technology and/or simulator, can be added to the available educational tools and would be valuable for improving safety [47, 48]. Ultrasound-guided technique may help to teach and also to perform EAA, especially when difficulties are awaited in specific population categories (obese patients, parturients, scoliosis, hyperlordosis etc) [49, 50].

Additionally, many attempts have been made to improve techniques for epidural space localization. The “membrane-in-syringe” technique, a modification of the 13-needle technique, combining loss of resistance to air and saline, allows reliable identification of epidural space, keeping injection of saline into the space to a minimum [6, 51]. Another experimental innovation is a device combining a visible and acoustic signal for epidural space identification [52]. Although these techniques are in an early experimental stage, the simple, objective and reliable technique for confirmation and accurate placement of an epidural catheter by low current electrical stimulation has become widely discussed [53-55]. A meta-analysis of available studies, investigating the ultrasound application as a diagnostic tool for epidural space visualization and its effects on EAA quality and performance, demonstrated a clear advantage over the use of this imaging technique. Regarding cost and practicability of these techniques, it has to be shown whether they will find application in everyday practice [4, 6, 56].

However, one of the important and unanswered questions regarding the ultrasound use to guide EAA is whether this technique will actually result in a lower incidence or severity of neurologic complications, versus classical methods of epidural space identification. As with any newer technique, there will be a learning curve when introducing ultrasound into clinician’s practice and as such anaesthetologists will need to be familiar with the anatomical landmarks and cognizant of the potential artifacts and pitfalls associated with ultrasound-guided regional anesthesia [4].

Transient Neuropathy

Transient neuropathy after EAA with eventual full recovery occurs more commonly, but is still relatively infrequent; a recent large, prospective, multicentre series involving 30.413 epidurals reported five cases of radiculopathy (0.016%), or 50% recovering completely within 3 months. Results are similar to ones previously published in large studies on transient neuropathy: 4 out of 17.439 patients (0.023%) and 0.013% from a retrospective study of 1.304.214 epidurals. Smaller studies report an incidence of 0.24-0.56%. After certain operations, such as tibial fracture fixation, EAA has been implicated in a higher incidence of neurological complications. However, a retrospective study demonstrated no significant association between peroneal nerve palsy development after total knee replacement, with the use of postoperative EAA [2, 10, 12, 22, 23].

The management of transient or permanent postoperative neurologic sequelae requires the cooperation of the anesthetist, surgeon, and neurologist. Additionally, the advice of the radiologist and neurosurgeon may also be sought. Although it is easy to blame epidural presence for an adverse neurologic outcome, it should be borne in mind that other factors can lead to demonstrable nerve injury. These include undiagnosed preexisting neurologic disorders; ligation of nutrient spinal cord vessels during abdominal surgery; injury to the femoral nerve during pelvic surgery, or to the lateral cutaneous nerve of thigh during retraction close to the inguinal ligament; or, pressure on the fibular head leading to neuropraxia of the lateral popliteal nerve. If an adverse outcome occurs, an attempt to localize
the lesion by history and examination should be made. Bilateral symptoms associated with pain should alert one to the possibility of neuraxial pathologies. For some, the presence of pain is both perioral and anterior with anticoagulation. Preservation of sensation over the paraspinal muscles suggests a more distal injury. Investigations should include blood cultures and coagulation studies. Immediate MRI is the gold standard for outruling central lesions. Electromyography can be used to determine the site of injury and the degree of axonal loss, although it can take up to 3 weeks after injury for changes to appear [2, 3, 4, 6, 9-11].

Adverse Events due to Insertion/Presence of an Indwelling Catheter in the Epidural Space

Epidural Haematoma

Epidural vessels puncture during catheter placement occurs during 3-12% of attempts [12]. Bleeding from an epidural vein may occur during needle/catheter insertion, but is usually self-limiting. However, the subsequent development of a spinal haematoma, defined as symptomatic bleeding within the spinal neural axis, which causes neurological damage, is a rare and potentially catastrophically complication following EAA [10, 22]. Epidural haematoma often occurs spontaneously, without any relationship with neuraxial anaesthesia. If not detected and treated early, it results in irreversible paraplegia [10 - 13, 22]. The true incidence of clinically apparent epidural haematoma is unknown, as any study attempting to quantify it would have to involve an enormous number of patients. The calculated incidence is approximated to be about 1/150,000 cases of EAA [57]. Because this estimate represents the upper limit of the 95% confidence interval, the actual frequency should be much less [58, 59]. However, the series involved in these calculations were conducted before the implementation of routine perioperative thromboprophylaxis and the risk may increase 15-fold by concomitant use of anticoagulant therapy, when appropriate precautions are not taken [60]. In this context, risk rate may be underestimated, since complications frequency is mainly based on cases reported in the literature. Recent reports have raised this risk to 1/100,000 after epidural labor analgesia, 1/150,000 in patients who were already receiving heparin or acetylsalicylic acid and 1/70,000 in patients who had experienced a traumatic spinal tap [57-60]. In a study including 1,710,000 patients, the overall incidence of epidural haematomas was around 1/50,000 and increased to 1/3,600 when analysis was restricted to EAA with a catheter for total knee replacement in women older than 70 years [23]. Other reports calculated the risk to be as high as 1/3,000 in specific patient subpopulations [3, 9-13, 22-30, 61]. In a retrospective review, three neuraxial haematomas were detected in 8,000 EAA, associated with epidural catheter, 2 days after its insertion [29]. Schroeder et al estimated that spinal haematoma incidence in patients undergoing EAA in combination with LMWH, in the United States, was 1/3,100 epidural injections [60]. It is apparent that risk increases substantially in elderly women, after a neuraxial catheter is inserted postoperatively or in combined use with anticoagulant therapy and bloody puncture [59]. This high prevalence could have a double explanation: the frequent dual therapy with antiplatelet agents and antithrombotic drugs in orthopaedic patients and that, in the past, the majority of Anesthesia Society Guidelines that establish a time interval between the administration of the anticoagulant and the performance of EAA have not been published [62, 63]. Recent case series and epidemiologic surveys suggest that the risk has increased, possibly as a result of increased use of regional anesthesia in combination with altered coagulation or of better reporting of the complication. Overall, the risk of clinically significant bleeding is currently related not only with concomitant drug administration, but also with procedure-related and additional personal risk factors (Table 2). It increases with age, associated abnormalities of the spinal cord or vertebral column, presence of an underlying coagulopathy, difficulty during needle placement, and an indwelling neuraxial catheter during sustained anticoagulation (particularly with standard heparin or low-molecular weight heparin). The need for prompt diagnosis and optimized intervention is also consistently reported [59, 62, 63].

New anticoagulant and antiplatelet drugs have been introduced recently, giving rise to new challenges in the management of the anticoagulated patient undergoing EAA. EAA performance could be considered safe in patients receiving drugs that after haemostasis, provided there is appropriate management based on safety intervals, suited to the anaesthetic-analgesic technique to be carried out and to the characteristics of the anticoagulant. International recommendations for thromboembolic prophylaxis and EAA application may help the physician to manage safely with antithrombotic agents when EAA is foreseen. Appropriate guidelines have been prepared by a number of roots societies of anaesthesiologists, but they do not have universal acceptance [3, 9, 10, 12, 22, 59, 61]. The first national recommendations on neuraxial anaesthesia and antithrombotic drugs were published by the German Society for Anaesthesiology and Intensive Care in 1997 [64], followed by the American Society of Regional Anesthesia and Pain Medicine (ASRA) in 1998 [65] and Belgian Anaesthesiologists in 2000 [66]. Since then, new anticoagulant agents have been introduced and new information, regarding EAA risks with concurrent anticoagulation, is available [59]. In response to such patient safety issues, the ASRA convened its Third Consensus Conference on Regional Anaesthesia and Anticoagulation. Practice guidelines and recommendations, published in 2010, summarize evidence-based reviews. However, the rarity of spinal hematoma defies a prospective randomized study, and there is no current laboratory model. As a result, the ASRA consensus statements represent the collective experience of recognized experts in the field of neuraxial anaesthesia and anticoagulation. These are based on case reports, clinical series, pharmacology, hematology, and risk factors for surgical bleeding. An understanding of the complexity of this issue is essential to patient management [62].

Additionally, in 2010, the European Society of Anaesthesiology (ESA) working party on Neuraxial Anaesthesia and Anticoagulants, composed of academic physicians experienced in this topic, published guidelines, to assist European anaesthesiologists in their daily clinical practice. The introduction of new anticoagulants together with recent reports of stent thrombosis in patients with periprocedural cessation of antiplatelet drugs have considerably broadened the issue and made revision necessary. To overcome deficiencies in content and applicability, the ESA has taken the initiative to provide current and comprehensive guidelines for the continent as a whole, based on extensive literature review [63].

Guidelines were designed to optimize both safety and efficacy of prophylaxis in the presence of EAA. Recommendations and suggestions are drug-specific and usually based on the pharmacologic profile (pharmacokinetics and pharmacodynamics) of each drug, mainly the time required to reach maximal concentration, the time to reach maximal antithrombotic activity, the half-life and the dose regimen. Two important factors also taken into account are how long to delay before removing catheters and when to restart anticoagulation. The recommendations are usually relevant to doses used for thrombosis prophylaxis, rather than therapeutic anticoagulation [59, 61-63].

All anticoagulants administered can be classified according to their specific target [59, 67-69] in the coagulation pathway:

- Inhibitors of the initiation of coagulation: factor VIIa/tissue factor pathway inhibitors
- Inhibitors of propagation of coagulation: mainly factor Xa (FXa) inhibitors, either direct or indirect
- Inhibitors of fibrin generation: direct and indirect thrombin inhibitors
- “Global” inhibitors of the coagulation pathway: antivitamin K drugs and unfractionated heparin

Interestingly, recommendations for prevention of haemorrhagic complications associated with EAA in patients given LMWH differ from country-to-country, and across continents. Indeed, in most European countries, the recommendations are that placement or removal of a spinal or epidural needle/catheter should be delayed at least 12 h after the last anticoagulant dose, but the recommendation is to delay 20 h and 10 h in France and USA respectively. Subsequent administration of LMWH is not recommended until 4 h after catheter removal in Europe, but is considered acceptable after only 2 h in the USA. In France, LMWH therapy is not initiated until 6 h after surgery in patients having EAA [59, 70].

Recommendations related to EAA and antithrombotic agents vary according to patient characteristics (age, weight, creatinine clearance and concomitant medications), difficulties associated with needle puncture, and pharmacokinetics of the anticoagulants. Recommendations and suggested strategies [59, 61-63, 68] can be summarized as follows:

- Consider the risk/benefit ratio of EAA for each patient. In general, outcomes sometimes appear comparable between general and neuraxial anaesthesia.
- EAA in patients receiving full anticoagulation continues to be contraindicated.
- Concomitant administration of medications affecting haemostasis, such as antiplatelet agents, NSAIDs, or dextran represents an additional risk of perioperative haemorrhagic complications, including spinal haematoma. Appropriate
53
THE ROLE OF CONTINUOUS PERIPHERAL NERVE BLOCKS IN THE MANAGEMENT OF ACUTE PAIN IN THE OPIOID-TOLERANT PATIENT

E.R. Mariano USA

INTRODUCTION: The management of acute postoperative pain in the opioid-tolerant patient is a common challenge for anesthesiologists around the world. For patients presenting for surgery on high doses of opioids, perioperative pain management requires a multi-modal approach, and regional analgesic techniques (e.g., neuraxial and peripheral nerve blocks) play an important role (1,2). This review will focus primarily on continuous peripheral nerve block (CPNB) techniques and the management of perineural local anesthetic infusions.

For appropriate surgical indications, CPNB techniques can provide target-specific analgesia for the opioid-tolerant patient (3-6). Compared to single-injection peripheral nerve block techniques, CPNB involves the percutaneous insertion of an indwelling catheter (i.e., perineural catheter) in the proximity of a target nerve, and this catheter can be used to continuously infuse the prescribed injectate solution. Perineural catheters can greatly improve the quality of recovery following surgery primarily by extending the duration of analgesia and minimizing opioid-induced side effects (7-10).

Overview of Catheter Insertion Methods

Perineural catheters may be inserted in a variety of ways based on the nerve localization technique and may include electrical nerve stimulation, ultrasound guidance, or a combination. When using electrical nerve stimulation, the CPNB placement needle is advanced toward the target nerve until the desired motor response is observed and maintained at a stimulating current amplitude < 0.5 mA (3,4). Once the desired needle endpoint is achieved, a non-stimulating perineural catheter (no conducting element within the catheter itself) can be inserted following local anesthetic bolus via the placement needle (3,4,9) or, alternatively, a stimulating catheter can be inserted through the placement needle before local anesthetic bolus (11,12). With ultrasound, target nerve images can be performed in short-axis (cross-sectional) or long-axis (longitudinal). After identifying the target nerve and potential needle trajectory, real-time ultrasound guidance of the perineural catheter placement needle can be "out-of-plane" or "in-plane" based on the relationship of placement needle to the ultrasound beam during needle advancement (13). An advantage of the in-plane needle guidance technique is the ability of the practitioner to visualize the entire needle, including the tip, throughout its trajectory toward the target nerve bundle when properly performed (14-18).

Four randomized clinical trials comparing ultrasound-guided CPNB with non-stimulating perineural catheter insertion to stimulating perineural catheter insertion have demonstrated decreased procedural times, higher catheter placement success rates, and fewer procedure-related complications in favor of ultrasound (16-19). In a subsequent study of popliteal-sciatic catheters only, ultrasound-guidance was associated with faster procedural performance and ultrasound (16-19). In a subsequent study of popliteal-sciatic catheters only, ultrasound guidance of the perineural catheter placement needle can be "out-of-plane" or "in-plane" based on the relationship of placement needle to the ultrasound beam during needle advancement (13). An advantage of the in-plane needle guidance technique is the ability of the practitioner to visualize the entire needle, including the tip, throughout its trajectory toward the target nerve bundle when properly performed (14-18).

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SELECTING THE SITE FOR PERINEURAL CATHETER INSERTION

Perineural catheter(s) for acute pain management should be inserted in proximity to the peripheral nerve(s) most likely to carry afferent pain transmission. For procedures involving the shoulder or proximal humerus, inter-scalene brachial plexus catheters provide effective analgesia (9,10,21). The intersternocleidomastoid technique for brachial plexus perineural catheter insertion has been effectively used for upper extremity surface procedures and treatment of chronic shoulder pain (22). For distal upper extremity surgery, supraclavicular (23,24), infracavicular (7,15,17), and axillary (25-27) brachial plexus perineural catheter sites have been employed. In a randomized clinical trial comparing supraclavicular to infraclavicular brachial plexus perineural catheters, the resulting analgesia in the two groups was equivalent (29). For major knee surgery including arthroplasty, posterior lumbar plexus catheters (30-32) and femoral perineural catheters (6,33,34) have demonstrated efficacy in providing postoperative analgesia. To provide complete analgesia and analgesia of the knee, a sciatic nerve block is necessary (35,36), but this benefit should be balanced against the cost of foot drop and expectations of early physical rehabilitation. In the opioid-tolerant patient with chronic pain, both femoral and sciatic perineural catheters should be considered (35). Post-operative pain of the lower leg, ankle, and foot is generally covered by continuous sciatic perineural catheters (16,37-39). A study comparing the subgluteal to the popliteal approaches for perineural catheter insertion failed to demonstrate a difference in postoperative pain control (38), but larger volumes of local anesthetic may be required in the popliteal fossa (40). In addition to the sciatic nerve perineural infusion, the saphenous nerve may need to be anesthetized to provide comprehensive pain relief when the surgical procedure affects this nerve distribution (41,42).

Managing the Perineural Infusion Regimen

The optimal infusate and duration of perineural infusion have not yet been established. While the ideal perineural local anesthetic infusion in the perioperative period maximizes analgesia and minimizes motor block, there is no single local anesthetic on the market that guarantees both at present. Both ropivacaine and bupivacaine are commonly used with ropivacaine possibly preserving motor function and demonstrating faster recovery to baseline motor function compared to bupivacaine (43). However, the results from other clinical studies differ (44,45). To date, no additives to local anesthetics for perineural infusion have been shown to improve analgesia, so plain local anesthetic solutions are recommended (46,47).

Studies evaluating basal-only, basal-bolus, and bolus-only perineural local anesthetic infusion regimens show that the basal-bolus combination results in the optimal balance of infusion duration, analgesic efficacy, and patient satisfaction (11,12). Comparing different concentrations of ropivacaine infusions administered in equal drug mass, the incidence of numbness and efficacy of analgesia differ at various catheter insertion sites (48-50). Therefore, the results of any study evaluating a single perineural catheter site cannot be extrapolated to all anatomic sites.

The optimal duration of perineural infusion for acute postoperative pain management is unknown. In a large multi-center prospective study of 1,416 hospitalized patients with perineural catheters involving 8 institutions in France and Belgium, the median infusion duration was 56 hours with a range from 2-7 days (51). However, randomized controlled trials comparing local anesthetic infusions to saline infusions demonstrate a return to equivalent pain scores in the treatment subjects once catheters are removed (7-10). Perhaps longer-term perineural infusions are warranted for patients with opioid tolerance, but evidence to support this notion is currently lacking. A large case series of 361 severe trauma cases with perineural catheters for pain management conducted by a military hospital reports an average infusion duration of 9 days with a range up to 34 days (52). Although the risk of infection becomes a concern for any indwelling catheter the longer it remains in place, the rate of catheter infection in this military case series was only 1.9%, and the 7 cases identified had superficial infections localized to the catheter insertion site which resolved without sequelae following catheter removal (52).

SYSTEMIC ANALGESICS

The acute pain management of opioid-tolerant patients cannot be accomplished by regional analgesic techniques alone. Preoperative baseline doses of opioids should be continued to avoid withdrawal with the addition of breakthrough nurse-administered or patient-controlled intravenous opioid analgesia postoperatively (1).

Non-opioid systemic analgesics such as non-steroidal anti-inflammatory drugs, anti-depressants, and alpha-2 agonists can be effectively combined...
with opioids as part of a postoperative analgesic regimen for opioid-tolerant patients (1,2). The perioperative use of gabapentin and pregabalin has been shown to reduce postoperative opioid requirements and should be considered in this setting (53–55).

Intravenous low-dose ketamine administered intraoperatively is a useful adjunct that can decrease supplemental opioid requirements and wound hyperalgesia (56) and may even have longer-term benefits in the development of persistent pain (57,58). In a recent study on chronic pain patients undergoing major spine surgery, the addition of low-dose intravenous ketamine resulted in decreased pain scores and opioid consumption in the immediate postoperative period, and these benefits continued for weeks after surgery (59).

In summary, CPNB techniques can offer many benefits for the opioid-tolerant patient in the acute postoperative setting as part of a multi-modal analgesic regimen. Many techniques have been described for perineural catheter placement and infusion management that allow practitioners to individualize pain therapy in this challenging population.

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54 FUTURE DIRECTIONS FOR REGIONAL ANESTHESIA IN FAST-TRACK SURGERY - ENHANCED RECOVERY

N.B. Scott.

Due to growing economic pressure, the need to reduce hospital lengths of stay is gaining increasing importance and the transition from fast track to enhanced recovery programmes embraces this need. Traditional fast track surgery programmes 'cherry-picked' patients who were young fit and healthy and by allowing them to deviate from the established routine until they were able to return to their own activities of daily living (ADL) including return to work. Success also depends on the level of expertise and engagement of the team that focuses on all aspects of the perioperative period and meets regularly to audit and redesign patient pathways for its own hospital. This team was designed to substitute opioids with analgesics that have less troublesome side-effects, but provide good quality pain relief. The most outstanding feature of even a single-shot regional technique is the excellent analgesia (without central depression) that is produced. Pain will develop on block regression, but administration of supplementary oral or parenteral analgesics should be timely so that they become effective before the block wears off. This results in a gradual, rather than a sudden, awareness of pain and reduces the requirement for (and complications of) subsequent anaesthetic therapy. Where needed, catheter techniques allow the period of profound analgesia to be prolonged well into the postoperative period.

Thus there is Level 1 evidence that the long held and widespread belief that opioids are the 'gold standard' for postoperative pain is no longer true. Opioids by whatever route, are inferior to both PNB and CNB and therefore analgesia to be prolonged well into the postoperative period.

Inflammation and immunosuppression: Current understanding of the mechanisms that initiate postoperative immunosuppression is poor, but the magnitude of the stress response correlates directly with both serum cortisol and the degree of immunosuppression. Triggers include transient episodes of ischaemia or malperfusion of vulnerable organs or surgical handling of major vessels and organs. Concomitant complement activation has been associated with exacerbation of ischaemic brain, kidney and myocardial injury through increased capillary permeability, neutrophil activation and protease-activated receptor upregulation. IL-6 produces negative inotropic effects and myocardial stunning, its concentration correlates with postoperative cardiac dysfunction, particularly after major procedures. However, full knowledge of these effects is needed so that the patient can be managed appropriately and the benefits gained.

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After major surgery both helper and suppressor cells are suppressed, and the numbers of circulating Natural Killer cells, which have a wide range of cytotoxic activity particularly against tumour cells, are reduced also. Thus, cellular immunity is disturbed for up to seven days postoperatively.

Regional compared to general anaesthesia for transurethral resection of the prostate reduces the postoperative depression of lymphocyte transformation. Combined spinal and general anaesthesia was shown to attenuate liver metastasis formation by preserving Th1/Th2 cytokine balance. These findings suggest that central block may result in less: hypercoagulation, although there is still relatively little objective evidence to indicate whether such effects influence outcome. On this topic, a recent large epidemiological database of arthroplasty patients in Taiwan has shown that spinal or epidural techniques are associated with significantly lower rates of surgical site infection compared with patients receiving general anaesthesia, probably as a result of attenuation of the stress response to surgery.

Regional anaesthesia in minimising this complication, although some of the benefit may simply be due to better analgesia improving mobilisation.

Colorectal surgery. Summarising the data, ERAS results in superior pain control, a reduction in the incidence of ileus, improved pulmonary function, a trend towards reduced thrombo-embolic and cardiovascular events and does not affect anaesthetic reduction rates. The patient’s quality of life postoperatively is improved. The utilisation of ‘minimally invasive surgery’ (MIS) via laparoscopic techniques or when this is either not available or not feasible, “maximally invasive anaesthesia” (MIA) using central neuraxial blockade, notably thoracic epidural analgesia (TEA) has led to remarkable reductions in the length of hospital stay, probably as a result of a reduction of the stress response. A recent study in open colorectal surgery, comparing an opioid based fast track programme with one in which opioids were avoided completely, showed significantly better analgesia, faster extubation times, less confusion, less postoperative nausea and vomiting and reduced length of hospital stay.

Orthopaedic surgery. There has been a widespread acceptance of the benefits of early mobilisation in reducing the incidence of DVT and pulmonary embolism. The combination of an intraoperative spinal with either PNB or intra-arterial catheters appears to provide the “ideal” analgesia for these procedures. In addition, by avoiding perioperative systemic and intrathecal opioids, the incidence of both urine retention requiring catheterisation and postoperative nausea and vomiting is less, thus allowing earlier ambulation and discharge. Except in rare circumstances relating to patient-specific co-morbidities, there is now little justification for the avoidance of regional anaesthesia and analgesia for major joint replacement in both upper and lower limb surgery. The recent National Audit by the Royal College of Anaesthetists confirms that spinal anaesthesia, performed and managed properly, is associated with minimal morbidity in the overwhelming majority of cases.

There is concern over the use of peripheral nerve blocks in lower limb surgery because of the profound motor block that is sometimes present. Thus although analgesia may also be profound the patient is unable to mobilize or indeed may fall as a result of loss of proprioception. Since spinal anaesthesia is more appropriate for surgery, effective analgesia can be achieved with low concentrations of local anaesthetic.

Thoracic surgery, Thoracotomy induces severe postoperative pain and impairment of pulmonary function. It is possible to fast-track patients following lung resection using a programme of minimally invasive surgical techniques with video-assisted and muscle sparing incisions, normovolaemia, normothermia, good oxygenation, euglicemia, the avoidance of unnecessary antibiotics and systemic opioids via epidural patient-controlled analgesia, early ambulation and oral feeding. In oesophageal and gastric surgery, patient-controlled epidural analgesia leads to a reduction in respiratory complications and the need for postoperative mechanical ventilation after oesophagectomy, thereby reducing the length of stay both in ICU and hospital.

There is a current controversy on whether TEA should be replaced by PVB for major thoracic procedures. Both are highly effective. However, both are poorly taught and both have significant failure rates. Given that surgery is often for malignancy and effective regional blockade may reduce the risk of recurrence, it is the author’s opinion that one is not to be preferred over the other. More importantly thoracic anaesthetists should learn to be proficient in both and be able to site either in preference to general anaesthesia by itself. Equally important is the need to ensure that they remain effective throughout the recovery period.

Major vascular surgery. Recently, an ERAS programme developed for patients undergoing open infrarenal aortic aneurysm repair showed that TEA reduced postoperative medical complications, the need for assisted postoperative ventilation and reduced the median length of stay in ICU.

Cardiac Surgery. Outcomes following this type of surgery, with its associated high mortality and mortality, have been successfully reduced over the last three decades with the application of fast track techniques. However, further improvements in perioperative care and outcomes can still be achieved with an enhanced recovery programme.

Cancer Surgery. Although enhanced recovery programmes have not addressed the topic directly, there is a growing interest in the potential for regional anaesthesia to have a beneficial effect on the incidence of postoperative cancer recurrence and metastases. Potential reasons include...
• Reduction in the immunosuppressant components of the stress response
• Avoidance of systemic opioid drugs which, in vitro at least, may promote cancer cell survival, and encourage neo-vascularization and tumour progression in angiogenesis-dependent tumours
• Reduced requirement for general anaesthetic agents that also depress cell mediated immunity
• A direct cytotoxic effect of local anaesthetic drugs

 Whilst great caution is needed in the interpretation of these data for tumour recurrence it is the author’s opinion that until a definitive answer is available, perhaps patients should be given the benefit of the doubt and that regional anaesthesia should be encouraged. As stated above Regional anaesthesia is central to enhanced recovery protocols.

Summary and conclusions: In summary, for major open surgery central neuraxial and paravertebral anaesthesia should continue to provide a central role in the development of ERAS pathways. The immediate benefit is on postoperative pain relief and mobilisation but the potential for additional benefits on postoperative pathophysiology and outcomes are real. For minimally invasive surgery and limb surgery, peripheral nerve blocks and wound infiltration are preferred to ensure early mobilisation and discharge.

It is of course self-evident that any beneficial effect of regional blockade will be lost in the presence of an ineffective block or one that is commenced after surgery. The teachers and protagonists of regional anaesthesia i.e. ESRA and its regional and national bodies must become more proactive in reducing the high failure rates associated with regional anaesthesia.

Key References:


On-line resources:

www.neuralblockadepainmanagement.com (This is the electronic version of the above text, but a subscription is required.


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ROLE OF ULTRASONOGRAPHY IN NEURAXIAL AND TRUNCAL TECHNIQUES

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Introduction: Ultrasound-guided regional anaesthetic techniques are now fully integrated into the everyday clinical practice of a large number of anaesthetists. Ultrasoundography is becoming an important adjunct in regional anaesthesia. Technological advances in the design of ultrasound equipment have allowed clear visualization of the majority of nerves, smaller and more portable ultrasound equipment has been developed. This has facilitated the use of ultrasound imaging in performing both peripheral and central nerve blocks.

By imaging nerves and other anatomical structures in real time with the aid of ultrasoundography, the dose of local anesthetic can be reduced and complications such as intravascular injection or intraneuronal administration can be avoided. Feasibility studies demonstrate real-time observation of injectate spread through epidural needles, epidural catheter insertion, and final catheter position. This technique can facilitate the performance of both peripheral or plexus blocks and neuraxial blocks in adults.

The body of literature examining the role of ultrasound in neuraxial anaesthesia in infants is smaller than that of other peripheral nerves block and surgical guidance.

The use of ultrasound-guided neuraxial techniques in adults is controversial; adults, in whom high-quality images of neuraxial structures are hard to achieve. The evidence consistently shows that ultrasoundography can identify the epidural space and accurately predict skin-to-epidural space distance. This has been demonstrated at the cervical and lumbar levels in adults and at the lumbar level in children.

In a study of orthopedic patients undergoing spinal anaesthesia, ultrasound examination accurately predicted the depth of the intrathecal space. Paravertebral blocks are much more promising for ultrasound-guided techniques because of better visualization with ultrasound.

Seventeen studies met inclusion criteria and can be generally categorized as ultrasound-assisted techniques or real-time ultrasound-guided techniques.

1. Ultrasound-assisted neuraxial techniques

Ultrasound-assisted neuraxial techniques involve preprocedural scanning to determine midline, targeted interspace, or depth from skin to the epidural or subarachnoid space before performing the procedure using traditional methods using a traditional loss-of-resistance technique.

2. Real-time ultrasound-guided neuraxial techniques:

Studies on real-time ultrasound-guided neuraxial anaesthetic techniques are fewer and more recent in nature. Most of these studies were performed on pediatric patients.

Neuraxial block in adults: EPIDURAL anesthesia and analgesia are particularly powerful instruments in obstetrics, acute pain management, and chronic pain therapy. Cesarean deliveries are primarily performed under neuraxial anesthesia. However, neuraxial anesthesia is not without risk. Failure to access the epidural space may be secondary to challenging anatomy or the experience and skill of the anaesthesiologist, and errors in the judgement of puncture level during neuraxial anesthesia can lead to significant complications.

Transient and permanent neurological deficits may occur as a result of direct trauma from a spinal or epidural needle to a low-lying spinal cord, or as a result of an inadvertent high needle placement. But fortunately iatrogenic neurological deficits after neuraxial block are rare. However, there has been an increase in the recognition of severe neurological trauma after spinal anesthesia, particularly at the level of the conus medullaris, due to ultrasound cannot identify the level at which this ends. Unfortunately ultrasonography is unlikely to exclude completely the risk of its damage.

Preprocedural neuraxial ultrasound can be used to guide obstetric epidural anesthesia, to evaluate epidural anatomy, to facilitate epidural puncture, by showing both the depth of the epidural space from the skin to expected and the inclination of the vertebral space, and to improve analgesia/anesthesia and patient satisfaction. But there are currently no comparative studies of the use of ultrasound-guided epidural injection or catheter placement in adults.

In children a comparison of ultrasound guidance to loss of resistance for epidural placement found that ultrasound reduced the number of bone contacts and facilitated faster placement of the catheter, but did not affect analgesia or complications.

Realtime ultrasound guidance resulted in a shorter procedure time and less instances of unintentional bony contact during the procedure.

Obstetric patients we found significantly fewer side effects among patients in the US group. There were reductions in mild and severe headaches and in back pain. Pareesthesia and blood in the catheter were found infrequently in the US-guided group. Patient satisfaction is increased as they are exposed to fewer needle punctures.

The quality of analgesia and analgesia is improved, likely by more accurate positioning of the epidural catheter. Vascular and neural structures can be easily identified and thereby avoided.

Using ultrasound imaging, a safe, validated, non-invasive, radiation-free, easy-to-learn technique. Although, there is no evidence that ultrasound eliminates complications; indeed, the limited existing data suggest that complication rates are similar to historical norms reported using traditional nerve localization tools.

Palpation, using anatomical landmarks, has repeatedly been shown to be inaccurate at identifying lumbar vertebrae and their corresponding interspaces, and ultrasound is an acceptable tool for the identification of spinal levels. It has been found a statistically significant difference between the clinical and ultrasound estimation of the intervertebral level. Possible causes for this, include inaccurate landmark palpation, in particular the palpation of the iliac crests, and puncture point level lower than the anaesthetist’s horizontal plane leading to tangential vision of the surface landmarks.

The level of the puncture mark documented by the anaesthesiologist was in agreement with the level estimated by postpartum ultrasound in 55% of the cases. It would mean that the ultrasound level was usually higher than the level described by palpation.

The evidence of puncture points up to three intervertebral levels higher than the expected highlights the potential risk, which is increased with higher target levels, and particularly if the target level chosen is above L3. Clinicians select interspaces that are one or two spaces higher than their intended selected space.

Apart from that, the anatomical landmark of Tuffier’s line can be more difficult to palpate in pregnant women because of pregnancy-related changes in soft tissues and increase in body mass index. Pregnant women have also a more pronounced lumbar lordosis. Therefore, anaesthesiists must be aware of this risk, particularly when performing spinal or combined spinal-epidural anaesthesia in obstetric patients.

Cesarean ultrasoundography is a useful adjunct to clinical examination of the lumbar spine before neuraxial anaesthesia, it may be more accurate than palpation of surface landmarks alone in correctly identifying lumbar inter-spaces. Although this results, ultrasoundography may improve the accuracy of interspinous space estimation, and can predict the depth of the epidural space with a high degree of accuracy; a study comparing ultrasoundography to a gold standard imaging technique is necessary to confirm the utility of ultrasoundography for inter-spinous space estimation in the obstetric setting.

Three unblinded randomized controlled trials (RCTs) comprising a total of 452 obstetric patients compared a group of patients undergoing pre-procedure ultrasound versus a control group receiving a standard landmark-based technique. All 3 studies report equal overall efficacy (100% epidural success rates in both groups) but a decrease in the number of attempts and a decrease in the number of interspaces attempted before reaching the epidural space.

Neuroaxial block in children: However, neuraxial structures are difficult to visualize in adults, partly because of interference from bones and ossified ligaments and partly because the depth to which ultrasound waves from portable equipment can penetrate is limited. As the vertebral column of infants is still in the process of ossifying and the depth to which neuraxial structures is less, it is reasonable to assume that conditions for visualizing neuraxial structures is a function of age.

Several investigations confirm the usefulness of ultrasound-guided regional anesthesia for visualizing the ligamentum flavum and particularly the dura mater in neonates, infants, and children up to 12 years of age; but to date there are little data linking this to actual clinical advantage in terms of improved block success or safety.

Preprocedural scanning offers a moderate prediction of depth from skin to expected loss-of-resistance. In addition, ultrasound guidance offers faster onset times and longer duration of block than more conventional techniques such as nerve stimulation in adults and in children. Compared with the traditional ‘loss of resistance’ technique, the number of puncture attempts and difficulties in advancing the catheter could be effectively reduced.
Caudal epidural anesthesia is the injection of medications into the epidural space via the sacral hiatus. It is useful when anesthesia of the lumbar and sacral dermatomes is needed. Although caudal analgesia is popular in paediatric anaesthetic practice too. That is useful when anesthesia for surgery or treatment of chronic pain is needed, it provide analgesia after a wide variety of surgical procedures in children.

Although caudal block via the sacral hiatus is a common regional technique in children, it is sometimes difficult to identify the sacral hiatus and locate the caudal space because of varying anatomical structures or local obesity. Both single injection and continuous infusion techniques are used. Single-shot caudal block through the sacral hiatus is the most common regional anaesthetic method for infraumbilical surgery in children.

Although clinical experience and many studies have confirmed the simplicity, reliability and safety of these techniques, significant complications can ensue. A high incidence of accidental intravascular injection has been described in children weighing < 10 kg. Successful caudal anesthesia relies on the proper placement of a needle in the epidural space. The sacrum is composed of five distinct semicartilaginous sacral vertebrae in neonates that gradually ossify and fuse to form the adult sacrum in the third decade of life, which allows for a relatively easy approach through the interspinous space in children. It has been reported that most complications following caudal injection resulted from misplacement of the needle into the superficial soft tissues, or intravascular, intra-osseous and intrathecal injections leading to technique failure, systemic toxicity or accidental spinal anaesthesia.

The most common method to identify the caudal epidural space is detecting the characteristic “give” or “pop” when the sacrococcygeal ligament is penetrated, commonly located at the level of S4-5 in infants and children. Through the sacral hiatus, the needle can easily reach the caudal canal because the sacral hiatus is a fusion defect of the S5 lamina and covered only with skin, subcutaneous fat tissue, and the sacrococcygeal ligament. In clinical practice, the “whoosh” test, nerve stimulation, and fluoroscopy are the three methods that can be used to identify the caudal space before the injection of medications.

Ultrasound guidance can increase the success rate of the needle insertion into the sacral canal. Nevertheless, ultrasound is used, the needle can deviate either left or right in the sacral canal. Ultrasound is superior to physical examination, but inferior to radiologic imaging, for correctly identifying spinal interspace levels. The advantages of ultrasound are that it is easy to use, is radiation-free, and can be used in virtually any clinical setting, it can be used as an alternative tool to guide needle placement. Most significantly, it can provide real-time and continuous needle-guiding images without radiation exposure, real-time ultrasound-guided epidural anesthesia is feasible in neonates and young children.

Even with experienced physicians, the failure rate of the placement of needles into the caudal epidural space can be up to 25%, it is sometimes difficult to identify the sacral hiatus because of anatomical variations. Ultrasound imaging may offer a solution to some of the difficulties experienced in identifying the epidural space in small infants. The S2-3 approach can be applied as a useful fallback method to the conventional landmark approach in children, especially in those older than 36 months who present with difficult identification of sacral hiatus. However, the dural sac may finish below the S2-3 level in some children, thus requiring careful puncture with a loss-of-resistance technique after ultrasound examination whenever possible.

US imaging also can be made pediatric regional anesthesia easier and more secure. Epidural anesthesia may pose significant challenges in infants and children because of difficulties in identifying the epidural space. Important anatomical details relevant to neuraxial anesthesia can be visualized, even more ultrasound imaging could confirm the correct placement of both the local anaesthetic and the epidural catheter within the epidural space. Real-time ultrasound-guided neuraxial blocks have proven valuable in pediatric patients whose smaller body mass allows the use of high-resolution linear transducers to image neuraxial structures.

Paramedian longitudinal scans with linear probes are the most favorable method of imaging neuraxial anatomy at lumbar and thoracic cord levels in infants and children, with the best results in neonates up to 3 months of age. Ultrasonographic assessment suggests that the optimal angle of needle insertion during caudal epidural injection in children is about 20° to the skin.

With this angle, the chance of performing a successful caudal injection can be increased with minimal risk of intra-osseous insertion. This technique may be safer and more reliable than the conventional technique.
HISTOLOGICAL ANALYSIS FOLLOWING NERVE PUNCTURING WITH DIFFERENT NEEDLE TYPES AND INTRANEURAL INJECTION OF LOCAL ANAESTHETICS

T. Steinfeldt, Germany

Background and aims: Ultrasound guided regional anaesthesia suggest that direct needle-nerve contact or even intraneural needle placement may not necessarily result in adverse outcome.1-2 However, there is conflicting data whether the diameter of the needle, the needle tip configuration or the injection of local anaesthetics in the intraneural space may contribute to the occurrence of structural nerve damage.3-4 Accordingly, we applied histological studies in a pig model for regional anaesthesia to challenge several hypotheses.5-8, Study A. Nerve penetration with large needles causes a more distinctive nerve injury compared to small cannulas; Study B. Blunt needles cause less nerve trauma compared to short bevelled needles; Study C. Pencil Point needles are less traumatic compared to Tuohy cannulas; Study D. Needle nerve contact does not contribute to structural nerve damage; Study E. The injection of local anaesthetics within the nerve results in nerve injury. Primarily defined endpoints of the studies were the presence and magnitude of posttraumatic regional inflammation, the occurrence of intraneural haematoma and signs of myelin damage.

Methods: After local authorities approval we studied 30 pigs (Deutsche Landrassen) weighing 27-49 kg. The brachial plexus of the anaesthetized pigs were exposed bilaterally by blunt dissection. Up to eight nerves in each pig underwent either needle nerve perforation (A, large Pencil Point needle (19G) vs. small Pencil Point needle (24G); B, Pencil Point needle vs. short bevelled needle; C, Pencil Point (19G) needle vs. Tuohy needle (18G)); D. Nerve nerve contact (with 0.15N or without needle advancement (0.0N)) or E. intraneural injection (bupivacaine vs. ringer’s solution). After 48 h, the nerves were resected during anaesthesia. The specimens were processed for visual examination (haematoxylin eosin) and the detection of inflammatory cells (immunohistochemistry: CD68-positive monocytic cells), myelin damage (Kluver-Barrera staining) and intraneural haematoma. The grade of nerve injury was scored ranging from 0 (no signs of inflammation, no structural damage) to 4 (intraneural haematoma, myelin damage, distinctive signs of inflammation).

Results: Two-hundred-seventy-three peripheral nerves were examined. Following needle nerve perforation with large or small sized needles (Study A) a significantly lower score was applied in the small-diameter group [median (inter-quartile range) 2.0 (2.0-2.0)] compared with the large-diameter group [3.5 (3.0-4.0) P=0.01]. Myelin damage and intraneural haematoma occurred predominantly in the large-diameter group. According to Study B (Facette vs. Pencil Point), there was no significant difference between the Pencil Point needles [2.0 (2.0-2.0)] and the short bevelled-needle group [2.0 (2.0-2.0) P=0.23]. No myelin damage was observed. Signs of post-traumatic inflammation were equally distributed among both groups. In Study C (Tuohy vs. Pencil Point), we observed no significant difference between the Pencil-Point needle group [median (interquartile range) 3.0 (3.0-4.0)] and the Tuohy needle group [3.0 (3.0-4.0) P=0.97]. The occurrence of posttraumatic regional inflammation, myelin damage, and intraneural hematoma was similarly high in both groups. In Study D histology revealed a significant difference between forced and non-forced needle-nerve contact (3.0 [2.0-4.0] vs. 2.0 [1.0-2.0]; P=0.004). Myelin damage and intraneural hematoma occurred only after forced needle-nerve contact. Following to intraneural injection of local anaesthetics (Study E) statistical analysis showed significant nerve lesions in the interventional groups compared to the negative controls (P=0.022). According to the applied injury score, there was no significant difference between the bupivacaine group [1 (1-1)] and the Ringer’s group [1 (0-2); P=0.585].

Conclusions: With regard to our observations, structural nerve damage after intentional nerve puncturing is directly related to the diameter of the applied needle. Hence, particularly when a large canula diameter is required in clinical practise (i.e. catheter techniques) nerve penetration should be avoided due to the prevention of severe nerve injury. Additionally, we have shown that neither the Pencil Point nor the Facette or the Tuohy needle tip can be designated a less traumatic device when nerves get punctured by the needle. Hence, due to better visualization in ultrasound and a less painful needle placement Pencil Point needles should not be preferred to Facette and Tuohy needles. Furthermore, we have demonstrated that needle-nerve contact together with forced needle advancement in pigs may lead to severe structural nerve injury. In contrast, no structural impairment but notable signs of inflammation were detectable after needle-nerve contact without force exposure. Therefore, we conclude that even needle nerve contacts without penetration should be avoided during needle placement for peripheral blocks. Moreover, we have found that the magnitude of nerve injury following intraneural injection was not related to the applied type of substance. However, posttraumatic inflammation and structural damage of nerve tissue were considerable signs of nerve injury after intraneural injection. A volutrauma due to intraneural injection can be designated an important trigger for severe structural nerve damage.

References

The structure of the pia matter includes a cellular layer and the complications derived from such techniques in regional anesthesia. Insights in regional anesthesia related to electron microscopy: Electron microscopy allowed us to study meningeal membranes and peripheral nerves from samples of human cadavers. We observed the ultrastructural details of dura mater, the laminar portion of the arachnoid internally covering the dural sac, and its trabecular components; we also observed cellular organization of the subdural compartment as well as the pia mater. In relation to peripheral nerves, we obtained samples from a sciatic nerve belonging to the upper end of the subdural compartment as well as the pia mater. In relation to peripheral nerves, we observed details of myelinic and nonmyelinic axons and their respective epineurium, perineurium, and endoneurium; the blood-brain barrier and the intraneural adipose distribution have been also studied.

Traditional knowledge about the structure of the meningeal membranes was brought about by light microscopy. Recently, scanning electron microscopy (SEM) allowed us to obtain 3-dimensional views from samples up to 2 cm in size, giving in this way an overall image of the surface structural details. In simple terms, SEM acts as a highly magnified lens providing views from the sample's surface while avoiding image distortion as we focus on sites located at different depths within the surface; this facilitates our observations. Transmission electron microscopy (TEM) is needed to complement the information obtained by SEM.

The introduction of SEM and TEM in research studies has enabled anaesthetists to outline the ultrastructural anatomy of significant structures in anaesthesia. I will briefly point out some of our recent findings: Dural sac: The thickness dural sac is slightly variable, from the cervical to the lumbar region; although this may vary at the same vertebral level depending on whether the cuts are antero-posterior or lateral (1-2) (Figure 1A). Dura mater: Dura mater is comprised by approximately 90 concentric laminas. Each dural lamina has a thickness of 5 microns and it is made of thinner laminas containing mostly collagen fibers (4-7). These collagen fibers of the laminar subunits are oriented in different directions but always within the concentric plane of each dural lamina (Figure 1B). Fibers do not cross between dural smooth surfaces. Each collagen fiber exhibits a smooth surface and measures approximately 0.1 microns. Elastic fibers are also present in lesser proportion; these fibers measure 2 microns in diameter and have a rough surface (4-7). Fibers inside dural laminas are distributed at random in all different directions as opposed to the classical description that have them arranged longitudinally and parallel to the main axis of the vertebral column. Instead the fibers are placed in all directions inside each of the concentric dural laminas.

Mastocytes and macrophages were found in the thickness of dura mater.

Arachnoid lamina: Conventionally, the arachnoid lamina was described as a fine membrane in close contact but not adhering to the internal surface of the dura mater. Recent developments confirm the fact that there is no space between the dura mater and the arachnoid lamina (see subdural space).

The arachnoid lamina is a semi-permeable membrane and thus exerts a barrier effect. Its thickness is about 50-60 microns. In its inner surface there are arachnoid cells strongly bonded by specific membrane junctions with a thickness of about 10-15 microns (8) (Figure 1C). Collagen fibers are placed at the center of the arachnoid lamina giving strength to the structure and improving its mechanical resistance. Flat elongated neurothelial cells occupy the outer portion of the lamina. Tearing off the arachnoid lamina exposes the subdural space. Neurothelial cells can be found attached either to the internal surface of the dura mater or to the external surface of the arachnoid lamina.

Trabecular arachnoid layer: The arachnoid mater is composed of two layers called trabecular arachnoid and arachnoid lamina (see above). The trabecular arachnoid merges with the cellular plane of the pia mater. This trabecular component of the arachnoid mater emits projections to all the structures that cross the subarachnoid space, including blood vessels and nerve roots. The projections that cover nerve roots are called arachnoid sheaths (9-11). These sheaths contribute to keep constant the position of each nerve root within the dural sac, limiting excessive shifting during movement. These sheaths however offer very low mechanical resistance and therefore do not offer significant protection against trauma, in fact, they are the first elements to be damaged during dissection.

Characteristics of the arachnoid sheaths in the cauda equina are variable; some are lax while others are formed by superimposed planes of the same components with a more compact appearance. The thickness of an arachnoid sheath ranges from 10 - 60 microns (Figure 2). In some cases, one or more nerve roots are enveloped by a single arachnoid sheath and in others, the nerve root has no sheath at all (9-11).

The existence of arachnoid sheaths surrounding nerve roots within the dural sac and the fact that we have demonstrated that micro catheters can be inserted into them have led us to suggest new mechanisms by which cauda equina syndrome and transient neurological syndrome could be explained in some cases.

Pia mater: The structure of the pia mater includes a cellular layer and a subpial compartment. The cellular layer is made of flat overlapping pial cells with a smooth and bright appearance. Amorphous fundamental substance is found around pial cells (12-13).
The subpial compartment has large amounts of collagen fibers, amorphous fundamental substance, fibroblasts, and a small number of macrophages as well as blood vessels. The subpial compartment is enclosed between the pial cellular layer and a basal membrane in contact with neuroglial cells (12-13) (Figure 3A).

At the level of the medullary cone and nerve root, there are perforations or fenestrations over the entire surface of the cellular layer of pia mater. These fenestrations have circular, ovoid, or elliptic shapes (12-13) (Figure 3B).

It may be possible that the fenestrations found in the pia mater have something to do with the migration of some immature pial cells as part of an inflammatory response.

Subdural space: In contrast to classical descriptions, ultrastuctural studies fail to demonstrate a space between the dura mater and the arachnoid lamina (14-15) (Figure 4A). Instead of a “subdural space”, our research has shown the presence of a solid but delicate tissue composed of specialized neurothelial cells. These elongated, fusiform cells with branched extensions are fragile and scanty cohesive to each other (14-15) (Figure 4B).

When tearing occurs along the subdural compartment, small fissures converge into larger ones to form what we know as the “subdural space”. Intercellular junctions between neurothelial cells are most susceptible to tearing and cellular fragments may be seen next to torn neurothelial cells. Weak cohesive forces between neurothelial cells and lack of collagen fibers in between facilitate the widening of a minimal fissure producing the false impression of a subdural space. It has been shown that this is an artifact.

The study of the structure of the subdural compartment could help to better understand the origin of cranial and spinal subdural hematomas associated with CSF hypotension.

Subdural anesthetic blockade caused by inadvertent injection of local anesthetic partially or totally between the dura and arachnoid may be a complication of spinal or epidural anesthesia. This accumulation of fluid can lead to the formation of a space by dissection of weak intercellular junctions.
between neurothelial cells filling what we ordinarily called "subdural space". The extent of the subdural block is unpredictable as it depends on the volume of local anesthetic injected and the nature or the dissection (cephalic or circumferential).

Nerve root cuffs: Bilateral projections of the dural sac into nerve roots give origin to nerve root cuffs or dural sleeves (Figure 1A). They are formed by lateral extensions of the dura mater and the arachnoid lamina that surround the nerve roots as they exit the vertebral canal. Nerve root cuffs have internal cellular and external fibrillar components respectively (16-17). At pre-ganglionic level, cells have cytoplasmic prolongations encroaching upon neighboring cells and leaving very little extra-cellular space. Unions between cell membranes are of the type desmosome and tight junctions (Figure 5A).

At post-ganglionic level, the cellular component has cell concentric layers. Their unions are of the type desmosome.

At ganglionic level, the morphology of the cellular component shows transitional changes as compared with pre and post-ganglionic areas, although it resembles more those characteristics shown at post-ganglionic level. Ultrastructural aspects of the cellular component at pre, post, and ganglionic levels are similar. Specialized membrane unions among cells at pre, post, and ganglionic levels ensure the barrier effect, limiting the passage of substances from the epidural space to nerve axons.

The fibrillar component is placed in the outer portion of the root cuff and it is made up mostly by collagen fibers arranged in concentric laminas with scarce elastic fibers (16-17) (Figure 5B).

Large numbers of adipocytes separate dural laminas in groups of concentric layers. SEM shows the distribution of adipocytes, these cells extend from the dural sac to the dorsal root ganglia.

Peripheral Nerves and blood-nerve barrier: SEM allows researchers to observe details about nerve root epineurium, perineurium, endoneurium, as well as intraneural vessels and adipose tissue distribution within the neural fascicles (18-21).

By means of TEM and SEM, it is possible to examine the perineurium enclosing nerve fascicles and their capillary vessels (Figure 6A). The perineurium comprises about 8 to 15 concentric layers of cells interposed with...
The future of research in Anaesthesia appears promising as An early, worthy focus Antonio De Andre and technical performance rarely measures judgment, patient selection, clinical experience, and more importantly, they also provide graphic and visual evidence to newly developed theories in regard to regional anaesthesia. This is a unique opportunity for researches to keep up with progress and we should dedicate all our efforts to encourage young anaesthetists to cooperate in the excitement field of research, with the aim at improving not only the highest standards in clinical practice but also the undeniable rights of patients to obtain the best treatments available in our times. 

Conclusions: The future of research in Anaesthesia appears promising as new technology such as Electronic Microscopy is applied at present in the field of ultrastructural Anatomy. Recent studies offer the advantage of supporting previous knowledge that had been mainly acquired throughout clinical experience, and more importantly, they also provide graphic and visual evidence to newly developed theories in regard to regional anaesthesia. This is a unique opportunity for researches to keep up with progress and we should dedicate all our efforts to encourage young anaesthetists to cooperate in the excitement field of research, with the aim at improving not only the highest standards in clinical practice but also the undeniable rights of patients to obtain the best treatments available in our times.

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References:


58 EDUCATION IN REGIONAL ANESTHESIA: CASELOADS, SIMULATION, JOURNALS, AND POLITICS J. Neal UXI. I wish to thank the European Society of Regional Anaesthesia and Pain Therapy Board of Directors, Professor de Andres, and Professor Van de Velde for bestowing upon me the honor of delivering this year's Carl Koller lecture. When Professor de Andres notified me of this wonderful honor, I was completely surprised and extremely grateful for this gesture of confidence and friendship. I am delighted to not only personally accept the award, but also to include by proxy all of those individuals who have been part of the international team that has grown the journal Regional Anesthesia and Pain Medicine and that has worked to craft international guidelines for training in ultrasound-guided regional anesthesia. Without the unflagging support of countless members of ESRA, none of these accomplishments would have been possible.

I will submit a full version of my lecture remarks to Regional Anesthesia and Pain Medicine. In this abbreviated syllabus, I will only outline the major points that I will discuss during my lecture.

One of my great research interests and loves is education in regional anesthesia. Over the last quarter century, I have been blessed with colleagues at Virginia Mason, throughout the United States, and internationally who have shared this interest in how we best train residents and practicing anesthesiologists in the art and science of regional anesthesia. Research always takes unanticipated twists and turns. It has thus been fascinating to observe how our capacity to educate has changed, how politics has crept into education, and how many challenges persist to our task of teaching our profession on a day-to-day basis with the goal of enhancing the comfort and safety of our patients.

How Many Blocks Are Enough?

• An early, worthy focus
• But number of blocks performed may not equate to competence
• And technical performance rarely measures judgment, patient selection, pharmacologic decisions, or complication management

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Are Our Residents and Fellows Even Performing the Minimal Number of Blocks?
- Surveys of US residents (performed every decade) consistently show that significant numbers of residents do not meet minimum standards if measured by the number of blocks performed
- Even regional anesthesia fellows may not receive a well-rounded exposure to a variety of techniques in a variety of patient settings
- But those interested in regional anesthesia as residents and fellows successfully incorporate these skills into their practice

The Creation of Regional Anesthesia Fellowship Guidelines
- Implications of a “non-accredited” fellowship
- What are the minimum requirements for faculty, facilities, number and variety of blocks, and research
- Integration of acute pain medicine

Preparing For Extremely Rare Events
- How do you teach management of severe local anesthetic systemic toxicity
- Do we embrace (or resist) checklists and standardized protocols
- The power of simulation

Teaching Residents and “Adults” a New Technique: The ASRA/ESRA Ultrasound-Guided Regional Anesthesia Curriculum
- First international effort
- Resident needs vs. practicing physician needs
- Local/country norms vs. common expectations
- What are the essential attributes of an anesthesiologist who is adept at performing UGRA

Do the ASRA/ESRA Guidelines Work?
- Testing the concept at Virginia Mason
- Do residents learn differently than their teachers
- Are there common mistakes that all learners make

The Role of Journals and Peer Review
- The international scientific forum
- What is good science vs. good opinion
- How are guidelines and practice advisories interpreted on the international stage
- The responsibility of journals to protect patients—does it supersede one’s own IRB or regulatory agency?

The Politics of Regional Anesthesia Education
- Europeans seem to embrace diplomas and certification
- Americans are mixed
- “High level certification” vs. “Holiday Inn Express certification”
- Will certification limit our practice and if so, is this in the best interest of our patients

SELECTION OF LOCAL ANESTHETIC AND ADJUVANTS - ESRA
A. Borgeat Switzerland
Commonly used adjuvants include adrenaline, clonidine, ketamine and neostigmine. Adrenaline not only acts as a vasoconstrictor, it may also produce analgesia through an alpha2-adrenergic mechanisms. Adrenaline may facilitate the uptake of the local anesthetic into nerves. Several recent studies have shown a synergism of clonidine with local anesthetics in various types of blocks, as well as with spinal opioids. Bradycardia and hypotension may be associated with the use of clonidine. Neostigmine may cause antinociception both in the spinal cord and in peripheral nerves. Neostigmine has been found to potentiate the effect of spinal opioids, but gastrointestinal side effects are frequent.

Adrenaline and opioids may be regarded as the best investigated and most important adjuvants in regional anesthesia. Other drugs, such as clonidine and neostigmine, may prolong analgesia in various regional anesthetic techniques, but possible side effects may limit their clinical application.

PATIENT SELECTION GUIDELINES AND DECISIONS—ASRA
J. Neal USA
This topic explores the guidelines that United States (ASRA) anesthesiologists consider when deciding which patients can undergo ambulatory surgery. My remarks are framed by two immutable facts: First, the United States does not yet work under a single payer / national health care model, thus insurance companies are the primary drivers of economic decisions of this nature. Second, the United States remains a very litigious country, so certain decisions regarding non-hospital-based patient care are influenced by medicolegal considerations.

What Are the Primary Drivers of Who is Treated as an Ambulatory Patient?
1. Insurance Company
2. Insurance Company
3. Insurance Company

What Drives the Actual Medical Decision?
Here I will focus my remarks on ambulatory patients who undergo a regional anesthetic/analgesic technique. Although our decisions are as evidence-based as possible, there is a paucity of studies specifically related to patient selection. Patient safety is a primary concern and influences many of these decisions.

1. Single-injection technique vs. continuous ambulatory perineural catheter techniques
   1. Low vs. moderate-to-severely painful procedures (few good data)
   2. Expected duration of significant pain
   3. Infrastructure to support perineural catheters
   4. Cost considerations
   5. Surgeon preference (not always science-based)

2. Obstructive sleep apnea
   1. Existing diagnosis vs. high clinical suspicion
   2. Significant opioid use pre-procedure
   3. OSA protocols prior to discharge decision

3. Quality of patient support
   1. Intelligence
   2. Family
   3. Language issues
   4. Distance from hospital

AMBULATORY ANESTHESIA PRACTICE: PATIENT SELECTION GUIDELINES AND DECISIONS
J. Raeder Norway
With modern techniques, anesthesia is not limiting the decision of carry on with a procedure as ambulatory. Still; planned loco-regional anesthesia may be of benefit in terms of less expected pain and nausea, as well as being readily cleared. However, prolonged bed rest after centro-axial block, urinary retention, post-spinal headache or prolonged motor block may jeopardize an otherwise planned ambulatory setup.
Inpatient status is based on limitations in either the patient's general health, level of daily function, psychosocial status or the type of surgical procedure planned. Ambulatory surgery should be planned if the particular patient for the particular surgical procedure may be expected to cope with the same day transport to home or hotel, and a safe and feasible stay with an adult escort there until next day. In modern surgical practice the in-patient or outpatient issue should be turned around from the routine of being in-patient care to routine being ambulatory care:

Two important questions may be useful to remember in the decision making:

1) Is there any reason for this patient to stay in hospital overnight?
2) What is the “worst case scenario” with this patient for this procedure if the patient is discharged on day of surgery?

It is not acceptable to take any risk on patient safety when deciding for an ambulatory setup, as the mortality associated with such approach in benchmarking studies is zero. Further, the patient should be willing to accept and cooperate on the ambulatory concept.

It may be very useful to have the ambulatory surgery “discharge to home hotel criteria” in mind during this decision making. If one expects that all criteria may be fulfilled, the patient should be planned as an ambulatory case:

- Patients should be within reach of professional, adequate health care as and when needed.
- Patients should be able to dress, mobilize and sit in a car
- Patients should have stable health situation, stable circulation, respiration and oxygenation
- Patients should be able to drink, take tablets and void
- Patients should have no nausea and minor or no pain
- Patients should be able to dress, mobilize and sit in a car
- Patients should have a responsible escort home (could be the taxi driver) and an escort at home until next day
- Patients should be within reach of professional, adequate health care assistance within safe time limits, depending upon the “worst case scenario” (pain? infection? bleeding?) for the particular case

In order to optimize the decision of ambulatory care as well as the anesthesiological planning and handling, it is very important to have optimal information on planned surgery, patient general health, drug consumption, allergies and daily level of function in front of anesthesia and surgery.

Patient and cases not suited for ambulatory care:

Procedures not suited:

Procedures with a need of specialized pre-operative hospital treatment may not be suited, similarly procedures with a need of surveillance or specialized treatment for more than the rest of the day. This will be the case with most emergency cases and other conditions when patients general health is unstable or severely unsettled. Most major procedures with laparotomy, thoracotomy or craniotomy will be inpatients; also procedures with major bloodloss, postoperative need of iv fluid therapy, strong pain expected or need of specialized care of wounds or drains. Patients with procedures who will not be expected to mobilize or take tablets and fluids before the night should also be in-patients.

Patients not suited:

Again, having the discharge criteria (see above) in mind may be useful in decision making.

ASA class I or II patients will normally be eligible for ambulatory care without further investigations or tests. It should be remembered that an otherwise healthy elderly patient or obese patient, basically are ASA class II. For ASA class III and IV patients an individual decision should be made of the surgeon and anesthesiologist together. Many of these patients live a stable life outside healthcare institutions and may have their surgery in an ambulatory setting, provided the health condition is stable and the planned surgery anesthesia is not expected to represent a major extra health challenge.

Special care should be given to patients with high risk of respiratory problems, either due to general anesthesia, opioid treatment or surgery within the thorax or abdomen. Such risk patients include newborns who are prematurely delivered, patients with severely compromised ventilatory function and patients with severe sleep apnoea syndrome. These should have a low treshold for inpatient observation, but individual evaluation of each case should be done.

Literature:


62 SELECTION OF LOCAL ANESTHETIC AND ADJUVANTS - ASRA
G. Weinberg USA.

The use of non-local anesthetic adjuvants in regional anesthesia dates to more than a century ago. Current adjuvants include clonidine, buprenorphine, dexmedetomidine, midazolam, neostigmine and opiates. The goals of adding such agents have changed little over time: improved analgesia and/or duration of block. However, with recently increased awareness of the potential for direct neurotoxicity of local anesthetics, a newer purpose is considered: is it possible that using a particular adjuvant could also reduce the risk of neurotoxicity? This question could occur either by improving blockade and thereby allowing reduction of the amount of local anesthetic or by improving block duration so that single injection could be used as an alternative to a catheter technique where prolonged perineural exposure creates theoretical risk. In this brief presentation, the choice of local anesthetic will be discussed and various adjuvants compared with respect to efficacy and potential toxicity.

63 PERIPHERAL NERVE BLOCK PROPOSALS FOR OUTPATIENT KNEE ARTHROSCOPY: A HISTORICAL REVIEW LEADING TO MULTIPLE BLOCK COMBINATIONS

Historical review

Introduction: Anaesthesia for arthroscopic surgery of the knee has undergone major changes in the past twenty years. What began as variations of general or neuraxial anaesthesia has evolved into more and more elaborate combinations of peripheral nerve blocks, which should provide surgical anaesthesia and adequate tourniquet tolerability with minimal amounts of adjuvant analgesics. Similarly, a long list of studies have investigated requirements to alleviate postoperative pain following these procedures. The most common procedures include simple arthroscopy with minor soft tissue surgery and more extensive arthroscopy including cruciate ligament reconstruction.

We were particularly interested in the developmental traits in the provision of surgical anaesthesia. We performed a Medline search with search criteria including “block” or “regional”, “cruciate”, “knee arthroscopy”, and “intraoperative” or “surgical” or “anaesthesia”. These searches yielded 557 abstracts, all of which were reviewed. From this primary list, 107 studies were chosen for closer review, and by examination of the original manuscripts, a short-list of 51 studies formed the basis of our review; 29 other studies were interesting but were largely unavailable for review or had incomplete data regarding block type, patient or surgery or number of patients included. A similar search, although less comprehensive, using “local anaesthesia” in combination with “knee arthroscopy”, completed the review. An overview of our search results is presented in Table 1.

Historical background: In broad terms, regional anaesthesia was introduced as a method of providing surgical anaesthesia for arthroscopic knee surgery in 1990. First studies included the use of infiltration analgesia of portal holes (the so-called “knee block”) and intraarticular LA injection, femoral nerve or lumbar plexus block. These methods were perfectly adequate to provide anaesthesia for simple knee arthroscopy and were achieved by blind or nerve stimulation techniques. More elaborate combinations including a sciatic nerve block were published a few years later, and to this day, the femoral/sciatic combination remains the most commonly investigated method of PNB for knee arthroscopy. Exactly the same methods were later applied to extensive arthroscopic surgery such as cruciate ligament reconstruction. It is important to recognize that this historical development first and foremost was instigated by a logistical need, to apply and resolve anaesthesia in a cheap and fast way without long recovery times in the PACU. Since many such surgeries were performed in private clinics, street readiness was an important issue that popularized the “knee block.” However, infiltration analgesia limited the number of surgical interventions that were possible, partly because movement of the knee joint into valgus position was still painful. The advent of femoral/sciatic blocks was patient-friendly but logistically time-consuming because the blocks had to be placed with the patient first on his back, then in the lateral decubitus position (and then back again for surgery). Furthermore, the motor abilities of the patients were severely compromised during the recovery period, i.e. not able to drive a car or work.
limited by these blocks, which interfered with hospital discharge, and significant failure rates of nerve-stimulation blocks were also issues that caused logistical problems. In 2002, the use of intravenous regional anaesthesia ("Bier block") was introduced for knee arthroscopy. It performed well, but the risk of LA systemic toxicity was still looming. Considerations on patient safety led to more extensive use of peripheral nerve blocks, with less LA volumes and with ultrasound as the primary guidance method. These combinations were first published in 2004 for knee arthroscopy, and 2009 for cruciate ligament reconstruction, respectively (see references below). While a large-volume femoral nerve block was sometimes referred to as a "3-in-1 block" by its occasional block of the NCFL and the obturator nerves, specifically targeted blocks of these small nerves were the backbone of these modern combination blocks. In addition, a trend towards blocks with less inherent motor paralysis was developing, and a focus on nerve damage and increased success rate necessitated the use of ultrasound technology for direct visualization of needle-to-nerve proximity and LA spread vis-à-vis the nerve structure. In a peculiar twist of fate, these elaborate and specific nerve block combinations require specialized knowledge and experience on PNB placement, which per-operative events were the worst - nausea/vomiting, gagging on the endotracheal tube, and pain were by far the most undesirable outcomes (Macario, Jenkins). Female patients are significantly more often concerned about hearing intraoperative sounds and seeing surgery itself, and they seem less inclined to undergo neuraxial anaesthesia than males because of anxiety about neurological risk (Dove). In conclusion, it seems worthwhile to add the modern anaesthetic technique of ultrasound-guided multiple blocks to the spectrum of techniques already available for orthopaedic day surgery.

References for Multiple Nerve Blocks


References for Anaesthetic Preferences


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Background and aims: Outpatient knee arthroscopy (KA) and anterior cruciate ligament reconstruction (ACL-RC) require an anaesthetic regimen that addresses both surgical and tourniquet-related pain. The objective of these new block proposals was to describe the applicability of a well defined combination of ultrasound-guided (USG) blocks of the femoral, lateral femoral cutaneous and obturator nerves (both branches) for KA (quadruple block) and including the sciatic nerve for ACL-RC (quintuple block). The current trend of ever increasing numbers of out-patient surgery has resulted in a focused interest for ultrasound-guided (USG) peripheral nerve blocks (PNBs), since peripheral regional anaesthesia in some clinical settings may help reduce the length of stay (LOS) in the post anaesthesia care unit (PACU), reduce the need for opioids, facilitate faster return of physical activities and make earlier hospital discharge possible (Hadzic 2005). However, in even minor to moderate knee surgery an inflated tourniquet is often used to secure a bloodless surgical field. The use of an inflated tourniquet will eventually cause ischemic pain, a phenomenon that correlates with patient age and duration of surgery, with an average time of tolerance at about half an hour in healthy young volunteers (Kam 2001, Konrad 2005). Unfortunately, some regimens of PNBs do not address the issue of tourniquet pain, which will result in suboptimal conditions for patients and physicians, including an occasional need for conversion to general anaesthesia. We have recently employed two multiple nerve block techniques, where either four or five peripheral nerves of the lower limb are blocked in a systematic sequence. For outpatient KA (arthroscopic abrasion arthroplasty, meniscus repair, partial meniscectomies or arthroscopic reinsertion and microfracture surgery) four nerves are blocked (i.e. quadruple block). With outpatient ACL-RC five nerves are blocked (i.e. quintuple block), since there is a need of hamstring tendon harvest for ACL-RC, and the procedures are longer lasting. We have chosen this systematic multiple nerve block sequence based on a detailed anatomical knowledge of the innervation of the knee and thigh (Table 2).

Our goal was to provide surgical analgesia for ambulatory knee surgery, and at the same time provide analgesia for a tourniquet placed at the proximal end of the thigh. The aim of this study was to investigate the intraoperative characteristics of these two new USG PNB combinations and to assess physical abilities (Barthel/100 Index) and perceived ill health (Short Form-8 Index) during the first 24 postoperative hours.

Methods: The study was a prospectively designed cohort study in which 40 consecutive adult surgical patients (ASA I-II) undergoing elective KA (n = 30) or ACL-RC (n = 10) were included. The patients were given the written and informed choice several weeks prior to surgery to choose between general anaesthesia, spinal anaesthesia or peripheral nerve blocks for the planned arthroscopic knee surgery. On a written form the patients could indicate which anaesthetic technique they preferred, and they then signed the form and supplied their contact details. They could also ask to be contacted by an anaesthetist if they were in doubt. On the day of surgery they were once again contacted by the anaesthetist in charge to ensure the anaesthetic plan would be followed or whether changes were needed. Thus, the patients were not randomized to receive one of the three previously mentioned anaesthetic techniques, and there was no comparison between the outcomes of the various techniques. Further, we did not intend to compare outcome between the KA and ACL-RC groups; i.e. the study was a feasibility study on 40 consecutive patients undergoing various forms of arthroscopic knee surgery, and in our unit there is a relationship of approximately three KA to one ACL-RC.

Perioperative variables: Prior to the block procedure, data on patient demographics and ASA physical status were recorded. During the block procedure data regarding the amount of local anaesthetic injected for each nerve, duration of each block procedure, and patient tolerance were recorded. Following the block performance we registered the degree of sensory onset after 10 and 20 minutes (pin prick test and thermal distinction test) to assess onset of surgical anaesthesia. At the same time we also recorded sensory characteristics of the blocks, and the motor block outcome (both Bromage scale and a specific femoral nerve block test) (Bromage 1965). During the surgical procedure we registered intraoperative pain using a Numerical Rating Scale (NRS 0-10). Postoperatively we registered surgeon satisfaction with the anaesthetic procedure, pain score (NRS 0-10) either at the time of PACU bypass or at arrival in and departure from the PACU, the use of supplemental opioids, LOS in the PACU and PACU bypass. Criteria to be met in order to bypass the PACU were similar to those used when discharging from the PACU and being transferred to the wards; criteria were standardized and modified according to Aldrete and the Danish Society of Anaesthesia and Intensive Care.

Follow-up interview: A follow-up telephone interview was performed for all patients after hospital discharge. The patients were asked a set of standardized questions with special reference to complications related to the block procedure, adverse effects (if any had occurred), the duration of sensory and motor block (hours), maximal pain when the sensory block had completely subsided (NRS 0-10), and patient views on the entire block experience. In addition, at the telephone interviews the patients were rated by standardized score charts regarding their physical abilities by the Modified Barthel Index/100 (MBI 100) and their perceived ill health by the Short Form 8 Index (SF8) in the first 24 hours following the surgical procedure (Shah 1989, Fanelli 1998).

Femoral nerve block test: The patient remained in the supine position following the block procedure and was asked to flex the hip and bend the knee. Subsequently, the patient was asked to extend the knee. A positive test required that the patient was either (i) unable to flex the hip, or (ii) able to flex the hip (and bend the knee), but unable to extend the knees.

Block Technique: All block procedures were performed prior to surgery in a dedicated block area to ensure surgical anaesthesia was present in good time before surgical procedures could commence. Routine non-invasive blood pressure, ECG and pulse oximetry monitors were applied, and intravenous access was established. According to protocol, all patients were offered 1-2 mg of midazolam intravenously before placement of the nerve block. A time-out procedure was performed according to hospital policy to ensure a correct block procedure. The skin was disinfected with 2%
chlorhexidine in 70% isopropyl alcohol. The ultrasound equipment used was the SonoSite M-turbo or S-ICU series (Bothell, Washington, USA). A linear high-frequency probe (6-13 MHz) covered with sterile sheath (Flexasoft) was used to scan the femoral nerve (FN), the obturator nerve, anterior branch (ONA), obturator nerve, posterior branch (ONP) and the lateral femoral cutaneous nerve (LFCN) just caudal to the inguinal ligament where the nerves enter the thigh (Figures/Pictures 1A-1C in the below). A curved array (2-6 MHz) covered with a sterile sheath was used to scan and guide the block of the sciatic nerve (SN) at the antero-medial thigh level (Figure/Picture 1D in the below).

In all cases a short-axis view of the neurovascular, muscular and interfascial structures in question was obtained. A 22-gauge, 80 mm insulated needle (Stimuplex) was advanced in-plane with the ultrasound beam. According to protocol, the physicians performing the quadruple block first needle (Stimuplex) was advanced in-plane with the ultrasound beam. According to protocol, the physicians performing the quadruple block first entered the thigh (Figures/Pictures 1A-1C in the below). A curved array (2-6 MHz) covered with a sterile sheath was used to scan and guide the block of the sciatic nerve (SN) at the antero-medial thigh level (Figure/Picture 1D in the below).

A total of 40 consecutive surgical ASA I-II patients were included in the study. Immediate intraoperative data were present for all 40 patients whereas data regarding postoperative duration of the blocks and MBI 100/SF8 were available for 36 and 35 patients, respectively. 30 out of a total of 40 patients had KA performed in quadruple block, and the remaining 10 patients in the consecutive group had ACL-RC performed in quintuple block. All patients had successful nerve blocks (no supplemental opioids were needed intraoperatively), positive motor tests, uneventful surgeries, and minimal pain immediately after surgery (Table 3 - Intraop. and postop. characteristics).

Complete data sets available in 40 patients. Medians with range in brackets where relevant. Maximal pain (NRS 0-10). Satisfaction ratings assessed on a 4-point Likert scale (1=excellent, 4=unacceptable). Motor function according to Bromage as assessed at 20 minutes after nerve block, 1=full motor ability, 4=complete paralysis. Femoral nerve motor function as assessed at 20 minutes post-block (positive test = unable to extend the knee following hip flexion). PACU, post-anesthesia care unit; N/A, not applicable.

Table 3. Intra- and postoperative characteristics of the quadruple and quintuple nerve blocks for KA and ACL-RC.

<table>
<thead>
<tr>
<th>Outcome measures</th>
<th>Quadruple</th>
<th>Quintuple</th>
<th>Quadruple</th>
<th>Quintuple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximal pain (NRS 0-10)</td>
<td>1 (0-3)</td>
<td>1 (0-3)</td>
<td>0 (0-6)</td>
<td>0 (0-6)</td>
</tr>
<tr>
<td>Sedative adjuvants</td>
<td>2/3/6 (95%)</td>
<td>9/12/10 (96%)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Surgical satisfaction</td>
<td>1.0 (1-2)</td>
<td>1.1 (1-2)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Patien satisfaction</td>
<td>1.0 (1-2)</td>
<td>1.1 (1-2)</td>
<td>1.0 (1-2)</td>
<td>1.0 (1-2)</td>
</tr>
<tr>
<td>Length of stay (minutes)</td>
<td>N/A</td>
<td>N/A</td>
<td>0 (0-33)</td>
<td>39 (30-100)</td>
</tr>
<tr>
<td>Motor function (Bromage 1-4)</td>
<td>N/A</td>
<td>N/A</td>
<td>2 (1-3)</td>
<td>4.0 (4-5)</td>
</tr>
<tr>
<td>Femoral nerve block test</td>
<td>N/A</td>
<td>N/A</td>
<td>30/70 (100%)</td>
<td>10/30 (100%)</td>
</tr>
</tbody>
</table>

One patient of the thirty in the KA group experienced severe pain (NRS = 8) when the cuff was deflated at the end of surgery, but the pain subsided completely after two minutes (Table 3- Intraop. and postop. characteristics). One patient of the ten in the ACL-RC group experienced moderate pain (NRS = 4) at the end of surgery while the cuff had been inflated for close to two hours (Table 3 - Intraop. and postop. characteristics). The pain disappeared completely when the cuff was finally deflated. The majority of patients received slight sedative adjuvants (i.v. midazolam 1-2 mg) but remained awake and responsive throughout the surgical procedure. Both surgeons and patients were satisfied with the quality of intraoperative anaesthesia (Table 3 - Intraop and postop. characteristics). The median total amount of local anaesthetic used for quadruple block was 40 ml (range, 32-45 ml) and for quintuple block 60 ml (range, 20-65 ml). The median block procedure duration was 10 minutes (range, 6-20 minutes) and 16 minutes (range, 10-24 minutes) for the quadruple and quintuple block, respectively. All patients had complete surgical anaesthesia within 20 minutes of block placement (assessed with pin prick test and thermal distinction test). Surgical procedures lasted 33.21 minutes for KA and 105.29 minutes for ACL-RC, and patients were affected with an inflated tourniquet for 32.58 minutes for KA and 99.71 minutes for ACL-RC. After completion of the surgical procedure a total of 70% of patients bypassed the PACU. The duration of sensory and motor block associated with the quadruple and quintuple blocks, respectively, are shown in Table 4 - Motor and sensory characteristics.

Patient satisfaction with the block procedure was 92% and 88% for the quadruple and quintuple blocks, respectively (Table 4 - Motor and sensory characteristics). The physical ability to perform activities of daily living was retained to a very high overall degree in both groups (Table 5 - Ability to perform activities of daily living). Thus, the residual motor block for the KA and ACL-RC groups only moderately reduced the patient's abilities of daily living (mean BMI 100 reductions by 4% and 10%, respectively) (Table 5 - Ability to perform activities of daily living).

Pain scores following regression of the nerve blocks were a median of 5 (range, 1-10) and 7 (range, 7-9) for the KA and ACL-RC groups, respectively (Table 4 - Motor and sensory characteristics). High pain scores following regression of the blocks were reflected in the patients' perceived ill health in the first 24 hours since complaints of postoperative pain were the most

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**Figure 1. Ultrasound-guided (USG) peripheral nerve blocks (PNBs) for KA and ACL-RC.**
The major finding of the current feasibility study of two new USG regional anaesthesia regimens for outpatient awake knee surgery was that adequate intraoperative anaesthesia could be accomplished in all patients, both with regards to the surgical intervention and analgesia for tourniquet pain. Furthermore, these multiple injection blocks could be performed within an acceptable time frame and were not associated with any adverse effects. Patient and surgeon satisfaction with the techniques were high, and a substantial number of patients were able to bypass the PACU.

The objective of the current study was to show the feasibility of our quadruple and quintuple block combinations in a typical daily clinical setting. In this particular setting dealing with outpatient arthroscopic knee surgery, we wish to promote a simple principle of blocking the nerves as peripherally as possible and only as centrally as necessary. We believe the current study to be the first to focus on USG PNB techniques that cover both the area associated with a proximal thigh tourniquet as well as the knee joint.

Our results show that the quadruple nerve block technique is clinically feasible for knee arthroscopy and if combined with an anterior sciatic nerve block, i.e. the quintuple block technique, it can also be successfully used for more extensive outpatient knee surgery, e.g. arthroscopically assisted cruciate ligament repair. Not only will it allow the procedures to be carried out as truly awake procedures but, even more relevant to the logistics of a busy outpatient knee block, i.e. the quintuple block technique, it can also be successfully used for more extensive outpatient knee surgery, e.g. arthroscopically assisted cruciate ligament repair. Not only will it allow the procedures to be carried out as truly awake procedures but, even more relevant to the logistics of a busy outpatient knee block, it will also allow a majority (70 %) of the patients to bypass the PACU and be street ready in a short time frame. It can be argued that the multiple block procedures are overall time consuming. However, the time necessary to perform the USG blocks prior to surgery was only 6-24 minutes. In addition, all patients had achieved surgical anaesthesia 20 minutes after the block procedures had been finalized. Furthermore, if the logistics are optimized, including the availability of a dedicated block room, it is our experience that the turnover times can be kept to an absolute minimum. A particular strength of the present feasibility study is that it also includes a structured follow-up interview with regards to physical abilities and perceived ill health, as assessed by the well-established MBI 100 and the SF8 Index methods (Shah 1989, Fanelli 1998). It is our belief that such follow-up investigations in the future will provide us with new knowledge and a better understanding of the patients’ health following accelerated patient pathways. The findings of a reduction of less than 10 % in MBI 100 and approximately 30 % in the SF8 are reassuring and attest to the clinical validity of our USG PNB techniques in the context of outpatient knee surgery.

Multiple nerve block regimens or continuous perineural catheter infusions have an inherent risk of toxicity to excessive amounts of local anaesthetics. In the current study median total amount of local anaesthetic used for KA was 40 ml (range, 32-45 ml) and for ACL-RC 60 ml (range, 20-65). It has recently been shown that ultrasound can reduce the minimum effective local anaesthetic volume compared to other guidance techniques (McNaught 2011). However, the performing physician in our current study had to inject sufficient local anaesthetic to ensure that the solution encircled the nerves in the case of the FN, LFCN and SN, or spread sufficiently in the interfascial muscle layers in the case of the ONA and ONP. It is also worthwhile to notice that the total amount of local anaesthetics injected in this study were below maximum recommended doses (Rosenberg 2004, Kapitanyan 2010). However, we are well aware that maximum recommended doses of local anaesthetics are often not evidence based, and that every effort should be taken to minimize the total volume of injected local anaesthetics (Rosenberg 2004, McNaught 2011). Finally, in our block room facility we are well equipped with emergency medications (e.g. intralipid, atropine, epinephrine etc.) and the patients are fully monitored at all times prior, during and after surgery.

Limitations of the study: First, being a feasibility study and not a randomized controlled trial, it is for obvious reasons not possible to compare the benefits of the current techniques with that of other anaesthetic techniques. Second, despite preserving a reasonably stable activity of daily living, the pain reappearing on average 9 hours postoperatively most likely contributed to an unnecessary reduction of 30% of the perceived ill health index during the latter part of 24 hours observation period. Whether it may be worthwhile to insert perineural catheters for continuous blocks of an individual nerve (e.g. the saphenous nerve) in addition to the administration of quadruple and quintuple blocks is still not known but will be the focus of future studies. Third, due to difficulty in reaching some patients, follow-up interviews were conducted at slightly varying intervals, which we acknowledge may introduce some recall bias. However, we learned that most patients had a clear recall of events of the first postoperative day since pain breakthrough and perceived ill health issues were prominent after the blocks subsided.

In conclusion, our current study of the clinical utility of two new USG multiple PNB techniques for awake outpatient knee surgery found the

Table 4. Motor and sensory characteristics after quadruple and quintuple nerve blocks for KA and ACL-RC.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Quadruple</th>
<th>Quintuple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of motor block (h)</td>
<td>8 (3-23)</td>
<td>11 (8-16)</td>
</tr>
<tr>
<td>Duration of sensory block (h)</td>
<td>9 (3-48)</td>
<td>15 (4-24)</td>
</tr>
<tr>
<td>Pain after block subsided (NRS)</td>
<td>5 (1-11)</td>
<td>7 (5-9)</td>
</tr>
<tr>
<td>Acceptance of the block experience</td>
<td>27/28 (96%)</td>
<td>7/8 (88%)</td>
</tr>
<tr>
<td>• Completely satisfied</td>
<td>19/28 (60%)</td>
<td>5/8 (62%)</td>
</tr>
<tr>
<td>• Reasonably satisfied</td>
<td>3/28 (11%)</td>
<td>3/8 (38%)</td>
</tr>
<tr>
<td>• Unsatisfied</td>
<td>2/28 (7%)</td>
<td>0/8 (0%)</td>
</tr>
<tr>
<td>• Do not wish again</td>
<td>2/28 (7%)</td>
<td>1/8 (13%)</td>
</tr>
</tbody>
</table>

Sensory impressions following block

<table>
<thead>
<tr>
<th></th>
<th>15/28 (54%)</th>
<th>8/8 (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricking sensation</td>
<td>3/28 (11%)</td>
<td>3/8 (38%)</td>
</tr>
<tr>
<td>Feels numb, swollen or heavy</td>
<td>8/28 (29%)</td>
<td>3/8 (38%)</td>
</tr>
<tr>
<td>Feels hot or cold</td>
<td>2/28 (7%)</td>
<td>2/8 (25%)</td>
</tr>
</tbody>
</table>

Data obtained from telephone interviews postoperatively. Complete data sets available for 36 patients. N/A, not applicable.

Table 5. Ability to perform activities of daily living (by the Modified Barthel Index/100) in the first 24 hours after quadruple and quintuple nerve blocks for KA and ACL-RC.

<table>
<thead>
<tr>
<th>Activities of daily living</th>
<th>Quadruple</th>
<th>Quintuple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Barthel index/100</td>
<td>96% (60-100%)</td>
<td>90% (64-100%)</td>
</tr>
</tbody>
</table>

In the past 24 hours, I have been completely able to...

<table>
<thead>
<tr>
<th></th>
<th>Quadruple</th>
<th>Quintuple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take care of personal hygiene</td>
<td>26/27 (96%)</td>
<td>6/8 (75%)</td>
</tr>
<tr>
<td>Take a shower</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Eat</td>
<td>27/28 (100%)</td>
<td>8/8 (100%)</td>
</tr>
<tr>
<td>Go to the bathroom</td>
<td>23/27 (85%)</td>
<td>7/8 (88%)</td>
</tr>
<tr>
<td>Walk on stairs</td>
<td>19/27 (97%)</td>
<td>8/7 (89%)</td>
</tr>
<tr>
<td>Get dressed</td>
<td>21/27 (85%)</td>
<td>7/8 (88%)</td>
</tr>
<tr>
<td>Defecate</td>
<td>27/27 (100%)</td>
<td>8/8 (100%)</td>
</tr>
<tr>
<td>Micturate</td>
<td>27/27 (100%)</td>
<td>8/8 (100%)</td>
</tr>
<tr>
<td>Walk about</td>
<td>21/27 (78%)</td>
<td>5/8 (63%)</td>
</tr>
<tr>
<td>Move to and from chair or bed</td>
<td>23/27 (85%)</td>
<td>6/7 (85%)</td>
</tr>
</tbody>
</table>

Data obtained from telephone interviews postoperatively. Complete data sets available for 35 patients. Modified Barthel index/100, assessed on a 0-100% scale of physical ability. For specific physical abilities, numbers out of totals, with percentages in brackets. N/A, not applicable.

Table 6. Perceived ill health (modified from the Form-8 Index) in the first 24 hours after quadruple and quintuple nerve blocks for KA and ACL-RC.

<table>
<thead>
<tr>
<th>Health and emotional complaints</th>
<th>Quadruple</th>
<th>Quintuple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average complaint level (0-8 points)</td>
<td>72% (21-91%)</td>
<td>66% (24-91%)</td>
</tr>
</tbody>
</table>

In the past 24 hours, I have experienced that to some extent...

<table>
<thead>
<tr>
<th></th>
<th>Quadruple</th>
<th>Quintuple</th>
</tr>
</thead>
<tbody>
<tr>
<td>My physical health has limited my daily activities</td>
<td>12/27 (44%)</td>
<td>4/9 (50%)</td>
</tr>
<tr>
<td>It was difficult to do my work because of my health</td>
<td>11/27 (41%)</td>
<td>4/8 (50%)</td>
</tr>
<tr>
<td>Health or emotional issues have limited my social activities</td>
<td>5/8 (62%)</td>
<td>7/8 (88%)</td>
</tr>
<tr>
<td>I have been bothered by emotional problems</td>
<td>7/27 (26%)</td>
<td>3/8 (38%)</td>
</tr>
<tr>
<td>Emotional problems made it difficult to work or function socially</td>
<td>2/27 (7%)</td>
<td>2/8 (25%)</td>
</tr>
<tr>
<td>My general health has been poor</td>
<td>15/27 (56%)</td>
<td>5/8 (63%)</td>
</tr>
<tr>
<td>I have had much pain</td>
<td>7/27 (26%)</td>
<td>2/8 (25%)</td>
</tr>
<tr>
<td>I have had little energy</td>
<td>7/27 (26%)</td>
<td>2/8 (25%)</td>
</tr>
</tbody>
</table>

Data obtained from telephone interviews postoperatively. Complete data sets available for 35 patients. In the SF-8 Index, each health or emotional item is assessed on a 5 or 6 point scale (from no complaints to many complaints). Average complaint level (mean with range in brackets) is assessed from the sum of relative reductions in each health item. For the specific items, complaints are listed out of the totals, with percentages in brackets.

[Perceived ill health]
The Netherlands.

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3-5

whereas an ultrasound-guided interscalene

Furthermore, a significant volume-reduction of local anesthetic for

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Regional Anesthesia and Pain Medicine

9

The

10

7

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References:


10. McNaught A, Shastri U, Carmichael N, Awad IT, Columb M, Cheung J, Holtby RM, McCartney CJ. Ultrasound reduces the minimum effective volume dependent. whereas an ultrasound-guided interscalene brachial plexus block with an even larger volume of 10 mL ropivacaine 0.75% at root C7 resulted in a lower incidence of hemidiaphragmatic paresis of 13%.

Furthermore, a significant volume-reduction of local anesthetic for interscalene brachial plexus block is possible with an estimated ED95 of 3.6 mL (3.3-6.2 mL) at root C7 and an estimated ED95 of 0.9 mL (0.3-2.8 mL) between roots C5 and C6. In the dose-finding study for interscalene brachial plexus block at the level of root C7 none of the patients developed hemi-diaphragmatic paresis up to and including 2 hrs after surgery. In all patients, the phrenic nerve could be visualized on the anterior surface of the anterior scalene muscle behind its fascia. No spread of local anesthetic was ultrasonographically observed toward the phrenic nerve or anterior to the anterior muscle in any patient up to and including 2 hrs after surgery. However, 22 hrs after start of a continuous infusion of ropivacaine 0.2% a mean decrease in hemidiaphragmatic excursion of 55% was observed.

Supracervical brachial plexus block Since this brachial plexus block is performed at a more caudal level than the interscalene brachial plexus block, spread of local anesthetic to root C4 seems to be a less likely explanation compared with direct spread of local anesthetic toward the phrenic nerve. By using ultrasound, local anesthetic was injected in a controlled manner using a multi-injection technique to avoid rostral and medial spread of local anesthetic to the subclavian artery.

Therefore spread of local anesthetic towards the phrenic nerve, which enters the thorax between the scalenus anterior muscle and subclavian vein, was avoided. Using this approach, hemidiaphragmatic paresis could be avoided in all patients (95% CI, 0.00 - 0.14).

Conclusions: Preliminary results show that hemidiaphragmatic paresis in both ultrasound-guided interscalene and supraclavicular brachial plexus block can be avoided.

References:


HOW MANY SCIATIC APPROACHES? ULTRASOUND HAS THE ANSWER

V. Tagariello


65

References:

66 CANCER SURGERY AND IMPLICATIONS OF ANAESTHESIA
A. Borgeat Switzerland.
Recently published retrospective analysis of patients undergoing cancer surgery showed a possible benefit of perioperative continuous epidural infusions of local anesthetics. Long-term survival after colon cancer surgery was different. Cancer recurrence after radical prostatectomy for prostate cancer were both significantly improved by epidural anesthesia, although there are other studies in which no benefit. The potential mechanisms by which local anesthetics might prove to be beneficial in this context are not yet known, but a common pathway with inflammation may be one of them.

References:

67 ANTICANCER CHEMOTHERAPY AND IT’S ANAESTHETIC IMPLICATIONS
J. Bovill The Netherlands.
Chemotherapeutic drugs are used for the treatment of cancer. A growing number of patients undergo surgical procedures with general anesthesia soon after receiving chemotherapy, and occasionally such treatment is also given during surgery. Chemoprophylaxis, when anticancer compounds are infused into organs (e.g., liver), is increasingly being used and these procedures usually require general anesthesia. It is therefore important that anaesthetists are aware of the pharmacology of these agents, and how they may impact on the conduct of anesthesia. This lecture will direct attention to the various classes of chemotherapeutic agents and discuss the particular aspects of their pharmacology that are relevant to anaesthetists.

Treatment with these drugs is intended to selectively destroy malignant cells by their DNA synthesis, replication or transcription, inhibiting division of the cancer cell. Because they act on actively dividing cells, toxicity is common, especially in rapidly dividing normal tissues such as the bone marrow, gastrointestinal epithelium, hair follicle cells and the reproductive system. Bone marrow suppression results in decreased leukocyte production and an increased risk of infection. Gastrointestinal toxicity is common, and nausea and vomiting can be extremely severe, especially with the alkylating agents and cisplatin. Many cytotoxic drugs are carcinogenic, and some patients, cured of a primary cancer, subsequently develop a second, treatment-induced cancer. Anti-cancer chemotherapeutics have a vast array of adverse effects, some of which, e.g. cardiac and pulmonary toxicity, are of particular anaesthesiological relevance. Recently it has been shown that following chemotherapy with anthracyclines subtle abnormalities in cardiac function may exist even in those patients with a normal resting cardiac function, which become apparent only during anesthesia or exercise.

Delayed cardiotoxicity appearing years after completed chemotherapy has been reported after anthracycline therapy. Of importance for regional anaesthetics is that a sub-clinical, unrecognized neuropathy may exist even in those patients with a normal resting cardiac function, which become apparent only during anesthesia or exercise.

Over the past years, new technologies were introduced to make catheter insertion easier and more successful. Stimulating catheters represent one of these advances. They have been developed to confirm the correct positioning of the catheter close to the nerve while doing the technique and so, try to reduce the incidence of secondary failures. However, the ability to electro-stimulate the nerves through the tip of the catheter has not been shown to be highly reliable. In fact, recent studies showed conflicting results, with a trend toward a sparing effect on local anaesthetic and rescue medication consumption and a faster onset [2-5], but their clinical superiority still have to be proved [4, 6].

Ultrasound, the newest established technology in regional anaesthesia is now also routinely used in some institutions for continuous peripheral nerve catheter techniques. In several recent studies [7-9], ultrasound guidance permits placement of catheters in shorter time and with less procedure-related pain. It was also associated with less vascular punctures [7, 9]. Ultrasound guidance seems also to improve the efficacy of postoperative catheters when compared to traditional nerve catheters [10] but not when compared to stimulating catheters [8]. The possibility to optimise the final position also gives ultrasound an advantage over nerve stimulation. The first step for optimisation is to localise the exact position of the indwelling catheter, which can be sometimes very challenging. Some novel approaches have been described using injection of agitated contrast to help localise the tip of the catheter with the ultrasound [11]. The catheter technique can be done using either an “in-plane” and an “out-of-plane” approach. Wang and coll. showed that both techniques are equally successful but the insertion of the catheter perpendicular to the nerve takes significantly less time [12]. Also, the “in-plane” catheter introduction technique allows a longer subcutaneous passage of the needle, creating a “natural tunnelling”, which makes inadvertent removal of the catheter less frequent and probably reduce the risk of infection [13]. Before the introduction of the catheter, “expanding the space” with the injection of dextrose 5% in water is not mandatory and does not add value to the catheter placement [14].

Even if continuous peripheral nerve block has numerous advantages, it can also lead to some complications. Among them, infectious complications have been well described although they are infrequent with a rate of localised infection of 0-13,7%, local infection of 0-3,2% and abscess formation of 0-0,9% [15]. However, bacterial rates of colonisation of the catheters are higher and greatly depend on the location of the catheter [16]. The best way to reduce bacterial contamination is to use strict aseptic technique. The American Society of Anaesthesiologists guidelines (ASA) recommend the...
same aseptic technique for regional anaesthesia than for neuraxial anaesthesia [17]. Nerve injury is also a potential complication of single-shot and continuous regional anaesthesia. A recent study of Steinfieldt and coll. showed that the severity of nerve injury after needle nerve perforation is related to the diameter of the needle [18]. So, the needles for continuous peripheral block being larger than single-shot needles, the severity of nerve injury might be more important. Another infrequent complication is vascular puncture, which can be reduced by using ultrasound guidance [7, 9]. Finally, the direct contact of local anaesthetic with the nerve and the muscle can also cause direct neurotoxicity and myotoxicity [19-20]. Is it related to the duration of the contact of the nerve with the local anaesthetic? Is it related to the concentration of the local anaesthetic? The widespread use of continuous regional anaesthesia is associated with many advantages for the patients and very few complications. However, these complications can be sometimes devastating. Anaesthesiologists are continuously looking for a medication providing a very long-duration analgesia (24-48 hours) which will enable them to perform a single shot technique to provide long postoperative analgesia, avoiding by this way the performance of peripheral nerve catheters. Many adjuvants have been studied yet. Some, like clonidine, have a pretty good safety report but doesn’t prolong significantly enough the duration of long-lasting local anaesthetics [21]. Others, like dexamethasone, prolong significantly the duration of analgesia but the safety report still has to be made [20, 22]. Some anaesthesiologists recommend the use of less invasive technique such as periarticular infiltration which could be as effective as peripheral nerve blocks [23].

Ultrasound regional anaesthesia greatly improved the installation and the efficacy of peripheral nerve catheters. It is also more accessible to a wider range of anaesthesiologists. But although the learning curve of ultrasound anaesthesia is faster than nerve stimulation guidance, catheter placement can still be very challenging [24-25]. Future technology research will probably help to resolve these technical problems.

**Conflict of interest:** Abbott, Astra Zeneca, B Braun, Polymedic and Philips.

**References:**

The performance of regional anesthesia (RA) techniques has been increasing in the last two decades. Mostly because there is a generalized concept that RA is associated with more advantages and few major complications compared to general anesthesia (GA). But still, there are not enough studies validating that RA decrease mortality and morbidity when compared to GA(2).

Beforehand, definition of some concepts needs to be addressed. It is important to distinguish side effect from complication, the first is predictable and can be beneficial, whereas the later is unseen, harmful and should be promptly recognized and treated. The objective is to prevent a side effect to become a complication (Table 1). Guidelines are recommendations systemically reviewed for helping decision-making. They can be adopted, modified or rejected and their use cannot guarantee any specific outcome. Statements are opinions, beliefs and best medical judgment. Standards are rules or minimum requirements for clinical practice and can be modified only under very special and uncommon situations.

TABLE 1. RA technique/ Side effect / Potential complication

<table>
<thead>
<tr>
<th>Technique</th>
<th>Side effect</th>
<th>Potential complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interscalene block</td>
<td>Pressure injury</td>
<td>Thermal, pressure injury</td>
</tr>
<tr>
<td>Interscalene block</td>
<td>Sensory loss</td>
<td>Thermal, pressure injury</td>
</tr>
<tr>
<td>Neuraxial blocks / Autonomic block</td>
<td>Hypoxemia, bradycardia</td>
<td>Neuroaxial block / Phrenic nerve block / Respiratory insufficiency</td>
</tr>
<tr>
<td>All blocks / Sensory loss / Thermal, pressure injury</td>
<td>All blocks / Sensory loss / Thermal, pressure injury</td>
<td>Neuroaxial blocks / Phrenic nerve block / Respiratory insufficiency</td>
</tr>
</tbody>
</table>

The main objective of this paper is to provide useful information for minimizing complications during the general practice of RA.

Prevention

Benjamin Franklin once said: “One ounce of prevention is worth a pound of cure”. The most effective way to manage RA complications is to prevent/ minimize the risk of the occurrence of the latest in the first place.

RA safety and success begins with compliance to standards of care: a) proper patient selection (careful pre-operative evaluation); b) take informed consent; c) use appropriate technique and equipment; d) have adequate monitoring; e) keep precise and detailed documentation and records; f) seek active patient-doctor communication and close post-operative follow up.

a) Patient Selection

Not all patients are suitable for RA.

Pre-operative visit is the best time for risk evaluation and opportunity for recognizing complications predisposing factors and avoid unpleasant surprises at the operating room.

Making a proper selection must take into account several factors:

1. Patient's level of cooperation and tolerance for the procedure (pediatric population; psychiatric disorders; states of anxiety, previous experiences with local, regional or general anesthesia). Some patients oppose rigidly to RA, and its important not to insist too much with them to accept those techniques. Refusal is an absolute contra-indication.

2. Evaluation of co-existing morbidities (previous neurologic disease; coagulation abnormality; respiratory pathology that can turn into respiratory insufficiency due to phrenic nerve block during supraclavicular techniques or intercostal nerves block associated to high spinal/epidural block; diabetic neuropathy increases the need for higher currents during nervalstimulation techniques in order to have a motor response). Neurologic deficits should be documented prior the performance of RA. Infection at the site of injection, allergy to local anesthetics and INR > 1.5 (neuraxial block, but INR < 2 is accepted for spinal procedures) are absolute contra-indications.

3. Anatomic and physiologic considerations (anatomical deformities, severe arthritis, obesity).

4. Medication taken by the patient should be verified and given instructions as to be continued on the day of surgery or otherwise.

5. Availability of proper equipment (for monitoring, resuscitation and drugs including lipid emulsion 20%, for block performance - Neurostimulator and/or Ultrasonography)

6. RA technique suitable for surgical procedure (uncomfortable position for an extended period of time, lengthy procedures that outlast the duration of the local anesthetic - single shot injection) and executed by a skilled anesthesiologist.

b) Consent

Potential complications, risks and alternatives to RA should be discussed with the patient. It would be preferable for the patient to sign a written form. However, disclosure, effective communication with the patient and an appropriate ethical approach are not a guarantee of legal protection.

c) Use appropriate technique and equipment

Modern RA equipment can decrease incidence or minimize the severity of complications.

Neurolocalization methods

Neurostimulation (NS) opened the door of science to RA techniques and ultrasonography (US) will soon become an ordinary tool for block performance(3). US allows for direct visualization and needle advances towards the neural structure and the spread of the local anesthetic solution, as well as the surrounding tissues, decreases dose/volume of local anesthetic, time of block performance and provides more comfort to the patient. US can be useful in neuraxial blocks in adults(4) and children(5) improving the outcome in most peripheral nerve techniques in adult(3) and children(6).

Needles

For PNB - use insulated needles, small gauge and short beveled. The length should be tailored for the deepness of the target nerve. For Spinal Block - thinner, pencil-point tip needles are associated with less incidence of Post Dural Puncture Headache (PDPH). But, deviate easily during their passage through different tissues. Cerebrospinal Fluid (CSF) spontaneous flow is slow as and injection of fluid can be accomplished also very slowly (can alter drug distribution).

d) Adequate monitoring

The recognition of these complications requires continuous monitoring (human and instrumental). ASA standard monitoring should be in place while the performance of the block and remain in place. Some authors advise the use of a pressure injection monitor during the peri-neural administration of the local anesthetic solution(7).

Discharge from the recovery room is possible when evidence of regression of sensory and motor block and stable vital signs present. If planned a continuous infusion of local anesthetic in the ward, the Acute Pain Service should visit the patient regularly.

e) Keep precise and detailed documentation and records

Detailed documentation of patient consent and clinical case is important for quality of care and for legal issues.

f) Seek active patient-doctor communication and close post-operative follow up

Prevention and early diagnosis needs an effective communication between patient and health care provider, in ambulatory and inward settings. Discussion should focus on common complications, how to recognize and minimize potential risks and give instructions how to protect the numb limb from injury or pressure for the duration of the block(8).

Behavior factors

Safety habits should be encouraged and admitted as a standard of care. Anesthesiology is one of the safest medical disciplines by adopting some risk and quality management tools (critical incidence reporting, plan-do-check-act cycles, respectively(9) and simulation(10) is becoming an invaluable instrument in teaching and training (specially for unusual cases).

Fatigue and sleep deprivation can severely impair anesthesiologist’s performance and monitoring tasks(11).

Knowing when to stop performing a RA technique is crucial. Ask for assistance is advisable when facing difficulties and always have an alternative plan in mind if persistent failure (more than 3 attempts or 20 minutes) occurs.

National and international guidelines(12)(13)(14)(15) should be followed and any deviation should be justified and clearly documented.

Complication recognition

Monitors are important, but a perspicacious and talented anesthesiologist is an invaluable “tool” anticipating events detected by devices and advanced therapy can be started, minimizing/avoiding possible catastrophic complications.

Most complications of RA are minor, easily managed and temporary but in rare instances it can be severe and permanent (Table 2). The calculated incidence of severe complications in RA in the study published by Auroux et al (16) was lower than 5 in 10,000 patients.
Trauma patients with long bone fractures of the forearm or leg have an increased risk of developing compartment syndrome (17). This situation may prevent the performance of blocks, and in this setting, different anesthetic and postoperative analgesic techniques may be more appropriate. However, if RA is considered an option, it should be discussed with the surgeon, the patient and requires a high level of suspicion, a very close monitoring until recovery of motor function and while under the influence of local anesthetic block. Some authors defend that if RA is performed in these patients, the limb must be monitored (measurement of compartmental pressures) and adequate pain management does not ‘hide’ this complication but, on the contrary, can facilitate early diagnosis since the increase in requirement for pain medication precedes other clinical symptoms by an average of 7.3 h (17).

**Conclusion:** Recent developments in patient safety, monitoring, have decreased the number of major complications in Regional Anesthesia (RA). Training RA programs can overcome performance difficulties, improve confidence and experience with common and severe complications (18-20).

Avoidance of complications is dependent on a wide health care team, composed by anesthesiologists, surgeons, nurses and others with management responsibilities. Monitors and monitoring chain is crucial and should not be overlooked.

Pre-anesthesia visit has the objective of identify risk patients. All, but especially those particular risk patients, should be kept under close monitoring. Any suspicion ought to be immediately investigated in search for a diagnosis and prompt treatment.

Safety in anesthesia has increase due to the implementation of checklists, critical incidence reporting and plan-do-check-act cycles. Simulation can be an excellent tool for learning and training unusual complications.

Following standards of care and guidelines don’t guarantee outcome or legal action, but can assure that all has been done in accordance with what is the actual standard of care.

### References:

blocks were performed. Six epidural hematomas (five after thoracic epidurals and one cranial hematoma after a lumbar epidural) occurred. Currently, 90451 documented visits of catheter based regional analgesia revealed that a mean pain score of 1.4 (NRS 0-10) and 2.5 during resting and moving conditions, respectively. Bloody taps were documented from 0% (127 paravertebral blocks) up to 7.6% (2350 psoas blocks) in peripheral blocks, and from 0.5% (thoracic epidural) to 0.8% (lumbar epidural) of neuraxial blocks. Inadvertent dura penetration was documented in 0.5% of neuraxial blocks. Toxic reactions without the necessity to resuscitate were reported in 4 patients.

Conclusions: When the incidence of a given complication is low (epidural hematoma, epidural abscess, intoxication), a registry has the potential to better provide data for general risk calculation. When the incidence is high (bloody taps, catheter associated infections, mechanical complications), our registry can serve as a benchmark to improve practice.


PATHS OF MEDICAL INNOVATION - DISCOVERY AND TRANSLATION

G. Weinberg USA.

The following discovery of the description of lipid resuscitation for local anesthetic systemic toxicity (LAST) is abstracted from the editorial, "Intravenous lipid emulsion: Why wait to save a life?" Emerg Med Aust 2011; 23:113-115 (with permission).

Here is a most improbable story connecting a near cardiac arrest in a young patient having liposuction and the dramatic save of another young patient in cardiac arrest following an attempted suicide. The saving medicine? Implausibly, it was an oil emulsion normally intended to improve a patient's nutritional status. How did a nutritional supplement turn into an antidote for lipopholic drug overdose? Neither by accident, nor intent, but by a stranger path still - one leading ultimately to practice guidelines and lives saved.

More than a decade ago, I learned of a patient with carinile deficiency who exhibited extreme sensitivity to bupivacane, a lipopholic local anesthetic known to cause severe cardiac toxicity. I wondered if carinile deficiency lowers the threshold for local anesthetic toxicity and later determined that bupivacane inhibits a carinile-dependent mitochondrial enzyme that is necessary for metabolizing fats, the hearts preferred fuel. We hypothesized that this effect contributed to the well-known cardiotoxicity of bupivacane and only needed a model of carinile deficiency to prove the theory.

This proved difficult, or in our hands, impossible. The alternative was to recreate the metabolic context of impaired fatty acid oxidation which was known to enhance arrhythmias through accumulation of cytoplasmonic fatty acids. What better way to reproduce this than loading the test subject with a lipid emulsion? Our hypothesis predicted that this would make the rat more susceptible to bupivacane....the experiment proved exactly the opposite: infusion of lipid emulsion made the animal resistant to bupivacane. Follow up experiments showed that administering the same lipid emulsion after an otherwise fatal dose of bupivacane rapidly reversed the signs of local anesthetic toxicity. Later, we published a paper showing the same effect in dogs: resuscitation was always successful after a huge dose of bupivacane when an intravenous bolus of lipid emulsion was given. An accompanying editorial asked, "Could this be the silver bullet?" to the problem of local anesthetic toxicity, a potentially life-threatening complication of regional anesthesia that had vexing anesthesiologists for decades.

But lipid resuscitation would remain forever a laboratory phenomenon until someone who had read these papers (probably rare) was present when a case of bupivacane toxicity occurred (definitely rare) and had the courage (rarer still) to try something that had never been done in a human. That vanishingly unlikely occurrence transpired when Dr. Meg Rosenblatt at Mount Sinai in NYC happened upon a team of anesthesiologists twenty minutes into the resuscitation of a patient who arrested shortly after a bupivacane-based brachial plexus block. She knew the literature and after ascertaining that the resuscitation was going nowhere, ran to the pharmacy, picked up a 20% lipid emulsion ran it back to the code blue team and instructed them to give 100 ml as an intravenous bolus. Within a minute, the patient had a pulse and quickly recovered normal vital signs. He was ultimately discharged with no neurological or cardiac sequela. A nearly identical case of ILE reversal of ropivacaine-induced cardiac arrest was published shortly thereafter by Rainer Litz and colleagues from Dresden. Meg and Rainer's courageous action saved a life and ushered in the clinical translation of lipid resuscitation. Dozens of reports of successful saves from local anesthetic overdose have followed in the literature including examples of bupivacane, ropivacane and even lidocane toxicity. Many examples of lipid resuscitation can now be found at the educational website: www.lipidrescue.org. Several professional societies have included lipid rescue in their practice guidelines for treatment of local anesthetic overdose, including most recently the American Heart Association in their 'Special Circumstances' section of the ACLS guidelines.

Fortunately, the story does not end here as another unlikely occurrence proved equally important to advancing this method. Archie Siriani, an anesthesiologist in a small community hospital outside Philadelphia was called to intubate a young, near-suicide who was in cardiac arrest after taking a massive overdose of bupropion and lamotrigine. Returning almost an hour later to place an arterial cannulae, the patient was still receiving chest compressions was nearing the end. Archie did some quick work and found that bupropion was a sodium channel blocker and a bell went off. He called home and asked his wife to pull an issue of Anesthesiology to find out what treatment had been used to reverse bupivacane toxicity the previous summer. He then ran to the pharmacy and returned to the bedside a few minutes later with a bag of 20% lipid emulsion. Within one minute of a 100 mL bolus, the patient had a pulse and normal vital signs. She was later discharged with no significant neurological defects. This is the most remarkable save I know. This case, in addition to providing testimony to the importance of good CPR and innovative thinking under duress, also circumvented years of basic science in just a few minutes. Apparently, lipid resuscitation wasn't just for local anesthetic overdose.

What's next? The field of lipid resuscitation is rapidly evolving. Recovery is likely to be better when tissue toxicity is addressed (reversed) early in the toxicidrome. In the setting of bupivacane-induced cardiovascular instability, for example, it is really better to wait until every conventional method has been exhausted and the patient is pulseless before administering ILE? Where risk and benefit favor benefit, I choose early use of ILE and ask, "Why wait to save a life?" However, in other less clear cut scenarios the decision will depend for now on clinical judgment. Ultimately, I look for guidance in this matter to quality outcomes research. This is the future of ILE and we must continue to perform solid science to find the answers.

72 CRITICAL INCIDENT REPORTS INVOLVING REGIONAL ANESTHESIA

J. Neal USA.

Much of what we know about regional anesthesia complications comes from case reports that are followed by larger population surveys, registries, or sufficiently large prospective studies that assess sufficiently frequent complications. In this brief panel presentation, I wish to focus on three aspects of critical incident reporting — when is a case report of a complication publishable, what are the emerging serious complications in regional anesthesia, and how has one institution significantly changed the manner in which it addresses complications and how has that decision impacted its medical liability profile?

When Is a Complication Publishable as a Case Report?

• Is this a not previously described complication?
  • Is this a complication known to other branches of medicine, but new to regional anesthesia?
  • Is this an ‘old complication’ that is now presenting itself in the setting of a new technique, such as ultrasound-guidance?
  • Does the response to the complication reflect a unique systems approach — such as wrong-site blocks?
  • Is there a unique learning opportunity?
  • Several examples of complications presented as case reports in Regional Anesthesia and Pain Medicine

What Are the “Emerging Complications” in Regional Anesthesia?

• The association between spinal stenosis and neuraxial hematoma
  • Is there cause and effect?
  • When is spinal stenosis significant?
How to manage the patient with known spinal stenosis?

- What about the patient with no prior knowledge of spinal stenosis?
- Inflammatory neuropathies
- The importance of early recognition and referral
- Bigger, meaner, nastier anticoagulants
  - Will we ever have more than “pharmacokinetic-based recommendations” for these drugs?
  - Is there a concerted move towards more benign perioperative antithrombotic therapies?
- Cerebral ischemic events in the beach-chair position
  - Is it really blood pressure related?
  - Can we afford not to treat it as a blood-pressure related issue?
- Lipid emulsion: How early, how much, and what if it does not work?
- Ultrasound-guided regional anesthesia: Will it reduce nerve injury?
- Will it reduce significant local anesthetic systemic toxicity?
- Will it allow above the clavicle blocks in patients with severe lung disease?

Virginia Mason Medical Center’s Approach to Medical Liability Issues
- Mary L. McClinton story
- TEAM approach to disclosure
- Approach to a medical claim
  - If we are within standard of care, we vigorously defend
  - If we did not meet standard of care and our care is causally related to the injury, we acknowledge our mistake, apologize, and seek a prompt and equitable resolution
- A systems approach to medical accidents
  - Humans make honest mistakes
  - Humans require support when medical mistakes are made
- As a result
  - Frivolous claims have greatly decreased
  - Yearly average claim payouts are down 50% over the past 8 years
  - Our, along with our patients’, legal fees have been significantly reduced
  - Institutional focus on patient safety
- One of two US “Hospitals of the Decade” in recognition of our safety and quality efforts

73

COMPLICATIONS IN REGIONAL ANAESTHESIA: POOR AFTERCARE/LACK OF STAFF
S. Tighe

Introduction: Numerous complications have been attributed to Regional Anaesthesia (RA) techniques. Many are avoidable by meticulous intraoperative technique. However, good postoperative care and attention to detail are also essential components of the overall strategy to minimise complications and maximise benefit of RA. To achieve this, we are dependent on high quality nursing and physiotherapy staff, both in the level of skill and in the numbers available. Nurses and physiotherapists must be supported by suitably trained and competent resident medical staff, with sympathetic managers.

The Acute Pain Service (APS)
The APS has been comprehensively shown to improve postoperative pain control and minimise complications. RA is a key part of the APS. The APS should provide a 24/7 service in support of the ward staff, together with regular consultant ward rounds. The APS will produce protocols and guidelines for the safe management of analgesic techniques, together with continuous education and audit. Over 80% of UK hospitals have an APS and without one, it would be impossible to maintain the quality of care that patients both deserve and expect.

Ward or Critical Care?
RA catheter techniques are associated with a higher risk of postoperative complications, particularly neuraxial, compared to single shot RA. Some hospitals therefore admit patients to the High Dependency Unit or even Intensive Care. These tend to be institutions that do not have a comprehensive APS. With effective nurse training and staffing ratios, there is no reason why these techniques cannot be safely managed on the general ward.

Monitoring
- Monitoring protocols should be in place for each RA technique and compliance should be audited by the APS. If staff ratios are inadequate, monitoring frequency reduces and serious morbidity can result.

Failure
- Up to 25% of epidurals fail at some point during the intended duration of use. 45% of these failures are related to catheters being displaced, often during poorly controlled mobilisation. Similarly, PNB catheters can fail with poor nursing care.

LA toxicity
- Peak blood levels of local anaesthetics usually occur early, whilst the patient is still in the operating theatre complex. However, catheters can migrate and local anaesthetic toxicity can present late on the general ward. There have been several reports of accidental intravenous infusion of local anaesthetics, often with lethal consequences. Nurses should be familiar with the signs and symptoms of LA toxicity. If these are missed, serious consequences are inevitable.

Prolonged Block
- Prolonged sensory and motor block requires close attention to pressure areas.
- Poor nursing care has been associated with pressure necrosis, particularly in the lower limb. The insensate upper limb should be protected in a suitable sling and patients should be mobilised very carefully if they have a lower limb block, to avoid falls and secondary injury. If nursing or physiotherapy resources are inadequate, patients may try to mobilise themselves, with disastrous results.

Hypotension
- Hypotension is frequently associated with neuraxial techniques and robust protocols should be in place for nurses to recognise this, institute early treatment and seek medical assistance.
- Hypotension has multiple aetiologies and it is particularly important to exclude surgical causes before assuming it is block related.

Respiratory depression
- Neuraxial opioids can cause respiratory depression, either as a single shot or by continuous infusion. This can present late, is frequently subtle and is often masked by oxygen therapy. It is particularly important that nurses assess respiratory rate and the sedation score at frequent intervals, with the ability to administer naloxone according to an agreed protocol.

Urinary retention
- Nurses should be alert to the possibility of urinary retention after neuraxial block. Patients will frequently have a urinary catheter is situ, but they may not. It is equally important that catheters are removed as soon as possible, to minimise morbidity.

Neurological complications
- After neuraxial block, monitoring should include the degree of motor block and the sensory level. Nurses should be trained to alert medical staff early if resolution is delayed and to be aware of the importance of back pain, bladder and/or bowel dysfunction. In NAP3, several cases of cord compression had a delayed diagnosis. Medical staff should also be alerted if a PNB is persisting longer than usual, or is associated with dysaesthesia. Skilled physiotherapy can often mitigate many of the problems associated with prolonged immobilisation.

Rebound pain
- The APS should encourage early, regular administration of additional oral analgesia to prevent rebound pain, a problem that is particularly prevalent with PNB. Nurses should be trained to anticipate block resolution. Early oral nutrition and effective anti-emetic treatment is particularly important in encouraging oral analgesia.

Inadequate Analgesia
- 60% of patients receiving epidural analgesia required intervention for inadequate analgesia. Ward nurses can be trained to optimise the dose of epidural infusions. If such training is unavailable, or treatment is delayed, significant patient discomfort will result. PNB’s may not be fully effective and although this should be noted in the recovery area, failure may not become apparent until the patient is on the ward, particularly when catheters are used.

Nausea and Vomiting
- Although RA techniques reduce PONV compared to systemic opioids, it can still occur, particularly when neuraxial opioids are used. PONV may also become problematic during the conversion to oral analgesia. Anti-emetics should be administered as soon as symptoms develop.

Summary: Inadequate ward staffing and poor education are often factors that are directly related to RA morbidity and mortality. Managers must
provide sufficient funding to ensure adequate staffing levels and provide comprehensive education via an effective APS.

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75 INCIDENCE OF FALLS/INJURIES AFTER LOWER LIMB BLOCKS

A. Yilmazlar

Turkey

A long - acting peripheral nerve block provides anesthesia and analgesia, but also leads to a loss of proprioception and the protective reflex. Patients with peripheral nerve block are thus potentially at risk of falls, trauma and immobility. The incidence of accidental injury to the limb or surgical site from block placement or discharge resulting in neurological injury or surgical complication is very small.

Discharging patients with a long-acting peripheral nerve block remains controversial. Accidental injury of the limb or surgical site because of an insensate extremity is common. Klein SM et al concluded that long-acting peripheral nerve blockade may be safely used in an ambulatory setting with a high degree of efficacy, safety and satisfaction. This technique is associated with a low incidence of injuries(1).

Continuous peripheral nerve blocks may induce muscle weakness, and several recently published series emphasize patient falls after postarthroplasty continuous peripheral nerve blocks. Ilfled BM et al collated data from 3 previously published, randomized, triple-masked, placebo-controlled studies of continuous peripheral nerve blocks involving the femoral nerve after knee and hip arthroplasty. Their analysis suggests that there is a causal relationship between continuous peripheral nerve blocks and the risk of falling after knee and hip arthroplasty.

Atkinson HDE et al recommended that after having a femoral nerve block patients should undergo enhanced postoperative evaluation for proprioception function (2-point discrimination, light touch, and vibration sense) to ensure safe neurological function before mobilisation. They also presented a serious postoperative complication related to the use of femoral nerve block in four patients, each of whom fell and sustained further injury(2).

Femoral nerve block provides excellent analgesia with respect to early mobilisation and related falls, as muscle, skin and joint proprioception from the legs are the dominant sensory input determining safe ambulation and balance. However, the addition of epinephrine may increase the duration of the nerve block and may cause falls.

Femoral nerve block is a well documented option for post-operative analgesia following major knee surgery. However, motor blockade may be prolonged preventing early mobilisation thereby increasing the length of stay. In addition, as a consequence of persistent quadriceps weakness, patients have an increased risk of falling. Kandasami et al presented a series of five patients who underwent total knee replacement with spinal anaesthesia and femoral nerve block and who then fell, sustaining complete wound...
postoperative pain management after lower extremity surgery is important to achieve a good clinical outcome. Patient participation in the rehabilitation program is predicated on satisfactory pain control, and patient participation in physical therapy and gait training is critical to a final successful result. Several adjunctive measures are used to make patients more comfortable so that they can participate more fully in their rehabilitation program.

Femoral nerve/sciatic nerve/lumbar plexus blocks, administered via an indwelling catheter, are successful in controlling postoperative pain. Patients who receive this type of pain control are more comfortable and confident in performing range of motion exercises and gait training after surgery. On the other hand, nerve blocks result in the loss of muscle control necessary to stabilize the lower extremity when the patient is standing or walking. Lower doses of anesthetic agents may produce a partial nerve block with good pain control and some preservation of muscle function. Unfortunately, the dose response curve may not be linear, and the exact dose is difficult to predict.

When a regional nerve block is used, the patient’s entire care team must be aware that the block is in place and that the patient may not have control of the leg. Patients with regional nerve blocks should stand or walk only with appropriate support and assistance until the catheter is discontinued and the effect of the nerve block has worn off. Obviously, a fall in the immediate postoperative period can lead to devastating complications.

One hospital has instituted measures to limit the likelihood of falls in patients with regional nerve blocks. A sign—“Fall Precaution - Nerve Block”—is placed on top of the patient’s chart in the OR holding area and remains with the patient during surgery and the stay in the postanesthesia care unit. When the patient is transferred to the medical-surgical care unit, the sign is placed above the patient’s bed, where it serves as a reminder to caregivers and others that the patient has a nerve block and is at high risk for fall and injury. These patients also have bright yellow stars outside their rooms. Hospital staff and visitors are told what the stars mean and are asked to serve as “extra eyes” to assist in preventing patient injury by alerting medical personnel when they observe a patient in a room with a star who is attempting to stand or walk without assistance.

Advances in regional anesthesia have greatly improved perioperative and postoperative pain control and increased patient participation in rehabilitation. However, when patients are moved from the OR to the surgical floor, hospital staff must be mindful of the consequences of these nerve blocks. Awareness of potential complications and involvement of both hospital staff and patients’ families will help limit adverse events and improve surgical outcomes.

With the current emphasis on preemptive analgesia in the perioperative period, more patients are receiving epidural, femoral, sciatic, popliteal and ankle blocks—individually and in combination for both primary anesthetic technique and postoperative pain control. The use of long-acting agents such as bupivacaine, in conjunction with indwelling perineural catheters, means that it is not necessary for an orthopaedic surgeon or an anesthesiologist to be in attendance all the time while the block is in effect.

Thus, all who come in contact with the patient must be aware of the consequences of these long-acting blocks. The entire health care team and family members can play a role in fall prevention. Patients with regional nerve blocks must be identified, and personnel—whether in the preoperative holding area or on the medical-surgical floors—must be aware of the effects that lower extremity regional nerve blocks have on a patient’s ambulatory ability to limit the likelihood of falls.

References:

LOW DOSE CSE FOR CESAREAN SECTION: TECHNIQUES, RISKS AND ADVANTAGES

E. Rooffhoof, M. Walters, M. Van de Velde Belgium

Spinal induced hypotension is a common problem during Caesarean delivery. It can cause serious maternal and foetal morbidity. Various strategies to prevent hypotension are only partially successful. The present review will focus on the usefulness and efficacy of low dose spinal anaesthesia to prevent maternal hypotension while maintaining good anaesthetic conditions. The Caesarean section rate increases (1). Spinal anaesthesia is the anaesthetic technique of choice in elective and unplanned situations (1). Spinal induced hypotension remains the most important side effect occurring in 20 to 100 % of women (2,3,4). Hypotension causes maternal discomfort (nausea and vomiting) (2) and impairs utero-placental perfusion, resulting in foetal acidemia (5,6). The severity and duration of the hypertensive episode determines the extent of the fetal academia (7). Various strategies have been described to prevent hypotension: left uterine displacement, prophylactic IV fluid loading using both crystalloids and colloids, maternal leg wrapping and prophylactic epidural or phenylephrine infusions. Unfortunately, despite these strategies, spinal induced hypotension remains a common problem in patients undergoing Caesarean delivery (2,3,8-15). A recent meta-analysis showed that none of these interventions have been shown to eliminate the need to treat maternal hypotension during spinal anaesthesia (16). Furthermore, prophylactic management has side effects such as iatrogenic pulmonary oedema reactive hypertension and prophylactic beta sympathomimetic induced foetal acidosis (15,17). Apart from reflex bradycardia, phenylephrine can cause maternal arrhythmias. Lai et al. recently described a case of ventricular bigeminy seconds after starting a phenylephrine infusion, which reverted spontaneously to sinus rhythm when the phenylephrine infusion was stopped (18).

There is some evidence available in the literature indicating that reducing the spinal dose of bupivacaine can produce effective anaesthesia with less haemodynamic side-effects. The present review will put this evidence into perspective.

Haemodynamic effects of low dose spinal anaesthesia.

Fan et al. evaluated the effects of different spinal doses of bupivacaine (19). A CSE was performed in 80 healthy, term parturients who underwent elective Caesarean deliveries. All patients received 1000 ml of Ringers solution. Patients were randomized to 4 groups of intrathecal hyperbaric bupivacaine with varying dose: group A received 2.5 mg, group B 5 mg, group C 7.5 mg and group D 10 mg. An epidural catheter was then inserted into the epidural space. If after 15 minutes a block to pinprick to level T4 was not reached additional epidural local anaesthetic was administered. Hypotension was defined as a systolic blood pressure (SBP) below 90 mmHg or a 30% decrease in SBP from baseline. If hypotension occurred epidural was administered per 5 or 10 mg intravenously. Very little hypotension was observed in groups A and B, while the incidence of hypotension was 35% in group C and 50% in group D. Significantly less epidene was required in groups A, B and C as compared to group D. The incidence of nausea and vomiting was higher in the patients treated with 7.5 and 10 mg of bupivacaine. There was also more maternal dyspnea in the group treated with 10 mg bupivacaine.

Ben David et al. randomised 32 patients to two study groups: In one group isobaric bupivacaine 10 mg was intrathecaclly administered; In the second group 5 mg of isobaric bupivacaine was given intrathecaclly combined with 25 microgram of fentanyl (20). Hypotension was defined as a decrease of SBP below 95 mmHg or a 25% decrease from baseline. If hypotension occurred boluses of 5 mg epidend were given. In all patients good quality anaesthesia was noted, although some patients in the 5 mg group noted some

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comf or at the time of delivery. However, the only reason for complaint and not being fully satisfied with anaesthesia was nausea and vomiting which only occurred in the 10 mg group. The incidence of nausea and vomiting, the incidence of hypotension and the average dose of ephedrine required to treat hypotension were also much higher in the bupivacaine 10 mg group as compared to 5 mg bupivacaine combined with fentanyl.

Vercu tera and co-workers published three trials in which they evaluated the incidence of hypotension following CSE anaesthesia with 6.6 mg of hyperbaric bupivacaine and 3.3 mcg of sufentanil (22,23). CSE was performed with the patients sitting. All patients received 5 mg of prophylactic ephedrine, 1,000 ml of Ringer’s solution and 500 ml of hydroxyethylstarch solution prior to spinal anaesthesia. Hypotension was defined as a SBP < 90 mmHg. Hypotension occurred for both studies combined in only 8 out of 102 patients (8%). This is probably the lowest incidence reported by any previous author. The same group recently compared low dose CSE anaesthesia with plain levobupivacaine, bupivacaine and ropivacaine, all three combined with sufentanyl and confirmed that low dose CSE anaesthesia is able to preserve maternal haemodynamics in most women (24). More recently, Choi et al. compared single shot spinal anaesthesia, using 9 mg of hyperbaric bupivacaine with 20 microgram of fentanyl, with CSE anaesthesia using 6 mg hyperbaric bupivacaine with 20 microgram fentanyl intrathecally (25). Propofol (100 mg) with 25 mg of sodium thiopental was given intravenously. Hypotension was defined as a systolic blood pressure decrease of more than 20% from baseline or a decrease below 95 mmHg. Hypotension was treated with ephedrine. Significantly more patients in the high dose spinal group experienced hypotension and this resulted in a significantly higher proportion of patients in nausea and vomiting.

At our institution, we also performed a randomised comparison of patients treated with CSE using either 6.5 or 9.5 mg of hyperbaric bupivacaine combined in both groups with 2.5 microgram of sufentanil (26). Patients in the 9.5 mg group experienced more pronounced and longer hypotensive periods as compared to the 6.5 mg group. The mean lowest recorded systolic pressure was higher in the 6.5 mg group (102 ± 16 vs 88 ± 16 in the 9.5 mg group; p < 0.05). More patients in the 9.5 mg group experienced hypotension compared to the 6.5 mg group (68% vs 16%; p < 0.05). In the 9.5 mg group 15 patients required pharmacological treatment for hypotension, compared to 5 in the 6.5 mg group.

Chen et al performed a dose-response study of spinal hyperbaric ropivacaine in 60 parturients scheduled for elective Caesarean section (27). The patients were randomized to four groups and received intrathecally, using a CSE technique, 10.5, 12, 13.5 or 15 mg of hyperbaric ropivacaine following a fluid load with 1000 mL of Ringer’s lactate solution. The rate of hypotension was significantly correlated to the dose of ropivacaine.

Teoh et al evaluated the effect of ultra-low dose spinal anaesthesia as part of a combined spinal-epidural technique for elective Caesarean deliveries (28). Forty-four women were randomized in a double-blinded trial to 2 groups. The first group received intrathecal hyperbaric bupivacaine 3.75 mg in combination with 25 mg fentanyl, 0.1 mg morphine and an epidural test dose of 3 mL lidocaine 1.5%. The second group received 9 mg of hyperbaric bupivacaine with the same adjuvants and test dose. Hypotension was defined as a systolic pressure > 80% of baseline and was treated with boluses of 5 mg of ephedrine IV. The haemodynamic parameters and block profile were measured every 2.5 minutes until delivery of the baby and every 5 minutes thereafter until the end of surgery. There was significantly less hypotension in the low-dose group with less ephedrine use and faster motor recovery. The same authors reported four cases of Caesarean section in severe preeclampsia using low dose CSE anaesthesia with stable maternal haemodynamics (29).

Kaya et al studied the combined effect of low-dose spinal bupivacaine with or without colloid preload or wrapping of legs to normal dose spinal bupivacaine on reduction of maternal hypotension during Caesarean section (30). They randomised 120 patients into 4 groups. The first group received 10 mg of bupivacaine intrathecally with 500 ml of Ringer’s lactate. The second group received a low dose spinal with 4 mg of bupivacaine plus 25 mcg of fentanyl with 500 ml of Ringer’s lactate solution. The third group received the same low dose spinal with 500 ml of hydroxyethylstarch and the fourth group received low dose spinal with colloid preloading and wrapping of the lower extremities. Hypotension was reduced from group one to four from 100 to 70, 47 and 23% respectively. Low-dose spinal therefore reduced hypotension and this was further reduced by colloid preloading and leg wrapping.

Recently, Ghazi and Raja published a letter on their experience with low dose CSE and concluded that the incidence of maternal hypotension and the need for vasopressors was reduced in women undergoing operative delivery (31). Landteuer et al. published an excellent trial measuring not only invasive blood pressures, but also cardiac output in women undergoing CSE anaesthesia with a high (10 mg) or a low (7.5 mg) dose of hyperbaric bupivacaine combined with sufentanil. The best hemodynamic profile was recorded in the low dose CSE treated patients (32).

McNaught and Stocks recently published a review on the topic of low dose spinal anaesthesia and epidural volume extension (33). They concluded that epidural saline can extend a spinal block. They also found that the CSE technique itself results in a higher sensory level of the block. This is explained by a change in epidural pressure when the epidural space is identified with the Tuohy needle, as negative epidural pressure is neutralised by the open connection to atmospheric pressure resulting in a reduction in dural sac volume, similar to injection of fluid. These authors concluded that low dose spinal anaesthesia is effective in reducing maternal haemodynamic instability.

It seems clear from these trials that hypotension occurs less frequent, is less severe and requires less pharmacological treatment when lower spinal doses are administered intrathecally as compared to higher, more generally accepted doses.

Quality of anaesthesia.

Many anaesthesiologists would worry that lowering the spinal dose would reduce the quality of anaesthesia and increase the incidence of pain during Caesarean section (34). Indeed Fan et al. and Ben-David et al. reported more breakthrough pain with bupivacaine doses of 5 mg or less (19,20). However, Vercu tera et al. and Choi et al. using between 6 and 7 mg of bupivacaine combined with opioids, reported excellent anaesthetic conditions (21,22,23,25). However, these authors used a CSE technique and could give epidural top-ups if required or they could anticipate pain if surgery was unexpectedly prolonged. In their review of the literature, McNaught and Stocks did conclude that the technique of using low intrathecal doses has an increased risk of intra-operative pain, shorter duration of effective anaesthesia with a slower onset (33).

In our trial, epidural supplementation was required in approximately 20% of patients treated with 6.5 mg bupivacaine versus only 8% in patients treated with 9.5 mg bupivacaine (26). If additional epidural anaesthesia was required this only occurred if surgery was prolonged after 60 minutes from the start of the spinal injection. Since we are using low spinal doses (5.5 - 6.5 mg bupivacaine with sufentanil) routinely as part of a CSE technique, we now know that if the uterus is not closed approximately 45 minutes after start of the CSE, epidural supplementation will be required and an epidural top-up (5 - 8 ml of ropivacaine 0.75% with sufentanil) is given prophylactically. We only very rarely have to supplement the initial spinal dose with epidural local anaesthetic within one hour of the spinal injection. We also very rarely observe complete motor block. Indeed many authors report on faster motor recovery (25, 33).

We recently evaluated the use of low dose CSE (< 7 mg hyperbaric bupivacaine with sufentanil 2 μg) in routine clinical practice in our teaching hospital. Pain and discomfort occurred in approximately 10% of patients, which is a similar incidence as with normal dose spinal anaesthesia where Kinsella reported a 6% spinal anaesthesia failure rate (35,36).

Conclusion: It is clear from prospective trials that lowering the spinal dose improves maternal haemodynamic stability. Doses of intrathecal bupivacaine between 5 and 7 mg are sufficient to provide effective anaesthesia. However complete motor block is seldom achieved and adequate anaesthesia is limited in time. As a result an epidural back-up catheter is a must. In my clinical practice, experience teaches us that a dose between 5.5 and 6.5 mg combined with opioids provides reliable anaesthesia from start of the spinal injection for 60 - 70 minutes. If the uterus is not closed after 45 minutes an epidural top-up is given to prevent breakthrough pain.

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emergency Caesarean delivery were significant predictors of chronic pain development.(2) Nerve entrapment of abdominal wall nerves such as the ilioinguinal and iliohypogastric nerves were present in about half of patients with moderate to severe pain.(2)

Although the incidence of persistent wound scar pain is seemingly lower than some other surgeries, the incidence of Caesarean section is rising. Chronic pain after Caesarean section may cause significant functional disability and affect the bonding of mother and baby. Identification of risk factors for development of chronic pain is important to individualise analgesic strategies. Nikolajsen et al investigated the incidence of chronic wound scar pain after Caesarean section via postal survey.(3) Chronic pain of more than 3 months was present in 18.6%. Patients with persistent pain were more likely associated with general anaesthesia than spinal anaesthesia for Caesarean section. Constant or daily pain was present in 5.7% posing significant pain disability.

Incidence of chronic pain after Caesarean section with spinal anaesthesia in the Asian population was investigated by Sng et al with a standardised spinal technique with intravenous morphine patient controlled analgesia for 24 hours postoperatively.(4) Spinal anaesthesia is a common mode of anaesthesia for elective Caesarean section and it has been suggested that regional anaesthesia may be associated with lower incidence of chronic pain than general anaesthesia.(3) The incidence of wound scar pain for 3 months after Caesarean section was 9.2%. The independent risk factors for development of chronic pain were higher pain scores recalled in the intermediate postoperative period, pain present elsewhere and non-private insurance status. The common sites of chronic pain present in those with chronic pain were back pain and headache.

Genetic basis of chronic pain development have also been investigated. Polymorphisms of the ATP-binding cassette sub-family B member 1 (ABCB1) gene that codes for P-glycoprotein may influence the efflux of morphine from the central nervous system affecting analgesic action. Sia et al studied the effect of ABCB gene polymorphism on analgesia and development of persistent pain in post Caesarean women.(5) Polymorphisms of ABCB1 were not associated with differences in morphine use in the first 24 hours after surgery. However, women with the T allele of C345T polymorphism showed a trend towards a higher risk of developing persistent postoperative pain.

Persistent pain is more common after Caesarean section than after vaginal birth (18% versus 10%, p<0.01, OR 2.1(1.2 to 3.7)).(6) A history of previous pain and pain on the day after delivery correlated with persistent pain. As postoperative pain is a subjective experience with large interindividual variation, recent studies have been conducted to find a simple preoperative quantitative sensory test that could predict the level of postoperative pain.(7) Mechanical temporal summation, wound hyperalgesia and diffuse noxious inhibitory control measurements are currently investigated to develop a prognostic model for chronic pain development after Caesarean section in several centres. Granot et al demonstrated that postoperative pain scores at rest and movement in women undergoing Caesarean section significantly correlated with preoperative suprathreshold pain score to heat.(8,9)

The current challenge is to develop a preoperative prognostic model through psychophysical testing and genetic screening to identify women at higher risk of severe acute and chronic pain after Caesarean section. Women at risk of chronic pain would have closer monitoring and possibly have individualised analgesic strategy including antineuropathic medications to prevent severe acute and chronic pain development.(10,11)

References:

to be safer and equally effective then morphine. Epidurally, 2.5 to 3 mg morphine seems to be a reasonable option.

Patient controlled epidural analgesia (PCEA).

PCEA provides excellent postoperative analgesia after C-section. Several studies demonstrated the efficacy of this invasive technique, but stressed that motor block and delayed mobilisation is a significant limiting factor to the technique (7,8,9). It is however far superior to PCA (10).

Novel strategies.

Continuous wound infiltration is a promising technique which recently has shown to be effective for pain relief after major abdominal surgery (11). At the moment the data on C-section patients is limited. Compared to placebo, wound infiltration provides pain relief (12,13). Compared to epidural analgesia, it seems to provide similar pain relief, but with less side effects (14). Lavand’Homme showed that adding diclofenac to the instillation improved pain relief (15).

Also more and more studies are emerging showing the possible benefits of the transversus abdominis plane Block (TAP) (16,17,18).

Conclusions: Paracetamol combined with NSAID’s are the basis for effective post cesarean section analgesia. However additional drugs/strategies are necessary, especially since acute postoperative pain is a predictor of persistent pain after C-section. Intrathecal morphine and dexamphetamine remain the cornerstone of effective post cesarean section analgesia. However these strategies are not without risks and side-effects.

With the TAP Block and incisional analgesia an opioid free analgesia technique becomes a distinct possibility.

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79 FAILED INTUBATION IN PREGNANCY: PROPHYLAXIS AND MANAGEMENT

Difficult or failed intubation following induction of general anesthesia for cesarean delivery remains the major contributory factor to anesthesia-related maternal complications.

Objectives: The purpose of this review is to define the difficult airway, highlight the main reasons for difficult or failed intubation, and propose a practical approach to management in Obstetrics.

Background: Although the use of general anesthesia has been declining in obstetric patients, it may still be required in selected cases. Because difficult intubation in obstetric anesthesia practice is frequently unexpected, careful and timely preanesthetic evaluation of all parturients should identify the majority of patients with difficult airway and avoid unexpected difficult airway. Failure to appropriately manage a difficult or failed intubation increases the risk of hypoxic cardiopulmonary arrest and/or pulmonary aspiration, resulting in a high probability of maternal morbidity and mortality. Possible difficult airway scenarios and their management are revised.

Conclusion: It is essential that all anesthesia care practitioners must have a preconceived and well thought-out algorithm and emergency airway equipment to deal with airway emergencies during difficult or failed intubation of a parturient. It is necessary also to develop adequate training skills in difficult airway management.

Objectives: The purpose of this review is to define the difficult airway, highlight the main reasons for difficult or failed intubation, and propose a practical approach to management in Obstetrics.

Methodology: This review article has used a search strategy starting with classic texts of Anesthesia, Obstetric Anesthesia and afterwards in an extended review of articles included in MEDLINE (years 1962-2011), basically using PubMed and Ovid-PubMed Access with the keywords (MeSH) intubation, intubation, intubation, endotracheal or endotracheal, laryngeal mask, airway management, failed intubation, prophylaxis, obstetrics, pregnancy, pregnant, gestation and anesthesia. Other databases included those of evidence based medicine were consulted, using the same thesaurus terms: Web of Knowledge, Uptodate, Clinical Evidence, Tripdatabase and the Cochrane Library Plus. For the web search we used the Google search engine.

After selecting the articles of apparent relevance we proceeded to obtain the full text for a discussion prior to its citation in the article. The key objective was to conduct a comprehensive and critical literature review that would draw up guidelines for action in prophylaxis and management of failed intubation in pregnancy.

Definitions:
The American Society of Anesthesiologists (A.S.A.) defines difficult airway as such situation where an experimented anesthesiologist had problems with tracheal intubation, facial mask ventilation or both.1,2

Difficult laryngoscopy is defined as the inability to visualize any portion of the vocal cords after multiple attempts at conventional laryngoscopy. Endotracheal intubation is considered difficult if it requires more than three attempts or takes longer than 10 minutes in the presence or absence of tracheal pathology. Failed intubation is considered when placement of the endotracheal tube fails after multiple intubation attempts.

However it has been proposed that a reasonably experienced anesthesiologist would be able to recognize a difficult intubation (laryngoscopy) from the first attempt, so the anesthesiologist could decide whether to call for assistance or to choose another approach for securing the airway without losing time.

Difficult mask ventilation means an inability to maintain oxygen saturation (SaO2) over 90% with an inspired oxygen concentration of 100% (O2) and positive-pressure ventilation. There are several specific grades, reproducible and progressive difficulty with mask ventilation:

1. Chin lift.
2. One person raising the jaw and sealing the mask on the face.
3. Insertion of oropharyngeal or nasopharyngeal tube.
4. Described in 2 and 3 jointly conducted
5. Two people raising the jaw with oropharyngeal or nasopharyngeal tube.
6. Impossible with the methods described.

If the anesthesiologist cannot provide adequate facemask ventilation, we should look for one or more of the following problems: inadequate mask seal, excessive gas leak, or excessive resistance to the ingress or egress of gas. Signs of inadequate face mask ventilation include (but are not limited to) absent or inadequate mask ventilation, absent or inadequate breath sounds, auscultatory signs of severe obstruction, cyanosis, gastric air entry or dilatation, decreasing or inadequate oxygen saturation (SpO2), absent or inadequate exhaled carbon dioxide, absent or inadequate spirometric measures of exhaled gas flow, and hemodynamic changes associated with hypoxemia or hypercarbia (e.g., hypertension, tachycardia, arrhythmia).

It should be remarkable that it is the failure in oxygenation and ventilation that causes a fatal outcome and not the inability to intubate per se. The degree of difficulty of intubation does not necessarily correspond to the difficulty in mask ventilation, but if it takes the latter, the consequences can be catastrophic. Thus, the ability to ventilate the patient effectively is of paramount importance.
Introduction: The difficult airway management in obstetric anesthesia has special considerations:

1. General points:
   - The use of general anesthesia has been reduced in Obstetrics in favor of regional spinal techniques, but it may still be required in selected cases, especially in emergent cesarean sections.

2. Incidence:
   - Difficult airway management happens in 1:283 pregnant patients, 8 to 10 times more frequent than in the general population, and it is also more difficult to evaluate. Others claim that this ratio must be much lower, as many critical intubations were reported to be only "difficult" and not definitively "failed". The reasons for the higher incidence of difficult airway in obstetric patients are not always evident.

   - Mask ventilation was found to be laborious or impossible in 0.02% of patients.

   - Studies on difficult airway management in pregnancy are not as frequent as in the general population, due to the need of extreme safety when applied to Obstetrics. A cross-sectional study of obstetric complications extracted from the Nationwide Inpatient Sample of the Health-care Cost and Utilization Project (years 1998 to 2005) revealed that the frequency of hospitalizations caused by at least one severe obstetric complication significantly increased from 0.64% in 1998-1999 to 0.81% in 2004-2005. This was due to an even more accentuated increase in caesarean sections on the expense of vaginal deliveries. Conversely, there was a decrease of more than 40% in rates of severe complications of anesthetica, including airway problems.

   - In 2011 the Eighth Report of the Confidential Enquiries into Maternal Deaths in the United Kingdom indicated that in the triennium 2006-2008, 261 women in the UK died directly or indirectly related to pregnancy. The overall maternal mortality rate was 11.39 per 100,000 maternities. Direct deaths decreased from 6.24 per 100,000 maternities in 2003-2005 to 4.67 per 100,000 maternities in 2006-2008. Mortality from anesthesia remains very low (0.31 per 100,000 maternities) and is still the seventh direct cause of maternal death. Two women died from failure to ventilate the lungs, four from postoperative complications and one from leucœnœphalitis. Two of the seven women were obese.

   - The anaesthetic specific recommendations of this report are:
     - The effective management of failed tracheal intubation is a core anaesthetic skill that should be rehearsed and assessed regularly.
     - The recognition and management of severe, acute illness in a pregnant woman requires multidisciplinary teamwork. An anaesthetist and/or critical-care specialist should be involved early.
     - Obstetric and gynaecology services, particularly those without an on-site critical-care unit, must have a defined local guideline to obtain rapid access to, and help from, critical-care specialists.

3. Airway anatomy changes during pregnancy:
   - The anatomy of the airway may be impacted by four mechanisms: pre-existing anatomical deformities, airway edema, coexisting diseases involving the airway, and obesity.
   - A resume is exposed in table 1 and key points in table 2.

<table>
<thead>
<tr>
<th>Changes affecting the airway during late pregnancy</th>
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<tr>
<td>Obesity, larger chest expansion (both, static and dynamic) and increased size of the breasts.</td>
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<tr>
<td>Airway edema.</td>
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<td>The mucosa is also more vulnerable and reacts to mechanical manipulations faster with further swallowing and bleeding.</td>
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<tr>
<td>Increased oxygen demand and reduced oxygen delivery.</td>
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<tr>
<td>Elevated intra-abdominal pressure, slower gastric emptying, decreased tones of the lower esophageal sphincter and presence of nausea.</td>
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<td>The gastric pH is lower in in no pregnant women</td>
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These changes (both physiological or patho-physiological) especially appear at end-stages, when a continuous evaluation of airway is mandatory: in example, it has been reported that the incidence of Class III airway Mallampati classification increased by 34% as pregnancy progressed.

   - These changes to airway management problems during late pregnancy. The physiological changes usually develop in a progressive way. The major obstacle to view or to recognize the glottis, as well as to pass an endotracheal tube. Laryngeal edema can obstacle to view or to pass a tracheal tube. Difficulty of general anesthesia is a consequence of this edema. In summary, the larynx may be viewed as a hostile environment during pregnancy.

   - Hypoxemia may ensue very rapidly. Hypoxemia may ensue very rapidly. Increased probability of vomiting in late pregnancy. Worst conditions in case of aspiration of gastric content.

   - The effective management of failed tracheal intubation is a core anaesthetic skill that should be rehearsed and assessed regularly.

   - The mucosa is also more vulnerable and reacts to mechanical manipulations faster with further swallowing and bleeding. The mucosa is also more vulnerable and reacts to mechanical manipulations faster with further swallowing and bleeding. Increased probability of vomiting in late pregnancy. Increased oxygen demand and reduced oxygen delivery. There is an increased oxygen demand due to higher maternal respiratory requirements combined with fetal metabolic oxygen consumption. There is also a reduced oxygen delivery induced by the elevation of the diaphragm, obesity, and a decreased expiratory reserve volume and functional residual capacity. We could see in 12% to 15% of parturients at term, the gravid uterus compression of the vena cava and aorta in the supine position, causing decreased venous return. Reduced intrathoracic pressure and increased intra-abdominal pressure may increase the risk of difficult intubation.

   - Maternal death. Two women died from failure to ventilate the lungs, four from postoperative complications and one from leucœnœphalitis. Two of the seven women were obese.

   - The anaesthetic specific recommendations of this report are:
     - The effective management of failed tracheal intubation is a core anaesthetic skill that should be rehearsed and assessed regularly.
     - The recognition and management of severe, acute illness in a pregnant woman requires multidisciplinary teamwork. An anaesthetist and/or critical-care specialist should be involved early.
     - Obstetric and gynaecology services, particularly those without an on-site critical-care unit, must have a defined local guideline to obtain rapid access to, and help from, critical-care specialists.

   - When managing the airway in pregnancy, the anaesthetist should be aware of the potential for significant obstetric complications and be prepared to manage them. Obstetric and gynaecology services, particularly those without an on-site critical-care unit, must have a defined local guideline to obtain rapid access to, and help from, critical-care specialists.

   - The mucosa is also more vulnerable and reacts to mechanical manipulations faster with further swallowing and bleeding. The mucosa is also more vulnerable and reacts to mechanical manipulations faster with further swallowing and bleeding. Increased probability of vomiting in late pregnancy. Increased oxygen demand and reduced oxygen delivery. There is an increased oxygen demand due to higher maternal respiratory requirements combined with fetal metabolic oxygen consumption. There is also a reduced oxygen delivery induced by the elevation of the diaphragm, obesity, and a decreased expiratory reserve volume and functional residual capacity. We could see in 12% to 15% of parturients at term, the gravid uterus compression of the vena cava and aorta in the supine position, causing decreased venous return. Reduced intrathoracic pressure and increased intra-abdominal pressure may increase the risk of difficult intubation.
return, cardiac output, blood pressure, and uterine blood flow. We must remember to avoid the complete supine position in parturients.

All of these changes give rise to ventilation/perfusion mismatches, there is also an early airway closure in the supine position (worsened by general anesthesia itself), so hypoxemia may ensue very rapidly in cases of failed intubation due to the reduction of the desaturation time after thorough pre-oxygenation from 9 to 3 min.

d. Increased probability of vomiting in late pregnancy. All parturients should be considered a “full stomach” patient. There are elevated intra-abdominal pressure, slower gastric emptying, decreased tonus of the lower esophageal sphincter and presence of nausea. The gastric pH is lower than in no pregnant women, so we could find worst conditions in case of aspiration of gastric content.

All of these negative circumstances contribute solely and in combination with each other to increase the risk and severity of hypoxic incidents and intra-partum or peri-partal morbidity and mortality.

4. Hypoxemia:

Hypoxemia is quickly established affecting both mother and fetus. The increased oxygen demand originates a brief time window in which the airway can be adequately secured before hypoxemia would occur. Even the knowledge of this time shortage may negatively influence the success of ongoing intubation efforts, by contributing to the stress of the intubating person. Any problem and risk posed by the airway affects not only the pregnant woman alone but also her unborn baby (or babies), thus having the potential to create a large-scale family tragedy.

5. Legal considerations:

Difficult airway is a major cause of mortality (7th) and legal conflicts (12% of claims). The ASA Closed Claims Database indicates a trend of increased safety in obstetric anesthesia. Comparing obstetric anesthesia claims for injuries from 1990 to 2003 with those found before 1990 shows that respiratory complications decreased from 1990 or later from 24 to 4%; claims related to inadequate oxygenation/ventilation or aspiration of gastric contents and esophageal intubation decreased in 1990 too. Considering this development, one may assume that there has been a significant improvement in airway management of obstetric anesthesia, mostly due to better monitoring of ventilation and gas exchange, better airway equipment and better training. However, due to the increasing rate of caesarean deliveries, which in turn also leads to more frequent employment of general anesthesia, still considerable attention has to be given to this issue, even more so because of the associated severity and preventability of airway complications.

6. Organization:

There are also problems in organization the anesthetic management of pregnant women: an undesired still great number of pregnant patients come to the Hospital without previous evaluation in the Anesthesia Consultation, and in many Hospitals there is only a single anesthesiologist on call to attend them.

Addressing the problem of failed intubation in pregnant women should be set on two fronts: first, adequate prophylaxis and secondly, when it fails the first point, to optimize the management and register in order to reduce the impact of critical event.

Prophylaxis:

Obviously the first thing to do is to increase the detection of patients with possible difficult airway management, preferably during a programmed pre-assessment. However, despite having a previous preparative study, we must assess the airway of pregnant women at admission and during childbirth and identify the factors predictive of difficult intubation, because circumstances can change and bring an unpleasant surprise.

A complete exploration of the airway require less than 2 minutes, and it is recommended, not only the Mallampati score (table 3).

The modified Mallampati test has been questioned in Obstetrics, as well as its isolated use in the general population, and also has no predictive value for difficult ventilation by facemask, a key aspect in managing the difficult airway. When compared with the upper lip bite test (ULBT), the discriminating power for both tests was low (0.60 for the ULBT [95% confidence interval, 0.57-0.63] and 0.66 [0.63-0.69]) for the Mallampati score, indicating that both tests are poor predictors as single screening tests. Khan et al. reported that ULBT showed significantly higher specificity and accuracy than the modified Mallampati test (P < 0.001), but comparisons of sensitivity, positive and negative predictive values, between the two tests, however, did not reveal any significant differences (P > 0.05).

The thyromental distance varies with the height of the mother, and this ratio is more predictive than the thyromental distance or Mallampati score.

However, these tests exposed in table 3 do not have the same predictive ability in the parturient as in the general population and do not predict the worst complication, the inability to ventilate with a facemask, or difficulties to place a laryngeal mask.
The presence of short neck, retrognathia, Mallampati III-IV and prominent maxillary incisors associated with a poorer laryngoscopy.

There have been studies that analyze multiple factors: Wilson et al. correlated 5 criteria of difficulty of laryngoscopy: weight, mobility of the neck, mobility of the mandible, retrognathia, and “buck tees,” protrusion of the upper incisors. In the presence or absence of each sign, they set up a score of difficult intubation (0 to 2 points). When the result was greater than 1, sensitivity was 0.75 and specificity of 0.88, but the predictive value remained below 0.214.

The presence of certain diseases or deformities involving the airway such as those outlined in table 4 can complicate even the management of the airway in a pregnant woman.

It has been reported by Rocke et al. in 1500 cases of prospective, elective and emergency intubations, two or more abnormal airway findings are needed for prediction of difficult intubation, with special emphasis in a neutral to extension sterno-mental distance of less than 5 cm, which was considerate a highly predictive sign of difficult intubation.

If we suspect the existence of difficult intubation, we must prepare the difficult airway equipment, ensure that it is complete and establish an initial plan for anesthetic management.

Despite the existence of multiple guidelines for action in a difficult airway in both obstetrics and general population, we should assess each individual case. Regional anesthesia should be considered if two or more risk factors are found, but it is very important to remember that an regional anesthesia could be no the definitive solution to a possible difficult airway management, because the block level may not be satisfactory (duration too short or even worse, too high), it could appear toxicity of local anesthetics, etc.…so there are practitioners who prefer to use a general anesthesia from the first time.

Anesthesiologists should be familiar with guidelines for difficult airway management such as the American Society of Anesthesiologists (ASA) Practice Guidelines for management of the difficult airway (figure 1), or the Difficult airway Society (figure 2), although almost every Society of Anesthesiology has its own protocols or even authors who had reviewed the question has proposed airway management protocols (e.g. Ezri et al. or Kuczkowski with guidelines specifically designed for Obstetrics, figures 3 and 4).

Supplement to the difficult airway management algorithm, with special reference to the presence or absence of fetal distress. This algorithm includes options in the management of a recognized difficult airway in an uncooperative patient or in a cooperative patient with dire fetal distress. *Denotes implications of this choice.

Biro et al. exposed that the really essential ingredients of a locally adopted failed intubation protocol are the following:

- Reduction of the failed intubation algorithm to a simple, linear (one-dimensional) stepwise decision making for the specific indication of the “unexpected difficult and failed tracheal intubation in a patient with an increased risk of hypoxemia and aspiration of gastric content, and therefore the necessity to secure the airway by tracheal intubation.”
- Inclusion of a limited number (three to four) of differing techniques into the algorithm that complement each other and cover the most likely scenarios.

[ASA difficult airway algorithm]

[Difficult intubation algorithm for C-section]
Ventilation  Facial masks (various sizes), oropharyngeal and nasopharyngeal cannulas (3 sizes of each)
Direct Laryngoscopy  Short handle laryngoscope (Dutta TM), McCoy laryngoscope, Macintosh and Miller blades, Supplemental batteries
Tubes and Guides for the tubes  At least 3-4 of assorted sizes, Endotracheal, Nasotracheal, Flexometallic, Trachlight, Esmann gum-elastic introducer, FROVA intubating introducers, Ventilating ETT exchangers, Magill pliers, Semirigid stylets
Supraglottic ventilation devices  Combitube, COPA, Laryngeal Mask airway (LMA) of assorted sizes, Fastrach, ProSeal, Supreme
Fiberoptic ventilator  Flexible fiberoptic intubation equipment
Retrograde intubation  Retrograde intubation equipment
Video assisted airway management (VAAM)  VAAM comprised video assisted intubation as well as video assisted laryngoscopy (VIL). While the latter is nearly self-explanating, video assisted intubation may be performed either with a video-optical stylet (VOS) or with a visualized endotracheal tube (VET).
Optical laryngoscope  Airtraq
Jet injector  Transtracheal jet ventilation equipment
Surgical tracheal access kits  Percutaneous or open surgical cricothyotomy and tracheostomy

[Material available for difficult airway management]

- Standardized teaching of the involved personnel of how to proceed according to the algorithm.
- Repeated, cyclic rehearsals of the failed intubation drill for the involved personnel.
- Institutionally organized quality control and post-hoc audit of cases that occurred in reality.
- And finally, fine tuning measures by implementing of results from the quality control audit on all levels of the failed intubation protocol.

We can have any imaginable material for managing the difficult airway (table 5) available but not be useful if we are not adequately trained in their use (table 6), e.g. some practitioners may have more experience with fiberoptic airway management than with establishing a well-functioning epidural.

• This table displays commonly cited techniques. It is not a comprehensive list. The order of presentation is alphabetical and does not imply preference for a given technique or sequence of use. Combinations of techniques may be employed. The techniques chosen by the practitioner in a particular case will depend upon specific needs, preferences, skills, and clinical constraints.

So, we remark the necessity of proper individualized preoperative assessment of every patient in order to decide according with our available equipment and personal experience the best anesthetic plan for this patient. And despite of this carefully preparation, it is possible we have to modify the initial plan, sometimes in an urgent and dramatic way, so alternatives should be considered always.

Another key point is the necessity for teamwork between anesthesiologist and obstetrician. The preanesthetic evaluation of all obstetric patients is not resolved in the majority of the Units. It is essential a smooth and continuous communication with obstetricians and nurses to further evaluation by the anesthesiologist in the admission of the patient in order to develop the action plan for high-risk patients and suspected of final cesarean section. Up to 87% of emergency cesarean sections can anticipate a regular and periodic assessment of patients admitted to a ward. The ACOG’s Committee Opinion n° 104 (American College of Obstetricians and Gynecologists) states that obstetricians should obtain an early consultation with an anesthesiologist in high-risk patients, particularly the morbidly obese or those with a potentially difficult airway, so that the anesthesiologist can properly prepare the patient for anesthesia. ACOG’s Committee Opinion recommends that strategies can be developed to minimize the need for emergency induction of general anesthesia in women for whom it would be hazardous 37.

It is recommended to administer prophylaxis of gastric aspiration to all pregnant patients in labor, something not shown to decrease the incidence of aspiration or improves prognosis but free of undesirable effects. The problem sometimes arises in patients newly admitted to hospital with periods of fasting not respected, or in patients who eat or drink without being authorized by the medical staff. Lately trends advocating return to natural birth may also worsened this situation because free intake of liquids and solids are allowed, and sometimes we get a patient in the hospital in poor condition (e.g. active bleeding, no fasting period, no preanesthetic assessment…) after complications arise in a home birth.

The incidence of aspiration in obstetrics ranges from 1/10,000 to 15/10,000 38, and it seems to be significantly higher in cesarean deliveries than with other obstetric procedures performed under anesthesia. In a retrospective study, a low incidence of aspiration in parturients requiring short peripartum procedures under general anesthesia without endotracheal intubation has been described 39.

All parturients should be considered a “full stomach” patient. Regurgitation of stomach contents into the oropharynx is more likely to occur when there is an increase in abdominal contents, slower gastric emptying, or decreased tonus of the gastroesophageal sphincter, all present during pregnancy. There is also elevated intra-abdominal pressure and presence of nausea. The gastric pH is lower than in no pregnant women, so we could find worst conditions in case of aspiration of gastric content. There is a group of factors in the pregnant woman that favors a higher propensity for regurgitation: physiological such as hormonal changes during pregnancy as increased gastrin secretin and progesterone and decreased secretion of motilin (responsible for the delay in gastric emptying), physical factors (decreased lower esophageal sphincter tone and increased intraabdominal pressures which are both worsened by the lithotomy position and the stress and pain of labor), and parenteral analgesics or induction and anesthesia during labor and delivery may delay gastric emptying and anesthetic agents (e.g. thiopental) relax the upper esophageal sphincter 40.

With mask ventilation, there is also a risk of distention of the stomach, and the inherent danger of aspiration of stomach contents. This is the reason advocated to avoid mask ventilation is avoided during induction of anesthesia in the obstetric patient. Gastric distention produced by poor mask ventilation and escape of anesthetic gases into the stomach further increase the intraabdominal pressure and hamper ventilation.

Sellick originally described the concept of cricoid pressure as a method to prevent passive regurgitation. A systematic review questions the technique’s effectiveness and we consider it optional during rapid sequence induction 41.

We can find three errors concerning the Sellick’s maneuver. First, cricoid pressure, be sure pressure with his hand is in the right place, particularly on the thyroid cartilage (Adam’s apple). If you are the single anesthesiologist you with the cricoid pressure, be sure pressure with his hand is in the right place. It is recommended to administer prophylaxis of gastric aspiration to all pregnant patients in labor, something not shown to decrease the incidence of aspiration or improves prognosis but free of undesirable effects. The problem sometimes arises in patients newly admitted to hospital with periods of fasting not respected, or in patients who eat or drink without being authorized by the medical staff. Lately trends advocating return to natural birth may also worsened this situation because free intake of liquids and solids are allowed, and sometimes we get a patient in the hospital in poor condition (e.g. active bleeding, no fasting period, no preanesthetic assessment…) after complications arise in a home birth.

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In practice an assistant maintains cricoid pressure, the anesthesiologist directs the application and duration of force being applied. When used, cricoid pressure is applied immediately following induction and maintained until adequate tube placement has been confirmed. This is
sometimes the third error in its application. Say specifically your assistant to maintain the pressure until you order to move his hand away. Sometimes Sellick's maneuver may reduce gastric insufflation during bag-mask ventilation, evidence that cricoid pressure reduces the incidence of aspiration. Brain death and brain death are not synonymous, and consists primarily of observational clinical studies and experimental data 41 so the effectiveness of cricoid pressure has been questioned 43, in as much as patients have died despite its application 44.

Several studies suggest it may contribute to airway obstruction and difficulty intubating in some cases 41, 45-47. A systematic review of cricoid pressure studies noted the following: case series and retrospective reviews describe both the success and failure of cricoid pressure to prevent aspiration, cricoid pressure is often used inconsistently and applied improperly in all airway management settings, cricoid pressure may impair the function of the lower esophageal sphincter and it is not free of undesirable effects because possible risks from cricoid pressure include movement of unstable cervical spine fractures and esophageal injury 41. So, until more definitive literature is published, the use of Sellick's maneuver during rapid sequence intubation and bag-mask ventilation has been suggested to be considered optional. However, the use of cricoid pressure in Obstetrics is deeply rooted, so its judicious use is included in most review articles.

Completing the section concerning the prophylaxis of failed intubation, some authors recommend the early use of epidural analgesia, even the ACOG's Committee Opinion n° 104 also indicates for those patients at risk for cesarean delivery, that consideration should be given to the planned placement of an epidural in early labor, with confirmation that the catheter is functional 37. We emphasize again that we must perform a comprehensive and individualized assessment for pregnant women, weighing the risk-benefit balance and remembering that regional analgesia or anesthesia does not mean that at any given time we have to induce general anesthesia.

Finally, possibly the best prophylaxis is to maintain adequate level of training in difficult airway management and review each case of difficult airway and the decisions that were made to continuously improve the organization and training in this situation.

The success in a difficult airway management scenario is often due to adequate anesthetic plan preparation after proper patient assessment, along with technical and nontechnical skills (advance, prioritization, authority and experience) of the anesthesiologist, factors that are in increasing consideration 48.

Management of difficult airway in obstetrics: Failure to intubate/ventilate is responsible for 30% of the overall anesthetic-related maternal mortality and death in the general surgical population 49. The increasing use of regional anesthesia for cesarean delivery has decreased the maternal death related to anesthesia (from 12.8 to 1.9 per one million live births in the United Kingdom 50, and from 4.3 per one million live births in 1979 to 1.7 per one million in 1988 to 1990 in the United States 51. Most deaths were attributed to airway management difficulties. The current overall maternal mortality rate is approximately 9.2 per 100,000 live births 52, 53. Today, failed intubation is the most common cause of anesthesia related maternal mortality occurring during cesarean deliveries 54.

We could see several situations, the planned difficult airway management scenario, the unplanned one, and within the last several scenarios. The recommendations are based on the different societies and guides (many of them have been extrapolated from the recommended actions in the non-obstetric surgical population). In all of this scenarios we should take the following precautions: a secure intravenous line, prophylaxis of pulmonary aspiration in time if possible, displace the uterus to the left to avoid aortocaval compression, have the difficult airway equipment ready, denitrogenation and adequate preoxygenation (especially important) and have help (another anesthesiologist or a specific assistant only for the anesthesiologist). Just prior to induction, 100 percent oxygen should be administered by face mask to denitrogenate the maternal lungs. Preoxygenation for three to five minutes establishes an oxygen reserve prior to the expected apneic interval that accompanies anesthetic induction and tracheal intubation. If there is insufficient time to accomplish this, an alternative is to administer 100 percent oxygen for four vital capacity breaths. This is important because of the reduced functional residual capacity of pregnant women.

1. Patient with known or suspected airway problems before not urgent cesarean delivery:
   Regional anesthesia is indicated if surgery is not urgent and there is not contraindication to a spinal technique. In the case of patient refusal or if regional anesthesia is not indicated, awaken fiberoptic intubation may be an option. Risks and benefits should be thoroughly explained to the patient, and she should be strongly encouraged to accept regional anesthesia if the only if the only reason for avoiding a regional anesthesia is the refusal of the patient. Spinal anesthesia is preferred over epidural anesthesia because of its faster onset, higher success rate and lower risk of total spinal anesthesia and local anesthetic toxic reaction, owing to administration of a smaller dose of drug. An experienced anesthesiologist may succeed in performing spinal anesthesia. If we there is failure of the spinal technique it should be considered to increase the total dose of local anesthetic or even perform a new regional technique to supplement the dose if possible, such as a combined spinal–epidural approach. If general anesthesia is chosen in the case of failure of regional anesthesia, a comprehensive plan of action and adequate equipment should be ready.

2. Patient with apparent normal airway before not urgent cesarean delivery:
   The more important and challenging scenario is the unexpected difficult intubation, which is recognized by the anesthetist during the first attempt to obtain a sufficient direct laryngoscopic view of the glottis entrance. One has to be prepared to face all situations during night shifts and often in remote locations, and therefore in many cases, there is a reduced ability to provide extended personnel and instrumental resources.

When unexpected difficult intubation is encountered during induction of anesthesia, the patient should be awakened (if there is no indication for an emergency operation) and surgery performed under regional anesthesia. It is essential to try to maintain oxygenation by mask ventilation between intubation attempts. However, with every intubation attempt, the amount of laryngeal edema and bleeding likely will increase 55. Therefore, if there is no new attraumatic manipulation that can be tried quickly (e.g., better sniffing position, application of external laryngeal pressure, new laryngoscope blade, new technique, more n laryngoscopist and ventilation by mask is still possible, it is prudent to cease attempts to intubate the trachea and either awaken the patient, perform a regional anesthesia, or perform the fiberoptic intubation of the trachea in the case of patient refusal or if regional anesthesia is contraindicated.

3. Patient who cannot be intubated but can be ventilated by mask with no fetal distress:
   In this scenario we can apply the same procedure protocol that above. Maintain facial mask ventilation, and regional anesthesia or awake fiberoptic intubation. Local infiltration anesthesia has also been used, but it is unusual in Europe.

During positive-pressure mask ventilation some authors considered that maintenance of cricoid pressure is mandatory 55. After awakening the patient, it also should be kept in mind the establishment of a surgical airway as an acceptable alternative, because emergence may be accompanied by progressive difficulty with adequate mask ventilation (e.g., secondary to increased secretions, edema, or airway reactivity). It is very apparent from the ASA Closed-Claim Study that death following failed intubation can be due to subsequent failure to effectively ventilate the patient by facemask 56.

4. Patient who cannot be intubated but who can be ventilated by mask with fetal distress present:
   This is a very bad scenario for an anesthesiologist. In the presence of fetal distress, management decisions are more problematic. If the patient is awaken in a conservative yet difficult decision will probably preserve the mother's life, but may result in the demise of the fetus. If we perform a tracheostomy or cricothyrotomy the ability to ventilate the lungs via a mask is lost. The third option is to continue anesthesia via mask ventilation while an assistant maintains cricoid pressure. The fourth option is to use a laryngeal mask airway (LMA) because the device frees the anesthetist's hands (but not provide effective protection from aspiration). However, the hazards of failure (carbon dioxide retention and subsequent maternal desaturation must be carefully considered, because the placement of an LMA in the obstetric patient who can be ventilated via conventional mask while cricoid pressure is being continuously applied would have little benefit and might induce vomiting and aspiration 57-60.

To avoid incorrect placement of the LMA cricoid pressure could be momentarily release as the distal tip of LMA reaches the hypopharynx 61. This action maximizes the chance of correct LMA insertion while
minimizing risk of aspiration. Once the LMA is in situ, it probably does not interfere with the efficacy of cricoid pressure 62.

Finally, the laryngeal mask airway could be used as an intubating conduit. The LMA has a perfect central position only in 45% to 60% of the time. A blind attempt to intubate through an LMA may be unsuccessful and even harmful, resulting in periglottic trauma especially in the presence of cricoid pressure. When blind tracheal intubation was attempted through the LMA in a series of patients thought to have normal anatomy, there was a 26% to 97% failure rate on the first attempt and a 10% to 79% overall failure rate with an ETT, and there was an 18% to 70% overall failure rate with the intubating stilette 35.

The use of cricoid pressure further decreases the chance of passing an ETT blindly through the LMA into the trachea for two reasons. First, when cricoid pressure is applied before the LMA is placed, the pressure prevents the tip of the LMA from fully occupying the 3.5-cm length of the hypopharynx behind both the arytenoid and cricoid cartilages. Thus, with cricoid pressure, the LMA may be wedged in the hypopharynx, but it can only occupy the 1.5 cm of the hypopharynx behind the arytenoid cartilages and is therefore 2 cm more proximal than usual. Variable obstruction to the passage of the LMA by cricoid pressure may explain why the concomitant use of cricoid pressure has resulted in widely variable success in simply inserting the LMA from a low of 15% to a high of 85% to 90%.

Conversely, passage of a fiberoptic bronchoscope through the LMA has a much greater chance of success and is nearly 100% successful in most series 35. If the LMA fails, an emergency pathway with the Combitube, transtracheal jet ventilation, and a surgical airway are the reasonable, but surely, if the obstetrician is an experienced one, the short duration of a cesarean section will make unnecessary to reach this point.

5. Patient who cannot be intubated, cannot be ventilated by mask with fetal distress present:

This is clearly the worst possible scenario, a critical situation despite of an optimist would say “could be worse, the patient could vomit.”

In these cases we must act extremely quickly and perform a surgical approach to the trachea, either through an intravenous catheter for transtracheal jet ventilation or through an emergency cricotomy. The objective is to maintain oxygenation anyway whereas the obstetrician made the cesarean section. If vomiting is present, we could try to isolate the trachea with the insertion of an endotracheal tube with the cuff inflated in the esophagus.

6. Utility of other devices:

Finally, although the LMA has acquired a relevant situation in the guidelines of difficult airway management, the introduction of the video optical devices is increasing.

These new class of devices can be summarized under the term video assisted airway management. This comprised video assisted intubation as well as video assisted laryngoscopy (VIL). While the latter is nearly self-evident, video assisted intubation may be performed either with a video-optical stilet (VOIS) or with a visualized endotracheal tube (VET). Video assisted intubation and laryngoscopy has a series of advantages: easy handling analogue to conventional intubation technique (lower psychological threshold), fast familiarization with the technique and fast learning, long range of the device providing sufficient distance to the video monitor, fast assembling, easy sterilization (no working channel), simple reestablishing after use, and relatively inexpensive fiberoptic. The shortages of these techniques are: use in anesthetized patients only (not suitable for awake application), no inbuilt steering capability of the fiberoptic, inappropriateness for nasotracheal intubation (VOIS only), the endotracheal view is sometimes not sufficient, no working channel (suction of secretions or oxygen insufflation not available).

We must finally address the issue of what is the most suitable neuromuscular blocking agent for intubation in an obstetric patient with suspected difficult airway.

The regimen of thiopental, succinylcholine and unsupplemented nitrous oxide/oxygen for cesarean section was first introduced 50 years ago. New drugs are now available. Sugammadex, a modified gamma-cyclolecinatin capable of rapid reversal of profound rocuronium neuromuscular blockade has introduced the possibility that succinylcholine might be replaced with a high dose rocuronium-sugammadex combination. In such situation, we could use succinylcholine (1 mg.kg-1), rocuronium (1.2 mg.kg.-1) or apply the timing or priming principles 63.

After a usual intubating dose of succinylcholine (1 mg.kg-1), in a patient with normal plasma cholinesterases, it is expected to observe a neuromuscular block lasting for 5-11 min (with 3-7 min of maximum block). When neuromuscular blockade last 10 to 30 min, a plasma cholinesterase deficit or an atypical enzyme in a heterozygous patient must be suspected, and in a patient with homozygous atypical enzyme the block will last up to 200 min, with up to 90 minutes of maximum block 64.

The appearance of a phase II block could be an unforeseen event that even complicate the situation. Prolonged apnoea and phase II block, two rare events, are more frequent to appear after repeated doses of succinylcholine (i.e. in a difficult airway scenario) or with continuous infusion, rather than after a single bolus dose 65, although both had been described after only 20 mg in a patient with low serum cholinesterase (1900 u. L-1) 66. So, the routine use of neuromuscular monitoring is advocated in all patients 67, 68.

There are hardly any references to the use of sugammadex in obstetrics 69-72 and no referentes about the emergency use of rocuronium in the pregnant woman to reverse rocuronium induced neuromuscular blockade after a failed intubation 73-76.

Summary: Difficult or failed intubation following induction of general anesthesia for cesarean delivery remains the major contributory factor to anesthesia-related maternal complications. Although the use of general anesthesia has been declining in obstetric patients, it may still be required in selected cases. Because difficult intubation in obstetric anesthesia practice is frequently unexpected, careful and timely preanesthetic evaluation of all parturients should identify the majority of patients with difficult airway and avoid unexpected difficult airway. Failure to appropriately manage a difficult or failed intubation increases the risk of hypoxemic cardiopulmonary arrest and/or pulmonary aspiration, resulting in a high probability of maternal morbidity and mortality. It is essential that all anesthesia care practitioners must have a preconceived and well thought-out algorithm and emergency airway equipment to deal with airway emergencies during difficult or failed intubation of a parturient. It is necessary also to develop adequate training skills in difficult airway management.

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80 POST-DURAL PUNCTURE HEADACHE: IS THERE ANYTHING NEW?

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Post-dural puncture headache (PDPH) is a well-known complication of intended dural puncture (anesthesia, diagnostic), catheterization (anesthesia, neurosurgery, pain therapy, oncology) or inadvertent dural puncture (epidural anesthesia, surgical). While anesthesiologists have anticipated this problem by using needles of smaller size and special design and radiologists have abandoned myelography, neurologists still have continued to use large bore Quincke needles.

Although the symptoms, preventive and treatment options are known for many years, some aspects may deserve special attention. Despite a tremendous amount of reports and reviews, the present contribution will mainly focus upon publications of the last five years while others will not be older than 10 years.

Symptomatology and diagnosis

The first event may be the free flow or aspiration of cerebrospinal fluid (CSF) though sometimes unrecognized. A high or total spinal may be another indication for a possible unintended intrathecal intention or communication between the extradural and subarachnoid space. In case of headache, the classical complaints include frontal-parietal headache in the first place but also neck pain, backache, nausea, vomiting, photophobia, diplopia (N. Abducens paresis), scotoma and tinnitus and other auditory disturbances (sometimes the sole finding without patient’s notice). However when left untreated more serious complications have been described such as seizures, temporary blindness, posterior reversible encephalopathy syndrome, cortical vein thrombosis and subdural hematoma / hygroma (due to traction upon intracranial veins) and paralysis of nerves V and VII (1-4).

When performing a blood patch, free flow or aspiration of CSF following the loss of resistance may evidence leakage provided that it has not been caused by a new tap. Imaging techniques such as MRI of the puncture site or intracranial structures are of rather poor value and even misleading in helping in the diagnostics of CSF leakage.

Differential diagnosis

Not infrequently different etiologies have been mistaken for PDPH. PDPH may be confused with headache resulting from caffeine withdrawal, pre-eclampsia, menigitis, intracranial space occupying lesion (tumor or bleeding), cortical or venous sinus thrombosis, pneumoccephalus, migraine, tension headache (5). Ondansetron seems to possibly cause headache mimicking PDPH. Due to this the anesthesiologist should be very critical when asked to perform an epidural blood patch (EBP). Especially when after a first EBP the headache persists a careful reappraisal should be performed before jumping into a second trial.

Prevention of PDPH

Besides a change in needle design (and less convincible the direction of the orifice) for spinal anesthesia no further precautions should be undertaken because the incidence of PDPH after such a procedure should be less than 1%. However when an unintentional tap has been performed with an epidural needle, the incidence may increase to more than 50%, more particularly in obstetric patients being very vulnerable for PDPH after delivery. Theories exist to prevent either the tap itself or the occurrence of PDPH. A loss of resistance to saline (LORS) may at least prevent the early type headache possible when air would enter the subarachnoid space by an accidental tap. Others have found that LORS may cause less accidental taps than air, the possible when air would enter the subarachnoid space by an accidental tap. Large retrospective studies have been able to demonstrate that Combined Spinal Epidural techniques may be less likely to cause a dural tap (6).

It is still a common belief that the needle bevel may play a role more for the epidural than the actual spinal needles while also a specific Jonas Quincke needles.
PDPH. Whereas the supine position may exacerbate the complaints, it has been even suggested to resume this position as soon as possible (provided PDPH is not too severe) to allow the dura to fit better against the bony structures of the spinal canal reducing CSF leakage.

To prevent the occurrence of headache itself several possibilities have been suggested including a prophylactic blood patch or placement of an intrathecal catheter for at least 24 hours. The present author does not have experience with prophylactic patches. A randomized study (not very easy to conduct) demonstrated that a prophylactic patch was not effective in reducing PDPH or the need for EBP except for a somewhat shorter duration of the headache (7). Although recently it has been shown that nevertheless a prophylactic patch may be better than conservative or no treatment (8,9) it should be emphasized that performing them via the epidural catheter with orifices (not all of them will remain opened) located above the dural hole (considering that a second epidural will mostly be done one or more interspaces more cephalad) is not a good idea.

Placing the catheter intrathecally and leaving it in place for at least 24 hours has been considered for quite some time to be the best option to prevent the later occurrence of PDPH or at least to lessen the need for an EBP (10,11). However recent similar studies were unable to confirm this when proceeding to continuous spinal anesthesia (CSA). During the last decade several local (12,13) and nationwide surveys (14-20) have been published to examine the incidences of accidental taps and PDPH and which strategies are followed subsequent on these events. Despite some increase still many colleagues prefer to place the epidural ad an interspace. In the most recent German survey less than 3% proceeded with continuous spinal anesthesia. Anesthetists should take into consideration that a new tap may be performed while epidurally injected substances may tend to spread more cephalad either by subarachnoid migration or dilution by leaking CSF. So, even if the incidence of PDPH may not decrease with conversion to a CSA technique, this is no reason to reject the latter option. Some concern has been raised with respect to the possible damage caused by introducing epidural catheters intrathecally. Finally it is unclear whether medication such as corticosteroids, neurectal opioids, epidural postoperative analgesia or intrathecal saline are really useful as prophylactic measures against the development of PDPH (21,22).

Also avoiding to mother to push during the second stage of labor (in favor of forceps or vacuum extraction) or reducing the duration of this stage has been shown to be less successful in reducing PDPH than previously suggested (15).

The treatment of PDPH.

Although most handbooks recommend to start with hydration, caffeine, symptomatic drugs (opioids, NSAIDS, weak muscle relaxants, theophylline...) some cases may not allow a rather long interval of conservative treatment with this treatment hoping that symptoms will resolve that way. Whereas conservative treatment may treat PDPH induced with small spinal needle may be less realistic or believe that said treatment in an obstetric population might be able to cure PDPH. Especially mideswives insist on quite rapid performance of an EBP to allow mothers remain mobile to take care of their neonate and allow discharge no later than uncomplicated cases. As a consequence the interval between the initial complaints (with subsequent conservative treatment) and an EBP is around 24 hours and preferably no longer than 48 hours. The EBP remains the most aggressive but most successful treatment option with a higher success rate than epidural injection of saline, dextran or tissue glue. Other newer modalities consist of systemic medication with variable success (hydrocortisone, ACTH, sumatriptan, troproctol, cosyntropin, mirtazapine, gabapentin...), acupuncture and even stellate-, sphenopalatine ganglion blocks and occipital nerve blocks (23-25).

The Epidural Blood Patch

Although the idea may seem attractive to perform the LOR technique to air (to make the distinction easier between recurring saline or CSF) the risk of pneumocephalus may make the treatment worse than the disease (26). The epidural injection of autologous blood has a high success rate although less than initially reported. Although sealing the hole by a clot may seem to explain the resolution of the headache, it does not explain the almost instantaneous relief of symptoms because the restoration of CSF required several hours. Therefore sealing of the dural hole may consolidate the final success, the immediate effect will be caused by the increase of the ICP as a consequence of the epidural injection of the blood. Most of the blood will spread cephalad over at least 4-5 dermatomes while a considerable amount will flow back subcutaneously along the needle track. It is desirable to inject the blood as close as possible to the hole provided that it is clear where the puncture has been done or which of the punctures might have caused the tap. Although a volume of 15-20ml seems optimal, some cases have been reported with volumes largely exceeding 30ml while other reviews reported median volumes of only 10ml (20). The injection should be stopped when the patients complains of low back cramping pain, pain in the legs or the head but there is a risk that this may occur at lower volumes than those recommended. Especially patients with mostly unknown spinal stenosis with a risk of mechanical compression of neural structures may be more likely to support smaller volumes than recommended. When the tap has been subsequent upon a difficult puncture, there is a considerable risk that a new tap may occur. However morbidity obese patients seem to be less at risk for PDPH when, in the author's experience, patients with previous spine interventions may also be less likely to develop PDPH probably due to the scar tissue preventing CSF to leak in the fibrotic epidural space. There is still some concern with respect to patients suffering chronic pain or muscle spasm and treated with intrathecal drugs following which CSF may leak subsequent upon a catheter through needle placement.

Recently fluoroscopically (contrast medium diluted in the blood) ultrasound (ocular sonography) and CT/MRI guided (unfortunately not real-time) performance of EBP has been reported particularly when a first EBP has failed to resolve the symptoms (27-30). Despite overall reported safety of an EBP some complications should be considered. Reported untoward effects, especially after extremely large or repeated patches, have been bradycardia, backache, abscession, pneumocephalus, cranial nerve V & VII paralysis, exacerbation of symptoms, arachnoiditis, radiculopathy; a new tap, intrathecal injection of blood (31-35). Although there has been some fear that subsequent epidurals might fail either because of the CSF leak or the injected blood, this does not seem to preclude a high success rate.

Some challenging problems

Cervical taps

In chronic neck pain epidural injection of corticosteroids may offer some relief of the symptoms. Some spontaneous leaks have been reported as well. The CSF pressure upon a cervical hole may be less than at the lumbar level but sometimes an EBP may be mandatory. Success has been reported with EBP at the lumbar level although permanent relief of PDPH seems hardly to explain by a sealing mechanism as it does not seem realistic to believe that the blood will spread that far (36,37).

The infected patient

HIV positive subjects may receive an EBP while also a first trial with dextran may be suggested (38) rather than the injection of allogeneic blood as reported in patients with other systemic infections and fever (39,40). In case of fever untreated with antibiotics and local infection the EBP should be refused.

The child with PDPH

Although it occurs less frequently and is more difficult to diagnose than in the middle age population, cases of PDPH have been reported following punctures, permanent catheters and taps in children. Other symptoms without PDPH such as nausea and vomiting may suggest CSF leakage. Epidural blood patch may be performed by the caudal route (41). No recommendations exist with respect to the volumes of blood to be injected.

The persisting headache

Despite EBP not all patients will be cured definitely. At least 25-30% may have only partial relief while less than 20% will not report any benefit (12-14). Most of the failures were observed in the obstetric population requiring a second patch. The success rate of a second patch is mostly not higher than 50%. A question for a third patch should be handled with even larger suspicion. Therefore the questions arise about optimal timing of EBP (too early in OB ?) and the indications for a new patch. Also the interval between two patches may be subject of debate based upon described complications related to the total volume of blood and/or number of patches. A careful and critical appraisal is mandatory before such a patch should be performed and at least 24h should relapse between the first and second patch. When in doubt, an 'objective' neurological consult should be asked for while also a CT or MRI may be desirable to rule out other possibilities. Only when a persistent leak may be evidenced by imaging techniques, surgical repair may be considered.

As long as the complaints are less prominent than before the patch it may be evaluated as to whether the symptoms decrease with time. When the patient can assume the erect posture for at least 15 minutes, a new EBP should not be considered.

E114

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There is a lack of reports of patients suffering headache consistent with PDPH but lasting several months before an EBP had been offered. Occasional and partial successes have been reported with such patches performed up to seven years after the causal (?) event (42).

**Formal complaints and litigation**

As most of the formal complaints seem to be related to non-compliance with existing protocols, brutality of the anesthesiologist, delayed return to home or daily activity, it may be recommendable that hospitals should organize audits, make algorithms and protocols while anesthesiologist should remain friendly at all times a complaint might result from their intervention.

**References:**

ALTERNATIVES TO REGIONAL ANESTHESIA FOR LABOR PAIN RELIEF


Anesthesiologists routinely use neuraxial analgesia techniques for labor pain relief. Objectives: However we should offer a fully integral treatment for labor pain relief without forgetting that there are special circumstances where these techniques are contraindicated (or the patient does not desire them).

Background: We should offer other alternatives for labor pain relief, especially pharmacological ones, since our high level training in the use of drugs including opioids (and their complications) makes us ideally suited for this. It is particularly remarkable the possibility of using remifentanil patient controlled analgesia (with respiratory monitoring). Finally we must not forget the psychological aspect of labor, and we should facilitate and recommend the use of no pharmacological alternatives (combined or used sequentially to enhance their total effect), especially those related to be free of adverse effects. Women tend to rate no pharmacologic interventions highly in terms of satisfaction possibly due to these techniques help women to maintain or restore a sense of personal control over the birth process, and a desire to repeat them in a future labor, even though their pain-relieving capability is modest or short-lived and many of them have not been proven in randomized controlled trials.

Different possibilities of both pharmacological and no pharmacological approaches to labor pain relief and their efficacy are reviewed in this article. Conclusion: Although our main objective is to eliminate the pain of childbirth, we should apply a multifactorial approach to improve the suffering of the pregnant woman.

Objectives: To offer a fully integral treatment for labor pain relief without forgetting that there are special circumstances where neuraxial analgesia techniques are contraindicated (or the patient does not desire them).

Methodology: This review article has used a search strategy starting with classic texts of Anesthesia, Obstetric Anesthesia and afterwards in an extended review of articles included in MEDLINE (years 1962-2011), basically using PubMed and Ovid-PubMed Access with the keywords (MeSH) cesarean section, labor pain, labor obstetric, labor stage, maternal mortality, obstetrical anesthesia, regional anesthesia, obstetrics, pregnancy, pregnant, gestation and anesthesia. Other databases included those of evidence based medicine were consulted, using the same thesaurus terms: Web of Knowledge, Uptodate, Clinical Evidence, Tripdatabase and the Cochrane Library Plus. For the web search we used the Google search engine.

After selecting the articles of apparent relevance we proceeded to obtain the full text for a discussion prior to its citation in the article. The key objective was to conduct a comprehensive and critical literature review that would draw up guidelines for action in alternatives to regional Anesthesia for labor pain relief in pregnancy.

Introduction: The pain of childbirth is described in pain management books as one of the most severe pain that a woman experiences during her lifetime. Many women, especially nulliparous, rate the pain of labor as very severe or intolerable.1,2

The pain of labor and delivery is experienced as a reflection of the individual’s emotional, motivational, cognitive, social, and cultural circumstances so it varies among women, and each labor of an individual woman may be quite different.3

The pain of childbirth can be perceived increased in primiparous (especially if older age), history of dysmenorrhea, low socioeconomic status, increased body mass index, greater height or dystocia. On the other hand, multiparous, older age, night deliveries, antenatal preparation, desired pregnancy, the possibility of a companion during labor and high socioeconomic status are possibly going to have a lower perception of pain.

The approach of pain during labor and birth can be made from two different therapeutic approaches, pharmacological (such as neuraxial blocks, peripheral blocks, administration of intravenous analgesia, use of inhaled medications) and no pharmacological (such as relaxation techniques and psychological techniques).4,5

Despite of the selected technique of pain relief, the ideal analgesic has to meet several prerequisites:

- Security for the mother and fetus
- Pain relief in an efficient and controllable way
- Do not interfere with the normal birth

The pain of labor has two stages of presentation and one trans-stage phase. The first stage presentation corresponds to the onset of contractions, and involves cervix, uterine body, lower uterine segment, ovaries and Fallopian tubes. The nerve fibers responsible for the initial phase of first stage enters the spinal cord after traversing the T10, T11, T12, and L1 white rami communicantes. This is a visceral, dull, diffuse pain. It is produced by uterine contractions, distention of uterine and cervical mechanoreceptors and by ischemia of uterine and cervical tissues. There is an offset from the beginning of uterine contractions and an onset of more pronounced pain perception in the early phase of birth, with clinical manifestations when intruterine pressures exceed 25 mmHg. In the initial phase of the first stage, the pain persists for 45% of the time of uterine contractions and in later stages of this occupies 60% of the contraction period.

Two types of pain are added at the end of stage 1: the secondary visceral pain due to distension of the pelvic organs) and deep somatic pain (originated by lumbosacral plexus compression), so it is frequent that labor pain can be also referred to the abdominal wall, lumbosacral region, iliac crests, gluteal areas, and thighs, in addition to the uterus.

The second stage of labor has a superficial somatic acute, localized pain, with regular distribution due to fetal descent and strain produced in the vagina and perineum. The involved area of innervation corresponds to the pudendal nerves from S2 to S4. Somatic pain from distention of the vagina, perineum, and pelvic floor and stretching of the pelvic ligaments is the hallmark of the second stage of labor. Second stage pain is more severe than first stage pain and is characterized by a combination of visceral pain from uterine contractions and cervical stretching and somatic pain from distention of vaginal and perineal tissues. In addition, the parturient experiences rectal pressure and an urge to “bear down” and expel the fetus as the presenting part descends into the pelvic outlet.

The trans-stage phase (or transition) refers to the shift from the late first stage (7 to 10 cm cervical dilation) to the second stage of labor. Involves segments from L2 to S1 and refers pain reflecting the stretching of the ligaments, fascia, pelvic muscles and compression of the lumbosacral plexus. Transition is associated with greater nociceptive input as the parturient begins to experience somatic pain from vaginal distention.

Techniques of labor pain relief: We can divide approaches to management of labor pain in pharmacological and no pharmacological (table 1). The target of pharmacologic approaches is the elimination of the physical sensation of labor pain, whereas no pharmacologic approaches are largely directed toward prevention of suffering.
Pharmacological
- Neuraxial blocks
- Epidural / Spinal
- Combines spinal-epidural
- Peripheral blocks
- Paracervical / Pudendal
- Inhaled drugs
- Nitrous oxide / Halogenated agents
- Intravenous analgesia
- Opioids / No opioids

No pharmacological
- Relaxation techniques
- Birth environment / Continuous labor support / Water immersion
- Maternal movement and positioning / Touch and massage
- Acupuncture and acupressure (shiatra) / Breathing techniques
- Music and audioolgansis
- Aromatherapy
- Psychological techniques
- Hypnosis
- Mechanical techniques
- Transcutaneous electrical nerve stimulation / Application of heat and cold / Swiss ball

[Approaches to management of labor pain]

1. Pharmacological approaches:
   a. Regional techniques (epidural, spinal):
   Neuraxial techniques provide unparalleled pain relief in labor with a minimum of maternal and neonatal side effects. The drugs are administered into a specific region, the lower neuraxis, to interrupt pain pathways, thereby producing pain relief. Relatively small doses are needed because the agents exert their effects locally, thus systemic drug concentrations are low. The analgesics may be administered via epidural, spinal, or a combination of both routes.
   b. Peripheral block:
   Sometimes, neuraxial blocks are contraindicated (table 2) or failed, so we must offer alternatives for labor pain relief.

Absolute
- Patient refusal / Spinal at the site of injection / Hypoesthesia / Conguapathy
- Indeterminate neurologic disease / Increased intracranial pressure

Relative
- Infection distinct from the site of injection / Unknown duration of surgery

[Contraindications to regional analgesia]

A peripheral block can then be performed such as paracervical block for the first stage of labor and bilateral blockade of the pudendal nerves for delivery. Local nerve blocks have several advantages: they are easily learned and simple to perform; when used in obstetrical patients, they do not appear to significantly interfere with the physiologic progression of labor. These blocks are generally safe for the woman and fetus, as long as the anesthetic is not injected intravascular and excessive doses are not administered, although are not devoid of side effects for both mother and fetus.

The patient’s obstetrician or gynecologist, rather than an anesthesiologist typically administers pudendal and paracervical blocks.

Uterine contractions are the main source of pain during the first stage of labor. Paracervical infiltration of a local anesthetic interrupts the visceral sensory fibers of the lower uterus, cervix, and upper vagina (T10-L1) as they pass through the uterovaginal plexus (Frankenhauser’s plexus) on each side of the cervix, but does not affect the motor pathways, so, progression of labor should and legs (the parturient can ambulate during labor) are not significantly affected. Paracervical block should be performed only in the first half of the first stage of labor when the cervical dilatation is 5 cm in primiparous patients and 4 cm in nulliparous, and at intervals of not less than one hour. After 8 cm dilatation, the procedure is more difficult to perform, less effective, and has a higher risk of inducing fetal bradycardia.

The paracervical block was widely used (58% of deliveries) in 1960-1970, but post-block fetal bradycardia (15 - 55%) was a potential side effect of this technique. So paracervical block became unpopular while expanding widely available epidural analgesia. The onset of analgesia is rapid (2 to 5 min, the duration depends upon the specific local anesthetic used and the block can be repeated during labor. It is important to avoid overdosing and possible cumulative effect of repeat administrations, especially with amide-type analgesics: meperidine 1% (analgesia lasted 60-90 min, maximum dose 4 mg.kg⁻¹), bupivacaine 0.25% (120-150 min, maximum 1 mg.kg⁻¹), lidocaine 1% (40 min, maximum 4 mg.kg⁻¹) or ropivacaine 0.75% (120-360 min, maximum 2.5 mg.kg⁻¹). Analgesia has been reported as good to excellent in 75% of parturient but when compared with single-shot spinal analgesia there was less satisfaction in the paracervical block group. The explanation could be that Frankenhauser’s plexus (blocked in this type of block) does not contain all of the sensory innervation of the uterus.

Technique: The parturient is placed in the lithotomy position and the perineum is prepped with a povidone iodine or chlorhexidine solution. The clinician’s right hand is used to position the needle guide when injecting the maternal right side. Two fingers interposed between the cervix or fetal head and the needle guide are used to direct the tip of the guide into the lateral vaginal fornix. The direction of the needle should be slightly lateral to the cervix and fetal head to avoid puncturing the fetus.

In the transvaginal route the anesthetic solution is injected at the base of the broad ligament along the lateral vaginal fornices at the junction of the cervix with the vaginal mucosa, no more than 5 mm beyond the tip of the guide although it is recommended no more than 2-3 mm of injection depth in order to decrease the risk of complications.

Once aspiration shows that local anesthetics are not injected intravascular, 1 mL anesthetic solution is administered slowly into the vaginal submucosa, and after waiting for 2-3 min without evidence of adverse effects, 5 mL are administered or a catheter for infusion is placed for blocking the Frankenhauser ganglion, which contains visceral sensory fibers from the cervix and upper vagina. After waiting three minutes, the same procedure is performed on the left side, but the clinician’s left hand is used for positioning the needle guide. The possibility of placing two catheters on both sides of the paracervical space allows a continuous block until full dilation of the cervix, using fewer doses of anesthetic.

It is safer to inject the anesthetic at 4 and 8 o’clock, rather than at 3 and 9 o’clock, because the latter sites are more vascular.

Complications associated with this type of lock are: fetal bradycardia, with systemic toxicity after intravascular injection, allergic reactions, lower extremity paralysis (7%) neureitis of the sciatic nerve block, parametral or vaginal/broad ligament hematoma, vaginal syndrome, infection (0.4%) and puncture of the fetal head.

Post-block fetal bradycardia typically occurs 2 to 10 minutes after infiltration. It is usually transient (2 to 8 min), but can last as long as 40 minutes. Fetal acidemia, low Apgar scores, and death had also been reported. Its cause remains unclear, although various hypothesis have been suggested: increased sensitivity of uterine arteries of the pregnant woman to local anesthetics resulting in vasocostriction, myometrial hypertonus, fetal ab- sorption of local anesthetic resulting in bradycardia from depression of the sinoatrial node or even a combination of several factors. So, many authors contraindicate this type of block in the presence of prematurity, placental insufficiency and fetal distress. Treatment of post-block fetal bradycardia includes treating maternal hypotension, administering oxygen to the mother, and positioning her onto her side to relieve aortocaval compression. Expeditious cesarean delivery is indicated if the fetal heart rate remains no reassuring.

The bilateral pudendal nerves block attempts to suppress the sensitivity of the lower third of vagina, vulva, and peritoneum, remaining outside the elevator ani muscle.

It is used in the second stage of labor and delivery for simple instrumentation of labor (low forceps, vacuum and spatulas), placental delivery, episiotomy, and sometimes to supplement epidural labor analgesia. It does not allow complex instrumentation, rotational maneuvers and exploration of the uterine cavity.

The pudendal bilateral block is simple to perform and can provide satisfactory analgesia. This block is ineffective in 10 to 50% on one or both sides and does not abolish sensation to the anterior part of the perineum because branches of the ilioinguinal and genitofemoral nerves supply this region, thus subcutaneous infiltration with additional medication will be needed to repair lacerations in this area.

The transvaginal approach is most frequently used unless the vertex has descended so far that access to the ischial spine is difficult. During the transvaginal approach, the ischial spines can be palpated as bony protrusions distinct from the rest of the pelvic sidewall and located posteriorly to the vaginal sidewall. The sacropinous ligament is a firm band running medially and posteriorly from the ischial spine to the sacrum. After aspirating to confirm the absence of an intravascular location, inject into the sacropinous ligament 5-7 mL and then the needle is advanced until perceiving a slight loss in resistance, aspirate again to exclude intravascular injection and deposit another 5-7 mL. The procedure is repeated on the contralateral side. The
transvaginal route has less risk because it prevents perineal hematoma, and lower risk of rectal perforation.

Transperineal approach is used in low fetal head presentations when the fetal head occupies the vagina and precludes the approach through the same. Ischi al tuberosity is identified with the index finger through the vagina and a skin wheal is practiced. The needle is inserted to block the pudendal nerve perpendicularly toward the sacral fossa (2.5 to 3.6 cm from the cutaneous plane), and when reached 5-7 mL of anesthetic solution are injected after excluding intravascular location. Subsequently the needle is advanced 1 cm to achieve the sacraligament and after aspiration 5-7 mL are injected to block the inferior hemorroidal nerve. If the block fails on only one side, an additional 5 mL of anesthetic may be injected into the under- anesthetized side.

The incidence of complications is rare, such as hematoma, infection, ischemic region paresthesias, sacral neuropathy, systemic toxicity after intravascular administration and allergic reactions. Pudendal block does not interfere with uterine contractions, but if the mother does not feel the fetus distending her lower vagina and perineum labor could be affected. No immediate neonatal neurobehavioral effects occur, regardless of the agent used, even when given up to 16 minutes before delivery. Neonatal local anesthetic toxicity after maternal pudendal block is extremely rare and can be manifested as transient hypotonia, apnea, seizures, mydriasis, cyanosis, and need for mechanical ventilation.

c. Inhalational anesthetics

Halogenated inhalation anesthetic agents and/or nitrous oxide, can somehow mitigate the perception of pain during labor. Nitrous oxide was introduced into obstetrics in 1880. The analgesic efficacy remains in controversy, since it will depend largely on the patient’s self-capacity of learning, because the parturient self-administers the anesthetic gas, as needed, using a hand-held facemask. The safety of this technique is that the parturient will be unable to hold the mask if she becomes too drowsy, and thus will cease to inhale the anesthetic. Furthermore, it can be used at any stage of labor as it takes effect within 50 seconds and is eliminated quickly via the lungs so it does not accumulate in the mother or fetus/neonate or cause newborn depression. A disadvantage is that efficient scavenging is difficult with self-administered inhalation agents, resulting in environmental pollution.

Entonox is a ready-to-use medical gas mixture consisting of 50% nitrous oxide and 50% oxygen for use in all situations where analgesia and sedation with rapid onset and offset is sought, such as during the childbirth.

A review concluded that the administration of nitrous oxide 50% mixed with oxygen inhalation as inhalation analgesia during labor produces moderate but satisfactory analgesia in labor without adverse effects for both mother and fetus but the degree of analgesia is less than when using other types of analgesics or anesthetics (enflurane, sevoflurane or remifentanil), so its efficacy is lower.

It is advisable to control oxygen saturation in women during labor and the administration of a local anesthetic if necessary perform episiotomy. Other authors reported that the analgesic effect of nitrous oxide was better than that produced by opioids, but less than with epidural analgesia.

The halogenated anesthetics are unusual drugs obstetrics, because it is difficult to adjust their analgesic concentrations and have significant limitations, such as low analgesic quality and the need to preserve consciousness and protective airway reflexes. Enflurane at 0.25% and isoflurane (0.2 to 0.25%) were used preferably instead of halothane (with a lower analgesic profile and more relaxing uterine effect). The combined use of isoflurane (0.2 to 0.25%) and Entonox allows the parturient to maintain an important cognitive level and reasonable pain levels.

The posterior introduction of sevoflurane in obstetric anesthesia with rapid induction and elimination times without irritating effects on the airway, makes it an inhalation agent to consider if used combined with Entonox.

d. Systemic analgesics: opioids

Systemic analgesics are useful for patients who prefer less invasive techniques, or in whom regional techniques are contraindicated, or are not an option due to lack of availability of skilled providers. Doses are exposed in table 3.

The most popular systemic agents are opioids or opioid agonists-antagonists. Opioids exert their effects in the maternal brain, although a portion of the dose also crosses the placenta and affects the fetus. This is manifested in utero by decreased fetal heart rate variability and in the neonate by respiratory depression.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Onset</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meperidine</td>
<td>25-50 mg IV + 50-100 mg IM</td>
<td>5 min IV</td>
<td>2-3 hr</td>
</tr>
<tr>
<td></td>
<td>75 mg in 100 mL of normal saline over 30 min (approximately 1 mg/kg in a single bolus).</td>
<td>40 mg IM</td>
<td></td>
</tr>
<tr>
<td>Fentanyl</td>
<td>0.025-0.05 mg IV + 0.05 mg loading dose, 0.05 mg loading dose, 0.025-0.05 mg loading dose, 0.02 mg, 5 min lockout, maximum dose limit of 0.240 mg.h-1</td>
<td>1-3 min IV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20-40 min IV</td>
<td>30-60 min IV</td>
<td></td>
</tr>
<tr>
<td>Remifentanil</td>
<td>PCA (0.04 mg loading dose, 0.04 mg boluses, 2 min lockout, maximum dose limit of 1.2 mg.h-1)</td>
<td>20 min by 0.005 increments, on patient request, to a maximum dose limit of 1.5 mg.h-1)</td>
<td>1-2 hr</td>
</tr>
<tr>
<td></td>
<td>PCA (0.5 µg.kg-1 bolus and 2 min lockout period)</td>
<td>1-3 min IV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCA (0.02 mg bolus as a starting dose, and a 3-min lockout interval without basal infusion. Increase dose every 15 to 20 min by 0.005 increments, on patient request, to a maximum dose limit of 0.3 mg.h-1)</td>
<td>7-10 min IM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCA (0.04 mg bolus)</td>
<td>1-5 min IV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCA (0.1 mg-h-1 IV)</td>
<td>5-10 min IM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCA (0.05 mg loading dose, boluses of 0.02 mg, 5 min lockout, maximum dose limit of 200 mg)</td>
<td>1-3 min IV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCA (49.5 mg loading dose, 5 mg boluses, 10 min lockout and maximum dose limit of 200 mg)</td>
<td>5-10 min IM</td>
<td></td>
</tr>
<tr>
<td>Naltrexone</td>
<td>10-20 mg IV</td>
<td>2-3 min IV</td>
<td></td>
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<tr>
<td></td>
<td>+ 10-20 mg IM</td>
<td>3-6 hr</td>
<td></td>
</tr>
<tr>
<td>Butorphanol</td>
<td>1-2 mg IV + 1-2 mg IM</td>
<td>2-3 min IV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 10-20 mg IM</td>
<td>1-3 hr</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 16-15 min IM</td>
<td>5-20 min IM</td>
<td></td>
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<td>Pentazocine</td>
<td>20-40 mg IV + 20-40 mg IM</td>
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<td>+ 20-40 mg IM</td>
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| [Opioids used for labor and vaginal delivery] |

It is necessary to remember that epidural analgesia provided better pain relief than parenteral opioids. Opioids mitigate the pain of labor but do not provide their complete relief except at high doses. However at these dosages nausea, vomiting, and sedation were common maternal side effects. Parenteral opioids decrease fetal heart rate variability but respiratory depression was the major neonatal concern.

Some authors believe that systemic opioids such as morphine and meperidine in laboring women produce relief by inducing somnolence rather than by producing analgesia per se (repeated intravenous administration resulted in increasing sedation scores in parturients with little change in pain scores).

Meperidine is the worldwide parenteral opioid administered for labor pain relief. It is an alternative in those patients who do not receive a neuraxial blockade.

The intramuscular route is the choice for administration of midwife and obstetrics, but continuous infusion, patient controlled analgesia (PCA) or both have also been used. However, meperidine has fallen into disfavor in order to replace it with more efficacious and less toxic opioid analgesics because of its potential side effects (e.g., serotonergic crisis, seizures and normeperidine toxicity) and multiple drug interactions (e.g., MAO inhibitors). Meperidine crosses the placenta and reaches a maximal concentration in the fetus between two and three hours after maternal dosing. As a result, classic teaching became that the neonate should be delivered within one hour or greater than four hours after a meperidine dose. Timing of delivery, however, is difficult to predict with precision. In addition, the metabolite normeperidine has pharmacologic activity and a prolonged half-life in the neonate (2.5 days), thus it may affect neonatal behavior and difficulty with breastfeeding regardless of the timing of maternal administration.

Meperidine PCA (49.5 mg loading dose and 5 mg boluses with a lockout of 10 min and a maximum overall dose limit of 200 mg) has also been used.

Morphine is less popular, but is occasionally the choice used to provide labor analgesia. However, the lack of efficacy and their associated maternal
and neonatal side effects have resulted in decreased usage in many labor units where regional techniques, are available.

Short duration of action opioid analgesics (fentanyl, alfentanil and remifentanil) have also been administered using the intravenous, rather than the intramuscular route to provide labor pain relief. Of these agents, only fentanyl and remifentanil are suited for systemic labor analgesia.42

Fentanyl is unable to completely relieve the pain of uterine contractions, especially in the second stage of labor even at doses up to 0.3 mg. However, fentanyl increases tolerance to pain, and have no significant neuromuscular deficits in the newborn. The most usual dose is 0.05 to 0.1 mg.kg\(^{-1}\) to 1.3 mg.kg\(^{-1}\).

Fentanyl PCA (0.05 mg loading dose and boluses of 0.02 mg with a lockout of 5 min and a maximum dose limit of 0.24 mg.h\(^{-1}\)) during labor has been studied41,42 and a trial43 found that it was preferable to meperidine because there appeared to be less maternal side effects and fewer requirements for naloxone.

The FDA for use in pregnant women classifies remifentanil47,48 as category C drug. That means there are no adequate and well controlled studies in pregnant women, it should be used during pregnancy only if the benefit justifies the potential risk to the fetus and its safety profile during labor has not been established. There are few randomized, prospective studies with sufficient sample size about the use of remifentanil during labor.

The pharmacodynamic profile of remifentanil is characterized by a rapid onset of action and short latency to its peak effect. Its rapid hydrolysis by non-specific blood and tissue esterases to an inactive metabolite results in a very short duration of action. The context sensitive half-life is 3-4 min and the elimination half-time ranges from 10 to 20 min. Most of an I.V. dose is excreted in the urine as the carboxylic acid metabolite. Its metabolism is independent of renal and hepatic function and there is no accumulation during repeat bolus injection 49. Remifentanil crossed the placenta with an umbilical venous/maternal arterial concentration ratio of 0.73 and an umbilical arterial/umbilical venous concentration ratio of 0.60 50, but is metabolized rapidly in the fetus and thus should not produce neonatal depression 51.

If its rapid onset of action is another advantage. So, remifentanil PCA is gaining popularity for providing analgesia for childbirth in parturients in whom regional analgesia is either contraindicated or not desired or requesting opioid analgesia 42, 52-54, but further studies are needed to refine the methodology for its safe administration 55.

An information sheet can be given to mothers antenatally and provisional consent obtained. Remifentanil is a potent respiratory depressant, so continuous monitoring is required. Maternal side effects of remifentanil in obstetrics are nausea (variable incidence), slight itching (that usually does not require treatment) 56, sedation 57 and risk of respiratory depression.

There is a case report of neonatal chest wall rigidity and respiratory depression following the use of remifentanil for cesarean delivery 58.

The doses used in PCA bolus ranging from 0.2 to 0.5 mg.kg\(^{-1}\) (range 0.2 to 0.93 mg.kg\(^{-1}\) at a infusion rate of 20 seconds with a lock interval of 1-3 minutes 59. Some authors reported that maintaining a steady basal perfusion (from 0.025 to 0.05, 0.075 and 0.1 mg.kg\(^{-1}\)) in remifentanil PCA 60, 61 compared with boluses only administration improved basal analgesia, and has a lower incidence of side effects and better results in the mean pain analgesic visual scale and satisfaction scales 60. However, other authors found that continuous infusion in the PCA does not produce a clear benefit over analgesia and increase side effects 42,56,62,63.

At a dosing regimen of a 0.5 mg.kg\(^{-1}\) bolus and a 2 min lockout period remifentanil PCA provided acceptable pain relief in labor with an acceptable level of maternal side effects for both multiparous and primiparous women and minimal effect on the neonate. Remifentanil crosses the placenta and appears to be either rapidly metabolized or redistributed in the neonate or both 51, 63, 64.

If labor becomes complicated, epidural analgesia may be required.

Remifentanil PCA appears to provide better analgesia than meperidine 65, meperidine PCA 40, fentanyl PCA 40 or intermittently inhaled nitrous oxide 42, 56, 63, 66.

Blair et al. 47 compared the analgesic efficacy and safety of remifentanil (0.04 mg with a 2 min lockout) and meperidine (15 mg with a 10 min lockout) via PCA for women in established uncomplicated labor: visual analogue scores for pain during the study and for overall pain and maternal arterial oxygen saturation were similar for both groups while the area under the curve for visual analogue scores of satisfaction with analgesia and Neurologic and Adaptive Capacity Scores (NACS) at 30 min was higher for remifentanil than for meperidine. They found that neonatal wellbeing was better with remifentanil than with meperidine: NACS, CTG analyses and Appgar ranges all tended to favor remifentanil.

Recent work investigating the pharmacokinetics of remifentanil in infants under 2 months is reassuring and provides an explanation as to why the fetus is relatively unaffected by exposure to remifentanil: its half-life in this population was found to be equal to that in adults 67.

The term fetus should therefore be able rapidly to metabolize remifentanil crossing the placenta. This is again a unique property of remifentanil as all other opioids have prolonged half-lives or problems with accumulation after prolonged exposure in neonates.

Because of its side-effect profile, guidelines should be in place to ensure routine oxygen saturation monitoring; oxygen supplementation if needed to treat maternal desaturation, and one-to-one nursing/midwife monitoring using trained personnel. The requirement for close monitoring is a potential drawback to routine use of the technique in a clinical setting.

Suggested Guidelines for PCA with remifentanil are exposed in table 4.

Labor nurses must establish competency in their use before providing care with remifentanil PCA 53.

Mixed opioid agonist-antagonists (e.g., naltobuphine, butorphanol, pentazocine, and buprenorphine) have been also used for pain relief. Their main advantage is a dose ceiling effect with regard to respiratory depression (butorphanol at doses greater than 10 mg intensifies analgesia without producing greater respiratory depression), whereas the principal problem is the association with opioid side effects in the mother and fetus, such as psychotomimetic effects.

e. Systemic analgesics: no opioids agents

Doses of no opioids drugs used for pain relief in labor and delivery are exposed in table 5.
Benzodiazepines may be used for sedation during vaginal delivery. Midazolam is preferred because it is nonirritating to veins, and has a short duration of action. These benzodiazepines and other anxiolytics such as diazepam may impair the mother’s memory of the birth if administered during labor. In addition, airway reflexes are obtunded, which is a risk factor for aspiration, especially since parturients in labor typically have increased gastric contents and delayed gastric emptying. Benzodiazepines undergo placental passage and may result in neonatal depression. Barbital, pentobarbital, and secobarbital are hypnotics and anxiolytics, but not analgesics. They may be administered orally and are sometimes prescribed by obstetricians to enable a patient to sleep through early labor. Thiopental has been the most widely used anesthetic in obstetrics, at doses 125 to 200 mg, administered on demand and supplemented with Entonox. Propofol can be used in final stages of delivery (bolus when needed with an infusion of 1 mg. kg⁻¹ h⁻¹, sometimes combined with Entonox. Ketamine produces a dissociative state and analgesia. It is a potent amnestic with a rapid onset of action (less than one minute after intravenous administration). Ketamine tends to preserve airway reflexes, but also increases airways secretions, which may lead to laryngospasm. Its propensity to produce psychotomimetic effects may be prevented with coadministration of benzodiazepines. A dose of 0.25 mg.kg⁻¹ supplemented with Entonox provides an intense and effective analgesia without adverse effects on ventilation mechanics. Ketamine will induce general anesthesia at doses of 1 mg. kg⁻¹, but lower doses may be used to provide analgesia for vaginal delivery or minor operative procedures, such as manual uterine exploration. Doses above 1 mg. kg⁻¹ may cause uterine hypotonicity and decrease uteroplacental perfusion with neonatal impact. Ketamine and benzodiazepines undergo placental passage and may result in neonatal depression.

2. No pharmacological approaches:

We must not forget that some psychological techniques designed to control anxiety and pain of childbirth can help to greater emotional control. The main target of pharmacologic approaches is the elimination of the physical sensation of labor pain, whereas no pharmacologic approaches are largely directed toward prevention of suffering (the primary goal is not to make the pain disappear). Suffering may be defined in terms of any of the following psychological elements: a perceived threat to the body and/or psyche; helplessness and loss of control; distress; insufficient resources for coping with the distressing situation or fear of death of the mother or baby. Although pain and suffering often occur together, one may suffer without pain or have pain without suffering. Moreover, the use of pain ratings frequently ignores the meaning of the pain for the woman, which is really more important than the degree of pain 3.

No pharmacologic techniques for management of labor pain can be combined or used sequentially to increase their total effect. However, data regarding the safety and efficacy of these interventions are limited since few randomized trials have been performed and most had a small number of subjects, wide variations in patient populations or study design, and methodological flaws 68.

Surveys suggest that women like no pharmacologic interventions, as they help women to maintain or restore a sense of personal control over the birth process. Women tend to rate no pharmacologic interventions highly in terms of satisfaction and a desire to repeat them in a future labor, even though their pain-relieving capability is modest or short-lived.

a. Birth environment:

Hodnett et al. 69 reviewed the difference between conventional institutional settings for birth and ideal home-like settings (with sense of comfort and privacy through use of comfort aids and provision of places to walk, bathe, and rest). They found that home-like settings increased the likelihood of the women not opting intrapartum analgesia/anesthesia, were more likely to request the same setting the next time and express greater satisfaction with intrapartum care than conventional institutional settings for birth. However, authors indicate that women willing to participate in such trials may not represent “typical” patients.

b. Continuous labor support:

The nonmedical care of the laboring woman throughout labor and birth by a nurturing, supportive companion trained person can help the woman cope with pain and anxiety.

c. Water immersion:

Immersion in warm water (at or slightly above body temperature) deep enough to cover the woman’s abdomen is thought to enhance relaxation and reduce labor pain. The water should not increase the woman’s core temperature (her temperature should be monitored). Women usually remain in the bath for a few minutes to hours during the first stage of labor. A Cochrane review of randomized trials that evaluated the safety and efficacy of water immersion during the first stage of labor found use of epidural, spinal, paracervical analgesia/anesthesia was significantly lower for immersion groups compared to controls, with no significant differences in meperidine use or overall analgesia outcome, labor duration, operative delivery rates, or neonatal outcomes 70.

Bathing did not increase the risk of maternal or neonatal infection, even in women with ruptured membranes 71.

Water aspiration and snapped umbilical cord appear to be risks of delivery in water 72.

d. Sterile water injection:

The incidence of low back pain in labor range is estimated at 15 to 74% of all labors 73. Cutaneous sterile water injections (sterile water blocks, SWB) are used primarily to decrease back pain during labor and, occasionally, the abdominal pain of labor 74.

SWB reduce the perception of severe low back pain in laboring women without side-effects on the fetus or mother, but the intracutaneous injections are transiently very painful for one or two minutes. Women need to be forewarned of the burning sensations they will experience during the injection. Physiological saline does not burn, but it also does not work. The use of subcutaneous injections may reduce injection pain.

SWB consist of four subcutaneous or intracutaneous injections of 0.05 to 0.1 mL sterile water (using four 1 mL or two 2 mL syringes with a 25-gauge needle) to form four small blebs or papules. The injection sites are most commonly located over the two posterior iliac spines and 3 cm below and 1 cm medial to these two sites. Alternatively, some clinicians ask the women to point to the area where she hurts most and they place the four injections in that area. The exact location of the injections does not appear to be critical to the success of the technique 74, 75.

SWB can be repeated as desired. Since some women find the injections very uncomfortable and may ask the provider to stop, it is best to make the first two injections on opposite sides, as these two injections alone may provide satisfactory results 75-77. Pain relief lasted 45 to 120 minutes and most women stated they would want to use cutaneous SWB again during a subsequent birth 78, 79.

The exact mechanism of action of SWB is not known. The Gate Control Theory and/or release of local endorphins are presumed to be responsible for the analgesic effect. Despite the potential benefits of SWB (a meta-analysis observed a significant decrease in the cesarean delivery rate among patients assigned to the sterile water injection group), this technique is no very popular, with less than 1.5% of the parturients using them 75.

e. Maternal movement and positioning:

Laboring women have always walked, and changed positions spontaneously to make themselves more comfortable. None of the women in these trials found the supine position more uncomfortable than other positions 71, 80-83. Early in labor the use of upright positions, interspersed with other positions, is associated with less painful labor. Women experienced more severe pain in the supine position during the second stage of labor and had a preference for other birthing positions 84.

f. Touch and massage:

There are no harmful effects to the use of touch or massage during labor. Women appreciate these interventions, which appear to reduce pain and enhance feelings of well being 85, 86.

g. Acupuncture and acupressure (Shiatsu):

Acupuncture (pressure with fingers or small beads at acupuncture points) can be done with minimal instruction, in contrast to acupuncture, which requires significant training and even some type of certification.

Acupuncture may provide relief of labor pain and women appear to be very satisfied with the intervention 87, 88, but systematic reviews have not found significant benefits.

h. Hypnosis:

A systematic review found that use of hypnosis was associated with a significant reduction in use of pharmacological analgesia 68.

Physiological hypnosis used for childbirth is almost always self-hypnosis: the hypnotherapist teaches the woman to induce the hypnotic state in herself during labor. The most common hypnotic pain relief techniques are “the anesthetic glove” (the woman imagines that her hand is numb and that it can spread numbness to other areas by placing her hand on painful areas), “time distortion” (perceiving the time between painful contractions as longer and the painful period as shorter than it really is) and “imaginative transformation” (the pain is interpreted as benign and acceptable) 89.
Hypnosis is contraindicated in persons with any history of psychosis, phobias, or distressing situations.

1. Transcutaneous Electrical Nerve Stimulation (TENS)
   TENS provides modest pain relief benefits and is a satisfying option for many women who use it. Its efficacy in relieving back pain deserves further study.

   To relieve labor pain, one pair of electrodes is placed paravertebrally at the level of T10-L1, and another at the level of S2 to S4.

   A systematic review reported no significant difference between TENS and control groups in pain ratings, although women receiving TENS to acupuncture points were less likely to report severe pain. No adverse events were described. The majority of women using TENS was satisfied and would use it again in a future labor 90.

   TENS may be more effective if initiated in early labor, presumably to allow for a build-up in endorphin production before the pain becomes severe. TENS may be more effective for relief of back pain than labor pain in general, but only a few observational studies have investigated this possibility 91, 92.

   It is the use of auditory stimulation, such as music, white noise, or taped messages. Audioanalgesia
   During labor, it can increase pain tolerance, reinforce or replace the placebo effect, and/or allow for a build-up in endorphin production before the pain becomes severe.

   No data are available regarding the optimal temperature or duration of heat therapy. Heat is typically applied to the woman's back, lower abdomen, groin and/or perineum.

   Cool or cryotherapy is usually applied to the woman's back, chest, and/or face during labor.

   There are no randomized trials on the use of heat or cold during labor.

   a. TENS may be more effective for relief of back pain than labor pain in general.

   b. Audioanalgesia during labor can increase pain tolerance, reinforce or replace the placebo effect, and/or allow for a build-up in endorphin production before the pain becomes severe.

   c. Classes of prenatal education are designed to inform pregnant women and their partners about labor and birth, early parenthood, and infant feeding. These classes should cover pain control measures or self-help measures, such as relaxation techniques and breathing, which may contribute more to a woman's ability to cope with labor pain than to actually reduce that pain.

   d. Audioanalgesia

   e. Audioanalgesia during labor can increase pain tolerance, reinforce or replace the placebo effect, and/or allow for a build-up in endorphin production before the pain becomes severe.

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Abstracts

Regional Anesthesia and Pain Medicine • Volume 36, Number 7, September-October 2011 Supplement


84. Ragnar, I, Altman, D, Tyden, T, Olsson, SE. Comparison of the maternal experience and duration of labour in two upright delivery positions—a randomised controlled trial. BJOG. 2006;113(2):165-70.
Over the last several decades, neuraxial analgesia techniques have undergone significant improvements to address the concerns of both parturients and obstetric care providers. The ideal labor analgesia should provide effective pain relief, tailored to the changing needs of the parturient throughout the different phases of labor, with minimal motor blockade and adverse maternal/fetal effects so as to provide the parturient with a highly satisfactory birthing experience.

In recognition of the importance of preserving maternal autonomy during labor, new drugs and techniques have been developed for the induction of labor analgesia. The combined spinal epidural analgesia (CSE) was introduced as the technique combining the advantages of the single shot intrathecal analgesia with the possibility to use subsequently an epidural catheter. In the same time the introduction of new local anesthetics, with a high degree of analgesic effect at low dosage without motor block, allowed the epidural technique to guarantee effective analgesia with preserved motor function. In the Comparative Obstetric Mobile Epidural Trial (COMET) (1) authors concluded that the combination of low concentration local anesthetics (LA) and opioids provides good analgesia with less motor block and higher maternal satisfaction both in epidural and CSE technique.

A Cochrane review (2) of CSE vs epidural analgesia in labor investigated the data from 19 trials and found no difference in maternal satisfaction, mobilization in labour, headaches, caesarean section or adverse effects for the baby. The authors concluded that CSE offers little benefit as compared to conventional epidural analgesia, however CSE produced faster analgesia, resulted in less need for rescue analgesia and was associated with less urinary retention, apart from a slight increase in the incidence of pruritus, these beneficial effects were not associated with more complications.

This Cochrane review can be criticized because a number of outcomes were not considered in the analysis such as one-sided analgesia, epidural catheter reliabilty, anaesthetist intervention rate, local anesthetic consumption and the occurrence of fetal heart abnormalities. Finally, very different types of CSE were used in the various studies. They were all considered to be a generic procedure and analyzed combined (3).

CSE advantages:

The most obvious advantage of CSE is that the onset of spinal analgesia with low doses of local anesthetic is more rapid (4-5 min) than that of epidural analgesia (15-20min). In addition, the spread to the sacral nerve roots is more reliable, making spinal analgesia useful in advanced, rapidly progressing labour. The VAS score for labor pain investigated in several comparative trials was lower with CSE or at least similar to epidural analgesia (4,5). No trials reported higher VAS scores with CSE.

With CSE it is easier to provide effective analgesia with an increased effect of subsequent epidural top ups (lower total dose). The presence of a dural whole facilitating the passage of part of the local anesthetics administered epidurally to the subarachnoid space, could offer part of explanation of the CSE decreased total local anesthetic consumption. Low dose epidurals are successfully used to allow laboring women to maintain mobility whilst being completely pain free (1,6). However, several authors demonstrated that with CSE motor function and balance remained intact whilst low dose epidurals induced clinically detectable dorsal column a reduced balance disorder after spinal dose (DFC dorsal column somatosenory function) (7).

CSE is attractive in advanced labor when rapid and effective analgesia is required but also in early labour is particularly appreciated. In early labor the only use of spinal opioids provide excellent analgesia without motor block, which is useful for women who want to walk (sometimes referred to as the walking epidural) or to allow for labour in positions other than the supine position.

Another great advantage of CSE is the security of a well positioned catheter also in patients with problems, like obesity or spinal deformities, because it provides verification of epidural space proximity through the definitive return of cerebrospinal fluid via the spinal needle.

The CSE technique has also been associated with a reduction in epidural catheter failures (8). When using a CSE technique a perfect midline approach is required to identify the subarachnoid space and consequently more epidural catheters reliably be positioned into the epidural space. Consequently there is less incidence of epidural catheter replacement and unilateral analgesia (9).

CSE disadvantages:

Non reassuring fetal heart tones during labor have been reported in 10 to 20% of patients after initiation of neuraxial analgesia, although adverse neonatal outcomes have not been reported (11). A systematic review (12) suggested that the use of intrathecal opioids was associated with an increased frequency of non reassuring fetal heart rate patterns and, in particular, bradycardia often necessitating emergency cesarean delivery. This problem decreases in incidence and duration if lower doses of opioids are used (13). Nicotet et al.(14) also indicated that older age and higher VAS scores prior to analgesia were risk factors associated with fetal heart rate abnormalities after CSE. Gaiser (15) suggested that the risk of abnormalities in the fetal heart rate is increased when the fetal head is not engaged or when decelerations are already present prior to initiation of the analgesia.

Hypertonic uterine contractions may occur more often after the administration of spinal opioids than after the epidural administration and are probably the result of a rapid decrease in plasma levels of ephinephrine (i.e., reduced β-agonist tocolytic activity) brought on by the very rapid onset of analgesia (3). Uterine relaxation can be accomplished with the intravenous administration of 250 μg of terbutaline or 50 to 150 μg of nitroglycerin or with the administration of 400 μg of nitroglycerin as a sublingual spray (16).

The use of lipid-soluble opioids in the intrathecal space is frequently associated with pruritus that in the most cases is mild and of short duration. In the rare cases of intense pruritus or nausea or vomiting, they may be treated with maloxone.

Both CSE and conventional epidural analgesia have been associated with usually mild hypotension. It is transient and easily treated keeping the parturient in the left lateral decubitus and avoiding the supine position. Hypotension following the spinal injection of opioids combined with local anaesthetics may be sometimes more pronounced and requiring plasmapnder exchanger infusion (500 ml hydroxyethylstarch).

Although it has been reported cases of menigitis associated with CSE, a systematic review of CSE versus epidural analgesia did not suggest an increased incidence (17). Most authors, however, agree that strict aseptic techniques are of vital importance to prevent serious infections both in epidural and CSE.

The needle-through-needle technique the detachment of metallic fragments has been described. Kits with a “backeye” (small hole on the large curve of the tip)allows the spinal needle to follow a linear path avoiding the friction between the two needles at Huber’s point.

Since CSE includes a dural puncture, there is a theoretical risk of post-dural puncture headache (PDPH). The incidence is not increased as compared to conventional epidural analgesia. Norris(18) reported that unintended dural puncture with the epidural needle occurs much more frequent when using conventional epidural analgesia as compared to CSE.

Finally other disadvantages of CSE, often cited, are the more invasive technique and the most expensive cost. The needle-through-needle technique may have a longer learning curve and a higher incidence of technical failure.

Kits with a “backeye” allowing the spinal needle to follow a linear path, increase dramatically the incidence of success and makes the technique simple to realize (19).

The theoretically possibility of respiratory depression does not exist if sufentanil is used for spinal dose. Sufentanil in epidural or spinal administration shows the following characteristics: reduced rostral diffusion to the brain, reduced late respiratory depression accomplished by the lower and increased passage to the spinal medulla around the area where it is injected. In conclusion, due to the considerations mentioned above, the CSE technique is the most reliable for the analgesia during the labour, especially in the high risk patients (i.e. obese women).

References List:


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PATIENT CONTROLLED EPIDURAL ANALGESIA - THE MODERN WAY

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Since the introduction of patient controlled epidural analgesia (PCEA) by Gambling, there have been several innovative developments to refine the technique. (1) Compared to continuous epidural infusion, PCEA has been shown to improve maternal satisfaction, reduce breakthrough pain rate, reduce anaesthetist workload, reduce local anaesthetic consumption and decrease motor blockade. (2) However, the optimal regimen is still unclear as recent advances have been made using automated boluses and computer integrated PCEA.

There are several conflicting evidences in the use of background infusion with PCEA. Generally, use of background infusion added to PCEA improved patient analgesia with reduction in breakthrough pain and anaesthetist workload. (3) Evidence also suggests that use of high rate of infusion of 5 ml/H or more for PCEA efficiency. Increasing infusion rate may however increase local anaesthetic consumption. Smiley et al have suggested a strategy that consists of administering one third of the expected local anaesthetic hourly demand as a background infusion. (4)

Women’s and Children’s Hospital (KKH), Singapore has been actively developing an innovative epidural delivery technique using computer integrated PCEA (CIPCEA). Computer integration titrated the background infusion to 5, 10, 15 ml/H if the patient required respectively one, two or three demand boluses in the previous hour. The background infusion was decreased by 5 ml/H if there was no demand in the previous hour. Sia et al found that CIPCEA compared to continuous infusion reduced the incidence of breakthrough pain without increasing local anaesthetic consumption. (5) Lim et al compared CIPCEA with PCEA without background infusion and observed similar local anaesthetic consumption, pain scores and breakthrough pain rates, but higher maternal satisfaction. (6) Sng et al compared CIPCEA with PCEA with moderate background infusion of 5ml/H and found higher maternal satisfaction with similar local anaesthetic consumption, pain scores and breakthrough pain rates. CIPCEA had higher infusion rate at second stage of labour compared to PCEA with moderate background infusion. This may suggest an increased local anaesthetic requirement as labour progresses. (7)

Automated mandatory boluses (AMB) as opposed to hourly equal doses of infusion provide better anaesthesia, higher sensory blockade and reduction in breakthrough pain. Wong et al used 2 independent pumps to deliver mandatory and patient controlled boluses that confirmed reduction in local anaesthetic consumption and breakthrough pain. (8) One drawback of independent 2-pump system is the possibility of delivering mandatory and patient controlled boluses at the same time resulting in excessive local anaesthetics in the epidural space. KKH has developed a 1-pump system that a novel computer system enables a ordinary infusion pump to work as a PCEA pump delivering automated mandatory boluses. (9,11) The programme integrates automated mandatory boluses with patient initiated boluses such that automated boluses may be delivered only after a predetermined PCEA lockout interval. Lee et al found that PCEA with AMB when compared with PCEA with moderate basal infusion, conferred greater patient satisfaction and a longer duration of effective anaesthesia after combined spinal epidural despite reduced local anaesthetic consumption. (11) The higher driving pressure of injecting automated mandatory bolus may effect a more uniform spread of local anaesthetics in the epidural space. (12)

A central monitoring system using wireless connection in the delivery suite to monitor the progress of labour epidural analgesia was implemented in KKH in 2009. This streamlined the obstetric anaesthetic care by providing anesthetists up to the second information of all labour epidural analgesia providing information on time of initiation of epidural analgesia, the epidural regimen, patient boluses, machine boluses, total demands, current infusion rate and status of the computer integrated pumps. This remote site monitoring is available at the clinician station and anaesthetic offices. A recent study was conducted in KKH to investigate independent risk factors of development of breakthrough pain. Women having maintenance labour epidural analgesia on CIPCEA with breakthrough pain had lower patient successful to total demands ratio and higher variable infusion rates compared to women with no breakthrough pain. This finding suggested that the pattern of use of CIPCEA may be used to alert anaesthetists on potential breakthrough pain necessitating closer monitoring and possibly earlier intervention.

Modern labour epidural delivery techniques and monitoring systems need further evaluation and show potential in optimising obstetric anaesthesia care for parturients in labour. PCEA parameters such as patient successful to total demand ratio and variable infusion rates may further developed to form a prognostic model to predict breakthrough pain.

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**84 EPIDUROSCOPY AND LYSIS OF EPIDURAL INFLAMMATORY ADHESIONS**

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Epiduroscopy offers an ideal combination of diagnostic and therapeutic interventions in one session and is of value in the diagnosis of spinal root pathology. In sciatica, adhesions unreported by MRI can be identified. Targeted epidural medication, administered near the compromised spinal nerve, results in substantial and prolonged pain relief. (1) This statement is not completely accepted and still there is reluctance in using the technique, for mayor invasivity if confronted with blind needle or fluoroscopic guided needle technique. The continuous upgrade of devices and optical quality is increasing the confidence and spread of the technique between pain therapists. Geurts prospectively evaluated whether abnormalities at the lumbar epidural space may be detected and targeted epidural lysis has been considered a valid therapy. Within this study, 124 prospectively evaluated patients were included in a prospective randomized controlled study. Epiduroscopy was performed before the epidural lysis of abnormalities (type 1 to 3). After epiduroscopy, intravenous local anesthetics were delivered around the target area. If after 30 minutes no pain relief was observed, epidural lysis was performed. The results show that epiduroscopy and epidural lysis are both safe and effective in patients with not intractable pain. Targeted epidural ablation has shown to be effective in cases of chronic pain following trauma to the spine. The effectiveness of epiduroscopy and lysis of epidural adhesions has been confirmed by epiduroscopic, and assessed if targeted epidural injection of medication alleviated sciatic pain.

**Methods:** A flexible, 0.9-mm fiberoptic endoscope was introduced through a disposable steering shaft into the caudal epidural space and advanced until the targeted spinal nerve was identified. Adhesions were mechanically mobilized under direct vision, and a mixture of 120 mg methylprednisolone acetate, 600 IU hyaluronidase, and 150 microg clonidine was applied locally. Pain scores were measured by visual analog scale (VAS) and global subjective efficacy rating. The authors concluded for a substantial improvement of clinical evaluation of pain scores. In our experience a similar study was conducted, including 154 consecutive patients, and results are displayed in table 1, Table 1. The Specialist Advisers listed key efficacy outcomes as pain relief, improved function and disability score, quality of life, psychological status, return to work and avoidance of spinal cord stimulation for chronic pain. 2 are considered theoretical adverse events to include catheter shearing, nerve root avulsion, nerve palsy, meningitis, arachnoiditis, paralysis, epidural infection or abscess and excessive epidural hydrostatic pressure associated with injection of fluid which could cause events such as spinal compression and haematoma. They listed anecdotal adverse events as numbness in the lower limbs and blindness. In conclusion this technique is representing a further step in imaging and treating in the same procedure the anatomical pathologies related to inflammatory adhesions of the epidural space. It is mandatory to follow safety procedures, related to deep education and a complete learning curve of pain specialists, strict sterility, appropriate environment, prolonged followup of patient. 1. Geurts JW. Reg Anesth Pain Med. 2002 Jul-Aug;27(4):343-5
2. NICE, February 2010

**85 INTRATHECAL OPIOID ANALGESIA DELIVERY**

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The prevalence of chronic pain is much higher among the elderly. In cases with intractable pain either due to chronic nociception (osteoarthritis, cancer etc.) or neuropathy (polyneuropathy, postherpetic neuralgia) intrathecal opioid analgesia delivery may be a treatment option. However, comorbidity has to be taken into consideration. Some patients with impaired cardiovascular function or a previous CNS injury may not tolerate the drugs, and adequate information prior to implantation is therefore mandatory.

Intrathecal treatment for chronic pain is to administer the opioid as close as possible to the site of the opioid receptors. Morphine is approximately 100 times more potent given intrathecally compared with oral administration. This allows smaller doses and less systemic side effects. Morphine is the most commonly used opioid and seems to provide good to excellent pain relief although the evidence is mainly from case reports and retrospective studies (1,2,3). In patients with refractory cancer pain, the use of IT opioids decreased the proportion of patients suffering from severe pain substantially, from 86% to 17% (4). Intrathecal opioids seem to provide better pain relief in patients with nociceptive pain than in neuropathic or deafferentation pain syndromes. IT morphine is not only an analgesic, but does also act as an antispasmodium (5).

Optimal selection of patients with non-cancer pain requires a thorough neuropsychological evaluation and a test trial with one or more IT opioids. During the test trial the patient should be kept within an intermediate dependency unit where vital functions can be monitored. The infusion rate should start low (morphine: 0.5 mg/day) and then increase gradually by 15% to 33% every 8 hours until adequate pain relief is achieved or the side effects have become intolerable. The semisynthetic hydromorphone has during the last years become a popular alternative to morphine. The drug activates not only the mu receptor, but also the delta and k-opioid receptors (6). Being more lipophilic hydromorphone is not only more potent and fast-acting drug than morphine, but it has a smaller supraspinal distribution which may account for fewer side-effects. The metabolites are also less active compared with morphine. Other opioids like sufentanil, fentanyl, methadone and pethidine (meperidine) have also been administered intrathecally. Safety studies on long term administration, however, are not available.

Hemodynamic responses to IT opioids such as bradycardia, hypotension and water fluid retention may represent a problem for patients with severe cardiovascular disease. A chronic, but slowly increasing, respiratory depression following IT morphine was published quite recently (7). Sedation and confusion will also require dose reduction and in some cases cessation of the therapy. Urinary retention generally subsides after some days, but the problem may persist in patients with chronic urinary obstruction. Over time intrathecal opioids affect the HPA axis, and regular blood tests are therefore recommended. In cases of severe hormonal suppression replacement treatment may be necessary. Granuloma formation at the catheter tip is more common in cases with high morphine concentrations, and may lead to spinal cord injury, particularly in elderly patients with a preexisting spinal stenosis. In patients with non-cancer pain the morphine concentration should therefore not exceed 20 mg/ml, and the dosages not pass 15 mg/day.

The opioid administered may be combined with an alpha-2-adrenergic agonist (clonidine), a local anesthetic (bupivacaine or ropivacaine), a N-type voltage sensitive calcium channel blocker (ziconotide), and with baclofen. Although clinical long-term data are lacking, IT bupivacaine seems to act synergistic with opioids (8). For neuropathic pain IT clonidine has been found even more effective than opioids (9,10). Baclofen, mainly used for spasticity and pain secondary to spasticity, has also been reported to be useful for both phantom limb pain, arachnoiditis, lumbar plexopathy and sciatic neuropathy (11).
Reference List:

2.1. Functional capacity
One of the characteristic features of normal ageing is a declined functional reserve of the organs and an impaired homeostatic mechanism that react less effectively on maximal exercise or stress.6,7 The maximal limits of those homeostatic mechanisms decline with increasing age, resulting in a situation, in which even a small insult may not be overcome and leading to death in a relatively short time.6 Physiological ageing can be influenced by external factors, such as lifestyle (for example nutritional intake, smoking and physical activity) and socio-economic status.8,9 Different organs in the same individual may age at different rates: each system has its own temporal pattern of age change.

2.2. Body composition
With advancing age, structural changes in the body composition occur. The body fat increases by 20-40% and the lean body mass and total body water (10%-15%) decreases progressively with increasing age.5,10-11

2.3. Liver function
Increased age is associated with a decreased liver volume and liver blood flow (40% less).12 However, in vitro studies to the amount and the activity of drug-metabolizing enzymes showed that the intrinsic liver capacity seems to be less influenced by age.5,13,14 Phase I drug metabolism in the liver is dependable on microsomal enzymes in the liver. The hepatic microsomal protein content and activity seems not to be altered in the old liver.10,15 The content and activity of different species of the cytochrome P450 are not decreased in older persons, although a decline in content of CYP 3A and 2E1 has been reported.16

2.4. Renal function
The renal mass decreases with approximately 30% with advancing age.18 Also, the glomerular filtration rate (GFR), measured by the creatinine clearance has been shown to decrease.19 However, in the same study, one third of the elderly population did not show any deterioration of the renal function. In addition, creatinine clearance may not be a reliable marker of the GFR in older persons, because of the presence of stable plasma creatinine levels, regardless of a diminished GFR. This is due to reduced creatinine production, caused by an age-related decrease in muscle mass.10 The widely used Cockcroft-Gault equation for estimating the renal function may not reliable in elderly people, potentially leading to an under-estimation in the healthy old people and overdosing in the frail old people.20 About 20-30% of the nephrons are lost due to a glomerulosclerosis.21 By this mechanism, the ageing kidneys lose their ability to concentrate urine during water deprivation.22 Although the renal function decreases by the process of ageing itself, coexisting diseases may have a more profound influence on the renal function.5

2.5. Cardiovascular system
Anatomical and physiologic changes in the vessels lead to an increase in vessel stiffness and reduction in arterial compliance in older patients.23-25 Whereas in younger subjects the blood pressure is primarily regulated by the peripheral vascular resistance, in older persons this is determined mainly by the stiffness of the large central vessels. As a result, increased age is associated with an increased systolic blood pressure, decreased diastolic blood pressure and an increased pulse pressure.23 Changes in cardiac morphology reflect numerous changes that occur with age at the molecular level in the heart. Hypertrophy of the left ventricular wall is a consequence of the chronically increased afterload that occurs because of the increased arterial vascular stiffness.8,24,25 The age-related increase in stiffness of the left ventricle causes the cardiac function to be more dependent on ventricular filling.24,25 The end-diastolic pressure is shifted upward in comparison to younger subjects.22 In addition, the stroke volume remains unchanged with exercise, but the increase in ejection fraction is blunted because the older heart fails to empty as completely as in the younger heart.26 Cardiac reserve decreases with increasing age and is further influenced by concomitant cardiac disease. Therefore, the increase in cardiac output as a reaction on stress or exercise is reduced.

2.6. Peripheral and central nervous system
Elderly patients exhibit anatomical and physiologic changes of the central and peripheral nervous system. Global changes that occur in the central nervous system between 20 and 80 years of age are a 30% decrease in cerebral blood flow, a 36% decrease in cerebral oxygen consumption and a 30% decrease in cortical neuronal density.27 There is a declining number of myelinated fibers in the dorsal and ventral roots and to the permeability is increased, which is caused by the deterioration of myelin sheaths.27,28 Furthermore, the number of axons in peripheral nerves decreases with advancing age, and the conduction velocity diminishes, particularly in motor nerves.29,30
3. The effects of age on the pharmacokinetics

3.1. Drug absorption and bioavailability

The age-related decreases in renal function, in particular the GFR may influence the clearance of water-soluble drugs. In older patients, due to altered neurotransmitters or receptor, hormonal changes, impaired glucose metabolism and possibly an enhanced penetration of the CNS may account for an altered drug response in the elderly. 

5.1. Antidepressants

5.1.1. Tricyclic anti-depressants (TCAs)

The absorption of TCAs is fast, but they undergo extensive first-pass hepatic clearance. TCAs are highly lipophilic and highly protein bound. Amitriptyline is metabolized to nortriptyline, which has an equi-analgesic effect. This secondary amine has an elimination half-life that is twice that of the parent tertiary amine, and more than a week may be required to clear TCAs. In older individuals the drugs may be metabolised more slowly and medication that inhibit CYP2D6 may increase plasma levels. Dosage adjustments are needed according to age and polypharmacy. Secondary adverse effects, such as nausea may have fewer effects. Cognitive adverse effects, fewer associated falls in the elderly, less mental cloudiness and reduced risk for orthostatic hypotension. TCAs should be used cautiously in patients with closed angle glaucoma, benign prostatic hypertrophy, urinary retention, constipation, cardiovascular disease or second and third degree heart block, conduction defects or prolonged QT intervals, and severe liver disease. Amitriptyline and its metabolite nortriptyline may interact with the pharmacokinetics of morphine, by increasing plasma morphine concentrations and delay morphine clearance. Due to the long half-life of TCAs, it is possible to prescribe TCAs on a once-daily basis. To decrease the risk of sedative effects during daytime, it may prescribe as a single bedtime-dose. In the elderly start doses of amitryptilline and nortriptyline are 10-25 mg an, which can be increased by 10-25 mg every 4-7 days. Maximum dose (approximately 75 mg) is consistently lower than that to induce an antidepressant effect.

5.1.2. Selective serotonin and norepinephrine reuptake inhibitors (SNRIs)

SNRIs, like duloxetine and venlafaxine have shown to be effective in the treatment of painful diabetic neuropathy, postherpetic neuralgia and poly-neuropathy. Because of their improved safety profile in comparison with TCAs, they may have an important role in the treatment of neuropathic pain in elderly patients, especially in the cardiac compromised patient. Duloxetine has been approved for the treatment of major depression and different chronic pain states, including neuropathic pain syndromes, such as diabetic peripheral neuropathic pain. Using a population pharmacokinetic model, Lobo et al. (2009) demonstrated that the apparent oral clearance (CL/F) of duloxetine decreases with advancing age. They suggested that this was a rather a consequence of a decreased systemic clearance than of a change in bioavailability with age. Adjustments of dosing in the elderly are apparently not needed for the recommended dose range of 30-60 mg twice daily. A review on the use of duloxetine in elderly patients with major depressive disorder demonstrated that the most frequent side-effects included dry mouth, nausea, diaphoresis, fatigue (especially in patients > 75 years of age), gastrointestinal complaints, decreased appetite, insomnia and decreased libido. It was concluded that duloxetine given to elderly patients is as safe and well tolerated as in younger patients. The pharmacological action of venlafaxine is dose dependent, being a serotonin/noradrenaline reuptake inhibitor at low to moderate doses, and a dopamine reuptake inhibitor with moderate to higher doses. Titration with weekly increments of 75 mg to an effective dosage of 150 - 225 mg daily is recommended. Venlafaxine has demonstrated efficacy in treatment of painful diabetic neuropathy, pain in nondiabetic polyneuropathy and post-mastectomy pain. Drug interactions occur, because SNRIs are often inhibitors of more than one CYP isoenzyme. Duloxetine as well as venlafaxine inhibit CYP 2D6.

5.2. Anti-epileptic medication (AEs)

Anti-epileptic medication is often used for the treatment of chronic pain syndromes, in particular neuropathic pain. With increasing age the prevalence of neuropathic pain syndromes is increasing. However, data on age-related alterations in the pharmacokinetics and -dynamics of AEs are hardly available. Therefore, some data may be obtained from studies that primarily are focussed on the treatment of epilepsy in the elderly population.
Elderly patients may be more sensitive to the CNS effects of certain drugs, like benzodiazepines and probably also other AEs.\textsuperscript{46-47} These age-related changes may narrow the therapeutic range.\textsuperscript{47} Interactions may occur between AEs and concomitant medication that is taken by the elderly patient.\textsuperscript{48} These interactions may occur in various ways and may influence the absorption, distribution, and metabolism of AEs. Some drugs displace AEs from their binding sites on proteins. In addition, certain drugs may induce or inhibit cytochrome P450 or other hepatic metabolizing enzymes, resulting in decreased or increased serum concentrations of AEs, respectively. This may result in an increased risk for toxic effects or therapeutic failure. Carbamazepine and other AEs are strong inducers of cytochrome P450.

5.2.1. Carbamazepine (CBZ)  
Carbamazepine is bound for 65%-85% to both albumin and AAG.\textsuperscript{46} Measurement of total serum CBZ concentrations may not accurately reflect pharmacological activity, because of the presence of its active metabolite.\textsuperscript{49} One study did not find a difference in CBZ disposition between young and elderly subjects.\textsuperscript{48} However, another small study showed a 40% reduction of the clearance of CBZ in the elderly population.\textsuperscript{48} A study using population pharmacokinetic modelling of carbamazepine in epileptic elderly patients showed a decreased clearance after oral administration of CBZ in elderly patients.\textsuperscript{47} These results suggest that CBZ dosages may be decreased and dosed less frequently in elderly patients.

5.2.2. Oxcarbamazepine (OXCZB)  
Oxcarbamazepine is possibly as effective as carbamazepine, but with less adverse events. OXCZB is rapidly metabolized to the monohydroxy metabolite, which is the active compound. Because this metabolite is eliminated by renal clearance, elderly patients with renal impairment may need dose adjustment.\textsuperscript{45} \textsuperscript{49} Furthermore, doses have to be slightly reduced, because of higher maximum plasma concentrations of OXCZB in elderly patients.\textsuperscript{50} In contrast to carbamazepine, OXCZB is not a generalized inducer of hepatic enzymes, but induces selectively CYP3A4/3A5 isozyme and inhibit the CYP2C19 isozyme.\textsuperscript{51} Particularly older patients are at risk to develop hyponatraemia after treatment with OXCZB.\textsuperscript{52} Most cases occur within the first three months and monitoring is suggested. Adverse events often seen in the older group of patients are vomiting, dizziness, sedation and fatigue, which may be dose related.\textsuperscript{48} Unlike carbamazepine, OXCBZ has been associated with no hepatic or hematologic toxicities and rash occurs less frequently.

5.2.3. Lamotrigine (LTG)  
Protein binding of lamotrigine averages 55% and its pharmacological profile is not likely to be affected by changes in binding.\textsuperscript{53} In the elderly, the clearance (37% decrease) and distribution volume (12% decrease) are reduced.\textsuperscript{52} LTG is not a strong inducer of hepatic metabolising enzymes, however, other hepatic enzymes-inducing drugs may decrease the LTG plasma concentration. LTG is eliminated by hepatic glucuronide conjugation, which may be decreased in elderly patients. Adverse effects include serious rashes that seems to be correlated with the rate of dose escalation, an effect on the PR interval of cardiac conduction and minor serious adverse events like drowsiness and headache.\textsuperscript{51}

5.2.4. Gabapentin (GPT)  
One of the disadvantages of gabapentin is its saturable absorption from the gut into the blood within the usual dosing range.\textsuperscript{54} This is because active transport sites in the intestine are involved with the drug transfer. GPT is eliminated unchanged by the kidneys and, therefore, its clearance is depending on the renal function.\textsuperscript{55} Dose adjustments, based on the creatinine clearance has to be made in the presence of renal insufficiency.\textsuperscript{56} Although creatinine clearance is reduced in elderly patients, plasma concentrations do not appear to be affected by age.\textsuperscript{51} Reduction of GPT dosage may only be required in elderly patients with reduced renal function.\textsuperscript{57} GPT does not display hepatic enzyme induction and may expose little interaction with other drugs.\textsuperscript{58} It is mostly well tolerated by older patient and the most frequent adverse events include somnolence, dizziness, ataxia, tremor and feelings of asthenia and headache. Because of its short terminal half-life, provided that the renal function is not altered, multiple dosing (3-4) per day is necessary.

5.2.5. Pregabalin (PGB)  
Pregabalin is not bound to plasma proteins; its distribution volume is 0.5 L/kg.\textsuperscript{53} Like gabapentin, PGB is excreted almost unchanged by the kidneys. Advancing age does not influence the renal clearance.\textsuperscript{59} However, renal insufficiency has a significant effect on the pharmacokinetics of PGB, and dose adjustments have to be made when the creatinine clearance fall below 60 ml/min.\textsuperscript{50} \textsuperscript{51} PGB is cleared by haemodialysis. Supplemental doses are required after each haemodialysis to obtain effective plasma PGB concentrations. The most important adverse events are dizziness (21%-26%) and somnolence (12%-16%), and may troublesome especially in the elderly population.\textsuperscript{56} \textsuperscript{57} These adverse events are dose dependent. Dose titration seems to be mandatory for achieving effective doses >150 mg/day. PGB has shown no significant interaction with cytochrome P450 isozymes in vitro, nor pharmacokinetic interactions with antiinflammatory (including gabapentin) and other medication.\textsuperscript{56} \textsuperscript{58} However, pharmacodynamic-interaction may occur with opioids, alcohol and benzodiazepines.

5.3. Opioids  
During the past decade the use of opioids has increased for the treatment of chronic cancer pain, but above all, of chronic non-malignant pain.\textsuperscript{59} Since the prevalence of cancer and chronic pain increases with advancing age, it is conceivable that opioids are often prescribed to older patients. However, older patients are frequently using concomitant medications, yet they are more vulnerable with regard to the side-effects of the prescribed drugs.\textsuperscript{60} In addition, they tend to have more co-morbidities, which may interact with the prescription of opioids.\textsuperscript{61} In the aged population, higher plasma levels after instant or chronic administration of opioids may caused by the reduced volume of distribution or decreased renal clearance of opioids.\textsuperscript{62} The clinical importance is not clear, because of the wide interindividual variability. Studies to postoperative opioid consumption shows a reduced initial dose and lower maintained doses in elderly patient, compared to their younger counterparts. No differences in chronic use of opioids were present between younger and elderly patients. Elderly patients were even using higher dose than the younger patients. It is recommended that opioid therapy is started with a low dose, escalated by careful titration and with lengthened dosing intervals. However, because of the variability, between older patients, dose requirements may equal those of younger patients.\textsuperscript{61} The rates of safety events, in terms of cardiovascular events, the risk of fracture and mortality, among older patients using opioids for nonmalignant pain may vary significantly by age.\textsuperscript{62} In a recent review of the use of opioids in the elderly it was concluded that for cancer pain, as well as for non-cancer pain all investigated opioids (buprenorphine, fentanyl, hydromorphone, methadone, morphine, oxycodone) seemed to be effective.\textsuperscript{63} However, data specifically aimed at the administration to older patients was hardly available. Those opioids were also effective against neuropathic pain.

Side-effects of opioid therapy in the elderly may be troublesome. Gastrointestinal side-effects include constipation, nausea and vomiting. When standard therapy with laxatives is not effective to overcome constipation, an opioid-rotation may be considered.\textsuperscript{63} Side-effects of the central nervous system, like sedation, hallucinations and cognitive disturbances are common. A recent study of elderly cancer patients on opioid therapy reveals that one-third of the patients had cognitive dysfunction.\textsuperscript{64} Other possible side-effects are pruritus, myoclonus and respiratory depression.

5.3.1. Morfine  
Older patients may be more sensitive to morphine.\textsuperscript{65} This may be contributed to reduced distribution volumes, which results in higher peak plasma concentrations, and reduced clearance of morphine. Morphine is metabolized to morphine-6-glucuronide (M6G) and morphine-3-glucuronide [M3G], whose elimination is significantly reduced with renal failure.\textsuperscript{65} M6G has anagiesic properties and M3G is associated with neuroexcitatory properties. M6G may accumulate because of age-related reduction in renal function or because of relative dehydration. It is recommended to lower the initial dose with 50% when starting therapy. Increase in doses escalation should not exceed 33%-50%.\textsuperscript{66}

5.3.2. Oxycodone  
Oxycodone may have an improved pharmacokinetic profile in comparison with morphine.\textsuperscript{66} The absorption after oral administration is higher and its clearance is less variable than that of morphine.\textsuperscript{66} \textsuperscript{67} Furthermore, it is 2-4 times as potent as morphine.\textsuperscript{66} Possibly, active metabolites contribute to the analgesic effects of oxycodone.\textsuperscript{66}

Recently, it has been shown that plasma concentrations after oral administration of oxycodone are increased in the elderly (+70 years of age).\textsuperscript{68} This is probably due to a lower clearance of the drug from the plasma in older, compared to younger patients.\textsuperscript{50} It is recommended that oxycodone is titrated to effect in the elderly patients. Interaction are possible with drugs that inhibit or activate CYP3A or CYP2D.\textsuperscript{66} \textsuperscript{69}

5.3.3. Methadone  
Methadone is a racemic mixture that acts as a mu-agonist and a weak N-methyl-d-aspartat (NMDA) receptor antagonist. Individual variability accounts for the wide variation in elimination half-life, ranging 20-35 hours in the elderly.
The increased elimination half-life accounts also for the long 2004; 7 for the steady state and maximal effect. Therefore, methadone may be 2,3 (5-6). (Fig 1) and L 24 hours to reach therapeutic serum concentrations of the drug. Because of the hepatic CYP3A4, CYP2B6 and CYP2D6 isoenzymes. 73 74 Interactions (inducing or inhibition) exist between methadone and drugs that are depending on the same isoenzymes for their metabolism. 75 Methadone is associated with increased QTc-interval at the ECG, possibly exposing susceptible patients to a higher risk of arrhythmias. 74 There is still debate on the clinical relevance of this phenomenon. The elimination half-life is dependend on the renal and/or hepatic function. However, no dose-adjustments have to be made in renal failure or stable chronic hepatic liver disease. This is because the metabolites are excreted primarily via the urine, but also by the faecal route. However, because of the partial dependency on renal excretion of methadone, some suggest a reduction of dose or dose interval in patients with severe renal failure (reduction to 50-75% of the dose) and in elderly patients. 75

5.3.4. Fentanyl

Transdermal fentanyl-patches have been shown to be effective in cancer pain treatment with a low incidence of constipation, somnolence, or nausea. 65 Furthermore, they seem to be effective in treating noncancer pain, without significantly impairing cognitive ability or psychomotor function and moderately effective in treating neuropathic pain. Fentanyl is primarily metabolized in the liver by cytochrome 3A4. 75 The elimination of fentanyl may be influenced by strong inhibitors of this hepatic isoenzyme. 63 Fentanyl is particularly suitable for transdermal application. 75 Via this route, it takes about 24 hours to reach therapeutic serum concentrations of the drug. Because of a subcutaneous depot the apparent elimination half-life is 22-25 hours. Therefore it is recommended to increase doses not earlier than 48 hours after application, with 25-50% of the original dose. The pharmacokinetics of transdermal fentanyl is influenced by age. In geriatric, debilitated and cachectic patients doses should be reduced and dose assessment should be made on a regular base. 73 The role of newer formulations of fentanyl, like the Oral Transmucosal Fentanyl Citrate (OTFC), Fentanyl Buccal Tablets (FBTs) and Intranasal Fentanyl (INF) in the management of pain in the elderly has still to be established.

5.3.5. Buprenorphine

In contrast to earlier reports suggesting a partial agonist effect, transdermal buprenorphine acts as a full μ-opioid agonist, without a ceiling effect for analgesia, but with a ceiling effect for respiratory depression. 76 Buprenorphine is mainly (80-90%) excreted unchanged by the biliary system and, therefore, its elimination is not affected by impaired renal function. 77 The remaining one-third is metabolised by glucuronidation and via CYP3A4 to an active metabolite, which has only 2.5% of the analgesic activity of the parent drug. Buprenorphine can be prescribed to elderly patient in the same dose as in their younger counterparts up to a dose to 70 μg/hour. Because of the limited risk on respiratory depression and the advantageous elimination kinetics in the clinical dose range, it may be an useful alternative for the treatment of malignant and nonmalignant pain in the elderly patient. 76 78

Figure 1. Tridimensional reconstruction of human lumbar epidural fat obtained from magnetic resonance images.

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The sacral canal begins at L₄-S₅, where the dural sac ends. Epidural fat is the main component in this region. The amount of posterior epidural fat increases caudally, from L₁₂ to L₄-₅. The thickness of these fatty deposits is approximately 21 mm (range 16-25 mm). Their width increases in the cranio-caudal direction from 6 mm at L₁₋₂ interspace to 13 mm in the L₄-₅ interspace.

The epidural fat deposits are in contact with the posterior surface of the dural sac and the vertebral lamina adhering only to the vascular pedicle. The morphology and distribution of the epidural fat can be altered in pathological conditions, such as the case of epidural lipomatosis, characterized by an increase in epidural fat volume (6-7). In another pathology that we encounter frequently, spinal canal stenosis, epidural fat is absent or markedly reduced around the stenotic zone (6-7). The are other conditions like kyphoscoliosis, where epidural fat is distributed asymmetrically and adipose tissue predominates in the concave portion of the curvature, while the spinal cord is displaced against the vertebral arch (6-7).

The membranes surrounding the spinal cord form the dural sac with cylindrical shape and variable thickness. Classically, dura mater has been described as a thicker membrane at cervical level compared to lower levels whereas it was thinner at lumbar level. However, we found some changes in the mean thickness between different areas of lumbar spine, anterior, posterior and lateral. More recently, we measured duramater at cervical, thoracic, lumbar and sacral levels and we observed that thickness was variable, between 250 and 400 microns in the areas studied (Fig 2).

Dura mater is made up approximately 80 concentric laminas (9-10). Each dural lamina has a thickness of 5 microns and it is made of thinner laminae containing mostly collagen fibers (Fig 2B).

In the inner part of dural sac lies the arachnoid lamina; its thickness is about 50-60 microns (9-10). Arachnoid cells are projected inside, to the subarachnoid space forming a trabecular like structure. This trabecular component of the arachnoid mater sends projections to all the structures that cross the subarachnoid space, including blood vessels and nerve roots. The projections that cover nerve roots are called arachnoid sheaths (11). The thickness of an arachnoid sheath ranges from 10-60 microns (11).

The pia mater contains a cellular layer and a subpial compartment. The cellular layer is made of flat overlapping pial cells with a smooth and bright appearance. Its thickness is made of 3 to 5 pial cells (10-15 microns) at medullary level and 2 to 3 cells (3-4 microns) at nerve root level. Amorphous fundamental substance is found around pial cells (12). The subpial compartment has large amounts of collagen fibers, amorphous fundamental substance, fibroblasts, as well as blood vessels. The subpial compartment is enclosed between the pial cellular layer and a basal membrane in contact with neuroglial cells (12).

The subpial compartment from low thoracic vertebrae has a thickness of 130-200 microns and here, variations in measurements are more significant than in the pial cellular layer. The thickness of the pia mater is reduced to 80-100 microns at the level of the medullary cone and continues to diminish down to 50-60 microns in the origins of the cauda equina. At nerve root level, the thickness of the subpial compartment is 10 to 12 microns (12). CSF is another important component of the space and its volume determines the effectiveness of stimulation at different levels.

The width of the dorsal subarachnoid space was studied by Holsheimer and associates in patients undergoing MRI scans. The mean width of the dorsal CSF layer was 2.5 mm in the midcervical, 5.8 mm in the midthoracic, and 3.6 mm in the low thoracic spine (13).

CSF volume can be measured by different techniques; magnetic resonance imaging (MRI) allows the estimation of CSF volumes from human axial images under physiological and pathological conditions (14-16).

The majority of studies are related to the total volume of CSF, however we are more interested in the volume occupied by nerve rootlets and then the volume of CSF a different vertebral levels where we place the epidural leads. Sullivan (15) in 2006, estimated a CSF volume of 35.8 ml ± 10.9 (range 10.6-61.3 ml) between a perpendicular plane in the intervertebral midpoint of T₄₅-L₁ and the lowest limit of the dural sac.

We have obtained measurements of CSF volume at different levels by 3D reconstruction of MRI. These results are shown as example, in a man of 1.62 m height and weight of 61 kg. (Table 1). The spinal cord is cylinder shaped with some anterior-posterior flattening. The size is not uniform, due to two dilatations at cervical and lumbar levels, the origin of cervical and lumbosacral plexus. The average dimensions of the spinal cord vary at different levels (17). At the midthoracic level, the average transverse diameter is 7.6 mm; at the midthoracic level, 7.2 mm; and at the low thoracic level, 7.8 mm (Table 2).

| Table 1. Spinal cord dimensions (from Testut-Latarjet. Human anatomy) |
|---------------------------|-----------------------------|-----------------------------|
| Cervical dilatation Mid-Thoracic Lumbar dilatation |
| Transversal diameter 13 mm 27 mm 12 mm Anterior-posterior diameter 9 mm 8 mm 9 mm |
| Greatest diameter (C6) 14 mm (T12) 22 mm | Length (C3-T2) 10-12 cm (T2-9) 18-22 cm (T10-L2) 7-9 cm |

| Table 2. Cerebrospinal fluid volume and nerve root volume (ml) per vertebral segment |
|---------------------------|-----------------------------|-----------------------------|
| sacral-L₁₂-L₁ | T₁₂-T₁ | End of conus medullaris |
| LCR2:6.83.453.153.734.613.593.43 |
| Nerve root fruitful 0.060.531.231.421.607.323.148.1.231.3 caudal L₁ Dorsal rootlets are continuation of nerve roots entering the spinal cord at different angles (Fig 3). Once inside the spinal cord these afferent fibers reach the dorsal columns, where they divide in ascending and descending fibers. These afferent fibers are different, more transverse oriented compared to the longitudinal fibers. |
Dorsal columns are made up by thick afferent myelinated fibers (18-21). Their diameter decreases as they advance cranially from 12 microns to 8 microns at the medulla (18-21). At the cauda equina level the diameter of nerve roots varies between 0.5 and 2.3 mm. (Fig 4).

Posterior roots are bigger than anterior roots (22-23). The size of anterior roots increase from 1.1 to 1.8 mm at lumbar level, and decrease from 1.9 to 0.5 mm in the sacral region. Posterior nerve roots at lumbar level have a diameter of 1.3 to 2.1 mm and in the sacral region 2.3 to 1 mm. It is at L5-S1 where the nerves reach the biggest size (22-23).

Motor and sensorial nerve roots, are independent structures with a macroscopic origin at the rootlets, from 7 to 8, coming out the posterior-lateral region of the spinal cord in case of sensorial roots and from 4 to 6 located anterior-lateral in case of the anterior roots. When they leave the spinal cord or the conus medullaris they run together, although independently until reaching the internal orifice of the dural sac, located anterior-laterally.

Conductivity of spinal structures

Of the structures described before, cerebrospinal fluid (CSF) is the most conductive intraspinal element followed by nerve fibers of white matter. Therefore, an electrical field that reaches the CSF has the greatest potential to be conducted to nearby structures (24-26). Of the structures within the cord, the longitudinal white matter demonstrates the greatest conductivity. Transverse white matter, on the other hand, is much less conductive. Gray matter falls somewhere between. Epidural fat on the contrary, demonstrates very low conductivity (18,27-29) (Table 3).

Dura mater also demonstrates low conductivity, but because it is so thin, it usually does not present significant resistance. Vertebral bone is the least conductive, insulating structures outside it from the electrical field.

There is a linear relationship between diameter and conductivity. Dorsal root fibers can be compared with straight fibers whereas dorsal column fibers are more complex, with perpendicular collaterals crossing to the gray mater (18). The diameter of dorsal root fibers is twice the size of dorsal column fibers. The size of dorsal root myelinic fibers is 10-20 \( \mu \text{m} \).

Dorsal root fibers also have a lower threshold than those in dorsal columns. In relation to collateral nerves, the stimulation threshold is 50% lower at branching points particularly when the distance between electrode and target fibers is higher. With short distance among them, there is not change in the threshold.

Furthermore, the current is not only moving in one direction in the dorsal columns, affecting other structures, i.e., dorsal roots or ventral roots. The nerve roots have much lower excitation thresholds than the dorsal columns (24-26). This is the result, not only of the large diameter of the dorsal root fiber, but also of their transverse position and curved shape (24-26). This transverse position influences also the stimulation threshold (30) as well as the curved shape of the dural cuff. The threshold decreases as the cathode moves away the dorsal roots.

The current induced at the contacts flows through the CSF to reach the spinal cord and roots. The amount of CSF at every vertebral level is the main factor influencing the stimulation of spinal cord. There is a close relationship between stimulation threshold and CSF thickness (19,29-30).

This thickness is variable along the spine and the same occurs with the diameter of spinal canal or the cord. The posterior subarachnoid space measures a mean of 2.5 mm at cervical region, 5.8 mm at mid thoracic region and 3.6 mm at lower thoracic region (30) and also changes with flex-extension position. By increasing thickness of the CSF layer, dorsal root fibers are more selectively activated than dorsal column fibers.

A lead placed in the most posterior region of the epidural space, more frequently in the thoracic region with a large epidural space and characterized by its high impedance, results in significant power consumption. Thus, paresthesia threshold is highest in the midthoracic region and lowest in the cervical region, where the posterior subarachnoid space is the smallest.

| TABLE 3. |
| Structures Conductivity (1 KZm) |
| Gray matter 0.23 |
| White matter 0.6 |
| Longitudinal 0.083 LCR 1.7 |
| Transverse 0.083 |
| Epidural fat 0.04 |
| Dura mater 0.03 |
| Vertebral bone 0.02 |
| Electrode insulation 0.0002 |

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Another factor to take in account is the position of the patient. The stimulation intensity increases substantially when the patient changes from a standing or sitting to a supine position. This can be explained by changes in the spinal cord and the thickness of the dorsal CSF space. The changes in threshold can be in the magnitude of 1V to 2V and can be responsible for either severe jolting or complete loss of stimulation.

Stimulation of the large myelinated afferent fibers can occur in four different areas of the spinal cord: the dorsal root, the dorsal root entry-zone, the dorsal horn, and the dorsal columns. Stimulation of the dorsal root can be obtained if the electrode is placed laterally in the spinal canal. It can be difficult to differentiate from stimulation of dorsal root entry-zone and/or dorsal horn. The perception threshold is the minimal voltage at which the patient starts to perceive paresthesias from the electrical stimulation. The perception threshold is lowest in the cervical area and highest in the midthoracic area. The curve of the perception thresholds suggests that there is a relationship between the thresholds and spinal levels of implanted electrodes. This relationship can be determined by the distance between the nerve fibers in the spinal cord and the electrode contacts. Therefore, the thickness of CSF layer is essential for stimulation.

Excitation threshold in dorsal columns is significantly higher than in dorsal roots, even higher if the thickness of CSF increases. At cervical (C5-T1) and mid-thoracic levels (T10) the space is lower, thus, it is the reason why we usually place electrodes at these levels (31).

With lateral electrodes, there is a recruitment of dorsal root fibers, decreasing effectiveness of stimulation. As electrodes are more centrally located, we obtain better results (32-35).

There is a study by Barolat 2 describing the areas where paresthesias are obtained in relation to the area where the active electrode was placed. He describes clearly how the lead contact typically is several levels above the desired area for concordant paresthesia (Figure 3). If the lead is near to the midline, the electrical field will reach the dorsal column before reaching the nerve root at the level of the lead (32-35).

The lead

There are two types of leads used for spinal cord stimulation: percutaneous and paddle (Fig 5A and 5B).

The percutaneous leads are catheter-like, cylindrical and flexible (Fig 5A). They can be introduced into the spinal column via an epidural needle (Tuohy, Husted). The contacts on the leads are also cylindrical, made of platinum-iridium alloys, although there is a new model with bigger flat contacts. The lead is made up of an isodiastematic polyurethane body containing wires that connect the contacts to a proximal connector, and then to the battery (36).

Paddle leads are much wider and flat, with round or rectangular plate contacts placed on one side of the flat portion, and are constructed of a flexible silicone (Fig 5B). They require a surgical procedure, such as laminotomy or laminectomy to be introduced in the epidural space (37). The proximal portion of the paddle is typically similar to the percutaneous leads, terminating in one or two long isodiastematic bodies that provide connection to the stimulating electronics.

There are different types of leads depending on the number of contacts, intercontact center-to-center spacing, contact length, contact width, contact shape, intraspinal lead shape, and for paddle designs with multiple columns, the relative orientation of the contacts among columns (38-39).

Percutaneous leads

Percutaneous leads are presented with 4 or 8 contacts (Fig 5A) and there are models with different distance between contacts. The contacts on the leads are cylindrical, most commonly 3-3.5 mm in length. Multiple contacts have the advantage of recapturing stimulation areas that can be lost in the postoperative phase due to migration of the lead. They have been shown to provide statistically improved long-term outcomes (40).

Mathematical modelling has shown that the center-to-center spacing between active contacts is a key factor in determining the fiber types to be stimulated. Lead models where the anode(s) and cathode were separated by a center-to-center spacing of 4 mm have been shown to be mathematically optimal for preferentially stimulating dorsal column fibers over dorsal root fibers (41-42). However, clinically, leads that use center-to-center anode-cathode separations of 10 mm have been shown to be superior at capturing challenging pain targets, such as covering the low back with paresthesia (43-44).

A short center-to-center spacing helps to concentrate the stimulation field beneath the cathode (Figure 2) and along the axis of the lead.

To achieve a successful stimulation, we target dorsal column fibers and place the contacts as close as possible to the desired neural targets to optimize paresthesia-pain overlap (31).

For that reason, a large number of contacts increase the likelihood of having a stimulating contact close to the neural target.

Paddle leads

Modern paddle leads also have multiple contacts, ranging from 2 to 20, arranged in single or multiple columns (Fig 5B). Paddle leads have been shown to have superior technical results when compared with percutaneous leads.

The primary reason for the improved stimulation appears to be mechanical (41-42). The flat, relatively rigid shape of the paddle lead tends to compress the pliable dorsal dural sac. This reduces the distance between the contact and the dorsal columns, and thus increasing the likelihood of primary dorsal column fiber activation (43-44).

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Figure 5. Leads A: Percutaneous leads B: Paddle leads
Second, because there is a smaller incidence of migration that with percutaneous leads can occur up to 20% of patients. However, percutaneous leads can still achieve technical results similar to paddles.

Figure 6. Human spinal cervical dural sac. Cervical 6-8 level. A, B, and C: Percutaneous leads. D, E, and F: Paddle leads
Figure 7. Human spinal thoracic dural sac. Thoracic 10-12 level: A and B: Paddle leads C and D: Percutaneous leads

Figure 8. Human spinal lumbar dural sac. Lumbar 3-5 level. A and B: Percutaneous leads
The factors influencing a good result in stimulation are the number of contacts, contact and lead geometry, and electric field shaping via the anode-cathode combination (45-46).

The setting of contacts on paddle leads with multiple columns of contacts is also of importance. Mathematical models suggest that active contacts aligned on the lead in “perfect parallel,” achieve better results that when contacts are staggered (39). When contacts are staggered, the cathodic fields do not optimally superimpose and, if two columns of narrow bipoles or guarded cathodes are programmed, greater anode-cathode cancellation can occur.

**Conclusions:** The location of the electrode or the paddle lead in the epidural space will determine the requirement of a greater or lower energy to generate an electrical field and induce stimulation. There may be some differences between the position chosen to place the electrode and the final position where it is placed. Frequently, electrodes move from the initial midline position in the epidural space. Paddle leads that are surgically inserted usually remain without displacement.

The study of anatomy applied to the field of neurostimulation will help to know the relationship between different structures under the effect of the electric field (Figs. 6, 7, and 8). At cervical level, the exit of posterior rootlets is closer to midline compared to thoracic or lumbar levels. These anatomic differences determine a type of stimulation mixed, affecting dorsal columns and roots at cervical levels whereas at lower thoracic and lumbar levels the stimulation includes more dorsal columns (Figs. 6, 7, and 8).

It is required a good knowledge of the structures underneath the stimulating electrodes or plates in order to get the best results.

**References:**


Peripheral nerve stimulation (PNS) describes the application of electrical stimulation to the peripheral nerve(s) for either functional restoration or analgesia. This latter type of PNS will be referred to as **peripheral nerve stimulation** and is discussed elsewhere. PNS utilizes the concepts from the gate control theory of Melzack and Wall. (1) Operationally, Wall and Sweet were the first to attempt direct neural stimulation. (2) Early series by several authors described success utilizing PNS (3, 4, 5, 6). One of the larger series of outcomes and complications from 91 patients at the Cleveland Clinic was published by the IASP. (6) PNS has suffered compared to spinal cord stimulation (SCS) from more technical problems and poorer hardware. Indeed, no complete modern system for PNS is currently available from any manufacturer, but must be pieced together using components largely designed for SCS. The absence of a minimally-invasive trial system similar to that for percutaneous SCS may be one reason that peripheral nerve surgeries have not advanced as rapidly. Lead migration, neural ischemia/injury and a narrow therapeutic range may be other reasons. Recently minimally invasive techniques were described for PNS. (7, 8, 9) Possible advantages to peripheral nerve stimulator placement via a minimally invasive technique include: 1) Minimal dissection and neural trauma; 2) Minimal perturbation of the epineurial and vasa nervorum; 3) A true percutaneous trial avoiding open surgery; and 4) Intraoperative testing in an awake patient with minimal sedation. Cadaver feasibility studies described possible approaches to target nerves. (7, 8) Subsequently the first case series of 9 patients of PNS via ultrasound was published. (9) Advantages noted during the first case series included description of workable approaches to PNS placement under US, characterization of placement of dual leads and anchoring techniques (a second electrode could be placed parallel or “sandwiching” the nerve targeted to more optimally stimulate the desired fascicles); and finally some patients avoided surgical incision when the trial lead placement was not analgesic. (9) Other technical developments are under way, and include the stimulus router concept (A passive implant delivery terminal is placed near the target nerve and current is routed between a surface cathode and a pick up terminal, a small fraction of which (10-15%) is passed to the delivery terminal. (10) Also under development are high frequency electrode systems for PNS that will produce a conduction block of the target nerve for pain syndromes such as phantom/stump pain.

**Patient Selection**

Generally, patients that might benefit from PNS would include those refractory to medical and previous surgical care, such as entrapment neuropathies, peripheral neuropathic pain syndromes, needlestick or traumatic injuries, and complex regional pain syndromes.

**Safety**

Open surgery for PNS has been plagued by a significant problem with loss of capture/ lead migration and thus need for revision surgery. Damage to the epineurium or vasa nervorum are also possible problems causing neural ischemia/edema and inflammation. Previous studies on mechanical effects on the epineurium or vasa nervorum are also possible problems causing neural ischemia/edema and inflammation. Previous studies on mechanical effects on the epineurium or vasa nervorum have been performed. One study (11) performed on perineural electrodes on long term neural function related to pressure and stimulation adverse effects. Helical wrap- around electrodes with 3-7 circumferential twists were examined to evaluate whether the mechanical or stimulation effects were responsible for adverse changes in histology. Prolonged high frequency stimulation may cause neurological injury. In our initial trials, frequencies required have been generally low and often were below the patients perceptual threshold. (9) We have seen no neurological damage as a result of percutaneous US-guided PNS.

**Anatomical Considerations: internal fascicular arrangement**

Normal nerves must be free to glide within their neurovascular bundles and fascial planes. Sunderland (12) described the configuration of motor or mixed fibers and their changing locations within relatively short distances. This situation makes the threshold for activation of muscle contractions very close to the threshold for sensory stimulation, particularly if the electrode contact is too close to the motor fascicles. It is possible, therefore, that an awake intraoperative test would be very useful. The thickness of the fascicular perineurium, fascicle diameter, and position within the nerve trunk have significant bearing to thresholds for activation and other stimulation characteristics. For example a cuff style electrode wrapping around the femoral nerve was evaluated in one study, wherein the target fascicle stimulation was found to be highly dependent on the location of the fascicles perineurium and its thickness. Increased perineurium thickness or larger fascicle diameter increased the threshold for electrical activation. Larger neighbor fascicles also affected target fascicle activation by as much as 80% +/- 11%. (13)

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Conclusions: US-guided placement of PNS electrodes may prove to be an important advance or a passing fancy. Investigators should be ever vigilant to ensure safety and efficacy as new knowledge is generated.

References:

Conclusions: See above

90

US FOR FACET DETECTION AND LTSYS WITH RF BETTER THAN FLUOROSCOPY?

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Background: In 1911, Goldthwait (1) reported the possibility of the spinal facet joint being a cause of sciatica. The term “facet joint syndrome” has been used since the 1930s. Overload of the posterior lumbar joint, muscle imbalance and degenerative change are all associated with lumbar facet joint syndrome(2) (3). In 1941, Badgley (4) reported that the posterior joint was the cause of chronic lower back pain. According to Shealy (5), facet joint lesion was present in 82% of the patients with chronic lower back pain. Bed rest, medication and physical therapy are performed for the treatment of posterior joint-related lumbar pain. In 1976, Moomen and Robertson (6) following the injection therapy using local anesthetics, improvement of symptoms was seen in approximately 43% of the patients at follow-up that was conducted after 7.9 months first performed intra-articular injection of steroid and local anesthetics. Since then, many studies have been conducted to examine spinal facet block Ultrasound (US) is an emerging imaging technique in interventional pain management. The main advantages are the identification of soft tissues, vessels, and nerves, without exposing patients and personnel to radiation, the possibility to perform continuous imaging, and the visualization of the fluid injected in a real-time fashion. Possible applications are nerve blocks of the cervical and lumbar zygaphyssial joints, stellate ganglion block, intercostal nerve blocks, occipital nerve blocks, blocks of the inguinal nerves, peripheral nerve blocks of the extremities, blocks of painful stump neuremas, caudal epidural injections, and injections of tender points. US may also be used for destructive procedures, such as cryoanalgesia, radiofrequency lesions, or chemical neurolysis. The increasing published data available suggest that US has a potential usefulness in interventional pain management, but also limitations.

Methods: The first study was published by Greher et al in 2004(7). The study describes the development of the technique in cadavers, evaluates it noninvasively in volunteers, and finally tests in a small series of patients whether the technique is usable under clinical circumstances. Using this method based on a sonographic cross- and long-axis view, the target point for a lumbar facet nerve block at the level L3-L5 (i.e., medial branch L2-L4) can be delineated with ultrasound, and a needle can be guided to it. The Authors demonstrated that the placement of this needle can be monitored in real time from skin puncture to the final position at the transverse process with ultrasound and that injection of 1 ml solution results in a striking spread around

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the needle tip. These features may be considered crucial to ensure specificity and to avoid complications related to needle malpositioning. Ultrasound in such a context and even in the most obese volumes with a body mass index of 36 kg/m², although constitutional limitations probably exist. The same group, few months later, published a second study (8). With this study they demonstrated that ultrasound-guided methodology for lumbar facet nerve blocks can be performed with high accuracy, as verified by 1-mm-slice control CT scans. Assuming that contrast dye distribution around the medial branch is a valid surrogate marker for a successfully accomplished block, the simulated block success rate of this technique was 94%. The medial branch lies in a groove at the base of the superior articular process, where it crosses the transverse process in a posterior and inferior direction. In theory, the medial branch can be blocked anywhere on its way from the cephalad border of the transverse process to its caudal rim medial to the accessory process. The target site is the bottom of the groove between the lateral surface of the superior articular process and the cephalad margin of the adjacent transverse process, because this is the most frequently used approach with a clear anatomical definition.

Two years later other Authors published a new study, again performed in embalmed cadaver. In contrast to the methodology of the previous studies, which was only possible at levels L3-5, they could demonstrate the accuracy of ultrasound guided facet joint injections at all lumbar levels. This is particularly relevant because the L5-S1 facet joint is frequently affected. Galiano performed an ultrasound inline approach, in which the needles were strictly advanced in parallel to the long axis of the transducer to keep them in the echo plane. This technique provides real-time monitoring of the inserted needle along its entire length. It is important to respect a systematic proceeding in depicting the joint space: first, the spinal level should be determined, subsequently, the transducer can be rotated and the corresponding spinous process can be traced until the lamina can be delineated. The lamina should be shown in their entire length to assess their lower margin. Proceeding along this margin of the lamina to the lateral and caudal aspect, the inferior articular process of the zygapophysial articulation with its medial facet can be demonstrated, and the next occurring slits has to be to the joint space. Starting from this imaging, by adjusting and swaying the transducer to a cranial orientation, all subsequent appearing cavities or spaces are established by the lateral aspect of the joint space, the located mamillary process, the accessory process, and the costal process, which cause a typical shadow signal lateral to these structures. This systematic technique avoids confounding the facet joints and mamillary or accessory process. The comparison of ultrasound and CT measurements demonstrated a good correlation.

In 2006 Shim (9) compared the success rate and validity of this new method to the use of fluoroscopic controls in patients previously diagnosed with lumbar facet joint-mediated pain. In 20 patients, 101 lumbar medial-branch blocks were performed under ultrasound guidance. The target point was the groove at the cephalad margin of the transverse process adjacent to the superior articular facet. In an other study Galiano (10) evaluate feasibility, accuracy, and time-saving of ultrasound-guided facet joint injections versus CT-controlled interventions in the lumbar spine in a prospective randomized clinical trial. 18 subjects from the group randomized to ultrasound were judged to be feasible for this type of approach. In 16 of them the facet joints were clearly visible and all of the associated facet joint injections were performed correctly. The duration of procedure and radiation dose was 14.3 ± 6.6 minutes and 14.2 ± 1.7 mGy cm in the ultrasound group, and 22.3 ± 6.3 minutes and 364.4 ± 213.7 mGy cm in the CT group. Both groups showed a benefit from facet joint injections. The study demonstrates that in 90% of patients, who were not specifically selected in terms of their eligibility for sonography, a visualization of the facet joints was possible. In all cases in which the target could be precisely identified and visualized, the needle placement was correct. Nevertheless, CT is a reliable and straightforward method for the assessment of detailed bony and partially soft tissue structures, and can be applied theoretically in 100% of the patients, regardless of their physical condition.

In 2007 (10) Galiano published the first study comparing ultrasound-guided lumbar facet joint injections to a CT-controlled procedure in a prospective randomized clinical manner. The study demonstrates that in 90% of our patients, who were not specifically selected in terms of their eligibility for sonography, a visualization of the facet joints was possible. In all cases in which the target could be precisely identified and visualized, the needle placement was correct. Therefore, no additional roentgenological control is required, if the target structures can be visualized exactly using ultrasound. Even in the patient who needed needle replacement the total radiation dose was lower than the mean dose of patients who had a CT-guided intervention. Moreover, duration of the procedure in this case was longer than usual, as two ultrasound approaches with subsequent CT control were performed.

More recently a study (11) was published regarding ultrasound assisted medial branch block in obese patients. Only in 54 of 84 patients the procedure has been successfully done. Most of the failed blocks occurred at L5 (dorsal ramus), the facet joint that is frequently affected. Major problem with the ultrasound-guided method in obese patients was that the operator could not reliably track the needle advancement to the target. The needle tip was almost invisible in the deeper structures because of increased noise of the surrounding, mainly adipose tissue. In addition, the poor accuracy for the L5-S1 approach was attributable to bony artifacts caused by the close proximity of the iliac bone and sacral ala. The authors concluded that the success rate of placement of needles in the facet joints in obese patients was insufficient to support exclusively using ultrasound guidance for lumbar medial branch blocks.

The last study published in 2010 (12) the authors compared ultrasound guided facet block to fluoroscopic guidance. The block were performed by an expert surgeon who examined the spinal structures in 30 normal healthy people prior to the ultrasonographically guided procedures. Based on the results obtained, it can be inferred that spinal facet block under ultrasonographic guidance can be simply performed in an outpatient setting with a certain degree of experience and training. They confirmed also that in obese patients, there was a great gap between the skin and the facet joint. There is a limitation that a high-quality ultrasonographic image can not always be obtained. On the contrary in ultra-lower-weight patients, the ultrasonographic probe cannot be closely contacted to the skin. This poses a difficulty in obtaining a high-quality image and there is difficulty to perform this procedure using ultrasonography. Furthermore to the limitation of the range of the ultrasonographic images, it is not easy to perform nerve root block.

Conclusions: Facet joint injections are widely used by most pain practitioners. Some infiltrations are still performed in a blind fashion, despite the well known fact that injections performed under image guidance can reduce complication rate and lead to better results. (13, 14) Equipment for roentgenological-guided interventions is expensive, and special requirements need to be met. In contrast, ultrasound is relatively inexpensive, broadly available, and feasible in most patients with great accuracy.

In conclusion, the ultrasound approach to the facet joints is feasible and has minimal risk in the large majority of patients, except for obese people, and results in a significant time and radiation dose reduction. Spinal facet block under ultrasonographic guidance can be a useful tool for a generally invasive procedure that is performed to treat the pain associated with the vertebral spines. If the accuracy of ultrasonographic guidance can be gradually enhanced, then this modality can be used as a substitute for irradiators and CT.

References:
 WHAT ARE THE LIMITS FOR TARGETS IN RADIOFREQUENCY NEUROTOMY? 

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Radiofrequency (RF) neurotomy is a minimally invasive technique for treating chronic pain. The technique is based on the assumption of a peripheral pain generator and that thermocoagulation of a nerve may interfere with the conduction of nociceptor stimuli. However, RF neurotomy is still controversial, and the numbers of physicians who offer this treatment vary from one country to another. The disagreement is about efficacy and safety, but there is also a discussion about mode of action and technique. Consensus guidelines are therefore badly needed.

To decide whether an anatomic structure is the cause of pain, Hildebrandt (1) has suggested four criteria to be fulfilled: 1) The structure must have an exact peripheral location with a nerve supply, 2) it should be capable of causing pain similar to that seen clinically in normal volunteers, 3) it must be susceptible to painful disease or injuries, and 4) a diagnostic technique that provides only minimal increase of the lesion size. Thus, optimal duration of the coagulation is suggested to be 60 to 90 seconds (5).

To perform a precise neurotomy, the pain physician needs training with different guiding techniques such as X-ray, CT and ultrasound. The target nerve should be easy to localize as when located on a bony structure, and not close to vital nerves or vascular structures (arteries and large veins). Heating the celiac plexus may for instance lead to serious injury of the aorta and should never be performed. Neurotomy of nerves with a cutaneous distribution is generally not recommended. It may cause neuropathic pain and lead to severe hyperphenomena. The technique is therefore mostly applied on peripheral nerves innervating deeper structures like joints and skeletal muscle.

The medial branches of the dorsal root are the most common targets for RF neurotomy. Their anatomical localization is well described. The nerve branches contain both sensory and motor fibers and innervate several potentially painful structures. A medial branch block will consequently stop nociceptive signals both from the zygapophysial joint, to and from the medial posterior muscles (multifidus, interspinales) and from the ligament between the spinal processes. In randomized controlled trials the technique has shown clinically and statistically significant pain relief and improved health related quality of life and function with effects lasting for several months (9,10).

Neurotomy of the lateral branches from S1-S4 to the sacrocaudal (SI) joint has been suggested as a potential treatment for SI related pain. The results from non-controlled studies, seem promising (11), and a randomized cross-over study is ongoing (http://clinicaltrials.gov/ct/show/NCT01104051).

RF neurotomy of the paravertebral sympathetic chain or of the splanchnic nerves has been carried out for several years although there is still no scientifically evidence (12,13). Case reports and case series indicate that some patients profit, while others may experience deterioration. However, the risk for developing neuropathic pain seems to be less for percutaneous RF techniques compared with surgical sympathectomy.

In a recent RCT Choi et al (14) reported significant pain relief and improved function after RF neurotomy of genicular nerves to the knee among patients with osteoarthritis. The study is small and the short follow up short (12 weeks), and does not provide satisfactory documentation about the safety aspects. Neurotomy of genicular nerves can therefore not be recommended for clinical use at present time.

Intradiscal RF treatment (“IDET”) became a popular procedure for discogenic low back pain after promising non-controlled reports during the nineties. The results from randomized controlled studies, however, are less conclusive (15,16,17). According the Cochrane Database from 2003 there is limited evidence that intradiscal RF thermocoagulation is conclusive (15,16,17). According the Cochrane Database from 2003 there is limited evidence that intradiscal RF thermocoagulation is not effective for chronic discogenic low-back pain (18).

Reference list:

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IS THERE A REASON FOR DIAGNOSTIC MEDIAL BRANCH BLOCKS BEFORE LUMBAR RADIOFREQUENCY ZYGAPophysIAL (FACET) JOINT DENERVATION?

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Degenerative disease of the zygapophysial (facet) joints accounts for approximately 10-15% of the cases of chronic low back pain. 1 Radiofrequency (RF) denervation of the medial branches of the dorsal rami, is a frequently performed procedure to treat pain originating from the facet joints. Success of RF facet denervation is highly dependent on patient selection. Diagnostic blocks are recommended in guidelines and reviews for selecting patients with facet joint pain from a population with non-specific low-back pain, however with a large variation in the techniques of performing and assessing the blocks.2 Cohen and colleagues published an RCT assessing 3 selection paradigms prior to lumbar facet radiofrequency denervation.3 The design and findings of this study provide an important contribution to the ongoing debate on patient selection and the so-called “diagnostic blocks.”4

The importance of correctly performed and assessed diagnostic blocks becomes clear when examining the 7 randomized controlled trials (RCTs) on lumbar facet denervation.5-11 In 5 of the 7 RCTs the RF treatment has a superior outcome to the comparator,6,8,9,11 whereas there is one negative trial and one equivocal study.5 In all these studies diagnostic blocks were performed. There is however, no gold standard on how to perform the diagnostic blocks, resulting in a wide variation of technique, medication used, dose and interpretation, which is illustrated in table 1. Consequently, the percentage of patients that are ultimately selected for treatment, varies from 10% to 92%, which is not in line with prevalence data of facet arthropathy (10-15%). These large variations in patient selection may contribute to the differences in observed success rates between different RCTs. The goal of diagnostic blocks is to select patients with facet joint pain, who are supposed to benefit most of RF facet denervation. This can be expressed by the number of patients needed to be treated in order to result in one patient with a positive outcome (NNT). The lower the NNT the more effective the treatment.

In the negative and equivocal RCT on RF facet denervation patients were selected by means of aspecific intra-articular blocks instead of medial branch blocks. Moreover Leclaire et al judged the intra-articular block with local anesthetic and corticosteroid to be positive when the patient reported “significant” pain relief during 24 hrs within the week following the injection.7 The 92% inclusion rate may reflect the high false positive rate. The NNT in this study was 11.9 in the RF group. In a controlled study using single diagnostic medial branch blocks were the outcome of the block was assessed by the patient with help of a study nurse during 30 minutes following the injection the prevalence of facet joint pain was 31%.8 The NNT in the RF group was 1.6. In a non-randomized but high quality prospective study, Dreyfuss et al.9 included patients after 2 positive controlled blocks with lidocaine and bupivacaine. The prevalence of facet joint pain was 10.8% and the NNT 1.1. In conclusion the use diagnostic intra-articular facet joint blocks can not be recommended anymore and better patient selection with medial diagnostic blocks improves the outcome of RF facet denervation.

There are however two concerns regarding a future standard recommendation of controlled diagnostic blocks. Firstly by increasing the number of diagnostic blocks the false positive rate will be reduced but unfortunately the false negative rate will increase, thus increasing the risk of withholding an active treatment to patients. Moreover aberrant medial branch innervation was demonstrated in 11% demonstrating an addition risk for false negative blocks.10,11 The second concern is related to the balance of the burden of multiple interventions versus the potential benefit. The study by Cohen et al adds another piece of information to this complicated puzzle. The authors try to identify the most beneficial strategy for selecting patients for a RF facet denervation by calculating the cost per successful RF procedure based on three strategies for patient selection: (1) solely based on clinical examination, (2) clinical diagnosis followed by one diagnostic block and (3) clinical diagnosis followed by double diagnostic blocks. RF treatment of patients selected on clinical examination has the lowest cost per successful treatment, whereas the highest costs per successful RF treatment is generated when performing this procedure after one single diagnostic block. Price of the global management will vary from one country to another and as the authors also suggest changes in the decisions of third party payers may change the monetary outcome of this study. It confirms the statement made above that a better patient selection will result in a better treatment outcome. Besides the costs of the different interventions, it is worth to consider the extra burden for the patient related to extra visits and interventions associated with controlled blocks. In the study of Cohen et al.12 64% of the patients treated after 2 diagnostic blocks and 39% of the patients treated after 1 block, had a successful outcome. This means that for a 25% increase in successful outcome after RF treatment 100% more diagnostic interventions are needed.

There is also a definite risk of excluding patients based on false negative blocks. In the Cohen study each group contained 50 or 51 patients. Patients were randomly allocated to one of the treatment groups to create homogeneous populations in the three study groups. When looking at the number of patients who had 3 months pain relief we notice: Group 0 n= 17, group 1 n = 8 and group 2 n = 11. These differences suggest that a number of patients were excluded from treatment in groups 1 and 2 based on false negative blocks, and thus withholding patients prolonged pain relief. The question thus arises whether the relative small gain in success justifies the extra burden for the patient, the higher costs and possible side effects of an
additional treatment session. Moreover only minor and transient side effects are reported in the literature after RF facet denervation. In conclusion standardization and scientific validation of (controlled) diagnostic medical branch blocks is highly needed, to allow identifying its real value in clinical practice.

References:

Best Free Papers
93 ROPIVACAINE INHIBITS THE ACTIVATION OF SRC AND ICAM-1 AND THE PRODUCTION OF MCP-1 IN H838 LUNG CANCER CELLS
T. Piegeler1,2, G. Liu, G. Votta-Velis, B. Beck-Schimmer, R.D. Minshall1, A. Borget USA, Switzerland.
Background: Retrospective analysis of patients undergoing cancer surgery suggests a possible benefit of Regional Anesthesia in survival or cancer recurrence. Ropivacaine, a long-acting amide local anesthetic is known to have anti-inflammatory properties in the lung. Inflammatory processes are also important during development, growth and metastasis of cancer. Src protein tyrosine kinase, lying downstream of activated ICAM-1 where it is thought to signal vascular inflammation and endothelial hyperpermeability, may also be involved in signaling epithelial-to-mesenchymal transformation of cancer cells necessary for metastasis. Monocyte Chemoattractant Protein-1 (MCP-1) attracts macrophages and monocytes to sites of inflammation. MCP-1 production is associated with tumor-associated angiogenesis and macrophage invasion, a phenomenon linked to poor prognosis, e. g. in breast cancer.
Methods: We tested the effect of ropivacaine on basal and bacterial lipopolysaccharide (LPS) activation of Src and ICAM-1 as well as on TNF-a-induced MCP-1-production in H838 lung cancer cells. Statistical analysis was made with bivariate correlation analysis (Spearman-Rho).
Results: Ropivacaine attenuated the expression of inflammatory mediators and blocked transendothelial migration of PMNs. A possible mechanism might be related to the inhibition of Src activation and ICAM-1 phosphorylation. Ropivacaine might therefore be evaluated further in vivo.

94 ROPIVACAINE INHIBITS TRANSENDOThelial MIGRATION OF LEUKOCyTES AND ATTENUATES THE ACTIVATION OF ICAM-1 AND SRC PROTEIN TYROSINE KINEASE IN VITRO
T. Piegeler1,2, G. Votta-Velis, Z. Chen, A. Borget, R.D. Minshall1, B. Beck-Schimmer USA, Switzerland.
Background: Ropivacaine, a long-acting amide-linked local anesthetic, has anti-inflammatory properties in experimental lung injury. Src kinase regulates vascular inflammation and endothelial permeability in part by phosphorylating ICAM-1 and thereby controlling neutrophil adhesion.
Methods: Human Lung Microvascular Endothelial Cells (HLMVEC) cultured on Transwell filter inserts were pretreated with lipopolysaccharide (LPS) in presence or absence of ropivacaine or with ropivacaine alone. Polymorphonuclear leukocytes (PMN) added to the upper chamber were collected from the bottom chamber and lysed to determine glucuronidase activity to quantify PMN transmigration. The effect of ropivacaine on basal and LPS-induced Src- and ICAM-1-phosphorylation in HLMVEC was also evaluated. Statistical analysis was performed with bivariate correlation analysis (Spearman-Rho).
Results: Ropivacaine dose-dependently inhibited transendothelial migration (r-value -0.743, p<0.001) as well as phosphorylation of Src (r-value -0.906, p<0.001) and ICAM-1 (r-value -0.669, p<0.002) compared to HLMVECs treated with LPS alone. Ropivacaine alone dose-dependently attenuated Src (r-value -0.795, p<0.001) and ICAM-1-phosphorylation (r-value -0.666, p=0.018) compared to naive HLMVECs but had no effect on PMN transmigration (r-value -0.111, p=0.381).
Conclusions: Ropivacaine attenuated the expression of inflammatory mediators and blocked transendothelial migration of PMNs. A possible mechanism might be related to the inhibition of Src activation and ICAM-1 phosphorylation. Ropivacaine might therefore be evaluated further in vivo.
as it might be a promising new drug for the prophylaxis or treatment of ALL or ARDS.

95
INTRAOPERATIVE LOCAL INFLTRATION ANALGESIA IN TOTAL HIP ARTHROPLASTY: A RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL IN 120 PATIENTS
T.H. Lunn1,2, B.B. Kristensen1,2, H. Husted1,2, S. Solgaard1,2, L. Gaarn-Larsen, H. Kehlet1,2, L.O. Andersen Denmark.

Background and aims: High-volume local infiltration analgesia (LIA) is widely applied in total hip arthroplasty (THA). However, methodological problems hinder exact interpretation of previous trials, and the evidence for LIA in THA remains to be clarified. Therefore, we evaluated whether intraoperative high-volume LIA, in addition to a multimodal oral analgesic regime, would further reduce acute postoperative pain after THA.

Methods: Ethics committee approval was granted. Patients scheduled for unilateral, primary THA under spinal anaesthesia were included in this randomised, double-blind, placebo-controlled trial receiving high-volume (150ml) wound infiltration with ropivacaine 0.2% with epinephrine (10µg/ml) or saline 0.9%. Slow release paracetamol 2g, celecoxib 400mg and gabapentin 600mg was given preoperatively. Rescue analgesic consisted of oral oxycodone. Pain was assessed repeatedly the first 48h after surgery. The primary endpoint was pain during walking (5m) at 8h after surgery. Secondary endpoints were pain at rest, pain upon passive hip flexion and consumption of oxycodone.

Results: Pain during walking was low and did not differ significantly (p=0.71). Consumption of rescue oxycodone in the ropivacaine vs. the placebo group [median (IQR) (95% CI): 5mg (0-10) (0-24) vs. 10mg (0-15) (0-29)] did not differ (p=0.45).

Conclusions: LIA provided no additional reduction in acute pain after THA when combined with a multimodal oral analgesic regime, and is therefore not recommended. The analgesic benefit of LIA previously reported in THA might be due to an analgesic effect of NSAID added to the LIA-mixture (but not in the control group) in combination with a less comprehensive oral analgesic regime.

96
PHARMACOKINETICS OF HIGH DOSE ROPIVACAINE WITH AND WITHOUT EPINEPHRINE FOR COMBINED SCIATIC/FEMORAL NERVE BLOCK
K. Schoenmakers, T. Vree, N. Jack, B. van den Bermt, R. Stienstra
The Netherlands.

Background and aims: Currently there are no pharmacokinetic data on doses of ropivacaine larger than 300 mg for peripheral nerve block in man. The purpose of the present study was to obtain the pharmacokinetic profile in serum of 450 mg ropivacaine with and without epinephrine in patients undergoing anterior cruciate ligament reconstruction under single-shot combined sciatic/femoral nerve block.

Methods: Twelve patients were randomly allocated to receive a single-shot combined sciatic/femoral nerve block with 60 mL of either ropivacaine 0.75% alone (R-group) or ropivacaine 0.75% plus 5 µg/mL epinephrine (RE-group). Venous blood samples for total and free ropivacaine serum concentrations were obtained during 48 hours following block placement.

Results: Mean total Cmax in group R was 2.66 ± 0.80 mg/mL, and 2.05 ± 0.21 mg/mL in group RE (NS). The mean tmax was significantly shorter in group R compared to group RE: 0.84 ± 0.27 h versus 2.17 ± 0.67 h respectively. The free ropivacaine serum concentration was 0.16 ± 0.08 mg/mL in group R and 0.12 ± 0.04 mg/mL in group RE (NS). There were no significant differences between the groups in any of the other pharmacokinetic parameters.

Conclusions: Free serum concentrations of ropivacaine remained well below the assumed threshold of 0.56 µg/mL for systemic (CNS) toxicity. The addition of epinephrine prolonged tmax significantly, but the difference in Cmax was statistically not significant.

97
ULTRASOUND (US) GUIDED TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK DOES NOT IMPROVE ANALGESIA AFTER ELECTIVE CAESAREAN SECTION (CS) UNDER INTRATHecal DIAMORPHINE & BUPIVACAINE
L. Bhutal1,2, R. Rajendram, S. Gopinath.

Background and aims: Bilateral TAP blocks improve postoperative analgesia after CS under spinal anaesthesia with fentanyl[1] but not morphine[2]. At PAH elective CS is routinely performed with intrathecal hyperbaric bupivacaine (11mg) and diamorphine (300µg). This is occasionally supplemented with US-guided TAP blocks. However, the efficacy of this practice has not been reported. A prospective audit at PAH addressed this issue.

Methods: 48 ASA 1&2 women undergoing elective CS received spinal anaesthesia and regular postoperative paracetamol and diclofenac with or without fentanyl. At the discretion of the attending anaesthetist 22 received bilateral US-guided TAP blocks (20ml 0.375% levobupivacaine each). Morphine use in the first 24 hours postpartum was obtained from the drug chart. Patients were questioned on sleep quality and satisfaction with analgesia (good, fair, poor). The t-test was used to analyse parametric data and Fishers exact test was used for non-parametric data.

Conclusions: US-guided TAP blocks do not improve analgesia after CS under spinal anaesthesia with bupivacaine and diamorphine. This may be because the duration of action of intrathecal diamorphine is greater than fentanyl.

References:

98
PRIOR POST-DURAL PUNCTURE HEADACHE AND SUBSEQUENT SPINAL ANAESTHESIA
M. Armstrong, C. Leech, D. Silva, S. Gowrie-Mohan

Background and aims: Concerns have been raised about whether previous post-dural puncture headache (PDPH) increases a patient’s risk of further PDPH after subsequent spinal anaesthesia. We report our experience of twelve obstetric patients who were asymptomatic following a previous PDPH and underwent caesarean section under spinal anaesthesia.

Methods: 12 patients who met the above description have attended our institution in recent years. Initial PDPH followed labour epidural in 8 cases, and post-combined spinal epidural in the remainder. 6 patients required a blood patch. All 12 patients were asymptomatic by the time they re-presented for spinal anaesthesia for caesarean section. In each case a 25G pencil point needle was used. The interval between dural insults was between 2 and 6 years.

Results: 10 out of 12 patients re-developed PDPH symptoms, varying from mild to severe, with 50% requiring blood patches and 50% resolving with simple analgesia.

References:
1. 1
2. 2

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Conclusions: 25G pencil point needles have previously been reported as causing PDPH in 2.5% of parturients, however, in this series prior PDPH resulted in an 83% incidence of subsequent PDPH. Patients with a prior history of PDPH may be at a greater risk because of the inflammatory response and healing on the punctured dura, or of because of anatomical variation pre-disposing to symptoms. Either way, patients who have had previous PDPH should be advised of their increased risk of further PDPH and consideration given to avoiding dural puncture.

Results: A total of 25175 neuraxial blocks were performed. Ninety-eight women had a recognized ADP (0.4%). From 1997-2006, prolonged intrathecal catheters were inserted into 49% of women with ADP. Since 2006 this practice increased to 79%. In total 61 women received a prolonged spinal catheter. The incidence of PDPH after ADP was reduced in women who received a spinal catheter compared to those who did not. (44% vs 65%; p = 0.048).

Conclusions: At our institution the management of ADP with a spinal catheter, left in place for 24 hours after delivery, has reduced the incidence of PDPH.

Reference:

FREE COMMUNICATIONS

101 DOES ULTRASONOGRAPHY FACILITATE EPIDURAL ANESTHESIA IN OBESE PATIENTS?

Background and aims: Epidurals in obese patients are challenging. This study compared paramedian ultrasound guided epidural anaesthesia(UGE) and the standard loss of resistance(LOREA) technique in obese patients.

Methods: After internal ethic comity approval, twenty parturients BMI=30kg/m2 scheduled for labor epidural anesthesia were randomly assigned to receive either real time paramedian ultrasound guided epidural anesthesia(UGE) or standard LOR epidural access(LOREA group n=10). A 5 MHz curved array probe (Logiq book xp-pro™GE Solingen, Germany) was applied for LP scout scan to select L3-L4 level. A helper fixed the probe and standard loss of resistance confirmed epidural space all cases. Visibility of ligamentum flavum dura mater complex(LF-DM) rated as [well -hardly-not] defined. Number of attempts and needle redirections were recorded. Analgesic efficacy was defined using visual analog score (VAS). The extent of sensory block and the degree of motor block according to Bromage were recorded. Patients satisfaction assessed by a six points score(1:very good2:good3:average4: sufficient 5:unsatisfactory:6:unsufficient). The differences between groups were assessed with the Mann-Whitney test for continuous data and Fisher's exact test for categorical data.

Results: The results were similar regarding demographic characteristics. (LF-DM) complex was well defined for all patients in UGEA group(figure 1).
This study suggests that ultrasonography could be a valuable support for epidurals in obese patients.

**102**

**1% PLAIN CHLOROPROCAINE FOR SPINAL ANESTHESIA. 10 YEARS’ CLINICAL EXPERIENCE WITH AN ULTRA-SHORT ACTING LOCAL ANESTHETIC DRUG**

T. Palas Switzerland.

**Introduction:** Chloroprocaine (cp) has a great potential of a good anesthetic drug due to its properties of fast onset, rapid break down, and low toxicity. An ideal replacement for lidocaine in spinal anesthesia for ultra short surgical procedures. We have used plain, additive free 1% cp intrathecally in clinical anesthesia since 2001.

**Methods:** 3500 patients had surgery with spinal 1% chloroprocaine. A 27G pencil-point needle was used. 40mg of an additive free, plain 1% chloroprocaine was injected intrathecally at the L3/4 or L4/5 interspace. Patients were told to report any discomfort (pain, burning..) during the injection, intraoperatively, and at the PACU. The maximum time for surgery was being limited to 50 minutes. Signs for PONV, urinary retention, allergic reactions or TNS were being noted.

**Results:** There was good surgical anesthesia in every case. There were no reports of pain, paresthesias or burning during the whole hospital stay. No PONV, urinary retention or allergic reactions. The time of anesthesia onset was 3-5 minutes. 90 minutes after intrathecal injection the patients were able to move their legs. Complete patient satisfaction. There was never a case of TNS.

**Discussion:** There has been a long search for a very short acting local anesthetic agent for spinal anesthesia. With a 1% chloroprocaine solution we have a good local anesthetic agent for short surgical cases without causing TNS.

**103**

**ULTRASOUND-GUIDED BILATERAL DUAL TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK: DISTRIBUTION OF LOCAL ANESTHETIC**

T. Jansen, A.F. Christensen, M. Petersen, K. Jensen, J. Borgharm Denmark.

**Background and aims:** Spread of local anaesthetic (LA) in various modalities of TAP blocks is a matter of much debate. We aimed to objectively quantify and qualify the spread of the injected LA by MR-imaging in the Bilateral-Dual-TAP and the Classical-TAP-block.

**Methods:** The local ethics committee approved the double-blinded RCT. Ten healthy males were included and randomised to a unilateral dual-TAP (UD-TAP); i.e. a CL-TAP and a high intercostal-TAP (IC-TAP). On the opposite side a CL-TAP and a sham perforation to the IC-TAP level was conducted. LA used in the study was ropivacain 0.5%. On the UD-TAP side 2×15ml was injected both high and low. On the CL-TAP side 30ml was injected beneath the thoracic cage and above the iliac crest. A blinded radiologist then evaluated MR-imaging.

**Results:** Two deposits of 2×15ml of LA with the UD-TAP showed marked spread at the IC-TAP (Th6-Th9) and the lower CL-TAP plexuses. The CL-TAP with 30ml of LA only spread in the lower CL-TAP plexus (Th10-Th12) but did not spread cephalad to the IC-TAP. Degree of dermatomes anaesthetized confirmed this spread.

**Conclusions:** MR imaging confirms it is paramount to individually target the IC-TAP and CL-TAP plexus to achieve optimal spread of LA.

**104**

**BACTERIAL COLONIZATION OF CONTINUOUS PERIPHERAL NERVE BLOCK CATHETERS**

H.K.P. Kalagara, V. Uppal, G. Haldane

**Background and aims:** The incidence of Continuous peripheral nerve block (CPNB) catheter colonization is 44%, if signs of local inflammation are present. Colonization of CPNB catheters can lead to local infection, abscess formation or systemic infections. We aimed to find the common types of bacteria that are responsible for colonization of CPNB catheters.

**Methods:** After obtaining approval from our institutional clinical governance department, conducted a retrospective analysis of our hospital acute pain services database. The hospital database from June 2002 to December 2010 was investigated for all positive culture results. The type of bacteria and the site of catheter insertion were noted.

**Results:** 976 CPNB catheter insertions were recorded in the database. 61 of these showed signs of local inflammation and therefore were sent for microbiological analysis. Twenty-two CPNB catheters had positive culture results. Five of these had two types of bacteria cultured, making the total number of bacteria isolated, twenty-seven. The types and number of cases with bacteria cultured from various CPNB catheters are Staphylococcus epidermidis 13, Methicillin resistant staphylococcus aureus 5, Pseudomonas 3, Enterobacter 2, and Proteus, Klebsiella, Bacillus, Enterococcus 1 case each.

**Conclusions:** Results of our study show that Staphylococcus epidermidis and Staphylococcus aureus are the common bacteria that colonize the CPNB catheters. The knowledge of bacteria commonly colonizing the CPNB catheters can be useful in guiding the antibiotic therapy should the infectious complications occur.
105 EFFICACY OF MAGNESIUM AS AN ADJUVANT TO BUPIVACAINE IN 3-IN-1 BLOCK ADMINISTERED TO PATIENTS UNDERGOING ARTHROSCOPIC KNEE LIGAMENT REPAIR

R. Sunder, T. Muthiah, M.K. Arora USA, India.

Background and aims: Arthroscopic anterior cruciate ligament (ACL) repair is a minimally invasive procedure of the knee. ACL reconstruction is associated with significant post-operative pain requiring parenteral narcotics. Three- in- one blocks have been proven as effective modalities for postoperative analgesia. Magnesium is a non-competitive antagonist at the NMDA receptors. This study evaluates the opioid sparing effect of magnesium when added as an adjuvant to bupivacaine in 3-in-1 blocks for arthroscopic knee surgeries.

Methods: The patients were randomized into three groups of twenty each. GROUP C received 30 ml 0.25% bupivacaine in the block + 1.5 ml of intravenous saline. GROUP I received 30 ml 0.25% bupivacaine in the block + 1.5 ml saline with 150 mg magnesium intravenously. GROUP BM received 30 ml of 0.25% bupivacaine and 150 mg of magnesium in the block + 1.5 ml of saline intravenously. The block was performed under nerve stimulator guidance. Anesthesia was induced with midazolam.

Results: The time to first analgesia was significantly prolonged Group in BM (789 ± 436 mins) vs. control group (p = 0.02). However, significantly less number of patients in Group BM (1/20) received morphine in the first 6 hours postoperatively, compared to Group C (8/20) and Group I (6/20) (p = 0.008 & 0.03 respectively).

Conclusions: Magnesium as an adjuvant to bupivacaine in 3- in- 1 block for arthroscopic anterior cruciate ligament repair significantly prolongs the time to first analgesia and improves the quality of analgesia in the immediate postoperative period.

106 PREINSERTION ULTRASOUND GUIDANCE FOR SPINAL ANESTHESIA IN PREGNANCY: OUTCOMES AMONG OBESE AND LEAN PARTURIENTS


Background and aims: Preinsertion lumbar ultrasound imaging is particularly advantageous in parturients associated with tissue edema and weight gain, resulting in difficulty for neuraxial procedures. The aim of this study was to assess the efficacy and safety of ultrasound-guided spinal blocks in obese and lean parturients.

Methods: A hundred (50 lean with BMI < 30 kg/m², and 50 obese with BMI ≥30 kg/m²) parturients, scheduled for cesarean delivery, were divided as ultrasound and control groups: Gr 1 (n= 25) obese and Gr 2 (n=25) obese parturients with prepuccure ultrasound examination (US groups), and Gr 3 (n=25) obese and Gr 4 (n=25) obese parturients without ultrasound examination (control groups). Distance from the skin to the subarachnoid space was measured by US (ultrasound depth:UD) and by needle (needle depth, ND) at the level of L4-L5. The number of puncture attempts and puncture levels and the duration of spinal procedure were recorded.

Results: A lower number of puncture attempts and fewer puncture levels were detected in US groups (p< 0.001). First attempt success rate under US guidance was 92% in comparison to 44% using a conventional technique in obese parturients (p< 0.001). The duration of spinal procedure was shorter in US groups (22 vs 52 sec, p=0.031). We found a high correlation between the ultrasound and needle depths (r=0.709, p< 0.001).

Conclusions: We found a high level of success in the prepuccure ultrasound determined insertion point. Ultrasound imaging technique can be a reliable guide to facilitate spinal anesthesia especially in obese parturients.

107 REGIONAL ANESHTHETIC TECHNIQUE CAN PROVE TO BE COST EFFECTIVE

R. Bhosale, S. Ganti, A. Eissa

Background and aims: Paos compartment block provides effective analgesia for lower limb surgery. It is a well known analgesic technique in pediatric age group. Novel techniques to achieve lumbar plexus block using ultrasound are developing.

Methods: We evaluated the effect of psoas compartment block on the post-operative pain relief in 86 children undergoing various lower limb orthopaedic procedures. All blocks were placed under general anesthesia using peripheral nerve stimulation.

Results: Mean intra-operative dose of local anesthetic used was 2.09 mg/kg (0.66-5.5). The mean intra-operative morphine used was 0.07 mg/kg (0.0-0.23). Mean pain scores at 0, 6, 12, 18, and 24 hours after the surgery were 0.5, 0.25, 0.41, 0.35, 0.48 respectively. Mean post-operative morphine consumption was 0.37 mg/ kg (0-2.28) in the first 24 hours. We did not encounter any technique related complications or infections. Diversity of surgical sites had no impact on the block efficacy. PCA was discontinued due to low usage in 24% cases.

Conclusions: Single shot psoas compartment block provides good post-operative analgesia, reducing the need for morphine in first 24 hours and thus curtailing the expenses related to Patient Controlled Analgesia (PCA). A set of PCA per day per patient can cost up to £35. All blocks were done using nerve stimulation technique.

References

108 COMPARISON OF THE ANALGESIC EFFICACY OF CONTINUOUS EPIDURAL ANALGESIA AND PARAVERTEBRAL BLOCKADE WITH PATIENT CONTROLLED ANALGESIA IN PATIENTS UNDERGOING OPEN RENAL SURGERY


Background and aims: Epidural analgesia remains the gold standard analgesia following renal surgery. Recent reviews conclude that paravertebral (PVB) analgesia allows superior respiratory function following thoracotomy. We compared PVB and epidural analgesia in patients presenting for elective open renal surgery in a randomized controlled, single blinded clinical trial.

Methods: Following written informed consent, 51 patients presenting for open renal surgery were randomized to receive either epidural analgesia, (n = 25) or PVB analgesia with PCA morphine (n = 26). All patients received a standard general anaesthetic and regular paracetamol postoperatively. A blinded postoperative investigator assessed each patient at 1, 2, 4, 6, 12, 24, 48, and 72 hours postoperatively. Blood was collected perioperatively compared to stress response to surgery.

Results: Epidural blockade reduced postoperative VAS scores at rest significantly at 1, 2, and 4 hours, (p < 0.05), at 6 hours (p = 0.01) and 12 hours (p < 0.001). Epidural blockade reduced postoperative VAS scores on movement significantly over the first 48 hours. VAS pain scores were significantly reduced at 1 and 2 hours (p < 0.01), at 4 to 12 hours (p < 0.001), at 24 and 48 hours (p < 0.05). Postoperative mean arterial blood pressures were higher at all postoperative time points in the PVB group compared to Epidural analgesia.

Conclusions: Epidural analgesia provides superior postoperative analgesia compared to continuous PVB blockade with patient controlled opiate analgesia in patients presenting for open renal surgery.

109 THE ANALGESIC EFFECT OF DEXETOPROFEN WHEN ADDED TO LIDOCAINE FOR INTRAVENTOUS REGIONAL ANAESTHESIA: A PROSPECTIVE, RANDOMIZED, PLACEBO CONTROLLED STUDY


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Background and aims: Several non steroidal anti-inflammatory drug addition to local anesthetics for intravenous regional anesthesia (IVRA) improve block quality. We have aimed to evaluate whether dexketoprofen addition to lidocaine would improve block characteristics and postoperative analgesia.

Methods: Forty-five patients scheduled to have minor hand surgery were randomly divided into three groups. IVRA was achieved with 3 mg/kg lidocaine diluted with saline to 40 ml. Saline placebo (Group Control), iv dexketoprofen (Group IV) or dexketoprofen as an additive in IVRA solution (Group IVRA) were used in groups with a double blind method. Sensory and motor block onset times, intraoperative, postoperative NRS scores, intraoperative fentanyl need, time to first analgesic demand and total paracetamol consumption in 24 hours were recorded.

Results: Complete sensory and motor block time were faster in Group IVRA (p<0.05). Intraoperative and postoperative NRS scores were lower at Group IVRA in comparison with Group Control and Group IV (540.67+285.49 vs 58.46+58.29 and 321.00+302.82 respectively (p<0.05). Postoperative paracetamol use was also statistically lower at Group IVRA in comparison with Group Control and IV (p<0.05).

Conclusion: The co-administration of dexketoprofen with lidocaine in IVRA decreases intrathecal-postoperative pain NRS scores and decreases post-operative analgesic demand without any serious side effect.

110 ULTRASOUND GUIDED POPLITEAL BLOCK PROXIMAL TO NERVE BIFURCATION: SINGLE VERSUS DOUBLE SEQUENTIAL INJECTIONS A PROSPECTIVE RANDOMIZED SINGLE BLIND STUDY


Background and aims: Delayed onset is the main shortcoming of popliteal block. Therefore, we hypothesized that double sequential injections proximal to sciatic nerve bifurcation could shorten onset time via increasing exposed surface area of the nerve to local anesthetic (LA).

Methods: Fifty patients scheduled for elective foot or ankle surgery were randomized into two groups; Group(S), received ultrasound (US) guided popliteal block via single injection (30 ml), located 3cm proximal to nerve bifurcation. Group D, received double injections (15 ml each), the 1st injection was located 3cm proximal to nerve bifurcation while the 2nd injection was proximal to the 1st one and located 3 cm proximal to the point at which no more LA spread from 1st injection could be traced. All blocks were performed using equal volumes of 2% lidocaine and 0.5% Levobupivacaine with 1:200,000 epinephrine.

The progress of sensory and motor block in both tibial and common peroneal nerve territories was assessed every 5 mins by a blinded observer. Other measurements included LA spread distance, performance time, procedure related discomfort and patient satisfaction.

Results: Group (D) presented with 37% faster sensory block (15.2 ± 4 vs 23.6 ± 4.7 mins, P < 0.0001), 29% faster motor block (19.2 ± 4.7 vs 26.8 ± 4.8 mins, P < 0.0001), 40% longer exposed nerve length (8.6 ± 1.3 vs 5.16 ± 1.2 cm, P < 0.0001), and longer procedure time (5.5 ± 1.1 vs 3.7 ± 1 mins, P < 0.0001). The distance between the two injections in group (D) was (5.8 ± 1cm). Both groups showed complete block success with comparable procedure-related discomfort and patient satisfaction.

Conclusions: US guided double sequential injections proximal to sciatic nerve bifurcation fastened block onset with correlated increase in exposed surface area to LA.

111 GENE SILENCE OF SUBCUTANEOUS NMDA RECEPTOR NR1 SUBUNIT BY LENTIVIRAL VECTOR-MEDIATED DELIVERY OF MICRORNA-BASED SHORT HAIRPIN RNA REDUCES FORMalin-INDUCED NOCICEPTION IN RAT

P.H. Tan, J. Spielberger Taiwan R.O.C.

Background and aims: Stable gene knockdown can be achieved by rationalized designed primary microRNA-based shRNA, e.g., shRNAmir, can produce 12 times more potent and stable gene knockdown than RNA polymerase III does. The development of peripheral N-methyl-D-aspartate (NMDA) receptor antagonists avoid the adverse central nervous system effects. Thus, in this study, we examined the effects of gene silencing and antiinociception on formalin-induced pain by subcutaneous injection of a lentiviral vector encoding shRNAmir targeting the NR1 subunit of the NMDA receptor.

Methods: The rats were assigned to receive different sequence, doses of NR1 shRNAmir and underwent injection of formalin. The flinch responses were assessed. Then the messenger RNA and protein of NR1 in skin and L5 dorsal root ganglion were analyzed.

Results: Subcutaneous injection of 1, 5, and 10 μg of vector expressing NR1 shRNAmir effectively diminished formalin-induced nociception and inhibited gene expression of NR1 in skin and dorsal root ganglia as evidenced by decreased levels of NR1 mRNA and protein. The effect of antiinociception and inhibition of NR1 expression by NR1 shRNAmir showed on day 3 and persisted for 7 days after injection of 5 μg of vector.

Conclusions: This study provides novel evidence supporting potent and long-term reduction of pathological pain by shRNAmir, in which pain reduction is induced or maintained by peripheral nociceptor activity.

112 HYPOGONADOTROPHIC HYPOGONADISM IN PATIENTS ON LONG TERM INTRATHECAL OPIOID ADMINISTRATION

R.V. Duarte1,2, J.H. Raphael1,2, J.L. Southall, R.L. Ashford, M. Labib

Background and aims: Opioids are one of the factors that can modulate the functioning of the hypothalamic-pituitary-gonadal axis at the hypothalamic or pituitary level, with the potential to cause hypogonadotropic hypogonadism. The aim of this study was to investigate the effects of long-term opioid intrathecal drug delivery systems (IDDS) therapy on the hypothalamic-pituitary-gonadal axis of male chronic non-malignant pain patients.

Methods: Twenty consecutive male patients undertaking long-term IDDS therapy for chronic non-malignant pain had the gonadal axis evaluated by assays of luteinising hormone (LH), follicle stimulating hormone (FSH), testosterone and sex hormone-binding globulin (SHBG) and by calculating the free androgen index (FAI). Blood samples were collected as part of routine clinical care. Results were expressed as mean ± SEM.

Results: The average age at the time of blood collection was 58±1.5 years, duration of IDDS treatment was 92±13 months with an intrathecal opioid dose of 3.22±0.6 mg/day. Mean duration of pain prior to implant was 14±2.3 years. The mean LH was 2.7±0.9 IU/L, FSH 7.9±1.6 IU/L, testosterone 7.2±1.2 nmol/L, SHBG 54.7±6.7 nmol/L and FAI 16.9±3.6. Based on testosterone, LH and FAI results, hypogonadotropic hypogonadism was present in 75% of the patients. LH was significantly lower in patients with more than 100 months of IDDS therapy, p<0.05, r=-0.57.

Conclusions: Hypogonadotropic hypogonadism is common in IDDS patients. The low testosterone may be a contributory factor in the symptomatology of these patients. Future research should centre on whether testosterone replacement therapy would be of clinical benefit to IDDS patients.

113 INTRATHECAL DRUG DELIVERY SYSTEMS FOR CHRONIC NON-MALIGNANT PAIN: A 13 YEAR FOLLOW-UP COHORT STUDY

R.V. Duarte1,2, J.H. Raphael1,2, E. Sparkes1,3, K. LeMarchand, J.L. Southall, R.L. Ashford

Background and aims: Intrathecal drug delivery systems (IDDS) have become a recognized therapy for the management of severe and otherwise intractable chronic pain. However, as with most treatments its effectiveness might be reduced with time. The aim of this study was to investigate IDDS effectiveness after an average of 15 years.
METHODS: A questionnaire including sensory and psychosocial items was completed by a cohort of 16 male and 9 female patients prior to IDDS, at 4 and 13 years post IDDS implantation. Statistical differences between the 3 time points were investigated.

RESULTS: The average age at the moment of last follow-up was 61±2 years with duration of IDDS treatment of 13±0.7 years (range: 10-18). Mean duration of pain previous to implant was 10±2 years. Significant differences (p< 0.005) between prior IDDS and 13 year follow up were observed for numerical rating scale, pain relief, mobility, quality of life, social life, sleep, housework, depression, coping and independence. Number of hours in pain was also significantly different prior and 13 years after IDDS, p< 0.01, r=0.45. No significant differences for these variables were observed between the follow-up at 4 and 13 years. Perception of worthiness, as well as satisfaction with treatment did not present significant differences between assessments at 4 and 13 years.

CONCLUSIONS: IDDS maintains a long-term effectiveness even at a 13 year follow-up. Furthermore, it continued to be perceived by the patients as worthwhile even considering the side-effects potentially faced throughout this period.

114 USING PROLONGED EPIDURAL ANALGESIA IN PREPARATION TO OPERATIVE TREATMENT OF PATIENTS HAVING CHRONIC PANCREATITIS WITH SEVERE PAIN SYNDROME

A. Ovechkin, S. Sitkin, M. Petrushin, V. Silaev, E. Bozova Russia.

Background and aims: Aim of study was to learn impact of prolonged epidural analgesia (PEA) on homeostasis in patients having chronic pancreatitis (CP) with severe pain syndrome.

Methods: 2 groups of patients were investigated. In 1 group (9 pts) epidural analgesia (Th7-Th8) with 0.2% Ropivaicine and Phentanyl was performed during 5 days. In 2 group (12 pts) for pain treatment was used parenteral administration of non-steroid drugs and opiates. 10 score visual analog scale (VAS) was used to assess pain intensity. Values of vegetative regulation of heart rhythm served as homeostasis assessment criteria. Stress index (SI) and standard deviation of normal to normal R-R intervals (SDNN).

Results: Initial pain intensity was equal in both groups - before eating - 4.6±1.2 and after eating - 7.4±1.8 points (VAS). Because of pain patients refused to eat that resulted in atrophy. Body mass index was 18, 2±1, 2 kg/m². All patients showed increased sympathetic activity. SI - 315, 2±21, 6 points, SDNN - 18, 4±0, 8 (ms). In 1 group pain sensation was fully eliminated. SI lowered by 61, %, SDNN increased by 63, 1%. In 5 days body mass increased by 2, 6±0, 3 kg. In 2 group pain intensity at rest was 3.1±0.8 and after eating 4.9±1.2 points (VAS). SI lowered by 25.2% and SDNN increased by 21.4%. Increasing of body mass wasn’t observed.

Conclusions: Using of PEA before operation in patients with CP with severe pain syndrome results in pain elimination and improvement of patient status during preparation to traumatized operations.

115 THE ROLE OF HIGH FREQUENCY SPINAL CORD STIMULATION IN THE TREATMENT OF COMPLEX REGIONAL PAIN SYNDROME. PRELIMINARY DATA FROM A PROSPECTIVE, OPEN-LABEL STUDY

A. Al-Kaisy, S. Palmsani, T. Smith, A. Shetty, N. Padfield

Background and aims: High Frequency (HF) stimulation has already been shown effective in managing failed back surgery syndrome (1). Aim of this study is to evaluate safety and effectiveness of HF stimulation in the treatment of CRPS refractory to common physical and medical management.

Methods: Open-label, single-centre, prospective study. Patients meeting the “Budapest” revised version of IASP criteria for CRPS and with a VAS greater than 5 will be eligible. A “tunnelled” trial of HF stimulation (Nevro) for 7 days will be performed before having the permanent system implanted. A specific algorithm developed in our institution will be used to program and optimize the system. Primary outcomes of the study will be VAS scores at 1, 3, and 6 months follow-ups. Secondary outcomes will include CRPS Severity Index, painDETECT, EQ-5D, Brief Pain Inventory Interference Scale, and Pain Catastrophizing Scale scores.

Results: This is an on-going study. At the end of April, three patients have already received a permanent implant (2 CRPS of the hand and 1 CRPS of the knee). At 1-month follow-up, all patients reported a significant reduction in both primary and secondary outcomes. None of the patients reported any paresthesia-like feeling, although 2 of them were aware of the presence of stimulation.

Conclusions: HF SCS is a safe and effective option for CRPS patients. A specific algorithm should be used during both leads implantation and system optimization.


116 THE EFFECT OF PARA VERTEBRAL LUMBAR CHEMICAL SEMPATHECTOMY ON TISSUE PERFUSION SINTIGRASY FOR ISCHEMIC DIABETIC LEG PAIN

I. öztèkin, H. Top, A. Sankayaa, M. Öztürk, I. Yildrum Turkey.

Background and aims: To threat diabetic ischemic leg pain always very big problem. Paravertebral lumbar chemical sympathectomy (PLCS) is the best of threatment modalities on this pain condition. Nevertheless, PLCS has increasing on arterial perfusion in ischemic leg. We study how much the effect of PLCS is on perfusion of diabetic ischemic legs and pain control.

Methods: After approval by the hospital ethics committee, we studied on 6 patients with ischemic diabetic legs according to Class 4 of Fontaine. We have made PLCS by injection 5 cc of phenol %10 on each level of Lumbar 3,4,5 of ischemic leg side. Before and after PLCS, leg tissue perfusion sintigraphy by 15 mc 1Te-99m MIBI i.v. has been performed for each patient. Ischemic pain score also has been recorded according to Visual Analog Scale (VAS). Tempreature and color of ischemic leg have been recorded before and after PLCS, too. Results were analyzed by Kruskal-Wallis test (p< 0.001).

Results: After PLCS VAS for pain has been diminished average from 7 to 4. Tissue perfusion sintigraphy and tempreature have been increased significantly in each patient. Color has been changed from dark to light color (pink). (p< 0.001).

Conclusions: We have supported PLCS is the best treatment choice of diabetic trifluration arterial occlusive disease below knee according to tissue perfusion sintigraphy.

117 ANAESTHESIA FOR MRI-GUIDED FOCUSED ULTRASOUND ABLATION OF EARLY PROSTATIC CANCER - INITIAL EXPERIENCE

A.T.L. Ng, P.C. Ip-Yam Singapore.

Background and aims: MRI-guided focused ultrasound (MRgFUS) thermal ablation of prostatic cancer is a novel procedure in the management of early stage prostatic cancer. The anaesthetic considerations and requirements are significant in MRgFUS ablation requires an immobile therapeutic field with adequate levels of sedation and analgesia provided to the patient. The duration of therapy is lengthier compared to diagnostic MRI scans. Epidural anaesthesia with dexmedetomidine sedation was utilised to avoid the hazards of general anaesthesia in a remote MRI environment and was found to be advantageous and effective. We report our initial experience and discuss the relevant anaesthetic considerations.

Methods: Six patients underwent MRgFUS ablation under general and epidural anaesthesia (n=5). Dexmedetomidine infusion was used to provide moderate levels of sedation in the epidural group.

Results: The mean duration of procedure was 271±75 minutes (range 195-420 minutes). The lowest heart rate ranged from 40 to 58 beats per minute (mean 52±6) and lowest systolic blood pressure from 95 to 130 mmHg (mean 110±12). The lowest temperature ranged from 34.0 to 36.4°C (mean
35.3±0.85). Dexmedetomidine was found to be instrumental in shivering prevention.

<table>
<thead>
<tr>
<th>Patient</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D (GA)</th>
<th>E</th>
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<tr>
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<td>52</td>
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<tr>
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<tr>
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<td>305</td>
<td>265</td>
<td>195</td>
<td>420</td>
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Conclusions: There were significant advantages of using epidural anaesthesia with dexmedetomidine infusion for MRTgFUS thermal ablation procedures. Epidural anaesthesia provided satisfactory interventional conditions while dexmedetomidine infusion provided adequate levels of sedation without respiratory depression and haemodynamic instability and was also useful in prevention of shivering. The pharmacological properties of dexmedetomidine contribute to make this technique safe and effective.

118 BASIC ULTRASOUND COMPETENCY IN PROBE AND NEEDLING (BUSCIPAN) - A TEMPLATE FOR THE FUTURE? M. Kigozi, D. Jadhav, G. Foxall, T. Pepall, J. Kirk-Bailey

Background and aims: Formal training and assessment of ultrasound (US) skills for anaesthetists are widely advocated[1]. We describe a novel, deanery-funded US skills course in the U.K based on the 2010 draft guidelines for anaesthetic US training[1].

Methods: BUSCIPAN is a one-day training course which focuses on basic, generic US skills and introduces 1st and 2nd year anaesthetic trainees to their application in regional anaesthesia, vascular access and thoracic and abdominal scanning. A multidisciplinary faculty of anaesthetists, radiologists and physicians deliver a multi-modal curriculum-based teaching programme.

Results:
- Pre and post-course multiple choice questions
- Practical Skills (probe handling, image optimisation and needling)
- OSCE Stations (Anatomy, CVC insertion, communication and safety)

[Table 1: Assessment Tools]

Candiates are assessed to the standard of level 1 US practice (Table 1).

Results: Thirty-five trainees have completed the course. Three candidates failed practical assessments but were successfully retested following additional tuition.

Conclusions: To our knowledge, BUSCIPAN is the first basic US course in the U.K on the 2010 draft guidelines for anaesthetic US training[1].

1. Weinberg Anesthesiology 1998;88:1071

120 SIMULATION FOR ULTRASOUND GUIDED REGIONAL ANAESTHESIA: A COMPARISON BETWEEN DIFFERENT PHANTOMS G. Michelagnoli[1,2], L. Giuntoli, N. Cilloni, A. Giovannitti, E. Cerchiari Italy

Background and aims: Simulation can improve the learning of Ultrasound Guided Regional Anaesthesia (USGRA), but no consensus exists about what are the best phantoms and how these affect the learning process.

This study aimed to evaluate the efficacy of different phantoms for USGRA in a population of anaesthetists with different experience in ultrasoundography.

Methods: Thirty-eight trainees were divided in three groups and enrolled in two consecutive simulation trials. The first consisted in the sequential learning of the basic skills for USGRA with a minimum score to be reached. Groups were assigned to different phantoms (gelatin, wax, meat) and the number of attempts, mistakes and total performance time were recorded by independent observers. The second trial, on a meat phantom, consisted in a complete procedure with ultrasound guidance, without possibility of re-attempts. A performance score was attributed by independent observers.

Results: Mean performance time was lower for the basic skills in the meat group, although not achieving statistical significance. The performance score during the complete procedure trial was slightly better too. Moreover, in the meat phantom group there were no re-attempts during the first trial.
Among low fidelity phantoms, meat simulators seem to be most effective. Assessments are ongoing.

Conclusions: Among low fidelity phantoms, meat simulators seem to be more effective for the learning process of the basic skills of USGRA, compared to high needle visibility phantoms, such as gelatin and wax-based.

References

121
TRANSLATION OF SONOELASTOGRAPHY FROM THIEL CADAVER TO PATIENTS FOR PERIPHERAL NERVE BLOCKS
S. Munirama, A. Satapathy, G. Corner, S. Cochran, G. Mcleod

Background and aims: B-mode ultrasound has clinical limitation: needle visibility is restricted to specific angles; spread of local anaesthetic, particularly small test volumes, difficult to visualise and differentiate between intraneural/intravascular and extraneural/extravascular injection. Sonoe lastography (SE) provides a colour image of tissue stress. The aim of project was to establish stability and Dose-Response curve of sonoelastography for peripheral nerve blocks in Thiel cadavers, then translate application to patients.

Methods: All blocks were performed using Zonare ultrasound machine, Mountain View, CA using linear probes with B-Mode and elastography split imaging. Video recordings started for cadaver and patient before injection, continued for 30 seconds, rated by two clinicians using the Likert and Vienna scores. For Dose-response study, volumes 0.25, 0.5, 1.0, 2.5 and 5.0 ml injected & for stability,1ml injections repeated at regular intervals for 28 weeks.

Results: Thiel stability: Median (IQR) visibility of nerves was 5.1 (4.6-5.5). Median (IQR) spread of fluids was more visible using elastography 7 (6.25-7) compared to B-mode 4.5 (3-5), p=0.04. Dose response: Using ANOVA, there was significant difference in elasticity with volume, F-ratio 21.6, p<0.001. There were characteristic patterns of fluid spread in patients, but no intraneural expansion. The spread was readily visible on SE colour map compared to that on B-mode.

Conclusions: Translation of sonoelastography from Thiel cadavers to patients has highlighted perineural spread using colour map. Future studies will concentrate on efficacy.

122
A COMPARISON OF IMMEDIATE LEARNER-LED VERSUS TERMINAL FEEDBACK ON SKILL ACQUISITION FOR ULTRASOUND GUIDED NEEDLE MANIPULATION IN A SIMULATED SETTING
S.F. Sultan, G. Iohom, G. Shorten Ireland.

Background and aims: The timing of the feedback has been shown to influence motor learning for discrete tasks such as suturing. Previous studies have shown that performance improves equally with concurrent or terminal feedback. The objective of this study was to determine the effect, if any, of timing of feedback on skill acquisition for needle manipulation using ultrasound (US) guidance.

Methods: This was a prospective, randomized, comparative interventional study.

24 participants were randomized to 2 groups: Immediate learner-led Feedback (IF) and Terminal Feedback (TF). All participants received a didactic tutorial on the US Machine and the tasks in the form of a video. The participants were asked to perform a series of tasks 5 consecutive times on a gelatine model with an embedded target structure:

1. Orientation of probe
2. Identification and depth of target structure
3. Color-flow analysis
4. Insertion and approach of needle towards target using in-plane technique
5. Aspiration and injection around target

Feedback was provided in the form of a video for errors if occurred according to group allocation. After a time interval of 24 hours the participants were videotaped performing the same set of tasks. Two blinded assessors marked the videotapes. Outcome measures included imaging time (IT), needle time (NT) and performance time (PT) in seconds, error rate (ER) and additional needle insertions (NI).

Results: Assessments are ongoing.

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Conclusions: Comparison between trial 5: trial 1 for both groups showed a decrease in PT p<0.001. The ER comparison for IF was p=0.003 and for SF p=0.16.

123
POPLITEAL SCIATIC NERVE BLOCK IN A PREGNANT PATIENT (CASE REPORT)

Background: Peripheral nerve blocks are rarely administered in pregnant patients for non-obstetric surgeries. The use of popliteal sciatic nerve block for foot-ankle surgery has been presented in a pregnant patient.

Case Report: A nulliparous parturient at 32 weeks’ gestation was scheduled for surgical exploration of an arterial pseudoaneurysm on her right plantar surface due to a penetrating stab injury. Since surgical intervention did not require pneumatic tourniquet, sciatic nerve was blocked via popliteal approach with a single shot injection of 30 mL 0.375% levobupivacaine. The operation and the anesthesia course were uneventful.

Conclusion: Popliteal sciatic nerve block was successful and uneventful for a short foot surgery not requiring tourniquet application in a parturient in the last trimester.

124
DOES EPIDURAL ANALGESIA FOR PAIN RELIEF IN LABOUR AFFECT BREASTFEEDING?
P. Kajekar, M. Koutra, I. Suri

Background and aims: There have been recent concerns that epidural analgesia results in difficulty in establishing breastfeeding. The aim of our study is to determine whether the use of epidural analgesia for pain relief in labour affects breastfeeding in pregnant women.
survey was to determine any association between epidural and 1) Time of initiation of breastfeeding 2) Quality of suckling as determined by the LATCH score 3) Effects on breastfeeding at 4 weeks postpartum. 

Methods: We compared the above parameters in two groups of mothers with 25 women in each group. Group A comprised of women who had an epidural following maternal request and Group B did not request an epidural. All mothers were interviewed on day 1 and 2 following birth to establish the immediate effects on the quality of breast feeding and the time of initiation of breast feeding. Delayed effects were sought through a telephone interview with the mothers at 4 weeks postpartum.

Results: The mean time from delivery to initiation of breast feeding was 31.64 minutes (SD 23.9) in the epidural group and 41.92 minutes (SD 28.3) in the non epidural group. The p value using unpaired students t test was 0.1646. There was no significant difference between the two groups with regard to quality of suckling as determined by the LATCH score. The feeding at 4 weeks post partum was also found to be similar in both groups.

Conclusions: Although there was a trend towards faster onset of breast feeding in the epidural group there was no statistical significance between the two groups with respect to time of initiation or quality of breast feeding.

125 DOES ANTE NATAL CONSULTATION POSITIVELY INFLUENCE LABOUR ANAESTHETIC INTERVENTIONS IN THE MORBIDLY OBESE PARTURIENT? S. Verma, S. Bijral, K. Salau nkey Background and aims: CEMACH/RCOG guidelines recommend that parturients with booking BMI>40, should have antenatal anaesthetic consultation to identify potential difficulties and have anaesthetic plan made for labour and delivery.

Methods: The notes of 52 morbidly obese parturients were analysed to see whether the anaesthetic plan was followed or not.

Results:
1. The average BMI of parturients was 46 (range 40-62).
2. 96% of parturients were advised an early epidural during labour.
3. 20% of parturients were predicted difficult intubation.
4. Epidural rate was 42% compared to 17% for all parturients. All elective LSCS are done by Consultant anaesthetists.

Conclusions: Epidural uptake is better in parturients attending anaesthetic antenatal clinic. Even senior anaesthetists found difficulty in 46% of parturients. Most of the patients undergoing emergency LSCS had difficult regional block sitings.

References
2. CEMACE/RCOG guideline :Management of women with obesity in pregnancy, March 2010.

126 ANALGЕSIC EFFICACY ОF ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK AFTER OPEN APPENDECTOMY IN CHILDREN
Y. Metodiev, N. Gavrilova Bulgaria.

Background and aims: To date there are only few reports on the use of TAP block in children. We present a randomized, prospective, observer-blinded study on the analgesic efficacy of TAP block in children who underwent open appendectomy.

Methods: Thirty-four children aged 3 to 17 years (ASA 1-2) were enrolled in this study. Patients were randomized in two groups (17 in each) differing in the postoperative analgesia plan. Patients in group T were assigned to receive TAP block at the end of surgery, and those in group O were to receive conventional opioid-based pain treatment. Pain scores were registered four times during the initial 24 hours.

Results: The overall opioid consumption was 1345 mg tramadol in group O, against 210 mg in group T. Pain scores were significantly lower in the TAP group for the initial 24 hours (p< 0.05). No complications related to transversus abdominis plane block were encountered. Nausea and vomiting were relatively common in group O - 45% against 17% in group T.

Conclusions: Transversus abdominis plane block is an effective and safe regional technique and provides superior pain relief to the opioid-based pain treatment in children with appendectomy.

127 INCIDENCE OF COMPLICATIONS RELATED TO ULTRASOUND-GUIDED PERIPHERAL NERVE BLOCKS IN CHILDREN
Y. Metodieв Bulgaria

Background and aims: This is a retrospective analysis, conducted for the period between April 2010 and April 2011. The aim of this analysis was to evaluate the safety of performing ultrasound-guided regional anesthesia for extremities and abdominal wall in pediatric patients.

Methods: One-hundred twenty-four children, ASA 1 - III, received an ultrasound-guided peripheral nerve blocks under general anesthesia. The type of surgery determined the level of the blocks. Local anesthetics used for all the blocks were lidocaine and levobupivacaine, or a mixture of both. Consent from the ethical committee and from a parent to perform the study was obtained. Children were monitored for two weeks after anesthesia.

Results: All the blocks were successfully performed. Only in two children (1.61%) complications related to the ultrasound-guided blocks were encountered. One child had Horner syndrome after supraclavicular brachial plexus block which resolved in 5 hours and had no other neurologic sequelae. The other child had axillary vein punctured during the performance of axillary block.

Conclusions: Ultrasound-guided regional anesthesia, performed under general anesthesia, in pediatric patients is a safe technique for analgesia in skillful hands. The incidence of technique related complications is low and without long term consequences.
128 POST-OPERATIVE ANALGESIA IN MAJOR PEDIATRIC ORTHOPAEDIC SURGERY: EPIDURAL OR NURSE-/PATIENT-CONTROLLED ANALGESIA +/- CAUDAL INJECTION?

S. Jassim, E. Ali, A. Rehm

Background and aims: Adequate pain control following paediatric orthopaedic surgery is of utmost importance for patient morbidity, comfort and mobilisation. Epidural and nurse- or patient-controlled analgesia (NCA/PCA) have similar efficacy for pain relief, yet complication rates can vary, having an impact upon time to mobilisation and discharge from hospital.

Aims: To establish outcomes for different types of post-operative analgesia in major paediatric orthopaedic operations, regarding complications, mobilisation and discharge times.

Methods: Retrospective review of notes of paediatric patients from age 6 years having pelvic or femoral osteotomies since 2004. Types of operation, complications, pain scores and times until mobilisation and discharge were recorded.

Results: 38 patients (Age range 6-20, mean age 13 years) had femoral and/or pelvic osteotomies for a variety of indications. 29 had epidurals, 8 had NCA/PCA, and 1 had oral analgesics only. Complication rates were higher in those having epidurals. A significant percentage of those having epidurals had their pain score rating as poor (34% vs. 0% for NCA/PCA), as assessed by the Acute Pain Team. Those receiving a NCA/PCA had a shorter median time before mobilising from their beds and leaving hospital compared to those with an epidural.

Conclusions: Following major paediatric orthopaedic surgery, post-operative analgesia in the form of NCA/PCA gives fewer complications and good analgesic control compared to epidurals. These patients were also able to mobilise from their beds and leave hospital sooner than those having epidurals post-operatively. We would advocate NCA/PCA as a suitable alternative to epidural following major surgery.

129 THE EFFECTS OF INTRAOPERATIVE SINGLE DOSAGE TRAMADOL OR DEXMEDETOMIDINE ON POSTOPERATIVE ANALGESIA, SEDATION AND EMERGE REACTIONS IN PEDIATRIC PATIENTS UNDERGOING ADENOTONSILLECTOMY

N. Bedirli, M. Akcabay, U. Emik Turkey.

Aim: Providing adequate postoperative analgesia to children undergoing adenotonsillectomy is often a challenge. Opioids or nonsteroidal antiinflammatory agents provide effective analgesia, but they may interfere with adverse effects such as nausea and vomiting, respiratory depression or bleeding. This prospective, double-blind, randomized study was designed to compare the effects of intraoperative tramadol and dexmedetomidine on postoperative recovery including pain, sedation, emerge reactions, and hemodynamics in pediatric patients undergoing tonsillectomy and adenoidectomy.

Method: After Institutional Ethics Committee approval and parents’ written consent. Eighty patients, aged 2-12, undergoing adenotonsillectomy were included in this study. Anesthesia induction and maintenance were provided with sevoflurane in O2:N2O mixture. Intubation was facilitated with rocuronium. Patients received a single intravenous dose of 2 mg/kg tramadol or 1 μg/kg dexmedetomidine. Intravenous morphine 25 μg/kg administered for rescue analgesia. Duration of surgery and anesthesia, hemodynamic data time to tracheal extubation, emerge reactions, pain scores, time to first post-operative rescue analgesic, amount of total rescue analgesic received, need for antiemetics, intraoperative and recovery complications, and discharge time were assessed.

Result: There were no significant differences between the 2 groups in patient demographics, emerge reactions, antiemetic need, and discharge time. Mean arterial pressure and heart rate values were significantly lower in dexmedetomidine group. There were no significant difference in emerge reactions. The pain score, the first analgesic requirement time, total analgesic consumption, and sedation scores were significantly lower in tramadol group.

Conclusion: When compared with dexmedetomidine, the use of tramadol in children is associated with lower side effects, opioid requirement, and comparable emerge agitation reactions.

130 PREEMPTIVE ANALGESIC EFFECT OF INTRA-ARTICULAR LEVOBUPIVACAINE AFTER ARTHROSCOPIC KNEE SURGERY


Background and aims: Local anesthetics are used commonly after the arthroscopic procedures. Levobupivacaine is a local anesthetic, which has recently been used for pain treatment. The aim of this study was to determine whether levobupivacaine administered preoperatively reduced the need of analgesics and the effect of levobupivacaine up to the time of the first analgesic request.

Methods: After the approval of Ethic Committee of Hacettepe University, a total of 40 adult-patients. The information about VAS was given to all patients before the procedure. (0: no pain, 10: the worst) their pain scores were recorded both in rest and in a knee movement. After the procedures, their pain were assessed both in rest and in a knee movement at 1st, 2nd, 3rd, 4th, 8th, 12th and 24th hours after the surgery. Also, time elapsed to first analgesic request and total analgesics used in 24 hours after the surgery were recorded. Morphine Patient Controlled Analgesia devices were administrated to all patients postoperatively. Also, scores of patients’ pain satisfactions were recorded.

Results: In levobupivacaine group, the time of first analgesic requirement was longer than those in control group. Also, pain satisfactions in levo group was better than those in control group.

Conclusions: The effect of intraarticular levobupivacaine on preemptive analgesia, we found that preemptive analgesia was achieved by using a dose of 5 mg/ml levobupivacaine and opioid consumption was reduced in post-operative period.

131 POSTOPERATIVE ANALGESIA IN TOTAL HIP REPLACEMENT: A COMPARISON OF THE ANALGESIC EFFICACY OF PERIARTICULAR INFILTRATION OF LOCAL ANAESTHETIC WITH INTRATHECAL MORPHINE

D. McCarthy, J. Galbraith, G. Shorten, G. Iohom Ireland.

Background: Analgesia following total hip arthroplasty (THA) may be improved using intrathecal opioids, epidural analgesia or continuous peripheral nerve blockade.

Objective: To evaluate the analgesic efficacy of peri- and intra-articular infiltration with levobupivacaine Vs intrathecal morphine following THA. The primary outcome measure was analgesia in the first 48 postoperative hours as assessed by visual analogue scale (VAS) scores for pain.

Methods: Ethical approval was obtained from the governing committee. Patients were prospectively randomized to one of two groups. The standard group received spinal anaesthesia with intrathecal bupivacaine and morphine 0.2 mg. The infiltration group received spinal anaesthesia with intrathecal bupivacaine without morphine, and infiltration with levobupivacaine 0.5% 2mg/kg body weight plus 0.5mg epinephrine made up to a volume of 1.5ml/kg with saline. A catheter was sited prior to wound closure and connected to an elastomeric pump which delivered a continuous infusion of levobupivacaine 0.25% at 4ml/hr from 6 to 30 hours postoperatively. Patients’ VAS scores for pain were assessed for 48 hours both at rest and on passive flexion to 30°.

Results: Of the planned 50 patients, 46 have been recruited to date (23 to the standard group and 23 to the infiltration group). There is a trend towards lower mean VAS scores for pain on movement in the infiltration Vs the control group at 24 hours (22.0(SD 22.2) Vs 34.3(SD 21.2), respectively, p=0.07).

Conclusion: The preliminary findings suggest that the local anaesthetic infiltration technique has no advantage over intrathecal morphine for analgesia up to 48 hours following THA.

132 DOES CONTINUOUS WOUND INFUSION OF 0.2% BUPIVACAINE PROVIDE SUPERIOR ANALGESIA COMPARED TO STANDARD OPIOID-BASED THERAPY IN WOMEN FOLLOWING AXILLARY CLEARANCE SURGERY?

Background: Axillary clearance is associated with moderate postoperative pain. The effective treatment of acute postoperative pain may reduce the risk of chronic pain after breast cancer surgery. We conducted an audit on analgesia following Total Abdominal Hysterectomy and Bilateral Salpingoophorectomy (TAH-BSO) to assess the quality of analgesia and postoperative comfort of patients.

Objective: To investigate whether continuous wound infusion of bupivacaine provides superior analgesia compared to standard opioid-based pain management following axillary clearance surgery.

Methods: Ethical approval was obtained. Patients were prospectively randomized to one of two groups – Bupivacaine and Control. Both groups received general anesthesia and intraoperative morphine up to 0.1 mg/kg. Wound infiltration with 20 mL of 0.25% bupivacaine with adrenaline was performed by the surgeon before closure. In the Bupivacaine group, a catheter was sited before wound closure and connected to an elastomeric pump which delivered a continuous infusion of 0.2% bupivacaine at 4 ml/hr. Both groups received standardised oral analgesia postoperatively. Patients’ visual analogue scores (VAS) for pain at rest and on abduction of the operative arm to 90° were assessed in the PACU and at 6, 24 and 48 hours postoperatively.

Results: Of the planned 42 patients, 22 have been recruited to date (10 to the control group and 12 to the bupivacaine group). There is no difference between the groups in the VAS scores up to 48 hours postoperatively; nor is there a difference in opioid consumption.

Conclusions: The preliminary findings of this planned interim analysis suggest that the continuous wound infusion of 0.2% bupivacaine has no advantage over standard opioid-based analgesia up to 48 hours following axillary clearance surgery.

References
2 postoperative days, with average postoperative length of stay 4 days. 52% of patients with medial skin incisions were given saphenous nerve block. We introduced an analgesic care pathway for ankle surgery to improve pain relief and conducted a prospective re-audit to evaluate its effectiveness.

Methods: Key points in the care pathway included:
- All patients should receive a popliteal nerve block unless contraindicated.
- In surgery involving incision, saphenous nerve block must be administered.
- All patients should receive regular oral analgesics with PCA morphine postoperatively.

We collected data from 65 patients who underwent ankle fracture surgery from September to December 2010. Data collected included regional blocks, time to first analgesia, pain scores, post-operative analgesic consumption and length of hospital stay.

Results: Popliteal blocks were administered to 56 patients (86%). 76% of patients with medial incisions received saphenous nerve blocks. We reduced duration of PCA use from 46 hrs to 32 hrs. There was a reduction in the proportion of patients who had moderate pain (22% vs 63%). Post-operative length of hospital stay was reduced from 3.8 days to 2.3 days.

Conclusions: Introduction of an analgesic care pathway and pain team involvement led to higher regional analgesia rate, improved postoperative analgesia and consequently, earlier discharge.

137 EPIDURAL COMPLICATIONS: A SURVEY OF THE KNOWLEDGE OF MEDICAL STAFF WORKING ON SURGICAL WARDS IN A LARGE UK TEACHING HOSPITAL

M.A. Allan, M.B. Clarke, P.S. Beavan.

Background and aims: In the UK, the NAP3 study highlighted the importance of assessing and diagnosing complications of neuraxial blockade. Of those patients with permanent sequelae, 60% came from epidurals. Of these, 80% were peripherally placed. Royal College guidance highlights the need for appropriately trained staff to care for patients with epidurals. We conducted a survey of medical staff on surgical wards in a large UK teaching hospital to evaluate knowledge of, and confidence in excluding, epidural complications.

Methods: We conducted an anonymous paper survey of medical staff working on all non-obstetric wards accepting patients with epidurals. Questions explored the perceived risks of epidural complications, factors which may prompt an anaesthetic review, and general confidence in excluding the major complications of epidurals.

Results: The assumed risks of epidurals by medical staff were far higher than published values. Median values for risks of epidural haematoma, temporary nerve damage, permanent nerve damage and meningitis were given as 1:100, 1:100, 1:5000 and 1:10000 respectively. An anaesthetic review would be requested by 76% for deep back pain, 76% for persistent leg weakness/numbness and 79% for reduced GCS. 48% of respondents were not confident in excluding complications of epidurals.

Conclusions: In our institution, although general knowledge regarding epidural complications was good, a significant number did not recognise certain symptoms as potentially serious and nearly half did not feel confident in assessing symptoms in patients with epidurals. Greater education is required for those caring for patients with epidurals to reduce the risk of serious morbidity.

138 EFFECT OF ADDING KETAMINE TO BUPIVACAINE IN EXTRADURAL ANAESTHESIA

K. Naghibi Iran.

Background and aims: Extradural anaesthesia is the best choice for lower abdominal and lower extremities surgeries. The aim of this study is to determine the effect of adding ketamine to bupivacaine on the onset of sensory block and the duration of sensory and motor block in extradural anaesthesia.

Methods: After obtaining the approval of the Local Ethics Committee and with written informed consent and under prospective double blind, randomized study, 40 adult, ASA I and II patients candidate of elective lower abdominal and extremities surgeries under epidural anaesthesia were studied. Patients were allocated randomly into two equal groups of receiving bupivacaine 0.5% plus ketamine 25 mg (group K) and bupivacaine 0.5% plus normal saline (group P) for epidural anaesthesia. The onset of sensory block and the duration of sensory and motor block were measured and compared. Statistical analysis was performed using SPSS 15.0 software and the t-test was used to compare variables.

Results: The onset of sensory block was shorter significantly in ketamine group (9 ± 2 min.) than in placebo group (14.6 ± 2.9 min.) (P< 0.05). The duration of sensory block was significantly longer in ketamine group (182.85 ± 40.6 min.) than in placebo group (157.5 ± 38.85 min.) (P< 0.05). The duration of motor block was longer in placebo group (129 ± 65.6 min.) compared ketamine group (42 ± 19.6 min.) (P< 0.05).

Conclusions: Addition of ketamine to bupivacaine in epidural anaesthesia result in more rapid onset longer duration of sensory block.

139 THE POSTOPERATIVE ANALGESIC EFFECT OF ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK FOR PATIENTS UNDERGOING TOTAL ABDOMINAL HYSTERECTOMY OPERATION


Background and aims: The landmark-guided transversus abdominis plane (TAP) block is an effective method of providing postoperative analgesia in patients undergoing abdominal surgery, but is associated with complications. We evaluated the analgesic efficacy of the ultrasound-guided TAP block in patients undergoing total abdominal hysterectomy under spinal-epidural anaesthesia.

Methods: A randomized, double-blind trial was performed at a tertiary hospital. Forty women undergoing total abdominal hysterectomy were randomized to receive standard combined spinal-epidural anaesthesia either without (Group I, n=20) or with TAP block (Group II, n=20). Ultrasound-guided bilateral TAP block was performed with bupivacaine 0.25%. All participants received a combined spinal-epidural anaesthesia with bupivacaine, followed by postoperative patient-controlled epidural levobupivacaine + fentanyl. Postoperative demand of levobupivacaine + fentanyl using a patient-controlled analgesia device, average pain scores, nausea, vomiting, urinary retention, hypotension, satisfaction with pain relief were recorded.

Results: TAP block was performed successfully in all cases in group II, and there were no local complications attributable to the TAP block. Total levobupivacaine + fentanyl use in 48 hours was reduced in group II (mean ± SD: 160.9 mg ± 257.5μg) compared with group I (mean ± SD: 415.3 mg ± 664.5μg) (p=0.000). The satisfaction with pain relief was better in group II than in group I (p=0.002).

Conclusions: The ultrasound-guided TAP block reduces levobupivacaine + fentanyl requirements, decreases pain scores and increases patient satisfaction after total abdominal hysterectomy.

140 IMAGE OPTIMISATION- WORTH DOING?

A.M. McEwen.

Background: Image optimisation is an important part of successful ultrasound-guided regional anaesthesia. On SonoSite® M-Turbo™ this can be achieved by adjusting beam frequency and examination type. Available settings are: ‘General’, ‘Resolution’, ‘Penetration’ and ‘Bre’, ‘Smp’, ‘Msk’, ‘Nr’, ‘Vas’, ‘Ven’ respectively. Our aim was to ascertain how many anaesthetists in our department regularly used these settings and what effect this had on image quality.

Methods: Pictures of a superficial nerve (Median) and deep nerve (Sciatic) were taken at each of the different frequency settings on a SonoSite M-Turbo™. Pictures were also taken at 3 of the different examination settings (‘Nr’, ‘Msk’, ‘Vas’). 20 anaesthetists were questioned on their routine practice for image optimisation and asked to rank each series of pictures in order of clarity. A scoring system was used to give each setting a total score.
141

COMPARISON OF THREE TEACHING INTERVENTIONS ON SKILLS LEARNING AND RETENTION IN ULTRASOUND-GUIDED NEEDLING TASKS: COMPUTER SLIDESHOW VERSUS VIDEO VS VIDEO WITH ERRORS SPECIFICALLY HIGHLIGHTED


Background and aims: To date, the most efficient and effective method of teaching ultrasound guided regional anaesthesia remains unclear. We aim to create an evidence-based introductory teaching package for US-guided regional anaesthesia in novices that optimises skills learning and retention.

Methods: Randomised control trial. Three groups of 25 medical students, naive to ultrasound will be allocated to a particular learning intervention. They will then answer a multiple choice questionnaire and assessed performing a basic validated ultrasound needling skills task.

The subjects will be randomly allocated to watch either a powerpoint slideshow presentation or a video presentation, or a video presentation with a section including most common errors made by novices specifically highlighted.

The subjects will then be assessed on their ability to operate the ultrasound, orientate the probe, identify the olive, scan ergonomically and then direct a needle onto the olive safely. The 3 groups will be compared statistically regarding their ability to recall information, perform the task and the number of errors made.

After 8 weeks, without offering additional information or allowing the groups to see the presentations again, the questionnaire and assessment will be repeated.

Results: Pending

References
144 SURVEY OF INFORMED CONSENT FOR REGIONAL ANAESTHETIC PROCEDURES IN THE UK
D. Polakovich, A. Abdel-Aziz

Background and Objectives: Little is known about the information UK anaesthetists provide to their patients before obtaining consent for regional anaesthetic procedures. Equally, it is unknown to what degree they adhere to the principles of good consenting practice stated by both the General Medical Council (UK) and the Association of Anaesthetists of Great Britain and Ireland. We aimed to obtain a more detailed picture of consenting discussions before regional anaesthesia and to evaluate their compliance with the published standards.

Methods: An on-line survey looking into respondents’ consenting practices was designed. Link to the survey was distributed to trainee anaesthetists nationwide as well as consultant anaesthetists working in the North-East of England.

Results: We obtained 470 responses (346 from trainees, 124 from consultants). While nearly 98% of participants advise their patients about block failure, fewer mention nerve damage (55%), pneumothorax (53%), IV injection (25%), neurotoxicity (4%), cardiac toxicity (3%) and death (1%). Benefits commonly quoted include better analgesia (95%), less nausea/vomiting (72%), quicker recovery (57%) and less sedation (52%). Ninety percent volunteer information about alternative techniques. Pre-operative discussion is most commonly documented on the anesthetic chart (96%); including discussion of risks (93%), alternative techniques (48%), explicit consent (42%) and benefits (38%).

Conclusions: The current consenting practices of the anaesthetists surveyed often fail to meet published standards. At the same time, our survey gives the reader an opportunity to compare their practice with that of a relatively sizeable sample of UK practitioners.

145 SURVEY OF OPINION AMONGST ANAESTHETISTS IN A UK DISTRICT GENERAL HOSPITAL: REGIONAL ANAESTHESIA AND ANTI-ThROMBOTIC THERAPY
I. Mowat, G. Foxall, A. Vaughton, P. Dasancharya

Background and aims: Recent guidelines regarding regional anaesthesia for patients receiving anti-thrombotic therapy recommend the same strategy for peripheral nerve blockade (PNB) as for central neuraxial blockade (CNB). This may be considered restrictive. We set out to determine current opinion amongst anaesthetists at our hospital regarding both CNB and PNB in patients receiving certain anti-thrombotic therapies.

Methods: We conducted a questionnaire survey of anaesthetists who perform regional anaesthesia as part of their practice. The questionnaire asked which anti-thrombotic treatment the participants deemed safe to conduct CNB and PNB with. If deemed unsafe, participants were asked what period of treatment cessation they would deem acceptable before proceeding. Participants were also asked if they were aware of any guidelines pertaining to this topic and Fisher’s exact test was employed to determine of this had any significant effect on opinion.

Results: Our response rate was 65%. Over 75% of respondents were either consultants or senior trainees. The vast majority of anaesthetists agreed with current guidelines regarding CNB and anti-thrombotic therapy. Almost a third would apply PNB earlier than recommended treatment cessation times for clopidogrel and thromboprophylactic doses of unfractionated and low molecular weight heparin. Opinion regarding PNB with treatment LMWH and fondaparinux was in line with current guidelines. Awareness of guidelines did not significantly effect opinion.

Conclusions: Our results suggest that whilst the opinion of majority of anaesthetists in this hospital, concur with current guidelines regarding anti-thrombotic therapy and CNB, a significant proportion did not concur with regard to PNB.

146 EFFECT OF INTRAARTICULAR INJECTION OF LEVOBUPIVACAINE ON THE ARTICULAR CARTILAGE AND SYNOVITIS IN RAT

Background & aim: Intraarticular local anaesthetics are often used for prevention of pain after arthroscopic knee surgery. However, intraarticular histopathological effects of local anaesthetics on articular cartilage and synovium, except bupivacaine, has not been studied and complications associated with the injection of intraarticular bupivacaine have appeared in the literature. The aim of this study was to evaluate the effects of levobupivacaine on the articular cartilage and synovium in rat.

Method: Under aseptic conditions, 0.2 ml (5mg/ml) levobupivacaine was injected into the right knee joint while 0.2ml of saline was injected into the left as control at the same time to the 20 adult Sprague-Dawley rats. Groups of five rats were sacrificed at 1st, 7th, 14th and 21th days after the administration of study drug. The knee joint samples were evaluated for the presence of inflammation in the articular, periarticular regions and synovium. Inflammatory changes were graded on a five-point scale. Grade 0: no inflammation, Grade 1: minimal inflammation: mild congestion and oedema, Grade 2: mild inflammation: erosion of joint surface, congestion and oedema, Grade 3: moderate inflammation: neutrophils and macrophages, synoviocyte hyperplasia, and Grade 4: severe inflammation: neutrophils and macrophages, synoviocyte hyperplasia, fibrin.

Results: We did not find any significant differences between levobupivacaine and control groups for the presence of inflammation in the articular, periarticular regions and synovium.

Conclusions: Although more studies are needed before final recommendation can be made, by evaluating the results obtained from our study, clinical use of intraarticular levobupivacaine can be recommended for arthroscopic knee surgery.

147 ORTHOPAEDIC SURGEONS’ AND ANAESTHETISTS’ PREFERENCES FOR NERVE BLOCKS FOR THEIR PATIENTS AND FOR THEMSELVES
K. Koltka, N. Koltka, N. Sivrkoz, O. Kulosgolu, S. Ozyanlturk, Turkey.

Background and aims: This survey reports orthopaedic surgeons’ and anaesthetists’ preferences for their patients and for themselves toward regional anaesthesia (RA) in orthopedic surgery.

Methods: A survey consisting of seven hypothetical surgical procedures were mailed to Turkish orthopaedic surgeons and Turkish anaesthetists using the membership databases of Turkish Society of Orthopaedics and Turkish Society of Regional Anaesthesia. Anaesthetic preferences (GA alone, RA alone, GA + RA, or no preference) were determined for hypothetical surgical procedures (Op1: Ankle fracture Op2: TKR Op3: THR Op4: Shoulder arthroscopy Op5: diagnostic knee arthroscopy Op6: Anterior cruciate ligament repair Op7: distal radius fracture) for a healthy patient, for the surgeon/the anaesthetist.

Results: 350 questionnaires were mailed to the orthopaedic surgeons, and 200 were returned (57% response rate). 400 questionnaires were mailed to the anaesthetists, and 280 were returned (70% response rate). Anaesthetic preferences of the surgeons’ and the anaesthetists’ were similar for their patients and for themselves, except for Op1. For ankle fracture surgery both the surgeons’ and the anaesthetists’ significantly chose more GA for themselves. While the surgeons’ and the anaesthetists’ preferences for themselves were compared, for operations 2, 5 and 6 the anaesthetists chose significantly more RA alone for those operations.

Conclusions: A surgeon’s or an anaesthetist’s anaesthetic preference for his surgery predicted their preferences for their patients. Since surgeons direct their patients’ choice of anaesthesia more than anaesthetists it’s important to increase surgical awareness of the advantages of RA.

148 A MULTI-PORE CATHETER FAILED TO ATTAIN A HOMOGENEOUS SPREAD OF DYE SOLUTIONS IN TWO PHANTOM TISSUE MODELS
S. Yamato, H. Mouri, O. Nagata, T. Murayama, Japan.

Background: Peripheral nerve blocks often employ a multi-pore catheter for the delivery of local anesthetics. We evaluated drug-diffusion areas attained by bolus injection and by continuous infusion with a multi-pore catheter using two phantom tissue models, one sponge and one meat (pork rib).

Methods: Blue-colored water, a dummy substitute for local anesthetic, was administered in the vicinity of simulated surgical wounds in two tissue
models. A SURFLO® (TERUMO Co., Japan) catheter ETFE (20-gauge (G), 5.1cm long) was fashioned into a four-pore catheter by boring pores at 1, 2, and 3 cm from the tip of the catheter using a 24G needle. A 0.3 mL volume of colored water was injected in 1 second in the bolus injection model and the same amount was infused at a rate of 4 mL/hr in the continuous infusion model. After the administration, blue-stained diffusion capacities were compared.

Results: The diffusion capacities were significantly greater at the tip than at the other pores in both the sponge-bolus and meat-bolus models, but the diffusion capacity at the pore closest to the infusion site was greater in the sponge-infusion model. Stained areas were only observed at both the tip and at the pore closest to the infusion site in the meat-infusion model.

Conclusion: The multi-pore catheter failed to diffuse the solution uniformly. The bolus injection delivered the solution from the tip of the catheter and the continuous infusion delivered the solution from the pore closest to the infusion site.

149 CENTRAL NEURAXIAL BLOCKADE FOR THE ENDOVASCULAR REPAIR OF THE ABDOMINAL AORTIC ANEURYSMS (EVAAR) IN PATIENTS USING ANTIPLATELET DRUGS

S. Tsakilotis, C. Pourzitaki, V. Chasapidis, A. Zarmakoupis, N. Melas, P. Petropoulu, Greece.

Background and aims: Antiplatelet agents are generally considered to reduce not only mortality in patients with cardiovascular disease, which is common in patients with Abdominal Aortic Aneurysm but also the development of graft occlusion or stenosis. As for our experience with the use of dual antiplatelet therapy (clopidogrel and aspirin), clopidogrel was continued as a life long treatment. In this study we examine the application of spinal anesthesia in patients who take clopidogrel without discontinuation.

Methods: Thirty one patients undergoing EVAAR (30 scheduled &1 as urgent case) participated in EVAAR. Laboratory tests included preoperative values of PLT, PT, PTT, urea, creatinine, intraoperatives values of lactate in different times, postoperative values of all of these above and Bromage scale. Differences between parameters were evaluated by one sample t-test, Kol-mogorov smirnov test, friedman test and x-square test.

Results: The mean operative time was 135,64 min. All measures parameters where in normal range. Concerning Bromage scale (0-3) in 6,67% of patients was 0, in 33,33% was 1, in 53,33% was 2 and only in 6,67% was 3 detecting fast rehabilitation of mobility, without any indication of spinal epidural haematoma.

Conclusions: Although laboratory tests do not always detect impaired coagulation recommendations regarding regional anaesthetic procedures with current thromboprofilaxis, like clopidogrel based on case reports and experts opinion. It’s considered the interval time between cessation of medicalization and neuraxial blockade at two times the elimination half-life of the drug, this approach adopted by most national societies.


150 POST-OPERATIVE ANALGESIA FOLLOWING PRIMARY KNEE ARTHROPLASTY: COMPARISON OF LOW-DOSE INTRATHECAL DIAMORPHINE AND SINGLE-SHOT FEMORAL NERVE BLOCK: A PROSPECTIVE OBSERVATIONAL STUDY

R. Sethuraman, A. Burunadayal, R. Deepak

Background and aims: Primary knee arthroplasty(PKA) requires good analgesia for postoperative rehabilitation. Intrathecal diamorphine(ITD) and Single shot femoral nerve block(SSFN) are commonly used in multimodal analgesia after PKA. We conducted a prospective observational study to compare the efficacy of ITD and SSFN for analgesia after PKA.

Methods: 100 consecutive patients, who underwent PKA, were followed up prospectively from the day of operation(day 0) until discharge. Anaesthesia and post-operative analgesia was left to the discretion of the attending anaesthetist. All patients who received either ITD or SSFN were included in the study. Chi squared test and students’ t-test as appropriate was used to statistically compare the outcomes. Statistical significance was described as p<0.05.

Results: 56/100 and 35/100 patients received SSFN and ITD respectively. Higher proportion of patients who received SSFN achieved target pain scores on day 0,1 and 2, but not statistically significant. There was statistically significant higher morphine consumption in ITD group on day 0, after leaving recovery. Morphine consumption in ITD group was still higher on day 1 and day 2 but not statistically significant. The incidence of complications like anti-emetic usage and urinary catheterisation was statistically significant in ITD group on day 0 &1. Statistically higher proportion of patients in group SSFN achieved straight leg raise and independent mobility on day 1 and 2. There was no statistical difference in length of stay.

Conclusions: SSFN with weaker concentration of local anaesthetic solution is safer and more effective than ITD for post-operative analgesia in patients undergoing PKA.

151 THORACIC EPIDURAL AND PARAVERTEBRAL BLOCKS FOR POSTOPERATIVE ANALGESIA AFTER THORACOTOMIES: ARE THEY REALLY COMPARABLE?

I.P. Guimarães e Castro Portugal.

Background and aims: Thoracic epidural analgesia is still the gold-standard for managing postoperative pain after thoracotomy. In the recent years, thoracic paravertebral block is gaining ground, not only because is easier to perform, has less contraindications/comlications, and has a better side-effects profile, but also provides “at least” comparable analgesia as thoracic epidural.

The aim of this study is to enhance that despite the veracity of other arguments, thoracic epidural analgesia is superior to paravertebral in relieving pain after thoracotomy.

Methods: A retrospective study was performed, enrolling 100 patients submitted to thoracotomies in 2 groups of 50: one under combined anesthesia (general/epidural) + epidural analgesia, other under combined anesthesia (general/paravertebral) + paravertebral analgesia; pain scores and “rescue” medication at emergence, 6, 12, 24 and >24h (< 42 h) postoperatively were collected from Acute Pain Database (SPSS for Windows®), and compared.

Results: Thoracic epidural group achieved better VAS scores (VAS 0) than paravertebral in all timings, more significant at emergence, 24 and >24 h (emergence: 84% to 62%; 6h: 54% to 42%; 12h: 62% to 56%; 24h: 68% to 50%; >24h: 78% to 60%, respectively). Paravertebral group had the highest “rescue” medication requirements in all timings, especially on emergence (32% to 14%), being almost similar to epidural in remaining times (less than 8%).

Conclusions: Thoracic epidural anesthesia/analgesia is superior to paravertebral, and should remain the first choice for thoracotomy.
Paravertebral anesthesia/analgesia should be reserved for those patients in whom epidural is not succeeded or contraindicated.

152 THE ANALGESIC EFFECT OF TRANSVERSUS ABDOMINIS PLANE BLOCK AFTER LAPAROSCOPIC CHOLECYSTECTOMY IN DAY-CASE SURGERY: A RANDOMIZED CONTROLLED TRIAL

P. Petersen, P. Stjernholm, V.B. Kristiansen, J.B. Dahl, O. Mathiesen, The Danish TAP Study Group, Denmark.

Background and aims: We investigated the effect of TAP block on postoperative pain scores while coughing (primary outcome), pain scores at rest, opioid consumption, and opioid side-effects in patients undergoing laparoscopic cholecystectomy in day-case surgery.

Methods: In this randomized double-blind study, eighty patients undergoing laparoscopic cholecystectomy in our day-case surgery unit were allocated to receive either bilateral TAP block (20 ml 0.5% ropivacaine) or bilateral placebo block. Postoperative pain treatment was acetaminophen 1000 mg × 4, ibuprofen 400 mg × 4, morphine IV (0-2 hours), and ketorolac (2-24 hours). Patients were assessed 0, 2, 4, 6, 8 and 24 hours postoperatively.

Results: VAS-pain scores while coughing (AUC/24h) was significantly reduced in group TAP: weighted average level 26 (13) versus group Placebo: 34 (18) (P=0.037). VAS-pain scores at rest (AUC/24h) showed no significant difference between groups. Median morphine consumption was 7.5 mg (IQR 5-10) in the placebo group compared with 5 mg (IQR 0-5) in the TAP group (P= 0.001). There were no between-group differences in total ketorolac consumption, levels of nausea, consumption of ondansetron, or levels of sedation. However, twenty-two patients in the placebo group compared with 13 patients in the TAP group experienced episodes of vomiting (P=0.036).

Conclusions: TAP block after laparoscopic cholecystectomy reduced pain scores (AUC/24h) while coughing as well as reduced morphine consumption for the first 2 postoperative hours. In addition, fewer patients experienced vomiting episodes with a TAP block.

153 PERIOPERATIVE DEXKETOPROFEN OR LORNOXICAM ADMINISTRATION FOR PAIN MANAGEMENT AFTER MAJOR ORTHOPAEDIC SURGERY - A RANDOMIZED, CONTROLLED STUDY


Background and aims: Non-steroidal anti-inflammatory drugs (NSAIDs) are recommended for multimodal postoperative pain management. We evaluated perioperative pain relief and opioid sparing effects of dexketoprofen and lornoxicam after major orthopaedic surgery.

Methods: After ethical committee approval and informed consent 120 patients undergoing elective hip or knee replacement under general anaesthesia were randomly assigned to receive 50 mg dexketoprofen (GD), 8 mg lornoxicam (GL) or placebo intravenously (GP) at the beginning of skin closure and at 12th, 24th postoperatively. Postoperatively, PCA was started (0.01 mg/kg bolus dose, lockout 10 min without continuous infusion). Pain assessments were made using VAS at rest or during movement on postoperative 1, 2, 4, 6, 8, 12 and 24th hours.

Results: The three groups were similar in terms of age, gender, ASA class; number of patients underwent hip or knee surgery, weight, and height and operation duration. Patients in GD and GL demonstrated significantly reduced pain scores at rest and active motion compared to GP with lower scores in the dexketoprofen group. Patients in GD and GL used significantly less morphine in the postoperative period compared to GP. The total morphine consumption of patients in GD was significantly lower than GL. Regarding sedation there were no differences between the groups.

Conclusions: Intravenous application of two doses of 50 mg dexketoprofen and two doses of 8 mg lornoxicam improved analgesia and decreased morphine consumption following major orthopaedic surgery. Also dexketoprofen was superior to lornoxicam in terms of pain relief and decreased morphine consumption.

154 FACILITATION OF DIAGNOSTIC AND PERCUTANEOUS TRIAL LEAD PLACEMENT WITH ULTRASOUND GUIDANCE FOR PERIPHERAL NERVE STIMULATION ILIOPINGUAL NERVULA

B. Bouche, E. Eisenberg, M.K. Karmakar, M. Meignier, A. Suarez, J. Lemarie French Guinea, France, Hong Kong S.A.R.

Background and aims: The nerves usually involved in ilio inguinal pain are ilio inguinal (II) or genital branch of the genitofemoral (GGF). Others nerves have also been associated: iliobypogastriac (IH), femoral branch of genitofemoral (FGF), lateral cutaneous (CL) and femoral nerves. We describe here a series of 10 patients treated by Péri-Nervous Stimulation (PNS), using Ultrasound (US) guidance for diagnostic and implantation.

Methods: 10 patients suffering from intractable pain due to ilioinguinal neuralgia. All treatment options were unsuccessful. So, we decided to perform a continuous nerve block to evaluate the potential benefit of PNS. We use US guidance for the perinervous underwelling catheterization on implicated nerve(s). It allowed us to identify precisely which nerve(s) were involved in this neuralgia and the good results obtained on pain relief confirmed that these patients were good candidates for PNS. We therefore performed a stimulation trial, implanting the lead(s) (Boston®) close to the nerve(s) involved, under US guidance and visualization. After the 10 days trial, the permanent stimulator was implanted (Boston®).

Results: All patients have paresthesias covering 80 to 100% pain area. Prior to regional test and PNS implantation, pain scale (VAS) varies between 6 to 8/10. All decrease to 0 to 2/10 at the end of regional test and PNS trial. At 12 months, VAS varies from 0 to 2/10. Non complications occurred.

Conclusions: This study identifies 10 patients with chronic groin and ilio inguinal intractable pain. US guidance was both useful for diagnostic of nerve(s) involved nerve(s) in pain and PNS trial.

155 FACILITATION OF DIAGNOSTIC AND PERCUTANEOUS TRIAL LEAD PLACEMENT WITH ULTRASOUND GUIDANCE FOR PERIPHERAL SUBCUTANEOUS FIELD STIMULATION ON INFRAPEATELAR BRANCHES OF SAPHENOUS NERVE


Background and aims: Chronic pain following surgery or trauma of knee is a major source of morbidity. We present our preliminary experience in five patients with chronic pain located in the knee, responsive to peripheral subcutaneous field stimulation (PSFS) therapy, after regional saphenous catheterization test using Ultrasound (US) guidance.

Methods: Pain was severe and all treatments were unsuccessful. Regional test with underwelling catheter on saphenous nerve was the first step. US guidance (Sonosite,M-turbo®) was used, to place the catheter on saphenous nerve in the adductor canal, deep to the sartorius muscle and adjacent to the vastus medialis. Continuous infusion of local anesthesia was then applied for a minimum of 5 days, and resulted in significant pain relief (>80% reduction of VAS score). A neuromodulation trial was then conducted, using lead placed subcutaneously, using US guidance, in medial and inferior joint knee and approached proximally, allowing for electrical stimulation of the articular branches as well as the cutaneous branches of saphenous nerve. After trial stimulation, all patients reported excellent pain relief, before permanent implantation.

Results: VAS significantly decreased from 6-8/10 at the pre-catheterization and pre-operative evaluation, to 0-2/10 by the end of the trial and after 12 months. All reported significant improvement in quality of life.

Conclusions: Regional test with underwelling catheter on saphenous nerve has a good prognostic value: we prove implication of saphenous nerve in knee joint pain with objective rating scales. US guidance was useful for diagnostic of nerve (saphenous) involved in pain and implantation lead PSFS.

156 PULSED MODE RADIOFREQUENCY LESIONING OF GLENOHUMERAL JOINT FOR THE TREATMENT OF CHRONIC SHOULDER PAIN: 3 CASES

E. Ozyuvaci, A. Ak yol, A. Acikgoz, H. Leblebici, Turkey.

Abstracts Regional Anesthesia and Pain Medicine • Volume 36, Number 7, September-October 2011 Supplement
157 THE EFFECT OF INTRAARTICULAR INJECTION OF PARACETAMOL ON THE ARTHRITIC PAIN IN RATS
O. Arun, O. Canbay, N. Celebi, A. Sahin, A. Konan, P. Atilla {\textit{Turkey}}.

**Background and aims:** Paracetamol (acetaminophen) is one of the most popular drugs in the treatment of pain and fever. We aimed to examine the effects of intraarticular injection of paracetamol to the arthritic pain-related behavior and spinal c-Fos expression induced by carrageenan injection into rat knee joint.

**Methods:** 20 Sprague-Dawley rats were sedated with sevoflurane before intraarticular injection. Drugs were injected into the knee joint of right hind limb and measurements were done on both knee joints. Drugs were as follows: Group 1 intraarticular saline, group 2 intraarticular \( \lambda \)-carrageenan, group 3 intraarticular \( \lambda \)-carrageenan and 400 \( \mu \)g intraarticular paracetamol, group 4 intraarticular \( \lambda \)-carrageenan and 400 \( \mu \)g intraperitoneal paracetamol. One day before and 4 and 8 hours after injection, diameters of both knee joints were measured and recorded. Rat's motility, paw loading and joint mobility were assessed at 4th and 8th hours after inflammation occurred with a scale based on Butler et al. After sacrifice, L3 and L4 spinal segments were excised for the c-Fos assessment.

**Results:** Our results showed that treatment with paracetamol diminished arthritic pain and also intraarticular route of administration was found superior to intraperitoneal route for analgesic efficacy. For the motility of rats there wasn't any statistically significant difference between intraarticular and intraperitoneal route of administration.

**Conclusions:** Although there are reports concerning that the paracetamol doesn't have antiinflammatory effect, according to the rats' knee diameter measurements we suggest that intraarticular paracetamol administration may have antiinflammatory effect.

158 PERSISTENT HICCUPS AFTER EPIDURAL STERIOD INJECTION: A RARE SIDE EFFECT
A. Makris, M.E. Matala, A. Spanomanoli, A. Piperopoulos, D. Sarridou, N. Skarpa, S. Sgouroumalis Kostaki, {\textit{Greece}}.

**Background and aims:** Epidural steroids are commonly used in chronic pain management. Side effects of epidurally administered steroids are relatively well known. There are not many reports including hiccups as a potential side effect. We present a case of recurrent persistent hiccups occurring after administration of epidural betamethasone.

**Methods:** A 67 year old male presented with a history of chronic L5 radicular pain. He underwent a laminectomy procedure 2 years ago but symptoms continued. Previous treatment (physiotherapy, oral medications) had failed. He was treated with an epidural steroid injection (ESI), using the caudal approach, with 20 ml of a mixture of 0.1% ropivacaine and 12 mg of betamethasone. The patient reported persistent hiccups, starting approximately 4 hours after ESI with gradual improvement and relief 5 days later, with no treatment. Another ESI was performed 4 weeks later, using the same betamethasone dose, but in 20 ml of normal saline instead of ropivacaine. 3 hours later, the patient complained of persistent and excruciating hiccups. He received metoclopramide intravenously and was prescribed oral metoclopramide.

**Results and discussion:** Hiccups did not improve and 3 days later the patient complained of difficulty with breathing and fatigue. He was prescribed chlorpromazine and the hiccups decreased gradually but lasted 15 days. It has been proposed that corticosteroids lower midbrain synaptic transmission threshold and directly stimulate the hiccup reflex arc, binding to steroid-receptors within its effenter limb, while some literature also postulates binding to receptors within the effenter limb.

**Conclusions:** Although a rare adverse effect of epidural corticosteroids, hiccups can be very distressing. Pain specialists should be aware of this complication and its management.

159 POST-OPERATIVE ANALGESIA FOR OPEN THORACOTOMY LUNG SURGERY: A SURVEY OF UK CARDIOTHORACIC UNITS

**Background and aims:** To determine the analgesia practices and factors influencing the choice of Regional Anaesthesia after adult open thoracotomy (lung surgery) within thoracic centres in the UK.

**Methods:** A questionnaire survey which was reviewed & endorsed by ACTA (Association of Cardiothoracic Anaesthetists) was distributed (web based postcard) to 38 UK thoracic units.

**Results:** Of the 38 units, 2 were excluded as primarily paediatric & non-pulmonary surgery centers. The response rate was 92.1% (35/38) - 37 units responded; 2 incomplete responses were excluded. 62.9% (22) of the units routinely used Thoracic Epidural (TEA) - One of these supplemented with PCEA.

31.4% (11) used Paravertebral block (PVB) combined with IV PCA - One of these added an intrapleural catheter. 2.9% (1/35) units used PVB + Intrathoracal morphine. Another unit used PCA or intrapleural catheter. 74.3% (26/35) units thought their current practice was ideal. 25.7% (9/35) were dissatisfied.

5 of the 22 units using TEA were dissatisfied - 1 of them would have preferred TEA+PCEA, a 2nd (would've preferred) PVB+IV PCA & the 3rd TEA+PCEA / PVB+intratheral. 4 of the PVB+IV PCA group said that they would rather use TE+PCEA. The PCA/Intrapleural unit would prefer IV PCA+Intrapleural block or PVB+PCA.

**Conclusions:** TEA is the predominant choice with reasonable satisfaction. Most of the units were happy with their current practice. Most of the units were happy with their current practice. A few units had their choice altered by lack of HDU/ITU beds(51%), surgical preference, departmental policy, level of monitoring/staff, equipment shortage/problems & cost.

**160 THE DIRECTION AND GEOMETRIC SPREAD OF A TRANSVERSE ABDOMINIS PLANE (TAP) BLOCK AN MRI STUDY IN HEALTHY VOLUNTEERS
K. Jensen, T. Jansen, A. Christensen, J. Borglund, {\textit{Denmark}}.

**Background and aims:** Constraining borders of a transverse abdominis plane (TAP) block may in principle be viewed as a compressed ball structure (ellipsoid). Aim: investigate if the ellipsoid distribution of injectate could be reproduced, and if certain directions of injectate movement were favored.

**Methods:** Following IRB approval, a controlled, double-blinded MRI study in 10 males was undertaken. An upper (intercostal) and lower (Classical) TAP injection were administered with ropivacaine 0.5%, either 15ml or 30ml. The term eccentricity refers to the compression of the minor axis in relation to the
major axis and is defined by the equation: 

\[ e = \sqrt{(major \ axis^2 - minor \ axis^2) / \text{major \ axis}} \]

**Results:** Distributions of injectate are clearly eccentric. Intercostal TAP blocks spread in the sagittal plane, whereas Classical TAP blocks spread along dermatomes (Table 1). The 15 ml Intercostal TAP injectate loses its eccentricity at 2 hours, whereas the 30 ml Classical TAP injectate does not. **Conclusions:** Intercostal TAP borders remain fixed, suggesting anatomical limits by the rectus muscle or aponeurosis. The unchanged eccentricity of 15 or 30 ml Classical TAP block at 30 minutes suggests that the borders of the injectate are reached at low volumes, suggesting even lower volumes may be sufficient for clinical applications.

**References:**

### 161

**SONOANATOMY OF THE ARTERIES IN THE SUPRACLAVICULAR REGION RELATED TO ULTRASOUND-GUIDED SUPRACLAVICULAR BLOCK**


**Background and aims:** Ultrasound-guided suprclavicular block is recommended to perform at the level where the brachial plexus (BP) and the subclavian artery (SCA) lie on the first rib in the ultrasound image to avoid pneumothorax. However, the risk of inadvertent puncture of the branches of SCA, such as the transverse cervical artery (TCA) or the dorsal scapular artery (DSA), during ultrasound-guided suprclavicular block has not been elucidated. Thus, we examined the rate of appearance of TCA or DSA at 3 types of detection levels in the suprclavicular region.

**Methods:** After obtaining institutional approval and written informed consents from the subjects, ultrasound examination of the suprclavicular region was performed in 53 adult healthy volunteers. The ultrasound images of TCA and DSA were classified into 3 types according to their detection levels as follows: the most caudal level where BP and SCA lay on the first rib (Level A), the level where BP lay on the first rib and SCA on the pleura (Level B), and the most cephalad level where BP lay between the anterior and middle scalene muscles (Level C).

**Results:** A total of 106 suprclavicular regions were examined. The rates of appearance of TCA in the images were 1.9%, 29.2% and 57.7% at levels A, B and C, respectively, and those of DSA were 2.8%, 21.7% and 9.4% at levels A, B and C, respectively.

**Conclusion:** The risk of inadvertent arterial puncture as well as pneumothorax could be minimized when ultrasound-guided suprclavicular block is performed at the recommended level.

### 162

**A POSSIBLE EXPLANATION FOR SOME FAILURES DURING INFRACLAVICULAR BLOCK**

M. Benkhadra, A. Faust, S. Aho, G. Feigl, C. Girard France, Switzerland, Austria.

**Background and aims:** The aim of our work was to analyze the type of failure during a dorsal injection relative to the axillary artery, for ultrasound guided infracavicular block (US-ICB).

**Methods:** 20 cadavers preserved according to Thiel’s embalming method were investigated. A solution (methylene blue and lidocaine) was injected dorsally relative to the axillary artery with ultrasound guidance. A fine dissection of each of the 40 (right and left) plexus brachialis was performed and were recorded: the spread of the solution and which nerve structures among the 3 trunks, 3 cords, 7 nerves (Median, Axillary, Ulnar, Radial, Musculocutaneous, Cutaaneous Brachial and Cutaaneous Antebrachial) had been colored. “Anatomical successful” blockade was defined as the simultaneous coloring of the 3 trunks, or the 3 cords or the 7 nerves or a mixed and appropriate coloring of the three 3 types de structures. Macroscopic vascular, nervous and pulmonary lesions were recorded too.

**Results:** In 33 cases, all the nervous elements of the plexus brachialis were circumferentially colored. In 3 cases, only 1 or 2 elements of the plexus brachialis were colored. In 4 cases there was no coloring in spite of an adequate spread visualized on ultrasound images. In those cases the total amount of the solution was find in the thoracoscapular space: limited by infra- scapular and serratus muscles. There was no vascular, nervous or pulmonary lesion.

**Conclusions:** A possible anatomical explanation for some failures consecutive to a dorsal injection during US-ICB is the thoracoscapular space which the anesthetic solution migrates preferentially.

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**Abstracts**

**Regional Anesthesia and Pain Medicine** • Volume 36, Number 7, September-October 2011 Supplement
164
CALCULATION OF LOCAL ANAESTHETIC VOLUME SPREAD IN ULTRASOUND-GUIDED (USG) TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCKS: VALIDITY OF MRI MEASUREMENTS

J. Berglund, T. Jansen, A. Christensen, K. Jensen, Denmark.

Background and aims: Three-dimensional distribution of local anaesthetics is an area of interest in the field of USG nerve blocks. Precise measurements of injected volumes must rely on correct visualization and a valid theoretical distribution of injectate. However, anatomical variations make such measurements difficult to translate into valid volume estimates. Aim: To describe the precision of a geometrical tool for the estimation of TAP block volumes and relate our results to previously published material on intracranial volumes using simple empirical calculations.1-2

Methods: Following IRB approval, a MRI study including 10 healthy volunteers having USG TAP blocks administered at the Intercostal and Classical TAP plexuses with 15 and 30 ml of ropivacaine 0.5%.

Results: MR imaging depicts the distribution of the injectate to resemble an extended, compressed ball structure (an eccentric ellipsoid, in geometric terms). Table 1 summarizes our results.

<table>
<thead>
<tr>
<th>Volume of Injection</th>
<th>Ellipsoid Volume (cm³)</th>
<th>Deviation from Theoretical Volume (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellipsoid TAP 15 ml</td>
<td>11.4 ml</td>
<td>0.0%</td>
</tr>
<tr>
<td>Ellipsoid TAP 30 ml</td>
<td>21.5 ml</td>
<td>10.5%</td>
</tr>
<tr>
<td>Classical TAP 15 ml</td>
<td>11.3 ml</td>
<td>0.0%</td>
</tr>
<tr>
<td>Classical TAP 30 ml</td>
<td>21.1 ml</td>
<td>11.1%</td>
</tr>
</tbody>
</table>

Conclusions: Ellipsoid volume estimate is more precise than the empirical calculation. However, both calculations underestimate the injected volumes. We conclude that discrepancies in injectate distribution cause deviations from classic geometric shapes, especially in the lower TAP block. These discrepancies should be corrected when precise volume estimates are crucial.

References

165
SUBSARTORIAL SAPHENOUS NERVE BLOCK: ANATOMIC AND CLINICAL EVALUATION OF AN ULTRASOUND GUIDED TECHNIQUE

M. Nakou, T. Paraskevopoulos, A. Adonì, I. Koukopoulos, T. Saranteas, G. Kostopanagiotou, S. Anagnostopoulou, Greece.

Background and aims: We evaluated the anatomy and the clinical results of an ultrasound-guided saphenous nerve block at the level of the inferior foramina of the adductor canal.

Methods: The anatomic study included eleven formalin-preserved cadavers. The saphenous nerve was dissected at the level of the adductor canal. The clinical study included 23 volunteers. After receiving ethics committee approval, we depicted femoral artery and sartorius muscle at the level of the inferior foramina of the adductor canal using a linear probe. Ten milliliters of 1.5% lidocaine were injected between sartorius muscle and femoral artery.

Results: In 9 of 11 (82%) specimens the saphenous nerve exited the adductor canal from the distal end of the vastoadductor membrane, whereas in 2 of 11 (18%) specimens the saphenous nerve pierced proximally the vastoadductor membrane. In all the specimens (100%), saphenous nerve passed between the sartorius muscle and the femoral artery at the level of the inferior foramina of the adductor canal. Fifteen minutes after the injection, 22 out of 23 volunteers responded with a complete sensory block at the medial surface of the lower extremity of tibia. None of the volunteers experienced a motor block.

Conclusions: In our cadaver series, saphenous nerve always passed between the sartorius muscle and the femoral artery at the level of the inferior foramina of the adductor canal.

2. At this level, ultrasound-guided injection of local anaesthetic between the sartorius muscle and the femoral artery may result in a reliable saphenous nerve block.

166
HISTOLOGICAL CONSEQUENCES FOLLOWING INTRANEURAL INJECTION OF BUPIVACAINE OR RINGER’S SOLUTION IN A PIG MODEL


Background and aims: Previous studies show various histological findings due to intraneural injection of local anaesthetics. Therefore we applied an established score for histological assessment following nerve puncturing and subsequent injection of local anaesthetic or Ringer’s solution.

Methods: Intraneural injection was applied in six anaesthesized pigs to a total of 36 brachial plexus nerves. Either bupivacaine 0.5% or Ringer’s solution was applied. After 48 hours of maintaining general anaesthesia 48 nerves including negative and positive controls were resected. The specimens were processed for visual examination and the detection of inflammatory cells, myelin damage, and intraneuronal haematoma. The grade of nerve injury was assessed using an objective score ranging from 0 (no injury) to 4 (severe injury).

Background: Statistical analysis showed significant nerve lesions in the interventional groups compared to the negative controls (p<0.022). According to the applied injury score, there was no significant difference between the bupivacaine group [median (interquartile range) 1 (1-1)] and the Ringer’s group [1 (0-2) P =0.585]. The occurrence of posttraumatic regional inflammation and myelin damage was comparable in both groups.

Conclusions: In the present study, the magnitude of nerve injury following intraneural injection was not related to the applied type of substance. Post-traumatic inflammation and structural damage of nerve tissue were notable signs of nerve injury after intraneural injection. According to the present data a volutrauma due to intraneural injection can be designated an important trigger for nerve injury.

167
HAS ULTRASONOGRAPHY CONTRIBUTE WITH MORE EFICACY AND SECURITY THAN NERVESTIMULATION IN POSTERIOR SCIATIC NERVE BLOCK?

A. Martínez Navas, R. Ortiz de la Tabla González, R. Rodríguez de la Torre, M. Dávila Arias, E. Medina Madrid, C. Almeida González, M. Echevarría Moreno, Spain.

Background and aims: To compare the efficacy and security between ultrasonography and nervestimulation during popliteal block.

Methods: A randomized, prospective study was performed on patients scheduled for foot surgery under popliteal block. Group 1, sciatic block with nervestimulation with 20 ml 1,5% mepivacaine. Group 2, out of plane sciatic block with ultrasonography with 20 ml 1,5% mepivacaine. Effectiveness: The anatomic study included eleven formalin-preserved cadavers. The saphenous nerve was dissected at the level of the inferior foramina of the adductor canal. The clinical study included 23 volunteers. After receiving ethics committee approval, we depicted femoral artery and sartorius muscle at the level of the inferior foramina of the adductor canal using a linear probe. Ten milliliters of 1.5% lidocaine were injected between sartorius muscle and femoral artery.

Results: In 9 of 11 (82%) specimens the saphenous nerve exited the adductor canal from the distal end of the vastoadductor membrane, whereas in 2 of 11 (18%) specimens the saphenous nerve pierced proximally the vastoadductor membrane. In all the specimens (100%), saphenous nerve passed between the sartorius muscle and the femoral artery at the level of the inferior foramina of the adductor canal. Fifteen minutes after the injection, 22 out of 23 volunteers responded with a complete sensory block at the medial surface of the lower extremity of tibia. None of the volunteers experienced a motor block.

Conclusions: In our cadaver series, saphenous nerve always passed between the sartorius muscle and the femoral artery at the level of the inferior foramina of the adductor canal.

2. At this level, ultrasound-guided injection of local anaesthetic between the sartorius muscle and the femoral artery may result in a reliable saphenous nerve block.

References
block at 20 minutes after the technique G1 65%, G2 70% (p<0.05). The average achievement time of the technique was G1 90 (12,5-172,5) seconds, G2 45 (11.25-202,5) seconds (p<0.05). Nerve swelling occurs in three patients of G2. Three patients of G1 and four patients of G2 presented slight paresthesias in first finger at 48 hours but they disappeared in some days (p<0.05).

Conclusions: ultrasonography was successful in first puncture. It had more incidence of paresthesia. Ultrasonography was related with lower time to achieve surgical block and identification of intraneural injection with 1 ml of local anesthetic.

168
PERIPHERAL NERVE BLOCKADE AND INTRANEURAL INJECTION: CAN YOU FEEL THE PRESSURE?
S. Martellock

Background and aims: Intraneural injection of local anaesthetic remains a hazard of regional anaesthesia. In a canine model, intraneural intrafascicular, but not intraneural extrafascicular injection, was associated with both high injection pressures (>12psi) and neurological damage.

We tried to establish if practitioners can detect dangerously high levels of resistance by subjective “feel”.

Methods: Using a flow restrictor calibrated to generate injection pressures >12psi, we tasked 14 anaesthetists and 16 anaesthetic assistants to inject from a 20ml, 10ml, 5ml and 2ml syringe, presented in random order, asking if they would inject a real patient at the resistance encountered. Data underwent chi² testing.

Results: 37% of practitioners (anaesthetists 43%, anaesthetic assistants 31%, p=0.51) would inject at a resistance >12psi from a 20ml, 60% (43% vs 75%, p=0.07) a 10ml, 53% (29% vs 75%, p=0.01) a 5ml, and 80% (64% vs 94%, p=0.04) from a 2ml syringe (20ml vs 10ml: p=0.07, 20ml vs 5ml: p=0.19, 20ml vs 2ml: p=0.007, 10ml vs 5ml: p=0.60, 10ml vs 2ml: p=0.09, 5ml vs 2ml: p=0.03, overall: p=0.008).

Conclusions: Subjective “feel” of resistance does not protect from intraneural intrafascicular injection. Smaller syringes may increase the risk of intraneural intrafascicular injection, advocating the use of bigger syringes irrespective of injectate volume.

Anaesthetic assistants may be less reluctant to inject at high resistance, rendering the practice of delegated injection questionable.

In-line manometry or blow-off valves may be helpful.

In order to educate “feel”, it may be advisable to consistently use a single size of syringe irrespective of injectate volume.

169
EFFECTS OF SPINAL AND GENERAL ANESTHESIA ON UMBILICAL CORD MALONDIALDEHYDES AND ISCHEMIA MODIFIED ALBUMIN LEVELS IN CESAREAN SECTION
S. Geze, S. Güven, B. Cekic, C. Karahan, E. Erktör, A. Menteşe, Turkey.

Background and objective: Oxidative stress may account for the elevated cord blood ischemia modified albumin and malondialdehydes levels in elective caesarean section. The aim of this study was to compare the effects of the general and spinal anaesthesia on cord blood malondialdehydes and ischemia modified albumin levels in elective caesarean section.

Methods: A total of 40 patients were enrolled to the study in two groups; The Spinal Anaesthesia Group (Group S, n=20), the General Anaesthesia Group (Group G, n=20). Groups were compared for cord blood malondialdehydes and ischemia modified albumin levels.

Results: Cord blood plasma concentration of ischemia-modified albumin was significantly lower in Group S (0.62 ± 0.1) than Group G (0.74 ± 0.5) (p<0.05). Cord blood plasma concentration of malondialdehydes was significantly lower in Group S (0.32 ± 0.06) than Group G (0.39 ± 1) (p<0.05).

Conclusion: Cord blood ischemia modified albumin and malondialdehydes levels was significantly higher in general anaesthesia group than spinal anaesthesia for caesarean section. Spinal anaesthesia may be a prefer to general anaesthesia for caesarean section.

170
AVOIDING INADVERTENT INJECTION ERRORS IN LABOUR EPIDURAL ANAESTHESIA
U. Paralkar, S. Vamadevan, G. O’Sullivan

Background and aims: NPSA Audit - 11 inadvertent injections notified. Of these 3 were Epidural metaraminol administration and 6 IVbupivacaine administration. 1Death resulted. 8 suffered no harm. 6 happened in Obstetrics, suggesting that this is an area where the risk factors for inadvertent accidental injection must be examined.

NPSA Guidelines state the following.- Clearly label infusion bags and syringes for epidural therapy. Judicious use of color and design of equipment. ‘For Epidural Use Only’ in a large font. We decided to examine this crucial risk mitigator in our obstetric practice.
Methods: The audit proforma was designed reflected NPSA guidelines. Data was prospectively collected by a single investigator over a 2-month. Patients receiving epidural analgesia in labour ward were assessed.

Results: 36 labour epidurals. 83% of the cases were performed by the senior residents. 6/36 were done by the junior residents. 28% had no epidural sticker attached to the epidural catheter or filter at any point. These errors were all in the senior trainee group.

Highlighting no correlation between seniority and adherence to precautions.

Conclusion(s): The ways to reduce the incidence of inadvertent injections we recommend.

1) Appropriate & adequate training of individuals in risk mitigators.
2) Different attachments for the epidural set.
3) Premade epidural syringes by the hospital pharmacy.
4) Color coding of the tubing.
5) Label all epidural administration sets with ‘Epidural’ when in use.
6) Rationalise range of epidural products.
7) Having departmental protocols.

References:
NAP3, January2009.

171 A RETROSPECTIVE AUDIT ON THE STANDARD OF CARE BY THE COMBINED OBSTETRICS AND ANAESTHESIA TEAMS’ FOR THE EMERGENCY CAESARIAN SECTIONS

M. Meela, J. Rauf, J. Multall, Ireland.

Background and aims: Anaesthesia related maternal deaths have largely been attributed to the use of general anaesthesia for caesarean section. Two audits conducted in our unit in 2001 and 2005 showed a 49% and 91% rate of regional anaesthesia respectively. The Royal College of Anaesthetists has set standards at an 85% rate of regional anaesthesia and less that 3% conversion rate for emergency caesarean sections. To qualitatively test our current units practices, we retrospectively audited all emergency caesarean sections performed from the 1st of July 2009 to the 31st of May 2010.

Methods: The number of Emergency caesarean sections, technique of anaesthesia used, decision to delivery interval time and maternal ages were recorded.

Results: 204 cases were included in this audit. The regional anaesthesia rate was 79.9% with a conversion rate of 1.5%. The mean decision to delivery intervals were 14.61 and 29.74 minutes for the category 1 and 2 groups respectively, p= 0.05.

Conclusions: The rate of regional anaesthesia for emergency caesarean section was lower than that recommended by the college. This rate was much lower in category 1 caesarean sections (48.8%), which may prompt the need to review the recommendations and make them category specific.

172 EFFECT OF PREOPERATIVE FORCED AIR-WARMING AND FLUID WARMING DURING CESAREAN SECTION UNDER SPINAL ANAESTHESIA


Background and aims: Postoperative shivering is frequent event in patients during cesarean section under spinal anesthesia. We assessed the effect of preoperative warming during cesarean delivery under spinal anesthesia and compared efficacy of the forced air-warming with that of warm fluid for prevention of shivering.

Methods: Forty-five patients undergoing cesarean section were randomly assigned to three groups. Group F received warmed intravenous fluid (40°C); Group A were actively warmed by forced air-warming; Group C were control. Either forced air-warming or warmed fluid was maintained during 15min before the spinal anesthesia. Core, skin temperature of arm and thigh were measured before warming and every 15min after spinal anesthesia and shivering was graded. Patients evaluated their thermal comfort with visual analog scales.

Results: The core temperature at 45min decreased less in Group F and Group A than Group C (0.3°C vs -0.3°C vs -0.6°C); 0.4°C vs -0.9°C; 0.4°C, respectively; P=0.004). The arm temperature at 15min and 30min exhibited greater increase in Group A than Group F and Group C (P=0.001, P=0.012).

The incidence of shivering was significantly less in the Group A and Group F than Group C (20%, 13.3%, 53.3%, respectively; P=0.035).

Conclusions: Preoperative forced air-warming and warmed intravenous fluid did not improve cold sensation felt by the patients. But these warming methods significantly decreased the incidence of shivering during cesarean section under spinal anesthesia. Probable reason for decreased incidence of shivering is that core temperature was maintained above shivering threshold during spinal anesthesia.

173 PATIENT OBESITY CORRELATES WITH INCORRECT IDENTIFICATION OF LEVEL OF SPINAL AND EPIDURAL ANAESTHESIA NEEDLE INSERTION

T. Lynch, S. Hoesni, T. Tan, Ireland.

Anaesthetists often incorrectly identify the level of epidural and spinal anaesthesia insertion (1). The conus medullaris extends below L1 in 58% of adults. Insertion of needles at or above L1 increases the risk of neurological injury (2). Aim: To examine using ultrasound the spinal and epidural needle insertion level and how this compared to documented level.

Methods: With patient consent, during the post operative pain round, the level of needle insertion was determined using ultrasound. This was compared with the documented level of insertion.

Demographic data: age; height; weight recorded. Body mass index (BMI) was calculated.

Results: 28 consecutive patients included.

- 12 patients were obese.
- 7 patients were severely obese.
- 2 patients were morbidly obese.
- 1 patient was superobese.

Patient BMI correlated with a higher level of inaccurate needle placement. Pearson correlation coefficient 0.51, P=0.006.

- 11 patients needles were inserted at or above the T12/L1 or L1/2 level.
- 9 of these patients were obese.

Conclusion: Obesity levels correlated with incorrect identification of needle insertion level. Anaesthetists did not identify the correct level of needle insertion most of the time (20/28). Many patients had needles inserted at or above the L1/2 level (7/28). Ultrasound guidance may be useful in correctly identifying needle insertion level (3).

References

174 REGIONAL ANAESTHESIA FOR LABOUR, “EXPLORING THE UNKNOWNS”, A REGIONAL SURVEY

T. Katawala, S. Rathinam

Background and aims: ‘Intrapartum care’, NICE guidance details a few things about managing labour epidural analgesia. The aim of the survey was to explore the unknowns and to know if anaesthetists are abiding by these guidelines and also to know their local hospital policies and practice.

Method: This prospective survey that includes 13 questions was conducted using online software ‘Survey monkey’ among anaesthetists in our region between November and December 2010. Data were collected and analysed by the same software.

Results: 112 anaesthetists opened the survey and 112 replied with a response rate of 100%.

Anaesthetists getting informed consent about epidural affecting breast feeding 1% Routine administration of IV fluids for low dose epidural/ CSE 79%.
2% chlorhexidine as skin disinfectant before epidural 38%
Don’t provide labour epidural in febrile women 56%
Wait for an hour following antibiotic in febrile women 30%
Don't encourage mobilisation with low dose epidural 42%
Using low dose mixture for test dose 83%
Using 0.25% or 0.5% Bupivacaine for partially working epidural 27%
Conclusion: It is surprising only 1% get informed consent about epidural
affecting the breast-feeding. 80% of them are not aware of NICE guidance
recommending that preloading and maintenance fluid infusion need not be
administered routinely.
Nearly half of them don't encourage mobilisation during labour. Febrile
women should not be denied analgesia provided they are systemically well
and have received antibiotics.
Reference: NICE guidance “Intrapartum care”, care of healthy women and their babies

175
AN AUDIT OF INCIDENCE OF CHRONIC PAIN AFTER
CAESAREAN SECTIONS
G. Bhat, T. Tamilselvan, A. Philip
Background and aims: Occurrence of chronic pain after caesarean section
is well documented but the extent of problem is not clearly elucidated.
Chronic pain can have huge implications on quality of life on this group of
young patients, who are economically active. We aimed to study the inci-
dence of chronic pain following caesarean section.
Methods: A questionnaire was designed to explore the quantitative and
qualitative extent of the chronic pain problem in post caesarean section
patients. A survey was conducted by sending a questionnaire to 294 women
who had had caesarean sections in the year 2008.
Results: A total of 134 responses were received. Out of these 19.4% of
patients complained of experiencing chronic pain of varying severity. Among
the patients with chronic pain 61.5% of patients complained of pain while
conveying babies or heavy weights. 10.7% of patients said pain had significant
impact on their mood. 57.6% patients experienced pain while exercising. In
4 patients (15.3%) there was neuropathic element in the pain and back pain
was the predominant complaint in rest of the 22 patients.
Conclusions: Chronic pain affects a significant number of patients after
caesarean sections. Results of our survey correlates with other studies of the
same nature. Further research is needed to prevent and treat this challenging
problem.
Reference:
Chronic pain following Caesarean section( ‘Acta Anaesthesiol Scand.’ 2004
Jan;48(1):111–6),Nikolaïsen L et al.

176
UNRECOGNISED DURAL PUNCTURES - CAN THEY
BE RECOGNISED?
S. Kuthanur Natarajan, B. Sujith, K. Koneti.
Background and aims: Accidental dural puncture(ADP) and post dural
puncture headache(PDPH) are common unsolved problems in obstetric an-
aesthesia. Recent studies are looking at prophylactic interventions to prevent
or reduce the severity of headache.
Methods: We did a retrospective audit looking at the incidence and man-
agement of ADP and PDPH for 3 years period from January 2007 to De-
cember 2009.
Results: 1804 women had epidurals in 3 year period. There were total of
21(1.16%) ADP and 60% of these patients were assumed to have dural
puncture as they developed headache consistent with PDPH. 19 patients
(1.05%) developed PDPH. Four patients cured with conservative manage-
ment and remaining 15 patients had epidural blood patch (EBP). We had 80%
success rate with single EBP and 93% success rate with second EBP.
Conclusions: The incidence of ADP and PDPH are meeting the standards
and there is a good success rate with EBP. The incidence of unrecognised
dural punctures is very high(60%) compared with the previous studies. With
the recent studies stressing on preventive measures, it is not possible to have
preventive strategy if the dural punctures are unrecognised.
Previous studies suggest that initial dural puncture with intact arachnoid
and later arachnoid tear due to pushing as the possible mechanism for
unrecognised dural puncture. With saline preferred to air for loss of resis-
tance, the possibility of missing CSF leak when using saline cannot be ex-
cluded. There is currently no other means except high index of suspicion for
recognising unrecognised dural punctures, especially in those patients where
there have been repeated attempts at epidural insertion. We suggest all
patients should be followed up in hospital before discharge to the community
even after a failed procedure.

177
ULTRASOUND ASSISTED EPIDURAL ANALGESIA IN
A WOMAN WITH SPINAL METAL RODS: CASE REPORT
D. Cristina, A. Ceron, G. Inzigneri, L. Montagnini, C. Zannoni, Italy.
Background and aims: The use of ultrasound scan to facilitate the cath-
eterization of the epidural space in women requiring labour analgesia, has
become an area of increasing interest. Ultrasounds can be used to pre-scan
the lumbar spine in difficult cases like surgically corrected severe scoliosis,
condition associated with an increased risk of complications and failure in
obtaining satisfactory analgesia.
Methods: A 21 year old woman with a history of severe idiopathic scoliosis
corrected at 16 year age with metal rods, interesting the spinal tract from D10
to L4, was admitted for labour induction with vaginal prostaglandins fol-
lowed by oxytocin infusion and an epidural analgesia was requested. She had
palpable iliac crests, but her spine not revealed useful landmarks. With the
patient in sitting position, we studied her spine with ultrasounds using a
portable Sonosite Titan scanner with a convex array probe Sonosite C60. We
didn’t found difficulty in recognizing the epidural and an epidural catheter
was correctly placed.
Results: We obtained an excellent analgesia without any side effect.
Conclusions: Both corrected or uncorrected scoliosis represents a challenge
for anesthesiologists in performing neuraxial anesthesia, which still results in
inadequate or failed analgesia/anesthesia in a high rate. The use of ultra-
sounds is very helpful, because it permits to place the catheter at the correct
intervertbral space, which is the first condition to obtain a good analgesia.
In conclusion, ultrasounds can greatly facilitate the epidural catheterization
for labor analgesia also in women with corrected scoliosis and spinal
instrumentation.

178
WRAPPING OF THE LOWER LIMBS FOR PREVENTION
OF POST SPINAL HYPOTENSION IN CESAREAN SECTION
UNDER SPINAL ANAESTHESIA
Background and aims: Prehydration and/or vasopressor are commonly
used for prevention of post spinal hypotension in cesarean delivery. Wrap-
pering of the legs is simple way to perform and have reported the effect of the
prevention in post spinal hypotension in few obstetric units.
Methods: 45 parturients were randomly allocated to one of 3 groups: pre-
hydration with 10ml/kg (group I), prehydration with 10ml/kg and wrapping of
the legs (group II), prehydration with 5ml/kg and wrapping of the legs
(group III). Blood pressure was recorded every 1 min for 10 min, every 2 min
for another 10 min after spinal block. Hypotension was defined as 20%
decrease from initial systolic arterial pressure(SAP) or SAP lower than
90mmHg and treated with ephedrine. The severity of hypotension was de-
fined as a number of ephedrine given, mild ( given once), moderate (given
two or three times) and severe ( more than three times).
Results:

FIGURE 1.
Group II showed significant decrease in the incidence of severe hypotension compared with group I, but there was no difference of the total incidence of hypotension among the groups. SAP showed significant decrease in group I than other groups in 1 min.

Conclusions: Wrapping of the legs with prehydration for prevention of post spinal hypotension in cesarean section reduces the severity of hypotension and delay the development of hypotension. But wrapping of the legs dose not influence the incidence of hypotension.

A PROSPECTIVE, RANDOMISED ASSESSMENT AND COMPARISON OF ECHOCGENIC B-BRAUN STIMUPLEX® ULTRA AND NON-ECHOCGENIC B-BRAUN STIMUPLEX® REGIONAL ANAESTHETIC BLOCK NEEDLES

R. Sethuraman, J. Shorthouse, M. Crowley

Background and aims: Pajunk® Sonoplex echogenic needles have exhibited better tip visibility than Pajunk® Uniplex non-echogenic needles. We have compared echogenic B-Braun Stimuplex® Ultra (Needle E) and non-echogenic B-Braun Stimuplex® (Needle NE) regional anaesthetic block needles in this prospective randomised study.

Methods: Needle E and Needle NE were placed into an envelope. Anaesthetists scored each needle for tip visibility using a linear numerical scale of 1 (worst) to 10 (excellent).

Results: 44 nerve blocks were analysed, (n=22 for each needle). Scores given by anaesthetists were compared using student's t-test. Overall, we found no statistical difference in tip visibility between the two needles during advancement (p=0.16) and injection (p=0.34). However, there was statistically significant better visibility on advancement (p=0.01) and injection (p=0.04) for blocks performed at 45° with Needle E. No significant difference in visibility was found at angles of less than 45°.

Conclusions: We have demonstrated better visibility with echogenic needles produced by B-Braun®. These findings are consistent with a previous study comparing Pajunk® echogenic and non-echogenic needles, demonstrating that the former had better visibility even at steeper angles.

Reference:

COMPARISON OF PREEMPTIVE AND PREVENTIVE CAUDAL ANALGESIA FOR POSTOPERATIVE PAIN RELIEF IN CHILDREN

K. Naghibi, Iran.

Background and aims: Caudal anesthesia is one of the most used popular regional blocks in children. We designed this randomized double blind study to evaluate the efficacy of preemptive (preincisional) caudal Bupivacaine analgesia with preventive caudal Bupivacaine analgesia (postincisional) for postoperative analgesia in children undergoing herniorrhapy.

Methods: After institutional review board approval and informed consent, in this randomized, prospective clinical trial study, eighty four children, ASA physical status I and II, aged 2 - 12 yr, who were undergoing elective elective hernia repair were randomly allocated into two groups. Group I (preemptive group) received 0.5 ml/kg 0.125% bupivacaine caudally after the induction of anesthesia but 10 min before surgery. Group II (preventive group) received the same dose of drug caudally at the end of the surgery. In the recovery room pain was assessed using the modified Children’s Hospital of Eastern Ontario Pain Scale (CHEOPS). In addition, the motor block, sedation, and the time to first postoperative analgesics and additional analgesic requirement for postoperative analgesia were assessed up to 12 h after operation.

Results: Eighty four children were included in the study. There were no significant differences between the two groups with respect to age, gender, weight, ASA class, and Clinical characteristics. The pain score and analgesic requirements were significantly less in preemptive group compared with preventive group (P< 0.01).

Conclusion: Preemptive caudal administration of 0.125% bupivacaine resulted in superior analgesia with a longer period and less additional analgesic demand compared with preventive caudal 0.125% bupivacaine in children undergoing herniorrhapy.

THE EFFECTS OF INTRAVENOUS DEXKETOPROFEN TROMETAMOL ON POSTOPERATIVE ANALGESIA AND MORPHINE CONSUMPTION UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY


Background and aims: The aim of this study was to investigate the effect of intravenous dexketoprofen on postoperative pain.

Methods: Patients undergoing laparoscopic cholecystectomy participated in the prospective, randomized, double-blind study. After induction of standard general anesthesia, in the group D, patients received 50 mg dexketoprofen trometamol intravenously before 30 min the completion of surgery. Group P, patients received same volume of 0.9% NaCl. After end of surgery
5 mg morphin was given to all patients. After that, morphine was adminis-
tered by PCA (patient controlled analgesia), administering 2 mg of bolus
dose with a lockout period of 10 min and a dose limit of 30 mg every 4
hour. Pain intensity was assessed at 1, 4, 8, 12, 24 hours (using with Numerical
Rating Scale [NRS];0=no pain, 10=worst pain). Total PCA morphine con-
sumption, number of needed rescue analgesic, side effects were recorded for
up to 24 hour in groups. Statistical analyses was performed with independent
sample t and Mann-Whitney U tests, and p<0.05 was regarded as significant.

Results: Patient demographics were similar. Morphin consumptions were
higher in Group P both at PACU and ward compared with Group D (5.05 ±
1.69 and 55.30 ± 2.88 versus 2.90 ± 1.35 and 40.65 ± 3.37 respectively)
[p< 0.05]. NRS scores are shown in table.

<table>
<thead>
<tr>
<th>Group P</th>
<th>Group D</th>
<th>p</th>
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<tr>
<td>1. hour</td>
<td>1(0-2)</td>
<td>0(0-2)</td>
</tr>
<tr>
<td>4. hour</td>
<td>0</td>
<td>0(0-1)</td>
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<tr>
<td>8. hour</td>
<td>2(0-3)</td>
<td>1(0-2)</td>
</tr>
<tr>
<td>12. hour</td>
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<tr>
<td>24. hour</td>
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References
2) 185 POSTOPERATIVE PREEMPTIVE SEGMENTAL EPIDURAL ANALGESIA AND WOUND INFILTRATION FOLLOWING THE POSTERIOR FUSION SURGERY IN ADOLESCENT PATIENTS WITH SCOLIOSIS

Background and aims: Wound infiltration with local anesthetics prevents nociceptive impulses and relieves postoperative pain. The aim of this randomized, prospective, double blind study is to investigate the effect of wound infiltration and preemptive segmental epidural analgesia after posterior instrumentation or fusion surgery on postoperative pain management.

Methods: Patients diagnosed as adolescent idiopathic scoliosis were randomly allocated to Group I (n=15) “intravenous morphine PCA”, Group II (n=15) “preoperative segmental epidural analgesia+intravenous PCA”. Standard TIVA protocol was applied in all patients. The MEP moni-
torization was done. A standard epidural medication was prepared. 20 mcg/kg morphine+Levobupivacaine 0.5 % 5 ml along with 15 ml of NaCl 0.09% effective and simple method in postoperative pain management following scoliosis surgery.

Conclusion: Initiation of a local anesthetic and opioid combination through epidural catheter before scoliosis surgery provides improvement in pain and decreases IV morphine PCA consumption.

Results: Groups were comparable for demographic data. Patients in Group I (n=15) “intravenous morphine PCA”, Group II (n=15) “preoperative segmental epidural analgesia+intravenous PCA”. Standard TIVA protocol was applied in all patients. The MEP moni-
torization was done. A standard epidural medication was prepared. 20 mcg/kg morphine+Levobupivacaine 0.5 % 5 ml along with 15 ml of NaCl 0.09% was prepared and 2 ml of this solution was administered to patients in Group II for every segment to be operated before the surgical intervention. The epidural catheter was removed after the injection of the study solution. Perioperative hemodynamic and post-
operative pain data (VAS and VPRS scores), morphine consumption at the first 24 hours and morphine related side effects were noted.

Results: Groups were comparable for demographic data. Patients in Group I experienced higher postoperative hemodynamic and VAS- VPRS data at rest, movement and stepping. Morphine consumption was higher in Group I compared to Group II (p<0.05).

Conclusions: Initiation of a local anesthetic and opioid combination through epidural catheter before scoliosis surgery provides improvement in pain and decreases IV morphine PCA consumption.

References

186 INTRAPERITONEAL AND INCISIONEL LOCAL ANESTHETIC ADMINISTRATION FOR POSTOPERATIVE PAIN MANAGEMENT IN LAPAROSCOPIC SURGERY

Background and aims: This prospective randomized study was planned to investigate whether intraperitoneal and port sites administration of bupiva-

kain has beneficial effects on postoperative analgesia.

Conclusion: We concluded that administration of IV dexketoprofen tro-
metamol reduces the consumption of morphine and declines the incidence of adverse effects, therefore improving the quality of analgesia in patient un-
dergoing laparoscopic cholecystectomy.

183 CONTINUOUS LOCAL ANESTHETIC INFUSION PROVIDES EFFECTIVE ANALGESIA AFTER OPEN PROSTATECTOMY FOR BENIGN PROSTATE HYPERPLASIA (BPH)

Background and aims: Local anesthetics are increasingly and successfully administered via the wound after different types of surgery for postoperative analgesia. The aim of this study is to determine whether a subfascial contin-
uous infusion of ropivacaine in patients undergoing open prostatectomy for BPH would result in postoperative analgesia.

Methods: 50 patients undergoing open prostatectomy were enrolled into this prospective, placebo-controlled study. All patients gave written informed
consent. In all cases a spinal anesthesia was administered. An epidural catheter
was placed subfascially at the end of surgery and attached to an electronic pump
that administered either 0,2% ropivacaine (Group R n=25pts) or normal saline
(Group P, n=25pts) into the wound at a rate of 6ml/h for 48 hours postopera-
tively. VAS scores were assessed every 6h at rest and on coughing as well as the
consumption of morphine used by a patient controlled analgesic system.

Results: Pain scores were significantly lower in the Group R compared to
Group P up to 48h postoperatively. Summarized pain scores (6-48h) were
lower for all assessments: pain at rest (p=0.002); and pain on coughing
(p=0.002). The consumption of morphine was significantly less in Group R:
8±2.55mg, compared to Group P: 20±3±2.1mg (p< 0.05). There were no
problems with wound inflammation or catheter kinking in any group of patients.

Conclusions: Continuous subfascial infusion of ropivacaine result in post-
operative analgesia and reduced morphine consumption after open pros-
tectomy for BPH.
**187**

**RANDOMIZED PROSPECTIVE STUDY OF THE ANALGESIC EFFICACY AND SAFETY OF NEFOPAM AFTER CARDIAC SURGERY**

J. Sim, W. Kim, I.-K. Lee, Republic of Korea.

**Background and aims:** Nefopam is a centrally acting non-opioid analgesic agent. The effect and side effect of nefopam on postoperative pain control after cardiac surgery were compared in a prospective randomized double-blind study.

**Methods:** One hundred and forty patients were randomly assigned to fentanyl PCA group (fentanyl 1500 mcg) or fentanyl-nefopam PCA group (fentanyl 700 mcg + nefopam 140 mg) or nefopam PCA group (nefopam 300 mg). Pain scores measured on a visual analog scale (VAS) at rest and on mobilization, and patient-controlled intravenous fentanyl or nefopam consumption, were assessed at 12, 24, 48 and 72 postoperative hr. We also measured the incidence and degree of side effects, and patient satisfaction.

**Results:** The resting VAS of nefopam group (1.3–3.5) were not significantly different from fentanyl (1.1–2.7) and fentanyl-nefopam group (1.2–3.5) during 72hrs. In mobilization, the VAS of nefopam group (2.1–4.5) also were not significantly different from fentanyl (2.1–3.5) and fentanyl-nefopam group (2.4–4.8). Sedation score was higher in fentanyl group than nefopam group. Adverse effects were comparable in the three groups, except for significantly more nausea (25% vs 5%) and itching (14% vs 0%) in the fentanyl group than nefopam group. Tachycardia, sweating and dyspnea were not different in the three groups.

**Conclusions:** The analgesic effect of intravenous nefopam PCA comparable to fentanyl PCA without major side effect of opioid after cardiac surgery.

**188**

**EVALUATION OF GABAPENTIN EFFECTS AS A PROPHYLACTIC DRUG ON SEVERITY OF POST SPINAL HEADACHE**

S. Vahabi, Iran.

**Background and aims:** Post dural puncture headache is one of the adverse effects of spinal anesthesia. Gabapentin is an anticonvulsant drug that has been used as an oral non opioid analgesic in recent years. We evaluated Gabapentin effects as a prophylactic drug on severity of post spinal headache.

**Methods:** In this placebo-controlled double-blind study, 120 patients in ASA class I-II, undergoing elective urologic or lower abdominal surgery under spinal anesthesia, were randomized in two equal groups. The patients in Gabapentin group received Gabapentin 300 mg orally one hour before the surgery and then every 12 hours for the first 24 hours after the surgery while the placebo group received placebos in the same way. Severity of headache assessed by verbal rating scale for pain (VRSP), morphone consumption, nausea, vomiting, somnolence, pruritus, dizziness in the first 48 hours.

**Results:** In first 48 hours post operative the mean of severity of headache (VRSP) in Gabapentin group was 0.20 ± 0.056 and in placebo group was 0.93 ± 0.125 and mean of morphine consumption in Gabapentin group was (0.20 ± 0.030) mg, and in placebo group was (0.42 ± 0.033) mg that were statistically significant. Regarding the percentage of incidence of the adverse effects there were no differences between 2 groups.

**Conclusions:** Administration of Gabapentin decreased the severity of post spinal anesthesia headache and morphine consumption, without any significant differences in serious adverse effects.

**189**

**THE MEDIAN EFFECTIVE DOSE OF SPINAL ROPIVACAINE IN LOWER LIMB SURGERY FOR PATIENTS ABOVE 75 YEARS OF AGE**

K. Kokkinis, M. Nikakis, E. Laou, K. Theodoropoulos, I. Zogogiannis, Greece.

**Background and aims:** Intrathecal anesthesia is commonly used for lower limb surgery. Ropivacaine has been used as intrathecal drug but its dose especially in elderly patients, has not been fully determined. In this study we determined the median effective dose of ropivacaine in lower limb surgery for patients above 75 years.

**Methods:** Forty patients scheduled for lower limb surgery under combined spinal-epidural anesthesia, aged above 75 years, were prospectively studied. All patients gave written informed consent. The dose of ropivacaine varied using up-down sequential allocation technique. The dose for the first patient was 8 mg and the incrementing was set at 1 mg. A success was recorded if a bilateral T12 sensory block to cold was attained within 20 min after intrathecal injection and surgery proceeded successfully until at least 60 min after intrathecal injection without supplementary epidural injection. The ED50 was calculated using the method of Dixon and Massey.

**Results:** The ED50 was 5.9 mg (95% CI: 4.97–6.57 mg). The mean age of patients was 84.4 years (SD: 11) and the duration of successful spinal block was 70.5 min (SD: 12).

**Conclusions:** The ED50 for spinal ropivacaine in lower limb surgery of 70 min duration or less for patients above 75 years of age was 5.9 mg.

**190**

**INTRATHECAL ADMINISTRATION OF BOTULINUM NEUROTOXIN TYPE A ATTENUATES FORMALIN-INDUCED NOCICEPTIVE RESPONSES IN MICE**


**Background and aims:** Botulinum neurotoxin type A (BoNT/A) has been used as an analgesic for myofacial pain syndromes, migraine, and other types of headaches. Although an antinociceptive effect of central or peripheral administration of BoNT/A is suggested, the effect at the spinal level is still unclear. In this study, we evaluated the antinociceptive effect of intrathecally administered BoNT/A on the ICR mice during the formalin test.

**Methods:** BoNT/A (0.01 U/mouse) was injected intrathecally in ICR mice, and we observed formalin-induced inflammatory pain behaviors at days 1, 4, 7, 10, 14, 21, and 28 after the injection. We also examined the level of calcitonin gene-related peptide (CGRP), phosphorylated extracellular signal-regulated kinases (p-ERK), and phosphorylated Ca2+/calmodulin-dependent protein kinase type 2 (p-CaM-KII) using immunoblot or immunohistochemical analyses before and after BoNT/A intrathecal injection.

**Results:** Even a single intrathecal injection of BoNT/A significantly decreased the nociceptive responses in the first phase (10 and 14 days later) and in the second phase of the formalin test at 1, 4, 7, 10, and 14 days later (p < 0.05) without any locomotor changes. Interestingly, intrathecally administered BoNT/A attenuated the expression level of CGRP p-ERK, and p-CaM-KII in the 4th and 5th lumbar spinal dorsal horn at 10 days after injection in comparison with control.

**Conclusions:** We showed that intrathecally administered BoNT/A may have a central analgesic effect on inflammatory pain through the modulation of central sensitization. BoNT/A, with its long-lasting antinociceptive effect, may be a useful analgesic in inflammatory pain.

**191**

**ALTERATION OF ULTRASOUND RADIATION PARAMETERS ON SCIATIC NERVE RECOVERY**

J. Izadi Mobarakkeh, M. Mokhtari, Iran.

**Background and aims:** The initial studies have shown that low energy ultrasound incite living tissue cells to reduce regeneration or speed up their...
recovery. The purpose of this study is to examine the effects of variation of ultrasound parameters on acceleration of recovery in injured sciatic nerve.

**Methods:** 200 NMRI mice with injured left paw by crushing sciatic nerve were randomly selected; they were exposed to ultrasound radiation with various frequencies, intensities and radiation time; the animals were classified in 20 groups (19 treatment groups and 1 control group). SFI test was used to evaluate difference among groups of the functional efficiency of sciatic nerve and its recovery.

**Results:** The results of SFI test obtained the 14th day showed a significant difference among the groups (P< 0.05). On 14th day after operation the treatment group’s sciatic nerve recovered up to 90%.

**Conclusions:** It was demonstrated that altered ultrasound radiation parameters of various treatment groups reach us to a desirable point in treatment by ultrasound radiation. Based on the present results, it is possible to write a comprehensive recovery instruction to speed up sciatic nerve recovery.

**192 NATIONAL SURVEYS OF PERFORMANCE OF STERILE TECHNIQUE FOR NEURAXIAL ANALGESIA IN ISRAEL: BEFORE AND AFTER THE RELEASE OF INTERNATIONAL GUIDELINES**


**Background and aims:** We conducted a survey to assess sterile technique practices for neuraxial anesthesia in Israel before and after publication of international ASRA guidelines.

**Methods:** The sampling frame was the general anesthesia workforce in each of the four medical faculties in Israel. Representative hospitals had high volume maternity services. Data was collected anonymously over one week in each hospital; waves occurred in April 2006 and September 2009. Primary endpoint questions: handwashing, removal of wristwatch/jewelry, wearing mask, wearing hat/cap and wearing sterile gown; the answering option was: “always”, “usually”, “rarely” or “never”. Primary endpoint for analysis respondents who both wash their hands and wear a mask (“handwash-mask combo”) - “always” vs “any other response”.

**Results:** 135/160 (2006) and 127/164 (2009) anesthesiologists responded to the surveys; response rate 84% and 77% respectively. Respondents constituted 23% of the national anesthesiologist workforce. Data is presented graphically (Figure 1 and 2) for: compliance (“always”) and non-compliance (“never”). The main outcome “handwash-mask combo” increased after guideline publication (33% vs 24 vs 58% vs 21; p=0.0058). In addition, significant increases were seen for handwashing (37% ± 25 vs 63% ± 21; p=0.0028) and wearing of hat/cap (53% ± 26 vs 76% ± 14; p=0.0044).

**Conclusions:** International guidelines may have exerted a significant impact on the practice of sterile technique by anesthesiologists.

**193 ARE THE INFERIOR TIPS OF THE SCAPULAE A SURFACE LANDMARK OF T7 IN THE SITTING POSITION?**

S. Lee, S. Ok, Republic of Korea.

**Background and aims:** The appropriate placement of a thoracic epidural catheter provides adequate postoperative analgesia in chest and upper abdominal surgery. Usually, when a thoracic epidural puncture is performed, both scapular lower tips and the seventh thoracic (T7) spinous process is assumed to be at the same horizontal level. The aim of this study is to identify the relationship between the thoracic vertebrae and the scapular lower tips, in the sitting position with the neck flexed and arms crossed.

**Methods:** One hundred patients with postoperative patient controlled epidural analgesia (PCEA) using thoracic epidural catheters were enrolled. It is presumed that both scapular lower tips and the T7 spinous processes are at an equal level when performing thoracic epidural punctures. The actual insertion level of the Tuohy needle was examined by radiography when the patient was in the sitting position.

**Results:** Out of 100 patients, 62% were at the same level as the scapular lower tips and T7 spinous process. However, 1% of the patients leveled at T4, 1% at T5, 25% at T6, 18% at T8 and 1% at T9.

**Conclusions:** When performing a thoracic epidural puncture under the sitting position, the relationship of the T7 spinous process and the scapular lower tips is not always at the same horizontal level. Therefore, it is advised to utilize a C-arm guide when epidural puncture is carried out.

**194 INFLUENCE OF SPINAL ANESTHESIA ON THE LEVEL OF 8-ISOPROSTANE DURING GYNECOLOGICAL ENDOSCOPIC SURGICAL INTERVENTIONS**

A. Pyegov, S. Petrov, L. Podrez, E. Shifman, Russia.

**Background and aims:** Oxidative stress (OS) can be defined by quantitatively measurement of 8-isoprostane (8-1), the most widespread human prostaglandine F2. Study objective: To define level of 8-1 depending on analgesia during gynecological laparoscopic interventions (GLI).

**Methods:** After obtaining of the informed consent 100 patients are investigated, who underwent during GLI. Spinal anesthesia (SA) was performed in 60 patients, and 40 - general (GA) with ventilation. Each group has been divided into subgroups on an airway management: facial mask (FM), laryngeal mask (LMA), endotracheal tube (ET) and LMA. SA was performed at level L2-L3, isobaric solution Bupivacaine 0,5%-2,5 was used. Groups were comparable on age, body mass index, somatic diseases and characteristics of GLI.

**Results:** Level of 8-1 was determined in plasma before and in two hours after GLI.

**Conclusions:** The preoperative period and GLI are accompanied by increase of serum level of 8-1, which is significantly lower at SA group. Combination of SA and LMA during GLI allows to manage anesthesia with minimal level of OS.

**195 EPIDURAL ABSCESSES - A RETROSPECTIVE AUDIT OF INCIDENCE AND THE SIGNIFICANCE OF CATHETER TIP MICROBIOLOGY**

B.M. Daly, A. Baker, K. Ramage, G. Haldane.

**Background and aims:** Spontaneous epidural abscesses occur but are rare. The incidence is 1 in 47,000 to 1 in 100,000. Our aim was to get an incidence of infection related to epidural insertion and its relation to catheter tip microbiology.

**Methods:** The Acute Pain Database was searched from 1st May 2001 to 31st December 2009 for all patients who had an epidural for surgery. The total number of positive catheter tip cultures and infections were recorded.

**Results:** 1510 epidurals were sited, with 80 positive tip cultures and 4 infections. Incidence of tip colonisation was 5.3% and infection 0.264%. Of the total colonised, 55 were coagulase negative staphylococci. There were no epidural space infections. There were 4 cases which developed localised infections, these responded to organism directed antibiotic therapy. There were no neurological sequelae. See Table 1.

**TABLE 1.**

<table>
<thead>
<tr>
<th>Group</th>
<th>SA (n=60)</th>
<th>GA (n=60)</th>
<th>Group</th>
<th>GA with ventilation (n=60)</th>
<th>Group</th>
<th>SA with ventilation (n=60)</th>
<th>Control group (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subgroup I1</td>
<td>FM (n=21)</td>
<td></td>
<td>Subgroup I2</td>
<td>LMA (n=20)</td>
<td>Subgroup II1</td>
<td>ET (n=22)</td>
<td>Subgroup II2</td>
</tr>
<tr>
<td>Before intervention</td>
<td>63,12±1,93</td>
<td>68,48±3,67</td>
<td>61,63±1,98</td>
<td>68,74±3,78</td>
<td>19,58±1,04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 hrs after surgical intervention</td>
<td>115,16±5,36</td>
<td>101,83±6,39</td>
<td>104,47±7,37</td>
<td>122,12±7,86</td>
<td>158,31±6,02</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

The note: * at p<0.05 in comparison with the initial data. 1 at p<0.05 - with Subgroup I2, 2 at p<0.05 - with Subgroup I2.
Conclusions: We argue that contrary to other studies, we have found it useful to send all tips for culture. At £15 per patient, this is still cost effective. If there are signs of early or late infection, organism directed therapy can be instituted immediately which can ultimately affect outcome. This case series confirms that the incidence of epidural abscess is rare.

References:

196 THE EFFECT OF REGIONAL ANAESTHESIA ON COAGULATION AND FIBRINOlysYS AFTER MAJOR ABDOMINAL SURGERY
P.A. Lyuboshevsky, A.M. Ovechkin, A.V. Zabusov, Russia.
Background and aims: Major surgery causes the expressed changes in coagulation/fibrinolysis system, which can lead to thromboembolic complications or perioperative bleeding. We have estimated the influence of regional anasthesia (spinal and continuous epidural) on haemostatic system and frequency of thromboembolic complications and requirement for a transfusion in major lower-abdominal surgery.

Methods: 120 patients were randomized to receive either i.v. anaesthesia (group G, n = 40) or general anaesthesia with continuous epidural anaesthesia (group GE, n = 40) or with single-shot spinal anaesthesia (group GS, n = 40).

Results: In the postoperative period in patients of group G marked hypercoagulation and degree of the ADP-induced platelets aggregation with acceleration of fibrinolysis was noted. Postoperative changes of hemostasis in groups GE and GS or by the epidural infusion of 0.2% ropivacaine + fentanyl 2 µg ml⁻¹, also with NSAIDs in group GE. Coagulation status was monitored using coagulography and agregatography. Doppler ultrasoundography was also performed.

Methods: Postoperative changes of hemostasis induced by abdominal surgery are characterized by hypercoagulation with simultaneous acceleration of fibrinolysis. Regional anesthesia (both spinal, and continuous epidural) effectively limits these changes that can cause decrease in frequency of thrombosis and requirement for a transfusion.

Results: Both anesthetic techniques have provided to operated side an average sensory level at T10 and a similar motor block (Bromage ≥ 3).

The incidence of hypotension was 38.66% for group1 vs 17.56% for the group2. consumption of ephedrine was 8mg group1 vs 4mg group 2.

Conclusions: The hypobaric spinal anesthesia is a simple technique that provides satisfactory conditions for surgery with less hemodynamic compromise compared to the ischemic spinal anesthesia.

198 THE EFFICACY OF IONTOPHORESIS USING THE BIPOLAR SQUARE WAVE WITH DUTY CYCLE
R. Wakita, A. Nakajima, H. Haida, H. Fukayama Japan.
Background and aims: We revealed that the efficacy of lidocaine iontophoresis using bipolar square wave with duty cycle (AC-IOP) depended on its duty cycle and correlated with the mean average voltage in vitro study. The aim of this study was to investigate the permeation efficacy and adverse effect on dermis using either the direct current (DC-IOP) or AC-IOP.

Methods: The iontophoretic device having 2 electrodes containing lidocaine and saline was attached unilateral dorsal region of the male hairless rats. Either AC-IOP or DC-IOP groups was applied each IOP for 120 minutes, respectively. The passive absorption group was standing without IOP for 120 minutes. Dermal delivery of lidocaine was estimated by microdialysis for each 20 minutes. Skin injury of the rats and their probe depths were assessed by H-E stain.

Results: The lidocaine using AC-IOP increased intradermal absorption approximately 6 times compared with DC-IOP. The passive and DC-IOP did not increase its intradermal permeation. Histological examination demonstrated the most inflammatory responses by DC-IOP, less by AC-IOP and least by the passive absorption in subcutaneous tissue.

Conclusions: These results show lidocaine transport with AC-IOP in vivo was more efficient than DC-IOP and suggest the average voltage is not the major component that regulates its efficiency. Influences on the dermis support that AC-IOP was the most useful technique for lidocaine permeation.

199 CONSENT FOR REGIONAL ANAESTHESIA IN A UK SAMPLE POPULATION - TOO MUCH (OR LITTLE) INFORMATION?
Introduction: Interestingly, no anaesthetists in our department discuss the rarer, serious complications of RA, though neither do many of our colleagues in North America. We wanted to investigate our patients’ viewpoint of consent.

Methods: Local REB approval was waived for this retrospective survey. 48 hours after their procedure, we asked patients the seven questions outlined below.

Results: (n=67)
1) How satisfied (0-10) are you that you were fully informed about the involved risks?
2) If a defined risk of this procedure was painless, transient and could be treated would you want to be informed about it if it occurred.
3) Do you feel that you ought to be told about risks of long term nerve damage if that risk was approximately 1 in 2500?
4) Would this knowledge have made you question or refuse a regional technique?

Discussion: Interestingly, having initially been generally satisfied (8.2, 6.7-9.7) about the consent procedure, most patients would have wanted to know of the serious risks, and doubted whether they might have consented had they known these. Most also wanted to be informed about the lesser complications. Clearly other factors are involved here, e.g. our specific, well read patient population and an individual’s ability to quantify a risk, as well as balance it against the benefits of excellent analgesia.

1. RAPM 32(1) Jan/Feb 2007
2. RAPM 34(6) Nov/Dec 2009
200

TITLE: ASEPSIS DURING ULTRASOUND GUIDED SINGLE SHOT PERIPHERAL REGIONAL ANAESTHESIA

A. Kulkarni, H. Singh

Background and aims: Ultrasound guided single shot peripheral regional anaesthesia continues to be used with greater frequency at our University Hospital Trust. Guidelines on asepsis vary within various Regional Anaesthesia societies. We surveyed the current practice of asepsis followed by anaesthetists in our department with the aim to set up departmental guidelines for asepsis during single shot regional anaesthesia.

Method: Registered with Clinical Governance. A three part questionnaire was set up and anaesthetists were asked what measures they utilised for asepsis. First part of the questionnaire dealt with patient related factors (aseptic solution used and use of patient drape), second was equipment related (use of ultrasound probe cover) and the last was operator related (use of gloves, mask, hat, gown). Other factors that anaesthetists thought important for asepsis on patients at high risk for contracting infection were also solicited.

Results: Fifty two responses were obtained. Chlorhexidine 2% on patient was used by 100% anaesthetists, while 25% anaesthetists used patient drape. Ultrasound was used by 71% respondents and almost all except one used probe cover. Operator results: use of sterile gloves- 98%, hands washed- 88%, hats-92%, mask-13%, gown-7%.

Conclusions: The incidence of infectious complications after regional anaesthesia remains low. However, it is vital to have a high safety profile for ultrasound guided regional blockade, especially as its usage is getting more popular. We found a wide variation in practice for asepsis within our department. This study was carried out so that guidelines can be made to achieve a standardised practice for asepsis during regional blockade.

201

INTER-OBSERVER VARIATION IN INTERPRETATION OF SUPRACLAVICULAR BRACHIAL PLEXUS ULTRASOUND IMAGING

A. Kant1,2, L. Adams, A. Vats1,2, T. Lawton, P. Gupta1,2, P. Hopkins1,2

Background and aims: Ultrasound guided supraclavicular blocks have become popular amongst all grades of anaesthetists. We wish to evaluate the variance amongst anaesthetists in the interpretation of a series of supraclavicular ultrasound images with regards to what actually constitutes the brachial plexus.

Methods: A consultant anaesthetist experienced in over 200 supraclavicular blocks recorded ultrasound scans from 20 healthy NHS staff volunteers. From these images, this anaesthetist along with three trainees independently measured what they thought was the cross-sectional area (CSA) of the plexus (using imageJ version 1.43u). As a control, CSAs of the subclavian artery were also measured.

Results: The mean plexus CSA was 0.79 cm² and the intraclass correlation coefficient (ICC) between the four anaesthetists was 0.18. The two most experienced anaesthetists correlated best (ICC 0.55) and the two least experienced the worst (ICC 0.04). The mean artery CSA was 0.35 cm² (ICC 0.83). Our estimate of the standard deviation of plexus CSA measurement on the same ultrasound image by two different anaesthetists is 0.35cm² (95% CI 0.19-0.73cm²).

Conclusions: When inspecting a still ultrasound image, there appears to be variability in what anaesthetists interpret as the boundaries of the brachial plexus but not so with the subclavian artery. This has implications as to where anaesthetists tend to deposit local anaesthetic. Further analysis may reveal whether error occurs from image capture and also from repeat measurement by the same anaesthetist.

202

PAIN AND OPIOID CONSUMPTION FOLLOWING ULTRASOUND-GUIDED ILIOINGUINAL/ILIOHYPOGASTRIC NERVE BLOCK FOR OPEN INQUINAL HERNIA REPAIR IN ADULTS

F. Barentzen, K. Jensen, C. Maschmann, B. Bellage, J. Borglum Denmark.

Conclusions: When inspecting a still ultrasound image, there appears to be variability in what anaesthetists interpret as the boundaries of the brachial plexus but not so with the subclavian artery. This has implications as to where anaesthetists tend to deposit local anaesthetic. Further analysis may reveal whether error occurs from image capture and also from repeat measurement by the same anaesthetist.
Background: An ultrasound-guided nerve block (USGNB) of the ilioinguinal/iliohypogastric nerves has in children been proved to be more successful than the landmark technique for postoperative pain management. Very little is known about its efficacy in adults.

Methods: A double-blinded RCT comparing two groups of adult male patients having USGNB with 20 ml bupivacaine 0.5% or 20 ml saline prior to Lichtenstein operations. All blocks were administered following induction of intravenous anaesthesia. Pain, opioids consumed, physical ability and perceived ill health were evaluated postoperatively.

Results: In the PACU, pain at rest and during mobilization was significantly reduced (p< 0.001). A significant reduction in the consumption of opioids was also observed in the PACU and at the ward (p< 0.04). Length of stay in PACU and street readiness were similar in both groups. Regrettably, at 24 and 48 hours after surgery, the effect of the USGNB did not impact the physical ability and perceived ill health status.

Conclusion: USG nerve block prior to Lichtenstein operation in adults significantly reduced postoperative pain at rest and during mobilization, opioid consumption in the PACU and at the ward, but did not improve PACU length of stay, or physical ability and perceived ill health at home.

204 THE PATIENT'S PERSPECTIVE: ARE ULTRASOUND-GUIDED NERVE BLOCK PROCEDURES COMFORTABLE?
M. Walsted, B. Worm, J. Borghum, K. Jensen, Denmark.
Background and aims: Studies agree that patients are positive, curious or indifferent to regional anaesthesia. Further, most patients having had regional anaesthesia are willing to undergo the same type of anaesthesia again. However, there is a general perception that certain block procedures are not welcomed by patients. Such procedures include those close to the face, technically difficult or lengthy procedures, and patients not having any adjuvant sedatives at all.

Methods: A prospective cohort of 742 patients undergoing preoperative nerve blocks were asked about their experience with the block procedure. Replies were related to their sedative requirements, technical difficulties, location and duration of the procedure.

Results: 307 upper extremity blocks and 435 lower extremity blocks were included. Table 1 displays our main results. 2/3 of patients did not ask for any sedatives. 71% had a positive overall experience.

<table>
<thead>
<tr>
<th>Clinical scenario</th>
<th>Pleasant</th>
<th>Acceptable</th>
<th>Tolerable</th>
<th>Unpleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awake/sedated (upper extremity)</td>
<td>10%</td>
<td>59%</td>
<td>36%</td>
<td>15%</td>
</tr>
<tr>
<td>Easy/difficult procedure (upper extremity)</td>
<td>10%</td>
<td>9%</td>
<td>62%</td>
<td>56%</td>
</tr>
<tr>
<td>Duration of procedure &lt;=5 mins/5 mins</td>
<td>11%</td>
<td>7%</td>
<td>61%</td>
<td>58%</td>
</tr>
<tr>
<td>Awake/sedated (lower extremity)</td>
<td>12%</td>
<td>15%</td>
<td>60%</td>
<td>47%</td>
</tr>
<tr>
<td>easy/difficult procedure (lower extremity)</td>
<td>14%</td>
<td>12%</td>
<td>59%</td>
<td>49%</td>
</tr>
<tr>
<td>Duration of procedure &lt;=5 mins/5 mins</td>
<td>10%</td>
<td>21%</td>
<td>55%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Conclusions: Patients experience of their block procedure is largely unaffected by proximity to the patient’s face, sedative requirements, procedure difficulty or duration of the procedure. The design of the study limits further conclusions about sedative requirements of anxious patients, but our results suggest that simple communication without sedatives during an ultrasound-guided nerve block procedure is perfectly adequate for most.

References:
adjoining structures. For mnemonic purposes, the proposed terms were derived from French parlance.

**Results:** Table 1 presents the classification. We find it has three advantages: 1) enhanced visualization of the nerve, 2) documentation of injectate deposition, 3) easily remembered descriptive terms.

<table>
<thead>
<tr>
<th>Descriptive term</th>
<th>Geometric shape</th>
<th>Nerve block examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doughnut</td>
<td>Circular</td>
<td>Intercostal or popliteal (by short axis)</td>
</tr>
<tr>
<td>Croissant</td>
<td>Crescent</td>
<td>Infraclavicular (by short axis)</td>
</tr>
<tr>
<td>Pretzel</td>
<td>Double circular</td>
<td>Popliteal at division of peroneal and tibial (by short axis)</td>
</tr>
<tr>
<td>Sandwich</td>
<td>Twin parallel</td>
<td>Femoral (by short axis); any by long axis</td>
</tr>
<tr>
<td>Pancake</td>
<td>Flat, oval, single parallel</td>
<td>Saphenous, TAP; IH/II, interscalene (by short axis); any by long axis</td>
</tr>
<tr>
<td>Syrup</td>
<td>Indeterminate</td>
<td>Adductor canal, deep cervical, psoas compartment, high volume femoral, paravertebral, supracaudal, axillary (by short axis)</td>
</tr>
</tbody>
</table>

**Conclusions:** Descriptive terms are important for shape recognition and documentation. Since ultrasound-guided nerve blocks rely on pattern recognition and close proximity to neural or surrounding structures, a classification of injectate spread may be helpful. The validity of the classification and its clinical value will be defined in future studies.

**References**

**206 ULTRASONOGRAPHIC DETAILS OF NEURAL STRUCTURES. THE VIENNA SCALE REVISITED**

**Background and aims:** Ultrasonographic visualization of peripheral nerves requires knowledge of their echogenicity. In general terms, echogenicity varies according to size and location of the nerve (Table 1). A scale for ultrasonographic identification of nerves has previously been proposed. We wanted to assess the variations in the visual appearance of these nerves and the clinical applicability of the proposed scale.

**Methods:** A prospective cohort study in 635 patients. Ultrasonographic appearance of the nerves was graded using a high frequency linear probe and short-axis view.

**Results:** Table 1 summarizes our findings. For both hyperechoic (femoral, sciatic, popliteal, infracaudal) and hypoechoic (intercostal) nerves, practitioners found it difficult to distinguish between “internal structure” and “surrounding halo.” For isoechoic (LCFN, obturator, saphenous) nerves, many were in fact directly visible. Practically no nerves were characterized as “isoechoic,” suggesting that practitioners were unable to distinguish between identification by “tissue reflection” and “isoechoic behavior.”

**Conclusions:** The Vienna scale has limited clinical application for large peripheral nerves. Practitioners find it difficult to distinguish between its elements, one of which may in fact be redundant. Variations in appearance may reflect stochastic rather than ultrasonographic variations. Small nerves, however, are sometimes quite visible.

**Reference:**

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**207 THE USE OF PERIPHERAL NERVE BLOCKS (PNBS) IN DENMARK A NATIONWIDE QUESTIONNAIRE STUDY**
K. Jensen, I. Henriksen, J. Borghum, Denmark.

**Background and aims:** Labat published his groundbreaking textbook on regional anesthesia in 1922, and in 1994, Kapral published the first clinical use of ultrasound-guidance. Although it is agreed that the use of PNBS has been increasing since then, little is actually known about the extent of use on a wider scale. We wanted to investigate the variability of PNBS use in Denmark and the potential reasons for differences between hospitals.

**Methods:** A nationwide questionnaire sent to 45 anaesthesia units at public hospitals in Denmark (population: 5 million). Questions included extent of PNBS use, technique, training, advanced use, promoting or limiting factors, and active research into regional anesthesia.

**Results:** Response rate was 93%. 14% were extensive PNBS users, while most others had infrequent use of PNBS (Table 1). Most respondents were open and claimed that patient concerns promoted the use of PNBS, but they were unable to meet these needs for economic or organizational reasons.

**Conclusions:** Major geographic differences in PNBS use still prevail. The development of regional anesthesia in Denmark has been the result of work of single individuals. Dedicated prime movers, deliberate organizational changes and bold economic priorities are necessary for a broad scale increase in regional anesthesia use. These premises are not yet consistently present at Danish anesthesia departments.

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**208 THE REQUIRED CURRENT INTENSITY FOR MUSCLE TWITCHES DURING INTRA- AND EPINEURAL NEEDLE LOCATION IN A PORCINE MODEL OF REGIONAL ANESTHESIA**
T. Wiesmann, A. Bornträger, T. Vassiliou, A. Gockel, H. Wulf, T. Steinfeldt, Germany.

**Background and aims:** Many anesthesiologists assume that intraneuronal nerve stimulation might be feasible with lower currents compared to epineurial needle position.

**Methods:** 6 pigs were narcotized. Both axillary regions and sciatic nerves were exposed surgically. Randomly, an insulated needle (StimuplexA, 22G) was placed onto the epineurium or 5mm intraneurally. Investigator B variantly tuned in different
209 THE EFFECT OF LOCAL ANAESTHETIC CONCENTRATION ON MOBILISATION AFTER TOTAL KNEE ARTHROPLASTY
B.-P. Tieu, N. Davis, J. Lee. Australia
Background and aims: The most efficacious ropivacaine concentration for single shot femoral nerve block (FNB) for post-operative analgesia to aid physiotherapy after total knee arthroplasty (TKA) is unknown. We performed a 12 month retrospective clinical audit assessing the effect of varying concentrations of ropivacaine (0.2%, 0.375%, 0.5%, 0.75%) with a standard volume of 20ml, on patients’ ability to perform physiotherapy on day 1. Secondary outcomes included post-operative pain scores, opioid consumption and antiemetic use.
Methods: 29 patients undergoing primary TKA having FNB were identified. We excluded other potential confounding factors such as intrathecal morphine and the use of additional nerve blocks for post-operative analgesia.
Results: Patients who received 0.2% ropivacaine were more able to perform physiotherapy on day 1, but also had the highest opioid consumption and antiemetic use. Of the patients who were unable to perform physiotherapy on day 1, severe pain was identified as the primary cause in all patients who received 0.2% ropivacaine, whereas motor weakness was the cause in 60% of the 0.75% ropivacaine group. There was no difference in pain scores between the varying concentrations of ropivacaine.
Conclusions: Mobilisation after TKA with FNB is dependent on multiple factors including post-operative pain and residual motor blockade. 0.2% ropivacaine may provide an optimal balance of analgesia with minimal motor blockade to encourage early mobilisation after TKA, however this requires further study.

210 CRITICAL INCIDENTS FOLLOWING ULTRASOUND GUIDED BRACHIAL PlexUS BLOCK - A SURVEY FROM THE NORTH WEST DEANERY, UK
K. Bhaitia, J. Corcoran

Background and aims: Critical Incidents following US guided brachial plexus blocks (USGBPBP) have infrequently been reported in the anaesthetic literature. We like to present findings of our survey which looked into the occurrence of critical incidents in the North West deanery, UK following US guided blocks.

Methods: A web based questionnaire was distributed to all the regional anaesthetic leads to 17 hospitals across the North West deanery using the link from Survey Monkey in November 2010. Questions included the type of hospital practising USGBPBP, average number of BPB performed per year and any critical incidents (except nerve injury) reported since the introduction of US.

Results: Of the 17 hospitals, four did not have the ultrasound machines and were excluded from our survey. Pneumothorax, wrong sided blocks, intra-vascular injections of local anaesthetic(LA) agent including two cardiac arrest, respiratory failure requiring ventilation and convulsions following TAP block were reported by 12 out of 13 hospitals. 90% of the regional anaesthetic leads felt that complications of USGBPBP are underreported in anaesthetic journals.

Conclusions: This survey highlights that complications following USGBPB are not uncommon.

Following recommendations have been suggested to decrease the complications:
1) Marking the site of the block and a “Time out” before blocks could prevent wrong sided blocks.
2) Correct and accurate visualisation of entire needle and its tip, while performing USGBPBP could minimise the risk of pneumothorax.
3) Slow and fractional injection of LA could detect accidental intravascular injection of LA and possibly prevent cardiovascular collapse.
4) Appropriate supervision is mandatory especially for those who are on the learning curve of USGBRA.

References:
anaesthetic charts met all the standards. Inconsistency in documentation by the same anaesthetist was also noted.

Conclusions: Our study suggests that PNB documentation does not meet the recommended standard. It is important that accurate and consistent documentation is made to comply with good medical practice and to meet the medicolegal requirements.

References:

213 COMPARISON OF THE PARASACRAL AND THE POSTERIOR WINNIE APPROACHES TO THE SCIATIC NERVE BLOCK COMBINED WITH THE PSOAS COMPARTMENT BLOCK IN KNEE ARTHROSCOPY

T. Tezer, I. Gungor, A. Babacan, Turkey.

Background and aims: We aimed to compare parasacral and posterior Winnie approaches to the sciatic nerve which were combined with psosas compartment block(PCB) in terms of clinical effectiveness and effects on both the posterior cutaneous femoris(PCF) and obturator nerves.

Methods: Fifty patients undergoing elective knee arthroscopy were randomised to receive either a combined PCB and sciatic nerve block (SNB) with Winnie approach (Group I; n=25) or a combined PCB and SNB with parasacral approach (Group II; n=25). Groups were evaluated and compared for the block performance parameters (time to first motor response, block procedure time, number of attempts to elicit the nerve), number of patients in whom complete sensory and motor blockade developed, time to sensory and motor blockade onset, number of patients who received general anaesthesia, success rates of complete obturator and PCF nerve blocks and finally the effect of Body Mass Index (BMI) on the block procedure parameters.

Results: Two groups revealed no significant differences with regards to the above mentioned comparison parameters. Focusing on the rates of the complete blockade of the obturator (%68 vs %72) and PCF (%84 vs %96) nerves, parasacral approach did not reveal a statistical significance over Winnie approach. While a positive correlation was observed between the BMI and the number of attempts to elicit the nerve, block procedure time and time to first motor response for the PCB, no relationship has been observed between the BMI and both of the SNB approaches.

Conclusions: No significance was observed between both groups in terms of the block performance, complete PCF nerve blockade and complete blockade of the obturator nerve which is infact a target of PCB.

214 INFECTION CONTROL DURING ULTRASOUND GUIDED PERIPHERAL NERVE BLOCKS DO WE TAKE IT SERIOUSLY? A SURVEY FROM THE NORTH WEST DEANERY, UK

K. Bhata, H. Mechie, E. Selvarasaan.

Background and aims: Infection after single shot peripheral nerve block (PNB) is rare, whereas 0-3% of peripheral nerve catheters (PNC) result in localized infection. Ultrasound guided regional anaesthesia (USGRA) theoretically increases risk of infection due to probe colonisation. The AAGBI guidelines states that minimum standard for asepsis during single shot PNB is hand cleansing, sterile gloves, drapes and cleansing solution for skin. In addition ASRA recommends masks, gowns, jewellery removal and appropriate dressing at the catheter site while inserting PNC. Our aim was to look at infection control practice (ICP) during USGRA for single shot PNB and PNC in the North West, UK.

Methods: We surveyed 45 anaesthetists with special interest in USGRA looking at their ICP using a questionnaire.

Results: The findings are summarised in the table given below:

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Compliance while performing single shot USGPNB 45 anaesthetists surveyed</th>
<th>Compliance while performing USGPN Catheter 11/45 inserted peripheral nerve catheters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand washing before procedure</td>
<td>97%</td>
<td>100%</td>
</tr>
<tr>
<td>Skin cleaned with Chlorhexidine / betadine before procedure</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Theatre Cap, Sterile gloves, Drapes during the procedure</td>
<td>33%</td>
<td>100%</td>
</tr>
<tr>
<td>Face Mask</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>Sterile Gown</td>
<td>13%</td>
<td>100%</td>
</tr>
<tr>
<td>US probe protection</td>
<td>83% Tegaderm over probe</td>
<td>90% Sterile sheath over the probe</td>
</tr>
<tr>
<td>Sterile US gel used</td>
<td>77%</td>
<td>100%</td>
</tr>
<tr>
<td>US probe cleaned before and after the procedure</td>
<td>77%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Conclusions: Our survey shows great variability in ICP with poor compliance as per the standards. A greater awareness amongst anaesthetists, education and a globally recognised evidence based infection control policy is paramount for safe use of USGRA.

References:
2) AAGBI. Infection Control in Anaesthesia 2008
propose an appropriate needle insertion technique correlated with nerve stimulation (NS).

**Methods:** After ethical committee approval and informed consent, 100 patients undergoing hip and knee trauma surgery had a FN analgesic blockade. A 4 cm-wide linear ultrasound probe (Logiq g, GE Healthcare) was positioned at the inguinal region and manipulated caudally to allow optimal visualization of FN, FA, FI and GIPM. A 22 gauge insulated 50 mm, short-beveled (Stimuplex A, B Braun), connected to a nerve stimulator (H12, B Braun) needle, was inserted in plane and advanced lateral-to-medial to contact the lateral part of the GIPM, where FN was identified by NS, followed by a test injection, before blockade.

**Results:** FN and GIPM were clearly visualized in 68 and 85 % of cases respectively above the FA division. Elicited contraction of the quadriceps muscle was observed in all cases. No pain was observed at the position changes.

**Conclusions:** We suggest that lateral part of the GIPM contains the nerves of the quadriceps muscle and is a reliable target because of the lesser anisotropic effect of ultrasound on the iliac and psoas muscles than on the FN [1].


**216**

**HAEATOMA RELATED NERVE INJURY IN REGIONAL ANESTHESIA**

T. Werner1,2, D. Eismann1,2,3, A. Gockel, T. Steinfeldt, Regional Anaesthesia Research Group Marburg, Germany, Switzerland.

**Background and aims:** The occurrence of perineural haematomas is a common complication in the application of regional anesthesia techniques. Besides the direct needle-nerve-trauma the presence of haematomas might be another important factor of nerve injury in scope of regional anesthesia. Aim of this study was to determine the traumatic potential of perineural haematomas stated at a histological trauma score.

**Methods:** In 20 anesthetized pigs the sciatic nerves were bilaterally located via nerve stimulation with a general used current of 0.2 to 0.5 mA. After achieving the final needle position on one side a perineural haematoma was simulated by injecting a 50 ml bloodpatch whereas the other side was stimulated only. After 48 hours, the nerves were resected during anesthesia. The grade of nerve injury was rated ranging from 0 (no signs of injury) to 4 (severe injury).

**Results:** 40 nerves were examined. The applied trauma score was significantly lower in stimulation only group (0.5; 0/1) (median; 25th percentile/75th percentile) compared to the haematoma group (2.0; 2/2) (P < 0.01).

**Conclusions:** Not only a direct needle-nerve-trauma but also a haematoma can be responsible for a nerve injury related to regional anesthesia. The exact pathomechanism in terms of traction, compression, induction of an aseptic inflammation or as a combination of these factors should be purpose of futher investigations.

**217**

**SERVICE EVALUATION AUDIT OF ANALGESIA AFTER DAY CASE LAPAROSCOPIC CHOLECYSTECTOMY**


**Background and aims:** Laparoscopic cholecystectomy is increasingly being performed as a day case procedure. The anaesthetic aim is to achieve rapid recovery by using multimodal analgesia, thereby minimizing the opioid use and reduction of post-operative nausea & vomiting (PONV). Anaesthetic techniques vary and there is no optimal technique. In our centre we practice Interpleural block (IPB) in addition to standard local anaesthetic infiltration with an aim to reduce opioid usage. IPB is safe and has very low complication rates in expert hands. We audited our performance to establish any difference between the standard method and addition of IPB.

**Methods:** Local audit committee approval obtained. Prospective audit, data collected on 50 consecutive patients undergoing daycase laparoscopic cholecystectomy.

**Results:** The demographic data in both the groups were comparable. All patients in either group received either Fentanyl or Remifentanil, IV paracetamol & IV NSAID as standard, unless contraindicated. The IPB was done immediately after anaesthetic induction. The volume of IPB varied between 20–40mls; 88% used 0.25% bupivacaine. A long acting opioid (IV morphine/Oxycodone) was administered intraoperatively at the discretion of the anaesthetist depending on the response to surgery. No complications occurred as a result of IPB.

**218**

**PARAVERTEBRAL BLOCK FOR MASTECTOMY: REDUCING THE DURATION OF HOSPITAL ADMISSION**

C.A. Goddard, L. Sulaiman.

**Background and aims:** We evaluated analgesia and length of stay in patients receiving paravertebral blockade (PVB) for mastectomy. PVB reduces pain scores after breast surgery compared to usual treatment. Effects on admission duration are unknown.

**Methods:** We prospectively audited 18 patients having mastectomy under general anaesthesia and PVB, compared with historical controls. Blockade was established with 7mls 0.5% Bupivicaine at T2, T4 and T61, post-induction. Fentanyl was administered during induction and morphine given as indicated. Data collected included: morphine given in theatre, recovery and postoperatively, pain (0-10) and nausea scores (0-4) at intervals for 48 hours.

**Results:** Morphine consumption was reduced in the PVB group in theatres (3.4 vs 8.3mg, P < 0.05) and on the ward (0.0 vs 5.3mg, P < 0.05). PONV were reduced in the PVB group (0.9 vs 3.3 at 1hr, 0.5 vs 1.9 at 4 hrs and 0.1 vs 1.2 at 12 hrs P < 0.05). Nausea scores were equivalent. More patients receiving PVB were discharged within 48 hours compared to controls (14 vs 9, P = 0.05).

**Conclusions:** PVB offers better analgesia with less morphine after mastectomy than balanced analgesia alone. The duration of single-shot PVB seems well-suited to the natural decay profile of post mastectomy pain. Hospital stay was reduced in the PVB group.

**Reference:**


**219**

**ANALGESIC EFFICACY OF BILATERAL CERVICAL PLEXUS BLOCK FOR THYROID SURGERY: A META-ANALYSIS**

N. Sahgal, R. Khiwadkar, A. Banerjee, F. Wright, J.M. Hunter.

**Background and aims:** Thyroidectomy is a common inpatient procedure resulting in postoperative pain. Bilateral Superficial Cervical Plexus Block (BSCPB) versus saline control has been used in several randomised controlled trials (RCTs) with conflicting results regarding its analgesic efficacy. We performed a meta-analysis to assess this.

**Methods:** We searched PubMed, EMBASE, and published abstracts. The primary outcome variable was incidence of postoperative rescue analgesia use. Time to first analgesic requirement and incidence of postoperative nausea and vomiting (PONV) were the secondary outcomes. The Jadad scores were 1-5 for the 8 RCTs retrieved. Dichotomous data was summarised using odds ratio (OR) and Mantel-Haenszel (M-H); continuous data with standardised mean difference (SMD) and inverse variance (IV) with random effects and 95% confidence intervals (CI). All analyses were performed using Review Manager version 5.1.
Results:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>RCTs/ Participants</th>
<th>(M-H, Random [95% CI])</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postoperative rescue analgesia</td>
<td>7/766</td>
<td>0.38 [0.21, 0.69]</td>
<td>0.002</td>
</tr>
<tr>
<td>PONV</td>
<td>6/537</td>
<td>0.68 [0.41, 1.12]</td>
<td>0.13</td>
</tr>
</tbody>
</table>

[Dicotomous data results]

<table>
<thead>
<tr>
<th>Outcome</th>
<th>RCTs/ Participants</th>
<th>SMD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to first analgesia requirement</td>
<td>3/703</td>
<td>0.96 [0.55, 1.36]</td>
<td>0.002</td>
</tr>
</tbody>
</table>

[Continuous data results]

Forest plots are shown in figures 1 and 2.

**FIGURE 1.** Forest plot: postoperative rescue analgesia

**FIGURE 2.** Forest plot: time to first analgesia

**Conclusions:** BSCPB significantly reduces postoperative rescue analgesia use and increases the time to the first dose of it. It has no effects on the incidence of PONV.

**Background and aims:** In this randomized study, we compared intrathecal (i.t.) Morphine for postoperative analgesia after retropubic radical prostatectomy.

**Methods:** 56 patients undergoing retropubic radical prostatectomy were included in this study. Patients were randomly divided into two groups. Group Morphine received i.t. Morphine (200 mcg/r) before the induction of general anesthesia. Group Control did not receive i.t. morphine. All the patients underwent the same general anesthesia technique. Postoperative analgesia was provided with Tramadol PCA. Patients were assessed at 0 min, 15 min, 30 min, 45 min, 60 min, 2, 4, 6, 12, 24 h after operation with verbal analogue pain scores (VAS). Vital parameters, Tramadol consumption, adverse effects (pruritus, postoperative nausea and vomiting, respiratory depression), and rescue analgesia were recorded.

**Results:** Groups were comparable with respect to demographic data. VAS scores were significantly lower in i.t. Morphine group than the control group at all times (p < 0.05). Tramadol consumption and the incidence of postoperative nausea were lower in i.t. Morphine than the control group (p < 0.05). Only three patients recorded mild pruritis in the i.t. Morphine group. Patient satisfaction was higher in the i.t. Morphine group (p < 0.05).

**Conclusions:** It Morphine provided a significant reduction in postoperative pain scores, tramadol consumption, rescue analgesia, and postoperative nausea after retropubic radical prostatectomy without serious adverse effects. It also provided a high patient satisfaction.

**221**

**COMPARISON OF EFFICIENCY OF ANALGESIA IN PCEA, PCA AND 5% LIDOCAINE PATCH IN LAPAROSCOPIC COLORECTAL SURGERY**

A. Spindler Vesel, K. Rezonja, A. Repar, N. Pozar Lukancovic, Slovenia.

**Background and aims:** Postoperative pain after laparoscopic colorectal surgery could be relieved by thoracic epidural analgesia (TEA). Since the laparoscopic procedure is less invasive, less invasive pain relieve technique could be used, such as intravenous opioids. Total amount of opioids could be reduced by lidocaine patch, located at the wound site. The aim of this study was to evaluate and compare the efficiency of postoperative pain relief with TEA, the infusion of piritramide (patient controlled analgesia, PCA) alone or combined with 5% lidocaine patch at the wound site.

**Methods:** In this prospective study 39 patients, older than 18 years, ASA (American Society of Anesthesiologists, ASA) I-III, scheduled for elective colorectal surgery, were included. Patients were randomly divided into three groups. In group 1 13 patients received patient controlled epidural analgesia (PCEA). In group 2 13 patients with continuous infusion of piritramide (PCA) were included. In group 3 13 patients had PCA and also 5% lidocaine patch at the wound site. Postoperative analgesia was recorded every 6 hours, measuring visual analogue scale (VAS). The amount of piritramide used was measured in the recovery room and on intensive care ward on the day of the operation and in next two postoperative days.

**Results:** In the studied period we found no statistically significant differences in demographic data and in VAS between groups. First day after the surgery patients in group 3 needed less piritramide as patients in group 2 (p = 0.05).

**Conclusions:** 5% lidocaine patch at the wound site reduces piritramide consumption for postoperative pain relief in laparoscopic colorectal surgery and decreases risk for complications associated with strong opioids.

**222**

**DOES PARAVERTEBRAL BLOCK PLAY A ROLE IN PREVENTING CHRONIC POSTOPERATIVE PAIN AFTER BREAST SURGERY**

E. Sturini Saporito, A. Saporito, L. Anselmi, R. Tomasetti, Switzerland.

**Background and aims:** Post-operative pain after breast surgery is often prolonged and some studies have shown its association to a high chronicization rate. Aim of this study is to assess if the anaesthesia technique can play a role in preventing chronic post-operative pain.

**Methods:** Following ethics committee approval, an observational prospective study was conducted on a consecutive cohort of patients undergoing mastectomy, quadrantectomy or tumorectomy in our institution from January 2009 until December 2010. Patients were contacted by telephone one year after surgery and interviewed about incidence, severity, duration and frequency of chronic postoperative pain.

**Conclusions:** Paravertebral block (PVB) was not effective in preventing chronic postoperative pain compared with the control group.
223

A COMPARISON OF TAP BLOCK AND WOUND CATHETER TECHNIQUE FOR POSTOPERATIVE ANALGESIA AFTER HYSTERECTOMY

A. Jokic, B. Mazul Sunko, D. Franic Kasunic, M. Vukelic, Croatia.

Background and aims: Both Transversus Abdominis Plain (TAP) block and wound catheter technique are a part of multimodal postoperative analgesia widely used in many different operations with different success. We wanted to compare those two methods and their influence on postoperative VAS score and morphine consumption on patients after hysterectomy.

Methods: 30 female patients (ASA II-II) scheduled for total abdominal hysterectomy with or without bilateral salpingo-oophorectomy were randomized in two groups. Group A (13 patients) received TAP block bilaterally after induction of anesthesia and in group B (17 patients) a 20-gauge epidural catheter was placed above superficial abdominal fascia at the end of operation. Group A received 1,5 ml/kg of 0,25 % bupivacain and group B received through the catheter 0,25 % bupivacain 10 ml bolus followed by 7 ml/h for 48 hours. Both groups also received diclofenac 75 mg every 12 hours for 48 h and patient controlled analgesia with morphine iv.

Results: Mann-Whitney test was used to analyze VAS and morphine consumption. Morphine consumption in the first 24 hours was the only variable statistically significantly lower in the TAP group (median=10 mg in group B, 6 in group A, p<0.04). There was no differences in incidence of nausea and occurrence of peristalsis. Conclusions: Statistically significantly lower morphine consumption and tendency towards lower VAS in TAP group indicate that TAP might be a more efficacious analgesic method but larger studies are needed to confirm our preliminary results.

224

PAIN MANAGEMENT IN THE ELDERLY: DOES COGNITIVE FUNCTION REALLY MATTER?

C.S. Lynn, K. Bloom, J. McDonough, N.M. Kalynch, USA.

Background and aims: The purpose was to identify differences in analgesic administration in the post-anesthesia care unit (PACU) to elderly patients with cognitive impairment, versus the cognitively intact, following total hip or knee arthroplasty. Pain is an anticipated finding in the postoperative patient, but it can be treated. Inadequate management lead to increased morbidity, mortality, hospital stay, costs, and discomfort.

Methods: This was a retrospective descriptive comparative design. Power analysis required a sample size of 68. The records of 34 patients with intact cognition having undergone the surgery under general anesthesia were reviewed to determine if analgesic medication was administered to them in the PACU. The records another 34 surgery patients but who also had either “Alzheimer’s” or “dementia” of any etiology or severity in their preoperative health history or physical examination were reviewed.

Results: There was significant difference (p < .001) in the use of analgesics between the two groups. In the group with intact cognition 91% (n=31) received analgesic medication, whereas in the impaired group 47% (n=16) received analgesics. Converted to “morphine equivalent mg” the subjects in the intact group received 269.7 (mean = 6.95)mg, while the impaired group received 80.66 (mean = 2.38) mg.

Conclusions: The two groups were comparable in age, surgical procedure, and co-morbidities, so one could conclude that comparable pain existed as well. However, the cognitively intact group received three times more analgesia than the cognitively impaired group. This is especially important for elderly individuals with cognitive impairment.

225

ANALGESIA WITH PARACETAMOL/TRAMADOL VS COX-II INHIBITOR CELECOXIB IN ONE DAY SURGERY

M. Mantouvalou, Greece.

Background and aims: the analgesic efficacy of a fixed combination of tramadol/paracetamol 37,5/325 mg vs celecoxib 100mg was compared in 200 patients undergoing one day procedures (inguinal hernia, haemorrhoidectomy, laparoscopic cholecystectomy). Patients with elevated blood pressure and history of peptic ulcer or gastrointestinal bleeding were excluded from the study.

Methods: Patients were randomly divided into two groups. All patients received the same propofol -remifentanyl anesthesia. Group A received one tablet of paracetamol/tramadol after surgery ended, followed by one tablet four times daily for 48 hours. For the celecox group (group B), the dose was 3 tablets of 100mg daily for 48 hours.Pain was assessed by visual analog scale (VAS). Whenever VAS was > or = 3 the patients were given a rescue medication (tramadol 50 mg IM). The quality of life (time to return to normal activities, nightly rest and self care) was assessed in the post-operative period.

Results: There was no statistically significant differences between the analgesic effects (VAS < or =3) for the require of rescue medication in the two groups.

Conclusions: A fixed association of paracetamol/tramadol as well the COX-II inhibitor celecoxib are valuable and safe tools for postoperative pain management, especially whenever time of hospitalization needs to be reduced.

226

IMPLEMENTATION OF A NERVE BLOCK CHART FOR CLINICAL DOCUMENTATION, QUALITY ENHANCEMENT AND THE PATIENT’S PERSPECTIVE

K. Jensen, A. Bartholdy, J. Borglum, Denmark.

Background and aims: Consistent, prospective documentation is mandatory for administration, quality assurance and staff training regarding peripheral nerve blocks (PNBs). Failed documentation often occurs because of time constraints or information overload. Charts have been developed for billing purposes or adverse event monitoring. Charts on the block procedure itself are also available. No charts have focused on expertise, PNB duration or patient perspective.

Methods: Our department employs 38 anaesthetists. A chart for each type of PNB has been in use since 2009. PNBs are administered preoperatively in a room designated for this purpose, with one attending nurse.

Results: Chart items are seen in Table 1. Completeness of chart items vary (57-100%). Followup rate was 83%.

<table>
<thead>
<tr>
<th>Main item</th>
<th>Response rate</th>
<th>Main item</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight/height of patient, date/time,</td>
<td>95%</td>
<td>Duration of nerve block</td>
<td>100%</td>
</tr>
<tr>
<td>name and charge of anaesthetist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient status and positioning</td>
<td>80%</td>
<td>Pain when block subsided</td>
<td>100%</td>
</tr>
<tr>
<td>Indication for block and type of surgery</td>
<td>97%</td>
<td>Analgesic effect</td>
<td>100%</td>
</tr>
<tr>
<td>Technical approach and guidance method</td>
<td>90%</td>
<td>Patient acceptance of having the block</td>
<td>100%</td>
</tr>
<tr>
<td>Local anaesthetic and adjuvants used</td>
<td>96%</td>
<td>Sensory impressions</td>
<td>100%</td>
</tr>
<tr>
<td>Nerves localized and Vienna scale</td>
<td>84%</td>
<td>Patient acceptance of the block</td>
<td>100%</td>
</tr>
<tr>
<td>Clinical effect, adequacy, side effects</td>
<td>57%</td>
<td>Functional abilities</td>
<td>(Bratzel/100 index)</td>
</tr>
<tr>
<td>Duration of procedure and difficulty level</td>
<td>80%</td>
<td>Perceived ill health</td>
<td>(SF-8 index)</td>
</tr>
<tr>
<td>Expertise of the anaesthetist</td>
<td>81%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 1: Chart items and response rates
Conclusions: Observations that lend themselves easily and immediately to the anaesthetist are consistently documented, whereas observations on clinical adequacy and paralysis require longer observation which may interfere with OR logistics. However, a chart for the PNB procedure and the patient’s perspective is feasible in a clinical unit with many PNB practitioners.

References

227 EFFECTS OF CLONIDINE ON BILATERAL PAIN BEHAVIORS AND INFLAMMATORY RESPONSE IN RATS UNDER THE STATE OF NEUROPATHIC PAIN
X. Feng, F. Zhang, R. Dong, B. Yu, China.

Background and aims: This study was to investigate the effects of clonidine on bilateral pain behaviors and inflammatory response in neuropathic pain induced by partial sciatic nerve ligation (PSNL) and to better understand whether the antinociception of clonidine was related to α2-adrenoceptor mechanisms.

Methods: Rats were divided randomly into five groups: sham-operation with saline; PSNL with clonidine or saline; PSNL with yohimbine followed by clonidine. On post-operative day 1, 3, 7, 14, and 21, both ipsilateral and contralateral pain behaviors were measured. In rats receiving antagonists, the bilateral behavioral changes were measured on day 14. Bilateral paw pressure threshold and withdrawal latencies were measured, and glial activation as indicated by macrophage antigen-1 (Mac-1) and glial fibrillary acidic protein (GFAP), production of tumor necrosis factor α (TNF-α) and interleukin (IL)-6 were determined as well.

Results: PSNL induced bilateral behavioral hyperalgesia, with ipsilateral level greater than contralateral side. In addition, the glial activation markers and cytokine production were greatly increased bilaterally. Clonidine caused significant attenuation of bilateral mechanical allodynia and thermal hyperalgesia, accompanied by inhibition of glial activation and expression of cytokines. The effects of clonidine were blocked by the α2-adrenoceptor antagonist yohimbine and partially reversed by the µ-opioid receptor antagonist naloxone.

Conclusions: These data suggest that the bilateral antinoceptive effects of clonidine might mediate through immunomodulation by acting on α2-adrenoceptor during neuropathic pain.

228 COMPARISON OF APPLICATION OF LA+STEROID WITH PULSED RF IN SUPRASCAPULAR NERVE BLOCK PERFORMED UNDER US-GUIDANCE
K. Keskimäura, I. Aydinli Tarkey.

Background and aims: Recently, the ultrasound (US)-guided injection technique in the supraspinal neve (SSN) block has been described. SSN block has been shown to be effective in acute, postoperative and chronic shoulder pain. The objective of this study is to compare the efficacy of pulsed radiofrequency application or local anesthesic corticosteroid injection on SSN under US guidance in patients with chronic shoulder pain.

Methods: 113 patients suffering from shoulder pain, with no response to systemic or physical therapy were enrolled. The US-guided SSN block was performed with the patient in sitting position. US scanning was performed with a linear probe placed in a coronal plane over the suprascapular fossa with a slight anterior tilt. Once the typical US image was obtained, a 22G 50 mm needle was inserted directly to reach what was considered to be the “suprascapular notch” from the medial side of the probe using an in-plane technique. In 61 patients (group L+S), a mixture of 0.25% bupivacaine 6 mL and methylprednisolone acetate 40 mg was administered and in 52 patients (group PRF) PRF application was done.

Pain assessment was done using a standardized 7-point Likert scale and shoulder joint function assessment by Oxford Shoulder Score (OSS). The outcome measures were assessed in the third week as short-term and in six months as long-term.

Results: 108 patients completed the study. Both Likert score and OSS score were improved in both group in short-term. But in long term, mean Likert score and OSS score in group PRF were better than group L+S [6±7.3:0.78, 4.50±1.07 -p=0.000]; (16.28±3.15; 10.81±2.23- p< 0.001] in the two assessment periods in comparison with baseline.

Conclusions: Suprascapular nerve PRF lesioning performed under US guidance was effective in chronic shoulder pain of rotator cuff lesion, and this effect was maintained in the long-term period.

229 BAYESIAN METHODS IMPROVE EVIDENCE SYNTHESIS FOR COMPLEMENTARY AND ALTERNATIVE MEDICINE: CANNABIS FOR PAINFUL HIV-RELATED DISTAL SENSORY POLYNEUROPATHY (HIV-DSPN)
M.J. Andreae, G. Carter, M. Johnson, H. Sacks, USA.

Background: Current methods of comparative effectiveness research fail to answer many clinical questions. Orthodox evidence synthesis is limited to analogous outcomes derived from studies of similar design.

Our hypothesis exemplifies this: Cannabis is effective for painful HIV-DSPN? Orthodox reviews exist, but could not -include all pertinent clinical data, -combine non-randomized data with RCTs, -pool data on varied interventions or at variable postoperative intervals nor -integrate pre-existing evidence from related conditions.

Methods: We performed a literature search, extracted data in duplicate and we weighted studies according to methodological quality. We build an iterative hierarchical Bayesian model, incorporating additional studies with each step. Initially, we included only RCTs on smoked Cannabis for HIV-DSPN. Subsequent iterations included related neuropathies and other modes of Cannabis administration. Interference was implemented by employing a Gibbs sampling scheme to generate a computer simulation of a Monte Carlo sample from the posterior distribution in Openbugs. Methods are detailed in our protocol registered with PROSPERO.

Results: We report preliminary results of our Bayesian evidence synthesis of smoked Cannabis for HIV-DSPN including three heterogeneous RCTs for our first two iterations (Table 1). The Bayes factor (BF) strongly supports Cannabis for HIV-DSPN. Subsequent iterations will incorporate more data on related neuropathic pain conditions, other modes of Cannabis administration and non-randomized data to further increase the BF.

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E178

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230
AUDIT ON THE EFFECTIVENESS OF LUMBAR PSOAS COMPARTMENT BLOCKS (LPB) IN CHRONIC HIP PAIN
Aim: In our Pain Unit, LPB is used to provide analgesia for chronic hip pain mainly secondary to osteoarthritis. A previous small retrospective audit of our practice showed 73% patients reporting >50% improvement. We wanted to confirm the effectiveness of this procedure in a larger prospective audit.
Methods:
- On the day of the LPB the patients completed a baseline questionnaire including diagnosis, pain scores and current analgesia.
- The injection technique and injectate (5mls of 1% Lidocaine and 80mg of methylprednisolone made up to 20mls) were used recorded.
- Patients were contacted by phone after 8 weeks.
- Questions included block effectiveness, pain scores at rest and movement, duration of relief, improvement in quality of life with positive impacts in sleep, medications and mobility.

Results:
- 52 patients (29 female and 23 male) had LPB over a 4 month period and all were contacted.
- 37 had osteoarthritis of the hip, 11 had pain from previous surgeries and 4 from other diagnoses.
- 75% (39/52) of the patients reported >50% pain relief and of those 79% reported pain relief for >8 weeks.
- Mean pain scores were 1.5 at rest and 3.9 on movement (baseline scores were 4.8 and 8.1 respectively).
- 40/52 patients reported improvements in quality of life.

Conclusions: Our audit confirmed that a LPB is a worthwhile procedure to consider in chronic hip pain. It helped 75% of our patients where conservative treatment had failed and surgery was not possible or needed to be delayed.

231
ADVANTAGES OF THE PARAMEDIAN APPROACH FOR CERVICAL EPIDURAL STEROID INJECTIONS
Background and aims: Ligamentum flavum in the cervical region is thin or not fused at the midline. We investigated the patterns of the pressure changes on entering the ligamentum flavum in the Midline and Paramedian groups during CESIs.
Methods: Thirty-two patients were randomly allocated to the Midline or Paramedian group. We performed CESIs by midline or paramedian approach under fluoroscopic guidance. Pressure change was observed using a closed pressure measurement system. All documents on the screen were video-recorded and reviewed by another anesthesiologist who was independent from the interventional procedure. Then, the patterns of the pressure changes at the moment of entering the epidural space were divided into 4 grades; Grade I and II have a precipitous decrease pressure, however, Grade III and IV have not. We also measured stabilized cervical epidural pressure (CEP).

Results: No difference in the equilibrated CEPs between the two groups existed. A precipitous decrease pressure was observed more frequently in the Paramedian group (N = 13) than the Midline group (N = 7). The odds ratio was 7.43 [95% CI, 1.23 - 45.01] and statistically significant (P = 0.025).

Conclusions: A precipitous decrease pressure at the moment of entering the epidural space was observed more frequently when performing CESIs by paramedian approach, even though there was no difference in the stabilized mean cervical epidural pressure finally. We conclude the paramedian approach may be advantageous to find cervical epidural space using adjunctive LOR technique.

232
PULSE RADIOFREQUENCY TREATMENT OF STELLATE GANGLION FOR COMPLEX REGIONAL PAIN SYNDROME
H. Shanthanna, P. Chan, Canada.
Background and aims: CRPS is a challenging neuropathic pain condition for which there is no effective treatment. In type 1 CRPS of upper limbs, stellate ganglion block is done to ascertain the involvement of sympathetic system and for pain relief. There are limited options for patients initially responding to stellate ganglion blockade, as the local anesthetic effect could wear off within 24-36 hrs. There have been only few studies and case reports regarding the use of conventional radiofrequency ablation of stellate ganglion, which is however associated with potentially significant side effects. Ours is the first case series report on the use of Pulse RadioFrequency (PRF) treatment of stellate ganglion in patients of CRPS.
Aims: To retrospectively analyse the effectiveness of PRF of stellate ganglion, for pain relief efficacy, duration and functional improvement, along with assessment of side effects.
Methods: 7 patients suffering from CRPS of upper limb were treated with PRF of stellate ganglion under fluoroscopy at C6 and C7 levels after a successful diagnostic stellate ganglion block.

Results: All 7 patients reported significant pain relief (>50%), with good functional improvement, with a mean duration of relief of 6 months. 2 patients reported decrease in the dose of analgesic medications. No side effects were reported from any patients.

Conclusions: Stellate ganglion PRF treatment could be an effective intervention for long term pain relief in CRPS, without any major side effects. However a controlled study needs to be done to ascertain its efficacy. 2 level technique, perhaps increases the treatment efficacy.

233
A STUDY OF SEASONALITY OF REFERRALS FOR CHRONIC PAIN RELIEF, ADJUSTING FOR POSSIBLE CONFOUNDERs
D. Gore, A. Oldroyd, M. Bukhari.
Background and aims: Chronic pain is a common symptom encountered by doctors.1, 2 Many pathophysiological theories exist to explain chronic pain and the presence of a correlation between chronic pain and seasons has been illustrated in research3 4 and contested.5, 6 A limitation of many studies is the lack of research in this area as highlighted by a 2010 Cochrane Review.7
We aimed to: Investigate whether hospital referrals for chronic pain exhibit seasonality adjusting for age and SES.

Methods: This retrospective seasonal observational study acquired hospital referral data for all patients referred to chronic pain services at a teaching hospital in the UK (at latitude 54° North) between 2007 and 2011. For each patient referral date, age, gender and SES were noted. Risk-sets were constructed looking at Incident Rate Ratios (IRRs) comparing winter to summer months and analysed using a logistics model considering the impact of confounding variables age, gender and deprivation level (SES).

Results: Over the 5-year period 7017 patients were referred and included in the study. Results illustrated that a referral for chronic pain was more likely in winter and the IRR was 1.99 (95% CI 1.01, 1.19). No significant difference was found between the genders referred, age at referral or SES.

Conclusions: Chronic pain referrals are more likely over the winter period even when gender, SES and age are taken into account and excluded as confounding variables.

234
FACILITATION OF DIAGNOSTIC AND PERCUtANEOUS TRIAL LEAD PLACEMENT WITH ULTRASOUND GUIDANCE FOR PERIPHERAL NERVE STIMULATION ON LATERAL CUTANEOUS FEMORAL NERVE
B. Bouche, S. Narouze, M.K. Karmakar, E. Eisenberg, M. Meignier, A. Suarez, J. Lemarie France, USA, Hong Kong S.A.R.
Background and aims: Lateral cutaneous femoral nerve (LCFN) injury is frequent (iliac crest bone graft surgical procedures, nerve pressure and resulting ischemia, diabetes mellitus...). We present our experience with five patients suffering from chronic pain secondary to the LCFN injury, successfully managed with regional catheterization test and peripheral nerve stimulation (PNS). Both procedures were performed under ultrasound (US) guidance.

Methods: Five patients, with intractable pain due to LCFN injury, presented chronic pain refractory to conventional treatments. First, US guidance (Sonosite®, M Turbo) was used to place the underlying catheter, with in-plane approach, on the LCFN nerve, near the antero-superior iliac spine.
between the fascias (iliotibial and lata) and sartorius muscle. Continuous infusion of local anesthesia was then applied for more than 5 days and resulted in significant pain relief (>90% reduction of VAS score). In order to provide long-term pain relief, a neuromodulation trial was then conducted with percutaneous octopolar stimulation lead (Piscis Octad, Medtronic®). The lead was placed subcutaneously in the same LCFN anatomic territory under US guidance.

Results: All patients were successfully responsive to the temporary LCFN peripheral nerve stimulation (PNS) after trial period, and reported complete and well-tolerated paresthesia coverage of the pain territory.

Conclusions: US guidance is a safe technique for mini-invasive diagnosis and treatment of patients with severe pain secondary to LCFN injury and refractory to conventional treatment. The regional catheterization test has a good prognosis value to predict long-term PNS outcomes and can therefore be used as a predictive test for patient selection.

235 EFFICACY OF SPINE INTERVENTIONAL MANAGEMENT IN CHRONIC LOW BACK PAIN IN THAILAND

N. Tontisirin, W. Waikakul, V. Kounsongtum, K. Pasutharnchat, Thailand.

Introduction: The study examined the efficacy of fluoroscopically-guided procedures in chronic low back pain, which is a major health problem in Thailand because of high prevalence of agriculture-related occupations.

Method: Adults with chronic low back pain received one of the six spine interventions including medial branch block (MBB), radiofrequency ablation of medial branch (RF-MB), selective nerve root block (SNRB), radiofrequency lesioning of dorsal root ganglion (RF-DRG), epidural steroid injection (ESI), and sacroiliac joint injection (SI) between December 2008-June 2010, and were followed at one- and three-month periods. The efficacy was quantified using numerical rating scale (NRS), patient satisfaction, and improvement in sleep, mood, physical activity, and overall. Pain intensity was compared by Wilcoxon signed rank test.

Results: 145 (51M: 94 F) adults (58 ± 12 yrs) with severe chronic low back pain (for 10 ± 5 months) were included. Significant and efficacy of interventions found correlated: 1) degenerative disk diseases/facet hypertrophy with MBB, RF-MB; 2) foraminal stenosis/herniated intervertebral disk with SNRB, RF-DRG; 3) central stenosis with MBB and RF-MB; and 4) failed back surgery syndrome with MBB, SNRB, RF-MB and ESI. The improvement of sleep and overall improvement was significantly alleviated at three-month. Patient satisfaction was high (≥ 9.10 ± 8.5%).

Conclusion: Patients with lumbosacral pain benefit from facet or medial branch treatments, while patients with radicular pain respond well with nerve root intervention for three months. These procedures may be considered as therapeutic interventions, as well as diagnostic tools for potential surgical cases.

236 COMPARISON OF EFFICACY OF INTRAARTICULARLY APPLIED MORPHINE AND STEROID IN PATIENTS WITH KNEE OSTEOARTHRITIS

S.G. Beyaz, O. Arun, A. Tüfek, O. Tokgoz, H. Karaman, Turkey.

Background and aims: Primary therapeutic aim in the knee osteoarthritis which is the most seen osteoarthritis form in the elderly population is to relieve pain as much as possible. The aim of this study was to compare the efficacy of intraarticular triamcinolone versus intraarticular morphine in pain relief due to knee osteoarthritis in elderly population.

Methods: Patients between 50-80 years of age were randomized into 3 groups. Group M received triamcinolone plus bupivacaine and Group T received triamcinolone plus bupivacaine and Group C received saline plus bupivacaine. Patients were evaluated before injection and at 2nd, 4th, 6th, and 12th weeks after injection. First line supplementary analgesic was oral paracetamol 1500 mg/day. If paracetamol was insufficient for analgesia, oral dextroketoprofen trometamol 50 mg/day was recommended to all patients.

Results: After the injection, there was statistically significant decrease in VAS scores in group M and T when comparing to group C. The decrease of VAS scores seen at the first two weeks continued steadily until end of 12th week. When the WOMAC scores were considered there was significant decrease in group M and T when compared to group C. According to WOMAC scores, there was no significant difference between morphine and steroid groups. Significantly less supplementary analgesics had been used in morphine and steroid groups.

Conclusions: This study showed that intraarticular morphine has similar results with triamcinolone. Steroid treatment has side effects; therefore intraarticular morphine can be effective with lower side effects.

237 BILATERAL SCIATIC BLOCK FOR ORTHOPEDIC SURGERY OF CHILD WITH MENTAL DISABILITY - CASE REPORT


Background and aims: Postoperative pain control after orthopedic surgery is crucial for a quick and successful rehabilitation. Good analgesia after surgical procedures allows better compliance of patients, especially children with mental disability who need additional hospital care.

Methods: A 14-year old boy, weighing 65kg, with cerebral palsy presenting for bilateral tendon dissection in the popliteal region. Patient had mild mental retardation and spastic quadriplegias. The boy has already undergone three operations and parents reported symptoms of postoperative nausea and vomiting (PONV) after each procedure. Induction to general anesthesia was performed with midazolom 5mg, sufentanil 20mcg, propofol 150mg and rocuronium 30mg. After orotracheal intubation, the patient was turned to prone position and bilateral sciatic block at subgluteal level was performed with ultrasound guidance. A total of 30 ml of 0.5% levobupivacain (15 ml per leg) with epinephrine 1:200000 was administered. Anesthesia was maintained with propofol infusion at a rate of 8-10 mg/kg/h and oxygen in air.

Results: Procedure lasted for 180 minutes and there was no need for additional opioid administration. Patient reported pain 16 hours after operation and it was described as mild. There were no symptoms of PONV.

Conclusions: Bilateral sciatic block combined with general anesthesia maintained with propofol infusion enabled good postoperative pain control and diminished opioid consumption during and after surgical procedure which contributed to the abolition of PONV.

238 MASSIVE PRILOCAINE OVERDOSE SUCCESSFULLY TREATED WITH METHYLENE BLUE

S. Yurtlu, V. Hanci, A. Caliskan, O. Okyay, H. Ayoglu, I. Ozkokar Turan, Turkey.

Introduction: Prilocaine induced methemoglobiniemia is well described in literature, following report presents an intoxication case with a highest dosage of prilocaine to date, which was successfully treated. A written informed consent has been obtained for this report.

Case: Four month old, 5,5 kg infant was taken into the operation room for surgical decompression of an supraorbital abcess extending to frontoparietal scalp tissue. Monitoring was limited to electrocardiogram (ECG) and peripheral oxygen saturation (SpO2). Thirty min later anesthesia team was called for an emergency intervention for the baby because he had convulsions and SpO2 started to decrease (60% at lowest measurement). Mask ventilation with 100% O2 did not rose SpO2 and he was immediately intubated after 15 mg propofol administration. 500 mcg ascorbic acid and 2 mg/kg methylene blue was intravenously administered upon determination of 45% methemoglobin level on blood gas analysis. We learned that 340 mg prilocaine in fractionated doses had been given to the patient. SpO2 stayed around 80% with 100% oxygen, 1 mg/kg methylene blue administration was repeated 3 times within the next 15 hours and he could be extubated 18 hours after prilocaine administration. No neurologic sequela was determined within the follow up.

Discussion: Prilocaine as low as 2.5 mg/kg may cause to methemoglobinemia. In the presented case prilocaine dose was 62 mg/kg, to the best of our knowledge, this is the highest dose given to a patient. This patient has responded well to classic methylene blue treatment, thus intravenous lipid emulsion infusion was not necessary.

239 LUMBAR MEDIAL BRANCH NEUROTOMY USING A NOVEL MULTITINDED EXPANDABLE ELECTRODE CASE REPORT WITH EMG OF THE SEGMENTAL MULTIFIDUS AT ONE MONTH

R.E. Wright, S.A. Brandt, USA.

Background and aims: Durable pain relief following radiofrequency (RF) medial branch neurotomy requires sufficient volume of tissue ablation. A
novel multitined expandable RF electrode was developed to create an elongate spheroid lesion offset from the central cannula axis toward tines 8-10 mm in diameter. The initial case report with follow-up EMG of the multifidus is presented.

Methods: Following informed consent a 47-year-old male with lumbar zygapophysseal joint pain (R L4/S) was treated. Using posterior oblique fluoroscopic guidance the RF electrode was advanced “down the beam” to the mid base of the right L4 superior articular pillar (SAP). The tines were then deployed medially toward the base of the SAP into the groove containing the L3 medial branch nerve. Placement was confirmed with multiplanar fluoroscopy, and neurostimulation at 2 Hz, and 50 Hz. A Radionics RFG 3C RF generator was ramped to 75° C for 80 seconds total lesion. Procedure was repeated at L5 (L4 MB). Impedances were < 250 ohms and power levels remained < 10 watts. EMG of the L3-L5 lumbar multifidi was obtained at 240 days post-procedure.

Results: 30-day follow-up revealed an uncomplicated recovery and resolution of z-joint related pain. EMG demonstrated electrophysiologic evidence of active and acute denervation of the right lumbar paraspinals at the L4, and L5 levels. Ipsilateral L3 and contralateral levels appeared normal.

Conclusions: A novel RF electrode using dual deployable tines for electrical field diffusion produces desired medial branch neurotomy via a simplified (down-the-beam) single lesion technique.

240
EPIDURAL ANESTHESIA FOR CAESAREAN SECTION IN A PATIENT WITH SYRINGOMYELIA
A 33-year-old primiparous woman (height 158.5cm, weight 55.5kg) with syringomyelia was scheduled to undergo caesarean section for preventing excessive straining during vaginal delivery. Syringomyelia had been diagnosed after a magnetic resonance imaging (MRI) scan, performed 2 years earlier, to investigate a history of dizziness. Syrinx was found 2cm from the C3 level of spinal cord. The patient also had a history of generalized anxiety disorder and euthyroid nodular goiter. Elective caesarean section was performed at 38 weeks' gestation under epidural anesthesia. Epidural catheter was placed at L3-4 interspace. Analgesia was established using a total dose of 19ml of 2% mepivacaine. The height of the block was assessed as T4 bilaterally. Surgery was initiated and a healthy baby was delivered 8 minutes later. Additional doses of 0.75% ropivacaine (6ml then 4ml) were given for maintenance. Surgery was ended without complications after 58 minutes, with measured blood loss of 685ml. The patient was discharged 8 days later without neurological complications.

A critical point of anesthesia for the patient with syringomyelia is to avoid aggravating the already disturbed cerebrospinal fluid (CSF) pressure relationship. General anesthesia has the potential hazard of airway complications, especially in primiparous women. Although the presence of active neurologic disease is no longer considered an absolute contraindication to regional anesthesia, spinal anesthesia is best avoided in syringomyelia, as previous reports suggested that puncture aggravated signs and symptoms. Epidural anesthesia can avoid precipitate decrease in blood and CSF pressures, thus circumventing aggravation of syringomyelia, resulting in potential neurologic defects.

241
TENSION PNEUMOTHORAX WITH ULTRASOUND GUIDED SUPERCLAVICULAR BLOCK IN DAY CASE SURGERY
R. Pagedar, R. Balakrishnan.
Ultrasound guided nerve blocks have been shown to shorten performance time, onset time and reduce the dose of local anaesthetic. One of the advantages is reduction in complications including pneumothorax. The incidence of pneumothorax with supraclavicular block is reported to be up to 6.1% without ultrasound guidance. Bhatia et al reported the first case of clinically significant pneumothorax following ultrasound guided supraclavicular block. This was likely due to rupture of an emphysematous bulla. We report a case of tension pneumothorax following ultrasound guided supraclavicular block for day case surgery. Our patient had a supraclavicular block using a 22G 100 mm Stimuplex needle and 1.36 MHz linear probe with an in plane lateral to medial corner pocket approach. There were three attempts by trainee and consultant with occasional transient loss of visualisation of the needle. Surgery was uneventful. Just prior to discharge, the patient had chest pain on inspiration with haemodynamic and respiratory compromise, which necessitated urgent needle decompression, chest drain insertion and admission to hospital postoperatively. Visualisation of the needle tip while advancement is necessary to target nerves and avoid trauma to surrounding structures thereby increasing the safety of the block. Studies in the literature have identified this as the foremost error during training. Our needle was transiently not visualised during initial advancement and the pleura may have been punctured then. We highlight an important learning point for training that while ultrasound guidance reduces the frequency of complications, continuous needle tip visualisation is imperative to avoid pneumothorax.

References

242
HYPERMOBILITY SYNDROME AS A CAUSE FAILURE OF REGIONAL ANAESTHESIA
G. Khanna
We would like to present a case of 46 year Caucasian lady who presented to us for 2nd and 3rd joints metatarsophalangeal (MTP) joint replacement for arthritis. She had a background of type 2 diabetes mellitus, hypertension and chronic back pain for 6 years. She had a caesarean section under GA because of a failed spinal anaesthetic. Her daughter also had a history of failed epidural for labour analgesia.

On the day of the scheduled surgery, she had a failed popliteal nerve block and failed ankle block done under ultrasound guidance and the aid of a peripheral nerve stimulator under conscious sedation. Regional anaesthesia was abandoned and pain relief was established using intravenous analgesics.

On further questioning she had previous episodes of shoulder and elbow hypermobility and had thin fragile skin. She met the 4 minor Brighton score criteria for diagnosis and was diagnosed as Benign Hypermobility syndrome. Benign joint hypermobility (Ehlers-Danlos type III) syndrome is characterized by repeated joint dislocation, arthralgia and soft tissue dislocations. It is diagnosed by Brighton criteria (major, minor). The failure of local anaesthesia and regional anaesthesia was an incidental finding when taking histories to assess skin thickness in Ehlers-Danlos syndrome type III (EDS-III), patients experienced much pain despite conventional local anaesthesia. All these patients reported previous experience of partial or complete failure of local anaesthesia in dental or obstetric procedures. We wish to draw attention to the possibility of resistance to local anaesthesia in individuals with this common and under-diagnosed syndrome.

243
CAN YOU WORK YOUR RESUSCITATE? NEONATAL COLLAPSE ON THE POST-NATAL WARD
C. Cromey
A mother, treated for pregnancy induced hypertension with oral labetolol, required an epidural for a forceps delivery. During routine post-epidural follow-up by the anaesthetist the following day, she noted that her baby boy had become blue and floppy. She handed the unresponsive infant to the reviewing anaesthetist. The baby was apnoeic and dusky and was taken to the resuscitaire by the neonatal cardiac arrest team.

Initially, the baby remained apnoeic and had a heart rate of 40 beats per minute. Five inflation breaths were given and the infant’s colour and heart rate improved. The infant required further support of his ventilation and on stitting an cannula, the blood glucose was 1.3mmol/L. The baby’s respiratory, cardiovascular and neurological status improved following administration of IV glucose although it took several days before the infusion could be weaned. Currently, the child appears to be developing normally.
The use of labetalol in pregnancy may increase the risk of health problems for the neonate. These problems can include neonatal hypoglycaemia which may be exacerbated by poor feeding or low birth weight. All staff involved in the care of these mothers and babies need to be aware of the extra vigilance required when labetalol has been used to control pregnancy-induced hypertension. Secondly, anaesthetists need to familiarise themselves with the location and workings of the resusciator on their post-natal ward as they may be expected to perform neonatal resuscitation, even during the “routine” post-operative follow up ward round.

Sarcoptes scabiei

24 years old healthy nulliparous woman, with full term

65 elective surgical patients were included in this study, of which,

Ultrasound facilitates the successful placement of the neur-

Altough there were no lesions at the lumbosacral area, adult mites

Volume 36, Number 7, September-October 2011 Supplement

Portugal.

Due to the little amount of literature concerning the security

A sequence of errors led to the incorrect epidural

3 attempts in 95% patients.

Discussion/Conclusion:

Case report:


Background and aims: Scabies is an infestation of the skin that is caused by Sarcoptes scabiei, a mite transmitted by direct skin-to-skin contact, that nowadays is still found worldwide. The parasite originates burrows under the host’s skin that cause allergic itching and subsequent sores that are susceptible to secondary bacterial infection.

Despite being a common infestation, we couldn’t find information concerning suitability of neuraxial blockade in these patients.

Methods/Case Report: 20 year old woman, ASA I, 40 weeks of gestation, presenting with labour pain.

On examination, we found an extensive crop of skin lesions in the buttocks, inner thighs, legs, and arms that had been evolving for ten days without evidence of superimposed infection. The lumbosacral area was free of lesions and so an epidural at L3-L4 interspace was performed for analgesia. 20 mg of ropivacaine 0,2% were injected in the space without complications. After birth, the catheter was withdrawn.

The patient was discharged home on the third postpartum day. At the follow-up appointments (one and six months after) the patient had no complications.

Results: Although there were no lesions at the lumbosacral area, adult mites can move at a rate of 2,5 cm/min and there’s the risk of introducing particles into the epidural space, with unknown consequences.

Conclusions: Due to the little amount of literature concerning the security of neuraxial blockade in these patients, the decision should rely on good clinical judgment, informed consent from the patient and a strict evaluation for possible late complications.

E182

244

LABOUR ANALGESIA IN A PREGNANT WITH SCABIES


Background and aims: Scabies is an infestation of the skin that is caused by Sarcoptes scabiei, a mite transmitted by direct skin-to-skin contact, that nowadays is still found worldwide. The parasite originates burrows under the host’s skin that cause allergic itching and subsequent sores that are susceptible to secondary bacterial infection.

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245

EPIDURAL INJECTION OF HYPERTONIC SALINE


Introduction: Many drugs have been accidentally injected into the epidural space, sometimes with severe neurological effects.

Sudden pain and neurological damage after injection are due to neurotoxicity, pH and osmolality.

The speed of injection and total dose play an important role. There is no effective or definitive treatment.

The question is whether epidural injection of hypertonic saline is harmful and if recognition and prevention systems can be improved.

Case report: Patient was histerectomized under combined anesthesia (epidural and general anesthesia), without any incidents. On second post operative day the anesthesiologist intended to inject 2.5 mg Morphine (1mg/ml). After slow injection of 1 ml, the patient immediately complained loudly of severe back pain and paraesthesia in both legs.

The injection was interrupted. All used ampoules where checked. It was then noted that Morphine had been diluted with hypertonic saline (20%) solution.

The symptoms disappeared after 16 hours. Neurologic examination was normal and the patient was able to walk, unassisted, 60 minutes after the incident.

Discussion/Conclusion: A sequence of errors led to the incorrect epidural injection of hypertonic solution.

In the central pharmacy and in the operation theatre, the ampoules were mistakenly stored in the allocated site for normal saline.

Finally the Anesthesiologist prepared the dilution without properly checking the label. Slow injection with maintenance of verbal contact, helped detect the problem early.

Special attention must be given to the risk of confusion between similar-looking packaging. The importance of reading labels carefully should be noted. Preventive strategies are needed at all levels.

246

“INNOCENT” FEVER ASSOCIATED WITH EPIDURAL ANALGESIA: A CASE REPORT


Background and aims: The main infectious cause of fever during labor is acute chorioamnionitis that is associated with a high risk of maternal and neonatal morbidity. [1] Epidural analgesia is the most common causes of non-infectious fever during labor particularly in nulliparous[2].

Case report: 24 years old healthy nulliparous woman, with full term pregnancy was admitted in active labor with membrane rupture. After 1 hour of regular contraction and with a cervical dilatation of 4cm, an epidural catheter was placed at L3-L4 level, for labor analgesia. A bolus of 12mg of ropivacaine and 0,01mg of sufentanil was administered through the catheter. Thirty minutes after the epidural catheter placement we noticed face and neck redness and shivering. The body temperature was 39°C (102.2°F) unresponsive to acetaminophen 1g, heart rate of 110 bpm and arterial pressure within the normal range. After 2 hours of ineffective labor, the fetus showed sustained tachycardia and an emergent cesarean section was performed under general anesthesia. The patient remained with fever until the epidural catheter was withdrawn after the surgery. Septic screening did not reveal occult infection nor in the mother nor in the new born.

Conclusions: The epidural analgesia is a regular procedure used in almost every pregnant woman in labor in our hospital. Fever during labor associated with epidural analgesia appears to be an unusual benign condition without risk to the neonate. The management and outcome of that condition is different from the infectious one but very difficult to distinguish.

247

ULTRASOUND FACILITATED CENTRAL NEURAXIAL ANAESTHESIA IN ELECTIVE OBSTETRIC AND ORTHOPAEDIC SURGERY - A CASE SERIES

V. Nayak, B. Packianathaswamy.

Background and aims: Success rate of Neuraxial block by standard landmark technique was reduced in patients high BMI and/or anomalies of the spine and elderly. There is increasing evidence that pre-procedure ultrasound (US) not only enhances the success rate, but also reduces the number of attempts and associated complications during central neuraxial block.

Methods: 65 elective surgical patients were included in this study, of which, 28 from Obstetrics and 37 from Orthopaedics. A pre-procedure scan was performed to locate the correct vertebral interspace, to measure the depth of the posterior dura from the skin, to mark the needle trajectory point. Neuraxial anaesthesia was performed using the marked spot as the point of entry for the needle. During the placement of the needle, the following parameters were recorded: total number of attempts, time taken to perform spinal/epidural procedure, actual depth of posterior dura from the skin, time for the patient to be ready for surgery after successful placement.

Results: We observed that there is a good correlation between the depth measured by pre-procedure US scan and actual measured depth (r=0.98 ). The correct needle placement was achieved in < 3 attempts in 95% patients. There is also a strong agreement between the US depth and actual depth using Bland-Altman plot.

Conclusions: Ultrasound facilitates the successful placement of the neuraxial block by identifying the appropriate intervertebral space, the depth of posterior dura from skin and best space for needle placement with angulation of the spinal/epidural needle.

248

COMPARISON BETWEEN PARAVERTICAL BLOCK AND CERVICAL EPIDURAL BLOCK IN PATIENTS UNDERGOING BREAST SURGERY- A DOUBLE BLINDED RANDOMIZED CONTROL TRIAL


Background and aims: Regional anaesthesia is becoming an increasingly important aspect of modern anaesthesia practice. Paravertebral block and
Cervical epidural anaesthesia are two main techniques which can be used for giving regional anaesthesia for breast cancer surgery. Here in this study our aim is to compare these two techniques in terms of perioperative vitals and their efficacy.  

**Methods:** After ethical permission 60 patients of ASA I and II of age group 18-60 yrs undergoing surgery for breast carcinoma were enrolled in this prospective, double blinded, randomized study. Participants were randomly allocated into either Group CEA or Group PVB. Group CEA received cervical epidural block at C7-T1 or C6-C7 with 10 ml of 0.5 % bupivacaine. Group PVB received Paravertebral block at each level from C7 to T6 with 3 ml of 0.5% bupivacaine. All hemodynamic parameters like HR, NIBP, ECG and SpO2 were monitored during surgery. Surgeon’s response was recorded on a scale of 1-5. Post-operative requirement of morphine was calculated for the first 24 hours. Data analysis done by student’s t-test/mand-whitney test.  

**Results:** Onset of block was early in CEA group. Hemodynamic parameters like NIBP, HR, etc were decreased in CEA group more than the PVB group which is statistically significant but the decrease lies within normal physiological values. Decrease in SpO2 was more in CEA. Surgeon satisfaction score was more for CEA group than PVB. Failure rate was more in PVB group. Conclusions: Paravertebral block is associated with better hemodynamic control while the efficacy and results of block were better in Cervical epidural. Hence both these techniques can be used safely and choice should be made according to patients’ need.

**249 CURRENT ANAESTHESIA PRACTICE OF NEURAXIAL BLOCKADE AND ANTOCOAGULATION THERAPY IN THE REPUBLIC OF IRELAND**  

J.R. Sheehan, S. Mannion Ireland  

**Background and aims:** There are a number of national guidelines which have been developed to assist the anaesthesia management of patients on anticoagulation therapy (ACT) who require neuraxial blockade (NAB) . However, because of the paucity of clinical data, there is significant variations in national practices. As there are no guidelines in the Republic of Ireland (ROI), we conducted a survey of current national practice.  

**Methods:** An online survey was produced and was sent electronically to all Fellows registered with the College of Anaesthetists of Ireland.  

**Results:** 116 anaesthetists responded, 107 work in the ROI. 70% were Specialists and 77% agreed that national guidelines should be developed.  

<table>
<thead>
<tr>
<th>Aspirin(%)</th>
<th>Clopidogrel(%)</th>
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<tbody>
<tr>
<td>Always</td>
<td>5.6</td>
</tr>
<tr>
<td>Never</td>
<td>61.7</td>
</tr>
<tr>
<td>When in combination with other ACT</td>
<td>32.7</td>
</tr>
<tr>
<td>Days stopped before NAB Median(range)</td>
<td>7 (0-14)</td>
</tr>
</tbody>
</table>

[For the question - do you stop (drug name)?]  

The median(range) target INR for patients off Warfarin was ≤1.4(1-2) and 4(0-7) days suggested to achieve this. The median(range) for stopping LMWH was 12(6-24) hours for prophylactic and 6(0-24) hours for therapeutic doses, The median(range) for first dose LMWH after NAB was 6(0-24)hours for prophylactic and 12(2-24) hours for therapeutic doses.  

**Conclusions:** Our data demonstrate that the majority of Irish practice is in line with current European guidelines. The large inter-indvidual variation suggests that agreed national guidelines may assist in standardising clinical practice in ROI.  

**250 REGIONAL ANAESTHESIA AND ANTI-PLATELET AGENTS: DIFFERENCES IN EUROPEAN AND POLISH GUIDELINES AND THEIR IMPACT ON ANAESTHESIOLOGISTS’ DECISIONS IN A POLISH ORTHOPAEDICS AND TRAUMA HOSPITAL**  

J. Kurak, J.A. Majewski, E. Gornik-Wlaszczuk, R. Szczygiel, Poland  

**Background and aims:** Local regional anaesthesia guidelines differ between the European Union countries, and even between hospitals (due to the “house guidelines”). According to European (ESRA) guidelines, Aspirin up to 150mg daily is not a contraindication to neuraxial anaesthesia. Polish guidelines include a platelet function examination, if appropriate device is available (e.g. PFA-100 Platelet Function Analyser: Dade-Behring).  

**Methods:** A retrospective review of the hospital records. A review of the European and Polish guidelines concerning regional anaesthesia.  

**Results:** In years 2009-2010, 121 trauma patients on up to 150mg aspirin daily were admitted to our hospital. The European guidelines allow performing neuraxial blocks in all these patients. In 57 of these patients the platelet function examination with use of PFA-100 yielded abnormal results (>160s). In consequence, the surgery were postponed (3.3 days on average, from 0 to 9 days) or general anaesthesia was carried out.  

**Conclusions:** Minor differences in the regional anaesthesia guidelines have significant impact on the trauma patient management.

**251 INTRATHECAL HYPERBARIC ARTICaine PLUS FENTANYL: BETTER ANALGesIA DURING AND AFTER INGUINAL HERNIORRHAPHY WITHOUT PROLONGING RECOVERY FROM THE BLOCK**  

P.M. Kairaahuoma, M. Bachmann, H. Kallio, P. Rosenberg, P. Pere, Finland  

**Background and aims:** We have found spinal anaesthesia with hyperbaric articeaine suitable for day-case open inguinal herniorrhaphy (OIH) (1). Analgesia may be improved by adding fentanyl to spinal articeaine (2).  

**Methods:** After ethical committee approval we performed a randomized, controlled study in 100 adult patients undergoing OIH. We tested intrathecal hyperbaric articeaine 72 mg with (Group A+F) or without (Group A) fentanyl 10 µg. Intravenous (i.v) fentanyl was used as rescue analgesic intraoperatively. Postoperatively paracetamol 1 g i.v. and thereafter fentanyl in doses of 0.05 mg were given as needed in the recovery room. A group-blinded assistant performed pin prick and motor block testing until recovery.  

**Results:** Spinal anaesthesia was adequate for surgery in all except one patient in both groups who needed general anaesthesia because of insufficient block. There were no differences in the maximum median extension of the sensory block (Th5 vs. Th5), mean duration of sensory block above Th1( A:73 vs. A+F:76 min), or total duration of sensory (146 vs. 146 min) or motor block (A:107 vs. A+F:99 min). Group A+F needed less fentanyl (7.5 vs 25 µg, p< 0.05) intraoperatively. Postoperatively Group A+F needed less paracetamol (40 vs. 349 mg, p< 0.001) and fentanyl (0 vs. 7 µg, p< 0.05).  

**Conclusions:** Fentanyl 10 µg added to spinal hyperbaric articeaine improved analgesia and reduced analgesic consumption during and after OIH. Fenta- ny1 did not delay recovery from the block.

**References**  


catheter in Group FS. Patients with 4 or higher VAS (visual analogue scale) score, received 0.1 mg/kg subcutaneous morphine as an additional analgesic. Pain scores during rest and physiotherapy, requirement of additional analgesia, total bupivacaine consumption and patient satisfaction were recorded at postoperative 6, 12, 24 and 48 hours.

**Results:** Pain score, total bupivacaine consumption, patient satisfaction and degree of knee flexion were similar in both groups.

**Conclusions:** We believe that both methods can be used for adequate pain relief and knee rehabilitation after total knee arthroplasty.

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**253 COMBINED SPINAL EPIDURAL ANESTHESIA WITH LOW DOSE LEVOBUPIVACaine FOR CESAREAN DELIVERY**

H. Gülşe, S. Degerlı, E. Berçin, S. Şahin, E. Ö兹şay, A. Saltık, Turkey.

**Background and aims:** Combined spinal epidural anesthesia is a commonly used regional anesthesia method for elective cesarean sections. Levobupivacaine is a long acting local anesthetic. This agent was shown to be less cardiotoxic compared to bupivacaine in several studies and is now being used in cesarean sections. Rapid development of sympathetic blockade in pregnancy and requirement of keeping sensory blockade at T4-5 in labor increases its importance. The aim of the study was to compare routine dose and lower dose use of levobupivacaine in terms of efficacy, adequacy and hemodynamic effects for cesarean operations.

**Methods:** Thirty three parturients scheduled for elective cesarean section ASA I-II with no problem in the fetus and mother and no contraindication for regional anesthesia were included in the study. Subjects were randomly distributed into two groups. Group 1 (n = 15) was given 10 mg levobupivacaine 0.5 % and Group 2 (n = 18) was given 7 mg levobupivacaine 0.5 % by combined spinal epidural method into the subarachnoid space.

**Results:** No difference was observed in the frequency of hypotension (p: 0.482), bradycardia (p:1.00), nausea and vomiting (p:0.448), between two groups. Frequency of sedation was similar in both groups (p:0.383).

**Conclusions:** Use of smaller doses of local anesthetic agents to prevent maternal hypotension and consequent adverse effects on uteroplacental blood flow during combined spinal epidural anesthesia is an important topic for the safety of fetus and mother. In our study, we could not prevent the development of hypotension after combined spinal epidural anesthesia by using 7 mg of levobupivacaine.

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**254 THORACIC EPIDURAL IN COMBINED ANAESTHESIA TECHNIQUE FOR MAJOR ABDOMINAL SURGERY: 5 YEAR EXPERIENCE IN “FAST-TRACK SURGERY”**

D. Castro, P. Leão, A. Fonte, M. Pacheco da Fonte, L. Gomes, Portugal.

**Background and aims:** There have been increasing data that combined anesthesia techniques positively influence the surgical outcome, reduces patient morbi-mortality and also reduces the hospital stay and costs. With the concept of “Fast-track Surgery” already implemented by the Department of General Surgery of our hospital, we followed this trend, and started using the combined anesthesia technique, using thoracic epidural anesthesia (TEA) as a routine in the management of our patients submitted to Major Abdominal Surgery as well as encouraging our residents to dominate this technique.

**Methods:** We retrospectively selected 326 patients submitted to combined anesthesia using TEA in the last 5 years. We registered who performed it (assistant or resident), the technique variables, its efficacy and complications.

**Results:** Performer: Assistant 61.04%; 1st year resident 6.44%; 2nd year resident 14.35%; 3rd year resident 8.89%; 4th year resident 9.50%.

Technique characteristics: Patient awake 97.85%; Lateral Decubitus 70.86%; Paramedian approach 75.77%; Epidural space achievement at 1st attempt 57.36%.

Complications: Intraoperative hypotension 35.89%; Postoperative hypotension 23.31%; Blockade failure 8.28%; Accidental dural puncture 2.76%; Pneumothorax 0.30%; Epidural Hematoma 0%; Epidural abscess 0%; Neurological lesion 0%.

Efficacy: Epidural catheter use to provide successful analgesia in the first 24 postoperative hours 78.22%.

**Conclusions:** The incidence of complications with TEA doesn’t seem to be higher than with the lombar approach. Assuming that this technique may influence the patient’s outcome, our data should contribute to demystify the use of the thoracic epidural and should encourage teaching residents this technique.

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**255 COMPARISON OF INTRATHecal BUPIVACAINE AND BupivAcaine + SufentANIL IN PATiENTS UNDERGOING TRASureTHRAL RESECTION**

C. Doger, B.E. Yüksel, O. Canoler, D. Ornek, N. Kadogullar, Turkey.

**Background and aims:** The present study aimed to compare the effect of bupivacaine and bupivacaine + sufentanil on hemodynamic parameters and the recovery period in patients undergoing TUR under spinal anesthesia.

**Methods:** The study included 40 ASA I-III patients scheduled to undergo TUR. Patients were blindly and randomly divided into 2 groups. Group I (n = 20) received 10 mg of intrathecal bupivacaine and group II (n = 20) received 7.5 mg of bupivacaine + 5 µg of sufentanil. Intra-operative and post-operative blood pressure, heart rate, and level of sensorial and motor block were recorded. Perioperative and post-operative motor and sensorial block were assessed.

**Results:** No differences in mean arterial pressure or heart rate were observed between the 2 groups. Time for sensorial block to reach the T10 level and maximum sensorial level (T8) did not differ between the groups. Ending time of sensorial block was later in group II (P = 0.012). Motor block was significantly higher in group I (P < 0.05). In group II pruritus was observed in 3 patients (15%). Nausea, vomiting, and respiratory depression were not observed in any of the patients.

**Conclusions:** Similar hemodynamic stability and sufficient level of sensorial block were provided by bupivacaine and bupivacaine + sufentanil used for spinal anesthesia in patients undergoing TUR. Due to the fact that less motor block was observed and the recovery period was shorter, the combination of bupivacaine + sufentanil might be more appropriate for patients undergoing TUR.

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**256 COMPARISON OF HYPERBARIC BUPIVACAINE AND HYPERBARIC LEVOBUPIVACaine in HIGH-RISK PATiENTS IN unILATERAL SPINAL ANAESTHESiA UNDERGOiNG LOWER EXTREMiTy AMPUTATION SURGERY**


**Background and aims:** The aim of this study was to compare the block durations and haemodynamic effects associated with intrathecal hyperbaric bupivacaine and hyperbaric levobupivacaine in high cardiac risk patients in unilateral spinal anaesthesia undergoing lower extremity amputation surgery.

**Methods:** After approval by the hospital ethics committee and obtaining written informed consent; 40 patients, aged 50-80 years, ASA III-IV who were scheduled for non-elective lower extremity amputation surgery were included. Patients were randomly divided into two groups receiving either (in group B) 7.5 mg hyperbaric bupivacaine 0.5% or (in group L) 7.5 mg hyperbaric levobupivacaine 0.5%. The level and duration of sensory block, intensity and duration of motor block were recorded. Heart rate (HR), mean arterial pressure (MAP) were recorded throughout the study; at baseline and 1st, 3rd and 5th min after intrathecal injection, then at 5 min intervals. A 20% or more decrease in MAP compared to baseline was considered as hypotension, iv ephedrine 5 mg bolus administered. Atroopine 0.5 mg iv administered when HR> 50 beats/min. Statistical analysis was performed using SPSS 17 version.

**Results:** Demographic data, surgery times were similar in both groups. No significant difference between groups with MAP and HR. 3 patients were needed ephedrine in group L. In group L, the motor block scores were higher on the operative side at 1st min than group B(p=0.012). No significant difference between groups with sensory block characteristics.

**Conclusions:** Hyperbaric bupivacaine and hyperbaric levobupivacaine both provided satisfactory unilateral spinal anaesthesia with good haemodynamic stability for lower extremity amputation surgery.

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**257 ULTRASOUND-GUIDED LUMBAR INTERSPINOUS INJECTION CASE REPORT AND DESCRIPTION OF A NEW TECHNIQUE**

M.O. Beleil, A. Kibeida, D. Harmon, Ireland.
Background and aims: Lumbar interspinous Infection for back pain relief is performed blindly or with fluoroscopy guidance. In this case report we describe a new previously unreported technique that promises elimination of the radiation risk, lower cost and wider availability. It involves using Ultrasound guidance instead of blind technique or fluoroscopy guidance. Our technique involves using a portable ultrasound scanner and a curved linear transducer (4-5MHz) (SonoSite Micromaxx SonoSite, Inc. 21919 30th Drive SE Bothell W.A. 98011) to guide injection. 

Methods: The technique was implemented in a 36 year old construction worker who had been suffering from chronic dorso-lumbar region pain due to interspinous bursitis which interfered with his work causing him significant financial distress. Oral and topical analgesics as high as the second analgesic ladder were unsuccessful. The patient consented to the procedure. With the patient in prone position an ultrasound transducer in a transverse orientation was used to locate the T12-L1 intervertebral region. The spinous process was first identified and then by moving caudally the interspinous space. There was the area of maximal tenderness. A sterile technique was used. A lateral to medial needle orientation was used in long-axis. A 22G spinal needle was guided via ultrasound real-time to the interspinous space to inject 2.5% Chirocaine with Triamcinalone solution. 

Results: Patient symptoms significantly improved and no complications were encountered. 

Conclusions: Ultrasound guidance is as efficient as CT , simpler, more readily available and avoids the risk of radiation.

EPIDURAL STEROIDS INJECTION IN THE MANAGEMENT OF LUMBAR RADICULAR PAIN A PROSPECTIVE STUDY OF 160 PATIENTS FOLLOWED UP FOR A 6 MONTHS

M. Zackova, G. Maknouni, M. Zanello, Italy.

Background and aims: Radicular pain is one of the most frequent disease that leads patients to the centre for antalgic therapy. Controversy exists to the efficacy of epidural steroids in the treatment of low back pain. The aim of this prospective study is to evaluate the use of epidural steroids and local anaesthetics in our practice. 

Methods: We have undertaken a prospective study of 160 patients (age range 26-87years) with lumbar radicular pain, of more than 6 months duration, who failed pharmacologic treatment. Neither patients with non-specific “low back pain” nor patients with spinal stenosis were included in this study. All patients received a lumbar epidural injection of Bupivacaine (10 mg)and Methylprednisolone (80 mg) as a day case procedure. Pain score (VQS) , range of lumbar movements and Patient’s active daily life (ADL) were used to assess patients before and after the epidural injection. Subjective satisfaction degree were also evaluated. Statistical analyses was done by Wilcoxon’s test. 

Results: There were no complications. Seventy-six percent of the patients improved significantly at six weeks and sixty-six percent reported continued improvement at a six month follow-up. A promising initial response was a good predictor of the future epidural injections. Fifty-seven percent of the patients still derived a significant benefit after 12 months with an important reduction in analgesic requirements. 

Conclusions: Lumbar epidural injection of steroids and local anaesthetics in this series has been safe, correct and reproducible procedure, but often with only transient effects. 

CERVICAL CORD STIMULATION IN POSTAMPUTATION PHANTOM LIMB PAIN: A CASE DESCRIPTION AND CLINICAL REVIEW

M.M.R. Mubarak, D. Oshodi, P. Murphy, Ireland.

Background and aims: This review focuses on postamputation phantom limb pain (PP). Phantom sensation is the sensory perception that doesn’t include pain. In contrast, phantom pain is a noxious sensory phenomenon of the missing limb. Treatment (ts) modalities (surgical, medical or neuro-modulation) are different for each type. Long term opioids with antdepressants has provided satisfactory relief that decrease with time while acupuncture may exacerbate pain(1). 

Methods: A 35 Y old male pt. has sustained injury at work. He underwent re-implantation of Lt hand fingers, however amputation of his re-implanted hand was done 1 month later. He has undergone many trials of medical ts. and interventional pain management including stellate ganglion blocks (SGB) with little benefit for 5 months. His quality of life has markedly improved due to ongoing pain. 

Results: He reported excellent coverage of PP following SGB and stage 1 cervical SCS. One week later, stage 2 implant was done. SCS was very beneficial as patient reported more than 50% reduction in pain intensity at 1,3, and 6 months. 

Conclusions: Tx of PP has generally not been very successful. 43 methods for treating phantom limb pain were identified (2). The selection process is crucial when considering SCS for tx of PP. 

References:

IMPORTANT OF THE SEX HORMONE-BINDING GLOBULIN FOR THE DIAGNOSIS OF HYPOGONADISM IN PATIENTS UNDERGOING INTRATHecal OPIOID ADMINISTRATION

R.V. Duarte1,2, J.H. Raphael1,2, M. Labib, J.L. Southall, R.L. Ashford.

Background and aims: Hypogonadism is frequently diagnosed based on testosterone levels alone. However, 99% of testosterone is bound to the sex hormone-binding globulin (SHBG) with only 1% free testosterone. SHBG is generally genetically determined, with few substances affecting its levels. SHBG and testosterone can be used to calculate the free androgen index (FAI). The aim was to investigate the importance of SHBG and FAI when diagnosing hypogonadism in intrathecal drug delivery systems (IDDS) patients. 

Methods: Ten male patients undertaking long-term IDDS therapy for chronic non-malignant pain had the gonadal axis evaluated by assays of testosterone, SHBG and FAI calculation. Further evaluation of these markers was performed approximately one year after initial assessment. 

Results: Average age at the time of first blood collection was 59±2.3 years. IDDS treatment duration 100±20 months and intrathecal opioid dose 2.19±0.5 mg/day. Mean testosterone at baseline was 6.36±1.5 nmol/L and

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Eighty six patients with non-radicular chronic low back pain, this study documents that intraarticular injection of ropivacaine and betamethasone increases the success rate without an added cost or radiation exposure. Future research shouldcentre on confirming this finding.

Conclusions: SHBG should also be measured when diagnosing hypogonadism in IDDS patients. Intrathecal opioids may affect SHBG levels, which should be taken into consideration when interpreting serum testosterone in these patients. Future research should centre on confirming this finding.

262 DOUBLE INJECTION APPROACH: SIMULTANEOUS CT GUIDED FACET AND PERIRADICULAR INJECTIONS IN THE MANAGEMENT OF LOW BACK PAIN
H.M.F. Anwer, A. Yehia, Egypt

Background and aims: Vertebrogenic lumbar pains may have multi-structural attributions. Multi-targeted infiltration may have therapeutic advantage. In this study we assessed the efficacy of adding CT guided periradicular injections to the planned facet joint injections in patients suffering from non-radicular low back pain suspected to be due to facet joint disease.

Methods: Eighty six patients with non-radicular chronic low back pain, referred for facet joint corticosteroid injection were randomly allocated to 2 groups (43 patients each). CT guided Facet injections were performed on group I patients and CT guided facet and periradicular injections (simultaneous 2 needles insertion) were done for group II patients. Treatment success was evaluated one hour after the injection and after 2 and 12 weeks.

Results: Subjective patients’ evaluation of the effect of treatment indicated that 28 (65.1%) patients of group I versus 37 (86%) of group II demonstrated >50% improvement one hour after the injection (P=0.02), and 13 (30.2%) versus 24 (55.8%) after 12 weeks (P=0.02). Also, group II patients showed significantly better VAS and Objective Disability Score than group I at all interview times. Demographic data, number of images (slices) and CT acquisitions needed to complete each procedure were not statistically different between the groups.

Conclusions: CT periradicular injection performed at the same setting with facet joint injection increases the success rate without an added cost or radiation exposure.

263 EVALUATION OF THE USE OF EEG IN THE ASSESSMENT OF CHRONIC PAIN SYNDROMES: A SYSTEMATIC LITERATURE REVIEW
N. Hylands-White1,2, E. Sparkes1,3, R.V. Duarte1,2, R.L. Ashford, J.H. Raphael1,2

Background and aims: Clinical pain syndromes are difficult to diagnose, and often require trials of different forms of treatment before patients experience reliable pain relief. Furthermore, standard objective assessment of treatment efficacy is lacking, with clinicians having to rely on subjective report from patients. EEG equipment is relatively inexpensive, compact, non-invasive, safe, and found in most hospitals. The aim of this study was to investigate the use of EEG in diagnosis and assessment of chronic pain.

Methods: Systematic literature review was undertaken by searching databases EBSCOHOST (CINAHL, EMBASE, Medline & PsycINFO) using search terms (EEG, electroencephalography, diagnosis, assess, chronic pain, pain measurement). This yielded 52 papers, 24 of which were considered relevant. A hand search of references yielded 5 further papers.

Results: The evoked response potential to phasic noxious stimulation is a robust finding, and reliably comprises 4 components (N1, N2, P2, P3), of which the N2-P2 amplitude correlates with perceived pain intensity. In continuous EEG data, the peak α frequency is related to subjective perception of tonic pain intensity, and relative changes in slow wave power (β, θ, α) are linked to subjective pain control.

Conclusions: It may be possible to utilise EEG in the objective assessment of pain treatment efficacy. The capacity for diffuse noxious inhibitory controls, habituation, sensitisation, and temporal summation is differentially affected across conditions, opening the possibility for EEG guided diagnosis and treatment in the future: many conditions are yet to be investigated in this way.

264 COMPARATIVE STUDY OF INTRAARTICULAR LIDOCAINE AND CORTICOSTEROIDS VERSUS ROPIVACAINE AND CORTICOSTEROIDS FOR CHRONIC SHOULDER PAIN RELIEF
D. Saridou, S. Theocharakis, B. Goulidakis, A. Makris, E. Drakoulakis, Greece

Background and aims: Shoulder pain may be defined as chronic when it lasts more than six months. Common causes include rotator cuff disorders, adhesive capsulitis, shoulder instability, and shoulder arthritis. Most patients are initially treated conservatively with a combination of activity modification, physiotherapy, medications, and corticosteroid/local anesthetic injections. We compare the effect of intraarticular injection of lidocaine and betamethasone versus ropivacaine and betamethasone.

Methods: The study included 27 patients devided randomly in two groups (A and B). Group A (10 patients, 8 males & 2 females, mean age 44.8 years) received 1 ml betamethasone (6 mg) plus 3 ml lidocaine 2% intraarticularly. Group B (13 patients, 6 males - 7 females, mean age 44.6 years) received 1 ml betamethasone (6 mg) plus 3 ml ropivacaine 0.5% intraarticularly. All patients were prescribed celecoxib 50 mg for 7-10 days after injection. Visual Analogue Scale (VAS) and Shoulder Pain and Disability Index (SPADI) were used to measure pain and shoulder disability before and after injection and at the first visit in outpatient clinic (1 week). Differences between groups were analyzed using unpaired Student's t-test.

Results: 3 patients were missed from follow up. A and B groups showed no statistically significant differences in VAS scores. A statistically significant difference was documented in SPADI scores. Group A showed higher SPADI scores (higher disability) at the immediate post injection period and at the first follow up visit. No patient was treated surgically.

Conclusions: This study documents that intraarticular injection of ropivacaine and betamethasone provides better analgesia and functional activity than lidocaine and betamethasone.

265 STUDY OF BREAKTHROUGH CANCER PAIN, INTENSITY OF PAIN AND RESPONSES
E. Mavroudi, S. Anisoglou, M. Mavroudi, G. Anastasiadou, Greece

Background and aims: Cancer is often accompanied by significant pain. The incidence of pain is approximately 70%. Breakthrough cancer pain is a frequent event in cancer patients, with a prevalence from 19% to 95%. The treatment of cancer pain shows a special challenge. The purpose of this study is to examine the characteristics and the treatment of breakthrough pain in our hospital.

Methods: This study involved 74 patients with breakthrough cancer pain. Patients with pain were questioned about the characteristics of their pain, the management of their pain, and the effectiveness of alternative routes of administration and the need for additional treatment.

Results: The median number of episodes was 3/24h. The median duration was 60 min, and the median time to peak intensity was 15 min. Ten percent of patients reported mild pain, 30% moderate pain and 60% unbearable pain. Ninety percent of patients reported that their pain was related with their daily activities. All patients were using opioids, 50% non-opioid anti-inflammatory drugs, 30% antidepressants, 70% anticonvulsants and none non-pharmacological interventions. Sixty percent of the patients used opioids transmucosally, when they felt breakthrough pain. Three percent of patients reported problems with their mouth.

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Conclusions: The tumor pain is often unbearable and requires the combined administration of several different classes of drugs. Patients who felt more pain, seemed to be those with lung cancer and bone metastases.

266

THERE IS NO FACET SYNDROME. SHOULD CLINICIAN ELIMINATE FACET JOINT INJECTION AS A DIAGNOSTIC/ THERAPEUTIC PAIN PROCEDURE? A META-ANALYSIS

F. Etahi, USA.

In this meta-analysis, more than 120 related articles identified throughout close literature review, only 31 article validated to use as my source of dispute, used as the battlefield for challenging this very hot topic in pain medicine.

Zygapophyseal joint pain is one of the best studied and best validated in the specialty of pain medicine. Few practitioners practice according to the evidence. They claim to use a procedure that has been proven to work. It is hard to find another realm of medicine in which there is so much dissonance between science and practice. A syndrome is a clinical entity defined, and recognized, by a specific constellation of clinical features. For instance, Reiter’s syndrome is defined by a combination of urethritis, uveitis, and spodyloarthropathy. No combination of clinical features defines facet syndrome. Although some proponents have submitted that aggravation of pain by certain movements is indicative of facet syndrome, this has been refuted by studies using control diagnostic blocks. There is no facet syndrome, what patients have is zygapophyseal joint pain. This is an entity defined, not by clinical feature, but by a specific source of pain. The pain has an anatomic basis, and can be diagnosed by a clinical examination. In this study I will review the entire literature to identify whether pain generator is located inside the facet joint or somewhere else. Intraarticular block will face validity, especially injecting contrast inside the joint would be criticized, and provocation of pain would be strongly rejected. In contrast, medial branch blocks have been extensively promoted. I will identify based on literature where would be the target point as “pain generator.”

267

UNILATERAL EPIDURAL ANESTHESIA IN ARTHROSCOPIC SURGERY

O. Turan, D. Ornek, F. Donmez, D. Kalayc, B. Dikmen Turkey.

Background: We aimed to investigate the effect of local anaesthetic application rate on unilateral block characteristics, hemodynamic parameters and discharge criteria in patients undergoing knee arthroscopy with unilateral epidural anesthesia.

Methods: After ethical committee approval and written informed consents were obtained, 60 ASA 1–2 status patients were included in this prospective, double blind and randomised study. Standart monitoring was applied. While patients were being in lateral decubitus position on which operation side was on the bottom, 18 G epidural needle which its tip towards to side of the operation and with 5–10 degree angle from midline, epidural space was found and the catheter was placed in to L2-3 interval. levobupivacaine 5% was applied via catheter in Group F(n:30) in 1 minute and in Group S(n:30) in 3 minutes.

Results: Unilateral epidural block was successful in 16% of patients in Group F and 70.3% in Group S (p< 0.001). Sensorial and motor block characteristics of the operation and non-operation sides were compared; in operation sides, they were similar but in non-operation sides of group S maximal sensorial block time was shorter and two segments regression time was longer (p< 0.05). While sensorial block onset time was shorter and maximal motor block level higher in operation sides, maximal sensorial block level of non-operation sides was high. Walk-out time was longer in group F (p< 0.05).

Conclusions: Slow application of local anaesthetic in unilateral epidural anesthesia is more effective and intentional unilateral epidural anesthesia with slow injection may be an alternative anaesthetic method.

268

PRilocaine for Day Case Spinal Anaesthesia in the UK: A Preliminary Experience

R.M. Thistlethwaite, B. Manickam

Introduction: In the UK, options of local anaesthetic agents for establishing spinal anaesthesia have been limited to bupivacaine. This report describes our experience of introducing hyperbaric 2% prilocaine for spinal anaesthesia in day-case patients.

Methods: We evaluated the use of spinal prilocaine in 20 patients who underwent a day case procedure. Spinal anaesthesia was performed using hyperbaric prilocaine 2% (Priloket, Goldshield) - dose range 40-64mg.

Results: The average age of patients was 65 and ASA grade ranged from I (25%), II (50%) to III (25%). No patients required conversion to general anaesthesia. Regression of the sensory block (to S1) and motor block (Modified Bromage = 0) took a median of 215 minutes and 178 minutes respectively.

Conclusions: In this report, 2% prilocaine appears to be an effective agent for use in spinal anaesthesia. Patients were able to be mobilised from 4 hours after spinal administration, had minimal post-operative analgesia requirements and there were no unplanned hospital admissions. Urinary retention occurred in 10% of patients.

Discussion: This study has shown that in our institution spinal anaesthesia with prilocaine 2% is a feasible choice for day case patients with a reliable onset and block quality. There were limitations to this study: it was a small study and there was no standardised protocol for treatment. Some of the timings of block regression may be inaccurate - this is likely to have led to an overestimation of the block duration.
Even today, the jury is out as to the optimal timing and volume for an EBP, with studies ongoing. However, the high success and low complication rates have ensured EBPs remain the gold standard of treatment of PDH.

270  THE USE OF SPINAL ANAESTHESIA AFTER ACUTE REVERSAL OF WARFARIN INDUCED ANTICOAGULATION BY ADMINISTRATION OF PROTHROMBIN COMPLEX CONCENTRATE (PCC)

P. Kriz, B. Jindrova, M. Urban, M. Stribesky, Z. Kriska, J. Kvasnicka Czech Republic

Background: Spinal haematoma is one of the most serious and feared complications associated with regional anaesthesia. In the article published by Vandermeulen, 68% of 61 patients with spinal haematoma were chronically administered anticoagulation or antiaggregant drugs. According to current literature the use of regional anaesthesia in such patients remains controversial. Warfarin is described to be one of the most frequently used anticoagulation drug. There are no data in current literature about the use of regional anaesthesia in acute surgical patients on oral Warfarin which effect would be reversed by the administration of PCC.

Methods: Patients on regular Warfarin who suffered proximal femur fractures and were in need of acute surgical treatment were administered PCC to antagonize the anticoagulation effects of Warfarin. The time intervals from admission to PCC administration and to the start of surgical procedure, aPTT, INR, serum levels of clotting factors II., VII., X., XI. and shape of thromboelastographic (TEG) curve were recorded 48 hours after administration.

The modes of anaesthesia were general anaesthesia or unilateral spinal anaesthesia according to patients preference.

Results: The median levels of INR were 2.3 at admission, and 1.2 after administration of PCC. The median dose of PCC was 1600 IU. General anaesthesia was performed in 3 and spinal anaesthesia in 3 patients.

Discussion: The acute reversal of Warfarin induced anticoagulation effects by PCC administration seems to significantly shorten the admission-to-surgery time interval. After the normalization of coagulation spinal anaesthesia can be safely performed.

271  THE EFFECTS OF MIDAZOLAM ON THE HEMODYNAMIC, EARLY COGNITIVE FUNCTIONS AND ANXIETY IN HYPERTENSION VERSUS NON HYPERTENSION PATIENT UNDER SPINAL ANAESTHESIA DURING UROLOGIC SURGERY

S. Geze, F. Ak, B. Oktay, E. Erturk, Turkey

Background and aims: Regional anaesthesia is one of the commonly used anaesthetic methods in urological operations. Most of the patients want to be sedatized during surgery to decrease their anxiety. The purpose of this study is to evaluate effect of using continuous infusion midazolam on hemodynamic parameters, anxiety and early cognitive functions in patients undergoing urological surgery with and without hypertension under spinal anaesthesia.

Methods: 70 ASA I–II patients were enrolled the study. Patients were randomly assigned to two groups. Group I (n=35) included patient without hypertension, Group II (n=35) included patient with hypertension. In all patients spinal anaesthesia was performed with hyperbaric bupivacaine. In all groups intravenous midazolam infusions during operation. Systolic, diastolic, mean blood pressures, heart rate, respiratory rate and oxygen saturation were recorded before spinal anaesthesia and in five minutes intervals following spinal anaesthesia. Anxiety was evaluated with STAI, and cognitive functions were evaluated with MMT (Mini Mental Test) preoperatively and at the postoperative 15th and 60th. Side effects were recorded.

Results: There wasn’t significant difference among groups in terms of age, sex, height, weight, and ASA physical status. There wasn’t any statistical difference between groups of heart rate (p>0.05). Hemodynamic stability was seen in both groups regarding with blood pressure. Regarding to cognitive functions of the patients with hypertension, their MMT was reduced than normotensive patient in preoperative and early postoperative period. A significant difference was found between Group I and Group II preoperative, postoperative at 1 and 60. min respectively (p< 0.05). In both group postoperative cognitive function was similar to preoperative cognitive function.

Conclusions: Continuous midazolam infusion with spinal anaesthesia in hypertensive patients can be preferred since it provides a stable hemodynamics and it doesn’t damage postoperative cognitive functions.

272  EPIDURAL ANAESTHESIA - DOES ULTRASOUND PLAY A ROLE?

B. Krishnachetty, S. Wray

Background and aims: In the UK, according to the National Audit Project 3 (NAP3), around 707,000 central neuraxial blocks (CNB) are performed per year of which epidurals account for over 40%. This decade has seen an increased interest in the use of ultrasound to guide peripheral and central nerve blocks. The National Institute for Health and Clinical Excellence (NICE), in 2008, stated that ultrasound is safe and may be helpful in correct epidural placement. NAP3 has concluded that multiple attempts at CNB especially with bleeding, increases the risk of infection. Various research trials have shown to reduce the number of puncture attempts when ultrasound is used.

Methods: We conducted a postal survey targeting the obstetric specialty which is responsible for more than 50% of all epidurals. A questionnaire relating to the use of ultrasound was sent to all registered members (2,011) of the Obstetric Anaesthetists Association in the UK.

Results: We received 1092(54.3%) replies which were deemed suitable for analysis. Out of the 802 respondents who were aware of the NICE guidance, only 95 actually used ultrasound in their practice to aid epidural placement. Ultrasound guidance was used regularly by 508 respondents for peripheral nerve blocks and 923 for central venous access.

Conclusions: Although most surveyed considered that ultrasound should not be used routinely, they agree it would definitely have a role in difficult anatomy. As epidural success rates are high with conventional techniques, future studies would need to adequately powered, in order to claim a potential difference in efficacy.

273  INFLUENCE OF REGIONAL ANAESTHESIA ON POSTOPERATIVE RESPIRATORY FUNCTIONS AFTER LOWER-ABDOMINAL SURGERY

P.A. Lyuboshevskiy, A.V. Zabosov, A.M. Ovechkik, Russia

Background and aims: Respiratory postoperative disfunction is a rather frequent problem, especially after abdominal surgery. The aim of study was assessment the influence of neuraxial anaesthesia on respiratory functions and frequency of pulmonary complications in major lower-abdominal surgery.

Methods: 120 patients were randomized to receive either general anaesthesia (group G, n = 40) or general with epidural anaesthesia (group GE, n = 40) or general with spinal anaesthesia (group GS, n = 40). Post-operative analgesia was provided by i.m. tramperidine and ketorolac in injections in groups G and GS or by epidural infusion of 0.2% ropivacaine+fentanyl 2 µg ml⁻¹and i.m. ketorolac in group GE. We investigated the course of anaesthesia and the period of postanaesthesia adaptation, postoperative pain relief, spirometric parameters, and arterial blood gases.

Results: In groups GE and GS decrease in the charge of opiates, anaesthetics and muscle relaxants was accompanied by faster postanaesthesia adaptation, restoration of spontaneous breath and extubation. The quality of pain relief was considerably higher in group GE. Significant decrease in spirometric parameters was marked in the postoperative period in all groups; however, it was less expressed in group GE. The index of a peak expiratory flow correlated with intensity of a postoperative pain. Blood gases after surgery remained within normal values and did not differ between groups. Frequency of respiratory complications did not differ between groups.

Conclusions: Both spinal, and continuous epidural anaesthesia accelerate postanaesthesia adaptation, however only epidural analgesia improves spirometric parameters after lower-abdominal surgery that speaks the best pain relief.

274  COMPARISON OF SPINAL ANESTHESIA BETWEEN THE YOUNG AND THE ELDERLY PATIENTS


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Background and aims: As the changes of anatomy and physiology occur with the advancing years, clinical features may appear differently between the elderly and the young who received spinal anesthesia. This study was undertaken prospectively to compare the clinical aspects regarding the spinal anesthesia between the elderly and the young patients.

Methods: Starting in December, 2007, patients who underwent spinal anesthesia in our hospital were surveyed over a period of a year. They were divided into the Young and the Elderly groups based with patients aged 65 years. Patients with neurological problems and C-section were excluded from the study. Quincke needle was used to all patients for puncture. Spinal anesthesia was administered with 0.5% heavy bupivacaine combined with fentanyl 10–20 mg. Intraoperative data and postoperative data on the day after surgery were collected. The patients were also asked about their general satisfaction with spinal anesthesia and whether they like to be under the spinal anesthesia again.

Results: Six patients among 1186 cases were excluded from the study because of spinal anesthesia failure. Total number of patients were divided into the Elderly group (n=367) and the Young group (n=813). The rate of more than three puncture attempts was statistically higher in the Elderly group (15.5%) than the Young group (6.0%). There were no statistical differences of periorperative data between the two groups. The satisfaction rate of the spinal anesthesia was 96.2% and 96.5%, respectively. The rate to expect spinal anesthesia in the future was 96.4% and 97.5%, respectively.

Conclusions: Although the elderly patients had more puncture attempts than the young patients, the rate of other complications were similar between the two groups. The most of the elderly patients also satisfied with the spinal anesthesia and wanted to have it again in the future.

275

ANTI-NEUROGENIC PAIN EFFECTS OF THYME OIL (THYMUS VULGARIS L.) IN MICE

A. Eidi, A. Nesabi, A. Haeri Rohani, M. Eidi Iran.

Background and aims: Herbal medicine has been used for many years by different cultures around the world for the treatment of diabetes. The antinociceptive effect of thyme (Thymus vulgaris L.) essential oil was investigated in adult male NMRI mice.

Methods: Antinociceptive activity was studied using formalin and hot plate tests in mice. The thyme oil (0.1, 0.2 and 0.3 ml/kg body wt.) was administered intraperitoneally. The control group was intact.

Results: The present data showed that the thyme oil decreased both phases of formalin-induced pain. In hot plate test, thyme oil raised pain threshold during 60 mins in mice.

Conclusions: It could be proved that this plant has antinociceptive effect on mice but more works are required to be done in order to elucidate the mechanism(s) involved in antinociceptive effects of the Thymus vulgaris L. oil.

276

THE EFFECTS OF INTRATHECAL FENTANYL ON BIS SCORES AND PROPOFOL CONSUMPTION BETWEEN AGES 55–70 AND 71–85

N. Bakam, M. Ozdemir, Y. Yanli, O. Tuzun, Turkey.

Background and aims: Neuromaxx anesthesia with fentanyl has been reported to reduce sedative requirements. In this study, we aimed to compare the effects of fentanyl used with intrathecal local anesthetics on BIS scores, propofol consumption, recovery times.

Methods: Sixty-eight patients (55-85age) undergoing lower extremity surgery were included. Patients divided into four equal groups; GroupL55–70 (%0.5levobupivacaine2ml+25g fentanyl), GroupLF71–85 (%0.5levobupivacaine2ml+25g fentanyl), GroupF55–70 (%50.5levobupivacaine2ml+25g fentanyl), GroupLF71–85 (%50.5levobupivacaine2ml+25g fentanyl). Haemodynamic parameters (HR, MAP), SpO2, nasal ETCO2 and BIS were monitored. Five minutes after spinal anaesthesia, propofol bolus (1mg.kg -1) dose was injected intravenously and infusion (1mg.kg -1h -1) was started. The infusion dose titrated to maintain the BIS values between 70–85.

Results: There wasn’t any difference among BIS scores of levobupivacaine and levobupivacine-fentanyl groups in 55–70 and 71–85 ages (p>0.05) (except for levobupivacaine groups in 40th and 105th min.)(p< 0.05). The propofol consumption of the 71–85 ages was less than 55–70 ages both Group L and Group LF (Group L at 75th, 90th min. and Group LF at 20th, 90th, 135th min.)(p< 0.05). There is no difference between total and the other measured times propofol consumption and recovery times in all ages of levobupivacaine and levobupivacine-fentanyl groups (p<0.05).

Conclusions: It is reported that the fentanyl and higher doses of local anesthetics decrease the propofol doses and BIS values. In our study, we didn’t find significant difference on BIS scores and propofol consumption while comparing GroupL(55–70 and 71–85) and GroupLF(55–70 and 71–85). We thought that this result depends on levobupivacaine high doses in levobupivacine group. Additional studies are needed in this topic.

277

MANAGEMENT OF A CASE OF ACUTE BACLOFEN WITHDRAWAL SYNDROME FOLLOWING INTRATHECAL PUMP FAILURE

S. Raghavan, D. Hartmann, G. Gillespie

Background and aims: Intrathecal baclofen pumps have been used effectively to treat severe spastic disorders. Baclofen withdrawal syndrome is a rare but potentially life threatening condition. We report baclofen withdrawal due to a software programming error leading to pump failure.

Methods: A 45 year old lady suffering from spina bifida and severe lower limb spasticity was managed successfully for six years with intrathecal baclofen via a Medtronic SynchroMed EL pump. She presented to the hospital with increase in spams 48 hours following sounding of a pump alarm. Interrogation of the pump was not possible because the pump had stopped working.

Results: A diagnosis of acute baclofen withdrawal was impending but a pump was not readily available for emergency implantation. She then became sweaty and tachycardic and developed severe muscle rigidity but with no signs of sepsis. She was managed medically in a high dependency unit with intravenous midazolam and oral baclofen, dantrolene and tizanidine. An intrathecal pump was implanted on the fourth day and baclofen commenced after administration of a bolus dose resulting in resolution of symptoms.

Conclusions: Acute baclofen withdrawal can be life threatening. Clinicians dealing with patients receiving intrathecal baclofen should be aware of the symptoms and signs of withdrawal. Centres offering intrathecal baclofen services should have protocols for management of baclofen withdrawal and also have standby pumps and catheter kits available for emergency use at all times. Patients and carers must be educated to recognise baclofen withdrawal symptoms and pump failure alarms and seek help promptly.
Results: The patient had complete bilateral sensory block and was pain free receiving only 4.0g paracetamol until discharge 36 hours postoperatively.

Conclusions: Using ultrasound guidance and a combined single shot and titrated low dose catheter technique bilateral interscalene blockade was safely performed in a respiratory competent patient undergoing bilateral shoulder arthroscopy.

279 ANAESTHETIC MANAGEMENT OF A MедICALLY CHALLENGING PATIENT FOR ELECTIVE LAPAROSCOPIC CHOLECYSTECTOMY - A CASE REPORT
M. Sivakumar, P. Balaji, P. Lanka, P. Jain

Laparoscopic cholecystectomies are normally performed under general anaesthesia. But there are few case reports and research studies of laparoscopic cholecystectomies being performed under regional anaesthesia. We are here to report one medically challenging patient who underwent successfully a laparoscopic cholecystectomy under combined spinal epidural anaesthesia (CSE) in our hospital recently.

A 69 year old lady was scheduled for elective laparoscopic cholecys-
tomy. Her past medical history includes severe chronic obstructive pul-
monary disease with FEV1 of 0.83Litre, atrial fibrillation and ischemic heart disease with two episodes of previous myocardial infarction. She also had multiple non-malignant pulmonary nodules on her CT chest. Her exercise tolerance was 7–10 yards (20 – 30 feet).

She had combined spinal epidural anaesthesia at L1/L2 Level. We controlled the pressure of the pneumoperitoneum carefully during surgery using intraoperative mild sedation and low inflation pressure to ensure adequate diaphragmatic excursion.She was comfortable throughout surgery.

Patients receiving this technique must be assessed very carefully and managed by anaesthetists with considerable experience of regional anaesthesia. A combined spinal-epidural (CSE) block was chosen because of personal familiarity, reliability and control of the level of anaesthesia which minimised the amount of sedation required intraoperatively. By doing this surgery under central neuraxial block we successfully avoided the complications associated with the general anaesthesia and unexpected admission to intensive care unit because of severe cardio-respiratory dysfunction.

References:

280 SPINAL EPIDURAL ABSCESSES FOLLOWING EPIDURAL ANALGESIA IN AN OBSTETRIC PATIENT: REPORT OF A RARE CASE
A. Kazanci, İ.H. Tekkők, Turkey.

Background and aims: Epidural abscess is a rare but potentially serious complication of epidural anesthesia with an overall incidence of 0.2 to 2 per 10,000 hospital admissions per year and may cause significant disability if not diagnosed and treated promptly.

Methods: A 33-year-old woman was admitted to our department with back pain and difficulty standing upright. Past medical history included a recent caseran section (C/S) with epidural analgesia. Further questioning revealed that she was discharged on the second post partum day with the epidural catheter at the 30th min of epidural anesthesia. But there are few case reports and research studies of laparoscopic cholecystectomies being performed under regional anaesthesia. We are here to report one medically challenging patient who underwent successfully a laparoscopic cholecystectomy under combined spinal epidural anaesthesia (CSE) in our hospital recently.

She had combined spinal epidural anaesthesia at L1/L2 Level. We controlled the pressure of the pneumoperitoneum carefully during surgery using intraoperative mild sedation and low inflation pressure to ensure adequate diaphragmatic excursion.She was comfortable throughout surgery.

Patients receiving this technique must be assessed very carefully and managed by anaesthetists with considerable experience of regional anaesthesia. A combined spinal-epidural (CSE) block was chosen because of personal familiarity, reliability and control of the level of anaesthesia which minimised the amount of sedation required intraoperatively. By doing this surgery under central neuraxial block we successfully avoided the complications associated with the general anaesthesia and unexpected admission to intensive care unit because of severe cardio-respiratory dysfunction.

References:

281 CASE REPORT: INFECTIVE SACROILIITIS FOLLOWING SACROI LIAC RADI O FURO NEURO TOMETRY WITH THE SIMPLICITY III ELECTRODE
W.E. Rea, S. Kapur, H. Mutagi

Background and aims: Radiofrequency neurotomy of nerves supplying the sacroiliac joint is an accepted treatment for sacroiliac joint (SIJ) syndrome as a cause of low back pain. Complications are rare, occurring at a frequency of less than 1%, and are usually self limiting.

The Simplicity III electrode (Neurotherm, Wilmington, USA) enables multiple bipolar strip lesions of the lateral branches of the SI-3 roots to be made via a single insertion point. This, in theory, reduces the risk of post-operative complications.

Methods: We present the case of a male patient who developed staphylo-coecal bacteremia as a complication of radiofrequency neurotomy using a Simplicity III electrode. MRI pelvis confirmed the presence of an SI effusion consistent with infective sacroilitis together with evidence of osteomyelitis within the ilium.

We report that the patient made a full recovery but only after a prolonged course of antimicrobial therapy.

Conclusions: Correct placement of the Simplicity electrode requires that close proximity to the posterior sacrum be maintained. We believe that this may result in small breaches of the peristeum. There is also a distinct possibility of breaching the posterior SIJ capsule, traversing the posterior SIJ space.

Infective sacroilitis with secondary osteomyelitis is a rare but serious complication of sacroiliac neurotomy with the Simplicity III electrode. Meticulous placement of the simplicity probe may reduce this rare complication.

282 NON INVASIVE VENTILATION TOGETHER WITH EPIDURAL ANAESTHESIA FOR AN EMERGENCY CHOLECYSTECTOMY OPERATION IN A SEVERE CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENT
S. Yurtlu, B. Koksal, V. Hanci, O. Ozkocak Turan, Turkey.

Introduction: Experience with intraoperative non invasive mechanical ventilation (NIMV) is limited. In this report we present use of thoracic epidural anaesthesia together with NIMV for an emergency upper abdominal surgery of a patient suffering from severe chronic obstructive pulmonary disease (COPD) Written informed consent has been obtained from the patient.

Case: 46 years old male patient with a history of severe COPD had been preoperatively consulted to anesthesia team for an emergency cholecystectomy. He was using NIMV device at home for a year, together with his inhaler drugs. He had bilateral rales, rhonchi on auscultation, respiratory rate was 24. Peripheral oxygen saturation was 74%. Arterial blood gas analysis revealed pH 7.37 pO2 41 mmHg pCO2 49 mmHg while having 2 lt.min O2 support. Thoracic epidural anesthesia was initiated through an epidural catheter placed between T8-9 interspace, upper level of sensory block was adjusted to be at T4. NIMV at bilevel positive airway pressure mode with a IPAP 25, EPAP 6 cm H2O setting was used throughout the procedure; at the 30th min of NIMV he had pH of 7.39, pO2 48, pCO2 42 mmHg on arterial blood gas analysis. NIMV continued after the procedure and he was discharged from ICU at the 3rd and from the hospital at 5th post-operative day.

Discussion: Intubation increases pulmonary complications in COPD patients. In this patient combined use of epidural anesthesia and NIMV prevented intubation and possible pulmonary complications. We conclude that this combination should be considered in similar cases.

283 CONTINUOUS SPINAL ANAESTHESIA IN A CENTENARIAN PATIENT
S.E.T. Alves, O. Pereira, C. Teixeira, P. Lemos, Portugal.

Background and aims: The anaesthesia of elderly patient present additional challenges, demanding an anaesthetic plan that minimizes the surgical stress response thus diminishing the perioperative morbimortality.

E190

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A 105 year old female, ASA physical status III, 1.45 m and 45 kg, was admitted for trochanteric fracture repair. As comorbidities she presented heart failure (NYHA II) and atrial fibrillation.

**Methods:** The anaesthetic plan included a continuous spinal anaesthesia with bupivacaine 0.5% for an open reduction with internal fixation of a trochanteric fracture.

**Results:** After a femoral nerve block for analgesia a spinal tapping was carried out in the midline approach at the L4-L3 space (right lateral decubitus).

Multiple boluses of bupivacaine in a total of 7.5 mg were initially administered, being necessary to add 2.5 mg one hour after.

A satisfactory spinal block was achieved up to the T10 level in the dependent side. The patient remained in the lateral decubitus position until surgical positioning.

During the procedure the heart rate, noninvasive blood pressure and oxygen saturation remained within normal range.

After the surgery of 3 and half hours, which ended with a hemi-arthroplasty, the patient was transferred to the Post Anaesthetic Care Unit for surveillance.

Postoperative pain was controlled with intravenous paracetamol and tramadol. Discharged uneventfully from the hospital on the 15th postoperative day.

At sixth postoperative month the patient was alive, however with reduced mobility.

**Conclusions:** We present a case report of a continuous spinal anaesthesia in a centenarian patient with subsequent outcome. The anaesthetic choice provided a satisfactory analgesia and hemodynamic stability in our patient.

The continuous technique offers advantages over the single shot technique: titration of local anaesthetics agents via a subarachnoid catheter minimizing the hemodynamic consequences of spinal anaesthesia and allows multiple bolus or continuous administration in a prolonged surgery.

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### 284

**CAESAREAN DELIVERY AND EXIT PROCEDURE FOR THE MANAGEMENT OF A LARGE FETAL NASOPHARYNGEAL TERATOMA UNDER COMBINED SPINAL EPIDURAL ANAESTHESIA**

H. Alfoudri, L. Mlechkova, D. Almatrook &

**Background:** A number of case reports have been published in the literature describing the use of an EXIT (EX Utero Intrapartum Treatment) procedure during cesarean section (CS). The EXIT procedure involves partial delivery of the fetus where its upper half is exteriorised while the torso remains in the uterus with an intact placenta allowing fetal surgery to be performed. Most EXIT procedures are performed under deep general anaesthesia (GA) which allows uterine relaxation through inhalational agents. However, we report this case of an EXIT procedure performed successfully under combined spinal epidural anaesthesia (CSE).

**Method and Results:** A 33 years old pregnant woman presented for an elective CS and an EXIT procedure to manage a large fetal orofacial mass. The procedure was performed under CSE which was achieved with 2.5mls intrathecal 0.5% heavy bupivacaine with 25mcg fentanyl and an epidural catheter sited to allow further topups. A dense neuroaxial blockade was established reaching T4 dermatome. Delivery of the fetal head and thorax was achieved through a Pfannenstiel incision. Intraoperative (IV) nitroglycerin was not required as the uterus was sufficiently relaxed. Examination of the baby revealed a large 10 x 10cm mass protruding from the mouth.

The fetal airway was secured with a tracheostomy and a live female was delivered postoperatory vigilance and familiarization of the surgeon with this analgesic technique.

**Conclusions:** Because the lack of experience with the TAP block, a bibliographic research was performed, without any explanation why the local anaesthetic wasn’t absorbed after 5 days, and the probable explanation was that it was deposited between fascias.

Therefore, we conclude that the diagnostic mistake was led by the lack of postoperative vigilance and familiarization of the surgeon with this analgesic technique.

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### 286

**TAP BLOCK LEADING TO A DIAGNOSTIC MISTAKE - A CASE REPORT**

D. Castro, C. Fernandes, P. Leião, M. Pacheco da Fonte, L. Gomes, Portugal.

**Background and aims:** The transversus abdominus plane block (TAP) has gained a new notoriety in abdominal wall analgesia with the ultrasound-guided technique.

**Methods:** This report shows a case of diagnostic mistake in the fifth day after a TAP Block was made, which conditioned a second surgical intervention in a patient.

**Results:** A 20 years old female patient, with a diagnosis of acute appendicitis was proposed to appendectomy. A TAP block was performed with ultrasound-guided technique and a total of 20 ml of ropivacaine 0.375% was injected. In the recovery room, no rescue analgesia was necessary. After 48 hours, asymptomatic and apyretic, was discharged home. In the 5th postoperative day she visited the Emergency Department complaining of abdominal pain. She had fever and leukocytosis. An abdominal ultrasound reported a collection of a laminar liquid in the right flank of the abdominal wall, next to the surgical wound. Highly suspicious of an operatory wound abscess, the patient was reoperated, with the drainage of a clear, transudate liquid. A sample sent to microbiological culture turned negative. In the immediate postoperative period, the diagnosis of an acute amigdalitis was performed.

**Conclusions:** Then specific anaesthetic considerations in this syndrome are discussed.

Regional anaesthesia and analgesia is feasible method of perioperative management in this rare disease.

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### 287

**ULTRASOUND-GUIDED SUPRASCAPULAR NERVE BLOCK. A TECHNIQUE THAT DOES NOT DEPEND ON THE SUPRA SCAPULAR NOTCH**

M. Beleil, A. Kibeida, D. Harmon, Ireland.

**Background and aims:** Nerve entrapment due to arthritis and degenerative disease is amongst the most difficult to treat. Suprascapular nerve entrapment is one of those conditions that can be crippling and can diminish quality of life significantly. Nerve block offers great relief in these conditions and is known to greatly improve quality of life. The block is classically done under CT guidance or via a blind technique using anatomical landmarks. In
this report we document a new guidance method much simpler than CT guidance and much more reliable than blind methods. It describes an ultrasound guidance technique which has not been reported previously. Our technique avoids the difficulty of having to identify the suprascapular notch. Huge variability in this structure has been reported.

**Methods:** The case was 62 years old lady who had been suffering from bilateral shoulder pain and tenderness for 2 years that did not respond to more conservative measures. Suprascapular nerve block in this lady was done under aseptic conditions using a portable ultrasound scanner and a curvilinear transducer (4-5MHz (SonoSite Micromaxx SonoSite, Inc. 21919 30th Drive SE Bothwell W. A.). The transducer was placed in a transverse orientation over the base of the neck to identify the clavicle anteriorly and the suprascapular fossa posteriorly. The suprascapular fossa was traced laterally to the direction of the acromium and suprascapular notch. A 22G spinal needle was guided by real-time ultrasound imaging to the lateral aspect of the suprascapular fossa and 2.5% chirocaine and Triamcinalone was injected in the floor of the fossa. Doppler was used to avoid any intravascular injection.

**Results:** This provided pain relief for a period of 4 months and no complications were reported.

**Conclusions:** Ultrasound guidance is much simpler and more reliable and provides comparable pain relief.

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**288 FACILITATION OF DIAGNOSTIC AND PERCUTANEOUS TRIAL LEAD PLACEMENT WITH ULTRASOUND GUIDANCE FOR PERIPHERAL NERVE STIMULATION SUPRASCAPULAR NEURALGIA**

B. Bouché, E. Eisenberg, S. Narouze, M.K. Karmakar, M. Meignier, J. Lemarie France, USA, Hong Kong S.A.R.

**Background and aims:** Osteoarthritis with adhesive capsulitis or pain after multiple shoulder surgery or traumatic are intractable painful . Medications, nerve injections,radiofrequency ablation,pulsed radiofrequency modulation, surgical nerve transposition and SCS have been attempted as treatment options to treat usually nerve involved:suprascapular. We describe case 5 reports series Peri-Nervous Stimulation (PNS) with UltraSound (US) guidance in diagnostic and implantation for suprascapular neuralgia.

**Methods:** All treatment options were unsuccessful. The first step (regional test) is US guidance (Sonosite,M Turbo®) for perineurual undermining catheterization on implicated nerve. The US transducer locates the nerve in the suprascapular notch, depth beneath the transverse scapular ligament. If the test is successful (VAS<3), the second step is US guidance nerve localization for trial PNS. Under US visualization, the lead (Boston lead®) is placed as closed to the nerve. After the trial PNS, permanent peripheral stimulator is implanted (Boston®).

**Results:** Follow up on patients implanted is over 12 months. Prior to regional test and PNS implantation, pain scale (VAS) varies between 6 and 8/10. All decrease less than 2/10 by the end of the two trials. All no longer requires any pain medications and pain rates are 0 to 4/10 at 12 months follow up. Six patients who were working before neuralgias, return to work. No complications (infections, leads problems...) occurred.

**Conclusions:** US guidance is allows optimal placement of undermining catheter and stimulator leads, minimizing trauma and decreases both operative and post operative complications. US guidance has a important role for US guidance in localization of targeted nerve, suprascapular, in PNS trial.

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**289 SUPRASCAPULAR NERVE BLOCK IN CHRONIC SHOULDEN PAIN**


**Background and aims:** This is a retrospective study to assess the effectiveness of suprascapular nerve block to relieve pain and improve the range of movement in degenerative disease of shoulder.

**Methods:** We studied 104 patients, 33 men and 71 women aged 60.5±10.87, with chronic shoulder pain. The patients were in pain for a period more than 3 months and had functional disability due to degenerative disease. We performed suprascapular nerve block with 10 ml of levobupivacaine 2.5 mg/ml using anatomical landmarks and a nerve stimulator to determine needle placement. Thirty minutes later the patients had physiotherapy session. They were given instructions to do specific exercise for as long as the block lasted. A series of 4–6 suprascapular nerve blocks were performed to the patients. We recorded pain scores and range of movement. The follow up was 12 weeks.

**Results:** The success rate of the block was 99.5 %. There was significant improvement in all pain scores (pain at rest, at night and at movement) 90% in all patients. Pain VAS score was 2–3 occasionally, during the follow up. The range of movement improved 80–90% in all patients. There were no significant adverse effects in the patients due to the peripheral nerve block.

**Conclusions:** Suprascapular nerve block is an easy and safe method to perform with minimum side effects and very effective in the management of chronic shoulder pain, which is a common clinical problem.

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**290 FLUOROSCOPY GUIDED CERVICAL INTERLAMINAR STEROID INJECTIONS IN PATIENTS WITH CERVICAL PAIN SYNDROMES: A RETROSPECTIVE STUDY**

S.G. Beyaz, A. Tüfek, O. Tokgöz, H. Karaman, Turkey.

**Background and aims:** Epidural steroid injections are frequently used for relieving pain due to spinal pathologies and cervical pain syndromes. The objective of this retrospective study was to examine the efficacy of fluoroscopically guided cervical interlaminar epidural steroid injections (CILESI).

**Methods:** Sixty-five patients who received their first fluoroscopically guided CILESI over 12 months interval were retrospectively identified. Patients who had failed conservative non-surgical management and patients who were otherwise candidates of surgery were included in this trial of CILESI. The verbal numerical rating scales (VNRS) before the treatment, within one hour after the treatment and upon follow-up were analyzed.

**Results:** The most preferred intervention level of CILESI was C5-C6. There was a statistically significant improvement in the VNRS scores from before the injection to immediately after the injection, and upon follow-up. Fifty-one patients (80%) had perfect/good scores. No major complications were encountered after CILESI, but one patient had (1.54%) vasovagal reaction and another 1 patient had (1.54%) transient increase of pain after injection.

**Conclusions:** Fluoroscopy guided CILESI is a safe and effective means of treating patients with cervical pain syndromes. The success rates show that a large percentage of the patients may obtain relief from radicular symptoms and avoid surgery for the follow up period up to 12 months.

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**291 DO SMALL BURNS MATTER?**

G. Camilleri, R. Griffiths

**Background:** Few studies have examined the prevalence of neuropathic pain in patients following burns. Previous studies were performed mostly in patients with large total body surface area (TBSA) burns and identified a prevalence of sensory disturbance of 71% and 82% and pain of 36%, 35% and 52%. We wished to explore the prevalence of neuropathic pain in patients with small (≤ 5%) TBSA burns and the impact of this injury.

**Methods:** A descriptive, cross-sectional study was designed to examine the prevalence of neuropathic pain more than 6 months following injury. Fifteen consecutive patients with ≤5% TBSA burn were sent a DN4 Neuropathic Pain Questionnaire to elicit the diagnosis of neuropathic pain. Patients also commented on whether the neuropathic pain affected normal daily activities. Size, depth and location of the burn were obtained from the medical notes.

**Results:** 9 patients (60%) completed a DN4 questionnaire 6 months after their injury. Average TBSA burn was 1.5%. 44% developed neuropathic pain
at 6 months although none reported any interference with normal daily activities. No obvious associations were found between size, depth or aetiology of burn and development of neuropathic pain. 

**Conclusions:** Patients with small TBSA burns have a prevalence of neuropathic pain similar to patients with larger TBSA burns. However, daily activities were not inhibited in our study group. Further research into identifying the prevalence of chronic neuropathic pain following burns of different sizes and its impact on daily living is needed to help plan future pain management services for these patients.

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**SURGICAL SPINAL CORD STIMULATOR (SCS) LEADS VERSUS PERCUTANEOUS SCS LEADS IN THE TREATMENT OF NEUROPATHIC BACK PAIN SYNDROMES**

R. Raggi, P. Zenetos, R. Purdy, USA.

**Background:** Much debate exists as to which SCS modality is preferable in treating neuropathic back pain. In a 2000 study Villalvicencio et al, concluded that surgical leads provided better long term effectiveness. Other articles by Kumar et al and Henderson et al established that the main complication with SCS therapy clearly was lead migration. The Conventional thinking within the SCS implanting community is that surgically implanted leads are far less prone to lead movement, while another common belief is that surgical leads provide improved parasthetic coverage when treating back pain. Recent advances in the construction of both surgical and percutaneous leads as well as anchoring systems for these leads have helped to improve pain relief and reduce revisions due to lead migration.

**Methods:** Retrospective study. Evaluation of patient subsets who have been treated with both percutaneous and or surgical leads. The parameters evaluated include overall pain relief, complications, and revision rates.

**Results:** Pain Reduction in Surgical lead group

- 16/16 >50% pain reduction
- 11/16 >60% pain reduction
- 9/16 >70% pain reduction
- 4/16 >80% pain reduction
- 1/16 >90% pain reduction

Pain Reduction in Percutaneous lead group

- 9/10 >50% pain reduction
- 7/10 >60% pain reduction
- 6/10 >70% pain reduction
- 2/10 >80% pain reduction
- 0/10 >90% pain reduction

**Conclusions:** Surgical leads are less prone to movement and to reprogramming. This does not mean that percutaneous leads are not of use. Interesting to note that overall pain reduction was not influenced by lead type.

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**PARAVERTEBRAL BLOCK WITH METHYLPRIDNISOLONE FOR MANAGEMENT OF CHRONIC PAIN AFTER CHOLECYSTECTOMY**

O.Y. Cok, H.E. Eker, S. Akin, A. Aribogan, Turkey.

**Background and aims:** Persistent pain occurs in many patients after cholecystectomy. However, the pathogenesis and risk of chronic pain after cholecystectomy are unknown and the treatment modalities may vary in success. Here, we present successful use of paravertebral block with methylprednisolone for management of chronic pain after cholecystectomy.

**Case:** A sixty years old female patient was referred to pain clinic due to a dull, aching-like, continuous but severe and persistent unilateral pain localized to the right side of the upper abdomen at the site of cholecystectomy that she underwent 7 years ago. Her pain was initiated two years ago and was resistant to non-steroidal anti-inflammatory drugs and opioids and exacerbated by activity. Her initial pain was assessed as 9 by numeric rating scale (NRS) for pain where 0 represented “no pain” and 10 represented “the most severe pain”. Consultation with general surgery department and radiologic and laboratory examinations revealed no any other pathology and she was otherwise healthy. We performed a diagnostic paravertebral block with 20 mL levobupivacaine 0.25% at Th-8 level and after confirming pain relief up to 70%, the block was repeated with levobupivacaine %0.25 and methylprednisolone 80 mg. The patient’s NRS was 2 for the following 4 months.

**Conclusion:** We suggest that patients with unexplained and resistant pain following cholecystectomy may benefit from paravertebral block with methylprednisolone when medical treatment fails to provide successful pain relief.

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**CT-GUIDED TRANSSACROCOCCYGEAL NEUROABLATION OF THE GANGLION IMPAR FOR CANCER-RELATED PELVIC AND PERINEAL PAIN**

H.M.F. Anwer, Egypt.

**Background and aims:** Ganglion impar neuroablation has been used as an effective treatment for pain in the perineal area associated with malignancies. Of the various techniques utilized to block the ganglion impar, the transsacroccygeal approach is the most direct and therefore has acquired popularity. Fluoroscopy is the usual radiological aid used during this technique. We performed our study to evaluate the role of computed tomography (CT) in needle placement during the transsacroccygeal approach for ganglion impar block as well as the efficacy and safety of the procedure in relieving cancer-related pelvic and perineal pain.

**Methods:** After successful diagnostic block with bupivacaine, CT guided ganglion impar neurolysis (using absolute alcohol), through the transsacroccygeal approach, was performed for 14 patients suffering from intractable pelvi-perineal pain due to colorectal cancer (8 patients) and cancer prostate (6 patients). Pain relief was assessed 1 hour, 1 week and one month after the neuroablation.

**Results:** The technique was successful with accurate needle placement in all the patients. Five of the patients had almost complete pain relief and 9 had partial but satisfactory pain relief. No major complications were seen in our patients.

**Conclusions:** CT-guided neuroablation of the ganglion impar results in a significant reduction of pain in the perineal area associated with malignancies. CT guidance provides detailed image that may increase accuracy and safety.

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**QUALITATIVE EXPLORATION OF THE EXPERIENCE OF SPINAL CORD STIMULATION**

E. Sparkes, R.V. Duarte, E. Denny, R.L. Ashford, J.H. Raphael

**Background and aims:** Psychological factors surrounding spinal cord stimulation (SCS) are commonly investigated using questionnaires, although the information provided by these is limited. The aim of this study was to...
explore psychological factors influencing the experience and outcome of SCS through a qualitative approach.

Methods: Semi structured interviews were carried out 1 year post SCS implantation. Thirteen participants (6 male, 7 female) were recruited via a pain management clinic. Eight participants reported ≥50% pain relief, 5 < 50%. Interviews were recorded and transcribed verbatim. Thematic analysis was carried out by 2 independent researchers.

Results: Two core themes emerged: coping and pain, and SCS treatment. Coping and pain included feelings of helplessness, being controlled by pain, frustration and anger, responsibility for pain relief and acceptance of pain. Maladaptive coping strategies including helplessness and activity avoidance in response to pain were described almost unanimously. SCS treatment described information provision, a desire for expert patients, independence/recovering control and unexpected experiences (body image and SCS trial). SCS trial was associated with feelings around a lack of recognition for the uncomfortable experience encountered.

Conclusions: This study provides a context for understanding the experience of SCS from the patient’s perspective. In addition the findings contribute to the practical implications for preparation for SCS. Although SCS was described in relation to regaining independence and control, other aspects: access to information, expert patients, health professional relationships and uncomfortable SCS trial alongside body image factors need further consideration when preparing patients for SCS therapy.

296 ANALGESIC AND ANTI-INFLAMMATORY EFFECTS OF CHAMOMILE (MATRICARIA CHAMOMILLA L.) IN MICE


Background and aims: Chamomile (Matricaria chamomilla L.) is a well-known medicinal plant species from the Asteraceae family. Chamomile has been reported to exhibit antiseptic, healing, stimulative, carminative, spasmylytic and sedative activities. Since chamomile has been recommended in the literature as a remedy for the alleviating of pain, it was considered worthwhile to investigate the antinoceptive and anti-inflammatory effects of chamomile ethanolic extract in adult male NMRI mice.

Methods: Antinociceptive activity was done using formalin, hot plate and writhing tests. The effect of chamomile ethanolic extract on acute inflammation was studied by ear edema-induced by xylene in mice. The chamomile ethanolic extract (5, 10 and 50 mg/kg body wt.) was injected intraperitoneally. The control group was administrated with saline.

Results: The results showed that the chamomile ethanolic extract decreased only second phase of formalin-induced pain. In hot plate test, the chamomile ethanolic extract did not raise pain threshold during 60 min. The chamomile ethanolic extract exhibited antinociceptive activity against writhings-induced by acetic acid. In xylene ear edema test, chamomile ethanolic extract showed significant activity in mice. Conclusions: The present data indicated that the plant has antinociceptive and anti-inflammatory effect on mice and the plant should be considered in future therapeutic researches.

297 UNRECOGNISED SUBDURAL PLACEMENT OF AN EPIDURAL CATHETER

C. Makura, R. Thukrar, C. Bhamarasetty, D. Marks

Background and aims: Subdural placement of an epidural catheter is rare. We report a case of unrecognised subdural placement of an epidural catheter presenting with unusual symptoms.

Methods: A posterior fusion of L5/S1 was performed on a 58-year-old woman with L5/S1 grade 1 spondylolysis. An epidural catheter placed surgically as routine through microlaminotomy, was noted to have been passed with slight difficulty. An epidural bolus of 10mls ropivacaine 0.2% was followed by an infusion of bupivacaine 0.125% at 10mls/hr, which was stopped two hours later when the patient complained of numbness of her right index finger, thumb and anterior aspect of her right thigh. Examination revealed a sensory deficit in the right C6/7 dermatome, and a marked deficit in the L2 myotomes bilaterally. Rapid resolution of the symptoms prompted recommencement of the epidural infusion. Fourteen hours later, the patient again complained of significant numbness of her right thigh. The epidural catheter was removed. Examination revealed a new onset left-sided L2 myotome motor deficit.

Results: (MRI)

Extradural collection at L2 (MRI performed 19 hours after cessation of the epidural infusion). Examination two hours after the MRI revealed complete recovery of normal neurology.

Conclusions: A pool of local anaesthetic from an unrecognised subdural catheter, and not a haematoma, caused unusual neurological symptoms which resolved rapidly.

References:

298 DELAYED ONSET PARAPARESIS AFTER EPIDURAL ANALGESIA

R. Sundararatnam, W. Notcutt

Safety profile of peri-operative epidurals were shown to be inferior among neuraxial blocks. We present a case of neurological damage, happened after a peri-operative epidural.

82 years old lady was scheduled for elective open cholecystectomy and incisional hernia repair. Her co-morbidities included; MI and fully recovered CVA; she was independent and self caring. Under GA, epidural was inserted at T7/8 space on first attempt. There were no intra-operative complications. Post-operative recovery was uneventful apart from back pain. Epidural site was non-tender, dry and she was apyrexial with no motor problems. She was discharged home 3 weeks post-op. with mobilising frame.

One year later, she presented with recurrent falls, bilateral reduced vibration and proprioception below T8, reduced lower limb reflexes and spastic gait. MRI spine showed cystic collections at T6-9, dorsal to the cord with compression. Consultant radiologists and neurologists speculate that this was due to epidural induced arachnoiditis. There was no spinal trauma, surgery, stenosis and disc disease. Repeat MRI after 6 months showed no progression. No surgical treatment was advocated by neurosurgeons due to her age and probable poor outcome. She is currently wheel chair bound.

This is the first post-thoracic epidural induced non- adhesive arachnoiditis. Very few arachnoiditis following CNB were reported. In most, etiology...
was unclear. In our patient, subdural haematoma induced arachnoiditis was suspected by the neurologists. Anaesthetists need to be aware of this delayed onset and dreadful neurological complication following CNBs.


299
UNINTENTIONAL INTRAVASCULAR INJECTION OF LOCAL ANAESTHETIC UNDER ULTRASOUND GUIDED REGIONAL ANAESTHESIA: A REVIEW OF PUBLISHED CASES


Background and aims: In spite of ultrasound ability to visualize vascular structures, needle advancement and local anaesthetic (LA) spread, cases of local anaesthetic systemic toxicity (LAST) are still reported during ultrasound guided blocks. Therefore, we reviewed published reports of unintentional intravascular injection of LA during ultrasound guided blocks whether led to LAST or was early detected, in order to identify the possible factors as well as the reliable surrogates that can help in early detection and LAST prevention during US technique.

Methods: Using medical literature search engines, the search included reports published from January 2001 to 2011. Cases were analyzed with respect to needle approach, block type, and surrogates of intravascular injection.

Results: Search revealed eight relevant reports of accidental intravascular injection of LA that led to LAST in four cases and was early detected in the remaining cases. Axillary block was the most involved approach (50% of reports). Accidental injection into compressed veins was more common than intraarterial injection. All cases of intraarterial injection were early detected; however, all LAST cases were precipitated by intravenous injection. In-plane needle approach was used in 5 cases vs. 3 out-of-plane approach. Nerve stimulation was used in combination with ultrasound in five cases, three of them presented with LAST. Aspiration was an unreliable surrogate (100% false negative). Surrogates of intravascular injection included failure to visualize LA spread, visualizing the needle inside the vessel after probe release, visualizing a blush inside the artery and absence of response to nerve stimulation when additionally used.

Conclusions: Venous compression by ultrasound probe and failure to visualize needle tip make accidental intravascular injection possible with ultrasound technique. Ultrasound can increase safety, minimize LAST incidence and help in early detection provided acquiring proper skills and following reliable surrogates of intravascular injection that don’t include aspiration.

300
INFRARED THERMOGRAPHY AND SKIN CONDUCTANCE FOR ASSESSMENT OF PERIPHERAL NERVE BLOCK BEFORE AND DURING SEDATION

J.Y. Kazansky, V. Kulin, J. Mercier1,2, L. Bjertnaes1,2, Norway.

Background and aims: Skin conductance fluctuations (SCF) in awake conditions and Infrared thermography (IRT) during deep sedation have not been used for peripheral nerve block (PNB) assessment. We have made comparison of clinical pinprick/cold sensation (PS) with IRT and SCF for PNB assessment in awake condition before sedation and evaluation of IRT for PNB assessment during deep sedation.

Methods: Twelve ASA I–II adults requesting deep sedation, scheduled for elective wrist/hand surgery. Blocks were performed using an ultrasound guided sagittal infraclavicular approach. Four points (TPs) were used: TP1 (10-min before PNB), TP2 (30-min after PNB), TP3 (before sedation), TP4 (during deep sedation prior to surgery). Clinical evaluation (scale: presence (1) & absence (0) of sensation & muscle control). Mean dorsal hand skin temperature (Tmsk) calculated from IRT were carried out in blocked and unblocked arms at all TPs. SCF were made at TP1 & TP2.

Results: Clinical evaluation: 1 (one patient), 0 (11 patients). At TP1 there was no difference in Tmsk between blocked and unblocked hands (33.2°C & 33.0°C respectively). The change in Tmsk at TP2 was (+0.9°C & −1.8°C respectively). The difference in Tmsk between blocked and unblocked hands compared to TP1 was also evident at TP3 (+1.2°C & −3.1°C respectively) and at TP4 (+1.3°C & −1.8°C respectively). SCF always responded to PS in unblocked hands at TP1 & TP2. At TP2 SCF responses were insignificant in blocked arms in 10 patients.

Conclusion: PNB can be assessed before sedation by SCF and by IRT during sedation.

301
BUPRENORPHINE ADDED TO LEVOBUPIVCAINE ENHANCES POSTOPERATIVE ANALGESIA OF MIDDLE INTERSCALENE BRACHIAL PLEXUS BLOCK

A.U. Behr, U. Freeo, C. Ori, B. Westermann, F. Alemanno, Italy.

Background: Recently, we described a new, middle interscalene, brachial plexus block (MIB) that proved highly effective and safe. Many opioids have been used as adjuvants for nerve blocks, but their efficacy and optimal dose remain controversial. Aim of this study was to assess whether buprenorphine added to epineural levobupivacaine can enhance postoperative analgesia of MIB.

Methods: One hundred and fifty consenting adult patients scheduled for shoulder arthroscopic surgery, for a rotator cuff tear, under MIB with levobupivacaine 0.75% (29.5 ml), were randomized to receive additionally either saline (controls) or intramuscular buprenorphine (0.15 mg) or epineural buprenorphine (0.15 mg). Onset and duration of sensory and motor blocks and of postoperative analgesia, and consumption of postoperative analgesics were recorded.

Results: Demographic and clinical features were similar across groups. MIB with levobupivacaine alone yielded a postoperative analgesia of 637 ± 72 minutes (control); additional intramuscular and epineural buprenorphine prolonged (P < 0.05) postoperative analgesia of levobupivacaine MIB to, respectively, 820 ± 335 and 1049 ± 242 minutes. Duration of postoperative analgesia was significantly larger (P < 0.05) with epineural than with intramuscular buprenorphine which is consistent with a PNS site of action of buprenorphine. Further, intramuscular and epineural buprenorphine decreased (P < 0.05) postoperative analgesic requirements. Complications were few from MIB procedure (< 1%) and none from buprenorphine.

Conclusions: Added to levobupivacaine, buprenorphine enhances postoperative analgesia after MIB.

302
THE EFFECTIVENESS OF SUBCUTANEOUS INFILTRATION OF LOCAL ANAESTHETIC IN BLOCKING THE INTERCOSTOBRACHIAL NERVE


Introduction: A regional anaesthetic is an ideal choice for arterio-venous (AV) fistula. Proximal extension from the cubital fossa towards the axilla during AV fistula formation involves an area where sensation is partially provided by the intercostobrachial nerve (ICBN).1 The ICBN is not blocked by a brachial plexus technique and requires a separate “blind” injection. The success rate of this technique is unknown. The aim of this study is to determine the effectiveness of blocking the ICBN by subcutaneous infiltration along the axillary crease.

Methods: Having obtained ethics approval, 10 patients scheduled for brachio-cephalic arterio-venous fistula formation were recruited. Following a successful supravacular block (SCB), the area of normal sensation in the arm (corresponding to ICBN distribution) was mapped. An ICBN technique was performed with subcutaneous infiltration of 0.5% bupivacaine along the axillary crease.

Results: ICBN Block was successful in 80% of the cases. Block onset time ranged from 5–20mins with a median time of 12.5mins. Only one patient required local anaesthetic supplementation intraproactively with no patient requiring general anaesthesia. Two patients developed bruises which resolved without long-term complication. The sensory distribution of the ICBN was variable with the area extending as distal as the medial epicondyle in some patients.

Conclusion: Given its variable distribution, this study suggests it should be combined with a SCB for AV fistula formation. Although a success rate is acceptable, alternative methods should be sought such as ultrasound.

References:

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303
SURVEY OF PATIENT PREFERENCE FOR UPPER-LIMB SURGERY: REGIONAL OR GENERAL ANAESTHESIA?
C. Leech

Background and aims: Upper-limb surgery is often amenable to being performed under either regional (RA) or general anaesthesia (GA). In an increasingly patient-oriented delivery of healthcare it is important to establish exactly what the informed patient would choose and why.

Methods: Adult patients attending a day-case Hand Trauma Unit were provided with an information leaflet detailing the advantages and disadvantages of RA versus GA. They were then asked to complete a questionnaire regarding whether they would or would not like to have their operation solely under RA.

Results: 104 patients aged 16 to 90 years were recruited. 81% had not previously heard of RA for hand surgery. When asked whether they would prefer RA, 45% answered ‘Yes’ or ‘Yes/DM’ (don’t mind, whatever the anaesthetist thinks is best), 27% answered ‘No’ or ‘No/DM’, 19% answered ‘DM’, and 9% answered ‘Yes/No/DM’. 40% who answered ‘Yes’ said they would not want to be ‘awake’ for their operation, even if sedated. 21% patients said ‘No’ because they’d previously been told by the surgeon that the operation had to be under GA.

There was no statistical correlation between either the age or sex of those who would opt for RA over GA.

Conclusions: Given the option, the majority of patients would prefer to have RA over GA although a significant proportion are happy to be guided by their anaesthetist.

304
ULTRASOUND GUIDED BRACHIAL PLEXUS NERVE BLOCK (BPNB) IN DAY CARE HAND SURGERY - AN ASSESSMENT OF PATIENT PERCEPTION AND POSTOPERATIVE PAIN
K. Ray, A. Berrill

Background and aims: Patient preference, postoperative analgesic requirements, and postoperative pain score and analgesic requirement in patients undergoing day case hand surgery under BPNB.

Methods: Ultrasound guided BPNB (90 axillary, 10 supravclavicular) was performed using local anaesthetic (LA) as per hand unit protocol (equal mixture of 1% prilocaine and 2% lignocaine with 1:200 000 epinephrine).

Patient demographics, preoperative pain score (verbal numeric rating scale), LA volume, and patient perception were recorded. BPNB duration, postoperative pain score and analgesic requirement were assessed using a 24 hour telephone follow-up.

Results: 100 patients [median age 41 years (IQR 25–66), M: F 3:1] underwent hand surgery (Elective: Trauma 30:70). The median pre-operative pain score was 2(IQR 1–4). The median LA volume was 38 ml (IQR 30-40). 16 patients needed preoperative LA top up, while none required intraoperative opioid, sedation or LA infiltration. BPNB was considered Excellent by 65, Good by 32 and Average by 3 patients respectively. The median BPNB duration was 240 minutes (IQR 200–240). The median post operative pain score was 4(IQR 3–5). In first 24 hour postoperatively, 56 patients used regular analgesics while 40 patients used as required. No analgesics were used by 4 patients.

Conclusions: Ultrasound guided BPNB is an excellent technique for day care hand surgery with minimal intra operative anaesthetic intervention. It is rated well by the patients and has acceptable postoperative pain score.

305
NERVE BLOCKS FOR KNEE ARTHROPLASTY AT QUEEN ELIZABETH HOSPITAL (QEH), KING’S LYNN- AN AUDIT OF CURRENT PRACTICE
A. Bhat, R. Balakrishnan

Background and aims: Role of femoral nerve block in knee arthroplasty is well established but evidence for sciatic block is weak.1 QEH practices combined femoral and sciatic blocks for knee arthroplasty. This audit aimed to observe the post-operative course of patients, specifically looking at post-op analgesia, patient satisfaction, block recovery and compliance with physiotherapy.

Methods: Questionnaires were filled by anaesthetist for 34 patients undergoing knee arthroplasty who were followed up for 24 hours.

Results: Out of 34 patients, 23 had femoral & high sciatic blocks (FS group) and 11 had femoral & ultrasound guided popliteal fossa blocks (FP group). There was no significant difference in the mean pain scores, analgesic consumption and patient satisfaction scores between the two. However, 5 patients had residual motor block in FS group compared to 1 in FP group and 7 patients had poor compliance with physiotherapy in the FS group compared to none in the FP group.

Conclusions: Combination of femoral and sciatic nerve blocks provides good post-operative analgesia and high degree of patient satisfaction in the first 24 hours after knee arthroplasty. However, with regards to the type of sciatic block, ultrasound-guided popliteal block provides comparable analgesia with fewer incidences of motor block and better compliance with physiotherapy compared to high sciatic block. Other advantage of popliteal block is hamstring muscle sparing which aids early patient mobilization and physiotherapy.


306
CAUDAL EPIDURAL INJECTION WITH BUPIVACAINE AND EPINEPHRINE FOR LUMBAR SPINAL SURGICAL PROCEDURES UNDER GENERAL ANAESTHESIA
H.M.F. Anwer, M. Nassar, T. Hassan, Egypt

Background and aims: Blood loss is a major concern during spinal surgery. In addition, reducing operative site bleeding can improve surgical accessibility and decrease surgical time and effort. We tested the effect of pre-incisional administration of caudal epidural injection of bupivacaine with or without epinephrine during lumbar spinal surgical procedures under general anesthesia.

Methods: Sixty patients undergoing decompressive laminectomy with instrumented fusion under standard general anaesthesia were randomly allocated into 3 groups (20 patients each). Group I and II received pre-incisional caudal epidural injection of plane bupivacaine 0.125% and bupivacaine 0.125% plus epinephrine 1:200000 respectively. Group III did not receive caudal block (control). Intraoperative blood loss, surgeon’s satisfaction as related to operative field and postoperative analgesic requirements were assessed.

Results: Demographic data and intraoperative hemodynamics were not statistically different among the three groups. Significant reduction in surgical blood loss and better surgeon's satisfaction were seen in the caudal injection groups as compared with the control. Also, operative time was significantly less and postoperative analgesic requirements were reduced. The addition of epinephrine (in group II) significantly further improved all the tested parameters.

Conclusions: In addition to a better postoperative analgesia, caudal epidural injection with bupivacaine or more influentially bupivacaine plus epinephrine before lumbar spine surgery reduces blood loss, improves surgical field satisfaction and reduces operative time.

307
CAN WE PREDICT EPIDURAL SPACE DEPTH IN OBSTETRIC PATIENTS?
S.E.T. Alves, I.D.V. Medeiros, H. Cabido, P. Lemos, Portugal, Germany

Background and aims: The aim of this study is to find a relationship between lumbar epidural space depth (LePs depth) at L3-L4 and L4-L5 and body mass index (BMI) in the obstetrical population attended at our Hospital.

Methods: We retrospectively collected data from the labour analgesia records during a six month period. Of the 1223 records available, only a total of 1003 records of labour analgesia in the sitting position at L3-L4 or L4-L5 were analyzed (192 cases were excluded due to incomplete information). The BMI was calculated and treated as an independent variable and grouped into twelve categories of three-units starting from 18 kg/m². The last three categories (with BMI over 45 kg/m²) were discarded due to having only
2 cases or less. The average BMI, [LEp depth] and respective standard deviations for the nine categories were calculated. We then take the average BMI and average [LEp depth] of these nine categories and fit the data to a line by linear regression.

**Results:** The linear regression has 7 degrees of freedom (9 categories minus 2 variables) and the fit found has $r^2$ greater than 0.95 and F-statistic of over 150. The expression obtained was $[LEp depth] = a + b1*BMI$, with $a=1.6$ cm and $b1=0.12$ cm $\times$ (m$^2$/kg) with statistical standard deviations of the fit of 0.3 and 0.009 respectively (in the same units).

**Conclusions:** As expected the average [LEp depth] tends to increase with increasing BMI and this is noticeable already in the calculated averages and standard deviations of each category.

We succeeded in obtaining a good statistic correlation in the analysis of lumbar epidural space depth (LEp depth) at L3-L4 and L4-L5 and body mass index (BMI) for epidural catheter placement in Portuguese-based patients.

**308 BMI: DIFFICULTY PREDICTOR FOR EPIDURAL CATHETER PLACEMENT IN OBSTETRICS PATIENTS**

S.E.T. Alves, I.D.M. Varzielas, H. Cabido, P. Lemos, Portugal, Germany.

**Background and aims:** The combination of pregnancy-related alterations contributes to the challenge of performing an epidural anesthesia in a pregnant patient.

The aim of this study was to investigate how significantly the body mass index (BMI) affects epidural catheter placement in the obstetric population.

**Methods:** We retrospectively collected data from the labour analgesia records during a six-month period. We analysed 925 records with complete information of L3-L4 and L4-L5 epidurals, out of a total of 1225 for labour analgesia.

The number of attempts was recorded and the level of difficulty was self-reported by the performer on a numerical scale from 1 to 4. The number of attempts and difficulty were treated as independent variables. The average BMI and lumbar epidural space depth (LEp depth) and respective standard deviations were calculated for each attempt and difficulty category.

Cases with over 4 attempts were not fully analysed due to small numbers.

**Results:** The pregnancy population analysed had average BMI of 28.3 with std dev of 4.2.

Only 27 of the 925 analysed records (less than 3%) had 3 or 4 attempts. The number of attempts correlates more with the LEp depth than with BMI. As the number of attempts increases, average LEp depth always increases whereas average BMI increased except for the first two attempts.

**Conclusions:** Our data suggests that BMI is a difficulty predictor and BMI above 30.1 increases the number of attempts (median 3 attempts, a LEp depth of 5.6, Standard deviation LEp depth 1.26).

Due to the characteristics of the procedure we consider likely that only 3 or more attempts reliably indicates difficulty.

The study is ongoing with more data being collected to further validate these findings.

**309 POSTOPERATIVE ANALGESIA AFTER CESAREAN SECTION: A COMPARISON BETWEEN PROGRAMMED INTERMITTENT EPIDURAL BOLUS (PIEB) VERSUS CONTINUOUS EPIDURAL INFUSION (CEI)**

S. Stirparo, A. Laudan, R. Haiberger, C. Leopardi, G. Capogna, Italy.

**Background and aims:** PIEB technique has been used with benefit in labor analgesia. We compared PIEB to CEI for postoperative epidural analgesia, using identical hourly doses of local anesthetic.

**Methods:** After ethical approval and informed consent, 120 parturients undergoing c-section under CEI anesthesia with 12 mg hyperbaric bupivaca- caine were randomized to receive 0.0625% levobupivacaine + 1 mg/mL sufentanil as PIEB (5 mL every h) or CEI (5mL/h), for postoperative anal- gesia, immediately after an epidural loading dose of 2 mg of morphine. Analgesia (VAPS), sensory block (pinprick, Hollmen scale) and motor block (Bromage scale) were assessed postoperatively (5,10,20 h).

**Results:** We studied 104 subjects (PIEB =55; CEI =49). Median number (range) of blocked segments were greater in the CEI group: 9 (0–20) vs 7(0–17) at 5 h and 6 (0–16) vs 1.5 (0.16) at 10 h. ($P < 0.001$). Asymmetric sensory block was more frequent in the CEI group ($P<0.01$). Motor block was observed only in CEI group (14,18, and 9% respectively at 5,10 and 20 h ($P < 0.001$). In all cases, patients who had motor block had a denser sensory block. There was no difference in the VAPS in the time interval examined.

**Conclusions:** PIEB has the potential to decrease the extent of sensory blockade as well as decreasing unilateral blockade and motor block, thereby improving the quality of epidural analgesia after c-section. A relationship between density of sensory block and the occurrence of motor block was noted.

**310 SURVEY OF OBSTETRIC DATABASE USERS IN EAST ANGLIAN REGION, UK**

U. Kempnanna, D. Jeevaratnam, S. Ijioma

**Background and aims:** A variety of database programmes are available that capture information regarding anaesthetic interventions in Obstetrics like epidurals and sub-arachnoid block. The discontent with the functionality of the database programme in use in our hospital prompted us to explore other avenues. This survey was conducted to formally collate the impressions of obstetric anaesthetic departments in the region and their experience with different databases.

**Methods:** Questionnaires were sent to 17 lead obstetric anaesthetists (Head of the Department) relating to the user friendliness and utility of database programmes using the ‘Surveymonkey’ website.

**Results:** There were 10 replies, 4 units did not use any software for capturing data. Of the remaining 6 units, 4 used ‘in house’ developed packages and 2 units used commercial systems (Wamsbeck and Protos Evolution). There was a cost implication only for the commercial packages which ranged from initial installation costs and an annual maintenance fee. The in-house systems were free, but demanded valuable time from consultant colleagues for the development and update. Departments using software programmes had a varying response regarding frequency of software update required. Incorporation of data into personal logbooks was excellent with one database system.

**Conclusions:** This survey shows that there is no uniformity between various hospitals regarding data collection. Our system shows that there are inade- quacies in all the systems that are in use in the region. A system that is compatible and useful for anaesthetic departmental, personal and national audit, logbook records and service development will be the way forward.

**311 THE USE OF CERVICAL EPIDURAL BLOCKADE FOR THE TREATMENT OF SEVERE CERVICAL RADICULOPATHY IN PREGNANT WOMEN**


**Background:** Cervical radiculopathy is a painful and incapacitating event particularly in pregnant women. Surgery may be of high risk in pregnant women especially during the first trimester. We try in this preliminary work to study the efficacy of cervical epidural blockade in pregnant women with severe radiculopathy as an alternative to surgery.

**Methods and Materials:** Six pregnant females having clinical and radiological (MRI) evidence of severe cervical radiculopathy. Surgery was judged to be of high risk all these patients. An epidural cervical injection in the sitting position under local anesthesia was done using 2ml of 0.5% Bupivacaine and 80mg of methylprednisolone one 2 occasions with a one week interval.

**Results:** Six pregnant females were judged suitable for this study. All were in their 1st trimester with a mean age of 25–35 years. 50% had C5 radiculopathy and 50% had a C6 radiculopathy. After 2 injections, all patients achieved clear improvement. Before the blockade the mean estimation of the pain intensity was 9/10 but after blockade it decreased to 2/10 on numerical scale. The obtained results were statistically significant. We didn’t find any compli- cation with a 6 months of follow up.
Conclusion: Epidural cervical blockade is a good alternative in pregnant women to avoid the complication of surgery for both the mother and the fetus. It shows also to be safe and reproducible.

Background and aims: Good pain control after LSCS results in early bonding of mother and baby and early mobilisation. Main aims- Adequacy of pain control and Patient satisfaction

Recommendations to improve pain control and satisfaction.

Other aims-Monitoring nausea and vomiting, pruritus.

Monitoring sedation and respiratory rate.

Methods: This audit was based on Rcoa recommendations(i)-

>90% of patients should have worst score< 3(VAS)

100% of patients should be prescribed NSAIDs unless contraindicated.

100% of patients should have documented respiratory sedation level

>90% must be satisfied with pain management.

Prospective study over 3 months.71 patients enrolled.

Results: Urgency of surgery:Emergency-58%, Elective-42%

Mode of anaesthesia:GA - 6%, Spinal - 27%, Epidural top-up - 24%, CSE-43%

Pain scores:

OT: 98.5 %< 3, 1.4%: 4-6, Recovery: 83% < 3

11.2%: 4-6

2.8%:7-10.

Pain scores in ward

60.5% < 3

21.1%:4-6

7.04%:7-10.

Pain scores at 12 hrs 43.6% < 3, 21.1%:4-6, 11.26%:7-10.

At 24 hrs 36.6% < 3, 33.8%:4-6, 21.1%:7-10.

At 48 hrs 60.5% < 3, 28.8%:4-6, 9.8%:7-10.

Analgesics prescribed: 92% of patients received NSAIDs, 80.3% had codydramol pm 8.5% had paracetamol.

Side effects: Nausea and vomiting-Recovery:18%, Ward:22%

Pruritus: Recovery:26%, Ward:30%

Satisfaction:Excellent =34%, Good=47%, Fair=13%, Unsatisfactory=6%

Conclusions: Our audit demonstrated that 94% of patients were satisfied with our current management. However, more regular prescription of paracetamol and diclofenac is required as they reduce opioid consumption. Patients should be prescribed Cyclizine pm. Also consider TAP block after GA. Epidural morphine to continue.

(i) Ref: Pain relief after caesarean section: E. Pickering, Holdcroft: Rcoa: Audit recipes

314 FORCED AIR WARMER FAVORS SAFE SKIN-TO-SKIN CONTACT (SSC) DURING CESAREAN SECTION MAINTAINING NEONATAL NORMOTHERMIA

S. Stirparo, A. Laudani, G. Capogna, Italy

Background and aims: WHO recommends SSC after delivery, but after cesarean section this is not performed for practical reasons and because infants may suffer mild hypothermia. The aim of this preliminary study was to compare mothers’ and newborns’ temperatures when SSC was practiced using a forced air warmer (FAW) compared to routine care during cesarean section under general anesthesia.

Methods: Ethics approval and informed consent were obtained. After general assessment, including cord pH evaluation, and completion of Apgar score under a radiant heat source, neonates were randomized to be left in their mothers’ arms warmed by FAW (SSC group) or put in an incubator (controls). Maternal and neonatal rectal temperatures (T°C) were recorded.

Results: Mean room T was 22.5 °C (SD 0.2). All neonates’ umbilical cord pH were within normal range with no differences between the groups. T of neonates from the SSC group were comparable with those of the control group.

<table>
<thead>
<tr>
<th>Time</th>
<th>Mother</th>
<th>Controls</th>
<th>Neonates</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>before birth</td>
<td>36.9 (0.4)</td>
<td>36.7 (0.3)</td>
<td>37.0 (0.4)</td>
<td>36.5 (0.4)</td>
</tr>
<tr>
<td>at birth</td>
<td>36.6 (0.3)</td>
<td>36.5 (0.3)</td>
<td>36.9 (0.3)</td>
<td>36.3 (0.3)</td>
</tr>
<tr>
<td>time 0</td>
<td>36.4 (0.4)</td>
<td>36.3 (0.4)</td>
<td>36.3 (0.4)</td>
<td>36.3 (0.4)</td>
</tr>
<tr>
<td>5 min</td>
<td>36.3 (0.4)</td>
<td>36.3 (0.4)</td>
<td>36.4 (0.4)</td>
<td>36.4 (0.4)</td>
</tr>
<tr>
<td>15 min</td>
<td>36.4 (0.3)</td>
<td>36.3 (0.3)</td>
<td>36.4 (0.4)</td>
<td>36.6 (0.3)</td>
</tr>
</tbody>
</table>

[Mean (SD) Maternal and Neonatal Temperatures]

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Conclusions: FAW prevents neonatal hypothermia while the mother is undergoing surgery in the operating room and favors SSC. FAW may fulfill WHO SSC recommendations during cesarean section, when the standard room temperature is usually unfavorable.

315 REGIONAL ANESTHESIA IN OBSTETRICS : THE POST PARTUM PAIN EXPERIENCE AND ANALGESIC REQUIREMENTS

L. Kalagac Fabris, Croatia.

Background and aims: Although persistent pain has been described to occur after various type of surgery, little is known about this entity following cesarean section or vaginal birth. This study compares postoperative analgesic requirements and recovery profiles in women undergoing vaginal childbirth, scheduled cesarean and unplanned cesarean delivery following labor. We postulated that scheduled cesarean deliveries will increase postoperative analgesic requirements.

Methods: We conducted a retrospective chart review of 1519 childbirth at General Hospital Pula during the 2010 year. The epidural analgesia was performed in 12% (155) of the vaginal labor, and cesarean section in 16.4% (249) of parturients. The survey recorded the women’s health history, previous pain, details of the cesarean section (general anesthesia, spinal or CSE anesthesia) or vaginal birth, the description of their pain experience, and the postpartum analgesic requirement.

Results: The 51% of parturients were L-para, age 26–30y; for 37.7% of all women. The 60.7% of all C.S. were emergency sections, and 68.8% of all C.S. were first time cesarean experience. We found that in the vaginal labor the experience of pain (mean VAS 5–6) and analgesic requirement is more pronounced on the second postpartum day. There is no differences in postoperative pain score after scheduled and unplanned cesarean delivery for up to five days postoperatively. The women that have general anesthesia recalled significantly more pain on the first day after cesarean section.

Conclusions: The result indicate that women experience less pain after regional anesthesia, but that the analgesic requirements are similar after scheduled compared to unplanned cesarean delivery.

316 SACRUM- PERINEA HEAT THERAPY FOR PHYSIOLOGIC LABOR PAIN MANAGEMENT: A RANDOMIZED CONTROL TRIAL STUDY

S. Taavoni, S. Abdolahian, H. Haghani, Iran.

Background and aims: One of the safe non-pharmacologic/noninvasive interventions could be heat therapy by using warm moisture towel on perineum-sacrum, since a few data are available for significant efficacy of it.

Aim: To evaluate effectiveness of perinea-sacrum heat therapy on labor pain, contraction and duration of active phase of physiologic labor.

Methods: In this randomized control trial study 60 volunteer 18–35 years old healthy primiparous women during their active phase of physiologic labor process after feeling in informed consent, were randomly divided in two groups. Tools have three main parts (Personal characteristics, Labor process chart, and Pain Visual Analogue Scale (VAS)).

Results: There were no significant differences between age, educational level, having job, planned pregnancy and duration of pregnancy in two groups. There was no significant difference on average of pain score during first 30 minutes of intervention, but after 60, 90 and 120 minutes average of pain score in heat therapy group were significantly less than control group. (P< 0.05). There were no significant differences between uterine contraction and duration of active phase in two groups.

Conclusions: Perinea-Sacrum Heat Therapy during active phase did not have significant effect on labor pain during first 30 minutes, duration of active phase, uterine contraction and its duration, but this safe noninvasive intervention significantly reduced the intensity of pain during active phase of Physiologic labor/delivery after one hour intervention. It is recommended to study the effects of combining this of method, with other complementary, especially comparing results during various times after intervention.

317 COMPARISON OF THE EFFECT OF HYPERBARIC LEVOBUPIVACAINE WITH FENTANYL OR MORPHINE IN COMBINED SPINAL EPIDURAL TECHNIQUE UNDERGOING ELECTIVE CESAREAN SECTION


Background and aims: Our prospective study aimed to detect the effect of intrathecal levobupivacaine combined with fentanyl or morphine with combined spinal-epidural technique on the maternal hemodynamic changes, sensory-motor block characteristics and effects on the fetal arterial blood gases and APGAR scale in patients undergoing elective cesarean section.

Methods: After approval by the hospital ethics committee and obtaining written informed consent; 40 women, aged 18–45 years, ASA I–II, undergoing elective cesarean section with a combined spinal-epidural technique were enrolled. Patients were randomly allocated into two groups receive either (in group LF) 7.5mg hyperbaric levobupivacaine 0.5%/+25 mcg fentanyl or (in group LM) 7.5mg hyperbaric levobupivacaine 0.5%/100 mcg morphine. The level and duration of sensory block, intensity and duration of motor block were recorded. Heart rate(HR), mean arterial pressure(MAP) were recorded throughout the study; at baseline and 1st, 3rd and 5th min after intrathecal injection, then at 5 min intervals. Visual analog score(VAS), APGAR score(at 1st, 5th min) and fetal umbilical blood gases analysis (FABG) were recorded. Statistical analysis was performed using SPSS 17 version.

Results: There were no significant differences between groups regarding sensory-motor block characteristics, HR, APGAR score and FABG. In group LF, the MAP were lower at 1st, 3rd and 5th min than group LM (p=0.025, 0.033, 0.049). In group LF, the VAS were lower on periton closure time than group LM (p=0.035) but in group LM the VAS were lower at 60th min postop. Significantly less than group LP (p=0.032).

Conclusions: Levobupivacaine with fentanyl or morphine is suitable for combined spinal-epidural anaesthesia in elective cesarean section.

318 TRANSVERSUS ABDOMINIS PLANE BLOCK WITH LOW DOSE KETAMINE REDUCES CYTOKINE EXPRESSION AFTER MAJOR ABDOMINAL OPERATION IN CHILDREN

D. Dmytriiev, Ukraine.

Background: Inflammation and nociceptive sensitization are hallmarks of tissue surrounding surgical incisions. Our studies were directed towards determining if administration ropivacaine with low dose ketamine alter cytokine production after major abdominal operation in children.

Methods: A 17 children after major abdominal operation was used to measure the effects of TAP block (ropivacaine) with low dose ketamine (0.1–0.3 mg/kg) administration on cytokine production in blood 45 minutes, 4 hours after operation. We examination 44 patient, undergoing major abdominal operation in children, first group receive combination TAP block (ropivacaine) with low dose ketamine, second group receive low dose ketamine. For statistical analysis - tests were used.

Results: Operative incised abdominal wall displayed profound allogny which was reduced by ropivacaine with low dose ketamine combination in the 4 hours following incision. Blood samples these patients showed enhanced levels of 3 cytokines: IL-1ß, IL-6, tumor necrosis factor alpha (TNFα). Ropivacaine with low dose ketamine administration reduced levels. First group lower cytokines levels over second group (mean +/- SD, IL-1ß - 7.0 +/- 0.8 vs. 17.4 +/- 1.3 pg/mg protein, IL-6 - 207.3 +/- 82.4 vs. 461.1 +/- 92.2 pg/mg protein, TNFα - 14.2 +/- 3.1 vs. 44.4 +/- 8.4 pg/mg (p < 0.001). Conclusion: TAP block (ropivacaine) with low dose ketamine administration reduces cytokine expression. These studies suggest that TAP block (ropivacaine) with low dose ketamine combination may alter the inflammatory reaction.

319 THE EFFECT OF INTRODUCING ULTRASOUND GUIDED RECTUS SHEATH BLOCK ON ANAESTHETIC MANAGEMENT FOR PEDIATRIC UMBILICAL HERNIA REPAIR

A. Shido, A. Hashimoto, N. Yokokawa, S. Sakura, Y. Saito Japan.
Background and aims: Because of increasing popularity of ultrasound guided regional anaesthesia, we have introduced and have performed the ultrasound guided rectus sheath block (u-RSB) combined with general anaesthesia (GA) to the paediatric patients undergoing umbilical hernia repair for recent three years. The aim of this study is to find out whether introducing u-RSB had improved anaesthetic management in our institution compared with the management before introduction of u-RSB when GA combined with non-ultrasound guided caudal epidural anaesthesia was frequently performed. Methods: Children who underwent umbilical hernia repair under GA combined with u-RSB (u-RSB group) and/or with caudal epidural anaesthesia (Epi group) for the past seven years in our institution were included in this study. Information about anaesthetic conditions including anaesthetics doses and times required for anaesthesia were obtained by reviewing the anesthetic records. Data were statistically analyzed and compared between the groups (unpaired t-test, chi-square test, significant when P < 0.05).

Results: Sevoflurane was used for GA with or without nitrous oxide in all of the cases. Intraoperative sevoflurane concentration calculated with consideration of used nitrous oxide concentration and expressed in minimum alveolar concentration (MAC) was significantly lower in u-RSB group (n=64, 1.69±0.52 MAC, mean ±SD) than in Epi group (n=34, 2.70±0.99 MAC). Anaesthetic induction time (min) in u-RSB group (20.8±10.6) was significantly longer than that in Epi group (16.9±6.9).

Conclusions: Introduction of u-RSB decreased intraoperative sevoflurane requirement but made anaesthetic induction time longer in paediatric umbilical hernia repair anaesthesia.

320 COMPARISON OF PEROPERATIVE AND POSTOPERATIVE ANALGESIC PROPERTIES OF Ilioinguinal/Iliohypogastric and Sacral Blockage in Unilateral Inguinal Hernia Surgeries of Children
S.K. Cosarcan, A. Mahli, Turkey.

Background and aims: In this study, we aimed to compare peroperative and postoperative analgesic properties of ilioinguinal/iliohypogastric and sacral blockage in children to undergo inguinal hernia surgery.

Methods: Sixty patients between 1-8 years were enrolled and consents were obtained from their parents. Patients were randomized into two equal groups. All patients received 8% sevoflurane within 50% O2 + 50% N2O in induction and appropriate LMA was placed following assurance of sufficient anesthesia depth. Transcassal epidural blockage in lateral decubitus position from S2-3 space and IL/II nerve branch from 2cm medial and 2cm cranial aspects of spina iliaca anterior superior in supine position were administered in Group S and Group I, respectively. 0.25% isobaric bupivacaine and 0.7mL/kg were administered in both blockages at once. 40% O2 + 60% N2O with 1.2 MAC-sevoflurane were continued for 10 minutes as maintenance. Ten minutes following the blockage, N2O was closed and medical air was started. Intraoperative analgesia end-tidal MAC-sevoflurane and postoperative analgesia were evaluated with HR, CHEOPS and APDS, respectively.

Results: Analysis showed no statistically significant difference between groups in terms of intraoperative and postoperative analgesia, while it was less in group I at eight and twelfth hours in a 24-hour period when additional analgesic requirements were examined.

Conclusions: Consequently, IL/II nerve blockage is a considerable approach in terms of effective and safe analgesia in inguinal surgeries effecting the same dermatomes such as inguinal hernia and hydroureter due to minimal risk of motor blockage and more comfortable use in comparison with transsacral epidural and caudal blockage.

321 RETROSPECTIVE COMPARISON OF POSTOPERATIVE ANALGESIC EFFICIENCY OF TRAMADOL AND LEVOBUPIVACAINE WOUND INFILTRATIONS IN PEDIATRIC INGUINAL HERNIA AND CRYPTORCHIDIC TESTIS OPERATIONS
B. Cekic, U. Dogan, S. Geze, H. Ulusoy, Turkey.

Background and aims: The aim of this study was to compare the postoperative analgesic effects of tramadol and levobupivacaine wound infiltrations after pediatric inguinal hernia and cryptorchidic testis operations.

Methods: The files of children who were operated for elective inguinal hernia and cryptorchidic testis surgery under general anesthesia were reviewed and a total of 45 patients who were between 1–6 years old and had a ASA physical status of I–II were included in the study. The patients who were intubated with 2 mg/kg tramadol in saline solution as 0.2 m/kg into the surgical incision area (fascial area) by the surgeon at the end of the operation were named as Group T, the patients who received 0.25% levobupivacaine as 0.2mL/kg were named as Group L, and the patients who were infiltrated with 0.2mL/kg saline solution included to the Group S. CHEOPS pain scores and additional analgesic dosage of the postoperative 6 hours were recorded from the files.

Results: First analgesic requirement time of levobupivacaine group (Group L) was longer than the control and tramadol groups (p < 0.05). CHEOPS pain score in the control group was higher than the other two groups (p < 0.05). The amount of total additional postoperative analgesic requirement in the tramadol group was lower than the levobupivacaine and saline groups (p < 0.05).

Conclusions: Wound infiltration with tramadol or levobupivacaine can be suggested as safe and successful methods of postoperative analgesia in pediatric inguinal hernia and cryptorchidic testis operations.
general anesthesia on intraoperative hemodynamic parameters and postoperative pain relief in children undergoing developmental dysplasia of the hip (DDH) surgery in children.

Methods: After ethical committee approval, records of 21 children undergoing DDH surgery with combined spinal and general anesthesia during the years 2009 and 2010 were reviewed. Spinal anesthesia was performed with 0.3 or 0.5mg/kg of hyperbaric bupivacaine and 2 µg/kg of preservative-free morphine. Light general anesthesia consisted of sevoflurane induction and maintenance with laryngeal mask insertion. For postoperative analgesia i.v. paracetamol q.d. and, tramadol as necessary were used. Intraoperative hemodynamics, postoperative pain relief and side effects were assessed.

Results: The mean age was 3.2 years (range 1.5 – 6) (14F / 7M). All blocks were successful, and all patients were haemodynamically stable during surgery. Intraoperative morphine injection resulted in excellent postoperative pain relief in 19 of 21 (90%) patients during postoperative 6 hours, and seventeen patients (81%) did not require rescue analgesics up to 24 h after spinal injection. Postoperative vomiting were recorded in only 3 of 21 patients (14%).

Conclusions: Spinal anesthesia with morphine combined with light general anesthesia provides stable intraoperative haemodynamics and good postoperative analgesia in children undergoing DDH surgery. Further randomized trials are necessary to compare spinal anaesthesia with general anaesthesia for this patient group.

324 SURVEY OF PENILE AND CAUDAL BLOCK USE IN PAEDIATRIC SURGERY WITHIN A TERTIARY CHILDREN’S HOSPITAL

A. Jennings

Background: A recent Cochrane review concluded penile and caudal blocks both provide effective analgesia for circumcision surgery. Increased incidence of motor block associated with caudals suggests they should be reserved for younger boys who are non-ambulatory. For hypospadias repair, caudal block is commonly recommended although penile blocks are also effective. We sought to establish preference in our institution.

Methods: A survey was distributed to consultant anaesthetists at Birmingham Children’s Hospital. Respondents described the regional technique they would use in both circumcision and hypospadias surgery in 1, 2, 4 and 6 year-olds including preferred pharmacy.

Results: Twenty three out of 27 consultant anaesthetists replied. All used regional anaesthesia routinely during penile surgery. Penile block was favoured in older boys having circumcision surgery (age 6: 17/23). However, in younger boys, caudal blocks were preferred (age 1: 17/23). In hypospadias surgery, caudal blocks were preferred for all ages (age 1: 22/23; age 6: 17/23).

Penile block was universally performed using 0.25% levobupivacaine and a volume of 0.43 ml/kg [0.2-1]. Caudal block was commonly performed using 0.25% levobupivacaine and a volume of 0.65 ml/kg [0.5-1].

Conclusions: These results suggest that paediatric anaesthetists are not confident in the efficacy of penile blocks both for hypospadias repair and younger boys undergoing circumcision; caudals instead are favoured. If a future study demonstrated that penile block is effective then this would potentially be a safer alternative to invading the caudal (extradural) space. Neuraxial adjunctive agents are widely used despite insufficient evidence of benefit.

325 ULTRASOUND-GUIDED INFRACLAVICULAR BLOCK FOR TRAUMA SURGERY IN CHILDREN

Y. Metodiev, N. Gavrilova, Bulgaria.

Background and aims: Ultrasound guided peripheral nerve blocks are still rarely used techniques for intra- and postoperative analgesia in pediatric patients. The purpose of this study was to compare the quality of analgesia in children who received either ultrasound-guided infraclavicular block or parenteral opioid analgesia.

Methods: We randomized 34 children aged 17 months to 16 years into two groups: group 1 who received ultrasound-guided infraclavicular block combined with intravenous or inhalational sedation, and group 2 who received general anesthesia with additional intravenous fentanyl. Children in both groups were monitored for 24 hours after anesthesia. We recorded the duration of the block, the intensity of pain, the postoperative need of opioid supplementation and complications or side effects related to either techniques.

Results: In 16 children from group 1 (94.2%) a successful block was obtained. In 1 patient the blockade of brachial plexus failed and supplementary fentanyl was added. Mean intensity of pain assessed according to visual-analogue scale (VAS) in group 1 was 4.9 and NSAIDs were enough to deal with it. In group 2 76.3% of the patients experienced pain above 7 (according to VAS) between third and fifth postoperative hour and needed additional opiate by mouth. Mean duration of pain free period in group 1 was 378.7 minutes.

Conclusions: Infracavicular block of brachial plexus provides better comfort after surgery in pediatric patients, than conventional analgesia with opioids. Ultrasound guidance permits the performance of this technique to be safer and with greater success rate.

326 GUILLAIN-BARRE SYNDROME AFTER KNEE REPLACEMENT SURGERY


Background and aims: Guillain-Barre syndrome is an acute inflammatory demyelinating polyneuropathy with the exact causes not yet known. Until now regional anesthesia has not been reported as a triggering cause.

Methods: A 80- year old patient, ASA II, with no known medical problems underwent a total knee replacement surgery under spinal anesthesia. The preoperative evaluation revealed SpO2 99%, and rales on both lung bases on auscultation. According to the pneumonologist and X-rays there were no signs of active lung infection without excluding an older one. We used a 25G needle at O2-Oa interspace, with Ropivacaine 0, 75% 19mg plus 10mcg fentanyl. The operation lasted 137min and the patient recovered 170 later.

Results: The patient’s postoperative clinical condition was stable and uncomplicated, so 6 days later he left with full sensation and movement of the limbs.14 days postoperatively he came back to hospital complaining of ascending symmetrical muscular weakness, diminished motion of the lower limbs, inadequate standing of the trunk on sitting position and minor muscular weakness of upper limbs. There were no disorders from the autonomic nervous system. The patient was transferred to a specialized neurology center, where he was diagnosed with Guillain-Barre syndrome from the clinical signs as well as a high concentration of proteins in the cerebrospinal fluid.

Conclusions: The appearance of Guillain-Barre syndrome in short period from a regional anesthesia can produce problems with the differential diagnosis.

327 ULTRASONOGRAPHIC ASSESSMENT OF A RETAINED PERIPHERAL ARTERIAL CATHETER FRAGMENT FOR EASE OF REMOVAL

K. Oremus, S. Sostaric, Croatia.

Background and aims: Although peripheral vascular catheter insertion is among the most common invasive medical procedures performed there are few reports on related complications and their management. We report the use of ultrasound in assessing the potential difficulty in removing a retained peripheral arterial catheter and its subsequent extraction under regional anaesthesia.

Methods: A 45mm 20G catheter (Becton Dickinson Floswitch™) inserted two days earlier into the left radial artery of a 58 year old man undergoing total hip arthroplasty was accidentally cut during removal of an adjacent intravenous cannula. Ultrasonography with a linear 5-13MHz transducer (General Electric LOGIQ®e 12L-RS) was used to visualize the retained fragment in longitudinal and transverse views revealing a portion of it still transversing the vessel wall and protruding into the subcutaneous tissue. With this information the decision was made by the orthopaedic surgeon to attempt
328 TAP BLOCK AND LOW-DOSE NCA FOR MAJOR UPPER ABDOMINAL SURGERY

O.W. Masters, K.C. Thiesf

Background and aims: The transverse abdominis plane (TAP) block provides significant surgical and long-lasting postoperative analgesia in neonates and infants undergoing unilateral laparotomy. There is minimal experience on using sub-costal TAP block for major paediatric upper abdominal surgery via supra-umbilical transverse incision. We were presented with a 5-month-old girl (6.4kg) requiring surgery via supra-umbilical transverse incision whose parents had refused epidural analgesia. We wanted to ascertain how effective bilateral sub-costal TAP blocks would be at providing post-operative analgesia in this case.

Methods: After consenting the parents, anaesthesia was induced and bilateral Subtenon anaesthesia is potentially the optimal

Methods: After consenting the parents, anaesthesia was induced and bilateral Subtenon anaesthesia is potentially the optimal

Results:

1) Intra-operative: There was no response to skin incision. Occasional boluses of fentanyl were given to cover visceral pain not covered by the TAP block.
2) Post-operative: Morphine analgesia via NCA was commenced in recovery of fentanyl were given to cover visceral pain not covered by the TAP block.

Results:

1) Intra-operative: There was no response to skin incision. Occasional boluses of fentanyl were given to cover visceral pain not covered by the TAP block.
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References:


329 SPINAL ANAESTHESIA AND SUBDURAL HEMATOMA


Background: Spinal anaesthesia can be followed by postdural puncture headache (PDPH) and even cerebral haemorrhage. The true incidence of subdural hematoma after dural puncture is unknown.

Methods: We report a case of a 33 year-old female who had an uneventful

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330 BEWARE THE BACKACHE: A CASE OF SPONTANEOUS VERTEBRAL OSTEOMYELITIS, DISCITIS AND EPIDURAL ABSCESS

M. Salman, R. Kumar, P. Sweet

Background and aims: To establish the implications of detecting ‘red flags’ in patients with history of persistent back pain.

Methods: After consenting the parents, anaesthesia was induced and bilateral Subtenon anaesthesia is potentially the optimal

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331 A CASE REPORT SUBTENON VS. GENERAL ANAESTHESIA - A DIRECT COMPARISON OF A NEW ANAESTHETIC APPROACH FOR CORNEAL GRAFT SURGERY

B. Straub, B. O’Hare, W. Power, M. Mukhtar, Ireland.

Background and aims: Subtenon anaesthesia is potentially the optimal regional anaesthetic technique for anterior chamber ophthalmic surgery, notably cataract surgery. We report using the technique in a new area of ophthalmic surgery normally performed under general anaesthesia—keratoplasty.

Methods: A 72-year old, with ischeamic heart disease, two CABG procedures, moderate mitral regurgitation, atrial fibrillation, on Warfarin (INR3.2 —contrindicating a sharp needle block), dyspnoea on moderate exertion pre-

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References:

**Discussion:** Coughing, PONV or difficulties lying supine postoperatively after general anaesthesia can jeopardise graft position. Subtenon blocks avoid cardiovascular effects from anaesthetic medication, surgical stimulation and positive pressure ventilation. Anaesthesia and recovery times are significantly shorter. A dense high quality block is required for good surgical conditions.

**Conclusions:** In experienced hands subtenon anaesthesia is safe and effective for keratoplasties in high risk patients.

**References:** A review of sub-Tenon's block: current practice and recent development

C.M.Kumar, S.Williamson, B.Manickam

**EJA** 2005;22:567-577

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**332**

ULTRASOUND-ASSISTED LUMBAR EPIDURAL PERCUTANEOUS SPINAL CORDINAL STIMULATION (SCS): CASE REPORT

B. Bouche, S. Narouze, E. Eisenberg, M.K. Karmakar, M. Meignier, V. Dixneuf, J. Lemarie France, USA, Hong Kong S.A.R.

**Background and aims:** Ultrasound (US) imaging has been reported useful for guiding neuroaxial anaesthetics in patients with prior surgical instrumentation or scoliosis. In this case, we used US-assisted lumbar epidural approach for SCS on a patient with severe scoliosis and Harrington rods.

**Methods:** A 16-years-old female, ASA , with marked dorso-lumbar scoliosis and Harrington rods, suffers of chronic pain refractory to all treatments and is candidate for SCS. The US scan was performed using a 2-to-5-MHz curved array transducer with a Sonosite™unit. The lumbosacral spinal anatomy was delineated in the longitudinal and transverses planes. The surface spinous processes (SP) curved line was identified, 15 cm laterally to the median line. The best vertebral spaces and the most lateral tip of the L2 transverse process were identified and marked on the skin, parallel to the SP line. Once the paramedian sagittal articular process view has been obtained, the probe is titled to angle the beam in a lateral-to-medial direction toward the median sagittal plane. The slopping hypoechoic laminae was visualized.

**Results:** The posterior dura was distinguished and the two leads were introduced into the epidural space and steered to the desired starting location using US and fluoroscopic guidances. The probe is kept on the left paramedian sagittal oblique, with a title of 10 degree, because of rotation of vertebrae.

**Conclusions:** We believe this is a success full example of the concept that US neuroaxial guidance can be useful to facilitate epidural approach in patients with abnormal spinal deformity: scoliosis, Harrington rods. It decreases X-ray exposure and improves percutaneous security SCS.

**References:**


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**333**

ULTRASOUND GUIDED SUPRACLAVICULAR NERVE BLOCKADE AND THE ACROMIOCLAVICULAR JOINT

J. Maybin, N. Bedforth, P. Townsley, A. Allan

**Background and aims:** We describe a technique for identifying the supraclavicular nerve using ultrasound, as part of a regional technique for awake shoulder surgery.

Despite having a demonstrable motor and sensory block of C5-7, a proportion of patients experience discomfort during surgery, especially during instrumentation of the acromioclavicular joint. We believe this is because the supraclavicular nerve in innervates part of the AC joint and this is spared with low volume interclavicular blocks.

**Methods:** The supraclavicular nerve can be identified as a small hypoechoic structure originating from the root of C4 and lying superficial to the deep investing layer of cervical fascia at the level of C4 and C5 nerve roots. Scanning caudally, the nerve tracks superficially over the belly of scalenus medius deep to and then posterior to the sternocleidomastoid muscle and is seen to divide into its three terminal branches. We now apply 2–3 ml of local anaesthetic to the nerve to accomplish a rapid onset supraclavicular nerve block with demonstrable loss of sensation over the shoulder.

**Discussion:**

- Despite a demonstrable motor and sensory block of C5-7, a proportion of patients experience discomfort during surgery, especially during instrumentation of the acromioclavicular joint. This is because the supraclavicular nerve innervates part of the AC joint and this is spared with low volume interclavicular blocks.
- To achieve a rapid onset and demonstrable loss of sensation, 2–3 ml of local anaesthetic is injected at the nerve's division into its three terminal branches.

**References:**


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**334**

EVALUATION OF THE EXTENT OF SENSORY BLOCK FOLLOWING ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE INJECTION AT UMBILICAL LEVEL: A PROSPECTIVE AUDIT

M.M. Mubarak, N. Conlon, A. Sohel, H. Shakeban, Ireland.

**Background and aims:** The transversus abdominis plane block (TAP) involves injection of local anaesthetic into the neurofascial plane of the abdominal wall, located between the internal oblique and the transversus abdominis muscles. Several different approaches have been described. There have been inconsistent results and conflicting reports of the extent of sensory block that can be achieved by TAP block. The goal of this observational study was to evaluate the extent of sensory block achieved following ultrasound-guided TAP block using an injection point at the umbilical level.

**Methods:** Twenty patients undergoing abdominal surgery had an ultrasound-guided TAP block performed bilaterally at the umbilical level. 20mls of 0.25% bupivacaine was injected on each side. The extent of the sensory block was evaluated in the post anaesthesia care unit using ethyl chloride spray 1 hour after surgery.

**Discussion:**

- Twenty patients undergoing abdominal surgery had an ultrasound-guided TAP block performed bilaterally at the umbilical level. 20mls of 0.25% bupivacaine was injected on each side.
- The extent of the sensory block was evaluated in the post anaesthesia care unit using ethyl chloride spray 1 hour after surgery.

**References:**

Results: A total of 40 TAP blocks were performed in 20 patients. 18 (90%) patients had a demonstrable sensory block. The assessment was performed at a mean of 203 minutes (range 120 to 240 minutes) after initial injection. The median sensory block was 5 dermatomal segments (IQR 4 to 6), the highest blocked level was T8 (IQR T7 to T9) and the lowest was L1 (IQR T12 to L2). Of note 3 patients had bilateral femoral nerve block.

Conclusion: The extent of sensory block after local anesthetic injection into the TAP plane is very variable.

References:

335
RADICULOPATHY CAUSED BY OSSIFICATION OF THE YELLOW LIGAMENT AT THE THORACIC SPINE


Background and aims: Radiculopathy and paresthesia on lower legs are commonly caused by spinal lesion at lower lumbar level. But the ossification of the yellow ligament at thoracic spine can rarely cause same symptoms. We met a patient whose symptoms is mainly lower legs pain and paresthesia. With MRI views that showed both lesion on thoracic and lumbar level.

Methods: There was a 60-year-old man with progressive radiculopathy, paresthesia and weakness on both legs for 1 year. MRI of the spine was taken and it showed not only central canal stenosis and disc protrusion at L2-5, but also ossification of the yellow ligament at T7-12.

Results: We tried three times of lumbar epidural block and L4 root block to differentiate the origin of pain. But there were just about 20% improvement of his symptoms. We decided that his symptoms were caused by ossification of the yellow ligament at the thoracic spine, transferred him to neurosurgeon. After he got decompressive laminectomy of T7, T9-10, radiculopathy and paresthesia disappeared.

Conclusions: Radiculopathy and paresthesia on legs are common symptoms in lumbar spinal stenosis. But, all of these symptoms does not mean problem on lumbar lesion. We sometimes need to evaluate other spinal level for the refractory lower extremity radiculopathy or paresthesia.

336
ASSESSMENT OF THE EFFECTIVENESS OF LUMBAR TRANSFORAMINAL EPIDURAL STEROID INJECTION FOR LOW BACK PAIN

A. Attn, S. Deniz, O. Kılıçkaya, M.E. Orhan, T. Purtulõgulu, E. Kurt, Turkey.

Objectives: Transforaminal Epidural Steroid Injection (TFESI) is a minimal invasive technique used for low back pain. We aimed to assess the efficiency of TFESI in patients with low back pain that does not respond to conservative or surgical methods.

Methods: This study included retrospective analysis of the results of 37 patients (range: 24–80) that were presented to our clinic with low back pain and treated by TFESI. Outcomes were assessed by Visual Analog Scale (VAS) measured at 3rd week and 6th month.

Results: Median age of the patient was 50 years and mean duration of symptoms was 48 months. Diagnosis was Lumbar Disc Herniation (LDH) in 51%, Failed Back Surgery Syndrome (FBSS) in 38%, Spinal Stenosis (SS) in 11% of the patients. Baseline VAS scores were similar between the groups. The 3rd week and 6th month VAS scores of LDH and FBSS cases were significantly decreased compared to baseline scores (p<0.001, p=0.001), and no significant change was observed between the VAS scores at 3rd week and 6th month (p=0.05). If success is defined as 50% or more decrease in VAS scores, success rate of TFESI was 84% at 3rd week and 78% at 6th month.

Conclusion: TFESI significantly reduced the intensity of low back pain in most of the patients with LDH, FBSS or SS, thus it may be considered as an effective method in the treatment of low back pain.

337
SUBPLEURALY PATIENT-CONTROLLED ANALGESIA INFLUENCE POSTTHORACOTOMY PAIN BETTER THAN SUBPLEUREALLY INTERMITTENT ANALGESIA

V. Goharian Iran

Background and aims: The efficacy of sub pleural analgesia to reduce postoperative pain intensity in patients after lateral thoracotomy is controversial. In this study, we demonstrated efficacy of two types of subpleural analgesia.

Methods: This prospective, controlled, randomized, and double-blinded trial was performed in department of thoracic surgery of alzahra hospital of the University of Isfahan Medical Science from jun 2009 until aug 2010. After posterolateral thoracotomy and admission to the ICU, patients were randomly assigned into two groups, Subpleuraly patient-controlled analgesia (SPCA) (0.02cc/kg/h of 0.5% bupivacaine) and subpleuraly intermittent analgesia (SIA) (1cc/kg/h of 0.5% bupivacaine). Data of age, sex, visual analog scale (at 8, 16 and 24 h after initiation of analgesia), morphine consumption, systemic adverse effects, length of ICU, hospital stay, complications, JPS criteria and cost. Data were analyzed by Mann-Whitney U-test, measured repeated test, chi square test and the Fisher’s exact test. A P<0.05 was considered significant.

Results: 90 patients participated in the study. There were no differences in sex, age, weight, intraoperative analgesics, and duration of one-lung ventilation and adverse effects between SPCA and SIA groups. Mean pain scores were significantly reduced at 16 h after the first SP instillation of bupivacaine 0.5% with patient-controlled analgesia. However, there was no difference between the groups when comparing mean pain scores at 8 and 24 h the first SP instillation of bupivacaine 0.5% . there were also no differences between the groups .there weren’t any differences between sex and VAS scores at three times.(p>0.05)

Conclusions: SPCA bupivacaine for postoperative pain treatment is more effect than SIA bupivacaine if used optimal. The consumption rate of opioid and bupivacaine is also decreased in SPCA group.

338
PARAVERTEREBRAL CATHETERS FOR LATISSIMUS DORSI FLAP RECONSTRUCTION: IMPROVING QUALITY

C.A. Goddard, L. Sulaïman

Background and aims: We evaluated analgesic quality in patients receiving paravertebral catheters (PVC) for Latissimus Dorsi (LD) flaps for breast reconstruction.

Methods: We prospectively audited 10 patients having LD flaps under GA and PVCs compared with historical controls using patient-controlled analgesia (PCA) with morphine. Blockade was established with paravertebral injection of 5mls 0.5% Bupivicaine at T2, T4, T6, T8 and T10, post-induction with a catheter at T6 through which 0.15% Bupivicaine was infused at 10 ml/hr post-operatively. Data collected: morphine in theatre, recovery and postoperatively, pain (0-10) and nausea scores at intervals for 72 hours.

Results: Total morphine consumption was reduced in the PVC group compared with historical controls using patient-controlled analgesia in theatre/ recovery (9.4mg vs 16.1mg, P<0.001) and on the ward (9mg vs 85.6mg, P<0.001). Pain scores were reduced in the PVC group from 12 hours onwards, significantly so at 24, 48 and 72 hrs (1.3 vs 3.2 at 24hr, 1.3 vs 3.2 at 48 hrs and 1.1 vs 3.2 at 72 hrs P<0.05). The majority of catheters were removed at 48 hrs but the improved analgesia persisted at 72 hrs. Nausea scores were equivalent.

Conclusions: Pain associated with LD flaps is substantial with a significant morphine requirement in the absence of regional anaesthesia. PVCs offers better quality analgesia than PCA, most notably after 12 hrs, with less morphine after mastectomy than balanced analgesia alone. The effects on improved pain scores outlasted the duration of the infusion.

339
IMPROVING POSTOPERATIVE PAIN MANAGEMENT IN A DISTRICT GENERAL HOSPITAL: FROM A PATIENT’S PERSPECTIVE

S. Soni, K. Gaskell, S. Munk, H. Barker, S. Seath, S. Sultana

Background and aims: Optimising post-operative pain management results in better care, greater patient satisfaction, faster recovery and reduced expenditure per patient. However postoperative pain continues to be inadequately managed. Our aim was to investigate patient’s experience of
post-operative pain management in our hospital. Standards were adopted from The Royal College of Anesthetists and the NHS National Patient Safety Agency.

Methods: We performed a prospective observational audit using a 10-minute questionnaire of all surgical patients admitted during one week in December 2008 (23 patients) and re-audited a similar population in 2010 (41 patients). Following the audit in 2008 a number of improvements were made; coherent guidelines were developed regarding post-operative pain management; dedicated pain nurses were employed; and ward staff were educated on pain management.

Results: The main results from the two audits were:

- In 2008 10% patients had no pain post operatively compared to 25% in 2010.
- In 2008 47% patients stated there was a delay receiving analgesia on the wards versus 7% in 2010.
- In 2008 47% of patients were totally satisfied with their pain relief versus 97% of patients in 2010.
- There was a positive correlation between patients who were happy with their pain management and reduced length of stay.

Conclusions: The results demonstrate that changes made after the initial audit led to a vast improvement of post-operative pain management. However improvements can still be made. Therefore we have re-developed guidelines, developed patient information leaflets and developed an intranet site available to staff and patients.

340

EFFECTS OF A SINGLE PREINCISIONAL DOSE OF DEXAMETHASONE ON PAIN FOLLOWING OPERATIVE FIXATION OF FRACTURED NECK OF FEMUR

S. Szucs, A. Broderick, F. Sultan, G. Iohom, Ireland

Background and aims: Dexamethasone has the potential of inhibiting cortisol secretion. In addition, preoperative glucocorticoids improve analgesia and decrease opioid consumption with reduction in associated side effects in a variety of clinical settings (1, 2). We hypothesised that a single dose of preoperative dexamethasone enhances postoperative analgesia and attenuates the inflammatory response in patients undergoing operative fixation of fractured neck of femur (FNF), in a prospective, randomized, placebo controlled trial.

Methods: Patients scheduled to undergo operative fixation of FNF were randomized using sealed envelopes to two groups. Patients in group 1 received a single dose of 0.1 mg/kg dexamethasone i.v. preoperatively, patients in group 2 received placebo. The anaesthetic technique was standardised, serial saliva and blood samples (for cortisol levels) were obtained and pain scores were recorded at several postoperative time points.

Results: To date eight patients were recruited out of 40 planned (n=3 and n=5). Patients in group 1 had lower visual analogue scale scores compared to those in group 2 i) at rest at 6h [8.0(7.2) vs 52.8(21.5), p=0.007], 12h [6(7.9) vs 41.2(28.0), p=0.04] and 24h [11.0(15.7) vs 43.0(19.5), p=0.03] and ii) on passive movement at 6h [21.6(18.8) vs 84.2(12.5), p=0.0006] and 12h [28.0(39.6) vs 89.25(10.5), p=0.01] postoperatively.

Conclusions: A single preincisional dose of dexamethasone appears to improve analgesia up to 24h following operative fixation of FNF.

341

ENHANCING RECOVERY FOLLOWING TOTAL KNEE ARTHROPLASTY

M. Kigozi, A. McMinn, G. Foxall, S. Golding, M. MacGregor

Background and aims: We report the latest of a cycle of multidisciplinary audits assessing the peri-operative care of patients undergoing Total Knee Replacement (TKR) surgery at our institution. The initial audits resulted in data collection from 103 patients and provided evidence for the introduction of a new pain pathway for TKR. This was re-audited using standards derived from the National Joint and Bone Registry and the NHS Institute for Innovation and Improvements Enhanced Recovery programme.

Methods: Data collected included: Patient demographics, Pre-operative starvation periods, Anaesthetic technique, Intra-operative fluid requirement, Barriers to mobilisation, Incidence of post-operative nausea and vomiting (POMV), Length of hospital stay (LOS). Data was obtained for 50 patients. Significant findings included:

1. Reduction in LOS from: (mean±SD) 7.5±1.2days to 4.7±1.1days following introduction of the pain pathway.
2. A mean starvation period of 12±5 hours (mean±SD).
3. High POMV rates associated with: Reduced mobility An increased LOS (5.31 days in patients with PONV compared to 4.36 days)

Conclusions: LOS has fallen following introduction of the pain pathway. In response to long pre-operative starvation periods and high rates of POMV, a ‘TKR peri-operative pathway’ has been developed. This includes: pre-operative carbohydrate loading, femoral nerve blocks and intra-operative cardiac output monitoring. This audit cycle has supported the creation and refinement of a comprehensive integrated care pathway based on the principles of enhanced recovery.

References:


342

POSTOPERATIVE PAIN CONTROL AFTER PANCREATIC RESECTION: EPIDURAL VS CONTINUOUS WOUND INFUSION ANALGESIA. RETROSPECTIVE RESULTS


Background: Post-operative pain control (POPC) after abdominal major surgery is a challenging issue. Epidural (EA) and intravenous analgesia (IA) are the most often methods adopted. Our retrospective study aimed to compare EA vs perifascial analgesia (PA) in pancreatic resections.

Methods: 41 patients underwent elective pancreatic resection. They received thoracic epidural (n=19, Ropivacaine0.2%/Morphine7.4mcg/ml, 7ml/h) or continuous perifascial (n=22, Ropivacaine0.2%/ 7ml/h) analgesia. Rescue treatment consisted of Ketorolac. POPC was evaluated by dynamic (coughing and static VAS) rescue analgesic needings, timing of patient mobilization, bowsel motility recovering and complications.

Results: Table 1 reports main results after the 2nd post-operative day. Both after awakening and at 1st post-operative day, pain control comparison did not show any difference.

<table>
<thead>
<tr>
<th></th>
<th>Perifascial mean(DS)</th>
<th>Epidural mean(DS)</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>SAP (mmHg)</td>
<td>125.3(16.3)</td>
<td>126.4(22.5)</td>
<td>0.863</td>
</tr>
<tr>
<td>SpO2 (%)</td>
<td>95(4.2)</td>
<td>95(2.8)</td>
<td>0.645</td>
</tr>
<tr>
<td>Dynamic VAS (cm)</td>
<td>2.4(1.2)</td>
<td>1.8(2.6)</td>
<td>0.359</td>
</tr>
<tr>
<td>Rescue drugs (n)</td>
<td>19</td>
<td>6</td>
<td>0.000</td>
</tr>
<tr>
<td>Length-of-stay (LOS, days)</td>
<td>14(9.3)</td>
<td>11(3.6)</td>
<td>0.152</td>
</tr>
<tr>
<td>Bowels function recovery (hours)</td>
<td>66.2(23.1)</td>
<td>83.3(22.7)</td>
<td>0.028</td>
</tr>
</tbody>
</table>

(Table 1)
**Conclusion:** When patient moves from bed to chair (after 48hs) EA was more effective than PA, but during the early post-operative period PA is as much effective as EA. Although EA is considered the most effective method, after pancreatic surgery it may expose the patient to the risk of complications (1). Furthermore, we know that EA does not reduce LOS, (2) Despite our study was not sufficiently wide for reliable conclusion, according our experience PA may be a safe alternative method to EA.

**References:**
(1) J Gastrointestinal Surgery 2008;12:1207-1220;

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**343 PROGRESSION ANGLE CHANGES DURING THE SECOND STAGE OF LABOR IN PATIENTS WITH OR WITHOUT ANALGESIA ASSESSED BY TRANSLABIAL INTRAPARTUM ULTRASOUND**

T. Gihi, M. Nanni, A. Youssef, M.P. Rainaldi, V. Valentini Italy.

**Objectives:** To assess whether epidural analgesia has an impact on progression angle changes measured by intra-partum transperineal 3D ultrasound during the second stage of labour.

**Methods:** We prospectively recruited nulliparous low-risk women at term (<37+0-41+0) at the beginning of the second stage attending the labour ward of our University hospital between November 2010 and January 2011. We divided our population in 2 groups: group A included patients that underwent an elective epidural and group B that did not have analgesia. In each patient we acquired a volume at the beginning of the active second stage of labour (time 1), after 20 minutes (time 2) and after 40 minutes (time 3) by transperineal 3D ultrasound. After delivery, the volumes were elaborated, and the angle of progression was calculated at each acquisition time.

We compared the progression angle mean values (time 1, 2 and 3) in groups A and B.

**Results:** During the study period we included 34 patients, of which 21 in group A and 13 in group B. The progression angle was comparable in group A and B at the beginning of the active second stage of labour (135°±17.3 vs 128°±9.1, P=0.16) and did not vary after 20 and 40 minutes (respectively 146°±23.3 vs 138°±13.2, P=0.34; 150°±21.2 vs 144°±11.8, P=0.73).

**Conclusions:** Epidural analgesia does not influence the progression angle changes during the active second stage of labour. Furthermore, the active second stage of labour seems to begin when the progression angle is around 130°.

**References:**

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**344 PROPHYLACTIC ILIAC ARTERY BALLOONS IN THE MANAGEMENT OF PLACENTA PERCRETA**

F. Arif, J.F. William

Uterine artery embolisation can be used to treat life threatening uterine haemorrhage. Here we discuss a case where prophylactic iliac artery balloons led to safe management of a case of placenta percreta.

**Background:** 39 years G3P2.

Previous deliveries were by Caesarean, one in Nigeria due to PET. Known fibroids.

**Presentation:** 28 +/-4/40- antepartum haemorrhage.

Ultrasound- large fibroids and low-lying placenta.

Further scan at 32/+4 confirmed placenta percreta.

**Operative Management:** Admitted for elective Caesarean-Section at 34 weeks.

Pre-operative intravenous and arterial access and an epidural catheter was inserted. Prophylactic iliac artery balloons were inserted via 8-french introducer under local anaesthetic. Balloon inflation confirmed a significant reduction in uterine blood-flow.

C-Section was performed under epidural anaesthesia. Iliac artery balloons were inflated pre-surgical incision. Surgery was technically difficult with dense adhesions and a large fibroid. Estimated blood-loss intra-operatively was ~1.3L and 440ml was returned by a cell saver. She was haemodynamically stable intraoperatively and after balloon deflation.

A liveborn healthy baby boy was delivered.

Post-operative haemorrhage: 5 hours post delivery, haemorrhage occurred refractory to conservative management with oxytocin, hameobeate and misoprostol. Inflation of the iliac balloons significantly reduced the bleed.

8 units of red cells, 3 units of FFP & 2 pools of platelets were given.

**Interventional Radiology:** Bilateral uterine artery embolisation was performed rapidly via the iliac catheters.

**Further Care:** She remained stable on HDU post embolisation with no further bleeding.

Due to coagulopathy, the femoral artery sheaths were left in-situ for 48 hours.

She was discharged home on day 9.

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**345 THROMBOPROPHYLAXIS AFTER CAESAREAN SECTION**

M. Agarwal

**Background and aims:**
- 41 maternal deaths directly due to thromboembolism reported in 2003-05 triennium (CEMACH report)
- PE remains leading direct cause of maternal death in UK
- Pregnancy is a risk factor for VTE
- Some women are at even higher risk due to one or more factors
- Pre-existing: Previous VTE, Thrombophilia disorders, Obesity (BMI >30 kg m\(^{-2}\) at booking), Age > 35 years, Parity > 4, Sickle cell disease

**Aim:**
- To assess compliance with NICE & RCOG guidelines relating to thromboprophylaxis following Caesarean section
- To recommend improvements in practice to achieve improved compliance in the next triennium (CEMACH report)

**Methods:**
- 36 women included; none excluded-Elective = 14 (39%) - Emergency = 22 (61%)
- Number of women with more than one risk factor = 6- Other conditions noted- Gestational diabetes (2),Hepatitis B (2),Placenta praevia (1),Thalassaemia(1)- Intravenous drug abuse (1)- Was Clexane prescribed in the drug chart? Yes = 33 (91.7%) No = 3 (8.3%)- Was the dose of Clexane prescribed the correct dose for the patient’s body weight? Yes = 26 (78.8%) No = 7 (21.2%)Of these, 4 had ≥2 risk factor.

**Conclusions:**
- NICE guideline on antenatal care recommends that every woman should have her BMI calculated at the first antenatal visit-Clexane was not prescribed in 8.3% of cases, and was incorrectly prescribed in 21.2%
- New guidelines are urgently needed for thromboprophylaxis for morbid obese women
- Risk assessment in early pregnancy must include identification of morbid obesity and other risk factors

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**346 A SURVEY OF MIDWIVES IN SOUTH EAST SCOTLAND TO ASSESS THEIR AWARENESS OF RECOGNITION OF LOCAL ANAESTHETIC SYSTEMIC TOXICITY**

P.A. Singh, V.A. Clark, J. Duguid, J. Critchley

**Background and aims:** Local anaesthetics(LA) are used by midwives to top up epidurals in labouring patients in our units. Toxicity although rare, can be fatal if the maximum dose is exceeded or in cases of accidental IV injection. It was felt that midwives had little knowledge about LA systemic...
We conducted a prospective survey (questionnaire based) of midwives in 3 units about LA toxicity, its treatment, and if IntraLipid is recommended for toxicity, with further questions about its location and dose. After collating the data from the first survey, we distributed a leaflet to educate the midwives regarding LA toxicity and its management (AAGBI Guidelines). We conducted another survey, approximately 4 weeks later to assess any improvement in awareness.

**Results:** In the first survey, very few signs of LA toxicity were appreciated, with only quarter of midwives knowing about correct order of treatment/ use of IntraLipid as a part of LA toxicity treatment. In the second survey more midwives knew about important signs and symptoms of LA toxicity with the majority knowing about its management with IntraLipid, its location and protocol about dose.

**Conclusions:** The results of the first survey showed lack of knowledge regarding LA toxicity and we therefore distributed leaflets to address this. The second survey gratifyingly showed improvement in knowledge. In future, there are plans to do a few teaching sessions for midwifery staff, as well as to incorporate the leaflet into the epidural competency pack for the midwives.

**434**

**MONITORING AFTER REGIONAL ANAESTHESIA FOR LOWER SEGMENT CAESAREAN SECTION**

A. Pearce, S. Sudunagunta

**Background and aims:** Regional anaesthesia is used routinely for Lower Segment Caesarean Section (LSCS). The Association of Anaesthetists of Great Britain and Ireland recommend that all patients undergoing regional anaesthesia should receive the same level of recovery as in the main theatre complex, including monitoring and documentation of conscious level, respiratory frequency and pain intensity. Our audit aimed to determine whether these standards of care were met for patients undergoing LSCS under regional anaesthesia.

**Methods:** Notes of 47 women undergoing regional anaesthesia for LSCS were reviewed for documentation of monitoring of conscious level, respiratory frequency and pain intensity in the immediate post-operative period.

**Results:** 15% of the women included had a Category I LSCS, 40% Category II, 2% Category III and 43% elective LSCS. 40% received spinal anaesthesia, 23% combined spinal and epidural and 36% epidural anaesthesia.

**Conclusions:** Monitoring of obstetric patients following regional anaesthesia is poor, especially following emergency procedures. Modified Obstetric Early Warning (MEOWS) Charts were used for the majority of patients having elective procedures, but used less frequently following emergency procedures. Our recommendations include further multidisciplinary education on risks of regional anaesthesia and importance of post-operative monitoring, and routine use of MEOWS charts in obstetric recovery.

**347**

**RESTRICTED SPINAL BLOCK BY EPIDURAL VOLUME EXTENSION FOR CAESAREAN SECTION: A DIFFERENT APPROACH TO CSE-EVE**

L. Kalagac Fabris, Croatia.

**Introduction:** Spinal-induced hypotension remains the most important side effect during caesarean section with a reported incidence between 20 and 100%; it can cause maternal discomfort and impaired utero-placental perfusion. The risk of fetal asphyxia depends on the severity and duration of the hypotensive episode.

**Material and methods:** After approval by the Ethics Committee, 60 full term parturients with uncomplicated pregnancies were prospectively randomized into two groups: SSS-single shot spinal anaesthesia (29 patients) and CSE-EVE—combined spinal-epidural anaesthesia to induce the restriction of the spinal space by the epidural volume compression (31 patients).

For CSE-EVE we use needle through-needle technique at L2/3 level in sitting position. The initial dose for CSE-EVE was exactly half of the SSS dose (0.5mg per 10cm height of hyperbaric levobupivacaine and 20mg fentanyl). In the CSE-EVE the epidural catheter was inserted 12cm high and after spinal injection was extended with a volume of 20ml saline solution.

Anesthetic efficacy was assessed using haemodynamic monitoring (NIBP, HR). Bromage motor score, visual analogue pain score, Apgar score at birth, pH-placentae, and epinephrine consumption.

**Results:** Patients characteristics were similar.

The following table summarizes the results of the study:

<table>
<thead>
<tr>
<th></th>
<th>SSS</th>
<th>CSE-EVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readiness for surgery (min)</td>
<td>9 +/- 2</td>
<td>10 +/- 2</td>
</tr>
<tr>
<td>Surgery time (min)</td>
<td>39 +/- 5</td>
<td>42 +/- 5</td>
</tr>
<tr>
<td>% intraop. hypotension (&gt;20% meanBP)</td>
<td>32%</td>
<td>9%</td>
</tr>
<tr>
<td>Bromage motor score at end of CS</td>
<td>3 (60%)</td>
<td>1 (60%)</td>
</tr>
<tr>
<td>pH-placentae</td>
<td>7.18</td>
<td>7.29</td>
</tr>
<tr>
<td>Intraoperative nausea (% of patient’s)</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Time for first walk (min)</td>
<td>310 +/- 35</td>
<td>130 +/- 20</td>
</tr>
</tbody>
</table>

**Conclusions:** These results support the idea that hypotension can be avoided with the implementation of CSE-EVE technique for caesarean section.

**349**

**AN AUDIT OF EPIDURAL RE-SITES IN A TERTIARY REFERRAL MATERNITY UNIT**

S. Napier, H. Swales, H. Williams

**Background and aims:** Epidural analgesia has a known failure rate, either because insertion is impossible or analgesia is unsatisfactory. Some epidurals need to be re-sited due to catheter migration or disconnection, which is potentially avoidable. The anaesthetist must ensure that the epidural is secured to prevent migration, to try and prevent disconnection of the component parts and thereby prevent the need to re-site. Following a series of catheter disconnections in our unit, we carried out an audit of epidural re-sites and reasons for re-site.

**Methods:** Information about epidurals that had to be re-sited was collected retrospectively in a 2 month period.

**Results:** Total number of Epidurals - 254

- Re-sited due to inadequate analgesia - 13 (5%)
- Re-sited due to catheter disconnection - 5 (2%)
- Re-sited due to catheter falling out - 7 (3%)
- Required spinal in theatre due to inadequate epidural analgesia - 10 (4%)
- Required spinal in theatre due to catheter disconnection - 2 (0.78%)
- Required spinal in theatre due to catheter falling out - 3 (1%)

**Conclusions:** In a two month period 254 epidurals were sited in labour. 40% required either 2nd epidural or spinal. Of these, 17% were due to catheter disconnections or migration. Re-sites due to inadequate analgesia, difficulty with insertion and unilateral blocks are generally unavoidable. However, re-sites due to catheter disconnections and migration are avoidable. We have introduced an effective method of securing epidurals to prevent disconnections or catheter migration.

**References:**

350 CAN LOW DOSE SPINAL BLOCK WITH SUPPLEMENTED ILIOINGUINAL BLOCKS BE A BETTER ALTERNATIVE FOR CESAREAN SECTION IN CRITICAL OBSTETRIC CASES? OUR EXPERIENCE OF TWO CASES


Case I: A thirty-five years old (G3P2) parturient presented for emergency cesarean section (CS) due to scar tenderness. Her pregnancy was complicated by peripartum cardiomyopathy (PPCM) (already diagnosed in last pregnancy), gestational diabetes mellitus and nutritional anaemia. Her echocardiography confirmed the diagnosis. She was on standard anti-failure management for PPCM and insulin for diabetic control.

Case II: A thirty-six years old unbooked Tanzanian parturient (G1P1) was scheduled for emergency CS for foetal bradycardia. Her indirect Coom’s test is positive (1 in 265 dilutions in 2004). She is a known case of rheumatic heart disease with severe AS confirmed by echocardiography but was asymptomatic. Perioperative management: In both the cases combined spinal epidural (CSE) anesthesia with low dose spinal block (5 mg of 0.5% hyperbaric bupivacaine and 25 µg of fentanyl) and added bilateral ultrasound guided ilioinguinal nerve blocks (INB) were given to supplement skin incision. Epidural top ups were avoided to avoid undue hypotension. Patients were put on prophylactic non-invasive ventilation to prevent auto-transfusion induced sudden pulmonary edema. In both the cases live crying babies were delivered with good Apgar score. Both the patients were shifted to ICU for postoperative monitoring and postoperative pain was managed with standard epidural infusion. Both the mothers had uneventful postoperative course. Conclusions: Low dose spinal anesthesia with added bilateral INB with epidural catheter back up can be a excellent and safer alternative than CSE only in critical obstetric cases.

351 ULTRASOUND-ASSISTED EPIDURAL FOR LABOUR: A CASE SERIES

M. Nejdlova, T. Johnson

Background and aims: The use of a pre-insertion ultrasound scan has the potential to increase the ease, efficacy and safety of epidural catheter placement. We present a series of 50 cases in which ultrasound-derived measures were used to guide epidural catheter placement during labour.

Methods: 50 parturients in labour received a systematic scan of the lumbar spine in both longitudinal and transverse planes prior to epidural catheter placement. We assess the ability to identify lumbar interspaces and the midline, compare the measured depth of the epidural space to that found by loss of resistance, describe the number of insertion points and needle passes, assess efficacy and list any complications.

Results: Interspaces and midline were identified in 50/50 (100%). A single insertion point was used in 49 (98%), and 42 (84%) required a single needle pass. Depth measurements were obtained in both longitudinal and transverse planes in 40 (80%). In 36/40 measured depth was within 5 mm of that found by loss of resistance. 8 patients (16%) had inconclusive images in the transverse plane. 46 (92%) had satisfactory analgesia across the epidural catheter placement. Lumbar interspaces can be reliably identified and epidural depth measured with reasonable accuracy in most patients. Image quality in the longitudinal plane was superior to the transverse plane.

352 SPINAL VERSUS GENERAL ANESTHESIA FOR MATERNAL AND FETAL OUTCOMES IN ELECTIVE CESAREAN SECTION

F. Hawwas, U. Azar, M. Orhan Sungur, M. Karadeniz, T. Ozkan Seyhan, Turkey.

Background and aims: In this prospective study, maternal and fetal outcomes of general and spinal anesthesia are compared in elective cesarean section.

Methods: Parturients operated in 2009 were observed under standardized general anesthesia (Group-G) and spinal anesthesia (Group-S). Operating room entry-surgery start (T1), incision-hysterotomy (T2), hysterotomy-delivery (T3), surgery conclusion-entry to recovery room (T4) durations, total fluid and ephedrine administered were recorded. Maternal and newborn recordings included analgesia, return of gastrointestinal functions and hospital discharge, umbilical cord gas analysis, Apgar scores, need for ventilation, phototherapy or nutrition.

Results: Demographic data and results are shown in table as mean ± SD and median [min-max]. Maternal demographics and newborn outcomes were similar in both groups.

Table: [Table]

Conclusions: General anesthesia has resulted in longer duration in maternal bowel movement return and hospital stay in elective cesarean section although newborn outcome and use of operating room were similar.

353 ANAESTHETIC MANAGEMENT OF A PARTURIENT WITH NOONAN SYNDROME

A. Almeida, A. Cunha, A. Bernardino, T. Paiva, N. Medeiros, Portugal.

Background and Goal of Study: The Noonan syndrome (NS) is a genetic disease characterized by short stature, hypertelorism, anterior projection of the ears, short neck, pectus excavatum and underdeveloped genitals. Valve abnormalities and coagulation disorders are commonly associated.

Methods: 28 years-old parturient with NS, proposed for cesarean at 36 weeks of gestation for oligohydramnios and delayed intrauterine growth. The patient had restrictive respiratory pattern, kyphoscoliosis and pectus excavatum. She had short stature (130 cm), retrogastria, lower jaw forming triangular, Mallampati III, poor mouth opening (< 1 cm), poor neck mobility. Had undergone three general anesthetic procedures: aortic valve stenosis repair (5 months-old) and 2 corrective surgeries of kyphoscoliosis (12 and 18 years) with impossible intubation in one of them and consequent tracheotomy. We tried neuroaxial blockade technique with no success after several attempts. After explanation of the technique, the parturient was sedated with midazolam and fentanyl, and fibrescopic intubation with 7 endotracheal tube was performed. Immediately after intubation, induction was performed with propofol and remifentanil, maintaining spontaneous ventilation. The surgical procedure lasted for 17 minutes. The patient remained stable and was discharged uneventfully postoperatively.

Results: This parturient was an anesthetic challenge due to her respiratory changes and anticipated difficult intubation. We couldn’t perform a central block probably because of altered conformation of the spine and her surgical history. Although the predicted difficult airway and the respiratory disease, we performed a general anesthesia with fibrescopic intubation without incidents or complications.
The Noonan’s syndrome is an anesthetic challenge due to expected difficult intubation, respiratory, cardiovascular and coagulation disorders, and skeletal deformations.

Takotsubo cardiomyopathy (TC) is characterized by transient left ventricle dysfunction with apical dyskinesia. It’s frequently diagnosed as Acute Coronary Syndrome (ACS). It’s more frequent in post menopausal women, triggered by a physical or emotional stressor. The diagnose is made by the echocardiographic findings and an unchanged coronary angiography. In 95% of cases there is recovery until 4 weeks. The in-hospital mortality is low (0-8%) with a recurrence of around 10%.

Case Report: A 73 years woman, caucasian, with a history of dyslipidemia, atrial fibrillation, allergy to amiodarone. Medicated with digoxin, statin, aspirin. Patient reported episodes of "cysto-swing". Before the proposed date for the surgery the patient presented a clinical, electrocardiographic and enzymology compatible with ACS. One week before the patient’s husband had died. The echocardiogram is suggestive of TC and coronary angiography revealed no changes. Was added oral iron and trivalent. Electrocardiographic follow-up showed reversal of the changes. Surgery was performed 5 months later. The patient was pre-medicated with benzodiazepine. Surgery was performed under sub-arachnoid block and sedation with propofol, having passed uneventfully.

Conclusion: CT can be triggered by stressful events such as surgical interventions (9.7%). The pathophysiology and treatment are controversial. The centerpiece of therapy is the prevention of thromboembolic events and interventions (9.7%). The pathophysiology and treatment are controversial. The neuraxial blockade in addition to ensuring cardiovascular stability appears to respond by an anti-inflammatory effect attributed to the use of local anesthetics and decreased release of inflammatory peptide mediators due to opioids.

How far can we go with ultrasound-guided nerve blocks in pain management?


Background and aims: The use of ultrasound to guide nerve blocks in pain management has increased dramatically over the last few years (1). Ultrasound allows pain medicine physicians to target specific locations and observe the spread of local anesthetic, but it can also increase their medicolegal responsibility.

Methods: 25 years old female, immunocompromised after having undergone lung transplantation, came to our pain management unit because of episodes of severe pain in the 8th left intercostal space with movements of the chest, that began after a laparoscopic ovarian surgery.

Results: Chest X-ray, abdominopelvic ultrasound and thoracolumbar CT were normal. Only a slight decrease in pain was achieved with various analgesics, including strong opioids and capsicain. Paravertebral block between T7-T9 was performed twice, with temporary relief. An ultrasound-guided intercostal nerve block was proposed. When performing the ultrasound evaluation of the area, a lobulated structure was observed, in contact with the lower edge of the 7th rib. The technique was suspended and the lesion was surgically removed and diagnosed as an intercostal leiomyoscarcoma.

Conclusions: The location of the lesion, in our opinion, justifies the nature of this pain. The aim of pain medicine physicians is basically the control of pain. With ultrasound, it’s possible to see occasional abnormal structures. Its correct identification can help to understand what’s causing the pain or to diagnose comorbidities, thus increasing the spectrum of ultrasound’s use in chronic pain. Investment in knowledge of sonopathology, promotes accurate diagnoses and better clinical decisions, reducing the risk of medicolegal conflicts.

Can a heart tear? Takotsubo cardiomyopathy: Case report

F. Almeida, N. Ferreira, R. Veiga, N. Pinheiro, T. Egidio, Portugal.

Introduction: Takotsubo cardiomyopathy (TC) is characterized by transient left ventricle dysfunction with apical dyskinesia. It’s frequently diagnosed as Acute Coronary Syndrome (ACS). It’s more frequent in post menopausal women, triggered by a physical or emotional stressor. The diagnose is made by the echocardiographic findings and an unchanged coronary angiography. In 95% of cases there is recovery until 4 weeks. The in-hospital mortality is low (0-8%) with a recurrence of around 10%.

Case Report: A 73 years woman, caucasian, with a history of dyslipidemia, atrial fibrillation, allergy to amiodarone. Medicated with digoxin, statin, aspirin. Patient reported episodes of "cysto-swing". Before the proposed date for the surgery the patient presented a clinical, electrocardiographic and enzymology compatible with ACS. One week before the patient’s husband had died. The echocardiogram is suggestive of TC and coronary angiography revealed no changes. Was added oral iron and trivalent. Electrocardiographic follow-up showed reversal of the changes. Surgery was performed 5 months later. The patient was pre-medicated with benzodiazepine. Surgery was performed under sub-arachnoid block and sedation with propofol, having passed uneventfully.

Conclusion: CT can be triggered by stressful events such as surgical interventions (9.7%). The pathophysiology and treatment are controversial. The centerpiece of therapy is the prevention of thromboembolic events and interventions (9.7%). The pathophysiology and treatment are controversial. The neuraxial blockade in addition to ensuring cardiovascular stability appears to respond by an anti-inflammatory effect attributed to the use of local anesthetics and decreased release of inflammatory peptide mediators due to opioids.

Regional Anesthesia and Pain Medicine • Volume 36, Number 7, September-October 2011 Supplement

References:


Uterine artery embolization under epidural neuraxial blockade - An effective anaesthetic/analgesic alternative: About two case reports

M.R. Caetano, Portugal.

Authors report two cases: 35 year old female, ASAII, severe pelvic pressure uterine fibroid; 41 year old female, ASAI, fibromirotomatus uterus and menorragic history. Both submitted to UAE under epidural anesthesia. Standard monitoring, prophylactic antibiotics and mydazolam intravenous (iv) bolus, followed by epidural space catheterization. Opioid (morphine 3 mg) and local anaesthetic (LA) (ropivacaine 0.75%) were administered through the epidural catheter, to achieve a satisfactory level anaesthetic blockade. Alfentanil, 0.05 mg iv bolus was administered at the precise moment of arteries embolization.

In the first case no NSAID was given. Present low pain levels (EVA 2-4).

In the latter, NSAID was used; difficult pain control was described, rescue opioid iv infusion and bolus were necessary to keep patient comfortable, despite rescue LA epidural bolus. A new epidural catheter was placed, revealed itself to be effective and pain control was achieved.

Therefore, authors concluded that the first catheter was at somepoint dislogged. No side effects were noticed in both cases. Released 24 hours after admission in PACU to Gynecology Department and discharged 3 days after procedure.

Despite scientific literature is not consensual for best anaesthetic approach, epidural blockade anaesthesia has shown to be a safe and effective technique, as well as a multimodal scheme to control severe pain levels.

Chest X-ray, abdominopelvic ultrasound and thoracolumbar CT were normal. Only a slight decrease in pain was achieved with various analgesics, including strong opioids and capsicain. Paravertebral block between T7-T9 was performed twice, with temporary relief. An ultrasound-guided intercostal nerve block was proposed. When performing the ultrasound evaluation of the area, a lobulated structure was observed, in contact with the lower edge of the 7th rib. The technique was suspended and the lesion was surgically removed and diagnosed as an intercostal leiomyoscarcoma.

Conclusions: The location of the lesion, in our opinion, justifies the nature of this pain. The aim of pain medicine physicians is basically the control of pain. With ultrasound, it’s possible to see occasional abnormal structures. Its correct identification can help to understand what’s causing the pain or to diagnose comorbidities, thus increasing the spectrum of ultrasound’s use in chronic pain. Investment in knowledge of sonopathology, promotes accurate diagnoses and better clinical decisions, reducing the risk of medicolegal conflicts.

Vocal cord paralysis and respiratory arrest following posterior instrumentation


Background and aims: We aim to present a case of respiratory arrest due to vocal cord paralysis following scoliosis surgery.

Case: Posterior instrumentation and fusion was planned to a 15 years’ old female who had 42° right-sided thorolomerb scoliosis between T6-L1. Standard TIVA was applied and MEP monitoring was done. For pre-operative analgesia 20 mcg/kg morphine 20 mcg/kg + Levobupivacaine 0.5% 15 ml along with 15 ml of NaCl 0.09% was prepared and 2 ml was administered for every segment to be operated before the surgery. Posterior pedicular rod was placed between T4-L1. Following extubation respiratory arrest developed in recovery unit and the patient is reintubated without any difficulty. As GCS scale was 5 during the follow up in ICU, hypothermia (32°) was done and thiopental infusion was given for brain protection. After the neurological recovery the patient was extubated but following extubation the patient was desaturated and reintubation was done. During the reintubation the vocal cords was paralytic so tracheostomy was done until the remission of paralysis. Then the patient was discharged to physical therapy department for rehabilitation of the weakness in the lower extremities.

Conclusion: Postoperative respiratory complications can be seen following scoliosis surgery (1). The respiratory depression in this case is caused by vocal cord paralysis that is probably due to the correction in a very long segment and due to the prone position during surgery.
Greece. -1

clonidine. Because of left shoulder pain the patient was

1

The use of a regional scalp block, with minimal amounts of

Prior to surgery, the patient was conscious, cooperative, oriented with

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fentanyl. The patient was sedated

In this case, the approaches of neuroanesthesia are presented

we present the case of a 46 year old woman who was expected

Thoracic CSEA for laparoscopic cholecystectomy is an

A Mayfield holder was attached to the patient 10 min

*Turkey.

References:

etomidate and 6 mg pancuronium intravenously. Continuation of 50/50% O

a blood pressure of 130/80 mmHg and a heart rate of 75 beats per minute

19 years ago and a myocardial infarction two months ago.

intracranial hematoma complication. The patient had a single vessel bypass

in a 73-year-old male with an existing cerebellum tumor followed by an

rowing of the trachea. She was otherwise healthy. The patient was

scheduled for cholecystectomy due to cholelethiasis and recurrent gold

bladder pain. She presented hoarseness of voice and inspiratory wheezing.

We decided to perform regional anesthesia and consequently the surgery

due to cholelethiasis and recurrent gold bladder pain. She presented hoarseness of voice and inspiratory wheezing.

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due to cholelethiasis and recurrent gold bladder pain. She presented hoarseness of voice and inspiratory wheezing.

The advantages of regional anesthesia in this particular case were greater

due to cholelethiasis and recurrent gold bladder pain. She presented hoarseness of voice and inspiratory wheezing.

Results We performed thoracic epidural at the level of T6-T9 with

The patient was sedated with midazolame 4mg to Ramsey score 3. The operation was completed

uneventfully with sub costal incision in 45 minutes. The patient was

transferred in the pacu for 30 min. The epidural catheter remained for

48 hours for postop analgesia. She had an uncomplicated postoperative

course.

Conclusions: despite the advances in airway management techniques

the advantages of regional anesthesia in this particular case were greater

became the imposed risk of postoperative laryngeal edema and obstruction of an already compromised airway.

Thoracic Epidural for Open Cholecystectomy in a Patient with Difficult Airway


Background and aims: the benefits of regional anesthesia when intubation is expected to be difficult or impossible are significant.

Methods: we present the case of a 46 year old woman who was expected to present difficulties in airway manipulation. The patient had suffered a car accident with head and thoracic injury at the age of 20 and had a history of tracheomalacia due to long term intubation in the ICU. She was submitted to reconstruction of the trachea with vocal cord excision and arytenoid cartilage excision. Concurrently she suffered of extreme narrowing of the trachea. She was otherwise healthy. The patient was scheduled for cholecystectomy due to cholelethiasis and recurrent gold bladder pain. She presented hoarseness of voice and inspiratory wheezing.

We decided to perform regional anesthesia and consequently the surgery had to be performed with open rather than laparoscopic technique in order to avoid any difficulties in breathing that would necessitate urgent conversion to general anesthesia.

Results We performed thoracic epidural at the level of T8-T9 with 15 ml of ropivacaine 0.75% plus 100 γ fentanyl. The patient was sedated with midazolame 4mg to Ramsey score 3. The operation was completed uneventfully with sub costal incision in 45 minutes. The patient was transferred in the pacu for 30 min. The epidural catheter remained for 48 hours for postop analgesia. She had an uncomplicated postoperative course.

Conclusions: despite the advances in airway management techniques the advantages of regional anesthesia in this particular case were greater because the imposed risk of postoperative laryngeal edema and obstruction of an already compromised airway.

References


Thoracic Combined Spinal- Epidural Anaesthesia for Laparoscopic Cholecystectomy in Obese Patient with Asthma and Multiple Drug Allergies-Case Report

A. Daszkiewicz, H. Misiołek Poland.

Introduction: Thoracic CSEA for laparoscopic cholecystectomy is an alternative method of anesthesia for selected patients, especially with major respiratory diseases. Nowadays allergies are very common and performing anesthesia on patients allergic to general anesthetics is a challenge. 

Case report: A 34 year old female, ASA 3, obese (BMI 45,2) was presented for laparoscopic cholecystectomy. Preoperative evaluation showed her coexisting major diseases: hypertension, bronchial asthma, stage 3 chronic kidney disease (cyclosporin nephropathy) and multiple drug allergies diagnosed and confirmed including allergy to atropine, midazolam, ethomidate, fentanyl, tramadol, suxamethonium, vecuronium, cisatracurium, metamizole. Allergy to lidocaine and bupivacaine was ruled out. We decided to perform thoracic combined spinal-epidural anesthesia at Th10 level using needle through needle technique. Spinal anesthesia was obtained with 1,3 ml of 5 mg ml⁻¹plain bupivacaine mixed with 0,2 ml of 150 mcg ml⁻¹clonidine. Because of left shoulder pain the patient was
Amputation involved removal of the scapula. Total surgery time.

E211 Thoracic CSEA can be a safe and useful alternative to general anaesthesia in patients who had further investigation must be done to study general anaesthesia.

Conclusions: Thoracic CSEA can be a safe and useful alternative to general anaesthesia for laparoscopic cholecystectomy in special cases but only for anaesthesiologists with experience in CSE anaesthesia.

361 ACUTE ISCHAEMIC STROKE IN PREGNANCY: A RARE AND TRAGIC EVENT

Background and aims: Ischaemic stroke in pregnancy is a rare event. The incidence has been estimated to be 3.5 ischaemic strokes per 100,000 and maternal mortality has been reported in 0% to 25%.

Methods: A 41-year-old woman at 37 weeks gestation, morbidly obese (BMI: 35 Kg/m²), hypertensive, gestational diabetes, who presented headache, dysarthria and paresis of superior member for less than 24 h. US showed no fetal heartbeat and MRI revealed a recent ischemic lesion.

Caesarean section with general anaesthesia was planned. Invasive pressure monitoring and aspiration prophylaxis were done. Rapid sequence induction was done with phentany (3 µg/kg), propofol (2 mg/kg) and rocuronium (1 mg/kg) and maintenance with propofol perfusion BIS guided. During intra-operative period hypertensive hemodynamic profile was observed and maintained (SBP 140-180 mmHg; DBP 90-110 mmHg).

Postoperative period occurred without complications and patient recovered from motor deficits.

Results: The complications of general anaesthesia in patients who had suffered a recent cerebrovascular event (CVE) is unknown. Secondary brain injury must be minimized in a brain whose autoregulation becomes arterial pressure dependent. Both elevated and low blood pressures are associated with poor outcome. A good analgesic control, normoxia, nor-moglycaemia and mandible are mandatory. Obese parturients are at increased risk of anesthesia-related complications. Predicted difficult intubation, aspiration risk and blood pressure response during laryngoscopy are concerns. A neuroaxial technique was excluded because it could worsen the haemodynamic profile.

Conclusions: Further investigation must be done to study general anaesthesia and CVE.

362 ANAESTHETIC IMPLICATIONS AND MANAGEMENT OF A CASE OF OSTEGENESIS IMPERFECTA

Background and aims: Osteogenesis Imperfecta (OI) is an inherited disorder of connective tissue with defects in collagen formation, affecting 6 to 7 per 100,000 people. Prompt surgical intervention of fractures is sometimes needed.

Methods: Nine year old child, hypothyroidism, osteogenesis imperfecta tarda, 24 kg, presented to urgent patella fracture surgery. History of frequent skeletal fractures for which had undergone general anaesthesia eventuall.

On physical examination: Mallampati III, blue sclera and opalescent teeth. Premedication done with midazolam and general anaesthesia was started: pre-oxygenation for 3 minutes and induction with fentanyl (3 µg/kg), propofol (3 mg/kg) and rocuronium (1 mg/kg). Anesthesia was maintained using sevoflurane MAC-guided and O2/air.

Vomiting prophylaxis done with dexamethasone 4 mg and ondansetron 2.5 mg and analgesia with ketorolac 12 mg and paracetamol 500 mg. Muscle blockade reversal with atropine 0.48 mg and neostigmine 0.96 mg.

The postoperative period was uneventful and the child was discharged on 3rd postoperative day.

Results: Many potential anaesthetic complications are associated with OI: difficult airway must always be assumed and risk of odonto-axial dislocation. Nondepolarizing muscle relaxants are preferable as fasciculations associated with succinylcholine may produce fractures. Positioning on the operating table and pressure from automated blood pressure cuff are concerns. Malignant hyperthermia is probably the most worrisome anaesthetic implication due to the hypermetabolic state. Cardiac anomalies such as mitral valve prolapse and platelet dysfunction must be studied and managed accordingly.

Conclusions: Preanaesthetic evaluation in OI is very important and gentle care is essential in handling these patients.

363 HOW HARD IT CAN BE TO CHOOSE THE RIGHT KIND OF ANESTHESIA?
D. Franic Kasunic, Croatia.

The Case: Female patient KP (1984) was diagnosed with scoliosis at the age of 3. The 3 operations were made: Hemiarthrodesis 6-12 vertebra (1991), Spondylodesis posterior Th II-L III cum instr RRI (1997) and Reop (2005).

She also has Chronic Obstructive Pulmonal Decease and restrictive disorder of ventilation of the high degree.

After regular ambulance controlled pregnancy she came into our hospital in the 38th week of pregnancy, in acute respiratory infect and with high fever.

Spirometry showed restrictive opustrophic Pulmonal Decease and restrictive disorder of ventilation of high degree (FVC = 48%, FEV1 = 50%). Inspite of the therapy with antibiotics, bronchodilatators and corticosteroids the state remained the same. It was decided that the Cesarean Section must be made and the anestesiologist has to choose the right kind of the anesthesia. She insisted on spine Rtg. In sitting position with paramedical approach spinal anesthesia was achieved on the level L4-L5. Trendelenburg, mask-oxygenation, small doses of i.v. analgetics and tranquilizers were necessary.

A healthy baby-boy 3050/50, Abgar 10/10 was born. Mother's postoperative state was regular. Both were released from the hospital 4 days after the operation.

364 CONTINUOUS THORACIC PARAVERTEBRAL BLOCK FOR THORACIC LIMB AMPUTATION IN A DOG
D. Gamba, Italy.

Background and aims: Dogs brachial plexus block is usually an adjunct rather than an alternative to general anaesthesia, providing a sparing effect on general anaesthetics. Continuous thoracic paravertebral block has never been reported, nor considered as an alternative to brachial plexus block in dogs. We report the block in a clinical dog with owner consent.

Methods: In a 10-year-old, male, Dalmatian dog, weighing 25 kg, undergoing right front limb amputation, anaesthesia was induced with propofol and maintained with sevoflurane. Patient monitoring included electrocardiogram, direct arterial blood pressure (ABP) and expired sevoflurane (EtSevo) concentration during surgery, and the Glasgow Composite Pain Scale (SF-GCPS) postoperatively. Using a 19 G epidural set and the Loss-of-Resistance technique, the right paravertebral space was entered at T4 level according to Lomqvist, and a 3-holed catheter was threaded through the Tuohy needle at T2 level. X-ray confirmed catheter position. 20 minutes prior to surgery baseline readings were obtained, and 0.75% ropivacaine (37.5 mg) was administered through the catheter. Postoperatively 0.125% ropivacaine (6.25 mg) was administered at 12-hour intervals.

Results: Amputation involved removal of the scapula. Total surgery time was 118 minutes. EtSevo was 0.8%, and heart rate and ABP remained within 7% from baseline. Although at recovery the dog exhibited a 3-hour lasting high fever.
detected. GPCS was 5 or lower, suggesting effective analgesia. Opioid administration was not required.

Conclusions: Thoracic paravertebral catheterization is possible in dogs and may allow effective blockade for surgery without complications.

Paravertebral catheter was removed after a bolus of 16 mg ropivacaine, and patient was discharged stable to ICU (90 minutes stay).

Conclusions: Paravertebral anesthetic block is safe and suitable for mastectomy in high risk patients.

365
CONTINUOUS PERIPHERAL NERVE BLOCKADE FOR PALLIATIVE CARE OF A PATIENT WITH AN ACUTELY ISAEMIC LIMB
T. Geary, G. Haldane, K. Lake

Introduction: Management of pain in the end-of-life setting is strongly based on the WHO cancer pain guidelines. The majority of palliative patients can have acceptable pain relief with timely and judicious analgesics in this manner. We present a case in which a continuous regional analgesic technique provided improved comfort in the terminal setting where conventional opioid analgesia had failed.

Case Report: A 100-year-old lady with a history of NIDDM, hypertension, cerebral vascular infarct, duodenal ulcers, atrial fibrillation with previous peripheral vascular events necessitating iliac embolectomy 2-months prior to admission - presented with an acutely ischaemic left leg. CT-angiogram suggested embolus in the iliac, femoral and popliteal arteries. Repeat embolectomy and fasciectomy were performed, under local anaesthetic, without improvement of circulation. Following discussion with the patient and family further surgery was considered inappropriate.

Despite regular strong opioid analgesia as IV and continuous subcutaneous morphine, with adjuvant acetaminophen and gabapentin, the patient continued to have severe (4/4) pain. An ultrasound-guided sciatic popliteal nerve block with catheter was inserted (18G Portex Touhy needle & catheter, 20mls 0.25% levobupivcaaine) and infusion of 8ml/hr 0.125% levobupivcaine commenced via an elastometric-pump device. The patient's pain score improved to mild (1/4). The patient remained comfortable for the following six days, prior to her death, requiring only two further boluses of local anaesthetic for pain rating worse than mild (>1/4).

Conclusions: The use of continuous peripheral nerve technique can provide excellent analgesia for end of life care in patients with peripheral limb pathology.

366
HIGH THORACIC PARAVERTERAL ANESTHETIC BLOCK FOR RADICAL MASTECTOMY
I.P. Guimarães e Castro, A. Morais, Portugal.

Background and aims: Radical mastectomy (with or without axillary dissection) is usually performed under general anesthesia, requiring endotracheal intubation. More and more often, patients with advanced age and multiple co-morbidities are scheduled for surgery, having higher risk for anesthetic complications.

Thoracic paravertebral block is suitable for high risk patients, combined or not with sedation, providing excellent anesthesis/analgesia with favorable side-effect profile.

Methods: A 80 years-old ASA IV female, with history of ischemic myocardiospathy, class III NYHA heart failure (ejection fraction 30%), chronic renal failure under hemodialysis, smoking and overweight (BMI 29), underwent a right radical mastectomy under paravertebral anesthesia. For hemodynamic monitoring, a radial artery and a bladder catheter were inserted. An epidural catheter was placed at right T4 paravertebral space, and 20 ml ropivacaine 0.5% were given; after 30 minutes, motor and sensitive blockade were confirmed between T1 - T6, and a propofol 0.1 ml/kg/h was started for axtolysis.

Results: Surgery was held uneventfully for 45 minutes. Hemodynamic and respiratory stability were maintained, and no more ropivacaine, propofol, or opioids were needed.

At recovery room arrival, patient had no pain and was lightly sedated (Ramsay 3), but was dyspneic; inhaled salbutamol and I.V. furosemide were given, with relief of symptom after 20 minutes.

Conclusions: The plan was to go ahead with regional anaesthesia (USG) and GA for elective surgery. However more case series are evolving where in peripheral blocks are being performed, with no complications. In our institution, this is the first case wherein we performed the block in a patient on clopidogrel. However more evidence is awaited before we recommend any change in practice.

Ref: (i) J Athroplasty 2008; 23:550-354

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369 CASES OF UNCOMMON NEUROLOGIC COMPLICATIONS ASSOCIATED WITH NEURAXIAL ANESTHESIA

Background and aims: Neurologic complications associated with neuraxial anesthesia include cauda equina syndrome and transient neurologic symptoms. We report two cases of atypical manifestations of prolonged paralysis after spinal and combined spinal-epidural anesthesia.

Methods: We performed 2300 cases of spinal or combined spinal-epidural anesthesia by use of bupivacaine from March, 2003 to December, 2010, and experienced 2 cases of prolonged paralysis.

Results: Case 1: A 34-year-old pregnant woman, weighing 37 Kg, was scheduled for cesarean section. She had scoliosis and strong deformation of the pelvis. She received spinal anesthesia with 1.5 ml of 0.5% isobaric bupivacaine. Because of insufficient anesthesia, 1.2 ml was additionally administered, but nevertheless, anesthetic block height was Th11. Thus additional 4 ml of bupivacaine was administered, which produced appropriate anesthesia for the operation. Postoperatively, she had sensory and motor deficit in the right leg until the second postoperative day. Case 2: A 37-year-old pregnant woman, weighing 50 Kg, was undergoing urgent cesarean section. She received spinal anesthesia with 1.8ml of 0.5% isobaric bupivacaine followed by continuous epidural block with 0.2% ropivacaine. On the first postoperative day, she had sensory and motor disturbances in the left L2 nerve region. Although epidural tube was removed, the symptoms did not improve. MRI revealed a swelling of the left L2 nerve root. Six months later, motor disturbance has improved with mild sensory disturbance left.

Conclusions: Neurologic complications associated with neuraxial anesthesia were not common, but could be caused by either pharmacological or mechanical mechanisms, even if the procedure was performed without technical problems.

370 BRUGADA SYNDROME - EPIDURAL ANESTHESIA FOR CESAREAN SECTION IN A PATIENT AT RISK OF SUDDEN DEATH

Introduction: Brugada Syndrome (BS) is a rare clinical entity responsible up to 12% of all sudden deaths registered. It has a genetic basis and transmission affecting mostly males.

Its diagnosis is made upon family history, electrocardiogram (EKG) findings and clinical history (syncope, ventricular fibrillation). The heart is structurally normal. The diagnostic triad consists in abnormal EKG showing a right bundle block, elevation of ST segment in the right precordial EKG leads and sudden death. The treatment is an implantable cardioverter-defibrillator (ICD) placement.

Case presentation: A 40 year old pregnant female is admitted at a maternity initiating labor. Personal history reveals an untreated BS, diagnosed during pregnancy.

An epidural catheter was placed and continuous epidural analgesia was started with a 0,1% ropivacaine solution under permanent cardiac monitoring. Due to acute fetal suffering, a cesarean section was performed under epidural anesthesia. All potential arrhythmogenic factors were cautiously avoided.

No complications occurred during hospital stay.

Conclusion: BS is a potentially fatal condition rarely diagnosed and its preferential anesthetic management is still poorly described.

The emphasis is on its early recognition and the cautious anesthetic management, avoiding arrhythmogenic factors, drugs and mandatory continuous cardiac monitoring.

371 HIGH VOLUME NERVE BLOCKS AND SYSTEMIC TOXICITY OF LOCAL ANAESTHETICS. A CASE REPORT
K. Jensen, J. Borglum, Denmark.

Background and aims: The toxicity of local anaesthetics (LA) is a subject of much concern (1). Risk estimates, clinical presentations and treatment of toxic effects are based on animal studies and clinical cases. Such cases are rare but may increase with the advent of more elaborate combinations of nerve blocks and a growing number of practitioners unfamiliar with the practice and risks of large volume blocks.

Methods: We present a case with CNS toxicity of a transverse abdominis plane (TAP) block with placement of inadvertently large amounts of LA.

Results: A 41-year old male underwent a laparoscopic sigmoidectomy for a rectal cancer. To alleviate postoperative pain, a bilateral TAP block was administered in the PACU according to standard techniques (2), with ropivacaine 7.5 mg/ml 20 ml at each of the four points. After twenty minutes, the patient suddenly lost consciousness with opisthotone and generalized convulsions. His seizures stopped after intralipid infusion 100 ml and diazepam 2.5 mg iv. He regained consciousness, but continued to have incoherent speech for half an hour. There were no cardiovascular events, and he was discharged in well-being to the ward seven hours later. There were no long-term neurologic sequelae.

Conclusions: It is generally agreed that the amount of perineural ropivacaine should not exceed 200 mg (1). An interfascial deposition above this may result in potentially fatal adverse effects. These effects may not be immediate. Familiarity with recommended maximum dosages of LA is crucial, especially in large volume blocks. Intralipid is effective and should be readily available where nerve blocks are administered.

References:
orthostatic, often debilitating and may last for weeks. Effective treatment includes a patch of autologous blood in the epidural space. The effect is often immediate, and a complete restitution occurs within the first week afterwards. Epidural blood patches have been shown to be effective in some cases of long-lasting PDPH.

**Methods:** A descriptive case report and a short literature review (Table 1).

<table>
<thead>
<tr>
<th>Author and year</th>
<th>Patient age</th>
<th>Case of PDPH</th>
<th>Duration of symptoms</th>
<th>Effect of epidural blood patch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilton 1986</td>
<td>45 years</td>
<td>n/a</td>
<td>19 months</td>
<td>Yes</td>
</tr>
<tr>
<td>Parise 1987</td>
<td>25-64 years</td>
<td>Spinal anaesthesia</td>
<td>15 months to 10 years</td>
<td>In 4 of 6</td>
</tr>
<tr>
<td>Abouelmagd 1995</td>
<td>n/a</td>
<td>n/a</td>
<td>2 years</td>
<td>Yes</td>
</tr>
<tr>
<td>Klepstad 1999</td>
<td>20 years</td>
<td>Spinal anaesthesia</td>
<td>11 months</td>
<td>Yes</td>
</tr>
<tr>
<td>Genili 2000</td>
<td>31 years</td>
<td>Spinal root surgery</td>
<td>6 months</td>
<td>Partial</td>
</tr>
<tr>
<td>Raffin 2006</td>
<td>31 years</td>
<td>Spinal anaesthesia</td>
<td>7 years</td>
<td>Yes</td>
</tr>
<tr>
<td>Jensen 2010</td>
<td>36 years</td>
<td>Spinal tap</td>
<td>10 months</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(Epidural blood patch for long-lasting PDPH)

**Results:** A 35-year old healthy woman had a diagnostic lumbar puncture at the L3-L4 level with a 20 G quincke needle, when she presented with a monosymptomatic paralysis of the right facial nerve. She was diagnosed with Bell’s paralysis, which resolved in a few months. Shortly after the spinal tap, persistent frontal headache, vomiting, general fatigue and visual disturbances developed. Pain VAS was 6-8 in the upright position, and 3-4 when lying down. Noises aggravated the symptoms, and she had trouble concentrating and mobilizing words. 10 months after debut, she agreed to an epidural blood patch, and 20 ml of autologous blood was placed at the L2-L3 level. Her headache promptly disappeared, and she was able to resume her work as a preschool teacher.

**Conclusions:** An epidural blood patch may be effective long after the debut of PDPH symptoms.

374

**COUGH HEADACHE AFTER A SPINAL ANAESTHETIC**

R.G. Kanagavelu, S. Gilbert

**Background:** A 65 year old man with complaints of Cough Headache after an uneventful spinal anaesthetic for Hernia surgery. He was referred to our Pain Clinic by Neurologists for consideration of an epidural blood patch for presumed dural puncture headache. After the surgery, the patient developed a headache in the frontal and occipital areas whenever he coughed and bent down.

**Previous diagnosis and treatment:**

- An MRI scan showed asymptomatic small vessel ischaemic change, presumably related to hypertension and cigarette smoking, but no other findings or focal neurology on clinical examination.
- Neurologist’s advice to increase hydration and caffeine intake.
- Analgesics and Amitriptyline were ineffective. He took Amlodipine for hypertension.

**Our diagnosis and treatment:**

- There was no headache in between attacks and no suggestion of any neck pain or exacerbation by standing, which might have indicated a persistent low CSF pressure headache.
- Diagnosis of Primary Cough Headache made.
- Initially tried ocular pressure manoeuvre with no benefit. Then tried Aspirin 900mg with little effect.
- He was then given Indomethacin 25mg tds. After 2 months, he felt completely relieved. Subsequently the dose was reduced to bd. If he reduced the dose further the symptoms recurred.

**Conclusion:** We report an unusual complication of spinal anaesthesia which is resolved completely by Indomethacin which many anaesthetists will be unfamiliar. We hypothesise, that there may have been some change in the intracranial relationship of the intervention of the meninges, either from the Trigeminal or upper cervical nerves, although there were no significant findings on the MRI scanning.

375

**A NOVEL METHOD FOR SECURING THE EPIDURAL CATHETER IN A MORBIDLY OBSESE PARTURIENT**

R. Kerry, Y. Poonawala

**Background and aims:** We present a case involving the challenging placement and subsequent securing of a lumbar epidural catheter in a pregnant woman with a BMI of 70, undergoing induction of labour.

**Methods:** After discussion between the patient, obstetrician and anaesthetists, IV access was secured, and consent for the procedure obtained. We employed a two-operator technique. Both operators were scrubbed; one performing the initial skin preparation and retraction of skin / subcutaneous tissue, while the other performed a secondary skin prep and sited the epidural. The epidural catheter was secured at the level of insertion, then run horizontally under the skin crease.

Results: Using this technique, the epidural space was successfully accessed and the catheter advanced to 5cm within the space. By running the catheter horizontally along the skin crease, rather than vertically, prior to applying dressings, extra movement and tension on the catheter was avoided and it remained in place during labour.

**Conclusions:** Using two scrubbed operators made the placement of this challenging epidural catheter possible and the novel horizontal taping ensured that it was not dislodged by patient movement.

376

**‘SEEING IS BELIEVING’: AWAKE SHOULDER SURGERY IN THE OBSESE PATIENT**

M. Kigozi, I. Mowat, G. Foxall

**Background and aims:** Obesity presents several anaesthetic challenges including technical difficulty in regional anaesthetic techniques such as interscalene brachial plexus block (ISBPP). Whilst ISBPB provides the most complete anaesthesia for shoulder surgery, it is associated with ipsilateral diaphragmatic paralysis that may be significant in obese patients with pre-existing respiratory dysfunction. Research has shown that:

i) Reducing the volume of local anaesthetic used reduces respiratory complications
ii) Lower volumes are possible with ultrasound(US) guided as compared to landmark techniques

We describe the use of an US guided low volume ISBPB in an obese man previously refused surgery on account of his high anaesthetic risk.

Anaesthetic assessment revealed: Multiple predictors of difficult intubation, a BMI of 56, severe sleep apnoea and ischaemic heart disease.

**Methods:** US was used to visualise the nerve plexus at a depth of 3cm. A posterior in-plane approach with US needle enhancement technology was used. Appropriate nerve stimulation was applied to exclude interneural
IS ARNOLD CHIARI I AN ANESTHETIC CHALLENGE?
J. Louro Cruz, A. Vieira, P.J. Fragoso, T.F. Faria, Portugal.

Background: Arnold-Chiari malformation Type I (ACM) is a congenital anomaly of downward displacement of the lowermost portion of the cerebellum with herniation of cerebellar tonsils through foramen magnum. ACM normally presents in adolescents or adults with symptoms related to hydrocephalus or syringohydromyelia. Features include scoliosis, oculomotor disturbances, syncope, paraparesis, spasticity, respiratory failure, sleep disturbances and occipital dysplasia.

Patients may have difficult airway and are at risk of neurologic deterioration during anesthesia induction.

Case report: A 63-year-old woman, ASA II, with ACM, hypertension and dyslipidemia was scheduled for hip replacement. The patient had Mallampati II score, but diminished cervical mobility. She presented no neurological symptoms.

Monitoring was according ASA standards. Pre-medicated with Midazolam 2 mg iv. Induction was achieved with Fentanyl 0.2 mg, Propofol 150 mg, cisatracurium 6 mg iv, and maintenance with a mixture of Sevoflurane, oxygen and air. Orotracheal intubation was performed using videolaryngoscopy.

Surgery was performed without incidents. The patient was discharged to the surgical ward after 2 hours of uneventful stay in the post anesthesia care unit.

Discussion: The challenge in anesthetic management of ACM patients is to avoid intracranial or intra-spinal pressure variations and deal with possible airway difficulties.

In the present case, although no neurologic deficits were reported in the patient history, general anesthesia was chosen to avoid any spinal manipulation that could reduce intraspinal pressure.

We used videolaryngoscopy to accomplish two goals: overcome cervical spine diminished mobility; and lessen the sympathetic response to direct laryngoscopy.

References:
Neurosurgery. 1999 May;44(5):1005-17

CERVICAL PLEXUS BLOCK AND SPINAL ANESTHESIA FOR AXILLO BIFEMORAL BYPASS

Background and aims: Axillo-bifemoral bypass is alternative procedure for the elderly and/or high risk patients with aorto iliac occlusive disease. This procedure usually performed under general anesthesia. We present our experience with cervical plexus block and spinal anesthesia for these patients.

Methods: 67 years old man with previous myocardial infarction, ejection fraction 30%, insulin-dependent diabetes mellitus, chronic obstructive pulmonary disease and previous stroke was premedicated with midazolam 0.05 mg/kg intramuscularly. An infusion of remifentanil was started (0.04 μg/kg/min) before anesthesia administration. Deep cervical plexus block was performed by injecting 3-5 ml mixture of local anesthetics (2% lidocaine and 0.5% levobupivacaine) at each of the transverse process C2, C3, C4. Superficial cervical plexus block was performed with 15 ml of local anesthetics mixture along the posterior border of sternocleidomastoid muscle. Spinal anesthesia was performed at level L2-3, using 3 ml 0.5% levobupivacaine. Arterial blood pressure, heart rate and oxygen saturation were recorded before anesthesia (T1), after anesthesia administration (T2), after proximal anastomosis completed (T3), after distal anastomosis completed (T4), after surgery completed (T5).

Results: Mean systolic arterial pressure was 126±21 mmHg (T1: 160, T2: 120, T3: 100, T4: 110 and T5: 130 ), mean heart rate was 73±11 beats per minute (T1: 70, T2: 65, T3: 60, T4: 74, T5: 82), and mean oxygen blood saturation was 96±2% (T1: 97%, T2: 96%, T3: 93%, T4: 96%, T5: 98%).

Conclusions: Cervical plexus block and spinal anesthesia are good and safe choice for anesthesia in axillo bifemoral surgery.
Conclusions:
1. Patients with Ankylosing Spondylitis pose a dilemma when considering neuro-axial anaesthesia. Despite adhering to ASRA anticoagulation guidelines, our patient developed a SEDH.
2. Ankylosing spondylitis is a risk factor for SEDH in addition to increased age, spinal canal stenosis, renal impairment, and anticoagulation.
3. This case highlights the need for increased vigilance in patients with many risk factors for development of epidural haematoma.

**AN UNUSUAL CASE OF NEUROPATHIC PAIN COMPLICATING CERVICAL EPIDURAL STEROID INJECTION**

Z. Nassa, C. Gosavi

**Background and aims:** Cervical epidural steroid injections (CESI) are used for the treatment of cervical radiculopathy.

**Methods:** A 61 year old lady with a history of whiplash injury presented for a CESI procedure. This was performed through the C6-C7 interspace, in the sitting position using a standard 17G Touey needle. On first attempt, needle insertion resulted in paraesthesia to the right hand. A second attempt was made using 3mls of 1% lignocaine and 4mg dexamethasone.

**Results:** This second injection caused paraesthesia in the wrist, again on the right, which resolved within minutes.

On day two symptoms developed in the opposite limb, shooting pains in the left arm and tightness around the wrist. There was associated swelling and erythema of these areas. A MRI scan and nerve conduction studies were performed. Both were normal. The left arm pain resolved after several months but the wrist pain persisted.

**Conclusions:** We proposed two mechanisms of possible neuropathic injury in this patient. As suggested by her symptoms, the nerve tip could appear to be closer to the exiting nerve root thereby precipitating neural toxicity on deposition of the steroid solution. The second explanation may be spinal cord compromise resulting from a large herniated intervertebral disc, impinging posteriorly onto the ligamentum flavum. This however was negated by the normal MRI scan.

Neither mechanism offers a viable explanation for the symptoms experienced by this patient i.e. first paraesthesia of the right wrist and then subsequent symptoms in the opposite hand.

**SEVERE HEADACHE AFTER LUMBAR EPIDURAL INJECTION**

P. Patel, G. Biswas

Pneumocephalus and high spinal block are rare but recognised complications of epidural analgesia. We report a case of both complications occurring in a patient after inadvertent dural puncture during lumbar epidural injection.

A 55 year old man with a history of multiple spinal operations and chronic back pain was referred for epidural steroid injection. The injection was performed at the L5/S1 interspace by a consultant anaesthetist and loss of resistance to air was used to identify the epidural space with a 16-gauge Touey needle. 10 mls of 0.125% plain bupivacaine and 20 mg of triamcinolone were injected in the absence of any obvious cerebrospinal fluid leak. Within five minutes of the procedure the patient complained of severe frontal headache and had a transient episode of loss of consciousness. A high spinal block was demonstrated with sensory block to C5, bradycardia and hypotension. The patient was adequately resuscitated but the headache remained severe despite intravenous opiates. An MRI scan showed a small volume of air in the subarachnoid space, mainly around the pons. Severe headache and some residual motor and sensory deficit in the lower limbs remained for more than 48 hours. The patient was discharged 5 days later.

This case describes the serious complications that may arise during epidural placement in a patient who has had multiple spinal surgical procedures. In addition to high spinal block due to intrathecal injection, this case demonstrates the prolonged and severe headache that may occur immediately after inadvertent dural puncture with very small volumes of air.

**A CASE OF MENINGITIS IN PUERPERIUM: MIGHT IT BE RELATED TO SPINAL ANAESTHESIA FOR CAESAREAN SECTION?**

S. Quaglia, E. Golio, Italy.

**Aim:** Meningitis is a rare complication of spinal injection procedures performed in health-care settings. We present (after obtaining her consent) a case of meningitis diagnosed in a healthy patient 12 days after spinal anaesthesia for caesarean section.

**Case report:** A healthy 24-year-old primigravida was scheduled for caesarean section at 38 weeks gestation for podalic presentation. Spinal anaesthesia was performed and a healthy baby was delivered. The patient was discharged from hospital in good health on postpartum Day 4. After two days she experienced headache, neck pain and high fever (T ≥ 39°C) associated with clinical mastitis. The hospital prescribed treatment with Ampicillin 1 g X 2, but her headache and fever did not get better. She returned to hospital after six days. Blood tests revealed high levels of inflammation indicators. Neurological examination and brain magnetic resonance imaging were negative. The situation was unclear and a cerebrospinal fluid (CSF) examination was performed: the test showed a lymphocytic meningitis, no microorganisms were isolated. Treatment with Ceftiraxone 2 g X 2 and Acciclovir 500 mg X 3 were performed for 7 days and the patient was discharged from hospital in good health on Day 10. A follow-up clinical examination conducted 4 weeks later was normal.

**Conclusions:** Although the most likely etiopathogenesis of lymphocytic meningitis is viral, the previous antibiotic treatment cannot exclude with certainty a bacterial pathogenesis of this meningitis due to spinal anaesthesia.

**PERIOPERATIVE ANESTHETIC MANAGEMENT OF A PATIENT WITH HETEROZYGOUS SICKLE CELL DISEASE AND AORTIC STENOSIS UNDERGOING MAJOR ORTHOPEDIC SURGERY**

D. Sarridou, D. Rozakis, A. Makris, P. Papadopoulos, A. Mela, Greece.

**Background and aims:** We present the anaesthetic management of a patient with heterozygous sickle cell disease and aortic stenosis, for total knee arthroplasty (TKA). Although general anaesthesia is preferable for such patients, we decided to take advantage of our centre's experience in regional anaesthesia, and use a central nerve blockade after proper preoperative evaluation and preparation. Our goal was to avoid hypoxemia/hypovolemia/hypothermia and transfusion that would trigger either a sickle cell crisis or complications due the valvular disease.

**Methods:** A 70 year-old female patient, with the above history, hypertension and hypothyroidism was scheduled to undergo TKA. Her exercise capacity was equal to 4-5 METs. Preoperative screening included a normal ECG and a cardiac Doppler showing aortic stenosis (PG: 79mmHg, MG: 50mmHg) and grade I diastolic dysfunction of left ventricle with normal dimensions. Her medication consisted of perindopril, isosorbide mononitrate and thyrox hormone. Intraoperative monitoring included ECG, HR, invasive BP measurement, and pulse oxymetry. After preload with 4 ml/kg R.L., spinal anaesthesia was performed using 2.6 ml bupivacaine 0.5%, through a 25G needle in O4-O5 level.

**Results:** Level of sensory block reached T12. The use of tourniquet was more than 48 hours. The patient was discharged 5 days later.

**Conclusions:** Central nerve block can be used in certain patients with sickle cell disease and aortic stenosis, after careful evaluation and proper perioperative management.

**ANESTHETIC APPROACH TO A PATIENT WITH MULTIPLE PTERYGIUM (ESCOBAR) SYNDROME**

N. Sertoz, S. Karaman, Turkey.
Escoobar syndrome is a rarely seen disease with autosomal recessive inheritance, which is generally progressive. During the anesthesia of these patients, problems may be encountered in regional anesthesia due to advanced vertebral deformities, and in general anesthesia due to difficulty intubation and ventilation. We applied only regional anesthesia without any requirement of general anesthesia to a 14 year old boy who underwent bilateral proximal femur osteotomy and z-plasty.

Case: The patient was a 14 year old (35kg) boy. While taking the age atropine was administered. After written informed consent, in the lateral decubitus position, epidural space was accessed using an 18G Tuohy epidural needle, inserted through the L4-L5 interspace with a single blood-free attempt, at a depth of 4cm, using the loss of resistance to saline technique. Through this needle, spinal space was entered with a 27G pencil point spinal needle, and using a 0.5% heavy bupivacaine (1.5ml) and fentanyl (0.5ml) mixture was administered through the 27G pencil point spinal needle, spinal anesthesia was administered without any complications.

During the general anesthesia applications of Escobar syndrome, it is important to know that difficult airway management is an important feature and appropriate airway algorithm should be implemented accordingly. In addition, based on the procedure to be conducted, regional anesthesia should be taken into consideration as a good alternative for the preoperative and postoperative patient comfort.

386 ANAESTHETIC AND ANALGESIC MANAGEMENT OF COMBINED CAESAREAN SECTION AND RIGHT HEMICOLECTOMY
K. Shoukry, J. Uqubart

The reported incidence of colorectal cancer in pregnancy is 0.002%. In this report we outline a unique anaesthetic and analgesic management plan for an extremely rare condition.

A 30 year old 29 weeks pregnant patient, normally fit and well, was diagnosed with metastatic adenocarcinoma of colorectal origin during her pregnancy. On her 33rd week she was diagnosed with colonic obstruction secondary to the cancer. In the light of this and the increasing severity of her epigastric pain the joint obstetric and general surgical decision was to perform an emergency caesarean section followed by a laparotomy.

The initial anaesthetic plan was to site an awake thoracic epidural, followed by a general anaesthetic to cover both the caesarean section and the laparotomy. However, although practical and safe, this plan had an important drawback. This patient with a terminal condition would miss an important emotional experience with her partner; delivery of her baby. Therefore, the plan was modified, and the decision was made to site an awake thoracic epidural, followed by an awake spinal for the caesarean section. Then, once the baby had been delivered, general anaesthesia would be induced for the laparotomy.

Apart from minor complications the operation was uneventful. Given that she may not live long enough to see her son’s first birthday, she was very grateful that she was able to be awake for his delivery and share this emotional experience with her partner. She was subsequently sent home and returns to hospital on a regular basis for chemotherapy.

387 INTRAOPERATIVE DILEMMA: ANAPHYLAXIS CAUSED BY PATENT BLUE
V. Shyam, R.C. Tanzola, D. Engen, A.K. Ellis, Canada.

Background: Vital blue dyes are increasingly used by the surgeons for lymphatic mapping of sentinel lymph node biopsies such as melanoma and breast cancer. These dyes may cause allergic reactions with an incidence of 0.6-2.7%. We present a case of anaphylaxis ultimately linked to the administration of patent blue.

Case Summary: Consent for publication was obtained. A 43 year patient presented for melanoma excision of the upper arm and sentinel node biopsy from right axilla. General anesthesia was induced with fentanyl, propofol, rocuronium, and morphine. Patent blue was given at the surgical site. Twenty minutes later, severe hives in the upper arm, trunk, and abdomen were noted. The patient was hemodynamically stable and treatment consisted of anti-histamines and hydrocortisone. The surgical procedure was completed. In PACU, her symptoms worsened to include dysphonia, swollen eyelids and marked increase in hives. She was treated with epinephrine boluses (total of 50 mcg) which produced relief in the swelling and hives and her phonation normalized. A subcutaneous dose of epinephrine 150 mcg was given for sustained effect. The patient was discharged from PACU after 6 hours symptom-free. Six weeks postoperatively an allergy specialist performed skin prick and intradermal testing. Positive tests were noted to morphine, rocuronium, and patent blue.

Conclusion: The incidence of anaphylaxis under general anesthesia is 0.01% and usually attributed to neuromuscular blockers, antibiotics, and latex. The incidence of severe reactions to patent blue has been found to be 0.5%. Although the patient demonstrated positive skin tests to three drugs, the timing of the reaction in relation to the injection of patent blue suggests that it was the likely cause of the anaphylaxis. This case illustrates the importance of referring cases of intra-operative anaphylaxis for assessment by an allergy specialist and highlights the potential for anaphylactic reactions to patent blue.

388 ANESTHETIC MANAGEMENT FOR CAESAREAN SECTION IN PATIENT WITH SEVERE MITRAL STENOSIS: A CASE REPORT
C.G. Silva, I. Ribeiro, Portugal.

Background and aims: Mitral stenosis is a complicated cardiac disease and in combination with pregnancy can result in high maternal mortality.

Methods: We describe our management of a pregnant woman with severe mitral stenosis from 24 week gestation until labor.

Case Report: A 32 year old woman with severe rheumatic mitral stenosis, she had delivered two healthy babies. During the second pregnancy she had a ballon valvuoloplast.

The patient was hospitalized with 24 week gestation for optimization of clinical condition (New York Heart Association class III), she received therapy with propranolol, furosemide and antibiotics for prophilaxis against bacterial endocarditis. Repeated echocardiogram showed some deterioration, with mitral valve surface area decreasing to 0.9 cm² associated with moderate pulmonary hypertension however, hemodynamic parameters were stable.

At 30 weeks gestation because of oligohydramnios she was proposed for caesarean section under epidural. The patient was monitored during delivery oximetry, diuresis, arterial pressure line and transthoracic echocardiography (pulmonary arterial pressure of 50mmHg).

Anaesthesia was made with epidural with lidocaine 2% slowly titrated until a T5 sensory block was reached. During the surgery the hemodynamic parameters were stable. In the postoperative period there weren’t complications and after 24hours she was dismissed from the coronary unit care. She received epidural analgesia with ropivacaine and morphine. The baby was admitted in neonatal unit care.

Conclusion: Pregnant with mitral stenosis require a multidisciplinary approach in order to optimize cardiac function and a careful anesthetic planning before delivery to have a successful outcome.
persistent headache from the immediate post operative period non respon-
sive to opioids or NSAIIDs. Despite prophylactic management of PPH
the head circumference increased and the patient became restless. CSF bio-
chemistry and cytology showed increased proteins (115 mg/dL and high WBC
(250/mm3) with normal glucose. CSF film after Gram and AFB staining
and culture did not reveal any organism. Her anti nuclear antibody was
negative. Head CT scan revealed generalized cerebral oedema. On the basis
of biochemical and haematological markers and a negative CSF culture a
diagnosis of chemical meningitis was made. The patient was managed con-
servatively. She was discharged from the hospital on 10th post operative
day. One month follow up showed that she had recovered fully without any
neurological deficit.

Outcome: Though our aseptic precautions were adequate, a proper wip-
ing of a wide area of back after part preparation and a change of sterile gloves
after prop have been included in our standard operating procedure for
attempting sub arachnoid block.

Results: After 120 days the lesion was completely healed and patient
regained ability to walk free of crutches.

Conclusions: The sympatholytic effect of the continuous infusion of local
anesthetic through the sciatic catheter allowed a better perfusion of the
dystrophic lesion inducing a fast recoverand pain relief. In 120 days The
patient could return to normal daily activity.

397

EPIDURAL ANALGESIA MASKING AN ACUTE DUODENAL
PERFORATION DURING LABOUR

M. Takvakili2,1, F. Schneider1,2, L. Mulleaghe

Background: Duodenal ulcer and its perforation are not common during
pregnancy but are difficult to diagnose as they mimic the gastrointestinal
signs and symptoms of late pregnancy. We report a case where epidural
analgesia for labour masked the onset of such perforation leading to delayed
presentation of the resultant acute abdomen.

Case description: Our patient, a full-term primiparous 31 years old Cau-
casian lady, had normal vaginal delivery of a healthy baby with epidural analgesia.
She had no past medical history of note. She only experienced mild
non-specific abdominal symptoms at the end of the labour with some ilesus
afterwards. She was discharged home two days post-partum and after a
negative surgical consultation.

Three days after discharge, she presented with an acute abdomen and Multi-Organ Dysfunction due to sepsis. An urgent CT-Scan confirmed a
duodenal perforation so an emergency laparotomy was performed to oversee
the large D1 perforation with the overlying omental patch. Post-operatively
she went through a two-week ICU stay to receive multi-organ support. The
recovery phase was complicated by the presence of a duodenocutaneous
fistula and a DVT. However, she recovered from both and was discharged
home three weeks after ICU discharge. There has been no further surgical
issue since discharge.

Conclusion: Our literature search did know identify a similar case reported
before. One should be vigilant of non-specific abdominal symptoms during
labour especially if Epidural analgesia is employed as it can mask a more
sinister cause, as observed in this case.

398

EFFECTIVE PAIN MANAGEMENT WITH A CONTINUOUS
INTRAPLEURAL INFUSION OF LOCAL ANAESTHETIC
IN A PATIENT WITH RIB FRACTURES AND LARGE
INTRATHORACIC MASS

N. Ungureanu, C. Webb

Background and aims: Intrapleural local anaesthetic infusion for chest
wall trauma is infrequently used although the potential benefits (less atelectasis
and infection, improved gas exchange, decreased opioid use, patient satis-
faction) seem to outweigh rare associated risks (local anaesthetic toxicity,
iatrogenic pleural effusion). We present a simple and effective technique
used on a patient with an interesting incidental X-ray finding.

Methods: A previously healthy 64 year old male was admitted after a fall
from 8 feet.He was in severe pain (score 3/3 on VRS) and dyspneic. The
chest X-ray showed:left sided rib fractures (6-10), left pneumonia, sub-
cutaneous emphysema and a large intrathoracic mass.Our management in-
cluded : an intercostal chest drain, regular oral analgesia and a continuous
intrapleural infusion of 0.125% Levobupivacaine at 15ml/h for 5 days via a
19G epidural catheter inserted using a falling column technique.

Results: The recorded pain scores remained stable (0/3 at rest and 1/3 on
movement).The patient also received oral regular Paracetamol, Diclofenac
and Codeine for the first 3 days.The eventual diagnosis of the mass was an
invasive thymoma. He underwent radiotherapy, chemotherapy and a suc-
cessful tumour resection 8 months later.

Conclusions: This technique is an effective and safe way of managing acute
pain in highly monitored patients. The associated risks are rare and greatly
reduced by concomitant use of a chest drain. New types of chest drains that
incorporate an additional lumen to facilitate local anaesthetic infusions are
available.

E218
Portugal. The advantages of epidural anesthesia in children under-7

In both groups CK-MB and troponin I levels did not increase, indicating no myocardial injury. Holter monitorization detected equivalent ST segmental changes in both groups.

Conclusions: Both selective spinal anesthesia and general anesthesia methods may be safe with regard to peroperative myocardial ischemia in geriatric patients undergoing brief transurethral surgery.

397 SURVEY ON INTRATHecal OPIATES IN EAST ANGLIA

A. Kumar, P. Bhagwat, A. Bhat

Background: Opiates are a popular adjunct in Spinal anaesthesia. Advantages of opiates include prolonging duration of analgesia, height of sensory block and good post operative analgesia but also associated with complications.

Methods: An online survey sent to 9 hospitals in East Anglia July 2010. 137 completed responses out of estimated 400 anaesthetists with a Response rate of 36%.

Results: Eighty eight, 81 and 30% of respondents routinely used intrathecal diamorphine, fentanyl and morphine respectively. Seventy one percent respondents used 0.25 - 0.5mg and 11% used up to 1mg diamorphine. Among the respondents using fentanyl 42% injected 11-20 mcg whereas 51% injected 21-30 mcg intrathecally. Ninety percent respondents observed the duration of action of diamorphine and morphine to be over 12-24 hours. Eighty six percent respondents observed morphine to act up to 6 hours.

References:

THORACIC EPIDURAL ANALGESIA THROUGH CAUDAL APPROACH IN A 72 HOUR NEONATE

R. Veiga, S. Alves, S. Vargas, Portugal.

Background and aims: Congenital diaphragmatic hernia (CDH) is a rare condition with varying severity. It is associated with pulmonary hypoplasia and hypertension, right-to-left shunting and cardiopulmonary failure. This case reports a 72 hour-old neonate weighing 2.6 kg scheduled for thorascoposcopic CDH repair.

Methods: Anaesthetic plan included combined anaesthesia with epidural catheter placed under ultrasound guidance.

Results: The patient arrived to the operating room from the neonatal intensive care unit (NICU) sedated and intubated. After general anaesthesia induction, the distance from the sacral hiatus to the desired thoracic level was measured. Using ultrasound guidance a 20G caudal needle was inserted. 24G epidural catheter was threaded to T6-T7 without resistance and the tip position was confirmed. Levobupivacaine 0.25% was administered. After 2 hours of surgery under hemodynamic and ventilatory stability, the neonate returned to the NICU sedated and intubated. Analgesia was maintained through the epidural catheter with morphine for 48 hours and intravenous paracetamol. Uneventful hospital discharge on day 13.

Conclusions: The advantages of epidural anaesthesia in children undergoing major abdominal or thoracic surgery includes profound analgesia, reduced need for postoperative ventilation and reduced stress response. In neonates the paucity of fatty and fibrous tissue in the epidural space allows successful advancement of epidural catheters from the sacral hiatus to thoracic segments. Under 6 months of age, when there is little space between neuraxial structures, ultrasonography offers a unique opportunity to verify the correct position of the epidural catheter. Understanding of sonographic anatomy should lessen both the failure rate and the possibility of incurring serious complications.
Discussion: Diamorphine and fentanyl more commonly used in East Anglian Hospitals. Nine out of ten anesthetist use < 0.5 mg diamorphine. Morphine is not used routinely because of side effects like respiratory depression, drowsiness, nausea and vomiting. High incidence of itching observed with all opiates. Duration of analgesia observed similar with morphine and diamorphine (12-24 h). A larger national survey is required.

References:

398 KILLING THREE BIRDS WITH ONE STONE...
A. Burumdayal, S. Galitzine
Background: Neuraxial ultrasonography (US) is a relatively recent introduction to regional anaesthesia and is still somewhat unpopular with our Operating Department Practitioners (ODPs) and assistants. We describe our recent experience of ultrasound-assisted day-case spinal anaesthesia (SA) in a difficult patient that may change perception.
Case description: A 63-year-old morbidly obese male (weight 170kg, BMI 47.6kg m²) with multiple comorbidities presented for a knee arthroscopy. After careful consideration of pros and cons, the patient was consented for SA.
Under full asepsis and standard monitoring, SA was attempted multiple times using 90mm and 119mm-25G pencil-point needles, unsuccessfully, with bone being encountered as deep as 9.5cm. An ultrasonographic examination of the lumbar region then performed allowed correction of the midline at 0.5cm right to the initial landmark and estimation of the depth of the ligamentum flavum-dura mater complex at 11cm from skin. The new insertion point was marked and with aseptic precautions again, dural puncture was achieved at the first attempt using a 25G-119mm needle. 2.5ml of 0.25% isobaric bupivacaine injected intraheletically produced excellent surgical anaesthesia. The patient mobilised successfully 3hrs 45min after the SA and was discharged home shortly afterwards.
Discussion: This case illustrates three important points. Although the anaesthetic management of morbidly obese patients remains challenging, preprocedure US can help.
Secondly, careful choice of local anaesthetic, dosage and operating list order can allow successful use of SA for day-case surgery.
Thirdly, this case reiterates the importance of team-work in anaesthesia. Demonstration of the advantages of US and provision of training tailored to ODPs should help change perception.

Conclusions: This case report highlights the importance of close observation in cases of spinal anaesthesia presenting symptoms suggestive of spinal hematoma. Early diagnosis and urgent surgical treatment is indicated. Good results may be expected in patients with mild preoperative neurological deficits.
Results are poor in patients with sub-arachnoid hematoma, severe preoperative deficits and in those whose surgery has been delayed. Furthermore, we strongly recommend close clinical surveillance post-anaesthesia, especially when postoperative lumbar radicular symptoms occur.

References:

399 SURGICAL COMPLICATION OF SPINAL ANAESTHESIA
A. Cerroni, Italy.
Background: According to the ASA Closed Claims Project, a structured evaluation of adverse anesthesia outcomes taken from the closed anesthesia malpractice insurance claim files of more than 35 professional liability American companies, haematoma is accounted for 43% of the 84 complications of the neuraxis after regional anesthesia in claims from 1980 to 1999. 89% of these cases resulted in permanent neurological deficits.
Methods: The author presents the case of an unusual finding of myxopependimoma due to the lesion of a tumor during a spinal block. The patient, a 33 years old male, underwent spinal anesthesia for operative fixation of tibial shaft fracture. On the third day after surgery the patient started to complain of paraesthesia in the lower extremities followed by severe motor and sensitive compromise to both legs. MR scan showed an image suggesting subdural haematoma Urgent surgical decompression revealed a large tumor (ependimoma myxopapillare) from L2 L3 to S1 with an hematoma in the lower part, coinciding with the location of spinal anesthesia.

400 CONSENT OBTAINED FOR SPINAL ANAESTHESIA AT THE ROYAL SURREY COUNTY HOSPITAL
P. Dasannacharya, S. Younie, G. Foxall
Background and aims: This audit investigated documentation of consent for spinal anaesthesia by anaesthetists for surgical non-obstetric patients in a district general hospital. Audit standards were devised from the Association of Anaesthetists of Great Britain and Ireland (AAGBI) guidelines on consent for anaesthesia.
Methods: The audit looked at 100 patient records receiving a spinal anaesthetic over 6 weeks. The documented consent, grade of anaesthetist, and whether the spinal was performed awake or under general anaesthesia was recorded.
Results: Consent for spinal anaesthesia was documented in 82% of cases. Consent was not documented in 34% of procedures carried out by consultants compared to 8% in non-consultant posts. PDPH was quoted as a complication in 16% of cases and nerve damage in 19% of cases. Quoted risk of nerve damage ranged from 1 in 10,000 to 1 in 200,000. 39% of spinals were performed under GA; of these (69%) by consultants.
Conclusions: It is clear from this audit that documentation could be improved.
A high number of SA were performed under GA. The American Society of Regional Anaesthesia and Pain Medicine encourages performing regional anaesthesia awake when possible.

There are serious risks associated with spinal anaesthesia which should be explained to patients and recorded in the notes. As a result of this audit we are currently developing patient information leaflets for spinal anaesthesia.

References:
Consent for anaesthesia revised edition. The Association of Anaesthetists of Great Britain and Ireland; 2006
The audit has the approval of the Hospital Clinical Audit Department.

401 REGIONAL ANAESTHESIA WITH ISOBARIC BUPIVACAINE FOR PERCUTANEOUS BILIARY DRAINAGE
T. Di Ieso, S. Gagliardi, M. Paladino, V. Mariani, G. Tenze, A. Artale, M. Rocco, Italy.
Background and aims: Neoplastic biliary strictures and cholelithiasis are indications for Percutaneous Transhepatic Cholangiography (PTC) performed under radiological guidance and in locoregional anaesthesia. However rise of serum bilirubin levels determines a state of hyperalgesia which reduces efficacy of local anesthetics causing a great discomfort. Analgesia and sedation are both necessary to improve patient's tolerance to PTC and to allow better execution: if the sedation is too deep the need to ventilate the patient could represent difficult approach for procedure; instead, analgesia must be adequate to prevent the patient's discomfort.

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Methods: 21 ASA-III patients requiring PTC placement with different indications (neoplastic biliary obstruction, post-operative complications) were enrolled and divided in two groups:
  
GROUP A: Droperidol (0.20 mg/kg) in bolus and remifentanil (from 0.025 to 0.12 mcg/kg/min) in continuous infusion and a local anesthetic was applied in the insertion site of the biliary drainage.

GROUP B: 0.5% isobaric Bupivacaine 7-9 mg or 0.5% Ropivacaine 7-9 mg regional anesthesia at level between T9 and T12.

Results: GROUP B maintained a significantly lower value starting from 1.3 to reach the maximum value of 1.9 and to remain stable at the end of the procedure at 1.7. If we observe Rudkin scale the difference between the two groups is more evident.

Conclusions: Both techniques are effective.

Regional anesthesia is excessive for this type of procedure but patient’s pain relief is most relevant target.

402 PERCUTANEOUS LITHOTRIPSY FOR BILE DUCT- AND CHOLEDOCO-LITHIASIS: COMPARISON BETWEEN REPEATED GENERAL ANAESTHESIA AND CONTINUOUS EPIDURAL ANAESTHESIA

T. Di Ieso, V. Mariani, S. Gagliardi, G. Tenze, B. Cocettii, M. Roccc, Italy.

Background and aims: Percutaneous Lithotripsy must be performed commonly under general anesthesia.

Methods: 21 patients who needed multiple treatments of lithotripsy were enrolled in this study. They were classified ASA class I-III and allocated into two groups: In GROUP A (10 patients) lithotripsy was performed under general anesthesia. In GROUP B (4 patients) it was performed under epidural anesthesia with an epidural catheter placed in the T11-T12 or T10-T11 thoracic intervertebral space and twice tuned into the side of the spine and on left hip. Also a benzodiazepine or droperidol were administered at the beginning of procedure.

In both groups water, introduced in the stomach through the lithotripter and eliminated using a nasogastric tube, was carefully monitored.

In GROUP A nasogastric tube was placed after general anesthesia induction and after intubation. In GROUP B was placed at ward or after epidural catheter placement and administration of droperidol or midazolam and remifentanil.

Blood pressure, heart rate and pulseoximetry were monitored.

Results: The hemodynamic stability was ensured in both groups. GROUP B patients reported a mild post-operative pain and discomfort during nasogastric tube replacement.

In GROUP B blood pressure and heart rate were basically lower during procedures. Procedure duration was basically longer; in group B patients was lower because of the need to protect the airway without exceeding the limit of gastric filling.

Conclusions: Preliminary results report that continuous epidural anaesthesia, associated to neuroleptanalgesia, allows to reduce the effects of repeated general anesthesia and is reported an adequate postoperative pain control.

403 HEMODYNAMIC EFFECTS OF UNILATERAL SPINAL ANAESTHESIA IN ELDERLY PATIENTS UNDERGOING TOTAL HIP REPLACEMENT


Background and aims: Anaesthesia for major orthopaedic surgery is still a common problem in geriatric patients. We aimed to evaluate hemodynamic measurements in geriatric patients undergoing unilateral spinal anesthesia for total hip replacement.

Methods: The unilateral spinal anesthesia was achieved with heavy bupivacaine 0.5% 2cc/10 mg to obtain a block to Thoracal 10. 20 patients 60% of patients (n: 12) was female, and 40% (n: 8) was male. Age mean 77,6±1,75, hemoglobin 11,5±0,25, ejection fraction was 60±5,17,6.Cardiovascular monitoring was established by an arterial line and FloTrac Vigileo system.Stroke volume, cardiac output, blood pressure, heart rate were measured with Fisher’s X2 Test at baseline and perioperative period until postoperative 4th hours.

Results: Stroke volume were reduced highly significantly perioperative (X2=13,480 p<0,001) and postoperative period (X2=15.028 p<0,001) period, compared to baseline values. Also cardiac output were reduced highly significantly perioperative (X2=14,098 p<0,001) and postoperative period (X2=16.016 p=0,001), compared to baseline values. There was a slightly significant increase in perioperative (X2=0,139 p=0,710) mean arterial blood pressure but significant increase in postoperative (X2=16.016 p=0,001) values compared to baseline values. There was no significant change between baseline and perioperative (X2=1,224 p=0,269) and postoperative (X2=0,068 p=0,794) period of heart rate values. Intravenous fluids and vasopressor agents were given simultaneously.

Conclusions: On the basis of our data, cardiovascular monitoring is helpful to view hemodynamic changes in unilateral spinal anesthesia for geriatric patients undergoing total hip replacement.

404 PREOPERATIVE ULTRASOUND SCAN PREDICTS DIFFICULT CAUDAL BLOCK IN NEONATES AND INFANTS


Background: Caudal block provides potential benefits for patients undergoing lower abdominal surgery in neonates, but technical difficulty represents a problem in 11% of these patients (1). Ultrasound visualization of the caudal space may identify potential anatomical or anatomical variants. We hypothesize that clear ultrasound visualization of neonatal neuraxial structures is a potential advantage and predicts a difficult block.

Methods: 35 neonates and infants [18 days-6 months old, 2.1-8.4 kg] scheduled for lower abdominal surgery underwent a preoperative ultrasound scan of the neuraxial structures and caudal space using a high frequency linear transducer (longitudinal and transverse scanning). All anomalies were video-recorded together with the whole procedure that was subsequently further studied. The total number of needle passes (defined as any needle re-direion) and time required to perform the caudal block were also recorded. Additionally, local anesthetic spread was also verified by the use of ultrasound colour doppler flow.

Results: There was no difference in the time needed for the caudal block procedure, but the number of passes was greater only in two neonates where anatomical variants (poor visualization of the sacral cornua during ultrasound transverse scanning) were observed. Poor ultrasound visualization of the sacral cornua predicted a difficult block and an alternative regional technique was performed.

Discussion: Inability to visualize the sacral cornua was associated with prolonged and difficult caudal block procedures. The relatively high incidence of difficult caudal block in patients undergoing lower abdominal surgery leads to operating room delays and patient discomfort. Ultrasound scanning may be useful to predict this difficulty allowing the anaesthesiologist to avoid the caudal block and choose an alternative regional block or to identify an optimal vertebral interspace.

**405 USE OF OFF LABEL ADJUVANTS IN REGIONAL ANAESTHESIA: TIME TO STANDARDISE PRACTICE?**

S. Jagannathan, S. Sivasubramanium

**Background and aims:** Most of the drugs used as adjuvants in regional anaesthesia are used off label. The problems of such use are the relative lack of information for prescribers. We conducted a survey on the current practice on the use of off label medications for regional anaesthesia in England.

**Methods:** We conducted an electronic survey using surveymonkey™. We had 537 responses, with a response rate of 40%.

**Results:** Fentanyl (78.8%) and Diamorphine (79.1%) were the more commonly used adjuvants during central neuraxial block (CNB) than Morphine (14.9%). The commonly used dose of Fentanyl, Diamorphine and Morphine were 15-25 micrograms, 200-300 micrograms and 100-200 micrograms respectively. Diamorphine in a dose of >300 micrograms (45%) and morphine in a dose of >100 micrograms (80%) were commonly used. Most of the patients with spinal opiates including morphine were sent to the ward but availability of High dependency facility was a limiting factor for the performance of epidural (40%) with opioid adjuvant. Majority of the anaesthetists (>70%) were unsure about the licence for the use of opioids in CNB.

**Conclusions:** We observed a wide variation in the use of adjuvants in regional anaesthesia. Contrary to the available evidence, higher doses of diamorphine and morphine are routinely used. There is a lack of knowledge of the drugs which are licensed for use in regional anaesthesia amongst anaesthetists. We conclude there is a need for guidelines on the use of off label medications in regional anaesthesia.

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**408 EPIDURAL ANAESTHESIA MAY IMPROVE CARDIAC OUTPUT IN PATIENTS UNDERGOING MAJOR LAPAROSCOPIC COLORECTAL SURGERY**

N. Jenkins, C. Brosnan

**Background and aims:** It is increasingly recognised that “getting the balance right” regarding intra-operative fluids is crucial in patients undergoing surgery. Laparoscopic surgery can complicate fluid balance with pneumoperitoneum reducing venous return and increasing systemic vascular resistance (SVR), often accompanied by a reduction in cardiac output (CO). We present data from 6 patients undergoing laparoscopic colorectal surgery showing how use of a thoracic epidural intra-operatively can restore cardiac output (as measured by Oesophageal Doppler) to pre-insufflation values without the need for excessive fluid administration.

**Methods:** We assessed haemodynamic responses in six patients requiring colorectal resections. Oesophageal Doppler readings were taken at four points/groups. 1) Post-induction before pneumoperitoneum or epidural top-up. 2) Pneumoperitoneum established to 10mmHg but before top-up. 3) After epidural top-up and pneumoperitoneum restored to 10mmHg and epidural. Measurements of CO, SVR and mean arterial pressure were recorded.

**Results:** Figure 1 shows the influence of pneumoperitoneum and epidural on CO.

![Cardiac output L/min](image-url)

**Conclusions:** Our results suggest that establishment of epidural block after abdominal insufflation may improve cardiac output in patients undergoing major laparoscopic surgery.

**Reference:**

409 COMPARISON OF CAUDAL ANESTHESIA AND IN SITE LOCAL ANESTHETIC INFILTRATION FOR POST OPERATIVE PAIN MANAGEMENT IN PEDIATRIC INGUINAL HERNIA

M. Joudi, M. Fathi, Iran.

Background: Post operative pain management is one of the most important aspects in pediatric surgery. We have compared caudal anesthesia and in site local anesthetic infiltration in pediatric inguinal hernia.

Method & material: We evaluated 100 boys who have referred for elective inguinal herniorrhaphy. Their age was 18-24 month old. All patients had unilateral inguinal hernia. Study was double blind simple randomized clinical trial. After ethical consent we tried general anesthesia combined with caudal anesthesia (0.5ml/kg bupi 0.25%) for 50 cases (A) and general anesthesia combined in site local anesthetic infiltration (bupi 0.25%-3mg/kg) for others (B). Induction and maintenance drugs for GA was similar in both groups. Then surgery has started. We evaluated their postoperative pain score by FLCC at 2,4 and 6 hours after operation and at the discharging time.

Results: Pain score was significant (>4) in 11 cases and it was non significant in 89 cases. We found in re-evaluation of cases who had significant pain, multiple tries for peripheral vein cannulation as only different parameter, whereas just one try had done for cannulation in others.

Conclusion: There is no differences in incisional pain between caudal anesthesia and in site local anesthetic infiltration, then since doing caudal technique is more difficult than local anesthetic infiltration and it needs to patient and staff preparation and expert anesthetist we suggest to doing in site LA infiltration for post operative pain management, if caudal approach is not possible to do or anesthesiologist experience for doing it is not enough.

410 THE ASSOCIATION BETWEEN NEEDLE TYPES AND HEADACHE


Background and aims: Cesarean delivery is the most frequent obstetrical surgery in world. Regional anesthesia is commonly preferred in cesarean surgery. Spinal anesthesia is an old but very effective type of regional anesthesia. Regional anesthesia has superiority to general anesthesia in many conditions but also has complications. The most common complication is headache. In this study, we aimed to study the association between needle types and headache.

Methods: 664 ASA I-II group elective cesarean patients who had no contraindications for spinal anesthesia were included to this study. Patients were randomly divided into two groups: group I (atracurium 20G n=323) and group II (Quincke 26G n=342). The thickness of the needle and the shape of tip of the spinal needle was recorded after anesthesia. The education period of the anesthesia performer, number of attempts, the space used for anesthesia and movement of patients during anesthesia were recorded. Patients were questioned for headache for 72 hours. Chi-square and comparison of proportions were used for statistical evaluations and p<0.05 was accepted statistically meaningful.

Results: No statistical relation was found between headache and age, weight and height of patients (p>0.05). No statistical relation was found between headache and education period of the anesthesia performer, number of attempts, the space used for anesthesia (L1-3, L4) and movement of patient during anesthesia, hypotension during anesthesia, volume of liquid infusion during surgery, single or multiple delivery (p>0.05).

Conclusions: Two types of 26 gauge needles had no statistical difference on occurrence of headache.

411 REAL-TIME ULTRASOUND EVALUATION OF DRUG SPREAD LEVELS BY DOSAGE IN CHILDREN UNDERGOING CAUDAL BLOCK FOR POSTOPERATIVE ANALGESIA

E.J. Kim, J.M. Sun, H.K. Kil, Republic of Korea.

Background: If ultrasound can determine the drug spread level during caudal block, an appropriate dose for the surgery can be administered. The aim of this study was to assess the validity of real-time ultrasound in determining the spread level by different doses during caudal block in children.

Methods: After an approval from IRB, 80 children (1-50 months) were included. Caudal block was performed after anesthesia. In each patient, frontal drug spread within the epidural space was evaluated with ultrasound when 0.5 ml/kg, 1 ml/kg, 1.25 ml/kg, and 1.5 ml/kg was administered while injecting the 1.5 ml/kg ropivacaine at a rate of 1 ml/3s.

Results: A significant differences were showed in spinal level corresponding to frontal advancement of the drug between doses. The maximum level reached by the drug was lower as age increased.

<table>
<thead>
<tr>
<th>Dose (ml/kg)</th>
<th>N</th>
<th>Number of Segments*</th>
<th>Spinal level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>80</td>
<td>8 (5-10)</td>
<td>L3 (L5-L1)</td>
</tr>
<tr>
<td>1.0</td>
<td>80</td>
<td>10 (7-12.5)</td>
<td>L1 (L4-T10/11)</td>
</tr>
<tr>
<td>1.25</td>
<td>76</td>
<td>11 (8-14)</td>
<td>T2 (L3-T11)</td>
</tr>
<tr>
<td>1.5</td>
<td>66</td>
<td>13 (9.5-16)</td>
<td>T10 (L1/2-77)</td>
</tr>
</tbody>
</table>

Results: Ultrasound can provide obvious evidence of correct caudal space. The spread level was different significantly by doses, but ultrasound-determined level may be lower than the radiographic level reported previously because the drug spread can be eye-detected with the bulk movement. If the drug is injected too slowly, the drug movement may not be detected on ultrasound.

412 THE EFFECTS OF INTRATHecal DEXMEDETOMIDINE ON SPINAL ANESTHESIA USING LOW-DOSE BUPIVACAINE FOR TRANSPERETHAL RESECTION OF PROSTATE IN THE ELDERLY


Background and aims: Spinal anesthesia is the common technique for transurethral resection of prostate (TURP). Most patients with BPH are the elderly and frequently have comorbidities. Therefore, it is important to limit the anesthetic level to minimize the hemodynamic changes. We investigated the effects of dexmedetomidine with low-dose bupivacaine on spinal block in elderly patients undergoing TURP.

Methods: 54 patients aged > 65 years were allocated to dexmedetomidine or saline group (0.5% hyperbaric bupivacaine 6 mg with dexmedetomidine 3 μg or saline). We evaluated peak sensory block level, time to peak block, motor block scale (modified Bromage), time to 2-dermatomes regression of block, and time to the first analgesic after surgery.

Results:

<table>
<thead>
<tr>
<th>Group S (n=27)</th>
<th>Group D (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak sensory block level</td>
<td>T10 (T9-T12)</td>
</tr>
<tr>
<td>Time to peak block (min)</td>
<td>10.1 (3.2)</td>
</tr>
<tr>
<td>Motor block scale at peak block</td>
<td>1.3 (1.2)</td>
</tr>
<tr>
<td>Time to 2-dermatome regression from peak sensory block (min)</td>
<td>78.4 (27.3)</td>
</tr>
<tr>
<td>Motor block scale at 2-dermatome regression from peak sensory block</td>
<td>0.2 (0.4)</td>
</tr>
<tr>
<td>Rescue analgesic at ward</td>
<td>6</td>
</tr>
<tr>
<td>Time to first rescue analgesic (min)</td>
<td>345 (295-368)</td>
</tr>
</tbody>
</table>

[Table 1]
Conclusions: Intrathecal dexmedetomidine combined with low-dose bupivacaine spinal anesthesia prolonged duration of sensory block, potentiated motor block, and improved analgesic efficacy in elderly patients undergoing TURP.

413 CONTINUOUS EPIDURAL AND INTRAVENOUS OPIOID ANALGESIA ON HAEMODYNAMIC STABILITY AFTER SEVERAL PELVIC FRACTURE

D. Bartolek, R. Letica-Brndarid, K. Šakić-Zdravcević, Croatia.

Background and aim: Continuous epidural analgesia (CEA) improves excellent pain control in patients with pelvic fractures. Haemodynamic instability followed by retroperitoneal hemorrhage in the first 48 hours often post-pones application of CEA what enhances need for parenteral use of high dose of opioids. The aim was to compare the influence of early CEA and intravenous opioid analgesia (CIOA) on haemodynamic stability in patients with pelvic fractures.

Methods: Fifty trauma patients with pelvic fractures were divided in two equal groups and included in prospective, randomized study. In both groups, analgesia started with sufentanil 10 μg h⁻¹ in the first 24h. After that, in Group EP CEA (levibupivacain 0.125%, 5-7 ml h⁻¹) and in Group O CIOA (sufentanyl 5-10 μg h⁻¹) was applied. PICCO monitoring was established. Data were analysed by SPSS 11.0.

Results: In the first 24 hours during CIOA, both groups had high need for fluid replacement (Group EP=3.2+/−0.3, Group O=3.0+/−0.5 L/24h) (P=0.0928). Second day, SVRI was lower in O Group (1300−1520; EP Group=1700−1810)(P=0.0243) and recovered with 500−750 ml of crystalloids. ITBVI was statistical more stable in Group EP (950+/−50; Group O (1100+/−30)(P=0.0001) specially by patient with low CI (<3.0)(1000+/−120; Group O=1200+/−70)(P=0.0000). During CEA only 10% of patients with low CI (<3.0) had need for catecholamine support and during continuous opioid analgesia 52% of them (P=0.036).

Conclusions: Early CEA with 0.125% levibupivacain is safe as CIOA in patients with pelvic fractures but without opioids complications and better haemodynamic stability.

414 DOES SPINAL ANESTHESIA EFFECT ON POST SURGICAL DELIRIUM AT OLD PATIENT?

H. Madineh, M. Kabiri, R. Shabanian Gholam, Iran.

Background and aims: Delirium is a non specific syndrome which is accompanied with disequilibrium in consciousness, attention, perception, speech, memory, psychomotor and sleep. Delirium rate after anesthesia relates factors (age, alcohol consumption, status of primary perception function, electrolyte and glucose disturbance and type of surgery).

Methods: 80 patients 55-75 years (mean 59.8 years) underwent prostatectomy and herniorrhaphy at randomized trial anesthetize by spinal(A) and general (B) for operation.all patients by Memorial Delirium Assessment Scale until discharge of hospital accorded.

Results: Sleep disturbance was 11.2% of all patients but no saw psychomotor and behavioral disturbance post anesthesia.

Conclusions: We thought alcohol consumption, status of primary perception function, electrolyte and glucose disturbance and type of surgery are effect on postanesthesia delirium to type of anesthesia.

415 COMBINED SPINAL-EPIDURAL ANESTHESIA (CSE) FOR ORTHOPEDIC SURGERY - A RETROSPECTIVE ANALYSIS OF 508 CASES. PRELIMINARY STUDY


Background and aims: Combined spinal-epidural anesthesia (CSE) is frequently used anesthesia technique especially for obstetric and orthopedic surgery. There are some concerns about safety and reliability of this method. We analyzed a preliminary group of 508 out of 4500 patients to evaluate efficacy and safety of this method for lower limb orthopedic procedures in private hospital.

Methods: All analyzed patients were ASA I (n=468) and II (n=40). Mean age was 33.4 years. To perform the block needle-through-needle technique with Espocan™ set (BB Braun,Germany) was conducted. Epidural space was identified blindly by a loss of resistance to injection of saline. After CSF appeared at the hub of the spinal needle mean dose of 14.5 mg 0.5% heavy bupivacaine was administered to the subarachnoid space. Subsequently epidural catheter was introduced through Tuohy needle to epidural space. If spinal anesthesia was sufficient, epidural administration of bupivacaine with fentanyl (n=296) or sufentanly (n=212) started 90 minutes after.

Results: Spinal anesthesia was sufficient in 848 patients (95.3%). 24 patients (4.7%) needed epidural top-up to start the surgery. Complications were: bradycardia (n=190, 37.4%), treated successfully with atropine (0.01mg/kg) and hypotension (n=28, 5.5%) treated with fluid infusion and ephedrine (5-10mg). There were no severe complications such as permanent neurologic injury, infection or hematoma.

Conclusions: Results of this preliminary study indicate that CSE is safe and efficient anesthesia technique for orthopedic surgery.

416 EPIDURAL CATHETERIZATION IN PATIENTS FOR BARIATRIC SURGERY

T. Nishiyama, Y. Kohno, K. Koishi, Japan.

Background and aims: Epidural catheterization is difficult in obese patients. We investigated the usefulness of ultrasound in epidural catheterization in patients for bariatric surgery.

Methods: Sixteen patients for bariatric surgery were enrolled after written informed consent. The location of the vertebral process and dura was checked by ultrasound. The distance from the skin to the dura was measured. After the location of the spinal process and dura by ultrasound, an epidural puncture was performed with a 12 cm 17G Tuohy needle with an angle of 45 to 60 degrees against the skin. An epidural space was recognized by a loss of resistance and a catheter was inserted.

Results: Patients were 6 male and 10 female of 39 (mean) years, 166 cm, and 126 kg (body mass index : 46). The vertebral process was not recognized by hand in all patients. Ultrasound could show clearly the vertebral process but obscurely the dura. However, in all patients, an epidural catheterization was successful. The distance from the skin to the epidural space was 9.1 cm and that to the dura by ultrasound was 6.5 cm. The distance to the epidural space (r=1.98+1.1X (the distance to the dura by ultrasound)) (r²=0.86). Height, body weight and BMI did not correlate with the distance to the epidural space.

Conclusions: Ultrasound is useful for epidural catheterization in patients for bariatric surgery. The distance to the epidural space could be suggested by the distance to the dura by ultrasound.

417 CONTINUOUS SPINAL ANAESTHESIA FOR HIP FRACTURE SURGERY IN ELDERLY, HIGH-RISK PATIENTS


Background and aims: Continuous Spinal Anaesthesia (CSA) is the technique of producing and maintaining spinal anaesthesia by injecting small doses of local anaesthetic intrathecally, via an indwelling catheter. There has been a resurgence in interest in the use of CSA in recent years.

This study aimed to define the characteristics and perioperative course of patients receiving CSA for hip fracture surgery in our institution and document any perioperative complications related to the use of CSA.

Methods: This retrospective review of all cases of CSA for hip fracture surgery in our institution, over a 6 month period, looked at 34 patients from hospital admission to discharge/death. Perioperative and patient details were recorded.

Results: The mean age of the patients was 86.4 years (range 72-104). All patients selected for CSA were ASA 3 or 4. The mean total volume of local
anaesthetic (0.5% isobaric Bupivicaine) required to achieve surgical anaesthesia was 1.1mls (SD 0.69mls). Intra operative complications included difficult insertion and mild hypotension.

There were no significant post operative complications.

Conclusions: Hip fracture surgery in the elderly with multiple co morbidities is high risk.

This study demonstrates that one can achieve adequate surgical anaesthesia for hip fracture surgery with a low volume of 0.5% Bupivicaine, while maintaining haemodynamic stability.

Furthermore, the use of CSA in our study was associated with a low complication rate.

The findings of our study support the use of CSA for hip fracture surgery in an elderly high risk population as a means of providing safe anaesthesia.

418
ASSSESSMENT OF SUCCESSFUL EPIDURAL STEROID INJECTION USING PHOTOPLETHYSMOGRAM


Background and aims: One of effective treatment methods for back pain and radiculopathy is epidural steroid injection (ESI). However its effectiveness is hard to judge in immediate time and often some patients complains ineffective therapy later. Photoplethysmogram (PPG) is known as a technique to measure blood oxygen saturation using absorption difference. We investigated that this technique can evaluate the success of ESI and its possibility in clinical use.

Methods: Forty patients were recruited for this study and eight of them allocated to one of 5 groups according to ESI levels: L2-3, L3-4, L4-5, L5-S1, and caudal. They were in the lateral position with 4 PPG probes in their both 2nd fingers and 2nd toes. The PPG signals were collected to a device and converted digitally. The PPG signal has two components, one is total absorbance (TA), and the other is oscillating pulse component (OPC). After ESI injection in each group, we compared the initial toe and finger PPG signals with after ESI signals in each groups.

Results: TA changed in 60% of ESI patients and L4-5 and L5-S1 groups had high change rate compared to L2-3 group. The correlation between symptom relief and change of TA and OPC were high in L4-5 and L5-S1 groups, but low in other groups.

Conclusions: The PPG signal is useful to predict successful ESI. It is also needed to develop other level signal detection method and appropriate guideline for interpretation of PPG change.

419
REGIONAL ANESTHESIA IN PATIENTS WITH SCOLIOSIS - A SINGLE CENTRE CLINICAL EXPERIENCE IN INDIA

K. Pradeep Kumar, G. Subramaanam, B. Girija Kumari, K. Kishore Kumar, G. Jagadesh, India.

Background and aims: Kyphoscoliosis is a deformity of the costovertebral skeletal structures characterized by an anterior flexion (kyphosis) and lateral curvature (scoliosis) of the patient’s vertebral column. Anesthesia in the presence of spinal deformity is challenging to many anesthesiologists. We present our experience in providing spinal anesthesia for patients with moderate to severe cases of scoliosis in 90 patients in last one year period 2009jan-2010jan. Regional anesthesia was planned in order to reduce the risk of postoperative pulmonary complication that may be caused by general anesthesia.

Methods: Patients were divided into two groups based on the measurement of Cobb’s angle. Group 1: Patients with Cobb’s angle less than 40. Group 2: Patients with Cobb’s angle more than 40.2.5 ml of 0.5% bupivacaine given. Onset, Duration, and regression of sensory and motor blockade at 5,10,15,30mins.

Results: There was no significant difference in the demographic profile of the patients. No significant changes in hemodynamic parameters. Spinal blockade was successfully achieved in most of the patients, 4 patients were withdrawn from the study as they were not cooperative. Patchy block was noticed in 12 patients, unilateral anesthesia was achieved in 8 patients opposite to the side to be operated. Bilateral effective spinal blockade was achieved with flexion at the hips after giving spinal anesthesia thereby obliterating the spine curvature.

Conclusions: Administering anesthesia to patients with spinal deformities (scoliosis) is challenging. With our experience of 90 cases regional anesthesia can be safely given in moderate to severe scoliosis.

420
THE EFFECTS OF INTRAVENOUS DEXMEDETOMIDINE ON SPINAL ANESTHESIA FOR GERIATRIC TRANSURETHRAL SURGERY


Background: Dexmedetomidine has been shown to prolong the sensory and motor block in spinal anesthesia. We evaluated the effects of intravenous dexmedetomidine on low-dose bupivacaine spinal anesthesia in patients undergoing transurethral prostatectomy with BPH.

Methods: After an approval of IRB, 51 patients were allocated to two groups (1.0 μg/kg dexmedetomidine or saline intravenously prior to 6 mg bupivacaine-spinal anesthesia). Maximum sensory and motor block levels, time to maximum block, and time to regression were evaluated. Intraoperative blood pressure and heart rate, postoperative analgesia and adverse effects were evaluated.

Results: Blood pressure and heart rate were significantly decreased in dexmedetomidine group. Bradycardia-required atropine was more frequent in dexmedetomidine group (6/25 vs. 1/26). Dexmedetomidine group showed significantly lower VAS, less analgesic request, and longer time to first analgesic request comparing control group.

Conclusions: IV dexmedetomidine prior to low-dose bupivacaine spinal anesthesia prolonged the duration of spinal block and improved postoperative analgesia, while providing adequate sedation without serious adverse effects.

Values are mean ± SD or median [range]. (* P<0.05 )

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<th>Control (n=26)</th>
<th>Dexmedetomidine (n=25)</th>
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<td>Maximum block level</td>
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<td>Cold/Sensory</td>
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<td>T10 [L2-T6]: T11[L1-T7]: T9 [L1-T3]: T0[L2-T4]*</td>
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<td>Cold/Sensory</td>
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<td>8.2 ± 4/5.95 ± 4.8</td>
<td>7.1 ± 2.87/3 ± 3.0</td>
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<td>Time to maximum block level</td>
<td>41.0 ± 20.6</td>
<td>61.5 ± 29.4</td>
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<tr>
<td>Time to 2-segments regression of sensory block (min)</td>
<td>23.8 ± 33.3</td>
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[Spinal characteristics]
Conclusions: Administration of low dose ropivacaine offers greater haemodynamic stability comparing to standard dose in this group of patients. In practice, there is no need of use of vasoconstrictive agents due to absence of hypotension, while a significant decrease in recovery time post anesthesia was noted.

Reference:

Results:

Conclusions: In this article, we showed that nephrectomy operation plan need in a geriatric patient with pulmonary pathologies could be done successfully under epidural anesthesia with midazolam sedation and ketamin analgesia.

References:

A. Yeğta, Turkey.

Background and aims: This study was designed to compare the postoperative analgesic characteristics, spinal anesthetic effects and side-effects of different doses of intrathecal dexametomidine added to hyperbaric bupivacaine during spinal anesthesia.

Methods: 60 ASA-I group male patients who would undergo inguinal and perianal surgery were included in the study. Patients were randomized into 3 groups of 20 people. The patients of Group-1 were administered with 3 ml hyperbaric bupivacaine + 0.5 ml serum physiological; the patients of Group-2 were administered with 3 ml hyperbaric bupivacaine + 2 µg dexametomidine; the patients of Group-3 were administered with 3 ml hyperbaric bupivacaine + 4 µg dexametomidine; each intrathecal, in a total volume of 3.5 mL. The effects on the spinal anesthesia, time to the first pain and side effects were recorded.

Results: The demographic characteristics of the patients were found to be similar. The time to the first pain in Group-3 was observed to be significantly longer as compared to the Group-1 and Group-2. The time to the first pain in groups were lined up from the shortest to the longest as: Group-1 < Group-2 < Group-3. The Group-3 no analgesic was required.

Conclusions: The duration and efficacy of the multimodal analgesia performed by the use of different doses of dexametomidine, an adjuvant agent producing analgesia by the α2 agonistic mechanism of action, increases with the increasing dose of dexametomidine; and therefore the use of postoperative analgesic use decreases.

A. Yeğta, Turkey.

Background and aims: This study was designed to compare the postoperative analgesic properties, spinal anesthetic effects and side-effects of different doses of intrathecal dexametomidine added to hyperbaric bupivacaine during spinal anesthesia.

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A. Yeğta, Turkey.

Background and aims: This study was designed to compare the postoperative analgesic characteristics and side effects of intrathecal 12.5 mg incremental doses of ketamine and the combinations of hyperbaric bupivacaine and their effects on spinal anesthesia.

Methods: Following local ethical committee approval; 100 male patients (ASA-I group) were included in the study. The included patients were planned to undergo inguinal and perianal surgical operations. The patients were randomized into five groups (20 patients in each group). The medicine was administered intrathecal in total (3.5-4) mL of volume as follows: Group-1: 3 ml hyperbaric bupivacaine + 0.5 ml serum physiological; Group-2: 3 ml hyperbaric bupivacaine + 12.5 mg ketamine; Group-3: 3 ml hyperbaric bupivacaine + 25 mg ketamine; Group-4: 3 ml hyperbaric bupivacaine + 37.5 mg ketamine; Group-5: 3 ml hyperbaric bupivacaine + 50 mg ketamine. The time to first pain and the spinal anesthesia characteristics were recorded. 8mg intramuscular larnoxicam was administrated when the pain began.

Results: The demographic characteristics of the patients were similar. Time to the first pain was statistically significantly longer in Group 5 as compared to Group-1, Group-2, Group-3 and Group-4. The time to pain began...
Ketamine is an adjuvant agent that produces analgesia by antagonizing NMDA receptors. The study performed by different doses showed that multimodal analgesia duration and the efficacy was increased and the postoperative analgesic use is decreased by the ketamine dose increase.

426
THE POSTOPERATIVE ANALGESIC CHARACTERISTICS OF INTRATHECAL 250 µG INCREMENTS OF NEOSTIGMINE AND THE COMBINATIONS OF HYPERBARIC BUPIVACAINE AND THEIR EFFECTS ON SPINAL ANESTHESIA
A. Yektas, Turkey.

Background and aims: This study was designed to compare the postoperative analgesic characteristics and side effects of intrathecal 250 µg incremental doses of neostigmine and the combinations of hyperbaric bupivacaine and their effects on spinal anesthesia.

Methods: Following local ethical committee approval; 80 male patients (ASA-I group) were included in the study. The included patients were planned to undergo inguinal and perianal surgical operations. The patients were randomized into four groups (20 patients in each group). The medicine was administrated intrathecal in total (3.5-4) ml of volume as follows: Group-1: 3 ml hyperbaric bupivacaine + 0.5 ml serum physiological Group -2: 3 ml hyperbaric bupivacaine + 250 µg neostigmine Group -3: 3 ml hyperbaric bupivacaine + 500 µg neostigmine Group-4: 3 ml hyperbaric bupivacaine + 750 µg neostigmine. The time to first pain and the spinal anesthesia characteristics were recorded. 8mg intramuscular lamoxiam was administrated when the pain began.

Results: The demographic characteristics of the patients were similar. Time to the first pain was statistically significantly longer in Group 4 as compared to Group-1, Group-2, and Group-3. (p < 0.01). Time to the first pain was approximately 220.75±30 minutes in Group-1; 284.75±176.49 minutes in Group 2; 324.50±192.64 minutes in Group 3; 486.20±201.89 minutes in Group 4.

Conclusions: Neostigmine is a cholinesterase inhibitor that produces analgesia by increasing acetylcholine activity through muscarinic receptors. The study performed by different doses of neostigmine showed that multimodal analgesia duration and the efficacy was increased and the postoperative analgesic use is decreased by the neostigmine dose increase.

427
A COMPARISON OF THREE ANESTHETIC TECHNIQUES ON THE OUTCOME IN COLORECTAL SURGERY
S.S. Zarnic, I. Palibrik, S. Barovie, V. Masirevic, Serbia.

Background and aims: Epidural anesthesia produces highly effective pain relief, but bears a risk of serious complications.

The aim of the study was to assess and compare the effects of three anesthetic techniques on the outcome in abdominal surgery.

Methods: The retrospective analysis included 529 patients, who underwent colorectal operations between January 2002 and December 2010. All of them were split into three groups according to the type of anesthesia and postoperative analgesia applied: 1 group general anesthesia (GA), postoperative pain relief with parenterally given morphine ; 2 group GA and postoperative epidural analgesia(EDGA) and III group combined spinal epidural/general anesthesia (CSEDGA); intraoperative spinal/epidural anesthesia with light general anesthesia and postoperative epidural analgesia.

The primary parameters of efficacy were: perioperative complications (bleeding, infection, reoperation, cardiovascular, respiratory, hepatic or renal insufficiency) and total mortality. Visually analogous scale (VAS), used to measure postoperative pain intensity, was statistically examined and scores were compared between groups.

Results: No statistically significant difference in demographic and operative characteristics of the patients was recorded. The neuroaxial blockade (EDGA/ CSEDGA) decreased the frequency of respiratory complications (p<0.05 / p<0.01) and the need for reinterventions (p<0.01). Radically reduced perioperative bleeding, cardiovascular and infective complications (p<0.01) were recorded in patients operated in CSEDGA anesthesia.

Total mortality, recorded in group III, was less frequent than in groups II(p<0.05) and I(p<0.01).

Postoperative epidural analgesia(EDGA and CSEDGA) was associated with lower pain scores during the first 3 postoperative days.

Conclusions: Neuroaxial blockade reduces postoperative mortality and other serious complications.

428
IMPACT OF OPIOIDS IN NON-CANCER CHRONIC PAIN

Background and aims: Moderate to severe chronic pain affects 19% of adults in Europe and is a major public health problem. The treatment of chronic non-cancer pain with opioids is still controversial. The aim of this study is to assess the effectiveness of opioids in treating nonmalignant chronic pain, the risk of dependence /addition, the impact of pain on quality of life and the pain interference in daily life.

Methods: We performed a questionnaire with a random sample of 20 patients treated with opioids for chronic non-cancer pain on a Pain Unit. It consisted of a questionnaire of self response, including "Brief Pain Inventory/BPI") "Mini-Mental State (MMS)," Addiction Behaviors Checklist (ABC) and Short-Form-36 (SF-36).

Results: The pain interference in daily life, had an average of 4.6 in all areas (range: 0-10), having a significant interference (BPI). The relief of pain with opioids was of 50% (average). On the assessment of cognitive function (MMS), only one patient had a mild cognitive impairment. Just one patient showed possible problems of addiction (ABC). 90% of our patients had a quality of life below the average referring to the physical state and 75% to the mental state (SF-36).

Conclusions: Opioids were effective in reducing pain intensity by decreasing the pain interference in daily life, but there wasn’t a good quality of life. Signs of dependency and addiction were not relevant. It is necessary to invest heavily in studies of longer duration, greater number of patients with control groups.

References:
2. Exp Clin Psychopharmacol 2008;16:405-416

429
PAIN MANAGEMENT IN HEMATOLOGICAL MALIGNANCIES
H. Bektas, G. Yigit, Turkey.

Pain is frequently experienced by patients with hematological malignancies, although it often receives little attention. Different underlying causes and mechanisms may sustain several pain syndromes in hematological malignant patients. Pain may be due to disease itself, to disease-related complications, to iatrogenic causes or may be associated with unrelated medical conditions or invasive diagnostic procedures. The management of pain in this setting requires a multidisciplinary approach, integrating analgesics and causal interventions. The assessment of pain intensity is a critical aspect that should be used to guide the treatment approach. Pain on movement, also called incident pain, represents a distinct kind of break-through pain. Incident pain strongly limits physical activity in most cancer patients. Incidence of pain and motor disability have been reported as common concerns for patients with hematological malignancies. For most pain patients, the WHO’s three-step analgesic scale for cancer pain relief can provide adequate relief with oral options, although difficult-to-treat pain syndromes, requiring a more complex treatment approach, may also be observed. Relieving the pain of patients who have hematologic disorders requires a multifaceted approach. An understanding of the taxonomy of pain, basic pain pathophysiology, and a systematic evaluation of the pain
complaint will provide a rational basis for treatment decisions. After the source of the pain has been identified, appropriate nonpharmacologic and pharmacologic therapies can be initiated. In addition, an appropriate pain management strategy should possibly integrate all the available measures to provide an individualized treatment plan according to the patient’s clinical features and needs.

430 GERIATRIC PAIN MANAGEMENT

H. Bektas, Turkey.

Chronic pain is a frequent problem in up to half of the community-dwelling geriatric population, with estimates of up to 80% for the institutionalized elderly. Skeletal pain related to osteoarthritis, rheumatoid arthritis, cervical and lumbar spondylosis, osteoporosis, and fractures with resultant deformities, including contractures, may occur. Neuropathic pain related to peripheral neuropathy from diabetes mellitus, previous stroke, and post-herpetic neuralgia, as well as pain associated with peripheral vascular and cardiovascular diseases, skin ulcers, and cancer occur with greater frequency in this population. Serious consequences, including depression, insomnia, impaired mobility, delayed healing, and decreased socialization, may contribute to escalating health care costs and interventions. Although chronic pain conditions are generally less life-threatening, the impact on lifestyle, day-to-day functional performance, family and interpersonal relationships, and financial well-being can be tremendous. Pain assessment instruments for older adults should be simple, readily available to patients and staff, and in large print. Successful management of chronic pain in older people is dependent on a careful history and physical examination as it is in young adults. Drug interactions are common in older people as they take more medications and have reduced ability to clear most analgesics and adjuvant medications. Simple analgesics and narcotics are safe to use in older people without overt liver and renal disease, providing the lowest dose compatible with functional improvement is sought; the goal of therapy is to maintain optimum function rather than cure the pain. Achieving the goal of improved patient comfort requires frequent reassessment, use of multiple and complementary approaches, and careful monitoring of medical and functional status.

431 CAUDAL STEREOID INJECTION FOR THE MANAGEMENT OF INTRACTABLE PAIN DUE TO CAUDA EQUNIA SYNDROME

O.Y. Cok, H.E. Eker, A. Aribogan, G. Arslan, Turkey.

Background and Aims: Cauda equina syndrome is a neurologic disorder which may manifest with severe unilateral or bilateral leg and back pain, paresthesias and weakness, perineum or saddle anesthesia, and urinary or fecal incontinence (1). Because of the complexity of the pathology and etiology of the condition, treatment of the syndrome is often challenging. Here, we present efficient pain management of a patient with complete cauda equina syndrome.

Case: A twenty-eight years old female patient was referred to pain clinic with intermittent, throbbing, stabbing, shooting headache especially on the right side of the head. His pain was initiated 3 years ago and was diagnosed as migraine, tension and cluster-type headache, sinusitis at different times and attempted to treat with various drugs such as opioid and non-opioid analgesics anti-migraine drugs, antidepressants and antibiotics, however sufficient pain relief wasn’t achieved. He had two recent CT examinations assessed as normal cranial structures. After physical examination and history of nasal fullness like sinusitis and a mild growth of hands, feet and scalp for two years, hormonal assay and MRI revealed a pituitary tumor. The patient was referred to neurosurgery and operated and had no headache thereafter.

Conclusion: Stretching of the dura mater and invasion of pain-producing structures within the cavernous sinus due to pituitary tumor may lead to headache. However, small functional pituitary lesions may also present with severe headache without cavernous sinus invasion or suprasellar extension(2). We suggest that advanced examination should be performed or repeated intermittently to rule out a tumor when the headache of a patient persists despite extensive medical treatment.

432 A PITUITARY TUMOR HIDDEN BEHIND CHRONIC HEADACHE

O.Y. Cok, H.E. Eker, M. Cekinmez, A. Aribogan, Turkey.

Background and Aims: Pituitary tumors come to clinical attention due to endocrine dysfunction, distortion of local structures surrounding the pituitary fossa, or as an incidental finding during neuroimaging for headache(1,2). However, neurologic examination and radiologic examinations focused on headache may not reveal the etiology behind. Here we present a case with chronic headache due to undiagnosed pituitary tumor.

Case: A twenty-two years-old male patient was referred to pain clinic with an intermittent, throbbing, stabbing, shooting headache especially on the right side of the head. His pain in was initiated 3 years ago and was diagnosed as migraine, tension and cluster-type headache, sinusitis at different times and attempted to treat with various drugs such as opioid and non-opioid analgesics anti-migraine drugs, antidepressants and antibiotics, however sufficient pain relief wasn’t achieved. He had two recent CT examinations assessed as normal cranial structures. After physical examination and history of nasal fullness like sinusitis and a mild growth of hands, feet and scalp for two years, hormonal assay and MRI revealed a pituitary tumor. The patient was referred to neurosurgery and operated and had no headache thereafter.

Conclusion: Stretching of the dura mater and invasion of pain-producing structures within the cavernous sinus due to pituitary tumor may lead to headache. However, small functional pituitary lesions may also present with severe headache without cavernous sinus invasion or suprasellar extension(2). We suggest that advanced examination should be performed or repeated intermittently to rule out a tumor when the headache of a patient persists despite extensive medical treatment.

433 USE OF COOLED RADIOFREQUENCY LATERAL BRANCH NEUROTOMY FOR THE TREATMENT OF SACROILIAC JOINT MEDIATED LOW BACK PAIN: A LARGE CASE SERIES

W. Stelzer, H. Wagner, A. Dine, Austria, USA.

Background and aims: The sacroiliac joint (SIJ) complex is a common source of chronic low back pain. Radiofrequency (RF) neurotomy has been investigated as a minimally invasive treatment option for SIJ mediated low back pain. We aimed to retrospectively evaluate the use of Cooled RF lateral branch neurotomy (LBN) to treat chronic SIJ mediated low back pain in a large European study population.

Methods: Electronic records of 126 patients with chronic low back pain who underwent treatment with Cooled RF were identified. Subjects selected for treatment based on physical examination and positive response (±50% pain relief) to intra-articular SIJ block. Cooled RF lesioning the L5 dorsal ramus (L5DR) lateral to the S1, S2 and S3 posterior sacral foraminal aperatures. Visual analog scale pain scores, quality of life, medication usage, and satisfaction were collected before procedure, 3-4 weeks post-procedure (n = 97), and 4-24 months post-procedure (n = 105).

Results: At time to final follow-up (4-6 months, 6-12 months, >12 months, respectively): 86%, 71% and 48% of subjects experienced 50% pain improvement or improved; and, 100%, 62%, and 67% stopped or decreased use of opioids.

Conclusions: These results show durable improvements in pain, quality of life and medication usage, with benefits persisting to 24 months after treatment. These results are consistent with previous study findings on the use of Cooled RF to treat SIJ mediated low back pain.

434 COOLED RADIOFREQUENCY SYSTEM FOR THE TREATMENT OF THORACIC FACET JOINT PAIN: THE FIRST PROSPECTIVE CASE SERIES USING A NOVEL PLACEMENT TECHNIQUE

R.E. Wright, S. Brandt, K. Allan, J. Wolfson, A. Dine, USA.

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Background and aims: The thoracic facet joint is a source of spinal pain with reported prevalence of 34-48%. There is limited published literature on the RF neurotomy of the thoracic medial branches, where no meaningful conclusion can be derived due to incorrect ablated targets and the retrospective nature of these studies. The limited options for the treatment of thoracic spinal pain and the risk of puncturing the pleura cavity in the complex regional anatomy may be some of the reasons for the lack of published literature. We evaluated the safety and efficacy of thoracic facet joint denervation using cooled radiofrequency neurotomy in a prospective case series of 13 patients.

Methods: Following patient consent, we used a technique directing the introducer needle towards the ‘thoracic safe zone’ targeting the superolateral aspect of the transverse process with cooled radiofrequency neurotomy, creating a consistent zone of ablation sufficiently large to capture the thoracic medial branches.

Results: Over a 12-month follow-up period, the mean VAS score was reduced by more than 3 points at each follow-up. At the 9-12 months, 60% of patients continued to experience more than 50% pain relief. ODI, 58%, 42% and 30% of patients experienced a reduction of 10 points or more at 3, 6 and 9 months post-treatment, respectively. There were no complications reported.

Conclusions: Overall, the novel needle placement technique combined with cooled radiofrequency may be a safe and effective treatment option for thoracic facet joint denervation with significant clinical promise.

436 PERCUTANEOUS EPIDURAL NEUROPLASTY FOR THE TREATMENT OF DEGENERATIVE LUMBAR SPINAL STENOSIS IN THE ELDERLY


Methods: Percutaneous lumbar spinal neuroplasty (PCEN) has been applied as an treatment option for cervical disc herniation. The objective of our study was to evaluate the effectiveness of percutaneous epidural neuroplasty (PEN) for DLSS.

Conclusions: We suggest that SSNB can provide a viable part of a comprehensive pain management programme for patients who are either; considered too ‘high risk’ for joint replacement, or who have little to gain from shoulder arthroplasty because of pre-existing muscle damage. Patients must be willing to accept the motor disability associated with the procedure which is likely to be performed as a series of regular injections.
Results: PCEN were performed for protruded disc (67.1%) and extruded disc (32.9%). The mean age was 50 years (SD 9.5) and ranged from 27 to 77 years. The average follow-up period was 20.3 months (SD 3.9). All the patients showed statistically significant improvement of NRS scores at the follow-up when compared to preprocedural values. There was significant difference in patient-rated symptom improvement score between protruded and extruded disc (<0.001). There were no serious complications.

Conclusions: PCEN is a safe and effective procedure for cervical disc protrusion. Extruded type of disc has also good clinical outcomes. PCEN is a considerable treatment modality for cervical disc herniation.

439 EFFICACY OF A NEW NAVIGABLE PERCUTANEOUS DISC DECOMPRESSION DEVICE (L‘DISQ) IN PATIENTS WITH HERNIATED NUCLEUS PULPOSUS RELATED TO RADICULAR PAIN: RESULTS FROM THE ONE-YEAR FOLLOW-UP


Background and aims: To evaluate the 1-year follow-up efficacy of a new navigable percutaneous disc decompression device (L‘DISQ) in patients with lumbar disc herniation with radicular pain.

Methods: We performed disc decompressions using L‘DISQ on 10 patients with persistent disabling back and leg pain for one month or longer (average 5.9 months) due to a herniated lumbar intervertebral disc. Baseline data was prospectively gathered before the index procedure and at 1, 4, 12, 24 and 48 weeks post procedure. Data included pain intensity (Visual analogue scale, VAS), measure of disability (Oswestry disability index, ODI and Rolando-Morris Questionnaire, RM), health-related quality of life (Bodily pain scale of Short Form-36 version 2, SF-36 BP) and passive straight leg raising test (SLR).

Results: The VAS fell from 7.40 0.97 to 1.35 1.16 scores at 48 weeks post procedure. At 48 weeks the ODI had fallen from 42.08 8.93 to 12.60 10.50%, and the RM from 12.00 4.74 to 1.80 1.75 points. The SF-36 BP dropped significant improvement from 33.32 6.24 to 51.82 4.70 scales. In SLR test, the angular change of 48 weeks showed considerable improvement, from 58.50 19.44 to 89.00 3.16 degrees. No major complication occurred, although one case developed a disc re-herniation ten months post procedure.

Conclusions: The L‘DISQ device is specifically designed to remove herniated disc using a wand that can be navigated into a disc protrusion or extrusion. Following decompression we measured clinically significant pain improvement and decreased disability for patients with both radicular and axial pain caused by protruded and extruded discs.

440 EFFICACY TO ABLATE THE TORN ANNULUS USING NEW NAVIGABLE PERCUTANEOUS DISC DECOMPRESSION DEVICE (L‘DISQ) IN PATIENTS WITH LUMBAR DISCOCGENIC PAIN


Aims: The purpose of study is to assess the clinical outcomes of percutaneous disc decompression device (L‘DISQ) in patients with lumbar disc herniation using L‘DISQ.

Methods: We ablated the torn annulus using L‘DISQ on 20 patients with lumbar disc herniation with radicular pain.

Results: All the patients showed statistically significant improvement of NRS scores at the follow-up when compared to preprocedural values. There was no major complication occurred, although one case developed a disc re-herniation 10 months post procedure.

Conclusions: This device is specifically designed to ablate adjacent disc tissue, probably including nociceptive nerve free endings, using a wand that can be navigated into a torn annulus. Following ablation we measured clinically significant pain improvement and decreased disability for patients with axial back pain.

441 INTRATHecal DRUG ADMINISTRATION IN PATIENTS WITH CHRONIC PAIN

A. Patil, S. Eldabe, A. Gulve, C. Sinclair

Background and aims: Intrathecal infusion of analgesic medications is used since 1980s for chronic pain refractory to conventional treatment. It is administered through Intrathecal Drug Delivery System sited surgically.

Results: Total number of patients was 43. The commonest indication for the treatment was nociceptive pain (24 patients) followed by pain due to spasticity (9), mixed pain (6), neuropathic pain (3) and malignant pain (1). The drugs used included morphine, hydromorphone, fentanyl, clonidine, bupivacaine, baclofen and ziconotide. The duration of therapy ranged from 3months to more than 5 years. Only one patient exceeded the recommended maximum concentration and daily dose for hydromorphone.

Conclusions: The Commonest Indication for the treatment was nociceptive pain. The commonest drug used was morphine. Most patients were receiving therapy since 1- 3 years. Only one patient exceeded the recommended maximum concentration and daily dose for hydromorphone.

442 NEUROFIBROMATOSIS AND CHRONIC PAIN – CASE REPORT

E. Theodorou, G. Stamatiou, Greece.

Background and aims: Von Recklinghausen’s neurofibromatosis is an inherited autosomal dominant disease that is not limited to racial or ethnic origin. This disease is always progressive, with a markedly variable expressivity. It is characterised by abnormal cutaneous pigmentation (cafe au lait spots) and numerous neurofibromas of peripheral nerves.

Methods: Two patients father and son have been diagnosed with NF-1. The son, 32y old had experienced a very long and severe medical history of ten operations (optic glioma and neurofibromas in the thoracic and lumbar region of the spinal cord). He presented severe, neuropathic pain with numbness and causalgia and VAS= 90/100, in both of his legs for a long period of time, approximately 8 months after his last operation. His father had a congenital pseudosarcoma of his left tibia and he experienced neuropathic pain with causalgia and VAS= 80/100. They both received the same treatment with pregabalin 225mg/d, an antidepresant, and a combination of tramadol-paracetamol (37.5mg/325mg) up to 3 times/d.

Results: After 3 months period, they both presented VAS=30-40/100 and no causalgia at all.

Conclusions: Unfortunately, there is no specific cure for this disorder. These patients are followed by a team of specialists to manage symptoms or complications. Chronic pain management could be both difficult and challenging as well.
443
SEVERE HEADACHE CAUSED BY SPONTANEOUS CEREBROSPINAL FLUID LEAKS TREATED BY EPIDURAL BLOOD PATCH
M. Zackova, G. Maknoumi, A. Belloccchio, Italy.
Background and aims: Spontaneous intracranial hypotension is caused by spontaneous cerebrospinal fluid leaks and is known for causing severe orthostatic headache, with some other symptoms like tinnitus, nausea or photophobia. The aim of this study was to confirm the good pain relief using epidural blood patch.
Methods: A retrospective analysis was performed in 7 patients (all females, mean age 53 years) with heavy orthostatic headache (VAS 7-8). The conservative therapy was almost unsuccessful. Cerebral MR showed diffuse pachymeningeal gadolinium enhancement in all cases. It was not possible to identify the exact site of the spinal CSF leak. We performed in all patients epidural blood patch with 15 ml of blood in lumbar epidural space (L2-L3 o L3-L4) by one single shot. Neurological status and VAS were assessed before and 1 week after epidural injection. Follow up examinations took place after 2 months.
Results: After 1 week, 6 patients had a good pain relief (VAS 3-4) and clear improvement of the other neurological symptoms. This condition was present also after 2 months. Only one woman repeated epidural blood patch second time (after 1 week). One patient suffered from local back pain without radiculopathy for 3 weeks. There were no other side effects.
Conclusions: We can confirm that without known site of the leak, the lumbar approach with epidural blood patching, may be good choice of therapy. In case of recurrence this therapy can be repeated. This procedure is well accepted by patients, also considering low hospital cost.

444
TRANSCUTANEOUS CONTINUOUS CARBON DIOXIDE TENSION MONITORING IMPROVES VENTILATION STATE IN COMBINED REGIONAL ANAESTHESIA AND CONSCIOUS SEDATION DURING SHOULDER SURGERY
J.A. Aguirre, B. Baulig, M. Kesseli, A. Borgeat, W. Baulig, Switzerland.
Background and aims: We aimed to investigate the impact of transcutaneous continuous carbon dioxide tension (PtcCO2) monitoring on the ventilation state in regional anaesthesia during shoulder surgery in beach chair position.
Methods: After placement of an interscalene catheter, conscious sedation in 60 patients was performed with propofol and remifentanil using TIC. Patients were randomized either to the control (c-) group (25 patients) or to the intervention (i-) group (35 patients). Anaesthesiologists in the c-group were blinded to PtcCO2 values and conscious sedation was handled according to standard clinical practice, whereas in the i-group conscious sedation was regulated according to PtcCO2 values between 4.5 to 5.5 kPa. Data were recorded offline before and every 15 min until end of surgery and every 30 until discharge from the PACU after induction of conscious sedation.
Results: The demographic data were not significantly different. Propofol consumption was lower in the invention group, but did not reach significance. Perioperative recorded PtcCO2 values were significantly higher in the control group (p < 0.001) compared to the intervention group (Fig. 1a, 1b) with a mean ±SD [range] of PtcCO2 of 6.26 ±0.90 [3.80; 8.24] and 5.00 ±0.49 [4.11; 5.96], respectively. No significant difference was found between the groups for SpO2, Pulse rate, BIS, cumulative remifentanil-, and clonidin doses, crystalloid and colloid replacement volume, duration of surgery and recovery time.
Conclusions: PtcCO2 guided sedation reduces propofol consumption and early avoids significant hypventilations states in spontaneously breathing patients during shoulder surgery in beach chair position.

445
QUALITY OF LIFE IN THE EARLY POSTOPERATIVE PERIOD - COMPARISON OF GENERAL AND SPINAL ANAESTHESIA FOR THE PROSTHETIC HIP ARTHROPLASTY
R. Fidyych, M. Brackowska, D. Onichimowski, E. Mayzner-Zawadzka, Poland.
Background and aims: Different mechanisms behind general and spinal anaesthesia let one assume that the patients’ physical evaluation and emotional sensations may be different. The aim of this study was to compare the quality of the patients life in the early postoperative period who have undergone general anaesthesia and the spinal one for the prosthetic hip arthroplasty.
Methods: 60 patients suffering from hip arthropisis were included, they’ve undergone either general (n=30) or spinal (n=30) anaesthesia. The quality of life was analyzed on the basis of the authors own modification of the polish version of the American generic questionnaire SF-36 at the first 4, 24 and 48 hours after the surgical treatment and on the discharge day. We’ve taken into consideration also the hemodynamic parameters, blood loss volume, volume of transfused fluids, side-effects and VAS.
Results: Patients which underwent spinal anaesthesia evaluated their quality of life as better, they’ve lost less blood, received less colloids during the operation and presented more stable hemodynamic parameters.
Conclusions: Spinal anaesthesia in comparison with the general one for the prosthetic hip arthroplasty has a better impact on the quality of life in the early postoperative period.

446
BODY MASS INDEX INCREASES LENGTH OF STAY FOLLOWING PRIMARY KNEE ARTHROPLASTY WITHIN AN ENHANCED RECOVERY PROGRAMME
A. Burumdayal, R. Sethuraman, D. Ravindran
Background: Body Mass Index (BMI) could be linked to longer length of stay (LOS) after surgery. Enhanced Recovery Programmes (ERP) aim to improve patients’ wellbeing, rate of recovery and reduce LOS. This study looked at the correlation between body mass index (BMI) and LOS after primary Total Knee Arthroplasties (TKA) within an ERP used in our hospital.
Methods: 100 patients scheduled for elective TKA were subject to a prospective audit and followed up until their discharge day. Anaesthetic technique was left at the discretion of the anaesthetist. All patients received standardised preoperative and post-operative care. The standard LOS for TKA at our institution is 3 days. Local ethics committee approval was sought.
Results: Most patients received either a general anaesthetic with a femoral nerve block (GA/FNB) or a spinal with intrathecal opioid. Only 75 had their BMI recorded (range 18.6-44.4). 13 patients had BMI ≤25, 27 had BMI 25-30, 21 had BMI 30-35 and 14 had BMI >35. Mean LOS for all patients was 5 days. Mean LOS increased with the increase in BMI: 4.7 in BMI ≤25; 5 in BMI 25-30; 6 in the BMI 30-35 and 7 in the BMI >35.
Conclusion: Our data suggests that BMI has a direct correlation with length of stay in TKA patients. Although it was not possible to adjust for other variables, patients with a raised BMI were more likely to have longer LOS. BMI could be used as a predictor for increased LOS and during pre-operative counselling when discussing risks.

447
A SURVEY OF DOCUMENTATION OF REGIONAL ANAESTHESIA
A. Carey, K. Pinches
Background and aims: Regional anaesthesia has had, in recent years, a significant increase in interest and popularity. It is also the anaesthetic subspecialty that makes up the majority of claims and financial burden of the NHS litigation authority. Standards for documentation for UK anaesthetic practice, while not specific to regional anaesthesia, stress the importance of comprehensive documentation.
Methods: A survey was conducted to investigate the extent of documentation of regional anaesthetic techniques conducted in our hospital.
Results: Suboptimal documentation of various aspects pertaining to the conduct of regional anaesthetic procedures that are considered important to mitigate the risk of procedural complications.

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Conclusions: We support and advocate the local and widespread utilisation of a standardised procedure note or label to comprehensively document the conduct of regional anaesthetic procedures. Such a standardised approach has been demonstrated to improve documentation in two other completed audit cycles. In addition we advocate that a minimum standard of documentation be established by appropriate UK advisory and regulatory bodies, that is specific to the safe conduct of regional anaesthesia and designed to withstand medico-legal scrutiny.

448
Awake Neurosurgery with Regional Scalp Block (Video)
A. Cerroni, L. Mastronardi, S. Sherkat. Italy.

Background and aims: The awake craniotomy, originally introduced for surgical treatment of epilepsy has been used in patient undergoing surgical resection of brain tumour of the pre frontal area. Awake intraoperative mapping is the most reliable method to locate eloquent cortex and associated sub cortical tissue during brain resection. This technique is useful to maximize lesion resection sparing important brain areas.

Methods: A total of ten patient underwent awake craniotomy between September 2009 and April 2011 using an “Asleep Awake Asleep” (A2A2A) technique. After induction of TIVA general anaesthesia regional scalp block has been performed with ropivacaine 7.5mg/ml total amount 20ml (22.5mg into all layers of the scalp). Once exposed the dura was infiltrated with lidocaine 1% to provide regional dural block. Brain mapping has been performed in the fully co-operative patient in park bench position with a Mayfield three pin holder. Surgical resection has been completed under general anaesthesia, otorrheal reintubation was performed under fibroscopic guide passing through a laryngeal mask. Anaesthesia depth was monitored using BIS.

Results: Pain exposure is greatest during craniotomy and dural opening, during A2A2 drop in O2 saturation below 97% occurred. Medium VAS range during A2 was 8.9. Epileptic seizure occurred in 2 patients. Intubation was easily performed in all patients.

Conclusions: Awake resection is the gold standard for low grade gliomas in Rolandic area. The AAA technique, even if more complex, allows the advantages of avoiding breathing depression.

Reference:

449
Autologous Fat Transfer for the Management of Spinal Cord Stimulator Lead Protrusion
E. Sparks1,2, J.H. Raphael1,2, R.V. Duarte1,2, E. Erel, M. Ali, R.L. Ashford
Background and aims: Spinal cord stimulation (SCS) is an accepted therapy for the management of chronic non-malignant pain. Protrusion of the SCS leads is a recognized complication. The aim of this study was to investigate the benefits of autologous fat transfer (AFF) for the management of this complication.

Methods: Four SCS patients presenting protrusion of SCS leads were considered for AFF in the plastic surgery department. Fat was gathered from the buttock and thigh areas through liposuction and centrifuged for five minutes. It was then injected over the near-extruding lead to achieve 3.5 years (range: 41-49) with a duration of SCS treatment of 31±12 months (21-48). Patients had an average of 1.5±0.6 AFF episodes (1-2). Prior to the first AFF, an average of 2±1.4 (0-3) surgeries concerning protrusion of the leads were performed. Last AFF was performed at a mean of 8.25±1.7 months (6-10). Percentage reduction in palpability of the leads was 62.5±12.6% (50-80), contour deformity improvement was 67.5±15% (50-80) and percentage of pain relief was 59.8±4.9% (35-60). All patients considered this procedure worthy of recommendation to individuals with the same complication.

Conclusions: Autologous fat transfer appears to be an alternative to surgery for repositioning of the wires. Substantial improvements (≥50%) after autologous fat transfer were observed for pain relief, palpability and contour deformity caused by the leads in these patients. Future research should focus on duration of these benefits.

450
Determining the Effective Length of Stay For Post-operative Patients in the PACU Through the Location of Influencing Factors
A. Filhaber, Y. Koh, S. Shitrit, L. Rubin. Israel.

Background: The patient’s post-operative clinical condition, type of anaesthetic and type of surgery dictate post-operative care and monitoring requirements. There is no consensus in the literature regarding the Gold Standard for discharging patients from PACU.

Objective:
(1) Estimating actual PACU LOS for patients after general and regional anesthesia.
(2) Estimating appropriate PACU LOS for patients after general and regional anesthesia.
(3) Measuring the gap between actual and appropriate PACU LOS and identifying the main factors affecting LOS.

Methodology: Prospective study with 580 patients, mainly undergoing planned surgery. Data gathered from patient records, maintaining anonymity for six months.

Results: A significant difference was found between anesthesia type and actual LOS, t(508)=7.716, p<0.001. The actual LOS was higher when the anesthesia type was general. A significant differences were found in appropriate LOS between anesthesia types (general/regional) t(494)=8.114, p<0.001. Appropriate LOS was higher when the anesthesia type was regional. The most common reason for the delay was waiting for transport assistance (55%). Another common reason was the need to complete treatment/medication (29%). A significant difference was found between the reasons for the delay and the duration of the delay, F(2,206)=3.774, p<0.05.

Conclusions: This study is a pioneer, and further studies are required, on larger scales and in several hospitals, in order to determine an evidence-based standard for appropriate PACU LOS for post-operative patients based on anesthesia.

451
Virtual Reality vs Cadaver vs Patient Based Regional Anaesthesia Training - Amalgamation For Better Training!
R. Garibotti
Background: With training opportunities in regional anaesthesia limited and use of ultrasound in regional anaesthesia rapidly increasing, there is an urgent need to further develop options of cadaver and virtual reality based simulators, to teach safe ultrasound-guided needle placement.

Literature Review: There is an emerging consensus for the notion that patients should not be used to gain very early experience. Human cadavers are an invaluable training resource as they have similar echogenicity and textural feel of live human tissue, but are an expensive and difficult resource to access.

A Human-Computer- Imaging interface along with haptic and auditory devices to facilitate 3-dimensional-virtual-reality(3D-VR) would compliment the current training and has potentials to improve both patient safety and quality of life. It will enable anaesthetists to learn complex nerve blocks with steep learning curves, easily in a safe environment and practice techniques for diverse anatomical regions of the body incorporating variance and realism.

But dynamics of simulation in regional anaesthesia requires deformable geometry, incorporation of haptic/biomechanical feedback, discrimination of different types of tissue and data optimisation in real time to create a more immersive visual environment, improved tactile feedback and end points. And there may be a significant cost!

Conclusions: The future lies somewhere in creation of high fidelity 3D-VR simulator that may mimic a patient along with clear representation and feel of anatomy and in ‘pre-scanning’ patients where every patient would be scanned for variations in anatomy and a block attempted only after anaesthetist has trained on a 3D-VR model, if there is aberrant anatomy.
452
MEDICATION ERRORS- MORE COMMON THAN YOU THINK. IMPLICATIONS IN REGIONAL ANAESTHESIA


Background and aims: Among the various errors seen in anaesthesia, medication errors rank high on the list. Medication errors can result in either adverse patient outcomes and/or financial implications. We conducted a survey among public sector and private practice anaesthesiologists in Singapore during a 1 month period to determine the incidence of medication errors and its types.

Methods: We sent out 350 forms to anaesthetists, trainees and specialists, in institutions and in private practice. We classified the types of medication errors, the outcomes, factors that lead to its occurrence and the subsequent action taken as a fall out the errors.

Results: We received 176 responses to the 350 forms distributed. We found a total of 116 errors committed by 82 doctors (46.59%). The most common type of error was accidental injection of muscle relaxants instead of reversal with neostigmine. Ampoule identification was aided by many features, but labeling was overwhelmingly the most important identifying feature for syringes. None of the errors resulted in major adverse outcomes or death.

Conclusions: One in two anaesthesiologists in Singapore will have a medication error in a lifetime of practice. Since, regional anaesthesia is increasingly being adopted in recent times, there is scope for errors to occur during drug dilution and administration. Suggestions include improve drug labeling practices, text-sizing and color coding which may impact the frequency of drug errors.

453
ESTABLISHING A FAST-TRACK ORTHOPAEDIC ANAESTHESIA UNIT ACCORDING TO THE LEAN SUPPLY CHAIN PRINCIPLES

K. Jensen, J. Borglum, Denmark.

Background and aims: Effectiveness is a key issue in any busy anaesthesia department. Our aim is to describe key events in the transition from a standard anaesthesia department to its integration into a specialized sports-traumatology unit.

Methods: Retrospective, descriptive study with focus on quantitative developments in key indicators in the study period (2006-2010; 11569 surgeries).

Results: “Lean principles” were applied in 2006. Employing a bottom-up approach, OR activities were worked out using resource flow charts. Aims included parallel problem solving, minimal limitations to flow and standardized procedures. Key indicators for change are listed in table 1. Active promotion of regional anaesthesia by two consultant anaesthetists, investment in mobile ultrasound scanners and establishment of a block school facilitated OR and PACU logistics. The organization was now able to support not only the patients, but labeling was overwhelmingly the most important identifying feature for syringes. None of the errors resulted in major adverse outcomes or death.

Conclusions: Between surgeries).

454
A COMPARISON OF DISTANCE TO ULTRASOUND SCREEN PREFERENCES OF ANAESTHETISTS TO FILM AND TELEVISION INDUSTRY RECOMMENDATIONS FOR AUDIENCES VIEWING MOVING IMAGES

M. Kayani, D. Kruchek

Background and aims: To Compare Ultrasound Screen Location Preferences of Anaesthetists to Film and Television Industry Recommendations for Audiences Viewing Moving Images.

Methods: A Sonosite Corporation S Nerve Ultrasound device was presented to anaesthetists who used the machine for block purposes. A member of staff with an ultrasonically well defined brachial plexus had the ultrasound probe held to the interscalene region with the plexus displayed. Anaesthetists then view the screen at a 0 degree viewing angle and moved the machine until the view was typical for blocks. Bridge of nose to the screen was measured by an observer.

Results: Distance ranges from 43 to 110cm. Standards in the film and television industry may aid on decisions on appropriate screen size and location for distant viewing. Trainees can have a basis for logical positioning of screens during the conduct of blocks.

455
ORTHOPAEDIC SURGEONS’ AND ANAESTHESIOLOGISTS’ PERCEPTIONS AND ATTITUDES TOWARDS REGIONAL ANAESTHESIA (RA) IN ORTHOPAEDIC SURGERY

K. Kolika, N. Kolika, N. Sivrkoz, O. Kılıç, S. Özalp, Turkey.

Background and aims: Little information is available in our country about the orthopaedic surgeons’ and anaesthetists’ attitudes and perceptions on RA in orthopaedic surgery.

Methods: A survey consisting of multiple choice questions about RA preferences were mailed to orthopaedics and anaesthesiologists using the membership databases of national societies.

Results: 350 questionnaires were mailed to the orthopaedics, and 200 were returned (57% response rate). 400 questionnaires were mailed to the anaesthesiologists, and 280 were returned (70% response rate). Significantly more anaesthesiologists agree that RA provides better postoperative analgesia, decreases DVT/PE rates, decreases blood loss during operation, and causes less PONV than do the surgeons. Significantly more number of orthopaedic surgeons has the perception that general anaesthesia is often required to complete the operation than the anaesthesiologists. More than 90% of the anaesthesiologists and 80% of the surgeons have the perception that a successful RA provides higher patient satisfaction rates than general anaesthesia. Only 27% of orthopaedic surgeons and 13.6% of anaesthesiologists totally or partially agree that RA is less effective than general anaesthesia. More than 85% of the anaesthesiologists and 87% of the orthopaedic surgeons totally or partially agree that after RA patients are less sedated and confused than general anaesthesia. More than 90% the orthopaedic surgeons and 85% of the anaesthesiologists totally or partially agree that RA has unpredictable success rates.

Conclusions: Most of the orthopaedic surgeons do understand the benefits of RA; surgeon directed educational programmes may increase surgical awareness of the advantages of RA.

456
ULTRASOUND: THE ESSENTIAL KIT IN REGIONAL ANAESTHESIA

P. Kumar, A. Sultan, S. Razvi, S. Galitze
**Background and aims:** National Institute for Health and Clinical Excellence (NICE) published guidelines for Ultrasound guided regional anesthesia (UGRA) in 2009. Current evidence on the safety and efficacy of UGRA appears adequate provided that normal arrangements are in place for clinical governance, consent and audit. Clinicians wishing to perform this procedure should be experienced in the administration of regional nerve blocks and trained in Ultrasound(USG) guidance techniques. We conducted a survey in Oxford to assess the current usage of UGRA.

**Methods:** An email questionnaire was sent to all the consultants and trainees involved in regular regional block sessions at our regional orthopaedic centre. Questions explored USG hands on training experience and their views on the necessity of USG kit in performing various nerve blocks.

**Usage of USG for the specific nerve blocks:**
- Brachial Plexus: interscalene (76%), supra and infra clavicular (48%), axillary (60%) and elbow block (24%).
- Femoral nerve block (64%).
- Sciatic nerve block: anterior approach (8%), posterior approach (48%).
- 8% felt appropriate to use USG for Lumbar plexus; 80% would use for TAP block.

**Conclusions:** Anaesthesiologists vary in their background knowledge and perceptions regarding the usage of ultrasound in regional anaesthesia.

**Reference:** Ultrasound guidance to place a needle tip near nerve to give anaesthetic and/or pain relief. JPG 285 NICE Jan 2009.

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**457 INCIDENCE OF POSTURAL HYPOTENSION DURING MOBILIZATION FOLLOWING HIP & KNEE ARTHROPLASTY : COMPARISON OF ENHANCED PATIENTS AND TRADITIONAL RECOVERY PATIENTS**

S. Munirama, A. Satapathy, M. Checkkets, G. Mcleod, C. Grant

**Background and aims:** Our aim was to audit the incidence of postural hypotension in Elective Hip & Knee Arthroplasty patients, who went through the Enhanced Recovery For Arthroplasty ‘programme (ERA),’ which has been shown to improve quality of patient care significantly and to compare it with our previous audit of PH in same group of patients who went through a traditional recovery(TR) process.

**Methods:** Prospective audit of 43 patients undergoing elective Hip & Knee arthroplasty was conducted. Pre-operative data regarding patient demographics, co-morbidities, Blood Pressure, Haemoglobin (Hb) were collected. Intra-operative data included anaesthetic technique, vasopressors requirement, blood loss, intravenous fluids, blood transfused. During follow-up, post-operative Hb, fluid balance, pre/post mobilization mean arterial pressure (MAP), time at which first mobilized were recorded.

**Results:** ERA Patients: Overall incidence of PH >48% in ERA and 31.81% in TR patients. Incidence of failure to mobilise due to postural hypotension 16% in ERA patients vs 19% in TR patients. Chi-squared test showed that there was no statistically significant difference in variables between TR and ERA patients except for lower vasopressor use (p=0.02) ERA patients. Univariate analysis showed that postural hypotension(p=0.01) and hip surgery(p=0.03) were predictors of failure to mobilise.

**Conclusions:** Incidence of PH is higher in ERA patients but this does not seem to be a difference in mobilization between ERA and TR patients.

**Reference:**

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**458 THE HEMATOMA BLOCK AN EFFECTIVE ALTERNATIVE FOR FRACTURE REDUCTION IN DISTAL RADIUS FRACTURES**

N. Myderrizi, B. Mema, A. Maligiati, T. Bita, Albania.

An alternative to general anesthesia was tested against hematoma block by a double-blind, randomized clinical trial in reduction of Colles fracture.

**Patients and methods:** 96 patients more than 18 years old with displaced fractures of distal radius were selected from 2007-2009 on the basis of: 1) informed consent; 2) no contraindication to any method of analgesia; 3) no associated injury. Patients were randomized into 2 equal groups. The A group received Propofol intravenously, whereas the B group received 10 cc of 2% Lidocaine Hydrochloride into the fracture hematoma. Fractures are reduced under acceptable criteria. Pain measured by Visual Analogue Scale (VAS) was recorded before, during, and after reduction. Time to ED, to manipulation and to hospital discharge is measured. In radiographic before, after reduction and a week later the radial tilt, ulnar migration and dorsal tilt are measured. Loss of these parameters were study statistically data analysis by KW statistics.

**Results:** 96 patients with displaced fractures of distal radius at mean age 54.3 (19-84) years old, M / F rate 37 / 59, left / right hand 37 / 58 V AS during reduction was 0 in group A and 0.97 ± 0.7 in group B and after reduction was 2.72 ± 0.7 in group A and 2.25 ± 0.2 in group B Time to reduction was 2.63 ± 0.96 in A and 0.90 ± 0.47 in B After a week 21 fractures lose reduction in group A and 22. in group B.

**Conclusions:** Hematoma block by local anesthetic is a safe and effective alternative to intravenous general anesthesia in reduction of Colles fracture.

**Reference:**

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**460 SNAPSHOT AUDIT OF REGIONAL ANAESTHETIC TECHNIQUES FOR LOWER LIMB SURGERY IN A DGH**

U. Paralkar, S. Vamadevan

**Background and aims:** Current hospital practice for RA for elective lower limb orthopedic surgery. Adherence to NICE and RCoA guidelines on regional anaesthetic techniques.

**Methods:** Data was collected prospectively for 8 weeks on 35 patients post elective lower limb surgery. 6 patients excluded.

**Results:**
- Pre-operative:
  - Pre-op consenting, 93% (27/29) were seen preoperatively
  - 2 patients were not explained adequately about RA technique
- 1 Cons (Rev knee) (GA = Fem+Sci, asleep)
There are many risks associated with local anaesthesia. Seventeen patients were deemed to not require a blood bank specimen such that allogeneic blood could be transfused if needed. We identified a potential threat to surgical patient's safety in that the procedure to check this status required all Anaesthetists to telephone the haematology laboratory for each patient in each operating theatre.

Methods: The Anaesthetists responsible for sixty elective cases were asked a series of questions to establish their awareness of whether blood samples for their patients had been processed appropriately. The laboratory was subsequently contacted to confirm the patient's blood bank status.

Results: Seventeen patients were deemed to not require a blood bank specimen sent due to the surgical procedure that was planned. In reviewing the remaining 43 patient cases, the Anaesthetist stated when questioned that a 'group and save' (16) or 'cross match' (27) specimen should have been available. However, in only 7 cases did the Anaesthetist report that they personally checked the blood bank status by telephoning the laboratory for each patient in each operating theatre. The awareness of the blood bank status was reported in nearly half of the reviewed cases (20/43; 46.5%).

Conclusions: The main reason cited for not checking sample status was inconvenience. This is an important patient safety issue, and lent weight to the argument for changing the current system to include blood bank status on the computer system. Having presented our report, appropriate changes to the computerised system have been made.

462 PONV AFTER DAY CASE VITREO-RETINAL SURGERY UNDER PERIBULBAR BLOCK

S.S. Petrovic, B.M.L. Mijomanovic, Serbia.

Background and aims: In the last decade ophthalmic locoregional anaesthesia is increasingly common for vitreoretinal surgery (VRS). These operations are longer and anesthesiologist has to keep the patient calm, but aware and cooperative. The aim of this current study was to examine dynamic foot posture in similar groups using the F-scan system which gives plantar pressure data. Two areas were selected, the medial aspect of the foot and the pressure on the toes. This would give an indication of foot function. If these pressures appear different for the different patient groups and for the healthy controls it might be possible to modify them through the use of orthotics, gait retraining and exercise regimes.

Methods: Sample: 20 patients with OA hip (7 male 13 female, age 42 - 76) 20 patients with Medial Compartment OA knee (9 male 11 female, age 45-79). Tekscan in shoe pressure measurement was used to calculate plantar pressure.

Results: This study demonstrated significant differences in percentage plantar pressure for different areas of the foot between patients with different sites of lower limb osteoarthritis (OA) and healthy volunteers (Reilly et al 2006).

Conclusions: Gait patterns may be influenced by different dynamic foot posture and extremes of either foot type, pes cavus or pes planus, might result in changes in pattern which are sufficient to disrupt the normal closed chain functioning of the lower limb and loading of the proximal joints (Gross 2006).

464 SAFE USE OF LOCAL ANAESTHETICS IN THE EMERGENCY DEPARTMENT

M. Roe

Background/Aims: There are many risks associated with local anaesthetic use in the Emergency Department. When infiltrating around wounds or performing nerve block techniques in the trauma setting it is vital that as prescription only medicines, local anaesthetic use is clearly documented. A valid prescription should include the time and date that the drug was administered, name of drug, dose or volume, route or site of administration and a signature from the prescribing clinician. The aim of this audit was to determine whether these standards were being met.

Methods: A case note search was performed, examining all presentations to the Emergency Department during a two week period where the presenting complaint included the words 'laceration' or 'wound'. These notes were then examined in detail to determine whether a local anaesthetic agent had, or may have, been used. The level of detail and clarity in the documentation of the local anaesthetic used was then recorded.

Results: 24 cases were highlighted where a local anaesthetic was likely to have been used. In 88% of cases documentation was sub-optimal. 50% had no mention of the drug used 46% did not record a dose or volume.
465
REGIONAL ANAESTHESIA FOR INFRAUMBILICAL SURGERIES AT THE UNIVERSITY COLLEGE HOSPITAL, IBADAN, NIGERIA


Background and aims: Regional anaesthesia (RA) can be a good substitute for general anaesthesia (GA) for infraumbilical surgeries. These techniques can be employed as primary anaesthetic or combined with GA. Our aim is to document the use of regional blocks at the University College Hospital, Ibadan, Nigeria.

Methods: After obtaining approval from the institutional ethics committee, all records of patients who had regional anaesthesia for infraumbilical surgeries were retrieved from the anaesthetic register from 1st January 2010 to 31st December 2010. Information on the anaesthetic techniques employed and their outcome were obtained.

Results: A total of 585 patients had RA for infraumbilical operations during the period under review comprising 257 males and 328 females. The median age was 40 years (range 17months-90years). There were 438 conventional spinal blocks with 7 (1.6%) failed spinal anaesthesia. In 15 cases, surgical anaesthesia terminated before the end of the procedures necessitating conversion to GA or ketamine administration. Combined spinal epidural anaesthesia was employed for 67 (11.5%) patients as sole technique with the exception of one combined with GA. There were 19 unilateral spinal anaesthesia (SB), one saddle block and 9 epidural anaesthesia. Peripheral nerve block techniques employed were 3 femoral nerve blocks plus unilateral SB, 4 femoral nerve blocks with conventional SB, 1 femoral nerve block only, 5 combined femoral-popliteal block, 11 combined femoral-sciatic nerve block, 1 popliteal block only and 2 fascia iliaca compartment block plus conventional spinal block.

Conclusions: Our study shows successful use of RA techniques for infraumbilical procedures.

466
REGIONAL ANAESTHESIA: THE OPINION OF THE SURGEONS OF COIMBRA'S HOSPITAL CENTER

C. Silva, M. Filipe, R. Inácio, J. Gonçalves, E. Tavares, Portugal.

Background and aims: Regional anaesthesia has always been exciting for anesthesiologists and surgeons although for different reasons.

Patients’ preferences about anesthetic technique should be respected, so it’s important that patients can be correctly informed. Before the surgery, patients usually have several appointments with the surgeon, who is the first doctor who can clarify the patients’ doubts or even recommend a specific anesthetic technique.

The aim of this study was to know if our institution’s surgeons drive the patients’ choice of the anesthetic technique and what is their level of knowledge on regional anaesthesia.

Methods: An anonymous questionnaire was presented to general surgeons, urologists and orthopedists of our institution. From 55 delivered questionnaires, 40 returned.

Results: The majority of the participants affirm not to influence patients’ choice of the anesthetic technique. Most of them classify knowledge about regional anaesthesia as modest and consider the contact with anesthesiologists as the main source of information. In what concerns the advantages of regional anaesthesia opinions diverge, but there’s unanimity regarding disadvantages (delay in the operative room, unpredictability of success). The average has the perception that patients would benefit if their knowledge was better.

Conclusions: Lack of information about regional anaesthesia of our institution’s surgeons is accompanied by the recognition that patients would benefit if the level of knowledge was higher. As surgeons can influence patients’ decisions, information campaigns should be implemented in order to have more informed surgeons and consequently, more informed patients.
GA FOR LSCS AUDIT ERIKO MORINO, INITIAN
GANESARATNAM, MANJU AGARWAL
M. Agarwal

Background and aims: Regional commonest anaesthetic in c-sections and is safer. GA indications include; urgency (fetal) maternal refusal inadequate or failed regional Regional contraindications.

RCHOA “raising the standard 2006” >85% emergency c-section under regional >95% elective c-section under regional <1% regional to GA conversion rate for elective c-section <3% regional to GA conversion rate in emergency c-section.

Methods: Retrospective assessed GA c-section notes Specifically: Time of day Category of section Anaesthetic documentation Decision to delivery time Grade surgeon/anaesthetist Antacid prophylaxis BMI Indication GA.

Results:

Majority GA sections out of hours
Registrar led
Significant proportion obese patients
95% decision to delivery within 30 mins
Half patients not receiving documented antacid prophylaxis
Majority indications for category one fetal;
50% bradycardia, suspicious CTG accounting majority rest
75% documentation of why GA performed
Regional to GA conversion rate around 9%
RCHOA guidelines 3% for emergency section.

Conclusions:

* Why high regional to GA conversion rate?
* Technique; volume, inexperience block assessment
* Patient communication i.e language barrier
* Poor documentation regarding GA indication
* Better communication?????
  - Use of intravascular resuscitation
  - Reassessment of the need of cat-1 LSCS in theatre,
  - As there are no good data to suggest that reducing DDI below 15 min is beneficial overall.
  - Improve block assessment…..
  - Improve antacid administration and documentation…..
  - CTG training for anaesthetists??

AN AUDIT OF OBSERVATIONS IN RECOVERY FOLLOWING CESAREAN SECTION

M. Agarwal, L. Williams

Background and aims:

* CMACE Recommendations:
  * Identifying and managing very sick women
  * Use of modified early warning scores
  * Identification of recently delivered women in severe pain
  * Audit of postoperative observations recommended
* NICE Guidelines April 2004 (updated Nov 2011) Care should be same as for any post-operative patient. Women must be kept under clinical observation at all times and all measurements must be recorded. As a minimum non-invasive blood pressure, heart rate and rhythm, respiratory rate and continuous pulse oximetry every 5 minutes for the first 30 minutes in recovery.

Methods:

* Retrospective review of notes
* Notes requested from medical records covering a 3 week period
* Data collection sheet used according to NICE guidelines and hospital protocol
* Both emergency and elective c-sections reviewed and data from labour ward and main theatres compared

Results:

* 39 Notes reviewed 17/1/11-5/2/11
* 26 from Labour ward, 13 from main theatres
* 17 Emergency, 22 Elective
* None had all observations recorded
* 18 had all “essential” observations recorded
* 3 had no observations recorded
* 2/39 did not meet the discharge criteria

Conclusions:

* Poor documentation of observations overall
* Main theatres recorded “essential” observations in 100% patients
* Need to improve
* No adverse events occurred in these patients

References:

1. Anesth Analg. 1998;87:480-8;

LABOR ANALGESIA - WHAT ARE WE DOING?

A. Almeida, A. Cunha, M. Martins, L. Torres, T. Morgado, Portugal.

Background and aim: The pain and stress of labor are associated with a progressive fetal metabolic acidosis. Studies show that Apgar score are better if epidural analgesia was performed, when compared with systemic analgesia or no analgesia at all. Given the clear advantages of epidural analgesia during labor, we aim to assess the proportion of mothers of Maternidade Bisaya Barretto, who were not subjected to epidural analgesia, and why.

Methods: We performed a retrospective analysis of 1000 births in 2010. We evaluated the percentage of pregnant women whose delivery was vaginal, and of these what percentage of patients received epidural analgesia.

Results: Of the first thousand births, 186(18.6%) were performed by cesarean and 814 vaginal. Of the vaginal deliveries, 85.6% were performed with an epidural, which corresponds to 697 births, and the remaining 117 were vaginal deliveries without epidural analgesia. The reasons for not performing this analgesic technique were varied. On 27 and 66 cases, patients were admitted to the delivery room already with total dilatation or in delivery.
patient had allergy to local anesthetics and in 5 there was lack of time for placement of epidural catheter.

Discussion and Conclusions: Compared with 2000, when only 53.5% of vaginal deliveries with epidural analgesia occurred, there was a higher percentage of patients that benefited from this analgesic technique (1,2).

473   
EFFICACY AND SAFETY OF LOW DOSES OF HEAVY BUPIVACAINE IN SPINAL ANAESTHESIA USING A COMBINED SPINAL EPIDURAL (CSEA) TECHNIQUE FOR CAESAREAN SECTION

S.K. Arava1,2, R.S. Rautela, S. Chaudhary, India, UK.

Background & Aims: CSEA unlike standard spinal anaesthesia requires low doses of local anesthetic for similar sensory block (1,2). We compared efficacy of low doses (7.5 & 10mg) of 0.5% heavy bupivacaine in spinal anaesthesia using CSE technique for caesarean section.

Methods: Institutional ethical committee’s approval was obtained. 60 ASA I, II female patients scheduled for LSCS were randomised to receive 10mg (Group A) or 7.5mg (Group B) of 0.5% heavy bupivacaine intrathecally. Standard monitoring was instituted. CSEA was established in left lateral position at L3-4/2-3 space using needle through needle technique. After intratheal injection, epidural catheter was inserted secured. Surgery began when block level was >T6. If initial block was lower, 0.25% plain bupivacaine was injected epidurally to extend block to T6. Efficacy & safety was assessed in terms of sensory level (pinprick), motor block (Bromage), subjective analgesia & haemodynamic changes.

Results: Median block of T5 was achieved in both groups. 10 patients in group A had level of T4 or higher compared to 3 in group B (p<0.05). Motor block was significantly higher in group A. Subjective analgesia was good/ excellent in all patients in group A, while 2 patients in group B reported visceral discomfort needing epidural top up (p<0.05).

Conclusions: Low doses of intrathecal heavy bupivacaine (7.5 & 10mg) for caesarean section using CSEA technique are safe & efficacious.

References:


474   
PROSPECTIVE AUDIT OF INTRATECHAL MORPHINE FOR CAESERIAN SECTION AS POSTOPERATIVE ANALGESIA

A.K. Bangalore Puttappa, M. Meela, O. Roesag, K. McKeating, Ireland.

Background: Audit done between Feb -May 2011 to assess the Duration of postoperative analgesia, Incidence of Pruritus, Duration and Treatment, Incidence of postoperative nausea and Vomiting and Patient Satisfaction.

Methods: Total 102 Patients audited. ASA I & 2 with no contraindication to regional anaesthesia, Morphine preservative free 0.2 mg, Bupivacaine Heavy 12mg intrathecally, Paracetamol 1gm hourly, Diclofenac 100mg PR 16hourly as regular postop analgesia. Procloprexazine 12.5 mg IM PRN, Ondanseron 4mg PO PRN, Cetirizine 10mg 24hourly PRN.

Results: 102 patients audited. 42 had emergency and 60 had elective Caeserian section. 89% of patients reviewed at 24 hours or more. 98 patients didn’t required any additional opioids intraproactively and 94 patients did not required in recovery room. Regarding Pruritus 22 patients experienced none, 36 patients mild, which resolved on its own, 44 patients required treatment among those 32 responded to treatment. 79 patients showed itching within 4 hours. Duration of pruritus was up to 12 hours in 52 patients. 48 patients experienced itching most commonly on face. 72 Patients didn’t experience any PONV/16 felt nausea, 14 had vomited. 87 patients did not required/ additional opioids in the ward. With regard to pain 94 patients had no pain at rest and mild on movement. 56 patients are satisfied and 42 patients are very satisfied with present pain management.

Conclusions: Addition of intrathecal morphine provides. Good Post-operative analgesia for up to 24 hours, patient satisfaction is very good, 75% patients experienced pruritus and fairly respond to treatment, Approximately 25% patients experienced PONV.

475   
EFFICACY AND SAFETY OF AMBULATORY LABOUR ANALGESIA (ALA) USING EPIDURAL ANALGESIA (EA): OUR EXPERIENCE FROM DEVELOPING COUNTRY

P. Bhakta, S.R. Petakar, P. Agarwad, Oman, India.

Background and aims: This study was designed to assess the safety, efficacy and acceptability of EA and evaluated the effect on ambulation, progress of labor and neonatal outcome.

Methods: After obtaining ethical committee clearance, 30 uncomplicated parturients were enrolled for ALA. EA was inserted at L2-L4 lumbar vertebral spaces. After confirmation, incremental bolus of bupivacaine (0.125%) plus fentanyl (2 μg/ml) was injected. Onset of analgesia and evidence of motor block were noted. 8-10 ml of same mixture was administered on demand. Pain and motor blockade were assessed with visual analogue scale (VAS) and modified Bromage scale respectively. Appar scoring was done at 1, 5 and 10 min after delivery. Patients were interviewed after 24 hours regarding their experience. Complications whatsoever were also noted.

Results: 97% parturients experienced excellent to good pain relief without any incidence of motor blockade. Onset of analgesia was 6-12 and 4-8 min in primigravidae and multigravidae respectively. Duration of labour lasted for 212-357 min in primigravidae and 156-260 min in multigravidae. 76.66% patients delivered spontaneously, 16.66% required instrumental delivery and remaining 6.66% underwent CS which is at par with reported incidences. Appar score of 8-9 at 1 min in 93.3% and 9-10 at 5min in 100% neonates were noted. Complications like bladder distension (36.66%), pruritus (20%) and patchy blocks (10%) were noted.

Conclusions: EA is an effective technique resulting in effective pain relief without undue motor block, prolongation of labor or increased incidence operative deliveries.

476   
ANALGESIA AFTER EMERGENCY CAESAREAN SECTION UNDER EPIDURAL ANAESTHESIA IS NOT IMPROVED BY BILATERAL ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCKS

L. Bhatia1,2, R. Rajendram, S. Gopinath

Background and aims: Bilateral transversus abdominis plane (TAP) blocks improve postoperative analgesia after Caesarean section (CS) under spinal anaesthesia with bupivacaine and fentanyl [1]. At PAH emergency CS is routinely performed under epidural anaesthesia. At the discretion of the attending anaesthetist US-guided TAP blocks may be performed for post-operative analgesia. However, the efficacy of this practice has not been reported. A prospective audit of analgesia after emergency CS at PAH addressed this issue.

Methods: 29 ASA 1&2 women had category 2 CS under epidural anaesthesia with levobupivacaine (20 ml 0.5%) and fentanyl (25 μg). Diamorphine (2.5mg in 15ml 0.9% saline) was administered via the epidural at the end of the operation and for post-operative analgesia paracetamol and diclofenac were prescribed regularly with oramorph as required. 13 also received bilateral US-guided TAP blocks (20ml 0.375% levobupivacaine each). Patients were asked to rate sleep quality and satisfaction with analgesia (good, fair or poor). Morphine use in the first 24 hours postpartum was obtained from the drug chart. The t-test was used to analyse parametric data and Fisher’s exact test was used for non-parametric data.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>ASA 1</th>
<th>ASA 2</th>
<th>Morphine use (ml; mean ± SD)</th>
<th>Sleep Quality</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAP block</td>
<td>13</td>
<td>4</td>
<td>9</td>
<td>7.7 ± 9.3</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>No TAP block</td>
<td>16</td>
<td>5</td>
<td>11</td>
<td>9.4 ± 10</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Significance</td>
<td>ns</td>
<td>ns</td>
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</tr>
</tbody>
</table>

Table 1. Results

1. There were no reports of poor sleep quality or satisfaction.

Discussion: US-guided TAP blocks do not improve analgesia after CS under epidural anaesthesia with levobupivacaine, fentanyl and diamorphine. This may be because the duration of action of this combination of drugs is longer than that of TAP blocks.
477 KNOWLEDGE OF LOCAL ANAESTHETIC TOXICITY AND THE USE OF INTRALIPID®: A SURVEY OF MIDWIVES

R. Bruce-Payne, R.-L. Smith, S. Younie, G. Foxall

Background and aims: Epidural infusions of local anaesthetic (LA) solutions are used in Labour Ward. Drug administration errors are possible and may prove fatal [1]. Lipid emulsion (Intralipid®) has been incorporated into the Anaesthetists of Great Britain and Ireland guidelines for the management of refractory cardiac arrest following local anaesthetic toxicity [2]. Our aim was to assess knowledge amongst midwives regarding LA toxicity and intralipid®, providing further education if necessary.

Methods: Forty nine questionnaires were completed (55% of midwives). Following the survey, emails detailing the use and location of Intralipid® were distributed. Information was reinforced at multidisciplinary Training Days and by a poster displayed in the ward. A repeat survey was performed to assess the impact of teaching.

Results: Knowledge of Intralipid® and LA toxicity was gained primarily from Training Days (56%).

Conclusions: Recognition of LA toxicity, the use of Intralipid®, and LA toxicity with intralipid® providing further education if necessary.

References:

478 POSTPARTUM ANALGESIA - WHAT CAN WE DO?


Background and aims: Compare the use of epidural morphine with minor analgesia following vaginal delivery, according to the degree of satisfaction, side effects, analgesia and rescue analgesia.

Methods: Prospective study of 49 pregnant women undergoing vaginal delivery. After obtaining informed consent, all made the same epidural analgesic protocol. After delivery, a group of 30 puerperas received protocol A: 2mg of epidural morphine, 2 and 12 hours postpartum. Rescue analgesia was made with oral acetaminophen. The other group of 19 puerperas was counselled about the possibility of massive hemorrhage and blood transfusion, likelihood of hysterectomy and other surgical interventions including cystectomy and bowel resection and the need for preoperative internal iliac artery balloon occlusion catheter placement. She was assessed by anesthesiologists and the planned anesthesia technique was explained to her (Epidural catheter placement followed by general anesthesia) and the possible need for postoperative ICU admission where further resuscitative and ventilatory management can be done.

No significant statistical differences were found in the rescue analgesia and adverse effects. There was a lower mean of VAS in protocol B (2.7±1.3, p< 0.05).

Conclusions: Protocol A was associated with a lower mean of VAS. The sample was not statistically similar in relation to the type of delivery and this is a bias in the study.

References:
1. Anesth Analg 2010;110:159:64
Conclusions: Our assessment of less cognitive function in the first 24 hours postoperatively in patients undergoing surgery with narcosis supports a strategy of avoiding general anesthesia during caesarean section when possible.

481
PERIPARTUM ANALGESIA IN GRAND-GRAND MULTIPAROUS (≥10 BIRTHS) AND SIMILAR-AGED WOMEN WITH LESSER PARITY: PROSPECTIVE STUDY


Background: There have been no prospective studies of use of epidural analgesia/anesthesia for labor/delivery in grand-grand multiparous (GGMP) women relative to older women with lower parity. The aim of this study was to compare outcome related to analgesia for labor/delivery in GGMP to that in similar-aged women with lesser parity.

Methods: This was a prospective observational study of older gravid women. All laboring women in a 6-month period admitted to a tertiary Israeli center were included in this study if they were older than 36 years old and had had 1-2 previous births (Low Parity; n=126) or 4-5 previous births (Medium Parity; n=181), and all women with ≥10 births (any age; n=187).

Results: There were no significant differences in requests for or use of epidural analgesia (46.5%-59.4%) across parity groups. Percent of women receiving general (6%-9%), spinal (85%-80%), or epidural (2.5%-8%) anesthesia for cesarean sections and conversion rates from regional to general anesthesia (0-3%) across parity groups were comparable. Time from admission to epidural administration (range mean times: 168-187 minutes) and from advent of epidural to delivery (range mean times: 155-160 minutes) were comparable across parity groups. Induction rates (1.1%-5.5%) and caesarean section rates (5.8%-8%) were not significantly different.

Conclusions: Epidural use and other anesthesia for labor/delivery were comparable in older gravid women and not correlated with parity. Adverse events in all groups were low, probably because of good antenatal care.

482
AN AUDIT CYCLE OF RESPONSE TIMES FOR LABOUR EPIDURAL ANALGESIA

S. Jagannathan, E. McDonald

Background and aims: AAGBI/OAA guidelines state that, "The time from the anaesthetist being informed about an epidural until they are able to attend the mother should not normally exceed 30 minutes, and must be within one hour except in exceptional circumstances." Our first audit in May 2009 showed that an anaesthetist attended within 30 minutes and one hour in 72% and 87% of cases respectively. The aim of this re-audit was to see whether there was any improvement in the labour epidural analgesia service at our institution.

Methods: Our audit was conducted over a 6 week period starting in May 2011. Data collection included times that the patient requested an epidural, anaesthetist was called, anaesthetist attended and the first epidural dose was given and the reason for significant delay if any.

Results: We collected data on 83 patients of which 59 patients were outside normal working hours. The anaesthetist attended within 30 minutes and 1 hour in 67% (56/83) and 77% (64/83) of patients respectively in hours and in 58% (34/59) and 68% (40/59) of patients respectively out of hours. The commonest cause of significant delay was the on call anaesthetist being busy in theatre.

Conclusions: This audit showed that we are not meeting the OAA/AAGBI guidelines. The results are worse than the May 2009 audit which reflects the increase in obstetric workload at our hospital and provide supporting evidence for the provision of a second anaesthetist outside normal working hours.

483
THE EFFECT OF TYPE OF ANESTHESIA ON INTRA- AND POSTOPERATIVE BLOOD LOSS AT CESAREAN SECTION


Conclusions: Spinal anesthesia may reduce intraoperative bleeding compared with general anesthesia at c-section. To determine whether spinal anesthesia reduces postpartum bleeding, we reviewed retrospectively the changing rate (DR) of hemoglobin, estimated blood loss (EBL) of parturients undergoing cesarean section.

Methods: We compared with 153 patients received spinal anesthesia (Group S) and 135 patients received general anesthesia (Group G). We reviewed preoperative hemoglobin, 1st postoperative day Hb and 3rd postoperative day Hb(Hbpre, Hb1st, Hb3rd). We calculated EBL, DR. EBL = maternal blood volume (MBV) × ln(Hbpost-Hbpre)/MBV=(0.75 × (height*(inch)+50) + (weight*(pound)/25))/1000*(L).

Results: DR of Hbpre-Hb1st in Group S was significantly lower than Group G. There was no significantly differences DR of Hb3rd-Hbpre.

Conclusions: There were no significant differences in requests for or use of epidural analgesia during caesarean section but not reduce peripartum bleeding compared with general anesthesia.

484
EFFECT OF OPIOID ADDED TO HYPERBARIC MARCAINE ON POSTOPERATIVE ANALGESIA DURATION IN WOMEN UNDERGOING ELECTIVE CESAREAN SECTION: A PROSPECTIVE RANDOMIZED DOUBLE-BLIND STUDY

J.-L. Majcher, M. Wilwerth, N. Lenoir, P. Van der Linden, Belgium.

Background and aims: This study compares sufentanil 2.5 µg and 5 µg to fentanyl 25 µg when added to 10 mg hyperbaric 0.5% bupivacaine for spinal anesthesia in elective cesarean section.

Methods: 162 full-term parturients who gave written informed consent included in this prospective randomized double-blind study. Patients were randomized according to the opioid added to bupivacaine: group 1: 25 µg Fentanyl; group 2: Sufentanil 2.5 µg and group 3: Sufentanil 5 µg. Duration of analgesia was defined as the time from spinal injection to the first morphine (M+) requirement (PCA pump). Doses of morphine received during the 4 hours following the first M+ demand and during the first 24 hours following the spinal injection were recorded. Statistical analysis included non parametric tests and X2. A p < 0.05 was considered significant.

Data are presented as median [interquartiles] or percentages.

Results:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Spinal group (n=144)</th>
<th>General group (n=126)</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR Hbpre-Hb1st (%)</td>
<td>9.9 ± 8.8</td>
<td>15.0 ± 9.4</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>DR Hbpre-Hb3rd (%)</td>
<td>19.4 ± 10.0</td>
<td>21.4 ± 10.4</td>
<td>NS</td>
</tr>
<tr>
<td>DR Hbpre-Hb5th (%)</td>
<td>10.5 ± 7.7</td>
<td>9.0 ± 7.7</td>
<td>NS</td>
</tr>
<tr>
<td>EBL using Hbpre-Hb1st (mL)</td>
<td>570 ± 520</td>
<td>790 ± 570</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>EBL using Hbpre-Hb3rd (mL)</td>
<td>1160 ± 710</td>
<td>1230 ± 650</td>
<td>NS</td>
</tr>
</tbody>
</table>

Conclusions: Neither EBL nor analgesia duration differed significantly among the three groups.
these 2 dosages were also associated with a higher incidence of postoperative pruritus. Sufentanil 5 μg did not appear to offer significant benefit over Sufentanil 2.5 μg.

485 INFANT DOSE AND EXPOSURE TO PARECOXIB AND ITS PRIMARY ACTIVE METABOLITE VALDECOXIB VIA TRANSITIONAL BREASTMILK FOLLOWING A SINGLE DOSE OF INTRAVENOUS PARECOXIB AFTER CESAREAN DELIVERY

M. Paech1,2, K. Ilett, S. O’Halloran3,4, N. Muchatuta, Australia, UK. 

**Background and aims:** Non-opioid analgesics are frequently used for multimodal analgesia post cesarean delivery, a period during which the breastfed infant receives transitional breast milk. This study was designed to estimate infant dose and exposure to parecoxib and its primary active metabolite valdecoxib (cyclooxygenase-2 inhibitors) following single dose intravenous administration after cesarean delivery.

**Methods:** 40 and their infants participated in the study. Parecoxib (40 mg) was administered intravenously at a mean of 41 hours after birth. Maternal milk (4 samples) and plasma (1 sample) were collected over 24 hours and drug content was measured by liquid chromatography-tandem mass spectrometry. The infants were assessed clinically at birth and the day after parecoxib dosing. Absolute and relative infant doses through milk were estimated by standard methods.

**Results:** Milk to plasma ratios (mean and 95% CI) for parecoxib 0.53 (0.3-1.28) for parecoxib and 0.14 (0.11-18) for valdecoxib. Absolute infant dose was 1.8 (1.3-2.4) μg kg^{-1}·day^{-1} for parecoxib, and 1.8 (1.3-2.4) μg kg^{-1}·day^{-1} for valdecoxib. Relative infant dose was 0.4 (0.3-0.5)% of the weight-adjusted maternal dose for parecoxib and 1.8 (1.5-2)% for valdecoxib (as parecoxib equivalents). Neonatal neurologic and adaptive capacity scores were normal.

**Conclusions:** The relative infant dose of parecoxib and valdecoxib (2.2% for both drugs combined) was well below the recommended safe level of 10% exposure, and therefore unlikely to cause adverse effects in breastfed infants. We conclude that a single 40 mg intravenous dose of the cyclooxygenase-2 inhibitor parecoxib is suitable for administration to lactating women after cesarean delivery.

486 AUDIT OF THE MONITORING FOR HYPOTENSION AFTER COMMENCEMENT OF LABOUR EPIDURAL ANALGESIA

U. Paralkar, S. Vamadevan, G. O'Sullivan

**Background & Aims:** Hypotension in a parturient resulting from epidural induction of anaesthesia is a complication which can occur at any time of labour. The aim of this study was to audit the adequacy of blood pressure (BP) monitoring documentation.

**Methods:** Post-cesarean section (CS) patients from our tertiary referral centre were included in the audit. BP monitoring documentation was prospectively collected over 2 months. 1) Parturient positioned on her side 2) Monitoring BP 3) BP recorded mins after drug administration. In our tertiary referral centre we introduced BP monitoring labels, placed in patients notes. We recommended 1. Anaesthetist inserting the epidural should make the initial documentation of level of the block; and the first BP recorded 5 mins after drug administration. 2. Thereafter the midwife would record the level of the block and BP at 10, 15, 30, 60 & 120 min. Having introduced & done the initial training, we wanted to access the adherence of the staff to appropriate documentations.

**Results:** 36 epidurals placed for labour analgesia were examined over the 2 months. 83% of the cases were performed by the senior residents, while 6 were performed by the junior residents. 53% of cases done by the senior trainees had BP labels placed in the patient notes. None of the junior trainees placed the labels in the notes. Only 44% of the cases had the initial anaesthetic assessment done & documented. And only 39% of the cases had any BP documented.

**Conclusion(s):**
1. Our findings suggest that the importance of recognising the complications of epidural induced hypotension comes from experience.
2. Appropriate & adequate training of anaesthetist & midwives necessary
3. Departmental protocols.

487 OPTIMISING CELL SALVAGE USE IN OBSTETRIC PATIENTS

N. Parry, C. Jones

**Background and aims:** Our aim was to identify risk factors of post-partum haemorrhage (PPH) in a cohort of obstetric patients in a District General Hospital in the UK. We intended to improve identification of patients at risk of PPH in order to promote use of intra-operative cell salvage.

**Methods:** Case notes of all patients requiring blood transfusion over a twelve month period (Nov 2009 - Oct 2010) were reviewed. Details of blood loss and subsequent transfusion were collected along with risk factors for bleeding on a standardised data collection sheet.

**Results:** In total, 77 patients were transfused 197 units of blood. Interestingly, retained placenta/delayed third stage was associated with a significant increase in blood loss. Over the twelve month period, 10.47% of patients needing manual removal of placenta in theatre required blood transfusion. In addition, low antenatal haemoglobin was identified as a significant determinant of post-partum requirement for transfusion. Other features associated with increased bleeding included emergency Cesarean section, general anaesthesia and multiparity. In particular, the presence of multiple risk factors was associated with increased need for blood transfusion post-partum.

**Conclusions:** Identification of risk factors of post-partum bleeding could enable increased utilisation of intra-operative cell salvage (ICS), now an accepted technique in Obstetric practice. We have established a number of factors that predispose to blood loss requiring transfusion. We intend to utilise this data to promote use of ICS in Obstetric practice.

488 THE RELATION BETWEEN URGENCY OF CAESAREAN SECTION AND THE TYPE AND TIMING OF ANAESTHESIA

K. Rimaitis, V. Baluiulene, M. Rimaitis, A. Macas, Lithuania.

**Background and aims:** Regional anaesthesia (RA) is preferred in obstetrics as it is safer alternative to general anaesthesia (GA), for urgent caesarean section (CS) in particular. However, in CS category-1 setting GA is traditionally used expecting shorter induction time. Our primary objective was to examine timing differences between GA and SA in different CS urgency categories.

**Methods:** After approval of institutional Ethics Committee a prospective analysis of CSs in the Department of Obstetrics of a teaching hospital during February-August of 2010 was performed. We compared CSs distribution according to urgency and method of anaesthesia in respect to mean induction time of different types of anaesthesia as well as the duration of operating theatre admission-to-delivery and decision-to-delivery intervals. GA and SA were compared.

**Results:** 303 CSs were carried out during study period. Mean induction time of GA in category-1 was 7.44 ± 3.8 min as compared with 11.27 ± 3.1 min of SA. And this time interval was significantly shorter (p = 0.02) in GA induction, whereas in categories-2, 3 and 4 there was no such difference (p = 0.08, p = 0.77, p = 0.53 respectively). There were no significant differences between mean operating theatre admission-to-delivery nor mean decision-to-delivery intervals for general and spinal anaesthesia in all CS categories.

**Conclusions:** The only significant timing difference between GA and SA is detectable in category-1 CS regarding the time of anaesthesia induction. We conclude that SA does not affect neonatal delivery time even in urgent cases.

489 COMPARISON OF VARIOUS LEVOBUPIVACAINE DOSES DURING COMBINED SPINAL-EPIDURAL ANAESTHESIA FOR CESAREAN SECTION

P. Pehlivanoglu, S. Sahin, H. Gulhec, H. Szak, F. Pehlivanoglu, Turkey.
Background and aims: Levobupivacaine is used widely in cesarean section. Hypotension is a life threatening complication in pregnant and required drug dose management during regional anesthesia. We aimed to compare the efficiency of levobupivacaine in various doses for cesarean.

Methods: 45 patients, undergoing elective cesarean section, were divided into three groups. Combined spinal-epidural catheterization was performed at lumbar intervertebral space. Group 1, 2, 3 received intrathecal 10 mg levobupivacaine, 7.5 mg levobupivacaine with 25 mcg fentanyl, and 5 mg levobupivacaine with 50 mcg fentanyl respectively. Epidural catheterization for postoperative pain control was performed. Hemodynamic parameters, level of sensory block, Bromage scores and adverse effects were recorded before and after intrathecal injection, and throughout operation.

Results: No significant difference was observed with respect to Bromage scores, two segment regression time, time of reaching to T4 level, time between surgical incision and intrathecal injection, satisfaction of surgeon and adverse effects. Two patients in Group3 received general anesthesia because of inadequate muscle relaxation. Time between incision and delivery was significantly longer in Group3. Frequency of backache was higher in Group1. In the fifth minute of intrathecal injection hypotension and bradycardia were higher in Group 2, 3 and elederine consumption was higher in Group 2 (p=0.05).

Conclusions: Intrathecal levobupivacaine with fentanyl decreased frequency of backache. Usage of 7.5 mg levobupivacaine and 25 mcg fentanyl for cesarean resulted in similar hemodynamic findings with 10 mg levobupivacaine. Therefore 7.5 mg levobupivacaine with 25 mcg fentanyl could be used with safety for cesarean.

490 IS A RELATIVELY HIGH PRE-SPINAL HEART RATE ASSOCIATED WITH REDUCED EFFICACY OF PROPHYLACTIC VASOPRESSOR DURING SPINAL ANAESTHESIA FOR CAESAREAN SECTION?
L. Schofield

Background and aims: A relatively high baseline heart rate may be associated with lower SAP during spinal anaesthesia for caesarean section [1]. Prophylactic vasopressor was not used in that study. We have re-examined data from a previous study [2] to assess whether there is an association between pre-spinal heart rate and the lowest SAP recorded during spinal anaesthesia for caesarean section when prophylactic vasopressor is given.

Methods: 147 ASA I and II women undergoing elective caesarean section under spinal anaesthesia received prophylactic infusions of ephedrine 3 mg/ml (group E), phenylephrine 100 μg/ml (group P), or ephedrine 1.5 mg/ml combined with phenylephrine 50 μg/ml (group EP) titrated to maintain SAP at baseline. SAP and heart rate were recorded on the antenatal ward on the day of surgery (baseline), on arrival in the anaesthetic room (AR) and every minute following spinal anaesthetic until delivery.

Results: Baseline and AR heart rate were both negatively associated with the lowest SAP as a proportion of baseline during anaesthesia. The association being stronger for AR heart rate; R = -0.26, r² = 0.07 (P = 0.005) and R = -0.40, r² = 0.16 (P < 0.0001) respectively. The association between AR heart rate and the lowest SAP as a proportion of baseline was not seen in group P. We have, therefore, compared groups E and P, sub-divided by AR heart rate ≥ or < the median value of 91 beats/min (rpm) (Table 1).

Conclusions: When prophylactic vasopressor is given, a relatively high pre-spinal heart rate in the anaesthetic room appears to be associated with a clinically significant reduction in the efficacy of prophylactic ephedrine, but not phenylephrine.

491 SUBARACHNOID MORPHINE IN POST-CAESAREAN SECTION ANALGESIA. A RETROSPECTIVE STUDY

Introduction: Actually, the use of Spinal anesthesia for caesarean section is the technique of choice. Spite of being fast, effective, and of easy learning, quality of postoperative analgesia remains its largely limiting factor. The addition of morphine has been studied by various authors as a useful tool for postoperative pain.

Methods: We reviewed a total of 199 stories to determine the necessity of analgesia in the immediate postoperative period, determined by the demand of analgesia requested by the patient and his administration during their stay on the recovery room. We compared two groups of patients; in which spinal anesthesia was made using low doses of local anesthetic (6.25-7.5 mg of 8% hyperbaric bupivacaine) mixed with fentanyl 25 μg with or without morphine 100 μg. The incidence of postoperative nausea and vomiting (NVPO) was also assessed.

Results: From the total of patients, 61% (121) received spinal anesthesia with morphine and 39% (78) did not. There were statistically significant differences (p < 0.0001) regarding the use or not of intravenous analgesia during their stay in the recovery room. There was a statistically difference (p < 0.0001) in the use of dexamethasone for NVPO, 72.9% of patients received (n = 145) and the 100% not presented NVPO, unlike the other 27.1%, who did not receive it, registering NVPO in 9.4%.

Conclusions: mixtures of low doses of hyperbaric local anesthetics, with morphine 100 μg and fentanyl 25 μg, are effective to provide an excellent surgical analgesia and an effective postoperative analgesia.

492 USE OF ULTRASOUND FOR OBSTETRIC REGIONAL ANAESTHESIA: WHAT ARE WE DOING?
K. Bervel, R. Pandey, S. Sebastian, E. Hart

Background and aims: Central neuraxial anaesthesia is common in obstetrics and use of ultrasound (US) is gaining popularity. Research has shown a higher success rate (1) and superior quality regional anaesthesia with US use (2). NICE guidelines stress the importance of training when using US (3). Our aim was to evaluate the training opportunities available in a large teaching hospital.

Methods: Retrospective data was collected from our database between the period Jan ‘09 to May ‘11. Total number of procedures, elective/emergency use, indications and grades of anaesthetists was recorded.

Results: 14121 regional blocks were performed. US was used in 335 (2.3%) cases and performed by: Consultant 23% Consultant 30% Consultant and trainee 47% Indications for US use were obesity (71%) spinal deformity (7.4%), previous difficulty (4.4%), failed attempt (4.4%) and teaching (12.8%). Only 1.5% of all regional block cases were used for training in the use of US.

Conclusions: There is a huge potential to increase the use of ultrasound during routine cases and a structured approach is needed to maximize training opportunities. We aim to conduct a survey to elicit trainees views and evaluate the best way to introduce formal training.

References:
3. Ultrasound guided catheterization of the epidural space. Interventional procedure guidance 249. NICE, Jan 2008

493 AUDIT OF REGIONAL ANAESTHESIA PRACTICE FOR OBSTETRICS IN A UK UNIVERSITY HOSPITAL
S. Sebastian, A. Jacob, D. Malik, R. Leighton

Background and aims: Regional Anaesthesia (RA) has been shown to be safer than general anaesthesia in obstetric practice. UK national audit standards recommend a RA rate of 95% for elective and >85% for emergency caesarean sections (CS). Leicester Royal Infirmary (LRI) is a UK tertiary care centre with over 6000 deliveries per annum. We compared our results with national standards.

Methods: We retrospectively analysed electronic database to retrieve details of all the women who had CS in the year 2009 and the details were tabulated using a computer spreadsheet.

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Results: LRI had 1441 CS cases in 2009 (23.3% of all CS) with RA rate of 97.9% for elective and 88.5% for emergencies. Our obstetric epidural rate was 29.6%, the RA to GA conversion rates for CS were 3.6% and 1.9% for emergency and elective cases respectively. The common causes of RA to GA conversion for elective cases were intraoperative pain and inadequate block while they were maternal complications and prolonged surgery for elective cases.

Conclusions: Our RA rate for elective and emergency CS were better than national standards for the year 2009. Our RA to GA conversion rates during this period were slightly above national standards, but we think it was because many of our complicated cases were done under RA and also because of a prevailing high RA rate.

494
A RETROSPECTIVE AUDIT OF CONVERSION OF REGIONAL TO GENERAL ANAESTHESIA DURING CAESAREAN SECTIONS
P. Tamilselvan, M. Michail, K. Akyaempong-Aye, S. Venkatesh

Background and aims: Maternal deaths during anaesthesia have been largely attributed to the complications of general anaesthesia. The Royal College of Anaesthetists (RCoA) recommend a conversion rate of < 1% and < 3% for elective and emergency lower segment caesarean sections (LSCS) respectively. We decided to conduct a retrospective audit to find out how our labour ward performed against this RCoA recommendation.

Methods: A retrospective audit was conducted in our labour ward from January 2005 to December 2010. The following data was collected: number of caesarean done under regional (spinals, combined spinal epidurals (CSE), labour epidurals); numbers converted to general anaesthesia and the reasons for conversion very analysed.

Results: Over the audit period, 1818 electives (spinal 92% CSE 8%) and 2930 emergency (spinal 61% CSE 3% epidural top-up 36%) sections were done with a regional as the initial anaesthetic technique. Our conversion rate was 0.7% for electives and 4.9% for emergency caesarean sections. Pain discomfort was the commonest reason for conversion to general for both electives and emergencies.

Conclusions: Our results showed that our unit performed well with regards to conversion during the elective LSCS. But during, emergency LSCS, conversion rates were higher than recommended. This can be explained by other factors beyond the control of the anaesthetist such as surgical and foetal emergencies where time constraint make conversion rate higher.

Reference:

495
AUDIT OF FAILURE RATE OF EXTENDING LABOR EPIDURAL ANALGESIA INTO EPIDURAL ANAESTHESIA FOR CESAREAN SECTION AND INSTRUMENTAL DELIVERY
M. Tham, S. Hanna-Jumma

Background and aims: There is a wide variation in the reported failure rate of labour epidural analgesia extension into epidural anaesthesia for emergency caesarean section (1.7%-24%). This could be related to fundamental differences in the design and methodology of different studies. In this audit we aim to find the incidence of this complication in a typical UK district general hospital with an average of 5000-6000 deliveries/year.

Methods: An electronic database (InfoFlex) was introduced in our labour ward in 2007. This database was reviewed for the period between (April-2007 and April-2011). The unit practice is to use premixed infusion of 0.1% Bupivacaine with 4mcg/ml Fentanyl as PCEA bolus only. Conversion into epidural anaesthesia was attempted using 10ml of 0.5% Bupivacaine mixed with 10ml of 2% Lidocaine.

Results: During the study period (17914) prturient gave birth. Of these (3040/17914, 17%) had epidural for labour. Epidural anaesthesia for caesarean section or instrumental delivery was needed in (1218/3040, 40%). Epidural top-up failed to offer anaesthesia in (206/1218, 17%). Anaesthesia was achieved using spinal in (120,10%) and general anaesthesia in (86,7%).

Conclusions: Failure rate for augmentation of labour epidural into epidural anaesthesia for caesarean section was (17%). Only (7%) of these patients required general anaesthesia while the other (10%) had spinal.

References:
The most common complication was nausea/vomiting. The 300 caudal blocks were performed as a routine post-operative 9 Slovak Republic, UK.

Caudal block under general anesthesia is a safe alternative 2 USA.

Regional Anesthesia and Pain Medicine 7% 4%

We wished to data were obtained from 130 infants and 170 children. Median age was 1.6 (0.3- 4) year and median body weight was 11 (5-15.5) kg. Caudal block was successful in 96.6% of cases without any adverse event. Failure age was 1.6 (0.3- 4) year and median body weight was 11 (5-15.5) kg. Caudal block was successful in 96.6% of cases without any adverse event. Failure rate was similar in both infants and children.

Conclusions: The most common complication was nausea/vomiting. The treatment of acute pain with opioids in the postoperative period in our hospital has proved to be safe because there was no serious complication with sequelae. However, given the number of less serious complications, efforts should be undertaken to reduce their frequency.

Reference:
1. Pediatric Anesthesia 2010;20:119-125

498 A REVIEW OF CAUDAL ANESTHESIA IN INFANTS AND CHILDREN AT BAHRAMI CHILDREN’S HOSPITAL

M.E. Darabi, S. Nafisi, M. Azarshahin, M. Mireskandari, Iran.

Background and aims: Caudal anesthesia as a common analgesic technique for children undergoing lower abdominal surgery is performed in conjunction with general anesthesia.

Methods: 300 Caudal blocks were performed as a routine post-operative analgesic method in lateral position with marcaine 0.8-1.1 ml/kg (0.25 %) + epinephrine 5 microgram/ml soon after induction of general anesthesia.

Results: Data were obtained from 130 infants and 170 children. Median age was 1.6 (0.3- 4) year and median body weight was 11 (5-15.5) kg. Caudal block was successful in 96.6% of cases without any adverse event. Failure rate was similar in both infants and children.

Conclusions: Caudal block under general anesthesia is a safe alternative for post-operative pain management, specially in infants born before 60 weeks of post-conceptual age with significant risk of apnea. Bahrami Children's Hospital is a university hospital with residents involvement in procedures.

499 COMPARISON OF PAEDIATRIC MICROCUFF ENDOTRACHEAL TUBES IN ROUTINE CASES AT A TERTIARY CHILDREN'S HOSPITAL

A. Elayaperumal, M. Foulad, E. Wilson-Smith

Background and aims: It is essential to minimise laryngotracheal trauma during endotracheal intubation. The traditional teaching is that uncuffed tubes should be used in children less than 8 years of age. A recent study showed that Microcuff tubes could be safely used in infants and children.1 We wished to compare these findings with our own experience in routine clinical use.

Methods: Departmental funding was secured for size 3.0 to 5.5 Microcuff tubes and cuff manometers. Data collected from anaesthetist over a period before and after introduction of cuffed tubes. Data collected included ease of passage, tube exchanges, cuff pressure on seal and post-extubation airway complications.

Results: Conclusions: Microcuff tubes are associated with a significant reduction in both endotracheal tube exchange rate and throat pack use, with no increase in airway complications. Avoiding throat pack use has the added advantage of removing a potential source of significant complications as highlighted by the NHS National Patient Safety Agency.2

References:
2. Reducing the risk of retained throat packs after surgery. NPSA Safer Practice Notice. NPSA/2009/SNP001

500 SUPERFICIAL CERVICAL BLOCK FOR LYMPHATIC NODES EXCISION IN CHILDREN WITH MEDIASTINAL MASSES

P. Kenderessy1,2,3, Slovak Republic, UK.

Mediastinal masses consist of a heterogenous group of benign and malignant tumour types. Accurate histological diagnosis is important for appropriate and effective treatment. Tumours in the anterior and superior mediastinal compartments are most likely to cause anaesthetic complications due to their anatomical proximity to the heart and airway. Children with anterior mediastinal masses may experience severe problems during general anaesthesia, usually as a consequence of extrinsic compression of the airway, obstruction to venous return or obstruction to the output of the heart. Alternative techniques to general anaesthesia (GA) in high-risk cases are preferred. Where GA is considered unavoidable specific techniques are deployed, including keeping spontaneous ventilation and local anaesthesia.

We present 4 cases of lymph nodes excision under sedation with ultrasound navigated (USG) superficial cervical block. Levobupivacain (3-7 ml of 0.5 %) was injected under USG control using standard in line technique. Children age 5-17 years were sedated by continuous infusion of propofol and remifentanil in the operating theatre and using ECG, non-invasive blood pressure and pulse oximetry. Sedation was titrated individually to "cooperative "state (child was arousable and playing and chatting; the smallest child (age 5) was sedated and airway maintained by LMA due her obesity). All blocks were successfully placed and cervical lymphatic nodes extracted for diagnosis and procedures including: pleural puncture, bone marrow aspiration. Remifentanil infusion was stopped after cervical block placement

In conclusion, lymphatic node excision can be performed safely and effectively using superficial cervical plexus block when performed by experienced anesthesiologists.

References:
1. BONE FRACTURES PRESENTING TO PEDIATRIC EMERGENCY DEPARTMENT

M. Madholok, M. Liu, USA.

Background and aims: Acute long bone fracture(LBF) is common complaint for pediatric ED patients in moderate to severe pain. Previous studies show lack of timely elimination of fracture pain. Our purpose was to find time to pain medication for LBF in children seen at children's hospital ED and identify any factors that contribute to variation in time.

Methods: A retrospective chart review of patients with LBF seen in the ED from 1/1/08 to 12/31/10. Time to pain medication was calculated from arrival to ED and to administration of medication. For each patient encounter, multiple data fields were collected including demographic, social and economic indicators. Non-parametric Mann-Whitney Test was used to compare
502 AUDIT OF ANALGESIA FOLLOWING DENTAL EXTRACTIONS IN CHILDREN
S. Muthukrishnan, G. Jonker, V. Fletcher, S. Hivey

Background and aims: Poorly managed pain in children during dental extractions can cause anxiety and postponement of further treatment. Not many studies in literature have looked in to pain following extractions of third molar or ‘sixes’ in children. We looked in to data collected for a post-operative pain audit and compared the pain following third molars extractions with other deciduous teeth extractions in children.

Methods: 101 consecutive patients of ASA physical status 1-2, aged 3-12 years, undergoing elective simple dental extractions under community dental setting were included. These patients had intravenous/inhalational induction and an appropriate sized flexible LMA was placed. Anaesthesia was maintained with Isoflurane in oxygen and Air.

Local anaesthetic infiltration and systemic paracetamol were given intraoperatively. Ibuprofen/Diclofenac were used as rescue analgesics. Upon completion of the surgery, LMA was removed. Pain and PONV scoring were done in the Recovery area, in Daycare Surgical unit at 30 minutes and just before discharge. Time to first analgesic, Recovery time and time to discharge were also recorded.

Results & Conclusions: 4/16 children required rescue analgesics in the ‘sixes’ group while 22/85 children in the ‘milk teeth’ group required rescue analgesics, which is statistically not significant. The demographic data, PONV scores and average discharge time were similar between the two groups.

The number of children with recovery time longer than 2 hours is significantly higher in ‘sixes’ group. This signifies that children who have ‘sixes’ removed may be more distressed prolonging their recovery time.

503 IMPORTANCE OF CHILDREN’S PAIN THERAPY PATIENTS WITH REFRACTORY CHRONIC COMPLAINTS OF PAIN IN A PRACTICE WITH 20,000 PAIN PATIENTS

Background and aims: I have treated 20,000 pain patients about three generations. Among them 860 children. The complaints contain all illnesses of paediatrics.

By increased requirements in school and education as well as various midlle diversions the children are exposed to stress which makes pre-existing pains grow or triggers new pain syndromes. There are pains by increase of the height, faster length growth and lacking physical exercise, in the area of the hold apparatus.

Methods: Up till now there is hardly any pediatrician, which deal with the special pain therapy in the childhood and take part in pain conferences or pain further educations, this show work as the paediatric pain therapy is importantly is and the preventative one since clarify aspect of a paediatric pain therapy.

Results: It is here very important to remove the pains of the children continuously and to prevent a new appearance in the paediatric area to make a good professional education and one in addition turn chronification of the pains and possible subsequent illnesses by decades of analgesic use away as well as stimulus give for one better pain therapy education.

Conclusions: Examples of effective pain therapy in the childhood which get further common under the physically curative one like a preventative aspect and shall have a high place value under medical like economic points of view in the paediatric treatment are intervention with laser, acupuncture, specific neural therapy and phytotherapy, physiotherapy, TENS, mild-acting medicine pain therapeutical.

504 USE OF ULTRASOUND IN PERFORMING EPIDURAL ANESTHESIA IN CHILDREN < 8 KG
R. Steur, A. Absalom, The Netherlands.

Background and aims: Performing epidural anesthesia in newborns and neonates requires skills and experience of the performer. Does it consumes more time to use an echo of the vertebral to perform an epidural anesthesia with a catheter as an extra information when one is using the loss of resistance technique.

Methods: We performed an ultrasound examination of the vertebral column, measured the time that it took to get the information about the distance between the skin and the epidural space.

We measured the time to perform the epidural block by the loss of resistance technique in cases we did an ultrasound examination and in cases we didn’t use an ultrasound technique.

Results: We performed in 56 patients an ultrasound examination before an epidural block and registered the time consumed to do the ultrasound and the epidural puncture together.

We compared this group with 60 patients we performed an epidural puncture without an ultrasound.

The procedures with use of an ultrasound technique took in average 1.5 minutes longer than the procedures without an ultrasound technique. The advantage of using an ultrasound technique before an epidural puncture is the knowledge of the median structures and the distance between skin and epidural space. In clinical settings it doesn’t play a big role to have an epidural procedure that takes 1.5 minutes more time.

Conclusions: The time it takes to perform an epidural ultrasound examination before the puncture one can neglect on the total induction time of the anesthesia.
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506

EFFECT OF POSTOPERATIVE TOPICAL ADMINISTRATION OF MAGNESIUM SULFATE ON PAIN RELIEF IN PEDIATRIC ADENOTONSILLECTOMY

S. Vahabi, T. Shoja, Iran.

Background and aims: Adenotonsillectomy is often associated with moderate to severe pain. Although there are options for post operative analgesia, not an ideal method is still described in children. Magnesium is an NMDA receptor antagonist believed to be involved in pain modulation; hence, this study aimed to investigate its topical effectiveness in post operative pain.

Methods: After the informed consent was obtained, 110 ASA classes I and II patients aged 4 to 14 scheduled for adenotonsillectomy, were included in the study. The subjects were randomly assigned to two equal groups. In group M, the tonsillar fossa was packed for 3 minutes via 2.5 × 2.5 folded sterile gauzes saturated with 2 mg/kg of 20% magnesium sulfate diluted with 10 cc normal saline, while for group S 10 cc of normal saline was used alone. The mCHEOPS scale was used to evaluate pain intensity in the 1st, 2nd, 3rd and 6th hours post operation. Besides, laryngospasm, bleeding score and amount of analgesics consumption were recorded at the same time. Chi square and Friedman tests were used for statistical evaluation and the P-value of 0.05 was accepted as significant.

Results: The study showed a lower post operation pain score in group M in the 2 first hour after operation. Besides, analgesic consumption (acetaminophen) in the 1st and 2nd hours after the operation was significantly lower in group M (P < 0.001), but it was not significant in the 3rd and 6th hours post surgery. Total analgesic consumption was lower in group M, while laryngospasm were not significantly different in the two groups and bleeding score was significantly higher in the first hour after operation.

Conclusions: Topical Magnesium sulfate in tonsillar fossa decreased post tonsillectomy pain in children.

507

THE EFFECT OF LOW SERUM BICARBONATE VALUES ON THE ONSET OF ACTION OF LOCAL ANESTHESIA WITH VERTICAL INFRACLAVICULAR BRACHIAL PLEXUS BLOCK IN PATIENTS WITH ESRF

M.M. Al-mustafa, Jordan.

Background and aims: Vertical infraclavicular brachial plexus block is utilized in patients with chronic renal failure at the time of creation of an arterio-venous fistula (AVF). The aim of this study is to test the effect of impaired renal function, with the resulting deranged serum electrolytes and blood gases, on the success rate and the onset of action of the local anesthetics used.

Methods: In this prospective clinical study, we investigated the effect of the serum levels of sodium, potassium, urea, creatinine, pH, and bicarbonate on the onset of action of a mixture of lidocaine and bupivacaine administered to create infraclavicular brachial plexus block.

Results: A total of 31 patients were studied. The success rate of the block was 93.5% (29 patients). The mean onset time for impaired or reduced sensation was found to be 8.9 ± 4.7 mins and for complete loss of sensation was 93.5% (29 patients). The mean onset time for impaired or reduced sensation was found to be 8.9 ± 4.7 mins and for complete loss of sensation was 93.5% (29 patients). The mean onset time for impaired or reduced sensation was found to be 8.9 ± 4.7 mins and for complete loss of sensation was 93.5% (29 patients).

Conclusions: Our study suggests that infraclavicular block in patients with chronic renal failure carries a high success rate; the onset of the block is delayed in patients with low serum bicarbonate levels.

508

UNINTENTIONAL PERINEURAL INJECTION OF ETOMIDATE

A. Atchabahian, E. Chen, USA.

Background and aims: Medication errors accounted for 3% of anesthesia-related claims occurring in 1990-2001. Of those claims, 30% involved substituting another drug for the intended one. We describe an unintentional injection of etomidate instead of lidocaine during an axillary block of the brachial plexus.

Case Report: A 76 year-old female was scheduled for an elective open reduction and internal fixation of an ulna fracture. An ultrasound-guided axillary block of the brachial plexus was performed. A mixture of 30 mL of 0.5% bupivacaine and 10 mL of what was intended to be 2% lidocaine was injected incrementally around the median, radial, ulnar and musculocutaneous nerves. Propofol was given for sedation and the patient appeared comfortable after the start of surgery. It was then discovered that 10 mL of 0.2% etomidate had been injected with the bupivacaine instead of lidocaine.

Surgery progressed uneventfully. The patient gradually regained full sensory and motor function and was comfortable for thirteen hours after placement of the block. There was no sequela at the 6-week follow-up.

Conclusions: Perineural injection of etomidate does not appear to have any immediate adverse neurological effects. Recommendations regarding labeling and pharmaceutical preparations may help to reduce further occurrences of unintentional drug substitutions.

Reference:

509

A COMPARISON OF INTERSCALENE BLOCK ANAESTHESIA AND GENERAL ANAESTHESIA IN PATIENTS WITH PROXIMAL HUMERUS FRACTURE

S. Baranovic, B. Maldini, S. Marić, M. Milošević, Croatia.

Background and aims: A proximal humerus fracture is a common injury of the shoulder. The aim of this study is to compare the effects of two anesthetic methods in patients with proximal humerus fracture in development of postoperative pain.

Methods: 50 patients were included in this prospective, randomized study. They were randomized into two groups, interscalene (ISBA) group and general anaesthesia (GA) group. Patients in ISBA group were anesthetized using interscalene block technique; whilst patients in GA group were anesthetized according to general anaesthesia protocol. The VAS score was assessed every two hours at rest and in motion. We measured time necessary to prepare anaesthesia in both groups, duration of operation, hemodynamic and respiratory stability, loss of blood during operation, use of analgesics postoperatively and patient satisfaction.

Results: There was no statistically significant difference between groups regarding demographic characteristics and ASA status. ISBA group had statistically lower VAS score as well as lower analgesics use (P < 0.05). There were no statistically significant differences in intraoperative complications, although more hypotension was recorded in GA group. The loss of blood was higher in ISBA group, but this result bears no statistical significance. The time necessary to perform anaesthesia was significantly longer in ISBA group (P < 0.05). There is a statistically significant difference regarding patient satisfaction, to the advantage of ISBA (P < 0.05).
Conclusions: ISBA is a better method of anaesthesia than GA in patients with proximal humerus fracture, it leads to better pain relief, lesser use of analgesics, without significant complications.

510 CONVERSION OF RESIDUAL PARALYSIS IN BIER’S BLOCK INDUCED BY NON-DEPOLARISING MUSCLE RELAXANT ROCURONIUM: DOES SUGAMADEX REALLY WORK?

D. Bartolek, Croatia.

Background and aims: Bier’s block (IVRA) is effective and successful regional anaesthesia technique for most soft tissue forearm surgery. Poor muscle relaxation may be found by open forearm bone reposition/or osteosynthesis. Addition of low-dose non-depolarizing muscle relaxant to local anaesthetic (LA) prolongs unwanted residual paralysis of extremity and is restricted to a narrow indication field. Sugamade, as selective, non-competitive rocuronium neutralizer, may converse induced residual post-operative paralysis after IVRA.

Methods: 90 patients (ASA I/II, 45-56 age, forearm fracture), were randomized in three groups. LA (0.5% lidocaine, 3 mg/kg) was used alone (Group L), rocuronium (R)(0.6 mg/kg6% body weight of upper extremity) was supplemented to LA (Group LR). Sugamade was applied i.v. in opposite arm immediately after tourniquet release when rocuronium was used (Group LRS). All patients received sufentanil 0.5 μg and midazolam 0.05 mg i.v. before procedure. Ischemic condition was maintained for 60 min. Muscle function was monitored by Trai-of-Four stimulation (TOF)n.ulnaris; 2 Hz, 35 mA). Data analysis: SPSS 11.0.

Results: Residual muscle paralysis with standard LA solution was detected 21+/1 min after tourniquet release and ten times longer (3.5 hours) when rocuronium was supplemented (P=0.001). Sugamade shortened muscle function recovery on 41+/2 min after rocuronium addition (P=0.0102) (Graph 1).

Conclusions: Rocuronium supplementation in IVRA is allowed for forearm bone surgery when complete muscle relaxation is needed. In these cases, sugamade has been used to reduce residual limb paralysis on acceptable 40 minutes postoperatively.

511 TO COMPARE TOPICAL TETRACAINE 0.5% ALONE AND WITH INTRACAMERAL LIDOCAINE 1% AS A LOCAL ANESTHETIC AGENT IN PHACOEMULSIFICATION WITH INTRAOCULAR LENS (IOL) IMPLANTATION


Background and aims: Topical anaesthesia has become an increasingly popular option for day-case cataract surgery. Many surgeons now use supplementary intraoperative intracameral lidocaine, but the base for the supplementary use of intracameral anaesthetic during cataract surgery has different result in different studies.

Methods: A prospective randomized double-blind study was designed in 86 patient that schedule for cataract surgery in Farabi eye hospital, Tehran University of Medical Science from (2008-2009). Total of 86 patients scheduled for cataract surgery were randomly assigned to either the placebo group (topical anaesthesia with intracameral balanced salt solution [group 2, n = 46]) or the intervention group (combined topical+intracameral anaesthesia [group 1, n=40]). Systolic and diastolic blood pressure, pulse rate were recorded preoperatively (before using topical anesthetia) and after cataract surgery pluse VAS/Visual Analogus Scale) between 0 (no pain) and 10(unbearable pain) detected by an anesthesia specialist. Data was analyzed with student T-test.

Results: There was no significant changes in Systolic and diastolic blood pressure, pulse rate preoperative and postoperative in group 1(intracameral lidocain) but in group 2(placebo), there was significant changes between Systolic and diastolic blood pressure, pulse rate before and after surgery. Our data comparsion showed significantly lower pain perception postoperative in patient whom recieved supplementary intracameral lidocaine.

Conclusions: Postoperative pain cataract surgery undertopical anaesthetic is reduced by Lidocaine. Systolic,diastolic blood pressure,heart rate was more stable in group 1(intracameral Lidocain) than group 2(placebo group).

Although a statistically significant reduction in postoperative pain has been demonstrated, it is not yet possible to recommend this additional intervention without reservations.

512 A PROSPECTIVE REVIEW OF ULTRASOUND GUIDED BRACHIAL PLEXUS BLOCKS IN OBESE PATIENTS AT SALFORD ROYAL HOSPITAL

K. Bhatia, J. Corcoran

Introduction: Brachial plexus blocks (BPB) in the obese population using a peripheral nerve stimulator not only has a higher failure rate but also a higher complication rate.1-2

Methods: We prospectively reviewed ultrasound guided (USG) BPB performed using linear high frequency probe in all obese patients from October 2010 - January 2011.

Results: The results are summarised in Table -1

| No of obese patients | 25 |
| Mean age (Range) years | 53 (23-67) |
| ASA | 1 - 5 II - 12 III - 8 |
| Sex (Male : Female) Number of patients | 12:13 |
| Mean BMI (Range) kg/m2 | 36 (32 -50) |
| Brachial plexus block type - Number of patients | Interscalene Block - 12 Supravclavicular Block - 7 Axillary block - 6 |
| USG(BPB successful/Surgical anesthesia) | 23 |
| Average time to perform the USG BPB (Range) minutes | 9.42 (6-15) |
| Complications (Number of patients) | Unintended paraesthesia -5 Hoarseness - 1 Horners syndrome -1 |
| Patient satisfaction (%) | 23 (92) |

[Patient characteristics and USG BPB outcomes]

Conclusions: Our review (though small) suggests successful surgical USG BPB could be achieved in more than 90% of the obese population with minor side effects. A randomised controlled trial would be useful to evaluate whether USG BPB does provide superior results as compared with PNS in this complex group of patients.

References:

513 TELEPHONIC SURVEY OF PAIN RELIEF AND PATIENT SATISFACTION AFTER UPPER LIMB SURGERY FOLLOWING BRACHIAL PLEXUS BLOCK

K. Bhatia, S. Roberts.

Background and aims: Meta-analysis comparing general anaesthesia (GA) with peripheral nerve blocks (PNB) reveals that PNB is associated with faster recovery times, better pain relief, decreased incidence of nausea and higher patient satisfaction. We present our findings of a telephonic audit of pain relief and patient satisfaction following brachial plexus block (BPB) for upper limb surgery.

Methods: Patients having BPB from April to June 2010, following discharge were contacted by telephone and surveyed for comfort during performance of BPB, quality and duration of analgesia post-operatively, complications and patient satisfaction.

Results: 41 patients responded to our survey. Twenty four of them had an interscalene block for shoulder surgery, nine had supravclavicular for elbow
and forearm surgery and eight had axillary block for hand surgery. 98% of our patients were comfortable during performance of BPB. Average duration of pain relief provided by BPB was 16 hours following surgery. Unintended paraesthesia during the block (33%), transient neurological symptoms (Tingling/numbness) lasting 36 hours (5%), nausea (5%), dizzy spells (5%) and hoarseness (5%) were the most common side effects. 100% of the patients were satisfied with the anaesthetic care provided to them.

Conclusions: Pain relief and patient satisfaction are important components of patient’s peri-operative experience and quality of care in the NHS. Our survey reveals excellent pain relief provided by BPB with minor side effects, and high patient satisfaction at our institute.

References:
2. Picker Institute (see: www.pickereurope.org/).

514 AUDIT OF USS USE AND TRAINING IN REGIONAL ANAESTHESIA - FREEMAN HOSPITAL, UK. NOVEMBER TO DECEMBER 2010
M. Blundell

Background: Ultrasound (US) use for regional anaesthesia (RA) is increasing, and NICE guidelines support its use. However both NICE and the AAGBI emphasise the safety and efficacy of US use for RA is dependent on experience and training in the technique.

Aims: To evaluate the use of RA within the department and the technique used. From this we aim to see the training opportunities and limitations.

Methods: A prospective audit anonymously completed by anaesthetists for each RA block performed over a 6 week period.

Results: 88 blocks were performed in 78 patients, the majority in orthopaedic theatres (92%). 54 blocks (69%) were performed by consultants, observed by trainees in only 37% of cases. 45 (58%) of blocks performed with US. Blocks were performed without US because of preference for landmark technique (63%), not US trained (20%), US machine not available (13%) and poor view on US (3%). Objective block success was reported as 98% independent of technique.

Conclusions: US use for RA is the most popular technique irrespective of Anaesthetists grade. US was not used in 33% due to inadequate training or US availability. Trainees were encouraged to benefit from the significant number of unused training opportunities in consultant lead lists, and an additional US machine has been purchased by the department. The importance of training on the safety and efficacy of US use in RA was emphasised.

References:
1. NICE guideline IPG 285
2. ‘Ultrasound in Anaesthesia and Intensive Care - A guide to Training’ Draft 2010, AAGBI.

515 SKIN DEPRESSION AT THE ILIAC CREST PROMINENCE: A NEW LANDMARK FOR PERFORMING LUMBAR PLEXUS BLOCKADE
B. Borghi, A. Tognu, S. Paolini, L. Aurini, P.F. White, M. Bosco, Italy, USA.

Background: Lumbar plexus block is commonly used for lower limb orthopedic surgery, however the performance time and the success rate are influenced by the reliability of the landmarks. We propose a new landmark based on the skin depression at the iliac crest prominence as an alternative to the classical Cheyn approach. This investigation tests the hypothesis that the new landmark would reduce the time required to perform the block.

Methods: 54 patients, scheduled for lower limb surgery, were randomly allocated to have a lumbar plexus block performed using the Cheyn approach (n=27) or the experimental “Borghi” approach (n=27). The landmarks of both approaches were drawn on each patient before the randomization.

All the blocks were performed using a nerve stimulator and 30 ml of levobupivacaine 0.5%.

Results: The mean time to perform the block was 8.5 (±3.9 SD) min with the Cheyn approach compared to 5.1 (±2.6 SD) min with the Borghi approach (p<0.01). The Cheyn approach also required a significantly higher median number of needle redirections (3 [inter-quartile range: 2] vs. 0 [inter-quartile range: 1], p<0.005). Stratifying patients for BMI, in the non-obese patients the block performance time was 7.6 (±3.5 SD) min with Cheyn approach versus 5.2 (±2.9 SD) min with Borghi approach (p<0.03) whereas in the obese patients the difference was even larger: 11.5 (±4.0 SD) min to perform the block with Cheyn approach and 4.8 (±2.0 SD) min with Borghi approach (p<0.01). Five initial needle placement failures, all in the Cheyn group, led to ‘crossing over’ to the other approach.

Conclusion: This study suggest that using the skin depression at the iliac crest prominence to perform a lumbar plexus block may offer advantages over the classical approach using the inter-iliac crest line for identifying the needle insertion site.

E248

516 ULTRASOUND-GUIDED NERVE BLOCKS FOR OPEN ANKLE SURGERY: THE QUINTUPLE BLOCK FOR ANKLE SURGERY REQUIRING A THIGH TOURNIQUET
S. Bache, K. Jensen, J.H. Rasmussen, V. Nielsen, J. Borglum, Denmark.

Background: We present a specific combination of ultrasound-guided (USG) multiple blocks providing awake surgical anaesthesia for open ankle surgery requiring a thigh tourniquet. Our aim was to prove the clinical applicability of this specific combination of USG blocks.

A: USG block of the femoral nerve (FN), iliopectineus (IPM), femoral artery (FA) and vein (FV).
B: USG block of the lateral femoral cutaneous nerve (LFCN), Sartorius (SA), iliopectineus (IPM)
C: USG block of the obturator nerve - anterior branch (ONA), posterior branch (ONP), Pectineus (PM). adductor longus (AL), adductor brevis (AB), adductor magnus (AM).
D: USG block of the sciatic nerve (SN) – antero-medial approach. Sartorius (SA), femoral artery (FA), femur (FE).

FIGURE 1. Ultrasound-guided (USG) nerve blocks for open ankle surgery.

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Methods: Following local ethics committee approval, seven consecutive patients scheduled for open ankle surgery were included. Blocks were performed in the PACU prior to surgery. In a specific sequence the femoral, obturator (anterior and posterior branch individually), lateral femoral cutaneous and sciatic (proximal anterior-medial thigh) nerves were blocked (Figure 1). An equal mixture of bupivacaine 0.25% and mepivacaine 1% with epinephrine was used.

Results: The quintuple block provided surgical anaesthesia, allowed using an inflated thigh tourniquet for a median duration of 68 minutes (range, 11-107 minutes) and no supplemental opioids were needed. Median block procedure time was 17 minutes (range, 12-21 minutes), median duration of motor and sensory block was 10 and 15 hours, respectively (range, 3-24 hours), and a median of 55 ml of local anaesthetic (range, 40-60 ml) was used.

Conclusion: We describe the clinical applicability of a specific USG multiple nerve block combination providing surgical anaesthesia for open ankle surgery requiring a thigh tourniquet for a bloodless surgical field.

517 DURATION OF ULTRASOUND-GUIDED (USG) PERIPHERAL NERVE BLOCKS (PNBS) OF SMALLER NERVES OF THE LOWER EXTREMITY. BUPIVACAINE VS ROPIVACAINE

Background and aims: Duration of PNBS depends on local anaesthetic pKa value, lipophilicity, concentration, guidance method, pain intensity, and vascular washout. Using ropivacaine or levobupivacaine, duration of PNBS in large nerves of the lower extremity seems to be 13-18 hours. Both local anaesthetics share similar pharmacokinetic profiles. We wanted to investigate (i) the duration of sensory blocks of minor lower extremity nerves, and (ii) potential differences in duration between ropivacaine and bupivacaine.

Methods: Following IRB approval, a prospective cohort of 171 patients having a block of the lateral femoral cutaneous, obturator (anterior/posterior branch) or saphenous nerves (medialmoral approach) were contacted 24/48 hours postoperatively. All USG PNBS were administered using ropivacaine 0.75% or bupivacaine 0.5%, 5-15 ml.

Results: Figure 1 displays a Kaplan-Meier graph of the duration of sensory nerve block by each local anaesthetic. Median duration of sensory block is 19 hours for both drugs.

Conclusions: Duration of sensory blocks seems to last longer than the previously reported PNBS of major lower extremity nerves and may be due to differences in neural sheaths, slower within-nerve absorption, or decreased vascular washout. Bupivacaine and ropivacaine seem to have identical duration of effect in perineural anaestheisa of the smaller nerves on the lower extremity.

518 A COMPARISON OF LEVOBUPIVACAINE AND LEVOBUPIVACAINE-TRAMADOL IN COMBINATION IN BILATERAL INFRAROBITAL NERVE BLOCK IN POSTOPERATIVE ANALGESIA AFTER NASAL SURGERY
B. Cekic, S. Geze, E. Erturk, A. Akdogan, A. Eroglu, Turkey.

Background and aims: Our aim in this study was to investigate the effect of levobupivacaine and a levobupivacaine + tramadol combination on postoperative analgesia in intraoperative nerve block under standard general anesthetic.

Methods: 45 patients undergoing outpatient nasal surgery under general anesthesia were randomized into three groups. Anesthesia was induced with 2-3 mg/kg propofol, 0.6 mg/kg rocuronium and 70% nitrous oxide in oxygen, and 2% sevoflurane. Following tracheal intubation, the anesthetist slowly injected 2 mL of the study drug into each infraorbital foramen (0.25% levobupivacaine for Group L, 0.25% levobupivacaine + 50 mg tramadol for Group T and normal saline solution for Group S). During the early postoperative period and 12 h verbal numeric rating scale (NRS) and pain intensity, postoperative analgesic and antiemetic drug requirement, and side effects were recorded.

Results: Postoperative NRS pain score was lower in Group T compared with groups S and L (30 min and 60 min in Group S p < 0.05 ; 30 min in Group L p < 0.05). Effective analgesia time (sec) in the control group (142.67 ± 77.31) were shorter than levobupivacaine (240 ± 96.39) and levobupivacaine added to tramadol the group (277 ± 11.60) (p< 0.05). Additional analgesic requirement in the control group were higher than the other two groups (p<0.05).

Conclusions: Bilateral infraorbital nerve block with 0.25% levobupivacaine is an effective, reliable and simple technique in the treatment of postoperative pain in nasal surgery.

519 COMBINATION OF ACUPUNCTURE AND OCCIPITAL NERVE BLOCK FOR THE TREATMENT OF CHRONIC INTRACTABLE MIGRAINE
S.S. Chamandni, D. Sheih, Lebanon.

Background: Migraine is the commonest human neurovascular disorder.

Chronic intractable migraine is frequently associated with lifestyle and psycho social issues that Must be addressed concurrently.

Methods: Between 2008 and 2010 15 patients;10 females and 5 males referred to our pain clinic for chronic intractable migraine.

All patients suffer severe, recurring symptoms that respond poorly to acute prophylactic treatments.

A bilateral occipital nerve block was conducted using nerve stimulator while injecting 5cc of bupivacaine , 0.25% with methyl-predmisone 40 mg each side.

After accomplishing the occipital block = three (3)acupuncture points were used.

EX-HN-5 Tai yang.
EX-HN-3...Yin tang.
GV-20 Bai Hui.

Needles of acupuncture were left for 30 minutes and then removed and the patients were discharged home later.

These procedures (occipital blocks and acupuncture) were repeated for four (4)consecutive times on a one week interval.

Results: 6 months to one year follow up was conducted.

-Three patients (females) did not improve at all.

-10 patients improved dramatically and did stop all their medications.

-2 patients suffered mild migraine attacks, treated successfully with paracetamol

Conclusion: Occipital blocks has a good role in treating chronic migraine, As well as acupuncture.

The combination of acupuncture along with occipital blocks could have synergetic effect and give better results.

References
520 DERMATOMAL SENSORY BLOCK LEVELS AFTER TAP BLOCK

S. Chaudhari, E. Lynes, C. Pinnock

Background and aims: The Transverse Abdominus Plane block deposits local anaesthetic in the plane between internal oblique and transversus abdominis muscle. It has been used for lower abdominal surgery and shown to provide significant post operative analgesia.

There has been controversy in the literature regarding the spread and level of block achieved with a single TAP injection. Cadaveric study has shown that T11, T12 and L1 are consistently blocked.

The aim of this audit was to assess the level of sensory block after TAP block and any associated complications.

Methods: The audit was done prospectively. 50 patients undergoing gynaecological, general, urological and orthopaedic procedures were included. The TAP block was performed with either ultrasound guided or an anatomical technique using either Spinal or Tuohy needles.

All patients gave informed consent to the testing of sensory levels. The level of sensory block was tested to the modalities of cold and pinprick in the immediate recovery period.

Results: Study demonstrated that in 94% of patients sensory block was demonstrable. 93% patients had analgesia to both cold and pinprick.

There were no noted complications following the technique.

Conclusions: The findings of this audit demonstrated a level of sensory block varying from T1 to L3 dermatomes. 80% of patients had a sensory block between T10 and T12.

TAP blocks may be an alternative to epidural anaesthesia, particularly if the risk of neuraxial compression from bleeding is deemed high, with the potential for enhanced post operative analgesia in the immediate post operative period.

521 RECORDING AND EDITING ULTRASOUND GUIDED PROCEDURES - A SIMPLE AND EFFECTIVE METHOD

D. Clarence, P. Allsp, T. Bhatti

Background and aims: Recording ultrasound guided procedures is useful for documentation, teaching and presentation purposes. However during day to day work such endeavours are deterred by limited time and limited machine memory. We would like to present a simple method of digital recording and editing of complete ultrasound guided procedures.

Methods: We use a digital recorder with replaceable cassettes (Sony GV) using S video cable link to the ultrasound machine (Sonosite S-nerve). The recording starts at the beginning of the procedure and continues until the end of the procedure when the sterile field is removed. Each cassette can record upto 60 minutes of footage. Periods of inactivity are edited and the best images are extracted using Apple software iMovie.

Results: The result is an invaluable, easy to use tool for creating an archive, for teaching and presentation purposes.

Conclusions: This approach fills a void in real time recording of prolonged procedures which is difficult due to limited machine memory. The ease with which it can be done makes it more user friendly than intricate and easy-to-forget command sequences for recording by the machine (Sonosite S-nerve).

522 MANAGING HAND FLEXOR TENDON REPAIR WITH ACTIVE MOVEMENT DURING SURGERY

A. Crespo, J. Milan, O. Izquierdo, Spain.

Background and aims: Some techniques have permitted the flexor tendon repair with local anesthesia, axillary blockade, general anesthesia, and others. However, the wide awake approach technique, using the tumescent local anesthesia (LA) in hand flexor tendon repair, have been used as an valid alternative in non-sedated patients with no tourniquet. Some orthopaedic surgeons, hand specialized, don’t want to use the tumescent LA. The main reason is that LA may alter the underlying structures. Distorting to test the repaired tendon with active flexion and extension. We present our experience in this type of surgery using axillary blockade with sedation.

Methods: A prospective study of 23 patients (18M/3F) undergoing flexor tendon repair was undertaken. Mean age was 34. All patients were classified as ASA I. All surgeries were performed with tourniquet. An axillary blockade was performed. Injecting 20mL of Levobupivacaine 0.06% near Ulnar or Median, depending which flexor tendon will be repaired. Sedation was obtained with Remifentanil and Ketamine. Before surgeon wanted to evaluate the full active flexion and extension, tourniquet was released and Remifentanil was decreased. Ethical approval has been requested for this study.

Results: During intraoperative time, we observed a full collaborative active flexion and extension. Patients reported an excellent analgesia with a VAS score on movement < 2, and no motor block. None reported any notable side effect.

Conclusions: Axillary blockade using low concentration of levobupivacaine plus sedation with remifentanil and ketamine are seems to be a valid alternative to tumescent local anesthesia in flexor tendon repair.

523 A VARIETY OF REGIONALS: CURRENT PRACTICE OF PERIPHERAL NERVE BLOCKADE FOR KNEE AND HIP REPLACEMENTS

C. Cromey, C. Egeler

Background and aims: Peripheral nerve blocks are frequently used as part of a multimodal approach to analgesia for total hip and total knee replacements. There are many different options available, each with their own advantages and disadvantages. We investigated the current regional methods used in our centre to establish which techniques are most popular.

Methods: Consultant anaesthetists currently involved in regular elective knee and hip replacements in our centre were surveyed and their level of experience ascertained. We established their “recipe” for pre-operative, intra-operative and post-operative analgesia with particular attention to the type of peripheral block used, volume and concentration of local anaesthetic administered and method of nerve identification (peripheral nerve stimulator, ultrasound scan, landmark).

Results: All anaesthetists surveyed preferred general anaesthesia (GA) for maintenance peri-operatively although one combined spinal anaesthesia with GA. The majority of anaesthetists use femoral and sciatic blocks for total knee replacement although some use femoral blocks alone to try to minimise motor blockade post-operatively and promote early mobilisation. Most anaesthetists used fascial blocks for total hip replacements but obturator, “3-in-1”, and femoral blocks were also used. 50% of the anaesthetists surveyed used oxycotin as a pre-medication and continued this in the post operative period.

Conclusions: There is a wide variety of techniques employed for analgesia for lower limb joint replacement. Although there is some evidence and discussion of the “gold standard” in the literature we found no consensus of best practice amongst the anaesthetists in our survey.
524 PERIBULBAR BLOCK, A GOOD CHOICE FOR VITREORETINAL SURGERY
L. Cruz, I. Madeira, S. Machado, I. Aragão, Portugal.

Background and aims: In last years there is an increasing tendency for peribulbar block, which is claimed to provide a good level of anesthesia, while reducing complications. The aim was to evaluate its use in vitreoretinal surgery.

Methods: After hospital ethical approval, a prospective study was performed in Centro Hospitalar do Porto, since January 2009 to December 2010. We included patients scheduled for vitreoretinal surgery under peribulbar block. Demographic and clinical data collected were: sex, age, ASA physical status, volume of injection, supplementation rate, degree of akinesia, level of intraoperative pain (Numerical Rating Scale), systemic analgesia, and patient satisfaction using scale from 1 (dissatisfaction) to 4 (total satisfaction).

Results: Total of 231 patients were enrolled. Clinical evaluation revealed that in 196 (86.8%) patients, surgery was performed with preoperative block, using ropivacaine 10% mean doses of 4.50±0.85 ml in inferotemporal injection and 1.34±0.84 ml in superotemporal. Complete akinesia was achieved in 141 (61%) patients. A supplementation dose was needed in only 35 patients. Most patients, 162 (70.1%) referred no intraoperative pain. Moderate pain was registered in 13 patients and revealed was the highest score of pain achieved. Excluding paracetamol for preventive analgesia, 37 patients required fentanyl in doses ≤100 mcg for pain treatment. Relatively to satisfaction, 94.8% of patients stand between 3/4 level. When compared with intraoperative pain, statistically significance was found (p=0.05).

Conclusions: We conclude that peribulbar block reveals to be an adequate anesthetic technique for vitreoretinal surgery with a high satisfaction rate, which is directly related to painless.

525 THE EFFECT OF INTRODUCTION OF STANDARDISED RECORD FORMS ON THE DOCUMENTATION PRACTICE OF REGIONAL ANAESTHESIA
A. Dada, T. Bates, H. Rose, D. Factor, H. Hope, A. Pawa

Background and aims: With the advent of ultrasound-guidance, there has been an upsurge in interest in regional anaesthesia (RA) that will inevitably lead to an increase in the number of complications. There is however no gold standard for RA documentation and considerable variation in information currently documented [1]. A recent analysis of litigation in anaesthesia showed that RA accounts for almost half of all claims. Documentation of RA procedures is therefore important for patient care and quality assurance as well as for research and medicolegal purposes.

We audited the current practice of RA documentation in our institution and designed a standardised record form that incorporated all information we consider relevant for comprehensive RA documentation.

Methods: We analysed current documentation practice by retrospectively reviewing the anaesthetic charts of patients who had undergone RA over a period of one month. We then designed a standardised form that was piloted over a two-week period during which the documentation practice was re-audited.

Results: Block data (name and site) was recorded in 68% before versus 98% after new forms were introduced. Needle data (length, gauge, type) was recorded in 49% versus 98% while record of nerve localisation method (USS or PNS) was recorded in 91% versus 99%. Complications or lack of it was recorded in 40% versus 97% following introduction of forms.

Conclusions: There was universal improvement in documentation practice following introduction of standardised forms.


526 ULTRASOUND-GUIDED BRACHIAL PLEXUS BLOCK FOR AMBULATORY HAND SURGERY: AXILLARY OR SUPRACLAVICULAR APPROACH - DOES IT REALLY MATTER?
A. Dada, R. Farmer, A. Xavier, E. Aziz, J. Barron

Background and aims: Regional anaesthesia for hand surgery has been shown to result in faster recovery and better analgesia compared to general anaesthesia[1]. However, the best approach to the brachial plexus is still a subject of debate especially with the availability of ultrasound. We audited current practice in our institution looking at the approaches adopted by our regional anaesthetists and its implication for success, adverse events and patient satisfaction.

Methods: We obtained prospective data on 45 patients undergoing ambulatory hand surgery under ultrasound-guided brachial plexus block with or without sedation. Data included performance times, procedure-associated discomfort, success rates and conversion rates. Telephone interviews were conducted 24hrs and one week post-operation.

Results: 46%(n=20) had supraclavicular(SB) with 0.5% levobupivacaine while 54%(n=25) had axillary(AB) block with 50:50 mix of 0.3% levobupivacaine and 2% lignocaine. Mean(SD) scanning and needling times were 2.1(2.3)min and 5.6(3.8)min for the SB group while for the AB group it was 2.6(3.7) and 6.8(2.9). Group AB had better block effectiveness with supplementation rate of 0% while SB had a supplementation rate of 20%(P=0.022). Block duration was similar with mean(SD) of 9.3(3.5) versus 9.6(3.6)hrs in SB and AB. Patients’ acceptance and satisfaction was good in both groups. No neurological complications were reported.

Conclusion: There was no significant difference in most of the parameters recorded but supraclavicular blocks appear more likely to need supplementation.


527 THE EFFICACY OF A CONTINUOUS PSOAS COMPARTMENT BLOCK, COMBINED WITH A SINGLE INJECTION SCIATIC NERVE BLOCK, FOR PATIENTS UNDERGOING A TOTAL HIP ARTHROPLASTY

Background and objectives: The aim of this clinical observational study was to assess the clinical efficacy of a continuous psoas compartment block, combined with a single injection sciatic nerve block (cPCSNB), for patients undergoing a total hip arthroplasty (THA).

Methods: Ten patients undergoing a THA under spinal anesthesia (with or without PNS) was recorded in 91% versus 99%. Complications or lack of it was recorded in 141 (61%) patients. A supplementation dose was needed in only 35 patients. Most patients, 162 (70.1%) referred no intraoperative pain. Moderate pain was registered in 13 patients and revealed was the highest score of pain achieved. Excluding paracetamol for preventive analgesia, 37 patients required fentanyl in doses ≤100 mcg for pain treatment. Relatively to satisfaction, 94.8% of patients stand between 3/4 level. When compared with intraoperative pain, statistically significance was found (p=0.05).

Conclusions: We conclude that peribulbar block reveals to be an adequate anesthetic technique for vitreoretinal surgery with a high satisfaction rate, which is directly related to painless.

Discussion: In general, clinical efficacy data of the first 24 hours after a cPCSNB were similar to single injection PCSNB data. Beyond 24 hours post operation, the clinical efficacy of cPCSNB was more present compared to the single injection PCSNB. Further studies are required to explore the clinical efficacy of a cPCSNB in patients undergoing a THA.

528 COMBINED ULTRASOUND AND NEUROSTIMULATION GUIDANCE: A PROSPECTIVE RANDOMIZED COMPARISON AS PERINEURAL DISTRIBUTION OF LOCAL ANAESTHETIC AS THE END POINT FOR PERIPHERAL NERVE BLOCKS
R. Ehrenberg, S. Moritz, Germany.

Background and aims: Neurostimulation (NS) for peripheral nerve blocks (PNB) suggests a close needle nerve relationship by a motor response at or
A total of 160 patients were included in this prospective, randomized study. Primary end point was the perineural spread of LA (20ml ropivacaine 0.75% and 20ml prilocaine 1%) and surgical anesthesia. In the ultrasound group (n=80) the neural structures and the needle tip were visualized and a possible motor response was assessed. In the neurostimulation group (n=80) the distribution of LA was visualized and assessed at the needle position where a motor response was elicited at or below 0.5mA.

**Results:** There were no demographic differences between the groups. A successful block was achieved in all patients in the US group (100%) and in 66 patients in the NSUS group (83%). A motor response was shown in only 33 patients (41%) in the US group to an intensity to 0.5mA. 26 patients (32%) had no motor response to 2.0mA.

**Conclusions:** Ultrasound guidance for needle placement and monitoring the spread of LA is associated with a high success rate for PNB with or without motor response while neurostimulation may lead to contradictory results combining with US.

### References

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**529**

**ANTINOCEPTIVE AND ANTI-INFLAMMATORY EFFECTS OF OLIVE OIL (OLEA EUROPAEAE L.) IN MICE**


**Background and aims:** Olive (Olea europaea L., Oleaceae) is a long-lived evergreen tree that is widespread in various parts of the world. Since the olive oil has been recommended in the literature as a remedy for the alleviating of pain, it was considered worthwhile to investigate the antinociceptive and anti-inflammatory effects of olive oil in adult male NMRI mice.

**Methods:** Antinociceptive activity was done using formalin, hot plate and writhing tests, the effect of olive oil on acute inflammation was studied by xylene ear edema test in mice. The olive oil (1, 5 and 10 ml/kg body wt.) was injected intraperitoneally. The control group was intact.

**Results:** Results showed that the olive oil decreased only second phase of formalin-induced pain. In hot plate test, olive oil did not raise pain threshold during 60 mins. The olive oil exhibited antinociceptive activity against writhing-induced by acetic acid. In xylene ear edema test, olive oil showed significant activity in the mice.

**Conclusions:** The present data indicated that this plant has antinociceptive and anti-inflammatory effect on the mice but more works are required to be done in order to elucidate the mechanism(s) involved in antinociceptive and anti-inflammatory effects of the olive oil.

**530**

**TWO YEAR PROSPECTIVE AUDIT TO ASSESS ADEQUACY OF INTERSCALENE BRACHIAL PLEXUS BLOCK FOR DAY CASE SHOULDER SURGERY**

A. Elayaperumal, K. Russon, L. Maxwell

**Background and aims:** Shoulder surgery is painful. Interscalene brachial plexus block (ISB) is an effective method of providing analgesia for shoulder surgery. With an effective ISB, patients having shoulder surgery can be treated as day case

**Methods:** The anesthetist who did the block entered the details on an audit form and a nurse phoned each patient the day after surgery to find the duration of block, pain scores and whether there were any problems.

**Results:**

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**531**

**DOES USING NERVE STIMULATOR AS AN ADJUNCT TO ULTRASOUND IMPROVE THE EFFICACY OF AN INTERSCALENE BRACHIAL PLEXUS BLOCK?**

A. Elayaperumal, R. Goyal, M. Shekar

**Background and aims:** In our hospital we provide interscalene blocks for post operative analgesia for patients undergoing shoulder surgeries. We now report our service evaluation of these procedures with particular emphasis to the duration of the block and the volume of the local anaesthetic used.

**Methods:** We collected the data over a period of four months prospectively. The blocks were performed with either Ultrasound (USG) alone or both USG and Peripheral Nerve Stimulator (PNS). We also observed the volume and the type of the local anaesthetic and the duration of the block.

**Results:**
Conclusions: Though the volume and type of local anaesthetic agents were similar for both groups, the duration of block of the USG + PNS group is lower than the USG group. Therefore adding nerve stimulator as an adjunct to ultrasound for Interscalene Brachial Plexus block does not seem to be improving the duration of the block. These results are similar to the results of a study published. A randomized clinical trial would be needed to fully evaluate the utility of nerve stimulation as an adjunct to ultrasound.

Reference:

EVALUATION THE ANALGESIC EFFECTS OF KETAMINE AND MIDAZOLAM AS AN ADDITIVE TO INTRATHecal BUPIVACaine IN PATIENT UNDERGOING CESARian SECTION

M.-B. Khezeri, J. Ghasemy, T. Karimzadeh Patients scheduled for elective cesarean section, Iran.

Background and aims: This prospective randomized double blind clinical trial conducted to compare the effect of ketamine and midazolam combined with bupivacaine on the onset of sensory and motor block, postoperative analgesia and hemodynamic changes during spinal anesthesia.

Methods: Eighty seven patients randomized into 3 groups. They were schedules for elective cesarean section under spinal anesthesia. All patients received 2.5ml bupivacaine 0.5%. The second local anesthetics were normal saline (0.5ml), ketamine (0.1mg/kg) and midazolam (0.02mg/kg) respectively in control, K and M groups. The onset time of sensory and motor block were evaluated by patient’s ability for hip flexion and blunt pin from T10 to T6 nerve band. Hemodynamic parameters assessed every 5 minutes after anesthetics’ injection. In case of hemodynamic instability patient was given Efedrin. All patients received diclofenac suppository postoperatively. Duration of analgesia assessed using visual analog scale. If its score reached more than 4, patient was given petidine (25mg).

Results: Patients were similar in 3 groups regarding demographic characteristics. Patients in K group had the most stable hemodynamic parameters; while onset time of blocks occurred earlier and duration of analgesia was longer in M group (P < 0.05)

Conclusions: Applying combination of midazolam and bupivacaine provides better results in onset time of sensory and motor blocks and postoperative analgesia.

COMBINATION OF FEMORAL NERVE BLOCK AND PERIARTICULAR INFILTRATION ANALGESIA FOR POST-TKA PAIN: AN ALTERNATIVE METHOD TO SCIATIC NERVE BLOCK?


Background: Although femoral nerve block (FNB) is commonly used for postoperative analgesia after total knee arthroplasty (TKA), residual posterior knee pain decreases postoperative satisfaction. Some anesthesiologists have suggested the usefulness of additional sciatic nerve block (SNB) to provide better analgesia. A convenient local infiltration analgesia technique was recently developed by orthopedists to reduce postoperative pain. We assessed the efficacy of periarticular infiltration analgesia (PIA) compared with SNB after TKA.

Methods: After approval by the ethics committee and obtaining written informed consent, twenty-nine patients scheduled for TKA were prospectively randomized into PIA group (n=15) or SNB group (n=14) and received general anesthesia with ultrasound-guided FNB. In the PIA group, 60mL of 0.5% ropivacaine and 0.3mg epinephrine were infiltrated intraoperatively into the periarticular soft tissue before inserting the components. In the SNB group, patients received ultrasound-guided SNB with 0.375% ropivacaine 20mL and periarticular infiltration with 20mL of normal saline and 0.3mg epinephrine. Patients were postoperatively medicated with 60mg of lornoxicam sodium three times a day. We evaluated performance time for each analgesic technique, postoperative pain scores, frequency of rescue analgesics and side effects for 36 hours.

Results: There were no significant differences between the groups in pain scores (VAS< 30mm), frequency and time of first administration of rescue analgesics, and side effects. Performance time of periarticular infiltration was significantly shorter than that of SNB (p< 0.01).

LOCOREGIONAL ANESTHESIA IN VASCULAR SURGERY: CASE REPORT OF MULTIPLE PERIPHERAL BLOCKS.

F. Gobbi, B. Lavezzo, P.P. Donadito, Italy.

Background and aims: Most of the patient in vascular surgery are old, very critical due to the vascular disease with important anticoagulant therapy. The use of loco regional anesthesia techniques drastically decrease the number of general anesthesia improving the morbidity and mortality rates. Peripheral Blocks can be considered above all when Central Blocks are contraindicated.

We practice, on a 82 male patient, Multiple Peripheral Blocks in the left lower limb for a femoral-popliteal bypass. At 30 years old he had a tibia-vertebral transplant for osteomyelitis who made unrecognizable anatomy of the lumbar making it impossible for a Central Block.
He had a severe COPD treated with bronchodilators. In 2004 he has undergone an operation for cerebral aneurysm.

Methods: Under US guidance (linear probe 6-13 MHz) was performed a Femoral Block (Levobupivacaine 0.5% 15ml), Obturator Block (Levobupivacaine 0.5% 10ml), Subgluteal Sciatic Block (Levobupivacaine 0.5% 15ml) with ultrasonography evidence of a good spread of LA.

Results: The Blocks were successful.

The patient was in spontaneous breathing with minimal sedation with Remifentanil and Propofol TCI.

The hemodynamic and respiratory parameters remained stable throughout the surgery lasted 150min.

Postoperative pain therapy was only paracetamol 4 gr/die.

Conclusions: Peripheral Blocks are good alternative to Central Blocks or General Anesthesia in vascular surgery of the lower limb, especially in cases where both techniques are contraindicated, frequent occurrence in a population getting older and using anti coagulated therapy.

The use of US provides greater safety and efficacy of the blocks.

535

ANALGESIA IN FRACTURES OF THE FEMORAL NECK: IT IS TIME TO TAKE THE FASCIA ILIACA COMPARTMENT BLOCK TO THE FRONT DOOR

R. Goss

Background and aims: Analgesia in femoral neck fractures can be challenging. Increasingly, hospitals are introducing care pathways in an attempt to standardise and improve care. Many of these pathways include a nerve block for acute pain management. Because of its ease of administration, the Fascia Iliaca Compartment Block (FICB) is a tempting choice. The aim of this literature review was to clarify whether or not the FICB is as safe and effective as other nerve blocks (femoral nerve or three in one block), and whether there is concrete evidence that nerve blocks improve pain and other outcomes.

Methods: Review of literature focusing on comparisons between systemic analgesia and nerve blocks, comparisons between different nerve blocks, and safety profiles of available techniques.

Results: Pain is reduced by all three nerve blocks, with no firm evidence that any specific block is best. There is no firm evidence that nerve blocks reduce morbidity or mortality. The safety profile of the FICB is excellent.

Conclusions: The FICB can be recommended as a safe and effective way to provide excellent analgesia in femoral neck fractures. It requires no specialist equipment, and is simple to teach. Anaesthetists should encourage and support our emergency departments in delivering the FICB as soon as the diagnosis of femoral neck fracture is confirmed, possibly as part of a fractured neck of femur pathway.

536

EFFECT OF BILATERAL ILIOINGUINAL AND LOWER RECTUS SHEATH BLOCKS ON PAIN SCORES AND PONV FOLLOWING TAH

M. Gupta, S. Cheema, P. Gupta

Background and aims: The aim of our audit was to ascertain the impact of analgesic regimens on the incidence of postoperative nausea and vomiting (PONV) and pain after total abdominal hysterectomy (TAH) with a planned incision.

Methods: Data was collected retrospectively for all patients who had elective TAH over a 3 year period (2006 - 2009). The patients were identified to the common application of epidural anesthesia in veterinary medicine is to allow diagnostic, obstetrical, and surgical intervention. The present study aimed to directly compare the time of onset and duration of analgesia produced by a tramadol and lidocaine-tramadol combination with that produced by lidocaine administration in the epidural space of goat.

Methods: Epidural anesthesia was produced in seven healthy male goats by lidocaine and with two weeks intervals repeated by combination of lidocaine-tramadol and tramadol alone. Time to onset and duration of analgesia were recorded. Body temperature, heart rate and respiratory rate were recorded at 0 min (baseline) and at 5, 10, 15, 30, 60, 75, 90, 105 and 120 min after the epidural administrations of each treatment. Analgesia was defined as lack of a response to pin prick test and pressure from hemostat clamp applied first in the perineal area and then moved cranially toward the thoracic region until a response was observed.

Results: The tramadol produced a significant (p< 0.05) longer duration of analgesia than lidocaine alone and lidocaine-tramadol combination. Also, lidocaine-tramadol combination produced a significant (p< 0.05) longer duration of analgesia than lidocaine alone. Complete analgesia began more delayed in the tramadol treatment than lidocaine-tramadol and lidocaine alone. The combination of lidocaine-tramadol produced anesthesia of longer duration than lidocaine and the onset time was approximately same as for the lidocaine group.

Conclusions: Utilizing this combination, long duration of anesthesia could commence relatively soon after epidural injection and might be used without re-administration of anesthetic agent in long-duration obstetrical and surgical procedures.

538

WRONG SITE PERIPHERAL NERVE BLOCKS: A SURVEY OF PRACTICE AND PROPOSED ALERT CARD

V. Halikar

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Wrong site peripheral nerve block (PNB) is an error with a potential for patient harm (1). In spite of implementation of WHO surgical safety check list, it is recurrent (2).

Methods: We surveyed 40 anaesthetists in our department, practicing PNBs regularly. We compared current practice and opinion against the key elements of the Universal Protocol by Joint Commission of the USA (3).

Results: 50% of the respondents have performed a wrong site PNB in their career. 52% believed that pre-anesthetic site verification alone is sufficient to prevent a wrong site PNB. No one uses their own site marking, however 30% believe it should be used and 50% want to rely upon surgical site marking. Only 5% of the respondents performed a “time out” for the final check, whilst 55% want to use a time out. 30% believed that a consent form signed by patient and the anaesthetist will be an useful document.

Discussion: Wrong site nerve block is an error of multifactorial origin (4). Individual practice for prevention is variable and vulnerable. Pre-procedure site verification, site marking and “time out” are essential steps (2). We designed a plastic alert card (50 × 80 mm) to remind anaesthetists to use marking and time out and will be attached to nerve identification equipment.

References:
1. SM Rupp; Unintentional wrong - sided peripheral nerve block; Regional Anaesthesia and Pain Medicine; 2008; 33,2
2. SALG Safety notification; www.rcoa.ac.uk/index
4. O’Neill T; Preventing wrong site peripheral nerve block; J Clin Anesth. 2009,05.003, 74-77.

539 ROLE OF ELECTRICAL STIMULATION THRESHOLD IN ULTRASOUND-GUIDED SCIENTIFIC NERVE BLOCK
K. Hara1,2, S. Sakura, N. Yokokawa, A. Shido, Y. Saito, Japan.

Background and aims: Ultrasound-guided nerve block has become popular, yet we still use nerve stimulation combined with ultrasound image especially for blocks of deeply-located nerves such as the subgluteal region sciatic nerve. However, the efficacy of nerve stimulation in ultrasound-guided sciatic nerve block is unknown. We tested the hypothesis that low current stimulation threshold could lead to rapid onset of ultrasound-guided subgluteal sciatic nerve block.

Methods: After obtaining approval from our IRB, we reviewed records of patients who received ultrasound-guided subgluteal sciatic nerve block using 20 ml mepivacaine 1.5% with epinephrine for 18 months. An insulated needle was placed adjacent to the nerve with ultrasound image. Then, a nerve stimulator was turned on and the minimal current producing a motor response was measured. When the minimal current was < 1 mA, the anaesthetic solution was injected. Sensory and motor blockade were assessed until 30 minutes. Patients were divided into low current (< 0.5 mA) and high current (≥ or = 0.5 mA).

Results: Analysed data from 143 patients revealed the low current group consisted of 62%. The proportions of patients who developed sensory block on the territory of the superficial peroneal, sural, and tibial nerve, and motor block of ankle were higher in the low minimal current group than in the other group at 20 minutes. Block duration was similar between groups.

Conclusions: When ultrasound-guided subgluteal sciatic nerve block was conducted with nerve stimulation, the current threshold < 0.5 mA resulted in rapid onset of blockade.

540 UNUSUAL SONOGRAPHIC FINDINGS OF THE BRACHIAL PLEXUS IN A PATIENT WITH A FORM OF CHRONIC INFLAMMATORY HYPERPLASTIC POLYNEUROPATHY

Background and aims: Ultrasound-guided peripheral nerve blockade has become the preferred method of nerve location in many academic institutions throughout North America. Direct ultrasonographic visualization of neural structures provides a greater appreciation of normal anatomical variation, along with an opportunity to visualize pathologic structural alterations in peripheral nerves. We present a case in which the ultrasonographic appearance of the roots and trunks of the brachial plexus could be easily confused with large vascular structures.

Case: A 57 year old woman with a 5 year history of a polyneuropathy of uncertain etiology, presented to the emergency room after falling and sustaining a peri-prosthetic humeral fracture, and was scheduled for elective surgical repair. While scanning her right brachial plexus region, in preparation for an interscalene block, we noted massively enlarged cervical nerve roots with a diameter similar to the adjacent carotid artery. Color Doppler interrogation of these structures did not reveal any blood flow. She subsequently underwent ultrasound-guided interscalene block with 30 ml of 0.5% ropivacaine with 1:4000 epinephrine.

Discussion: Although enlargement of peripheral nerves associated with certain forms of Charcot Marie Tooth and Chronic Inflammatory Demyelinating Polyneuropathy disorders has been described in the medical literature, this has not previously been reported in the anesthesiology literature in conjunction with ultrasound guided brachial plexus blocks. Despite the unusually large nerve diameters observed on ultrasound, using a standard local anesthetic solution did not result in an abnormally long duration of action nor subsequent temporary or permanent sensorimotor deficits.

541 ASSESSMENT THE EFFECT OF NITROGLYCERINE AND DEXAMETHASON AS AN ADJUTANT TO LIDOCAINE IN PATIENTS SCHEDULED FOR CLOSE REDUCTION OF FOREARM FRACTURE
E. Hassani, Iran.

Background and aims: The disadvantages of intravenous regional anesthesia (IVRA) include slow onset, poor muscle relaxation, tourniquet pain, and rapid onset of pain after tourniquet deflation. In this study, we evaluated the effect of nitroglycerin (NTG) and dexamethason in quality improvement when added to lidocaine in IVRA.

Methods: 75 patients (20-50 yrs), were randomly allocated in three equal groups. Under identical condition, the control group received a total dose of 3mg/kg of lidocaine 2% diluted with saline, the group N received an additional 200 μg NTG, and the groupe D recived an additional 8mg dexamethason. Vital signs and tourniquet pain, based on visual analog scale (VAS) score were measured and recorded before and 5, 10, 15,30, and 60 minute after anesthetic solution administration. The onset times of sensory and motor block were measured and recorded in all patients.

Results: The sensory and motor block onset time were shortened in group N (2.50 vs. 5.00 and 4.25 vs. 7.07 min, respectively) (p < 0.05) and groupe D (2.58 and 4.45 vs. 5.00 and 7.07 min, respectively)(p < 0.05). The recovery time of sensory and motor block and onset of tourniquet pain were also prolonged in groupe N (7.10 vs. 3.35, 9.55 vs. 3.60 and 26 vs. 16.00 min, respectively) (p < 0.05) and groupe D(7.2,9.40 and 24 vs. 3.35, 3.60 and 16 min, respectively) (p < 0.05). Analgesia time after tourniquet deflation was prolonged and tourniquet pain intensity was lowered in study groups (p < 0.05).

Conclusions: The NTG and dexamethasone adding to lidocaine in intravenous regional anesthesia shortens onset times of sensory and motor block and decreases the tourniquet and postoperative pain, without any side effect.

542 PAINFUL SHOULDER SURGERY AND SUPERCLAVICULAR BLOCK IN SHOULDER
A. Hernandez, Random Patients, Mexico.

For many years we have used clinical methods for supraclavicular block with lidocaine 5 mg per kilo of weight. In the past 3 years, 48 patients studied, the methods were as follows: 50% with superficial block and sedation, 30% blockade and heavy sedation and 20% was blocking and intravenous
Conclusions: Pain scores on movement at 6 hours post-subarachnoid block

We conducted a prospective audit over a 2 week period. Patients
Although complex, an evolutionary score adequately reflects major 

Overall, the patients were highly satisfied with our service. 

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Belgium. 
The casenotes of 18 patients were analysed but 2 did not meet 
or 1) according to extent of use. Response rate was 93%. 

From a national questionnaire, we have developed an "evolu-

The use of PNBs may be increasing
*

INGUINAL HERNIA REPAIR

interval opiate also did not significantly differ between the 2 groups. Oxycodone received in the 24 hours following TKA, and the time to first 
tive morning did not significantly differ between the groups. The dose of 
did not differ significantly between the FIC group (Median 0.00) and the 
(0.00 vs 5.00) p = 0.023. Pain scores at rest at 6 hours post-SAB 
(P<0.05). Pain scores on the first postopera-
tive morning did not significantly differ between the groups. The dose of 
Oxycodeone received in the 24 hours following TKA, and the time to first 
interval opiate also did not significantly differ between the 2 groups. 

**Conclusion:** These results support increased utilisation of FICB for TKA. Further research is required to elucidate whether FICB affords improved 
analgesia without intrathecal opiate, and whether that analgesia is superior 
to intrathecal opiate or femoral nerve blockade.

**545**

**PATIENT SATISFACTION FOLLOWING AXILLARY BLOCK 
FOR DAY CASE HAND SURGERY**

S. Jagannathan, C. Blunt, R. Gowni

**Background and aims:** Axillary block is an effective form of anaesthetic for patients who undergo day case hand surgery. The introduction of block 
area has ensured minimal interruption of the list and better patient expe-
tience. The aim of our audit was to assess the satisfaction of our patients 
who undergo axillary block for day case hand surgery.

**Methods:** We conducted a prospective audit over a 2 week period. Patients were requested to fill in a questionnaire before discharge. The questionnaire 
cluded detailed information on preoperative information provided, experience in the block area and theatre, overall satisfaction and suggestions for service 

**Results:** All patients (n=33) were seen by anaesthetic team preoperatively. 11/33 patients felt that an anaesthetic information leaflet would have been useful. None of them experienced significant pain or paresthesia during the block. 5/33 patients waited for >1 hour after they were block ready to go 
to theatre. All patients had their surgery completed under axillary block with 
no need for general anaesthesia. 4/33 patients were uncomfortable during the procedure unrelated to the surgery (lying flat/back pain/hip pain/ 
feeling cold).

**Conclusions:** Overall, the patients were highly satisfied with our service. The following were the recommendations from our audit.

1. Consider anaesthetic information leaflet.

2. Better communication to minimise the patient waiting time in the block 
area.

3. Consider warming all the patients irrespective of the duration of surgery.

4. Consider intra-operative entertainment - (music/wall mounted TV for 
patients)

**546**

**BENCHMARKING THE USE OF PERIPHERAL NERVE 
BLOCKS (PNBs): AN EVOLUTIONARY SCORE**

K. Jensen, I. Henriksen, J. Borgholm, Denmark.

**Background and aims:** The use of PNBs may be increasing, but implementation in clinical practice is a challenge. The issue seems to be 
organizational. Academic organisations such as ESRA and ASRA have 
published guidelines for PNB practice, but such guidelines often fall 
short in the real world. Hospitals gradually develop organizational 
changes that inspire the use of PNBs, but a benchmarking tool has been 
lacking.

**Methods:** From a national questionnaire, we have developed an "evolu-
tionary score" for the extent of PNB use by standardized criteria (Table 1). These criteria aim to rank the institutions on a broad scale to join complex 
differences in organization and initiative.

**Results:** Although complex, an evolutionary score adequately reflects major 
regional differences in PNB use in Denmark (Table 1). Each item is desig-
nated a value (0, ½ or 1) according to extent of use. Response rate was 93%.

The score was unrelated to the size of the institutions.
Conclusions: A benchmarking tool is essential to compare the evolution of PNB use in anesthesia departments. The evolutionary score may highlight regional differences and increase best practice dissemination.

References:

547 DURATION OF ULTRASOUND-GUIDED PERIPHERAL NERVE BLOCKS
Background and aims: Duration of peripheral nerve blocks (PNBs) depends on local anesthetic pKa value, lipophilicity, concentration, guidance method, pain intensity, and vascular washout. The importance of anatomic location is undetermined. In studies using ropivacaine or levobupivacaine, duration of lower extremity PNBs seems to outlast upper extremity PNBs (13-18 hours vs 12 hours).1-3 We wanted to investigate if the anatomic location determines duration of sensory block using similar local anesthetic, concentration and guidance method.
Methods: A prospective cohort of 246 patients having a PNB at our orthopaedic day surgery unit were contacted postoperatively to ascertain block duration. All PNBs were administered by ultrasound guidance with ropivacaine 0.75%, 15-25 ml.
Results: Graph 1 displays a Kaplan-Meier graph of the duration of sensory nerve block after upper (interscalene and infraclavicular) and lower extremity (femoral, sciatic and popliteal) blocks.

Conclusions: Median durations of sensory block clearly vary by anatomic location (12 vs 18 hours; p<0.0001). This may be due to differences in neural structure, sheaths or vascular washout dynamics and deserves further investigation.

References:

548 LOW-VOLUME ULTRASOUND-GUIDED INTERSCALENE NERVE BLOCK FOR REDUCTION OF DISLOCATED SHOULDERS: 15 CASES AND A SHORT TOPICAL REVIEW
S. Bach, K. Jensen, J. Borglm, Denmark.
Background and aims: Reduction of dislocated shoulders often necessitates systemic analgesics and sedatives. An interscalene nerve block may accomplish pain-free reduction allowing for early discharge. The applicability of ultrasound-guided (USG) administration of 10 ml lidocaine 2% between C5 and C6 was tested. We hypothesized that this method would prove efficient in the emergency department (ED), allowing for fast reduction and early discharge.
Methods: Consecutive ED patients with confirmed dislocated shoulder joints, in which conventional attempts at reduction had failed. A Medline search was carried out to complete the review (Table 1).
Results: 15 patients aged 21-93 years were included. 14 patients had analgesic effect within 2-14 minutes. Eleven reductions were without pain. Four patients underwent surgery; three because of old trauma with capsular changes, and one because of fracture. All patients with successful reductions were discharged following x-ray confirmation. There were no adverse events.

Conclusions: Low volume USG interscalene nerve blocks provided excellent conditions for painless reduction in less than 14 minutes after block placement. However, patients presenting older date dislocations had to be surgically reduced. Low volume interscalene nerve blocks are feasible in the ED and deserve wider recognition in patients with dislocated shoulders.

References

549 A COMPARISON OF VERTICAL INFRACLAVICULAR AND CORACOID APPROACHES TO THE BRACHIAL PLEXUS
K. Koltka, Y. Yenigün, S. Kıcükgöncü, T. Özkan-Seyhan, M. Şentürk, Turkey.
Background and aims: Despite several risks, infraclavicular approaches to the brachial plexus gained popularity. The present study compared success rates, block performance times, block onset times, and frequency of adverse effects of vertical infraclavicular (VIB) and coracoid blocks (CB) in patients undergoing forearm and hand surgery.
Methods: After ethical committee approval and informed consent 40 patients undergoing forearm and hand surgery were included. The brachial plexus was located using a nerve stimulator and an insulated pencil point

Conclusions: Median durations of sensory block clearly vary by anatomic location (12 vs 18 hours; p<0.0001). This may be due to differences in neural structure, sheaths or vascular washout dynamics and deserves further investigation.

References:
neurolysis. Thirty ml bupivacaine 0.5% was used for the block. The blocks were assessed every minute for the first 5 min, then every 5 min for 15 min and then every 15 min and at the end of the operation.

Results: Time to perform block was shorter in group VIB (median 10 min vs 5 min). Block onset time of groups were similar. Higher rates of sensory block were found in group CB at the 5th, 10th, 15th and 30th minutes of assessment. Also higher rates of motor block were found in group CB at the 5th, 10th, 15th and 30th minutes of assessment. One patient in CB group required general anaesthesia. Except two vascular punctures in group CB no other side-effects were observed. Conclusions: Although more time consuming CB provided higher rates of sensorial and motor block in a similar onset time and without serious complications. CB can be accepted as a safe and reliable alternative to any brachial plexus block for forearm and hand surgery.

550 INTERPLEURAL BLOCK FOR BREAST SURGERY
K.K. Koneti, A. Jayaraman, M.K. Varma

Background and aims: Patients undergoing breast surgery have high incidence (as high as 60%) of post operative nausea and vomiting (PONV), which is further increased by the administration of morphine for perioperative pain relief. This audit is aimed to assess the requirement of morphine for pain relief, incidence of PONV and patient satisfaction following breast surgery supplemented with Interpleural block.

Method: After local audit committee’s approval, prospective audit of 48 patients undergoing elective breast surgery under general anaesthesia (GA) supplemented with Interpleural block looking at the analgesic requirement, incidence of PONV and patient satisfaction was done. Patients followed up post-operatively in recovery and ward.

Results: A Pain scores in recovery (Numerical Rating Scale): 35.4% patients had no pain in recovery, 58.33% had mild pain (NRS 1-3) and 6.25% had moderate pain (NRS 4-6) Morphine requirement: Intra Op: 0-5mg Morphine (8.3%) Recovery: 0-10 mg Morphine (33.33%); 11-20mg Morphine (6.25%) Total Morphine in first 24 hrs in ward: nil (85.41%); 0-10mg (10.42%); 11-20mg (4.16%) B. PONV: Only 14.58% patients had PONV and required anti emetics in the ward.

C. Patient satisfaction with anaesthesia: excellent (52.1%); satisfactory (20.1%); somewhat unsatisfactory (6.25%); No comments (20.83%)

Conclusion: We found that inter pleural block is a safe and effective mode of pain relief following breast surgery with significant reduction of PONV and high patient satisfaction rate. Supplemental regional anaesthesia also reduces the malignancy recurrence and hence with all the above benefits, Interpleural block is a good choice along with GA.

551 ULTRASOUND GUIDED INTERSCALENE BLOCK FOR SHOULDER ARTHROSCOPY: DO DIFFERENT TYPES OF NEEDLES AFFECT THE QUALITY OF BLOCK AND PATIENT SATISFACTION?
M. Koutra, N. Shah, M. Sebastian, M. Stanislas, I. Suri

Background and aims: Needle visualisation is the keystone for safety and efficacy of Ultrasound guided regional anaesthesia (UGRA). The aim of the present study was to evaluate three different needles that are currently used to perform UGRA.

Methods: Twenty eight consecutive patients (15 males, mean age 52.82 (SD 17.64) years) were prospectively assessed. All patients were ASA I & II and underwent arthroscopic shoulder surgery under General anaesthesia and ultrasound guided single shot interscalene brachial plexus block. Three different types of needles were used: PolymedicUPC 22GX50mm, Pajunk-UniplexNanoline 22GX50mm, StimuplexA 21Gx50mm. Standard volume of 25ml 0.375% levobupivacaine and standard intra-operative analgesia was used. The following outcomes were assessed: number of skin punctures, complication rates, pain scores and perioperative analgesic requirements, the duration of block and patient satisfaction scores.

Results: There was no statistically significant difference among the groups in terms of the number of skin punctures, bruising at puncture site, amount of morphine given intra-op, pain score in recovery, morphine requirements in recovery, frequency of Horner’s syndrome, phrenic nerve involvement, pain score the first and second post-op day, duration of block and patient satisfaction (p≥0.128). There was however significant difference in morphine requirements within the first twenty-four hours with the polymeric group needing less than the others (12.3% vs ≥ 77.8% p=0.01).

Conclusion: The present study demonstrated that there was no statistically significant difference between different types of needles and clinical outcomes of ultrasound guided interscalene blocks. Larger studies may be required to establish a significant difference if any.

552 PROSPECTIVE AUDIT OF COMPLICATIONS RELATED TO PERIPHERAL NERVE BLOCKS

Background and aims: Peripheral nerve blockade has been shown to provide excellent anaesthesia and analgesia. However, it has potential complications. We aim to assess the efficacy and complication rates associated with peripheral nerve blocks in our centre.

Methods: Details of all patients receiving peripheral nerve blockade in a single institution from November 2008 to October 2009 were recorded. They were followed-up on Day 1 and between Day 7 to 10 postoperatively. Data was collected prospectively including potential complications from nerve blocks. Neurological consults and further testing were arranged for patients with persistent neurological symptoms.

Results: 626 patients received a total of 727 peripheral nerve blocks in 1 year, of which the majority (67.4%) are ultrasound-guided. One patient (0.16%) had respiratory depression following a supraclavicular nerve block. There were no patients who experienced local anaesthetic toxicity upon block administration. Three patients (0.48%) had neurological symptoms requiring follow-up. One patient (0.16%) was found to have ulnar nerve demyelination after brachial plexus block for shoulder surgery. Two patients (0.32%) had persistent numbness after ilioinguinal nerve block for inguinal hernia repair, eventually attributed to neuropraxia. Another patient had the local anaesthetic infusion erroneously connected to the peripheral intravenous access but fortunately did not have overt symptoms of local anaesthetic toxicity.

Conclusions: Complications arising from peripheral nerve blockade are rare. The incidence of neurological complications (0.48%) in our centre is similar to the results of other prospective audits.

553 ULTRASONOGRAPHIC QUANTIFICATION OF NERVE VISIBILITY IN OBESE PATIENTS - PRELIMINARY RESULTS
B.A. Lubsycz, E. Fleischmann, S.C. Kettner, G. Prager, P. Marhofer, Austria

Background and aims: Obesity increases the complication rate of general anaesthesia. Therefore obese patients may profit from regional anaesthesia. Correct ultrasound nerve visualization is an insurance of safe and effective regional anaesthesia. The rationale of nerve visualization in ultrasound is the difference in echogenicity between nerves and surrounding tissues. Analysis of differences in greyscale enables quantification of nerve visibility. Accordingly, we compared differences of greyscale between median nerve and surrounding tissue in lean and obese patients.

Methods: After approval of the local ethics committee, we investigated median nerves in lean and obese females to quantify nerve visibility in ultrasound. We stored ultrasound pictures on a Sonosite M-Turbo® machine, and exported the pictures to Photoshop® image processing software to analyze for greyscale differences. For greyscale analysis the frequency distribution of all density values (0 for black, 255 for white) was used.

Results: The two populations were comparable regarding age, height and cross sectional area of the median nerve. Body mass index was higher (BMI 39 ± 9 kg/m²; n =11 versus BMI 21 ± 2 kg/m²; n=9) and depth of the median nerve was deeper in obese compared to lean patients. Greyscale differences between the median nerve and the surrounding tissue were lower in obese compared to lean patients (33.5 versus 30.5, P = 0.03).

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Conclusions: Grey-scale analysis objectifies difficulties in ultrasound nerve visualization in obese patients. The decreased visibility of nerves in obese patients may be the main cause for the high incidence of peripheral block failure in this population.

554 POSTERIOR TIBIAL NERVE SENSORY BLOCKADE PROLONGED BY ADDING DEXMEDETOMIDINE TO ROPIVACAINE
M. P. Malenfant Rancourt, Canada

Background and aims: Dexmedetomidine, an α₂-receptor agonist, prolongs analgesia when used in neuraxial and IV blocks. We evaluated whether dexmedetomidine added to ropivacaine for tibial nerve block increases the duration of sensory blockade.

Methods: For this prospective, randomized, double-blind cross-over trial, fourteen volunteers were allocated to two groups. One group received an echoguided tibial nerve block with 10 ml of 0.5% ropivacaine (group R); the other group received a 10 mL solution of 0.5% ropivacaine with 1 mcg/kg of dexmedetomidine (group RD). After the injection, monitoring of vital signs, onset and resolution of sensory block and level of sedation was performed. Three weeks later, patients were allocated to the other group in a cross-over fashion.

Results: Sensory block lasted longer in group RD (21.5 vs 16.2 hours; P < 0.0001); onset times were similar between groups. At 1, 2, 4, 6, and 8 hours, systolic blood pressure levels were lower in group RD (P < 0.01). Diastolic blood pressure levels in group RD were lower at 1, 2, 4, 6, and 14 hours (P < 0.02). Heart rates were lower in group RD at 1 hour (P = 0.005). A sedative effect was observed in group RD for the first 4 hours after the injection. SpO₂ was similar among groups.

Conclusions: Dexmedetomidine added to ropivacaine for tibial nerve block prolongs the duration of sensory blockade. However, it may lower blood pressures and heart rates, and lead to sedation.

555 IS COMPETENCE IN REGIONAL ANAESTHESIA ESSENTIAL?
A. McEwen, D. Connor, N. Damluji, I. Wilson

Background: Peripheral nerve blocks can provide valuable alternatives to general or neuraxial anaesthesia when these techniques are contraindicated. Is competence in regional anaesthesia therefore essential for general on-call Consultant anaesthetists?

Methods: We sought to canvass opinion on which (if any) regional anaesthesia blocks should be regarded as essential skills for Consultants participating in general on-calls in a typical District General Hospital.

We specified the latter because of the potential for scenarios to occur where general or neuraxial anaesthesia might be contraindicated and ability in regional anaesthesia required.Consultants were surveyed from four trusts within our region: Derriford hospital, Plymouth; Torbay hospital, Torquay; The Royal Devon and Exeter hospital, Exeter and Musgrove Park hospital, Taunton.

Results: A total of 82 Consultants were surveyed, a mean response rate of 85%. Of these 15% considered no blocks to be essential. However, the vast majority (85%) believed that general on-call Consultants should be able to perform at least some blocks, and 6 were considered essential by more than half of those surveyed (table 1).

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<tr>
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<th>Rank</th>
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<tr>
<td>Femoral</td>
<td>64 (78)</td>
<td>1st</td>
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<tr>
<td>Ankle</td>
<td>56 (68)</td>
<td>2nd</td>
</tr>
<tr>
<td>Axillary</td>
<td>50 (61)</td>
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<td>Pyriform</td>
<td>48 (59)</td>
<td>4th</td>
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<tr>
<td>Bio-inguinal</td>
<td>46 (56)</td>
<td>5th+</td>
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<tr>
<td>Sciatic</td>
<td>46 (56)</td>
<td>5th+</td>
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[Table 1. Essential Blocks]

Conclusions: According to the consensus opinion of this survey, all Consultant anaesthetists participating in general on-calls should be able to perform the 6 blocks listed in table 1.

556 MRI STUDY OF SUPERFICIAL AND MEDIAL CERVICAL BLOCK
D. Nalos, Czech Republic

Background and aims: The aim of the study was to clarify the distribution of injected solution after superficial cervical plexus block and medial cervical plexus block.

Methods: 12 volunteers were randomly assigned to receive either a single injection superficial cervical plexus block (methods described Murphy group A) or a single injection medial cervical plexus block at C3 (group B). Puncture site for medial block were in the middle of the posterior border of sternocleidomastoid muscle and needle is inserted approximately 5 mm below the muscle. This technique was described as medial cervical block. We used 20ml of normal saline solution in both groups. C1-T1 MRI was done 20 minutes after the injection.

Results: Group A: Normal saline solution did not reach interfascial space in two volunteers. In four volunteers solution was distributed in interfascial space, but did not reach the front part of this space. Group B Normal saline solution was found distributed in whole interfascial space in all volunteers. Solution reached attachment of medial scalene muscles to cervical vertebrae which is the space near of proper deep cervical nerve block.Intended injection of local anesthetic below the medial cervical fascia just below sternocleidomastoid muscle is able to fill the interfascial space up and provide successful block of cervical plexus without the necessity of the deep cervical block.

Conclusions: In some patient superficial cervical block is associated with the leak of local anesthetic underneath the medial cervical fascia and distributes in interfascial space. Intended injection of local anesthetic below the medial cervical fascia just below sternocleidomastoid muscle is able to fill the interfascial space up. The necessity of the deep cervical block for carotid surgery will be examine in the next paper.

557 MEDIAL CERVICAL BLOCK FOR CAROTID ENDARTERECTOMY
D. Nalos, Czech Republic

Background and aims: A method is presented describing ultrasound guided block of the cervical plexus in the interfascial space where individual anterior upper cervical nerve roots form subsequent peripheral nerves of the cervical plexus.

Methods: Cervical plexus block is a common method of regional anesthesia for carotid endarterectomy obligatory combining superficial and deep cervical block. The deep block is associated with statistically significant increase in serious complications. The article describes our experience with ultrasound guided medial cervical block based on anatomical studies of the cervical fascial structures and their behavior related to fluid injections in 50 patients undergoing carotid endarterectomy.

Ultrasound guidance enables precise identification of local anesthetic application space, reduces the likelihood of nerve injury, intravascular application and the volume as well as the dose of local anesthetic. The method enhances the advantages of superficial while avoiding the risks of deep cervical plexus block.

Results: Preliminary results noted no complications related to the medial cervical plexus block and detailed evaluation is still in progress. Supplementary local anesthetic solution has been applied on 19th patients. Only one patient underwent tree supplementation of local anesthetics. None of patients underwent method of general anesthesia.

Conclusions: The method is advantageous in precise delivery of local anesthetic to the desired space of peripheral nerve origins from cervical nerve roots. The consequent dose reduction reduced potential local anesthetic toxicity and risks while not compromising anesthesia and analgesia or increasing the rate of surgical complications.
558 TOURNIQUET PAIN DURING UPPER LIMB SURGERY UNDER ULTRASOUND-GUIDED AXILLARY BRACHIAL PLEXUS BLOCK

M. Narayanan, A. Soodan, I. Ahmad

**Background and aims:** One of the limitations of using a tourniquet in awake patients is the development of tourniquet pain. Blocking the musculocutaneous and radial nerves has been advocated to decrease the incidence of tourniquet pain during surgery under axillary brachial plexus blocks. We report the incidence of tourniquet pain in awake patients with upper limb surgery under ultrasound guided axillary brachial plexus block.

**Methods:** Over a period of nine months, eighty-six patients were included in the audit who under-went upper limb surgery under ultrasound guided axillary brachial plexus block. We blocked the musculocutaneous, median, ulnar, radial nerves and medial cutaneous nerve of the arm in all these patients. All patients stayed awake and were not given any sedation. A pneumatic tourniquet was used and the pressure of the tourniquet was maintained at 250 mm Hg. The tourniquet times, incidence of any tourniquet pain or discomfort was recorded. The measures taken to relieve the tourniquet pain or discomfort were also recorded.

**Results:** The tourniquet times varied from 5 to 169 minutes (mean 50.9). Tourniquet pain was reported in 1 patient and tourniquet had to be deflated a few minutes earlier and mild discomfort was reported in 2 patients who did not need any sedation or analgesia for the discomfort.

**Conclusions:** The effective block of the musculocutaneous, radial and medial cutaneous nerve of the arm during ultrasound guided axillary brachial plexus blocks decreases the incidence of tourniquet pain.

559 THE EFFECT OF LUMBOSacRAL PLEXUS BLOCKS ON THE EARLY POSTOPERATIVE COGNITIVE FUNCTIONS

G. Polat, K. Kaya, A.B. Çağuş, Ö. Gülbahar, Turkey.

**Background and aims:** Postoperative cognitive dysfunction (POCD) is a fairly common situation especially in elderly patients undergoing major surgery. Whether the effects of anesthesia techniques on the development of POCD studies conducted are focused on general anesthesia and central blocks. We aimed to research the effects of anesthesia techniques on the development of the early POCD with mini mental status examination (MMSE) and blood levels of neuron specific enolase (NSE) and S 100B protein.

**Methods:** After obtaining local ethical committee approval, study carried out on 62 total knee arthroplasty patients, between the ages of 50-85, ASA-III risk group and who agreed to take part. Applied to cases were divided into three groups according to the technique of anesthesia: general anesthesia on Group-I(n=21), spinal anesthesia on Group-II(n=21) and lumbar plexus-sciatic nerve block on Group-III(n= 20). MMSE had been applied and NSE and S 100B protein levels were measured preoperatively and on 24th hour postoperatively.

**Results:** Postoperative MMSE scores were significantly lower in general anesthesia group and also reduction in postoperative MMSE scores and the postoperative scores of MMSE being under 23 have been found to be positively correlated with general anesthesia. All in three groups postoperative values for NSE and S100 β protein, are significantly higher than preoperative values, but no significant difference between groups has been indicated.

**Conclusions:** The selected method of anesthesia has an effect on the development of POCD. Regional anesthesia methods have been found more positively related with postoperative improvement on the cognitive functions. A significant difference was not determined among the regional anesthesia techniques in terms of development POCD.

560 NATIONAL SURVEY OF ULTRASOUND GUIDED REGIONAL ANAESTHESIA TRAINING IN THE UK

K. Ponnusamy, M. Narayanan, R.G. Kanagavelu, A. Venkataramu, K. Kone

**Background and aims:** Ultrasound Guidance for Regional Anaesthesia (UGRA) has revolutionised the practice of regional anaesthesia. We aimed to find out the training opportunities available in the UK through our national survey.

**Methods:** Trainees were sent an online questionnaire through their deaneries containing 16 questions pertaining to personal experience, training opportunities in their hospitals and deanery.

**Results:** We received 150 responses. 45% were from senior trainees while 43% were from basic and intermediate level trainees. 48% of the respondents either routinely or frequently performed UGRA, 41% infrequently and 8% had never done UGRA. 14% were confident enough to train others, 23% were confident unsupervised, 38% were confident when supervised and 13% were not confident in UGRA. 45% of the respondents had attended a UGRA workshop, 16% had attended a regional anaesthesia course and 32% had only bedside teaching for UGRA.

73% said that ultrasound was routinely used in their hospital but only 33% said it was widely used and encouraged. 44% of the trainees had dedicated teaching lists in their hospital. 59% had opportunity for an advanced regional anaesthesia training program. 66% of the trainees were aware of ESRA diploma and 18% had already taken part or were planning to take up the diploma.

**Conclusions:**
- Practice of UGRA is widely variable across all regions in the UK.
- The advent of ultrasound has increased the popularity of regional anaesthesia.
- Time pressure, availability of trainers and lack of suitable training lists were cited as reasons preventing widespread use of UGRA.

561 FEASIBILITY OF ULTRASOUND-GUIDED RETROBULBAR BLOCK IN PATIENTS UNDERGOING VITRECTOMY SURGERY

M. Rachinsky, S. Da Silva, S. Ganapathy, J. Gonder, L. Siebert, Canada.

**Background and aims:** The retrobulbar block, described by Atkinson in 1963, is a unique method of providing complete surgical anesthesia and akinesia of the eye and orbit. In 2008, Luyet et al. were able to demonstrate dye spread into the retrobulbar space of cadavers with both ultrasound and CT scans, however, the study was criticized, in part, for not adhering to FDA approved standards of its ultrasound equipment for human eye scans. The aim of this study is to demonstrate feasibility of approved ultrasound device in patients undergoing eye surgery under retrobulbar blockade.

**Methods:** Fifteen patients were included. Retrobulbar block was performed by Atkinson's anatomical landmarks, using 25G (35 mm) retrobulbar block needles, and a mix of 1:1 of 0.75% bupivicaine and 2% lidocaine without epinephrine (5 - 7 ml). Sonosite M-Turbo Ultrasound (Bothell, WA) with L25X/3-16 transducer with specific ophthalmic setting (MI 0.2 and TI 0.0) was used to obtain ophthalmic and needle images in real time.

**Results:** All patients tolerated the block with ultrasound, without complications, and rated the procedure as satisfactory. Relevant orbital content anatomy was clearly identified in all patients. However, the needle was poorly visible. The needle shaft was identified in 2 out 15 patients. Needle tip was not clearly identified prior to injection in none of the patients. Local anesthetic spread was seen in 12/15 patients. Conclusions: Lower powered imaging, 25G needles used in this study, difficulty in maintaining coupling contact with convex eye surface, all were contributing factors to poor visualization of needle.

562 THE EFFECT OF SCALP BLOCKS WITH LEVOBUPIVACAINE ON POSTOPERATIVE PAIN CONTROL AND PATIENT-CONTROLLED ANALGESIA (PCA) CONSUMPTION AFTER CRANIOTOMY FOR ANEURYSMAL CLIPPING: PRELIMINARY STUDY


**Background and aims:** Levobupivacaine is an effective local anesthetic agent for nerve blockade with less systemic toxicity than racemic bupivacaine.

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The effects of scalp blockade with levobupivacaine after craniotomy for aneurysmal clipping have not been investigated.

**Methods:** 10 ASA I or II patients, scheduled for elective craniotomies for aneurysmal clipping, were enrolled in this prospective, randomized, placebo-controlled study. Scalp block was performed by blocking the supraorbital, supratroclear, and auriculotemporal nerves using 12 ml 0.75% levobupivacaine with 1: 200,000 epinephrine (group B, n = 5) or 0.9% normal saline (group S, n = 5). PCA consisted of opioid (fentanyl) and connected to patients. Postoperative headache (VAS), PCA consumption, hemodynamic variables (Heart rate [HR] and mean arterial pressure [MAP]) and the incidence of PONV and respiratory depression were recorded at 1, 2, 4, 8, 12, 24, 48, and 72 hr after alert consciousness (Glasgow coma scale >14).

**Results:** Statistically significant differences in postoperative pain (P = 0.001) and PCA consumption (P = 0.00) over time between the two groups were observed. Postoperative pain scores and PCA consumption were lower in group B than in group S at 1, 2, 4, and 8 hours after alert consciousness (P < 0.05). In addition, an anti-hypertensive agent was less required in group B than in group S (4 for group S vs. 1 for group B) through the difference did not reach statistical significance. There were no complications related to the technique of block or drugs in any of the 10 patients.

**Conclusions:** This study demonstrated than scalp blocks with levobupivacaine effectively relieved postoperative headache and spared postoperative PCA consumption without adverse events. In addition, scalp reduced the requirement of postoperative antihypertensive agent in patients with cranio-tomy for aneurysmal clipping.

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**563 BEST VIEWS: EVALUATION OF DIFFERENT NEEDLES AND ULTRASOUND MDES FOR REGIONAL ANAESTHESIAS**

S. Saha, J. Mukherjee

**Background and aims:** Our aim was to evaluate the image quality of the various needles and ultrasound modes available for ultrasound guided regional anaesthesia at our hospital. The methods: 23 anaesthetists took part in the study. We used a Blue Phantom and Sonosite S-cath to compare 4 options: the B Braun Stimuplex A, B Braun hyperechogenic Stimuplex D+, Pajunk hyperechogenic Sonotap and Sonosite's multibeam enhancement (MBe) mode with the Stimuplex A. The image with each needle was rated as good adequate or poor and ranked best to worst.

**Results:** The Pajunk Sonotap was the overall highest rated although the MBe mode with the Stimuplex A had similar image quality. These were followed by the Stimuplex D+ and finally the Stimuplex A unenhanced.

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<th>Image quality:</th>
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**Conclusions:** Our study demonstrated the superiority of the Pajunk Sonotap needle over the other hyperechogenic needle used by the department, the Stimuplex D+. Although ranked lower, the MBe mode (present on newer Sonosite machines) enhanced visualisation of the Stimuplex A giving a similar image quality to the Sonotap. Therefore we recommend Pajunk hyperechogenic needles or MBe mode with a non-hyperechogenic needle. However given the price difference between the needles, the cost savings of using non-hyperechogenic needles should be considered.

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**564 PSOAS COMPARTMENT BLOCK: HOW TO LIMIT SYSTEMIC SIDE EFFECTS?**

P. Schwarzkopf, H. Rüfft, K. Pracht, Germany.

Background: Psoas compartment block (PCB) is a widely-used technique for anaesthesia and/or analgesia in lower limb surgery. Despite its possible complications, such as total spinal anaesthesia or retroperitoneal haematoma, many physicians utilize a PCB as an effective locoregional anaesthetic technique reaching the three main nerves of the lumbar plexus.

**Methods:** Nerve stimulation guided PCB is routinely offered to patients undergoing total hip arthroplasty in our hospital. In general 30 ml of prilocaine 1% combined with 10 ml of bupivacaine 0.5% are injected after blood aspiration test.

**Results:** We performed a PCB on approximately 50 patients in 2010. One patient developed symptoms of systemic toxicity of local anaesthetics (LA) 15 seconds after injection (general seizure, hypertension, no arrhythmia). 10 mg of midazolam were immediately administered and the patient required mask ventilation for a short time. In accordance with current guidelines the patient was additionally treated with 1.5 ml/kg 20% lipid emulsion bolus followed by 0.1 ml/kg over 30 min.

**Conclusions:** The application of ultrasound allowing for lower doses of LA may help prevent severe systemic side effects. In our hospital all peripheral nerve blocks are performed utilizing ultrasound guidance techniques. Recently we have started equipping ultrasound devices with a curved array probe to allow us to perform ultrasound guided PCB. This may hopefully help in further reducing the complication rate of this technique.

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**565 A SIMPLE TECHNIQUE OF SACROILIAC REGIONAL ANALGESAIA IN HORSES**

M.M. Shokry, Egypt.

**Background & Aim:** Sacroiliac joint region pain can be a cause of poor performance in athletic horses (Jeffcott et al, 1985). The aim of the present work was to demonstrate a simple feasible technique of sacroiliac regional analgesia in horses.

**Materials and Methods:** Three sacroepic vented frozen specimens were used to study the anatomic location and external landmarks for injection of the sacroiliac joint region. In addition, 26 horses suggestive with the same complaint were treated by sacroiliac regional injection of a mixture of Mepivacaine HCl 2% (20 ml) and Triamcinolone acetate (40 mg).

**Technique:** The lumbosacral area was clipped and aseptically prepared. The lumbosacral area was clipped and aseptically prepared.

**Results:** The Pajunk Sonotap was the overall highest rated although the MBe mode with the Stimuplex A had similar image quality. These were followed by the Stimuplex D+ and finally the Stimuplex A unenhanced.

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**Conclusions:** Our study demonstrated the superiority of the Pajunk Sonotap needle over the other hyperechogenic needle used by the department, the Stimuplex D+. Although ranked lower, the MBe mode (present on newer Sonosite machines) enhanced visualisation of the Stimuplex A giving a similar image quality to the Sonotap. Therefore we recommend Pajunk hyperechogenic needles or MBe mode with a non-hyperechogenic needle. However given the price difference between the needles, the cost savings of using non-hyperechogenic needles should be considered.

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**566 A PROSPECTIVE, RANDOMISED ASSESSMENT AND COMPARISON OF ECHOCGENIC PAJUNK® SONOPLEX AND B- BRAUN STIMULPEX® ULTRA REGIONAL ANAESTHETIC BLOCK NEEDLES**

J. Shorthouse, R. Sethuraman, M. Crowley

**Background:** Previously, Pajunk® Sonoplex ecogenic needles have exhibited statistically better tip visibility than Pajunk® Uniplex non-ecogenic needles. In this randomised prospective study, we compared needle tip visibility of two types of ecogenic needle: Pajunk® Sonoplex and B-Braun Stimuplex® Ultra.

**Methods:** Anaesthetists picked either Pajunk® Sonoplex or B-Braun Stimuplex® Ultra needles randomly from an envelope, and assessed needle tip visibility during advancement and injection at the relevant angle of insertion for their chosen block. Needles were scored for visibility using a linear numerical scale of 1-10 (1=worst and 10=excellent).

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Results: 44 peripheral blocks were analysed (22 for each needle) and results compared using the Student’s t-test. Overall, Pajunk® Sonoplex needles scored significantly higher for tip visibility compared to B-Braun Stimuplex® Ultra during needle advancement (P<0.0003) and injection (P<0.004). Pajunk® Sonoplex needles also scored significantly higher for tip visibility during needle advancement (P=0.008) and injection (P=0.03) compared to B-Braun Stimuplex® Ultra at a 45° angle. No significant visibility differences were found at angles≤ 45°.

Conclusions: Echogenic needles use differing technology to influence tip visibility in vivo. Pajunk® Sonoplex use circumferential reflectors with cornerstone reflectors, whereas B-Braun Stimuplex® Ultra use laser-crafted reflectors. We have demonstrated a statistically significant improved visualisation of needle tip with Pajunk® Sonoplex at steeper angles when compared to B-Braun Stimuplex® Ultra. We recommend the use of Pajunk® Sonoplex needles for blocks requiring an insertion angle>30°.

References

567 EFFECTIVENESS OF TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK FOR POST-OPERATIVE ANALGESIA FOLLOWING LAPAROSCOPIC Gastric BYPASS SURGERY
N.B. Siddaiah, I. Foldi
Background and aims: TAP block is a peripheral nerve block where, local anaesthetic is deposited between transversus abdominis and internal oblique muscles. It reduces postoperative morphine requirements in abdominal surgeries for up to 48hrs.
Methods: Ethical approval was not required for this audit. Patients with chronic pain, multiple co-morbidities, those having additional surgical procedures or difficult anatomy due to previous abdominal surgery were excluded from our audit. 16 patients undergoing laparoscopic gastric bypass surgeries were consented to have TAP block under ultrasound guidance just before extubation, using 120mm nerve block needles with 30ml of 0.25% chirocaine on each side. 16 other patients undergoing same procedure served as control having additional local anaesthetic infiltration by the surgeons and no TAP block.
Results: Data collected was analysed using student-t test. There was no significant difference in demographics or duration of surgery, and intraoperative analgesics (except paracetamol) between the TAP group and non-TAP groups. The non-TAP group had higher intraoperative paracetamol from those who did not have TAP block. Time needed to perform the block (musculocutaneous, median, ulnar, radial and medial cutaneous nerve of the arm). At the end of the procedure each patient was asked whether they had felt any pain or discomfort as a result of the tourniquet. The responses were recorded as: 1) no pain, 2) pressure or 3) pain. If any pain was reported during the surgery, we noted interventions taken for the pain.
Results: The mean duration (range) of tourniquet times was 50.9 (5-179) minutes.

568 ULTRASOUND-GUIDED SINGLE SHOT SUPRACLAVICULAR BLOCK FOR SHOULDER ARTHROSCOPY
I. Skok, M. Vukelic, K. Sakic, J. Skok, Croatia
Background and aims: With the use of ultrasound in regional anesthesia supraclavicular block has gained a new popularity. Ultrasound guidance makes it easier to perform and helps in avoiding unintentional puncture of vascular structures or pleura. We propose this method to be a suitable choice for such procedures.
Methods: After the approval of the local human ethics committee, we identified using operating room records forty healthy patients who underwent shoulder surgery in supraclavicular block. Block was performed with 25ml 0.5% levobupivacaine, while low frequency nerve stimulator was used with ultrasound. All patients were given sufentanil 3μg iv. before performing the block. Time needed to perform the block, onset of the sensory blockage, intraoperative and postoperative pain (using visual analog scale), need for additional analgesia and patient satisfaction were measured.
Results: Time needed to perform the block was 15±5 min, onset of the sensory block was 15±8 min. There was no statistical difference between intraoperative and postoperative VAS (intraoperative and postoperative VAS were 1.5±0.6 and 1.9±0.5 respectively). Five patients needed additional sedatives (midazolam boluses 5 mg iv). Analgesic effect lasted 18±2.4 hours after the surgery. All patients were satisfied with such anesthetic method.
Conclusions: Ultrasound-guided supraclavicular block provides sufficient anesthesia and postoperative analgesia for shoulder arthroscopy. Single shot technique is suitable for patients who are discharged from hospital the next day. Using ultrasound guidance we can perform the block fast and accurate with reduced volume. It has fast onset time and high patient satisfaction level.
Background and aims: Elderly patients presenting with femur fracture are often challenging to the anesthesiologist, due to severe co-morbidities limiting anaesthesia choices. The combination of a lumbar plexus block and a sciatic nerve block has been proven as a safe and reliable technique in selected cases.

Methods: 29 pts (age 74-95, mean 82 y.o.) admitted for hip fracture repair were classified as ASA I-III, due to severe co-morbidities. All received a lumbar plexus block, according to Winnie's landmarks, plus a parasacral sciatic nerve block, according to modified Morris' landmarks, with 0.6 mL/kg of a LA mixture of 1:1 0.5% Ropivacaine and 1.5% Mepivacaine, dividing the dose (2/3 for the lumbar plexus and 1/3 for the sciatic block).

Results: 28/29 pts completed the surgery without conversion to GA; 10/28 received additional sedation and opioid analgesics. BP remained stable in the majority of pts with no interventions, even though there was a tendency to a lower BP in all patients.

Conclusions: In high risk, elderly patients, single shot spinal carries the risk of a severe hypotension, which is particularly dangerous in patients with CAD, hypertensive disorders or previous stroke. An alternative option is here presented, by the combination of a lumbar plexus and a parasacral sciatic nerve block, in a selected cohort of high-risk patients. Results are encouraging, even though that LA dosage is near the highest dose we can safely administer to a poor-condition patient.

571 ATYPICAL SONOAANATOMY FOR ULTRASOUND-GUIDED SUPRACLAVICULAR BLOCK

Background and aims: With the accumulation of the experiences of ultrasound-guided supraclavicular block, uncommon sonoaanatomy related to the block has been reported. Here, we add further information of uncommon sonoaanatomy related to the ultrasound-guided supraclavicular block.

Methods: After obtaining institutional approval and written informed consents from the subjects, ultrasound examination of the supraclavicular region was performed in 50 adult healthy volunteers.

Results: Out of 100 ultrasound images, 4 cases of clinically important uncommon sonoaanatomy were obtained.

Case 1: The serratus anterior muscle was originated from the inner edge of the first rib, and located between the subclavian artery and the first rib. According to the textbook, the serratus anterior muscle will originate from the outer surface and superior border of the first rib.

Case 2: The left subclavian artery was located along with the left subclavian vein, and medial to the left anterior scalene muscle, but not on the first rib.

Case 3: An artery which arose from the subelavian artery was detected between the first rib and the brachial plexus.

Case 4: A vein coursing anterior to the brachial plexus in the supraclavicular region joined the subclavian vein. The vein was identified as the external jugular vein.

Conclusion: There are clinically significant sonoaanatomical variations in the relative locations of the brachial plexus, the subclavian artery, and the first rib, which might affect the safety and efficacy of ultrasound-guided supraclavicular block.

572 EFFECTS OF ANTERIOR SCIATIC NERVE BLOCK ON INTRAOPERATIVE HEMODYNAMICS AND PAIN RELIEF IN THE POSTANESTHESIA CARE UNIT FOR PATIENTS UNDERGOING TOTAL KNEE ARTHROPLASTY

Background and aims: Anesthetic effect of femoral nerve block during total knee arthroplasty is sometimes insufficient for posterior surface of the knee. In this study, effects of additional anterior sciatic nerve block (ASNB) on intraoperative hemodynamic change and analgesia in the postanesthesia care unit (PACU) were evaluated.

Methods: After IRB approval, 27 patients scheduled for total knee arthroplasty were reviewed. Patients were assigned to a group receiving sole femoral nerve block (FB group: n=13) and a group receiving both anterior sciatic and femoral nerve blocks (ASNB group: n=14). Femoral nerve block and ASNB were performed with ropivacaine (0.75% and 0.2%, respectively) before general anesthesia maintained with sevoflurane and remifentanil. Intraoperative hemodynamic change and pain score in the PACU were recorded. Statistical analysis was performed by two-factorial ANOVA or Fisher's exact probability test. A level of p<0.05 was considered to be significant.

Results: Systolic blood pressure in the ASNB group did not elevate during avascularization by use of tourniquet in contrast to the FB group. Maximum infusion rate of remifentanil during avascularization in the ASNB group (0.15±0.09 µg/kg/min) was significantly lower than that in the FB group (0.23±0.05 µg/kg/min). Pain score in the ASNB group in the PACU was low, and number of patients who need additional analgesics in the ASNB group (16.7%) was smaller than that in the FB group (43.5%, p=0.04).

Conclusions: Anterior sciatic nerve block during total knee arthroplasty was contributed not only to analgesia in the PACU but also to hemodynamic stability during intraoperative avascularization.

573 ULTRASOUND GUIDED IN-PLANE CONTINUOUS FEMORAL NERVE BLOCK FOR POSTOPERATIVE ANALGESIA & EARLY MOBILISATION IN PATIENTS UNDERGOING UNILATERAL TOTAL KNEE ARTHROPLASTY: AN INDIAN EXPERIENCE

Background and aims: Ultrasound guided femoral nerve block is steadily gaining popularity for effective regional component of a multimodal postoperative analgesia strategy after major knee surgeries. In-plane approach of this block has not been used much for the purpose of postoperative analgesia after total knee arthroplasty (TKA) conducted under spinal anaesthesia. The study was undertaken to evaluate effectiveness of such a technique compared to epidural block.

Methods: Thirty six three ASA I-II patients, scheduled for unilateral TKA under spinal anaesthesia were included in this prospective, randomised study. The patients were allocated into 2 groups. In group E (n=30), epidural block was given and in group F (n=36), femoral nerve catheter was put in by in-plane technique. Bupivacaine infusion 8 ml of 0.125% bupivacaine was started in both groups after bolus dose (8 ml of 0.25% bupivacaine in epidural and 30 ml of 0.25% in femoral).

Side effects, motor blockade, VAS scores, fentanyl and bupivacaine consumption, rehabilitation indices in first 48 hours, Oxford knee scores at baseline, 1 & 3 months after the surgery were registered.

Results: Patient demographics and VAS scores was comparable between two analgesic groups. Total incidence of side effects (on post operative day 1) was significantly less in F group. Patient satisfaction was greater with the F group.

Conclusion: Ultrasound guided In-plane continuous femoral nerve block provides optimal analgesia and greater patient satisfaction in patients undergoing unilateral knee replacement. However, the long term functional recovery was comparable in both the groups.

574 THE NEWEST TECHNOLOGIES TO ENHANCE THE NEEDLES VISUALIZATION IN ULTRASOUND-GUIDED REGIONAL ANESTHESIA
I. Toretti, A. Vitardi, M. Brazzoni, C. Silvestrin, B. Dottore, A. De Flaviis, R. Muzzi, Italy.

Background and aims: A common problem for both experienced and resident anesthesiologists is the impaired visibility of the advancing block needle. We present the latest ultrasound needles and related available visualization software to improve image quality and the opinion of practioners.

Methods: Three latest echogenic needles, three echogenic catheters and the new SonoSite enhanced needle software visualization were prospectively tested for quality of visibility. Using an agar phantom and performing in-vivo, we have collected samples at 0° and 45° angles and during infracavicular block. Qualities of needle visibility were described by using visibility on a 4-point scale, score poor/sufficient/good/excellent, and formation of artefacts.Evaluation of the ultrasound scans blinded with regard to needle was performed through a questionnaire submitted to 30 anesthesiologists with varied experience.
Although in 0° angle there is no difference in visibility, respondents unexpectedly gave a low degree of visibility to the echogenic needles due to the presence of several artifacts. On the contrary highly echogenic needles had advantages over the conventional needles at 45° angles, however the visibility in vivo is less performing. Appreciations were also made to the new SonoSite’s advanced needle visualization software.

Results: Although in 0° angle there is no difference in visibility, respondents unexpectedly gave a low degree of visibility to the echogenic needles due to the presence of several artifacts. On the contrary highly echogenic needles had advantages over the conventional needles at 45° angles, however the visibility in vivo is less performing. Appreciations were also made to the new SonoSite’s advanced needle visualization software.

Conclusions: Although in 0° angle there is no difference in visibility, respondents unexpectedly gave a low degree of visibility to the echogenic needles due to the presence of several artifacts. On the contrary highly echogenic needles had advantages over the conventional needles at 45° angles, however the visibility in vivo is less performing. Appreciations were also made to the new SonoSite’s advanced needle visualization software.

Methods: We studied the spread of LA while performing an US-guided interscalene block and tracked the LA solution, in 20 patients undergoing shoulder surgery. Anterior spread of the LA onto the anterior scalene muscle produced hemi-diaphragmatic palsy in all patients confirmed by a postoperative chest radiograph. No patient experienced undue discomfort during the placement of an interscalene block. Additionally, patients reported a delayed frequency to the first dose of analgesic medication following discharge, which ranged from 4-12 hours. The patients had minimal pain upon awakening, and therefore had a delayed need for postoperative analgesics following an interscalene block.

Results: Interscalene brachial plexus block produced diaphragmatic paralysis in all patients included in the study, as demonstrated by the postoperative chest radiograph.

Conclusions: Ultrasound helps us to track the spread of LA and predict the development of hemi-diaphragmatic palsy. Lower volumes of LA can produce analgesia without the development of phrenic palsy if the solution does not spread anteriorly.

575 USE OF AN AMBULATORY POPITEAL SCITIC NERVE CATHETER CAN FACILITATE DAY OF SURGERY DISCHARGE FOR MAJOR FOOT AND ANKLE ARTHRODESES

J. Tyrrell, O. Tweedie, N. Savva

Introduction: Major foot and ankle arthrodeses are painful operations traditionally requiring extended inpatient admissions. We present results of a prospective audit demonstrating how an ambulatory popliteal sciatic nerve catheter, can facilitate day of surgery discharge.

Method: Patients received detailed written information regarding the nerve blocks including full risk-benefit profile. Ethics committee approval was granted prior to data collection. Ultrasound-guided popliteal sciatic nerve catheter and a single shot ultrasound guided subartorial saphenous nerve block above the knee were performed with the patient awake. Surgery was performed under spinal or general anaesthesia.

An ambulatory elastomeric pump delivering 0.2% levobupivacaine at 5mls/hr was connected at the end of the operation. We collected data prospectively on the first 31 patients having this procedure. Primary outcome measures were length of stay (LOS), opiate consumption and patient satisfaction.

Retrospective LOS data was also collected for previous 31 patients who underwent surgery before this technique was introduced.

Results:

Control (pre-catheter)
- Mean LOS 2.4 nights (95% CI = 1.9-3.2) (0 day-of-surgery discharge)

Catheter
- Mean LOS 1.5 nights (95% CI = 1.0-2.2) (4 day-of-surgery discharge)
- p = 0.023
- Average Oramorph™ first 24 hours 18.7 mgs
- Average Oramorph™ next 24 hours 9 mgs
- 96% satisfied with pain relief first 24hrs
- 92% would have same anaesthetic again

Conclusion: Day of surgery discharge can be achieved using this technique. High quality patient information must be available both pre and post-operatively. Patient follow-up and a system for re-admission in the case of block failure must also be in place.

Conclusions: Although in 0° angle there is no difference in visibility, respondents unexpectedly gave a low degree of visibility to the echogenic needles due to the presence of several artifacts. On the contrary highly echogenic needles had advantages over the conventional needles at 45° angles, however the visibility in vivo is less performing. Appreciations were also made to the new SonoSite’s advanced needle visualization software.

Methods: We studied the spread of LA while performing an US-guided interscalene block and tracked the LA solution, in 20 patients undergoing shoulder surgery. Anterior spread of the LA onto the anterior scalene muscle produced hemi-diaphragmatic palsy in all patients confirmed by a postoperative chest radiograph. No patient experienced undue discomfort during the placement of an interscalene block. Additionally, patients reported a delayed frequency to the first dose of analgesic medication following discharge, which ranged from 4-12 hours. The patients had minimal pain upon awakening, and therefore had a delayed need for postoperative analgesics following an interscalene block.

Results: Interscalene brachial plexus block produced diaphragmatic paralysis in all patients included in the study, as demonstrated by the postoperative chest radiograph.

Conclusions: Ultrasound helps us to track the spread of LA and predict the development of hemi-diaphragmatic palsy. Lower volumes of LA can produce analgesia without the development of phrenic palsy if the solution does not spread anteriorly.

577 COMPARISON OF LOCAL ANESTHETIC EFFECTS OF TRAMADOL AND LIDOCAINE USED SUBCUTANEOUSLY IN MINOR SURGERIES WITH LOCAL ANESTHESIA

S. Vahabi, J. Akhlaghi, Iran.

Background and aims: In this study, the local anesthetic and post-operative analgesic effects of Tramadol were compared to those of Lidocaine in minor surgeries under local anesthesia.

Methods: This double-blind clinical trial study included 70 patients in ASA physical status I and II, aging between 20 and 50 years, undergoing minor surgery (lipoma excision and revision of scars less than 4 cm within 30 minutes or less) under local anesthesia. The patients were randomly assigned to receive either 2 mg/kg Tramadol (group T, n=35) or 1 mg/kg Lidocaine 2% (group L, n=35) subcutaneously. Scores of the pain sensation were recorded as VAS (visual analogue scale 0-10) during injection, incision and 15, 30 and 45 minutes after incision, and then 2, 4 and 6 hours post-operatively at the ward.

Results: There was no significant difference between pain scores of the two groups during injection, incision and surgery or in the post-operative period at the ward (p = 0.181). Incidence of nausea was 0% and 22.8% in group L and group T, respectively. The difference was statistically significant (p = 0.002). Furthermore, 82.9% of subjects in group L and 60% of subjects in group T needed acetaminophen to control their pain and the difference was significant (p = 0.004).

Conclusions: Tramadol 2 mg/kg has local anesthetic and post-operative analgesic effect equal to Lidocaine 1 mg/kg in minor surgeries performed subcutaneously. Therefore, we concluded that Tramadol can be used in local anesthesia and has the ability to decrease the demand for post operative analgesics.

578 DOCUMENTATION OF REGIONAL ANAESTHESIA - AN AUDIT CYCLE

N. Venugopal, J. Mathew, M. Cervenka

Background and aims: Peripheral nerve blocks (PNB) should be clearly documented on anaesthetic records to aid future research and for medicolegal purposes. We conducted an audit and re-audit over two months in a regional trauma unit to assess our current standard of PNB documentation and improve it.

Methods: Anaesthetic charts of 60 consecutive patients were reviewed in the initial audit. We found variable extent of documentation of PNBs in anaesthetic records. We introduced a sticker label with tick boxes, incorporating salient points from a standardised PNB procedure note form. We conducted a re-audit with 60 patients to evaluate improvement.

Results: In the initial audit, aseptic technique was noted in only 53% of records. In 2 patients, it was not clear whether ultrasound or nerve stimulator was used. Nerve stimulation threshold was not noted in 11% of blocks. Gauge and length of needle used were not mentioned in nearly 50% of blocks.

Conclusions: Although in 0° angle there is no difference in visibility, respondents unexpectedly gave a low degree of visibility to the echogenic needles due to the presence of several artifacts. On the contrary highly echogenic needles had advantages over the conventional needles at 45° angles, however the visibility in vivo is less performing. Appreciations were also made to the new SonoSite’s advanced needle visualization software.

Methods: We studied the spread of LA while performing an US-guided interscalene block and tracked the LA solution, in 20 patients undergoing shoulder surgery. Anterior spread of the LA onto the anterior scalene muscle produced hemi-diaphragmatic palsy in all patients confirmed by a postoperative chest radiograph. No patient experienced undue discomfort during the placement of an interscalene block. Additionally, patients reported a delayed frequency to the first dose of analgesic medication following discharge, which ranged from 4-12 hours. The patients had minimal pain upon awakening, and therefore had a delayed need for postoperative analgesics following an interscalene block.

Results: Interscalene brachial plexus block produced diaphragmatic paralysis in all patients included in the study, as demonstrated by the postoperative chest radiograph.

Conclusions: Ultrasound helps us to track the spread of LA and predict the development of hemi-diaphragmatic palsy. Lower volumes of LA can produce analgesia without the development of phrenic palsy if the solution does not spread anteriorly.
patients. Ease of injection of local anaesthetic was not written in 85% of records.

The re-audit showed 100% compliance in recording aseptic technique. Clear mention of ultrasound or nerve stimulator was done in all records. Gauge and length of the needle, and easy injection were documented in 100% of records.

Conclusions: The introduction of a sticker label made recording of blocks uniform, and significantly improved PNB documentation in our anaesthetic records.

Reference:

579 VALUE OF AN ONBOARD ELECTRONIC TUTORIAL FOR ULTRASOUND-GUIDED REGIONAL ANESTHESIA


Background and aims: Use of ultrasound guided regional anaesthesia (UGRA) is growing tremendously, but requires considerable training. An electronic tutorial onboard of the ultrasound machine may help to identify sono-anatomy for novices. Therefore, we investigated whether an electronic tutorial could improve and accelerate identification of anatomical structures.

Methods: 35 novices in UGRA participated in a workshop on UGRA of the upper limb. The workshop started with a lecture on physics of ultrasound, anatomy, sono-anatomy and thereafter training in handling of ultrasound machines and hand-eye-coordination. Then novices were randomized into group S using a standard ultrasound machine and group T using the same type of ultrasound machine with an onboard electronic tutorial. Each novice had to identify 27 anatomical structures in a human volunteer. An experienced observer noted correct identifications and time required. Scores and times were compared between groups by analysis of variance.

Results: Number of correct identifications of anatomical structures was higher in group T (16.8±3.6 vs. 13.4±4.4, p<0.05), whereas time required was longer (1053±244s vs. 740±244s, p<0.001). Multivariate analysis revealed that experience in anaesthesiology had no influence on scores or time required. Differences in time between groups were greater at the beginning of the examination.

Conclusions: An electronic tutorial can help novices in UGRA to identify anatomical structures. Increased time required for the tutorial may partly be related to unfamiliarity. However, improvement from 50% correct answers to 62% of 27 basic anatomical structures demonstrates that UGRA cannot be learned in a workshop of a few hours.

580 SELECTIVE C-FIBER BLOCKADE BY PULSED RADIOFREQUENCY STIMULATION AT DRG IN THE NAEVE AND NERVE-INJURED RATS

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Background and aims: Pulsed radiofrequency (PRF) is better acceptable than conventional radiofrequency in treating peripheral neuropathic pain due to its less destructive character and preserving motor functions. However, how PRF alters the peripheral nerves is largely unknown.

Methods: Using a field potential technique, repeated conditioning electrical stimuli were delivered to the sciatic nerve to evoke electrical responses in the spinal dorsal horns. The recordings were identified as A and C-components to represent conditioned inputs thru large A- and small C-fiber activations. PRF stimulation, by 2Hz trains of 250 MHz RF waves with a 25ms train-width, 5V intensity for 5-min duration, was applied at the L5 DRG in naive rats or in L5 ligation rats 7 days later. Recordings were conducted before PRF and persisted for 2 h after PRF. Alterations of A and C-component were compared between PRF and sham PRF applications in either naive or neuropathic pain conditions.

Results: In neuropathic pain study, C-component showed remarkable increase in nerve-injured rats in comparison with that of the sham-operated rats. In particular, PRF treatment selectively reversed spinal C-sensitization, and the suppression persisted for 2 h. In normal rat study, selective blockade of C-fiber was similarly shown following PRF treatment. In contrast, PRF did not alter peripherally evoked spinal A-responses under two conditions.

Conclusions: The study demonstrates a lasting inhibitory effect of PRF on evoked spinal C-responses, which suggests that PRF selectively modulates C fiber-mediated noxious inputs to the spinal cord.

581 POSTOPERATIVE PAIN RELIEF AFTER SINGLE INJECTION INTERSCALENE BRACHIAL PLEXUS BLOCK FOR SHOULDER/UPPER EXTREMITY SURGERY: A RANDOMIZED, DOUBLE-BLINDED COMPARISON BETWEEN 0.25%, 0.375%, 0.5% ROPIVACAINE


Background: Interscalene brachial plexus block (ISBPB) provides perioperative analgesia for shoulder or upper extremity surgery. There is little study that showed the duration of postoperative pain relief after ISBPB with single injection of ropivacaine. We studied durations of postoperative pain relief after ultrasound-guided ISBPB with single injection of various concentrations of ropivacaine for shoulder or upper extremity surgery.

Methods: Consecutive 63 patients scheduled for shoulder or upper extremity surgery were studied. Three patients were excluded because of no availability of an ultrasound apparatus. Patients were randomized to three groups: those who received 30mL of 0.25% (n=20), 0.375% (n=20), and 0.5% (n=20) ropivacaine.

Patients were anesthetized with propofol, remifentanil and rocuronium.

Duration of postoperative pain relief was defined as the time from injection of ropivacaine to the time when patients required an initial analgesic postoperatively. Postoperative analgesics, such as diclofenac, loxoprofen, acetaminophen, or pentazocine and hydroxyzine, were given at the discretion of the orthopedist in charge.

Results: Fourteen patients in the 0.25% group, 15 in the 0.375% group and 16 in the 0.5% group required analgesics postoperatively. The duration of postoperative pain relief was 12.4±3.3 hrs in the 0.25% group, 11.9±2.6 hrs in the 0.375% group, and 12.3±2.2 hrs in the 0.5% group. The differences were not statistically significant.

Conclusions: When single injection ISBPB was performed with 30mL of ropivacaine for shoulder or upper extremity surgery, the concentration of administered ropivacaine, either 0.25%, 0.375%, or 0.5%, did not influence the duration of postoperative pain relief.
582 

THE EFFECTS OF SCIATIC- FEMORAL NERVE BLOCK COMBINED WITH DEXMEDETOMIDIN OR PROPFOIL INFUSION ON THE BLOCK QUALITY AND ANALGESIA DURATIONS DURING SURGICAL OPERATIONS OF LOWER EXTREMITIES


Background and aims: This study was designed to compare the effects of sciatic-femoral nerve block combined with intravenous dexmedetomidin or propofol infusion on the block quality and analgesia durations during surgical operations of lower extremities.

Methods: Following local ethical committee approval; 40 patients (18-65 years old; ASA I-II group) were included in the study. The included patients were planned to undergo surgical operations of lower extremities. The patients were randomized into two groups (20 patients in each group). 75 mg isobaric bupivacaine + 100 mg lidocaine in 20 ml volume was given to all patients. This combination was administered firstly into sciatic nerve with anterior approach, and then into femoral nerve. 1 mg kg\(^{-1}\) dose of propofol was infused in Group 1, and then 3 mg kg\(^{-1}\) dose infusion was initiated and the latter dose was continued during the surgery. 1.5 mg kg\(^{-1}\) dexmedetomidin was infused in Group 2 for 10 minutes, and then 0.05 mg kg\(^{-1}\) dose intravenous infusion was initiated and the latter dose was continued during the surgery. Ketamine and fentanyl were administrated as additive analgesics to the patients if required. The time to first pain was recorded. The analgesic requirement and time to the first pain of the patients were compared.

Results: The demographic characteristics of the patients were similar. No statistically significant differences in the intraoperative analgesic requirement were found between Group-1 and Group-2. (p=0.288). No statistically significant differences in the time to the first pain were found between Group-1 and Group-2 (p=0.548).

Conclusions: No statistically significant differences in the sciatic-femoral nerve block quality were found between intravenous dexmedetomidin and propofol infusion during surgical operations of lower extremities. Time to the first pain was statistically similar between groups.

583 

THE EVALUATION OF ULTRASONOGRAPHY AND TQRNIQUET APPLICATION ADDED TO STIMULATOR, IN AXILLARY BLOCKS, IN TERMS OF BLOCK SUCCESS, SAFETY AND PATIENT SATISFACTION


Background and aims: Peripheral nerve blocks can be used alone or with general anaesthesia for postoperative analgesia (1). The aim of this study is to evaluate axillary brachial plexus blockade with ultrasonography and peripheral nerve stimulator guidance and the effect of tourniquet addition to multi and single injection.

Methods: 60 patients undergoing hand surgery were randomly allocated to; Group I (single tourniquet multi-injection) a rubber tourniquet was applied 8 cm below the nerve stimulator needle entrance area before blockade, Group II (double tourniquet single injection) the distal tourniquet was applied in the same way and a second tourniquet was applied 2 cm above the injection site just after the removal of the nerve stimulator needle, Group III (double tourniquet multi-injection) both the tourniquets were applied and axillary block was performed with multi-injection. Local anesthetic agent is same in all patients. The success rate, onset of blockade and patient satisfaction were evaluated.

Results: The success rate was 100% in all groups. Blockade duration was shorter in group II. There was no significant difference in terms of onset of sensory and motor blockade of radial, median and ulnar nerves. Patient satisfaction was lowest in group III and highest in group II.

Conclusions: Ultrasonography and peripheral nerve stimulator guided axillary blockade accompanied with tourniquet application may result in better success rate, patient satisfaction and may be safer.

Reference:


584 

DOES REGIONAL COMPARED TO LOCAL ANAESTHESIA INFLUENCE OUTCOME AFTER ARTERIOVENOUS FISTULA CREATION?

R. Zaluniute, R. Kearns, M. Clancy, A. Macfarlane

Background and aims: Approximately 25% of arteriovenous fistulae (AVF) fail at an early stage. There remains no conclusive evidence that any particular anaesthetic technique can influence surgical outcome. Complications of general anaesthesia are well documented but there is little data comparing the two alternatives of local (LA) or regional anaesthesia (RA) 2. Because RA and not LA increases intra- and post-operative blood flow, which may be beneficial, we performed a retrospective analysis to investigate whether RA influenced surgical outcome compared to LA.

Methods: Patients undergoing AVF creation under either RA or LA were examined retrospectively using the renal registry. The type of AVF was collected along with the surgical outcome (success or failure). RA and LA groups were compared using Chi squared test.

Results: 76 AVF were performed, of which 65 were primary. Compared to LA, RA was associated with significantly greater AVF success rates overall (p=0.003), but also with primary AVF alone (93% vs 52%, p=0.01) and primary radioaccessive AVF (p=0.027). Brachiocephalic AVF success rates (n=11) were unrelated to anaesthetic (p=0.258).

Conclusions: RA improves the success rates of AVF compared to LA. Our data was likely underpowered regarding brachiocephalic AVF. Further prospective studies are required to confirm these findings.

References:


585 

EVALUATION OF DIFFERENT DOSES OF MEPERIDINE PLUS LIDOCAINE IN MODIFIED INTRAVENOUS REGIONAL ANAESTHESIA


Background and aims: Modified intravenous regional anesthesia is a technique for providing anesthesia in hand surgeries. Meperidine is known to have weak local anesthetic properties. We aimed at studying the effect of different doses of meperidine plus lidocaine on the quality of modified IVRA.

Methods: After approval of the university ethics committee, 45 patients candidate for elective hand surgery, divided into three groups, enrolled in a randomized double blind clinical trial study. In these groups 10 cc of 2% lidocaine plus 10 mg, 20 mg and 30 mg meperidine is used for groups A, B and C. Onset of sensory block, tourniquet pain and postoperative pain were recorded.

Results: Onset of sensory block was comparable for the groups B and C (4.9 and 4.3) while it was significantly slower for the group A (5.9 min)(P< 0.01). Onset of tourniquet pain was comparable for all groups. Onset of pain after tourniquet deflation for the groups B and C was significantly slower than the one of group A (76.2 and 79.2 against 68.5 min)(P< 0.01) while no significant difference was observed between the groups B and C (P= 0.488). Side effects were not significantly different between the three groups.

Conclusions: With increasing meperidine dose, onset of sensory block becomes faster and onset of tourniquet pain and postoperative pain become slower; but these differences were not statistically significant between 20 mg and 30 mg meperidine doses. So we can select 20 mg meperidine dose as a safe dose in modified IVRA.
Preemptive pregabaline significantly reduces postoperative pain and total analgesic consumption but is not impaired cognitive functions

587

T. A. Ayazoglu, H. Tuir, I. Okzyaynak, I. Esoglu, C. Bolat, M. Calin, Turkey

We aimed to evaluate the effects of preoperative administration of pregabalin on pain, analgesic consumption, postoperative recovery and cognitive functions of patients who scheduled for elective laparoscopic cholecystectomy under general anesthesia with TIVA.

Methods: 60 patients between the ages of 44-68, ASA physical status I-III, scheduled for elective laparoscopic cholecystectomy were included in the study. All of the patients were examined one day before the clinic, and informed about the applied anesthesia method. Mini Mental Test (MMT) was performed to patients. Patients were divided randomly into two groups, Group P (n = 30) and Group C (n = 30). One hour before surgery, Group P patients received pregabalin 300mg. At the end of the operation, extubation time, eye opening, response to commands and orientation time were recorded. In the first 15 minutes, intervals with 5 minutes after extubation RSS and AS were evaluated. MMT was performed at first hour and sixth hours after extubation.VAS were evaluated, and first analgesic time, total analgesic doses were recorded.

Results: In Group P, the Eye Opening and time to respond to commands (commands were given in group IVS) were significantly higher (p < 0.01). Aldrete Scores, MMT were not statistically significant both two groups. In Group P, patients statistically significantly sedated than patients in Group C (p < 0.01). In Group C, VAS were significantly higher (p < 0.01) than patients in Group P.

Conclusions: Pre-emptive pregabaline significantly reduces postoperative pain and total analgesic consumption but is not impaired cognitive functions.

Pain relief pathway for arthroscopic shoulder surgery

V. U. Thanawala, S. Magham, J. French, L. Lee, N. Bedford

Aims: To determine the peri-operative pain scores, adequacy of post-operative pain relief and patient satisfaction with the anaesthetic procedure. The RCOA standards for post op pain relief are:

100% patients should be discharged with regular analgesics.
100% patients should be discharged with verbal and written instructions about pain control.
< 5% patients should report ‘severe’ pain on verbal pain score in the first 48 hours after discharge.

Methods: Prospective audit of 49 patients (ASA1-3) undergoing arthroscopic shoulder surgeries from March to May 2010.

Results: The majority of patients (47) had Interscalene block with (0.75-1%) Ropivacaine and were satisfied with anaesthesia.

Most of the patients experienced first episode of pain 12 hours post op. The average pain scores were 4/10 on day 1, 3/10 on day 2 and 3/10 on day 3.

All the patients were provided with instructions for post pain relief with 72% using Paracetamol, 38% Ibuprofen and 26% using codeine.

Conclusion: RCoA standards were achieved for post-operative pain relief prescription and instructions.

To audit more complex shoulder surgeries for adequacy of analgesia.

References:

Survey on current UK practice of Transversus abdominal plane block

S. Belu Suderson1,2, S. Muthukrishnan1,4

Background and aims: Transversus Abdominal Plane (TAP) block is a relatively new technique. After its introduction in 2001(1) there has been an increasing interest(2) in recent years with advent of ultrasound guided technique. We conducted a survey to look into current practice of TAP block usage by UK Anaesthetists.

Methods: We sent web based questionnaire to anaesthetic departments (293) all over UK and collected the responses.

Results: Out of 665 responders (395 consultants, 53 middle grade, 217 trainees), more than half(374) regularly perform TAP block. Anaesthetists performing TAP block use it mainly as part of multimodal analgesia (78.4%) in anaesthetised patients before start of surgery(79%).

Majority (92%) follow single shot technique with sterile gloves (76%) and prepare the skin with 2% chlorhexidine (57%). The preferred type of needle is nerve block needle (74%) and preferred concentration of local anaesthetic is 0.25 % Bupivacaine/Levobupivacaine (58%).

TAP block is being used in Laparotomies (83.5%), Hysterecctomies (53.6%), Open Appendicectomies (49.6%), Caesarean sections (43.3%), Inguinal hernia surgeries (35.3%), Laparoscopic cholecystectomies (15.1%) and other Laparoscopic surgeries (6.8%).

Surgical Procedures Repsones out of 351 Response %
Laparotomy 293 83.5
Hysterecctomy 188 53.6
Open appendicectomcy 174 49.6
Caesarean section 152 43.3
Inguinal hernia surgery 124 35.3
Laparoscopic cholecystectomy 53 15.1
Open prostatectomcy 39 11.1
Other Laparoscopic surgeries 23 6.8

[Common operations using TAP block for analgesia are]

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The reasons given for not performing TAP block (288) were need for more training (130), preference of alternative technique (106), undependable analgesia (40) and risk of complications (16). The reported incidence of complications is 8/374 (2.1%).

Conclusions: Our survey showed that TAP block is used more regularly among anaesthetists as part of multimodal analgesia. It also highlighted the need for formal training to increase popularity and reduce complications.

References:

590 AUDIT OF ADEQUACY OF POST-OPERATIVE PAIN MANAGEMENT AFTER DISCHARGE IN DAY SURGERY PATIENTS
B. Das, J. Karattuparambil, A. Kapoor, M. Aluja
Background and aims: Evidence suggests that pain following day surgery remains a problem.[1, 2]. Therefore providing adequate analgesia is paramount. Patients’ low expectations may well contribute to this problem since studies have shown that 48% think it is part of healing and 39% see it as something to be endured [3]. Aim of this audit was to assess adequacy of postoperative pain management in patients having day surgery in our hospital.
Methods: Patients scheduled to have day surgery were audited over a period of six months. Adequacy of analgesia was assessed in the immediate post-operative period and telephonically post discharge. Practice was assessed against the ROCA UK standards for day surgery.

Result:

<table>
<thead>
<tr>
<th>indicator</th>
<th>target</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td>patients discharged with regular analgesics</td>
<td>100%</td>
<td>47%</td>
</tr>
<tr>
<td>patients discharged with instructions about pain control</td>
<td>100%</td>
<td>68%</td>
</tr>
<tr>
<td>reporting severe pain in first 48 hrs. after discharge</td>
<td>&lt;5%</td>
<td>9%</td>
</tr>
<tr>
<td>reporting no pain or mild pain after discharge</td>
<td>&gt;85%</td>
<td>95%</td>
</tr>
<tr>
<td>satisfied with management of pain at home</td>
<td>&gt;85%</td>
<td>94%</td>
</tr>
<tr>
<td>given instructions on what to take once analgesics finished</td>
<td>100%</td>
<td>48%</td>
</tr>
</tbody>
</table>

Conclusions: More clear instructions encouraging regular use of painkillers and what to do once they are over need to be put in place. Overall the patients were satisfied with their pain management.

References:

591 EFFECT OF PREOPERATIVE GABAPENTIN ON POSTOPERATIVE PAIN AFTER RETROPUBIC RADICAL PROSTATECTOMY
M.N. Deniz, N. Sertoz, E. Erhan, G. Uğur, Turkey.
Background and aims: To evaluate the efficacy of a single preoperative 900 mg of gabapentin for reducing postoperative pain after retropubic prostatectomy.
Methods: After ethics committee approval, a total of 51 male adult patients were randomly assigned to receive 900 mg of gabapentin orally 2 h before the operation. All the patients underwent the same general anesthesia technique. Postoperative analgesia was provided with intravenous patient-controlled analgesia with tramadol using a 50 mg loading dose, 20 mg bolus dose, 15-min lockout interval and 4-h limit of 200 mg. Patients were assessed at 15 min, 30 min, 45 min, 60 min, 2, 4, 6, 12, 24 h after operation with verbal analogue pain scores (VAS). Hemodynamic variables, parameters of PCA with tramadol, adverse effects, and rescue analgesia (paracetamol and pethidine Hydrochloride) were recorded.
Results: Groups were comparable with respect to demographic data. VAS scores were significantly lower at 45 min, 60 min, and 2 hr postoperatively in gabapentin group than in control group (p< 0.01). Less patients in gabapentin group required rescue analgesia than the control group (p< 0.05). Tramadol consumption was comparable between the groups. Side effects including sedation, nausea and vomiting were similar between the groups.
Conclusions: Preoperative administration of 900 mg of gabapentin resulted in lower postoperative pain scores and reduced the need for rescue analgesia in patients undergoing retroperic prostatectomy.

592 INTRAARTICULAR LEVOBUPIVACAINE INJECTION FOR POSTOPERATIVE PAIN CONTROL IN TOTAL KNEE REPLACEMENT: WITH OR WITHOUT MORPHINE?
N. Dereli, Ş. Sahin, A. Selçuk, E. Özayş, A. Kurtay, Turkey.
Introduction: The aim of this prospective randomized blinded study was to evaluate the efficacy of intraarticular levobupivacaine, epinephrine and morphine injection on postoperative pain control in total knee replacement.
Methods: 45 patients ASA I-III undergoing elective knee arthroplasty under spinal anesthesia were included study. The route and the dose used in spinal anesthesia were the same. The patients were randomised into 3 groups. All groups received 120 ml solution intrarticularly. Group I was received 120 ml solution containing 300 mg 0.25 % levobupivacaine + 5 mg morphine +0.5 mg epinephrine, Group II, 120 ml (300 mg) 0.25 % levobupivacaine + 0.5 mg epinephrine and Group III, 0.5 mg epinephrine in 120 ml saline. Patients were given tramadol, lornoksicam and metoclopramide by intravenous patient-controlled analgesia for reseque analgesic and antiemetic medication. Consumption of analgesic and visual analogue score (VAS) were recorded in 1,2,4,6,12,24,36 and 48 th hours.
Results: There was no statistically significant difference in VAS of groups. There was statistically difference in consumption of analgesic between group I and III, and group II and III but comparison of group I and II was similar. Morfin addition to levobupivacaine didn’t decrease the postoperative analgesic consumption. There was also no statistical difference in hemodynamic parameters between groups.
Conclusion: Intraarticular local anaesthetic infiltration during knee replacement decreases postoperative analgesic consumption but levobupivacaine solution with or without morfine have similar results in postoperative pain control.

593 A PROSPECTIVE AUDIT OF PERIOPERATIVE ANALGESIA AS PART OF ENHANCED RECOVERY PROGRAMME FOR DAY CASE ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
A. Fong, A. Marfin
Background and aims: Anterior cruciate ligament (ACL) reconstruction is common amongst young, healthy patients. Day surgery minimises disruption to patients, reduces healthcare costs and promotes early mobilisation.
This prospective audit evaluates perioperative analgesia facilitating same day discharge after ACL reconstructions as part of enhanced recovery programme. Our strategy aims to achieve adequate pain control with local infiltration analgesia (LIA) and multimodal systemic analgesia, preferably avoiding femoral nerve block, which can delay patients’ discharge.
Methods: 20 consecutive patients undergoing ACL reconstruction (autologous hamstring graft) under general anaesthesia were followed up for 24 hours. LIA was administered to the donor site immediately after harvesting and to soft tissues of the knee before closure. One ASA 3 patient received an additional femoral nerve block (FNB) with 20ml of 1% prilocaine, anticipating higher analgesia requirements. Post-operatively, all patients were prescribed oral paracetamol and codeine, with rescue tramadol available. Criteria for discharge...
were satisfactory vital signs, absence of nausea, pain score < 3 (Numeric Rating Scale 0-10), mobilisation with sticks.

**Results:** Mean pain score was 2.55, 7-9 hours post-operatively. 1/20 required rescue tramadol. 20/20 met discharge criteria on day of surgery. Patient satisfaction was rated as “Excellent” and “Very Good” by 15 and 5 patients respectively. All mobilised well and required no additional analgesia at home upon telephone follow-up within 24 hours.

**Conclusion:** LA, as part of multimodal analgesia, provided good pain control, high patient satisfaction and rapid discharge post-operatively. This protocol is successful within our institution’s enhanced recovery programme for ACL reconstructions.

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**594**

**PERIARTICULAR INFILTRATION FOR PAIN RELIEF FOLLOWING TKR**

S. Balasubramanian, M. Ganesh Ritesh

**Background:** Local anesthetics have the advantage of blocking pain conduction at its origin and minimizing the systemic side effects associated with postoperative narcotic use. In this study we assessed the efficacy of intraarticular regional analgesia on postoperative pain and analgesic requirements.

**Method:** Twenty nine ASA I-II subjects undergoing Total Knee Replacement were enrolled in the study. Twenty three patients received general anesthesia while six patients received spinal anesthesia. All twenty nine patients received periarticular infiltration with levo-bupivacaine 150mg + morphine 10mg + ketorolac 10mg intraoperatively. All twenty nine patients received paracetamol, ibuprofen, oramorph as regular postoperative analgesia and morphine injection as prn. Intensity of knee pain using visual analog scale (no pain, mild, moderate, severe) were measured at 4hrs, 8hrs, 12hrs and 24hrs.

**Results:** High satisfaction and good pain control after 24hrs was observed. Morphine consumption was significantly low in the first 24hrs.

**Conclusion:** A combination of intraoperative periarticular infiltration with multimodal drugs provided better pain relief, less morphine consumption, and improved patient satisfaction compared.

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**595**

**USE OF MORPHINE AND BUPIVACAINE FOR POST OPERATIVE ANAEGSIA AFTER UROLOGIC OPERATIONS**

H. Gani, P. Prifiti, I. Obri, V. Beqiri, F. Xhixha, M. Naco, Albania

**Background and aims:** To compare the post-operative analgesic efficacy and safety of intrathecal (IT) Neostigmine with intrathecal (IT) morphine in patients undergoing urologic operations with spinal anesthesia.

**Methods:** 190 patients were included to the study and were divided randomly into three groups. All patients have made successful spinal anesthesia. Each group received respectively: G1 received 15 mg Bupivacaine [sol:0.5%] and 50 ug Neostigmine. G2 instead of Neostigmine received morphine 300 ug. While G3 received 0.5 ml normal saline solution. During SA were evaluated: maximum level of motor block, duration of analgesia, the need for analgesia during 24-hours, interval visual analogue Scale (VAS) pain score, and incidence of side effects in the first 24 hours.

**Results:** G2 has later post-operator pain and more extended interval of time for analgesic request, compared with neostigmine group (p < 0.05). Pain score (VAS) during 24 hours were significant higher in the group with saline solution than in the group that received morphine or neostigmine (p < 0.05). Motor block duration was significantly longer in G1, compared with the morphine group and normal saline solution. The incidence of side effects was similar in the group who received morphine and neostigmine group, except pruritic problems (72%) p< 0.05.

**Conclusions:** The post-operative use of neostigmine intrathecal 50 mg as analgesic, gave a painless period until to 10 hours, while the group who received morphine 300mg during postoperative period as an analgesic gave a painless period until to about 12 hours. But neostigmine and morphine gave post-operative period analgesia longer than the group that received sol saline.

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**596**

**LOCAL ANAESTHETIC-SOAKED SWABS: A NOVEL TECHNIQUE FOR CO-ANAEGSIA AFTER BREAST SURGERY**

C.A. Goddard, L. Sulaiman

**Background and aims:** Many surgeons are reluctant to infiltrate local anaesthetic (LA) after wide local excision (WLE) of breast lumps for fear of promoting haematoma formation. We evaluated the analgesic effects of topicaly applying a LA-soaked swab to the cavity, a technique not previously reported.

**Methods:** We prospectively audited 10 patients having WLE & sentinel node biopsy. In the treatment group a swab soaked in 30 ml of 0.5% bupivacaine and 1,200,000 adrenaline was placed in the cavity for 3 minutes prior to skin closure. Where two cavities were formed each received a swab with 15ml of solution. We retrospectively audited the last 10 patients undergoing the same procedure as historical controls. In each group we recorded: morphine use; pain (range: 0-10) and nausea scores at intervals up to 24 hours.

**Results:** There was a significant reduction in morphine consumption in the treatment group (5.25 vs 7.25mg, P<0.05) and a trend towards reduced pain scores at 1 hour in the treatment group which failed to reach significance (1 vs 3.5, p=0.054). This possible effect was not evident at 4 hrs. There were no differences in nausea scores.

**Conclusions:** The LA-soaked swab technique was not very effective. There may be benefit in larger studies with a longer swab placement time or soluble holding medium. In this format the use of LA-soaked swabs has limited and short lived efficacy but may provide a simple form of co-anaesthesia with low morbidity.

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**597**

**ANAESTHETIC TECHNIQUE AND FUNCTIONAL RECOVERY FOLLOWING UNICOMPARTMENTAL KNEE ARTHROPLASTY (UKR)**

M. Gupta, A. Lindley, F. Watts

**Background and aims:** UKR is surgery to either the medial or lateral compartment of the knee, for localised arthritis in a younger age group of patients. Postoperatively, inadequate analgesia will lead to delayed early mobilisation and slower functional recovery. Our aim was to observe if functional recovery was influenced by the anaesthetic technique.

**Methods:** Data were collected for UKR surgeries done between May-November 2010 at a tertiary level orthopaedic centre. Anaesthetic techniques were noted, and review of the physiotherapy notes yielded time to straight leg raise (SLR), active range of motion (AROM), mobilization and length of inpatient stay (LOS).

**Results:** 23 patients: 6 had GA and 17 spinal. Mean time to SLR was 1.83 (GA) days. AROM 0-75° was achieved on (mean) 2.33 (GA) and 2 (spinal) days. Spinal group mobilized 0.25 day (mean) faster on each end point compared to GA group. Average LOS was 2.8 (Spinal) and 3 (GA) days.

**Conclusions:** When comparing functional recovery following UKR for spinal vs. GA, we found that the spinal group achieved the functional recovery goals at an earlier time, but had little impact on time to discharge.
598

INTRA OPERATIVE ANALGESIA IN ELECTIVE CAESAREAN SECTION PATIENTS

E.J. Hatton-Wyatt, S.H. Qureshi, K. Wood, S. Skipworth

Aim: Does intra-operative use of paracetamol in elective caesarean section increase the time to first post-operative analgesia?

Background: This retrospective study included 33 patients who had elective caesarean section, with ASA grades I (69%), II (27%), III (3%). The age range of patients was 22-41 yrs (mean 30 years) were divided into three groups:

(a) 21% patients had spinal anaesthesia with intra-operative paracetamol (b) 60% patients had spinal anaesthesia without intra-operative paracetamol (c) 9% of patients had spinal anaesthesia with transversus abdominis plane block. All the patients with spinal anaesthesia had intrathecal Fentanyl 15 microgram and per rectal Diclofenac 100mg. None of the operations had any complications.

Results: Overall, average time to analgesia from insertion of spinal to first dose of analgesics post elective caesarean section was 288 minutes. In group (a) average time to analgesia was 276 minutes.

In group (b) average time to analgesia was 310 minutes.

In group (c) this was the smallest group and the average time to analgesia was 283 minutes.

Conclusions: Paracetamol is routinely used intra-operatively by some anaesthetists but this study didn’t seem to give any additional benefit for time to analgesia. Although the number is small, patients with transversus abdominis plane block didn’t seem to increase time to post-operative analgesia requirements either. In view of these interesting results, this study needs to be done as a randomised controlled trial to establish the importance of use of paracetamol or transverse abdominal plane block in elective caesarean section patients.

599

ATTENTIONAL AVOIDANCE OF NEGATIVE EXPERIENCES AS PREDICTOR OF POSTOPERATIVE PAIN RATINGS AND CONSUMPTION OF ANALGESICS: COMPARISON TO OTHER PSYCHOLOGICAL PREDICTORS

M. Heesen, S. Lautenbacher, C. Huber, C. Baum, S. Hochrein, R. Rossaint, Germany.

Background and aims: Attentional avoidance of negative stimuli and preference for positive stimuli have been found to be predictive of postoperative pain. However, findings so far were mainly obtained in young patients with benign diagnoses. Aim of the present study was to test whether this relationship holds for aged patients with poorer prognosis.

Methods: Pre-operatively assessed psychological predictors, including attentional measures for emotionally loaded stimuli, were used to predict acute postoperative pain. 58 patients scheduled for surgery due to cancer (80%) with a mean age of 60.5 years. As predictors attentional biases for pain-related, social threat and positive stimuli were assessed in a dot-probe task. Further predictors were self-reported pain vigilance, pain anxiety, pain catastrophizing, general anxiety, depression, somatisation and pressure pain thresholds. As criteria of prediction, numerical scale ratings of acute postoperative pain and the amount of analgesics (patient controlled intravenous analgesia: PCA) requested after surgery were used.

Results: A significant 23% of variance of the PCA use was accounted for by the dot-probe, task parameters mainly the avoidance of social threat words. 77% of the patients with frequent PCA use could be classified correctly by this variable.

Conclusions: Attentional avoidance of emotionally negative stimuli prior to surgery proved again to be a powerful predictor of acute postoperative pain reflected by the consumption of analgesics; this time in a sample of aged patients with various but mainly malign diagnoses. This measure outperformed traditional predictors like depression, anxiety as well as pain catastrophizing and deserves further attention.

600

COMPARISON OF DIFFERENT POST OPERATIVE PAIN RELIEF OPTIONS FOR TOTAL KNEE REPLACEMENT- AN AUDIT


Background and aims: Provision of adequate pain relief is important in patients undergoing Total knee replacement surgery. Patient controlled analgesia, femoral nerve block (single shot or continuous catheter technique), epidural blocks, lumbar plexus blocks, femoral- sciatic nerve block combinations are among the available postoperative pain relief options. We audited our various practices to compare safety and efficacy.

Methods: The medical records of 157 consecutive patients undergoing elective primary total knee replacement surgery over a 1 year period were retrospectively reviewed. The outcomes studied were: 1) Pain visual analog scores post-operatively, 2) Knee function in terms of days to weight-bearing ambulation and range of knee flexion 4) morphine use, 5) hospital length of stay and 6) patient satisfaction.

Results: Out of the 157 patients, 64 patients received PCA morphine, 28 patients received a single-shot femoral nerve block and PCA morphine. 24 patients had a continuous femoral nerve block/ PCA morphine, 39 had a continuous femoral nerve block but no PCA morphine. The pain scores at rest and on movement were found to be the lesser for the PCA morphine group. The continuous nerve block group had lower pain scores as compared to the single-shot nerve block group at rest on POD 2 whereas the reverse is true on movement. Morphine usage, patient satisfaction and rehabilitation was not different in the 3 groups.

Conclusions: All three techniques were comparable for the studied outcomes. Pain management options need to be individualised and tailored to patient preferences and situation.

601

THE INTRODUCTION OF A PATIENT INFORMATION LEAFLET IMPROVED THE COMPLIANCE WITH POST-OPERATIVE ORAL ANALGESIA FOLLOWING DISCHARGE FROM SHOULDER SURGERY COMPARED TO VERBAL ADVICE ALONE

C. Janes, J. Shorthouse, J. Chantler

Introduction: Shoulder surgery is often performed under interscalene plexus blockade (ISB) and general anaesthesia (GA). This initially provides excellent analgesia post-operatively but regular oral analgesia is required once ISB wears off. An audit carried out in 2007 found almost one third of day-case patients were not taking regular oral analgesia on discharge after shoulder surgery despite repeated verbal advice given during admission. We therefore introduced a patient information leaflet with details on ISB and the importance of regular oral analgesia post-operatively even in the absence of pain. We re-audited in 2011 to examine the effect of this leaflet on compliance with regular oral analgesia in this group of patients.

Methods: Data was collected prospectively for consecutive patients undergoing shoulder surgery under ISB and GA over 4-months. Basic operative and ISB data, pain scores and analgesia taken were recorded at the time of surgery and after 48 hours by structured telephone interview. Data was compared to that of the audit carried out in 2007.

Results: Data was collected for 29 day-case patients undergoing shoulder surgery under ISB and GA and compared to 24 patients in 2007. In 2011, 24 (83%) of these patients were taking regular oral analgesia on discharge compared with 17 (71%) in 2007, x2: 0.043.

Conclusion: ISB in day-case shoulder surgery patients can delay the onset of post-operative pain until after discharge. We have shown that introducing a simple yet informative patient leaflet can significantly improve compliance of day-case patients in taking regular oral analgesia following shoulder surgery under ISB.

602

CAN ARTHROSCOPIC SHOULDER STABILISATIONS BE MANAGED SUCCESSFULLY AS A DAY CASE PROCEDURE WITH A MULTI-MODAL ANALGESIC APPROACH? A PRELIMINARY EXPERIENCE

C. Janes, J. Shorthouse, J.L. Rees, J. Chantler

Introduction: Shoulder stabilisations in our institution are now largely carried out arthroscopically with a view to the majority being done as day-cases in the future. For this to be successful adequate analgesia has to be provided throughout the peri-operative period. We present preliminary data
on closed stabilisations using a single shot interscalene plexus block (ISB) and general anaesthesia (GA) technique.

**Methods:** Ethical approval was obtained under the institutions standing policy. Data was collected prospectively for consecutive patients undergoing arthroscopic shoulder stabilisation. Patients were prescribed regular paracetamol and diclofenac. Inpatients were offered opiates as required. The use of opiates was used as a surrogate marker of failed analgesia. Once discharged patients were asked to contact the hospital if stronger analgesia was required. Pain scores and analgesic requirements were recorded at the time of surgery. All patients were further assessed at 48 hours using a structured telephone interview to confirm whether analgesia had been adequate when the block wore off and to check whether they had needed rescue analgesia.

**Results:** Sixteen patients underwent arthroscopic stabilisation: complete relief of pain was achieved in all patients after the block wore off and no patients required rescue analgesia. All the remaining patients reported no problems, were comfortable and did not require rescue medication.

**Conclusion:** We present our initial experience of carrying out arthroscopic shoulder stabilisations under single-shot ISB and GA. Although this data should be considered preliminary it suggests that patients with a successful block have adequate analgesia that allows discharge on the day of surgery.

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**603 LOCAL INFECTION ANALGESIA (LIA) AND POSTOPERATIVE BLOOD SALVAGE CAN BE SAFELY COMBINED IN MAJOR ORTHOPEDIC SURGERY**

J.-R. Jansson, R. Slappendel

**Background and aims:** The safe combination of these techniques has recently been questioned. Unawareness of issues to be considered in the safety evaluation might withhold patients the benefits of the combined techniques when available. So a formal review was thought to be worthwhile.

**Methods:** The evaluation is based on clinical pharmacological issues, clinical practice and a literature search.

**Results:** In plasma, ropivacaine is mainly bound to alpha-1-acid glycoprotein (AAG) that increases postoperatively. A postoperative increase in the AAG level will decrease the free fraction due to increased protein binding. This is the reason why unbound ropivacaine remains unchanged during a slow postoperative infusion.

The unbound plasma concentration relates to toxicity. Safe limits should be based on the unbound plasma concentrations measured in arterial blood as arterial blood carries the local anesthetic to produce the toxicologic responses after systemic administration.

Six studies were found in the literature where the LIA technique was used and where analyses of ropivacaine concentration in patients and/or in drain, when used, were performed. Change in unbound ropivacaine following re-transfusion of shed blood was not measured in any study. A worst case scenario based on data so far generated would theoretically generate a blood level of 0.18 mg/L of unbound ropivacaine, a concentration well below the threshold for systemic toxicity.

**Conclusions:** Data so far show that the intraoperative LIA technique with ropivacaine in major orthopedic surgery can be safely combined with autologous blood transfusion as a slow transfusion.

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**604 PAIN MANAGEMENT FOR MAXILLOFACIAL OSTEOTOMY**

A. Jennings

**Introduction:** Perioperative analgesia for patients undergoing maxillofacial osteotomies has conventionally involved use of long-acting opioids. We have evolved an anaesthetic technique using multimodal analgesia and facial nerve blocks that avoids routine use of opioids and the requirement for an intensive care bed. We describe the technique and present an audit of post-operative pain scores.

**Methods:** All patients received general anaesthesia with desflurane maintenance and remifentanil infusion. Parenteral analgesia used was intravenous paracetamol 1g and paracoxib 40mg. Analgesia was supplemented by nerve blockade. Mandibular osteotomies received bilateral inferior alveolar and long buccal blocks, and maxillary osteotomies bilateral infra-orbital blocks (bimaxillary cases both) using 0.25% bupivacaine.

A visual analogue scale (0 to 100) was assessed pain in recovery and after 24 hours. Post-operative analgesia administered was paracetamol, diclofenac and codeine with oromorph rescue.

**Results:** Data was collected for 27 patients over a 2 year period (6 mandibular, 6 maxillary, 15 bimaxillary). Mean pain score in recovery was 48 [5-85], and at 24 hours 38 [7-95] equating to a moderate severity. 4 patients required rescue intravenous morphine in recovery. No patients required admission to intensive care.

The mean admission duration was 3 days. There was a variable requirement for postoperative codeine and no patients required oramorph rescue.

**Conclusions:** Maxillofacial osteotomy procedures do not require opiate analgesia if a multimodal technique is used including local nerve blockade. There does not seem to be a requirement for oromorph rescue postoperatively if regular paracetamol and diclofenac are administered.

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**605 SUBFASCIAL WOUND CATHETER ANALGESIA COMPARED TO EPIDURAL ANALGESIA FOR POSTOPERATIVE PAIN IN ABDOMINAL HYSTERECTOMY**

M. Kılıç, E. Eröz, M. Orhan Sungur, M. Şentürk, T. Özkız Leyhan, Turkey

**Background and aims:** This randomized study aims to evaluate efficacy of wound analgesia compared to epidural analgesia in abdominal hysterectomy.

**Methods:** 40 patients were randomized into either Group W (bupivacaine 0.25% through subfascial wound catheter) or Group E (bupivacaine 0.125% through lumbar epidural catheter) with 10 ml/h infusion for both groups for 48 hours postoperatively. Analgesia was evaluated by numerical pain scale (0:no pain - 10:max pain) with iv morphine PCA rescue (bolus:2 mg, lock-out: 8 min). Total opioid consumption, dynamic and static pain scores and side effects were recorded.

**Results:** The static and dynamic pain scores are shown in the figure, which demonstrates statistical difference between the groups at the first 6 hours (p< 0.05). Total morphine consumption during 48 h was significantly less in group W compared to group E (14.4 mg vs 27.0 mg respectively, p< 0.05 ). 12 patients with motor block were observed in group E. PONV were similar in both groups (7/20 in group W and 8/20 in group E).

**Conclusions:** Subfascial catheter provided analgesia in first 6 hours was superior for dynamic pain compared to epidural analgesia although both techniques were similar for static pain. Wound catheters may be a good alternative to the more invasive epidural catheters without side effects following abdominal hysterectomy as a component of multimodal pain management.

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**606 THE COMPARISON EFFECT OF BUPIVACAINE 0.5% AND LIDOCAINE 2% INJECTION FOR PAIN CONTROL IN PATIENTS AFTER PRECUTANEOUS NEPHROLITOTOMY (PCNL)**

H. Khoshrang, S. Falahatkar, S.R. Akhavan, Iran

**Background and aims:** Pain control is very important for respiratory function, decrease of morbidity and patient convenient after PCNL surgery.
We compared efficacy of Bupivacaine 0.5%, Lidocaine 2% and Normal saline (NS) injection in puncture site of surgery for control of pain after PCNL.

Methods: In a double blind clinical trial we selected 60 patients in three groups: in the end of surgery we injected Bupivacaine 0.5% in dose of 0.5 mg/kg + NS up to 20 cc at skin of surgery site and tract of PCNL in group, Lidocaine 2% in dose of 4mg/kg + NS up to 20 cc in group II and just 20cc NS in group III. We measured visual analogue score (VAS) in times(hour) of 0, 3, 6, 9, 12, 18 after surgery and total dose of pethedine injection when VAS above 3 we used SPSS V14 for data collection and one way Anova for analysis. value less than 0.05 was significant.

Results: The mean of VAS in B. group was 2.65 ± 3.75, 4.85, the mean of VAS in L. group was 2.94 ± 6.0 and 5.85 and the mean of VAS in NS. group was 4.35 ± 6.5 and 6.40 (P value=0.0001, P=0.002 and P=0.01) the mean average dose of pethedine (mg) in times of 0,3,6 and 9 in B. group was 7.5, 7.25 and 13.25, in L. group was 10.5, 17.5 and 13.25 and in NS. group was 21, 19.5 and 16.5 (P value=0.009, P=0.018 and P=0.737), the mean time of first injection of pethedine in B. group was 274.2 ± 227.4 min. in L. group was 162 ± 141.6 min. and in NS. group was 54 ± 8.46 min.

Conclusions: Injection of bupivacaine 0.5% and lidocaine 2% in puncture site of PCNL is more effective than normal saline for control of pain after PCNL surgery.

RESULTS

Methods: We conducted a retrospective analysis of the collected data of 60 patients who underwent laparoscopic gynaecological surgery from 2010 to 2011. The use of low dose of ropivacaine by wound infiltration was of interest in the investigation. The use of ropivacaine 0.2% with or without a local anaesthetic was compared with saline injection in the puncture site of surgery for control of pain after PCNL.

Results: The use of ropivacaine 0.2% with or without a local anaesthetic was compared with saline injection in the puncture site of surgery for control of pain after PCNL.

Conclusions: The use of ropivacaine 0.2% with or without a local anaesthetic was compared with saline injection in the puncture site of surgery for control of pain after PCNL.
611 PARACETAMOL VS CELECOXIB (COX-II INHIBITOR), FOR TREATMENT OF POSTOPERATIVE PAIN AFTER LAPAROSCOPIC CHolecystectomy

M. Mantouvalou, Greece.

Background and aims: Coxibs and especially celecoxib have an anti-inflammatory effect while analgesic mechanism of paracetamol is not known. Aim of our study was to determine whether there was a difference in post-operative pain relief between two groups of patients undergoing laparoscopic cholecystectomy and received per os either paracetamol 500mg × 3 times daily or celecoxib 100mg 3 times daily for post operative pain management. We also noticed the side effects and any additional drugs taken.

Methods: 180 patients undergoing laparoscopic cholecystectomy were randomly divided into two groups of 90 patients each. All patients received propofol-fentanyl anesthesia and the IV analgesic drugs (pethidine) were given when the gall bladder was removed. In phase 1 PACU patients were given tramadol 100 mg sc and in phase 2 PACU tramadol 100mg/kg per os as needed to maintain VAS< 3/10. The patients were suppled with the per os study drugs for 7 postoperative days and asked to document their satisfaction with postoperative pain relief, any side effects and any additional drugs taken.

Results: The main outcome was the need of rescue analgesia (tramadol 50 mg per os) in different phases. No statistically significant differences were noticed between the two groups.

Conclusions: Paracetamol as well as celecoxib have the same analgesic effects for postoperative pain management after laparoscopic cholecystectomy. Caution should be taken in patients with elevated blood pressure or peptic ulcer and the use of coxibs.

612 TAP CATHETERS AND BOLUS 0.25% LEVOBupivacaine FOR ANALGESIA POST TRAM FLAP PROCEDURE

M. McAlindon, A. Gait, P. Hudson, M. Ali

Background and aims: Transverse abdominis plane (TAP) blocks are an established form of perioperative analgesia. We adapted this technique for patients undergoing transverse rectus abdominis myocutaneous (TRAM) flap breast reconstruction. Traditionally, epidural or patient controlled analgesia (PCA) is used however hypotension and lower limb weakness can affect flap perfusion and increase risk of thromboembolism. Respiratory depression and nausea are also recognised following opiate use. We felt that administration of local anaesthetic via TAP catheters would provide good post-operative analgesia, without such unwanted side effects.

Methods: A retrospective case note review was performed including 14 patients who underwent TRAM flap procedure. A randomized, placebo-controlled, double-blind trial of pregabalin 92% in the Parecoxib group at the end of surgery. Patients’satisfaction and pain were recorded. The pain score was recorded with the VAS scale (1, 2, 4, 8 hours post-operatively).

Results: No statistically significant difference was noticed between groups A and B (p < 0.005).

The post-operative pain was very low in all of the patients.

Three patients of group B suffered from itching due to morfine.

Conclusions: No statistically significant difference was noticed between groups A and B (p < 0.005). The post-operative pain was very low in all of the patients. Three patients of group B suffered from itching due to morfine.

614 COMPARISON OF ANALGESIC EFFICACY AMONG PREGABALIN, CELECOXIB, PREGABALIN WITH CELECOXIB AND PLACEBO AFTER TOTAL KNEE ARTHROPLASTY UNDER INTRATHECAL MORPHINE


Background and aims: Our study investigated whether a single dose of pregabalin, celecoxib, or in combination can improve analgesic efficacy of intrathecal morphine after total knee arthroplasty (TKA).

Methods: A randomized, placebo-controlled, double-blind trial of pregabalin (150 mg), celecoxib (400 mg) or in combination administered before TKA. All patients received spinal anesthesia with intrathecal morphine 0.2 mg and patient-controlled analgesic morphine postoperatively. Uses of visual analog scale (VAS) pain scores at rest and when moving, and the cumulative morphine consumption were analyzed. Secondary outcomes included anxiety scores, postoperative adverse effects, complications, and patients’ satisfaction.

Results: Data of 100 patients randomly assigned into four groups were obtained. There were no differences in the time to first dose of morphine, in the results of the 24-h VAS pain scores at rest and when moving, and in the 24-h cumulative morphine consumption. Significant decrease of anxiety scores were shown in the Pregabalin-Celecoxib group at 2-h and together with the Celecoxib group at 6-h and 24-h postoperatively. Postoperative adverse effects and complications were similar in all groups except for SpO2 < 92% in the Parecoxib group at the end of surgery. Patients’ satisfaction at 24- and 48-h after surgery was similar in all groups.

Conclusions: A preoperative single dose of pregabalin, celecoxib, or a combination does not improve the analgesic effect of 0.2 mg intrathecal morphine after TKA. Pregabalin with celecoxib given before surgery may decrease the patients’ anxiety.

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615 EFFICACY OF A CONTINUOUS INFUSION OF LOCAL ANESTHETIC INTO THE SURGICAL WOUND FOR PAIN RELIEF AFTER CESAREAN SECTION RECOVERED FROM GENERAL ANAESTHESIA


Background and aims: We assess the quality of postoperative analgesia by IV administration of paracetamol, parecoxib and morphine with or without infusion of local anaesthetic into the surgical wound after CS.

Methods: Forty patients ASA I receive IV analgesics plus a continuous infusion (6 ml/h) of 0.2% Ropivacaine in the subcutaneous catheter group (group R), whereas women in the control group received only the IV

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analgesics (group C). We assessed pain using theVAS scale at rest and with movement after 6, 12, 18, 24, 36 and 48 hours, and total morphine requirements in the first 48 hours, time for first requirement, complications related to the drugs or the technique used. They all received 10 mg/kg Paracetamol and 40 mg Paracoeplus 0.15 mg/kg morphine intraoperatively. The catheter was situated between the aponoeu rosis of rectus abdominis muscle and subcutaneous tissues and we administered 20 ml of 0.2% Ropivacaine. We performed a two-group T-test for each comparison with a significance level of 2.5%.

Results: Total morphine requirements were 61.8 ± 8.9 mg in group C versus 44 ± 5.2 mg in group R (p < 0.01). First administration of morphine was after 294 min in group R versus 216 min in group C. Postoperative pain scores (at movement) were higher in group C versus group R, but not at rest (p=0.23). Side effects were not reported.

Conclusions: Group R provides good analgesia with lower morphine requirements and minimal adverse effects. Wound infusion facilitates early mobility as well as patient satisfaction.

616

HAS THE CURRENT INTENSITY OF STIMULATING CATHETERS EFFECT ON POSTOPERATIVE ANALGESIA AFTER TOTAL KNEE ARTHROPLASTY?

R. Ortiz de la Tabla González, Á. Martínez Navas, C. Almeida González, M. Echevarría Moreno, Spain.

Background and aims: To determine if current intensity of stimulating catheter at femoral level has influence in postoperative analgesia after total knee arthroplasty (TKA).

Methods: Patients scheduled for TKA were randomized in four groups depending on the lowest current intensity patellar dance was observed with the femoral stimulating catheter: group 1 0.2-0.5 mA, group 2: 0.6-1 mA, group 3: 1.1 and higher and group 4: no motor response. An initial bolus of 0.4 ml/kg 0.2% ropivacaine followed by an infusion of 0.2% through the catheter. Variables: postoperative analgesia, rescue analgesia, sensory and motor block at recuperation unit, 8,16,24,36 and 48 hours. Statistical analysis with SPSS 14.0.

Results: 124 patients were included: 32 in group 1(25.8%), 21 in group 2 (16.9%), 31 in group 3 (25%) and 40 in group 4 (32.3%). Initial femoral bolus of 0.2% ropivacaine was 31.59 ± 4.72 ml. There was significant differences in: analgesia during movement at 36 hours (p 0.032), femorocutaneous sensory block (p<0.05) at reanimation unit, 8,24 and 48 hours and in obturador motor block at 24 hours (p<0.05) in group 1. Patient-controlled analgesia bolus demanded by patients was significant differen- at 16 hours (p=0.049). There was no secondary effects and patients showed a high satisfaction in all groups.

Conclusions: No relation between postoperative analgesia and lowest current intensity of stimulating catheter at femoral level. Perhaps future higher study should be necessary to demonstrate these differences.

2. Anesth Analg 2008;106

617

EFFICACY OF TRANSVERSUS ABDOMINAL PLANE (TAP) BLOCK FOR POSTOPERATIVE ANALGESIA IN INFANTS: REPORT OF THREE CASES

T. Purtuloglu, G. Ozkan, S. Senkal, M.E. Ince, A. Atim, E. Kurt, Turkey.

Background and aims: The transversus abdominis plane (TAP) block is being increasingly used in abdominal surgery for postoperative analgesia in both adult patients and children. With the use of ultrasound guidance technique increased the chances of successful pain control. We want to report three case of infant with inguinal hernia whom ultrasound guidance TAP block was performed for postoperative analgesia.

Methods: Infants scheduled for elective inguinal hernia repair procedure was 35, 43, 50-days old and 3000, 3500, 3400 grams respectively. After the induction of anesthesia and intubation, anesthesia was maintained with sevoflurane and %5 nitrous oxide in oxygen, without opioids. The abdomi- nal wall prepared for TAP block, a linear ultrasound probe was covered with a sterile glove and the probe was placed transversely to the abdomen on the midaxillary line between the costal margin and iliac crest. A 22 G, 50 mm needle was advanced until reaching the TAP with an in-plane technique. After 0.5 ml 0.9% NaCl was administered to confirm correct needle tip, 0.5 ml/kg 0.25 % bupivacaine was administered. The patients’ pain was evaluated with FLACC (face, legs, activity, cry, consolability) score. Supplemental analgesia consisted of paracetamol suppository and rescue meperidine was noted.

Results: All infants woke up easily and were comfortable. There was no pain noted and the infants did not receive any additional analgesics in the first 24 h postoperatively.

Conclusions: We assume that the TAP block provided effective analgesia and less agitation following inguinal hernia repair procedure in infants.

618

META-ANALYSIS OF SURGICALLY PLACED WOUND CATHETERS (SPWC) AND LOCAL ANESTHETIC INFUSION IN BREAST SURGERY


Background and aims: The effectiveness of surgically placed wound catheter (SPWC) and local anesthetic infusion in the management of postoperative pain following breast surgery is controversial. This meta-analysis was performed to assess efficacy SPWC compared to other techniques of pain management.

Methods: Medline search was performed using for Mesh terms anaesthetics, local administration, mastectomy, mammoplasty and breast reconstruction. The meta-analysis included randomised control trials that compared SPWC with other forms of pain control. Post-operative opioid requirements and pain measured in visual analogue scale (VAS) were analysed using Comprehensive Meta-analysis Software version 2. Literature was reviewed for the safety of the SPWC and local anesthetic infusion.

Results: Four randomised controlled trials evaluating 147 women were included in the final analysis. The overall standard difference in means was 0.094 and 0.033 for post-operative opioid requirement and pain respectively favouring the SPWC and local anesthetic infusion group. It was found to be a safe technique with no major adverse events as a result.

Conclusions: Surgically placed wound catheters and local anesthetic infusion is clinically safe in a wide range of surgical procedures on the breast and there appears to be a trend towards improved post operative pain relief. The studies analyzed in this review have several important drawbacks such as inadequate power to detect significant differences (none of them included more than 50 patients). A well designed RCT of patients undergoing breast surgery with an adequate number is of patients required to emphatically demon- strate that the operative site infusion with local anesthetic solution postopera- tively is safe and efficacious compared to opioid based regimens alone for post operative pain relief.

619

TO STUDY THE EFFECTIVENESS OF CONTINUOUS FEMORAL BLOCK AS AN ALTERNATIVE FOR POSTOPERATIVE PAIN MANAGEMENT IN PATIENTS UNDERGOING TOTAL HIP ARTHROPLASTY

S. Saksena Shrivastava, M. Butani, J. D Mello, K. Kluba, S. Gajendragadkar, V. Purandare, India.

Background and aims: Postoperative pain following total hip arthroplasty (THA), moderate at rest, is exacerbated on movement or by reflex spasms of quadriceps hindering mobilisation. Present study evaluates whether continu- ous femoral block, characterised by less severe complications and near in-depen dency of anticoagulant drug use, is suitable for pain management after THA and to compare it with intravenous patient-controlled analgesia (IV PCA) or continuous epidural analgesia.

Methods: 75 patients scheduled for THA were randomly divided into 3 groups. Postoperative analgesia was provided, with continuous epidural analgesia (0.1% bupivacaine, 0.1ml/kg/hr) in group EPI, IV PCA by fentanyl (dose, 0.4µg/kg; lockout, 15 min) in group IV and continuous femoral nerve sheath block (0.1% bupivacaine, 0.1ml/kg/hr) plus IV PCA (fentanyl) in group FNB. Pain scores at rest, movement and physiotherapy (VAS 0-10), supplemental analgesia, side effects, static exercises, day of first walk, were recorded.

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Results: Demography, quality of pain relief, postoperative rehabilitation, was comparable in the 3 groups. 90.9% patients in EPI, 59% in IV and 74.1% in FNB had effective pain relief (VAS ≤3) at rest in first 48 hrs. During physiotherapy at 48 hours, 36.4%, 22.5% and 48.1% patients had effective pain relief in EPI, IV and FNB groups respectively. Rescue analgesic use in 48 hours, was highest in IV followed by FNB and EPI respectively. Fentanyl requirements and PONV was higher in IV group.

Conclusions: Continuous femoral nerve block as an adjunct with IV PCA provides adequate pain relief and allows comparable rehabilitation after total hip arthroplasty.

620 SAFETY AND EFFECTIVENESS OF A LOW DOSE OUTPATIENT CONTINUOUS POPLITEAL BLOCK PROTOCOL

A. Saporito, E. Sturini Saporito, L. Anselmi, R. Tomasetti, Switzerland

Background and aims: Continuous regional analgesia (CRA) is an effective method to provide optimal analgesia with minimal side effects in ambulatory orthopaedic surgery. Aim of this study is to evaluate safety and efficacy of a low dose out-patient CRA protocol.

Methods: Following ethics committee approval, an observational prospective study was conducted on a consecutive cohort undergoing ambulatory forefoot surgery. All patients received an ultrasound guided popliteal nerve block with an initial bolus of meipivacaine 1.5% (mean volume 20±5 ml) and were discharged from hospital with a 5 ml/h ropivacaine 0.15% perineural continuous infusion through a disposable elastomeric pump. Exclusion criteria were: general contraindications to regional anaesthesia, patient's refusal, lack of an accompanying person or difficult accessibility to hospital. Patients were monitored daily by anaesthetic nurses through a telephone follow-up, with particular regard to pain levels and symptoms of local anaesthetic (LA) toxicity. Data are given as means ± standard deviations.

Results: From January 2010 until September 2010, 117 patients were enrolled (11 males/106 females, age 58.0±12.8 years, ASA class 1/2). All of them bypassed PACU to be directly discharged to the day-hospital clinic. Home-based CRA was 4.3±1.4 days long. Treatment was very effective (mean NRS: 1.9±2.6), with no cases of LA toxicity. 5.9% of patients referred prolonged motor block on the first postoperative day, despite the low concentration used.

Conclusions: Ropivacaine 0.15% at a fixed infusion rate of 5ml/h seems to be a safe and very effective protocol to manage postoperative pain on an outpatient basis after foot surgery procedures.

621 EFFECT OF INTRAARTICULAR TRAMADOL ON THE ARTICULAR CARTILAGE & SYNOVIOUM IN RAT


Background & aims: Intraarticular tramadol is often used for prevention of pain after arthroscopic knee surgery. The aim of this study was to evaluate the effects of tramadol on the articular cartilage and synovium in rat.

Methods: Under aseptic conditions, 0.2 ml tramadol was injected into the right knee joint while 0.2ml of saline was injected into the left as control at the same time to the 20 adult Sprague-Dawley rats. Groups of five rats were sacrificed at 1st, 7th, 14th and 21th days after the administration of study drug.

The knee joint samples were evaluated for the presence of inflammation in the articular, periarticular regions and synovium. Inflammatory changes were graded on a five-point scale. Grade 0: no inflammation, Grade 1: minimal inflammation: mild congestion and oedema, Grade 2: mild inflammation: erosion of joint surface, congestion and oedema, Grade 3: moderate inflammation: neutrophil and macrophages, synovioyte hyperplasia, and Grade 4: severe inflammation: neutrophils and macrophages, synovioyte hyperplasia, fibrin exudation.

Results: There was congestion ad inflammation at synovial vessels at 1st and 7th day at tramadol group. This inflammation turned to fibrosis at 14th day. We did not find any significant differences at control group.

Conclusions: Although more studies are needed before final recommendations can be made, by evaluating the results obtained from our study, there is inflammation at early period and it turns to fibrosis at late phase with intraarticular tramadol. We think that we have to use other analgesics for the knee surgery instead of tramadol.

622 POST-OPERATIVE ANALGESIA FOR SHOULDER SURGERY

A. Soodan, F. Moscuzza

Background and aims: Shoulder surgery is well recognized as having the potential to cause severe postoperative pain. We undertook this prospective audit with the aim to report the modalities of analgesia used for post-operative pain after shoulder surgery, to report the effectiveness of the analgesia for 48 hours post surgery and patient satisfaction with the analgesia.

Methods: 50 patients who underwent shoulder surgery were included in the audit. The recorded parameters were demographics, mode of analgesia and anaesthesia, VAS scores (0-10) post-operatively, analgesic consumption during the first post-operative day. Post-operatively patient-controlled analgesia was provided for patients who underwent joint replacement and oral analgesics prescribed for all patients.

Results: Of the 50 patients, 47 received inter-scalene block and 3 received parenteral analgesia. 41 patients were comfortable immediately after the surgery. VAS on arrival in recovery was more than 3 in 8 patients (3 of 8 did not have a block). No complication was noted in any of the patients. Inconsistent use of oral analgesics was noted. All patients were satisfied except 4 who were not happy with the analgesics prescribed.

Conclusions: Inter-scalene block provided good analgesia post shoulder surgery for up to 20 hours. No difference in pain scores was noted after the block wore off and stronger analgesics are needed when block wears off for major surgery.

623 PATIENT’S HOSPITAL STAY AFFECTED BY TYPE OF ANAESTHESIA AND USE OF MORPHINE IN UNCOMPLICATED LOWER LIMB JOINT REPLACEMENT SURGERY

A. Storey, S. Qureshi, G. Gopalarakrishnan, M. Achawal

Aim: Does the use of morphine IV/PCA as part of multimodal analgesic technique influence length of stay?

Background: This observational study included 97 adults(31% male: 69% female) with ASA grades: (I: 17.5%, II: 61%, III: 16.5%, undocumented: 5%), scheduled for arthroplasty of the lower limb. Patients with age range 40-88yrs(mean 68.59) were divided into five groups (a) G.A with block (b) Regional anaesthesia with block (c) Regional only (d) Regional with G.A (e) GA only. Regional anaesthesia included (1)Spinal 55%, (2)Epidural 15%, (3)CSE 30%.

Methods: Retrospective observational data collection.

Results: Overall average length of hospital stay was 7.82 days.
Conclusions: In this observational study, patients who remain in hospit-
0.001), respectively.
Altogether 36 patients were enrolled in our randomized study
Aim: Aim of our prospective randomized study was to find out if continu-
Results: 32 patients were identified who fulfilled this criteria. The mean
drugs and/or nerve blocks in recovery may help these patients and decrease

624 COMPARISON OF SYSTEMIC AND LOCAL PAIN TREATMENT AFTER AXILLARY DISSECTION BECAUSE OF BREAST CARCINOMA- A PROSPECTIVE RANDOMIZED STUDY

B. Strazisar, N. Besci, M. Blas, Slovenia.
Background: A satisfactory postoperative pain relief is important in cancer patient treatment.
Methods: Altogether 36 patients were enrolled in our randomized study from December 2010 - April 2011: 16 patients in wound catheter with elas-
tomeric pump (2 ml/hour infusion of 0.25% levobupivacaine) group and 20 patients in standard analgesia (=piriramide) group. Pain was measured
Conclusion: In breast carcinoma patients after axillary dissection a contin-

625 IMPROVING THE MANAGEMENT OF RESISTANT POST-OPERATIVE PAIN

N. Tate
Background and aims: Many post-operative patients have pain which is
difficult to control, sometimes leading to an increased stay on the recovery
ward. The Royal College of Anaesthetists sets a standard of 100% of patients
being pain free within 30 minutes of waking from anaesthesia. The aim of
this audit, was to identify these patients with resistant pain (requiring high
doses of opiates in the recovery ward), and to ascertain ways of improving
their pain management and decreasing their recovery stay.
Methods: Over a two month period, recovery nursing staff filled in
a questionnaire if their patient had required over 20mg Morphine peri-
operatively or those who had a prolonged stay secondary to pain control
(>4 hours). We gained information regarding pain scores, type of opera-
tion, use of different types of analgesia, risk factors for resistant pain and
length of recovery stay.

626 INCIDENCE OF PHANTOM LIMB PAIN AFTER LOWER LIMB AMPUTATION IN A SINGAPORE TERTIARY HOSPITAL

Background: Phantom limb pain is well described in the western popula-
tions with a reported incidence of up to 80%. There has been no published
literature on the incidence in Singapore.
We investigate incidence of phantom limb pain.
Methods: All adult patients who have undergone lower limb amputations in National University Hospital from September 2007 to March 2010 were
recruited.
Demographic data, indications and operation details were obtained. Postoperative pain and function were asked during an interview. Two
authors conducted the telephone interview using a standardized script and
questionnaire.
Results: 159 patients underwent lower limb amputations during the
30-month period. The mean age was 64 (range 21-95; SD 14) years. 104
(65%) were males.
49 (31%) agreed to our interview, 47 (30%) were deceased, 46 (29%) were not contactable, 13 (8%) were verbally non-communicative and 4 (3%) patients refused interview.
22 (45%) patients reported significant preoperative pain, 31 (63%) had phantom limb sensation, 12 (25%) had phantom limb pain, and 19 (39%) had stump pain. The most common indications for amputation were dia-
etes mellitus and peripheral vascular disease.
16 (73%) patients with stump pain and/or phantom limb pain were not followed up for pain; 11 (50%) were not on analgesics; 5 (23%) were
distressed by the pain. 15 (68%) could carry on their work or leisure activi-
ties despite pain.
Conclusion: The incidence of phantom limb pain appears lower in Sin-
gapore. This may be due to different population demographics, or inci-
dence of diabetes mellitus/ peripheral vascular disease as indications for amputations.

627 THE PAINFUL TRUTH: COMMON DEFICITS IN PAIN MANAGEMENT IN DEVELOPED AND DEVELOPING COUNTRIES

T.M. Tian 1,2, A. Carson-Stevens, L. Grigg
Background and aims: Alleviation of pain is recognised as a basic human
right. However a chasm remains between theory and practice. Universal barriers exist in developed & developing countries alike; particularly in-adequate assessment of pain by healthcare workers and inadequate reporting
by patients. The aim of this study was to identify deficits in pain manage-
ment and explore similarities and differences in practices.
Methods: 542 patients in Luton (UK) and 104 patients in Kiwoko (Uganda) were interviewed using a structured questionnaire about their pain management.
Results: Almost all patients suffered from pain in both hospitals. Pain was not assessed in 12% (n= 65/542) and 4% (n=4/104) of Kiwoko and Luton patients respectively. In these patients, a significant number did not voluntarily report their pain (Luton 18%; Uganda 45%), whilst assessment for analgesia efficacy does not always occur (Luton 16%; Uganda 30%). Pain scores were not used in Kiwoko, and in Luton 47% (n= 255/542) of patients did not have regular recordings.
Conclusions: Deficits in Luton were not dissimilar to Kiwoko. Regardless of economic status, small evidence-based changes may result in significant improvements in practice, particularly: 1) under-assessment is the biggest cause of pain mismanagement: assessment on admission is vital; 2) one drug does not fit all: reassessment for response to analgesia is crucial to optimize treatment; and 3) self-report is the most reliable indicator of pain; patients need active encouragement to report their pain. We will explore important contextual and cultural issues influencing sustainable change in pain management in both settings.

628 SAFETY AND FEASIBILITY OF CONTINUOUS PERIPHERAL NERVE BLOCK FOR POSTOPERATIVE ANALGESIA IN PATIENTS WITH SEVERE HAEMOPHILIA

A. Tiri che, S. Fournas, L. At El-Hadji, A. Benboudzid, Algeria.

Background and aims: Hemophilic patients with hemorrhaphy are chronic pain patients. Pain treatment is essential, in orthopedic surgery. Procedures are often associated with relevant postoperative pain. Moreover in hemophilia patients, the implementation of surgery requires early mobilization for rehabilitation in order to optimize functional recovery (a further cause of major pain). Continuous peripheral nerve block (CPNBs) has become the standard approach; this study assessed their realization (safety) and effects in these patients.

Methods: At our hospital, under adequate factor replacement, CPNB (Contiplex BBraun®) can be performed before 35% of cases) or after the patient was awake from general anesthesia (65%), using ultrasound or electrical nerve stimulation guidance. The interruption of the sensitive transmission can be obtained with low doses of anesthetic, in the absence of motor block with the use of elastomeric pump (Easypump® 8 ml/h) with a solution of bupivacaine 0.125%. 27 patients were included. They underwent a programme (five days) of early joint mobilization - factor activity level is maintained above 30% - and were evaluated for placement of catheter as the primary outcome; secondary outcomes included: VAS visual analogue scale, adverse effects and their satisfaction of pain control and compliance with physiotherapy.

Results: The success rate of catheter placement is higher using US (100%) compared to electrical nerve stimulation (92%). VAS diminished to 2.5 in all patients except three patients. Adverse effects = 1; satisfaction and good compliance of the patient with mobilization (all but two).

Conclusions: CPNBs may be safely performed in hemophilia patient and provides excellent postoperative analgesia. The anesthesiologist should be in charge of adopting most adequate approaches in order to contribute to improve treatment quality.

629 COMPARISON OF ANALGESIC AND HEMODYNAMIC EFFECTS OF BUPIVACAINE LOCAL PERFUSION VERSUS PATIENT CONTROLLED EPIDURAL ANALGESIA AFTER LAPAROTOMY


Background and aims: The purpose of this study was to compare the action of bupivacaine in a patient-controlled epidural administration and continuous infiltration of the wound after laparotomy for sigmoidectomy. Continuous peripheral nerve block (CPNBs) has become the standard approach; this study assessed their realization (safety) and effects in these patients.

Methods: The study involved 42 patients, aged 41-75, ASA 2-3, who underwent sigmoidectomy. The induction and maintenance of anesthesia was similar in all patients. Patients were randomized to receive either a patient controlled analgesia with bupivacaine (0.125%) epidural infusion or bupivacaine (0.5%) continuous wound infiltration for 48 hours.

Results: Mean arterial pressure, heart rate, and the number of rescue analgesics were recorded 2, 24 and 48 hours after the surgery. The statistical analysis was conducted with SPSS 16.0 using Mann-Whitney, Wilcoxon and Pearson correlation tests.

Conclusions: The study indicate that continuous local wound infiltration with 0.125% bupivacaine is a safe method for patients undergoing sigmoidectomy. However, we concluded that patient controlled epidural analgesia with bupivacaine reduces more effectively the objective pain and requires less supplementary analgesics postoperatively.

630 AUDIT OF THE SUCCESS OF POSTOPERATIVE EPIDURAL ANALGESIA AT GUY’S AND ST THOMAS’ HOSPITALS, LONDON

C. Vimalanathan, K. Salunkey, A. Natrajan, V. Ponnaiah

Background and aims: The United Kingdom Audit Commission has shown that less than 5% of patients should feel severe pain postoperatively. Published studies have shown between 15% and 38% of patients feel moderate to severe pain post-operatively. Our aim was to see how successful postoperative epidural analgesia is at Guy’s and St Thomas’ Hospitals.

Methods: All patients with epidural analgesia are reviewed by the acute pain team and data is collected on the epidurals and patients’ pain. Patients are given a pain score from 0-3 (0 = no pain, 1 = mild pain, 2 = moderate pain and 3 = severe pain). We reviewed the data collected from 133 patients at their pain team visits for the first 3 consecutive days postoperatively. If the patient had moderate or severe pain or if the epidural had been removed we was said to have failed. We also reviewed the level ofinsertion with relation to failure of epidurals.

Results: We found that from 0-24 hours post-operatively the epidural of 43 (32.5%) patients had failed. This decreased to 27 patients (20%) from 24-48 hours postoperatively and then increased to 36 (27%) of patients 48-72 hours postoperatively.

Conclusions: The standard of the epidural service at Guy’s and St Thomas’ Hospitals falls within that reported in the literature. We suggest that the decrease in failure rate from the first to the second postoperative day is due to intervention from the acute pain team which takes place at the first post-operative visit.

631 PATIENT CONTROLLED REGIONAL ANAESTHESIA FOR POSTOPERATIVE PAIN MANAGEMENT IN CHILDREN AND ADOLESCENTS

M. Vittinghoff, A. Gutmann, B. Messerer, Austria

Background and aims: In our institution peripheral regional anaesthesia is used for patient controlled postoperative pain management. The aim of this retrospective study was to evaluate the effectiveness and quality of regional analgesia in children and adolescents.

Methods: The peripheral nerve blocks were performed according to the standards of our institution using ropivacaine 0.375% plus clonidine. Postoperatively ropivacaine 0.2% plus clonidine were administered continuously. Bolus administrations with a lock out time of 15 min and a four hours limit were possible.

Regular pain scoring (0 - 10 points) was performed and adverse effects were noted. Intravenous rescue medication was administered if the pain score remained four after two additional bolus.

Results: 105 patients were included. The median age was 14 years (range: 1 - 18) and the median duration of PCA was four days (range: 1 - 20). Forty-two patients (40%) never scored four. Seventeen more patients (16,2%) managed with additional bolus administrations only. Thirty-one patients (29,5%) received a single dose and 15 patients (14,3%) multiple administrations of a rescue analgesic. But in 16 patients (51,6%) the single dose was administered in recovery room with a sensory block recorded simultaneously. Postoperatively 68 patients (64,8%) had a sensory block and 13 patients (12,4%) demonstrated an additional motor blockade. There were no further adverse effects or complications.

Conclusion: Patient controlled regional anaesthesia seems to be a safe and effective method in children and adolescents. The number of rescue medications in recovery room concludes that sensory block partially was diagnosed and treated as pain.

E277
632  
OPIOID FREE LAPAROSCOPIC INGUINAL HERNIA REPAIR: A REAL POSSIBILITY WITH ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK?  
M. Walsh, S. Mannion, Ireland.  
Background and aims: Ultrasound guided (USG) transversus abdominis plane (TAP) blocks reduce postoperative pain in patients undergoing abdominal surgery. While TAP blocks have been shown to be particularly effective for open lower abdominal surgery, there is less experience for laparoscopic procedures. We propose that the use of USG TAP blocks in laparoscopic inguinal hernia repair can negate the need for opioid analgesia.  
Methods: We describe a case series of two patients, undergoing laparoscopic inguinal hernia repair, who received a modified USG TAP block. In both patients the block was performed under USG with 30mls of 0.25% bupivacaine with adrenaline. Each patient received fentanyl 100 mcgs, paracetamol 1g and either, diclofenac 75mg IV, or Parecoxib 40mg IV. A total of 15 mls of levobupivacaine 0.25% was also given intra-abdominally and to port sites.  
Results: Both patients were pain-free in the recovery room and neither patient required rescue analgesia. Postoperatively, patient A refused analgesia offered at 5hrs following surgery and the first analgesia administered was paracetamol 1g at 9.5hrs postoperatively. Patient B refused all analgesia offered in early postoperative period with the first dose of diclofenac 75mg accepted at 10hrs postoperatively. Neither patient required opioid analgesia during the 24 hr follow-up.  
Conclusions: We propose USG TAP block as an effective periperal pain management option in patients undergoing laparoscopic inguinal hernia repair. In our patients it provided excellent perioperative pain relief, negating the need for opioid analgesia. We recommend a randomized controlled trial be performed to confirm our findings.  

633  
CONTINUOUS FEMORAL NERVE BLOCK IMPROVES KNEE FUNCTION AFTER TOTAL KNEE ARTHROPLASTY: A COMPARISON OF DIFFERENT SOLUTIONS OF ROPIVACAINE  
Background and aims: Adequate postoperative analgesia may be important for early functional recovery after total knee arthroplasty (TKA). Continuous femoral nerve block (CFNB) is often used for postoperative analgesia. The purpose of this study was to determine the analgesic effect of two different solutions of ropivacaine for CFNB after TKA and their impact on knee function.  
Methods: The data of 33 patients who underwent TKA with CFNB and general anesthesia were reviewed retrospectively between November 2009 and July 2010; 18 patients received ropivacaine 0.15% infusion and 15 patients 0.1% infusion for postoperative analgesia. Before receiving general anesthesia, all patients received a femoral nerve catheter. The degree of knee flexion of 1, 3, 7, 21 postoperative days (POD) and 3 months after surgery, pain scores and incidence of side effects such as motor impairment 48h after surgery were compared.  
Results: 0.15% ropivacaine achieved better knee flexion than 0.1% ropivacaine in POD 1, 3, 7, 21 (P=0.0184, 0.0045, 0.0135, 0.0148). However, 3 months after surgery, the mean of knee flexions were higher with ropivacaine 0.15%, although P values (P=0.0642) did not achieve significant difference between the two groups. Pain scores and incidence of side effects did not also differ.  
Conclusions: The present study suggests that a continuous infusion of 0.15% ropivacaine improves early knee function recovery as measured by knee flexion after TKA compared to an infusion of ropivacaine 0.1%. Analgesic quality of two doses were similar.  

634  
COMPARISON OF ANTI HYPERALGESIC EFFECT OF KETAMINE AND TRAMADOL DURING PERIOPERATIVE PERIOD FOR VISCERAL SURGICAL LAPAROTOMY  
Background and aims: Recently an anti-hyperalgesic activity of tramadol has been reported. The aim of our study is to compare it with ketamine (anti hyperalgesic of reference).  
Methods: This is a prospective double blind study. Patients scheduled for visceral surgical laparotomy were eligible for recruitment into the study. Inclusion criteria were: patient consent, American Society of Anesthesiologists physical status I-II and age between 18 and 65 years. The anesthetic protocol is similar for all patients: Premedication: hydroxyzine 1mg/Kg 2H before the surgery. Induction: Fentanyl 2DD/Kg, propofol 2,5mg/Kg and cisatracurium 0,15mg/Kg. Maintenance: Isoflurane 0,7 à 1,5% or propofol 10mg/Kg/H, fentanyl bolus 50 μg /20 or 30 min and cisatracurium bolus.  
The patients were randomized in two groups: Ketamin group (K): induction bolus 0,2mg/kg, maintenance and 48H post operative 26/kg/min infusion. Tramadol group (T): induction 100mg, end of surgery 0,5mg/kg and 48H post operative 0,1mg/kg/h infusion. Both groups enjoy the same post operative analgesia.  
Results: Forty patients were included in the study divided into two groups of twenty patients. The two groups were comparable in demographic terms. The dose of morphine titration was similar in both groups [7.67 mg for G (T) and 9.40 mg for G (K)]. Total consumption of morphine during the post-operative 48 hours was statistically higher in the group (T) (67.17 mg vs. 39.40 mg). On the other side, no adverse events were reported in the tramadol group. Conclusions: The anti hyperalgesic tramadol activity remains unproven. Morphine-sparing effect is less than ketamine.  

635  
EFFECTIVENESS OF DEXAMETHASONE IN POSTOPERATIVE ANALGESIA AFTER LAPAROSCOPIC CHOLECYSTECTOMY  
Background and aims: The effect of dexamethasone on PONV has been clearly demonstrated, its effect on postoperative pain is a subject of controversy. The aim of our study was to evaluate the effect of dexamethasone on postoperative analgesia after laparoscopic cholecystectomy.  
Methods: Prospective double-blind study. After consent, patients younger than 75 years, classified ASA1, 2 or 3 who will undergo laparoscopic cholecystectomy were included. After Randomization, the first group of patients received a preoperative injection of 8 mg dexamethasone (group M). The second group received an injection of a similar amount of saline (group P).  
The parameters collected were: demographic characteristics, VAS at rest and during exercise at different times and patient satisfaction. The difference is considered significant if p less than 0.05 (chi 2 for comparison of qualitative parameters).  
Results: We included 30 patients, demographic characteristics were similar in both groups. Assessment of postoperative pain by VAS showed a significant difference between the two groups.  
Conclusions: These results show that injection of dexamethasone is effective in reducing pain afterlaparoscopic cholecystectomy.
636
AUDIT ON PAIN AND NAUSEA AFTER ERCP
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Background and aims: Endoscopic procedures such as Endoscopic Retrorgrade Cholangiopancreatography (ERCP) are uncomfortable for patients and cannot be performed without adequate sedation. Usually, either midazolam ± an opioid administered by a gastroenterologist, or propofol administered by an anaesthetist are used. As propofol does not have analgesic properties, we wondered if our sedation protocol was adequate.

Methods: 50 patients who underwent ERCP under either midazolam or propofol sedation were included. Pre- and post-procedural pain-scores as well as nausea-scores were recorded on a scale '0' to '4'. Any analgesic or antiemetic given in the recovery area was documented.

Results: Post-procedure, 29 patients (58%) had a pain score of '0' - no pain at rest or on movement. 9 patients (18%) had a pain score of '1' - mild pain on movement, no analgesics were given. 12 patients (24%) scored between '2' (moderate pain on movement) and '4' (continuous pain at rest). 10 (20%) required analgesics.

Post-procedure, 38 patients (76%) did not suffer from nausea. 5 patients had a nausea score of '1' - nausea on movement only, no antiemetic was given. 7 patients (14%) scored between '2' (nausea at rest) and '4' (persistent nausea & vomiting, unrelieved by antiemetics).

Conclusions: Almost one quarter of the patients surveyed had significant pain after their ERCP-procedure. Nausea is less frequent but can be debilitating. The exact procedure performed did not seem to influence pain or nausea scores. We should consider the routine use of an analgesic such as intravenous paracetamol (acetaminophen).