High Ankle Sprains

Prognosis and Management

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Financial Disclosure

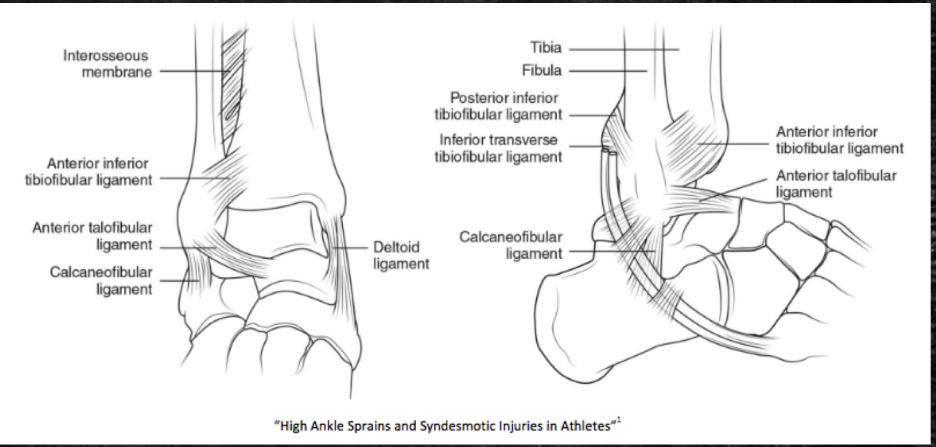
- None

High Ankle Sprain

- An injury to one or more of the ligaments comprising the distal tibiofibular syndesmosis
- Ankle sprains account for roughly 29% of all documented injuries in American Football
  - High ankle sprains account for 16%-24.6% of all ankle injuries
- Less common compared to lateral ankle sprains, management is challenging as this injury is more protracted and unpredictable

Anatomy

- Bony
  - Talus
  - Distal Tibia and Fibula
- Connective Tissue
  - Anterior Inferior Tibiofibular Ligament (AiTFL)
  - Posterior Inferior Tibiofibular Ligament (PiTFL)
  - Interosseous Ligament (distal - thickened portion of the interosseous membrane)
  - Transverse Ligament (distal portion of the PiTFL)



"High Ankle Sprains and Syndesmotic Injuries in Athletes"[1]

https://www.nuemblog.com/blog/high-ankle-sprain

Mechanism of Injury

- MOI
  - Forced external rotation *(most common)*
    - *Tibia is typically fixated in some capacity or tibia is forced into internal rotation*
  - Hyperdorsiflexion and external rotation
  - Plantarflexion and inversion *(not as common)*

https://www.saturdaydownsouth.com/alabama-football/video-shows-procedure-tua-tagovailoa-had-performed-on-his-injured-ankle/

Evaluation – Textbook Presentation

- Mechanism/Visual
  - Video evidence, examiner sees it, player identifies mechanism - patient notes some form of external rotation, hyperdorsiflexion, and/or extreme plantarflexion/inversion
- Signs and Symptoms:
  - Ankle pain – mortise area/distal leg, point tenderness at distal tib/fib, mid to high rating on pain scale (0-10)
  - Antalgic gait, unable to bear weight fully
  - Mild to moderate swelling initially
- Special Tests:
  - Kleiger's/Dorsiflexion External Rotation, Squeeze, Cotton

Evaluation – Alternate Presentation

- Mechanism/Visual
  - No visual evidence, player can't fully identify mechanism
- Signs and Symptoms:
  - Diffuse (anterior-lateral-posterior) ankle pain, point tender at distal tib/fib (anteriorly or posteriorly)
  - Antalgic gait, unable to bear weight fully, weak feeling when walking
  - Mild swelling, unsure about pain rating (0-10)
- Special Tests:
  - Special tests + Functional tests (Single leg squat, single leg calf raise, single hop)

Diagnosis

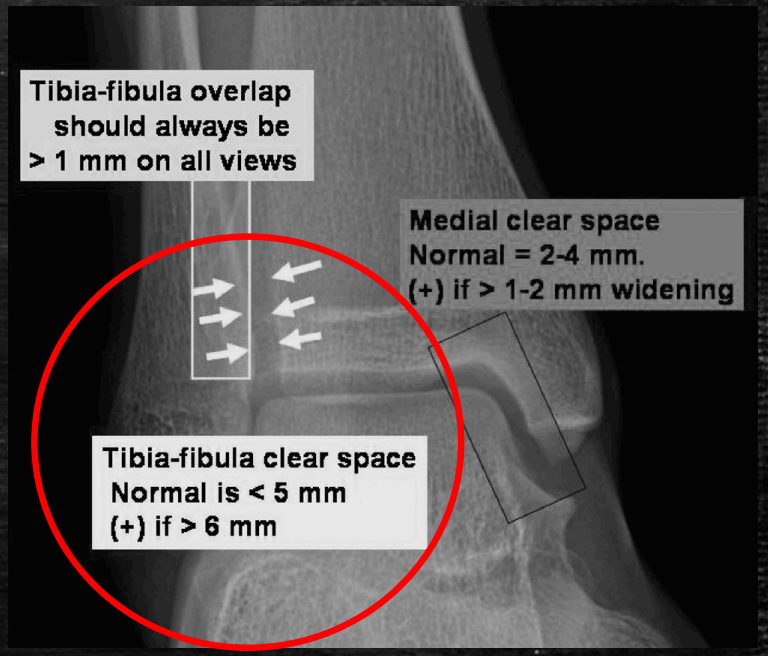
- Clinical assessment
- X-Ray
  - Rule out fracture – Ottawa criteria
- MRI
  - Best diagnostic modality to identify damaged structures
  - High sensitivity, specificity and accuracy
- Ultrasound
  - Best to identify injury to the AiTFL, dynamic assessment of diastasis

MRI and the Stability Puzzle

- Stability of the Syndesmosis
  - AiTFL ~ 35%
  - Transverse ligament ~ 33%
  - Interosseous Membrane ~ 22%
  - PiTFL ~ 9%
- Secondary advantages of imaging: Identifying concurrent injuries
  - ATF ligament sprain
  - CF ligament sprain
  - Deltoid ligament sprain
  - Bone bruise
  - Talar dome osteochondral lesions

Defining a Grading System

- Grade 1
  - Partial tear of AiTFL, no diastasis
- Grade 2
  - Complete AiTFL tear + partial tear of IOM, no diastasis
- Grade 3
  - Complete AiTFL + increased IOM tearing + partial / complete tear of PiTFL
- Grade 4
  - Complete AiTFL + PiTFL + IOM tearing + Deltoid ligament tearing



https://journals.lww.com/acsm-csmr/Fulltext/2009/09000/Management_of_Ankle_Syndesmosis_Injuries_in_the.7.aspx

Assessment Based Grading System

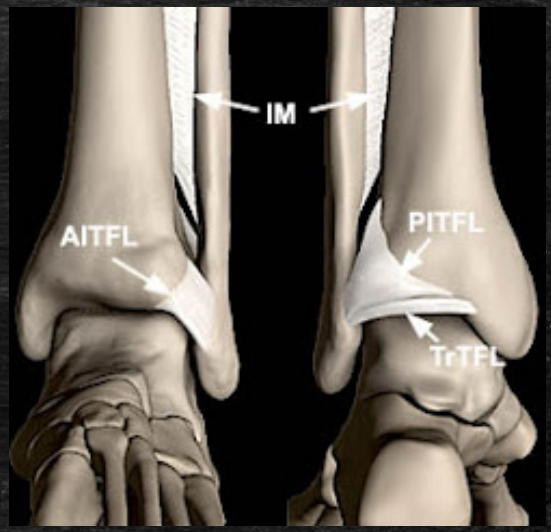
- "Perform serial clinical assessments on a weekly basis - after two weeks of immobilization in a fracture boot - using the single-leg hop test"
- If after two weeks of immobilization the patient can perform a single-leg hop test, a Grade 1 injury is diagnosed, and the patient managed accordingly.
  - If the patient is unable to perform a single-leg hop test, immobilization is continued for another week.
- If after three weeks of immobilization the patient remains unable to perform the test, a Grade 2 injury is assumed and the patient is either referred to an experienced surgeon or advanced diagnostic imaging, usually MRI is obtained to further determine the extent of injury.

Predictors of Return to Play

- Imaging alone does not have a strong correlation to return to play
- Physical Examination is more closely correlated with time to RTP
  - Injury height zone
- Concurrent injuries can lead to prolonged RTP
- Patients with higher grades of injury based on the number of syndesmotic ligaments involved and syndesmotic widening have shown to miss significantly more time

Injury Height Zone

- Height of injury zone = distance in centimeters from the distal tip of the fibula to the highest point of tenderness/pain along the interosseous membrane (anteromedial aspect of the fibula)



http://mrimusculoskeletalsection.blogspot.com/2016/09/high-ankle-sprains.html

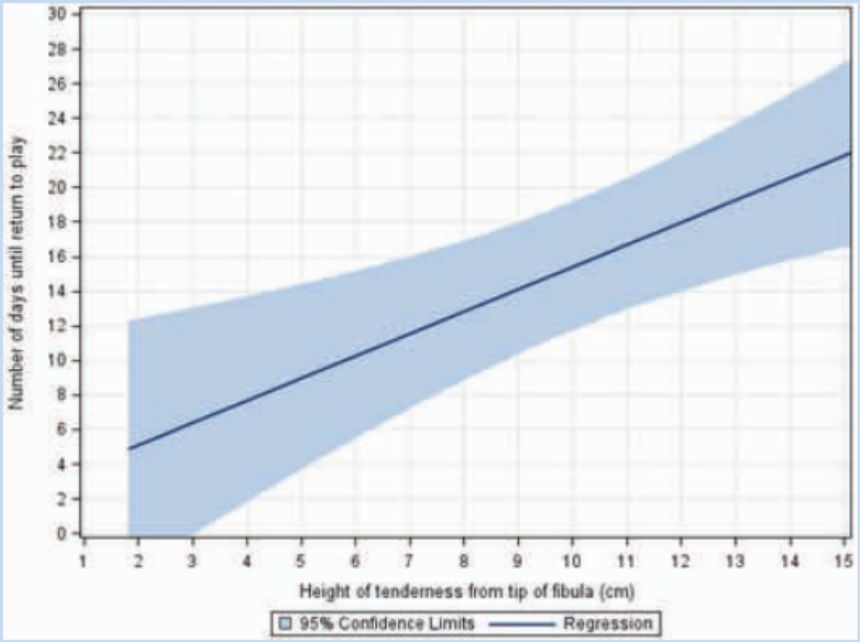


Figure 2. Time to return to play as a function of injury severity.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3497944/pdf/10.1177_1941738111434916.pdf

Examples

- Case 1) Forced external rotation injury, minor discomfort with locomotion, localized pain at AiTFL, small area of tenderness/pain, MRI shows AiTFL was disrupted + IOM tear = likely to return **sooner**

- Case 2) Forced dorsiflexion/ext. rotation injury, unable to fully bear weight, pain – front and back of ankle, large area of tenderness/pain, positive squeeze test + MRI shows AiTFL + bone bruise + IOM tear + PiTFL = likely to return **later**

Return to Play Time Frame

- Overall Time Frames in the absence of instability or frank diastasis
  - 2-6 weeks
    - Average = 30 days +/- 21 days
    - Average number of games missed = 3.3
    - Average number of practices missed = 16.7
  - A positive squeeze test is positively correlated with increased missed practices and missed games
    - Average = 22.3 missed practices, 4.2 missed games

Management: Treatment and Rehab

- Week 1 *(Acute Phase)*
  - Ealy immobilization
  - NSAIDs
  - Ice, Elevation
  - Hivamat, Shockwave, Laser
  - Intrinsic foot exercises
  - Hip and knee open-chain exercises
  - Isometric 4-way ankle MRE – sub-max effort
  - Double leg calf raises
  - Exercises listed here while using BFR
  - *Weight room limitations: Upper body only*

Immobilization Guidelines

- Immobilize 5-7 days
  - 24-72 hours in a cast – NWB
  - Transition to Cam Boot
- Progress to partial-weight bearing
  - Cam Walking Boot > Stirrup brace
- Once PWB is painless, progress to full weight bearing
  - Stirrup brace for several weeks

Management: Treatment and Rehab

- Week 2 *(Sub-Acute)*
  - Continue modalities
  - Transition from PWB to FWB
  - Aquatic exercises/walking
  - Continue BFR work: Isometrics, isokinetic exercises in limited ranges
  - Continue exercises to address knee and hip strengthening
  - Double leg calf raises to single leg calf raises as tolerated
  - Single leg balance
  - Single leg hop test *(continued weekly)*
  - *Weight room limitations: Affected ankle off limits*

Management: Treatment and Rehab

- Week 3 *(Sub-Acute)*
  - Soft tissue mobilization: Massage, Graston, light stretching, cupping
  - Continue double leg to single leg calf raise progression
  - Double leg closed-chain exercises
    - Squat and squat variations
    - In-line lunge
  - Increase isokinetic exercise resistance specific to the ankle
  - Pool walk to jog program
  - Single leg balance progression
  - *Weight room limitations: Continue affected ankle limitations*

Management: Treatment and Rehab

- Week 4 *(Sub-Acute)*
  - Ankle PNF patterns
  - Single leg calf raise progression-higher volume
  - Single leg closed-chain exercises
    - SL Squat
    - SL RDL
  - Initiate double leg jumping/plyometrics
  - Sport specific movements – Pass sets, chopping, backpedal, etc.
  - Aquatic bounding exercises
  - Alter G progression

Management: Treatment and Rehab

- Week 5 *(Advanced Training Phase)*
  - Dry Needling
  - Alter G Progression to Land Based Running
  - DL jumping/plyometrics to SL jumping/plyometrics
  - Foot work drills
  - Sport specific drills – Sled push, bag drills, backpedal w/ sport cord, etc.
- Week 6+ *(Advanced Training Phase)*
  - Single leg jumping w/ rotation
  - Change of Direction
  - Sport specific drills with an opposing individual
  - Integrate into practice

Surgical Considerations

- Presence of fracture
- Consider when ankle is clearly unstable
- Surgical: Fixed return to play time frame vs the conservative route
  - More clarity
    - Rehab progression based off established timeline
    - Coach knows the player had surgery

Recommendations

- Use all your findings to develop your plan:
  - In depth clinical assessment – emphasis on injury height zone / squeeze test outcome
  - Imaging: XR to rule out FX – MRI to identify injured structures
  - Ortho physician involvement for anything more than a Grade 1
- Management
  - Early immobilization
  - Slow rehab ramp up
  - Educate the patient/athlete
- Weekly external rotation test + single leg hop testing
  - 10 single leg hops with minimal to no discomfort = ready for sport specific training

Websites

- Anatomy
  - https://www.raynersmale.com/blog/2017/7/23/anatomy-101-ankle-syndesmosis-distal-tibiofibular-joint
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