Surgical treatment of late developmental displacement of the hip

RESULTS AFTER 33 YEARS


From Nuffield Orthopaedic Centre, Oxford, England

The outcome of displaced hips treated by Somerville and Scott’s method was assessed after more than 25 years. A total of 147 patients (191 displaced hips) was reviewed which represented an overall follow-up of 65.6%. The median age at the index operation was two years. During the first five years, 25 (13%) hips showed signs of avascular change.

The late development of valgus angulation of the neck, after ten years, was seen in 69 (36%) hips. Further operations were frequently necessary. Moderate to severe osteoarthritis developed at a young age in 40% of the hips. Total hip replacement or arthrodesis was necessary in 27 (14%) hips at a mean age of 36.5 years. Risk factors identified were high dislocation, open reduction, and age at the original operation. Two groups of patients were compared according to outcome. All the radiographic indices were different between the two groups after ten years, but most were similar before. It takes a generation to establish the prognosis, although some early indicators may help to predict outcome.

It is difficult to predict accurately the long-term outcome following treatment for developmental dysplasia of the hip (DDH). The results of open and closed treatment for children diagnosed over the age of 12 months vary greatly.1-4 Most authors agree that the radiographic and functional results do not correlate well in the short term. A hip may appear poor radiographically but the child functions very satisfactorily. However, the radiographic appearance more closely parallels functional outcome as time passes. It is evident from the few long-term outcome studies that the clinical results in adult life may not be predictable in childhood and adolescence. It is still not clear which radiographic parameters best predict the long-term outcome. Few studies follow the results of treatment into middle age, when the incidence of osteoarthritis may be compared with earlier predictors of outcome.1-4

The results of treatment by the technique of Somerville and Scott5 have previously been described at skeletal maturity in a large group of children with dislocated and subluxated hips,6 and highlighted the need for a longer term review to assess the efficacy of this treatment.

The present study reviews the outcome of children treated surgically by this method between 1947 and 1965 and compares the observations which are commonly used to monitor such patients with the long-term outcome. These include containment of the hip, the development of proximal femoral deformity, the development of osteoarthritis, and the need for total joint replacement. The patients were followed for a mean of 33 years (25 to 48).

Patients and Methods

The records of all patients treated surgically for developmental dislocation of the hip have been kept in a unique format at the Nuffield Orthopaedic Centre. Since 1948 all pelvic radiographs have been reprinted as 10 cm by 7 cm black and white photographs. Each photograph has been pasted on a large cardboard sheet in chronological order (Fig. 1). Arthrographic images were also photographed and mounted. The date of each radiograph was recorded beneath the photograph, and any treatment performed between radiographs was recorded in the margin between the pictures.

With increasing age, clinical and radiographic reviews became less frequent. Every attempt has been made to follow up all the patients for life. The records and radiographs of all patients treated up to, and including, 1965 have been reviewed.

The Somerville and Scott “direct” method of treatment.5 Children were not treated surgically before the age of nine months. This usually corresponded to ossification of the femoral head. Treatment involved initial traction on a
Longitudinal traction was combined with progressive abduction for a period of four weeks. At this stage the child’s hip was examined under anaesthetic, and an arthrogram performed. The subsequent treatment depended on the results of the arthrographic findings. If no block to reduction was shown, the child was regarded as having a ‘subluxated’ hip. A hip spica was applied with the hip extended, abducted to 40˚, and fully internally rotated. A month later a subtrochanteric derotation femoral osteotomy, with or without varus, was performed, typically with derotation of 60˚ to 90˚. After a further six weeks in plaster, the child was mobilised.

When the hip would not reduce concentrically at arthrography, it was regarded as being ‘dislocated’. If the arthrogram showed a block to reduction with dye pooling centrally and an inverted ‘limbus’, open reduction and excision of the ‘limbus’ was performed under the same anaesthetic. The operation was undertaken through a small transverse ‘bikini-line’ anterior incision. A capsulotomy was performed and the inverted ‘limbus’ hooked out and excised. The psoas was not divided and the capsule was not reefed. A hip spica was then applied with the hip in extension, abduction and full internal rotation and retained for four to six weeks. At this stage a subtrochanteric derotation osteotomy was performed, often with some varus, similar to that described for subluxated hips. A hip spica was reapplied, removed six weeks later and the child mobilised.

Children were followed up at three-monthly intervals for the first year, six-monthly for the second year and annually thereafter. When the hip appeared stable, the patient was reviewed biannually until skeletal maturity. Thereafter, they were seen every three to five years. At each review the patient was evaluated clinically, and a standing anteroposterior pelvic radiograph taken.

Radiological assessment. The radiographic series of both hips for each patient was analysed. The assessments were made at the initial presentation, at one year and five years after commencement of treatment, at 10, 16, and 25 years, and at the last review (Table I).

At each stage of development a clinical review of both hips had been performed. All radiographic morphological observations for this study were made by a single observer (GF) and recorded on a computer database. Measurements of the parameters were made using a computer linked to a digitised graphic measurement tablet. These measurements were taken from the original radiographs. A programme...
was written by one of the authors (GF) to calculate values for these findings which were recorded into a spreadsheet application programme. The specific information recorded at each developmental stage is described below.

**Pre-reduction radiograph.** The height of the initial dislocation was graded according to the position of the femoral metaphysis relative to the edge of the acetabulum as described by Gibson and Benson\(^6\) (Fig. 2). The contour of the acetabular roof was assessed, the presence of a notch was recorded\(^8\) and the acetabular index\(^9\) was measured.

**One year after initial treatment.** In addition to those observations taken on the initial films, estimations were made of both the vertical displacement (the height of epiphysis above Hilgenreiner’s line), and the lateral displacement (the percentage of the head not covered by the ossified acetabular roof).

**Five years after initial treatment.** In addition to the previous criteria, the acetabular edge and teardrop were assessed. The hip was graded by Severin’s classification\(^10\) and the degree of disruption of Shenton’s line\(^11\) was recorded. The ossific nucleus and proximal femoral growth plate were examined for signs of avascular change according to the criteria of Bucholz and Ogden.\(^12\)

**At ten years of age.** The centre-edge angle of Wiberg\(^13\) and Sharp’s angle\(^14\) were also measured. The sphericity of the head was evaluated using Mose’s rings.\(^15\)

**At 16 years of age.** This radiograph was taken at skeletal maturity. In addition to those assessments made on the film taken at ten years, the degree of degenerative change was graded by a four-grade classification from 0 (no evidence of degeneration) to 3 (severe degenerative change). The presence of osteophytes, sclerosis and reduced joint space were noted. We estimated the degree of congruity of the joint surfaces and the overall cover of the femoral head using a modification of the classification of Bauer and Kerschbaumer.\(^16\) An assessment of proximal femoral growth disturbance was made using the system of Kalamchi and MacEwen.\(^17\)

The presence and development of the femoral epiphyseal ossification centre was noted.

**Table I.** Comparison of variables at each stage between good and poor outcome groups

<table>
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<tr>
<th>Timing</th>
<th>Pre-reduction</th>
<th>+ 1 year</th>
<th>+ 5 years</th>
<th>10 years old</th>
<th>16 years old</th>
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* NSD, no significant difference
At 25 years of age and the latest follow-up. Similar measurements were made to those at 16 years of age.

Patients. There were 224 patients with 275 displaced hips. The radiographs of all patients were reviewed until the latest follow-up. All patients with full documentation, including initial and current radiographs, were included in the study. Those who did not have a follow-up of at least 25 years were excluded.

There were 77 patients who were not available for this study, and are not included in the overall analysis. Two patients had died before their 25-year review; one from a motor accident and one had committed suicide. Nine patients had emigrated abroad without a contact address. Fourteen patients failed to return for regular review and had less than 25 years of follow-up. Attempts to trace these patients were unsuccessful.

At the time of retirement of the senior operating surgeon in 1977, 52 patients were discharged from follow-up prior to the required inclusion period. He considered that these patients had a satisfactory outcome and no longer needed review. They have not been included in this review.

There were 147 patients available for inclusion in the study representing an overall follow-up of 65.6%. Most are still attending clinics at our institution on a regular basis. Some had moved from the region and were contacted to provide an update on their situation and a current radiograph. Patients who had undergone arthroplasty or arthrodasis of the hip were included, but no attempt has been made to assess the nature or outcome of these secondary procedures. They are the end-point for radiographic assessment of the hip and the final pre-operative radiograph was used as the latest follow-up. The mean period of follow-up was for 33.3 years (median 32.4; 25 to 48.1).

There were 191 displaced joints and 103 undisplaced (contralateral) joints for analysis. Bilateral dislocations were present in 44 patients. Of the unilateral displacements, 80 were left sided, and 23 were on the right. There were 134 women and 13 men.

Statistical analysis. Demographic data have been analysed with standard techniques using means and medians. Analysis of the final outcome was performed using the Student t-test and the Chi-squared test with Pearson correction as appropriate. Significance was determined to be at the level of p = 0.05. The main outcome variable for each hip was the presence of severe (grade 3) arthritic changes, a hip arthroplasty, or arthrodasis on the last radiograph. Other radiographic and clinical variables were compared with the main outcome variable.

Results

General
Age at reduction. The age of patients at their index operation was between 9 months and 7.9 years (median 2 years, mean 2.3 years). Treatment was started after the age of two years in 49 of the 147 patients, and after the age of three years in 19 patients.

Height of dislocation. The dislocated hip was classified as being high (Fig. 2) in 124 hips (65.5%), medium in 37 (19%), and as a low dislocation or subluxation in 28 (15%). The other 103 hips were normally located (Fig. 3). Where the hips were dislocated bilaterally (44 patients), 65 hips (74%) were high dislocations.

Congruency of reduction. Overall, the congruency as assessed by Severin’s classification10 (Fig. 4) gradually worsened over time.

After two years from the initial reduction, 49 hips (26%) were Severin I or II, 96 (50%) were Severin III, and five (24%) were Severin IV or V. One hip had re-dislocated (Severin VI). This hip remained dislocated and no further attempt at surgical reduction was made. She had not gone on to hip ablation at the last review, despite having a unilateral dislocation.

Radiographs at 16 years showed that 59 hips (31%) were Severin I or II, 75 (39%) were Severin III, 55 (29%) were Severin IV or V, and one was Severin VI. At the latest
review, 49 hips (26%) remained Severin I or II, 64 (34%) were Severin III, 75 (39%) were Severin IV or V, and three were dislocated (Severin VI). There were 30 hips which were graded Severin III at five years, which had displaced by final review, and two which had dislocated.

A comparison with the opposite side in patients with a unilateral dislocation is shown in Figure 4. Of the 103 non-displaced hips, 81 (79%) were Severin I or II at five years and 76 (74%) at the latest review. Only three hips in this group became displaced (Severin IV), two of these by the age of five years. At the final review more than 22 (21%) of these hips were dysplastic (Severin III or IV) despite being initially assessed as normal.

**Operation profile.** The operations which were undertaken are shown in Tables II and III. These are divided into primary and secondary, or salvage, procedures. All 191 displaced hips were treated by primary operation. Figure 5 relates to the initial type of operation with the grade of osteoarthritis at the latest review.

**Initial operation.** Sixty-one hips (32%) were treated by closed reduction prior to derotation osteotomy. In general, these were low or medium dislocations. Of these, 15 (25%) had developed moderate or severe arthritis (grades 2 and 3) at the latest review. At five years the rate of severe avascular necrosis (AVN) in the closed reduction group was twice that seen in those with an open reduction, although mild changes of mottling were common in the latter.

Open reduction and limbsextomy followed by later elective derotation osteotomy was performed in 120 hips (63% of all displaced hips). Of these, 59 (49%) had developed moderate or severe arthritis at the latest review. A high incidence of grade I avascular changes was noted in this group.

Seven hips (4%) underwent open reduction without limbsextomy, followed by derotation osteotomy. Of these, two had developed moderate to severe arthritis at the latest review.

The other three hips were managed with procedures outside the usual protocol. One had an open reduction without femoral osteotomy, one an open reduction and early pelvic osteotomy and the other a late derotation osteotomy. At the final review two had developed mild arthritis and one moderate arthritis.

**Height of dislocation.** Open reduction was more commonly performed in high initial dislocations (Table II). Of the 125 high dislocations, 95 (76%) were treated by open reduction whereas only five (18%) of the 28 low dislocations had an open reduction (p < 0.001). Of the five hips with low dislocations who had a limbsextomy, four had grade 2 to 3 arthritis at the final review.
Secondary operations. Many patients required further operations with a mean of 2.5 (1 to 7) additional procedures (Table III). There was a positive association between degenerative changes and the total number of operations performed. Secondary operations to achieve concentric stable reduction included femoral varus osteotomy, pelvic realignment osteotomy and a repeat of the open reduction. Later operations, including pelvic and femoral osteotomies, were performed to achieve stability, but not necessarily congruity. Hip fusion or replacement was regarded as the end point in outcome.

Avascular necrosis. According to the criteria of Bucholz and Ogden,12 13% of all displaced hips showed signs of marked avascular changes during the first five years after the start of treatment (types II to IV). A further 69% showed minor mottling of the ossific nucleus, which was assessed as type I change. Only 18% of hips showed no sign of avascular change in the ossific nucleus during the course of treatment.

Of the 166 hips graded which showed no evidence of AVN or only type I changes, 69 (42%) developed late onset valgus angulation of the femoral head which was not seen on the radiographs before ten years. The incidence of degenerative change was increased in hips with type I changes compared with those with no AVN. Moderate or severe arthritis occurred in 41% of type I hips at the latest review compared with 24% of those with no changes of AVN (p < 0.05) (Table IV).

Growth disturbance. Ninety-four hips (49%) showed disturbance of growth, as defined by Kalamchi and MacEwen17 with a much higher rate of degenerative change. Of these 51% had progressed to moderate or severe arthritis at the latest review. When late valgus deformity occurred, late degenerative changes were common, with 42 (61%) of 69 hips with this deformity developing moderate or severe arthritis. Of the entire study group 77 displaced hips (40%) developed moderate to severe arthritis. In hips with global physeal arrest (type IV), four of six hips (67%) developed moderate to severe arthritis.

Assessment of outcome
Congruency of reduction (Severin). The congruency of reduction at five years is compared with the severity of arthritis at latest review. Moderate or severe arthritis was not seen in Severin I hips, but occurred in 2 (22%) of Severin II hips and 17 (35%) of Severin III. When the hip was subluxated or dislocated (Severin IV to VI), 58 (76%) developed moderate to severe arthritis.

There was a significant difference (p < 0.001) between hips treated by open reduction, limbusectomy and derotation and those treated by closed reduction and derotation (Table II). Of the former, 50% (60/120) were graded as Severin IV or worse at final review whereas only 23% (14 of 61) who had closed reduction of the latter were displaced (Severin IV or worse). Of the hips which were not displaced initially only three of 103 were displaced at final review (Fig. 6). All three developed severe arthritis. Although 81 (77%) of the apparently ‘normal’ hips developed normally, 22 (18%) became uncovered (Severin VI). Of these only one hip had severe degenerative changes. It is noteworthy that of these apparently ‘normal’ hips, 13 showed signs of AVN; 11 were grade 1 and two grade 2.

Proximal femoral deformity. Deformity as defined by Kalamchi and MacEwen17 was assessed radiographically at maturity. Late developing lateral physeal arrest leads to valgus tilt of the femoral head, sparing of the neck-shaft orientation and less shortening of the neck. This deformity was not observed before the pubertal growth spurt and represents early slowing of growth in the lateral physis. It does not appear to be associated with overt avascular necrosis during the period of treatment.

Over half of the hips (71/130) which were treated by open reduction developed proximal femoral deformity. Seven (5%) hips showed central arrest, seven (5%) medial arrest and one (1%) early lateral arrest. Some of these hips (50; 38%) developed late onset lateral physeal arrest.

Of the 61 hips treated by closed reduction, 23 (38%) developed femoral deformity. Of 61, three (5%) had central arrest, 3 (5%) medial arrest, 4 (7%) early lateral arrest; 13 (21%) developed late onset arrest of the lateral physis. The increased severity of AVN in this group is noteworthy.
Degenerative arthritis. Of 191 displaced hips, 114 (60%) developed mild or no arthritis but 77 (40%) were moderately or severely affected (Table V). However, 4% (4 of 103) of hips initially assessed as being ‘normal’, had developed moderate to severe arthritis at the latest review.

Increasing age at reduction increased the risk of the development of degenerative arthritis. Moderate or severe arthritis occurred in 10 (21%) of patients treated before 12 months of age and in 11 (60%) of those treated after 36 months. Furthermore, children who were older at the time of initial reduction generally required further operations.

Only five (18%) hips with low dislocations developed moderate to severe osteoarthritic changes compared with 60 of 125 (48%) hips with high dislocations (Table VI). Avascular change demonstrable in the first five years of treatment increased the risk of the development of degenerative arthritis (Table IV).

The relative congruency and hip cover were assessed at the age of 16 using Bauer’s classification.16 Those hips with poor cover and lack of congruency (Bauer grade 4) had a poor outcome, developing moderate to severe arthritis.

Ablative surgery (total hip replacement/arthrodesis). Of the affected hips 27 (14%) had ablative surgery at a mean age of 36.5 years. Primary joint arthroplasty was performed in 25 hips, one was arthrodesed and one was treated by surface replacement arthroplasty.

Repeated operations and poor congruency at 16 years (maturity) increased the likelihood of ablative surgery. At maturity, 56 hips were Severin IV or worse; 13 (23%) were ablated. Of 75 hips graded Severin III at 16 years, 10 (13%) went on to ablation at a mean of 40.3 years (32.3 to 46.4).

Predictors of a poor outcome. The affected hips were divided into two subgroups on the basis of the latest review (Figs 7 and 8). A poor outcome was defined as grade 3 osteoarthritic changes, or treatment by ablative surgery. Hips which did not have severe arthritic changes or ablative operations were classed as good.

Gender bore no significant relationship to the final outcome. The other differences are summarised in Table I. Most parameters were not significantly different between the two prognostic subgroups at the initial assessment and assessment one year after surgery. Neither the shape of the roof at this time, the direction of the physeal plate, the presence of an ossific nucleus or a caput magnum nor the lateral displacement affected outcome. However, there were significant differences between the two subgroups at this time. The appearance of a normal acetabular edge was associated with a better outcome. The outcome was worse when the dislocation was high, and a high acetabular index at presentation and at five and ten years heralded a poor outcome.

At five years there was a significant difference in most parameters between the good and poor subgroups. From ten years there was a significant difference in all radiographic parameters between the two subgroups.

Discussion

The aim of early diagnosis and treatment of the dislocated hip is to achieve prompt concentric, stable reduction, to restore normal anatomy and reduce the risk of the develop-
ment of premature degenerative arthritis. Outcome studies following treatment in the 1950s and 1960s highlighted the problems of late recognition and the difficulties in obtaining congruent stable reduction\(^2\)-\(^6\) in older children.

When Somerville and Scott\(^5\) introduced their “direct” method of management for DDH they attempted to address the major obstacles to reduction. They believed that preliminary traction facilitated reduction and reduced the risk of AVN, that reduction should be closed when there was no block to reduction and that an incarcerated labrum, the limbus, was the prime obstacle to closed reduction requiring excision. They considered that excessive anteversion of the neck of the femur was the leading cause of redisplacement and that femoral derotation was the solution. They developed a scheme of management which was followed assiduously and has allowed us to review their results into middle age.

Some questions remain unanswered. It remains uncertain whether traction protects against avascular change. A system of prolonged fixed traction with abduction may so rigidly invert the labrum that it requires section to allow eversion. This study has highlighted the poorer outcome associated with excision of the limbus. Although histological examination of the excised limbus nearly always

**Fig. 7**

Radiographic series of a patient with a satisfactory outcome a) initial radiograph; b) post-operative radiograph; c) radiograph five years after surgery; d) radiograph at maturity; and e) radiograph at latest follow-up.
Fig. 8

Radiographic series of a patient with poor outcome in the right hip. a) initial radiograph; b) post-operative radiograph; c) radiograph five years after surgery; d) radiograph at maturity; and e) radiograph at latest follow-up.
demonstrated fibrocartilage only, it seems probable that the hyaline cartilage of the acetabular rim was damaged by its removal. As a result the margin of the acetabulum fails to grow and ossify normally. It is not clear whether correction of femoral antversion confers additional stability. Varus was sometimes but not invariably built into the osteotomy and previous studies have shown no correlation with outcome or residual neck-shaft angulation. Previous studies by Severin\(^1\)\(^\text{10}\) and Massie and Howorth\(^2\) using closed or open reduction followed by prolonged immobilisation, showed that less than 20% of older children had radiologically good results at skeletal maturity. They recorded an incidence of AVN of 23% and 41% respectively, which may have been an underestimate.

Psoas tenotomy and adductor tenotomy were not performed in our patients and it should be remembered that psoas tenotomy may endanger the circumflex vessels. The incidence of AVN in the series is comparable with other, more recent studies. It is not certain whether this is related to preliminary traction or to the limited surgical approach with only a small capsulotomy, no capsular repair and no inferior dissection to divide the transverse ligament or the psoas tendon. The study of Malvitz and Weinstein\(^1\) allows comparison between a series with closed reduction and our own. The two studies are well matched for numbers, age distribution and initial diagnosis. The follow-up is comparable at 30 years (15 to 53) in the American study and 33 years (25 to 53) in ours. The overall outcomes for late onset arthritis and arthroplasty are similar. The incidence of AVN is slightly greater in the series of Malvitz and Weinstein and the incidence of Severin III hips slightly greater in our own, a difference attributed to occult injury to the epiphysis of the acetabular ring. Both series record the trend for progressive subluxation of dysplastic hips sometimes in association with the common adolescent valgus tilt of the head. Morcuende et al\(^1\)\(^\text{18}\) reviewed the long-term results of open reduction of the hip via a medial approach. The demographics of their study are similar to our own. They describe the results of dislocations presenting at a mean age of 14 months and followed for a mean of 11 years (4 to 23). Although the follow-up is shorter, some important observations are drawn. Poor prognostic factors included proximal femoral growth disturbance, an inverted neolimbus, an initially high dislocation and operation after 24 months. The incidence of AVN was 43% and they too noted the high incidence of late valgus tilt of the head. The follow-up is too short to record the premature onset of arthritis.

When Salter\(^1\)\(^\text{19}\) introduced his innominate osteotomy in 1961 it promised to improve acetabular orientation and mitigate against late subluxation. Thirteen years later Salter and Dubois\(^1\)\(^\text{20}\) described the medium-term results of 110 children under the age of four years treated by traction, open reduction and innominate osteotomy. Those over the age of four years fared less well, but 96% of the index group had a good result and the rate of AVN was 5%. A longer term study\(^4\) of similarly treated children following 73 hips over a mean of 31 years showed moderate to severe arthritis in 16 of 63 hips (25%) and ablation in 7%.

We were aware of the difficulties of reproducing radiographic measurements. We used a digitising system with a single observer to exclude interobserver error but recognise that comparison with other studies remains controversial. Any hip which has been displaced for many months has lost sphericity of both the femoral head and the acetabulum. True concentric reduction is therefore impossible and an aspherical congruent stable reduction is the best we can achieve. In young children concentricity may develop but in older children it does not. The probability that degenerative arthritis will develop is directly proportional to age. The majority of children aged over 30 months when treatment is started will develop arthritis by their thirties. We used Bauer’s classification\(^1\)\(^\text{16}\) and Mose’s rings\(^1\)\(^\text{15}\) in an attempt to assess the shape of the femoral head and showed that if sphericity does not develop early arthritis is inevitable. The incidence of moderate to severe degenerative change rose from 12% for Bauer 1 hips to 62% for Bauer 4 hips. Herein lies the risk of AVN. Even when the changes are confined to the head and there is no arrest of growth, an irregular shape of the head, coxa magna and secondary acetabular maldevelopment predict a poor prognosis.

It may be argued that high dislocation rather than a limbseotomy leads to a poorer outcome in this series, and certainly the two went together. However, four of the five hips with a low dislocation and excision of the limbus developed severe arthritis, suggesting its removal is a major risk factor.

The incidence of AVN may appear high with only 34 of 191 hips showing no epiphyseal change. However, the criteria of Bucholz and Ogden\(^1\)\(^\text{12}\) were rigidly applied. Type I changes of mild epiphyseal mottling only were not predictive of disturbance of growth or arthritis and only 13% of these mottled type I hips later developed evidence of AVN.

Five hips showed early arrest of lateral growth and coxa valga. This is clearly associated with AVN and injury to the lateral growth plate. Valgus tilt of the head was seen in adolescence in 36% and this did not appear to be linked to early epiphyseal changes. The aetiology of this late growth disturbance remains uncertain.

Predictors for prognosis are important. The age at which treatment starts remains critical. Children do best if treated before they walk. The outcome deteriorates inexorably over the age of two years. We believe that the limbus should not be excised although there are no long-term studies to prove that radial labral incision and eversion improves long-term results. A steeply sloping acetabular roof and an acetabular notch are predictors of a poor outcome and lend support to the view that primary acetabular osteotomy should be recommended in some younger children with a very dysplastic acetabulum. A successful outcome is less likely in a hip with a high dislocation. AVN, especially when associated with growth arrest, considerably increases the risk of arthritis. By five years a reasonable prognosis...
may be offered, by ten years this is more reliable and at skeletal maturity a confident prognosis may be given.

The outcome is not as good as short follow-up may suggest. We should interpret with caution any study not followed to maturity. Even after this there is progressive deterioration of function and radiographic outcome with time as the studies of Gibson and Benson,6 Malvitz and Weinstein3 have shown. It remains to be seen whether late reconstruction in adult life will reverse the consequences of subluxation and incongruity.

In this series 52 patients were discharged from follow-up prior to the inclusion period. All had excellent clinical and radiographic outcomes and the majority were skeletally mature at discharge. This occurred at the time of retirement of the senior operating surgeon in 1977, who considered these patients no longer needed review. They have not been included in the assessment, as they did not meet the requirements for follow-up. They may represent the better part of the spectrum of outcome both clinically and radiologically which may lead to an unfavourable skew in the figures reported here. Our policy now is not to discharge any patient treated surgically for hip displacement.

Summary

With this method of management, moderate to severe osteoarthritis developed in 40% of dislocated hips reviewed at a mean of 33 years. Before ten years the radiographic indices which indicated a poor outcome were the initial acetabular index, the initial height of the dislocation and the shape of the edge of the acetabulum. After ten years all the remaining indices deteriorated.

While the philosophy of management of late presenting dysplasia of the hip has evolved since the time at which these children were treated, this study highlights some important factors which remain relevant. Early detection of the pathological hip by clinical and screening programmes is vital. It generates a tendency to establish the results of treatment, although there are some early indicators that help to predict the outcome.

To quote Edgar Somerville:5 “There is an old saying that we plant trees for posterity. Equally in the treatment of congenital dislocation of the hip it is our successors who will judge our results rather than ourselves”.

Supplementary material

Tables showing classification systems identified in the study are available with the electronic version of this article on our website at www.jbjs.org.uk

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References