



MINI-SYMPOSIUM: THE FOOT

(ii) The hindfoot: Calcaneal and talar fractures and dislocations—Part I: Fractures of the calcaneum

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Summary While extra-articular calcaneal fractures are usually treated simply with good results, the management of intra-articular calcaneal fractures remains controversial. Despite advances in surgical techniques and a good understanding of possible complications making operative treatment relatively 'safe', doubts remain about the efficacy of surgery in reducing the two main problems of persistent pain and subtalar osteoarthritis. Further randomised controlled trials may be required to confirm or refute the potential benefits of surgery.

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Introduction

The calcaneum is the most frequently injured tarsal bone comprising 1–2% of all fractures and about 75% of those affecting the foot. The management of calcaneal intra-articular fractures and dislocations, particularly surgical, remains highly controversial. There have been significant advances in relation to understanding the fracture mechanism,¹ classification,² surgical approaches,³ operative techniques and the management of the soft tissues before, during and after surgery.⁴ A recent study has given some support to surgery⁵ particularly in Sanders

grade II and, to a lesser extent, grade III fractures, but some reservations have been expressed.

Fracture patterns and mechanism

Calcaneal fractures may be either extra-articular (25%) or intra-articular (75%). The fracture pattern is dependent on:

- the direction and amount of force applied,
- the position of the foot relative to the ankle,
- the neuromuscular system,
- the bone quality, which may be affected by the patient's age.

Extra-articular fractures

These usually affect the anterior process, the calcaneal tuberosity, the body of the calcaneum

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(not involving the subtalar joint) or, rarely the sustentaculum tali. They are generally simple injuries which may be treated conservatively but some may require further investigation and surgery.

Anterior process fractures

There are two principle types of anterior process fracture:

- affecting the upper and lateral part of the lateral process with simple avulsion of the bifurcate ligament. Conservative treatment is usually appropriate.
- a larger intra-articular fracture affecting the calcaneocuboid joint due to forced abduction of the forefoot or eversion in dorsiflexion resulting in compression.⁶ This may be associated with intra-articular fractures of the subtalar joint and should be investigated by CT scan with a view to operative treatment. These are easily missed and may cause long-term discomfort.

Fractures of the body

These are generally simple fractures involving the posterior and inferior parts of the body lying behind the posterior facet of the subtalar joint. They are normally conservatively treated and have a good prognosis, but occasionally the heel pad is affected, which may give rise to more protracted symptoms and require further treatment.

Fractures of the calcaneal tuberosity

The foot is in plantarflexion at the time of the injury with the force going directly upwards through the tuberosity, resulting in avulsion of the tendo Achilles or a fracture of the medial process. The fracture line runs from a point inferior to the posterior facet of the subtalar joint a variable distance into the body. Undisplaced fractures are satisfactorily treated in an equinus below knee cast, an anterior equinus slab or a functional brace but displaced fractures require open reduction and internal fixation. This can be quite difficult in the occasional case presenting late.

Intra-articular fractures

These form the vast majority of calcaneal fractures and are a significant challenge. From the patient's

perspective, the aims should be:

- adequate pain relief both immediately and in the longer term,
- adequate restoration of subtalar joint function,
- early return to work,
- reduction of the risk of long-term subtalar osteoarthritis.

History and examination

Such fractures usually follow falls from a height greater than 2 m and are most commonly unilateral.⁷ They may be associated with more proximal injuries, particularly lumbar fractures and are sometimes seen in polytrauma patients, often with associated talar fractures or dislocations.⁸

With compression, the longitudinal arch may be reduced or abolished with broadening of the hindfoot. Bruising laterally or on the plantar surface of the foot after 24–48 h (Fig. 1) may be associated with the development of blisters and occasionally compartment syndrome. Open fractures, with or without dislocation, are rare.

Radiography

Properly performed plain radiographs can yield as much information as more complex investigations. They should include an AP view of the foot and ankle, a lateral views of the ankle and calcaneum and an axial view. Brodens views taken either preoperatively or intraoperatively with the foot internally rotated 45° and inclined 10°, 20°, 30° and 40° to the posterior facet give an excellent view of the subtalar joint.

Bohler's angle, formed by the intersection of lines drawn from the posterior tuberosity and anterior process should be measured. It is normally 25–40° (Fig. 2). Gissane's angle should also be



Figure 1 Skin bruising.

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