PARALYTIC DISLOCATION OF THE HIP

G. Blundell Jones, Exeter, England

From the Princess Elizabeth Orthopaedic Hospital, Exeter

Paralytic dislocation of the hip deserves recognition as a special problem; it should not be grouped loosely with other types of pathological dislocation. Yet few writers seem to have thought the paralytic cases worthy of separate consideration. Hilton (1879) said: "The acetabulum in a child is very shallow compared with that of an adult. It thus offers greater facility for displacement. This, I apprehend, may be the reason why dislocation of the thigh bone occurs so frequently in hip joint disease at an early period of life." Watson Jones (1926) discussed the mechanism of flexion and adduction deformity in spontaneous dislocation of the hip; he concluded that a combination of both forces was necessary, but that adduction was the more important, flexion alone not producing dislocation. Medial rotation did not seem to be important. Hart (1928) was in agreement with this view. Fairbank (1920) however reported the case of a patient with a flail hip in which reducible subluxation occurred. He remarked that all cases he had seen before had had paralysis of the abductor muscles but active adductors.

This paper records a study of twenty-two paralytic dislocations of the hip in fourteen patients. The causes of the paralysis are shown in Table I.

<table>
<thead>
<tr>
<th>Cause of Paralysis</th>
<th>Patients</th>
<th>Hips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poliomyelitis</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Spastic paraplegia</td>
<td>7</td>
<td>12</td>
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<td>2</td>
</tr>
<tr>
<td>Meningo-myelocoele</td>
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Insufficient attention seems to have been paid to the element of coxa valga which is always present. This is most marked if paralysis was present in the first two years of life and appears to be due to the weakness of the moulding forces of muscle action and of weight bearing. Of the two it seems probable that the influence of the muscles is the more important, because the change is still seen in cases in which weight bearing has been possible.

Piersol (1930) stated that the normal angle of the neck of the femur with the shaft ranges from 110 to 144 degrees in adults, the average for men being 125.1 degrees and for women 125.6 degrees. "At birth the angle of the neck may be 160 degrees, but is often less; it diminishes under the pressure of the weight as the child walks, and by the time of puberty has probably assumed its permanent angle." In a study of normal radiographs of the hips of twenty-five subjects between the ages of a few weeks and five years I have confirmed this, but it is also apparent that the major part of the reduction in the angle occurs during the first five years of life.
Observation of cases of paralysis in which dislocation later develops shows that the neck-shaft angle increases to nearly 180 degrees, when dislocation becomes inevitable, being uninfluenced by any form of treatment except surgery. Over-action of the adductors hastens dislocation but dislocation will occur when there is complete flaccid paralysis without contracture. The femoral head progressively rides out of the acetabulum and the subsequent growth of the femoral neck may bring it into alignment with the femoral shaft or even beyond. The empty acetabulum, although gradually becoming more shallow, remains of useful depth for several years. This has been seen at operations in nine hips. When the dislocation is beginning it can be reduced easily by simple abduction. In the later stages a contracture of the capsule and of the iliopsoas muscle appears, so that after four or five more years it becomes irreducible by traction or manipulation.

In this study of the problem it is concluded that the primary factor in the development of paralytic dislocation is the development of a valgus deformity of the femoral neck, and that, once this has happened, dislocation is inevitable. The presence of the valgus element in such cases is well recognized by other writers, but its importance in relation to treatment does not appear to have been recognized sufficiently.

**ILLUSTRATIVE CASE REPORTS**

**Case 1**—Boy first seen two months after birth. Massive meningo-myelocele in lumbar region and hydrocephalus. Early radiographs showed normal hip joints. At operation on the meningo-myelocele so much nerve tissue was removed in order to effect a closure that a permanent complete flaccid paralysis resulted. Radiographs four months later (at the age of six months) showed subluxation of both hips, with coxa valga (Fig. 1). A year later the subluxation was easily reducible in full abduction and the acetabula were still quite good (Fig. 2). Further radiographs two years later showed that the femoral necks were growing in line with the shafts and further displacement had occurred (Fig. 3). Figure 4 (at the age of seven years) illustrates the fully developed coxa valga, dislocation and shallowing of the acetabula. The dislocation was now irreducible by traction and abduction. In view of the complete and permanent paralysis of the lower limbs, it has not been thought wise to contemplate surgical reduction in this case.

**Comment**—This case exemplifies the development of coxa valga and later dislocation of both hips in complete flaccid paralysis of both legs.

**Case 2**—Girl with cerebral palsy. First seen at the age of six months with marked spasticity of both lower limbs and mild spasticity of arms. Good voluntary movements in all four limbs. Treatment by daily stretching and encouragement of active movements was begun. At eighteen months there were no contractures; calipers were supplied, and standing at a table with the legs moderately abducted was begun. At the age of three she was making moderately good attempts at walking with assistance in calipers. Pain in the left hip was then noted, with increased difficulty in standing and attempting to walk. Radiographs showed well developed coxa valga and subluxation of the left hip (Fig. 5). There was no adduction contracture; so a left obturator neurectomy was carried out. Three months later the result seemed satisfactory (Fig. 6). However, with such a degree of coxa valga dislocation was inevitable on both sides as shown in Figure 7 (age five) and Figure 8 (age six), in spite of the absence of contracture and weight bearing in calipers. At this stage simple abduction produced reduction of the dislocation (Fig. 9) and it was decided to carry out a corrective osteotomy below the femoral neck on both sides. Fixation of the osteotomy was secured by miniature Capener-type nail-plates. The nail-plates were removed six months later. Figure 10 shows the present condition two years later. This child can now get about unaided and the hips are quite stable with a full range of movement.

**Comment**—This case illustrates the inevitability of dislocation once the coxa valga deformity has appeared.

**Case 3**—Girl. Developed poliomyelitis four months after birth, with severe paralysis in trunk and lower limbs. Seventeen months later she was able to sit up (with some scoliosis) but unable to walk, stand or crawl. The muscle chart (Table II) showed the condition of the muscles controlling the hips. Radiographs showed bilateral dislocation of both hips (Fig. 11). The dislocation is attributed to valgus deformity of the neck of the femur in the absence of the moulding forces of muscular action. There was no rotational deformity and dislocation was easily reduced by abduction of the legs (Fig. 12).
Fig. 1
Case 1—Age six months. Coxa valga. Early subluxation of both hips.

Fig. 2
Case 1—Age eighteen months. Reduction by simple abduction.

Fig. 3
Case 1—Age three and a half years. Recurrent subluxation.

Fig. 4
Case 1—Age seven. Fully developed coxa valga with dislocation.
Fig. 5
Case 2—Age three and a half. Coxa valga. Subluxation of left hip.

Fig. 6
Case 2—Three months later, after reduction and obturator neurectomy.

Fig. 7
Case 2—Age five. Dislocation of right hip.
Fig. 8
Case 2—Age six. Redislocation of left hip.

Fig. 9
Case 2—Age six. Reduction by abduction.

Fig. 10
Case 2—Condition two and a half years after correction of coxa valga by osteotomy.
Case 3—Age nineteen months. Bilateral coxa valga. Dislocation of both hips.

Case 3—Reduction by abduction of limbs.

Case 3—Eighteen months after correction of coxa valga on each side by osteotomy.
Osteotomy of the femoral necks was carried out, the right side at the age of two years and the left side three months later, restoring the normal neck-shaft angle of the femur. Fixation of the upper fragment was obtained by transfixion by a Steinmann pin incorporated in a double plaster hip spica, the bones being so small that the use of miniature nail-plates was not considered practicable. The osteotomy on the left side was carried out rather higher in the neck than would be recommended; union was a little slow, but no evidence of damage to the circulation of the femoral head was observed.

The present condition eighteen months after the operations is shown in Figure 13. The muscle chart (Table II) illustrates the substantial gain in muscle power now that the hips are reduced. She is able to walk unaided using appliances below the knees only to control the paralytic deformity of the feet.

### TABLE II

**MUSCLE CHART IN CASE 3**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Age 12 months</th>
<th>Age 30 months</th>
<th>Age 41 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right</td>
<td>Left</td>
<td>Right</td>
</tr>
<tr>
<td>Gluteus maximus</td>
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<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Abductors of hip</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Adductors of hip</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Psoas</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Quadriceps*</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Inner hamstrings</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Outer hamstrings</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

* Mainly rectus femoris.

Operations: Right hip at age twenty-three months. Left hip at age twenty-six months.

**Comment**—The implications of structural hip instability together with muscular weakness are so serious that they may mean the difference between the ability to get about independently or not. This case illustrates well the increase in effective power of weak muscles as a result of restoring hip stability by osteotomy of the femoral neck, correcting the coxa valga.

**OPERATIVE TREATMENT**

**Corrective osteotomy below the femoral neck with internal fixation**—This operation is suitable for cases in which reduction of the hip dislocation can be obtained by simple abduction; which is possible when the dislocation is recent. In somewhat later cases, with tight adductors, the adductor contracture can often be overcome by adductor tenotomy and a short pre-operative period in an abduction plaster. It should be possible before operation to abduct the legs enough to allow the line of the femoral neck to make an angle of 120 degrees or less with the mid-line of the body.

The operation is carried out through a postero-lateral approach with the patient prone, the femur being exposed at the level of the lesser trochanter. A triangular wedge of femur with the base inwards is resected, the apical angle being equal to the angle of correction required. The base of the wedge should be as low in the femoral neck as possible and should include the upper half of the lesser trochanter. Correction having been thus obtained, internal fixation is easily carried out with a miniature nail-plate of the Capener type. If the bones are too small for this, the upper fragment is transfixed by a Steinmann pin which is
incorporated in the double hip spica applied at the end of the operation. The plaster is retained until the osteotomy is united. The nail-plate is removed six months after operation, before it becomes too deeply embedded in the growing bone. Some form of internal fixation has been found essential to control the unstable osteotomy.

**Open reduction, wedge osteotomy below femoral neck, femoral shortening, and internal fixation**—This operation was devised for the late case with contracture, in which the dislocation is irreducible even after a period of strong traction and gradual abduction with adductor tenotomy. The need for this operation should not arise if the dislocation is recognised early enough. In three operations of this type the limiting factor preventing reduction has been found to be contracture of the ilio-psoas muscle.

With the patient supine the hip is exposed by the Whitman incision, and division of the tensor fasciae latae gives a good exposure of the osteotomy site. It is necessary first to lengthen
the ilio-psoas tendon, then to excise the whole of the anterior and inferior capsule. Even then it is not possible to reduce the femoral head into the acetabulum until the osteotomy has been carried out as already described. The upper fragment is then transfixed with the nail-plate, and it remains to shorten the femur by half to three-quarters of an inch before satisfactory fitting can be obtained. Immobilisation in plaster is necessary until union has occurred. This is a formidable operation which is only justified if the possibility of walking depends upon it. The upper limit of age for this procedure is about ten years.

ILLUSTRATIVE CASE REPORT

Case 4—Girl with cerebral palsy. She had spastic quadriplegia and came under regular physical treatment and supervision at the age of one year. A child of moderate intelligence who was capable of good voluntary movement, she had learnt to stand but made no progress in walking. When she was seen at the age of eight years both hips were found to be dislocated (Fig. 14). When she was nine it was decided that she would never succeed in walking with unstable hips and that reduction might provide a chance of achieving this. Reduction could not be obtained by traction and abduction. The second operation described above was therefore carried out, first on the right hip and, after union of this osteotomy, on the left (Fig. 15). It was felt that there would be a risk of hip stiffness after this operation, but she has already regained 60 degrees of flexion on both sides and the hips are stable. Whether she will eventually succeed in walking unaided remains to be seen.

RESULTS

Only those cases in which there seemed to be a possibility of establishing independent walking by restoring stability to the hips have been chosen for operation. Nine hips in six patients have been so treated within the last two years. Two patients, previously with bilateral dislocation, unable to walk, are now walking unaided with a full range of movement in both hips (Cases 2 and 3). A third bilateral case (Case 4) shows promise. In the three unilateral cases two patients have been greatly improved in stability and ability to walk, but the third is still too recent to assess.

DISCUSSION

The follow-up of these cases is short, but it was felt that the material contained in this paper might prove of interest and help to others confronted with similar problems, even at this stage. If coxa valga and early dislocation are recognised, simple osteotomy of the femoral neck should remove many later difficulties, but it must be recognised and be dealt with early.

As the femur goes on growing after the osteotomy, it seems likely that there will be some tendency to recurrence of the deformity of the femoral neck, but it is hoped that this will be minimised by the improved muscle function and effect of regular weight bearing so that actual dislocation will not recur. In support of this statement, it should be noted that when paralysis occurs after the first two years of normal development, a mild degree of coxa valga is seen and dislocation is extremely rare. All twenty-two dislocations in the present series occurred in patients who had paralysis during the first two years of life.

Avascular necrosis of the femoral head has not been seen in the hips operated upon, and probably this risk is slight if the osteotomy is kept low enough. The only alternative to osteotomy is shelf stabilisation as described by Hallock (1942) and Le Vay (personal communication). The treatment of the basic deformity of coxa valga is more logical.

SUMMARY

1. Twenty-two dislocations of the hip occurring in patients paralysed from an early age have been studied. All showed abnormal coxa valga. The coxa valga, which may gradually reach 180 degrees, precedes dislocation and makes it inevitable. The presence of unbalanced adductor power may hasten dislocation, but the latter can occur in complete flaccid paralysis.
2. The combination of structural instability of the hip joint and muscular weakness may make independent walking impossible, but restoration of stability gives considerable improvement in any remaining muscular power and may alter the patient's whole future.

3. A method of correcting the basic deformity of coxa valga by osteotomy is described and the results of nine operations are reviewed.

I am indebted to Mr F. J. Suter, of the Devonian Orthopaedic Association Workshops, for making the miniature nail-plates, and to Mr A. Reaney, M.S.R., for the illustrations. I am grateful to my colleagues at the Princess Elizabeth Orthopaedic Hospital, Exeter, and Mount Gold Orthopaedic Hospital, Plymouth, who have given me the opportunity of observing and treating their cases.

REFERENCES


LE VAY, A. D. (1953): Personal communication.
