Strategies for ORIF of the Talus and prevention of varus malunion

Mechanism of Injury

- Fracture of the collum tali--an experimental study.
  Peterson L, Romanus B, Dahlberg E

- A common misconception is that hyperdorsiflexion of the foot forces the talar neck against the anterior edge of the tibia causing a talar neck fracture

- ‘Peterson and Romanus ‘used above knee cadaveric specimens and demonstrated that the only way to produce a talar neck fracture was to eliminate ankle motion by compressing the calcaneus against the overlying talus/tibia – then applying a dorsally directed force to the plantar aspect of the foot just distal to the talus. The talus acted as a cantilever between the plantar aspect of the foot and the tibia. As the talar neck fractured the talar body remained in the ankle mortise while the talar neck, head, calcaneus and the rest of the foot was displaced dorsally.

- Understanding the mechanism of injury is important as it helps understand the necessary steps required to attain an anatomic reduction

Blood Supply of the talus

- The vascular supply to the body of the talus enters via five main areas:
  1/ superior surfaces of the talar neck
  2/ inferior surfaces of the talar neck
  3/ anterolateral body of the talus
  4/ medial body of the talus (deltoid artery)
  5/ posterior tubercle
• The extent of intraosseous anastomosis between the different regions of blood flow is variable

• The majority of talar body blood flow originates from the vascular ring at the talar neck; therefore, the more posterior the primary fracture line the greater the disruption of blood flow to the remaining talar body

**Radiographic Evaluation**

• Most talar neck fractures can be diagnosed on a lateral radiograph of the foot and ankle

• The lateral radiograph best demonstrates the fracture pattern and the sagittal displacement

• In approximately 50% of talar neck fractures that primary fracture line extends into the body of the talus, this can be best appreciated by assessing the location of the fracture in the sinus tarsi area on the lateral radiograph (inferior aspect of the talar neck).

• On the lateral view, the amount of subluxation of the subtalar joint is a reflection of the amount of displacement. The calcaneus, talar neck, talar head and the rest of the foot move forward, dorsally and internally with increasing displacement

• CT evaluation is used more frequently, and better defines the primary fracture line, amount of comminution and the presence of associated injuries (fracture to the sustentaculum, malleoli, navicular and/ or tibial plafonde)

• Varus malunion of the talar neck is the most common malunion following treatment of talar neck fractures. The purpose of this study is to radiographically assess the displacement of the talar neck in the transverse plane (varus malalignment) and to identify a reliable method of measuring this deformity. Varus malalignment at the talar neck was created in ten cadaveric specimens and measured both directly and radiographically using anteroposterior, lateral and Canales views.

Canales view was found to be useful in visualizing the talar neck but not a reliable view for measuring varus malalignment. Direct radiographic measurement of the deformity using the axis of the talar head and talar body was unreliable. The transmalleolar vs the second metatarsal shaft angle (TMSMA) was the most useful method to measure varus deformity at the talar neck; however, due to the wide range of normal values its clinical usefulness is questionable.
The results of this study indicate that radiographic evaluation can be utilized for assessment of the hardware placement, but direct intra-operative visualization of the talar neck and foot position are recommended to assess the accuracy of the fracture reduction.

Classification

- Hawkins 1970 Classification with Cannale’s modification is universally accepted and still used today
  
  Fractures of the neck of the talus
  Hawkins L.G.

- Fractures of the neck of the talus
  Canale, S.T. and Kelly, F.B.
Treatment

• Operative management is recommended for all displaced talar neck fracture

• A combined medial and anterolateral approach is common

• Anatomic reduction is essential; the most common malreduction is talar neck varus and dorsal translation. Utilization of the lateral exposure allows for more accurate reduction and stabilization with plates and screws. Assessment of reduction should take into consideration the position of the foot and not just direct visualization of the talar neck. Caution: any suggestion of varus (supination) of the midfoot and forefoot on the operating room table will be exaggerated once the talar neck fracture is healed and the patient is weight-bearing.

• Reduction of this body fragment may be facilitated by first reducing the talar body within the mortise in neutral dorsiflexion - plantarflexion plane and maintaining this position with cross K-wires inserted from the medial and lateral sides of the talar fragment through the distal tibia in a retrograde direction. Now, having a stationary proximal talar body fragment, allows for easier reduction of the distal fragment on to it. Following fixation of the fracture, the cross K-wires are removed.

• There is no evidence that ORIF prevents avascular necrosis of the talar body

• Patients are kept non-wt bearing for 6 – 8 weeks, early ankle ROM is recommended, Nonunion is rare

Complications

• Avascular necrosis of the talar body

• Post traumatic arthritis of the ankle, subtalar and talonavicular joints (subtalar most common)

• Arthrofibrosis

• Infection – an infected and avascular talar body after ORIF is a devastating complication that may require a BKA
• Neurovascular injury

• Varus Malunion

• Compartment syndrome