

Fractures of the Calcaneus



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INTRODUCTION

“...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



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**Current Trends in
Orthopedic Trauma Symposium**

Tips and Tricks in the Age of Damage Control

INTRODUCTION

- High potential for disability
 - Pain
 - Gait disturbance
 - Unable to work
- “Best” treatment method controversial

Soft Tissue

- Very thin skin
- Almost no subcutaneous tissue



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**Current Trends in
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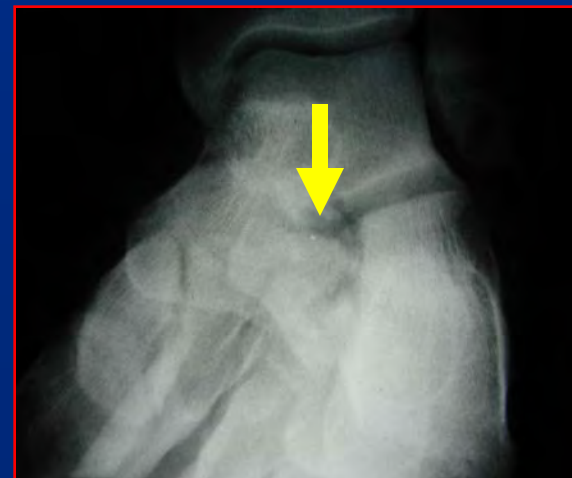
Tips and Tricks in the Age of Damage Control

“EXTRA-ARTICULAR” FRACTURES

- Anterior process fracture
- Tuberosity (body) fracture
- Tuberosity avulsion
- Sustentacular fracture

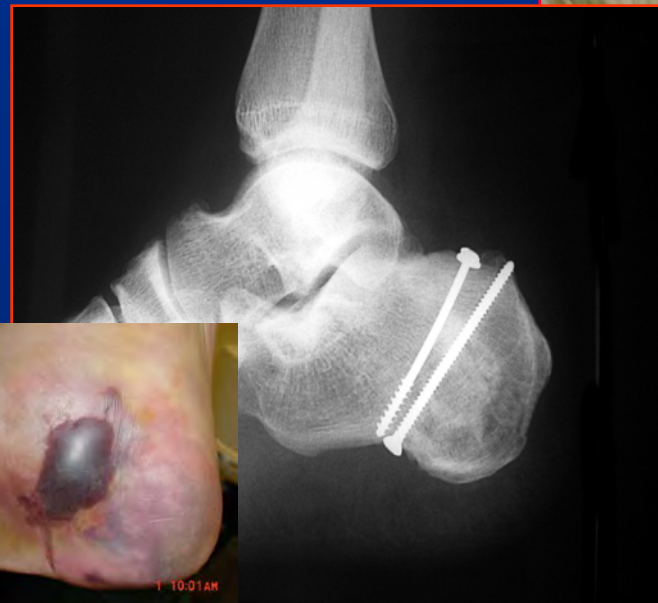
“EXTRA-ARTICULAR” FRACTURES

- Small, or non-displaced fractures are treated non-operatively
- Larger and/or displaced fragments may require open procedure



TUBEROSITY AVULSION

- The exception to the extra-articular rule
 - Achilles avulsion
 - Wound problems
 - Surgical urgency
 - Lag screws or tension band

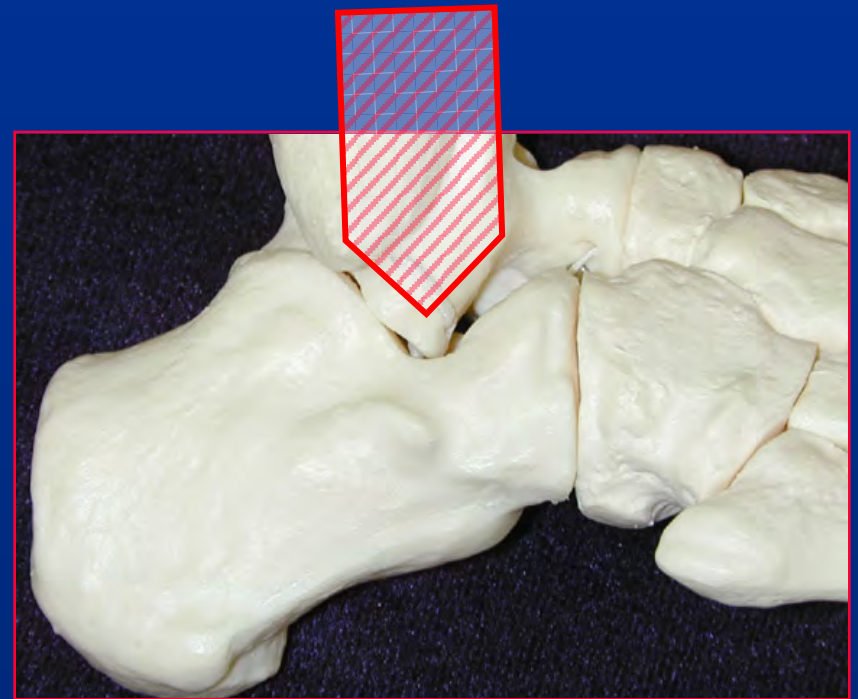


“INTRA-ARTICULAR” FRACTURES



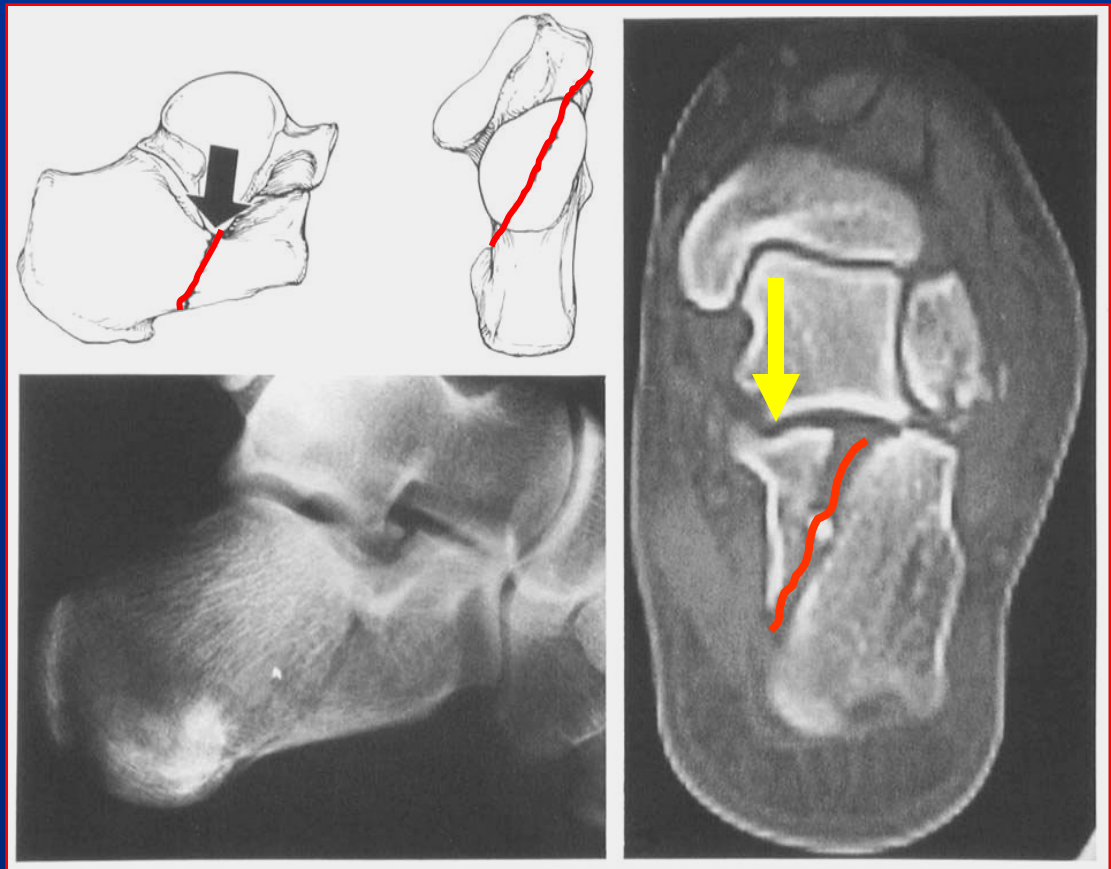
MECHANISM OF INJURY

- High energy:
 - MVA, fall
- Lateral process of talus acts as wedge
- Impaction fracture



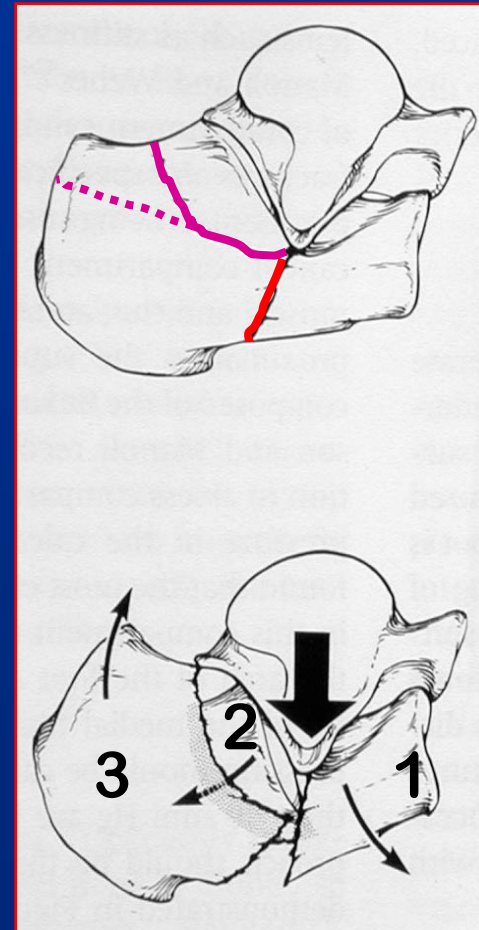
PATHOANATOMY

- Primary — fracture line
- Constant → fragment



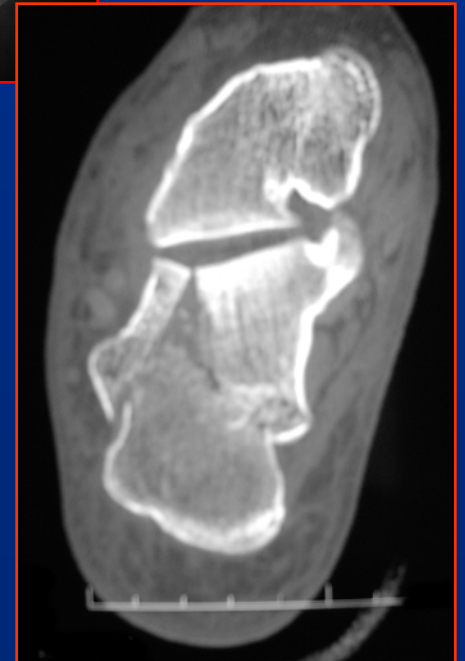
PATHOANATOMY

- Secondary ————
fracture line
- Extends posteriorly
through tuberosity
- Creates 3+ parts



PATHOANATOMY

- Articular incongruity
- Hindfoot varus
- Shape of foot
 - Wide
 - Loss of height/Short
- Peroneal impingement
- Heel pad crush



CLINICAL PROBLEMS

- Stiffness
- Loss of normal gait
- Walk on lateral border- varus hindfoot
- Shoewear problems- wide heel
- Arthritic pain- mainly subtalar joint
- Peroneals- subluxation or entrapment
- Heel pad pain

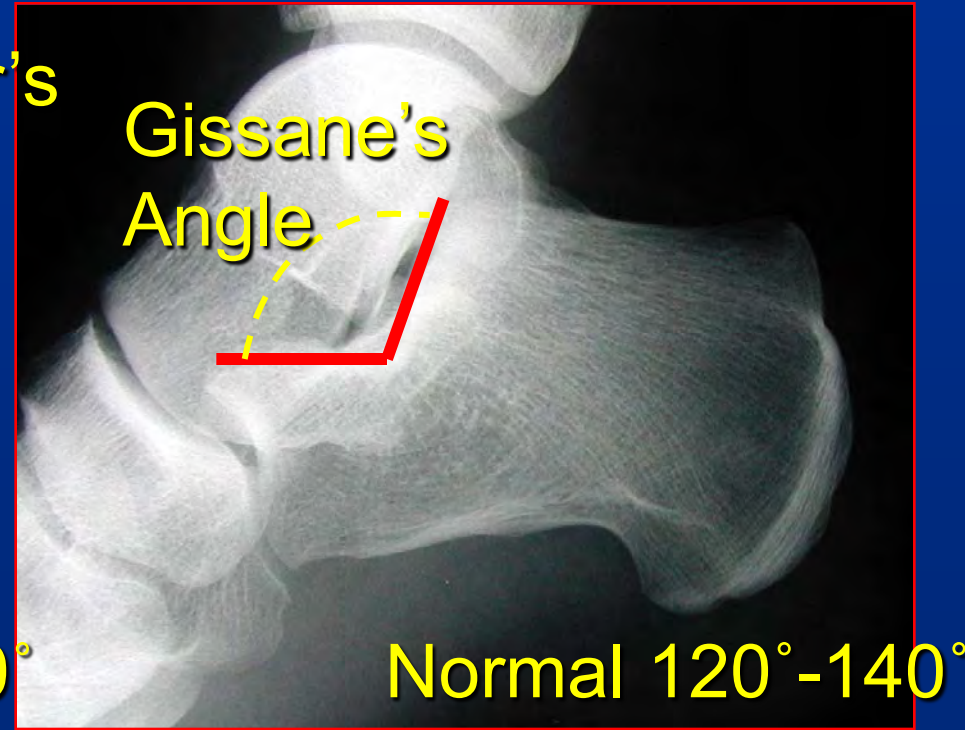
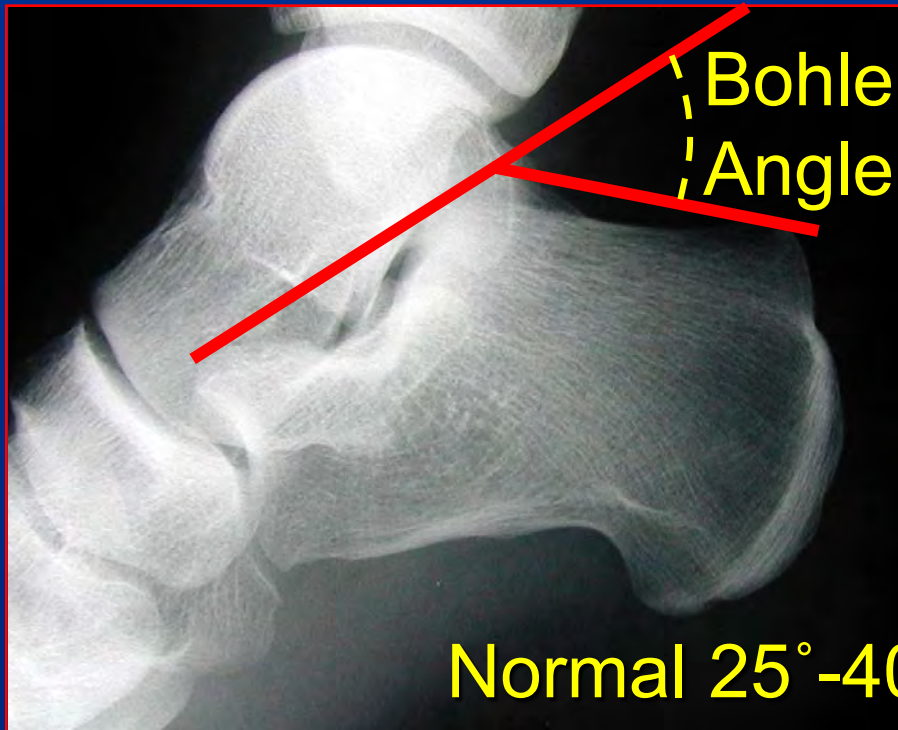
IMAGING: Plain Films

Standard Views

- 1. Lateral
- 2. Broden's
- 3. Axial (Harris)



LATERAL VIEW



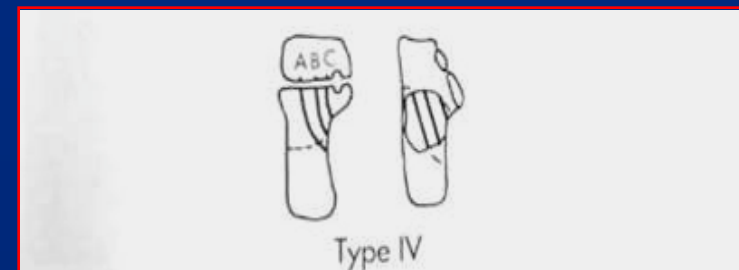
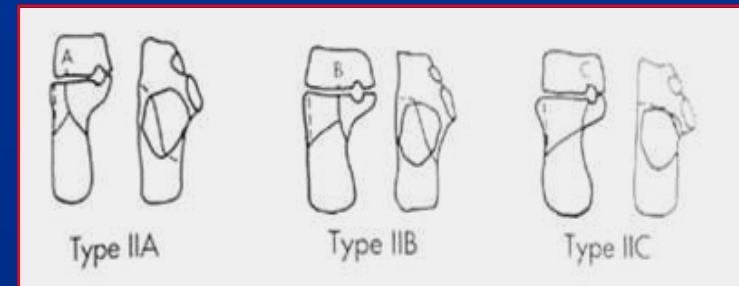
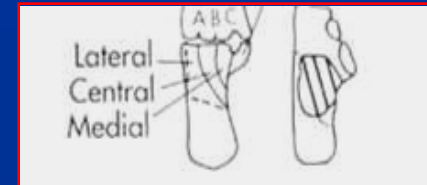
IMAGING: CT Scan

- ST joint
- Heel width/ shortening
- Lateral wall “blowout”
- Peroneal impingement or dislocation



SANDERS CLASSIFICATION

- Based on CT findings
- # joint fragments
 - 2 = type II
 - 3 = type III
 - 4 or more = type IV
- Subtype: L → M fx position
- Predictive of results



NON-OP TREATMENT:

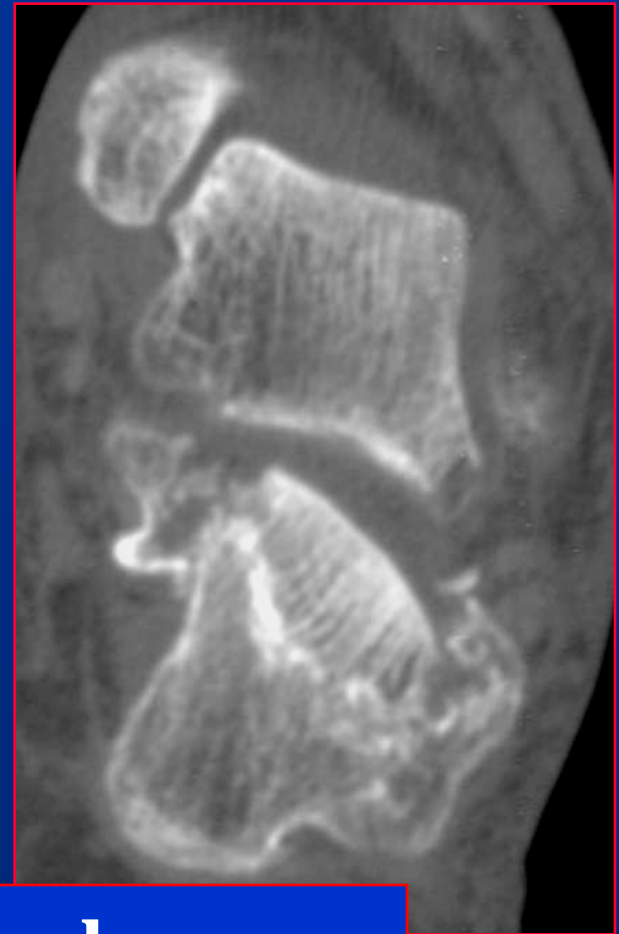
Injury



...maybe

NON-OP TREATMENT

Malunion



But bad things can happen

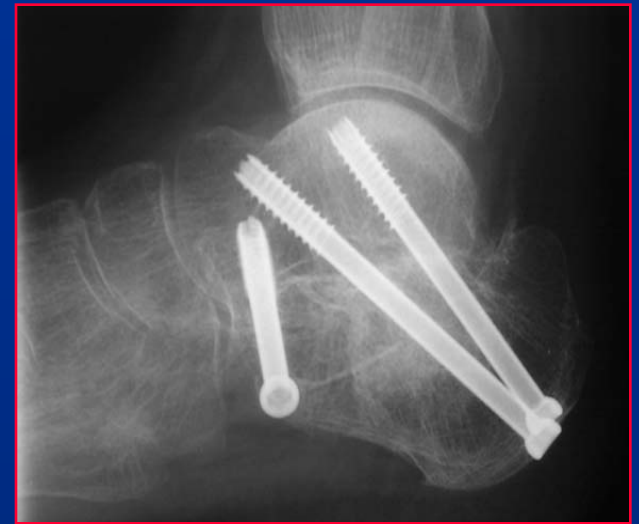
NON-OP TREATMENT: Complications

- Malunion
 - Varus hindfoot
 - Locks midfoot
 - Medializes “foundation” for stance
 - Shortened foot = short lever arm
 - Peroneal impingement/ dislocation
 - Shoewear problems

NON-OP TREATMENT: Complications

Malunion treatment

- Orthosis/ custom shoe
- Lateral wall exostectomy
- Peroneal tenolysis
- Subtalar fusion +/- bone block
- Sliding wedge osteotomy



OPERATIVE TREATMENT: Natural History

- Early studies recommending non-op treatment:
 - Old ORIF techniques
 - No CT classification
 - No assessment of fracture reduction



OPERATIVE TREATMENT:

Distal Radius



d

OPERATIVE TREATMENT:

Relative Contraindications

- Diabetes
- Vascular insufficiency
- Smoker
- Severe swelling
- Open fractures
- Elderly
- Neuropathic
- Non-compliant pt.
- In-experienced surgeon

TREATMENT: A Rational Approach?

- Many treatment methods attempted
- “Best” method remains controversial
 - Open vs Percutaneous?
- Assess each case individually
 - Injury/ patient/ surgeon
 - Risks vs. benefits

Surgical Tissue

- Elev
- Com
- Cast
- ORI
- + W



ORIF via Extensile Lateral Approach



Benirschke/Sangeorzan, Clin Orthop, 292: 128, 1993

Letournel, Clin Orthop, 290: 60, 1993

Sanders et al., Clin Orthop, 290, 87, 1993

Surgical Tips: Positioning

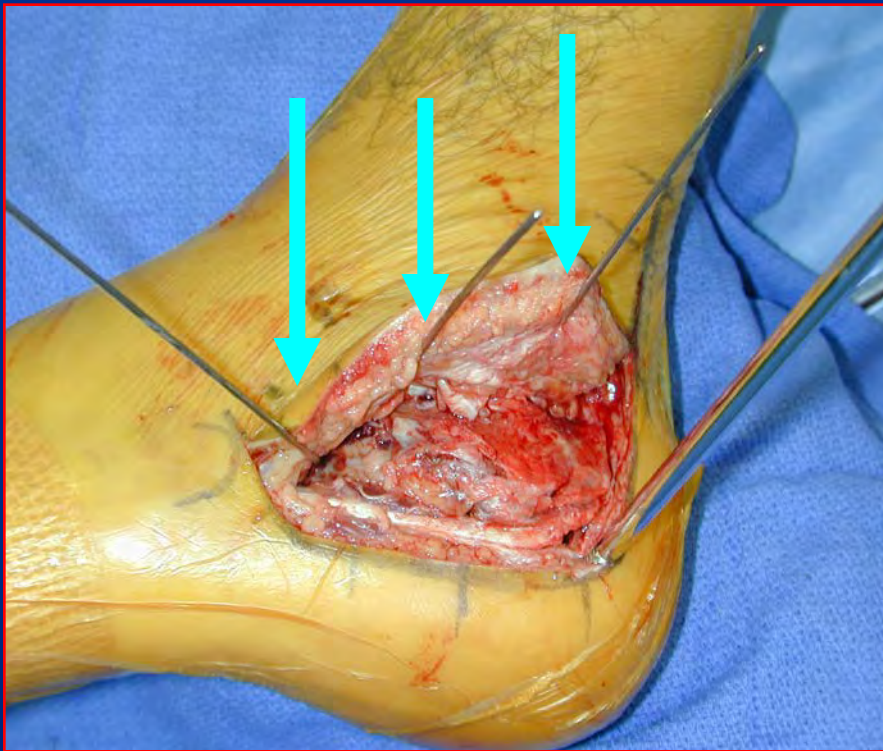
- Lateral decubitus



- “L” incision



Surgical Tips: Exposure



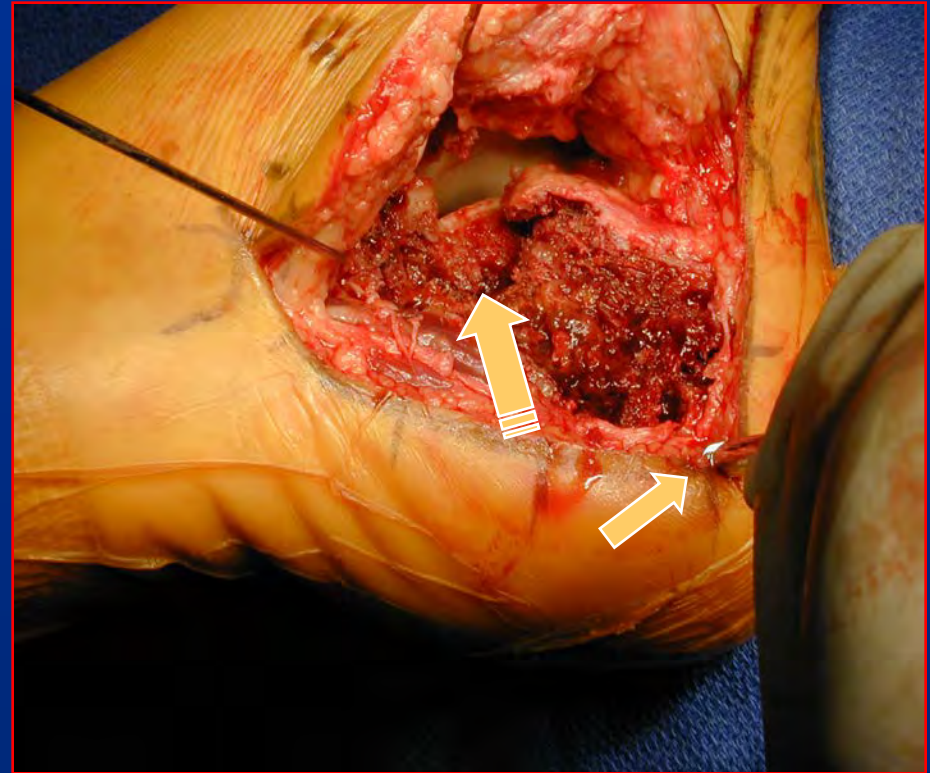
- “No touch” technique

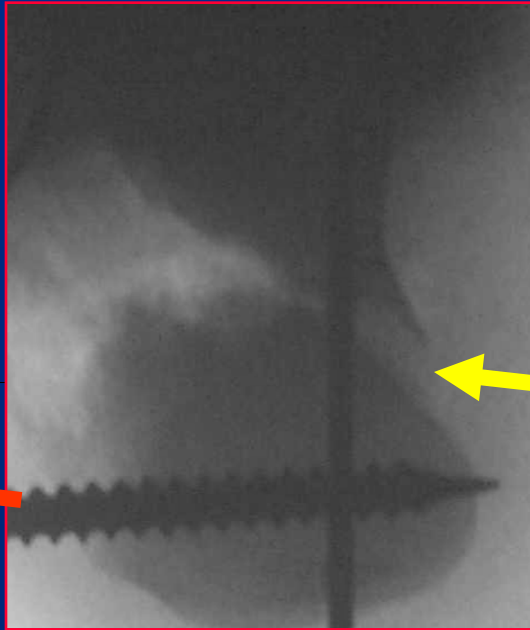
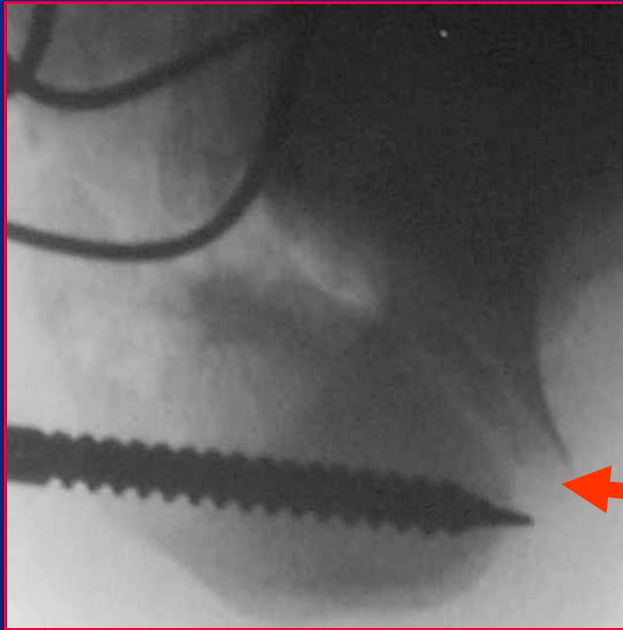
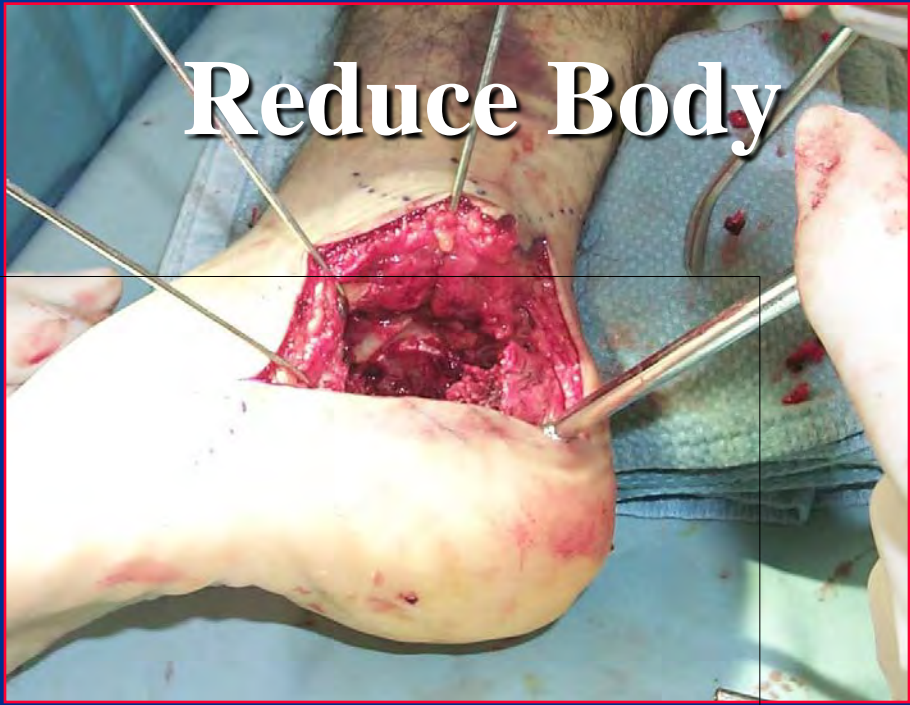


- Lateral wall removed

Surgical Tips: Restore Joint Surface

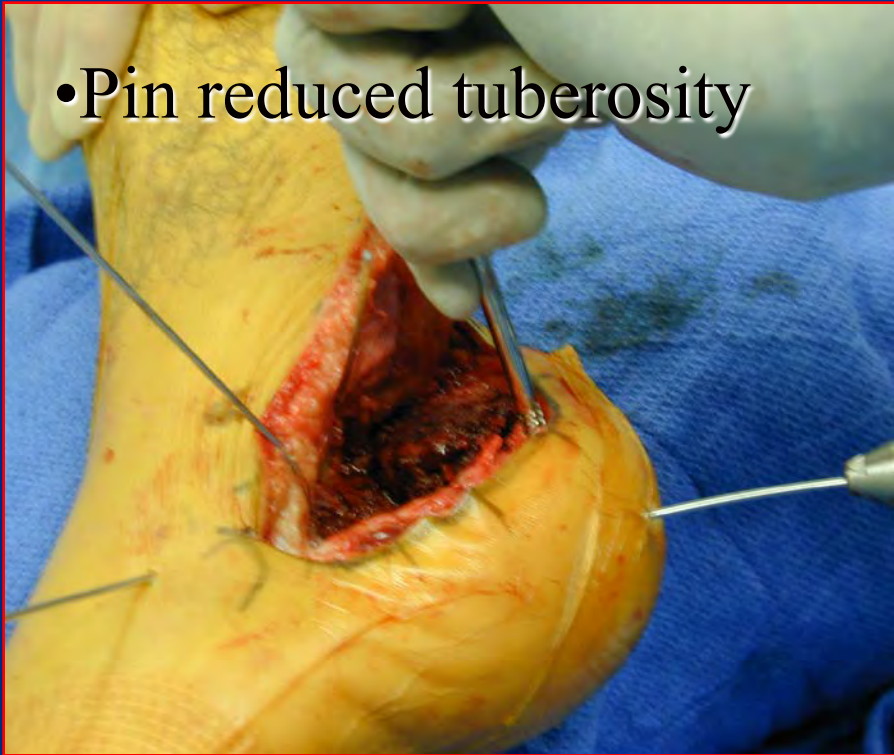
- Schanz pin to manipulate tuberosity
- Clean out fracture
- Disimpact sustentacular fragment



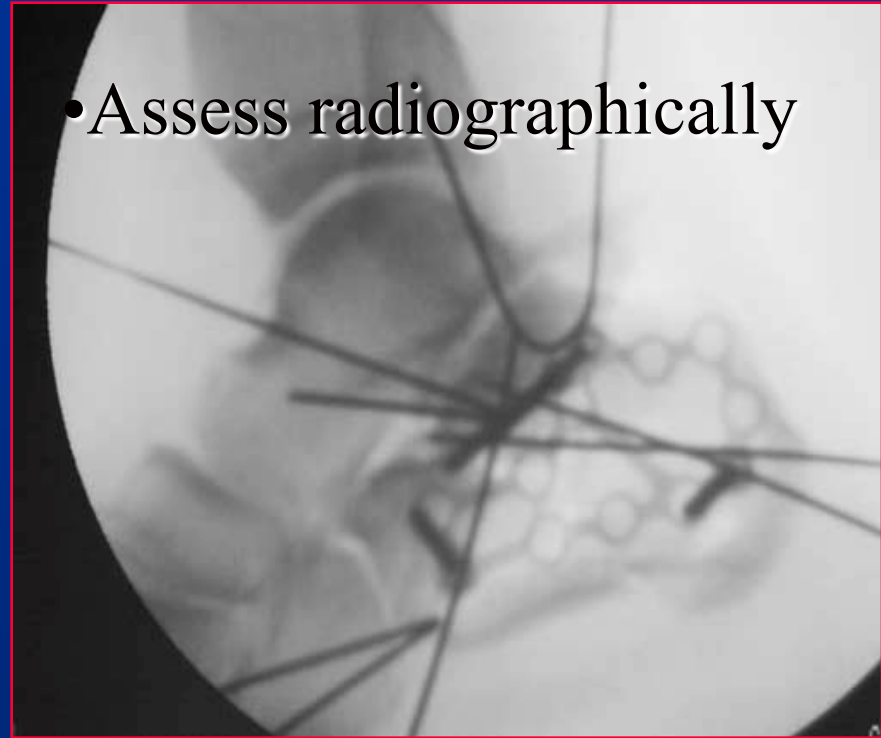


Surgical Tips: Tuberosity Reduction

- Pin reduced tuberosity



- Assess radiographically



Surgical Tips: Wound Closure



Full-thickness sutures tied towards apex

Surgical Tips: Drain and Deep Closure



Surgical Tips: Skin Closure & Splint



Nylon



OPERATIVE TREATMENT: Complications

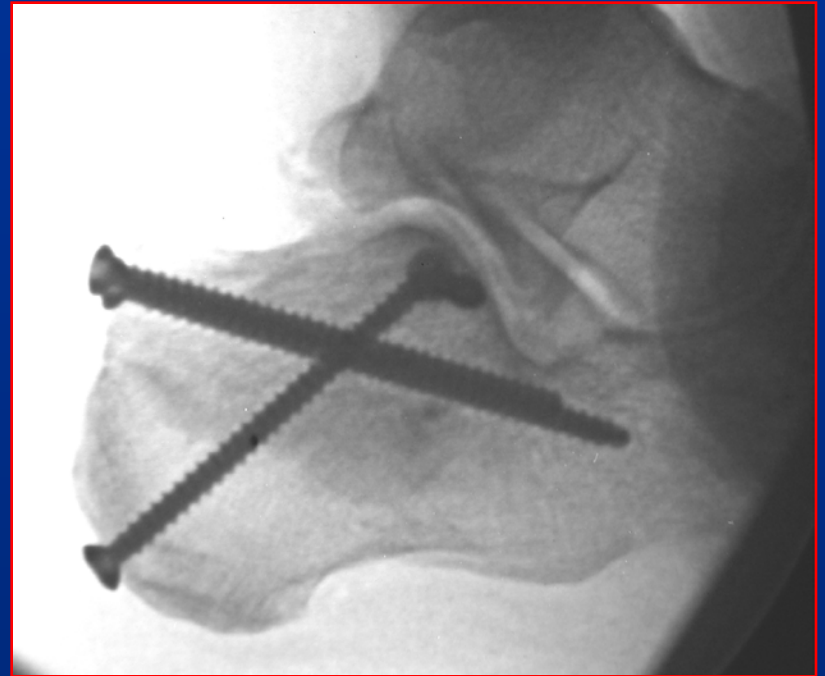
Wound problems

- Apical wound necrosis
 - Stop ROM
 - Leave sutures in
- Infection
 - Antibiotics
 - I&D
 - Soft tissue coverage?

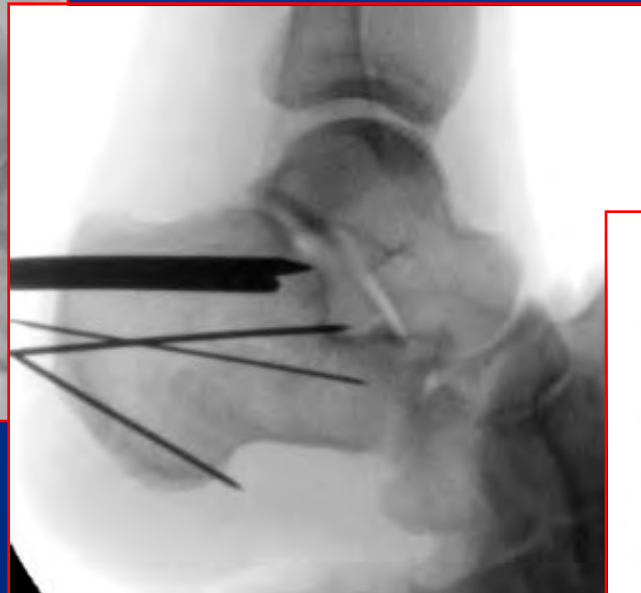
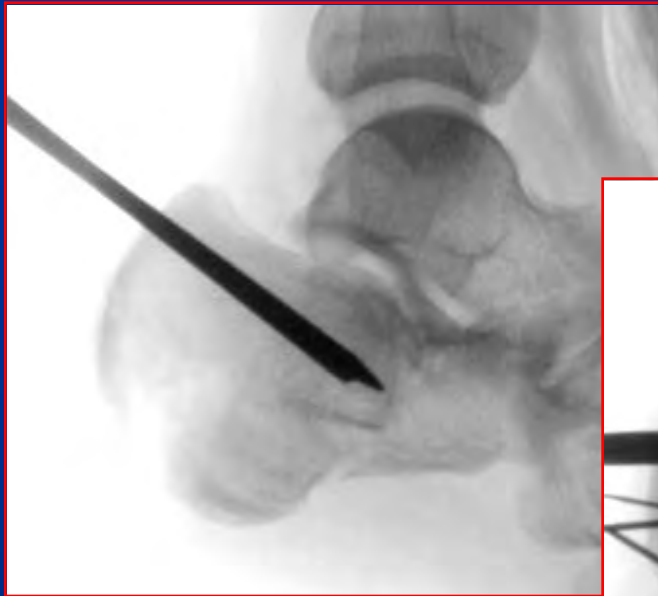


Percutaneous Internal Fixation

- Fewer wound problems
- More difficult reductions?
- Ex. Essex-Lopresti maneuver



Percutaneous Internal Fixation



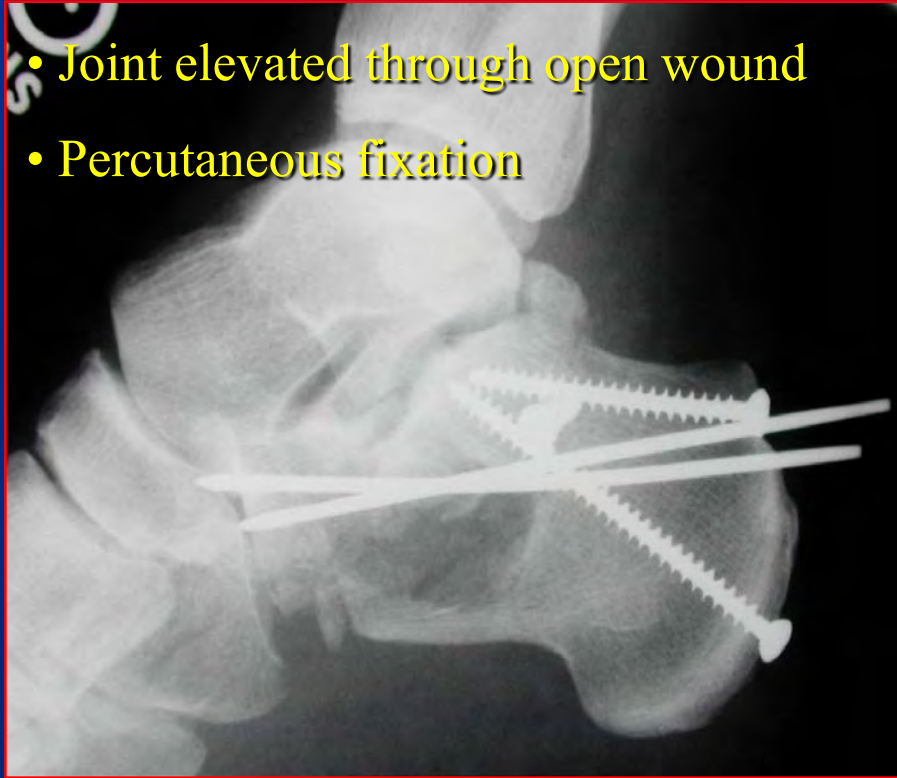
Essex-Lopresti, Clin Orthop, 290: 3-16, 1993

Percutaneous Internal Fixation



Percutaneous Internal Fixation

- Joint elevated through open wound
- Percutaneous fixation



Percutaneous Internal Fixation



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**Current Trends in
Orthopedic Trauma Symposium**

Tips and Tricks in the Age of Damage Control

Percutaneous Internal Fixation



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**Current Trends in
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Tips and Tricks in the Age of Damage Control

SUMMARY

- High energy injuries
- Risk for long term morbidity
- ORIF can give good, reproducible results if complications are avoided
- Individualize treatment
- Longterm outcomes studies are needed comparing treatment alternatives