

# Displaced Calcaneus Fractures

## Approach Choices

### 2024

James R Ficke, MD FACS  
Professor and Chair  
Department of Orthopaedics  
Johns Hopkins Hospital  
Baltimore Maryland

THE JOHNS HOPKINS HOSPITAL

# Calcaneus Fractures

“...the man who breaks his heel bone is done.”

- Cotton and Henderson, 1916

“...results of crush fractures of the os calcis are rotten.”

- Bankhart, 1942



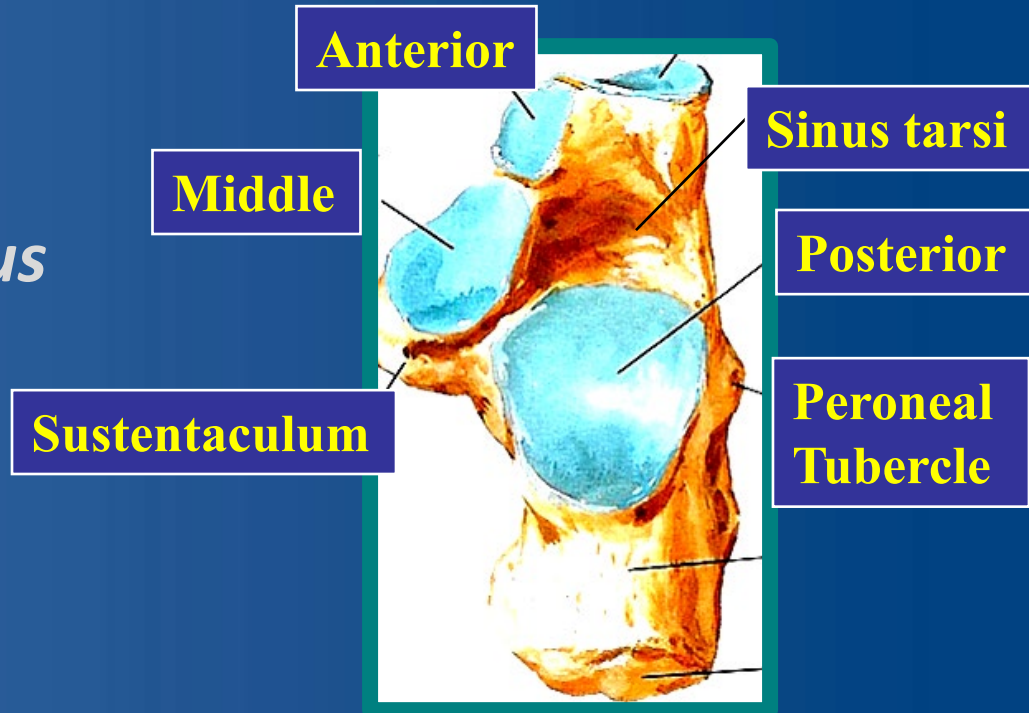
# Introduction

- 2% of all fractures
- 60% of **tarsal fractures (#1)**
- 90% occur in ages 20-40 yrs
  - *Mostly males*
  - *Most common injury mechanisms are:*
    - Falls from > 6'
    - Motor vehicle collisions
- 26% with other LE fractures
  - *Spine*
  - *Tibia*
  - *Foot*



# Anatomy

- Bone architecture
  - *Articular facets*
  - *Sustentaculum talus*
  - *Peroneal tubercle*
  - *Sinus tarsi*



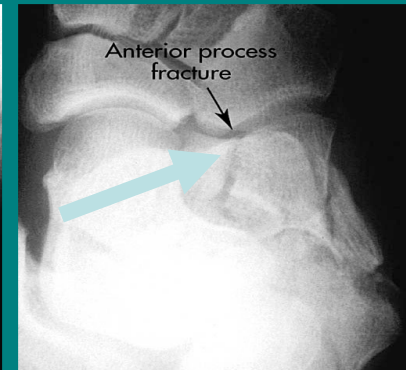
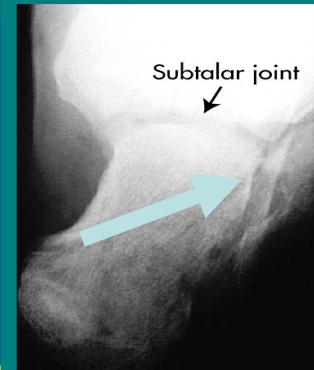
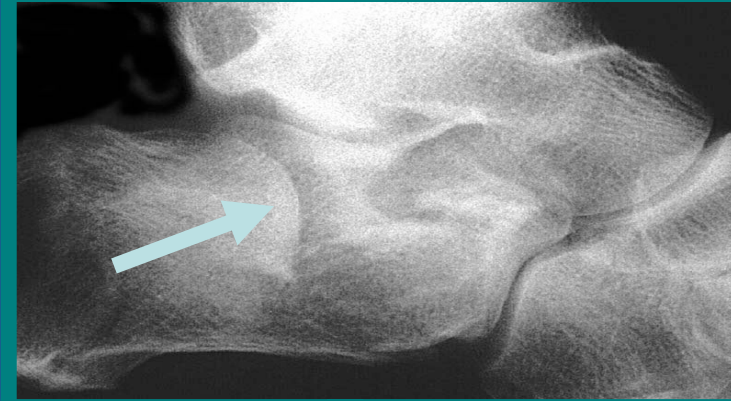
# Initial Evaluation

- Splint in neutral DF
- Elevation/ compress
- Fracture Blisters?
- Imaging



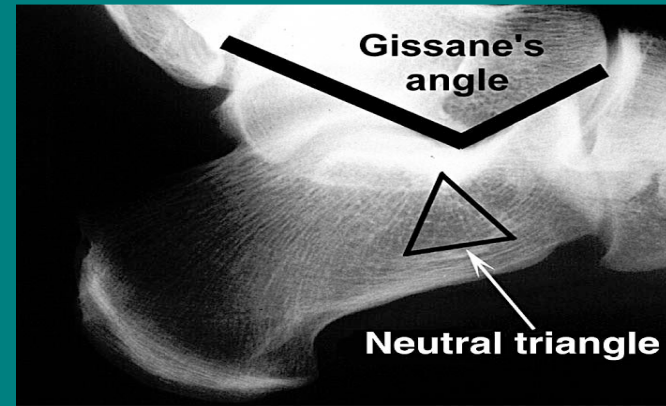
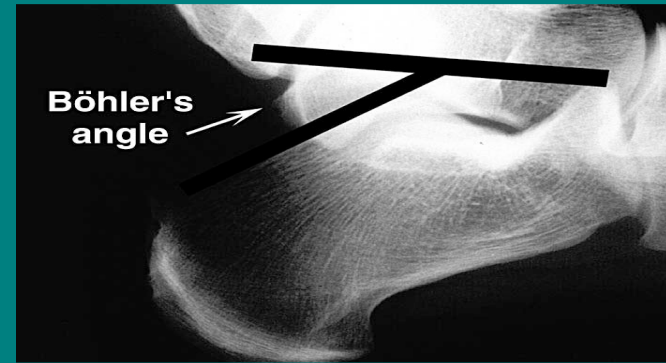
# Radiologic Evaluation

- Plain films
  - Lateral (Subtalar joint)
  - AP (C-C joint)
  - Harris axial
    - Alignment
    - Posterior facet
  - Broden views



# Initial Imaging- Plain Radiography

- Radiographic parameters
  - *Böhlers angle* (20-40° )
  - *Crucial angle of Gissane* (100- 130° )



# Initial Imaging: CT Scan

- Pre-op planning
- 3-5 mm cuts
- Axial, sagittal, semi-coronal cuts
  - Subtalar joint congruity
  - Heel width/shortening
  - Lateral wall
  - Peroneal impingement
  - Assesses articular fragments/varus

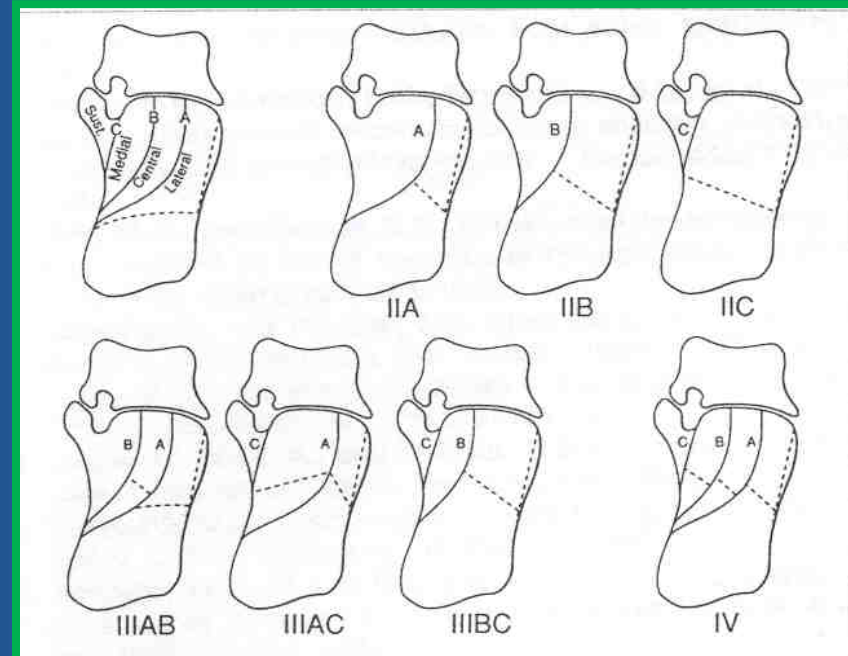




# SANDERS CLASSIFICATION

Type I = all nondisplaced fxs, regardless of # of fragments

- #1— Look at #of fragments
  - 2 = Type II
  - 3 = Type III
  - $\geq 4$  = Type IV
- #2— Location of fragments
  - Any combination of A, B, C
  - Lateral (A) to medial (C) –based on difficulty of reduction



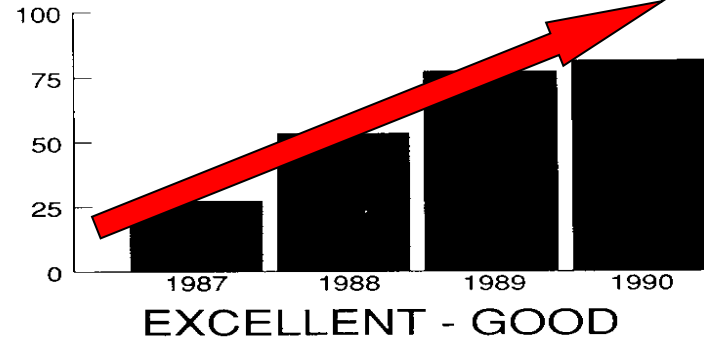
# Treatment Indications

- Nonoperative:
  - *Nondisplaced type I fractures*
  - *Open fractures/ life threatening injuries- delay*
  - *Soft tissue compromise*
  - *Severe peripheral vascular disease*
  - *Non/ limited preop ambulation*
  - *+/- smoking*
- Open reduction & internal fixation
  - *Type II and III patterns*
  - *Stable, intact soft tissue envelope*
    - **Fracture blisters-(Strauss, Egol JOT 2006)**
    - “*wrinkle test*”
  - *Within 3 weeks of injury*
- Primary arthrodesis
  - *Type IV pattern*
  - *After restoration of calcaneal shape*



# Surgical Contraindications

- Contraindications to operative treatment
  - *Diabetes*
  - *Vascular insufficiency*
  - *Smoker*
  - *Open fractures*
  - *Sanders Type IV*
  - *Elderly*
  - *Severe swelling*
  - ***Lack of experience***



**FIG. 10.** The learning curve for calcaneal fractures. Results steadily improve with the surgeon's ability to treat these fractures operatively. This ability did not extend to type IV fractures.

Sanders, R JOT 1992



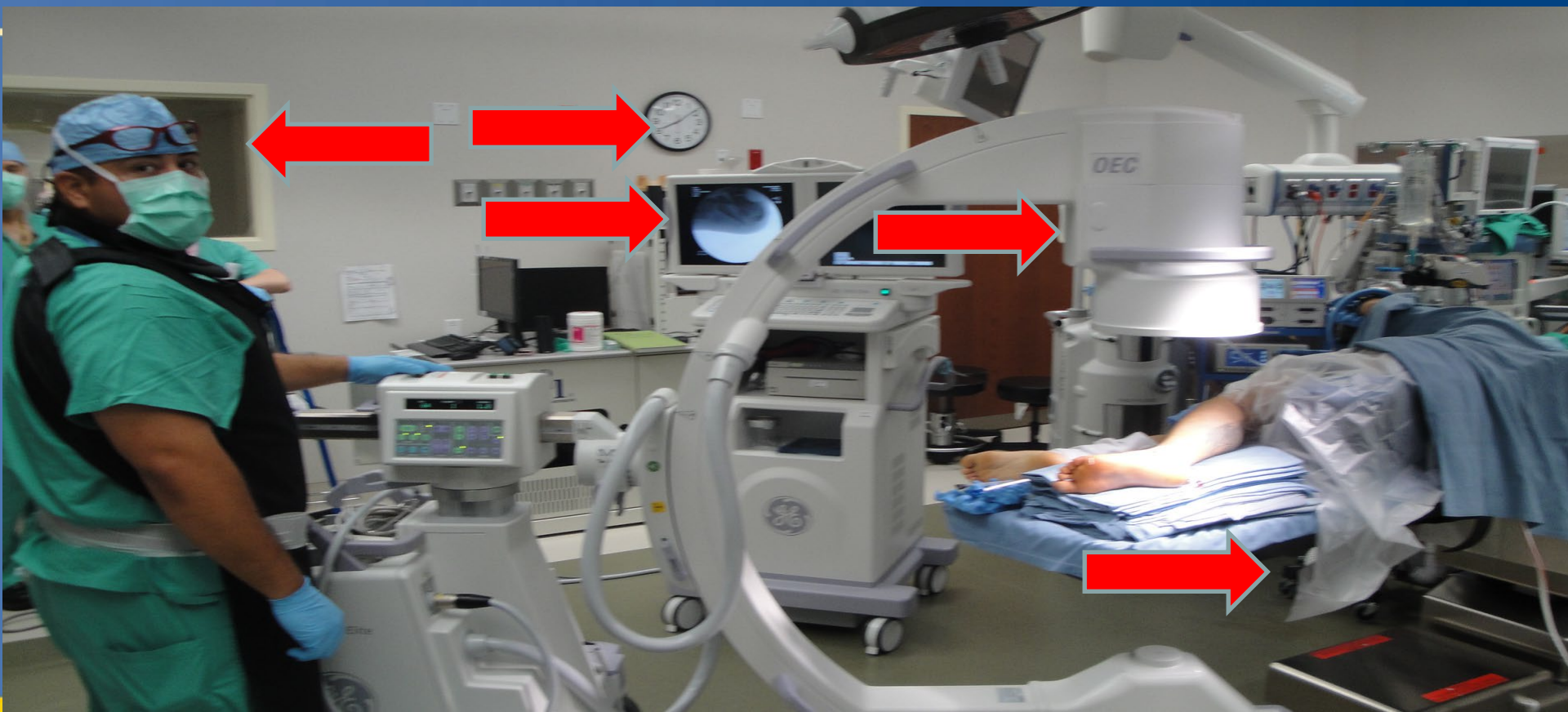


# Treatment- Timing

- Skin condition dictates
  - *Fracture blisters*
  - *Wrinkle test*
- Greater than 3 weeks
  - *Skin closure- shortening*
  - *Callus*

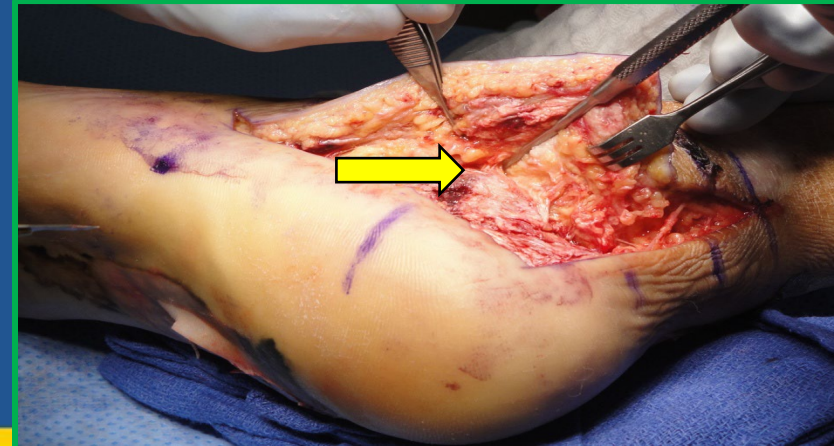
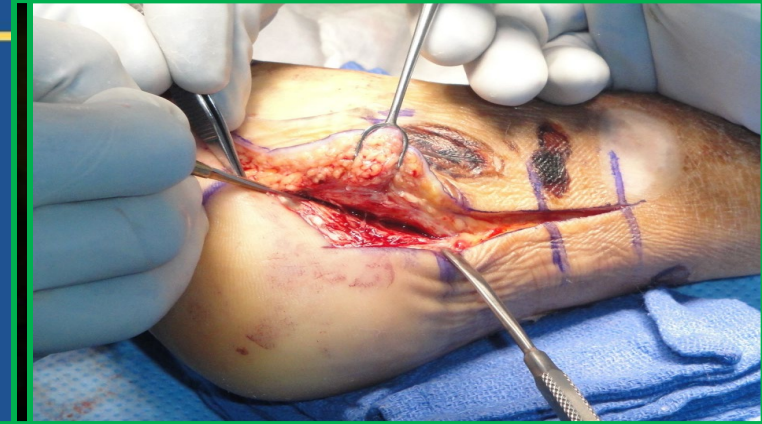


# Treatment- Room set up



# Extensile Lateral Approach

- L-incision:
  - *Sural nerve*
  - *Vascular supply*
  - *Peroneal tendons*
  - *“No touch” periosteal flap*
  - *K-wire retraction*



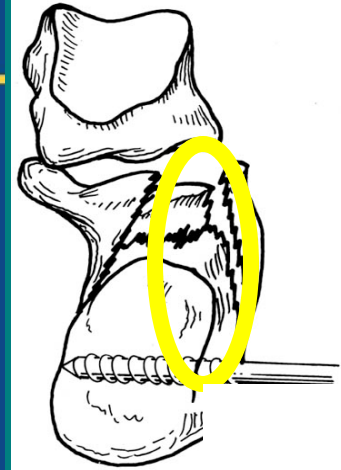
# Intraarticular Fractures Surgical Treatment



TOYOTA HOSPITAL

## Sequence of reduction

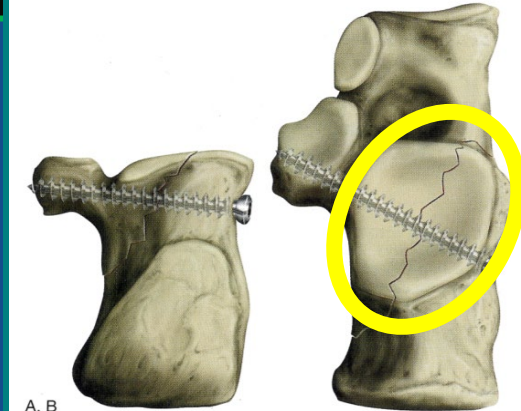
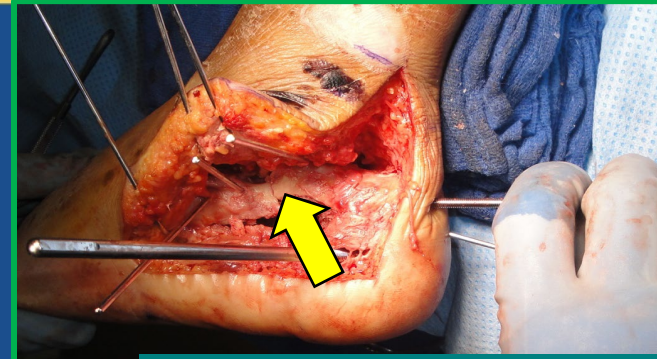
1. Remove lateral wall
2. Anterior process - sustentaculum tali
3. Posterior facet
4. Restore length, height, valgus, width (shantz pin)
5. ORIF posterior facet and lateral calcaneal plate



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A, B

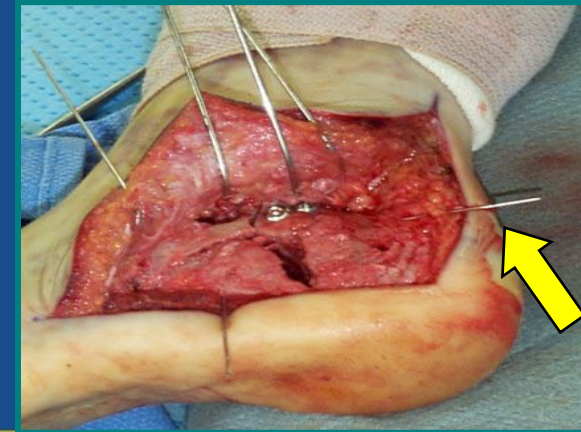
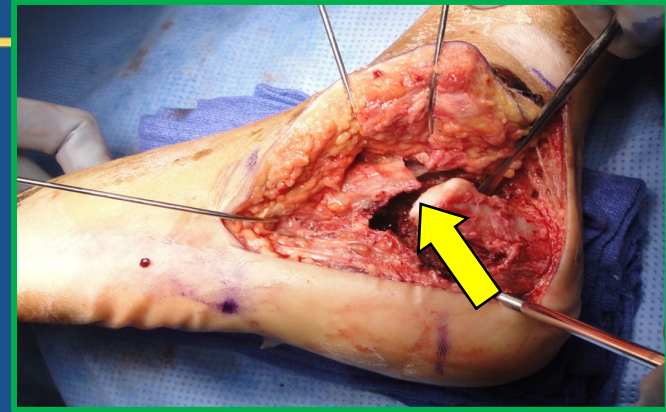




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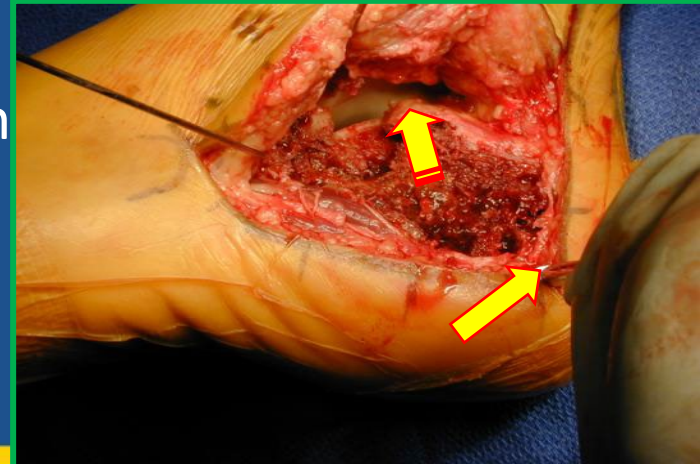
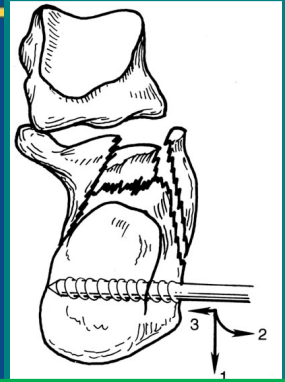
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MEDICINE

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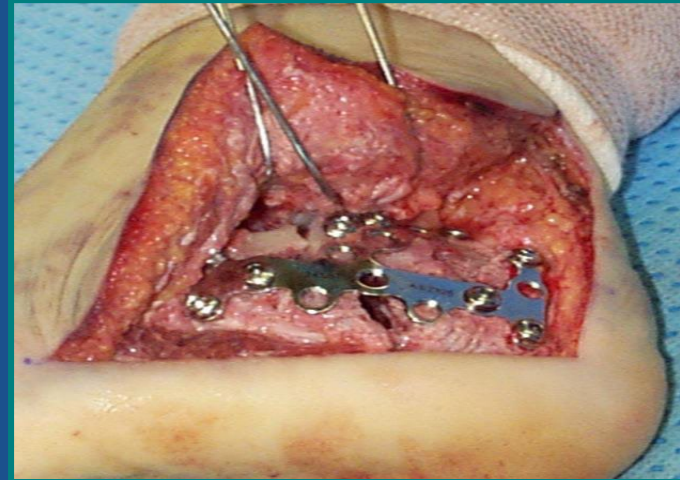
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# Radiologic Evaluation

- Brodén's Views
  - Leg- internal rotation 30-40°
  - Foot- neutral flexion
  - Tube- 10, 20, 30, 40° cephalad
- Intraop posterior facet imaging



# OR Imaging: Broden's Views



# Minimally Invasive ORIF

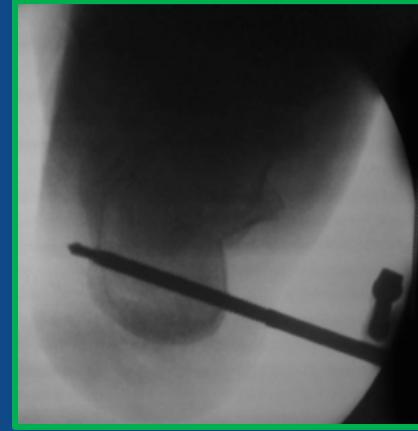
- 24 Sanders II-III calcaneus fractures -either extensile lateral or limited lateral open approaches
- No wound complications associated with limited open technique (v. 33% in extensile approach)
- Limited open technique shorter operative time
- No difference w/ regard to union & maintenance of reduction



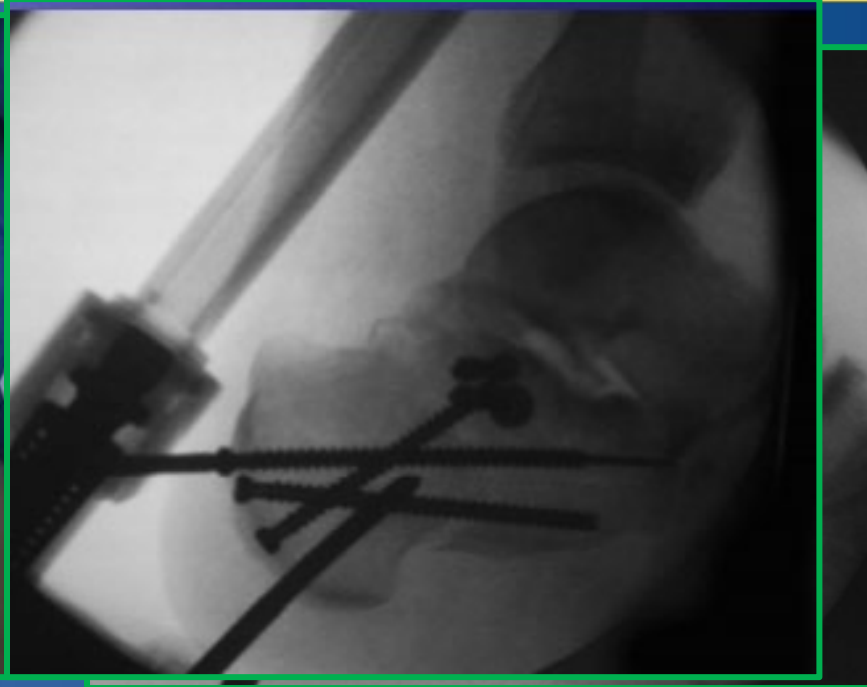
Weber et al; Limited ORIF of Displaced Intra-articular Fractures of the Calcaneus; JBJS-Br; 90B; 12: 2008



# Minimally Invasive Technique



# Minimally Invasive Technique





# Intraarticular Fractures Postoperative Management

- Layered Closure- interrupted
- Bulky Cotton dressing
- Drain pulled first day
- Alternative- NPWT 3-5 days
- Same splint 7-10 days
- Sutures at least 3 weeks
- Motion when skin healed
- Nonweightbearing 8 weeks



# Concluding Thoughts

- Operative Treatment- modest improvements in select groups (Nonsmokers; Women; Non-laborers)
- No surgery we perform can't hurt someone
- Soft Tissue critical determinant
- Choice of Approach- user experience; mitigate and manage risks and complications



A photograph of a high-altitude mountain range. The mountains are covered in snow and have sharp, jagged peaks. The sky is a clear, deep blue. The foreground shows a rocky, snow-dusted slope.

**Thank you!**