Management of Syndesmotic Injuries in the Athlete

Justin Fleming, DPM
University Orthopaedic Associates
Clinical Assistant Professor, Dept. of Orthopaedics
Rutgers-Robert Wood Johnson Medical School
Flemingjmak@gmail.com
Disclaimer:

• Consultant:
  • Arthrex
Injury Recognition

• “The eye only sees what the mind knows”
• Historically Underappreciated
• Poor Recognition of Subtle Injury Pattern
• Rearview Diagnosis
What’s the Big Deal?

- NCAA Injury Surveillance System (2004-09)
  - 25% of Ankle Sprains
- NFL
  - 2006 Combine – 15% of Players Reported History of Syndesmotic Injury
  - 2011: >2981 days lost to injury (89)
  - 2012: >100 reported injuries
- Predictive of long term dysfunction


Syndesmotic ankle sprains in athletes.

Williams GN¹, Jones MH, Amendola A.
What’s the problem?

Spectrum of Injury
Mechanism

• Direct Mechanism most common
• Fixed foot with valgus thrust applied
• External Rotation *ALWAYS* Present
• Dorsiflexion, External Rotation
• Mechanism must be part of questioning
• Non Contact Injuries are Possible as well
Physical Exam

- Inability to Weightbear
- Tenderness of Syndesmosis
- Standing Single Limb Evaluation
- Proximal Fibular Tenderness

- External Rotation Stress Test
- Mid-calf Squeeze Test
  - Coupled with Deltoid Tenderness

*High Specificity / Low Sensitivity*
• Surgical Management not warranted without diastasis?
• Static picture of Dynamic Structure
• 2 Ligament Injury Threshold
• “Peel Back Lesion of PITFL”
• Importance of the Deltoid
Stress Radiographs

• External Rotation Stress is the Most Sensitive Clinical Test to Determine Syndesmotic Instability

• NOT Sensitive Enough to Identify Subtle Instability Patterns

Acta Orthopaedica Scandinavica

Clinical diagnosis of syndesmotic ankle instability

Annechien Beumer, Bart A Swierstra & Paul G H Mulder
So What’s The Answer?

- No ligamentous disruption
- AITFL / Interosseous ligament
- AITFL / Interosseous / CFL
- All 4 ligaments disrupted

*Two ligament disruption is unstable
Defining Subtle Instability

- 10 Cadaveric Specimens
- Serial sectioning of Syndesmotic Ligaments
- Manual External Rotation Stress
- Passage of 3mm Sphere into Tibiofibular Space 100% Predictive for Two Ligament Injury

Arthroscopic Correlates of Subtle Syndesmotic Injury

Gregory P. Guyton, MD¹, Kenneth DeFontes III, MD¹, Cameron R. Barr, MD¹, Brent G. Parks, MSc¹, and Lyn M. Camire, MA, ELS¹
Algorithm for Treatment for the Subtle Injury

- MRI confirmation of 2 ligaments injury
  - EUA and Stress Fluoroscopy
- Equivocal Exam warrants diagnostic arthroscopy
- Syndesmosis Stabilization if:
  - Positive stress exam
  - Arthroscopically identified instability
Tightrope Stabilization

- Why use a TR?
  - 2x stronger in cyclical loading than a 4.5mm screw
  - Reduced Retrieval
  - Allows for normal physiologic motion of the fibula
    - Improved collagen healing
  - More Accurate Reduction
  - Reduction in Latent Diastasis

www.UOANJ.com
Syndesmotic screw vs. Tightrope

A Prospective Randomized Multicenter Trial Comparing Clinical Outcomes of Patients Treated Surgically With a Static or Dynamic Implant for Acute Ankle Syndesmosis Rupture

Mélissa Lafraîche, MD,⁎ Etienne L. Bézil, MD,† Luc Bélair, MD,‡ Michel P. J. van den Berkom, MD,§ Mark Glazebrook, MD,|| and Stéphane Pellet, MD, PhD, FRCS(C)¶

The Effect of Suture-Button Fixation on Simulated Syndesmotic Malreduction: A Cadaveric Study

Robert W. Wintersmam, MD, Chamnanee Rungsri, MD, Jessica F. Gooz, PhD, John Femino, MD

A prospective randomised study comparing TightRope and syndesmotic screw fixation for accuracy and maintenance of syndesmotic reduction assessed with bilateral computed tomography

Tero Kortekangas⁎⁎, Olli Savola⁎⁎, Tapio Flinta⁎⁎, Sannamari Lepojärvi⁎⁎, Simo Nortunen⁎⁎, Pasi Ohtonen⁎⁎, Jani Katisko⁎⁎, Harri Pakarinen⁎⁎

Randomized Trial Comparing Suture Button with Single Syndesmotic Screw for Syndesmosis Injury

Mette Renate Andersen, MD, Frede Frihagen, MD, PhD, Johan Canberg Hellbä at, MD, PhD, Jan Erik Madsen, MD, PhD, and Wender Figved, MD, PhD

Fixation of Ankle Syndesmotic Injuries: Comparison of TightRope Fixation and Syndesmotic Screw Fixation for Accuracy of Syndesmotic Reduction

Gohar A. Naqvi, MRCSI, MCh⁎, Patricia Cunningham, FFR (RCRCSI), Bernadette Lynch, DCR, HDipCT, show less Rose Galvin, PhD, Nasir Awan, FRCS, FRCSI (T&Orh)

Suture Button Versus Syndesmotic Screw for Syndesmosis Injuries

A Meta-analysis of Randomized Controlled Trials

Yoshisharu Shimizu,w,x MD, Eoghan T. Hurley,y Charles L. Myerson, z BA, Christopher D. Murawski, AA, and John G. Kennedy, y MD, MCh, MMSc, FSFS, FRCS (Orth)

Investigation performed at Hospital for Special Surgery, New York, New York, USA
Clinical Evidence

• Level II Prospective Cohort Study, 46 patients

• Results:
  • No difference in outcomes
    • AOFAS
    • FADI
  • Syndesmotic Reduction (CT)
    • 21.7% malreduced in screw group
    • 0% malreduced in Suture button group
    • Only independent predictor of the clinical outcome
  
  • “More accurate method of syndesmotic stabilization compared with screw fixation.”

Clinical Evidence

- Multicenter randomized double blinded controlled study
- 70 pts. / 5 trauma centers
  - 2 groups: Tightrope vs. Screws
  - 1 Tightrope or 1 quad cortical 3.5mm screw
- Radiographic / Clinical Outcomes
- Conclusion: Dynamic fixation…seemed to result in better clinical and radiographic outcomes
  - Hardware removal significantly higher in screw group
  - Loss of correction in 4 screw patients (3 after screw removal)

Pelet et al. A Prospective Randomized Multicenter Trial Comparing Clinical Outcomes of Patients Treated Surgically with a Static or Dynamic Implant for Acute Ankle Syndesmosis Rupture. JOT Vol.29,5, May 2015
• Level 1
• 2 groups:
  • 48 SB / 49 SS
• Outcome measures: AOFAS, OMA, VAS
• CT evaluation 6 wks, 6 mos., 1 and 2 years
• 14.3 % latent diastasis in screw group vs. 0% SB
• Less mortise widening at 2 years
• Higher AOFAS, OMA, VAS (lower) with SB
Case Example

- 16 year old MLB
- 235 lbs.
- “Ankle Sprain”
- Unable to WB
- External Rotation Injury
- Positive Mid Calf Squeeze
- Cotton’s Test
Dynamic Syndesmotic Evaluation
Syndesmosis Stabilization
Subacute Presentation

- 19 yo D1 290 lb OL diagnosed with a high ankle sprain
- 10 weeks post injury
- External rotation
- Unable to play
- Typical clinical findings

* Higher Demand / Accelerated RTP

* Diastasis without fracture
Arthroscopic Debridement, TR, AITFL
Arthroscopic Evaluation
17 yo Soccer Player Persistent Ankle Pain
Rotary Instability
Tightrope Fixation
Reconstruction of AITFL
Repeat Stress Exam
Deltoid Evaluation

Medial Malleolus

Deltoid Tear
Massive Deltoid Complex Tear

FDL

Posterior tib

Deltoid Tear

Talus

Courtesy of Dr. Giza
Deltoid Repair

• Higher incidence in young, healthy patients with syndesmotic injury
Summary

- Determining clinically relevant syndesmotic instability represents a challenging / difficult task.
- Arthroscopy is useful in detecting subtle instability with partial disruption (2 ligaments) of the syndesmosis.
- Syndesmotic instability may occur in multiple planes when viewed arthroscopically.
- Tightrope demonstrates improved performance for this utility.
Thank you
Rearview Diagnosis
Current controversies about the syndesmosis?

- **Recognition**
- **Reduction**
  - >50% Malreduction
  - Reduction accuracy increases with posterior malleolar fixation
  - Remains unsolved
- **Maintenance of Reduction**
  - Static Fixation – screws
  - Dynamic Fixation – suture button

Direct Visualization for Syndesmotic Stabilization of Ankle Fractures

Anna N. Miller, MD\(^1\); Eben A. Carroll, MD\(^2\); Robert J. Parker, BS\(^1\); Sreevathsa Boraiah, MD\(^3\); David L. Helfet, MD\(^4\); Dean G. Lorich, MD\(^1\)
Superficial Deltoid Repair
Something to consider
What are we missing?
Reasons to Scope Ankle Fractures

1. Diagnostic and Prognostic
   Evaluate cartilage, ligaments, reduction
   More accurate
   Fast (<10 min)
   - 29898, 8.5 RVUs (shaver touches bone)

2. Remove hematoma, inflammatory cytokines (TNF-a, IL-8, IL-10, MMPs)

Clinical Relevance: In addition to anatomic fracture reduction, these data lend credence to reducing acute intra-articular inflammation through the development of antagonists to these pro-inflammatory and degrading mediators. Likewise, intra-articular lavage might reduce this inflammatory burden.
Push Plate

- Earlier / Safer Return to Play
- Distribution of Forces along the Lateral Cortex
Reasons to Scope Ankle Fractures

1. Diagnostic and Prognostic
   - Evaluate cartilage, ligaments, reduction
     More accurate
   - Fast (<10min)
   - 29898, 8.5 RVUs (shaver touches bone)

2. Remove hematoma, inflammatory cytokines (TNF-a, IL-8, IL-10, MMPs)

3. It can Change Treatment Plans
Suture Button Fixation

- Dynamic Fixation
- Physiologic Healing
- Avoidance of implant removal
- Reduction in latent diastasis
- Faster return to work / sports
- Improved clinical outcomes

Where else in the body do you fix a ligament with a screw?
Clinical Evidence

- Level 1
- 43 total patients
- Tightrope vs. 3.5mm screw
- Accuracy and maintenance of syndesmotic reduction
- Weber C injuries
- Intraoperative / Postoperative CT
- Similar functional scores / reduction rates
- Maintenance of reduction 84% screw vs. 95% Tightrope

Pakarinen et al. A prospective randomised study comparing Tightrope and syndesmotic screw fixation for accuracy and maintenance of syndemotic reduction assessed with bilateral computed tomography. Injury 46 (2015).
What about the sagittal plane?

- Single suture button vs. solid quad cortical screw
- Simulated unstable model with complete ligamentous sectioning
- Effective in coronal plane
- Unable to restrict supraphysiologic motion with rotatory stress in sagittal plane
- Consider second suture button or direct AITFL augmentation

Drakos et al. Three Dimensional Analysis of Fibular Motion after Fixation of Syndesmotic Injuries with a Screw or Suture Button Construct. FAI 2016 Vol 37 (12)
Economics of Suture Button

- Cost effective analysis of unstable SER IV
- Used 20% / 4% retrieval rate screw / SB
- *SB device more cost effective than syndesmotic screws not removed on a routine basis*

• Level I trauma center
• Level II evidence
• 2004 – 2006 total 681 ankle fxs
• 16% (107) syndesmotic injuries
• 39% syndesmosis malreduction
  postop CT scan
  – 15% Open reduction of syndesmosis
  – 44% CR
• Malreduction - worse functional outcome
Multi-ligament Reconstruction

- AITFL
- PITFL
- Deltoid
- Syndesmosis
- IO
Strength contributions of syndesmosis

- Evaluate individual contributions of syndesmotic ligaments
- Physiologic rotational loading method
- Sequential ligamentous release
- Conclusion:
  - AITFL provides majority of resistance to external rotation and posterior translation of the fibula
  - Repair of the AITFL may be necessary to augment transosseous fixation to control rotatory instability
AITFL IB
EVERY ISOLATED FIBULAR FRACTURE WITH AN INTACT MORTISE SHOULD BE STRESSED!
Multi-ligament Reconstruction

- AITFL
- PITFL
- IO
- Deltoid
- Syndesmosis
Indications for Acute Deltoid Repair

- Medial Ankle Instability as demonstrated by Positive Valgus Stress
What’s wrong with screws?

- Latent Diastasis
- Periosteal “Rub”
- Loose Screw / Loss of correction
- Heterotopic ossification
- Broken screw
Latent Diastasis

My personal evolution...
When do we need more?

- PER / Syndesmosis / Deltoid
- Significant medial instability
- Fracture – Dislocations
- Identified sagittal or external rotation instability
Anatomy of the Syndesmosis

- AITFL (35%)
- PITFL (42%)
  - DTL
- ITL (22%)
- IOM
- Incisural notch

Normal Syndesmosis
Syndesmotic Injury