CHIARI PELVIC OSTEOTOMY FOR OSTEOARTHritis

THE INFLUENCE OF THE TORN AND DETACHED ACETABULAR LABRUM

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We assessed the results of Chiari pelvic osteotomy in 64 hips with early osteoarthritis in terms of acetabular labral detachment detected pre-operatively by arthrography. At an average follow-up of four years, assessment by the Merle d'Aubigné score showed 83% excellent or good results.

These satisfactory results were achieved in only half the cases with a detached labrum, but in nearly all cases with normal or torn acetabular labra. Other factors such as the acetabular index, the level and angle of osteotomy, and the displacement following osteotomy did not affect the results. Chiari pelvic osteotomy is a worthwhile procedure for early osteoarthritis in selected cases, but a detached acetabular labrum increases the risk of clinical failure.

Chiari pelvic osteotomy in young adults with acetabular dysplasia and early osteoarthritis of the hip has been reported to give favourable results (Colton 1972; Chiari 1974; de Waal Malefijt, Hoogland and Nielsen 1982; Reynolds 1986; Calvert et al 1987; Høgh and Macnicol 1987). Among the factors which may affect the result, these authors have emphasised the stage of the osteoarthritis, the patient's age at operation, the angle and height of osteotomy, and the degree of displacement of the osteotomised fragment.

Even using strict indications and good technique, some inconsistency in the results seems to be unavoidable (Chiari 1974; Mitchell 1974; Høgh and Macnicol 1987). There is failure to relieve pain in some patients; rarely, this is aggravated. Most such patients show no progression of the osteoarthritic or collapse of the head, so the causes of failure are uncertain. We have studied the influence of a torn or detached acetabular labrum, as detected by arthrography before operation.

PATIENTS AND METHODS

From 1978 to 1983, Chiari pelvic osteotomy was performed at Osaka University Hospital on 110 hips of 103 patients. All had osteoarthritis secondary to congenital subluxation or acetabular dysplasia. From these, 64 hips in 58 patients were selected for the study: all were in patients over 15 years of age who had had arthrography just before the operation, had been followed up for over two years and had had no other operations before the osteotomy. The radiological stage of osteoarthritic change was grade 1 or 2 on Kellgren and Lawrence's criteria (1957).

The patients included 48 females and 10 males, with an age range from 15 to 47 years (average 27). Follow-up was from 2 years to 7 years 3 months (average 4).

Operation. The original Chiari (1974) procedure was modified according to Kawamura, Hosono and Yokogushi (1982). Through a lateral transtrochanteric approach, a dome-shaped osteotomy is performed along the acetabular rim, using an oscillating saw. The distal fragment is medially displaced by about 50% of the thickness of the pelvic wall, to give 80% to 90% acetabular cover to the femoral head (Heyman and Herndon 1950). Postoperatively, the hip is immobilised in 20° flexion and 30° abduction in a plaster spica for three weeks. Partial weight-bearing is allowed at six weeks and full weight-bearing at 12 weeks.

Arthrography. All patients underwent arthrography before the operation, using the method of Tanaka, Ito and Yamamoto (1975). On the arthrographic findings, the images were classified as showing normal, torn or
Normal acetabular labrum, showing a normal 'rose-thorn'.

Table 1. Details of patients and hips in three groups according to the appearance of the labrum on arthrography

<table>
<thead>
<tr>
<th>Labrum</th>
<th>Normal</th>
<th>Torn</th>
<th>Detached</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>22</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>Male:Female</td>
<td>4:18</td>
<td>4:17</td>
<td>4:15</td>
</tr>
<tr>
<td>Number of hips</td>
<td>23</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Age at operation (yr)</td>
<td>25.5 (15 to 38)</td>
<td>27.5 (16 to 38)</td>
<td>30 (19 to 47)</td>
</tr>
<tr>
<td>Duration of follow-up*</td>
<td>44 (24 to 84)</td>
<td>44 (24 to 87)</td>
<td>51 (24 to 78)</td>
</tr>
<tr>
<td>Radiology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE angle (degrees)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-operative</td>
<td>2.7 (4.7 to +20)</td>
<td>-2.5 (-40 to +21)</td>
<td>2.4 (-35 to +21)</td>
</tr>
<tr>
<td>Postoperative</td>
<td>47.4 (18 to 72)</td>
<td>43.7 (6 to 67)</td>
<td>43.4 (15 to 58)</td>
</tr>
<tr>
<td>Height of osteotomy (mm)</td>
<td>9.8 (6 to 14)</td>
<td>8.8 (5 to 15)</td>
<td>9.9 (6 to 18)</td>
</tr>
<tr>
<td>Angle of osteotomy (degrees)</td>
<td>12.7 (0 to 28)</td>
<td>14.0 (0 to 33)</td>
<td>14.3 (0 to 30)</td>
</tr>
<tr>
<td>Displacement (per cent)</td>
<td>50.5 (23 to 71)</td>
<td>46.0 (20 to 70)</td>
<td>48.9 (25 to 72)</td>
</tr>
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</table>

* in months

detached acetabular labra (Figs 1 to 3). A normal acetabular labrum shows a 'rose-thorn' with a sharp lateral edge (Fig. 1). In a torn labrum, the contrast medium enters a fissure starting at the acetabular margin, giving a trapezoid contour (Fig. 2). In a hip with a detached labrum, the contrast medium fills the space between the detached fragment and the bony edge of the acetabulum, giving a triangular shape (Fig. 3). In the 64 hips, 23 labra were assessed as normal (36%), 21 as torn (33%), and 20 as detached (31%).

Follow-up and review. Table I shows that there were no significant clinical or other radiological differences between the three groups before osteotomy. We therefore compared the clinical and radiological results (Fig. 4) in relation to the labral abnormalities.

Hip function was assessed according to the Merle d'Aubigné hip score (1970), which gives six points each for pain, mobility, and gait. Excellent results had 18 or 17 points, good results 16 or 15, fair 14 or 13, and poor 12 points or less. Radiological results, with respect to congruency and degenerative changes were assessed on the latest radiographs.

RESULTS

In the 64 hips reviewed, there had been no severe complications such as deep infection, nerve palsy or nonunion. The mean Merle d'Aubigné hip score had improved from 14.3 to 16.4 points, with marked pain relief from 3.6 to 5.1 points. The result was excellent in 39 hips (61%), good in 14 (22%), fair in eight (12%) and poor in three (5%). Thus, the result was unsatisfactory in 11 hips (17%), in all of which the score for pain remained at 4 points or less.

Arthrography of the labrum. All 23 hips with normal labra had excellent or good results at follow-up. One of the 21
Radiographic measurements included the height of the osteotomy (H), its angle (α) and the displacement (A/B × 100). The height is the shortest distance between the femoral head and the new acetabulum. The angle is that between the line of the osteotomy and the horizontal. The displacement is expressed as a percentage of the width of the iliac bone.

Torn acetabular labrum, showing the fissure at the base of the labrum and its trapezoid outline.

Detached acetabular labrum, showing the complete separation from the acetabular origin.

hips (5%) with torn labra and 10 of the 20 hips (50%) with detached labra had only fair or poor results (Table II). Thus, Chiari pelvic osteotomy in hips with a detached labrum had a significantly worse outcome than those with normal or torn labra, mainly because of failure to relieve pain (p < 0.001).

Radiological changes. At the latest review, only one hip (one with a detached labrum) had progressed to more severe osteoarthritic change. None of the other 63 hips showed progression of osteoarthritis, and none showed collapse of the femoral head.

Despite the extra-articular procedure, a congruent joint had been obtained in two-thirds of the series; in the remaining one-third there was some irregularity at the osteotomy site but this was always under 2 mm and considered to be acceptable.

Other factors. In our study, the results of the pelvic osteotomy were not influenced by the patient’s sex, body-weight or age at operation. Neither bilateral or unilateral
involvement, nor pre-operative grade of osteoarthritis (either 1 or 2) influenced the result.

In the 11 hips with unsatisfactory results, the mean angle of osteotomy was significantly lower than in the 53 with excellent or good results (p < 0.05, Table III). However, the angle of osteotomy ranged from 0° to 18°, an acceptable variation, in all the unsatisfactory hips and in 41 of the 53 satisfactory results (77%). This finding makes it difficult to attribute the unsatisfactory results to the low angle of osteotomy.

**Characteristics of the hips with detached labra.** Of the 20 hips with detached labra, 15 had shown a painful click on pre-operative clinical examination; of these 15 hips, 11 had a painful click.

**Table II.** Clinical result of Chiari pelvic osteotomy related to the three types of labrum (number and per cent)

<table>
<thead>
<tr>
<th>Type of labrum</th>
<th>Excellent (18 to 17)</th>
<th>Good (16 to 15)</th>
<th>Fair (14 to 13)</th>
<th>Poor (12 or less)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal (n = 23)</td>
<td>22</td>
<td>96</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Torn (n = 21)</td>
<td>11</td>
<td>52</td>
<td>9</td>
<td>45</td>
</tr>
<tr>
<td>Detached (n = 20)</td>
<td>6</td>
<td>30</td>
<td>4</td>
<td>20</td>
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* difference highly significant: chi square (df = 6) = 34.0, p < 0.001

Radiographs, arthrograms and diagrams of a 25-year-old woman suffering with early osteoarthritis of both hips. Figure 5a – Pre-operative view of the left hip. The clinical score was 14 points (3 for pain). Figures 5b and 5c – The arthrogram showed a detached acetabular labrum on a film taken in abduction and internal rotation. Figure 5d – Postoperative view. The osteotomy height is 6 mm and the angle 5°, achieving 54% medial displacement. Figures 5e and 5f – Four years after Chiari osteotomy the hip scored 14 points (4 for pain), and the patient had occasional pain during walking. The arthrogram shows a dimple in the femoral head and a cyst in the acetabulum related to the area of the detached labrum under the new acetabular roof.
10 which had pain at the latest review still had this click. On plain radiography at review, most of the 10 painful hips showed no characteristic features, but two progressively developed a dimple in the femoral head and cystic changes in the acetabulum in relation to the site of the detached labrum (Fig. 5), becoming more evident with time. In five cases with residual pain, we performed a second arthrogram. In four of the hips this showed that the detached labrum had impinging and was crushed between the new acetabulum and the femoral head.

### DISCUSSION

In our series, Chiari pelvic osteotomy gave many successes with good relief of pain, but there was a 17% clinical failure rate. The presence of a detached acetabular labrum proved to be the most important factor which influenced the result.

The acetabular labrum probably has no nerve supply, and it is uncertain how detachment could account for the pain after a Chiari osteotomy. Most of the hips in our series with continued pain had either a painful click, or dimpling of the femoral head and cystic changes in the acetabulum, which could be caused by impingement.

We believe that labral tears and detachment are probably secondary to the acetabular dysplasia, as discussed by Dorrell and Catterall (1986). There is mechanical damage to the acetabular labrum, resulting in tearing which can be considered as an early degenerative change in the hip. Any increase in instability could well cause additional damage, and progress from a tear to detachment.

Since a detached acetabular labrum was associated with a 50% clinical failure rate, it must be considered a contra-indication for Chiari pelvic osteotomy. In the presence of detachment, alternative procedures such as triple osteotomy (Steel 1973) or double innominate osteotomy (Sutherland and Greenfield 1977) may be preferable. These operations displace the original acetabular edge in a lateral direction and may remove a detached labrum from the weight-bearing surface. Dorrell and Catterall (1986) have reported the excision of detached labra at Chiari pelvic osteotomy but do not describe their results. We have tried this method in nine dysplastic hips and have been encouraged by favourable early results.

We consider that Chiari pelvic osteotomy remains the preferred procedure for early osteoarthritis in a dysplastic hip, but that the presence of a detached acetabular labrum carries a serious risk of clinical failure, and should lead to consideration of other operations.

We are grateful to Professor A. Inoue and Dr K. Takaoka for providing clinical records and radiographs. 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