

Revision THR after periprosthetic femoral fractures

An analysis of 23 cases

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23 consecutive proximal femoral fractures in 22 patients, who had previously undergone total hip arthroplasty, were treated with long revision stems. At the time of the fracture, 21 stems were loose. An uncemented Wagner revision stem was used in 9

cases and different conventional revision stems in the others. All fractures healed, but 7 of the conventional revision implants rapidly loosened again, whereas so far none of the Wagner stems have loosened.

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Closed treatment of femoral fractures subsequent to total hip arthroplasty entails a high risk of complications as well as long treatment in the hospital (Fredin et al. 1987). On the other hand, surgical treatment is technically demanding. Barfod and coworkers (1986) suggested that revision with the use of a long stem was the best treatment.

We analyzed 23 fractures involving the proximal femoral shaft in 22 patients, who had previously undergone total hip arthroplasties.

Patients and methods

From January 1989 to July 1993, 22 consecutive patients (9 men and 13 women) who had femoral fractures after previous THR were treated with revision, within a few days of arrival at the hospital, for a total of 23 fractures (Table 1). The mean age was 69 (40-85) years. The fractures were classified according to Bethea et al. (1982) as Type A (3 cases), Type B (15 cases) and Type C (5 cases). In short, a Type A fracture is situated at the tip of the stem, Type B is a spiral fracture around the stem, while Type C is a comminuted fracture around the stem.

The fracture occurred, on average, 88 (2-200) months after the latest THR operation. Apart from 1 (Case 12), the other fractures occurred after minor trauma (Barfod et al. 1986, Adolphson et al. 1987). In 3 of the patients, the prosthesis had been previously revised (Cases 9, 14, and 22). 18 of them had radiographic signs of loosening and pain when walking, before the fracture. These 18 and another 3

stems were found to be loose in the revision operation. 1 patient had only recently been revised for stem loosening (Case 9). In 4 cases, the fracture occurred during revision, which was carried out because of mechanical loosening.

Simultaneous revision of a loose cup was done in 10 cases. 6 different types of femoral prostheses were used. Since June 1991, only the newly introduced Wagner uncemented revision stem has been used (Wagner 1989, Wagner and Wagner 1990).

During the fracture operation, all the hips were cultured for bacterial growth (Kamme and Lindberg 1981).

The average follow-up period was 41 (5-66) months.

Results

All the fractures healed with good radiographic callus development. No positive intra-operative bacterial cultures were found.

The duration of surgery was shorter (P 0.02 Mann-Whitney U-test) in the cases revised with the Wagner prosthesis, although the amount of bleeding did not differ. The total average stay in hospital, including all prosthesis complications, was 18 (8-58) days. Most of the patients were discharged to their homes. 7 of them, however, underwent a training period at a rehabilitation center after being mobilized for walking with crutches. All implants functioned initially well, as regards pain, walking ability and range of motion.

Table 1. Observations in 23 cases revision THR after periprosthetic femoral fractures

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	78	f	107	2	1	B	1	3+4	19	3	0	285	4100	4900	8	B
2	40	m	13	5	12	B	2	1+4	15	3	0	220	2000	2410	6	S
3	54	m	74	2	1	B	3	1+4	16	0	2	225	3500	4980	8	S
4	72	m	11	1	4	C	3	1+4	29	2	0	455	2300	7845	13	S
5	66	m	36	2	4	B	4	3+4	58	1+2+7	1+7	1025	14000	21910	36	S
6	68	f	144	2	2	B	4	3+4+5	13	3	5	295	3600	4420	8	B
7	84	f	70	2	1	B	4	3+4	18 S	0	5	180	2300	2850	4	B
8	66	f	200	2	1	B	4	3+5	13	0	0	225	3100	3750	5	B
9	84	f	2	1	2	A	4	3+5	19	3	3	275	1500	1910	4	S
10	82	f	72	3	3	C	5	1	20 S	0	0	230	4000	4670	11	B
11	57	m	80	3	3	B	5	1	11	0	0	155	2000	3010	3	B
12	68	f	106	4	4	C	5	1	12 S	4+5	4	170	1700	2800	5	B
13	69	f	168	6	6	B	5	1	8 S	0	5	235	2750	3780	6	B
14	70	f	77	7	4	A	5	1	23	0	0	150	1600	2240	3	S
15	79	f	89	2	2	C	5	1	15	6	0	155	1600	2220	4	S
16	44	m	130	2	2	B	5	1	18	1	8	145	1100	1790	3	S
17	66	f	108	2	2	B	5	1	17	0	0	165	2900	3375	9	S
18	73	m	149	2	3	B	5	1	20	4	0	190	1500	3840	7	S
19	80	f	125	2	8	B	6	3	12 S	0	7	210	3500	4845	5	B
20	70	m	89	2	1	B	6	3+4	9	0	5	150	2500	2850	4	S
21	85	m	91	6	3	C	6	3+4	8 S	0	6	145	1200	1670	2	S
22	57	f	20	2	3	A	6	2+5	29 S	3	7	315	1300	1960	6	B
23	66	m	65	2	3	B	6	2+5	21	1	1+7	300	3500	4420	5	S

A Case number	I Operative technique	7 Refracture of femur and prosthesis stem
B Age at operation	1 Uncemented	L Remarks
C Sex	2 Cemented only in distal fragment	0 None
D Time from last THR (months)	3 Cemented	1 Overweight 130 kg
E Type and condition of THR	4 Wiring	2 Playing tennis (Old-boys competition)
1 Charnley	5 Bone grafting	3 Revision two months before fracture revision
2 Loose Charnley stem	J Number of days in the hospital.	4 Fracture during dancing
3 Loose Exeter stem	Complications related to the prosthesis are included. If the patient was ambulated at a rehabilitation center, this is marked with a "S"	5 Perioperative fracture
4 Müller CDH	K Complications	6 Senile. Died 5 months after revision
5 Loose Ti-fit stem	0 None	7 Rheumatoid arthritis with multiple joint involvement
6 Loose Christiansen stem	1 Dislocation revised	8 Alcoholic cirrhosis
7 Loose Müller stem	2 Mechanical loosening revised	Mb. Bechterew
F Time from admission to revision THR (days)	3 Mechanical loosening not revised	M Duration of surgery time in minutes
G Classification according to Bethea et al. (1982)	4 A single dislocation without revision	Revision procedures included
H Implant used for revision	5 Deep venous thrombosis.	N Perioperative bleeding (mL)
1 Spectron long	6 Pulmonary embolism one month postoperatively	O Total bleeding (mL)
2 Ti-fit long		P Blood transfusion (units)
3 Küntscher Nail with welded Müller CDH		Q S Only stem revised
4 Charnley long		B Both components revised
5 Wagner uncemented self-locking revision stem		
6 Bi-metric long		

None of the 9 Wagner stems has so far loosened, whereas 7 of the 14 other stems are already loose ($P < 0.01$, Fischer's exact test).

5 patients had postoperative dislocations and 3 of them required revision. 1 patient had a deep venous thrombosis 3 weeks postoperatively and another patient suffered pulmonary embolism. The complications (Table 1) were all manageable. Case 5, however, had 3 additional revisions within 1 year after the fracture revision because of refracture, loosening and dislocation, respectively. Another patient with rheumatoid arthritis (Case 22) needed secondary bone grafting because of delayed healing.

Discussion

Loose THRs are obviously an important hazard as regards the occurrence of femoral fracture: in our series all except one of the femoral stems were loose before the fracture. All fractures were successfully treated with a long-stem prosthesis, i.e., the loose stems were revised at the same procedure. Plating, as advocated (Cooke and Newman 1988, Serocki et al. 1992), seems to be more unphysiological. Apart from the endosteal injury when a prosthesis is implanted, plating entails periosteal damage. Osteogenesis and callus development are therefore likely

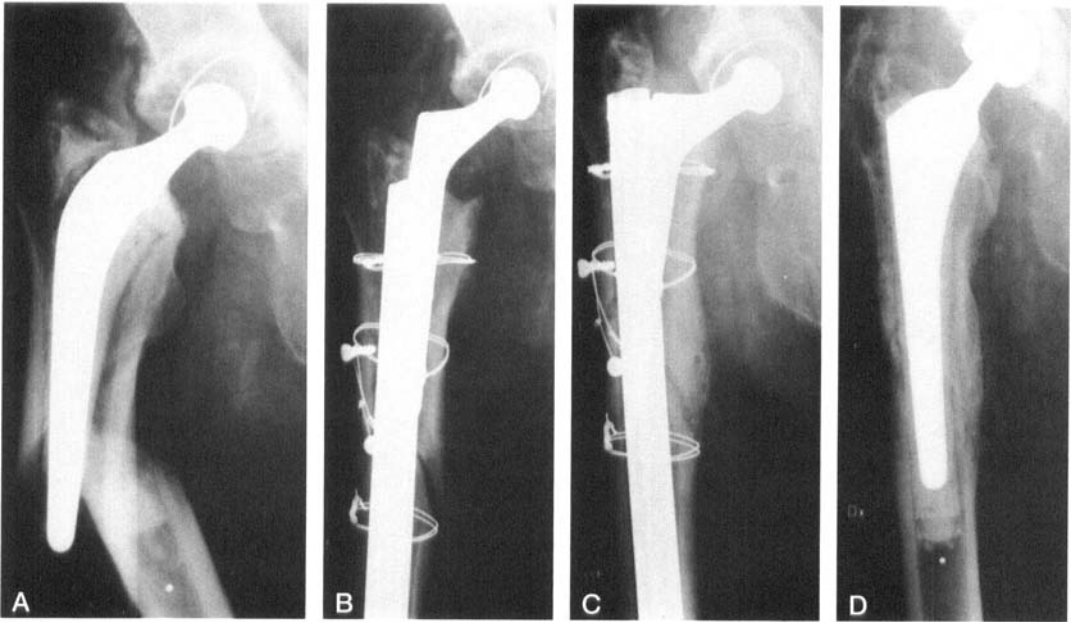


Figure 1. Case 4 before (A) and after (B) fracture treatment with the use of a Müller CDH prosthesis with the stem lengthened by a welded intramedullary Küntscher nail. Ten months later, the prosthesis had subsided into the nail but the fracture was consolidated (C). Rerevision was performed with a standard Bi-metric THR (D) with an excellent result one year later.

to be jeopardized.

The nail-prosthesis was introduced by Olerud and Karlström (1984) who presented good early results. These, however, were often followed by marked subsidence of the prosthesis (Figure 1). The Wagner revision stem system consisting of a complete series of conical stems, seems to provide good initial rotational stability which seems to be essential for long-lasting cementless fixation (Mjöberg et al. 1984, Phillips et al. 1990).

In our series, 7 of the conventional revision stems loosened, despite good fracture healing, in accordance with radio stereometric findings of early migration (Franzén et al. 1992).

Uncemented stems seem more suitable for revisions after fracture. One reason is that interposition of cement in the fracture can be avoided. Another reason may be the possibility for indirect bone healing with massive callus, as observed especially in the Wagner cases, in our series (Hutzschenreuter et al. 1969, Rahn 1987). With a firm fixation of the stem in the distal fracture fragment (which seems to be possi-

ble with the Wagner revision stem) and a loose adaptation of the proximal fractured and scalloped fragments, the fracture can heal and, at the same time, bone mass in the proximal femur can be restored (Figures 2 and 3) (Gie et al. 1993). Further studies are needed to confirm our preliminary observations

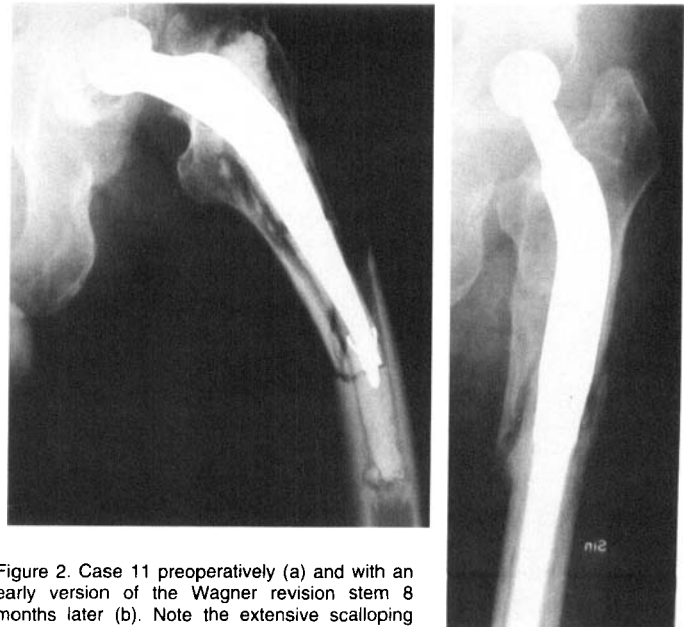


Figure 2. Case 11 preoperatively (a) and with an early version of the Wagner revision stem 8 months later (b). Note the extensive scalloping preoperatively which later filled with callus.

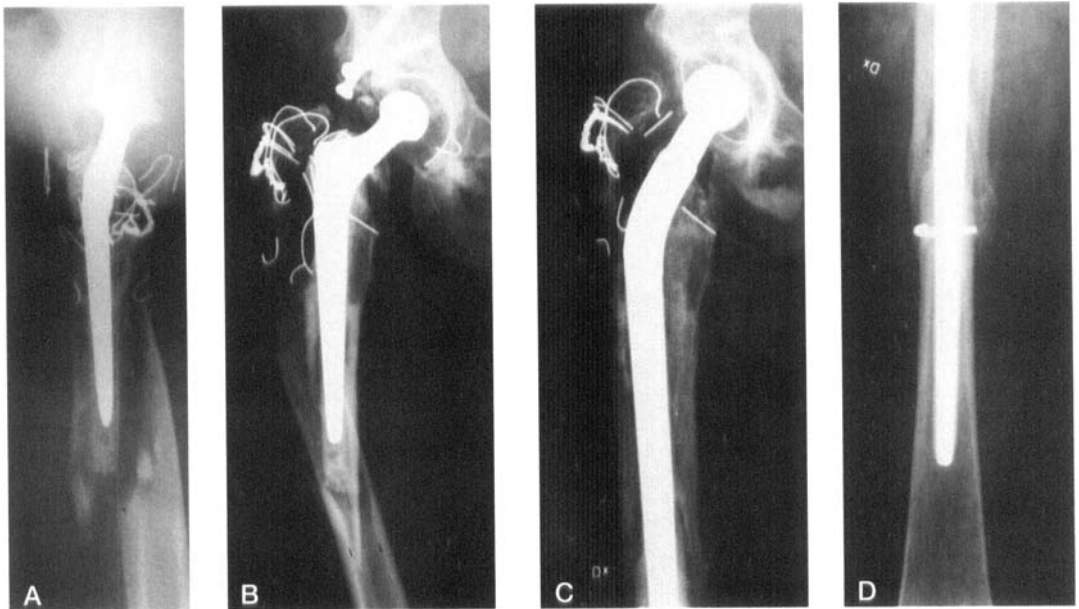


Figure 3. Case 12. Fracture (A and B) treated with the Wagner revision uncemented stem and consolidated fracture (C and D).

concerning new bone formation. The currently available DEXA software equipment seems suitable for measuring bone mineral density adjacent to metal implants.

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