Disclosures

- No relevant disclosures
Ankle Anatomy: Lateral ankle ligaments

![Lateral ankle ligaments diagram](image)

Figure S2-5

Ankle Anatomy: Medial ankle ligaments

![Medial ankle ligaments diagram](image)
Ankle Anatomy: Syndesmosis

Instability
Instability

• Inability to keep the talus perfectly positioned under the plafond

• How much is too much?
  o 1mm of translation → 42% articular tibiotalar contact area decrease
  (Ramsey, JBJS, 1976)

Instability

• Tibiofibular clear space: <6mm (AP & mortise)

• Tibiofibular overlap: >6mm (AP) and > 1 (mortise)

• Medial clear space: <5mm or equal to superior clear space
Instability

- Preoperative
  - Contralateral imaging
  - Stress x-rays
    - Dorsiflexion external rotation stress test
    - Gravity stress test
    - WB xray

- Intraoperative
  - Contralateral imaging
  - Stress maneuvers
    - Dorsiflexion external rotation stress test (more reliable)
      - Matuszewski et al. JOT, 2015
    - Modified Cotton exam
      - Both maneuvers may have high specificity but lower sensitivity
      - Pakarinen et al. JBJS, 2011.

Ankle fracture patterns and classifications
Operative vs Nonoperative Treatment of Unstable Ankle Fractures
Donken et al. *JOT*, 2012

- Retrospective with median 21 years followup
- 148 patients with SER II-IV
  - Congruent ankle → nonoperative
  - Unstable ankle → surgery
  - No stress x-rays but close serial x-rays if nonoperative
- No difference between operative and nonoperative groups in respect to function (O-M), loaded dorsal ROM, MCS, OA
- When ankle maintains congruity, ankle fractures do well long term


- Retrospective
- 51 Weber B lateral malleolus fractures (bimalleolar equivalent)
- Gravity stress test AOFAS
  - 4-5 mm MCS 90, 89
  - 6-7 mm MCS 72, 63
- Conclusions
  - More lateral instability results in worse functional outcomes
  - Medial ecchymosis or tenderness no a good predictor of instability

- Retrospective
- 43 Weber B lateral malleolus fractures (bimalleolar equivalent)
  - 26 non-operative vs 17 operative
- Findings
  - Age <30 had improved functional outcomes vs age > 50
  - MCS >5mm on stress xray only had best functional score (O-M 90)
    - 5-10mm MCS → 76
    - >10mm MCS or subluxation on presentation → Gravity stress test


- Prospective multicenter RCT
- 81 patients with non-displaced, unstable lateral malleolar fractures (>/- 5mm MCS)
  - 41 operative
  - 40 non-operative (cast/boot with 6weeks protected WB)
- Findings:
  - No function differences at 12 months (Olerud-Molander & SF-36)
  - Non-operative group: 8 pts final MCS >/= 5mm; 8 delayed/nonunions
  - Operative: 5 infections; 5 implant removals
- Conclusions
  - Non-operative treatment may be reasonable, certainly in older or less active patients
  - ORIF for younger, active patients as natural history of misalignment not fully understood

- Retrospective
- 41 patients with isolated lateral malleolus fx
  - MCS <7mm on gravity stress xray
  - Normal ankle mortise on WB xrays
- 1 year follow-up
- Findings:
  - Good functional outcomes (AOFAS 93, O-M 91, VAS 0.57)
  - No MCS widening
  - *Proposed WB xrays as stress test of choice*
  - Gravity stress may overestimate instability

Role of MRI

- 21 isolated lateral malleolus fractures (bimal equivalent)
  - Without initial subluxation/dislocation
  - Stress positive (≥5mm or >1mm contralateral)
  - Offered surgery or MRI
- 19 patients with partial deltoid injuries; complete deltoid injuries treated operatively
- Minimum 1 year followup.
- Treated non operatively, WBAT in boot.
- 15 patients with follow-up
  - 14 with AOFAS 100 scores
  - 15 with SF-36 normal
  - 14/15 would undergo same treatment

Warner et al. JOT, 2015

- Retrospective
- 300 ankle fracture in 6 years
- Compared MRI, injury x-rays, and intra-operative findings
- 94% agreement between MRI and LH class
- 85% agreement between MRI and LH grade
- No cases with complete ligament tear and medial malleolar fracture
- Conclusions:
  - Injury x-rays and intra-operative assessment is gold standard
  - MRI is not necessary in most circumstances

- Retrospective review of prospective database
- 122 SER III and IV without PM fracture
- 97% (119/122) PITFL delamination or avulsion from PM
  - Very few midsubstance injuries
- Conclusions:
  - Most syndesmotic injuries without PM fractures, may be amendable to soft tissue repair
  - MRI in SER III and IV injuries without PM fractures likely not necessary


- 61 patients with isolated SER lateral malleolus fractures
- DER stress test vs MRI
- Interobserver reliability: Stress test (94%) > MRI (72%)
- Did not recommend routine use of MRI to evaluate stability
When to weightbear ankle fractures?

- Stable fractures treated nonoperatively $\rightarrow$ immediate WB in SLC or boot.
- Unstable fractures treated nonoperatively $\rightarrow$ NWB
- Operative ankle fractures without syndesmosis instability $\rightarrow$ early WB can be tolerated (SER patterns only) without complication
  - Ongoing WOW! pRCT in Netherlands
- Operative ankle fracture with syndesmosis instability $\rightarrow$ 6-12 weeks? Earlier?
When to weight bear ankle fractures?

- Ligaments take longer than bone to heal
- Stable fixation? Articular impaction?
- Early goals
  - Reduce swelling and inflammation
  - Wound healing
- Patient early needs
  - Isolated injury vs polytrauma

Advanced ankle topics summary

- Unstable vs Stable (particularly SER patterns)
  - Anatomically aligned fractures do well
  - Increased displacement on stress x-rays do poorer
  - WB stress x-ray may be an alternative
- Role of MRI
  - Probably not necessary for stability issues; stress imaging = gold standard
- WB ankle fractures
  - Stable fracture (whether nonop or stable after fixation) probably can tolerate early WB
  - Syndesmotic injuries may take longer