## STUDENTS' CORNER

# ANKLE FRACTURES: EVALUATING THE JUNIOR DOCTOR APPROACH TO THE SITUATION

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The Ankle Joint is a hinge type synovial joint formed by the two long bones of the leg, namely Tibia and Fibula, and Talus, a carpal bone. Strengthened by many ligaments, this joint is the junction of leg and foot and acts as a fulcrum for many of the foot's movements. Besides that it also allows many important structures to pass from leg to foot, both from the anterior and the posterior aspect of the joint. These include important vessels, nerves and tendons. Therefore a doctor should have a sound knowledge of the ankle's anatomy before handling an ankle fracture.

The joint is formed when the body of the talus articulates with the lower end of tibia superiorly, the medial malleolus (projection on the distal end) of tibia medially and lateral malleolus of fibula laterally, and can be felt as a slight depression approximately 1 cm proximal to the tip of the medial malleolus. This bony configuration is strengthened by the presence of two ligaments, a strong medial ligament and a comparatively weaker compound structure, the lateral ligament.

The Medial or Deltoid ligament is proximally attached to the tip of the medial melleolus by its apex and distally to the calcaneus, the navicular and the talus via four adjacent and continuous parts, the tibiocalcaneal part, the tibionavicular part and the anterior and posterior tibiotalar parts. This stronger of the two ligaments supports the joint during eversion and prevents subluxation or partial dislocation of the joint.

On the other hand the Lateral ligament comprises of three distinct bands or different ligaments, the Anterior talofibular ligament which extends from the lateral malleolus to the neck of the talus, the Posterior talofibular ligament: which runs from the malleolar fossa to the lateral tubercle of the talus and the Calcaneofibular ligament: which passes from the tip of the lateral malleolus to the lateral surface of the calcaneus.

These ligaments together with the bones play an important role in maintaining the stability of the joint. The deep mortise formed by the lower end of tibia and the two maleoli keeping talus securely in position and the ligaments strengthening it from all sides, the ankle joint is fairly stable but ironically the Ankle injuries are amongst the most common of the bone and joint injuries. Ankle fractures or dislocations occur if the joint is stressed beyond the strength of its elements. The injury might be a sprain or a fracture. If only the ligaments give away, then the person is said to have sprained his ankle. Ligaments are injured when a greater than normal stretching force is applied to them for example during the athletic events, awkward planting of the foot during running, climbing the stairs, or stepping on an irregular surface. Since the medial ligament is the stronger among the two ligaments the lateral ligament injuries are more common. The most commonly injured ligament is the anterior talofibular ligament (one of the constituent ligaments of the lateral ligament).

The injury to the joint itself can occur in two ways.[1] The first one involves a rotator mechanism in which the body rotates around the foot and the other is a crushing mechanism. The twisting type of injuries are far more common, and there is less likelihood of damage to the cartilage, thus only the bones making up the ankle joint must be carefully re-aligned. On the other hand, the second type of injury which occurs from a fall from a height, or in a motor vehicle accident is usually far more serious and is often associated with cartilage damage. Proximal a vascular necrosis (AVN) is a potential complication of talar neck fractures. A vascular necrosis of the talus can be quite devastating, and can lead to arthritis, deformity and pain. The two main arteries that supply the talus are the artery of the tarsal canal and the artery of the tarsal sinus. The two arteries may be disrupted in a displaced fracture, thus placing the talar dome at the risk of developing a vascular necrosis.

The development of AVN[2] is determined to a large extent by the type of the talus fracture. This is because of the blood supply to the talus is damaged in certain fracture types, and not in others, for instance the incidence of AVN is very high, almost 100%, when the talus dislocates out of the ankle socket. Interestingly however, the presence of AVN does not change the rate of healing of the fracture and even in fractures where AVN does develop, the fractured bone usually unites together as sufficient blood is available to allow the fracture to heal, but it's not enough to maintain the blood supply for a totally viable talus. The talus can break up into fragments and may even collapse if it experiences a vascular necrosis. This is however not predictable because a majority of fractures which develop AVN do not go on to collapse, and the AVN is limited to small segments of the talus.

'Aviator's astragulus' is the term which describes the compression fractures of the talar neck, fractures of the body, fractures of the posterior process, or fracture dislocation injuries. The talar neck is the most frequently injured site and talus bone itself is the 2nd most injured bone of the foot. According to the Hawkins classification,[3–5] the talar neck fractures can be divided into 4 types:

- Type 1, in which the risk of avascular necrosis is 0–13% and its radiological findings include a nondisplaced fracture line,
- Type 2, in which the risk of avascular necrosis is 20–50% and its radiological findings include a displaced fracture, subluxation or dislocation of the subtalar joint,
- Type 3,which has a 69–100% risk of avascular necrosis and a diplaced fracture with dislocation of the subtalar and tibiotalar joints are seen on its radiological examination and
- Type 4 which has the highest risk of avascular necrosis and involves a displaced fracture with disruption of the talonavicular joint.

Frequently it is difficult to diagnose a fracture over a Sprain without the help of radiographs, however, due to potential hazardous effects of ionizing radiation exposure on tissue over time, a patient should not be asked to get an X-ray done unless important. Therefore Ottawa rules have been laid down to prevent any unnecessary radiological exposure. These rules determine the need for radiographs in patients with an injured ankle. According the Ottawa rules, an X-ray series is required only if there is pain in the malleolar zone and any one of the following:

- bone tenderness along the distil 6 cm of the posterior edge of the fibula or the tip of the lateral malleolus,
- bone tenderness along the distil 6 cm of the posterior edge of the tibia or the medial malleolus,
- or the inability to bear weight for 4 steps both immediately and in the emergency department.

A doctor should have basic knowledge of the measurement of the lateral clear space and the medial joint space on an x-ray film to objectively diagnose a fracture or displacement. The lateral clear space is measured from the medial border of the fibula to the lateral border of the posterior tibia 1 cm above the tibial plafond. Evident widening of the lateral clear space indicates syndesmotic rupture. Meaning that there is no dislocation, but there still can be instability. Widening of the ankle mortise is another sign of ligamentous rupture. Widening of the medial joint space up to 6 mm or more implies disruption of the medial collateral ligament.[6–8]

Only after determining the type and extent of the fracture, the appropriate medical care can be provided. Surgical techniques used for these fractures include meticulous handling of the soft tissues, general or regional anaesthesia, use of a tourniquet, use of prophylactic antibiotics, sufficient exposure.

Post-operative care and rehabilitation involves the application of sterile dressings and a plaster spirit, use of superior splinting techniques, limb elevation, a follow up with in one week of surgery, instructions of a range of movement exercises, use of compression bandages, no weight bearings and a follow up after eight weeks.

The Hawkins sign is a subchondral radiolucent band in the dome of the talus resulting from an increase in bone reabsorption relative to the bone formation. It can be seen on anteroposterior radiographs of the ankle 6–8 weeks after a vertical fracture of the neck of the talus but can only be seen on lateral radiographs until the 10–12th weeks after the fracture due to overlapping of these structures. Its presence suggests that the blood supply to the talar dome has been preserved and that avascular necrosis likely will not occur.[9,10]

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