High Ankle Sprains and Isolated Fibular Shaft Fractures
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Take-Home Messages

High Ankle Sprains
- Most treated without surgery, out 4-8 weeks
- Surgery for static diastasis, possibly for stress/arthroscopic evidence of instability

Fibular Shaft Fractures
- Most treated without surgery
- Possible higher re-fracture rate in contact athletes

Offensive Lineman
- Blocking play
- MRI
- Out 23 days, misses 2 games

Wide Receiver
- Tackled on passing play

MRI
- IR, misses last 11 games of season

Anatomy

Anterior inferior tib-fib ligament
- Chaput's tubercle to anterior tubercle of fibula
- Inferior portion viewed arthroscopically

Posterior inferior tib-fib ligament
- Runs obliquely from posterior tubercle of tibial to posterior lateral malleolus
- Proximal and superficial to inferior transverse ligament

Inferior transverse ligament
- Fibrocartilaginous extension of the posterior tibial articular surface
- “labrum” of the ankle

Tib-fib interosseous ligament
- Distal continuation of interosseous membrane
- Just proximal to AITFL and PITFL
- Stiffer and stronger than AITFL
Relative Contributions to Resistance to Diastasis
- Anterior Inferior Tib-Fib Ligament → 35%
- Inferior transverse Ligament → 33%
- Interosseous Tib-Fib Ligament → 22%
- Posterior Inferior Tib-Fib Ligament → 9%

-Olgilvie-Harris et al

Mechanism of Injury
- Forceful external rotation of the foot and ankle relative to the tibia
- Valgus load to leg with planted foot
- Rapid internal pivot off of a foot planted in ER
- Direct blow to lateral heel of a kneeling player

Assessment
- Amount of swelling varies with extent of injury
- TTP over inferior tib-fib ligaments
- Assess for TTP proximally and medially over deltoid ligament as well
- External rotation stress test
- Squeeze test

Imaging
- WBing AP, Lateral and Mortise views
- Tib-Fib views
- Stress view (manual or gravity)
- Useful in determining need for operative stabilization

XRays
- Tib-fib clear space should be <6mm on both AP and mortise views
- Tib-fib overlap should be >6mm on AP and >1mm on mortise
- Tib-fib views to evaluate for proximal fibula fx

MRI
- 100% sensitive and 93% specific for diagnosis of anterior inferior tib-fib ligament tear
- 100% sensitive and specific for posterior inferior tib-fib ligament tear
- Takao M et al
- No clear link between MRI results and clinical outcome or need for operative intervention

Classification
- Continuum of Injury
- West Point Ankle Grading System (Gerber et al)
  - Grade I → No Evidence of Instability (partial tear of AITFL)
  - Grade II → Slight Evidence of Instability (Tear of AITFL and partial tear of IOL)
  - Grade III → Definite Instability with complete tear of syndesmotic ligaments
Indications for Surgical Fixation
- Gross diastasis of the syndesmosis
- Syndesmotic diastasis on stress radiographs
- Arthroscopic evidence of syndesmotic instability

Goals of Surgery
- Anatomic reduction to re-establish the correct tibia-fibula relationship
- Provide adequate fixation and time to achieve healing

Treatment – Grade I
No Diastasis or Instability
- Phase I (Acute): WBAT in cast or boot, modalities prn, mobility/ROM exercises within comfortable range
- Phase II (Sub-acute): Mobility, general strengthening, neuromuscular/proprioceptive exercises
- Phase III (Advanced Training): Focus on “return to sport” functional training
- 6-8 weeks to return to sports (Avg = 55 days)
  – Hopkinson et al, Foot & Ankle, 1990

Treatment: No Static Diastasis, but unstable on Stress views
- “Dealer’s choice”
- Non-op = 4 weeks NWBing in a cast followed by 2-3 wks in a boot or walking cast
- Repeat xrays q 1-2 wks to assure no late diastasis
- Operative = Screw vs Endobutton/Suture fixation +/- arthroscopic debridement
- Arthroscopic Debridement
- More commonly advocated in chronic setting
- May have advantages acutely
  – May assist in reduction
  – Allows you to see if deltoid ligament is trapped in the medial gutter
  – Assess for and manage associated chondral defects

Treatment: Grade 3
- Immediate ORIF vs arthroscopic-assisted reduction and percutaneous screw placement
- ORIF may require medial incision to clear deltoid ligament
- Surgical Considerations
- Screw size
- One screw vs Two Screws
- Three vs Four Cortices
- Tightrope Device
- Deltoid Ligament Repair
Screw Size
Biomechanical Comparison of Syndesmosis Fixation with 3.5- and 4.5-millimeter Stainless Steel Screws, Thompson et al, *Foot Ankle Int, 2000*

"No biomechanical advantage of a 4.5 mm screw over a 3.5 mm screw"

Number of Screws
Tricortical Versus Quadricortical Syndesmosis Fixation in Ankle Fractures: A Prospective, Randomized Study Comparing Two Methods of Syndesmosis Fixation, Hoiness and Stromsoe *J Orthop Trauma, 2004*

– Level I study comparing one 4.5-mm quadricortical screw to two 3.5-mm tricortical screw
– No differences in function, pain or ROM at 1 year


– Cadaveric study comparing one 4.5-mm to two 4.5-mm screws showed greater mechanical strength of two 4.5-mm screws

Number of Cortices
Syndesmosis Fixation: A Comparison of Three and Four Cortices of Screw Fixation Without Hardware Removal, Moore et al, *Foot Ankle Int, 2006*

– Level I study comparing syndesmotic fixation using two 3.5-mm screws with through either 3 or four cortices
– No differences in loss of reduction, screw breakage or need for hardware removal

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Endobutton/Suture Fixation
Transosseous Fixation of the Distal Tibiofibular Syndesmosis: Comparison of an Interosseous Suture and Endobutton to Traditional Screw Fixation in 50 Cases, Cottom et al, *J Foot Ankle Surg, 2009*

– Level 2 study comparing screw fixation to endobutton and transosseous suture fixation
No significant differences in time to post-op WBing or subjective outcome scores (AOFAS ankle and hindfoot and SF-12)

Suture-Button Syndesmosis Fixation: Accelerated Rehabilitation and Improved Outcomes, Thormes et al, CORR, 2005

- Level 3 study comparing screw fixation to endobutton and transosseous suture fixation
- Better AOFAS ankle scores and faster return to work in endobutton/suture group
- Eliminates the need for later hardware removal

Deltoid Ligament

- Repair via medial incision should be considered
- Medial Incision may be necessary to obtain anatomic reduction
- Intraoperative Diagnosis of Syndesmosis Injuries in External Rotation Ankle Fractures. J Orthop Trauma, 2005, Jenkinson et al

- Joint contact area decreases by 42% with 1-mm lateral talar shift
- Which ankle fractures require syndesmotic stabilization? J Foot Ankle Surg, 2007, van den Bekerom et al

- A lateral talar displacement of more than 2 mm results in a more than 90% chance of degenerative changes unless it is properly realigned.

Post-op Protocol

Post-op: NWB in splint

- 1 Week: Protected WBAT in boot, initiate ROM exercises
- 2 weeks: Start resistance band exercises, wean out of boot to stirrup brace over next 2 weeks
- 4 weeks: Increase WBing / proprioceptive exercises, stationary bike
- 6 weeks: Bike → elliptical trainer → stair-climber
- 8-10 weeks: Running
- 2 months: Sport-specific agility drills
- 3 months: Remove Screws
- 4 months: Return to sport

Defensive Back/Kick Returner

Imaging Studies

Running Back

Imaging Studies

Isolated Fibular Shaft Fractures

- Functional recovery complete in 6-8 wks with no immobilization, symptomatic management and progressive WBing
  - Skeletal Trauma, 3rd edition

Isolated Fibular Shaft Fractures

Traumatic Fibular Shaft Fractures in Athletes, AJSM, 1995, Slauterbeck et al
Case Series of 3 athletes (2 football, 1 soccer)
- All treated with either a walking cast or fx orthosis and progressive WBing
- All 3 were complicated by re-fracture upon return to athletic activities after fracture was clinically and radiographically healed
- Conclusion: Suggests a higher re-fracture rate in contact athletes. Delays in return to play may be expected despite radiographic healing in contact athletes.

Isolated Fibular Shaft Fractures
- Retrospective review including 5 isolated fibula fractures
- Return to competitive play averaged 18 weeks

Isolated Fibular Shaft Fractures
- Treat symptomatically
- Typically will not require immobilization
- Only 6-15% of body weight is transferred via the fibula
- Makes fx more tolerable symptomatically
- Intact tibia may not allow adequate functional stress transfer to facilitate rapid healing
- Be aware of the potential for increased healing time and risk of re-fracture in contact athletes

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