

Table 1. Individual Patients Demographics																						
Group		Patient				Duration of Anesthesia		Duration of Surgical Procedure		Duration of Surgical Site		Duration of Surgical Procedure		Duration of Tourniquet			Mean Arterial Blood Pressure			Compound A Concentration		Compound A Inspired
No.	Age (yr)	Height (cm)	Weight (kg)	Anesthesia (min)	MAC H	MAC	Procedure (min)	Site	Procedure	Inflation (min)	Loss (ml)	Blood Pressure (mmHg)	Peak (ppm)	Mean (ppm-h)	AUC							
												Pre	Lowest	Ave								
Low-flow Sevoflurane plus Probenecid (LSP)	101	22	163	75	585	21.3	2.2	550	Knee	Ligament reconstruction	155	130	78	63	81	57.2	35.1	342.2				
	104	27	165	61	425	9.3	1.3	295	Knee	Ligament reconstruction	115	8	98	81	91	39.4	25.5	180.5				
	202	20	176	72	425	13.4	1.9	311	Shoulder	Arthroplasty		141	75	61	78	54.2	25.2	178.4				
	105	25	173	68	370	8.0	1.3	229	Knee	Ligament reconstruction	135	4	67	63	72	48.0	26.7	164.4				
	204	21	171	70	320	7.1	1.3	235	Shoulder	Arthroplasty		111	65	68	77	31.6	25.6	136.6				
	107	23	176	68	485	11.4	1.4	352	Knee	Ligament reconstruction	172	44	73	62	70	46.7	30.2	244.0				
	205	23	176	73	460	9.2	1.2	346	Shoulder	Arthroplasty		47	75	61	81	41.3	21.8	167.5				
	207	23	170	58	485	8.7	1.1	387	Shoulder	Arthroplasty		108	83	67	79	36.5	18.7	151.1				
	111	24	164	80	480	9.8	1.2	350	Knee	Ligament reconstruction	185	33	80	65	75	57.1	33.8	270.3				
	210	23	180	77	475	14.1	1.8	362	Shoulder	Arthroplasty		187	89	73	83	54.9	43.1	341.5				
	112	22	170	65	485	17.5	2.2	358	Knee	Ligament reconstruction	121	24	87	73	83	62.7	41.5	335.1				
	114	19	175	68	435	8.5	1.2	289	Knee	Ligament reconstruction	151	16	72	66	75	33.5	25.6	185.6				
	211	36	183	74	365	8.4	1.4	259	Shoulder	Arthroplasty		98	83	68	73	33.8	26.1	158.5				
	120	27	177	74	375	13.9	2.2	268	Knee	Ligament reconstruction	115	30	71	61	69	44.3	34.4	214.8				
	129	24	175	75	375	8.8	1.4	275	Knee	Ligament reconstruction	134	82	79	64	76	52.0	34.4	212.3				
	223	33	168	60	245	8.3	2.0	121	Shoulder	Arthroplasty		95	82	67	74	39.2	24.9	101.8				
mean±SD		25±5	173±6	70±6	424±82	11.1±4.0	1.6±0.4	312±92				143±25	72±54	79±9	66±5	77±6	45.8±9.8	29.5±6.9	211.5±75.2			
Low-flow Sevoflurane (LS)	102	28	177	75	430	11.7	1.6	301	Knee	Ligament reconstruction	175	4	81	70	76	48.9	38.5	276.0				
	103	21	162	65	430	7.9	1.1	298	Knee	Ligament reconstruction	192	9	71	67	77	39.3	31.5	225.9				
	201	24	174	70	335	9.6	1.7	210	Shoulder	Arthroplasty		55	73	59	65	45.1	26.7	148.8				
	203	26	174	63	430	115.0	1.6	313	Shoulder	Arthroplasty		145	74	68	76	55.3	33.9	242.7				
	106	19	180	70	430	16.8	2.3	303	Knee	Ligament reconstruction	177	20	82	67	75	74.0	37.3	267.1				
	206	21	170	63	445	13.0	1.6	332	Shoulder	Arthroplasty		159	70	57	66	32.9	24.7	182.9				
	208	18	176	86	315	11.2	1.4	197	Shoulder	Arthroplasty		157	67	58	70	44.4	33.1	173.6				
	108	22	175	75	485	9.0	1.2	349	Knee	Ligament reconstruction	133	55	77	63	70	50.4	31.9	257.7				
	209	24	171	73	470	9.2	1.8	351	Shoulder	Arthroplasty		182	78	63	83	73.5	43.0	336.6				
	109	34	172	66	485	14.0	1.7	359	Knee	Ligament reconstruction	125	40	88	71	79	49.9	33.0	267.1				
	110	24	171	65	490	16.6	2.1	360	Knee	Ligament reconstruction	129	45	76	69	77	36.3	27.2	222.0				
	212	24	165	55	335	5.8	1.0	223	Shoulder	Arthroplasty		246	74	75	83	28.3	19.9	111.0				
	113	21	173	70	415	13.8	2.0	295	Knee	Ligament reconstruction	210	50	73	71	82	76.6	35.4	244.6				
	122	18	175	62	485	8.9	1.4	395	Knee	Ligament reconstruction	109	21	87	76	88	32.1	16.3	131.7				
	218	26	170	65	335	11.6	2.1	210	Shoulder	Arthroplasty		71	99	79	88	25.7	19.9	111.3				
	125	36	180	78	555	14.9	1.9	468	Knee	Ligament reconstruction	94	23	78	79	88	33.3	26.7	247.0				
mean±SD		24±5	173±5	69±8	429±69	11.6±3.1	1.7±0.4	310±74				160±37	80±73	78±8	68±7	78±8	46.6±16.3	29.9±7.4	215.4±65.4			
High-flow Sevoflurane plus Probenecid (HSP)	213	22	173	90	495	16.6	1.9	398	Shoulder	Arthroplasty		325	85	70	81	11.8	6.6	54.3				
	118	29	160	51	455	10.1	1.8	313	Knee	Ligament reconstruction	241	4	74	65	81	5.8	3.0	22.6				
	119	21	180	75	500	12.3	1.4	403	Knee	Ligament reconstruction	178	6	84	73	80	4.5	1.8	14.8				
	121	22	162	52	450	11.4	1.5	340	Knee	Ligament reconstruction	123	8	78	67	82	8.2	3.2	24.4				
	216	22	164	54	350	10.4	1.5	247	Shoulder	Arthroplasty		46	74	65	69	2.9	1.7	10.2				
	126	23	170	62	435	15.4	1.7	313	Knee	Ligament reconstruction	153	12	69	56	68	3.5	2.1	15.0				
	127	24	168	70	470	14.2	2.0	320	Knee	Ligament reconstruction	234	11	77	65	82	5.9	2.7	21.3				
	217	22	178	85	355	10.8	1.9	234	Shoulder	Arthroplasty		27	90	78	95	11.0	7.8	45.9				
	222	34	173	90	410	9.3	1.3	308	Shoulder	Arthroplasty		186	86	71	82	6.5	5.0	33.9				
	128	35	173	61	410	7.6	1.3	265	Knee	Ligament reconstruction	102	9	83	68	80	2.8	1.2	8.4				
	224	20	168	82	380	8.4	1.8	288	Shoulder	Arthroplasty		77	69	59	69	7.7	4.8	30.5				
	132	32	170	66	480	9.8	1.4	358	Knee	Ligament reconstruction	133	102	75	61	81	6.5	3.4	27.6				
	133	22	166	62	475	11.0	1.6	340	Knee	Ligament reconstruction	125	27	89	77	89	15.3	6.5	51.4				
	225	23	173	75	425	13.4	1.6	338	Shoulder	Arthroplasty		60	83	72	90	8.7	5.0	35.2				
	136	20	165	58	390	10.1	1.5	267	Knee	Ligament reconstruction	113	85	83	68	79	8.6	3.5	22.8				
	228	31	160	64	335	13.8	1.8	265	Shoulder	Arthroplasty		79	70	57	66	5.1	3.3	18.7				

mean±SD	25±5	169±6	69±13	426±53	11.5±2.5	1.6±0.2	312±50				156±51	67±84	79±7	67±7	80±8	7.2±3.4	3.9±1.9	27.3±13.9
High-flow Sevoflurane (HS)	115	37	165	75	520	14.4	1.7	400	Knee	Ligament reconstruction	120	192	65	53	65	7.7	5.3	45.3
	214	30	168	65	340	12.7	1.7	230	Shoulder	Arthroplasty		45	81	67	65	5.2	2.9	16.2
	116	23	177	84	515	11.3	1.4	435	Knee	Ligament reconstruction	314	7	90	73	82	8.9	3.7	31.7
	117	22	174	72	465	10.1	1.3	365	Knee	Ligament reconstruction	139	102	76	68	83	8.9	4.3	33.6
	215	32	170	70	410	8.5	1.5	307	Shoulder	Arthroplasty		108	87	76	92	6.9	3.2	21.7
	123	21	162	54	545	7.9	1.1	445	Knee	Ligament reconstruction	142	7	84	75	90	6.6	2.9	26.2
	219	28	162	62	420	14.3	1.8	325	Shoulder	Arthroplasty		237	84	75	84	6.8	4.7	32.6
	220	23	165	59	340	9.0	1.5	221	Shoulder	Arthroplasty		110	73	65	76	12.1	9.5	53.9
	124	23	172	72	445	11.7	1.7	348	Knee	Ligament reconstruction	83	24	89	77	83	4.8	2.4	17.6
	221	23	167	68	340	11.3	1.6	245	Shoulder	Arthroplasty		136	73	67	75	7.2	3.4	19.3
	226	22	165	70	285	11.5	1.8	210	Shoulder	Arthroplasty		145	69	66	77	8.1	4.2	19.9
	130	20	164	61	430	11.6	1.4	331	Knee	Ligament reconstruction	121	7	77	70	81	5.8	3.3	23.9
	131	19	180	70	425	12.4	1.6	320	Knee	Ligament reconstruction	135	11	64	52	67	5.3	2.5	17.5
	227	31	185	76	505	12.8	1.8	423	Shoulder	Arthroplasty		540	84	75	90	8.6	5.4	45.5
	134	27	166	71	405	13.1	2.0	277	Knee	Ligament reconstruction	178	9	78	64	78	5.4	1.9	12.8
	135	21	165	70	460	8.8	1.6	350	Knee	Ligament reconstruction	156	8	92	74	89	6.1	3.8	29.3
mean±SD	25±5	169±7	69±7	428±74	11.3±2.0	1.6±0.2	327±76				154±65	06±13	78±9	68±7	79±8	7.2±1.9	4.0±1.8	27.9±11.9

Pre = preanesthesia; Lowest = the lowest mean arterial blood pressure during anesthesia; Ave = average mean arterial blood pressure
AUC= area under the curve
P<0.01 compared with the low-flow sevoflurane group. ~P<0.01 compared with the low-flow plus probenecid sevoflurane group.

Table 2

Table 2. Preoperative and Postoperative Serum BUN, Creatinine Concentrations, and Creatinine Clearance							
	Group	Preanesthesia	Day 1	Day 3	Day 5	Day 7	
Serum BUN (mg/dL)	Low-flow Sevoflurane plus Probenecid	13±3	11±3**	11±2**	13±3	14±4	
	Low-flow Sevoflurane (LS)	14±3	10±3**	10±3**	14±4	15±4	
	High-flow Sevoflurane plus Probenecid	14±3	10±4**	11±3**	15±4*	16±4*	
	High-flow Sevoflurane (HS)	13±4	10±4**	10±2**	13±3	14±3	
Serum Creatinine (mg/dL)	Low-flow Sevoflurane plus Probenecid	0.9±0.2	0.9±0.1	0.8±0.1**	0.9±0.1*	0.9±0.1	
	Low-flow Sevoflurane (LS)	0.9±0.1	0.9±0.1	0.9±0.2*	0.9±0.2	0.9±0.1	
	High-flow Sevoflurane plus Probenecid	0.9±0.1	0.9±0.1	0.8±0.1**	0.8±0.1*	0.8±0.1	
	High-flow Sevoflurane (HS)	0.9±0.1	0.8±0.1	0.8±0.1*	0.8±0.1	0.9±0.1	
Creatinine Clearance (ml/r	Low-flow Sevoflurane plus Probenecid	110±24	127±32*	113±24	104±18	104±23	
	Low-flow Sevoflurane (LS)	106±18	127±27*	98±19	104±24	110±30	
	High-flow Sevoflurane plus Probenecid	109±35	129±49	127±47	112±49	106±37	
	High-flow Sevoflurane (HS)	113±28	144±26*	128±41	113±30	104±19	
BUN=Blood Urea Nitrogen							
*P<0.05 compared with preanesthesia value.**P<0.01 compared with preanesthesia value.							

Table 3

Table 3. Time Course of Urinary Excretion of Protein, Albumin, α_2-microglobulin, Glucose, and NAG											
	Group	Days after anesthesia									
		Pre	1	2	3	4	5	6	7	Max	Ave
24 h Urinary	Low-flow Sevoflurane plus Probenecid (LSP)	60*33	94*32	106*44**	106*50	89*52	64*39	60*37	65*35	129*55	83*30
Protein Excretion (mg)	Low-flow Sevoflurane (LS)	54*18	279*508**	293*296**	339*403**	240*267*	140*117	97*63	88*44	466*562	211*214
	High-flow Sevoflurane plus Probenecid (HSP)	65*16	73*31**	62*32	65*24*	53*36	42*24	56*57	49*37	100*51	57*22
	High-flow Sevoflurane (HS)	47*17	144*222**	84*47	77*39	48*31	50*28	44*27	48*31	150*219	70*47
24 h Urinary	Low-flow Sevoflurane plus Probenecid (LSP)	8*4	12*7	14*7**	12*8	12*6	9*6	9*4	8*3	17*7	11*5
Albumin Excretion (mg)	Low-flow Sevoflurane (LS)	7*5	55*87**	67*84**	115*165**	129*186**	48*75	21*29	9*6	145*191	63*86
	High-flow Sevoflurane plus Probenecid (HSP)	8*7	15*12*	9*6	12*7	11*10	8*5	8*4	7*4	20*14	10*5
	High-flow Sevoflurane (HS)	8*5	20*24*	10*6	9*5	9*7	7*3	8*4	7*4	21*24	10*5
24 h Urinary α_2-microglobulin	Low-flow Sevoflurane plus Probenecid (LSP)	45*14	146*234**	218*299**	172*247**	67*39	54*26	52*23	41*20	285*370	107*99
Excretion (μg/g creatinine)	Low-flow Sevoflurane (LS)	44*18	3073*10294**	2691*8743**	1111*2514**	339*442	189*364	97*115	61*37	3411*10863	1075*3346
	High-flow Sevoflurane plus Probenecid (HSP)	54*36	118*115*	156*128	248*341	115*184	138*236	100*135	116*200	341*374	141*139
	High-flow Sevoflurane (HS)	46*23	443*1317**	285*408**	159*151**	88*103	55*48	79*102	53*36	609*1324	166*244
24 h Urinary	Low-flow Sevoflurane plus Probenecid (LSP)	55*42	225*270**	446*931**	144*108**	102*59	145*305	58*30	58*24	555*934	168*194
Glucose Excretion (mg)	Low-flow Sevoflurane (LS)	65*19	535*1000**	750*1471**	732*1395**	588*1067**	196*282	117*83	94*94	833*1498	430*749
	High-flow Sevoflurane plus Probenecid (HSP)	66*77	145*110*	117*96	190*231	85*94	46*30	67*60	52*21	241*216	100*66
	High-flow Sevoflurane (HS)	62*30	205*194**	111*51	101*74	62*27	79*82	64*43	58*22	239*194	97*40
24 h Urinary NAG Excretion	Low-flow Sevoflurane plus Probenecid (LSP)	1.6*0.7	1.6*1.1 [■]	1.9*1.2	2.7*1.1	3.0*1.8*	2.5*1.4	2.6*1.4	2.3*1.6	3.8*1.5	2.4*1.1
(U/g creatinine)	Low-flow Sevoflurane (LS)	1.5*0.8	2.9*4.9	4.6*4.1**	6.1*5.2**	4.2*2.8**	4.2*3.0**	3.1*1.5	3.1*1.8	7.5*5.2	4.0*2.4
	High-flow Sevoflurane plus Probenecid (HSP)	1.9*0.8	2.2*0.9	2.1*1.3	2.5*1.5	2.8*1.0**	3.0*1.7*	3.2*2.4**	3.0*2.4	3.8*2.3	2.7*1.3

Table 3

	High-flow Sevoflurane (HS)	2.0±0.6	2.6±1.3	3.8±5.0	4.0±4.0	3.8±2.4**	3.8±1.9	3.3±2.1	2.8±1.0	5.7±5.1	3.4±2.1
NAG=N-acetyl-_-glucosaminidase											
Pre = preanesthesia; Max = maximum value after anesthesia; Ave = average value after anesthesia											
*P<0.05 compared with preanesthesia value. **P<0.01 compared with preanesthesia value.											
P<0.05 compared with the Low-flow sevoflurane (LS) group. P<0.01 compared with the Low-flow sevoflurane (LS) group.											
®P<0.05 compared with the High-flow sevoflurane (HS) group.											