REDUCTION OF NEGLECTED CONGENITAL DISLOCATION OF THE HIP IN CHILDREN OVER THE AGE OF SIX YEARS

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Thirty-two neglected congenital dislocations of the hip in twenty-two children over the age of six years were treated by traction, open reduction and Chiari osteotomy. In five hips, where prolonged traction failed to bring the femoral heads into the vicinity of the acetabulum, a shortening subtrochanteric osteotomy of the femur was performed. The overall results were good and this regime of treatment is recommended.

The best approach to congenitally dislocated hips is early detection and treatment. Unfortunately, in less favoured populations the dislocation is usually only discovered when the child starts to walk. Even then, orthopaedic treatment is sometimes unavailable and has to be delayed until the family migrates or a new surgical team arrives. Such were the circumstances here, for our hospital serves a large population of immigrants and a neighbouring area where orthopaedic treatment was unavailable until 1966. Since then, an increasing number of children with dislocated hips have been referred to our department. From 1966 to 1975 we treated 119 congenital dislocations of the hip discovered after the age of walking. The majority of children were in the age group of two to six years and their treatment consisted of open reduction and innominate osteotomy. Initially we did not treat children seen for the first time over the age of six, but as experience accumulated we began operating on older children. There are few reports in the literature on the treatment of the older child and we consider that our most encouraging results are worth publishing.

THE CLINICAL MATERIAL

The series consists of twenty-two children with thirty-two dislocated hips first diagnosed by us over the age of six years. None of these patients had had any previous orthopaedic treatment. Only children with completely dislocated hips are included in the present series, as subluxations or dysplasias pose much simpler therapeutic problems. The oldest child was twelve years old and the mean age was eight years and six months. The follow-up ranged from two to nine years with an average of three years and eight months. An additional seven children, with ten dislocated hips, over the age of six years were operated on by us during 1976 and 1977. Their follow-up being too short, they are not included in the present series.

TREATMENT

Before operation. Initial treatment consisted of skin traction on both legs for two to four weeks with progressively increasing weights. Traction was started with 1 kilogram on each leg and increased to a maximum of 6 kilograms, adding an average of 1 kilogram of traction to each leg twice weekly. Traction was in neutral rotation, moderate abduction and very slight flexion. Tranquilisers were administered during this period.

The operation. Percutaneous adductor tenotomy was performed in only five hips. For the majority of patients adductor tenotomy seemed superfluous after the preoperative traction. The hip was approached anteriorly through an incision joining the anterior superior iliac spine and the junction of the middle and lateral thirds of the inguinal ligament. The innominate bone was stripped of periosteum on both sides from the iliac crest down to the great sciatic notch in preparation for the osteotomy.

The capsule of the hip was opened using a T-incision and the ligamentum teres was identified. Using the latter as a guide, dissection was carried down into the acetabulum. This was usually shallow and filled with connective tissue. The ligamentum teres was excised and the acetabular fossa curetted down to the articular cartilage, taking care to avoid any damage to the latter. In cases where the femoral head was in the vicinity of the acetabulum, the leg was laterally rotated, and the psoas tendon identified and sectioned at its insertion into the lesser trochanter. Reduction was then attempted using moderate traction, abduction, flexion and medial rotation. Where the femoral head was located too high to allow an easy reduction, a subtrochanteric shortening osteotomy was performed. To this end, a second incision was made on the lateral aspect of the thigh in the subtrochanteric region. The femoral shaft was demuded of periosteum on its outer surface from the region of the trochanter distally for about 10 centimetres. Using a Gigli saw the femur was divided slightly below the lesser trochanter. The proximal femoral segment was retracted outwards using a hook in the medullary canal. This allowed a good view of the lesser trochanter and sectioning of the psoas tendon, in those cases where it had not been performed before. At this point the acetabular fossa could be viewed properly from below and cleaned of any residual soft tissue.

After femoral osteotomy and overlapping of the femoral shaft, reduction of the femoral head was very easy. After reduction, the distal femoral segment was brought out into the wound and shortened as necessary to obtain minimal pressure in the joint but good contact at the site of the femoral osteotomy. The distal femur was slightly rotated to correct any exaggerated anteverision and the osteotomy site was fixed using a small plate and four screws.

The Chiari osteotomy was performed just above the acetabular roof and on the outside of the capsule of the joint. The displacement was usually easy, and care was taken to preserve contact between the fragments of the sectioned innominate bone throughout half of their
breath. The osteotomy was internally fixed with one Steinmann pin and, if the reduction did not appear very stable, another thin Steinmann pin was passed through the trochanter, the femoral neck and head into the acetabulum. A control radiograph was taken and both pins were cut at a sufficient length to be ultimately easily palpable under the skin. The wounds were closed in layers and the leg put into a plaster spica in moderate flexion, abduction and neutral rotation.

After operation. The children were kept in hospital for about five days after operation. If the temperature and blood count were both normal, they were discharged for bed rest at home to be readmitted six weeks later. On readmission the plaster spica was discarded, the Steinmann pins removed and the legs put in an abduction splint fixed by two leg plasters. This allowed flexion and extension of the hip joints and progressive sitting up in bed. In bilateral cases, the contralateral side was operated on two weeks after the first operation so that the total stay in the spica was not longer than two months. The abduction splints were removed three months after the last operation.

There was no routine physiotherapy and the children were discharged from hospital after control radiographs on the day of removal of the abduction splints. The parents were advised to keep the children in bed for another week and allow them free, spontaneous mobility without any external help. A week later daily baths were advised and the children allowed to play on a carpet on the floor. Standing and walking were neither encouraged nor discouraged and the young patients decided for themselves the right moment for these activities, several weeks after discarding the splints. In one case where abduction and flexion contracture persisted for a month after removal of the abduction splint, traction in bed was applied for three weeks.

COMPLICATIONS

Complications were remarkably few. There was not a single case of redislocation. There was one case of sepsis which was controlled with antibiotics but the child showed early changes of osteochondritis of the femoral head. In the earliest case in our series a sciatic femoral palsy complicated the reduction: apparently the preoperative traction was insufficient and the manipulation during the operation too forceful. A shortening osteotomy should have been performed and the complication was due to incorrect treatment. The palsy partially regressed: the sensory recovery was full but a triple arthrodysis had ultimately to be performed to control the foot drop.

ILLUSTRATIVE CASE REPORTS

Case 1. This boy was first seen at the age of five years and eight months with bilateral neglected dislocation of the hips. He had been treated previously in another hospital and his limping had been explained to his parents as caused by a deformity of both feet. A forefoot adduction had been treated on and off for a couple of years by a series of plaster boots but no pelvic radiograph had been taken.

On arrival here a high dislocation of both hips was found (Fig. 1), but a general examination revealed severe adenoids with some snoring and respiratory impairment. After consultation with our anaesthetist, the orthopaedic operations were delayed and the child referred to the E.N.T. Department. He returned a year later when he was nearly seven years old. He weighed 16 kilograms and the preoperative traction applied reached 6 kilograms on each leg by the end of four weeks. An open reduction and Chiari osteotomy was performed on the right side and was followed by a similar operation on the left three weeks later. A pint (600 millilitres) of blood was administered during each operation.

The postoperative course was uneventful. The abduction splint and plasters were discarded at three months (Fig. 2) and the child began walking, using a support, one month later. Six months after the

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Case 1. A seven-year-old boy with bilateral congenital dislocation of the hip. Figure 1—Initial radiograph of the pelvis. Figure 2—Radiograph three months after bilateral open reduction and Chiari osteotomy. Figure 3—A year after operation. Figure 4—Three years after operation. Note remodelling of the pelvic brim.
Case 2. An eight-year-old boy with previously untreated congenital dislocation of the hip. Figure 5—Radiograph on admission. Figure 6—During reduction of the right hip, Chiari osteotomy of the pelvis and shortening subtrochanteric osteotomy of the femur. Figure 7—After a similar procedure on the left hip. Figure 8—After removal of plaster. Figure 9—After a year of full weight-bearing.

Case 3. A six-year-old girl with left congenital dislocation of the hip. Figure 10—Radiograph on admission. Figure 11—Six months after operation. Figure 12—Four years after operation. Note apparently normal contour of the pelvic brim.

operations he walked freely, the Trendelenburg sign was negative but a moderate stiffness of hips persisted. At a year (Fig. 3) both clinical and radiological results were classified as very good, and after three years (Fig. 4) there was almost complete remodelling of the pelvic brim.

Case 2. This eight-year-old boy from a neighbouring country had been limping severely since he had started walking. Examination revealed bilateral high dislocation of the hips (Fig. 5). He weighed 25 kilograms. Skin traction was applied and progressively increased, reaching 6 kilograms on each leg.

Four weeks after admission an open reduction with shortening of the femur and a Chiari osteotomy were performed on the right side (Fig. 6), and three weeks later on the left (Fig. 7). A plaster double hip spica was kept on for six weeks after the second operation and then an abduction splint with two separate leg plasters was applied. All external fixation was discarded one month later; the reduction was stable (Fig. 8) and the femoral heads normal. A year later (Fig. 9) the radiograph of the pelvis was satisfactory and the gait free.

Case 3. A six-year-old girl was admitted with a high dislocation of the left hip (Fig. 10). Treatment consisted of traction, open reduction and Chiari osteotomy (Fig. 11). Four years later the gait was free, mobility full, radiographs (Fig. 12) showed good coverage of a well-placed femoral head, and the pelvic contour appeared perfectly normal. Bone growth had corrected any damage caused by the Chiari osteotomy which might have affected future pregnancy.

Case 4. A six-year-old girl with a bilateral neglected congenital
dislocation of the hips (Fig. 13) was treated by traction, open reduction and bilateral Chiari osteotomy. Nine years later (Fig. 14) the clinical result was perfect. A mild flattening of the femoral heads was evident on both sides but the contour of the pelvic brim appeared quite normal, deformity secondary to the Chiari osteotomies having almost disappeared. Mobility of the hips was restricted in the first year after operation and free walking without limping was not observed until two years later. The result appears satisfactory at present, but because of some flattening of the femoral heads and a mild subluxation on the right, the long-term prognosis is reserved.

Case 5. A ten-year-old boy was admitted with a dislocation of the right hip (Fig. 15). The right femoral head, placed high in a false acetabulum, was flattened in its lower part. After three weeks of traction, an open reduction and a Chiari osteotomy were performed (Fig. 16). Two years later mobility was free but the Trendelenburg sign remained positive; radiographs (Fig. 17) revealed a good acetabular roof, but some subluxation of the femoral head. A varus derotation osteotomy was performed. Four years after the reduction and a year after the subtrochanteric osteotomy, the Trendelenburg sign was negative. Radiographs (Fig. 18) revealed a well-shaped femoral head in a good position.

RESULTS
In evaluating the results five factors were taken into consideration: mobility, limping, deformity of the femoral head, coverage of the head and complications. When all five factors were normal, the result was considered to be very good. A mild anomaly of a single factor was graded good; two mild anomalies or a single marked anomaly was graded fair; but when the restriction or deformity was so severe that functionally the hip was unimproved by treatment, the result was considered bad.

In the present series restriction of mobility was always associated with a deformity of the femoral head: where the radiograph was normal, mobility was always full. In one child a mild limp persisted despite a perfect radiological result, and was apparently secondary to laxity of the joint and weakness of the gluteus medius.

In nine hips a deformity of the femoral head was observed as a complication of the operation, but in only one was this severe enough to be classified as a bad result. Three of these had been deformed before operation by irregular pressure in a high pseudo-acetabulum; the clinical results were perfect, but due to the persistence of the radiological anomaly the results were only classified as good, not very good. All the cases
of avascular necrosis became manifest within the first
year after operation. No deterioration in the structure of
the femoral head was observed during the follow-up.

The coverage of the femoral head was measured
using the acetabular index and the CE angle of Moberg.
In no case was the roof insufficient and in several cases
the CE angle approached 90 degrees without any
limitation of abduction. In two of the hips where no
subtrochanteric shortening osteotomy had been per-
formed, an apparently well-centred head tended to
displace laterally and there was transient limping; varus
derotation osteotomy was performed, two and three
years respectively after the open reduction, and a good
final result was achieved.

It is interesting to note that with bone growth, a
good remodelling of the pelvic brim was observed in the
hips followed for several years. In the one hip followed
up for nine years, the contour appeared almost normal
despite a bilateral Chiari osteotomy.

The only complication affecting the final result was
the sciatic palsy in one child. After partial recovery the
final result was improved by triple arthrodesis.

On grading the results, sixteen were very good (50
per cent) with perfectly normal hips, ten were good (31
per cent), five fair and one bad (Table 1).

<table>
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<tr>
<th>Grading</th>
<th>Number of hips</th>
<th>Remarks</th>
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<tr>
<td>Very good</td>
<td>16</td>
<td>Normal hips</td>
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<tr>
<td>Good</td>
<td>10</td>
<td>3 Preoperative deformity of the femoral head</td>
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<td></td>
<td></td>
<td>1 Isolated Trendelenburg sign with joint laxity</td>
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<td></td>
<td></td>
<td>3 Mild avascular necrosis of the femoral head</td>
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<tr>
<td></td>
<td></td>
<td>1 Mild weakness of extensors of the foot</td>
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<td></td>
<td></td>
<td>2 Lateralisation of the femoral head</td>
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<tr>
<td>Fair</td>
<td>5</td>
<td>Mild avascular necrosis of the femoral head with minimal restriction of mobility</td>
</tr>
<tr>
<td>Bad</td>
<td>1</td>
<td>Avascular necrosis of the femoral head with marked restriction of mobility</td>
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<td>TOTAL</td>
<td>32</td>
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DISCUSSION

Bertrand, Bénard and Chassagne (1965) stated that the
principal indication for the Chiari osteotomy of the
pelvis was subluxation or low dislocation with a shallow
acetabulum. In high dislocation the Chiari osteotomy
was contraindicated. This osteotomy might, however, be
possible in future, after shortening resection of the
femur. Klisić (1967) published a series of seventeen
cases of dislocated hips in children between the ages of
five years and puberty treated with such a shortening
resection. His method of treatment is somewhat
different from ours. We employ more traction before the
operation and use two small skin incisions instead of the
large one described by Klisić. The reduction is
attempted through the upper incision allowing a better
freeing of adhesions, and the psoas tendon is simply cut
and not transplanted. Only when reduction is difficult is
the shortening osteotomy performed through a second
incision. The indication for the operation described here
is a high dislocation of the hip in children over the age of
six years.

In children aged two to six years open reduction and
the Salter osteotomy appear to be the treatment of
choice (Herold 1974). Where innominate osteotomy
fails and the hip redislocates, the operation described
here may be used as a salvage procedure. This was done
in two children aged five years and not included in the
present series and the final result was very good in both.
One of the difficulties with the Salter osteotomy in older
children is that the lowering of the acetabular roof is
difficult, necessitating more complicated techniques
such as the triple osteotomy recommended by Steel
(1973). The latter technique, however, does not resolve
the problem of bringing the femoral head down into the
acetabulum in those cases where traction alone is
insufficient. A further problem is that the lowering of
the acetabular roof further increases the pressure on the
femoral head, whether the Salter or the Steel technique
is used.

There are three main problems connected with high
dislocation in older children: lowering the femoral head,
reduction and centring of the head in the acetabulum,
and covering the head with a broad acetabular roof to
assure stability. Some of the methods of treatment
employed solve only one of these problems; for example
the Chiari osteotomy assures only a good covering for
the femoral head but the most difficult problem is
bringing the head down to the acetabulum. This must be
gentle and progressive to avoid damage to the nerves
and vessels of the leg and, more particularly, to avoid the
complication of avascular necrosis of the femoral head.
The preoperative traction is mainly intended to avoid
such complications. Morel (1975) recommends progres-
sive prolonged heavy traction with medial rotation in the
final phases, and he succeeded in lowering the head to
the acetabulum in all his cases. His series of seventy-two
cases included twenty dysplasias and his patients were
relatively young, between fifteen months and eight years
of age, with only seventeen over the age of four. In his
series avascular necrosis of the femoral head developed
only once.

Ashley, Larsen and James (1972), systematically
employing a femoral shortening procedure, reported six
cases of reduction of dislocation of the hip in older
children and found it unnecessary to undertake preoperative traction and soft tissue release before reduction; consequent osteoporosis of the femur was thus avoided. But a shortening osteotomy of the femur is not devoid of inconveniences. A supplementary or a longer operative scar may be aesthetically, the operating time is prolonged, the bleeding and the risk of septic complications might be somewhat increased. In unilateral cases a residual discrepancy in leg length might require further treatment. Traction, on the other hand, to be efficient may require at times a very prolonged period in hospital.

In the present series we made a compromise, limiting traction time to a maximum of four weeks and employing adductor tenotomy and femoral shortening procedures as required. The basic principle was the avoidance of any forceful manipulation. Where the adductors seemed contracted despite the traction, a subcutaneous adductor tenotomy was performed before approaching the hip joint. Where the femoral head remained high despite traction, a shortening osteotomy was performed. In this way, exaggerated pressure on the reduced femoral head could be avoided.

No varus derotation osteotomy was performed as part of the treatment programme in this series. Where a shortening osteotomy had to be performed, the distal fragment was fixed in a slight lateral rotation in relation to the proximal femur. In two cases only, where subluxation of the femoral head was found on follow-up, a subtrochanteric varus derotation osteotomy was performed, two to three years after open reduction.

Colton (1972) defined the prerequisites for a successful Chiari osteotomy. For a good clinical result, the new outer acetabular lip must be located to give a CE angle of 20 to 40 degrees, together with a roof angle between 10 degrees below and 20 degrees above the horizontal. In our series we had cases with CE angle as high as 60 degrees with a perfect clinical result and full abduction.

Contrary to our experience with the younger age group and the Salter operation, no secondary dislocation occurred and reoperation was never necessary.

Garcia-Moral and Brown (1972), evaluating innominate osteotomies, found that the results of operation were better in younger children. Using the technique described in the present paper, the results in the older age group compare favourably with those in the younger one.

Lagrange et al. (1973), evaluating the results of the Colonna arthroplasty, insisted on two points which are important to the present discussion. First, they never observed a very good result in a child over the age of eight and a half years, while such a result was quite possible with the technique advised in the present paper. Secondly, avascular necrosis of the femoral head observed by Lagrange in fifteen out of fifty-eight cases always appeared in the first year after operation. In the present series, deformity of the femoral head, when present, was evident within the first year so that good results at a year are probably final. Avascular necrosis is not always the result of treatment and is sometimes secondary to pre-existing malposition (Herold 1977). In such cases, despite some deformity of the femoral head, the treatment described results in a marked functional improvement.

Rosman (1975) reviewed sixty-four hips in patients with congenital dislocation of the hip diagnosed after walking age. In his assessment of results, 62.5 per cent of the affected hips were rated as normal or good and 37.5 per cent as fair or poor. Using our technique the results in the older age group are certainly acceptable: 77 per cent were rated as normal or good. Adapting the treatment to the age of the patients allows a good proportion of satisfactory results in the treatment of congenitally dislocated hips even in older children.

Where the results of the operation are fair or poor, a total hip replacement will probably be required in future. The previous reduction of the femoral head into the acetabulum and the Chiari osteotomy will certainly facilitate such a procedure.

REFERENCES

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