# Femoral shortening in total arthroplasty for completely dislocated hips

## 3–7 year results in 25 cases

**Olav Reikeraas, Paul Lereim, Imre Gabor, Ragnhild Gunderson and Ingjald Bjerkreim**

**During the years 1988–1991, we performed 25 total hip replacements for completely dislocated hips in 15 women and 4 men with a median age of 54 (17–67) years. In all cases, femoral shortening at the subtrochanteric level was performed to obtain reduction of the hip. The patients have been followed for 3–7 years. 1 patient experienced sciatic nerve palsy, 1 a delayed union and 1 a malunion at the osteotomy site. There were no signs of mechanical failure. All patients were satisfied. According to the Charnley hip score, function was excellent in 15 cases, good in 9 and fair in 1. The median Harris hip score improved from 43 at the time of operation to 93 at follow-up. 7 hips had a positive and 18 a negative Trendelenburg test. Before operation, all patients had a Trendelenburg limp. Our intermediate results indicate that femoral shortening at the subtrochanteric level is a suitable adjunct to total arthroplasty for a completely dislocated hip.**

Departments of Surgery and Radiology, National Orthopedic Hospital, N–0570 Oslo, Norway
Tel +47 22-867010. Fax -045419
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Total replacement in adults with severe hip pain secondary to complete dislocation presents a technical challenge, and complications and failures are more frequent than after native arthroplasties (Dunn and Hess 1976, Crowe et al. 1979, Hartofilakidis et al. 1988, Linde et al. 1988, Jasty et al. 1995). Successful management demands anatomic reduction without excessive compression force across the joint. To avoid contractures due to longstanding hip dislocation in children, femoral shortening was proposed by Ombreddanne in 1932, and this procedure has been recommended by subsequent authors (Schonecker and Strecker 1984, Klisic et al. 1988, Shih and Shih 1988). We report our results with femoral shortening as an adjunct to total replacement of completely dislocated hips in adults.

## Patients and methods

During the years 1988–1991, we performed 25 total replacements for disabling complete dislocation of the hip. The main indication was pain. There were 15 women and 4 men with a median age of 54 (17–67) years. The median follow-up was 5 (3–7) years.

Preoperatively, conventional radiographs in two planes were obtained. By the use of transparencies, the acetabulum was placed at its natural level, the femur was correspondingly brought down and the shortening estimated.

The operative procedure was carried out through a lateral or posterolateral approach with the patient in lateral position. The femoral neck was transsected, and precise reaming of the canal was followed by a transverse osteotomy just beneath the lesser trochanter. The hypoplastic acetabulum could then be easily identified and prepared. After the acetabular component was seated, the femoral shortening was performed as preoperatively planned. Alternatively, the femoral component was inserted in the proximal part of the femoral bone and reduced in the acetabulum. The proximal and distal fragments of the femoral bone were then overlapped, and resection of the bone could be performed accordingly. After removal of the piece of bone of determined size, the distal femoral canal once again had to be prepared, and a precise additional reaming was performed. If trial reduction proved impossible because of tight soft tissues, further shortening and reaming were done before the femoral component was inserted. The fixation of the osteotomy, was then achieved by press-fit of the stem. In 4 cases a cemented Weber prosthesis was used. In 21 cases, either a Harris Galante (15) or Landos coraill (6) noncemented prosthesis was used.

At follow-up, pain, hip mobility and walking ability were rated on a numerical scale, according to the method of d'Aubigné and Postel, as modified by Charnley (1972). Grade 1 denotes disability and

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Figure 1. A. Completely dislocated hips (Schanz osteotomy on the right side)

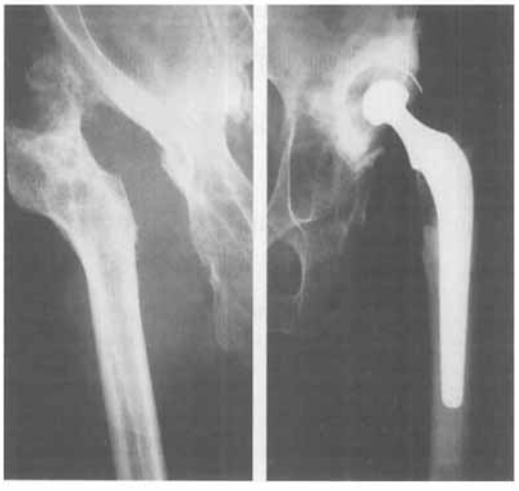

Figure 1. B. The left hip has been treated by arthroplasty at the false level (cemented prosthesis).

Figure 1. C. The right hip has been treated by subtrochanteric shortening osteotomy (arrow) and hydroxyl apatite uncemented prosthesis at the true acetabulum.

Figure 1. D. Control radiograph after 6 (left) and 4 (right) years; the cup on the left side is loose.

grade 6 indicates normal findings. The result was judged to be excellent when the sum of the three evaluations was 15–18, good when it was 11–14, fair when it was 7–10 and poor when it was 3–6. The subjective benefits were graded from very much satisfied to much satisfied, satisfied, less satisfied to unsatisfied. The functional outcome was classified according to the modified Harris (1969) hip score. Furthermore, the Trendelenburg test was noted, and the strength of the abductors and flexors was graded on a standard scale for manual muscle testing, where 0 point denotes no muscle contractions and 5 points indicate normal muscle strength.

Radiographic evaluations were done on preoperative and postoperative anteroposterior radiographs. At follow-up, socket demarcation or migration was recorded according to Carlsson and Gentz (1984). For definite socket-loosening (Carlsson and Gentz grade III), migration exceeding 2 mm or other such obvious changes of position were required. Radiographic stem loosening was defined as subsidence of 2 mm or more with or within the cement, or a varus tilt substantiated by a zone between the stem and bone cement exceeding 1 mm.

## Results

At operation the hip center was reduced by a median of 7 (3–10) cm to the level of the real acetabulum. The median shortening of the femur was 5 (2–8) cm. The median net leg-lengthening was 3 (1–4) cm. Before operation, the median leg-length discrepancy was 3 (0–8) cm. At follow–up it was 1 (0–3) cm.

1 patient experienced sciatic nerve palsy which partly recovered. There was 1 delayed union (> 3 months) and 1 malunion (varus angulation) at the osteotomy site. There were no revisions during the observation period, and at follow-up there were no signs of mechanical failure.

7 hips had a positive Trendelenburg test and 18 a negative. The median muscle strength of the abductors was 4 (3–5) and of the flexors 4 (2–5).

9 of the patients were very much satisfied, 7 were much satisfied and 3 were satisfied. According to the Charnley score, hip function was excellent in 15 cases, good in 9 cases and fair in 1 case. The median Harris hip score improved from 43 (29–69) at the time of operation to 93 (65–98) at follow-up.

## Discussion

In totally dislocated hips, the anatomy is markedly distorted by such conditions such as abnormality of the neurovascular structures, soft tissue contractures, inadequate bone stock, abnormal location of the the hip center, abductor insufficiency and leg-length discrepancies. In these hips the major problems are to achieve reduction, to maintain the reduced position and to obtain satisfactory function. Moreover, the patients tend to be younger and, consequently, there is an increased risk of mechanical failure (Halley and Wroblewski 1986, Strömberg and Herberts 1994). Some authors (Charnley and Feagin 1973, Coventry 1974) therefore believe that total hip replacement is contraindicated in these patients, while others prefer to place the cup in the false acetabulum (Jasty et al. 1995). The position of the cup proximal to the center of the acetabulum will result in less lateral bony support, and loosening of acetabular components placed on the pelvic wall present a major problem (Linde et al. 1988). Placing of the cup at the site of the true acetabulum in dislocated hips secures the acetabular component in a position where bone cover is maximum, without the need for extensive structural bone grafting. The resultant force on the hip will be optimal, and this improves the function of the gluteal muscles and facilitates leg-lengthening (Dunn and Hess 1976, Harley and Wilkinson 1987, Hartofilakidis et al. 1988, Linde et al. 1988).

Our study describes the results of shortening of the femur to obtain anatomic reduction in the total replacement of completely dislocated hips. In agreement with the results of Paavilainen et al. (1990), our data suggest that this technique provides gratifying intermediate-term results. A step-shaped osteotomy may be preferred, to secure rotational stability. However, the circumferential contact between the endosteal cortex and the femoral stem will be reduced correspondingly to the step. In our opinion, this will give less press-fit of the stem and tend to bring it in varus position.

What really limits reduction of dislocated hips is the amount of strain the soft tissues can tolerate. Sciatic neuropathia has been reported in series where distal positioning of the acetabular cup was a major goal (Johanson et al. 1983, Edwards et al. 1987). We aimed to lengthen the leg by no more than 4 cm. One of our patients experienced sciatic neuropathia, but this was not related to extreme leg-lengthening. Operative trauma or traction on the nerve by soft tissue adherences most probably caused the nerve injury. It has been shown that the incidence of nerve injuries is significantly higher in difficult arthroplasty reconstructions than in routine arthroplasties (Johanson et al. 1983, Edwards et al. 1987, Nercessian et al. 1994).

In congenital dislocation of the hip, the femur may be in excessive anteversion or have angular disorders. In this series such problems were solved by correction at the osteotomy site. After the osteotomy was performed, rotational or angular deformities were corrected before further shortening and then reaming of the distal femoral canal was done. Abnormal configuration of the femoral canal must be taken into account while reaming, to avoid penetration and fracture of the cortex.

A special factor in the evaluation of hip replacement in dislocated hips is the function of the hip muscles. In this series preoperative strength of the muscles was not measured, but all the patients had a preoperative Trendelenburg limp. It was astonishing to see that there was never any problem in bringing the proximal fragment with the attachment of the gluteus medius down to its original place. The tension of the muscle was then increased, and we assume that the restoration of the mechanics of the gluteus medius is the explanation for the disappearance of the Trendelenburg limp in most cases. However, some of the patients still had inadequacies of the abductor muscles, but none needed external support.

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