Uppsala screws or Hansson pins for internal fixation of femoral neck fractures?

A prospective study of 180 cases

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In a prospective randomized trial, two methods of internal fixation of femoral neck fractures were compared. Totally, 179 patients with 180 fractures were treated with either two Uppsala screws (n 96) or two Hansson pins (n 84). In all, 130 fractures were primarily displaced (Garden stages III and IV), whereas 88 percent of the fractures in both groups were well reduced. The patients were followed clinically and radiographically for 1 year. Thirty-six patients died within 12 months after the operation.

The functional results and the incidence of segmental collapse and nonunion did not differ between the groups. However, at the 4-month follow-up, 2 of 59 of the Garden's stages III and IV in the Uppsala-screw group were found displaced, whereas the corresponding result in the Hansson-pin group was 9 of 52 (P= 0.03).

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Because in Sweden the Uppsala-screw technique (Rehnberg 1988) and the Hansson-pin method (Hansson 1982) are currently popular methods to treat femoral neck fractures, we performed a prospective randomized comparative trial.

Table 1. Distribution of age, sex, and fracture severity

	Age	Sex (F/M)	Undisplaced/displaced
Uppsala	77 (32–96)	61/35	25/71
Hansson	78 (28–97)	52/32	25/59

Patients and methods

During one year, July 1988 to June 1989, 179 patients with 180 femoral neck fractures were randomly assigned to treatment with either the Uppsala-screw method (Rehnberg 1988) or the Hansson-pin method (Hansson 1982). Pathologic fractures and fractures in children were excluded. The fractures were classified according to Garden (1961).

The two treatment groups were comparable as regards the studied background factors, e.g., sex, age, and fracture severity (Table 1). Fifty-nine percent of the patients had a good prefracture mental status; 83 percent lived in their own homes; and 51 percent could walk alone outside without any walking aid. The patients were operated on within 24 (1–100) hours of admission.

Before the operation, displaced fractures, Garden stages III and IV, were treated in tibial pin traction. All 20 surgeons at our department were trained in both operational methods. Simple randomization with a single sequence of random numbers was used. One fracture was omitted because it could not be reduced and was therefore operated on with a primary hemiarthroplasty. The average duration of the operation was 38 (15–95) minutes in the Uppsala-screw group and 33 (13–95) minutes in the Hansson-pin group. The degree of reduction was measured with the Garden (1961) angle. The reduction was classified as good if the angle was between 155° and 180° in the frontal view and between 160° and 200° in the lateral view (Halpin and Nelson 1980). Immediate full-weight bearing was encouraged. Clinical and radiographic follow-up examinations were done after 5 (3–8) months and 13 (9–25) months. Radiographs were also taken immediately postoperatively and after 1 week. The radiographs were evaluated by the same radiologist (FM-P) together with 1 of the surgeons (BH).

The following definitions were used in the radiographic analysis:

Union. Radiographic visible trabeculations across the fracture line (Brown and Abrami 1964).

Table 2. Complications within 12 months

	Segmental collapse		Nonunion	
	Reop	No reop	Reop	No reop
Uppsala (n 72)	2	8	3	13
Hansson (n 70)	5	8	2	15

Table 3. Other reoperations within 12 months

	Uppsala	Hansson
Local discomfort due to protruding screws	6	0
Deep infections	3	2
Penetration perop. into cartilage	1	0
Trochanteric fracture same side	1	3

Nonunion. No radiographically visible trabeculations across the fracture line (Banks 1962).

Segmental collapse. A depressed segment of the femoral head (Brown and Abrami 1964). The definition also includes avascular necrosis (Garden 1971).

Fracture displacement. Displacement within 4 months postoperatively.

The chi-square test with Yate's correction and Fisher's exact test were used to study univariate correlations.

Patients and methods

There were no preoperative deaths. Three patients died within 2 weeks postoperatively. Within the first 4 months after the operation, another 20 patients died. During the first postoperative year, a total of 21 patients in the Uppsala group and 12 in the Hansson group had died. Three patients in the Uppsala group and 2 in the Hansson group did not attend the follow-up examination because their general condition was too poor.

Totally, 115 of the 130 displaced fractures were well reduced. The mean hospital stay was 12 days. The functional results were comparable in the two treatment groups. Sixty-five patients returned to previous independent living; 50 of the patients used canes or two quadrupeds on discharge; and 127 patients still needed at least a walking frame or a similar device. Ten of the 11 patients with an early fracture displacement were in the latter group. At the 4-month follow-up examination, 22 patients (11 in the Uppsala group and 11 in the Hansson group) had severe pain when walking or during passive joint motion, and 15 of them developed radiographic complications or underwent a second procedure during the first year.

Complications

Among the primarily undisplaced fractures in the Hansson-pin group, there were four segmental collapses (two reoperated on) and one nonunion (reoperated on), whereas the corresponding result in the Uppsala-screw group was three segmental collapses and one deep infection (reoperated on). At 4 months postoperatively, nine of 52 primarily displaced fractures in the Hansson group and two of 59 in the Uppsala group had redisplaced ($P = 0.03$); all of these patients had been reoperated on.

There were no later redisplacements. At 1 year, the incidence of segmental collapse and nonunion did not differ between the groups (Table 2). In 4 patients (2 in each treatment group) with fracture union, the radiographs revealed a loss of anchorage in the femoral head, however, without subsequent redisplacement. Table 3. Totally, 18 reoperations were performed in the Uppsala group and 21 in the Hansson group. Of the 6 patients with rheumatoid arthritis, 4 had healing complications. Detailed data on patients and fractures are given in a general table (Table 4).

Discussion

In accordance with several authors (Strömqvist et al. 1987, Sernbo 1988, Rehnberg 1988), we have analyzed the results separately for undisplaced (Garden stages I and II) and displaced fractures (Garden stages III and IV). According to the actuarial method of analysis (Armitage 1971), the cumulative success rate after 1 year of follow-up was 67 percent in the Uppsala group and 49 percent in the Hansson group. Lindequist et al. (1989) used similar definitions, and had a cumulative success rate of 74 percent after 1 year with the von Bahr screws. After treatment of displaced femoral neck fractures with four AO cancellous bone screws, Madsen et al. (1987), using the same follow-up periods and radiographic definitions, had union rates similar to ours.

Like Sernbo (1988) and Borgqvist et al. (1990), we found that the walking capacity 2 weeks after the operation could be used as a prognostic instrument. As noticed by Rehnberg (1988), we found that nearly every patient with severe pain at the 4-month follow-

Table 4. Observations in 179 patients operated on for femoral fracture

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
1	61	2	1	1	1	2	1	1	3	1	1	2	42			32	2	2	2	2	2	2	1	2	2	2	2	2			8		123	568
2	82	2	1	1	2	1	1	1	6	1	3	2	43			29	2	2	2	2	2	1	1	2	2	2	2	2			11		140	367
3	88	1	1	2	2	2	1	2	6	1		2	30	6	8	35	2	2						2			2				15		122	
4	68	2	1	1	2	1	2	6	6	1	1	2	40			19	2	2	2	2	2	2	1	2	2	2	2	2			8		116	751
5	77	2	1	5	1	1	3	1	6	1	1	1	45			19	2	2	2	2	2	1	1	2	2	2	2	2			25		129	367
6	75	2	1	2	1	2	1	1	6	1	3	2	50	2	2	38	2	2	2		2			2	2		2				11		134	
7	28	2	1	1	1	2	1	1	3	1	2	2	41			16	2	2	2	2	2	2	1	2	2	2	2	2			5		126	368
8	88	2	1	4	2	2	1	1	6	1	2	2	55			18	1	2	2	2	2	1	2	2	1	1	2	2			7		125	
9	90	2	1	7	2	1	3	1		1		2	20			51	2	2						2			1				11			
10	93	1	1		2	1	1	1		1		2	19			17	2	2						2			1				10			
11	88	2	1	4	2	2	2	2	6	1	2	2	35	1	1	14	2	1						2			2	2			10		137	347
12	71	2	1	1	2	2	1	1	3	1	1	2	60			20	2	2	2	2	2	2	1	2	2	2	2	2			8		123	307
13	88	2	5	5	2	1	2	6	8	2		2	70			22	2	2					2	2			1				11			
14	80	2	3	4	2	1	4	3	6		2	2	65			24	2	2	2	1	2	2	2	2	2	1	2	2			12		138	341
15	72	2	1	4	1	2	1	2	6	1	1	2	25	2	3	18	2	2	2		2			2	2		2				7		133	
16	88	1	5	5	2	1	4	3	6			2	85			18	1	2						2			1				7			
17	77	2	1	4	2	1	1	1	6	1	3	2	60	6	8	18	2	2	2		2			2	1		2				11	1	124	
18	76	2	1	4	2	1	1	1	6	1	3	2	57	6	8	23	2	2	2	2	2	2	1	2	2	2	2	2			9		121	385
19	85	2	1	8	2	1	2	1	6	1	2	2	45			20	2	2	2	2	2	1	1	2	1	1	2	2			14		120	376
20	71	2	1	1	2	1	1			1	1	2	25	2	3	17	2	2	2		2			2	2		2				10		93	
21	69	2	1	1	2	2	1	1	3	1	2	2	25	3	6	10	2	2	2		2			2	2		2	2			9		92	325
22	74	2	1	4	2	1	1	1	3	1	1	2	40			19	2	2	2	2	2	2	1	2	2	2	2	2			12		159	400
23	71	1	4	4	2	2	1	1	6	6	3		2	40		21	2	2	2		2			2		2	1				7			
24	91	2	1	4	2	2	1	1	6			1	2	40	2	1	26	2	2						2		2				10		193	
25	89	2	1	5	2	1	1	3	6	1		1	55	6	6	23	1	2						2							18			
26	86	1	1	4	2	1	1	1	3	1	1	2	42			22	2	2	2		2			1	1		2	1					127	
27	75	1	4	4	1	1	4	6	6		1	2	23			38	2	2	2	2	2	2	2	2	2	2	2	2			8		153	397
28	74	2	1	4	2	1	2	6	7	2		2	55			46	2	2	2	2	2	2	2	2	2	2	2	2			13			435
29	87	2	3	6	2	2	5	7	8	2							2	3						2			1				18			
30	72	1	1	1	2	2	1	1	3	1		2	30			22	2	2	2	2	2	2	1	2	2	2	2	2			13			358
31	63	2	1	1	2	1	1	1	3	1	2	2	55	6	5	23	2	2	2	2	2	2	1	2	2	2	2	2			12		123	387
32	88	2	3	4	2	1	4	6	8	2	3	2	17			18	1	2	2		2			2	1		2	1			43		157	
33	82	1	1	4	1	1	3	6	6	1			30			45	2	2						2			1				23			
34	77	2	1	5	2	1	1	1	6	1	1	2	85			16	2	2	2	2	2	2	1	2	2	2	2	2			6		111	403
35	81	1	1	6	1	2	1	1	6		1	2	60			24	2	2	2	2	2	1	1	2	2	2	2	2			5		242	572
36	88	1	6	4	1	1	3	6	8		1	2	30			21	2	2	2	2	2	2	1	2	2	2	2	2			3		130	355
37	80	2	3	5	2	1	3	6	7	1		2	40			21	2	2	2		2			2	2		2	1			11		123	
38	83	1	1	4	2	1	1	6		1		1	25			48	2	2						2			1				10			
39	90	2	4	5	2	2	3	1	6	2		2	45			19	2	2						2			1				4			
40	83	2	1	4	2	1	4	6	6		1	2	55			86	1	2	2		2			2	2		2	1			14		146	
42	88	2	1	1	2	1	1	1	6	1	2	1	80	1	5	33	2	2	2	2	2	2	1	2	1	1	2	2			15		121	323
43	62	1	1	2	2	2	1	1	1	1	2	2	30			13	2	2	2	2	2	2	1	2	2	2	2	2			14		246	392
44	67	1	4	4	2	2	2	1	8	4	1	2	43			23	2	2	2	2	2	2	1	2	2	2	2	2			4		118	409
45	84	2	3	4	1	2	3	1	8	2	1	2	60			26	2	2	2	2	2	1	1	2	2	2	2	2			18		132	361
46	75	1	4	4	2	1	2	6	6	2		2	15	6	8	27	2	2						1			2				4			
47	87	2	5	5	2	1	4	6	8	4	1	2	25			32	2	1	2	2	2	2	1	2	2	2	2	2			8		110	354
48	32	1	1	1	2	1	1	1	3	1	1	2	90			26	2	2	2	2	2	2	1	2	2	2	2	2			10		53	381
49	85	2	1	1	1	2	1	2	6	2	1	2	22			28	2	2	2	2	2	2	1	2	2	2	2	2			36		156	351
50	86	1	3	4	2	1	3	6	7	3		2	30			22	2	2						2			1				36			
51	84	2	1	1	1	1	1	1	6	1	2	2	30			23	2	2	2	2	2	1	1	2	2	2	2	2			20		152	347
52	91	1	1	3	2	2	2	2	6	1	3	2	18	6	8	19	2	2						2							17			
53	76	1	1	4	2	1	1	7	6	1	2	2	31			21	2	2	2	2	2	2	2	2	2	2	2	2			16		100	343
54	91	2	3		1	2	2	1				2	25			66	2	2									1				10			
55	73	1	4	4	2	1	4	6	8	3	1	2	25			28	2	2	2	2	2	2	1	2	2	2	2	2			3		110	339
56	82	1	4	4	2	2	4		8	1		2	45			19	2	2	2	2	2	2	1	2	1	1	2	2			4			395
57	94	2	1	4	1	2	1	1	6	1	2	2	30			100	2	2	2	2	2	2	1	2	2	2	2	2			20		141	395
58	71	2	1	5	2	2	1	2	6	2		2	23	2	1	18	2	2	2					2							25			
59	89	2	4	4	1	2	2	1		3	3	2	13			16	2	2	2	2	2	2	1	2	2	2	2	2			4		123	376
60	83	2	8	8	1	1	1	1	6		2		75			19	2	2	2		2			2	2		2	1			3		185	
61	83	2	1		2	1	1	6	6	2	2	2	20			20	2	2	2	2	2	2	1	2	2	2	2	2			17		154	392
62	82	2	1	5	2	1	1	1	6	1	3	2	25	2	2	25	2	2	2	2	2	2	2	2	2	2	2	2			17		134	372
63	67	2	1	4	2	2	1	2	6	1	2	2	25			21	2	2	2	2	2	2	1	2	2	2	2	2			32		154	372
64	81	1	1	7	2	1	1	1	6	1	3	2	27			23	2	2	2	2	2	2	1	2	2	2	2	2			16		134	387
65	80	2	5	5	1	2	3	6	6	3	3	2	30			35	2	2	2		2			2	2		2	2		1	7		182	384
66	76	2	3	3	2	2	3	2	6	2	2	2	30			18	2	2	2	2	2	1	2	2	1	1	2	2			16		120	393
68	78	1	5	5	2	1	1	1	8	4	3	2	30			19	2	2	2	2	2	2	1	2	2	2	2	2			4		118	384
69	93	2	1	4	2	1	3	2	6	1	1	2	35			20	2	2	2		2			2	2						5			
70	87	1	6	6	2	1	4	6	6	3		2	20			6	2	2						2			1				2			
71	82	1	1	1	2	2	1	1	3	1	2	2	30			25	2	2	2	2	2	2	1	2	2	2	2	2			15		128	366
72	97	1	1	1	1	2	1	1	1	1	2	2	20			28	2	2	2	2	2	2	1	2	2	2	2	2			15		115	366
73	88	2	3	4	2	2	3	1	8	4		2	30			36	2	2	2		2			2	2		2				53			
74	72	2	3	4	2	2	2	4	2	6	1		2	23	2	1	19	2	1						2			2				7			
75	74	2	1	5	1	2	1	1	6	1		2	20			19	2	2						2			1				6			
76	78	2	1	4	2	2	3	6	8			2	30	2	1	24	2	3						1							21			
77	76	2	1	1	1	1	1	1	3	1	2	2	40			19	2	2	2	2	2	1	1	2	2	2	2	2			15		133	350
78	35	1	1	1	2	1	1	1	3	1	2	2	80			14	2	2	2	2	2	2	1	2	2	2	2	2			12		122	369
79	87	2	1	4	2	2	3	6	6	1	2	2	48			27	2	2	2	2	2	2	2	2	2	2	2	2			8		122	416
80	76	1	1	6	2	2	1	1	7	1		2	20			47	2	2	2	2	2	2	1	2	2	2	2	2			25		639	
81	76	2	1	4	1	2	1	1	6	1	2	2	20			21	2	2	2	2	2	2	1	2	2	2	2	2			7		125	491
82	79	1	5	5	1	1	4	6	6	1	1	2	40			64	2	2	2	2	2	2	2	2	2	2	2	2			8		124	364
83	70	2	1	1	2	2	1	1	6	1	3	2	53	2	1	31	3	2	1		2			2	1		2				8		84	
84	92	1	1	5	2	1	1	1	6	1		2	35			22	2	2						2			1				5			
85	79	2	1	5	2	2	1	6	6			2	48	6	8	19	2	2						2							8			
86	87	2	3	4	2	1	1	1	6	1		2	35	2	2	19	2	2	2		2			2	1						21			
87	68	2	1	6	2	2	1	2	6	1	3	2	45	2	1	22	2	2	2		2			2	1		2				17		144	
88	54	1	1	1	2	1	1	1	3	1	1	2	90			18	2	2	2	2	2	2	1	2	2	2	2	2			6		164	347
89	85	2	3	3	2	2	4	8	8	4	1	2	25			17	2	2	2		2			2	2		2				10		100	
90	74	2	1	1	2	1	1	1	3	1	1	1	30	3	8	25	2	2						2			2				13		168	
91	50	2	1	1	1	2	1	1	3	1	2	2	75			11	2	2	2	2	2	2	2	2	2	2	2	2			8		129	
92	88	1	1	4	1	2	1	1	6	1	1	2	35			13	2	2	2	2	2	2	1	2	2	2	2	2			10		107	394
93	70	1	1	1	2	2	2	1	3	1	2	2	20			17	2	2	2	2	2	2	2	2	2	2	2	2			21		98	387
94	82	2	4	4	1	1	4	6	6	2		2	21			17	2	2	2	2	2	2	1	2	2	2	2	2			5			
95	86	2	1	1	2	2	1	1	3	1	3	2	33	2	3	12	2	2	1		2			2	1		2						96	
96	76	2	1	4	2	2	1	1	6	1	1	2	30			22	2	2	2	2	2	2	1	2	2	2	2	2			7		125	371
97	88	2	3	3	2	1	1	2	6	3	2	2	55			22	2	2	2	2	2	2	1	2	2	2	2	2			16		242	407

Continued

Table 4. continued

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
98	76	2	1	4	2	2	2	1	8	3		2	45	2	3	20	2	2						1							19			
99	85	1	4	4	2	2	2	2	8	4		2	19			21	2	2						2			1				3			
100	89	2	1	4	2	2	3	1	6	4	3		33			23	2	2	2	2	2	2	2	2	1	1	2	2			33		146	
101	69	2	1	1	1	1	1	1	3	1	2	2	23			21	2	2	2	2	2	2	1	2	2	2	2	2			11		118	381
102	82	2	1	4	2	1	1	1	8	3		2	35			26	2	1	2	2	1	1	2	1	1	1	2	2			26			
103	52	1	1	1	2	2	1	1	3	1	1	2	40			22	2	2	2	2	2	2	1	2	2	2	2	2			10		116	362
104	82	1			2	1							38			25	2	2									1						
105	85	2	1	4	1	1	1	6	6	2	2	2	34			17	2	2	2	2	2	2	1	2	2	2	2	2			10		120	383
106	91	2	1	6	2	2	6	1	8	4		2	25	1	6	43	2	2						1							17			
107	47	2	1	1	2	2	1	1	3		3	2	18	2	1	24	2	2	2		2		2	2	1		2				8		90	
108	59	2	1	1	2	2	1	1	3	1	1	2	40			21	2	2	2	2	2	2	1	2	2	2	2	2			9		128	381
109	81	1	1	4	1	2	1	1	6	1	1	2	23			21	2	2	2	2	2	2	1	2	2	2	2	2			9		99	344
110	88	1	1	4	2	1	1	2	6	2	3	2	50	2	2	5	2	1	2		2			2	2		2							
111	84	1	1	4	2	1	1	1	6	1	2	2	18			44	2	2	2	2	2	2	2	2	2	2	2	2			5		83	343
112	80	1	1	1	2	2	1	1	6	1	3	2	23			28	2	2	2	1	2	2	2	2	1	1	2	2			14		132	473
113	67	1	1	1	2	2	1	1	3	1	2	2	15			24	2	2	2	2	2	2	1	2	2	2	2	2			6		124	363
114	68	1	1	1	1	1	1	1	3	1	2	2	42			46	2	2	2	2	2	2	1	2	2	2	2	2			6		128	499
115	61	2	1	1	2	1	1	1	3	1	1	2	49			21	2	2	2	2	2	2	1	2	2	2	2	2			10		121	360
116	81	1	1	4	2	1	1	1	6	1	2	2	82			9	2	2	2	2	2	2	1	2	2	2	2	2			24		149	359
117	64	1	1	7	1	2	1	1	6	1		2	50			20	2	2	2	2	2	2	1	2	2	2	2	2			3			343
118	86	1	1	5	2	2	1	1	6			2	95			29	2	2	2	2	2	2	1	2	2	2	2	2			4			
119	88	2	5	5	2	2	3	1	6	2		2	47			19	2	2									1				4			
120	87	2	3	6	2	1	4	6	6	2	2	2	40	1	6	17	2	2						2							33			
121	79	2	1	1	2	1	1	1	6	1	2	2	30			18	2	2	2	2	2			2	2		2	2		1	12		121	522
122	81	2	1	4	1	2	1	1	6		2	2	20			21	2	2	2	2	2	2	1	2	2	2	2	2			8		181	360
123	91	1	3	5	2	1	1	1	6	3	2	2	45	6	8	32	2	2	2		2			2	2		2	2			11		112	349
124	82	2	1	4	2	2	3	2	6	1	2	1	25	2	3	43	2	2	2		2			2	2		2				16		129	
125	80	2	1	4	2	1	1	1	6	1	2	2	75			44	2	2	2	2	2	2	1	2	2	2	2	2			15		126	354
126	41	2	1	1	2	2	1	1	3	1	2	2	15			24	2	2	2	2	2	1	1	2	2	2	2	2			12		140	354
127	65	1	1	1	2	1	1	1	3	1	1	2	35			16	2	2	2	2	2	2	1	2	2	2	2	2			14		136	353
128	70	2	1	6	2	2	1	1	8		2	2	42			21	2	2	2	2	2	2	2	2	1	1	2	2			2		135	352
130	85	1	5	5	2	1	5	8	8	3		2	30			17	2	2						2			1				2			
131	76	2	2	6	2	1	1	1	6	1	3	2	40	6	8	22	2	2	1		2			2	1		2				5	1	121	
132	82	1	4	4	1	2	3	1		1	1	2	35			24	2	2	2		2			2	2		2	2			4		132	346
133	65	1	1	4	2	1	2	2	6	2	1	2	30	2	1	41	2	2						2							14			
134	77	1	1	1	2	1	1	1	3		1	2	20			21	2	2	2	2	2	2	1	2	2	2	2	2			11		127	344
135	63	2	1	1	2	1	1	1	3		2	2	30			18	2	2	2	2	2	2	2	2	2	2	2	2			10		129	372
136	82	2	3	5	1	1	3	6	8			2	25			16	2	2						2			1				71			
137	87	1	1	4	2	1	1	1	6	1	2	2	20			1	2	2	2	2	2	2	2	2	2	2	2	2			3		113	378
138	90	2	1	4	2	1	3	6	6	1	1	2	30			26	2	2	2	2	2	2	1	2	2	2	2	2			12		143	495
139	86	1	1	4	2	2	1	1	6	4	1	2	33			21	2	2	2		2			2	1						6		172	
141	80	2	1	4	2	1	1	1	6	1	3	2	45			19	2	2	2	2	2	2	1	2	2	2	2	2			16		144	357
142	64	2	1	1	2	1	1	1	6	1	2	2	30			20	2	2	2	2	2	2	1	2	1	1	2	2			8		144	375
143	68	2	1	1	2	2	1	1	3		1	2	20			36	2	2	2	2	2	2	2	2	2	2	2	2			13		144	375
144	40	1	1	1	1	1	1	1	3	1	2	2	38	6	6	22	2	2	2		2			2	2		2				12			
145	62	1	3	3	2	1	1	1	3	2	1	2	55			23	2	2	2	2	2	2	1	2	2	2	2	2			15		168	404
146	47	2	7	6	1	1	1	1	6	1	2	2	35			25	2	2	2	2	2	2	1	2	2	2	2	2			4		186	387
147	93	1	1	1	2	2	2	7		1	2	2	20			30	2	2	2	2	2	2	2	2	2	2	2	2			8		146	381
148	85	1	1	1	1	1	1	1	2	1	1	2	20			46	2	2	2	2	2	2	1	2	2	2	2	2			6		144	411
149	66	1	1	6	1	1	1	1	6	1	2	2	17			24	2	2	2		2			2	2		2	2			2		169	406
150	88	1	3	4	2	2	4	6	8			2	40			20	2	2						2			1				14			
151	72	2	1		2	1	1	1	6	1		2	30			17	2	2						2			1							
152	87	2	1	4	1	2	1	1	6	1	1	2	20			13	2	2	2	2	2	2	1	2	2	1	2	2			12		142	368
153	86	2	3	3	1	1	2	6	6	1	2	2	48			21	2	2	2	2	2	2	1	2	2	2	2	2			10		131	366
154	74	1	3	3	2	2	1	6	6	4	2	2	40			19	2	2	2	1	2	2	2	2	2	1	2	2			19		143	396
155	81	2	4	4	1	1	3	6	6	2	2	2	17			21	2	2	2	2	2	2	1	2	2	2	2	2			4		128	335
156	91	2	1	1	1	1	1	1	6	1	2	2	18			12	2	2	2	2	2			2	1		2	2		1	18		137	
157	87	2	1	4	2	1	1	1	6	1	2	2	65			20	2	2	2	2	1	1	2	2	1	1	2	2			11		135	392
158	55	2	1	6	1	2	1	1	3	1		2	50			19	2	2						2			2		1		3			
159	74	1	6	6	2	2	1	1	8	2		2	60			22	2	2	2	2	2	2	1	2	2	2	2	2			2			390
161	86	2	3	3	2	2	4	2	6	4		2	20			9	2	2		2		2	1	2		2	2	2			18			
162	68	1	1	6	2	1	1	1	6	1	2	2	25			11	2	2	2	2	2	2	2	2	1	1	2	2			7		133	367
163	59	1	1	1	2	2	1	1	3	1	1	2	37			6	2	2	2	2	2	2	1	2	2	2	2				14		130	
164	73	2	1	1	2	2	1	1	3	1	1	2	30			21	2	2	2	2	2	2	1	2	2	2	2	2			8		131	362
165	73	1	5	5	2	2	3	1	6	4		2	60			20	2	2						2			1				3			
166	82	2	1	1	2	1	1	1	6		1	2	15			19	2	2	2	2	2	2	1	2	2	2	2	2			14		121	384
167	90	2	1	6	1	1	2	6	6	2		2	20			28	2	2						2			2	1	1		17			
168	75	2	1	4	1	1	1	6	6		1	2	20			22	2	2	2	2	2	2	1	2	2	2	2	2			17		124	377
169	89	2	1	1	1	2	2	2	2		1	2	30			28	2	2	2		2			2	2		2	1			9		113	
170	85	2	3	3	2	1	2	1	6	1	3	2	15	2	1	24	3	2	1		2			2	1		2	2			11		121	
171	78	2	3	3	1	1	3	1	6	4	2	2	30			18	2	2	2		2			2	2		2			1	7		109	
172	65	2	1	1	1	1	1	1	3	1	1	2	20			22	2	2	2	2	2	2	1	2	2	2	2	2					190	355
173	97	2	3		1	2	4		8	1	2	2	16			23	2	2	2		2			2	2		2	1					125	
174	79	2	1	4	2	2	3	2	6	1		2	13			24	2	2						2			1				16			
175	66	2	1	1	2	1	1	1	3	1	2	2	30	6	8	35	2	2	2	2	2	2	2	2	2	2	2	2			6		152	377
176	88	2	3	5	2	1	4	6	8	4		2	24			20	2	2						2			1				7			
177	84	2	3	3	2	1	2	1	8	3	2	2	22			18	2	2	2	2	2	2	1	2	2	2	2	2			5		143	345
178	90	1	1	4	2	2	1	1	6	1	3			2	1	24	2	2	2		2			2	2		2				9		142	
179	79	1	6	6	2	2	4	8	8	4		2	45			29	2	3	2	2	2	2	1	2	2	2	2	2			2			270
180	80	1	1	4	2	2	1	2	6	1	2	2	30			20	2	2	2	2	2	2	2	2	2	2	2	2			4		224	366
181	59	2	4	4	2	1	3	6	6	2	1	2	41			23	2	2	2	2	2	2	1	2	2	2	2	2					139	341
182	87	2	3	3	1	1	2	6	6	4	2	2	19			22	2	2	2	2	2	2	1	2	2	2	2	2			12		105	342
183	64	2	1	1	2	1	1	1	3	1		2	45			31	2	2	2	2	2	2	1	2	2	2	2				12		130	
184	88	2	1	4	2	1	3	6	8	1	2	2	26			17	2	2	2		2			2	2		2	2			10		142	365
185	77	1	1	3	2	2	1	1	6	1	1	2	39			22	2	2	2	2	2	2	1	2	2	2	2	2			7		140	366

Legends to Table 4

A Case
B Age
C Sex
  1 male
  2 female
D Admitted from
  1 own home
  2 convalescent home
  3 almshouse (charity)
  4 geriatric hospital
  5 nursing home
  6 hospital
  7 other
  8 nursed in another department
  9 unknown
E Discharged to
  see above
F Fracture severity
  1 Garden stages I and II
  2 Garden stages III and IV
G Osteosynthesis
  1 Uppsala
  2 Hansson
H Walking capacity before fracture
  1 independent walking outside
  2 walking outside only when accompanied
  3 independent walking inside
  4 walking inside only when accompanied
  5 sitting in a chair
  6 bedridden
  9 unknown
I Walking aid before fracture
  1 none
  2 one crutch
  3 two crutches
  4 one crutch and one quadruped
  5 two quadrupeds
  6 walking frame
  7 wheelchair
  8 not walking
J Walking aid when discharged
  see above
K Mental status
  1 well
  2 do not remember which day
  3 do not remember where they live
  4 do not remember their name
L Pain at 4 months when walking or passive joint motion
  1 none
  2 moderate
  3 severe
M Rheumatoid arthritis
  1 yes
  2 no
N Duration of operation (minutes)
O Type of reoperation
  1 screw/pin extraction
  2 hemiarthroplasty
  3 total hip arthroplasty
  4 reosteosynthesis
  5 Girdlestone
  6 other
P Indication for reoperation
  1 fracture displacement
  2 nonunion
  3 avascular necrosis
  4 ordered position of pin/screw without redisplacement
  5 local discomfort of protruding screws/pins (fracture union)
  6 deep infeciton
  7 refractured
  8 other
Q Time from admission to operation (hours)
R Garden angle in the frontal view
  1 less than 155°
  2 155°–180°
  3 more than 180°
S Garden angle in the lateral view
  1 less than 160°
  2 160°–180°
  3 more than 180°
T–AC 1 yes
  2 no
T Avascular necrosis, 4 months
U Avascular necrosis, 12 months
V Segmental collapse, 4 months
W Segmental collapse, 12 months
X Union
Y Altered position of pins/screws without redisplacement after 1 week
Z Altered position of pins/screws without redisplacement after 4 months
AA Altered position of pins/screws without redisplacement after 12 months
AB Dead before 4 months postoperatively
AC Dead between 4 and 12 months postoperatively
AD Lost for 4-month follow-up
  1 yes
AE Lost between 4 and 12 months postoperatively for follow-up
  1 yes
AF Stay in orthopedic department (days)
AG Reoperated on twice
  1 yes
AH Time to 4-month follow-up (days)
AI Time to 12-month follow-up (days)

up examination developed healing complications. The value of a good reduction for the result has been pointed out by, for example, Söreide et al. (1977), Frandsen (1979), and Sernbo (1988). These findings were evident also in our series. Like Lindequist et al. (1989), we also found that a loss of anchorage in the femoral head does not always lead to fracture displacement. Also in our study, rheumatoids had more complications (Strömqvist et al. 1988, Stephen 1981). Sex, age, and fracture severity did not differ between the two groups, and the results were similar to what have been reported by other authors (Madsen et al. 1987, Sernbo 1988).

An average duration of 36 minutes for the operation agrees well with Sernbo (1988), but was shorter than Rehnberg (1988). Holmberg and Thorngren (1988) have shown that fracture displacement is one of the complications that needs most hospital resources. Although the total number of reoperations and radiographic complications were relatively similar between the two groups, we had fewer technical failures in the Uppsala group. Our results with the Uppsala screw accord with Rehnberg's results (1988); but with the Hansson pin, we have not managed to achieve the good results of Strömqvist et al. (1987). We have no explanation for this.

We conclude that on the basis of our experience and results, the Uppsala-screw technique gave slightly better results than the Hansson-pin technique for internal fixation of femoral neck fractures.

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