Talus Fractures:
When and Why on Screws and Plates

Frank A. Liporace, MD
Associate Professor – Director of Orthopaedic Research
New York University / Hospital for Joint Diseases, NY, NY
Director Orthopaedic Trauma – Jersey City Medical Center, Jersey City, NJ
Disclosures

• Please refer to program
Talar Neck Fx’s

- 2nd most common tarsal bone fx’s
- 60% artic. Cartilage
- No muscle / tendon
  - Ligaments only
Talar Neck Fx’s

• Talar Neck
  – Dorsiflexion agnst tib w/ axial load

• Hawkins
  – 26% med mall fx’s
  – 64% w/ other fx’s
  – 21% open fx’s
Blood Supply

Arterial supply:
- Artery of tarsal canal
- Artery of tarsal sinus
- Dorsal neck vessels
- Deltoid branches

Inferior view of talus, showing vascular anastomosis
Vascularity

- **Artery of tarsal canal** majority of talar body b.s.
- **Need at least 1 of 3 anastomoses**

![Diagram](image)

Mulfinger & Trueta (1970)
CT scan

- Can be a useful assessment tool
- Confirms truly undisplaced fx’s
- Demonstrates subtalar comminution, osteochondral fractures
MRI Scan

• Assess complications:
  – AVN
  – Cartilage / cysts

• May consider
  TITANIUM implants

Zone of osteonecrosis following distribution of Artery of Tarsal Canal
Maybe **NOT** an Emergency?

- **Lindvall, Haidukewych, Di Pasquale, Herscovici, Sanders: JBJS - A 2004**
  - DELAY IN REDUCTION & FIXATION DOES NOT AFFECT:
    - UNION
    - ON
    - OUTCOME

  - NO CORRELATION WITH TIMING OF FIXATION & ON!!!
Open vs Closed

Front or Back

Approach for Reduction
Hawkins 1

- I: undisplaced
- AVN 0 – 13 %
Hawkins 2

- Displaced fracture
- Subtalar subluxation
- Fx line enters subtalar joint
- AVN 20 – 50 %
- ST arthritis 64-86%
VD – 2 years
Posterior to Anterior Fixation:

- Stronger than A to P fixation with 2 screws

- Shear force of active motion = 1129N (Swanson, JBJS 1992)
  - Neither k-wires or A-to-P screws could do this

- Screws perpendicular to fracture site
Watch for FHL w/ P-to-A screws!

- Mostly Non Displaced
- Lateral Position
- Rare Open Posterior Approach
Hawkins 3

- Subtalar and ankle joint dislocated
- Talar body extrudes around deltoid ligament
- AVN 83 – 100 %
Hawkins 4

- Incorporates talonavicular subluxation
- Rare variant
- Often requires stabilization of TN joint
- 70% arthritis ankle & ST jts
- **Closed injuries**
  - Talar body rests posterior and medially
  - **Medial / Posteromedial approach**
    - May need medial malleolar osteotomy
    - **Do NOT dissect deltoid ligament from MM**
      - Only remaining blood supply
SIMPLE INJURY
Fracture

• When is it talar neck (not a talar body)?
  – *Talar neck fractures exit distal to the lateral process of the talus***!!!
Treatment

• Screws

• Post to Ant Strongest

• OFTEN Best bone lateral neck

• Other options w/ OPEN APPROACHES
  – Headless screws
  – Mini-frag screws
  – Mini-frag plates
  – Bio-absorbable implants
Surgical Incisions

Lateral
Tip of fibula
Base of 4th MT
Raise EDB
Clear Sinus Tarsi

Medial
Tip of medial mall
Btw TA & PT
To TN joint
Dissect deep
Anteromedial approach

- Provides view of neck alignment and medial comminution
Anterolateral (Bohler’s) Approach

- *Incision in line with 4th MT*
- Centered at the ankle joint
- *Protect the sup. peroneal nerve*
- Incise the extensor retinaculum
- Elevate anterior compartment
- Pilon → TN joint
Anterolateral (Bohler’s) Approach

- *Incision in line with 4th MT*
- Centered at the ankle joint
- *Protect the sup. peroneal nerve*
- Incise the extensor retinaculum
- Elevate anterior compartment
- Pilon $\rightarrow$ TN joint
Anterolateral (Bohler’s) Approach

- *Incision in line with 4th MT*
- Centered at the ankle joint
- *Protect the sup. peroneal nerve*
- Incise the extensor retinaculum
- Elevate anterior compartment
- Pilon $\rightarrow$ TN joint
Anterolateral (Bohler’s) Approach

- **Incision in line with 4th MT**
- Centered at the ankle joint
- *Protect the sup. peroneal nerve*
- Incise the extensor retinaculum
- Elevate anterior compartment
- Pilon → TN joint
Surgical Approaches

- Posteromedial
  - Useful for irreducible posteromedial dislocation of body
  - Medial malleolus/ Achilles
  - FDL/FHL
Surgical Approaches

- Modified Ollier
  - Reflect EDB distally
  - Protect sinus tarsi contents
  - Exposure of neck/ lateral process/ subtalar joint
38 yo male fall off a roof
38 yo male fall off a roof
Anterior Plate Fixation

- Comminuted fractures:
  - Medial and/or lateral mini-fragment plates
Plates vs Screws Alone

- Helps with reduction when comminution
- No significant biomechanical difference
- Acutely Avoids coronal and sagittal deformity
Posterior Process Fractures

• Lateral tubercle
  – Nondisplaced
    • NWB SLC
  – Displaced
    • ORIF vs. excision
    • Posterolateral vs. posteromedial approach
Posterior Process Fractures

• **Medial tubercle**
  - Nondisplaced
    • NWB/SLC
  - Displaced
    • ORIF
    • Posteromedial approach – FDL/FHL
Technique

- Prone
- Bump contralateral hip
- Flex knee
  - Facilitates imaging
- Medial distractor or ex fix

Case Courtesy: Lori Reed, MD
Approach

- Posteromedial
- Achilles/FHL
- Release FHL retinaculum to improve exposure

Case Courtesy: Lori Reed, MD
FHL retraction

Case Courtesy: Lori Reed, MD
Provisional reduction

Case Courtesy: Lori Reed, MD
Slide plate over k-wires

Mini fragment plates, lag screws through plate
Final fixation

Case Courtesy: Lori Reed, MD
Complications

- Osteonecrosis
  - Canale (1972): 15-100%
  - Vallier/Lindvall (2004): Types 2/3 - 39-64%
    - No correlation to surgical timing

- Post-traumatic arthritis
  - Vallier (2004): 54%
  - Lindvall (2004): 100%

- Nonunion
  - 0-4%

- Arthrofibrosis

Malunion – varus
  \[ >3^\circ = \text{decreased ST ROM} \]
  \( \text{(Daniels TR, JBJS 1996)} \)
  \[ >2 \text{ mm} = \text{altered ST contact forces} \]
  \( \text{(Sangeorzan J Orthop Res 1992)} \)
Results

- Fracture Type
  - Type I
  - Type II
  - Type III / IV

- Malunion (*varus*)
  - 0% - 10%
  - 0% - 25%
  - 18% - 27%
Malunion Rx:

- Calcaneus osteotomy
- Tendo Achilles Lengthening
Post Traumatic Arthritis / AVN

• Incidence of post-traumatic arthritis
  • 30-90%

• Hawkins sign
  – Objective Predictor vascularity
  – Absence NOT predictor of AVN
  – Up to 36 mo to re-vasc
Post Traumatic Arthritis / AVN

• Most commonly involves Subtalar joint

• Rx: Arthrodesis
Take home

- Talus fractures with variable results
- More dislocations w/ neck fx $\rightarrow$ Higher AVN
- Body Fx’s may be poor prognosis
- Stable fixation required
  - Consider plates with COMMINUTION
- Lateral side of neck more often key
  - Medial side comminuted and may promote varus
- SIMILAR stability plates and screws
- NOT AN EMERGENCY
  - Unless skin compromise / irreducible dislocation
THANK YOU