

Severe Foot Trauma

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ARMC Trauma Symposium



Introduction

- Foot and ankle trauma is common
- 25% of all traumatic injuries
- Significant time loss from work
 - Foot required for walking



General Concepts

- Open versus closed injury
- High energy versus low energy
- Occupation: sitting versus standing job
- Job satisfaction



Open versus Closed Injury

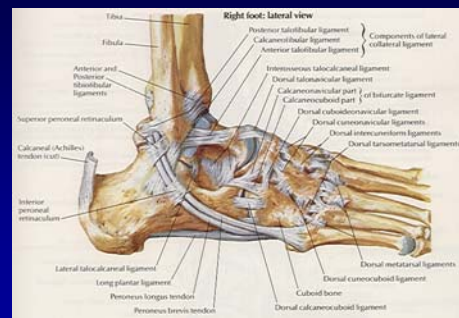


General Concepts

- Acute fractures
 - Swelling and ecchymosis typically present
 - Mechanism of injury
 - Get X-rays – significant swelling, tenderness
 - If no improvement after 2 weeks – Xrays!



Anatomy



Common Foot Injuries

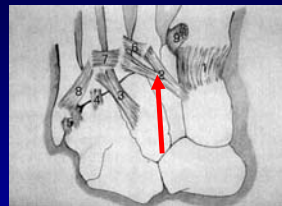
- LisFranc fracture-dislocation
- Calcaneus fractures
- Talus fractures
- Ankle fractures



Lisfranc fracture-dislocation

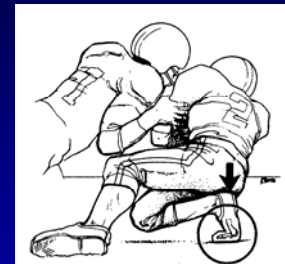


Lisfranc anatomy



Lisfranc fracture dislocation

- Debilitating midfoot injury
- Most often caused by an axial load (indirect mechanism)
- Direct mechanism



Lisfranc fracture dislocation



- Up to 40% overlooked on initial radiographs
- High index of suspicion
- Xrays may show minimal displacement vs complete disruption
 - Weightbearing films key



Lisfranc fracture-dislocation

- Often associated with other fractures
 - Metatarsal neck
 - Metatarsal base
 - Cuboid
 - Chip fractures of the 1st or 2nd metatarsal



Lisfranc fracture-dislocation

- Other diagnostic studies
 - CT
 - Stress foot films
 - Technetium bone scan



Treatment – General concepts

- Early recognition is key
- Obtain anatomic reduction
- Surgery if displacement >1mm or gross instability

Treatment

- Non-displaced
 - Non-weight bearing cast
 - Frequent checks until non-tender
 - Usually requires 4-8 weeks
 - Once healed, consider orthotic device

Treatment

- Surgical Indications
 - Acute injury with displacement
 - Neurovascular compromise
 - Open fractures
 - Foot compartment syndrome

Treatment

- Surgery
 - ORIF



Postoperative Management

- Splint immobilization, 2 weeks
- Cast, non-weight bearing, 4 weeks
- Cast, weight bearing, 6 weeks
- 3-6 months with arch support in shoe

Prognosis

In general ...

- Prognosis depends on accuracy of reduction
- No correlation with severity of injury, degree of displacement, or pattern



Prognosis

- Expect lengthy rehabilitative period
 - > 1 year
 - Patients experience midfoot pain for average of 1.3 years after the injury
- Return to work difficult for laborers
- Incidence of traumatic arthritis
 - 0-58%



Calcaneus Fractures



Historical note

- Rare in prehistoric times
- Became slightly more common in Europe with the building of monasteries, castles and churches
- Industrial revolution
 - Falls from heights, MVAs much more common



Prevalence

- 2% of all fractures
- Most frequently fractured tarsal bone
- 60-75% are displaced intraarticular
- 10% have associated spine trauma
- 90% occur in males, 41-45 years of age
 - Most are industrial workers

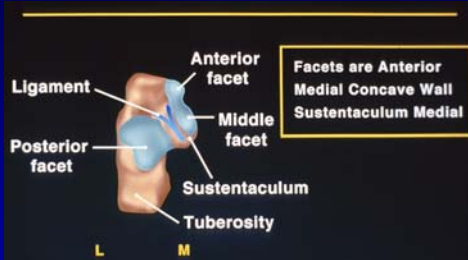


Economic impact

- 20% may be incapacitated for up to 3 years and partially impaired for up to 5 years



Anatomy of Calcaneus



Radiographic views

- Standard views
 - AP, lateral, and axial view of foot



Computed Tomography

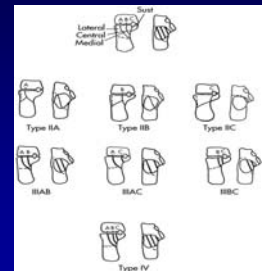


- CT revolutionized our understanding of these fractures
- Coronal view
 - Transverse view
 - Sagittal view



Sanders Classification

- Type I – non-displaced
- Type II – 2 part or split
- Type III – 3 part or split depression
- Type IV – 4 part or comminuted articular fxs



Mechanism of injury

MECHANISM OF FRACTURE



Operative treatment

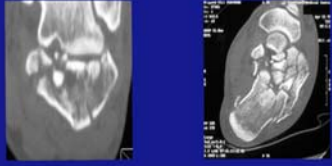
- Indications
 - Type II or III fx
 - Intra-articular displacement
 - Widening/lateral impingement
 - Skin/soft tissues intact
 - Compliant/active patients
 - Knowledgeable surgeon



Operative treatment

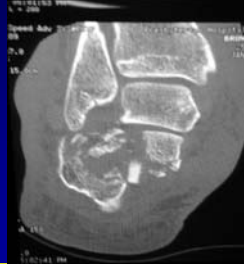
- Type IV
 - Poor results with ORIF (91% with fair/poor results)
 - 100% poor results with nonoperative treatment

Sanders Type IV



Operative treatment

- Type IV
 - ORIF and primary subtalar arthrodesis

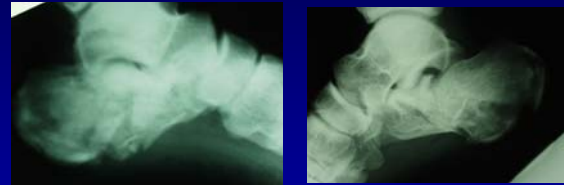


Illustrative case

- 41 year old painter
- Fell 2 stories from ladder, landing on heels
- Presented to ER unable to bear weight



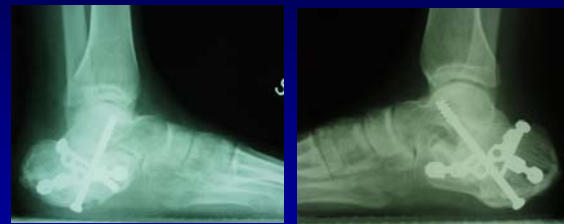
Illustrative Case



Illustrative Case



Illustrative Case



Postoperative management

- Posterior splint, ice, elevation
- Place into removable splint or walker boot
- Begin active ankle and subtalar ROM at 7-10 days
- Suture removal at 2-3 weeks
- Non-weight bearing for 2-3 months



Results of ORIF

Table 1. RESULTS OF ORIF BY FRACTURE TYPE

Fracture Type	Excellent/Good	Fair/Poor
II	73%	27%
III	70%	30%
IV	9%	91%

From Sanders R, Fortin P, Dipasquale T, et al: Operative treatment in 120 displaced intraarticular calcaneal fractures. Results using a prognostic computed tomography scan classification. Clin Orthop 290:87-95, 1993



Workman's Compensation

- Primary subtalar arthrodesis has a predictable time for return to work
- Hall and Pennal
 - Avg. time off, 6.4 months
- Buch, Myerson, Miller
 - 92% returned to work by 8.8 months
- Sanders, et al.
 - 87% returned to work within 6 months



Complications

- Infection
- Wound healing
- Sural neuritis
- Peroneal tendonitis
- Traumatic arthritis



Talus Fractures



Types of talus fractures



- Head fractures
- Neck fractures
- Body fractures
- Crush fractures
- Lateral process fxs
- Posterior process fxs

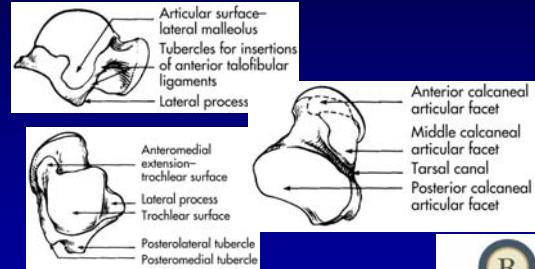


Talar neck fractures

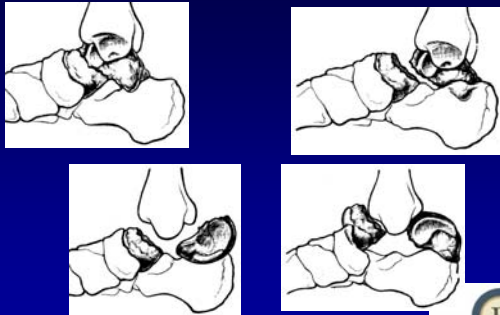
- Account for 50% of talus fractures
- Aviator's astragalus – WW I
- Hyperdorsiflexion injury
- Most commonly seen in MVAs, falls from a height



Anatomy of the talus



Hawkins' Classification



Risk of AVN

- Hawkins I: 0-13%
- Hawkins II: 20-50%
- Hawkins III: 80-100%
- Canale and Kelly IV: ? ~100%



Treatment

- Goals
 - Urgent anatomic reduction with fixation
 - Restore congruency to subtalar and ankle joints
 - Reduce risk of AVN by preserving blood supply

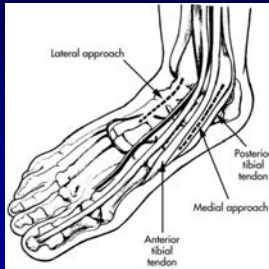


Treatment

- Hawkins I
 - Casted in neutral position, non-weight bearing for 6-8 weeks
- Hawkins II – IV
 - ORIF

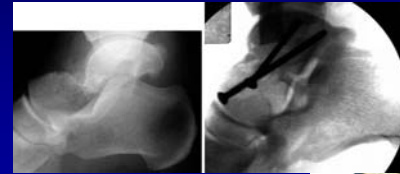


Treatment



Illustrative case

- 32 year old delivery driver
- Involved in MVA
- Closed Hawkins II talus fx
- ORIF



Prognosis

- Hawkins I – excellent, may experience some loss of motion
- Hawkins II – less predictable results
 - Anatomic reduction + no AVN, good result
 - Expect some arthrosis of subtalar joint
 - 20-60% of cases
 - Return to work in 6-8 months



Prognosis

- Hawkins III – long-term results poor
 - 5-8 months for osseous union
 - AVN 80-100%
 - Nonunions ~ 30%
 - Many require subsequent procedures, including amputation



Complications

- Skin necrosis
- Infection
- Nonunion
- Malunion
- AVN
- Subtalar and ankle joint arthrosis



Complications



Ankle Fractures



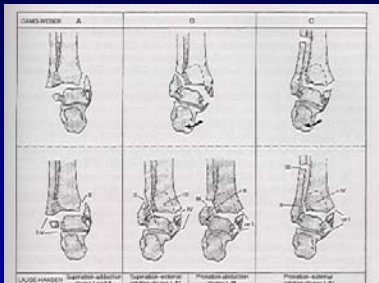
Ankle Fractures



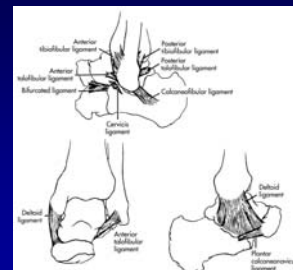
- Simple ankle fractures
- Pilon fractures



Classification of ankle fractures



Simple ankle fractures



- Isolated lateral malleolus fx
- Medial malleolus fx
- Bimalleolar fx
- Trimalleolar fx



Treatment

- Undisplaced fractures (medial or lateral)
 - Cast immobilization, weight bearing
 - 6 weeks
- Displaced fractures
 - >2mm of displacement
- Need to treat each case individually!



Treatment



- Bimalleolar and trimalleolar fxs
 - ORIF
 - Consider condition of skin



Postoperative management

- 4-6 weeks non-weight bearing in cast
- 4 weeks full weight bearing in walker boot
- Begin active ROM at 4-6 weeks

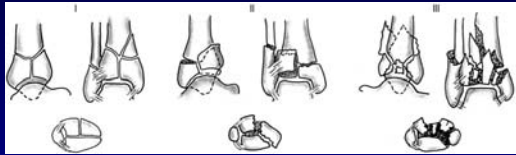


Tibial pilon fractures

- High energy injury
- Fracture of the distal end of the tibia involving the articular surface



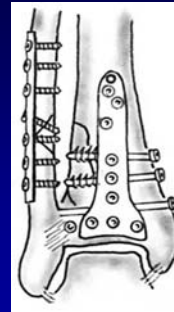
Classification of pilon fractures



- Ruedi and Allgower classification
 - Type I: fx without displacement
 - Type II: fx with displacement, no comminution
 - Type III: fx with displacement and comminution



Treatment



- Requires ORIF
- ? Percutaneous screws for tibia
- Timing of surgery



Illustrative case

- 29 year old male
- Contractor
- Fell through ceiling



Illustrative Case



Prognosis

- Results of operative treatment
 - Quality of reduction
 - Severity of injury
 - Fracture type
 - Amount of stability accomplished
- Type II – 77% good to excellent
- Type III – 63% good to excellent



Conclusion

- Foot and ankle trauma is common
- High morbidity
- Time loss from work is great
- Functional capacity significantly impaired
- Be patient, most injuries require lengthy rehab



Thank You

