THE MANAGEMENT OF PRIMARY ACETABULAR DYSPLASIA
ITS ASSOCIATION WITH HABITUAL SIDE-LYING

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Fifty-one infants with limited abduction of the hip and acetabular dysplasia were, between 1969 and 1975, treated with abduction-adduction exercises, administered by the parents; no abduction devices were used. In 1983 a follow-up examination was carried out on 41 of these patients. Although at birth these children had characteristics similar to patients with congenital dislocation of the hip, none of their hips dislocated.

At birth acetabular measurements showed that half the children had severe dysplasia and the other half slight dysplasia; the difference between the affected and the healthy hips was significant. At follow-up the gait was normal in all the patients. Movements at the hips were symmetrical and within normal limits in all but one patient. The acetabular angle, the centre–edge angle, the shaft–neck angle, the hip ratio, and the size of the femoral head were the same on the previously affected side as on the normal side.

Nineteen of the children followed up had preferred lying on one side and dysplasia of the upper hip had developed. The significance of the sleeping position on the development of acetabular dysplasia is discussed.

The clinical picture of a baby with restricted abduction of one hip and restricted adduction of the other, but without signs of instability, is well known. The gluteal folds are asymmetrical and the adducted limb is apparently shorter. These signs often arouse suspicion of congenital dislocation of the hip. The baby may also have scoliosis and asymmetry of the head, thorax and feet (Lloyd-Roberts and Pilcher 1965). When these babies are a few weeks or months old, it may be noticed that they habitually lie on one side.

Radiography of the hips frequently reveals acetabular dysplasia in the adducted hip. When combined with pelvic obliquity, this condition has been called fixed pelvic abduction (Badgley and O'Connor 1953; Weissman 1954) or fixed pelvic adduction (Lloyd-Roberts and Swann 1966). Obliquity of the pelvis alone gives a picture of an apparent acetabular dysplasia on standard radiographs (Tönnis and Brunken 1968) but, in the absence of pelvic obliquity, the appearance of dysplasia is usually the result of an abnormal inclination of the acetabulum. The radiological criteria of acetabular dysplasia are imprecise, but include a sloping acetabular roof with an indistinctly marked lateral margin, and a small femoral head.

Several methods of measuring are available, but few of them are useful in the newborn. The acetabular angle (Hilgenreiner 1925) and the diameter and depth of the acetabulum can be useful in neonates, although the acetabular angle has a wide normal range and is influenced by the age of the patient, the obliquity of the pelvis, and its inclination (Tönnis and Brunken 1968). In older children, the acetabular angle has been considered unreliable, and the centre–edge angle of Wiberg (1939) or the hip ratio (Bolton-Maggs and Crabtree 1983) have been preferred.

There is no general agreement as to the natural history, treatment and prognosis of acetabular dysplasia without dislocation, although the fear of subsequent dislocation is not groundless (Cozen 1968). Hip dysplasia has also been blamed for leading to osteoarthritis in early adult life (Putti 1933; Lloyd-Roberts 1955). For these reasons surgeons are anxious to treat dysplasia actively, using the same methods as for congenital dislocation, namely, various kinds of abduction devices, or traction followed by plaster (Finsterbush and Pogrund 1980; Johnson et al. 1981; Green and Griffin 1982; Kalamchi and MacFarlane 1982). The results achieved with these methods have all been good, but they always carry a risk of aseptic necrosis of the femoral head.

Since the 1960s, infants with limited abduction and acetabular dysplasia brought to the University Children's Hospital in Helsinki have been treated at home with abduction-adduction exercises administered by the parents; abduction devices have not been used. We followed up 41 of these patients to find out if stretching exercises alone are sufficient treatment for acetabular dysplasia without dislocation.
The habitual side-lying syndrome. Figure 1—This baby girl always prefers to lie on her left side. Figure 2—When she is held supine, she keeps her right leg adducted and her left abducted.

PATIENTS AND METHODS
The records of 51 patients with acetabular dysplasia (but without dislocation, subluxation or unacceptable pelvic obliquity) who had presented at the University Children's Hospital in Helsinki between 1969 and 1975 were located. The radiographs, histories, symptoms and signs of these infants were re-evaluated with particular reference to the exclusion of babies with instability; 41 of the 51 patients were contacted and called for a follow-up visit to the outpatient department in 1983.

The acetabular angles, the diameter and the depth of the acetabula and, whenever possible, the diameter and the height of the femoral heads were measured from the earliest radiographs. To rule out any possible error caused by lateral rotation or abnormal inclination of the pelvis, both the diameter of the obturator foramen and the angle between the symphysis pubis and the ischium were measured. Patients were included only if the rotation and inclination of the pelvis were within acceptable limits when evaluated using Tönnsis and Brunken's (1968) method.

At follow-up each patient's history was taken, the gait analysed and movements of the hips measured. A radiograph of the hips was taken from which the acetabular angle, the centre-edge angle, the shaft-neck angle of the femur, and the diameter and height of the femoral heads, were measured; in all cases both hips were measured.

RESULTS
Nine boys and 32 girls were investigated. The mean birth weight of the boys was 3639 g and that of the girls 3346 g. The mean age of the patients when first seen was 11 weeks (range 1 to 26 weeks).

All the children had been referred because of the suspicion of congenital dislocation of the hip. The reasons for referral are given in Table I; 8 of the children were referred by the maternity unit and 30 by child welfare clinics.

It was observed that 19 of the children (46%) preferred to lie on one side, with the lower hip adducted and the upper one adducted (Figs 1 to 4). In these children the upper was the dysplastic hip. When lying supine the obliquity of the pelvis and the adduction were clearly visible (Fig. 2), but when lying prone the abduction of the other hip was more obvious. The existence of associated deformities of the skull or the thorax remains uncertain—they were not noted in the hospital records and, at follow-up, the parents could not remember whether they had been present. The dysplasia was on the left side in 18 infants, on the right in 16, and on both sides in 7. Altogether, 48 hips were affected. Seven children were born in the breech position. Twenty-seven patients (66%) were first-born, 10 second-born and 4 third-born. In only one case was there a positive family history of congenital dislocation of the hip. One patient had muscular torticollis which was treated conservatively.
In the primary radiographs the acetabular angle averaged 36.3° in the affected hips and 27.6° in the healthy hips; this difference was statistically significant ($P < 0.01$).

When the acetabular angles were assessed in relation to the age of the patients (Tönnis and Brunken 1968), it was found that the dysplasia was slight in 24 hips (Fig. 3) and severe in 24 hips (Fig. 5); of the seven bilateral cases, the dysplasia was severe on both sides in five and on one side in two.

The depth and the diameter of the acetabula were measured and the acetabular quotient calculated using the formula proposed by Heyman and Herndon (1950):

\[
\text{acetabular quotient} = \frac{\text{acetabular depth}}{\text{acetabular length}} \times 100
\]

The mean quotient for the affected hips was 16 and for the healthy hips 21; this difference was significant ($P < 0.01$).

In some infants only one radiograph had been taken and the nuclei of the femoral heads had not yet ossified. In 23 unilateral cases, however, the femoral heads could be seen. Their diameter and height were measured and their area calculated: this averaged 26 mm$^2$ on the affected side and 45 mm$^2$ on the healthy side; this difference was significant ($P < 0.01$).

At follow-up the mean age of the children was 10 years 4 months (range 8 years to 14 years 8 months). All were normally active and none had needed medical attention for their hips. Five patients had flat feet, three had slight metatarsus adductus, and two had knock knees. One patient had Scheuermann’s disease. In one girl the previously affected leg was 10 mm longer than the normal one and had 15° more medial and lateral rotation; her femoral shaft–neck angles and articular-trochanteric distances were equal on both sides. In all the other patients, the movements of the hips were symmetrical and were within normal limits. The gait was normal and the Trendelenburg sign negative in every case.

The average acetabular angle in the affected hips was now 12.5° and in the healthy hips 12.7°. The acetabular quotient was 32 on both sides. The average centre–edge angle in the affected hips was 32.4° and in the healthy hips 34.1°. The hip ratio was calculated using the formula proposed by Bolton-Maggs and Crabtree (1983):

\[
\text{hip ratio} = \frac{\text{centre–edge angle} + \text{acetabular quotient}}{2}
\]

In the normal hips this was 32.2 and in the previously abnormal hips 33.1.

The mean area of the femoral head was 753 mm$^2$ on the affected side and 806 mm$^2$ on the healthy side. The shape of the femoral head was normal in every patient.

The average femoral shaft–neck angle was 136° on the affected side and 137° on the healthy side; no varus or valgus deformity could be found.

Severe acetabular dysplasia. Figure 5—A 14-week-old girl with an acetabular angle of 42° on the left and 26° on the right; the symphysis pubis–ischium angle is 112° (acceptable range 100° to 135°); and the ratio of the diameters of the obturator foramina is 0.71 (acceptable range 0.56 to 1.80). Figure 6—At 10 years old her hips are normal.

No statistically significant differences could be found in the follow-up radiographs between the hips that had been dysplastic and the healthy ones (Fig. 6).

DISCUSSION

The present study included only patients with limited abduction and with radiological dysplasia of the acetabulum, but without instability of the hip. All the children were treated with simple stretching exercises administered by the parents, and they all became normal. Although the series is relatively small, we conclude that: acetabular dysplasia in the absence of instability is not of serious significance; the use of traction or abduction splints, with its associated risk of avascular necrosis, is not indicated; and early osteoarthritis of the hip is not to be expected. In hips with severe limitation of abduction, however, an arthrogram may be needed to exclude subluxation. We note also that Pratt, Freiberger and Arnold (1982) found no late dislocations in 18 Navajo Indians whose dysplasia had been left untreated.

The patients in our study had several features in common with those children with congenital dislocation of the hip in Finland (Heikkilä 1984): the great majority were girls, and there were more than the expected number of first-born and breech-born children, and of those with associated foot deformities. A positive family history of congenital dislocation of the hip was, however, found in only one of our patients. The birth weight corresponded to the normal Finnish mean (Ojajärvi 1982).
The incidence of dysplasia is difficult to estimate because children with acetabular dysplasia but no dislocation are often grouped together with children who have frank congenital dislocations. Thus, in a report by Bjerkreim (1974) on late diagnosis of congenital dislocation of the hip, about a quarter of the patients only had dysplasia; in those aged between 1 and 3 months this proportion was nearer half. Similarly, in Palmén’s report (1980) of late diagnosis of congenital dislocation of the hip in Sweden, 21% of the patients only had dysplasia. During the period of our study (1969 to 1975) 405 children were treated for congenital dislocation and subluxation at the University Children’s Hospital, Helsinki, and 51 for acetabular dysplasia alone—a ratio of 8 to 1.

The side-lying syndrome. The significance of sleeping position on the development of acetabular dysplasia is difficult to define. Nineteen (46%) of our patients preferred to lie on one side; and in all of these it was the upper hip which was dysplastic. It is possible that more of the children habitually slept on one side but, at review, the parents could not remember the earlier sleeping habits of their children.

Although not found in our series, some authors have stressed that abduction contracture may develop in the lower, radiologically normal hip (Badgley and O’Connor 1953; Weissman 1954; Tachdjian 1972; Green and Griffin 1982). Weissman (1954) reported 51 children with dysplasia and an abduction contracture of the opposite hip; 13 recovered spontaneously and the others responded well to treatment by splintage. However, Cozen (1968) reported five children with abduction contractures who later dislocated.

We believe that acetabular dysplasia associated with the side-lying syndrome is a deformation and not a malformation. Our results confirm Wynne-Davies’ concept (1970) that acetabular dysplasia is only one aetiological factor of congenital dislocation of the hip and that dislocation is not likely to occur in the absence of some other factor or factors.

REFERENCES


THE JOURNAL OF BONE AND JOINT SURGERY