Ankle Injuries

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Outline

- Ankle/Foot Anatomy
- Ankle Sprains
- Ottawa Ankle Rules
- DDx: “The Sprain That Wasn’t”
Anatomy: Ankle Mortise
Bony Anatomy
Lateral Ligament Complex
Medial Ligament Complex
Ankle Sprains

- Most common sports related ligament injury
- 90% lateral ligament complex
- Inversion mechanism
- High rate of recurrence
  - Inadequate rehabilitation
Lateral Ankle Sprain

- ATFL
- CFL
- PTFL
History

- Mechanism of injury
- Pop?
- Previous injury
- Ambulate immediately after
- Precise location of pain
Exam

- Inspection
- ROM
- Strength
- Special Tests
- Palpation
Inspection
ROM

- Plantar/dorsiflexion
- Inversion/eversion
- Heel cord flexibility
Special Tests

- Anterior drawer test and Suction sign
  - Integrity of ATFL
- Talar tilt test
  - Integrity of CFL
- Squeeze test and External rotation test
  - Syndesmotic injury (tib-fib ligaments)
Anterior Drawer

FIGURE 2. Tests for ankle instability include the anterior drawer (A), suction sign (B), and inversion stress (C) tests. During the anterior drawer test (A), the examiner stabilizes the anterior tibia just above the ankle with one hand while grasping the posterior heel with the other hand and attempting to translate the talus anteriorly within the ankle mortise by applying anterior force. The test should be performed on a relaxed leg with the knee bent and the ankle held in slight plantar flexion.

To elicit the suction sign (B), the examiner looks for a dimple in the anterolateral ankle during the anterior drawer test as the talus reaches full anterior excursion. The dimple results from negative pressure within the ankle joint that is produced when anterior talar translation elongates the joint space.

To perform the inversion stress test (C), the examiner grasps the heel and inverts the ankle. This test should be performed with the ankle in dorsiflexion to test the calcaneofibular ligament and in plantar flexion to test the anterior talofibular ligament. A clunk may be heard or palpated in an unstable ankle as the medial talar dome contacts the distal tibial articular surface, suggesting injury to one or both ligaments.
Squeeze/External Rotation Test

**FIGURE 3.** Two provocative tests for syndesmotic injury are the squeeze test (A) and the external rotation stress test (B).

To perform the squeeze test (A), the examiner compresses the tibia and fibula above the ankle. Pain at the distal syndesmosis (indicated by finger) confirms distal syndesmotic ligamentous injury.

To perform the external stress test (B), the examiner grasps the medial border of the foot with one hand and supports the lateral fibula and tibia with the other hand. Upon external rotation of the foot, pain at the distal syndesmosis confirms distal syndesmotic ligamentous injury. Anteroposterior and lateral stress radiographs may be taken to reveal diastasis of the distal tibiofibular joint.
Palpation

BE SPECIFIC!
Grading Severity

- Grade 1 - stretch injury
- Grade 2 - partial tear
- Grade 3 - complete tear
Tear: ATFL

Normal

Torn
Ottawa Ankle Rules

- 100% sensitivity for detecting malleolar or midfoot fractures
- Reduced use of radiography by 30%

JAMA 1993;269(9):1127-32
JAMA 1994;271(11):827-32
Ottawa Ankle Rules

Exclusion criteria:

- <18 yo
- Pregnant
- Intoxicated
- Neurologic deficit
- Elderly/osteopenic
Ottawa Ankle Rules

- Inability to walk (bear weight) 4 steps at time of injury or at time of evaluation → xrays
  or
- Tenderness posterior aspect of medial or lateral malleolus (6cm) → ankle xrays
  or
- Tenderness 5th metatarsal, navicular, (cuboid) → foot xrays
Ottawa Ankle Rules

- **Posterior edge or tip of lateral malleolus (6-cm length)** (marked as A)
- **Midfoot zone**
- **Base of fifth metatarsal** (marked as C)
- **Posterior edge or tip of medial malleolus (6-cm length)** (marked as B)
- **Navicular bone** (marked as D)
Treatment: Acute

- RICE 24-72 hours
- NSAIDs 3-7 days
- Protect from further injury
- Functional weight bearing
- Early ROM
Treatment: Subacute

- Restore full ROM, strength, heel cord flexibility, and proprioception
- Return to play - sports specific drills
- Protect!

ASO – ankle stabilizing orthosis
Ankle Rehabilitation
Return to Play

- Grade 1: 1-2 wks
- Grade 2: 2-4 wks
- Grade 3: 4-8 wks
- “High ankle sprain”: 6-12 wks
Complicated Ankle Sprains

- Unable to bear weight
- Tenderness both medial and lateral
- Proximal fibular tenderness
- + Squeeze or external rotation test
- High ankle sprains
“...and the sprain that wasn’t”

- Misdiagnosed
- Co-existing injury
- Persistent pain
**DDx: Acute Ankle Injury**

- **Fracture**
  - Lateral malleolus
  - Medial malleolus
  - 5th metatarsal
  - Lateral process of the talus
  - Anterior process of the calcaneous
  - Posterior process of talus
  - Avulsion fracture of navicular, talus, or cuboid

- **Peroneal tendon injury**
  - Strain/tear
  - Dislocation/subluxation

- **“High ankle sprain”**
  - Anterior Inferior Tibio-fibular Ligament
  - Syndesmosis

- **Impingement**
Distal Fibular Fractures

- Check for medial tenderness and injury to deltoid ligament
- R/o syndesmotic injury
Weber Classification

- **Weber A**
  - Below level of syndesmosis (distal fibula)

- **Weber B**
  - At level of syndesmosis (joint line)

- **Weber C**
  - Proximal fibular fractures + deltoid ligament tear
  - or medial malleolus fractures
  - Unstable
Weber Classification

Figure 2. A 45-year-old woman was running and slipped on gravel. Anteroposterior radiograph reveals a nondisplaced lateral malleolus fracture (arrow), classified as a Lauge-Hansen supination-lateral rotation type, or as a Danis-Weber type B. She had tenderness over the fracture site but none over the deltoid ligament medially and therefore was treated with a short-leg cast for 6 weeks. Her fracture healed without displacement.
Avulsion Fx 5th Metatarsal

- Inversion mechanism
- C/o “ankle sprain”
- Tenderness base of 5th MT
- Avulsion fx from pull of peroneus brevis tendon and lateral band of long plantar ligament
Treatment: Avulsion Fx 5th MT

- Weight bearing as tolerated
- Low-top walker boot or post-op shoe for comfort → stiff soled shoe
- 4-6 wks
Jones Fracture 5th Metatarsal

- Acute fracture at metaphyseal-diaphyseal junction
- Weightbearing difficult
- Tendency for poor healing and nonunion

Figure 3: An oblique radiograph of the left foot of a 30-year-old male recreational basketball player reveals an acute Jones fracture (arrow).
Treatment: Jones Fracture

- 8 weeks non-weightbearing cast + 4 wks walking boot

- Or ...

Figure 5. An oblique radiograph of the left foot of a 20-year-old male soccer player was obtained after percutaneous internal fixation of a diaphyseal stress fracture (arrow) using a cannulated screw. Although radiographs may take several months to show healing, patients generally return to sports about 8 weeks after this procedure.
Fx Lateral Process of Talus

- Inversion and dorsiflexion
- Snowboarding

Figure 1: Lateral perspective of the hindfoot shows in situ anatomy of the lateral process of the talus, with its two articular surfaces: the trochlea, which articulates with the proximal fibula, and the talocalcaneal joint.

Figure 2: Three types of fracture of the lateral process of the talus: Type 1, chip; Type 2, simple, and Type 3, comminuted. Type 2 fractures can be displaced, as shown, or nondisplaced.
FX Lateral Process of Talus

Figure 3: Courtesy of Peter C. Jones, MD

Figure 3. Two snowboarders were injured, each one when he fell forward with his ankle in acute dorsiflexion. Each immediately felt pain. CT of one patient's ankles (a) and lateral tomography of the other's injured ankle (b) revealed fractures of the lateral process of the talus. Each patient was treated with immediate open reduction and internal fixation and had a good recovery, with some residual pain on 6-month follow-up.
Fx Anterior Process of Calcaneus

Tender 1cm inferior and 3-4cm anterior to lateral malleolus
Peroneal Tendon Tear

- Tenderness along course of tendons
- Pain with active or resisted eversion
Longitudinal Tear
Peroneal Tendon
Peroneal Tendon Dislocation/Subluxation

- Forced dorsiflexion
- Avulsion of retinaculum
- Tender over posterior lateral malleolus
- Tendon subluxes with resisted eversion
Shepherd’s Fracture: Posterior Process of Talus

- Trigonal process (os trigonum)
- Posterior tenderness
- Pain with plantarflexion
Anterior Impingement

- H/o prior ankle injury and/or overuse
- Anterior ankle pain with loaded dorsiflexion
Talo-Navicular Avulsion Fx

- Hyperplantar flexion injury (falling forward on dorsum of foot)
DDx: Persistent Pain s/p Ankle Sprain

- Incomplete rehab
- Osteochondral lesion
  - Talar dome
- Chronic lateral instability
- Post-traumatic synovitis
- Sinus tarsi syndrome
- Post-traumatic arthritis
Osteochondral Lesion

- Stage I - Compression subchondral bone
- Stage II - Partial osteochondral fragment
- Stage III - Completely detached fragment without displacement
- Stage IV - Completely detached fragment with displacement
Osteochondral Lesion
Chronic Lateral Instability/Synovitis

- Persistent ankle pain
- Feels loose on exam (+anterior drawer)
- +/- effusion
- Tx: rehab, strengthening, proprioception, bracing, consider injection
Sinus Tarsi Syndrome

![Diagram of the ankle and foot showing the tibiotalar joint and surrounding structures.]

**Figure 2:** Palpation can detect characteristic points of tenderness in sinus tarsi syndrome. Physicians may use a simple technique to detect tenderness. With an eraser-tipped pencil, one palpates the anterior to the lateral (tibial) and the sinus tarsi (posterior) one at a time. Individual patients avoid the exacerbating pain from compressing both structures simultaneously.