Ankle fractures are seen in all age groups but are particularly common in younger patients as a result of sporting accidents or high heels and excess alcohol! It is normally a result of twisting in which the rotation of the talus causes an increasingly more significant injury depending on the force applied.

Anatomy of the Ankle
The ankle joint consists of three bones; the tibia, fibula and talus. The image below shows the features of the normal ankle joint. The tibia and the fibula are bound together at the syndesmosis, preventing them from splaying on weightbearing. The talus, when in neutral and dorsiflexion, is perfectly congruent with the tibia and fibula creating a mortice as shown by the dotted line on the AP view.

On the lateral view the fibula can be hard to see as it is behind the tibia and talus (as shown by the dotted line).

Ankle Fractures
There are three malleoli which can be fractured in ankle injuries. The malleoli consist of the fibula, and the lateral and posterior parts of the tibia.

Lateral Malleolus Fractures
The first area to consider is whether there is a fracture of the lateral malleolus. This is the commonest site of ankle fracture and is classified by the Weber classification. The key to this classification is the relationship to the syndesmosis and it is broken down into three groups; A, B and C.

Weber A - fracture below the level of the syndesmosis (stable).
Weber B - fracture at the level of the syndesmosis (sometimes stable).
Weber C - fracture above the level of the syndesmosis (never stable).

Management of Lateral Malleolus Fractures
The management of lateral malleolus fractures depends on stability and displacement. Weber A fractures are always stable and so it is rare for them to require operative management. They are normally managed in a below knee complete plaster and the patient is allowed to weightbear as pain allows.

Weber C fractures are always unstable and usually require open reduction and internal fixation. The only exception to this is patients who are medically too unwell to undergo surgery. In these patients the fracture should be manipulated into as good a position as possible and treated in plaster, non-weightbearing for 6-8 weeks.

Weber B fractures often represent a difficult management decision. They are sometimes stable and sometimes unstable. If the fracture is undisplaced or has been manipulated into a perfect position then a trial of conservative management is appropriate. They should have check x-rays at least at weeks one and two and if there is any doubt week three. If these show displacement then management should revert to open reduction and internal fixation. If the fracture remains undisplaced then they can continue conservative management with plaster for 6 - 8 weeks non-weightbearing.
Two or Three Malleolus Fractures
Ankle fractures may affect more than one malleolus. It is uncommon for the lateral malleolus not to be involved, though this does sometimes happen. When more than one is affected the fracture is referred to as bi- or tri-malleolar. These fractures are almost always unstable and so management follows that of Weber C fractures. Remember that the Weber classification only refers to the lateral malleolus, whether this is the only malleolus affected or if two or three are affected. The following x-ray shows a tri-malleolar fracture. The major fragments are shown by the dotted white outlines but there is significant comminution present.

![X-ray of tri-malleolar fracture]

The next image shows the above fracture fixed by open reduction and internal fixation at 3 months following surgery.

![Open reduction and internal fixation]

There is a long lateral plate bridging the comminuted fibula fracture with a single lag screw holding one of the larger fragments in place. There is one screw holding the medial malleolar fracture (normally two would be used but the bone quality was poor). There are two screws from front to back holding the posterior malleolar fragment in place.

Talar Shift
Talar shift is an important concept to understand. It is an indicator of instability. If you look at the first image in this chapter there is a normal ankle with the mortice outlined by the white dotted lines. The talus should exhibit an equal joint space all the way around its articulation with the fibula and tibia. If it does not then the talus has moved. This is talar shift and the fracture has made the ankle joint unstable. Note that x-rays taken with the ankle in plantar-flexion can be confusing as posteriorly the talus is narrower than anteriorly and this can make the mortice appear incongruent.

The diagram below illustrates talar shift in the presence of a bi-malleolar fracture.

![Diagram of talar shift]

The mortice is outlined by the white dotted line. In the fracture there is clear medial widening and a lateral shift of the talus as shown by the arrow.
Pilon Fractures

Pilon fractures are a particularly severe type of fracture involving the ankle. They acquire their name from the French word *pilon* which translates as pestle (as in pestle and mortar), an instrument used for pounding food.

The typical mechanism of injury is a fall from a height landing on the feet. This is a high impact axial loading injury, ‘hammering’ the talus into the distal tibia shattering it. They are sometimes seen in lower energy trauma as sustained by skiers.

When associated with high energy trauma they are severe injuries with significant trauma to the surrounding soft tissues. Around a quarter of these injuries will be open fractures and there is a high risk of compartment syndrome. One of the main reasons for the poor outcomes in high energy trauma is the soft tissue complications.

The following image shows a pilon fracture sustained by a patient who fell from a third story window landing on their right leg.

![Image of Pilon Fracture](image)

The heavily comminuted fracture can be seen extending from the ankle joint all the way up into the diaphysis.

**Management of Pilon Fractures**

Low energy fractures should be managed with prompt open reduction and internal fixation once swelling has become acceptable. Care should be made to reduce the intra-articular component accurately.

High energy injuries present a problem. They almost always have a significant soft tissue injury and swell impressively. There is no point performing open reduction and internal fixation if the soft tissues cannot be sutured after to cover the metalwork. If a compartment syndrome develops this must be decompressed emergently. If the fracture is open then it should be washed out and debrided.

It will not usually be possible to fix the fracture early for these reasons. When this is the case the fracture should be stabilised with external fixation. This will buy time in which the limb can be elevated and the soft tissue injury allowed to settle. Once the soft tissues are amenable, an open reduction and internal fixation can be performed.