Ankle Fractures
Common Misconceptions

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Objective
Common "Myths" in ankle fracture management

Reducing a displaced Syndesmosis
Find the largest clamp you can find and use it to squeeze the fibula up against the tibia
High Fibula Fracture

No need to reduce and stabilize a fibula fracture if it is more than halfway up the leg.

Order of Reduction

Always reduce and stabilize the fibula first before doing anything else.

Posterior Malleous

No need to reduce and stabilize unless is is at least 25% of the articular surface on a lateral x-ray.
Why do we operate on Ankle fractures?

• To restore stability to a joint

• Contrary to popular belief, not to make crooked bones straight

To Restore Joint Stability

• Address the Boney Injury

• Address the Ligament Injury

• All ankle fractures involve both

Important Ligament Anatomy

Often neglected
Important Ligaments for Joint Stability

- Deep Deltoid ligament
- Syndesmosis
  - AITF
  - PITF
  - Syndesmosis ligament (tib-fib)
  - Interosseous Membrane

Syndesmosis

- Anterior tibio-fibular ligament (ATFL)
- Posterior tibio-fibular ligament (PTFL)

Syndesmosis-Boney Attachments

- Posterior inferior tib-fib ligament is attached to the posterior malleolus
- Anterior inferior tib-fib ligament is attached to the Chaput
Deltoid

- Superficial Deltoid attached to anterior collicus of the Medial Malleolus
- Deep Deltoid is attached to the posterior collicus of the Medial Malleolus

Understanding the ligaments helps in understanding how to restore stability of the ankle joint

Syndesmosis and the Posterior Malleolus Fracture
Posterior Malleolus Fracture

- Has the Posterior Inferior Tib Fib ligament attached
- In the presence of a Posterior Malleolus Fracture, the ligament is intact 100% of the time

Opportunity

- If we reduce and stabilize the posterior malleous, we have in effect “repaired” the PITFL(syndesmosis)

So which ones should we fix?

- All of them!
- Late fractures
- Indirect reduction of the articular surface but direct reduction of the fragment
- Absolute stability with anti-glide +/- lag
What about size?

- Traditionally fix if 25% on a lateral x-ray
- Problem -
  - These fractures are oblique in nature and not in the pure coronal plane
  - 25% on a lateral x-ray does not provide any information on the actual size of the fragment

15 patients with posterior malleous fx studied with MRI-posterior tib-fib ligament intact
- Cadaveric PLR IV fractures either fixed with ORIF of Posterior Malleolus or Syndesmotic Screws ---Fixing posterior malleous restored stiffness to 70% compared to only 40% with syndesmotic screws

Size does not matter

- Reducing and stabilizing a posterior malleous will in effect restore the PITFL
- Avoid Syndesmotic stabilization
Syndesmotic Injury

• All rotational ankle fractures have some degree of syndesmotic injury (SER, PER)

• Reduction and stabilization of a posterior malleous will “repair” the syndesmotic component of the injury

How to reduce
Indirect Reduction

• Posterolateral approach (Harmon) - between Peroneals and FHL

• Posteromedial

• Reduce looking at posterior cortex
  – Effective if no articular impaction
  – Supine with bump under ipsilateral hip
  – Prone - not good if there is a concomitant medial mal fracture
  – Use implant in an anti-glide manner to reduce

Case Example
Case Example

Patient Positioning

Approach
Final Construct

Medial Malleolus

- Deep Deltoid attaches to Posterior Colliculis
- Reducing and stabilizing a MM with a posterior Colliculis will in effect repair the deltoid injury

Medial Malleolus

- Stable to ER stress - no syndesmotic stabilization indicated!
Medial Malleolus

- Most Rotational injures the MM is “pulled off”
- Fracture at or below level of the plafond
- Tension Failure
- Lag to stabilize
  - Cancellous
  - Four cortical

Medial Malleolus Anterior Colliculis

- Has only superficial Deltoid attached
- Deep Deltoid most likely torn
- Reducing and stabilizing this anterior Colliculis will contribute very little to ankle stability

Medial Malleolus

- With some mechanisms (PAB, SAD), mm is pushed off
- Sheer injury
- So need to push these back on or Antiglide
Syndesmosis

What is the Problem?

- High rate of mal-reduced syndesmosis
- Mis-understood anatomy
- Often an after-thought during ORIF ankle fx
- To much "noise" in regards to implants
  - Screws vs. Tight-rope
  - Number and size of screws

Not enough emphasis on reduction

Too much talk about fixation methods
Reduction is the Problem

The Functional Consequence of Syndesmotic Joint Malreduction at a Minimum 2-Year Follow-Up

H. Claude Sagi, MD, Aftaan R. Shah, MD, and Roy W. Sanders, MD

Definition of Reduction Syndesmosis

- Fibula needs to be out to length
- Fibula needs to be correctly aligned in three planes
- Fibula needs to be corrected Rotated
- Fibula needs to be in the correct place within it’s sulcus-incisura

Old wive’s tale

- If fibula fracture more than half way up from ankle joint, no need to “fix”
Restoring Length, Alignment, Rotation

- Directly Reduce Fibula regardless of fracture's location
- Only reliable way to achieve reduction as defined

Reducing Fibula

- Fibula now out to length
- Fibula now at correct rotation
- Fibula correctly aligned

Issues to reducing Fibula

- Very Proximal fracture-fear of nerve
- Approach and reduce
  - +/- stabilize
  - Once reduced with respect to length and rotation
  - Address syndesmosis reduction and stabilize syndesmosis in a reduced state
Issues to reducing Fibula

- Very Comminuted Fibula
- Rely on Talo-cural angle from uninjured side?
- Other tactics
  - If there is a medial Malleolus fracture that is not comminuted (likely tension failure), reduce and stabilize MM first
  - Posterior Malleolus

Comminuted Fibula

- Can you rely on Talo-Crural angle from other side?
- Maybe, but individual variation can vary from 75 to 86…(Foot Ankle, 1989, Rolfe et. Al)

Comminuted Fibula
Other Tactics

- Reduce and stabilize a non-comminuted Medial Malleolus FIRST!
- Ligamentotaxis will help restore fibula length
Comminuted Fibula
Other Tactics

- Reduce and Stabilize posterior Malleolus FIRST!
- PM has posterior-inferior tib-fib ligament
- Bonus: Reducing and stabilizing PM will often restore syndesmosis stability

Reduction in the Sulcus

- Open reduce
- Allows debridement of the tib-fib joint
- Allows direct reduction
- Put fibula into sulcus
- Pay attention to the rotation within the sulcus
- No guess Clamp position

Reduce Syndesmosis

- Start with a fibula that is reduced with respect to length alignment and rotation
- Fibula resides in a sulcus
- If you reduce a posterior Malleolus, it will place the fibula in the correct location, then just need to correct rotation within sulcus
- If no posterior malleous, then consider open reduce
Articular Impaction Injuries

Often missed, not recognized, or not addressed

Articular Impaction Injuries

- Look out in SAD and PAB injuries
- Evaluate with CT scan

Articular Impaction

- SAD and PAB
- Need to reduce
What about Late fractures?

3 weeks Plus

Late Fractures

- Must take down partially healed Posterior Malleous in order to restore length of fibula
- Take down high fibula’s
- Open debride syndesmosis
Soft Tissues

- Straight incisions
- Avoid curving, "J" or any other letter incision
- Traumatized tissue best with straight incisions done sharply (knife, not spread (tear))

Just a few words about the fibula fracture component

The Fibula in Rotational Injuries
SER, PER
Most rotational injuries (short oblique/spiral) very amenable to open reduction under direct vision, lag and neutralization plate or posterio-lateral anti-glide plate—absolute stability.

Operative Lateral Malleolus

- Rotational (SLR, PER)
- Simple fracture patterns
- Lag Screws and Neutralization Plates
- Posterior Anti-glide

Fibula's that fail under tension (transverse - PAB) amenable to IM lag screw, tension banding, tension band plate.
Lateral Malleolus Lag Screw for transverse

Lateral Malleolus Low transverse

High Fibula(diaphyseal)

• OK to stabilize with a stouter Plate (like LCP or similar)
Conclusions

• Reduce fibula with respect to length, alignment and rotation
• Reduce Syndesmosis
• Reduce and stabilize posterior malleous
• Reduce articular impaction injuries
• Straight Incisions