Femoroacetabular impingement is recognised as being a cause of labral tears and chondral damage. We report a series of five patients who presented with persistent pain in the hip after arthroscopy for isolated labral debridement. All five had a bony abnormality consistent with cam-type femoroacetabular impingement. They had a further operation to correct the abnormality by chondro-osteoplasty of the femoral head-neck junction. At a mean follow-up of 16.3 months (12 to 24) all had symptomatic improvement.

Patients and Methods

There were three women and two men with a mean age of 40 years (27 to 48). The operative reports of the arthroscopy confirmed the presence of labral tears which had been treated by isolated labral debridement. No cartilage delamination was noted in any of the reports. The mean time to consultation with the senior author (PEB) after arthroscopy was 13.6 months (6 to 18). All the patients had a positive impingement sign on physical examination.16 The University of California Los Angeles (UCLA) hip score17,18 was used to assess pain, walking, function and activity.

Radiological evaluation consisted of anteroposterior (AP) pelvic and cross-table lateral radiographs (Fig. 1).19 Although the AP radiographs had not been standardised to meet the criteria of Siebenrock, Kalbermatten and Ganz, acetabular retroversion was not seen in any case. All the patients had further MRI with gadolinium arthrography.21 In four, a persistent labral tear was seen. The fifth patient had complete labral excision in the antero-superior quadrant. On the radial reformations of MRI, the α angle of Notzli et al22 was a mean of 80.8° (66° to 95°). On the cross-table lateral radiograph, the offset ratio of Eijer et al23 was a mean of 0.10 (0.08 to 0.14) (Table I).

All five patients had further surgery when the MRI findings were confirmed (Fig. 2). All had associated acetabular chondral damage of type 4 as described by Beck et al.13 Each underwent chondro-osteoplasty of the femoral head-neck junction and repeat debridement of the torn labrum. The classic surgical dislocation...
approach of Ganz et al 24 (Fig. 3) was used in three cases. The other two had a combination of arthroscopy of the hip and labral debridement with anterior arthrotomy, through which the chondro-osteoplasty was performed under direct visualisation.25,26 This was done to avoid a more extensive soft-tissue dissection. None of the patients required labral re-fixation with rim trimming because of the absence of acetabular retroversion. Weight-bearing was restricted for four to six weeks.

Statistical analysis. The difference between the pre-operative and follow-up hip scores was analysed using Student’s t-test. Statistical significance was determined as a p-value < 0.05.

Table I. Clinical details and radiological findings in the five patients

<table>
<thead>
<tr>
<th>Case</th>
<th>Gender</th>
<th>Age (yrs)</th>
<th>Side</th>
<th>Time after hip arthroscopy (mths)</th>
<th>Impingement sign</th>
<th>Offset ratio</th>
<th>α angle (˚)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>27</td>
<td>Right</td>
<td>14</td>
<td>Positive</td>
<td>0.10</td>
<td>90</td>
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<tr>
<td>2</td>
<td>Male</td>
<td>38</td>
<td>Right</td>
<td>18</td>
<td>Positive</td>
<td>0.08</td>
<td>66</td>
</tr>
<tr>
<td>3</td>
<td>Female</td>
<td>43</td>
<td>Right</td>
<td>6</td>
<td>Positive</td>
<td>0.08</td>
<td>80</td>
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<tr>
<td>4</td>
<td>Female</td>
<td>48</td>
<td>Right</td>
<td>12</td>
<td>Positive</td>
<td>0.12</td>
<td>95</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>44</td>
<td>Right</td>
<td>18</td>
<td>Positive</td>
<td>0.14</td>
<td>73</td>
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</tbody>
</table>

Table II. Individual University of California Los Angeles hip scores in the five patients before and after operation

<table>
<thead>
<tr>
<th>Case</th>
<th>Pain Pre-operative</th>
<th>Pain Post-operative</th>
<th>Walking Pre-operative</th>
<th>Walking Post-operative</th>
<th>Function Pre-operative</th>
<th>Function Post-operative</th>
<th>Activity Pre-operative</th>
<th>Activity Post-operative</th>
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<tr>
<td>1</td>
<td>6</td>
<td>9</td>
<td>8</td>
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<td>8</td>
<td>1</td>
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<td>2</td>
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<tr>
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<td>6</td>
<td>8</td>
<td>10</td>
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<td>7</td>
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<td>8</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Results

There were no post-operative complications. One patient required the removal of screws because of painful internal fixation, after which the symptoms resolved. At a mean follow-up of 16.3 months (12 to 24), all the patients had symptomatic improvement (Table II). The mean UCLA hip score improved as follows: pain, from 3 (1 to 6) to 7 (6 to 9) (p = 0.01); walking, from 8 to 9.2 (8 to 10) (p = 0.07); function, from 5.8 (1 to 8) to 8 (4 to 10) (p = 0.00); and activity, from 6 (2 to 10) to 7 (4 to 10) (p = 0.03).

Discussion

Before the description of femoroacetabular impingement, isolated labral tears, diagnosed by means of hip arthroscopy27 and/or MRI with arthrography,21,28 had been identified as a primary cause of pain in the hip.9,29 These tears were usually categorised as idiopathic1,29 or secondary to minor trauma. The reason for this was in part due to the fact that assessment of hip morphology was performed only in the coronal plane, while very often the major deformity in femoroacetabular impingement was in the sagittal plane.23,30 The anterolateral head-neck junction was also not systematically examined in the peripheral compartment. Because the initial results of treatment of isolated labral tears were encouraging, this left some uncertainty as to the need for correcting a co-existing bony abnormality.10,31,32 Our data support the added clinical benefit in correcting pre-existing bony dysmorphosis in the presence of labral pathology and provides additional clinical evidence that an uncorrected bony abnormality consistent with femoroacetabular impingement can lead to the failure of isolated labral debridement. Although in the initial early experience of the treatment of femoroacetabular impingement, there were good to excellent results in only 65% to 68% of patients,13,14 more recent series in which the labrum has not been resected, have had a better
outcome, with over 80% of patients showing significant improvement in their hip function. However, despite an improvement in function, three of our five patients still had pain with activity which required the occasional use of anti-inflammatory agents. It is difficult to speculate why these three patients had more pain than the other two, but this may be related to the amount of remaining labrum after the initial labral debridement as well as the extent of chondral damage. When Espinosa et al. compared the outcome of patients treated for femoroacetabular impingement by open surgery, those who had labral refixation did significantly better than those with resection. None of the patients in our series underwent labral refixation nor did they undergo further labral resection. Currently, we perform labral refixation in the presence of acetabular retroversion and/or with a delamination flap extending beyond 5 mm. A study by Ferguson et al. suggested that the labrum may act more as a seal, ensuring a more constant fluid film for lubrication and limiting the rate of expression of fluid from the articular cartilage. This occurs by preventing fluid flow, tangential to the cartilage surfaces, through the interarticular gap and by increasing the length of the fluid flow path through the labrum. Based on this model, complete or partial excision of the labrum is likely to disrupt the sealing effect, thus putting the cartilage surfaces at risk of premature wear. In addition, even in the presence of a partial tear with femoroacetabular impingement, recent work by Ito, Leunig and Ganz has shown that the tip of the labrum remains intact, thus potentially maintaining its function as a fluid sealant.

There remains the unresolved issue as to how much bony abnormality is acceptable in the presence of a damaged labral-chondral complex. This is especially true for dysplasia or femoroacetabular impingement in which osteo-

![Fig. 2a](image1)
![Fig. 2b](image2)

Intra-operative views of a) the insufficient concavity of the femoral head-neck junction and b) after treatment by chondro-osteoplasty.

![Fig. 3a](image3)
![Fig. 3b](image4)

Intra-operative views showing a) the partially excised labrum (dotted line) and b) associated cartilage flap of the acetabulum.
omy of the pelvis\textsuperscript{37} or surgical dislocation and chondro-osteoplasty\textsuperscript{24} are the standard procedures. In addition, although it is now well known that most labral tears are associated with a structural bony abnormality,\textsuperscript{5,6} there is little information on how correcting a bony abnormality can improve outcome. We believe that our report provides evidence to support re-operation after failed isolated labral debridement in the presence of femoroacetabular impingement, and stresses the importance of assessing hip morphology in both the coronal and sagittal planes. As less invasive surgical techniques such as hip arthroscopy are perfected, the question of correcting a bony abnormality associated with femoroacetabular impingement\textsuperscript{38} may become less of an issue.

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