The effectiveness of capsular decompression for internal fixation of intracapsular hip fractures

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ABSTRACT

**Purpose.** To compare the results of screw fixation plus capsular decompression versus screw fixation alone for managing intracapsular hip fractures.

**Methods.** Of 201 patients with intracapsular hip fractures, 99 underwent screw fixation with capsular decompression (capsular decompression group) and 102 underwent screw fixation alone (control group). The incidence and time to development of avascular necrosis of the femoral head, union rate, time to union, and other clinical parameters were compared.

**Results.** In patients with displaced fractures, the incidence of avascular necrosis was significantly higher in the control than capsular decompression group, whereas the time to development of this complication was significantly shorter.

**Conclusion.** Capsular decompression did not improve the union rate and time to union in undisplaced intracapsular hip fractures, but in displaced fractures it appeared to reduce the incidence and delay the onset of avascular necrosis.

**Key words:** decompression, surgical; fracture fixation, internal; hip fractures

INTRODUCTION

Avascular necrosis (AVN) and non-union are 2 major complications of traumatic displaced intracapsular hip fractures.1-3 The repair procedures are complicated and unfavourable clinical results are common.3,4 Many preventive measures have been suggested, including: prompt surgery, hip traction, proper reduction, haematoma aspiration, and capsular decompression.5-8 Haemarthrosis is related to hip joint pressure in femoral neck fractures.9-12 Capsular decompression may decrease intra-articular pressure and the tamponade effect, and therefore improve blood flow.8 However, incising the capsule may...
The effectiveness of capsular decompression for intracapsular hip fractures

We retrospectively reviewed 201 patients to determine whether capsular decompression has any effect on healing and the development of AVN in patients with either displaced or undisplaced intracapsular hip fractures.

MATERIALS AND METHODS

Records of 201 patients with intracapsular hip fractures treated from July 1994 to December 2002 inclusive were retrospectively reviewed. Patients with open or pathological fracture, concomitant hip dislocation, or acetabular fracture were excluded, as were those at high risk of AVN, such as patients with alcoholism, using long-term steroid use, or aged >65 years with a displaced fracture. Femoral neck fractures were classified as undisplaced (types I and II) or displaced (types III and IV), according to the Garden classification.

Within 24 hours of injury, the patients underwent closed reduction and fixation using 3 short, threaded, cannulated screws, with or without capsular decompression. Patients were categorised depending on the on-call schedule of surgeons; one team performed fixation plus capsular decompression (capsular decompression group), another fixation alone (control group). Surgeons of both teams had changed during the study period.

Closed reduction was performed under fluoroscopy and confirmed by anteroposterior and lateral radiographs. Varus or retroverted deformities were not accepted. A 10-cm straight lateral incision was made from the greater trochanter along the femur; the fascia lata was incised longitudinally and the vastus lateralis was reflected anteriorly. Screws were then inserted under fluoroscopy. The capsular attachment at the trochanteric ridge was exposed with anterior retraction and the capsule was incised in line with the femoral neck. A scissor was then inserted through the plane between the capsule and the femoral neck to enlarge the capsule till there was a gushing out of haematoma. One vacuum suction drain was then inserted. Reduction was improved during surgery if necessary.

Postoperatively, patients started partial weight-bearing walking exercises for 4 weeks, followed by full weight-bearing walking exercises with the aid of a physiotherapist. Radiographs of the hip were taken at each follow-up. Bone union was defined as the presence of bony trabeculae across the fracture in the radiographs and absence of pain and tenderness after a provocation test. Non-union was defined as the presence of a radiolucent zone without any signs of cross trabeculae 6 months after surgery, together with mal-alignment. The diagnosis of AVN was made when sclerotic changes and subchondral collapse (the crescent sign) were noted on radiographs and confirmed by bone scans revealing increased uptake and the complaint of pain.

The incidence and the time to development of AVN of the femoral head, the union rate, time to union, and other clinical parameters of both groups were compared. The Fisher’s exact test was used for dichotomous variables with a frequency of <5 and the Chi squared test if the frequency was ≥5. Student’s unpaired t test was used for normally distributed data and the Wilcoxon Mann-Whitney U test for continuous variables with a skewed distribution. A p value of <0.05 was considered significant.

RESULTS

Gender ratio, age distribution, blood loss, and follow-up periods were comparable in the 2 groups (Table 1). 99 patients underwent fixation plus capsular decompression...
decompression and 102 had fixation alone. Closed reduction was successful in all.

In patients with displaced fractures, the incidence of AVN was significantly higher in the control than capsular decompression group (35 vs 10%, \( p = 0.049 \)), whereas the time to development of this complication was significantly shorter (13 vs 18 months, \( p = 0.007 \)) [Table 2].

Patients with AVN or painful non-union underwent revisions (either hemiarthroplasty or total hip arthroplasty). Those with superficial wound infections were treated with daily dressings and antibiotics. Those with mild back-out and protrusion of screws were kept under observation. None of the 201 patients died.

**DISCUSSION**

The mean age of our patients was younger than that in other studies, because patients aged >65 years with displaced fractures were excluded. Moreover, most femoral neck fractures in the elderly are displaced and are usually treated by arthroplasty rather than screw fixation. Thus, the higher union rate in our patients was probably related to their younger ages.

Capsular decompression did not improve the union rate and time to union for displaced fractures. Presumably because the retinacular vessels had been severely damaged during the injury, relief of the tamponade effect may have had a minimal impact in terms of improving blood flow for faster fracture healing. However, it could have been sufficient to reduce the incidence (or delay the onset) of AVN in such fractures. The tamponade effect is assumed to be greater in displaced fractures as more manipulation is needed for reduction. The difference in AVN incidence may also in part be due to the age difference between our 2 groups (\( p = 0.06 \)).

In undisplaced fractures, less manipulation is needed and haematoma formation and the tamponade effect are less likely, enabling preservation of the blood flow.\(^\text{16}\) Moreover, intra-articular pressure increases significantly during internal rotation of the hip joint.\(^\text{12}\)

Concomitant capsular decompression can be considered during fixation of displaced intracapsular hip fracture to reduce the incidence of AVN or to delay its onset. Its effect in undisplaced fractures was insignificant. Further prospective randomised controlled studies are needed to verify the results.

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**Table 2**

Comparison of outcomes in patients undergoing screw fixation plus capsular decompression versus screw fixation alone (control group)

<table>
<thead>
<tr>
<th></th>
<th>Capsular decompression group</th>
<th>Control group</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displaced fractures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of patients developed AVN*</td>
<td>3/29 (10%)</td>
<td>9/26 (35%)</td>
<td>0.049(^\text{†})</td>
</tr>
<tr>
<td>Mean time to development of AVN (SD, range) [months]</td>
<td>18 (2, 16–20)</td>
<td>13 (2, 12–16)</td>
<td>0.007(^\text{†})</td>
</tr>
<tr>
<td>No. of unions</td>
<td>26/29</td>
<td>23/26</td>
<td>1.000(^\text{‡})</td>
</tr>
<tr>
<td>Mean time to union (SD, range) [months]</td>
<td>11 (2, 8–14)</td>
<td>11 (2, 8–14)</td>
<td>0.719(^\text{‡})</td>
</tr>
<tr>
<td>Undisplaced fractures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of patients developed AVN</td>
<td>4/70</td>
<td>5/76</td>
<td>0.828(^\text{†})</td>
</tr>
<tr>
<td>Mean time to development of AVN (SD, range) [months]</td>
<td>20 (2, 18–22)</td>
<td>18 (3, 16–22)</td>
<td>0.505(^\text{‡})</td>
</tr>
<tr>
<td>No. of unions</td>
<td>68/70</td>
<td>74/76</td>
<td>1.000(^\text{‡})</td>
</tr>
<tr>
<td>Mean time to union (SD, range) [months]</td>
<td>7 (2, 4–12)</td>
<td>8 (2, 4–13)</td>
<td>0.420(^\text{‡})</td>
</tr>
<tr>
<td>No. of AVN patients undergoing revision</td>
<td>7</td>
<td>14</td>
<td>0.123(^\text{§})</td>
</tr>
<tr>
<td>No. of non-union patients undergoing revision</td>
<td>5</td>
<td>5</td>
<td>0.961(^\text{§})</td>
</tr>
<tr>
<td>No. of complications</td>
<td>4/99 (1 infection, 2 back-out screws, 1 protruding screw)</td>
<td>4/102 (1 infection, 3 back-out screws)</td>
<td>1.000(^\text{†})</td>
</tr>
</tbody>
</table>

* AVN denotes avascular necrosis

† Fisher’s exact test

‡ Wilcoxon Mann-Whitney U test

§ Chi squared test

\(^\text{†}\) Student’s t test
REFERENCES