We reviewed, retrospectively, 65 patients who had undergone arthroscopic treatment for osteochondral lesions of the talus. The 46 men and 19 women with a mean age at operation of 34.25 years, were followed up for a mean of 3.5 years. The medial aspect was affected in 45 patients and the lateral aspect in 20. All the lateral lesions and 35 (75%) of the medial lesions were traumatic in origin. Medial lesions presented later than lateral lesions (3 v 1.5 years) and had a much greater incidence of cystic change (46% v 8%).

At follow-up, 34 patients had achieved a good result, and 17 and 14 fair and poor results, respectively. Of the 14 poor results, 13 involved medial lesions. Cystic lesions had a poor outcome in 53% of patients. Excision and curettage led to better results than excision and drilling of the base. Further arthroscopic surgery for patients with a poor result was disappointing. There was no association between outcome and the patient’s age.

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Osteochondral lesions (OCLs) of the talus occur in more than 6% of ankle sprains, between 16% and 23% of patients undergoing lateral ligament reconstruction and in 38% of patients with supination external rotation type IV ankle fractures.1-4 Osteoarthritis is reported subsequently in 8% to 48% of ankles.5,6

Berndt and Harty,7 in their 1959 paper, considered that the lesions represented transchondral fractures. Using above-knee amputation specimens, they demonstrated that anterolateral lesions could be produced by an inversion force on a dorsiflexed foot. Posteromedial lesions were produced by an inversion and internal rotation force on a plantar-flexed foot. From these experiments they classified the radiological changes into four stages: 1, subchondral compression; 2, partially detached; 3, completely detached and undisplaced; and 4, displaced. The advent of computerised tomography (CT) and magnetic resonance imaging (MRI) has shown this classification to be inadequate, as cystic lesions commonly occur.8,9 A modification of the Berndt and Harty7 radiological classification was made by Anderson et al10 in 1989 to include cystic change which they classified as 2b. Also, compared with MRI, radiographs are unreliable as OCL are frequently not seen on plain radiographs.8,9,11 Arthroscopic findings correlated poorly with the radiographic appearance.12 MRI has become the investigation of choice for assessing OCLs. We have reported an MRI classification which regarded cystic change as the highest grading as we considered that it corresponded to the most severe symptoms, represented the greatest therapeutic challenge and had the poorest outcome.9

Tol et al,13 in a systematic review of 32 studies, found that non-operative treatment or excision alone gave poor results, whereas both excision, curettage and drilling and excision and curettage alone led to good or excellent outcomes in 85% and 78% of ankles, respectively. There is no evidence available to verify a difference. Both techniques assume that stem cell migration from the marrow populates the fibrin clot within the defect, which converts to fibrous tissue and fibrocartilage.14,15 Although it is recognised that this is disorganised, it can survive for prolonged periods.15,16 Despite these satisfactory outcomes, several new techniques have been described including mosaicplasty, osteochondral autografts, allografts and autologous chondrocyte transplantation.17-22 Some have been used as a primary procedure, but the results to date are variable.

We have reviewed retrospectively all patients with an OCL of the talus, treated arthroscopically. Our aim was to assess the outcome and identify factors which predispose to a poor result.
Patients and Methods

Between 1993 and 2000, 65 patients underwent arthroscopic treatment of OCLs of the talus. There were 46 men (71%) and 19 women (29%). The mean age at operation was 34.25 years (14.1 to 72.4). The mean follow-up was 3.5 years (0.5 to 8.25). The right side was affected in 43 patients and the left in 22. There were 45 medial lesions of which 35 were traumatic and ten atraumatic and there were 20 lateral lesions all of which were traumatic.

Preoperative radiographs, which were available for all patients, were classified according to the criteria of Anderson et al into stage 1: subchondral with trabecular compression (eight patients; four medial and four lateral), stage 2: incomplete separation (ten patients; five medial and five lateral), stage 2a: subchondral cyst (19 patients; 18 medial and one lateral), stage 3: unattached, undisplaced fragment (18 patients; 15 medial and three lateral) and stage 4: displaced fragment (ten patients; three medial and seven lateral). The preoperative MR scans which were available for 48 patients, were classified according to the criteria of Hepple et al into grade 1: articular cartilage damage only, grade 2a: cartilage injury with underlying fracture and surrounding oedema of bone, grade 2b: cartilage injury with underlying fracture without surrounding oedema, grade 3: detached but undisplaced fragment, stage 4: detached and displaced fragment and grade 5 subchondral cyst formation. The difference in staging with MRI between medial and lateral lesions is shown in Figure 1 and demonstrates that 46% of medial lesions have cystic change, compared with only 8% of lateral lesions. Coronal MR scans were assessed for the extent of bone damage and cyst formation and graded according to the maximum percentage depth of involvement compared to the depth of the talus. There was no significant difference in staging of the traumatic and atraumatic medial lesions (Fig. 2) using MRI.

Clinical results were graded according to the criteria of Berndt and Harty into good (freedom from symptoms or slightly annoying), fair (improved, but some disability persists) and poor (symptoms unchanged or require a revision operation). The time from a preceding traumatic event to the time of presentation was recorded. If there was no clear history of trauma, the duration of symptoms was recorded. The Student’s t-test was used for statistical analysis.

Operative technique and protocol. The operation was undertaken under general anaesthesia and tourniquet control with the patient placed supine and a sand-bag under the upper thigh to flex the hip. We applied a non-invasive ankle distractor and used saline (20 ml) to inflate the joint. Either a standard anterior medial or anterior lateral portal was used, based on ease of access and the site of the presumed lesion. A limited anterior synovectomy allowed us to obtain a clear view. The medial midline portal, which is positioned between tibialis anterior and extensor hallucis longus, was only used if necessary. For MRI grades 1, 2 and 4, excision and drilling of the base was originally undertaken with any loose cartilage being removed back to a stable rim with punches and transmalleolar drilling. This was carried out in 22 ankles with a 1.4 mm Kirschner wire to a depth of 1 cm at intervals of 3 to 5 mm. We currently prefer to use excision and curettage alone because two patients returned with persistent medial pain following trans-malleolar drilling and had persistent malleolar oedema on MR scans several months after operation. One sustained a stress fracture through the site of drilling after he returned to heavy manual work.

We undertook excision and curettage to the base with a combination of a 3.5 mm Linvatec Cuda debrider and a curette until healthy cancellous bone appeared with punctate bleeding in 39 patients (Fig. 3). For MRI grade 3 lesions, following an assessment of the suitability for internal fixation, two Orthosorb pins were placed across the fragment in two patients. For grade 5 lesions, if no cartilage defect was found, a retrograde bone graft was used. This occurred in two cases. Careful examination of the joint surface usually revealed a defect in the surface. Bone grafting is not appropriate under these circumstances and an excision and curettage was undertaken. Following washing out and the introduction of marcaine (10 ml of 0.5%), the portals were closed and a wool and crepe bandage applied. Post-

Fig. 1
Comparison of MRI grade for 35 of the ankles with medial and 13 with lateral lesions.

Fig. 2
The percentage of traumatic and atraumatic lesions in the MRI grades.
operatively, patients were allowed to partially weight-bear for six weeks. Out-patient physiotherapy was required to mobilise the ankle and subtalar joints.

**Results**

Altogether, 34 patients (52.3%) achieved a good outcome, 17 (26.2%) fair and 14 (21.5%) poor. No patient with a fair outcome requested further treatment and none with a poor outcome became worse through operative intervention.

The age at operation was not related to the outcome. The mean age of those with a good outcome was 33.5 years (14.8 to 72.5), a fair outcome 36.3 years (14.1 to 67.75) and a poor outcome 33.6 years (15.25 to 65.8). Only two patients had open physes at the time of operation and one achieved a good and one a fair outcome.

The mean time to presentation of medial lesions was three years compared with 1.5 years for lateral lesions ($p < 0.05$). The median time to presentation related to the MRI grade is shown in Figure 4. This shows that grade 5 lesions presented after a significantly longer period than any other, the median time being 3.8 years. Grade 4 lesions (detached, displaced) had the earliest median presentation (1.2 years).

With respect to site, 21 of 34 good outcomes, 11 of 17 fair and 13 of 14 poor outcomes, involved medial lesions. There was no significant difference in outcome between traumatic (18 good, six fair and 11 poor) and atraumatic (three good, five fair and two poor) medial lesions. Atraumatic lesions had a higher proportion of fair outcomes. One cystic lateral lesion had a poor outcome, six had a fair and 13 a good outcome.

The outcome in relation to the MRI grade is shown in Figure 5. In grade 5 cystic lesions there was a poor outcome in 53% of patients. MR scans were only undertaken for 35 of 45 medial lesions; eight of 16 (50%) grade 5 lesions had a poor outcome compared with only two of 19 (11%) grade 1 to 4 lesions.
In cystic lesions, the outcome could not be related to the length of preoperative symptoms, associated lesions or the size of the lesion. Good and poor results occurred in extensive lesions affecting up to two thirds of the depth of the talus. Small lesions up to one quarter of the depth of the talus had an equally variable outcome. The numbers in these subgroups are insufficient to demonstrate significant differences.

Time to operation and outcome is shown in Table I, with 13 of 14 poor results occurring in those patients who had operations over one year from the onset of injury or symptoms. The results of operative intervention are also shown in Table I.

In 54 patients, 57 other abnormalities were found on arthroscopic examination; 30 had anterior synovitis, 13 had damage to the anterior talofibular ligament, six to the calcaneofibular ligament, one to the posterior talofibular ligament and seven to the anterior tibiofibular ligament. Eight patients had a meniscoid lesion which was resected, two had an os trigonum which was excised and two had decompression of the flexor hallucis longus. There was no association between those patients who had other abnormalities and outcome. Any instability requiring stabilisation was carried out at the time of surgery in order to prevent ongoing damage to the talus. In the 14 patients with a poor outcome, eight had further arthroscopic excision and curettage of which four have achieved a fair outcome, but four remain with a poor outcome. Three patients had ankle arthrodeses, two await further surgery (one for lateral ligament reconstruction) and one has been treated elsewhere by mosaicplasty which achieved a fair outcome.

**Discussion**

Our results confirm that OCLs of the talus more commonly affect men, in the right ankle, on the medial side. Lateral lesions are traumatic, whereas medial lesions may be atraumatic. It has previously been recognised that medial and lateral lesions differ morphologically with lateral lesions presenting as flat, discoid fragments and medial lesions presenting as more rounded and deeper. Lateral lesions are more liable to be displaced and so become symptomatic at an earlier stage. Our finding that lateral lesions presented earlier and comprised the greater number of grade 4 lesions would support this. The morphological appearance of medial and lateral lesions can be explained by the different forces that are necessary to produce them. Lateral lesions are produced by a tangential shear force across the talar dome, whereas medial lesions are caused by a more perpendicular force resulting in a deeper lesion which is unlikely to displace from its bed.

The cause of the cystic change could either be the severity of the original injury or progression of the lesion to a higher grade by intrusion of synovial fluid. Loomer et al found a very high incidence (77%) of cystic defects on CT, but they worked in a tertiary referral centre where the mean delay between onset of symptoms and diagnosis was three years. They found that the articular cartilage was almost always intact over the cyst and that it was often necessary to probe with a needle in order to locate the lesion. This is in contrast with our experience as we were almost always able to find a cartilage defect over a cystic lesion, although sometimes these were small and difficult to identify. With time there is some progression to a more severe pathological grade. Surprisingly, Alexander and Lichtman found that delay in operation does not affect the outcome, whereas others have found that lesions presenting more than one year after injury or the onset of symptoms had a poorer prognosis. The radiographic results are better when the interval between injury and operation is reduced. This suggests that early diagnosis and treatment is advisable.

We consider that, in patients with ankle injuries whose symptoms fail to settle within three months, an MR scan should be obtained as radiographs cannot be used to diagnose and stage OCL reliably. We do not know the natural history of these lesions and so overtreatment may occur in lesions which may heal and become asymptomatic. This is especially likely in stage 2a lesions with bony oedema.

**Table I.** Outcome and time to operation from traumatic episode or onset of symptoms, and the outcome following the different types of operative intervention

<table>
<thead>
<tr>
<th>Time to operation</th>
<th>Operative intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>&gt;1 year</td>
</tr>
<tr>
<td>Drilling</td>
<td>Curettage</td>
</tr>
<tr>
<td>Total number of patients</td>
<td>20</td>
</tr>
<tr>
<td>Outcome (number of patients)</td>
<td>Good</td>
</tr>
<tr>
<td>Good</td>
<td>14</td>
</tr>
<tr>
<td>Fair</td>
<td>5</td>
</tr>
<tr>
<td>Poor</td>
<td>1</td>
</tr>
</tbody>
</table>

Outcome according to MRI grade following arthroscopic treatment of 48 patients with osteochondral lesions of the talus.

![Fig. 5](image)
this situation follow-up MRI is required in patients with persistent symptoms.

We, and others, have had disappointing results after revision arthroscopic excision and curettage. Many techniques have recently been reported which could be used in this situation, especially mosaicplasty. Hangody et al. reported that of 36 operations, 29 of which were revisions, 28 had an excellent, six a good and two a moderate outcome at a mean of 4.2 years with no apparent long-term donor site morbidity in the knee. This technique is technically demanding and we have concerns that a normal joint could be violated. Giannini et al. used autologous chondrocyte transplantation as a primary procedure in eight patients with medial and lateral lesions and all had a good outcome.

Grade 1 to 4 lesions respond well to arthroscopic management and this should be the first line of surgical treatment. Although grade 5 lesions respond less favourably, we were unable to identify any factor, beyond the presence of cystic change, which would predict a poor outcome after arthroscopic treatment. A lesion 1 cm in diameter is often empirically taken as a cut-off point for arthroscopic treatment, but we have had good outcomes in larger lesions. Arthroscopic excision and curettage does not prejudice any open surgery necessary after a poor outcome.

The cause of atraumatic medial lesions is not known. It is recognised that major stresses are imposed on the medial talar dome of the normal ankle and that repetitive micro-trauma may lead to osteochondritis in susceptible individuals. We found no difference in the stage of lesions which were of traumatic or atraumatic origin and there was no significant difference in the outcome of treatment of these lesions. Nevertheless, atraumatic lesions had a lower percentage of good results (30%) than traumatic lesions (51%), as others have also found. Age was not a prognostic factor.

Although Tol et al. in their review of the literature, could find no significant difference between excision and curettage and excision, curettage and drilling, we clearly found that the use of drilling led to inferior results with 36% having a poor outcome compared with 13% for excision and curettage alone. The effect of both treatments is to debride the lesion and allow bleeding from the base. As this can be done with curettage alone, there is no need to violate the normal structure of the medial malleolus to achieve this. Although our results are not as good as those found by Tol et al., this is explained by the late presentations and high percentage of stage 5 lesions.

Our arthroscopic findings emphasise that an OCL often follows an ankle injury with ligamentous damage and it cannot be viewed in isolation as there will be other associated damage to the joint.

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