Pilon Fracture

Malick Bachabi, M.D.

CONTENT

- Epidemiology / Mechanism of Injury
- Physical Exam / ER management
- Xray / Imaging
- Classification
- Surgical Management
- Outcomes
- Summary

EPIDEMIOLOGY

- Distal tibia intra-articular fracture
- 3-10% of all tibial fractures and ~1% of all fractures
- Male > female
- Avg. age 35-40 yrs. Old
- Common mechanisms →MVC, MCC, fall from height.

MECHANISM OF INJURY

Low energy

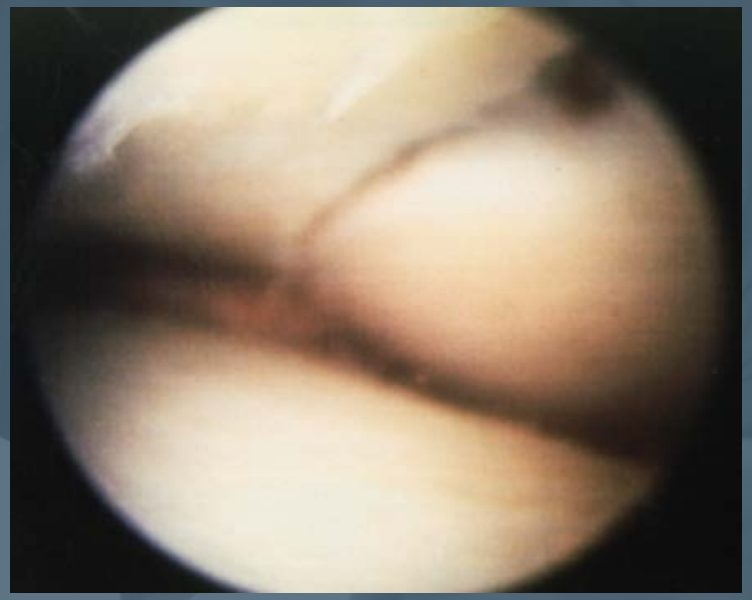
- Rotational force applied to a fixed foot ("ski boot top fracture").
- Slower rate of load application.
- Smaller amount of energy released.
- Smaller amount of soft tissue injury.

MECHANISM OF INJURY

High energy

- Significant axial force with translational/shear/ rotational forces.
- Rapid rate of force application.
- Articular and/or metaphyseal comminution.
- Large amount of energy released
- Significant soft tissue injury.

MECHANISM OF INJURY



MECHANISM OF INJURY

≠

MECHANISM OF INJURY

The thin soft tissue envelope surrounding distal tibia reflects energy dissipated during fracture

Soft tissue injury often dictates treatment and outcome

PHYSICAL EXAM / ER MANAGEMENT

PHYSICAL EXAM / ER MANAGEMENT

- Evaluate physiologic status of the patient
  - Systemic injuries occur in 27%-51% of patients

Bourne et al J Trauma 1983, Helfet et al CORR 1994, Marsh et al JBJS 1995, Tornetta JOT 1993

- Careful inspection for open fracture wounds/skin compromise/at risk
  - Open fractures reported 3% -57%

Bourne et al J Trauma 1983, Helfet et al CORR 1994, Marsh et al JBJS 1995, Tornetta JOT 1993

PHYSICAL EXAM / ER MANAGEMENT

- Goals:
1. Assess NV Status
2. Determine Compartment Syndrome risk
3. Assess swelling/blistering/skin tenting

Define the Injury- Fracture Pattern

Understand Fracture Energy, Bone Quality, Primary Displacement

PHYSICAL EXAM / ER MANAGEMENT

What is normal?

PHYSICAL EXAM / ER MANAGEMENT

PHYSICAL EXAM / ER MANAGEMENT

- Anterior plafond contributes more to the subchondral shadows seen on AP x-rays

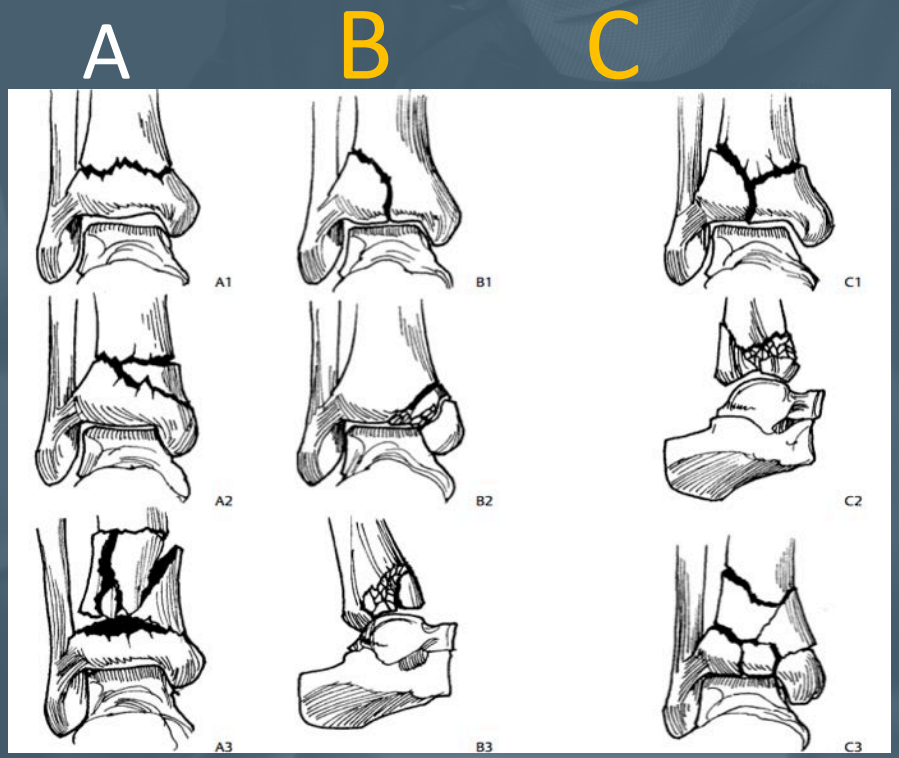
- Medial, central, and lateral aspects of the tibial plafond contribute equally to the subchondral shadow seen on the lateral x-ray

CLOSED REDUCTION & IMMOBILIZATION

- Goals:
  1. Improve vascular flow
  2. Realign the limb
  3. Take pressure off soft tissue

CLASSIFICATION

- AO/OTA Fracture classification 43 (distal tibia)
-



CLASSIFICATION

A type = Extra-articular

CLASSIFICATION

B type = Partial articular

CLASSIFICATION

C type = Complete articular

OPERATIVE INDICATIONS

- Fracture instability
- Malalignment of the epiphyseal segment
- Articular incongruence/Displacement
- Talar subluxation
- Open fracture

SURGICAL TREATMENT

- Staged management of pilon fracture
  - Fibular fixation and ex fix of plafond injury
  - Delayed definitive internal fixation until soft tissue recovery (swelling/blisters etc.) at 13-24 days
- Acceptably low rate (0-5.1%)of soft tissue complications/ infection

Sirkin et al JOT 1999, Patterson & Cole JOT 1999

SURGICAL TREATMENT

- External fixation +/- ORIF fibula for high energy pilon fxs
- Allow recovery of soft tissue injury
- Delayed ORIF of plafond injury

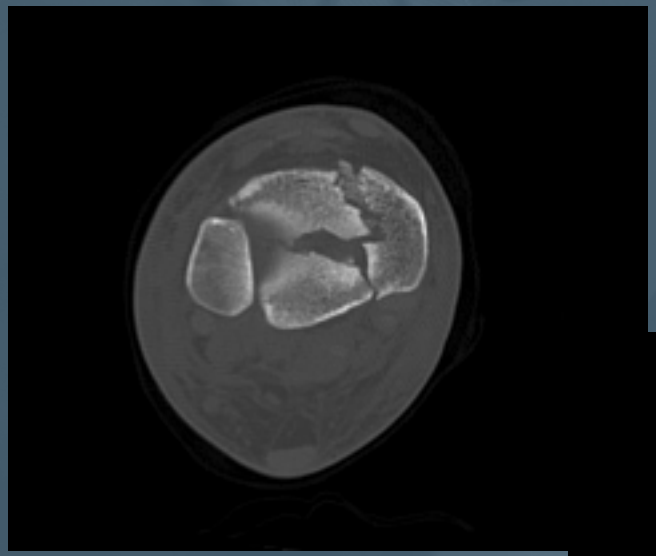


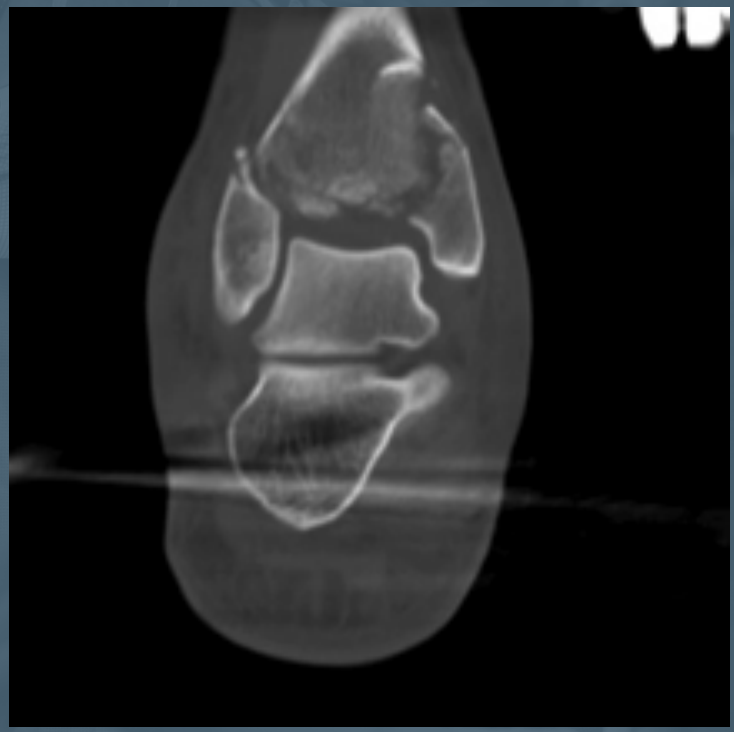

SURGICAL TREATMENT

- Maximizes anterior approach options for plafond reconstruction

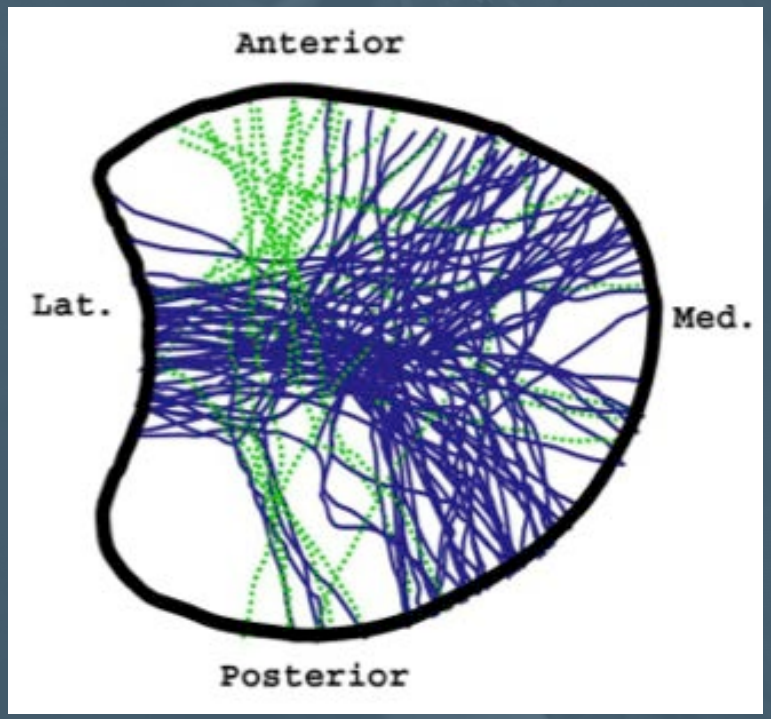
SURGICAL TREATMENT

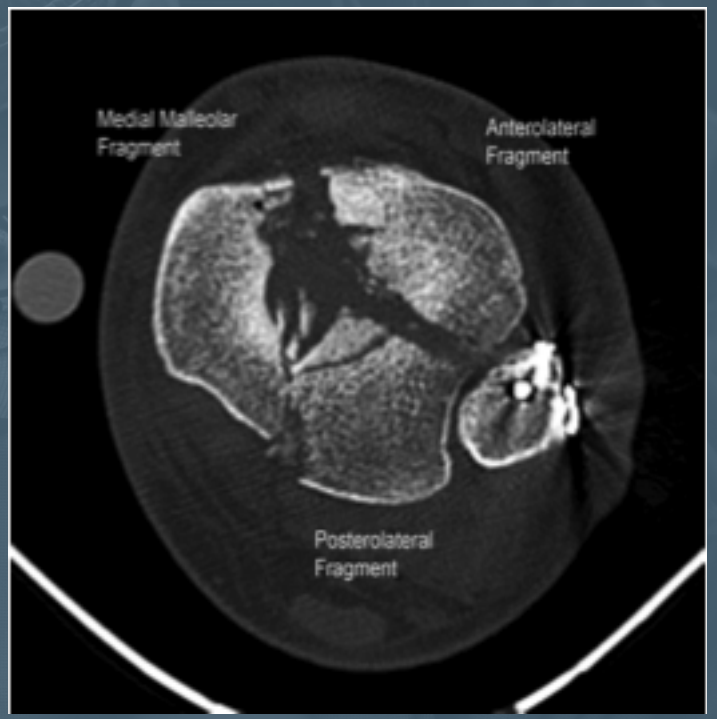
Define articular injury after external fixation





SURGICAL TREATMENT





Primary fracture lines = Main fragments

Cole, Mehrle et al JOT 2013

SURGICAL TREATMENT

- Fixation options are determined by fracture pattern, patient factors, and condition of soft tissue.
  - Plate
  - Intramedullary nail
  - Thin wire/hybrid external fixator
  - Primary fusion

SURGICAL TREATMENT

- Short leg splint post-operatively
- Elevation
- Anticoagulation
- AROM, gastroc stretching, anterior compartment activation when incisions are healed
- Boot or removable splint to prevent equinus contracture
- Non-weightbearing for ~6-12 wks

SURGICAL COMPLICATIONS

- Delayed wound healing
- Superficial/Deep infection
- Ankle stiffness
- Nonunion / Malunion
- Post-traumatic OA
- Amputation

OUTCOMES

- Pollak et al reported on 80 pilon pts (ORIF and exfix) at 3.2 years
  - Significantly lower SF-36 scores in physical health and function than population norms
  - Low income and lower educational level pts more likely to have poor clinical outcomes
  - 2 or more co-morbidities had poorer outcomes
  - Ex-fix more likely to have
    - limited ROM
    - more pain
    - more ambulatory dysfunction

Pollak et al JBJS 2003

OUTCOMES

- Diabetes and smoking are significant risk factors for soft tissue and bone healing complications

Belmont et al JOT 2015

Kline et al Foot Ankle Int 2009

- Patients can perceive some functional improvement long after their surgical treatment (1-2.4 yrs)

Marsh et al JOT 2010

Marsh et al JBJS Am 2003

OUTCOMES

- Severity of injury and quality of reduction seem to predict radiographic arthrosis and functional outcome

Korkmaz et al Injury 2013

Williams et al CORR 2004

- Pts with higher levels of education are more likely to have higher clinical scores and return to work

Volgas et al Foot Ankle Surg 2010

Williams et al CORR 2004

SUMMARY

- Pilon fractures are life-changing events for patients and among the most challenging fractures treated by orthopaedic surgeons.
- Surgical management requires extremely high level of respect for the soft tissue envelope.
- Staged management, meticulous surgical planning and careful execution of this plan will maximize patient outcomes.


Q & A

Thank You!

OrthoCarolina - Concord

354 Copperfield Blvd NE

Concord, NC 28025

704-786-5122

www.orthocarolina.com