Ankle Fractures: fix the posterior maleolus!

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How Big Is Too Big?

- Stability of ankle
  - Posterior talar subluxation
- Articular step-off

Posterior Malleolus

- How Big?

Posterior Malleolus

Posterior Malleolus – Size?

- Radiographs poor indicator
  - CT
  - MRI
  (Ferries et al., 1999)
  (Nielsen / Lorich AAOS 2000)

Posterior Malleolar Fractures

- Surgical Recommendations have varied
  - Strength of studies – poor
  - Limited f/u
  - Inaccurate evaluation of fragment size
  - Not all surgical cases fixed anatomically

Not to worry – cover them up w metal
Treatment
Nelson and Jenson (1940)

- 87 trimalleolar fractures treated by standard methods — mainly CR and casting
  - 8 cases posterior malleolus >33%
  - 3/8 satisfactory
  - 2 treated with ORIF
  - 1 treated with pins and plaster
- Conclusion: If >33% recommend ORIF posterior fragment

Posterior Malleolus: Treatment
McDaniel and Wilson 1977

- 75 cases — posterior malleolus >25%
  - 7 ORIF of posterior malleolus, cast treatment of medial and lateral malleolus
    - 6/7 anatomic
    - 6/7 good to excellent
  - 8 nonoperative cast treatment
    - 0/8 anatomic
    - 2/8 good to excellent
- Recommend ORIF if >25%

Predictors of Functional Outcome Following Transsyndesmotic Screw Fixation of Ankle Fractures
Jrad Wasing, MD, and Mohit Bhanderi MD, MSc, FRSC

- 51 ankle fractures with syndesmotic screws evaluated with postop plane radiographs
- 8/51 (16%) evidence of radiographic malreduction of the syndesmosis
- 8/51 did not require syndesmotic screw
- Anatomic reduction of syndesmosis strongly correlated with functional outcome scores

Syndesmosis malreduction

- 6/25 had plane radiographic measurements c/w malreduction
  - Only 4 of the 6 were confirmed by CT
- 13/25 (52%) had incongruity of fibula within the incisura
  - 8/13 had abnormal x-rays

Observation: syndesmosis malreduction

- 44% of malreductions involved posterior malleolus fracture
  - None required ORIF based on size of articular disruption
  - However, this may lead to incompetent posterior tibiofibular incisure to buttress fibula and prevent posterior translation in some cases

Gartner et al FAI 06
Restoration of the incisura by fixing posterior maleolus can only help with the anatomic restoration of the syndesmosis.

Posterior malleolus

May be more important than the size of the articular fragment.

Discussion

- Previous indications for PM fixation have focused on articular surface involvement.
- Not for restoring rotational stability.

Observation: PM goes with the fibula

- Does the PTFL remain intact?

Results -

- PITFL is almost always intact to the posterior maleolus.
Methods - Biomechanical

- Cadaveric study = PER4 fracture pattern created
  - 5mm posterior malleolar fracture w/ its intact PTFL attached
- Specimens randomly fixed with either:
  - 1. Syndesmotic screw
  - 2. Posterior malleolar fixation

Results - Biomechanical

- PM fixation provided better rotational stability than syndesmosis fixation (p = 0.031)
- Specimens with PM fixation: 70% intact stiffness restored
- Syndesmotic screw stabilization: 40% intact stiffness restored

Gardner et al COR 96

Posterior Malleolar Fractures Recommendations

- Routine stabilization of posterior malleolus

Posterolateral Approach

- Direct visualization of the posterior fibula
- Antiglideplating
- Direct exposure of the posterior malleolus and PTFL
  - PM fixation
  - PTFL repair
- Large soft tissue coverage
**Boney Injuries → Worse Outcomes?**

- “Bimalleolar” (61%) vs SER IV equivalent ankle fractures (39%)

- Bimalleolar fractures with significantly worse functional outcomes (Short Musculoskeletal Function Assessment)
  - Posterior malleolar fractures included → group heterogeneity
  - Fracture only if > 33% of the articular surface involved
  - External rotation stress used to confirm SER IV equivalent
  - No advanced imaging

Tejwani, E gol JBJS 2007
Anatomical Fixation of SER IV Ankle Fractures

- Prospective cohort of MRI confirmed SER type IV injuries (N=108)
  - Trimalleolar fracture (46%)
  - Posterior malleolar fracture with deltoid ligament tear (18%)
  - PIIFL tear with medial malleolar fracture (13%)
  - PIIFL tear with deltoid ligament tear (21%)

- Aggressive anatomical treatment protocol
  - Includes fixation of all posterior malleolar fractures

- No clinically relevant differences between boney and ligamentous equivalent (Foot Ankle Outcome Score)

Anatomical Fixation of SER IV Ankle Fractures: Articular Congruity

- Postoperative Computed Tomography
  - Examine articular reduction

- Articular Congruity defined as:
  - >2 mm of articular stepoff
    - Indirect reduction of posterior malleolus
  - >2 mm of articular gap
    - Impaction injury

Anatomical Fixation of SER IV Ankle Fractures: Articular Stepoff

- Indirect reduction of posterior malleolus

- Malreduction of medial malleolus

- High probability in untreated posterior malleolus fractures

Anatomical Fixation of SER IV Ankle Fractures: Articular Gap

- Anatomical articular reduction

- Impaction injury → bone loss

- May result from higher energy injuries

- Associated with poorer outcomes

Anatomical Fixation of SER IV Ankle Fractures: Articular Congruity

- Articular congruent (72 pts) vs Incongruent (36 pts)

- Worse FAOS scores
  - Symptoms (p=0.012)
  - Pain (p=0.004)
  - Activities of daily living (p=0.038)

- Articular reduction → Improved outcomes

Posterior malleolus

May be more important than the size of the articular fragment

- Articular congruity
- Articular stability

- Reestablishing anatomy of the distal tibia and fibular articulation = syndesmosis
- Syndesmosis stability
The ankle is a complex

- You cannot extract one individual part or injury and speak about it in isolation.
- Ankle syndesmosis is composed of 4 soft tissue structures.
- Injury is gradation of instability depending on what is torn/fractured and left intact.

Ankle stability is not the sum of its individual parts working independent......it is the combination of those parts working together as one functional unit.

Stop taking the nihilist approach to the ankle. Move into the 21st century it is an additional 5 minutes of surgery w a minimal increase in the surgical footprint. Stop asking why fix it and start asking why not fix it.

Thank You