


**Talus and Calcaneus Fractures:
Is this in my Wheelhouse??**

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Disclosure

- Associate Editor, JOT
- Reviewer, TIO, JAAOS
- Committee Member, OTA

- No Financial Disclosures




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Are either of these in my wheelhouse?

- High Energy Fractures
- Technically challenging to treat
- High(er) incidence of complications

- Are you doing your patients any favors?
- Are you doing yourself any favors?



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Today's Goals

- Understand what is urgent/emergent
 - When is it okay to transfer?
- Temporizing management
- Definitive management



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Calcaneus Fractures

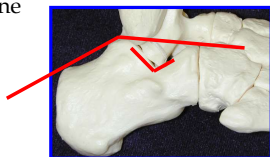
- Tenuous soft tissue envelope
 - Wound complications
 - Osteomyelitis
- Nonop management...
 - Generally poor outcomes
 - Debatable science nonop vs op
 - Buckley et al



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Calcaneus Anatomy

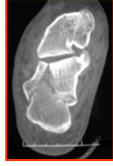
- Angles of Bohler and Gissane
- 5 deg hindfoot valgus
- ST, CC articulations



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Calcaneus Fractures- Pathophysiology

- Axial Load
 - Talus acts as wedge, cleaving calcaneus
 - Predictable primary and secondary fracture lines
 - Predictable reduction strategy
 - Predictable problems with nonop



DON'T FORGET TO CHECK THE L SPINE!!!



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Calcaneus Fractures

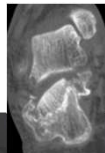
- Two Common Types
 - Joint-Depression
 - Tongue Type
- Different strategies
 - Reduction
 - Fixation



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Calcaneus Fracture Morphology

- Heel assumes widened, flat, varus position
 - Lateral wall blowout
 - Peroneal tendon impingement
 - Subtalar stiffness/gait disturbance (uneven surfaces)
 - Decreased ankle/foot ROM
 - Heel pad crush
 - PAIN



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Nonop Management- Addressing Sequelae

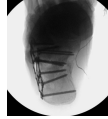
- Custom orthosis (Arizona brace)
- Lateral wall exostectomy
- Peroneal debridement
- Bone block arthrodesis (Sanders)
 - Addresses heel shape and subtalar arthrosis
 - Outcomes inferior to primary ORIF first (Radney et al)
- Sliding Osteotomy
 - Addresses heel morphology, ignores subtalar arthrosis



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Calcaneus Fractures- Operative Management

- Classic Extensile Lateral
 - Good results in experienced hands- Benirschke, Sanders
 - Technically challenging, high learning curve
- Sinus Tarsi
 - Growing in popularity
 - Must accept that you cannot make "perfect"
- Percutaneous Techniques
 - Equivalent Outcomes in some series (Definitely NOT perfect)
 - Marsh et al (Iowa Farmers.....)



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Picking your patients... AVOID?

- | | |
|------------------------------------|------------------------------|
| • Smokers* | • Non-compliant |
| • Diabetics* | • Inexperienced surgeon..... |
| • Vasculopath | • Open Fracture?*** |
| • Bad Soft Tissues | • Elderly/Low Demand |
| • Sanders IV (severe comminution)* | • Neuropathic |



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Extensile Lateral

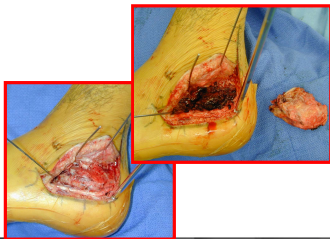
- Await + wrinkle test- 10-21 days
- “no touch” technique
- methodical closure
 - Multiple layers
 - Allgower-Donati
 - Drain
 - Advance to apex



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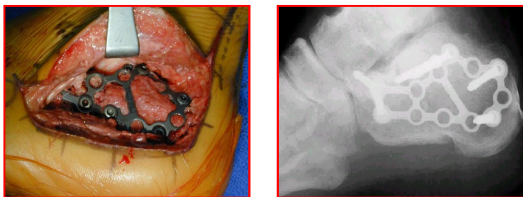
Extensile Lateral

- Wires in:
 - Cuboid, Talar neck, Fibula
- Remove lateral wall
- Schanz pin in Tuberosity
- Lag superolateral fragment



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Extensile Lateral



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Sinus Tarsi

- Apical dehiscence abated?
- Earlier surgery- probably
- Less risk in diabetics/smokers?
- But you cannot get it perfect.....
 - Does that matter to you? (It matters to me!)



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Sinus Tarsi

- Apical dehiscence abated?
- Earlier surgery- probably
- Less risk in diabetics/smokers?
- But you cannot get it perfect.....
 - Does that matter to you? (It matters to me!)



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Percutaneous

- I don't recommend this.....
 - No risk factors? Make it perfect with extensile lateral
 - Risk factors? Use a sinus tarsi approach
 - Poor host? Nonop all the way

*Cannot correct joint
Cannot correct hindfoot*



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What's emergent/urgent?

- Tongue Fractures
 - Watch for compromised soft tissues!
 - Cannot afford to wait/refer/transfer
 - Safe to percutaneously clamp/wire
- Open Fractures



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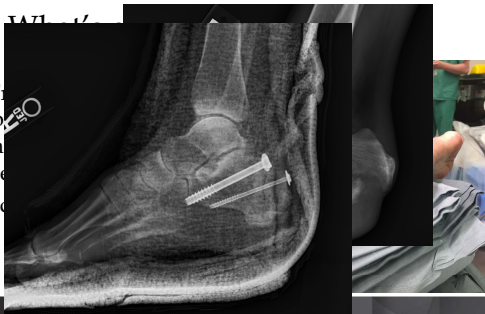
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- Tongue Fractures
 - Watch for compromised soft tissues!
 - Cannot afford to wait/refer/transfer
 - Safe to percutaneously clamp/wire
- Open Fractures



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Open Fractures?

- 6 hour rule is dogmatic
 - ensure early abx
 - skilled surgeon necessary

BUT

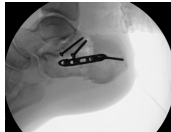
opportunity knocks...



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Open Fractures

- Almost always medial
 - tension failure/ sustentaculum spike
 - wound usually clean
- Direct access to PRIMARY fracture line
- reduction restores calcaneal height, width, length
- does not address subtalar articular surface.....



LATERAL/PLANTAR WOUNDS
 -BAD ACTORS→DEBRIDE, WASH AND TREAT NONOP



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Open Fractures

- Medial limited ORIF a good idea!
- Can address joint through limited lateral sinus tarsi
- DO NOT USE EXTENSILE LATERAL AFTER OPEN FRACTURE

Heier et al. Open fractures of the calcaneus. Soft tissue injury determines outcome. *J Bone Joint Surg Am* 2003;85:2276-2282

Beltran MJ, Collinge CA. Outcomes of high-grade open calcaneus fractures managed with open reduction via the medial wound and percutaneous screw fixation. *J Orthop Trauma*. 2012;26:662-670.



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Postop Care

- Judicious use of drains w/ extensile lateral
- Immobilize until soft tissues heal (2-3 weeks, longer if wound problems)
- NWB 12 weeks
- Early use of compression hose
- Early use of orthotics



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Talus Fractures- Anatomy

- Mostly covered in cartilage
 - Limits fixation options
- Retrograde vascular supply to dome
 - AVN common
- Transverse Tarsal Joint
 - TN and CC joints are coupled



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Talus Fractures- pathophysiology

- Forced dorsiflexion+adduction → dorsal and medial comminution
 - "Aviator's Astralgus"
 - Universal poor results with nonop management
- Injury uncouples Transverse Tarsal Joint
 - Rigid foot at heel strike



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Talus Fracture Implications

- Talar neck varus malreduction
 - locks transverse tarsal joint → rigidity a problem
 - As little as 5 degrees alters gait (Sangeorzan et al)
- Avascular necrosis
 - Predicted by injury characteristics → More severe patterns
 - Easy to watch for
 - NOT predicted by time to surgery (dogma)



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Wait- I can wait??

- No association between time to surgery and incidence of AVN
- What's best for your patient? A skilled surgeon
- Most talar neck fractures DO NOT require urgent/emergent surgery!



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Talar Neck Classification

- Hawkins
 - Type 1, nondisplaced
 - Type 2, subtalar incongruence
 - Type 3, subtalar and tibiotalar incongruence
 - Type 4, pantalar
- Why does this matter?
 - Helps predict AVN/PTOA/Outcomes



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Importance of type 2

- Most common fracture pattern
- 2A vs 2B
- Vallier et al JBJS 2014
- Subluxation vs dislocation of subtalar joint



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Type 2A vs 2B

- Vallier et al JBJS 2014
 - 2A- 0%
 - 2B- 25% AVN
 - 3- 41% AVN



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Operative Management

- Supine positioning
- DUAL Incision are critical
- Judicious use of Canale View
- Multiple fixation strategies
 - A to P screws
 - P to A screws
 - Lateral plates



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Technical Pearls

- Position screws medial, NOT lag screws
 - Prevents shortening and varus
- Cannulated screws helpful
 - Use lots of wires
- Make sure to clean out subtalar joint
 - Subtalar arthritis most common complication



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Postoperative Care

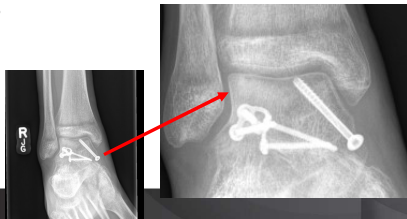
- Immobilize until soft tissues healed- 14-21 days
- Early ROM
- NWB 12 weeks
- Early use of compression hose
- Early use of orthotics



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What do I do if they have AVN?

- Check films at 12 weeks → Assess for Hawkins Sign
- What is it?



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AVN- Nothing changes

- Start WB at 12 weeks
 - protected WB DOES NOT prevent collapse
 - 33-44% revascularize without collapse (Vallier et al JBJS 2004, JBJS 2014)
- Address sequelae later if collapse occurs
 - Ankle arthrodesis



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Outcomes/Complications

- Lindvall JBJS 2004
 - Subtalar PTOA 100% of patients
 - 50% AVN
 - 88% union rate
 - Complication= poor outcome



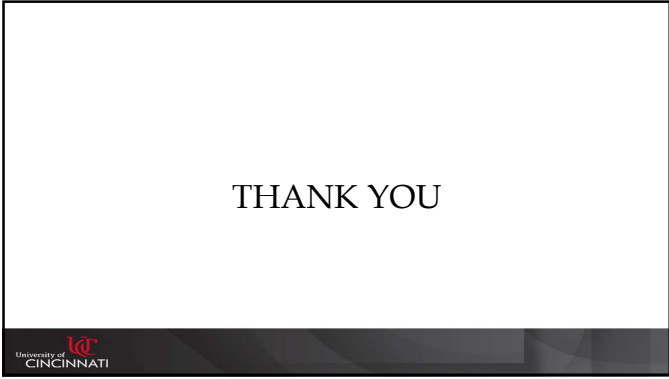
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Outcomes/Complications

- Vallier et al JBJS 2004
- Subtalar PTOA 54%
- AVN 49%
- Complications=poor outcomes



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