ANTERIOR AND POSTERIOR DISPLACEMENT OF THE HIP AFTER INNOMINATE OSTEOTOMY

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Ten patients were treated for anterior or posterior displacement of the hip after an innominate osteotomy for congenital dislocation of the hip. All required a repeated open reduction with an additional procedure, either at the same time as reduction or as a second stage. Stable reduction was achieved in eight cases, but in two the initial attempt failed and the operation had to be repeated. The clinical features of hips with this complication are described and the technique of the salvage operation is discussed.

In 1961, Salter published his classic paper on the use of innominate osteotomy in the treatment of congenital dislocation and subluxation of the hip. He stated that if the femoral head was reduced into the acetabulum during the first 12 to 18 months of life, normal or near normal development could be expected, but that this became less and less likely after 18 months of age. In his opinion the basic abnormality responsible for the instability of the reduced hip was the abnormal direction in which the acetabulum faced. He therefore developed innominate osteotomy as a realignment procedure.

It is now generally accepted that treatment of congenital dislocation of the hip should involve concentric reduction of the hip followed by realignment of the femoral head and acetabulum to maintain stability and encourage normal development. There is, however, a wide variety of opinions as to how these objectives should be achieved.

Innominate osteotomy has produced very good results in the hands of its originator (Salter and Dubos 1974; Salter 1985). It is accepted that it is a technically demanding operation, but relatively few papers have been published about the problems arising from its use (Gallien, Bertin and Lirette 1984). Tachdjian (1982), in his monograph on congenital dislocation of the hip, emphasises that the best way to avoid complications is to follow exactly the indications, technique and postoperative care outlined by the originator. Among possible complications he mentions redisplacement in either an anterior or a posterior direction.

PATIENTS AND METHODS
Ten patients have been referred to the Orthopaedic Department at this hospital with displacement of the hip following an innominate osteotomy. One was treated by the late Mr G. C. Lloyd-Roberts in 1973 and nine have been managed by the author. All were girls suffering from congenital dislocation of the hip which had been diagnosed at an average age of 1 year 7 months (range, birth to 2 years 8 months). They had been referred to this hospital at an average age of 3 years 3 months (range, 2 years to 5 years 4 months).

All these children had originally had conservative treatment which had varied from a short period of traction before their first operation to repeated attempts at splintage and traction over many months. The number of operations before they were referred ranged from one to four with an average of 2.3. Five of the patients presented to us with anterior displacement of the hip and five with posterior displacement, but at first it was not always possible to diagnose the direction from the clinical signs and radiographs. With increasing experience, it became clear that the clinical signs could help to differentiate the direction of displacement. While all patients showed shortening and a limp, those with anterior displacement tended to retain a reasonable range of movement at the hip, which was held in lateral rotation, with little or no range of medial rotation. By contrast, hips with posterior displacement showed marked stiffness, were held in medial rotation, often with some flexion, and allowed little or no lateral rotation. An anteriorly displaced head of femur was sometimes palpable in the groin, but in cases with marked anterior displacement, the greater trochanter is easily palpable in the buttock and can be mistaken for the femoral head. In two patients, attempts to repeat the open reduction had been abandoned as impossible by the referring surgeon.
Figure 1 – Radiograph of a girl aged 4 with posterior displacement of the left hip after a failed open reduction with femoral shortening and Chiari osteotomy. She had been referred as she still had posterior displacement of the hip despite two previous open reductions and an innominate osteotomy. Figure 2 – After removal of the metal, a CT scan shows the femoral head lying posterosuperior to the acetabulum. There is already considerable deformity of the femoral head and neck. Figure 3 – A CT scan at the level of the acetabula shows distortion of the left acetabulum with a bony bar obstructing the floor. Figure 4 – Radiographs taken at the age of nine, four years after a Colonna operation had been performed. The hip was clinically stable with a good range of movement, but there is severe growth disturbance of the femoral head and neck.

Figure 5 – Radiograph of a girl aged 2 years 6 months with posterior displacement which has recurred after an attempted open reduction at Great Ormond Street. She had been referred after conservative treatment, two previous open reductions and an innominate osteotomy. Figure 6 – At the age of 3 years 6 months, after a further open reduction stabilised with Kirschner wires, and a femoral osteotomy as a second stage. The hip is now stable but shows coxa vara, with disturbance of growth. Figure 7 – At the age of 13 years 3 months a stable concentric reduction is retained but significant growth disturbance of the femoral head and neck is evident.
All the patients were treated by a further open operation to reduce the displaced femoral head; this was frequently a technically demanding procedure because of dense scarring. Examination under anaesthesia and screening with an image intensifier can be very useful before operation. Arthrography is often difficult because of intra-articular scarring. CT scans were not used routinely but are very useful when the bony architecture is distorted on plain radiography. CT scanning can show the position and shape of the femoral head relative to the acetabulum and also the shape of the acetabulum; this may have become grossly distorted or even destroyed after previous treatment (Figs 1 to 4). In two such cases, one with a sciatic nerve palsy, CT scanning facilitated successful open reduction and Colonna arthroplasty.

**Technique of operation.** Each case presents its own individual problems but some basic principles can profitably be discussed. The Salter type of incision and approach is most useful, modified as necessary to allow for previous scarring. It is essential to expose the wing of the ilium, and access to the inner side of the pelvis helps with the location of the position of the acetabulum.

In cases with anterior displacement mobilisation of the femoral head may not be too difficult, but posterior displacement necessitates very careful dissection around the capsule. The head of the femur often becomes stuck posteriorly and the capsule is drawn across the mouth of the acetabulum, making it very difficult to identify. In a number of cases it was necessary to use a Kirschner wire and radiographs during operation to make sure of the position of the acetabulum.

The capsule is opened widely and the acetabulum is then cleared of the fibro-fatty tissue which may fill it; pituitary rongeurs are useful at this stage. After reduction a firm capsulorraphy is important. Redundant tissue is excised, and the remaining capsule is stitched down to the pelvis, with especial care at the anterior rim of the acetabulum. When there has been severe damage to the bony architecture of the acetabulum the Colonna capsular arthroplasty is the only satisfactory choice of operation.

**RESULTS**

In eight cases repeated open reduction produced satisfactory stability of the hip but in two displacement recurred. In none of these a Kirschner wire was used to stabilise the head in the socket at yet another operation; this child eventually had a good result (Figs 5 to 7). The second case subsequently had revision to a Colonna arthroplasty and the hip has remained stable (Figs 1 to 4).

Five patients had other procedures at the time of their open reduction. A Colonna arthroplasty was performed in two cases, a Chiari osteotomy and a femoral osteotomy in one, a cheilotomy with an abduction femoral osteotomy in one, and an acetabuloplasty in one patient. Stabilisation with temporary Kirschner wires was required in three cases.

The patient who required cheilotomy and abduction osteotomy demonstrated the very damaging effect of partial posterior displacement (Figs 8 and 9). This has produced marked stiffness and a dumb-bell shaped femoral head. At operation the distorted femoral head would not fit into the acetabulum and it was necessary to remove the abnormal mass of cartilage which formed the lateral part of the femoral head. After this the remaining, reasonably rounded, femoral head could be reduced concentrically into the acetabulum when the hip was held in maximum adduction. It was therefore necessary to perform an abduction osteotomy to stabilise the hip with the leg in neutral position.

Six patients required a varus femoral osteotomy.

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**Fig. 8**
Radiograph of a girl aged 2 years 4 months showing posterolateral redisplacement of the right hip with significant growth disturbance of the femoral head and neck. She had been treated for eight weeks from the age of 12 weeks by a Pavlik harness. At the age of six months she had had a closed reduction with a plaster spica for three months but this had failed. At 11 months she had had an open reduction and innominate osteotomy. At referral she had a limp, leg shortening, marked limitation of abduction and no lateral rotation—the clinical signs of posterior redisplacement. Figure 9 – Radiograph taken at the age of three years, after open reduction, cheilotomy of the femoral head and femoral osteotomy. The hip was stable with a reasonable but not full range of movement. There is significant growth disturbance of the femoral head and neck.
with derotation as a second-stage procedure six weeks after their open reduction. This was necessary in all five patients with anterior displacements, despite the fact that, lacking medial rotation in extension before operation, they had not shown the usual clinical evidence of excessive anteversion. However, at operation when the acetabulum has been cleared out and the femoral head reduced, all five cases showed 60° or more of femoral anteversion.

Most of the patients in this series have had their operations in the last five years and so follow-up is very short. However, stable reduction of the hip has been obtained in all 10 cases, although two required a revision operation. This type of surgery, on hips which are already badly damaged, must always be of a salvage nature; the aim is stability, accepting that some stiffness is inevitable. The quality of the long-term results is not yet known, although the patient who has been followed up for 12 years still has good function (Fig. 7).

DISCUSSION

After the late open reduction of a congenital dislocation of the hip some form of realignment procedure is commonly necessary. Salter's innominate osteotomy (1961) holds many attractions. It is an elegant procedure and leaves a much better scar than a femoral osteotomy. Salter recommended that it should be performed at the same time as the open reduction, which reduces the period of immobilisation in plaster to six weeks. Tachdjian (1982), in his monograph on congenital dislocation of the hip, considered Salter's osteotomy to be an excellent procedure in the hands of a surgeon experienced in children's orthopaedics, who should meticulously follow the details of the operation. However, the price of failure is high, in that secondary displacement, particularly if it is posterior, may make any revision extremely difficult.

Our experience bears out this contention. Anterior displacement after osteotomy is very much easier to deal with than posterior displacement because there is usually less scarring and less distortion of the femoral head. However, it is associated with increased femoral anteversion which will require correction, either at the same time as the open reduction or preferably at a second-stage femoral osteotomy.

Posterior re-displacement produces the characteristic clinical signs of a stiff, adducted, flexed, medially rotated hip. Like posterior displacement of the shoulder it can easily be missed on early postoperative radiographs. The major problems at re-exploration in these cases are the mobilisation of the femoral head from its posterior position, the probable deformity of the femoral head and the identification and clearance of the acetabulum.

The exact cause of the redisplacement after osteotomy is difficult to determine but it is likely, as listed by Tachdjian (1982), that the main factors are a poorly executed osteotomy, a lax capsulorrhaphy and excessive femoral anteversion.

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REFERENCES


