The clinical anatomy of examination of the ankle

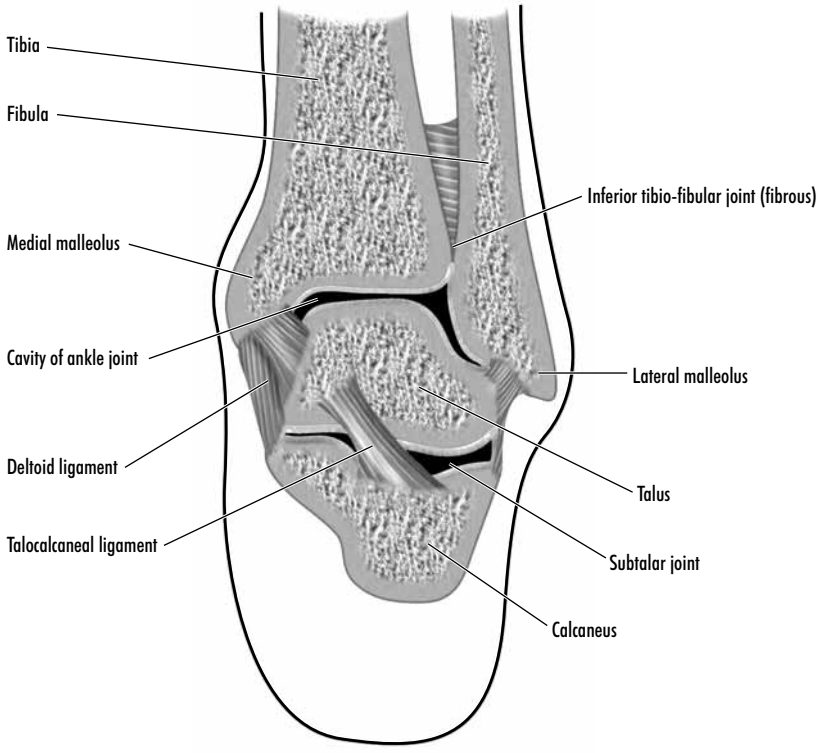


Figure 1. The ankle in coronal section.

Injuries of the ankle are extremely common. Indeed, most people at some time or other have sustained such an accident, which may range from a minor sprain (a partial ligamentous tear) to a major fracture-dislocation. Accurate clinical assessment of the injury depends on an accurate knowledge of ankle anatomy.

Anatomy

The ankle joint is a synovial hinge joint, that is to say it allows only the movements of extension (often, and rather confusedly, termed 'dorsiflexion') and flexion (often termed 'plantarflexion'). The weight-bearing surfaces of the joint are the inferior articular facet at the distal end of the tibia and the superior trochlear facet on the body of the talus (*Figure 1*). The stabilizing surfaces of the joint are formed by the medial malleolus of the tibia and the lateral malleolus of the fibula, which articulate respectively with the comma-shaped articular facet on the medial side of the body of the talus, and a larger, triangular-shaped facet on its lateral side. These articular surfaces are covered with hyaline cartilage. The joint is enclosed in a capsule, which is lined with synovial membrane.

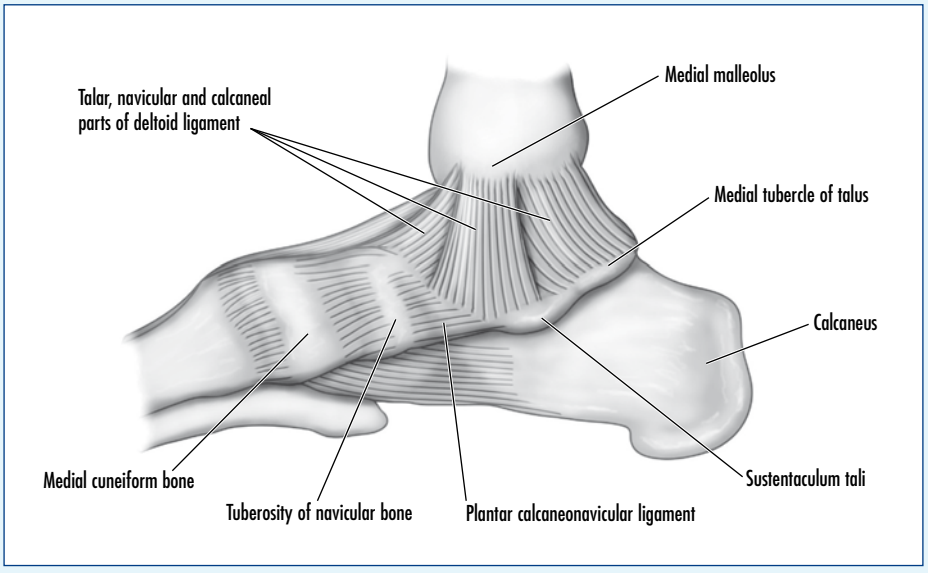
As with every hinge joint in the body, there are powerful medial and lateral collateral ligaments, which are essential in order to prevent side-to-side tilt, and only weakly reinforcing anterior and posterior ligaments. The medial collateral (deltoid) ligament (*Figure 2*) fans downwards from the tip of the medial malleolus to the navicular in front, then to the spring ligament, then the sustentaculum tali of the calcaneus and then, posteriorly, to the medial tubercle of the talus.

The lateral collateral ligament (*Figure 3*) is made up of three bands. As this structure is the most commonly injured of all the parts of the ankle, its details are of some importance:

The anterior tibio-fibular ligament joins the tip of the lateral malleolus to the neck of the talus. Flex your ankle and forcibly invert your foot – this is the position of the foot in the commonest twisting ankle injury and it is this ligament which is the most likely to be torn. Indeed, this is commonly the only part of the ankle to be damaged in a partial tear.

The calcaneofibular ligament is a cord-like strand that passes from the tip of the lateral malleolus downwards and backwards to the lateral surface of the calcaneus.

Figure 2. Medial aspect of the ankle joint to show the deltoid ligament.



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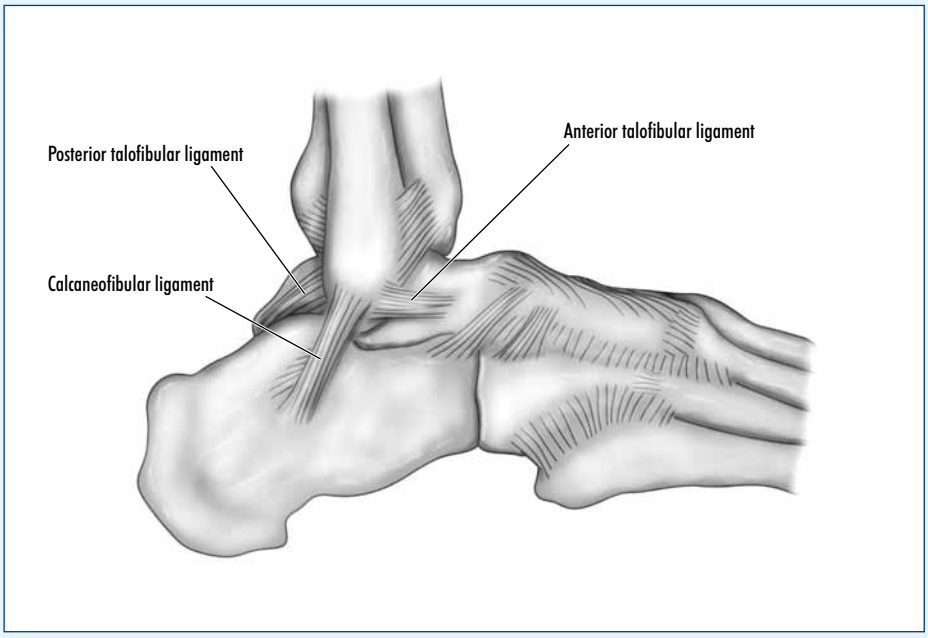

Figure 3. Lateral aspect of the ankle and the lateral collateral ligaments.

The posterior talo-fibular ligament runs backwards from the tip of the lateral malleolus to the lateral tubercle of the talus.

Immediately above the ankle joint, the lower ends of the tibia and fibula are bound together by dense fibrous tissue – the thickened part of the fibrous interosseous membrane between the two bones – this constitutes the inferior tibio-fibular joint (*Figure 1*), the only fibrous joint in the limbs. (The other, so-called 'fibrous joints' are the fibrous suture lines of the skull.) This joint may be torn in severe fracture dislocation injuries of the ankle. The muscles acting on the ankle joint are the extensors, which comprise the tibialis anterior (the most powerful), extensor digitorum longus, extensor hallucis longus and peroneus tertius; and the flexors, which comprise the gastrocnemius and soleus – acting through the calcaneal (Achilles) tendon, assisted by tibialis posterior, flexor digitorum longus and flexor hallucis longus.

Note in passing an important clinical point – a patient with a ruptured Achilles tendon can still flex the ankle on the injured side, admittedly rather weakly, because of the intact deep group of flexor muscles listed above.

The anatomy of ankle injuries

The majority of these are torsional injuries – 'twisted ankle' – of which inversion is commoner than eversion. The collateral ligaments may tear, partially or completely (a 'sprained ankle'), or the malleoli fracture, a malleolus may be pushed or twisted off by the talus, in which case the fracture is oblique, or may be pulled off by traction of the corresponding collateral ligament, in which case the fracture is transverse. A severely displaced fracture of both malleoli is accompanied by dislocation of the ankle.

This fracture-dislocation of the ankle was described by Percival Pott (1714–88) of St Bartholomew's Hospital, and all fractures of the ankle are sometimes loosely grouped together as 'Pott's fractures'.

An isolated fracture of one or other malleolus is usually accompanied by injury to the opposite collateral ligament.

Gentle clinical examination of the injured ankle will differentiate between a fracture and a ligamentous injury in a high proportion of cases. Inspection will reveal an obvious dislocation with accompanying backward displacement of the calcaneus. Tenderness over one or both malleoli indicates a high chance of fracture, whereas tenderness beyond the tips of the malleoli strongly suggests ligamentous injury.

In many cases X-rays of the ankle can be avoided, with considerable saving in the patient's waiting time, technicians' time and expense, by using the simple guidelines laid down by the orthopaedic department in Ottawa, Canada, and referred to as the 'Ottawa rules'. The rules which apply to ankle injuries state that an X-ray is necessary if:

1. The patient cannot weight-bear on the injured foot for four steps in the emergency department
2. There is bony tenderness along the distal 6 cm of the posterior edge of the tibia or of the medial malleolus
3. There is tenderness along the distal 6 cm of the posterior edge of the fibula or of the lateral malleolus.

To complete the Ottawa rules, these go on to state that fractures of the foot bones are suggested (and appropriate X-rays ordered) if there is tenderness at the base of the fifth metatarsal or at the navicular bone. Certain groups are excluded:

1. Children under the age of 18 years
2. Pregnant women
3. Those with diminished ability to cooperate with the test – for example, patients with a head injury or who are intoxicated.

Of course, carrying out these tests implies an accurate practical knowledge of the surface anatomy of the ankle and foot. **BJHM**

Conflict of interest: none.

KEY POINTS

- The ankle joint is a synovial hinge joint between the body of the talus and the lower end of the tibia, together with the medial and lateral malleoli.
- Like all hinge joints, it has powerful medial and lateral collateral ligaments and weak, lax, anterior and posterior capsular ligaments.
- The medial collateral ligament spreads broadly as the deltoid ligament.
- The lateral collateral ligament comprises the anterior talo-fibular ligament (the commonest part of the ankle to be injured), the calcaneo-fibular ligament and the posterior talo-fibular ligament.
- Fractures of one or both malleoli and partial or complete ligamentous tears ('sprained ankle'), are common injuries. Clinical examination allows accurate diagnosis in the majority of cases and frequently unnecessary X-rays can be avoided.