A LONG-TERM FOLLOW-UP OF CONGENITAL DISLOCATION OF THE HIP*

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Drawing upon a total experience of 450 hips affected by established congenital dislocation or subluxation, the author presents the long-term results in 177 hips treated for the first time between the ages of nine months and three and a half years, in support of his contention that surgical endeavour should in the first place be directed towards the limbus and upper end of femur rather than the acetabulum. The 144 patients, all treated on lines previously described in this journal (Scott 1953; Somerville 1953a, b; Somerville and Scott 1957), have now been followed up annually for between ten and twenty-five years, both hips receiving equal scrutiny. In brief, the routine has consisted of arthrography, excision of any limbus shown to be inverted, reduction by traction in abduction, and rotation osteotomy of 70 degrees. The addition of 10 to 15 degrees of varus was found beneficial and has become routine. Some hips required secondary procedures, and regret is expressed that these were not carried out sooner. The upper age at which recovery of the acetabulum may occur was found to be much higher than generally supposed, with a critical period between eleven and fourteen. The main conclusion is that in the great majority of cases first seen in this particular age group, improvement of the mechanics of the joint, especially by attention to the upper end of femur, leads to satisfactory development of the acetabulum and good functional results, at least up to early adult life.

Several very different mechanisms may result in displacement of the hip in infancy. In all of these except one it is a relatively minor part of a more serious condition such as myelomeningocele or arthrogryposis, to mention only two. In the one exception the only structural abnormality is the displacement, the child being otherwise normal. This has been described as typical congenital dislocation or subluxation of the hip and is the only type considered in this paper.

This report, on 177 hips in 144 patients, may be regarded as an extension of a previous account of a consecutive series of 100 hips (Somerville 1967). All the patients in the present series have been treated on the same lines and have now been followed up at intervals of about a year for a minimum of ten and a maximum of twenty-five years.

The differentiation between dislocation and subluxation was in all cases made by arthrography. When the limbus was demonstrably inverted and causing an obstruction to concentric reduction the hip was considered to be dislocated (Table I).

The 177 hips were selected from a total of 450, the selection being based on the followed criteria: the age at commencing treatment—between nine months and three and a half years (Figs. 1 and 2); the treatment—all on the same lines; the absence of all previous treatment, even neonatal splintage; the period of follow-up—a minimum of ten and a maximum of twenty-five years; and the method of review—at intervals of about a year throughout the whole period, radiographs of both hips being taken on each occasion.

Table 1. Material: 144 children

<table>
<thead>
<tr>
<th>Unilateral dislocation</th>
<th>Right 23: Left 88</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral subluxation</td>
<td></td>
</tr>
<tr>
<td>Bilateral involvement</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>177</td>
</tr>
</tbody>
</table>

ROUTINE TREATMENT

Treatment has consisted of gradual reduction by traction and abduction on a Wingfield frame (Scott 1953) followed by excision of the limbus when indicated, as it was in all hips regarded as dislocated. Whether or not the limbus was excised, the hip was then immobilised in a plaster spica for one month in full internal rotation and 45 degrees of abduction. Finally, stabilisation of the reduction was obtained by a high femoral osteotomy, always correcting anteversion by 70 degrees and sometimes increasing the varus by 10 to 15 degrees. After each procedure the child returned home in plaster, being

*This paper was first read at a symposium on congenital dislocation of the hip organised by Dr S. Stanisavljevic and held in Detroit in October 1974.

finally admitted six weeks after the osteotomy for removal of the cast and mobilisation.

The total length of treatment was usually fourteen weeks for unilateral and sixteen weeks for bilateral displacement, of which five or six weeks were spent in hospital. For a number of hips, however, the period of treatment was rather longer, often for reasons unassociated with the hip. At the end of active treatment no form of splint or restraint was employed, the child being encouraged to run free as soon as possible.

Pain was unusual, but ten patients had an ache which limited activity, and one has had a successful Chiari osteotomy because of this. In a few the plate caused an ache and its removal gave relief.

It was interesting to find that in twenty patients with a unilateral dislocation persistent foetal alignment was present in the opposite hip (Somerville 1957), which suggests that an increased angle of anteverision is an important factor in the development of the disorder. Another finding worthy of note was a single case of changes like Perthes' disease which developed two years after treatment and resolved spontaneously.

**Radiological assessment**

The hips were divided into five groups as follows.

*Normal.* The acetabulum and femoral head were congruous and round, and the superior articular surfaces were parallel and horizontal. Although the CE angle was not used specifically as an estimate of quality, no hip was classified as normal unless it measured 25 degrees or more.

*Stigma.* These hips complied with the above criteria but still did not appear quite normal because of some minor fault such as an alteration in the neck-shaft angle, which made it apparent that something had been wrong. "Normal" and "Stigma" have been bracketed together as "Acceptable".

*Minor subluxation* (Fig. 3). There was some decentralisation of the femoral head. The superior articular surfaces were parallel but not horizontal, and Shenton's line could appear to be broken. The CE angle was less than 25 degrees. These hips remained unchanged for a great many years and showed no loss of joint space. Because such hips did not fall into the "Acceptable" or "Unacceptable" groups, they have been considered separately.

*Frank subluxation.* There was a definite subluxation with later deterioration.

*Poor.* Such hips were quite unacceptable, though the functional assessment was often surprisingly good. "Frank subluxation" and "Poor" have been bracketed together as "Unacceptable".

**RESULTS**

**Unilateral dislocation**

Of 101 hips with unilateral dislocation, 80 per cent were acceptable, 10 per cent were unacceptable and 10 per cent showed minor subluxation. Such an assessment, however, did not take into consideration the age at the time of treatment. The breakdown of these figures indicates the effect on prognosis of the age at the time of treatment. In Table II the age groups have been deliberately separated by gaps so that the results in each should be more significant. In the youngest group of nine to fifteen months all the hips were acceptable, but between three and three and a half years only two-thirds.
**Table II.** Unilateral dislocations. Comparison of results by age

<table>
<thead>
<tr>
<th>Result</th>
<th>Age (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9–15</td>
</tr>
<tr>
<td>Normal</td>
<td>11</td>
</tr>
<tr>
<td>Stigma</td>
<td>2</td>
</tr>
<tr>
<td>Minor subluxation</td>
<td>—</td>
</tr>
<tr>
<td>Frank subluxation</td>
<td>—</td>
</tr>
<tr>
<td>Poor</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
</tr>
</tbody>
</table>

*Numbers in parentheses are percentages

**Table III.** Unilateral subluxations

<table>
<thead>
<tr>
<th>Results</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>Stigma</td>
</tr>
<tr>
<td></td>
<td>Minor subluxation</td>
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<tr>
<td></td>
<td>Frank subluxation</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

**Unilateral subluxation**

There were only ten such hips and all were treated below the age of two years. Nine were acceptable and none was unacceptable (Table III).

**Bilateral displacement**

In thirty-three patients the displacement was bilateral (Table IV). A detailed estimation of the correction of bilateral displacements produces so many variants that it is of little value. It is better to compare the results in individual hips where displacement was bilateral with those where it was unilateral (Table V).

It appears that the results in unilateral dislocation are slightly better than those in bilateral dislocation, but there are certain factors that may account for this. First, the age at diagnosis of bilateral dislocation is about four months greater (Figs. 1 and 2), presumably because it is easier to detect a unilateral limp. Secondly, at the start of this series over twenty years ago the opportunity was sometimes taken to modify the routine in some way on one side so as to afford comparison with the other. All except one of these variants resulted in failure, but it was quite impossible to exclude those cases from the series.

The only variant that proved successful was the addition of 10 to 15 degrees of varus at the time of the rotation osteotomy. There were in this series only seventeen hips where this was carried out as part of the primary procedure and the results were significantly better, 93 per cent being acceptable. It has now become routine practice.

There was no difference between the results of bilateral and unilateral subluxation.

**Secondary operations**

In twenty hips a further osteotomy was carried out to prevent deterioration. As expected the results were inferior to those of primary treatment only. Sixty per cent were subsequently acceptable, 10 per cent showed minor subluxation but 30 per cent remain unacceptable. There was no doubt, however, that some of the failures were due to delay and that earlier surgical intervention would have produced better results.

**PROGRESS**

The object of this regime of treatment is to correct the mechanics of the joint by establishing concentric movement in order that the hip may develop normally. Obviously it takes a long time for anatomical normality to be achieved.

Ninety hips which had been followed up for a minimum of fifteen years were separately reviewed at five, ten, fifteen, and twenty to twenty-five years after treatment. From Table VI it can be seen that in some hips development was complete by five years but not complete in a considerable proportion until ten years
after treatment. A number then deteriorated between ten and fifteen years.

After fifteen years, however, there was no further deterioration up to the end of this review at twenty-five years, when 74 per cent were acceptable.

### Table VI. Results at five-year intervals after treatment in 90 hips

<table>
<thead>
<tr>
<th>Years</th>
<th>Acceptable</th>
<th>Uncertain</th>
<th>Not acceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 years</td>
<td>59 (65.5 per cent)</td>
<td>22 (24.5 per cent)</td>
<td>9 (10 per cent)</td>
</tr>
<tr>
<td>10 years</td>
<td>72 (80 per cent)</td>
<td>11 (12 per cent)</td>
<td>7 (8 per cent)</td>
</tr>
<tr>
<td>15 years</td>
<td>66 (73 per cent)</td>
<td>12 (12.5 per cent)</td>
<td>12 (12.5 per cent)</td>
</tr>
<tr>
<td>20+ years</td>
<td>35 (74 per cent)</td>
<td>4 (9 per cent)</td>
<td>8 (17 per cent)</td>
</tr>
</tbody>
</table>

### Minor subluxations

Most of these are stable hips which cannot be included as "acceptable" because the acetabulum has not developed completely. Nevertheless they are good hips with normal function and have shown no deterioration over a great many years; therefore they cannot be regarded as "unacceptable" (Fig. 3). However, minor subluxations which are unstable must be recognised, because these hips will deteriorate (Figs. 4 and 5). But displacement may develop at any age (Figs. 6, 7 and 8). Indeed, progressive displacement may develop in an apparently normal hip and may be overlooked if both hips are not included in the routine radiographs (Figs. 9, 10 and 11). The presence of anteversion or valgus or both does not necessarily mean that a hip will deteriorate, though it is considerably more at risk (Figs. 12, 13 and 14).

The development of an acetabulum to its maximum potential often takes many years, and it is important that incomplete development should not be mistaken for subluxation (Figs. 15, 16 and 17).

**Fig. 3**

The left hip of a young woman now twenty-five years of age, married with one child, showing a minor degree of subluxation but no evidence of deterioration over more than twenty years. This is a stable hip and may continue thus for a very long time.

**Fig. 4**

The right hip of a girl five years after treatment. Subluxation is present and the acetabulum has not developed. The serial films showed progressive deterioration. Such a hip would become a total failure unless this trend could be reversed. As both anteversion and valgus had recurred, an osteotomy correcting both was performed.

**Fig. 5**

The same hip twenty years later, showing normal development.
Figure 6—The left hip of a girl aged eleven, nine years after treatment. It seemed to have developed normally but examination of rotation with the hip extended showed that anteversion had recurred. Figure 7—The radiograph one year later, showing minor subluxation. Figure 8—At seventeen years of age there was obvious incongruity and early sclerosis of subchondral bone. Such changes are irreversible.

Figure 9—The right hip of a girl aged three soon after a dislocation of the left hip had been treated. This hip was considered normal, and some persistent foetal alignment was ignored. Figure 10—By the age of fourteen the hip had subluxated and the acetabulum was damaged beyond spontaneous recovery. Femoral and pelvic osteotomies were carried out at the same time. Figure 11—Marked improvement.

Figure 12—Radiographs of a boy aged four who had severe bilateral dislocations treated at the age of two but with a marked recurrence of valgus two years later, when ossification centres could be seen developing in the acetabular roofs, more clearly on the right side. Figure 13—At ten years of age the right hip had improved greatly but the left still had some way to go. Figure 14—By the age of fifteen the right hip was normal and the left, though not normal, showed good acetabular development.
DISCUSSION
This review over a medium-long term has served to emphasise certain important points. The reduction of displacement of previously untreated hips in the age group of nine months to three and a half years is seldom difficult, nor is the maintenance of reduction. The problem is to ensure that the hip will grow properly throughout the whole period of growth and will remain functionally normal afterwards. That normal growth is occurring can only be assured by regular observation up to the end of growth. Which hips will then last longest cannot be ascertained unless the follow-up is continued far into adult life. In this series it has not always been the hip with the deepest acetabulum that has lasted the best. Some hips with impeccable acetabular development are showing early evidence of cartilage degeneration after more than twenty-five years (Fig. 17), whereas others with the acetabulum less good show no such change over the same period of time (Fig. 3).

So long as a hip is seen to be improving in the serial radiographs all is well, but when the films show no improvement or deterioration further surgical intervention is again necessary to correct the faulty mechanics and restore concentric movement. It would appear that the longevity of hips is affected more by the type of movement in the joint than by the anatomical configuration. The experience gained from this series has left a very strong impression that if secondary operation had been undertaken earlier, whether femoral or pelvic osteotomy or even simple plication of the anterior capsule, the number of failures could have been reduced.

A persistence or recurrence of anteversion or valgus does not necessarily mean that deterioration will occur, but such hips are certainly at risk. The critical period seems to be between the ages of eleven and fourteen, when either deterioration or improvement may occur.

REFERENCES