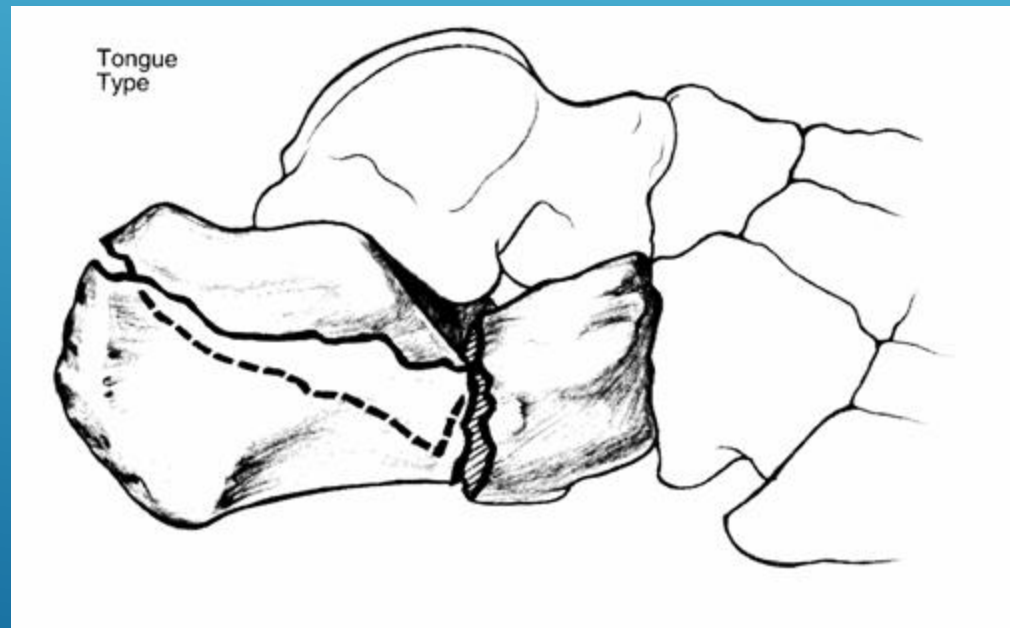


# CALCANEUS FRACTURES



- ▶ No disclosures relevant to this topic
  - ▶ Acknowledgement: some clinical pictures were obtained from the OTA fracture lecture series and AO fracture lecture series
- 

# INCIDENCE

- 2% of all fractures
- Most commonly fractured tarsal bone
- 60% of tarsal fractures
- 75% are displaced intra-articular fractures





# CALCANEUS FRACTURES

High incidence of associated injuries (50%)

spine (10%)

extremity (25%)

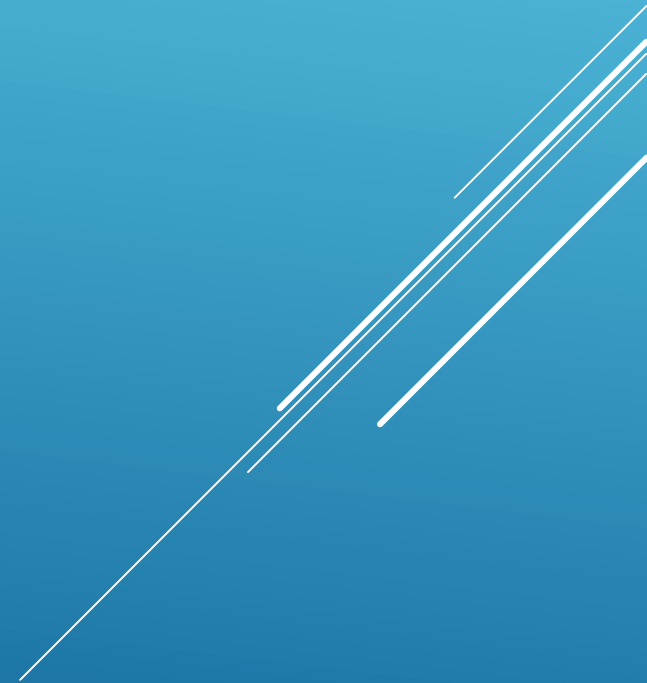


- High risk for disability
- Chronic pain
- Gait disturbance
- Inability to work
- Optimal treatment remains controversial
  - Must consider patient, injury, and surgeon factors

# CALCANEAL FRACTURES

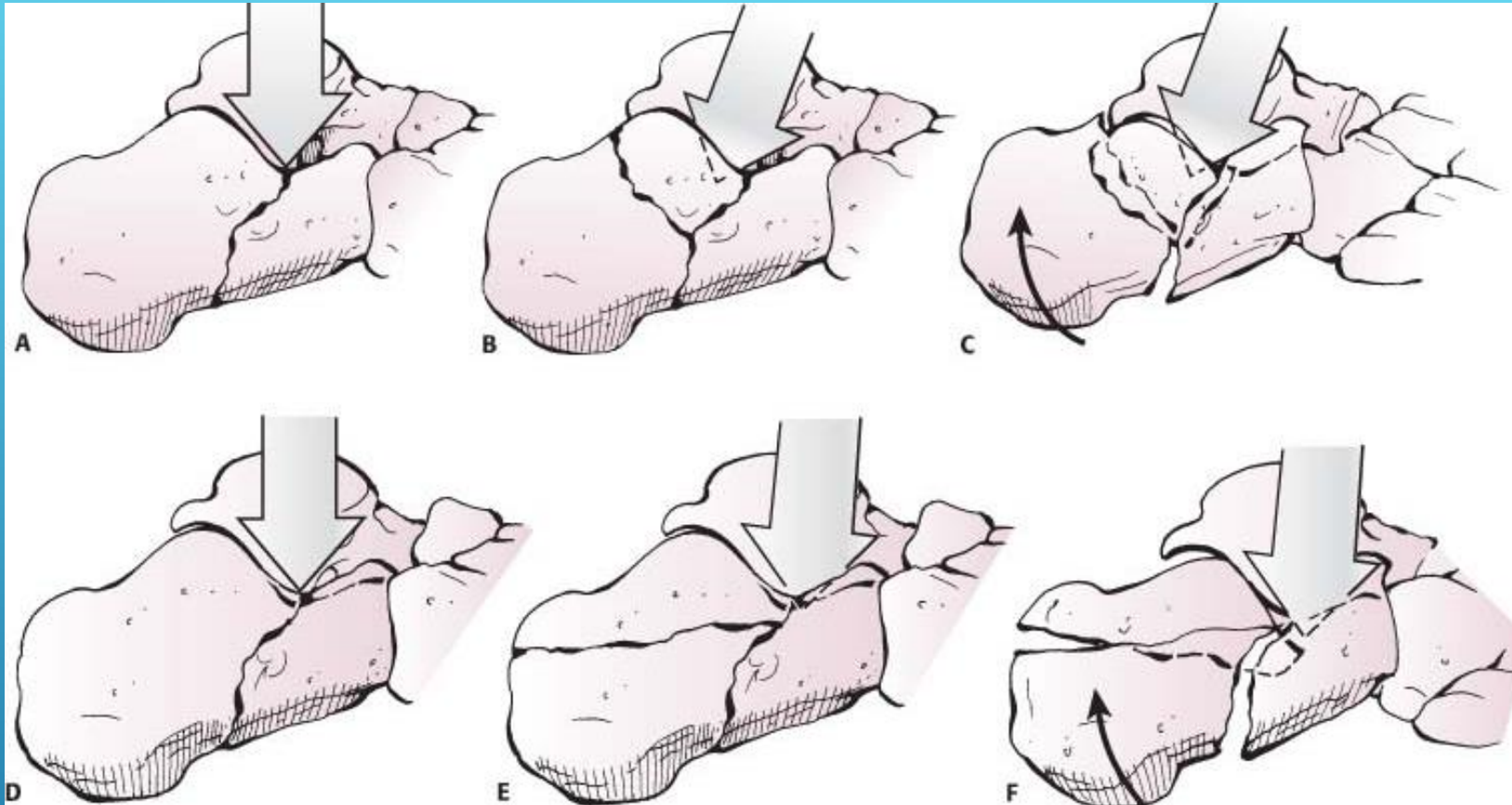
# CALCANEUS FRACTURES

History and functional level are important when choosing treatment  
most calcaneus fractures will heal  
surgery is to prevent malunion and disability associated with it  
some will tolerate a malunion better than others



# CALCANEUS FRACTURES

- Detailed History
- Important to determine appropriate treatment
  - Pre-injury level of function
    - Recreational activity
  - Occupation
    - Heavy manual labor?
  - Habits
    - Smoker?
  - Comorbidities
- ▶ Comorbidities
  - ▶ Diabetes
  - ▶ Vascular disease
  - ▶ Smoking
  - ▶ Neuropathy
  - ▶ Age?



Figures A-C: Joint depression fracture. Note the slight posterior vector of force leading to separation of the posterior facet in Figure B and C  
Figures D-E: Tongue-type. Secondary fracture line results from a purely axial force

# MECHANISM OF INJURY

# PHYSICAL EXAM

- Note condition of skin
  - Fracture Blisters?
  - Threatened skin?
  - Open wound?
- Detailed neurovascular exam
- Assess for associated injuries



- Bulky splint in neutral dorsiflexion
- Period of soft tissue rest
- If considering lateral extensile approach...
- PATIENCE!
- Await return of skin wrinkling
- May take 2-3 weeks

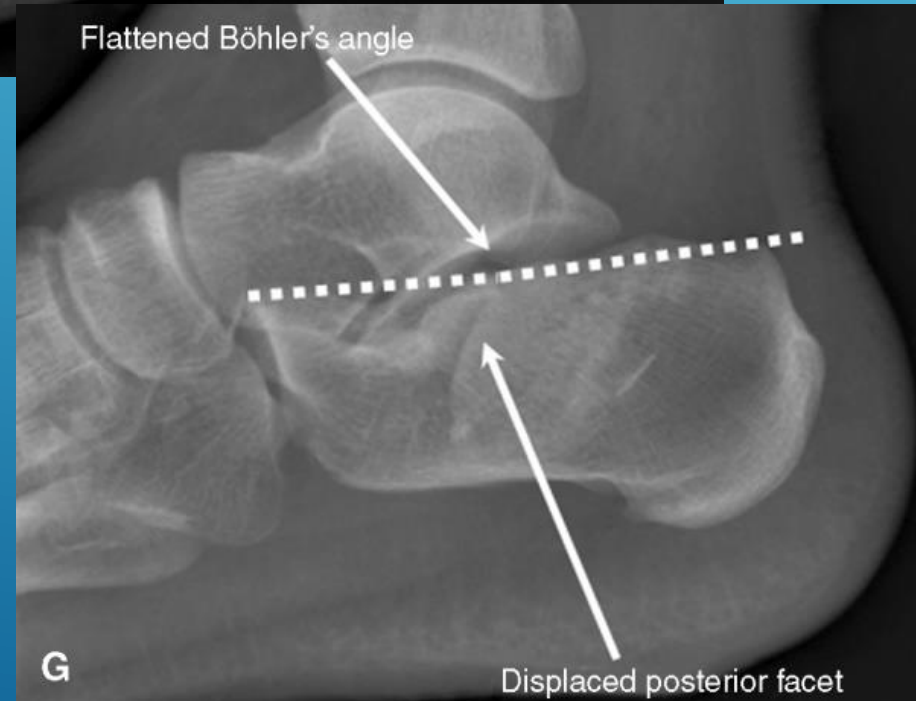
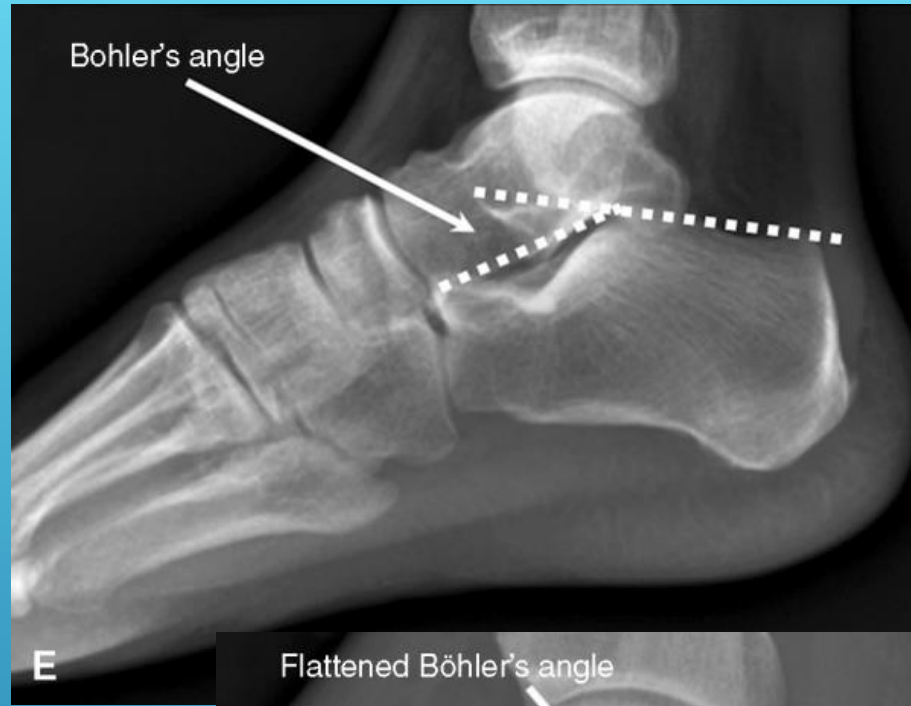


## INITIAL MANAGEMENT

- Foot series
  - AP, Lateral, Oblique
- Ankle series
  - Mortise
- Axial (Harris) view
- Contralateral views
- Broden's view (intraop)
- CT scan

# IMAGING

- Assess
  - Posterior facet
  - Middle facet
  - Calcaneocuboid joint
  - Calcaneal length and height



## LATERAL VIEW

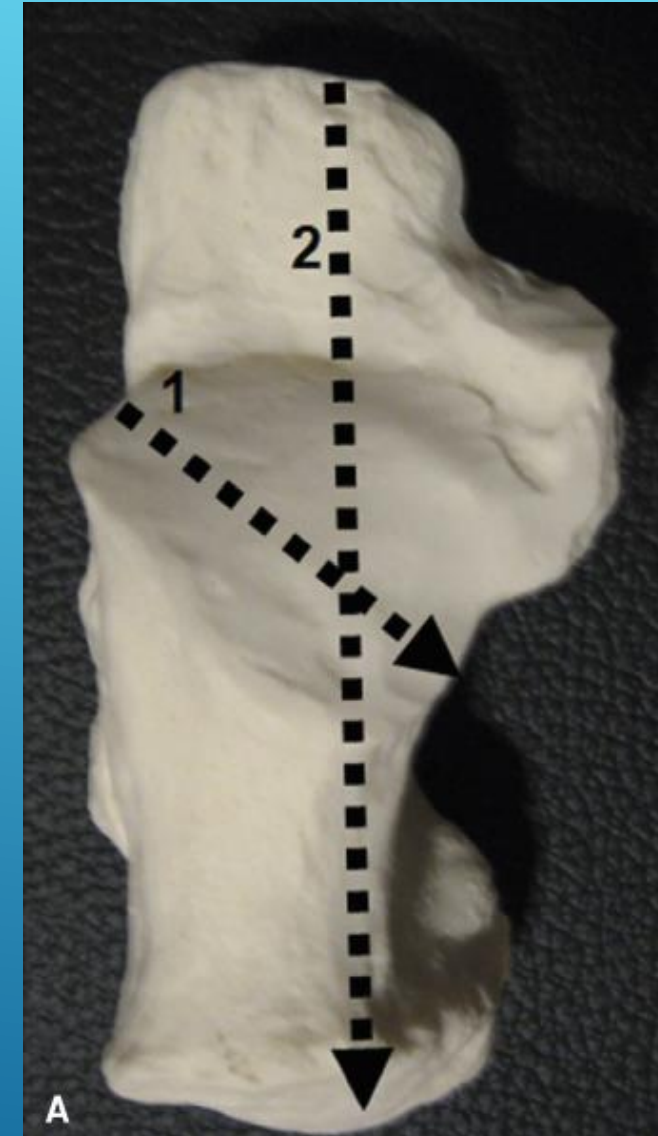
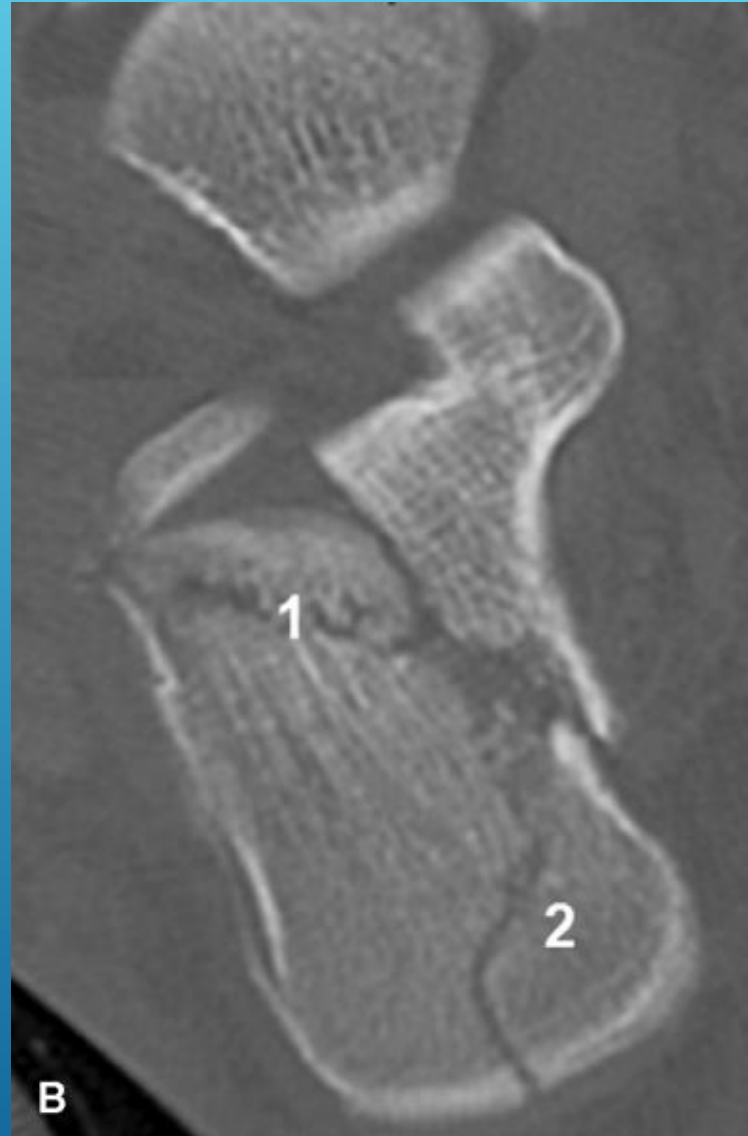
- 45° axial of heel
  - 2<sup>nd</sup> toe in line w/ tibia
  - Normal  $\approx 10^\circ$  valgus
- Assesses tuber alignment
- Varus/valgus
- Translation
- Width
- Can be difficult to obtain as dorsiflexion of ankle may be difficult in injured foot
- Intraoperatively used to assess:
  - medial wall reduction
  - screw placement / length



## AXIAL (HARRIS) VIEW

# CT SCAN

- ▶ Done in 3 planes
- ▶ Gives 3D picture of fragments
- ▶ Helpful with surgical planning and prognosis

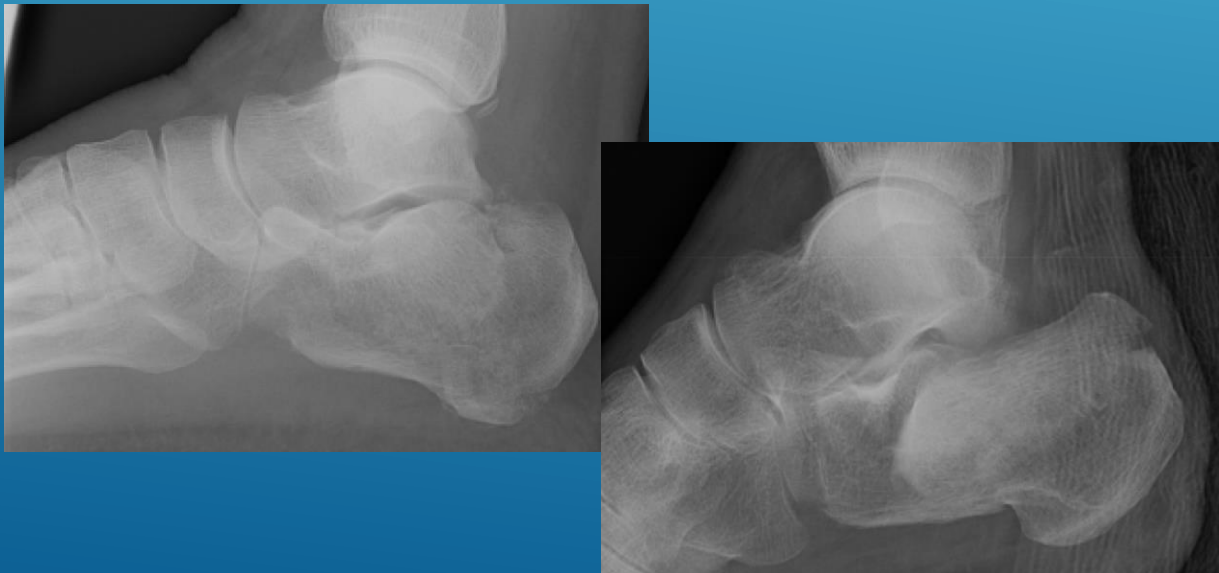
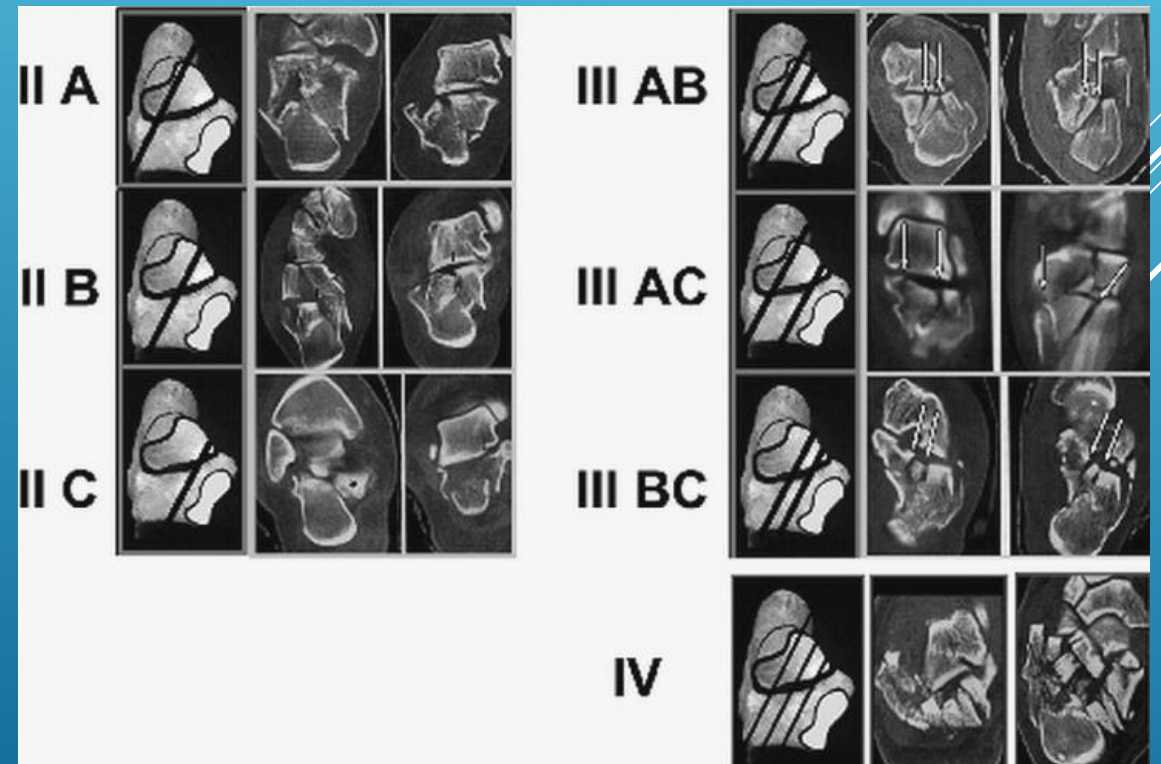


# CALCANEUS FRACTURES

## Classification systems

- ▶ Essex-lopresti— based on plain xray
  - ▶ Joint depression
  - ▶ Tongue type

- ▶ Sanders classification—based on ct scan



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# OPERATIVE COMPARED WITH NONOPERATIVE TREATMENT OF DISPLACED INTRA-ARTICULAR CALCANEAL FRACTURES

A PROSPECTIVE, RANDOMIZED, CONTROLLED MULTICENTER TRIAL

BY RICHARD BUCKLEY, MD, FRCSC, SUZANNE TOUGH, PHD, ROBERT MCCORMACK, MD, FRCSC, GRAHAM PATE, MD, FRCSC,  
ROSS LEIGHTON, MD, FRCSC, DAVE PETRIE, MD, FRCSC, AND ROBERT GALPIN, MD, FRCSC

*Investigation performed at the Calgary General Hospital, Calgary, Alberta; the Royal Columbia Hospital, New Westminster, British Columbia;  
the Royal Victoria Hospital, Halifax, Nova Scotia; and The Victoria Hospital, London, Ontario, Canada*

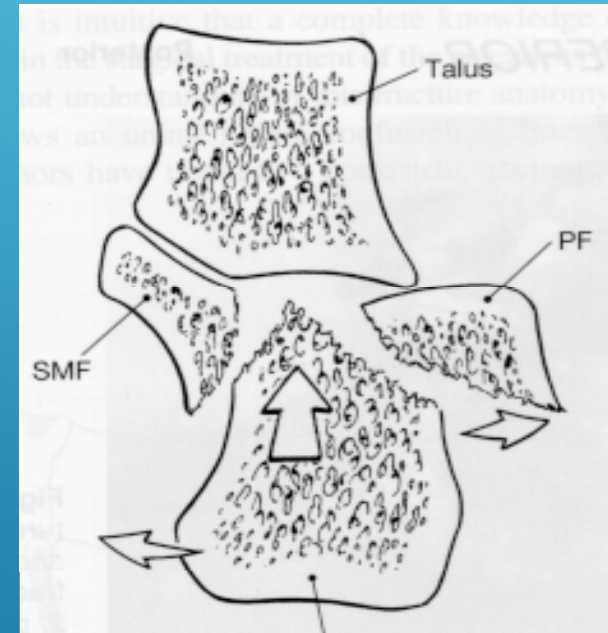
Table 1

## Decision Table for Management of Displaced Intra-articular Calcaneal Fractures

Factors	Surgery Recommended	Results Equivocal	No Surgery
Patient factor			
Age <sup>2,16-18</sup>	Pediatric; adult <40 yr	40 to 60 yr	>60 yr
Gender <sup>2,19</sup>	Females; young males	Middle-aged males	Older patients, either gender
Smoking history <sup>3,4,32</sup>	—	—	X
Chronic medical illness <sup>9,19</sup>	—	—	X
Workers' compensation claim <sup>2,19</sup>	—	X	—
Workload <sup>2,19</sup>	Any patient not claiming workers' compensation	Workers' compensation patients	Light or sedentary work
Fracture factor			
Bilateral injury <sup>2</sup>	—	X	—
Open fracture <sup>21</sup>	X	—	—
Böhler's angle <sup>2,22</sup>	>0°	<0°	—
Fracture classification <sup>2,5,7</sup>	Sanders type II, III	Sanders type IV	Extra-articular Sanders type I
Probability of achieving anatomic reduction <sup>2</sup>	≤2 mm step-off in joint surface: excellent chance of achieving reduction	Equivocal reduction	>2 mm step-off in joint surface: little chance of achieving reduction

# SURGICAL INDICATIONS CALCANEUS FRACTURES

- ▶ Intra-articular displacement
- ▶ Distortion of height, width, and alignment of heel



# SURGICAL INDICATIONS

## CALCANEUS FRACTURES

- ▶ Condition of soft tissues is critical for wound healing
- ▶ May require a several week delay
- ▶ Meticulous care of soft tissues intra-operatively



# EMERGENT CONDITIONS

- Threatened skin
  - Displaced tongue fragment or avulsion fracture
  - Delayed treatment results in full thickness necrosis
  - Treat with provisional or definitive percutaneous fixation

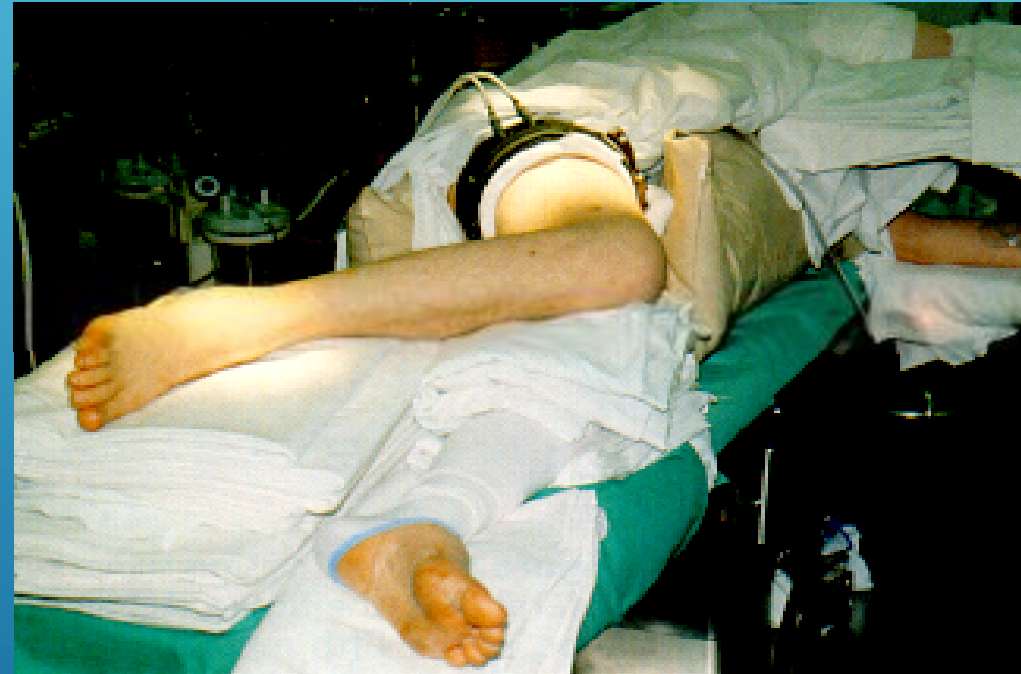
*Gardner MJ, Nork SE, Barei DP, Kramer PA, Sangeorzan BJ, Benirschke SK. Secondary Soft Tissue Compromise in tongue-type calcaneal fractures. J Orthop Trauma. 2008 Aug;22(7):439-45*



# BASIC SET-UP

## CALCANEUS FRACTURES

- ▶ Lateral incision (axillary roll, bean bag)
- ▶ Thigh tourniquet
- ▶ Possible bone graft
- ▶ fluoroscopy
- ▶ Prep & drape to above knee (& hip if iliac bone graft)
- ▶ Pre-op antibiotics



# IMPLANT CONSIDERATIONS

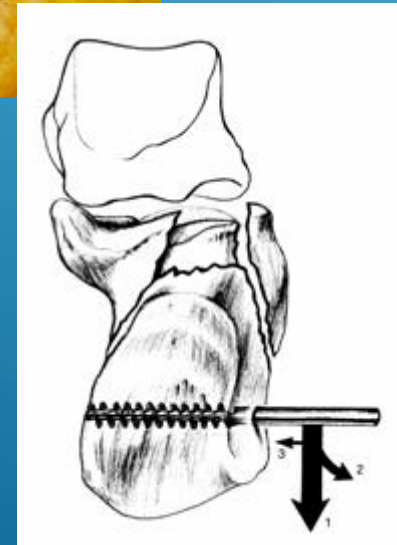
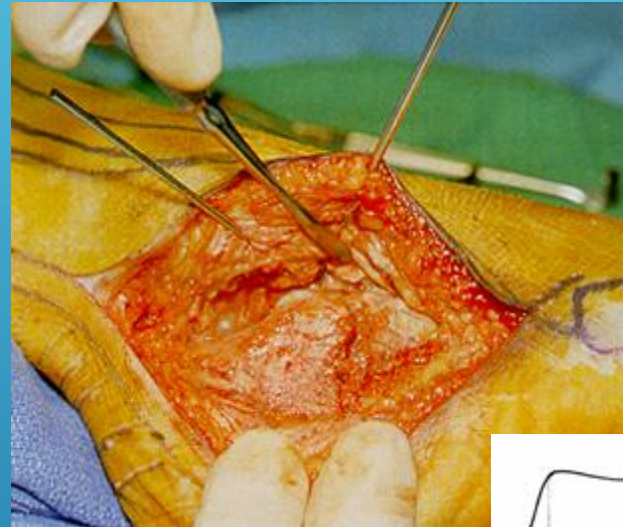
## CALCANEUS FRACTURES

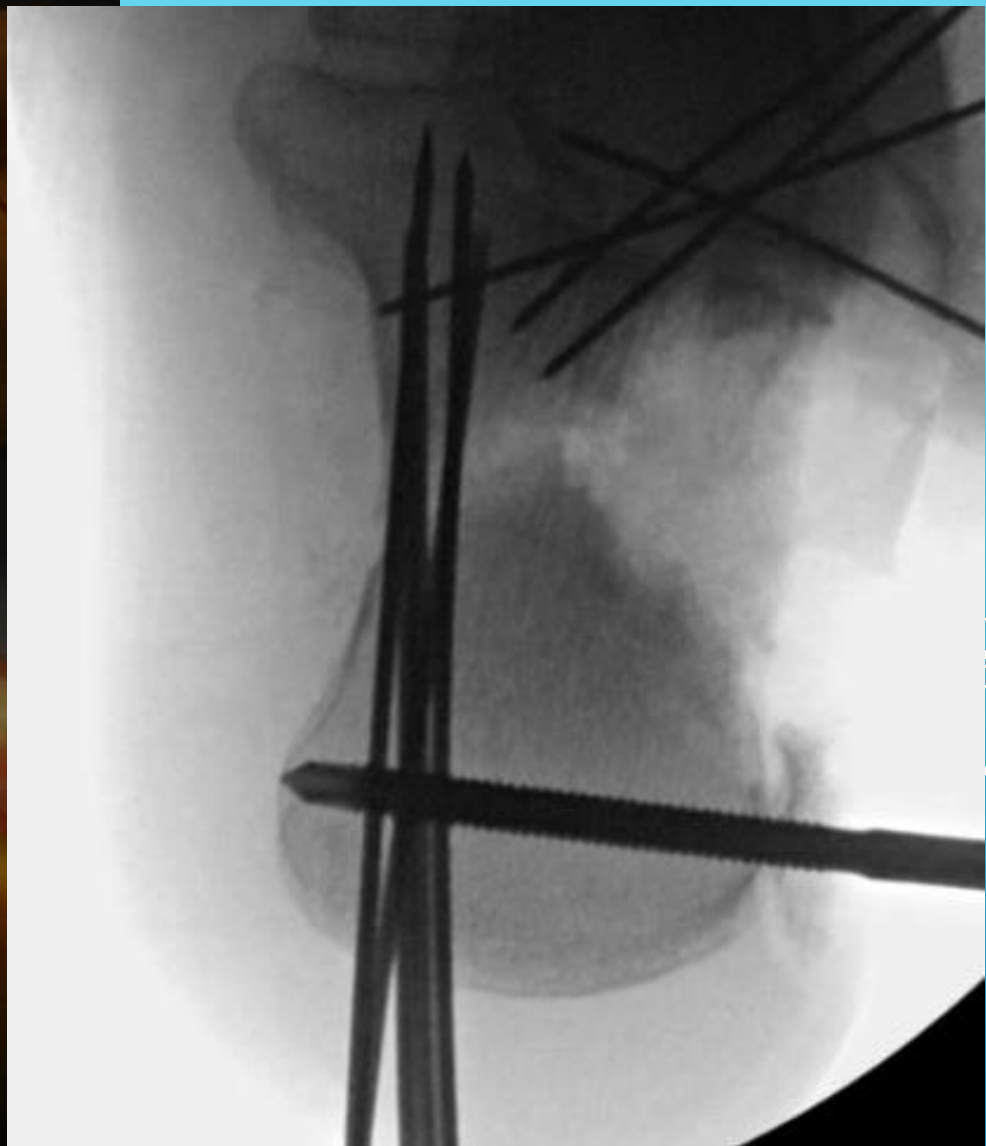
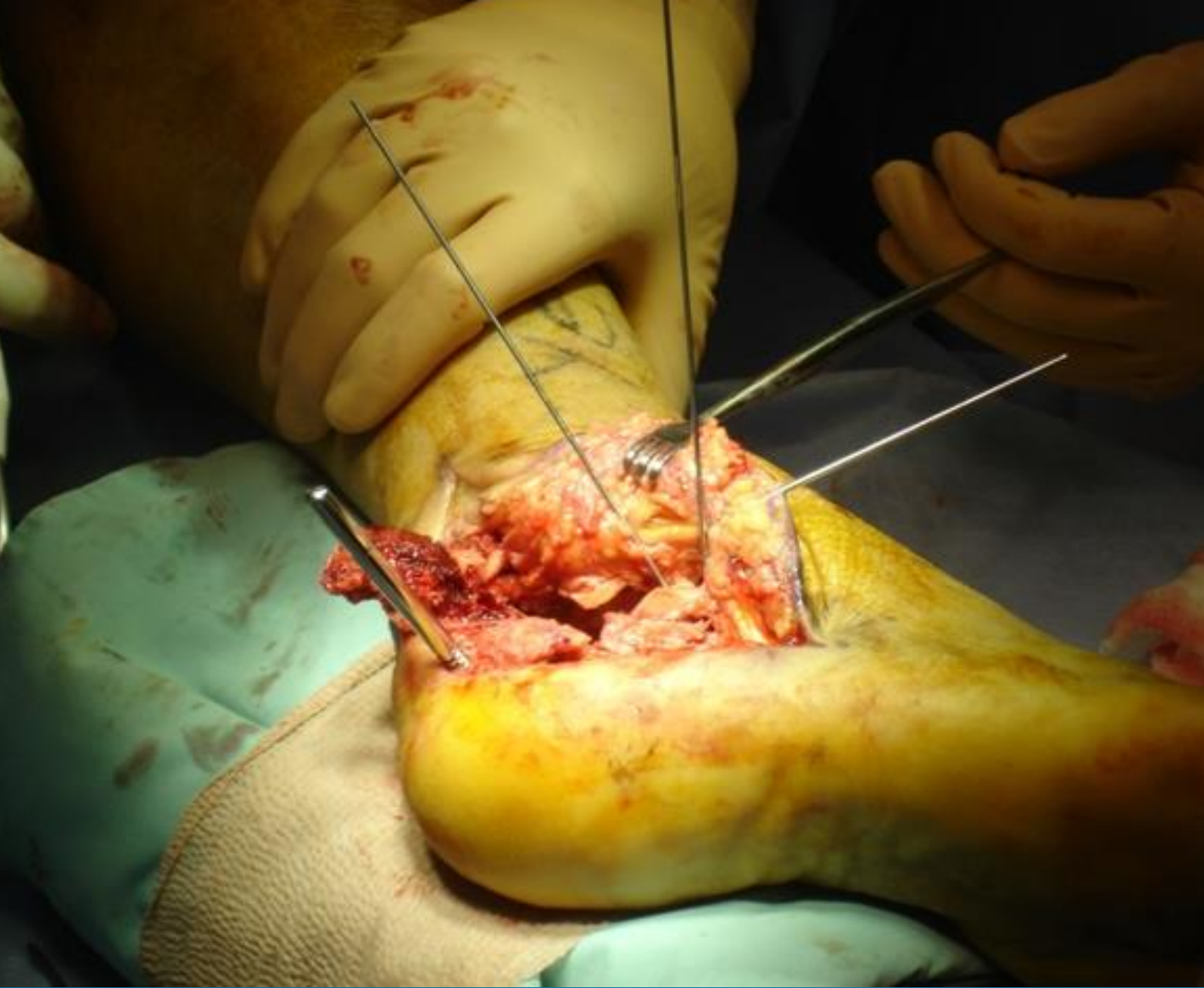
- ▶ Small fragment set
- ▶ Small cannulated screws
- ▶ 3.5mm reconstruction plates
- ▶ Locked calcaneal plates
- ▶ Cervical H plate
- ▶ 2.7 mm cortical screws & plates (mini frag)
- ▶ Extra k-wires
- ▶ Schanz screw & T-handle chuck

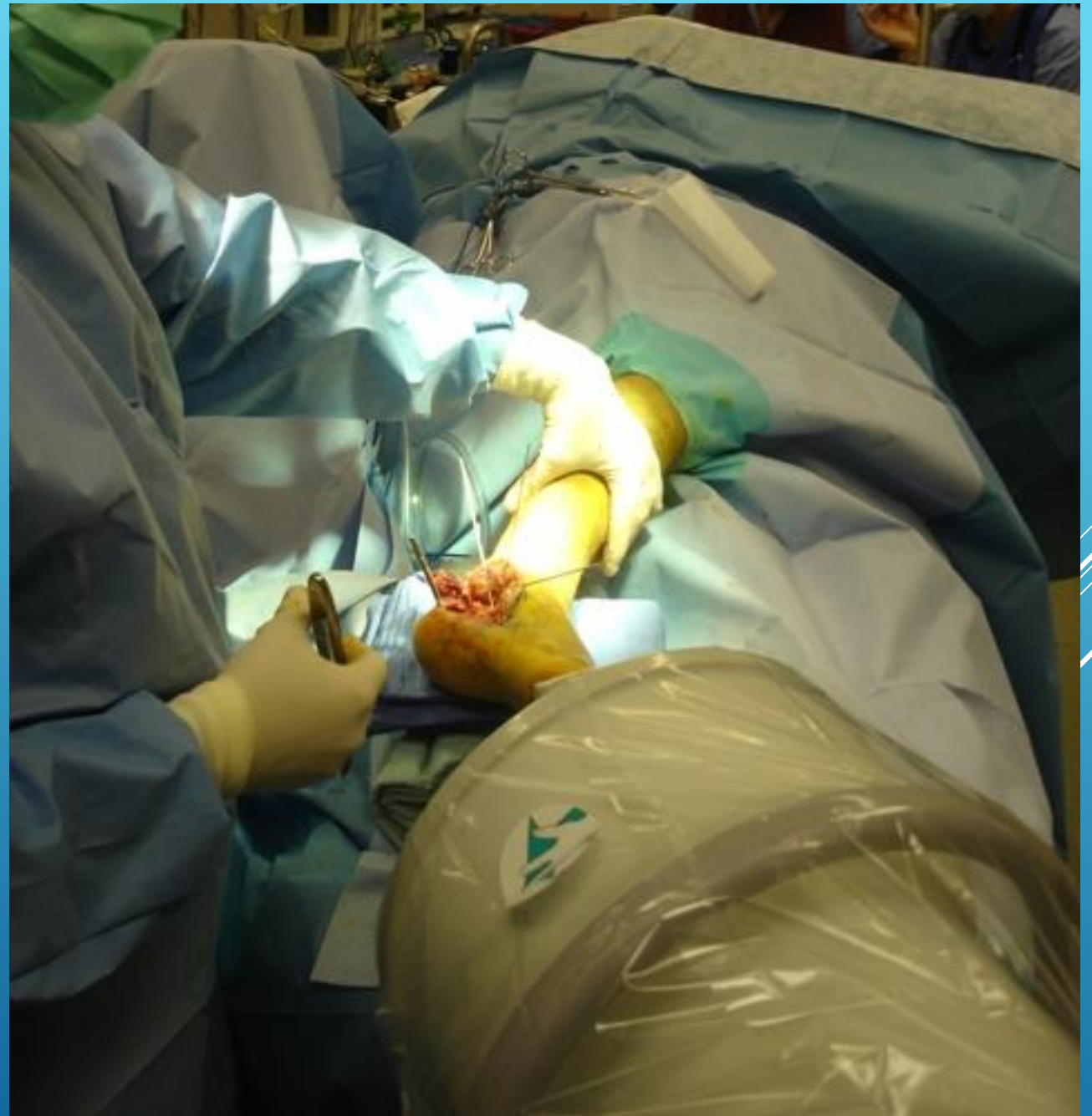
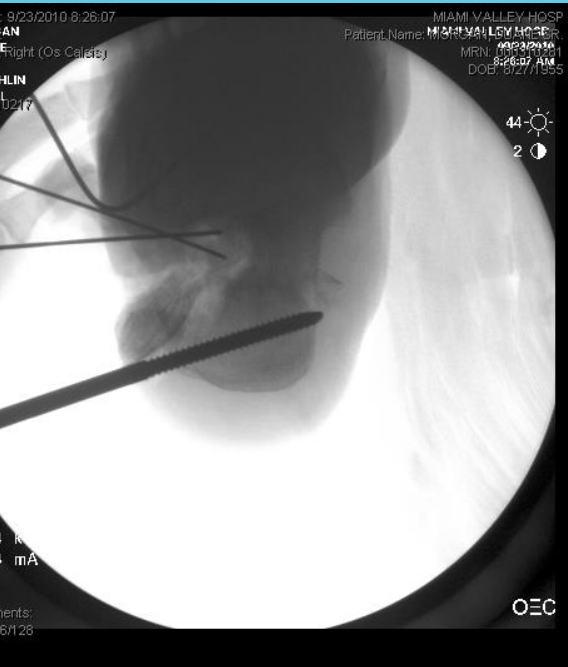
# SURGICAL TECHNIQUE

## CALCANEUS FRACTURES

- ▶ Meticulous soft tissue handling
  - ▶ K wires serve as retractors
- ▶ Schanz screw can serve as handle to correct deformity and reduce medial wall
- ▶ Sequence: reduce medial wall, reduce anterior fragments, reduce joint, place hardware



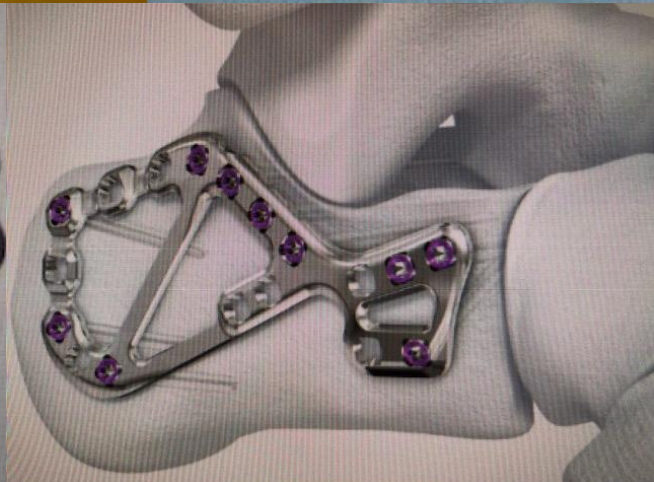
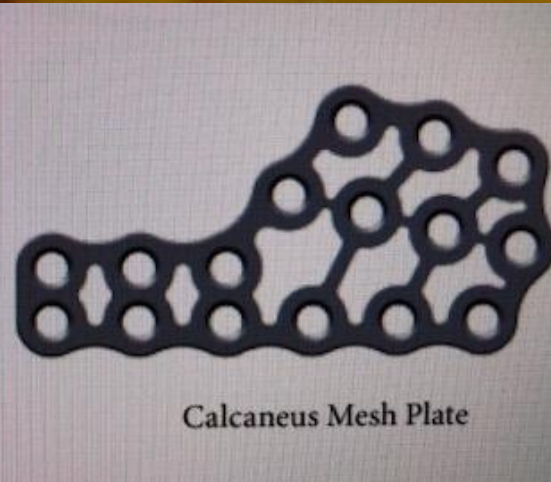
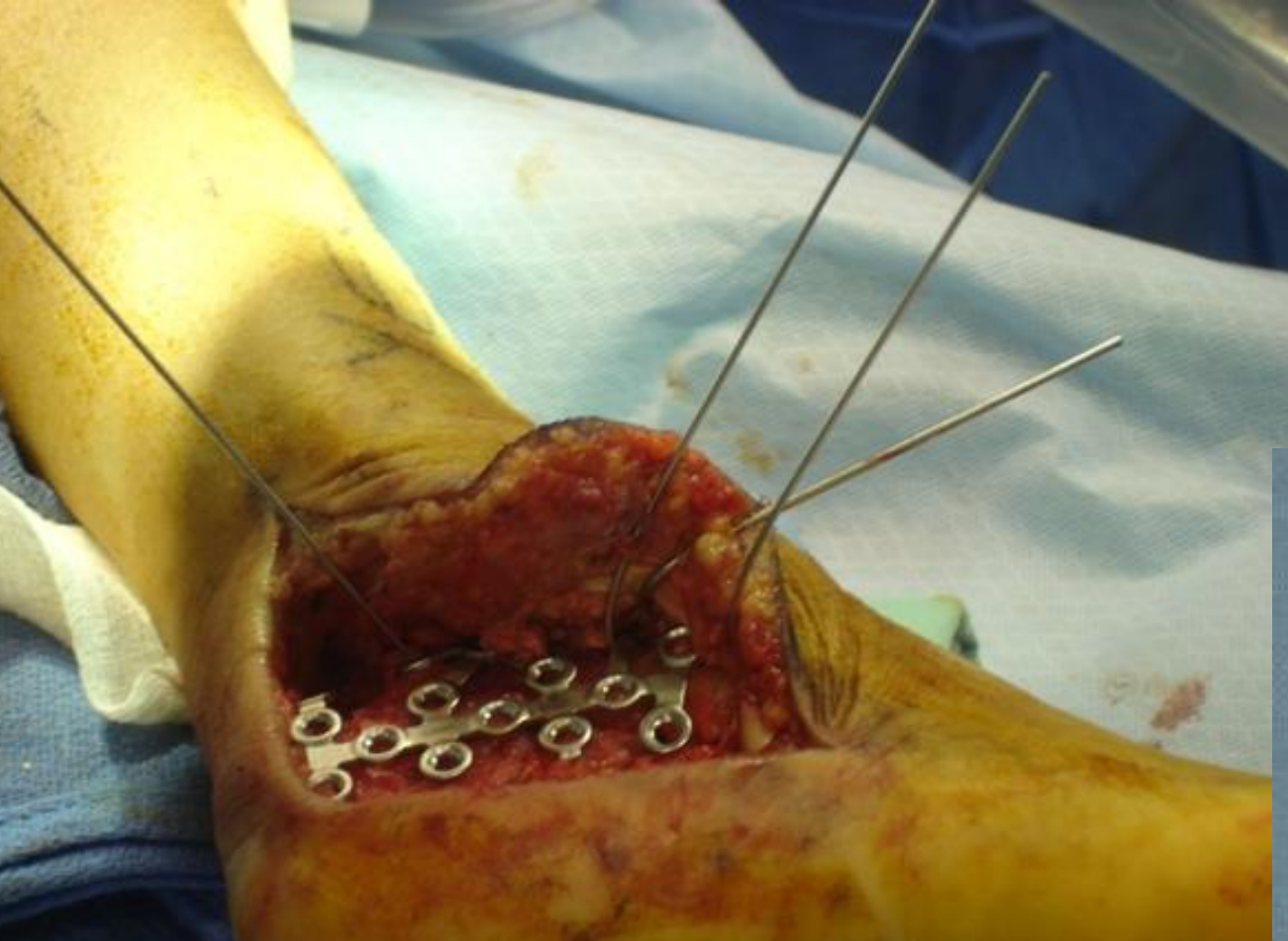




# CALCANEUS FRACTURE

Lateral position

Xray/fluoro: axial view of calcaneus



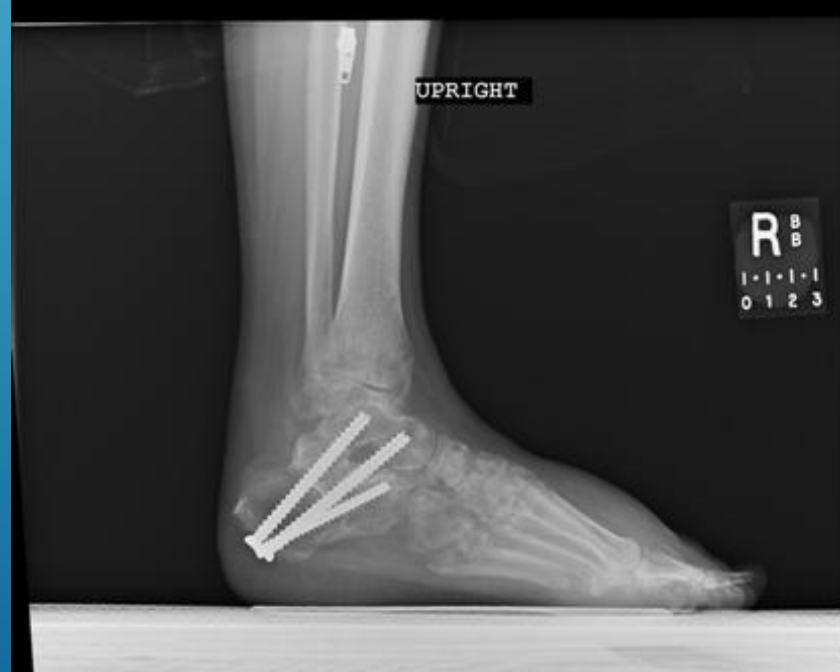
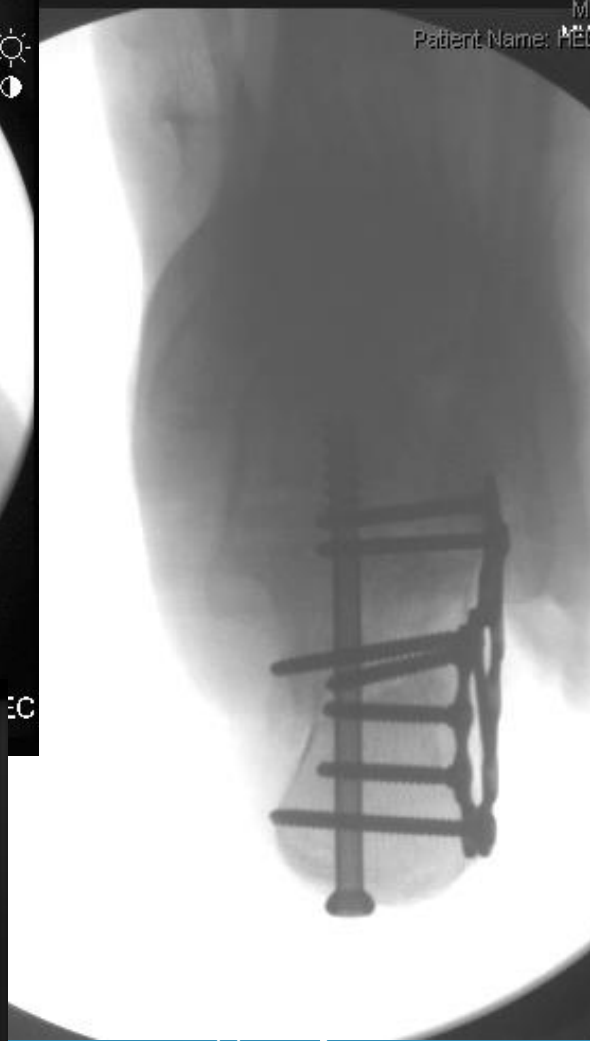
- ▶ Drain under the flap, leave for 1-2 days
- ▶ Tension free closure with nylon: simple/mattress/Allgower-donati
- ▶ Splint until wound is dry and stable



## CALCANEUS FRACTURE—POST OP

# CALCANEUS FRACTURES

- ▶ Other options for operative treatment
  - ▶ Percutaneous/limited open
  - ▶ Sinus tarsi approach
  - ▶ Primary fusion
  - ▶ 2 stage primary fusion



# CALCANEUS FRACTURE

- ▶ Postoperative care
  - ▶ Bulky cotton dressing and splint
  - ▶ Drain for open procedures
  - ▶ Elevation
  - ▶ Leave sutures in for at least 3 wks
  - ▶ Immobilize until skin stable
  - ▶ NWB for 3 months



# COMPLICATIONS—CALCANEUS FRACTURE

- Wound edge necrosis
  - Most common complication
  - Up to 25%
- Deep infection
  - 1-4% closed fractures
  - 19% open fractures
- Symptomatic hardware
- Stiffness
- Post-traumatic arthrosis
- Peroneal tendonosis
- Neuritis
- Heel pad pain




# CALCANEUS FRACTURE

- ▶ After care
  - ▶ Rolling knee scooter
  - ▶ ROM exercises as soon as skin stable
  - ▶ PT once weightbearing
  - ▶ Prepare patient for long recovery



# CALCANEAL FRACTURE

## ▶ Summary

- ▶ High energy injury, look for associated injuries
  - ▶ Many result in long term morbidity and impairment
  - ▶ This can be decreased with operative treatment provided complications avoided
  - ▶ Patient selection and management of comorbidities is essential for good outcomes
- 
- A decorative graphic consisting of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide.

THANKYOU

The image features a blue gradient background. In the center, the word "THANKYOU" is written in a white, uppercase, sans-serif font. On the right side, there are several white, parallel diagonal lines that sweep upwards from the bottom towards the top right corner.