Fractures of the ankle

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INTRODUCTION

This article is aimed at accident and emergency and orthopaedic senior house officers. While this review is not exhaustive, it attempts to emphasize some key points as an aid to the safe initial management of ankle fractures as they are such common injuries, whose management can be more clearly understood by the application of basic principles.

ANKLE FRACTURES

The ankle should be thought of as a two-column structure. The key issue when assessing an ankle fracture is whether or not the fracture is stable because, in general, internal fixation is the treatment of choice for unstable fractures. If both columns of the ankle are injured the fracture is by definition unstable. The medial column comprises the medial malleolus and the deltoid ligament. The lateral column comprises the lateral malleolus, the anterior and posterior tibiofibular (syndesmotic) ligaments and the interosseus membrane. Appreciation of the injured soft tissue components is as important as the assessment of the fractures in determining the fracture stability and hence the likely need for operative intervention.

Classification systems

The two commonly used classification systems for ankle fractures, Weber (1966) and Lauge-Hansen (1950), are both problematic in determining fracture stability. The Weber classification refers to the lateral malleolar fracture only and does not take into account either the soft tissue injury or a fracture to the medial malleolus. The Lauge-Hansen system is anatomically accurate and clearly delineates all components of the injury. Unfortunately it is regarded as too unwieldy by many trauma surgeons. However, certain key points can be distilled from Lauge-Hansen and incorporated into the Weber system to allow an accurate description of the injured structures in the majority of cases.

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Weber type A injuries

Weber type A injuries are those in which the lateral malleolus is fractured at the level of or distal to the ankle joint. These occur when the talus is forcibly adducted in the ankle mortise, causing an avulsion fracture of the lateral malleolus. These are stable injuries and can usually be treated in a weight-bearing cast. In more severe injuries of this type further adduction of the talus leads to a vertical impaction fracture of the medial malleolus. Internal fixation is recommended for these bicolumn injuries, which have a significant incidence of non-union and malunion of the medial malleolar fracture.

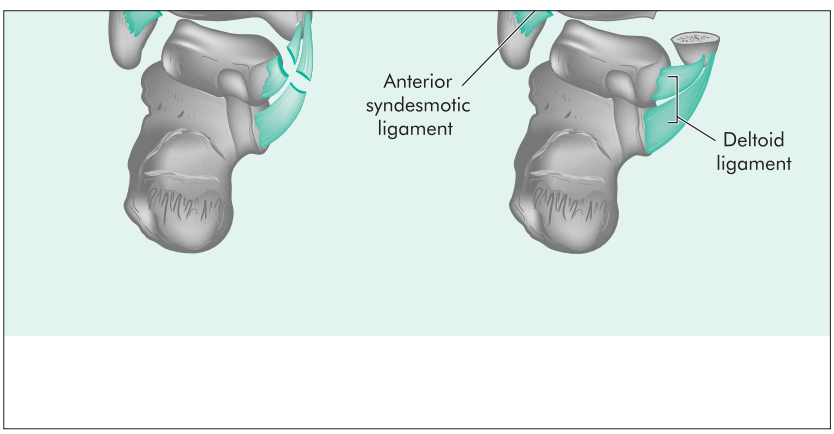
Weber type B injuries

Weber B fractures are those which occur at the level of the syndesmotic ligaments just proximal to the ankle joint. The fracture line runs obliquely in the same direction as the plantarflexed foot on the lateral X-ray (*Figure 1*). These are rotational injuries that occur in a circumferential direction around the ankle, commencing at the anterior syndesmotic ligament and proceeding through the lateral malleolar fracture. These are stable single column injuries.

In more severe fractures of this type the injury continues around the ankle tearing the posterior syndesmotic ligament or fracturing the posterior malleolus before exiting through the medial column in the form of either a transverse medial malleolus fracture or a deltoid ligament tear (*Figure 2*). These are unstable bicolumn fractures that usually require internal fixation. When the deltoid ligament is torn leaving the medial malleolus intact, the fracture is equally as unstable as the more dramatic looking bimalleolar fracture. Close inspection of the X-ray may reveal an increase in the medial clear space as the talus shifts laterally (*Figure 3*). This can only occur if the

Figure 1. Unstable Weber B fracture of lateral malleolus with injury to deltoid ligament.

Figure 2. Diagramatic illustration of unstable Weber B fracture.

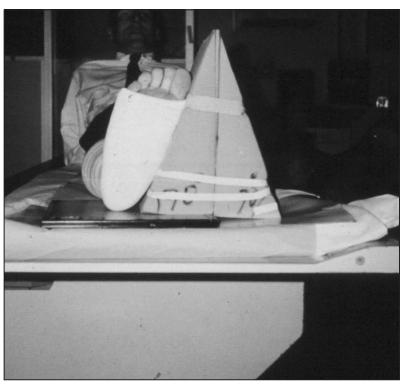


deltoid ligament has been disrupted. Hence assessment of bruising, swelling and deltoid tenderness in a Weber B fracture is vital.

Weber B fractures without injury to the medial column are stable injuries requiring a weight-bearing cast only, providing there are only a few millimetres of fracture displacement and the ankle mortise is intact (Joy et al, 1974). An anteroposterior ankle view does not adequately demonstrate the ankle mortise which in most people is externally rotated about 20º from the sagittal plane. A mortise X-ray in which the leg is internally rotated about 20º should always be requested (*Figure 4*).

Figure 3. Unstable Weber B lateral malleolar fracture with lateral talar shift secondary to disruption of deltoid ligament.

Figure 4. Positioning for mortise anteroposterior radiograph.



Weber type C injuries

Weber C fractures (*Figure 5*) are those in which the fibular fracture occurs proximal to the syndesmosis. The large majority of these injuries are caused by forced abduction or pronation of the talus within the ankle mortise. These are unstable bicolumn injuries commencing with either a deltoid ligament disruption or medial malleolus avulsion fracture and proceeding through the syndesmotic ligaments and interosseous membrane before exiting through the fibula fracture sometimes as proximally as the fibula neck in the case of the Maisonneuve fracture.

One of the main issues with these injuries is diastasis of the ankle as a result of rupture of the syndesmotic and interosseous ligaments. This leads to unstable separation of the lateral malleolus from the ankle mortise. This may not be apparent on an anteroposterior mortise radiograph which may appear normal. In this situation examination under anaesthesia is necessary to determine the presence of diastasis, which can be stabilized with a diastasis screw at the level of the syndesmosis giving the syndesmotic ligaments and interosseous membrane a chance to heal. Internal fixation is required for most type C fractures.

Management issues

Fracture dislocations of the ankle should be regarded as a relative emergency and reduced immediately in the emergency room before obtaining X-rays. The subluxation or dislocation of the talus from the ankle mortise is almost always in a lateral direction causing tenting of the skin over the medial malleolus which may or may not be fractured. If left in this position for a matter of a few hours, pressure necrosis of the skin occurs with all its associated consequences such as osteomyelitis.

Figure 5. Bimalleolar Weber C fracture.

In the majority of cases the direction of an ankle fracture dislocation is lateral. The dislocation is reduced under the appropriate sedation, e.g. morphine plus gas and air. Reduction is obtained by firmly pushing the lateral malleolus in a medial direction until the talus feels as if it has relocated in the mortise and the ankle looks straight clinically. At this stage any medial skin tethering should have been relieved. The reduction is then maintained by applying a substantial plaster backslab with an additional plaster 'stirrup' around the malleoli. A medial moulding force is applied to the plaster to prevent subsequent re-subluxation of the talus.

All ankle fractures have a propensity to swell quickly and should be elevated, splinted and, if possible, iced to enable early surgery. As a rule, after a period of 6–12 hours the ankle often becomes too swollen to permit safe surgery and a period of 4–5 days of elevation is required before surgical intervention.

CONCLUSION

When dealing with an ankle fracture in the accident and emergency department the first priority is to establish if a subluxation or dislocation is present, and perform an immediate reduction. The second priority is to establish if the fracture is unstable. The prognosis for an unstable ankle fracture is partly determined by the ability to maintain the ankle mortise in its anatomical position. For this reason internal fixation remains the treatment of choice for the majority of unstable fractures. HM

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Lauge-Hansen N (1950) Fractures of the ankle: II. Combined experimental-surgical and experimental-roentgenologic investigations. *Arch Surg* **60:** 957–85

Weber BG (1966) *Die Verletzungen des Oberen Sprunggellenkes:Aktuelle Probleme in der Chirurgie.* 2nd edn. Verlag Hans Huber, Bern