Acetabulum augmentation for Legg-Calvé-Perthes disease

12 children (14 hips) followed for 4 years

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Between 1986 and 1992, we performed 14 lateral shelf augmentation of the acetabulum in 12 children suffering from severe Legg-Calvé-Perthes disease. All children were over 9 years of age and none of the patients had previously undergone any other treatment. All children presented with a limitation of hip movement and episodes of pain during long walks and athletic activities. The clinical outcome was good in all children who were free of pain and walked without limping. Hip movement was painless and improved satisfactorily.

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The objective in the treatment of Legg-Calvé-Perthes disease (LCPD) is to prevent deformity of the femoral head and to achieve congruity of the hip joint.

Children over the age of 9 years form a special group with characteristic features of the femoral head, such as lateral displacement and enlargement, which crushes the anterolateral portion leading to hinged abduction, progressive subluxation and incongruity. The femoral neck appears short and broad, while the greater trochanter is elevated. These deformities predispose the child to repeated episodes of synovitis and decreased hip movement.

Treatment of these cases is difficult. Nonoperative is not successful. Various surgical procedures have been proposed to prevent deterioration and delay secondary degenerative changes, including Salter's pelvic osteotomy, Chiari's lateral displacement pelvic osteotomy and Steel's triple osteotomy (Thompson 1995, Salter 1980) or femoral subtrochanteric osteotomy, or a combination of both (Thompson 1995), however, with unsatisfactory results. Acetabulum augmentation by a lateral shelf arthroplasty has, however, in two studies been promising, (Kruse et al. 1991, Willett et al. 1992).

We present our experience with this method.

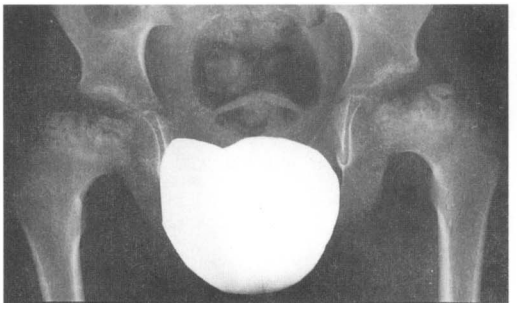
Patients and methods

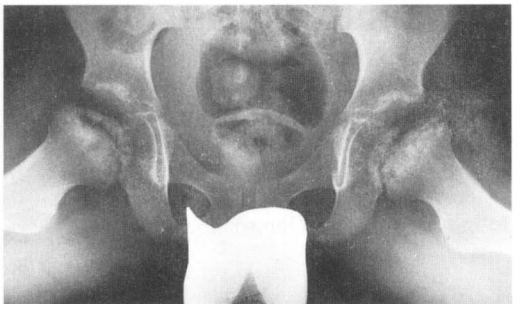
Between 1986 and 1992, we treated 12 children (14 hips) aged 9–12 years. They were all boys and the bone age was well below the chronological age. The children had undergone no previous treatment. They had pain during running and long walks. They had limited hip motion, particularly in abduction and internal rotation. Most of them reported pain on hip motion, indicating irritability of the hip. Plain anteroposterior and frog position radiographs revealed severe involvement of the entire femoral head.

All children were put on skin traction for a few days to allow the irritable hip symptoms to subside and a satisfactory range of hip movements to be obtained. An arthrogram was then performed to assess the deformity, the amount of extruded femoral head and the shape of the acetabulum. In 5 of the recent cases, MRI was also performed and gave more information regarding the degree of the deformity, subluxation, acetabulum congruence, as well as marking out the chondral portion of the femoral head.

Operative technique: We used a slightly modified lateral shelf procedure. The bony flap (4–5 cm long and 1.5 cm wide, hinged inferiorly above the insertion of the capsule) was secured on the outer cortex of the ilium, with two triangular bone blocks from the iliac crest. The intervening space was filled with cancellus bone chips. In this manner, adequate and stable coverage of the anteroposterior surface of the femoral head was obtained. A one and a half hip spica was applied for 6 weeks whereafter mobilization in bed was commenced. After that, the child was allowed partial weight bearing with crutches, followed by full weight bearing 3 months after the operation. At 6 months full activity was allowed.

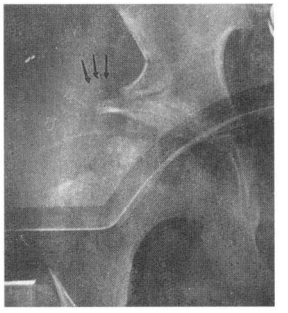
All patients were examined regularly every 4 to 6 months. The mean follow-up was 4 (3–8) years.



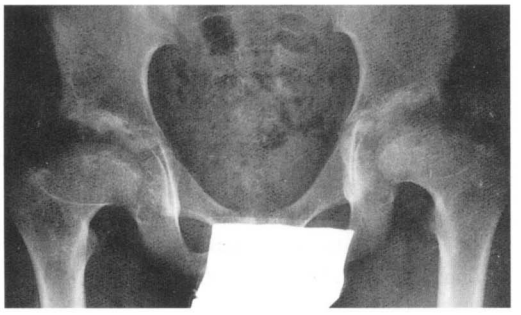


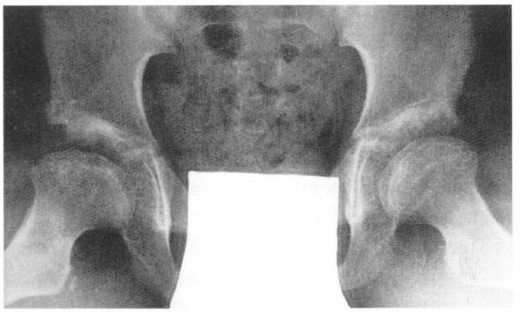
PreoperativeAP (left) and frog position view (right) of a 9-year-old boy who presented with repeated episodes of irritable hip for 2 years, limping, and limited and painful hip movement.

Preoperative MRI of the patient.



An intraoperative view showing the lateral shelf acetabuloplasty. Arrows indicate the shelf.





Postoperative appearance in AP (left) and frog position view (right) of the hip after 4 years.

Results

At the last follow-up all children were pain-free and walked without a limp, and the Trendelenburg sign was negative. Hip movement was painless. Motion in all hips was improved. Abduction in flexion in 6 hips was slightly reduced.

Radiographic consolidation of the shelf was observed in all cases. In 3 hips there was some absorption of the bone grafts, but the remaining part was judged to be satisfactory, covering the enlarged femoral head sufficiently. Complete healing of the disease was observed within 4–6 months from the operation. The size of the femoral head remained unchanged. The femoral head was satisfactorily covered. The acetabulum angle and the subluxation ratio had decreased.

Discussion

Management of children suffering from LCPD who are 9 years of age and older is difficult. At this age the femoral head is more osseous with poor potential for remodelling (Catterall 1995). Brace treatment is not accepted by children of this age (Herring 1994). Previous surgical series have considered the ratio of subluxation and flattening of the femoral head as a guide

for the application of containment subtrochanteric femoral osteotomy (Klisic 1983). This would have excluded cases, such as those described in our study. We found that an enlarged femoral head on a broad femoral neck with an elevated greater trochanter make this type of treatment unsuitable.

Salter's (1980) pelvic osteotomy in these children may increase the pressure at the femoral head, resulting in further deformity and crushing of the lateral portion of the femoral head. This procedure is technically demanding and more difficult in older children, given that the symphysis does not allow easy rotation of the distal part of the osteotomy. Other procedures, such as Chiari's lateral displacement osteotomy and cheilectomy, are considered as salvage procedures for older, severe cases (Klisic 1983).

A rational approach to this problem may be to increase the capacity of the acetabulum to receive the enlarged femoral head. This can be achieved using shelf augmentation of the acetabulum. This operation was initially used for the treatment of developmental hip dysplasia in cases with an underdeveloped acetabulum, to increase the load-bearing area of the femoral head. However, it has also been applied for LCPD. Kruse et al. (1991) reported long term results comparing two groups of such patients, one treated with shelf arthroplasty and the other with no surgery, and concluded that "the shelf operation proved useful in patients with severe LCPD characterized by lateral displacement, flattening and enlargement of the femoral head". Others have also found this procedure useful in selected children, including those unsuitable for redirectional osteotomies and children with Catterall's III and IV involvement (Van der Heyden and van Tongerloo 1981, Staheli and Chew 1992, Willett et al. 1992)

We found that lateral shelf augmentation of the acetabulum with a follow-up of 3–8 years, produced a satisfactory clinical outcome in patients with LCPD aged 9–12 years. Hip motion improved and pain disappeared. Radiographically, there was adequate coverage of the extruded femoral head.

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