Arthrosis after surgically treated acetabular fractures

A retrospective study of 60 cases

Björn Ragnarsson and Bengt Mjöberg

59 patients with 60 surgically treated acetabular fractures were followed up to 25 years. Coxarthrosis developed within 3 years in 23 fractured hips. There was a high correlation between nonanatomic reduction and posttraumatic arthrosis. The long-term results after an acetabular fracture can be predicted within 2–3 years of surgery.

Department of Orthopedics, Uppsala University Hospital, S-751 85 Uppsala, Sweden. Tel +46–18 663000. Fax–18 664462
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We have studied 60 surgically treated acetabular fractures to analyze the development of posttraumatic coxarthrosis.

Patients and methods

During the period 1964–1984, 74 patients were operated on for acetabular fracture at our hospital. 15 patients were excluded: 3 patients were primarily operated on with a prosthesis, 6 patients were dead and had not been followed after the initial 3–9 months, 2 patients were foreign citizens, 1 patient could not be traced, and 3 patients refused follow-up. Thus, 59 patients (60 fractures) were included in the study (Table 1). There were 45 men and 14 women. The mean age was 39 (15–77) years. 36 fractures were complex, i.e., classified as associated fractures according to Letournel and Judet (1981). The average delay to operation was 12 (3–34) days. A posterior incision (Kocher-Langenbeck) was used in most cases. The quality of reduction of the acetabular dome fragments was assessed from the operation report and from the early postoperative radiographs. Heterotopic bone formation was classified according to Brooker et al. (1973).

The width of the joint space was evaluated by comparison with the nonfractured side; arthrosis was defined as joint space reduction to less than half the width of the contralateral side (Danielsson 1964). The radiographs or the records were examined from the time of the operation until last follow-up or until arthrosis was detected. In the nonarthrotic group, follow-up time was on average 15 (6–25) years. Most routine radiographs were taken with the patient supine in AP and lateral views. The radiographs indicated that no patient had coxarthrosis at the time of trauma and no patient had arthrosis in the nonfractured hip at the follow-up.

The clinical outcome in 55 patients (4 had died), evaluated from a questionnaire performed during 1991, was classified in 4 groups: *excellent*—no pain and normal walk, *good*—slight or intermittent pain or slight limp, *fair*—mild to moderate pain or reduced walking distance without a cane, and *poor*—severe pain or reduced walking distance even with a cane. However, all cases with secondary surgery for arthrosis were graded poor.

Results

Anatomic reduction (i.e. ≤ 1 mm dislocation) in the dome was achieved in 38 hips (resulting in 7 cases of arthrosis), while there was 1–3 mm dislocation in 12 (7 cases of arthrosis), and more than 3 mm in 10 hips (10 cases of arthrosis). More than half of the patients formed heterotopic bone (Table 1).

21 of the 24 hips that developed arthrosis were detected within 24 months; another 2 within 32 months (Figure 1). In the latter 2 patients, no radiographs were taken between 3 months and 29–32 months when there was advanced arthrosis with obliterated articular space. One of the 24 arthrosis patients, Case 24, had no pain, had good function, and had no clinical problems for 14 years until at 81 years of age (15 years after the fracture) the hip joint had become painful and arthrosis was detected. Secondary surgery was performed in 17/24 patients with arthrosis. All but one of the arthrotic hips were graded fair or poor. In

Table 1. Observations in 59 patients with 60 operated on acetabular fractures

A	B	C	D	E	F	G	H	I	K	L	M	O	P	R
1	18	M	5	18	1	3	3	1	3	1	9	2		4
2	32	F	6	18	4	3	8	1	8	1	2	1		4
3	47	M	6	10	1	1	8	1	8			3	20	4
4	72	M	10	14	1	3	8	1	8			0		5
5	77	F	7	12	1	3	8	1	8			0	12	3
6	52	F	10	26	1	2	9	1	9	1	6	4		4
7	47	M	1	17	1	1	9	1	9	1	20	0		4
8	20	M	1	12	1	1	9	1	9	1	19	0		4
9	27	M	8	5	1	2	10	1	10	1	6	3		4
10	71	M	8	15	1	2	10	1	10	1	1	1		4
11	39	M	10	34	1	3	13	1	13			1	20	3
12	58	M	1	29	1	3	14	1	14	2	2	0		4
13	60	M	6	13	1	1	14	1	14	1	2	1		5
14	26	M	6	13	1	3	14	1	14	1	4	2		4
15	60	M	7	17	1	3	15	1	15			4	20	4
16	42	F	6	10	1	2	16	1	16	1	2	4		4
17	33	M	7	7	1	2	18	1	18	1	14	1		4
18	22	M	7	6	1	3	19	1	19	1	4	0		4
19	24	M	10	11	1	1	23	1	23			0	20	2
20	47	M	10	15	1	3	23	1	23			2		5
21	34	F	8	14	1	2	23	1	23	1	2	2		4
22	47	F	1	9	1	1	29	1	29	1	7	4		5
23	66	F	7	3	1	2	32	1	32	3	6	0		4
24	65	M	1	12	1	1	180	1	180	1	16	0		4
25	19	F	9	12	4	2	72	2				2	6	2
26	18	M	6	12	3	1	126	2				1	11	2
27	48	M	8	9	1	1	68	2				2	8	2
28	25	M	7	7	1	1	85	2				0	7	1
29	22	M	10	23	4	1	90	2				0	10	2
30	28	M	10	6	4	1	108	2				3	10	3
31	24	M	2	15	5	1	117	2				3	12	2
32	55	M	10	10	1	1	132	1				0	12	2
33	20	M	1	5	1	1	132	2				0	18	3
34	19	M	1	10	1	1	234	2				2	20	1
35	41	M	1	4	1	1	144	2				3		5
36	51	M	8	5	1	1	156	2				0	13	1
37	28	M	1	6	1	1	282	2				2	24	2
38	21	M	8	16	1	1	162	2				1	19	3
39	21	M	8	16	1	1	162	2				0	19	3
40	32	M	10	18	5	1	188	2				3	18	2
41	67	F	5	9	1	1	204	2				0	21	2
42	50	F	1	16	6	2	252	2				1	28	2
43	35	F	1	7	1	1	302	2				0	27	2
44	56	M	7	11	1	1	198	2				0	17	1
45	42	M	10	11	3	1	90	2				0	9	1
46	58	M	1	18	1	1	210	2				2	18	1
47	24	M	5	12	2	1	150	2				0	13	1
48	28	F	10	15	1	1	157	2				2	14	1
49	36	F	7	7	1	2	168	2				2	14	1
50	21	M	1	6	6	2	303	2				2	25	1
51	41	M	1	4	4	1	282	2				1	24	1
52	51	M	8	13	1	1	257	2				1	22	1
53	54	M	1	10	1	1	228	2				1	19	1
54	17	M	2	12	2	1	250	2				0	21	1
55	46	M	6	14	5	1	212	2				0	18	1
56	35	M	1	9	1	1	182	2				0	15	1
57	36	M	1	22	1	1	262	2				2	22	1
58	32	M	1	4	1	1	264	2				0	23	2
59	29	F	5	4	2	2	300	2				3	25	2
60	15	M	6	15	5	1	132	2				0	11	1

A Case (38 and 39 bilateral)
B Age at operation
C Sex
D Fracture type (Letournel and Judet 1981)
  Elementary fx
    1 posterior wall
    2 posterior column
    3 anterior wall
    4 anterior column
    5 transverse
  Complex (associated) fx
    6 t-shaped
    7 posterior column and posterior wall
    8 transverse and posterior walls
    9 associated anterior and posterior hemitransverse
    10 complete, both columns
E Operative delay (days)
F Incision
    1 posterior (Kocher-Langenbeck)
    2 anterior (ilioinguinal)
    3 iliofemoral
    4 Smith-Pedersen
    5 combined (anterior-posterior)
    6 lateral (Ollier)
G Quality of acetabular dome reduction
    1 < 1 mm
    2 1–3 mm
    3 > 3 mm
H Radiographic follow-up period (months)
I Diagnosis of arthrosis
    1 yes
    2 no
K Diagnosis of arthrosis (months)
L Secondary surgery due to arthrosis
    1 arthroplasty
    2 arthrodesis
    3 resection arthroplasty (Girdlestone)
M Secondary surgery (years)
O Heterotopic bone formation (Brooker et al. 1973)
    0 no heterotopic bone
    1 islands of bone
    2 bar of bone; gap > 1 cm
    3 bar of bone; gap < 1 cm
    4 bone bridging joint
P Clinical follow-up period (years) (Cases with secondary surgery due to arthrosis were not followed clinically)
R Clinical follow-up
    1 excellent
    2 good
    3 fair
    4 poor
    5 dead

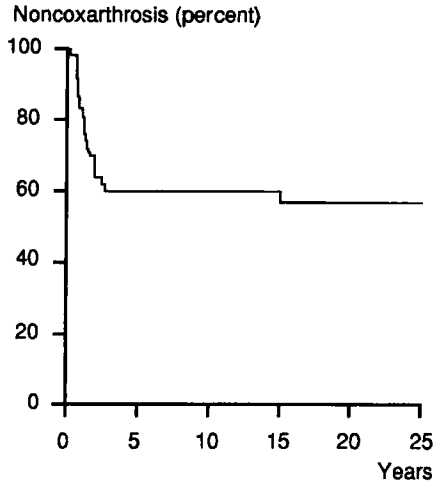

Figure 1. Kaplan-Mayer analysis of posttraumatic coxarthrosis. Note that 21 of the 24 hips that developed coxarthrosis were detected within 24 months—and 23 within 32 months.

the nonarthrotic group only 4/34 were graded fair and none poor (Table 1).

Adjusting for age at, and delay before operation, arthrosis was related (unconditional logistic regression) both to nonanatomic reduction (Relative Risk 48, $P < 0.0005$) and to the posterior incision (RR 70, $P < 0.0033$). However, clinical outcome was related only to arthrosis (RR 180, $P < 0.0155$), whereas heterotopic bone formation was not related to any of the investigated factors.

Discussion

The commonest complications from the hip after operative treatment of acetabular fractures are heterotopic bone formation and coxarthrosis. Heterotopic bone forms early; it is usually mature and unlikely to progress after 6 months (Garland 1991). Heterotopic bone formation has not clearly been shown to be associated with pain but with impaired mobility (Ahrengart 1991). In contrast to heterotopic bone formation, we found that arthrosis was related to the clinical outcome. The correlation between an inferior clinical outcome and the posterior incision may indicate that especially the complex fractures need a more extensile exposure for adequate surgical treatment (Reinert et al. 1988).

Rowe and Lowell (1961) found that 22 of their 24 hips with arthrotic changes after mainly conservatively-treated acetabular fractures could be demonstrated radiographically after one year. However, posttraumatic arthrosis has also been reported to appear 3 to 4 years or later after an acetabular fracture (Letournel and Judet 1981, Lanzetta et al. 1987). The detection of coxarthrosis may be delayed when radiographs are taken supine and nonweight bearing; radiographs taken standing and weight bearing can reveal joint space narrowing before bony changes appear (Ahlbäck and Rydberg 1985). The cause of posttraumatic arthrosis may be damage to the articular cartilage resulting from a high-energy trauma, gradual breakdown of the cartilage due to persistent joint incongruence, or avascular necrosis (Matta and Merritt 1988). We found a high correlation between nonanatomic reduction and posttraumatic arthrosis. Letournel and Judet (1981) and Matta et al. (1986) found that a satisfactory reduction of the fracture mostly resulted in a good clinical outcome.

Despite the fact that most radiographs were taken supine and nonweight bearing, all but one of our 24 hips that developed arthrosis were detected within 3 years. Our findings indicate that posttraumatic arthrosis after surgically-treated acetabular fractures develops at an early stage. In our series, the nonarthrotic cases were almost all graded excellent or good at follow-up. Thus, our study indicates that the long-term clinical results after acetabular fractures treated with different surgical techniques can be predicted within two years of surgery.

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