

RECURRENT AND NON-RECURRENT DISLOCATION FOLLOWING TOTAL HIP ARTHROPLASTY

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The rate of post-operative dislocation after primary total hip arthroplasty in 1739 cases was 3.3 per cent; 0.9 per cent being classified as recurrent dislocations. Malposition of the socket, limb shortening or any other single technical factors could not be demonstrated to be responsible for post-operative dislocation of the hip. A previous osteotomy predisposed for dislocation, but in no case was this dislocation classified as recurrent. Cases with a previous cervical-femoral fracture were significantly more commonly dislocated compared with coxarthrosis cases. This fact probably could be explained by a high rate of alcoholism in men and old age in women.

Key words: alcoholism; arthroplasty; cervical femoral fracture; post-operative hip dislocation

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A number of factors co-operate in making a total hip arthroplasty stable, both primarily and in the long-term perspective. Except for severe medical or neurological problems other than primary hip disease, the cause of dislocation seems to be related either to joint laxity or malposition of one or both of the prosthetic components (Carlsson & Gentz 1977, Fackler & Poss 1980, Fraser & Wroblewski 1981).

The aim of the present investigation was to present radiographic and clinical features in 56 dislocated primary total hip arthroplasties with special reference to hips with recurrent dislocation, which from the clinical point of view are the only ones of real importance (Charnley 1979). Although cases with more than one dislocation are usually referred to as recurrent, we wanted to stress the difference between uncomplicated and more complicated cases. Therefore recurrency in this investigation was defined as more than three dislocations, or exchange of one or both components owing to dislocation.

MATERIAL AND METHODS

Patients

From August 1968 to September 1981 1739 primary total hip arthroplasties were performed in the Malmö General Hospital. Fifty-six hips dislocated one or several times. Recurrent dislocation, more than three dislocations or components replaced because of dislocation, occurred in 15 cases.

The Charnley arthroplasties were performed with the patient in the supine position and with osteotomy of the greater trochanter. In all other methods the patients were operated on in the lateral position and through a postero-lateral approach without osteotomy, except for the patients with congenital dislocation of the hip in whom osteotomy was the rule.

With few exceptions all patients were residents in Malmö where there is only one Orthopaedic Department. Therefore there is no reason to believe that any dislocation was overlooked.

Eleven hips (four recurrent and seven non-recurrent dislocations) had to be excluded from the analysis because the radiographs did not allow reliable measurements.

As controls in the radiographic examination we used 103 stable Charnley arthroplasties performed in 1972

and 1978 and 136 stable Brunswik arthroplasties performed between 1972 and 1974 (Pettersson et al. 1982).

Excluding hips dislocating continuously, all dislocations were confirmed radiographically. Subluxations were not accepted in this study.

Radiographic evaluation

The post-operative radiographic examinations included standardized projections: one a-p view of the pelvis with the central beam directed towards the symphysis, and one a-p view of the operated hip with the central beam directed towards the joint with the patient in the same supine position with parallel femora and the same rotation position.

In the present investigation, the radiographs obtained 3–12 months after operation were reviewed, and the following variables considered:

1. *Inclination:* In the radiographs the circular opening of the socket was projected as an ellipse. The inclination of the opening in relation to the transverse plane of the body was defined as the angle between the large diameter of the ellipse and a line drawn through the inferior limits of the sacro-iliac joints or the inferior limit of the tear-drop formation in the radiograph of the whole pelvis.
2. *Socket version:* The angle of version of the opening of the socket was calculated from the a-p view of the operated hip. It can easily be demonstrated (McLaren 1973, Fackler & Poss 1980, Pettersson et al. 1982) that the angle β expressing the version may be calculated from the trigonometric formula $\sin \beta = d/D$, where d = the smaller diameter and D = the larger diameter of the above mentioned ellipse (Figure 1). To evaluate if the angle β represents an ante- or retroversion the small diameters of the ellipse on the two projections were compared: if the socket is anteverted the small diameter of the ellipse will be greater in the a-p view of the hip than in the a-p view of the pelvis. This method for evaluation of ante- and retroversion has been discussed in detail elsewhere (Pettersson et al. 1982).
3. *Shortening of the limb:* The vertical distance between the tip of the lesser trochanter and a line through the base of sacro-iliac joints or through the tear-drop formation was measured on both sides and the difference in vertical distance between the two sides was expressed as a shortening or lengthening of the leg on the operated side, the other side being regarded as normal. Hips in which the other side had been operated on or was deformed by disease or trauma were excluded.
4. *Position of the greater trochanter:* Dislocation of the greater trochanter was noted and measured in cm. Absence or presence of bony fusion of the greater trochanter was recorded.

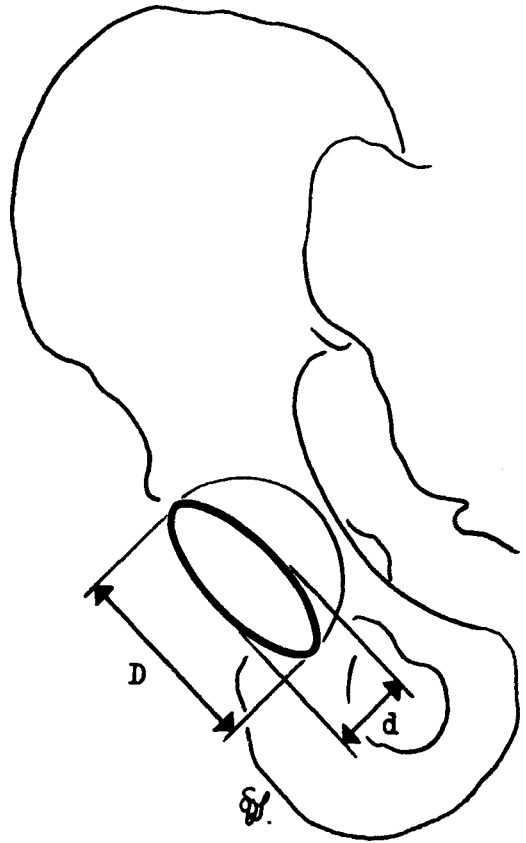


Figure 1. Diameters of the opening of the socket. The angles of version (β) are calculated from the formula $\sin \beta = d/D$.

RESULTS

Cases with more than three dislocations and those in whom one or both components had been exchanged because of dislocation are in this study defined as recurrent dislocations, all other cases are classified as non-recurrent. There were 41 non-recurrent and 15 recurrent dislocations. Calculated from the 1739 primary procedures performed during the period the dislocation rates were 2.4 per cent and 0.9 per cent, respectively.

Age and sex

There were 28 men and 28 women with dislocated hips. As there is an almost 3:2 preponderance of women among all operated cases, the

men were over-represented but this was not statistically significant. The proportion of men and women was the same in both recurrent and non-recurrent dislocations. The age distribution did not differ between dislocated and non dislocated cases, nor was there any difference between recurrent and non-recurrent dislocations with respect to age.

Infections

The infection rate among hips operated on without antibiotic prophylaxis before 1972 was 15 per cent (Carlsson et al. 1977) as compared with 13 per cent (2/16) in dislocated cases. With antibiotic prophylaxis the total infection rate was reduced to about 2 per cent (Carlsson et al. 1977), whereas infection was still confirmed in 10 per cent in dislocated hips operated on with antibiotic prophylaxis.

Diagnosis and prosthetic design

The preoperative diagnoses are presented in Table 1. There were significantly more ($P < 0.05$) dislocated hips among patients with previous cervical femoral fracture compared with coxarthrosis patients. Considering recurrent dislocation only, this difference was even more pronounced ($P < 0.01$) (Table 1). The prosthetic design did not significantly influence the rate of dislocation (Table 2).

Previous hip surgery

Previous operation with Moore-prosthesis, following cervical femoral fracture, was equally common in stable and dislocated total hip arthroplasties.

Hips previously operated on with osteotomy only because of coxarthrosis dislocated significant-

Table 1. Diagnosis in stable and dislocated total hip arthroplasties

Diagnosis	Total number of cases	Non-recurrent dislocation		Recurrent dislocation	
		n	%	n	%
Coxarthrosis	1283	29	2.3	6	0.5
Cervical-femoral fracture sequelae	175	6	3.4	6	3.4
Rheumatoid arthritis	133	2	1.5	0	0
CDH	70	2	2.9	2	2.9
Others	78	2	2.6	1	1.3
Total	1739	41	2.4	15	0.9

Table 2. Prosthetic design in stable and dislocated hips

Prosthesis	Total number of cases	Non-recurrent dislocation		Recurrent dislocation	
		n	%	n	%
Charnley	931	22	2.4	7	0.8
Brunswik	363	12	3.3	4	1.1
Lubinus	386	6	1.6	2	0.5
Christiansen	21	1	4.8	1	4.8
Others	38	0	0	2	5.3
Total	1739	41	2.4	15	0.9

antly more often ($P < 0.01$) than non-osteotomized hips. However, all these dislocations were non-recurrent.

One hip with recurrent and one with non-recurrent dislocation had previously been operated on with arthrodesis.

Time after surgery

The majority of both the recurrent and non-recurrent dislocations occurred during the first post-operative month (Table 3).

Dislocation and reduction

Spontaneous dislocation, which in this study

means that the patient did not know how the dislocation had occurred, was the most frequent in both recurrent and non-recurrent cases. In almost all other cases the dislocation had occurred in conjunction with flexion of the hip. Trauma such as fall from the bed etc. was the cause of dislocation in three non-recurrent and two recurrent cases. Almost 90 per cent of the dislocated hips could be treated by closed reduction. Recurrent and non-recurrent dislocations did not differ in this aspect.

Radiographic evaluation

As seen in Tables 4 and 5 there was no difference in the socket position in dislocated and stable

Table 3. Time after surgery of the first dislocation in recurrent and non-recurrent cases

	Non-recurrent dislocation	Recurrent dislocation	Total
Dislocation within 24 h post-operatively	4	1	5
Dislocation 2nd day – 1 month post-operatively	28	8	36
Dislocation 1–2 months post-operatively	3	1	4
Dislocation 2–6 months post-operatively	3	4	7
Dislocation more than 6 months post-operatively	3	1	4

Table 4. Number of correctly positioned anteverted and retroverted sockets in stable and dislocated hips

	Stable hips	Non-recurrent dislocation	Recurrent dislocation
Number with recommended position $\pm 10^\circ$	126	19	5
Anteverted more than 10° from recommended position	2	1	0
Retroverted more than 10° from recommended position	111	14	6

Table 5. Socket inclination (alpha) and version (beta) in stable and dislocated hips

	Stable hips	Non-recurrent dislocation	Recurrent dislocation
Number of cases	239	34	11
Inclination (degrees) Mean \pm s.d.	47 \pm 8	49 \pm 9	49 \pm 13
Anteversión (degrees) Mean \pm s.d.	4.9 \pm 8.9	3.3 \pm 11.8	1.4 \pm 9.4

hips. The recommended position of the Brunswik socket is 20 degrees of anteversion (Lubinus & Jacobsen 1973), and that of the Charnley socket was earlier, and still in practice at our hospital, 10 degrees of anteversion (Charnley 1967). Post-operative leg length did not differ between stable and dislocated hips, nor did the rate of non-union or dislocation of the greater trochanter differ between recurrent and non-recurrent dislocated hips.

Exchange operation because of dislocation

Excluding infected hips, eight of 13 recurrent cases had to be operated on with exchange of the stem or socket. Of these one was an irreducible dislocation. Of the five recurrent cases not reoperated on, one continued to dislocate, re-operation being contra-indicated for medical reasons. The remaining four cases dislocated 5–9 times, but have since remained stable for 14–42 months.

DISCUSSION

Post-operative dislocation is a relatively frequent complication following total hip surgery (Ahnfelt et al. 1980) and many theories concerning the mechanisms responsible have been suggested (Carlsson & Gentz 1977). Carlsson & Gentz (1977) demonstrated that high positioning of the socket, probably representing joint laxity, was of significant importance. The same phenomenon or other factors causing limb shortening, often combined with trochanteric detachment or malpositioning of the prosthesis, were found in 21 recurrent dislocations presented by Fraser & Wroblewski (1981). Fackler & Poss (1980) found a significant connection between post-operative dislocation and malrotation of one or the other prosthesis components, ipsilateral knee deformity, previous hip surgery and severe medical or neurological disorder. Robinson et al. (1980) found significantly fewer dislocations with a lateral transtrochanteric approach compared with a postero-lateral approach. However, we pooled the results of more than 16000 procedures followed by 228 dislocations and found the rate of dislocation to be 1.4 per cent with a lateral trans-

trochanteric approach and 1.3 per cent with a posterior approach without osteotomy (Carlsson & Gentz 1977).

In the present investigation, confined to primary total hip surgery, no prosthetic design or approach was associated with an increased number of post-operative dislocations. In a control material, previously presented (Pettersson et al. 1982), there were significantly more retroverted sockets in total hip prostheses inserted through a postero-lateral than through a lateral transtrochanteric approach. Our suspicion that this might imply an increased number of dislocations could not be verified in the present study. However, the dislocation is a kind of safety valve, which when not released causes repeated stress on the socket and the femoral head prosthesis with increased risk of loosening of one or both components (Charnley 1970). Socket inclination was neither in this nor in a previous study (Carlsson & Gentz 1977) of any significance with regard to dislocation. It was not possible to evaluate ante- or retroversion of the neck of the femoral head prosthesis in the present study. No significance could be found for shortening of the leg and dislocation of the greater trochanter.

Cervical-femoral fracture was significantly more common than coxarthrosis in dislocated hips. Analysing the hips with cervical-femoral fracture and dislocation more closely, we found that the average age in women was 76 years at the time of the operation, whereas the average age in men was 59 years. In a previous study (Carlsson 1981) the average age in both men and women operated on with Charnley prosthesis after cervical-femoral fracture was 59 years. Obvious alcoholic problems were found in five out of seven men with previous medial neck fracture and hip dislocation, the remaining two cases having serious medical disorders. Alcoholism and medical disorder may well explain why cervical-femoral fractures were over-represented among dislocated hips. Subluxation of a total hip is actually also a dislocation with pain which quickly disappears as the hip is spontaneously reduced. However, the diagnosis is difficult to verify both clinically and by radiographic examination and may be confused with other painful conditions. A number of total hip arthroplasties may have been

exchanged in our department because of subluxation, but this condition has not been included in the present investigation, even though subluxation may be a more frequent complication than true dislocation. Thus, Ritter (1976) reports 1 per cent dislocations and 5.5 per cent subluxations in 502 procedures and Eftekhar (1976), 0.5 per cent dislocations in 1400 procedures and 2 per cent subluxations in 700 procedures.

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