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SA Radiological Monitoring v1.0

Shoulder arthroplasty radiological monitoring form

This form has been developed on the basis of a core set of radiological parameters defined by consensus among an international panel of experienced shoulder surgeons. It is recommended for documentation of shoulder arthroplasty monitoring in registry settings and clinical studies.

Please complete a separate form for each monitoring time point

Definitions of terms marked by supercript numbers are presented on the next page

Monitoring time point ○ Postoperatively up to 1 week ○ 3-6 months ○ 12 months ○ Other time : _____

Date : _____

1- Implant migration (subsidence, tilt, shift)[1] ○ No ○ Yes ○ Cannot be assessed*

		Subsidence[1a]			Tilt[1b]		
		No sign	Suspected	Definite	No sign	Suspected	Definite
Humeral component		○	○	○	○	○	○
Glenoid component	○ n.a.	○	○	○	○	○	○

2- Radiolucency around the implant / Implant loosening[2] ○ No ○ Yes ○ Cannot be assessed*

	Grade 0 None	Grade 1a Incomplete <1.5mm	Grade 1b Incomplete ≥1.5mm	Grade 2a Complete <1.5mm	Grade 2b Complete ≥1.5mm
RLL humeral metaphysis	○	○	○	○	○
RLL humeral diaphysis ○ n.a.	○	○	○	○	○
Glenoid component ○ n.a.	○	○	○	○	○

3- Signs of shoulder joint displacement[3] ○ No ○ Yes ○ Cannot be assessed*

Shoulder joint displacement ○ Subluxation[3a] ○ Dislocation[3b]

Direction on AP view ○ Superior ○ Centered ○ Inferior

Direction on axillary view ○ Anterior ○ Centered ○ Posterior

4- Bone resorption / Bone formation[4] ○ No ○ Yes ○ Cannot be assessed*

	None	Bone resorption	Bone formation[4b]	Cannot be assessed
Humeral side metaphysis[4a]	○	☐ Calcar region ☐ Tuberosities	☐ Orthotopic ☐ Heterotopic	○
Humeral side diaphysis ○ n.a.	○	○	☐ Orthotopic ☐ Heterotopic	○
Scapular side	○	○	☐ Orthotopic ☐ Heterotopic	○

Notching grade[4c] ○ None ○ Grade I ○ Grade II ○ Grade III ○ Grade IV ○ n.a.

Modified Brooker classification[4b] ○ Grade I ○ Grade II ○ Grade III ○ Grade IV ○ n.a.

5- Wear of the implant articular surfaces[5] ○ No ○ Yes ○ Cannot be assessed*

Wear of the articular surfaces ○ Concentric ○ Eccentric

Location of eccentric wear on AP view ○ Superior ○ Centered ○ Inferior

Location of eccentric wear on axillary view ○ Anterior ○ Centered ○ Posterior

6- Fractures around the implant ○ No ○ Yes ○ Cannot be assessed*

Humeral side
- ☐ Tubercula
- ☐ Diaphysis spiral
- ☐ Diaphysis transverse
- ☐ Distal (below the stem)

Scapular side[6]
- ☐ Body
- ☐ Acromion
- ☐ Glenoid neck
- ☐ Glenoid articular (rim, fossa)
- ☐ Scapular spine
- ☐ Coracoid

7- Implant breakage / disassembly[7] ○ No ○ Yes ○ Cannot be assessed*

	Breakage	Disassembly
Humeral side	☐	☐
Scapular side ○ n.a.	☐	☐

Other relevant radiological observation(s) ○ No ○ Yes : _____

Comment(s)

* please indicate the reason why one or more radiological parameters cannot be assessed

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Definitions and specifications

1- Noticeable change of the position of the implant, relative to the bone it is supposedly fixed to (either cemented or uncemented).

1a- Subsidence : migration of the implant of more than 5 mm along a linear axis compared to the immediate post implantation position. Subsidence is suspected when no more than 5 mm of migration

1b- Tilt : migration of the implant resulting in an angulation of more than 10° of its main axis compared to the immediate post implantation position. Tilt is suspected when no more than 10° of angulation

Shift : migration as a combination of subsidence and tilt. Shift is suspected when both subsidence and tilt are suspected or one is suspected and the other is definite. Shift is definite when both subsidence and tilt are definite.

2– Radiolucency relates to the occurrence/observation of radiolucent lines (RLL) at the bone-implant, bone-cement or cement-implant interface. Radiolucency lines (RLL) are documented according to their presence or absence, location and thickness, separately for the humeral and glenoid components. The humeral component is further divided into metaphysis and diaphysis according to the surgical neck of the humerus. Within each of these locations (as appropriate for various prosthesis types), the severity of RLL occurrence is graded in one of 5 categories.

3– Loss of alignment of the articulating surface of the humeral component with the articulating surface of its joint partner.

3a- non-arm position-dependent eccentric misalignment of the articulating surfaces with residual contact visible on standard radiographs.
3b- non-arm position-dependent complete loss of contact of the articulating surfaces visible on standard radiographs.

4– Bone resorption is progressive disappearance of bone from the humerus and/or scapula following SA when compared to the immediate post-operative condition. Bone resorption includes scapular notching and osteochondral erosions.

- Orthotopic bone formation (ossification) is bone formation within the confines of the bone including the periosteum: bone is formed within tissue that is destined to be or become bone under normal healing or loading conditions.

- Heterotopic bone formation (ossification) is a subset of excess bone formation within or between tissues that is not destined to be or become bone under normal healing or loading conditions.

4a- Humeral side: further divided into metaphysis and diaphysis according to the surgical neck of the humerus (visible on standard radiographs). When located above the surgical neck, the involvement of the calcar region and/or the tuberosities is documented.

4b-Heterotopic bone formation is classified according to a modified Brooker classification
(Brooker AF et al. J Bone Joint Surg 1973;55:1629-1632)
Grade 1 = Islands of bone within the soft tissues around the shoulder
Grade 2 = Bone spurs from the proximal humerus or scapula, leaving at least one centimeter between opposing bone surfaces
Grade 3 = Bone spurs from the proximal humerus or scapula, reducing the space between opposing bone surfaces to less than one centimeter
Grade 4 = Apparent bone ankylosis of the shoulder

4c- if bone resorption is documented on the scapular side, the notching grade (Nerot-Sirveaux classification) is assessed
(Sirveaux F et al. J Bone Joint Surg Br 2004; 86(3): 388-395)
Grade 1 = notch limited to the scapular pillar
Grade 2 = notch reaching the inferior screw of the base plate
Grade 3 = notch extending beyond the inferior screw
Grade 4 = notch reaching the base plate central peg

5– Damage, erosion or loss of the articular surface material over time, which is identified by reduction of joint space observed on serial plain radiographs. When Eccentric, the wear location is noted from the AP view as well as from the axillary view or Y-view.

6– Reference : Euler E, Rüedi T. Scapulafraktur. In: Schulterchirurgie, edited by Habermeyer P, Schweberer L, 2nd edition Urban & Schwarzenberg, München, Wien, Baltimore, 1996; 261-272

7– One part of the implant is broken / Noticeable change of the relative position of the various parts of an implant humeral or glenoidal component