Common injuries of the foot and ankle

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INTRODUCTION

This article is aimed at accident and emergency and orthopaedic senior house officers. It emphasizes key points of the safe initial management of common foot and ankle injuries.

The adage that a fracture is a soft tissue injury around a broken bone is particularly relevant to safe management of many foot and ankle fractures. The foot and ankle often bear the brunt of high velocity trauma and failure to acknowledge the extent of the soft tissue injury will inevitably lead to suboptimal results. When considering fixation of fractures of the ankle, tibial plafond, os calcis and tarsometatarsal fracture dislocations (Lisfranc fractures), the timing of surgery and extent of the surgical procedure are determined as much by the state of the soft tissues as by the configuration of the broken bones.

PILON FRACTURES

These are high velocity compression injuries involving the tibial plafond. They are associated with severe accompanying soft tissue trauma including compartment syndrome. The prognosis depends largely on the extent of damage to the articular surface at the time of injury – more comminuted fractures have the poorest prognosis. Surgical management aims to maximize articular congruency of the plafond while preventing further soft tissue trauma and infection. Chronic osteomyelitis in these injuries caused by injudicious surgery may necessitate below-knee amputation.

Initial management aims to temporarily stabilize the fracture to prevent additional soft tissue trauma. Methods of temporary stabilization include external fixation across the ankle, skeletal traction with an os calcis Steinman pin, and plate fixation of an associated distal fibular fracture (*Figure 1*).

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Computed tomography (CT) with three-dimensional reconstructions is useful in delineating the fracture configuration, especially in more comminuted injuries. Definitive surgical management is considered after up to 2 weeks rest and elevation if, after CT imaging, the fracture is deemed reconstructable and the soft tissues will allow safe surgery.

These injuries may defeat the most able of trauma surgeons and the patient must be made aware at an early stage of the potential for serious disability.

TALAR NECK FRACTURES

These fractures are usually the result of forced dorsiflexion of the ankle, causing impingement of the talar neck on the anterior tibial plafond and propagation of the fracture line through the talar neck. The significance of these injuries is their association with avascular necrosis of the body of the talus (Canale and Kelly, 1978). This is caused by disruption of the retrograde blood supply to the talar body by the fracture, with the risk of osteonecrosis being strongly correlated to the extent of fracture displacement. Conservative treatment in a non-weight-bearing plaster cast is only an option for undisplaced fractures. Open reduction and internal fixation is recommended for even minimally displaced fractures to optimize the potential for revascularization of the talar body across the fracture site.

Figure 1. Pilon fracture with associated fibular fracture, temporarily stabilized with a fibular plate.

In the most severe cases the body fragment is dislocated from the ankle mortise and may compress the posteromedial neurovascular structures. These fractures require urgent open reduction and internal fixation and have a risk of avascular necrosis approaching 100%.

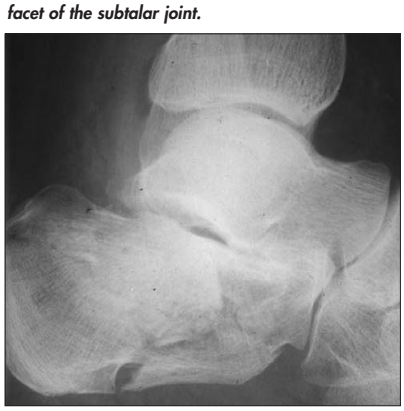
OS CALCIS FRACTURES

These fractures result from high velocity trauma and falls from height (*Figure 2*). Initial management aims to recognize associated injuries, in particular fractures of the thoracolumbar spine.

The decision to operate on os calcis fractures seems to polarize orthopaedic surgeons more than any other fracture, and there is no evidence from prospective randomized trials that surgical intervention improves outcome. Many use this to justify treating all os calcis fractures conservatively, especially as internal fixation has a reputation for infective complications. However, the situation is not that simple and a number of large studies on internal fixation (Sanders et al, 1993; Zwipp et al, 1993) suggest that better results are achieved in patients in whom anatomical reduction of the subtalar joint is obtained.

Plain X-rays including an axial view give limited information as to the fracture configuration and a CT scan is recommended for patients being considered for surgery. Internal fixation should be considered if the CT scan shows two or

Figure 2. Os calcis fracture involving the posterior facet of the subtalar joint.



at most three fracture fragments of the posterior facet of the subtalar joint with joint incongruity and depression. Internal fixation should probably not be attempted in fractures more comminuted than this, or in low demand patients. Bed rest with elevation for up to 2 weeks is often required before surgery to allow the soft tissue injury to subside.

TARSOMETATARSAL FRACTURE DISLOCATIONS

These less common injuries are easily missed, especially when tarsometatarsal complex disruption is solely the result of ligamentous injury. There is usually a history of axial compression of the fixed forefoot or a crush injury. A Lisfranc injury should be excluded if there is diffuse forefoot swelling following trauma.

Anteroposterior, lateral and oblique X-rays of the foot should be requested and closely studied. On the anteroposterior film the lateral borders of the second metatarsal and the intermediate cuneiform should form a continuous line. On the oblique film the medial borders of the fourth metatarsal and the the cuboid should form a continuous line (*Figure 3*). A significant ligamentous injury is present if either of these lines are disrupted. A CT scan is recommended, then open reduction and internal fixation with temporary screws and wires when soft tissue swelling allows.

ACHILLES TENDON RUPTURE

Achilles tendon ruptures are common, particularly in men in their 30s and 40s. The classical scenario is a 40-year-old man not used to regular exercise, playing football or squash. Often he starts playing without stretching beforehand. While running he experiences sudden severe pain in the distal calf and often describes turning around to see who has struck into him. Most ruptures occur in the midsubstance of the tendon where there is a watershed in the proximal and distal blood supply to the tendon.

Figure 3. Anteroposterior and oblique radiographs showing a Lisfranc injury.

These common injuries are still missed, resulting in the tendon healing in a lengthened position, affecting gait and making running extremely difficult.

A careful history is essential, with diagnosis confirmed by clinical examination. The patient must be examined prone. The swelling around the ruptured tendon is usually obvious when compared to the contralateral leg. On the normal side the ankle is held in about 20º of plantar flexion. This attitude is lost following a ruptured Achilles tendon (*Figure 4*). On palpation a gap in the tendon is usually apparent. Simmonds test is performed by squeezing the calf and looking for a loss of plantar flexion compared to the same test on the normal calf.

There is still disagreement about how best to treat these injuries. Re-rupture rates for surgically repaired tendons are 2–3% compared to 10–15% for those treated conservatively in a plantar flexed cast (Cetti et al, 1993). There is also evidence that a surgically repaired tendon affords stronger plantar flexion and hence propulsion. Proponents of conservative management argue that it has no risk of infective complications, compared to a small risk of wound dehiscence post-surgery which can be very difficult to treat and often renders the patient far more disabled than if conservative treatment had been used. Surgical repair is recommended in patients regularly involved in running or jumping sports. In others the risks and benefits of each treatment should be discussed and the patient will often decide how he/she wishes to be treated. Surgical treatment is also recommended for patients presenting more than 24 hours after injury as the haematoma formed at the rupture site impairs tendon apposition and these tendons inevitably heal with some lengthening.

Figure 4. Loss of plantar flexed attitude in left Achilles tendon rupture.

THE 'SPRAINED' ANKLE

Injury to the lateral ligament complex following forced inversion of the ankle is the commonest soft tissue injury of the foot and ankle. The ankle is swollen and tender over the origin of the anterior talofibular ligament from the anterior aspect of the lateral malleolus, and in more severe sprains also over the calcaneofibular ligament; the lateral malleolus remains relatively non-tender.

While X-ray of these ankles is not mandatory careful clinical assessment is needed to exclude fractures which may mimic the sprained ankle. Avulsion fractures of the base of the fifth metatarsal can be excluded by palpation of this bony prominence on the lateral border of the foot. Avulsion fractures of the anterior process of the os calcis can be felt by palpating a thumb's breadth proximally and superiorly to the base of the fifth metatarsal. Fractures of the lateral process of the talus present with most tenderness about a finger's breadth anterior to the lateral malleolus at the insertion if the anterior talofibular ligament. When any of these signs are present X-rays of the ankle and foot are mandatory. HM

Canale ST, Kelly FB (1978) Fractures of the neck of the talus: Long-term evaluation of seventy one cases. *J Bone Joint Surg* **60A:** 143–56

Cetti R, Christensen SE, Ejsted R, Jensen NM, Jorgensen U (1993) Operative *vs* nonoperative treatment of Achilles tendon rupture. A prospective randomized study and review of the literature. *Am J Sports Med* **21**(6): 791–9

Sanders R, Fortin P, DiPasquale T, Walling A (1993) Operative treatment in 120 displaced intraarticular calcaneal fractures: results using a prognostic computed tomography scan classification. *Clin Orthop* **290:** 87–95

Zwipp H, Tscherne H, Thermann H, Weber T (1993) Osteosynthesis of displaced intraarticular fractures of the calcaneus. Results in 123 cases. *Clin Orthop* **290:** 76–86