Talus fractures

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Orthopaedic Trauma course for NP/PAs
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Outline

• Anatomy
• Surgical Approaches
• Fixation strategies
• Outcomes and complications

Anatomy

Bone

• 60-70% articular cartilage
• No muscular attachments
• Complex articulations

Vascular

1. Posterior Tibial
   – Artery of the Tarsal Canal
   – Deltoid Artery (really off the Art of the Tarsal Canal)

2. Anterior Tibial

3. Perforating Peroneal
   – Artery of the Tarsal Sinus

Figure 3. The vascular anatomy of the talus.
Anatomy
Vascular

Inferior Anastomotic Sling
- Artery of the Tarsal Canal (Posterior Tibial)
- Artery of the Tarsal Sinus (Perforating Peroneal)
  - Send numerous branches into the inferior talar neck
  - Main supply of the talar body is from the artery of the tarsal canal

Injury mechanism
- Forced Dorsiflexion
  - Dorsiflexion causes tibiotalar impingement, leads to neck fracture
  - Dorsomedial comminution
  - Not reproduced biomechanically
- Shear Force

Classification
Hawkins*--Prognostic Based on Blood Flow
- Type I
  - Nondisplaced
- Type II
  - Subtalar subluxation or dislocation
- Type III
  - Subtalar and tibiotalar dislocation
- Type IV
  - Type III with talonavicular subluxation or dislocation

*Hawkins LG: JBJS 1970; 52-A
Canale ST: JBJS 1978; 60-A
Radiographic Evaluation

- Ankle Series
- Foot Series
- Canale View
- CT Scans
  - Consider for head, body, and lateral process fractures

Treatment
Closed Methods

- Non-operative (rare)
  - For truly undisplaced fractures
- Closed Reduction
  - Realignment of gross displacement or dislocation
  - Important for soft tissues
  - Becomes increasingly more difficult with severity of fracture

Treatment Principles

- Accurate alignment of talar neck
  - Re-establish hindfoot mechanics

- Stable fixation
  - Maximize revascularization potential
  - Allow early ROM

Treatment
Exposure

- Surgical Approaches
  - Combined anteromedial and anterolateral

Operative Considerations

- Radiolucent table
- Small clamps
- Small distractor or external fixator
- Small/mini-fragment fixation
  - 1.5mm
  - 2.0mm
  - 2.4mm
  - 2.7mm & 3.5mm
  - Mini-fragment plates occasionally
Intra-operative techniques

- Reduce and judge alignment through both approaches
- Lateral cortex usually provides good read (tension failure)
- Medial comminution (no lag screw fixation)
  - Cancellous bone graft/ structural bone graft
- Avoid stripping
- K-wire through talar head as reduction aid

Reduction of a Dislocated Talar Body

- Infrequently works in the ER... but worth a try.
- GA for paralysis
- Flex the knee, traction on the the hindfoot, direct pressure on the talar body
- For open reduction: Dual exposure
- Medial and lateral distractors (ex-fix) with a transcalcaneal pin
- Malleolar osteotomy

The body is usually between the posteromedial aspect of the tibia and the Achilles tendon, immediately adjacent to the posteromedial neurovascular bundle

Medial malleolar osteotomy

- Drill screw before osteotomy
  - Easier reduction
- Allows visualization of entire medial talus
Post-operative rehabilitation

- Early ROM exercises once skin allows
- NWB for 12 weeks
- In cases with ligamentous instability, longer cast immobilization might be considered

Complications

- Delayed union
- Nonunion
- Malunion
  - Particularly varus
- Subtalar and ankle arthritis
- Osteonecrosis

Complications

- AVN most common complication, followed by infection, mal-/non-union
- Hawkins sign is good predictor of appropriate blood supply at 6-8 weeks

Outcome

- Sanders et al.
  - Excellent functional outcomes if pt did not require 2nd reconstructive procedure
  - Development of varus and/or ST arthritis leads to poor functional outcomes
  - Most common indication for 2nd surgery was ST arthritis.
  - Risk factors for 2nd surgery were comminution, high Hawkins type, and associated L/E fractures.
  - All markers of higher-energy injuries
  - Time between injury and surgery did not correlate with outcome
  - 12% AVN rate (much lower than most other reports).

<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Osteonecrosis</th>
<th>Degenerative Joint Disease</th>
<th>Malunion</th>
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</thead>
<tbody>
<tr>
<td>Type I</td>
<td>0%-13%</td>
<td>0%-30%</td>
<td>0%-10%</td>
</tr>
<tr>
<td>Type II</td>
<td>20%-30%</td>
<td>40%-90%</td>
<td>5%-25%</td>
</tr>
<tr>
<td>Type III/IV</td>
<td>8%-100%</td>
<td>70%-100%</td>
<td>18%-37%</td>
</tr>
</tbody>
</table>

Sanders, DW, et al. J Orthop Trauma. 18:5, 2004
Summary

- Delayed fixation has no effect on outcome, union or AVN
- Outcomes worse with comminution, open injuries, varus
- Post-traumatic arthritis is common
- AVN may be partial and not lead to collapse
- Set expectations