

# Fractures of the Calcaneus and Talus: Is this in my Wheelhouse?

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## Disclosures

- None pertinent to this presentation
- Journal Reviewer
  - Journal of Orthopaedic Trauma
  - Journal of American Academy of Orthopaedic Surgeons
  - Techniques in Orthopaedics

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## Outline

- Calcaneus
  - Staged Protocol
  - Limited Approaches
  - Extensile Lateral
  - Reduction Techniques
- Talus
  - Staged Protocol
  - Approaches



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## Fractures of the Calcaneus

### Literature

- Inconsistent regarding benefits of operative treatment
- Trends suggesting best outcomes with anatomic reduction (articular and shape) and stable fixation
- Non-operative managed: 6X greater risk of requiring a salvage subtalar arthrodesis
- Worst outcomes: operatively treated with failure to achieve adequate reduction or had a significant complication

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## Fractures of the Calcaneus

### Patient Selection is Critical

1. Identify accurately those that will do well from non-operative management
2. Those that will benefit from surgery while reducing the risks of a poor surgical result

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## Fractures of the Calcaneus

### In My Wheelhouse?

- Do I have an interest
- Am I able
- # Cases Per Year
- Training
- Hospital Resources



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## Fractures of the Calcaneus

### Decision Making

- | Patient Factors        | Soft Tissue       | Fracture                    |
|------------------------|-------------------|-----------------------------|
| - Comorbidities        | - Open Fractures  | - Sander's Classification   |
| - Age                  | - Severe Swelling | - Bohler's angle            |
| - Gender               | - Blistering      | - Intra- or Extra-articular |
| - Functional Demand    |                   |                             |
| - Smoking              |                   |                             |
| - Compensation Schemes |                   |                             |
| - Psychiatric          |                   |                             |

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## Fractures of the Calcaneus

### Who is Your Patient

- Detailed History
  - Recreational Activity
- Occupation
  - Heavy Manual Laborer
- Habits
  - Smoker
- Comorbidities

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## Fractures of the Calcaneus

### Management Options

1. Non-operative Treatment
2. ORIF
3. Minimally Invasive Reduction and Fixation
4. Primary ORIF and Subtalar Arthrodesis

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## Fractures of the Calcaneus

- Associated Injuries



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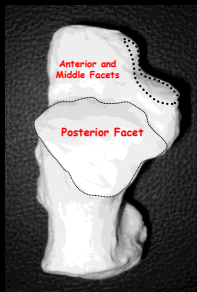
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## Fractures of the Calcaneus

- 3 view Foot
- 2 View Ankle (AP and Mortise)
- Harris View
- CT scan



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## Fractures of the Calcaneus

### Spectrum of Operative Fixation



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## Fractures of the Calcaneus

### Displaced Intra Articular Calcaneus Fractures




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## Fractures of the Calcaneus

### Approaches



**Pros:**  
 Lower risk of wound complications  
 Operate earlier (fracture mobile)  
 Direct view of posterior facet  
 Direct reduction of anterior process

**Cons:**  
 Indirect reduction of tuberosity  
 Difficult to address lateral wall blowout  
 Limited fixation options



**Pros:**  
 Visualization of entire lateral calcaneus  
 Direct view of posterior facet  
 Direct reduction of ant. process + tuberosity  
 Direct access to lateral wall "blow-out"  
 Stable fixation with lateral plate

**Cons:**  
 Increased risk of wound healing problems

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## Fractures of the Calcaneus

### Approaches



**NOT** amenable to all fracture patterns  
 Challenging indirect reduction requires surgeon experience  
 Limited body of literature  
 May be an option for patients with risk factors for wound problems prohibiting extended lateral approach



Well described in literature  
 Not for patients with significant risk factors for wound healing complication

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## Fractures of the Calcaneus

Operative Fixation



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## Fractures of the Calcaneus

### Patient Positioning



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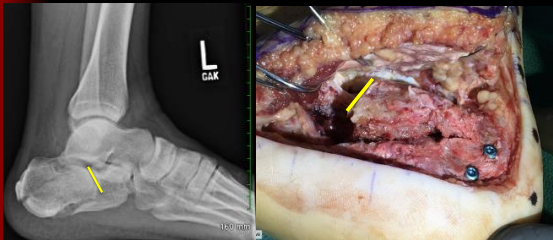
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## Fractures of the Calcaneus

### Understand Radiographs



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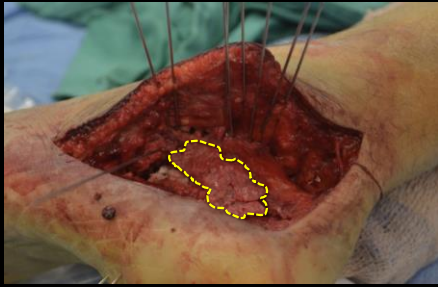
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### Fractures of the Calcaneus



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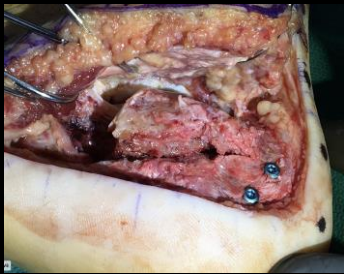
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### Fractures of the Calcaneus



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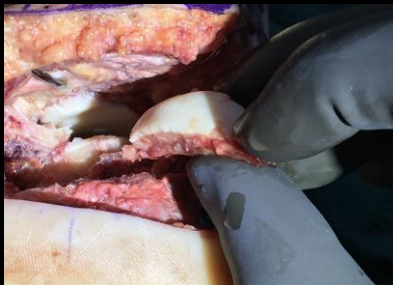
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### Fractures of the Calcaneus



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### Fractures of the Calcaneus



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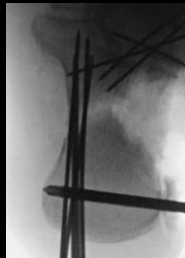
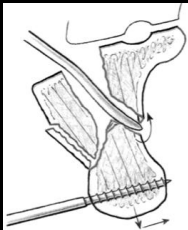
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### Fractures of the Calcaneus



Weber M, Lehmann O, Sgessner O, Krause F. Limited open reduction and internal fixation of displaced intra-articular fractures of the calcaneum. J Bone Joint Surg [Br]. 2008;90-B:1608-1616

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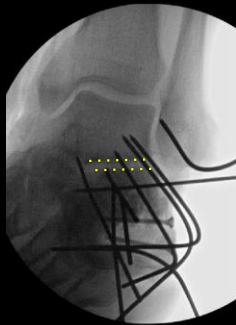
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### Fractures of the Calcaneus



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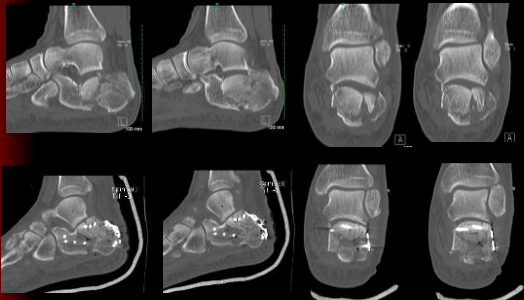
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### Fractures of the Calcaneus



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### Fractures of the Calcaneus



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### Fractures of the Talus

#### Epidemiology

- Rare Fracture
- 0.14 – 0.32% incidence
- 6-8 % of Foot Fractures
- Approx 50% Talar Neck



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## Fractures of the Talus

### Complications

- High Rate of Complications
  - Avascular Necrosis
  - Post Traumatic Arthritis
  - Malunion
  - Nonunion

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## Fractures of the Talus

### High Mechanical Demand

- Anatomic Link between Leg and Foot
- Transmits entire body weight

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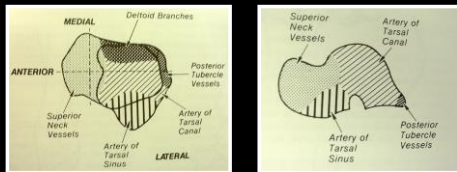
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## Fractures of the Talus

### Vascularity



Artery of Tarsal Canal Supplies Majority of Talar Body

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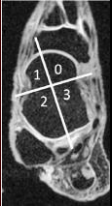
## Fractures of the Talus



### Vascularity

Quantitative Assessment of the Vascularity of the Talus with Gadolinium-Enhanced Magnetic Resonance Imaging

Lee N, Miller M, Madhri K, Pappas M, Vignola P, D'Alto D, D'Antonio J, Haddad M, and Dean J. *Journal of Bone Joint Surgery Am.* 2011;93B(11):21. doi:10.2106/JBJS.10009



- Substantial Portion of blood supply enters posteriorly
- Helps to explain why all talar neck fractures do not go onto AVN

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## Fractures of the Talus

### Injury Mechanism

- High Energy Injuries
- Often due to motor vehicle accidents or falls from height
- Approximately 50% of patient have several traumatic injuries




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## Fractures of the Talus

Hawkins LG: JBJS 1970; 52-A

### Predicting Avascular Necrosis




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## Fractures of the Talus

### Radiographic Assessment

- Radiographs
  - 3 views foot and ankle, Canale view
- Computed Tomography
  - Important tool: identify degree of displacement, location of comminution, and presence of osteochondral injuries

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## Fractures of the Talus

### Timing of Treatment

Not emergent based on several studies

- Vallier HA, Nork SE, Barei DP, et al. Talar neck fractures: results and outcomes. *J Bone Joint Surg Am.* 2004;86-A:1616-1624.
- Lindvall E, Haidukewych G, DiPasquale T, et al. Open reduction and stable fixation of isolated, displaced talar neck and body fractures. *J Bone Joint Surg Am.* 2004;86-A:2229-2234.
- Bellamy JL, Keeling JJ, Wenke J, et al. Does a longer delay in fixation of talus fractures cause osteonecrosis? *J Surg Orthop Adv.* 2011;20:34-37.
- Patel R, Van Bergeyk A, Pinney S. Are displaced talar neck fractures surgical emergencies? A survey of orthopaedic trauma experts. *Foot Ankle Int.* 2005;26:378-381.

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## Fractures of the Talus

### Timing of Treatment

- Acute treatment for the following:
  - Open fracture
  - Soft Tissue Concerns
  - Neurovascular compromise
    - Especially Posteromedial




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## Fractures of the Talus

### Principles of Fixation

- Accurate Alignment of the Talar Neck
  - 15 to 20 degrees medial to the body
- Stable Fixation
  - Optimize revascularization potential
  - Allow early range of motion

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## Fractures of the Talus

### Implant Selection

- Predicated upon pattern, degree of comminution, and bone quality
- Aim to provide sufficient fixation to enable early ROM
- Partially Threaded Screws
- Fully Threaded Screws
- Mini-Fragment Plates

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## Fractures of the Talus

### Surgical Approaches



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### Fractures of the Talus



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### Fractures of the Talus

#### Surgical Approaches



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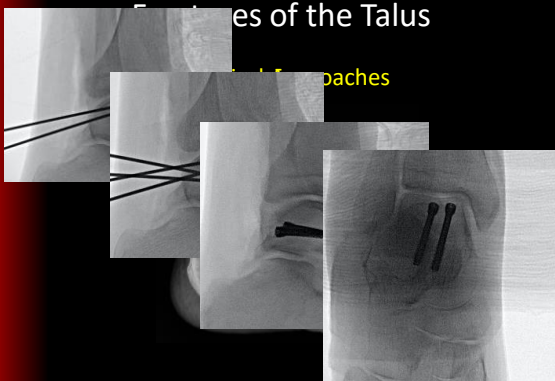
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### Fractures of the Talus

#### Surgical Approaches



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## Fractures of the Talus

### In My Wheelhouse?

- High-energy injuries
- Unique Anatomy
- Visualization is Key
- Complications



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Thank You

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