Total hip replacement for high dislocated hips without femoral shortening osteotomy


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When performing total hip replacement (THR) in high dislocated hips, the presence of soft-tissue contractures means that most surgeons prefer to use a femoral shortening osteotomy in order to avoid the risk of neurovascular damage. However, this technique will sacrifice femoral length and reduce the extent of any leg-length equalisation. We report our experience of 74 THRs performed between 2000 and 2008 in 65 patients with a high dislocated hip without a femoral shortening osteotomy. The mean age of the patients was 55 years (46 to 72) and the mean follow-up was 42 months (12 to 78). All implants were cementless except for one resurfacing hip implant. We attempted to place the acetabular component in the anatomical position in each hip. The mean Harris hip score improved from 53 points (34 to 74) pre-operatively to 86 points (78 to 95) at final follow-up. The mean radiologically determined leg lengthening was 42 mm (30 to 66), and the mean leg-length discrepancy decreased from 36 mm (5 to 56) pre-operatively to 8.5 mm (0 to 18) post-operatively. Although there were four (5%) post-operative femoral nerve palsies, three had fully resolved by six months after the operation. No loosening of the implant was observed, and no dislocations or infections were encountered.

Total hip replacement without a femoral shortening osteotomy proved to be a safe and effective surgical treatment for high dislocated hips.

Patients and Methods

We retrospectively reviewed 65 patients (74 hips) with high dislocated hips articulating in a false acetabulum who underwent THR between November 2000 and June 2008 in our hospital. The high dislocated hip was judged according the Hartofilakidis classification.9 The indications for THR were severe hip pain or limited mobility. Patients who had undergone a previous Schanz osteotomy with resulting severe curvature of the proximal femur, which would preclude THR without a further femoral osteotomy, were excluded. In all, 65 patients, 15 men and 50 women (74 hips), met the criteria for inclusion in the study. Of these, nine patients had high dislocation of the hip bilaterally and underwent staged bilateral THR. In addition, 14 patients had a low dislocation and nine had dysplasia in the contralateral hip according to the Hartofilakidis classification.9 Bilateral THRs were also performed in these patients either under the same anaesthetic or on a different occasion, depending on their physical condition. The mean age of the patients at the time of the operation was 55 years (46 to 72), and the mean follow-up was 42 months (12 to 78). There were 69 hips with a high dislocation
due to DDH, four due to a slipped capital femoral epiphysis and one due to tuberculosis. Permission to conduct this review was granted by the local ethics committee.

**Implants.** All implants except one resurfacing implant were cementless. A total of 68 hips were managed with a straight Secur-Fit hydroxyapatite-coated stem (Stryker, Mahwah, New Jersey) and either an Osteonics Crossfire highly cross-linked polyethylene or a ceramic acetabular insert (Stryker). A straight modular S-ROM stem (DePuy, Warsaw, Indiana) with either a Bantam polyethylene or a Duraloc Option ceramic acetabular component (both DePuy) was used in five hips. Both acetabular components were inserted into a Duraloc Acetabular Cup (DePuy). In one hip a resurfacing was undertaken with the Conserve Plus implant (Wright Medical Technologies, Arlington, Tennessee).

**Surgical techniques.** Pre-operative templating was undertaken to ensure that the femur was sufficiently straight to accept a commercial stem. The patient was placed in the lateral position and the hip and proximal femur were exposed through a standard posterolateral approach. Dissection of the inferior part of the elongated capsule permitted exposure of the true acetabulum. All osteophytes and hypertrophied soft tissue around the true acetabulum were removed to provide a complete view of the true acetabulum. The soft-tissue release is important for the reduction of the hip. If necessary, an iliopsoas and subcutaneous adductor tenotomy were performed. The acetabular component was placed at the level of the reamed anatomical location. When the coverage was < 80%, superolateral screws were placed in the roof of the component to enhance stability, and bone defects were filled with impacted morsellised autogenous bone graft taken from the resected femoral head. The femoral neck was divided more distally than in a standard THR, at the upper margin of the lesser trochanter, in order to lessen the tension when the hip was reduced. The femoral component > 5 mm was considered significant.

**Post-operative rehabilitation.** In addition to protecting the nerve, this posture was sometimes required because the soft tissue was tight after the leg lengthening. The joints were gradually extended over the course of two to three weeks, by which time full hip and knee extension was obtained without any nerve palsy. Patients were allowed to sit on a chair and mobilise with partial weight-bearing using crutches during this period. When they had regained full extension, walking exercises with crutches and full weight-bearing were initiated. The ipsilateral crust was discarded six weeks post-operatively, but the contralateral one was used for three months.

**Radiological evaluation.** Standard anteroposterior (AP) and lateral radiographs of the pelvis were taken pre-operatively, post-operatively and at follow-up examinations. The vertical distance from the tip of the greater trochanter to the inter-teardrop line was measured on both sets of radiographs. For the pre-operative leg-length discrepancy the difference in this distance between both hips was recorded. The extent of the lengthening obtained in the affected limb was determined by the difference of the values on pre- and post-operative radiographs.

Subsidence was measured using the method of Heekin et al. It was measured by determining the change in distance from the superomedial tip of the femoral stem to the most proximal point on the lesser trochanter. Subsidence of the femoral component > 5 mm was considered significant. Progressive radiolucencies were recorded and measured around the acetabular component in the three zones according to DeLee and Charnley. If the acetabular component had progressive radiolucencies in more than one zone, or migration, it was defined as loose. Any change of the position of the acetabular component by > 5 mm was considered to be migration, with the pelvic teardrops used as reference points.

**Clinical examination.** A physical examination was conducted pre-operatively, at three and six months post-operatively, and once yearly thereafter until the latest follow-up. Abduction strength was assessed with the Trendelenburg test. All patients also underwent a detailed clinical neurological examination, focusing on sciatic and femoral nerve function but not including routine electrophysiological testing. The outcome was assessed using the Harris hip score (HSS).

**Results**

No patients required revision during the follow-up period. The mean HHS score improved from 53 points (34 to 74) pre-operatively to 86 (78 to 95) at the final follow-up. The pre-operative Trendelenburg sign was positive in all 74 hips, but at the time of final follow-up was positive in only five (6.7%).

From radiological measurements, the mean limb-length discrepancy decreased from 36 mm (5 to 56) pre-operatively to 8.5 mm (0 to 18) at final review. The mean leg lengthening achieved was 42 mm (30 to 66).
five patients the leg lengthening ranged from 50 mm to 66 mm. No loosening of a component was observed in any patient at the last follow-up.

There were four (5%) femoral nerve palsies with numbness of the thigh and/or weakness of knee extension, all of which were observed immediately after the operation and treated conservatively. Three had resolved completely after six months. One patient had a permanent femoral palsy, with weakness of knee extension. In five hips (6.7%) there was a peri-operative longitudinal fissure femoral fracture which was secured with cables. No dislocation or wound infection was encountered (Figs 1, 2 and 3).

**Discussion**

In our series of 74 THRs performed for high dislocation of the hip without a femoral shortening osteotomy, a mean leg lengthening of 42 mm was obtained. One patient had permanent damage to the femoral nerve. Satisfactory clinical results were achieved with a mean HHS of 86 points at the latest visit. In this series, the principle of reconstruction involved placing the acetabular component at the level of the anatomical acetabulum. We used a cementless component with a small external diameter and a ceramic liner to reduce wear. Although the proximal femur was extremely narrow in some patients, narrow commercially available
stems were used. Nevertheless, intra-operative femoral fracture was a risk and occurred in five hips. These fractures were longitudinal fissures without significant displacement; they could be secured using cables and without compromising the stability of the implant. The literature on THR in high dislocated hips in the presence of a femoral shortening osteotomy reports an intra-operative fracture rate between 7% and 10%.5,6

In THR for high DDH, restoration of the anatomical hip centre reduces the reaction force of the hip joint and creates an improved lever arm for the abductor musculature, and is considered to improve the longevity of the THR.15,16 However, this method renders the reduction of the femoral component difficult because of the soft-tissue contractures, and leaves the nerves vulnerable to injury. Various femoral shortening osteotomies have been used, with good results. However, these techniques are complex and time-consuming, and reduce the capacity to restore the length of the leg, which may reduce abductor strength. There is also a risk of nonunion of the osteotomy, and instability of the osteotomy may result in early femoral loosening.7,17 Furthermore, resection of the proximal femur sacrifices the bone stock suitable for cementless fixation,18 and incongruency between the diameters of the proximal and distal canals after shortening can cause problems in achieving secure fixation of the femoral component.4

There are few reports of THR in patients with a high dislocated hip without femoral shortening osteotomy.19,20 This matter has been addressed twice by the same group, who felt that femoral osteotomy was not necessary.19,20 Of 84 THRs for high dislocated hips in that study,20 13 (15%) had 5 cm or more of leg lengthening without neurological complications. The two patients who had neuapraxia had 3 cm and 3.5 cm of lengthening, respectively, and both recovered fully.

There were two major points in our THR technique for high DDH: the reduction of the hip and the protection of the nerves. In our experience, the difficulty of the reduction was related to the degree of pre-operative stiffness of the hip. This must be addressed as described in our operative technique and managed post-operatively by a gradual re-establishment of extension. Although four patients presented with severe femoral nerve palsies in the early stage, three had recovered fully by six months after the operation. It has been suggested that the nerve damage in THR is not related to the amount of lengthening but to the difficulty of the surgery itself.21 We used a posterolateral approach in which the sciatic nerve was retracted directly during the procedure, but, interestingly, all nerve palsies related to the femoral nerve. We are unable to explain this.

The disadvantage of this technique was the difficulty in obtaining the correct anteversion of the femoral component in every hip owing to the presence of excessive femoral anteversion deformity. In these patients, modular stems were used to achieve the best correction. In this study there were no dislocations and no loosening of the components.

Although THR without a femoral shortening osteotomy in high dislocated hips has been described previously, the technique was different in requiring an osteotomy of the greater trochanter to improve the exposure via a lateral approach.19,20 This facilitated the reduction of the replaced hip owing to the reduction in tension around the joint, but reattachment of the greater trochanter was a problem. Fibrous union of the greater trochanter occurred in 22% of hips.19 Nonunion and migration of the greater trochanter was observed in one hip (1%).

Iliofemoral distraction with external fixators before THR has been described as an alternative technique to femoral shortening osteotomy.22,23 One report using this technique describes achieving a mean lengthening after THR of 46 mm.23 However, this technique was uncomfortable for patients and had the potential for pin-site infection.

Fig. 3a
Radiographs of a patient who had tuberculosis of the left hip in infancy, a) pre-operatively, showing a high dislocation, and b) 12 months post-operatively after total hip replacement without femoral shortening osteotomy, achieving a radiological leg lengthening of 60 mm.
We performed THR for patients with a high dislocated hip without femoral shortening osteotomy. This is a relatively easy procedure that can provide more initial stability for the femoral component and does not sacrifice leg length. Our results indicate that it is a safe method of treatment in THR for high dislocated hips.

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References


