Conservative treatment of isolated fractures of the medial malleolus

Between 1992 and 2000, 57 patients with 57 isolated fractures of the medial malleolus were treated conservatively by immobilisation in a cast. The results were assessed by examination, radiography and completion of the short form-36 questionnaire and American Orthopaedic Foot and Ankle Society ankle-hindfoot score.

Of the 57 fractures 55 healed without further treatment. The mean combined dorsi- and plantar flexion was 52.3˚ (25˚ to 82˚) and the mean short form-36 and American Orthopaedic Foot and Ankle Society scores 48.1 (28 to 60) and 89.8 (69 to 100), respectively. At review there was no evidence of medial instability, dermatological complications, malalignment of the mortise or of post-traumatic arthritis.

Isolated fractures of the medial malleolus can obtain high rates of union and good functional results with conservative treatment. Operation should be reserved for bi- or trimalleolar fractures, open fractures, injuries which compromise the skin or those involving the plafond or for patients who develop painful nonunion.

Fractures of the ankle occur at a rate of 187 per 100 000 person-years.1 There is concern that a non-operative approach may fail to produce an anatomical reduction of the mortise, leading to instability and post-traumatic arthritis of the ankle.2 It is therefore usually recommended that these injuries be treated by operation in order to obtain and maintain an anatomical reduction of the ankle.3,4 Although studies have shown good outcomes using non-operative treatment,5,7 this approach is currently reserved for patients in whom the fractures are not displaced, those whose medical comorbidities preclude surgical intervention, those who refuse surgery or, most often, as an intermediate step, used to stage displaced fractures until the soft-tissue envelope has sufficiently stabilised to allow operation. It has been feared that even if an anatomical reduction of the mortise is achieved without operation, the instability produced from the fracture and its associated soft-tissue injuries will ultimately lead to late subluxation of the ankle and an unacceptable result.3,8-10

Instability of the ankle may result from injuries affecting both the medial and lateral columns. However, fractures presenting as isolated injuries to the medial, lateral or posterior malleolus may be associated with no instability on physical examination and an anatomical appearance of the mortise on a radiograph. Even if displacement of the mortise can be shown using stress radiography, these injuries have a good outcome when managed conservatively.11 Displaced unmalleolar fractures are high-energy injuries and often require surgical management to obtain a good outcome.3,8-10 However, in the absence of displacement of the mortise, operation may not be necessary. The recommendation that a displaced fracture of the medial malleolus should be treated surgically is often related to its presentation in bi- or trimalleolar injuries (International Classification of diseases (ICD-9) codes 824.4 and 824.6).12 Since these are articular injuries it is suggested that surgery can produce higher rates of union, an earlier return to work or recreational activities, avoid prolonged periods of immobilisation and prevent any residual displacement which may lead to the development of post-traumatic arthritis of the ankle. However, there are no large series which discuss the acute management of isolated injuries to the medial malleolus. We have therefore evaluated the outcome of patients with isolated fractures of the medial malleolus who were managed conservatively.

Patients and Methods
Our study was submitted to and approved by the Institutional Review Board at the University of South Florida as a retrospective review.
Between January 1, 1992 and December 31, 2000, 132 patients with an isolated fracture of the medial malleolus were identified in the orthopaedic trauma registry at this level one-trauma centre. Selection was not based on the amount of initial displacement. All were managed conservatively. Exclusion criteria were open fractures in six patients, open growth plates in four, incorrect identification in the registry of either a fracture of the fibula in eight or a bi- or trimalleolar injury in 11, subluxation or tilting of the talus in four, infection in two, neoplasms in one, injuries extending into the tibial plafond in 15, peri-malleolar skin lesions precluding closed treatment in three, previously treated fractures in two or acute fractures managed operatively by other surgeons in nine.

This left 67 patients with 67 fractures. Seven died from their trauma or from other causes and three refused to return for review, leaving 57 patients available for evaluation. The mean age of the 24 females and 33 males was 39.7 years (17 to 69), with all the injuries resulting from either a motor-vehicle accident, a fall or as a result of a sporting accident.

**Classification and treatment.** The classifications of Müller et al.,10 and Pankovich and Shivaram13,14 were modified to group the fractures into four simple patterns. Type-A fractures were avulsions of the tip of the malleolus, type-B occurred between the tip and the level of the plafond, type-C were at the level of the plafond and type-D extended vertically above this level (Fig. 1). An injury was identified using plain radiography and if impaction was suspected, CT scans were undertaken to confirm that the injury was an isolated fracture. Displacement was measured from the anteroposterior or mortise view which demonstrated the greatest gap.

Treatment consisted of a short-leg non-weight-bearing cast, with the foot in slight inversion, for six weeks, with radiographs taken at two, four and six weeks to monitor the position of the mortise and the fracture. The patients were then placed in walking boots and began physiotherapy. They were followed for a minimum of two years. Final assessment including physical examination and radiography was undertaken by an author (JMS) who had not been involved in the treatment of the patients. Functional
assessment was by the general health status scale of the short-form-36 (SF-36) and the American Orthopedic Foot and Ankle Society (AOFAS) ankle-hindfoot scores.

Results

There were 11 type-A, 6 type-B, 29 type-C and 11 type-D fractures which were followed for a mean of 35.6 months (26 to 86). A total of 55 (96%) fractures united. At the final follow-up, the mean range of movement was 52.3˚ (25˚ to 82˚) of combined dorsi- and plantar flexion. The mean general health SF-36 score was 48.1 (28 to 60) and the AOFAS score 89.8 (69 to 100). There were no patients with medial instability, dermatological complications, radiological displacement, or malalignment of the mortise and no evidence of post-traumatic arthritis. Two cases of nonunion occurred in the type-C fractures.

Of the 11 (19%) type-A fractures (Fig. 2) seven had resulted from a motor vehicle accident and four from a fall, with a mean initial displacement of 2.8 mm (1 to 7). The mean follow-up in these patients was 31.8 months (28 to 57) and all showed radiological union. The mean range of movement was 47.2˚ (25˚ to 68˚) of combined dorsi- and plantar flexion. The mean SF-36 general health score was 52.9 (41 to 60) and the mean AOFAS score 92.3 (73 to 100).

All except one of the six (11%) type-B fractures (Fig. 3) were sustained in a motor vehicle accident. The remaining one was the result of a fall. The mean initial displacement was 3.9 mm (1 to 6) and the mean follow-up 39.5 months (25 to 68). All the fractures united. The mean range of movement was 54.1˚ (36˚ to 70˚) of dorsi- and plantar flexion with a mean SF-36 health score of 38.8 (28 to 53) and an AOFAS score of 77.2 (69 to 100).

There were 29 type-C fractures (51%) (Fig. 4). The mechanism of injury was a motor vehicle accident in 18 and a fall in 11, with a mean initial displacement of 4.7 mm (1 to 11). Patients were followed for a mean of 38.7 months (32 to 86) with 27 fractures uniting satisfactorily. The two nonunions had presented with displacement of 3 mm and 4 mm, respectively. They were secondary to falls and neither showed evidence of radiological union at six and eight months, respectively. Both patients had pain and tenderness over the medial malleolus. At operation, fibrous nonunion was seen. Open reduction and bone grafting were carried out and union was achieved by four months in both cases. In the remaining 27 patients, the mean range of combined dorsi- and plantar flexion was 53.3˚ (26˚ to 82˚) with a mean SF-36 general health score of 46.4 (41 to 59) and an AOFAS score of 96.1 (69 to 100).
There were 11 type-D fractures (19%) (Fig. 5), four from a motor vehicle accident and the remainder from a fall. The mean displacement was 2.2 mm (1 to 5) and patients were followed for a mean of 32.4 months (26 to 46). All the fractures united and the mean range of movement was 58.5° (36° to 61°) of dorsiflexion and plantar flexion. The mean SF-36 score was 54.2 (48 to 60) and the mean AOFAS score 93.8 (78 to 100).

Discussion

When discussing injuries to the ankle it is important to distinguish a stable unimalleolar injury from a bi- or trimalleolar fracture. There may be an associated ligamentous injury,17 with an unstable ankle mortise which can be identified either on plain films or with intra-operative stress tests.11,18 However, a stable unimalleolar injury does not produce disruption of the mortise, as was shown in our series even with large, displaced fragments. Since there was no displacement of the mortise and the fibula was intact, an undiagnosed ligamentous injury, if present, would have been expected to have had a similar outcome to that in patients with isolated ligamentous injuries of the ankle.

There have been numerous papers discussing the medial malleolus/deltoid ligament complex and its importance for stability of the ankle,19 its relationship to bi- and trimalleolar fractures,20-22 the load and pressure distribution exerted on the central and posterior malleolar regions during weight-bearing,23-26 and the weight-bearing function of the fibula.27 When assessing the pattern of load-bearing it has been shown that the area of contact begins at the anterolateral and postero medial regions of the dome of the talus and, with increasing loads, migrates towards the centre, so that during weight-bearing almost 90% of loading is to the central part of the dome, with the remainder applied to the medial and lateral facets.24-26 Case reports of long-term studies of patients in whom the medial malleolus has been removed following trauma have shown that they were able to maintain an anatomical reduction of the ankle with little limitation of function,28,29 indicating that the role of the medial malleolus as a bony restraint and its importance to the overall load-bearing surface of the ankle may have been overemphasised.

There have been previous studies of painful nonunion and the development of post-traumatic arthritis of the ankle.20-22 Sneppen22 noted the presence of osteoarthritis in 45% of 119 ununited fractures of the medial malleolus. However, his study failed to differentiate patients who presented with isolated injuries to the medial malleolus from those who sustained bi- or trimalleolar fractures, and an explanation for this large number of cases of nonunion may be the presence of a degree of malunion, no patient had any radiological displacement or malalignment of the mortise, indicating that an anatomical reduction may be more important for a good outcome than any residual malunion of a conservatively-treated fracture.

Our study has shown that conservative management of isolated fractures of the medial malleolus is an effective method which can produce high rates of union and a good outcome. We feel that the operative management of patients presenting with a fracture of the medial malleolus should be reserved for bi- or trimalleolar injuries of the ankle, open fractures, injuries which compromise the skin or those involving the plafond, and for those patients who present with the development of painful nonunion.

Supplementary Material

A further opinion by Mr James Calder is available with the electronic version of this article on our website at www.jbjs.org.uk

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


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