HINGE ABDUCTION OF THE HIP

DIAGNOSIS AND TREATMENT

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Hinge abduction is an abnormal movement of the hip which occurs when a femoral head, deformed as a result of avascular necrosis or Perthes' disease, fails to slide within the acetabulum. Patients with this condition present with pain and shortening and in some cases arthrodesis has been recommended. We report 27 cases in which the diagnosis had been established by arthrography. The satisfactory results of abduction- extension osteotomy of the femur in 26 hips with this condition are reported.

The term “hinge abduction” was first used by Grossbard (1981) and by Catterall (1981, 1982) to describe the abnormal movement of the hip which occurs when a deformed femoral head, often one with a large uncovered anterolateral segment, impinges on the lateral lip of the acetabulum (Figs 1 to 5). It may result from any form of avascular necrosis but is most common after Perthes' disease. Clinically, it causes restriction of movement, pain and often an unpleasant clunking sensation.

The problem of a prominent lateral mass on the femoral head after Perthes' disease has long been recognised; both Garceau (1964) and McKay (1964) advocated its excision. Few cases were reported, and the operation has not been widely adopted. The provision of lateral cover for the femoral head has also been advocated by such means as Chiari's pelvic osteotomy (Schepers, von Bormann and Craig 1978; Handelsman 1980) and the shelf procedure (van der Heyden and van Tongerloo 1981). Although these operations improve lateral cover, they may not reduce lateral impingement on abduction.

We report the result of abduction and extension osteotomy of the femur for this condition.

MATERIAL AND METHODS

From 1973 to 1983, 15 boys and 12 girls were admitted to the Children's Unit at the Royal National Orthopaedic Hospital, Stanmore, with a presumptive diagnosis of hinge abduction of the hip. The age of the onset of symptoms ranged from 5 to 14 years (average nine years). Presenting symptoms were increasing pain, limp, shortening and restriction of movement. The pain was usually an ache related to exercise; this ache seriously limited sports, and when severe could disturb sleep. The cause of the condition was Perthes' disease in 22 of the 27 patients; the other five had avascular necrosis from other causes (Table I). In the 22 patients with Perthes' disease, 19 full sets of radiographs were available and all showed Catterall Group III and IV changes. Four patients had previously had a varus-rotation osteotomy of the femur.

Pain and restriction of movement were not severe enough to warrant operation in two patients, but one patient had bilateral Perthes' disease with hinge abduction and required osteotomy on both sides. A total of 26 hips were therefore operated on at an average age of 13.4 years (range 8 to 23 years).

Management. When the diagnosis of hinge abduction was suspected, the patient was admitted for examination under general anaesthesia with arthrography (Figs 2, 3 and 4). The elimination of muscle spasm allowed the true fixed deformity to be estimated. Hip movements were studied by image intensifier with video recordings. This confirmed the diagnosis of hinge abduction, and allowed us to define the most congruent position of the head within the acetabulum. This was usually between 15 and 30 of abduction with 10 to 30 of flexion. An abduction-extension osteotomy was then advised to align the

Table I. Diagnosis and previous management of 26 patients with symptomatic hinge abduction of the hip

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number</th>
<th></th>
<th>Previous treatment (number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perthes' disease</td>
<td>22</td>
<td>13</td>
<td>None (15) Femoral osteotomy (5) Innominate osteotomy (1) Chiari osteotomy (1)</td>
</tr>
<tr>
<td>Slipped femoral epiphysis</td>
<td>2</td>
<td>1</td>
<td>Pinned in situ (2)</td>
</tr>
<tr>
<td>Femoral neck fracture</td>
<td>1</td>
<td>1</td>
<td>MUA and pinning</td>
</tr>
<tr>
<td>Septic arthritis</td>
<td>1</td>
<td>1</td>
<td>Open drainage; late innominate osteotomy</td>
</tr>
</tbody>
</table>
leg to this position of congruity, with stabilisation by a Coventry screw and plate. Postoperatively, limited weight-bearing was allowed until the osteotomy had united, when all normal activities were resumed.

**Follow-up.** The average period of follow-up was 37 months (range 6 months to 10 years), excluding three patients who had been followed for less than six months. All three were painfree, with united osteotomies and no complications.

**RESULTS**

The findings before and after operation in 23 patients are shown in Table II, and the radiographs of three cases are shown in Figures 1 to 5, 6 to 8 and 9 to 11.

**Pain.** All patients had pain before operation, forming the main indication for treatment; postoperatively 11 were painfree while leading active lives including some sport, and nine had occasional aching in the groin or thigh after prolonged exercise but this ache did not limit activities and required no analgesia. Three patients still had regular pain and restriction of activities; these symptoms were not sufficiently severe to warrant further operation. One patient, who had previously had an innominate osteotomy, had pain related to a neuroma of the lateral cutaneous nerve of the thigh; this neuroma was later excised.

**Range of movement.** Pre-operatively all but six patients had some fixed deformity; most had 10° to 20° of fixed flexion and up to 20° of fixed adduction. Two patients also had some fixed medial rotation and four had fixed lateral rotation. After operation no patient had persisting fixed deformity. No patient had a normal range of movement, but all had more than 90° flexion and only four patients had less than 10° abduction.

**Shortening.** Pre-operatively all but two patients had measurable shortening, and one of these two had bilateral Perthes' disease. Postoperatively leg lengths were equal in nine patients, there was less than 2 cm

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Table II. Clinical findings before and after abduction-extension osteotomy in 23 hips

<table>
<thead>
<tr>
<th></th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before operation</td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Occasional</td>
<td>2</td>
</tr>
<tr>
<td>Regular</td>
<td>21</td>
</tr>
<tr>
<td><strong>Deformity and movement</strong></td>
<td></td>
</tr>
<tr>
<td>Fixed adduction</td>
<td>20</td>
</tr>
<tr>
<td>Fixed flexion</td>
<td>15</td>
</tr>
<tr>
<td>10° active abduction</td>
<td>3</td>
</tr>
<tr>
<td><strong>Shortening</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>2</td>
</tr>
<tr>
<td>&lt; 2 cm</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 2 cm</td>
<td>11</td>
</tr>
</tbody>
</table>
shortening in another nine, and five patients had over 2 cm shortening.

**Radiology.** Three types of radiographic change were noted after operation. Firstly, an increase in the superior joint space: some occurred immediately and was maintained, further increase developed later with the reduced loading of part of the head (Figs 1 and 5). Secondly, a decrease in lateral femoral subluxation: this was measured as the horizontal distance between the most medial part of the femoral head or neck and the acetabulum (Figs 1 and 5). Thirdly, in the presence of Perthes' disease which is still active, healing of a central osteochondral defect has been seen to occur (Figs 9 to 11).

**Complications.** There were postoperative complications in three cases. In one the locking nut loosened and the operation needed revision. There was one case of wound infection and in one case fixed deformity recurred, requiring another osteotomy two years later. Of the four patients who had had previous varus-derotation osteotomies, review of the radiographs and arthograms showed clearly that containment had not been improved in two. This suggests that in older children, especially after previous operations, very careful assessment is needed before surgery is considered.

**DISCUSSION**

Although most of our reported patients originally had Perthes' disease, hinge abduction may be a late problem after avascular necrosis of the femoral head in the child from whatever cause. It is usually accepted that patients
with Perthes' disease will have few symptoms as young adults (Ratliff 1977; Mose et al. 1977). There are, however, a significant number who suffer early onset of pain, restriction of activities and rapid progression of secondary arthritis (Stulberg, Cooperman and Wallenstein 1981; Catterall 1982; Clarke and Harrison 1983; McAndrew and Weinstein 1984). Few reports consider the treatment of these problems, yet the collection of 23 patients in a comparatively short time suggests that the problems may be more common than has been suggested. Our findings agree with other reports than an older age of onset, severe disease and a higher proportion of girls are found in cases with unsatisfactory late results. In the past arthrodesis has been recommended for these patients because total hip replacement is not recommended in this age group (Chandler et al. 1981).

Because all these patients have serious deformities of the femoral head, operative treatment can only be regarded as a salvage procedure. Its aims are to relieve pain, to correct leg length, and to improve movement and abductor weakness. Examination under general anaesthesia and arthrography are valuable to establish the diagnosis and determine the appropriate treatment.

Garceau's chilectomy operation (1964) is an intracapsular procedure, and though it may remove the mechanical block to abduction caused by a major portion of the femoral head, it must increase the forces through the remaining part of the head and it will not correct residual shortening or abductor weakness.

The Chiari osteotomy has been recommended for cases with coxa magna, though Grossbard (1981) did not consider that coxa magna in itself caused symptoms. The Chiari operation will improve lateral cover, but will not reduce lateral impingement on abduction and it does tend to exacerbate abductor weakness. Its place in the management of this condition would seem to be at an earlier stage of the disease in the hope of inducing better long-term remodelling.

Abduction extension osteotomy of the femur relieves pain, improves leg length, reduces limp and provides a better functional range of movement. Pain relief was the most important result. In no patient was pain made worse and only three of 25 patients had significant persistence of pain. Reduction of leg-length inequality resulted from the abduction osteotomy for abduction deformity and at this correction 19 patients had a range of abduction of more than 10°. The extension component of the osteotomy did not cause significant loss of flexion. Although by the accepted criteria for Perthes' disease (Catterall 1971; Curtis et al. 1974) the results in the present series are not excellent, the patients do show great clinical improvement.

Bombelli (1976) has given a biomechanical analysis of the beneficial effects on the hip joint of altering the centre of rotation by abduction and extension osteotomy. He also suggests that traction on the superior capsule of the hip joint might induce osteophyte formation and improve lateral cover. We had expected to see further development of the lateral acetabular epiphysis in the younger patients but this has been inconsistent, and was seen only when the osteotomy was performed during the active stage of Perthes' disease. Bombelli's suggestion that the axis of hinging be moved to the medial or "caurina" osteophyte, which is insensitive, is not applicable in a child's hip. We do, however, attribute the continued relief of pain to correction of hinge abduction and the consequent unloading of the lateral parts of the head of the femur and the acetabulum.

Remodelling of the hip joint after this operation is variable. When preliminary arthrography has shown a large volume of lateral acetabular cartilage, the osteotomy was followed by the appearance of the lateral acetabular epiphysis and an improvement of overall cover. More consistently, there was an increase in the superior and a reduction of the medial joint space, which must produce a more congruent hip joint and better prospects for long-term function.

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REFERENCES


