

Open reduction of congenital hip dislocation

Advantages of the Ferguson medial approach

Between 1974 and 1982, 56 hips of 51 children with congenital hip dislocation were treated by open reduction via the medial approach according to Ferguson. The mean age at operation was 7 (3-15) months. After 4 months of plaster cast immobilization, 41 hips had a normal acetabular index. Three hips required supplementary surgery: Salter's pelvic osteotomy in one case and a varus osteotomy in two cases. Of the remaining 53 hips, 26 received supplementary abduction treatment. During the first 2 years after reduction, 19 hips showed slight lateral displacement due to capsular laxity.

The follow-up averaged 3 (0.5-8) years. All children older than 3 years now had stable, concentrically reduced hips without special treatment of the lateralization; in 9 of the 56 hips the acetabular roof was still dysplastic at follow-up. There was no difference in anteversion and neck-shaft angle between the treated and the contralateral hips. As vascular lesions were observed in only two hips and lateralization disappeared spontaneously, the Ferguson procedure seems safe.

Most orthopaedic surgeons agree that dislocation in children older than 18 months requires open reduction, but there is no consensus about the reduction in younger children. The main problem is to avoid necrosis of the femoral head. Salter & Field (1960), Bucholz & Ogden (1978) and Gage & Winter (1972) have shown that reduction should be performed without increasing intracartilaginous pressure, by avoiding extreme positions of immobilization, and by abolishing soft tissue contractures.

Open reduction via the medial approach was first described by Ludloff (1908, 1913) and reintroduced by Chiari (1957) and Ferguson (1973). The advantage of the medial approach is the direct access to structures that prevent concentric reduction, e.g. stricture of the caudal capsule and the iliopsoas tendon (Ferguson 1973). The disadvantages are the inaccessibility of other parts of the joint and the risk of damaging the medial circumflex artery (Kalamchi et al. 1982).

The aim of this study was to examine the development of hips treated by open reduction via the medial approach, the supplementary operations required, and the incidence of femoral head necrosis.

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Patients and methods

Between 1974 and 1982, 56 hips with typical congenital dislocation in 51 children (45 girls and 6 boys) were subjected to open reduction via a posteromedial approach (Ferguson 1973). The operation was the primary therapy for 47 hips, while for nine hips it was secondary to unsuccessful attempts at closed reduction. The mean age at operation was 7 (5-15) months.

During the first few years, 16 hips had preoperative traction for 1-3 weeks. Preoperative arthrography was performed in 18 hips; all had a medial accumulation of contrast. In only one case was an indication of an inverted limbus found. At all operations a stricture of the caudal capsule, the transverse acetabular ligament and the iliopsoas tendon proved to preclude deep concentric reduction. In only one case was a hypertrophic round ligament excised. Concentric reduction was achieved in all cases. After the operation the hips were immobilized in a bilateral plaster hip spica in 40° abduction, 20° flexion and 20° internal rotation for 4 months when all hips still showed concentric reduction. Supplementary treatment with an abduction splint during an average of 7 months was considered necessary for 26 hips. Especially in the early years, all hips were given supplementary abduction treatment, initially day and night and later only during sleeping hours. In the past few years, abduction splints were used only for those hips that still showed insufficient development of the acetabular roof after 4 months.

All patients and all radiographs were assessed by the author 3 (0.5–8) years postoperatively.

The measurements made at the radiographic examination were: the acetabular index according to Tönnis (1976), related to the normal values published by him; the quality of reduction according to Smith et al. (1968); anteversion and neck-shaft angle by the biplanar method described by Ogata & Goldsand (1979); and the presence of femoral head necrosis according to Gage & Winter (1972) and Salter et al. (1969).

Results

All hips had good mobility – even the two hips with necrosis of the femoral head discussed below.

Two of the 56 hips had secondary subluxation which required a derotational varus osteotomy; both had normal development subsequently. One hip had severe persistent dysplasia despite concentric reduction, and a Salter osteotomy was performed 3 years after the open reduction; subsequent development of this hip was uneventful.

Of the remaining 53 hips, 41 had a normal acetabular index after 4 months' plaster cast immobilization. Of these 41 hips, 18 were given a postoperative abduction splint and 23 were not. Twelve hips had an acetabular index in excess of twice the standard deviation 4 months after the operation. Eight of these hips received supplementary abduction treatment.

Nineteen of the 53 hips showed some degree of lateralization in anteroposterior roentgenograms of the pelvis with the hips in neutral position during the first 2 years after reduction. Radiographs with the hips in abduction and medial or lateral rotation, however, showed that concentric reduction had been achieved. There was no interposition of intra-articular structures. Lateralization was also observed in 14 of the 41 hips with a normal acetabular index for the age involved. The hips given supplementary abduction treatment had a smaller risk of lateralization. However, lateralization was no longer demonstrable at the age of 3 years, regardless of whether supplementary abduction treatment had or had not been given. At follow-up, 9 hips still had a dysplastic acetabular index.

Considering the relationship between the acetabular index after 4 months' immobilization, abduction treatment, lateralization and the ultimate acetabular index at follow-up, we found that four of the nine hips still showing dysplasia at follow-up were in the group of children still showing a dysplastic acetabular roof after 4 months' immobilization, given no abduction treatment and showing subsequent lateralization. The remaining five persistently dysplastic hips were distributed over the other groups (Figure 1).

In the hips not given supplementary surgery and in the contralateral hips, reliable measurements of femoral anteversion and neck-shaft angle were obtained in 45 treated and 37 contralateral hips. The treated hips had on average a neck-shaft angle of 139° (126°–158°) and femoral anteversion of 49° (16°–78°). The corresponding values for the contralateral, untreated hips were 142° (127°–164°) and 44° (15°–66°). No positive correlation was found between ultimate development of the acetabular roof and the degree of femoral anteversion and neck-shaft angle.

Two hips had radiographic evidence of necrosis of the femoral head. The first had so-called "type I changes" (Salter et al. 1969) with a rather low epiphysis as residual effect, but a spherical head. The second had a femoral head

Postop. Acetabular index >2SD	Result at follow-up	
	Postop. abduction splint	Laterali- zation Acetabular index >2SD
+12	+ 8	+ 1 - 7
	- 4	+ 4 - 0
	+18	+ 3 -15
	-41	+11 -12
		Total: 9

Figure 1. The acetabular index in 53 congenitally dislocated hips after open reduction and 4 months' immobilization related to additional treatment with abduction splint (26 hips)

lesion with metaphyseal changes (Figure 2). At the time of the follow-up this hip showed no lateralization, a normal acetabular roof and an apparently spherical femoral head. Ultimate development must be awaited.

Discussion

An alleged disadvantage of the limited medio-caudal approach is that it does not give access to all the structures that prevent concentric reduction. Kalamchi et al. (1982) published the results of open reduction of 15 hips via the medial approach as a secondary operation after unsuccessful attempts at closed reduction. After a perhaps insufficiently long period of immobilization all hips showed some degree of subluxation; in nine hips this persisted in spite of supplementary abduction treatment. Ten hips showed avascular necrosis of the femoral head. These results prompted the authors to abandon the medial approach.

Our experience is different. Concentric reduction was achieved peroperatively in all cases. Section of the transverse acetabular ligament seems to us to be the most important in this respect.

Lateralization or subluxation of the hip after plaster cast immobilization is a common phenomenon (Machacek & Salzer 1977, Roose et al. 1979). In our series, too, it was the most frequently encountered problem. It can occur in hips with a normal as well as in those with a

dysplastic acetabular roof and also in hips given supplementary abduction treatment. We therefore conclude that hyperlaxity of the joint capsule is the principal cause of this phenomenon, the more so because these hips return to normal without special treatment with increasing age. Harris (1976) reported normal development of the acetabular roof after concentric hip reduction before the fourth year of life, and found that development continued thereafter. The younger the patient at the time of reduction, the more rapidly the acetabular roof normalizes.

Consequently it seems advisable to give hips with an insufficient acetabular roof after 4 months' plaster cast immobilization supplementary abduction treatment, because this protects against lateralization and thus accelerates acetabular development.

Reliable measurements of anteversion and neck-shaft angle were not available in all hips. Although the angles were measured by a different biplanar method, anteversion of two-thirds of the hips proved to exceed twice the standard deviation according to Fabry et al. (1973). Since there seemed to be no difference between the measurements of the treated and those of the untreated contralateral hips, and apparently no correlation with the ultimate acetabular index, routine derotational varus osteotomy in lateralized hips does not seem indicated.

Femoral head necrosis after open reduction via the medial approach merits special atten-

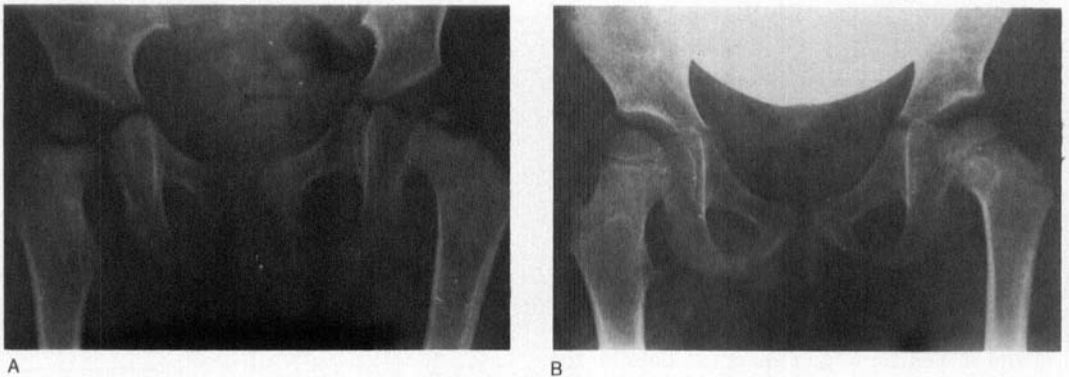


Figure 2. Femoral head necrosis after open reduction of the left hip at the age of 5 months.

- A. Ten months after operation, the left hip shows lateral displacement, a small epiphyseal nucleus, and a lateral metaphyseal defect, due to the vascular insult.
- B. Two years and nine months after operation the hip is well reduced without additional abduction treatment, the femoral head seems spherical, and the acetabulum is normal.

tion. Due to the limited exposure, the medial circumflex artery can only too easily be injured. Some authors have stressed the importance of leaving this artery intact, but others have observed no additional circulatory disturbances after ligation (Weinstein & Ponseti 1979). It is a conspicuous fact that the percentage of femoral head necrosis is small after primary open reduction (Ferguson 1973, Roose et al. 1979) and large after secondary open reduction (Kalamchi et al. 1982). Two hips in our series showed a vascular lesion. The first recovered well and seems to have a favourable prognosis. The second hip looks fine but the ultimate prognosis is uncertain in view of the lateral metaphyseal defect (Figure 2).

We conclude that open reduction via the medial approach according to Ferguson is a safe procedure as a primary operation. The risk for femoral head necrosis is small. The frequently observed lateralization usually disappears without special treatment.

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