

Factors predisposing to dislocation of the Thompson hemiarthroplasty

22 dislocations in 338 patients

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ABSTRACT – In a series of 338 patients, we have retrospectively analyzed technical and anatomical factors, which may predispose to a dislocation of the Thompson hemiprosthesis. 22 patients (7%) had at least 1 dislocation during the 6-month follow-up. The most significant independent factor predisposing to dislocation was the use of a posterior approach (dislocation rate 16%). We examined the radiographs and data on operations in the 22 patients, using 79 random patients without dislocation as controls. Factors correlating with an increase in the incidence of dislocation were the length of the residual femoral neck > 0.5 cm in short patients (< 165 cm), and considerable change in the postoperative offset of the hip. Acetabular measurements showed no correlation to the dislocation. Our findings suggest that the main factors predicting dislocation are technical and not related to anatomical measurements.

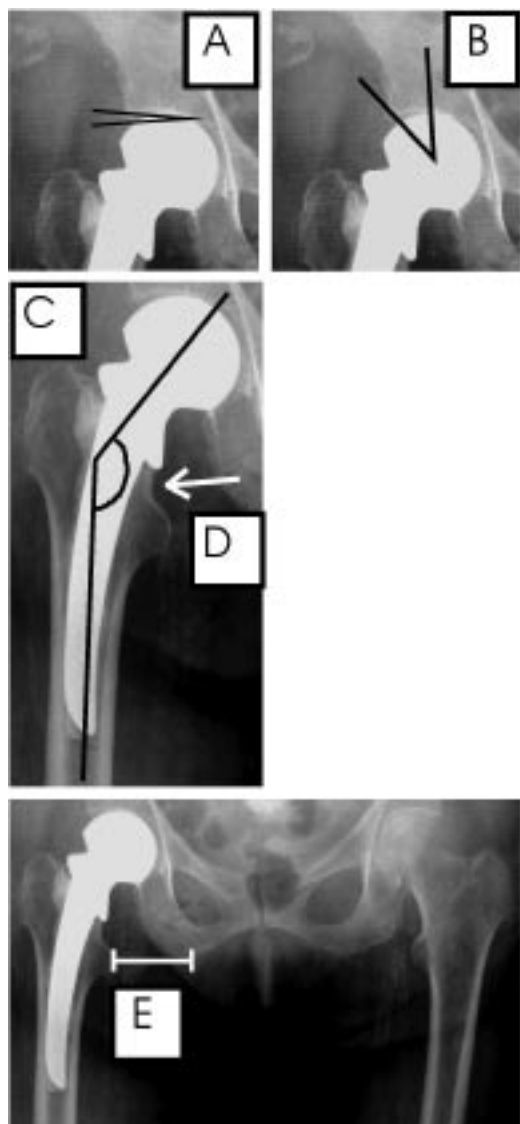
Hemiarthroplasty of the hip with a cemented monopolar prosthesis is widely considered to be one of the main choices for treatment of acute and displaced femoral neck fractures in aged patients (Gebhard et al. 1992, Hui et al. 1994, Puolakka et al. 2001). Early dislocation, a severe complication of hemiarthroplasty, has a mortality of 65–75% (Blewitt and Mortimore 1992). In previous studies, the chief factors predisposing to dislocation have been the use of a posterior approach and excessive residual femoral neck (Keene and Parker 1993, Unwin and Thomas 1994). However, the results are inconsistent (Paton and Hirst 1989, Wood 1980) and the optimal surgical approach to

the hip joint for hemiarthroplasty is still disputed. Moreover, possible differences in anatomic variations—i.e., in measurements of the acetabulum, which may cause instability of the prosthesis due to insufficient covering of the head of the prosthesis, remains to be analyzed.

To detect technical and patient-related anatomical factors predisposing to a dislocation, we retrospectively examined radiographs and data concerning the operation in a consecutive series of 22 patients with dislocation of a cemented Thompson hemiprosthesis.

Patients and methods

Between January and December 2000, 338 patients were treated in our department with a cemented Thompson hemiarthroplasty because of an acute and displaced fracture of the femoral neck. 69 (20%) patients were men with an average age of 80 (52–96) years, and 269 (80%) were women with an average age of 84 (49–99) years. The operation was usually done on the day after admission. 248 (73%) hemiarthroplasties were done by a senior orthopedic registrar, and 90 (27%) by a specialist in orthopedic surgery. Two types of approaches were used—i.e., the direct lateral (Hardinge 1982) or the posterior (Moore 1957)—depending on which method the surgeon was most familiar with. Standard anteroposterior and lateral radiographs of the hip were taken post-operatively, and full weight bearing was begun as soon as possible.



Analysis of postoperative radiographs in a 90-year old female patient with the prosthesis inserted via the posterior approach. The prosthesis is in a varus angle and with an excessive residual femoral neck. However, this patient did not have a dislocation during the follow-up.

Measurements in anteroposterior view:

A = acetabular index angle (AAI), measured as the angle between the roof and a horizontal line.

B = center-edge angle of Wiberg, measured as the angle between a vertical line and the line from the center of the prosthesis head to the lateral edge of the acetabular roof.

C = prosthesis neck – femur shaft angle.

D = residual neck length.

E = offset measured as the distance between the tip of the lesser trochanter and the ischial tuberosity.

The patients were followed by means of our register up to 6 months after surgery to document dislocation of the prosthesis. A retrospective masked analysis of the postoperative standard plain radiographs was done in the 22 patients with a dislocation and in 79 randomly chosen control patients from the same period without a dislocation. We studied the acetabular index (Massie and Howorth 1950) (Figure), the center edge angle of Wiberg (1939), the length of the residual femoral neck and the offset of the hip.

Statistics

Values are presented as means, with standard deviation (SD) and range. Comparisons of differences in means are shown with 95% confidence intervals (CI). Intervals excluding 0 are considered statistically significant. Relative risks (RR) for dislocation were calculated for the unselected series, and the values are given with 95% CI. Odds ratios (OR) between cases and controls were calculated for the factors evaluated, in a subgroup of 101 patients, using logistic regression analysis. 95% CI were calculated for crude odds ratios, and values excluding one were considered statistically significant. P-values were also calculated those <0.05 were considered statistically significant.

Results

22 patients (7%) had at least 1 dislocation during the follow-up, with a median interval of 22 (1–93) days between surgery and the first dislocation. 11 patients had at least one recurrent dislocation at 21 (2–122) days after the first one. Of the 86 patients who had been operated on with a posterior approach, 14 had a dislocation, but only 8 of the 252 patients with a direct lateral approach (odds ratio 5.9, CI: 2.4–15). We found no statistically significant correlation between the experience of the surgeon, age or gender of the patient, and the frequency of dislocation (Table).

None of the acetabular factors measured showed a correlation with the frequency of dislocation. Neither the prosthesis neck-femur shaft angle ($p = 0.6$), nor the length of the residual femoral neck ($p = 0.6$) did not correlated with the dislocation frequency in the unselected patients. However,

Hemiprosthesis dislocation and patient-related factors (n = 101)

	n	Observed disloc.	Odds ratio	95% CI
Sex				
Female	83	17	1.5	0.5–4.8
Male	18	5		
Age (years)				
< 80	26	8	1.9	0.7–5.4
> 80	75	14		
Height (cm)				
> 165	49	13	1.7	0.6–4.6
< 165	46	8		
Data missing	6			
Difference in the offset compared to opposite hip				
>10%	56	16	2.8	0.8–9.3
<10%	32	4		
Data missing	13			
Length of residual femoral neck				
>5 mm	40	11	1.5	0.6–4.0
<5 mm	55	11		
Data missing	6			

short patients (height less than 165 cm) who had a residual femoral neck length exceeding 5 mm (OR: 3.0, CI: 0.6–15) tended to have a higher frequency of dislocations than those with a length less than 5 mm. A postoperative offset, which differed by > 10% (increase and decrease) from the opposite hip showed a significant correlation with a higher frequency of dislocation (OR: 3.1, CI: 1.0–10, versus those with a change in the offset of < 10%).

Discussion

The frequency of a dislocation of a hip hemiprosthesis is one of the chief differences between the two commonest approaches to the hip—i.e., the posterior and the direct lateral. Like others, we have found a significantly higher dislocation rate using the posterior approach (Chan and Hoskinson 1975, Keene and Parker 1993, Unwin and Thomas 1994). To reduce the frequency of this complication, we therefore recommend the use of a direct lateral approach in hip hemiarthroplasty. Some authors justify use of the posterior approach because of less blood loss, shorter duration of sur-

gery and faster rehabilitation (Keene and Parker 1993). Moreover, to reduce the high incidence of dislocations, some modifications of the posterior approach have recently been described (Williams et al. 1997, Ko et al. 2001). Although these methods may reduce the dislocation frequency due to an increase in posterior stability of the capsule, they also increase the operation time and the advantages of the posterior approach may thus be lost to some extent.

The length of the residual femoral neck seems to be one of the most significant factors associated with hemiprosthesis instability (Kwok and Cruess 1982). Thompson (1954) recommended that the femoral neck should be excised at its base. However, differences in the offset of the hip and the length of the extremity may result, since no adequate patient-related adaptation of the prosthesis neck length can be made, as in modern total hip arthroplasty. Our results suggest that Thompson hemiarthroplasty may alter the anatomical relations and the consequent biomechanics of the hip in some patients, due to a change in the offset of the hip, in a way that may increase the risk of dislocation. Moreover, patients of small stature may be particularly vulnerable to technical errors, such as excessive residual femoral neck. However, we draw no definite conclusions about the optimal femoral neck length, since we found no linear correlation between the length of the neck and the frequency of dislocation, or the offset, in our series.

One factor possibly influencing mechanics of the hip, and consequently the stability of the prosthesis, is the rotation of the implant. In our department, we try to insert the prosthesis in an anteversion of about 10 degrees. However, we could not analyze the effect of stem rotation on prosthesis dislocation, because postoperative analysis of the rotation of the implant from standard radiographs, in our opinion, is too imprecise.

None of the measurements of the acetabulum correlated with the dislocation rate, although some patients had slight acetabular dysplasia (characterized by a center-edge angle of Wiberg less than 25 degrees). This would suggest that the main stabilizing structures of hemiarthroplasty are the soft tissues rather than the articular surface of the acetabulum, as reported by Ko et al. (2001).

No competing interests declared.

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