CASE REPORT

Reduction of high dislocation of the hip using a distraction nail before arthroplasty

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We report the case of a 22-year-old woman who underwent plate and screw fixation for a traumatic left acetabular fracture and fixation with cancellous screws for an associated femoral neck fracture. Two months later, the internal fixation became infected and was removed. This resulted in a painful high dislocation of the hip. We solved the problem with continuous soft-tissue distraction using a fully implantable motorised distraction nail in order to reduce the proximal femur prior to total hip arthroplasty. To our knowledge, this is the first time that reduction of a high dislocation of the hip has been performed using such a system.

Options for treatment for reduction of chronic proximal femoral migration before total hip arthroplasty (THA) include femoral shortening and continuous soft-tissue distraction with conventional external distractors. While femoral shortening is associated with nerve palsy and nonunion, distraction with external fixators may be complicated by the permanent risk of deep infection due to contaminated pin tracks.

Case report

A 22-year-old woman suffered multiple injuries to the left leg in a traffic accident. These included a fracture of the left acetabulum which was treated by plate and screw fixation and an ipsilateral femoral neck fracture (Pauwels II) which was stabilised using cancellous screws. Two months post-operatively, a deep infection prompted the removal of all the internal fixation and resection of the femoral head (Fig. 1). A painful high dislocation of the hip with an adduction contracture and functional shortening of the leg by 6 cm prevented walking 12 months later. We saw the patient after eight months without evidence of infection at that stage and advised THA. The planned treatment was continuous soft-tissue distraction with a fully implantable distraction nail, bringing the left lesser trochanter down to the same level as the right and reconstruction of the acetabulum and THA in an anatomical position as a second step.

The fully implantable distraction nail for this purpose (Fitbone, Wittenstein-Intens-Company, Igersheim, Germany) has already been used for leg lengthening in 250 cases. In this case, the telescopic-active-actuator variant of the distraction nail was rotated through 180°, introduced into the proximal femoral cavity and locked with its tip pointing proximally (Fig. 2). The cable of the integrated electromotor drive to the subcutaneously placed receiver was passed through a drill hole in the lateral aspect of the femur. The energy necessary for the distraction drive was controlled by a microcomputer and transformed via a corresponding transmitter placed on the skin adjacent to the antenna receiver. Thus, no cable penetrated the skin. A pelvic support plate (Fig. 3) was implanted for counter traction and offered the following advantages: adequate fixation to the ilium with five cancellous screws, sufficient movement for the nail in three directions (rotation, abduction and flexion) and avoidance of excessive force.
Tight scar tissue around the hip was initially excised. The pelvic support plate was then fixed to the ilium, meticulously avoiding all muscular structures important for the function of the planned THA. The telescopic-active-actuator variant was introduced using a standard lateral approach. Even with maximal distraction, the femur could be mobilised distally only about 2 cm, leaving another 4 cm for full reduction. In this position, the telescopic-active-actuator variant was locked and connected to the pelvic support plate.

Gradual distraction was initiated in the immediate postoperative period at a rate of 2.3 mm/day (Fig. 4). During the following 18 days the patient was hospitalised and mobilised on crutches without weight-bearing. Equal leg length was achieved after reaching a distraction of 4 cm and thus a total distance of 6 cm. The adduction contracture was gradually reduced.

Three weeks later, the second operation was performed. First, the distraction nail and the pelvic support plate were removed. Then the missing dorsal parts of the acetabulum were reconstructed using a tricortical bone graft from the left iliac crest to improve the dorsal support of the cup. A 52 mm St. Nabor cup (Centerpulse Orthopedics, Winterthur, Switzerland) was then introduced and fixed with two cancellous screws. Finally a 7.5 cm CLS cementless stem (Centerpulse Orthopedics) was introduced. Radiographs of the pelvis showed both lesser trochanters on the same level. A 32-mm ceramic head with a neutral neck length was used. The patient was mobilised partial weight-bearing for six weeks. Three months later full weight-bearing was allowed. Radiological examination (long radiographs, standing) confirmed equal leg lengths and the anatomical position of the THA (Fig. 5). Clinical examination showed the following range of movement in the left hip joint: extension/flexion 5/0/100° (right: 10/0/120°), abduction/adduction 30/0/35° (right: 30/0/60°), internal/external rotation 30/0/25° (right: 40/0/30°).

Discussion
Common causes of high dislocation of the hip include fracture-dislocation, extensive resection arthroplasty (Girdlestone), which is usually performed after infective complications\(^\text{10,11}\) and congenital dislocation with the femoral head migrating superiorly and posteriorly and articulating with an area of the iliac wing which resembles a false acetabulum.\(^\text{12,13}\) In traumatic cases, good results can be obtained with early, stable, and accurate reduction.\(^\text{14}\) THA may be required after Girdle-
stone procedures and congenital dislocation. Although THA for chronic proximal femoral migration can improve the patient's quality of life, it has been associated with high rates of complications, especially in regard to the fixation of the cup and the alignment of the proximal femur.

Placing the cup into the new acetabulum without balancing the muscles leaves the leg shortened and with a limited range of movement. Placing the acetabular component in the true acetabulum has yielded the best results. Cover of the cup can be achieved by the use of bone graft. The cup can thus be placed in an anatomical position, with enough bone stock to allow further surgery and leg length may be restored.

Femoral shortening prior to THA can be performed with a single osteotomy at the level of the femoral neck combined with soft-tissue release, or subtrochanteric osteotomy or a proximal diaphyseal step-cut osteotomy. The high rates of complications include loosening of the acetabular component, femoral or sciatic nerve palsy, dislocation, wound infection, and nonunion. However, most osteotomies of the femur leave the leg significantly shortened.

Alternatively, conventional distractors can be used for continuous stretching of soft tissue in order to reduce the femur in long standing high dislocation of the hip. This method has allowed satisfactory reduction and a good anatomical position of the prosthesis without secondary nerve palsy. However, the necessary assemblies between pelvis and femur lead to high stresses on the surrounding soft tissue. If the fixator screws are in the operative field, there is a risk of deep infection after the THA because of contaminated pin tracks. Furthermore, all external distraction systems are associated with pain and difficulty in sleeping.

Fully implantable distraction systems, frequently used for corrective surgery of the lower limb, can solve this problem and their use in this situation has not previously been described. There was no residual leg length discrepancy and excellent short-term function. The fully implantable distraction nail (Fitbone) would thus seem to be a suitable alternative for soft-tissue distraction in cases of high dislocation of the hip prior to THA.

One of the authors has contributed to the development of the fully implantable distraction device with the Wittenstein Company. One or more of the authors have received or will receive benefits for personal or professional use from a commercial party related directly or indirectly to the subject of this article.

References