The Wagner revision stem for severe osteolysis

31 hips followed for 1.5–5 years

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We used the Wagner (1989) method in 31 hip revisions because of loosening with pronounced scalloping, which made a conventional revision unsuitable. The radiographs showed that within a few months new bone developed in the defects. In 5 cases, a new revision was necessary at an early stage, because of dislocation and/or subsidence.

At follow-up after 3 (1.5–5) years, 21 of the remaining 26 hips were pain-free and 23 had almost full range of motion.

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Hip revision is difficult when the bone stock required for firm fixation of the new implant is reduced. To restore bone stock autogenous bone grafting (Chao and Sim 1992), allograft bone packing (Gie et al. 1993) and cortical strut grafting (Gröss et al. 1993) have been suggested. Wagner (1989) described a transfemoral approach with callus development around an uncemented revision stem.

We have used the Wagner method (Wagner and Wagner 1990) in 31 loose THRs with severe bone loss in the proximal femur.

Patients and methods

From 1991 through 1994 we revised 31 loose hip implants (31 patients) with the Wagner stem and followed them for 34 (17–55) months. All hips showed scalloping types 2–4, according to Gustilo and Pasternak (1988). The patient's mean age was 65 (38–89) years and 18 were men. Only patients assessed as unsuitable for conventional cemented or uncemented revisions, because of the amount of bone resorption, were included. 7 patients had had an infection and 6 patients had rheumatoid arthritis (Table 1). There were only 5 patients with unilateral disease.

The operative approach was transfemoral, as described by Wagner (1989). The distal osteotomy was situated near the tip of the old stem. After removal of the old implant, all cement and granulomatous tissue, the Wagner stem was implanted. If needed, additional osteotomies in the proximal femur were performed, in order to adapt a curved or deformed femur around the straight implant. The patients were requested to restrict load on the revised hip for 3–6 months postoperatively. All patients were reviewed at 6 weeks, 3 months, 6 months, 1 year and then once a year. These follow-up examinations included radiographs and grading of pain, walking ability and joint motion according to Merle d'Aubigné and Postel (1954).

An experienced radiologist estimated the amount of radiographically visible new bone in the proximal femur which was graded into three categories: no bone regeneration, possible, and definite new bone formation. Subsidence of the stem was not considered as significant, unless exceeding 10 mm.

Results

When only the stem was revised (11 cases), the average duration of the operation was 2.3 (1.5–3.3) hours and the perioperative blood loss was 1.3 (0.7–2.4) L. In the 20 cases where the acetabular component was also revised, the average duration of the operation increased to 3.3 (2.1–5) hours and the average blood loss was 2.9 (0.4–8.7) L. The total hospital stay was 12 (6–21) days (Table 1).

No thigh pain was noted after the first 6 weeks. The patients had difficulties in flexing their knees during the the first weeks postoperatively. Knee flexion, however, was restituted at the 6-week review.

24 of the 31 patients felt no hip pain (score 6) and 27 had a very good range of motion (score 5–6) at their latest follow-up. Only 7 of 26 who had not been re-revised had a walking ability less than 1 kilometer, mainly caused by impediments other than the revised hip (Table 1).

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Table 1. Observations in 31 hips revised with the Wagner stem

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	55	f	3	1,2,4	305–17	c	3.2	250		3		C	435	2	7
2	70	m	3	1,2,3	305–18		1.9	175	1 (14), 2	4	rev	C	625	2	19
3	64	m	2	1,2	305–22		1.2	125	3	2		B	556	2	13
4	61	m	2	1,2,4	305–16		0.7	115		2		C	655	2	21
5	69	m	2	1,2	305–15	c	1.6	175		2		B	666	2	16
6	63	f	1	1.2	305–14		2.8	175		2		B	666	2	6
7	68	m	1	1,2	265–17	c	1.2	130	1 (13)	2		B	665	2	12
8	66	m	1	1,2	305–17	c	5.0	250		2		B	635	2	17
9	75	m	2	1,2	305–23	c	3.6	195	1 (31), 2	2	rev	B	545	2	14
10	45	m	2	1,2,4	305–17		1.5	130		2		C	666	2	8
11	75	m	3	1,2	345–17		2.4	200		2		B	635	2	15
12	63	m	1	1,2	305–18	c	3.5	265	1 (10)	2		B	665	2	15
13	38	m	3	1,2	305–16		1.0	130	1 (12)	2		C	666	2	9
14	80	m	1	1,2	305–16	c	1.7	195		3		C	645	2	13
15	80	f	3	1,2	265–16		0.7	110		2		C	625	2	12
16	50	f	2	1,2,3,4	305–17	c	2.1	215		3		C	636	2	14
17	66	f	1	1,2	305–19	c	2.9	170	2	2	rev	B	524	2	6
18	76	f	1	1,2	305–17		1.3	145		2		A	665	2	14
19	71	f	3	1,2,3	305–16	c	2.0	170		2		B	665	2	13
20	57	f	1	1,2,4	265–16	c	1.8	200		2		C	434	2	7
21	89	f	3	1,2	305–20	c	3.0	180		2		C	535	2	10
22	44	m	3	1,2,3	305–16		1.2	200		2		B	665	2	11
23	77	m	2	1,2,3	305–17	c	1.9	200		2		C	645	1	21
24	72	m	3	1,2,3	345–18	c	8.7	300		2	inf	A	444	2	10
25	70	f	2	1,2,3	305–19	c	1.4	250		2		B	644	2	13
26	77	m	1	1,2	265–15	c	0.4	130		2		A	665	2	9
27	49	f	3	1,2	265–14	c	2.0	195		2		B	655	2	9
28	49	f	1	1,2,4	305–17	c	3.0	185	2	3	r	C	636	2	6
29	71	m	1	1,2	305–16	c	3.8	195	1 (20)	2		B	665	2	12
30	70	m	2	1,2	305–24	c	2.3	195		2		A	665	2	9
31	77	f	1	1,2	265–15		0.8	90	2	2	r	A	635	2	11

A Case number
B Age at Wagner revision
C Sex
D Number of previous hip arthroplasties
E Indication for Wagner revision and previous history
  1 Scalloping
  2 Loose implant
  3 Previous implant infection
  4 Rheumatoid arthritis
F Length and diameter of the Wagner stem used

Operative details
G c simultaneous cup revision
H Perioperative bleeding in L
I Duration of surgery in minutes
J Complications
  1 Subsidence (mm)
  2 Dislocation
  3 Thrombosis
K Grade of scalloping, according to Gustilo and Pasternak (1988).

Outcome at last follow-up
L Further revisions
  r revised with cup augmentation
  rev revised with a larger Wagner stem
  inf reinfection one year after the Wagner revision
M Charnley categories
N Numbers refer to pain, walking ability and mobility scores according to Merle d'Aubigné and Postel (1954).
O Bone regeneration
  0 No bone regeneration
  1 Possible bone regeneration
  2 Definite bone regeneration
P Stay in hospital (days)

Definite radiographic bone regeneration in the bone defects and the osteotomies occurred within a few months in all but 1 case (Figure 1, Table 1).

Within 6–12 weeks postoperatively, 6 subsidences (10–31 mm) of the stem were observed, with subsequent hip dislocation in 2 of these. Another 3 hips dislocated during the first postoperative weeks, but required no treatment other than closed reduction. 2 of these were probably due to large amounts of scar tissue in the medial part of the joint which, in combination with the short offset of the implant, acted as a fulcrum causing the dislocation. The third dislocation (case 31) was caused by insufficient attachment of the medial gluteus muscle to the greater trochanter.

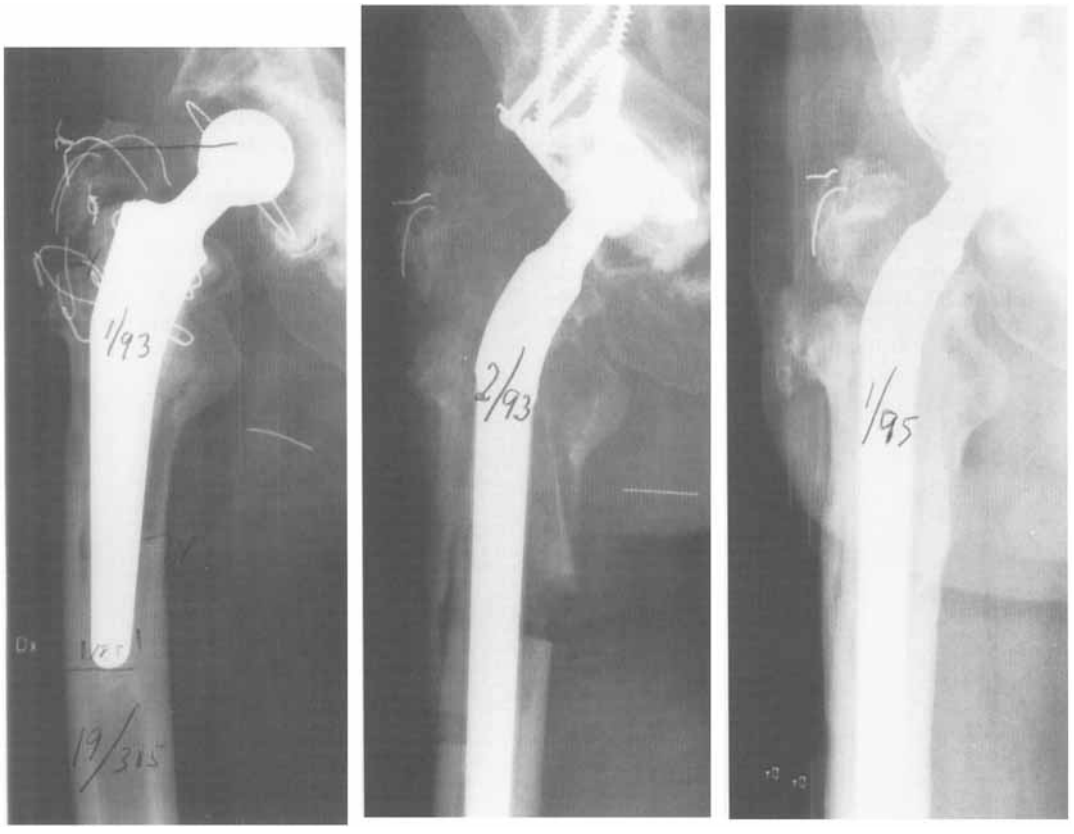
5 hips were re-revised: 2 with a larger Wagner stem because of subsidence and/or dislocation, 2 with cup augmentation in order to stabilize the joint (Karlström and Olerud 1985). The fifth hip was re-revised with a long cemented Charnley stem, which soon loosened and was subsequently replaced with a larger Wagner stem again (case 2). All re-revisions had by the time of the follow-up good pain relief, good joint motion and acceptable walking ability (Table 2).

No early infections occurred but one previously infected hip recurred 1 year postoperatively (case 24).

Discussion

A primary goal of the Wagner procedure is to create a

Figure 1. A loose Müller implant (case 12) with scalloping grade 2, according to Gustilo and Pasternak (1988).



Before revision.

Directly after the revision, the osteotomies and scalloped areas are "empty".

At the 2-year review, a bony regeneration has occurred in the previously scalloped and osteotomied areas.

fracture-like situation in the proximal femur, keeping the fracture fragments well vascularized to stimulate new bone formation which we observed in 30/31 cases.

Our hips revised with the Wagner stem could not have been properly revised with conventional prostheses, because of the large bone loss in the proximal femur. Filling of such bony defects with cement solves the problem transiently but will, with time, lead to even greater bone loss and, consequently the next revision will be even more difficult. Chao and Sim (1992) recommended the use of autografts, but for large defects the amount of available grafts is insufficient. Gross et al. (1993) used cortical allograft when large defects in the proximal femur were present. Gie et al. 1993 advocated the use of cancellous allografting and the early results seem to be good. In our opinion, these allografts serve as a filler similar to cement.

Several complications occurred in our series but, in general, the clinical outcome was good. The main reasons for subsidence within a few weeks were too small implants and/or insufficient distal bone quality, because of previous long stems, osteoporosis and a longitudinal fracture of the distal femur.

The Wagner revision procedure provides acceptable clinical results in hips which are difficult to revise with other methods. Good fixation can usually be achieved and there is a generation of new bone.

Table 2. Rerevision group (5 cases). Clinical outcome according to Merle d'Aubigné and Postel (1954)

Score	Pain	Walking ability	Mobility
Grade 6	3	0	1
5	2	0	3
4	0	1	1
3	0	2	0
2	0	2	0
1	0	0	0

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