

CONGENITAL DISLOCATION OF THE HIP PRESENTING AFTER THE AGE OF THREE YEARS

A LONG-TERM REVIEW

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We reviewed the cases of 38 children with 45 congenitally dislocated hips who presented for primary treatment after the age of three years. Of these, 34 hips were managed by the 'direct approach' of Somerville and Scott (1957); 14 of these required secondary operations for subluxation, often with a poor outcome. Eleven hips were treated by combined pelvic and femoral osteotomy which, in general, gave good results.

At a mean follow-up of 16.7 years, 80% of the whole series had a good or excellent clinical result and 51% were good or excellent radiologically. Simultaneous correction both above and below the hip is considered to be the best treatment for the older child with congenital hip dislocation.

Despite the introduction of screening programmes to detect congenital dislocation of the hip in the newborn, children still present later in childhood with established dislocation. Many different treatments have been recommended and there is no agreement on the optimum management. Few studies have dealt exclusively with children presenting after the age of three years; most have given only short-term results. It is recognised that radiological, and, to a lesser extent, clinical deterioration occurs with time (Gibson and Benson 1982); any useful assessment must consider long-term results.

We have reviewed all patients over three years of age who presented to our centre over a 32-year period.

PATIENTS AND METHODS

A special clinic at the Nuffield Orthopaedic Centre, Oxford has enabled us to achieve a 90% follow-up of patients with congenital dislocation of the hip until skeletal maturity and beyond (Gibson and Benson 1982). Of 502 children treated for established congenital dislocation from 1950 to 1982, 38 (about one per year) had been first diagnosed after the age of three years (Fig. 1). We have reviewed their case records, radiographs and the patients themselves.

Seven of the 38 children (18%) had bilateral dislocations, so 45 hips were available for study. There were 35 girls and three boys; of the unilateral dislocations, nine were on the right and 22 on the left. The average

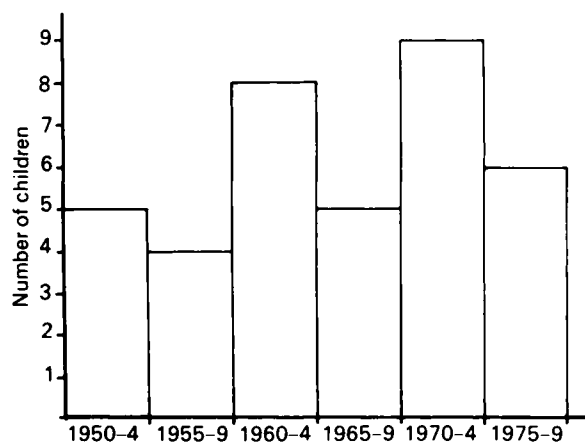


Fig. 1

Number of children over three years of age presenting with CDH in each five-year period from 1950 to 1979.

Table 1. Summary of treatment and follow-up

	Number of hips	Mean follow-up (years)
Direct approach alone	20	16.8
Direct approach and late femoral osteotomy	8	24.4
Direct approach and late pelvic osteotomy	6	17.9
Combined femoral and pelvic osteotomy	11	10.8
Total	45	16.7

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age at presentation was 4.3 years (range 3 to 9.5) (Fig. 2) and the average follow-up was 16.7 years (range 5 to 34.3); at latest review 30 patients had reached skeletal maturity.

Table I summarises the treatment given: 34 hips were managed according to the 'direct approach' of Somerville and Scott (1957). Preliminary traction was used in all 34, and followed by arthrography under anaesthesia. This revealed an inturned limbus in 25 hips; these patients accordingly had an open reduction and limbectomy. The other nine hips had closed reduction. All children were immobilised in a hip spica and underwent a femoral derotation osteotomy six weeks later. Fourteen of these 34 hips showed progressive subluxation later in childhood, and this was treated by pelvic osteotomy (usually a Pemberton acetabuloplasty) on eight occasions for six hips, or by further derotation femoral osteotomy on 10 occasions for eight hips. These secondary operations were carried out at an average age of 7 years (range 4.7 to 11).

Table II. Clinical assessment: the modified Severin grading (Gibson and Benson 1982)

Grade I	No pain, no limp, unlimited endurance
Grade II	No pain, slight limp, slight restriction of endurance
Grade III	Occasional pain, noticeable limp, endurance moderately restricted
Grade IV	Regular pain, marked limp, severe restriction of endurance

Table III. Radiological assessment: the Severin grading (Severin 1941)

Grade I	Normal hips; in adults, the centre-edge angle of Wiberg over 25°; in children from 6 to 14 years, CE angle over 15°
Grade II	Mild deformity of head or neck, but the hip otherwise deeply and concentrically reduced; CE angle as in Grade I
Grade III	Dysplastic hips without subluxation; CE angle less than 20° in adults and less than 15° in children
Grade IV	Subluxation
Grade V	The head articulating with a secondary acetabulum in the upper part of the original acetabulum
Grade VI	Redislocation

Clinical assessments were made from the case records at five years after primary treatment and at the latest review, using the modified Severin classification in Table II (Gibson and Benson 1982). A radiographic assessment was recorded at diagnosis, immediately postoperatively, at one and five years follow-up and at latest review. We measured the position of the femoral head, using the Smith (1968) grid; the acetabular index, the neck-shaft angle and the epiphyseal angle. The hips were also graded at five years and final follow-up using Severin's radiological criteria (Severin 1941) (Table III).

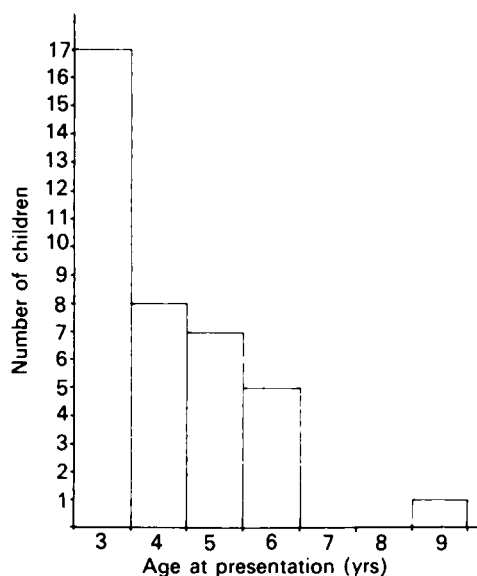


Fig. 2

Age at presentation.

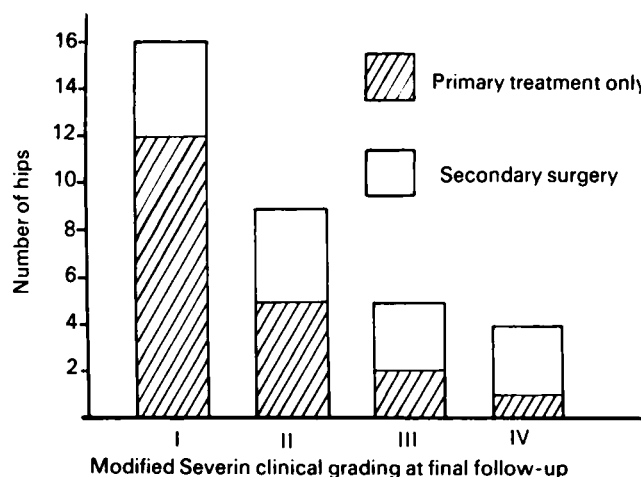


Fig. 3

Modified Severin clinical grading at latest follow-up of hips treated by the 'direct approach'.

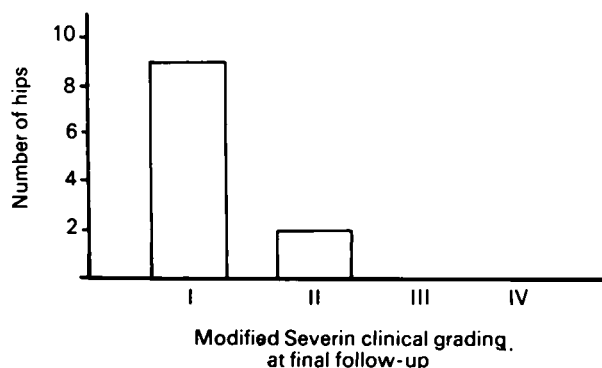


Fig. 4

Modified Severin clinical grading at latest follow-up of hips treated by combined femoral and pelvic osteotomy.

Eleven hips were treated primarily by combined femoral and pelvic osteotomy. In three this was undertaken by simultaneous open reduction, innominate osteotomy and shortening femoral osteotomy (Klisič 1982), and in eight by either closed (3) or open (5) reduction, followed by femoral derotation osteotomy, and then either a Salter osteotomy (5), a Pemberton acetabuloplasty (2) or a Chiari osteotomy (one).

For analysis, hips were placed in one of three groups: 'direct approach' alone, 'direct approach' plus later surgery, or combined femoral and pelvic osteotomy.

At the final follow-up degenerative change was recorded if cysts, sclerosis or osteophytes were seen. This was deemed to be mild, if the joint space was well preserved, moderate if there was narrowing, and severe if there was no joint space.

RESULTS

At final review over half of the 45 hips were grade I on the modified Severin clinical assessment, and a further quarter were grade II. On overall radiological Severin grading just over half were grade I or II, and under a quarter grade III. One quarter showed subluxation. Both clinical and radiological results tended to deteriorate during adolescence and early adulthood.

Results according to methods of treatment.

'Direct approach' alone. Of these 20 hips, most showed clinical grade I or II (Fig. 3), and just over half showed radiological grade I or II (Fig. 5). Examples are shown in Figures 7 and 8.

'Direct approach', plus later femoral or pelvic osteotomy.

The final radiological results of such secondary surgery were poor (Fig. 5), although clinically a small majority was grade I or II. No procedure seemed to have any particular advantage over the others. Figure 9 shows an example.

Limnectomy. In the above groups those hips requiring limbectomy and open reduction had a less favourable radiological outcome than those reduced by closed means (Table IV), but this did not reach statistical significance. Of the hips treated by closed reduction only two required further operations, whereas seven did not. Clinically there was little difference between those undergoing limbectomy and those who had a closed reduction. The incidence of degenerative change was also broadly similar.

Combined femoral and pelvic osteotomy. The results, both clinical and radiological (Fig. 10), were good or excellent in most cases (Figs 4 and 6). All 11 patients, however, were treated later in the series and therefore had a shorter follow-up (average 10.8 years).

We analysed various factors including age at presentation, initial acetabular angle, displacement of the femoral head and the quality of postoperative reduction, as measured by Smith's grid, to determine whether they predicted final clinical or radiological outcome. There was no significant correlation found between any of them.

Complications. The initial treatment caused complications in 18 patients. The most significant were avascular necrosis of the femoral head, supracondylar fracture after mobilisation, coxa vara, and premature fusion of the lateral growth plate (Table V). Avascular necrosis followed the 'direct approach' (four hips) and combined femoral and pelvic osteotomy (one hip).

Coxa vara (neck-shaft angle (NSA) of less than 110°) was seen in three cases, two of them due to premature fusion of the medial growth plate. In these two cases, neck-shaft angles of less than 90° required valgus femoral osteotomy to correct them to 115° and 120° respectively.

Table IV. Radiological results of the 'direct approach'

	Severin grading						Total
	I	II	III	IV	V	VI	
Closed reduction	3	2	1	3	0	0	9
Limnectomy	6	3	7	7	2	0	25

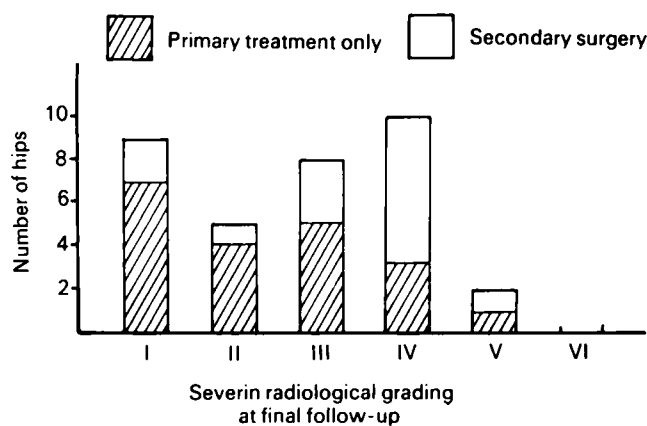


Fig. 5

Severin radiological grading at latest follow-up of hips treated by the 'direct approach'.

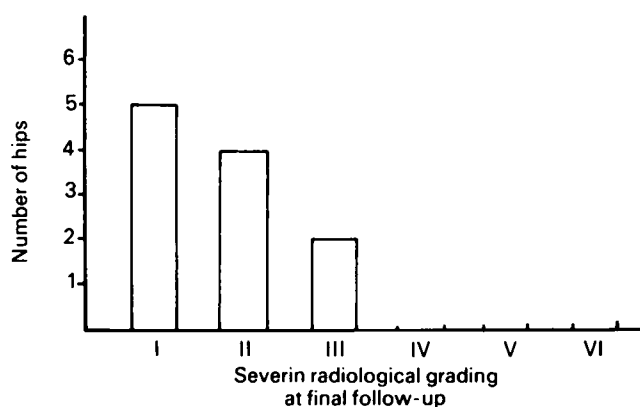


Fig. 6

Severin radiological grading at latest follow-up of hips treated by combined femoral and pelvic osteotomy.

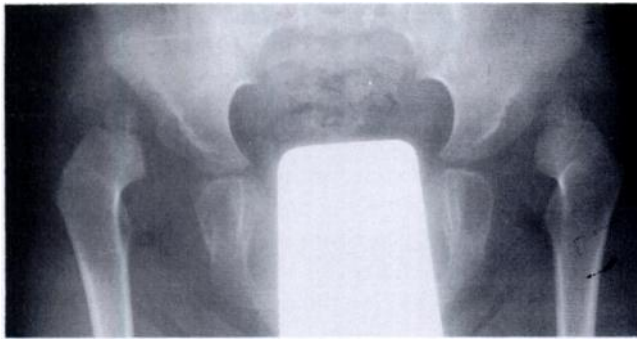


Fig. 7a



Fig. 7b



Fig. 7c

Radiographs showing bilateral CDH in a girl aged three (a) treated by limbectomies and derotating femoral osteotomies (b). At 15 years she has no symptoms and well-reduced hips (c).

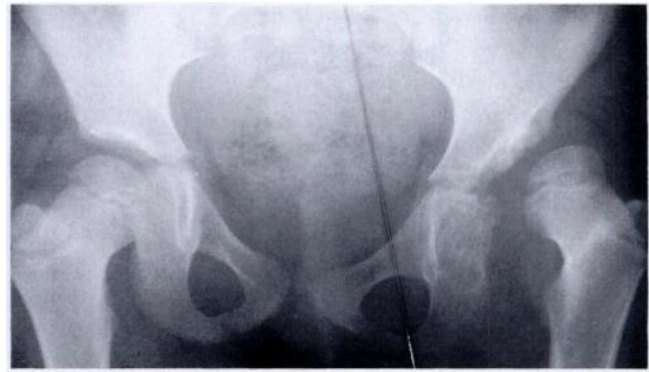


Fig. 8a



Fig. 8b



Fig. 8c

Radiographs of a child of nine with left CDH (a) treated by limbectomy and derotating femoral osteotomy (b) resulting in progressive subluxation at 27 years of age (c).

Degenerative changes. Table VI relates the distribution of degenerative change at final follow-up to the initial treatment. Although the combined femoral and pelvic osteotomy group had a much lower incidence of osteoarthritis, this could be due to the shorter follow-up: overall degenerative change correlated very closely with the time that had elapsed since primary treatment. No radiological grade I hips had more than mild degenerative change regardless of the initial treatment. On the other hand, final radiological grades III, IV and V always showed some degenerative changes after follow-up for 15 years or more.

Salvage operations. Three patients have had Chiari osteotomies in their 20s. One of these required arthrodesis

five years later, and the other two have been followed for only a few years. One patient has had a total hip replacement.

DISCUSSION

The aims of treatment for the older child with congenital displacement of the hip do not differ from those for the infant. The goal is deep reduction of the femoral head into the true acetabulum, but opinions differ on the age beyond which surgical treatment is contra-indicated because of the risk of serious complications. This varies from six years (Apley and Solomon 1982) to 14 years (Lloyd-Roberts 1978).



Fig. 9a



Fig. 9b



Fig. 9c

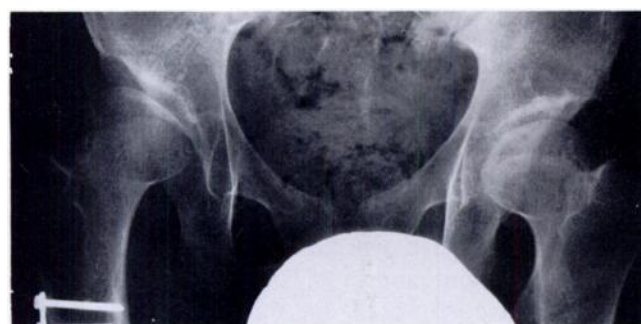


Fig. 9d

Bilateral CDH in a child of three years (a) treated by limbectomies and derotating femoral osteotomies (b). The left hip remained well-reduced, but the right hip showed subluxation at six years and was treated by further derotating femoral osteotomy (c). The right hip continued to subluxate as shown at latest follow-up at 21 years (d).

Somerville and Scott (1957) introduced the 'direct approach' for older children with congenital displacement of the hip, and, more recently, open reduction combined with a pelvic osteotomy to either re-orientate the acetabulum (Salter 1961) or to change the shape of

Table V. Complications in the whole series

Avascular necrosis	5
Supracondylar fracture	4
Coxa vara	3
Wound infection	2
Lateral physeal fusion	1
Meralgia paraesthetica	1
Pressure sore	1
Femoral fracture	1
Total	18

Table VI. Degenerative changes at latest follow-up

	None	Mild	Moderate	Severe
Direct approach alone	10	8	0	2
Direct approach and late femoral osteotomy	0	3	1	4
Direct approach and late pelvic osteotomy	3	2	1	0
Combined femoral and pelvic osteotomy	9	2	0	0
Total	22	15	2	6

the socket (Pemberton 1965), have been advocated. Other methods include combined innominate osteotomy and shortening femoral osteotomy (Klisič 1982), and the Colonna-Hey Groves capsular arthroplasty (Hey Groves 1927; Colonna 1932).

Our series includes two main approaches to treatment. Of the larger group treated by the classic Somerville and Scott regime, over a third required further operations because of progressive subluxation. These cases represent the failure of this primary treatment: not only was secondary surgery required but in general the radiological results of this were poor. Secondary surgical treatment, whether above or below the hip, rarely achieved a lasting reduction.

In an attempt to identify the hips likely to respond to the 'direct approach', we analysed various pre-operative factors. Neither radiographic indices nor age at presentation were useful predictors and, surprisingly, the quality of postoperative reduction as assessed on Smith's grid also failed to predict the final result or the need for further surgery. The marginally better outcome after closed reduction rather than limbectomy may simply reflect a less severe form of dislocation and not an advantage of this treatment. In all, just under half of those treated by the direct approach showed a well-contained hip at a mean follow-up of 19 years. It has been argued that in the older child the acetabulum loses its ability to remodel (Harris, Lloyd-Roberts and Gallien 1975); this may explain why, in our series, femoral

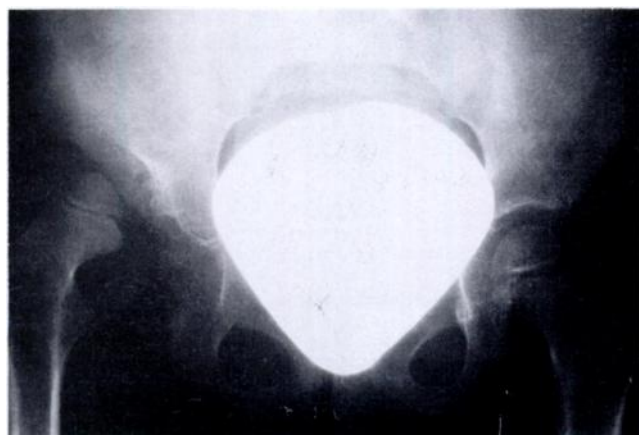


Fig. 10a



Fig. 10b



Fig. 10c



Fig. 10d

Radiographs of a child of five with unilateral CDH treated by the Klisić procedure. The hip is well-reduced at 14 years of age.

osteotomy alone failed to prevent further progressive subluxation in a large proportion of cases.

Combined pelvic and femoral osteotomy was the other main primary procedure. This was adopted more recently and the mean follow-up is shorter. In general an excellent clinical outcome was associated with good radiological results, significantly better than those after the 'direct approach' ($p < 0.01$, Mann Whitney U-test). Although the two series are consecutive, with no randomisation, there was no significant difference in the age of presentation or the initial radiographic indices between the two groups. This suggests that they are comparable. The overall radiological results in the 'combined osteotomy' group at latest follow-up (mean 11.5 years) were better than those of the femoral osteotomy group at only five years follow-up; this confirms that the shorter total follow-up is not the only reason for the better radiological outcome.

The importance of maintaining a good reduction is confirmed by the inevitable appearance of degenerative change in dysplastic or subluxated hips after 15 or more years of follow-up. These patients will probably have increasing symptoms in their third or fourth decades, with corresponding deterioration of clinical grading. It is

too early to know whether the combined femoral and pelvic osteotomy group will have a lower late incidence of osteoarthritis.

Previous reports from this centre on the 'direct approach' (Gibson and Benson 1982; Sherlock, Gibson and Benson 1985) have shown a deterioration of the radiological results with increasing age at presentation. In 2- to 3-year-old patients with hip dislocations only 30% were grade I or II at maturity; in those of similar age with hip subluxations only 35% were grade I or II at maturity. In children over three years of age our finding was that 41% had grade I or II hips at latest follow-up after the 'direct approach' and this is surprisingly good. It seems that children presenting with dislocation after the age of two years may perhaps be classed together as a group with a similar prognosis.

Analysis of our results showed no correlation between age at presentation and final radiological outcome; this throws into doubt the concept of an upper age limit for attempting reduction of a dislocated hip, but our series contained only one patient older than six years. Massie and Howorth (1951) reporting a series of 58 patients with an average follow-up of 18 years found no significant difference in late result between those

Table VII. Comparison with other studies

Authors	Age at presentation (years)	Number of hips	Method of treatment	Mean follow-up (years)	Avascular necrosis (per cent)	Grade I or II radiological result (per cent)
Massie and Howorth 1951	2 to 8	58	Open reduction and (usually) femoral osteotomy	18	41	21
Salter and Dubos 1974	4 to 10	30	Open reduction and innominate osteotomy	5	6	67
Klisič 1982	> 7	93	Open reduction, pelvic and femoral shortening osteotomy	6	Not known	59
Pozo, Cannon and Catterall 1974	3 to 10	50	Open reduction and capsular arthroplasty	19	2	78
Present series	3 to 9	45	Open reduction (usually) femoral \pm pelvic osteotomy	17	11	51

presenting before or after the age of three years and treated largely by open reduction and femoral osteotomy. Smith et al (1968) reported poorer results in older children, but this is accounted for by the increasing incidence of avascular necrosis with age in children treated without preliminary traction. Klisič (1982) found that 7- to 8-year-old children fared better than older ones after combined pelvic osteotomy and femoral shortening.

Our results are compared with other series in Table VII. Longer follow-up is still required to determine whether the good early results of innominate osteotomy (Salter and Dubos 1974) and combined pelvic and femoral shortening osteotomy (Klisič 1982) are maintained. The exceptionally good radiographic results of capsular arthroplasty (Pozo, Cannon and Catterall 1987) are perhaps to be anticipated after surgical deepening of the acetabulum, but the clinical results are less good with marked early stiffness and rapid functional deterioration

after about 20 years. This procedure is perhaps best reserved for salvage when other methods have failed.

Our long-term results are encouragingly good in relation to the late age of presentation, but we found that the direct approach of Somerville and Scott gave a rather unpredictable outcome. The small group who had pelvic osteotomy in addition to femoral osteotomy as primary treatment show better results, lending support to the growing opinion that operation on both sides of the hip is necessary for an older child with congenital displacement.

This work is based on the years of treatment of congenital dislocation of the hip by Mr E. W. Somerville; we should like to pay tribute to his expertise.

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