

Treatment of failed open reduction for congenital dislocation of the hip

A 10-year follow-up of 14 patients

Fourteen patients with 15 congenital dislocated hips with unsuccessful open reduction were referred for a secondary open reduction. All primary open reductions were incomplete due to an inadequate exposure and insufficient release of muscles and ligaments. The secondary open reduction was technically difficult. The patients were followed for 6-17 years. Six patients had no functional symptoms. Only three hips showed no radiographic deformity. In ten hips, femoral head necrosis was noted and two patients were left with shortening of 4 and 7 cm.

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In general, it is accepted that the younger the child, the greater will be the chance of a successful closed reduction in a congenital dislocation of the hip and the better will be the end result.

In the first year of life, failure of closed reduction for the treatment of congenital dislocation of the hip is uncommon. Morel (1975) reported that 22% of closed reductions failed in children under the age of 4 years, and open reduction was therefore required.

If open reduction fails, it is much more difficult to obtain a good result following a second open reduction. This paper presents our experience with 14 patients who required a second open reduction, along with secondary procedures at later stages.

Patients and methods

The study included 14 patients referred to our institution after unsuccessful open reduction of a congenitally dislocated hip. Thirteen patients were female, one of whom had a bilateral dislocation. The mean age at the time of diagnosis was 13 months (3 months - 3 years). Prior to the first open reduction, 12 patients were treated with skin traction for an average period of 3 weeks. In two patients an hour-glass configuration found on arthrography justified the omission of traction.

The average age at the primary open reduction was 1 year and 11 months (4 months - 4 years 10 months). In three patients (Cases 8, 13 and 14) a

reconstruction of the acetabulum was combined with the primary open reduction. The hips were immobilized for a mean postoperative period of 10 weeks. In one patient (Case 8) a bilateral high femoral osteotomy had been performed before referral to our institution.

Eight completely dislocated hips and seven cases of subluxation in which concentric reduction had not been achieved by previous procedures were subjected to reintervention at our institution. The mean age at the second open reduction was 3 years (7 months - 5 years 5 months). The interval between the first and the second open reduction ranged between 3 months (Case 4) and 26 months, with a mean of 13 months. In one case (Case 6) the second open reduction had to be postponed 6 months because of a poor range of motion. Preoperatively, routine radiography revealed signs of femoral head necrosis in only one hip (Case 8, left hip). Arthrography was not routinely performed prior to the second open reduction, nor was traction used.

Reviews of the radiographs of the eight hips with complete dislocation suggested that the femoral head had never been in the acetabular socket after the first open reduction.

Description of the secondary open reduction

The same iliofemoral approach (Smith Petersen) was employed as had been used in all primary procedures. An open adductor tenotomy was performed in two hips (Cases 6 and 13) to obtain a better exposure and to achieve abduction of the hip. The adhesions of the capsule to the ilium were released. The

capsule of the hip was incised in a T-shape. Adhesions between the femoral head and capsule were carefully freed.

The psoas tendon was routinely tenotomized intrapelvically. All soft tissue impediments including an inverted limbus or remnants of it were cleanly excised and the transverse acetabular ligament was incised. In three hips where the ligamentum teres was still present, this was resected. After reduction the capsule was closed by overlapping or excising redundant portions. Radiographic control of the hip was performed peroperatively. In seven hips the second open reduction was combined with an innominate osteotomy (Salter 1961) (Figure 1). A hip spica cast was applied for a period of 6 weeks.

Supplementary surgery

Supplementary surgery included high femoral osteotomy in seven hips and distalization of the greater trochanter in one hip. The femoral osteotomies were performed because of persistent excessive anteversion beyond the age of 8 years. The indication for a displacement osteotomy of the greater trochanter in Case 11 was an extreme weakness of the abductors of the hip.

Results at follow-up

In this retrospective study, 6–17 (average 10) years after the second open reduction the func-

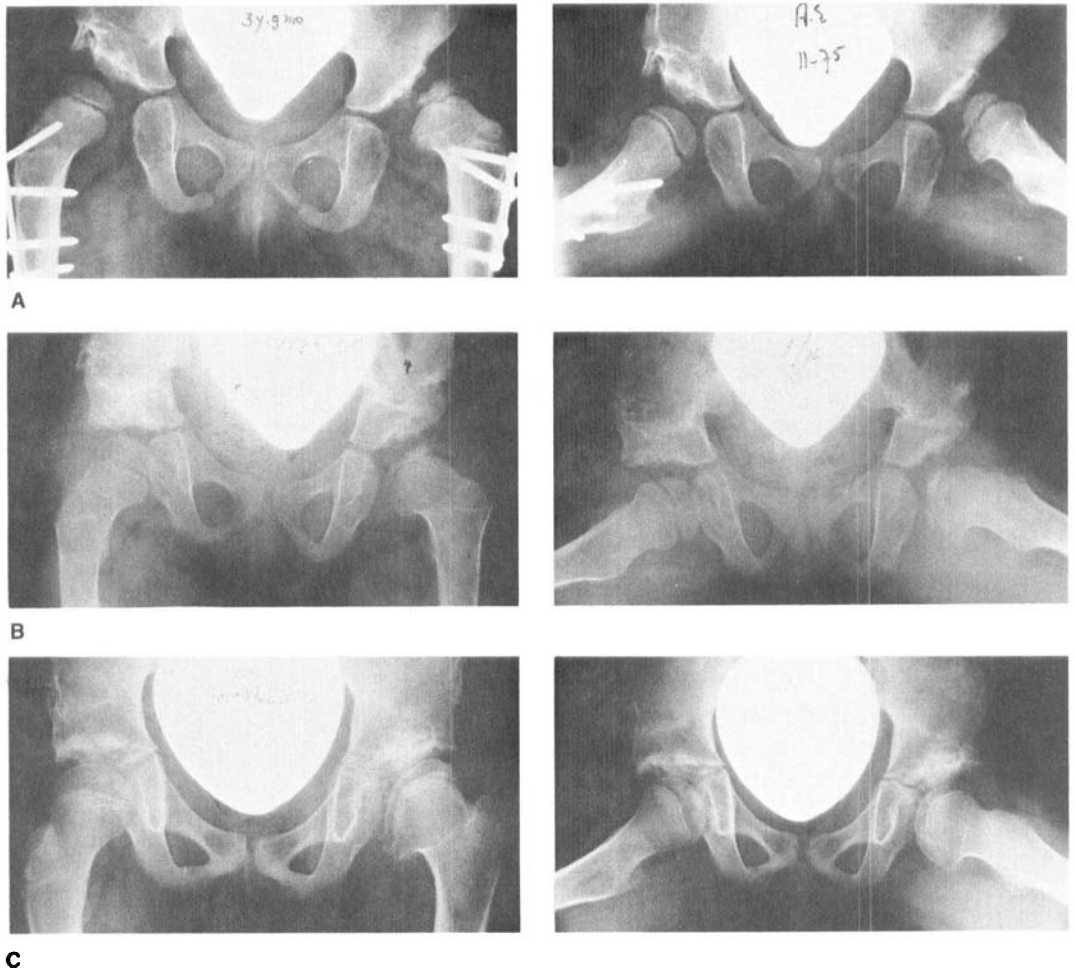


Figure 1A. Case 8: Radiographs prior to secondary open reduction. Both hips are subluxated. The left femoral head demonstrates an irregular and flattened epiphysis which indicates femoral head necrosis.
B. Six months after secondary open reduction and bilateral innominate osteotomy. The femoral head necrosis on the left side is more striking.
C. Six years after secondary open reduction. The right hip demonstrates a satisfactory development. The left hip shows a flattened physis, coxa magna and a shortened femoral neck.

tional results were assessed according to Ponseti (1944). Following these standards, 10 hips (six in category A and four in category B) were rated as good results. Four hips were rated as fair (category D) and one hip was rated as poor (category F) (Table 1, column 8).

The radiographic results were classified according to the modified method of Severin (1941). Using his criteria, three hips were identified in category 1 (excellent), six hips were identified in category 2 (good), three hips were identified in category 4 (fair) and two hips were identified in category 5 (poor) (Table 1, column 9).

Femoral head necrosis

At the follow-up, femoral head necrosis was noted in ten hips. The classification of Buchholz & Ogden (1978) was used to determine the various types of femoral head necrosis (Table

1). In one hip the end result was complicated by a type 2 femoral head necrosis resulting in a valgus appearance of the proximal femur. In four hips the development of the hip was altered by a type 3 femoral head necrosis, resulting in a relative overgrowth of the greater trochanter and a short femoral neck without any abnormal angulation. Five hips had type 4 femoral head necrosis, resulting in a varus deformity of the proximal femur (Table 1, column 11). Limb length discrepancies varied from 0 to 2 cm, except in type 3 femoral head necrosis in which two patients revealed shortening of 4 and 7 cm, respectively (Table 1, column 10).

Discussion

The chance of achieving a successful closed reduction was considerably decreased by the delay of diagnosis (mean age 13 months). Persistent soft tissue impediments necessitated

Table 1. Clinical data for 14 patients, reoperated after failed open reduction for congenital dislocation of the hip.

1	2	3	4	5	6	7	8	9	10	11	12
1	R	1, 6	d,e,f,g	3, 8	b	17	D	4	3	3	k
2	L	1, 10	d,g	2, 5	b,f	15	A	2	0	none	k
3	L	1, 10	a,e,f	2	b	13	B	2	1	2	k
4	R	4	b,d	7	b	13	D	4	?	4	
5	R	2, 2	d,e,f,g	4, 4	h,b	13	D	4	2	3	k
6	L	2, 3	d	3, 9	a,b,f	11	A	2	0	4	k
7	R	2, 3	d	3, 1	h,b	10	A	2	0	none	
8	R	2	e,f,h	3, 10	h,b	10	A	1	0	none	k
	L	2, 6	e,f	4, 1	h,b,f		B	2	0	4	k
9	L	1	e,f	1, 7	b	10	D	5	4	3	
10	R	1, 2	e,f	1, 10	h,b	9	B	3	2	4	
11	L	2, 6	e,f	3, 9	a,h,b	8	F	5	7	3	i
12	L	1, 6	d,e,f	2, 10	b	7	B	2	2	4	k
13	R	4, 10	c,d,f,h	5, 5	a,b	6	A	1	0	none	k
14	L	11	a,b,c,f,h	1, 11	h,b	6	A	1	0	none	

1 Case.

2 Side.

3 Age at primary surgery (years, months).

4 Primary surgery.

5 Age at secondary surgery (years, months).

6 Secondary surgery.

7 Follow-up (years).

8 Functional assessment (Ponseti 1944).

9 Radiographic classification.

10 Leg-length discrepancy (cm).

11 Classification of femoral head necrosis (Buchholz & Ogden 1978).

12 Supplementary surgery.

a Adductor tenotomy.

b Psoas tenotomy.

c Resection of redundant capsule.

d Resection of fibrous fatty tissue.

e Resection of limbus.

f Resection of ligamentum teres.

g Division of ligamentum transversum.

h Innominate osteotomy.

i Distalization of the greater trochanter.

k High femoral osteotomy.

an open reduction. The quality of the primary open reduction could be criticized for the lack of complete removal of soft tissue impediments. Nor did any operative note mention a perioperative radiological control. Nine open reductions were performed after the age of 18 months. As well as complete release of muscles (adductors and psoas), it is essential to enlarge the acetabular socket in these hips. This enlargement can be achieved by a capsulotomy down to the transverse ligament and division of this transverse ligament. Only in three hips had the transverse ligament been divided. The combination of primary reduction and innominate osteotomy in four hips could be criticized for the imperfect reduction, and in one hip (Case 14) the age of the patient did not justify a bony reconstruction of the pelvis.

The long-term results of treatment of failed open reduction for congenital dislocation of the hip are rarely reported, and it is therefore difficult to compare our experiences and results with those of others. In our series the long delay between primary and final open reductions explains why we never attempted any closed reduction as Scaglietti & Calandriello (1962) did in their series. Moreover, the constant intraoperative finding of adhesive formations of the capsule to the ilium and femoral head seemed to justify proceeding directly to open reduction. Technically the formerly operated hips were found to be difficult to operate through anatomical dissections. The ligamentum teres, still *in situ* in three cases, was excised. Invariably, this ligament was a hypertrophic structure close to the origin in the acetabulum where the ligament showed flattening near the insertion of the femoral head. It has been demonstrated (Buchholz & Ogden 1978) that the artery in the ligamentum teres supplies only a small region directly adjacent to the insertion into the femoral head, and for this reason excision of the ligamentum teres is always indicated during open reduction. The limbus was resected in nine hips in the primary open reduction. There is some controversy about whether excision of the limbus is harmful for the development of the acetabulum. Some authors (Salter 1961) perform an open reduction without a limbsectomy, whereas others (Somerville 1957,

Mitchell 1972) consider the limbus as the major obstacle to reduction. It is evident, however, that the cartilaginous labrum, which is an integral part of the true acetabulum, should not be excised. If a hypertrophic limbus, which is especially encountered in older children, prevents a deep concentric reduction, it should be excised gently.

The flattened and enlarged shape of the femoral head was a fairly consistent finding at reoperations of the hips. Nevertheless, in all cases it was possible to obtain a concentric reduction despite the enlargement of the femoral head by incision of the transverse ligament and resection of soft tissue impediments. It is important to emphasize that the second open reduction should not be attempted until the skin and soft tissues have softened up and hip motions have returned to prerelaxation ranges (Coleman 1978). In seven hips, increased anteversion of the femoral head was evident preoperatively and confirmed at surgery. This increased anteversion had to be corrected at later stages in all seven hips (Table 1, column 12).

It is evident that the chance of femoral head necrosis after a second open reduction is increased. We considered it significant that hips with femoral head necrosis type 3 showed a fair or poor radiological end-result (Table 1, column 9) and a concomitantly fair or poor functional end-result. In contrast, hips with type 4 femoral head necrosis showed great variety in functional and radiological end-result (Table 1, column 8 and 9). These functional results seemed to deteriorate with the years (Cases 1, 4, 5, 9 and 11), and it is evident that they will be worse after another follow-up period of 10 years.

It is obvious that any open reduction is likely to be harmful for the development of the hip. For a stable reduction, and to avoid any further harm to a hip after a failed open reduction, it is essential that any contracture of the adductors should be released, that an intrapelvic psoas tenotomy be accomplished, that an excellent exposure of the acetabulum be achieved and that all soft impediments should be resected. For optimal stabilization, the capsule around the femoral head should be repaired tightly; if necessary, stabilization of the hip is enhanced by a reconstruction of the pel-

vis. The goal of this entire surgical program should be to achieve a stable, deep, concentric reduction of the femoral head. If this concentric reduction requires rotation of the femur, it is now recommended that this operation should be performed simultaneously with the open reduction.

In conclusion, all primary open reductions were incomplete due to an inadequate exposure and insufficient release of muscles and ligaments. On the basis of these facts, we recommend that open reduction for congenital dislocation of the hip should be carried out only in orthopaedic centres with much experience in paediatric orthopaedic surgery.

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