Iliopsoas impingement after total hip replacement

THE RESULTS OF NON-OPERATIVE MANAGEMENT, TENOTOMY OR ACETABULAR REVISION

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We have reviewed a group of patients with iliopsoas impingement after total hip replacement with radiological evidence of a well-fixed malpositioned or oversized acetabular component. A consecutive series of 29 patients (30 hips) was assessed. All had undergone a trial of conservative management with no improvement in their symptoms. Eight patients (eight hips) preferred continued conservative management (group 1), and 22 hips had either an iliopsoas tenotomy (group 2) or revision of the acetabular component and debridement of the tendon (group 3), based on clinical and radiological findings. Patients were followed clinically for at least two years, and 19 of the 22 patients (86.4%) who had surgery were contacted by phone at a mean of 7.8 years (5 to 9) post-operatively. Conservative management failed in all eight hips. At the final follow-up, operative treatment resulted in relief of pain in 18 of 22 hips (81.8%), with one hip in group 2 and three in group 3 with continuing symptoms. The Harris Hip Score was significantly better in the combined groups 2 and 3 than in group 1. There was a significant rate of complications in group 3. This group initially had better functional scores, but at final follow-up these were no different from those in group 2.

Tenotomy of the iliopsoas and revision of the acetabular component are both successful surgical options. Iliopsoas tenotomy provided the same functional results as revision of the acetabular component and avoided the risks of the latter procedure.

The reported incidence of iliopsoas impingement after total hip replacement (THR) is as high as 4.3%. Although the psoas muscle can be irritated by screws for acetabular fixation which have penetrated through the ilium, the most common site of iliopsoas impingement is at the anterior rim of the acetabulum. This can be caused by extrusion of cement and/or by a prominent acetabular component or reinforcement ring which is either too large for the native acetabulum or is in a retroverted or lateral position. Irritation of the psoas after THR can also be caused by reasons other than impingement, such as increased offset or significant lengthening of the leg.

The diagnosis of iliopsoas impingement should be considered in patients complaining of pain in the groin during activities which require active hip flexion, such as walking up stairs and lifting the leg in and out of a car. Physical examination, with special attention to signs of psoas irritation, and visualisation of prominence of the acetabular component over the anterior aspect of the rim as seen on the cross-table lateral view or on CT scans, is often sufficient to confirm the diagnosis (Figs 1 and 2).

Conservative management using repeated peritendinous injections with a corticosteroid mix guided by ultrasound, iliopsoas tenotomy or lengthening, revision of the acetabular component, or trimming of the flanges of metal rings causing impingement have all been used successfully to treat the symptoms. There is, however, no consensus as to when one option should be used over the other, especially in patients who have clinical and radiological signs of impingement caused by a protruding acetabular component. Previous recommendations were based mostly on case reports or small series of patients with psoas tendonitis caused by multiple aetiologies and with inadequate follow-up.

In the early 1990s, we used two types of uncemented acetabular component for primary THR: the Balgrist conical expansional cup (Allopro, SulzerMedica, Winterthur, Switzerland) and the Zweymüller screw-in cup (Protasul-Ti; Sulzer, Winterthur, Switzerland). Because of the bulky nature of these cups and their truncated conical shape, the anterior aspect was often left quite prominent with respect to the native acetabular border.
The occurrence of iliopsoas impingement after implantation of these cups has allowed us to gain special insight into the management of this problem. The aims of this study were to describe the natural history of continued conservative management for iliopsoas impingement after THR, to assess the results of surgical treatment by either tenotomy or revision of the acetabular component, and to establish a possible treatment algorithm for the management of iliopsoas impingement after THR.

**Patients and Methods**

An observational study was conducted between December 1996 and December 2000 on 29 patients (30 hips) who were seen at our institution. They all complained of pain in the groin during active hip flexion, with reproduction of this pain during active straight leg raising and resisted hip flexion. All had prominence of the cup on true cross-table lateral radiographs and CT scans of the hip, and no evidence of infection or loosening of the components as seen on serial plain radiographs. An injection of the iliopsoas tendon sheath with a mixture of corticosteroid and local anaesthetic was used to confirm the diagnosis, resulting in temporary relief of pain in all 30 hips.

There were 12 males and 17 females, with a mean age of 63 years (29 to 82). The mean time since THR for all hips was four years (1 to 9). The initial THR was performed for osteoarthritis (OA) in 20 patients (21 hips), avascular necrosis in four patients (four hips), and developmental dysplasia in five patients (five hips). The acetabular components used at the time of THR are shown in Table I. Although the majority were of the truncated conical shape, this problem was also seen with other types of implant.

Despite initial conservative management, all patients continued to complain of significant impairment in their daily activities. As part of the initial work-up, all patients had an anteroposterior (AP) radiograph of the pelvis and a cross-table view of the affected hip. Prominence of the acetabular component was verified on transverse CT scan slices in most cases using techniques described previously. The prominent anterior acetabular component was visible on all scans. In one hip a ridge of cement also protruded anteriorly. Horizontal offset was not measured specifically because our radiographs were not standardised. Leg lengths were measured using the lesser trochanter as a reference.

Operation was recommended in all instances, but eight patients (27.6%, eight hips) preferred to continue with conservative management (group 1). They had more local injections into the iliopsoas tendon sheath and began stretching exercises for the hip flexors. The remaining 21 patients (72.4%, 22 hips) underwent surgical intervention for the relief of symptoms. Six patients (six hips) had an isolated tenotomy of the iliopsoas tendon (group 2) and 15 patients (16 hips) revision of the acetabular component with debridement of the tendon (group 3). The decision to proceed with either procedure was based on age, the patient’s general health status, and anticipated loss of bone during revision of the acetabular component. Tenotomy was chosen for patients who were older and revision for those who were thought likely to be suitable.

The surgical approach used to perform the iliopsoas tenotomy depended on that employed at the primary procedure. An anterolateral or a direct lateral approach was used in three hips. For the iliopsoas tenotomy, the medial capsule of the hip joint is exposed anteriorly and the rectus
and iliocapsularis muscles are mobilised off the capsule. The hip joint is flexed and externally rotated and the inferomedial aspect of the capsule is identified. This is bordered by the iliopsoas muscle and tendon, which can be exposed near its insertion on the lesser trochanter, where it should then be isolated with a clamp and tenotomised. The tendinous portion only is cut, and not the muscle fibres. Care should be taken to divide the tendon as close to the lesser trochanter as possible to prevent excessive bleeding by cutting vessels that are commonly found within the muscle itself. For revision of the acetabular component, a digastric trochanteric osteotomy, a so-called trochanteric slide, was used in nine hips, a direct lateral approach in two and a posterolateral approach in five. All the acetabular components were revised to a Ganz acetabular reinforcement ring with a hook (Ganz Roof Ring, Zimmer, Austin, Texas) into which a low-profile all-polyethylene cup was cemented. The results of the operation were reviewed clinically at six weeks, 12 weeks, 12 months, and then after a minimum of 24 months. Radiological evaluation was undertaken at six weeks and 12 months after revision, and at the last follow-up. All the patients were then contacted by phone at the last follow-up for the purpose of this study by one of us (CD).

The Harris Hip Score (HSS) was used to assess pain and function when patients first complained of symptoms, and at the last clinical follow-up for patients in all the groups. They were also specifically asked about the occurrence of groin pain during active hip flexion, and examined for reproduction of pain in the groin during active straight leg raising. At the telephone follow-up they were evaluated using a modification of the HHIS which included only the pain, gait and activity scores (a maximum of 91 points). They were also asked again about the occurrence of pain in the groin and weakness with flexion, climbing stairs, or getting in or out of a car.

Results

Table II shows the demographic data and the mean time since THR for each group. Patients in group 2 were on average older than those in groups 1 and 3.

The mean prominence of the acetabular component on CT scans was 5.8 mm (2 to 10). We did not measure horizontal offset specifically because our radiographs were not standardised, but the affected hip always appeared to have slightly less offset than the contralateral side. The mean leg-length discrepancy was 5 mm (0 to 16) compared to the opposite side. Iliopsoas impingement did not appear to be the result of either increased offset or leg-length discrepancy.

The iliopsoas tendon was inspected. The iliopsoas muscle was almost always seen through a defect in the neocapsule at the level of the uncovered implant. A change in the calibre of the tendon could be seen on its surface, which is normally quite smooth. If it was roughened, it was described as partially ruptured and scarred. In other cases, small blood vessels were seen on the surface of the tendon which appeared swollen and irritated. In such cases, fluid may also be found around the tendon. We classified these tendons as irritated. The iliopsoas tendon appeared partially ruptured and scarred in eight hips and swollen and irritated in 11 of them. The status of the iliopsoas tendon was not recorded in three hips.

### Table I. Primary acetabular implants

<table>
<thead>
<tr>
<th>Group</th>
<th>Balgrist</th>
<th>Zweymüller</th>
<th>Ganz</th>
<th>Others</th>
<th>Total number of hips</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>16</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Conservative treatment</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>1$^k$</td>
<td>8</td>
</tr>
<tr>
<td>Psoas tenotomy</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1$^l$</td>
<td>6</td>
</tr>
<tr>
<td>Acetabular component revision</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td>1$^{**}$</td>
<td>16</td>
</tr>
</tbody>
</table>

$^*$ Balgrist acetabular component: split truncated cone-shaped outer titanium ring, which is expanded by a tapered high density polyethylene insert during implantation

$^1$ Zweymüller acetabular component: cone-shaped threaded metal back from titanium alloy with a modular polyethylene inlay

$^k$ Müller’s self-locking acetabular component: non-cemented spherical titanium shell fixed with screws and a modular polyethylene inlay

$^l$ Cemented low-profile polyethylene acetabular component

$^{**}$ Spotorno acetabular component

### Table II. Demographic data for patients with iliopsoas impingement secondary to an overhanging acetabular component

<table>
<thead>
<tr>
<th>Group</th>
<th>Hips</th>
<th>Gender (M:F)</th>
<th>Mean age in yrs (range)</th>
<th>Time since THR in yrs (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservative treatment (group 1)</td>
<td>8</td>
<td>3:5</td>
<td>57 (37 to 78)</td>
<td>3.5 (1 to 5)</td>
</tr>
<tr>
<td>Surgical treatment (groups 2 and 3)</td>
<td>22</td>
<td>9:13</td>
<td>65 (29 to 82)</td>
<td>4 (1 to 9)</td>
</tr>
<tr>
<td>Psoas tenotomy (group 2)</td>
<td>6</td>
<td>3:3</td>
<td>73 (67 to 81)</td>
<td>3.5 (2 to 7)</td>
</tr>
<tr>
<td>Acetabular component revision (group 3)</td>
<td>16</td>
<td>6:10</td>
<td>62 (29 to 82)</td>
<td>4 (1 to 9)</td>
</tr>
<tr>
<td>All</td>
<td>30</td>
<td>12:18</td>
<td>63 (29 to 82)</td>
<td>4 (1 to 9)</td>
</tr>
</tbody>
</table>

$^*$ THR, total hip replacement
The mean follow-up for patients in group 1 was 41 months (24 to 65). Seven of the eight hips (87.5%) had no improvement in symptoms, and one patient (12.5%) had undergone revision of the acetabular component at 24 months in another institution because of continued symptoms. Hence, none of the hips which continued with conservative management had a successful outcome.

The mean clinical follow-up for patients in group 2 was 36 months (24 to 50), and all patients were contacted by phone at a mean of 6.8 years (5 to 9). After tenotomy, pain in the groin had completely resolved in one of the six hips (16.7%) at six weeks, in all six at three months and in five of the six (83.3%) at the last clinical follow-up. One hip developed heterotopic ossification and the symptoms recurred after a pain-free interval of 18 months. This patient still complains of pain in the groin seven years after surgery, and were no longer working. They also complained of weakness going up and down stairs: two believed it was a result of generalised weakness and advanced age, and the third thought it a result of a chronic trochanteric bursitis.

Patients with acetabular revisions had a high rate of complications, including a trochanteric nonunion, an anterior dislocation of the hip, a superficial wound infection and five cases of trochanteric bursitis. One patient developed an unexplained neuropathic pain after the revision, underwent multiple further revisions, and then developed a deep infection eventually requiring disarticulation of the hip. Seven additional operative procedures were required to manage the complications. The trochanteric nonunion required further fixation, the anterior dislocation needed a closed reduction under general anaesthesia, and removal of metalwork was performed in four of five hips with trochanteric bursitis. The superficial wound infection, which occurred five weeks after surgery, was treated with debridement and antibiotics for six weeks.

One patient died one year after acetabular revision from causes unrelated to the hip. The pain in the groin had settled by six weeks. The mean clinical follow-up for the remaining patients in group 3 was 40 months (24 to 65); 12 patients (13 hips) were contacted by telephone at a mean of eight years (5 to 9) from surgery. The groin pain had resolved by six weeks in eight of 15 hips (53.3%) and at three months in 13 (80%). At their last clinical examination, two young male patients still had pain nine years after surgery, and were no longer working. They also complained of weakness with flexion, climbing stairs, and getting in and out of a car. Two other patients complained of difficulty with stairs as a result of weakness of their abductor muscles.

Table III shows the mean HHS pre-operatively and at the last clinical examination. Patients in group 1 had no change in HHS, but those in groups 2 and 3 had an improvement. On average, patients in group 3 had the highest scores at this time. Patients in group 3 were, however, younger at the time of surgery than those in group 2, as all patients in the latter group were older than 65 years.

Table IV shows the mean modified HHS ascertained by telephone follow-up at a mean of 7.8 years (5 to 9). The scores continued to improve for those in group 2 and remained the same for patients in group 3, but there was no clear difference between the two groups.

Discussion
This study demonstrates that surgical management of iliosposa impingement associated with a protruding acetabular component with either revision of the cup or tenotomy is successful in relieving pain in the groin in the majority of cases. Conservative management failed in all hips. The use of injections for the management of this problem has been reported by other authors. Briceux et al noticed no improvement in six patients who were treated conservatively with injections into the tendon sheath. Jasani et al observed...
noted recurrence of symptoms at a mean of 3.7 months in eight of nine hips treated with CT-guided injections into the psoas sheath. Adler et al.\textsuperscript{12} found an average of 50\% improvement in ten patients at one year. In that study, several injections were given and the mean time to relief of pain ranged between two weeks and 17 months. However, Ali Eddine et al.\textsuperscript{3} at a minimum follow-up of three months, reported improvement in symptoms in five of nine patients after a first and second local injection. Three patients in their study did not have protruding cups and the reasons for the iliopsoas impingement were not mentioned. Of the remaining six hips, only two had improvement in symptoms after repeated injections. Previous reports have shown that the time to recurrence of symptoms is approximately 3.7 months.\textsuperscript{8} We believe that injections into the psoas sheath can provide valuable information at the time of diagnosis, but feel that its use for long-term management should be limited.

Iliopsoas tenotomy was successful in the long term in five of six hips. It has also been used successfully by previous authors.\textsuperscript{2,10,15} In patients who were all over 65 years at the time of surgery, the results were initially inferior to those in the younger patients who underwent revision of the cup and debridement of the tendon, but relief of pain was achieved by three months. Patients who underwent tenotomy alone continued to improve clinically over a period of years, and none complained of weakness in flexion or when getting in or out of a car. However, it is difficult to reach definite conclusions based on only six cases.

Revision of the acetabular component and debridement of the psoas tendon has previously been shown to be successful in treating iliopsoas impingement associated with a prominent cup.\textsuperscript{7} Symptoms resolved in 13 of 15 hips (80\%) in our patients who underwent this procedure, but at the expense of a high complication rate. In contrast, except for the one hip that developed heterotopic ossification after tenotomy, such surgery was free of complications. Tenotomy may be better suited for the management of iliopsoas impingement because of its low complication rate and the fact that it is not associated with a true long-term functional impairment. However, in a young patient with good bone stock who has a prominent malpositioned cup, acetabular revision may be a better option.

Protruding threaded metal-backed acetabular components screwed into bone have been suspected to be particularly at risk for anterior iliopsoas impingement.\textsuperscript{4} Press-fit unthreaded cups and cemented polyethylene cups have been implicated in other reports, and are currently more likely to be seen in practice as causing iliopsoas impingement.\textsuperscript{2,5,7} We found that removal of truncated conical cups was often difficult and in some instances was associated with significant loss of bone. With the advent of modern press-fit hemispherical cups and the use of specialised explanting instrumentation, removal of a well-fixed hemispherical cup can be carried out routinely with minimal loss of bone.

The drawbacks of this study include its retrospective nature and the fact that the patients were reviewed at final follow-up by phone. Statistical tests have not been performed, as the study has too few patients for reasonable power to detect a clinically meaningful difference between treatment groups.

However, conservative management for iliopsoas impingement failed in all patients. Tenotomy of the iliopsoas and revision of the acetabular component are both successful surgical options. Iliopsoas tenotomy provided the same functional results as acetabular revision without the added risks of revision of a well-fixed acetabular component. We perform an iliopsoas tenotomy as long as the placement of the cup does not pose any significant problems. If the patient is young and has a malpositioned or lateralised cup, revision is a better option.

No benefits in any form have been received or will be received from a commerical party related directly or indirectly to the subject of this article.

References