Isolated Syndesmotic Instability

“The High Ankle Sprain”

Robert B. Anderson, MD

Chief, Foot & Ankle Service
Carolinas Medical Center
OrthoCarolina

Team Orthopaedist, Carolina Panthers
Charlotte, North Carolina
DISCLOSURE

Consultant for: Arthrex, DJO, Wright Medical, Amniox
Royalties from: Arthrex, DJO, Wright Medical
Research support from: Arthrex
Syndesmotic Injuries

• Not as uncommon as once thought!
  – Now 10-15% of ankle sprains
  – USA
    • NFL 2011: 89 reported
      – Days lost to injury > 2981
    • NFL 2012: > 100
  – Role of artificial surface?
    • Cleat-surface interface
Anatomy

• Sickle shaped synovial lined functional joint with cartilage on both sides
• Shape varies
  – 75% have concave tibial surface
• Pistons, rotates, widens
• Depth Varies
  – 1.0 mm to 7.5 mm
Syndesmotic Stability

- Post tib/fib (PITF, Transverse) provides 40% resistance
- Ant tib/fib provides 35%
- IO ligament provides 22%
- All keep the fibula in the notch to stabilize the mortise; contain the talus

Ogilvie-Harris, Arthroscopy, 1994
Norkus, S; Floyd, RT, J Athl Train, 2001
Mechanism of Injury

• Classic = foot in fixed stable position and valgus thrust on leg
  – External Rotation with dorsiflexed foot
    • Dorsiflexion brings wide part of talus to syndesmosis, increasing stresses across the joint

But there are wide varieties - some noncontact and subtle
Mechanism of Injury

- Injury force
  - External rotation always present
    - Dorsiflexion
    - Eversion

Can be non-contact as well
Diagnosis – Physical Exam

- Tenderness over the syndesmosis
- Deltoid tenderness/dimple
- Proximal fibular tenderness
- Standing stress test
- Squeeze test
- External rotation test
  - Last 2 = high specificity, low sensitivity (de Cesar et al: FAI ‘11)
How do we Diagnosis?

– Plain radiographs

  • Standing – single limb may accentuate areas of diastasis and instability
Stress Radiographs?

- Beumer et al (2003): not reliable for diagnosis of syndesmotic instability
  
- *I have difficulty getting patients to relax!!!!*
Stress Fluoroscopy

Helpful when positive...
Role of CT and MRI?

- MRI is very sensitive for detecting syndesmotic injuries – *but not prognostic* (Oek, 2003)
- CT is able to detect minor (2-3mm) diastasis, though clinical significance is undetermined (Ebraheem, 1997)
- **MRI/CT is not predictive for instability – static studies!**
Arthroscopy?

• Probably the best diagnostic tool
• Very helpful in cases of negative xray, positive MRI and protracted recovery with vague pain
• Lue et al. found that arthroscopic evaluation was superior to fluoroscopic stress testing
  – Arthroscopy 2005
Syndesmotic Instability

• I agree = arthroscopic evaluation is superior to any imaging studies in subtle injuries
  – Done with EUA – different exam with patient relaxed
Case JM

- 21 y/o football player with recurrent high ankle sprains
- Difficulty with changing direction
- Normal x-rays, stress imaging, flouro exam
- MRI: chronic ligament changes medial and lateral, chondral defects
Case JM

• **Scope**
  - Chondral changes
  - Loose body
  - Unstable syndesmosis; absent inferior syndesmotic ligaments
Syndesmotic Reduction Is Important

- 1mm of lateral displacement of the talus results in 42% reduction in tibiotalar contact (Ramsey and Hamilton, 1976)
- Chissel and Jones, JBJS, 1995 – threshold of 1.5mm diastasis with worsening results with increasing malreduction/diastasis
- Weening and Bondari, JOT, 2005 – “the only significant predictor of functional outcome was reduction of the syndesmosis”
Why Fix?

- Case
  - 25 y/o NFL RB
  - Missed instability
  - Persistent pain
  - Arthroscopic: medial laxity and syndesmotic instability
Why Fix?

• Case
  – Arthroscopic: chronic bipolar OCL lateral

_Syndesmotic reduction is important_
Surgical Indications

Based on…

1. Presence of *any* diastasis
2. Documented instability
   - Weightbearing ankle x-rays
   - Stress plain films
   - Fluoroscopic exam
   - Arthroscopic exam

*If there is a gap, fix it!*
Syndesmotic Instability

• Diagnosis not just about images!!!
• Need to also consider clinical/functional exam
  – Inability to perform heel rise
  – Persistent pain with activity
    • Lack of improvement
  – Chronic inflammation

May point to subtle instability pattern
Subtle Syndesmotic Instability

- Wolf BR, Amendola A: *Curr Opin Orthop* 2002
  - Described a test for dynamic instability = “syndesmotic taping”
    - Player asked to perform single limb heel rise with and without tape wrapped around distal tib-fib
    - If tape assists then consider instability and need for syndesmotic fixation

*from Wolf et al*
Subtle Instability - Treatment

• In *an athlete* with no diastasis but instability identified on stress/scope…
  – Consider fixation to allow for a quicker return and improved rehab
  – Minimizes risk for progression and articular injury
Surgical Treatment

• If frank diastasis present
  – Open reduction of syndesmosis preferred
    • Avoid malrotation
Fixation

- Screws or suture-button position or both (hybrid)
  - Place at least 1.5cm above joint line to avoid “true” syndesmotic joint
  - Functional joint – why violate?
  - Avoid DJD
  - Kukreti et al: Injury ‘05
Why Use a Suture-button?

• No need for routine removal
  • No visual failure
  • Low profile
• Flexible Fixation may be better for ligament healing while avoiding malreduction
• Easy technique
Suture-button vs Screw


- No statistically significant differences ($P < \text{ or } = .05$) were noted in time to postoperative weight bearing, or subjective outcome scores between the fixation groups.
Buttress Plate?

- When placing screws/suture button *in the athlete*...
  - Addition of fibular plate may allow for earlier and safer return to play
Fixation of Proximal Fibula in Maisonneuve Fracture?

• Pelton et al FAI ‘10
  – 12 patients: 8 with closed reduction and syndesmotic screw stabilization and the other 4 with ORIF prior to syndesmotic stabilization
  – RESULTS: A statistically significant near anatomic result was found with the open group. The talocrural angle was 12.8 degrees in the open group and 9.9 degrees in the closed group

• My experience: difficult exposure, risk of nerve injury → if displaced open distal!
Should I Open Medially?

- Consider medial exploration/deltoid repair if unable to reduce or large avulsion
- Repairing deltoid adds stability
- *I have a low threshold to open*
Syndesmotic Fixation

• Case Example
  – 21 y/o football player
  – Maisonneuve fx
Syndesmotic Buttress Plate with Suture-buttons

• Case Example
  – Arthroscopic exploration
  – Open syndesmotic reduction
    • Compression clamp
    • Ankle in neutral
  – Buttress plate applied; suture-buttons placed
Syndesmotic Buttress Plate with Suture-buttons

- Case Example
  - Buttress plate applied; suture-buttons placed
  - Returned to sport at 5 months postop
Postop Course

• With stable fixation can use pool/bike as soon as wounds allow

• Can accelerate return to sport in those fixed for instability without gross diastasis (6-8 weeks)

• Those with associated fractures or gross diastasis are unlikely to return for 4-5 months

• Avg RTP = 137 days
Screw Removal?

• *Don’t remove too early!*
  - Weening et al: JOT 2005
  - 10% loss of reduction with screw removal at median of 9 weeks

• *Why remove at all?*
  - Moore et al: FAI 2006
  - Retention of syndesmotic screws, even with mechanical failure, does not pose a clinical problem
Syndesmotic Injuries

Complications

• Pain
  – Inflammation, degeneration in the syndesmosis
  • Bone scan/CT helps to diagnose
  • Consider injection under flouro or CT
Syndesmotic Injuries

Complications

• Pain
  – Failed hardware in syndesmotic joint → DJD
    • Avoid true syndesmotic “joint”
    • Benefit of suture-button?
Complications

- Painful synostosis
  - Almost always an *incomplete* type

- Debridement vs. syndesmotic fusion
  - I prefer debridement in the athlete
Case MP

- 24 y/o football player with “high ankle sprain” – normal x-rays and stress; MRI c/w injury
- Boot x 4 weeks
- Recurrent sprains/pain/dysfunction the following year
Case MP

- MRI repeated
  - Chronic syndesmotic inflammation
    - Persistent
    - Progressive
  - Joint okay
Case MP

- Repeat stress tests negative
- CT: incomplete synostosis with progression
- Suspected subtle syndesmotic instability
Case MP

- Scope confirmed

- Open debridement
Case MP

- Syndesmotic fixation
  - Suture-buttons
Late Diastasis

• Best to achieve tib-fib fusion
  – Synostoses don’t hurt but may limit some motion – especially external rotation

Salvage of Chronic Instability of the Syndesmosis with Distal Tibiofibular Arthrodesis

Functional and Radiographic Results

By Kirstina M. Olson, MD, Gregory H. Daintyko Jr., MD, and Brian C. Toolan, MD
Syndesmotic Injuries

Summary

• Have a high index of suspicion → diastasis not always present
  – Assess for instability with stress (standing x-rays, flouro)
  • Clinical signs (inability to heel rise) and lack of recovery can be as helpful as imaging
Syndesmotic Injuries

Summary

• EUA/scope/open if not improving

• Fix if unstable to reduce risk of chondral injury and deformity
  – Open reduction helpful

• Avoid the “true” syndesmotic joint with fixation
Thank You!
Position of Ankle for Syndesmotic Fixation?

• Tornetta (cadaveric model) demonstrated cannot overtighten the syndesmosis and therefore position of foot does not matter

Position of the Clamp does Matter!

  – *Oblique position may malreduce, need to be transverse*

• Miller et al: Iatrogenic syndesmosis malreduction via clamp and screw placement. *J Orthop Trauma* 2013

• *Benefit of open reduction*
Early Recurrent Diastasis (<6 mo)

- I prefer syndesmotic debridement and screw fixation
  - Usually requires medial gutter debridement and repair of superficial deltoid
  - May develop synostosis
- Harper: FAI 2001
  - 5/6 did well