Acetabular revision for recurrent dislocations

Results in 14 cases after 3 years of follow-up

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Submitted 01-01-26. Accepted 01-11-18

ABSTRACT – 17 acetabular revisions (16 patients) were performed for recurrent dislocations. 14 patients were examined clinically and radiographically after mean 3 (1–8) years.

We found malpositions of components in 12 of 17 cases. 8 of 17 had redislocations and 2 were rerevised. Harris hip scores improved from 57 to 70. 10 of 14 patients were satisfied with the surgical result.

Recurrent dislocations have several causes. In our patients, lack of cup anteversion was the commonest indication for revision surgery. We noted a high rate of redislocations and poor clinical results, despite correction of the preoperative component malposition in the 14 cases with follow-up.

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Dislocation is one of the major complications after hip arthroplasty, with an estimated incidence of 2–5% (Morrey 1997, Li et al. 1999). Several risk factors have been identified. A posterior approach has been said to double the risk. Dislocations are commoner in older patients and women with a ratio of 4:1 (Morrey 1997). About 1% of all hip replacements are revised for complications related to dislocations (Morrey 1997).

Dorr and Wan (1998) found three major causes of the dislocations: type I by extreme hip joint positions, type II by soft tissue imbalance or abductor insufficiency, including trochanteric nonunion and type III by malposition of the component, where a neutral position or retroversion of the acetabular component is commonest. Other component-related malpositions include excessive acetabular tilt and medial and proximal hip centers. Any rotational stem malposition and insufficient stem off-set can predispose to type III dislocations.

All previous publications on the operative treatment of hip dislocations emphasize that surgical intervention should be directed towards correcting the cause of dislocation. (McCollum and Gray 1990, Morrey 1997, Dorr and Wan 1998). Most early type I dislocations can be treated by closed reduction, a hip brace and instructions to the patient to avoid extreme positions. Type II dislocations resistant to treatment with a hip brace can be treated with trochanteric advancement where the trochanter is distalized, by capsular plication, or by increasing the hip off-set (Morrey 1997). For type III dislocations, revision of the malpositioned cup or stem should be performed. Another possibility is cup augmentation with enlargement of the posterior aspect of the liner (Watson et al. 1991). Constrained cup systems are another method for resistant cases of recurrent dislocation where other procedures have failed (Dorr and Wan 1998).

Results of revision surgery for dislocation are generally poor. Revision of the acetabular component is the most commonly used procedure for recurrent dislocations (70%) (Daly and Morrey 1992). However, a well-defined component with malpositioning is present in only 40% of cases with recurrent dislocation (Morrey 1997). Morrey (1997) stated that these had the best outcome of revision operations with an 80% success rate, as evaluated by absence of redislocations.

We analyzed clinical and radiographic results after acetabular revision for recurrent dislocations in 17 cases (16 patients). This was done to evaluate whether cases with component malposition had better results after isolated acetabular revision.

Material and methods

Patients

Between 1992 and 1998, we performed 17 acetabular revisions in 16 patients (9 women) for recurrent dislocations. Their mean age was 70 (46–87) years. At follow-up, 1 patient had died and 1 could not participate because of poor general health and dementia. 14 patients completed the clinical and radiographic follow-up after 3 (1–8) years.

Operative technique

In all cases, the indications for revision were based on preoperative clinical and radiographic evaluation of cup position, off-set, hip center and soft tissue support. All patients had been operated on via posterior approaches and this approach was also used for revision procedures. Laminar air-flow operating rooms and prophylactic antibiotics were used. Peroperative stability was evaluated. In cases with substantial acetabular bone loss or a need for lateralization of the hip center, transplantation with allogenic bone chips was performed. In patients below 65 years of age with moderate acetabular defects, we used a cementless cup (Duraloc, Depuy, Warsaw IN, USA). In other cases we used a cemented Exeter cup generally supplemented with impacted allograft chips to restore acetabular defects. All liners had a 10 degree elevated rim placed posteriorly. Capsular sutures and rotator muscle reinsertion were performed, when anatomically possible.

Thromboprophylaxis with low molecular heparin was given routinely until the patients were discharged from the hospital. Non-steroid anti-inflammatory drugs were given for 3 weeks as prophylaxis against heterotopic bone formation. The patients were mobilized on the postoperative day.

Clinical evaluation

We used the Harris Hip Score (HHS). At the most recent follow-up patient satisfaction was graded into 4 groups: very satisfied, satisfied, unsatisfied, and very unsatisfied.

Radiographic analysis

Standardized AP pelvis and lateral radiographs of the hip were taken in all cases before revision. Cup positioning and operative corrections were determined on pre- and postoperative radiographs. Follow-up and immediate postoperative radiographs were compared for loosening of the component and change in cup position. We defined loosening as radiolucent lines in 2 of 3 periacetabular zones or measurable component migration.

Acetabular anteversion (theta angle) and acetabular tilt (alpha) were evaluated with Woo and Morrey's method (1982). The anatomical position of the hip center was assessed as recommended by Ranawat et al. (1980). The acetabular center in relation to the total pelvic height together with the horizontal position of the acetabular center and preoperative stem off-set were determined. These measurements were compared with the unoperated side on preoperative radiographs. In 2 cases, a primary arthroplasty on the non-dislocating side was used as reference. A neutral or retroverted cup is present if the theta angle is 0 or minus. Excessive acetabular tilt is defined as an alpha angle $> 60°$. If a hip center or stem off-set position differed by 5 mm as compared to a contralateral hip, the difference was considered significant. Heterotopic ossification was classified with Brooker's method both pre- and postoperatively (Brooker et al. (1973).

Statistics

Pre- and postoperative Harris Hip Scores were compared using a non-parametric paired Wilcoxon test. We assessed the correlation between age, sex, cup malposition, onset of dislocation, on the one hand, and HHS and redislocations, on the other, with the non-parametric Mann Whitney test and chi-square analysis. For these analyses, the patients were divided into those below or above 65 years of age, and onset of dislocation into early (before 6 months) and late.

Results (Table)

Clinical results

10 of the 14 patients stated that they were satisfied or very satisfied with the operation. The total Harris Hip Score improved from 57 to 70 ($p < 0.001$). Only 5 of 14 cases had HHS > 80. In 4 patients, the HHS decreased primarily due to a poor pain score. Clinical results and redislocations were not related

Table. Observations in 17 acetabular revisions (16 patients) performed for recurrent dislocations

Clinical data								Radiographic data			
A	B	C	D	E	F	G	H	I	J	K	L
1	10	–	7	57	70	2	1	0	1	1	1
2	0	–	9	31	46	3	1	1	2	1	1
3	1	38	5	50	dead	–	2	0	1	1	1
4	8	–	2	71	91	2	1	0	2	1	1
5	5	20	3	55	80	2	2	0	2	1	1
6	2	3	2	78	–	–	2+4	0	2	4	4
7	2	–	3	87	–	–	1	0	4	1	1
8	18	15	3	76	57	4	2(3)	1	1	1	1
9	0	0	6	0	70	2	2(3)	0	6	1	1
10	7	7	3	96	82	3	2	0	4	4	4
11	96	–	5	67	88	1	1	0	1	1	1
12	4	–	3	97	65	2	1	1	2	1	1
13	72	–	6	30	33	2	1	0	2	1	1
14	0	–	3	41	70	1	1	0	2	1	1
15	1	3	6	5	79	2	2	0	2+4	1	1
16	0	0	2	53	96	2	2+3(5)+4	0	2+4	1	1
17	6	–	3	87	26	4	1	0	1	1	1

A Case no.
B Time to 1. dislocation, months
C Time from revision to redislocation, months
D No. of dislocations before revision
E Preop HHS
F Follow-up HHS
G Patient satisfaction
  1 very satisfied
  2 satisfied
  3 unsatisfied
  4 very unsatisfied
H Complications
  1 none
  2 redislocation (number of redislocations)
  3 infection
  4 rerevision
I Preop heterotopic bone (Brooker)
J Preoperative acetabular position
  1 normal
  2 neutral/retroverted
  3 proximal hip center
  4 medial hip center
  5 acetabular tilt > 60 degrees
  6 loose acetabular component
K Postoperative acetabular position
  1 normal
  2 neutral/retroverted
  3 proximal hip center
  4 medial hip center.
L Preoperative femoral stem position
  1 normal (anteversion 0–30°, off-set difference < 5 mm)
  2 retroverted stem
  3 off–set difference > 5 mm.

to the time interval from the primary operation to the first dislocation, age, sex and a well-defined component malposition.

Radiographic results

An acetabular malposition before revision was found in 12/17 of the cases. The commonest malposition (in 9/17 of the cases) was neutral or retroverted cup position. A medial hip center was seen in 5/17 of the cases. 1 patient had a proximal hip center and 1 a loose acetabular component. Stem off-set was regarded as insufficient in 4 cases. All cases with acetabular retroversion had been corrected according to the postoperative radiographs. In 2 patients, a medial hip center persisted after revision. One patient who had a redislocation went from 0 to 1 Brooker degree at follow-up (patient number 6 in the Table).

Complications

8 of 17 patients had redislocations. Of 5 cases with no defined acetabular malposition, 2 had redislocations. Of 12 cases with a defined acetabular malposition which had been corrected at revision, 4 had redislocations. In the 2 cases where the acetabular malposition was not corrected to anatomical level, both had a redislocation. 1 patient was rerevised due to redislocations and experienced no further dislocations. 1 patient had redislocations and a deep infection which required two-stage rerevision of the acetabular component.

Discussion

A recent publication from the Norwegian hip register shows an increase in dislocations as an indication for revision (Havelin et al. 2000). We found a poor clinical outcome after acetabular revision due to recurrent dislocations. Many complications occurred and almost half of the patients had redislocations. Our findings are similar to those in 20 patients with several revisions due to dislocations, 45% were clinical failures and rerevision was done in 6 of them (Wyssa et al. 1995). In another study of 95 patients who underwent stabilization procedures, 39% had redislocations. (Daly and Morrey 1992). 4 of 16 patients were dissatisfied with the outcome versus 10–15% after revision procedures due to aseptic loosening (Malchau et al. 1993).

In 4 cases, the HHS had decreased at follow-up. These patients had a relatively high HHS (above 75) before the revision procedure. 2 of these had considerable disability due to redislocations, and 2 had pain despite stable arthroplasties.

Evaluation of component placement is difficult on standard radiographs. Variations in positioning of the patient cause inaccurate measurements of cup orientation. This is why we chose a simple system to classify inadequate cup anteversion as a neutral or retroverted position and define excessive acetabular tilt as greater than 60 degrees.

Previous studies have claimed better clinical results in patients who had well-defined cup malpositioning (Morrey 1997). We found no reduction in the redislocation rate despite successful corrections of component malpositions nor did we find poorer clinical results in patients without cup malposition as suggested by other studies. However, we had only a few cases, and our poor results support the multifactorial nature of recurrent dislocations. Various subclinical patient-related factors may affect the findings, apart from component malpositions. These include poor muscular and soft tissue support, poor propriosensitive function and unrecognized abuse problems, as suggested by Hedlundh and Fredin (1995) and Hedlundh et al. (1999).

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