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





History

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



Inspection
ROM
Strength
Special Tests
Palpation



Inspection







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: Courtesy of Todd Hockenbury, MD





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 produces 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 syndesmoth injutest (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

ABE SPECIFIC!



Grading Severity

Grade 1 - stretch injury
Grade 2 - partial tear
Grade 3 - complete tear



Tear: ATFL

Normal







 100% sensitivity for detecting malleolar or midfoot fractures

Reduced use of radiography by 30%

Ann Emerg Med 1992;21(4):384-90 JAMA 1993;269(9):1127-32 JAMA 1994;271(11):827-32

- Exclusion criteria:
 - <18 yo
 - Pregnant
 - Intoxicated
 - Neurologic deficit
 - Elderly/osteopenic

or

 Tenderness posterior aspect of medial or lateral malleolus (6cm) => ankle xrays

or

Tenderness 5th metatarsal, navicular, (cuboid)
 foot xrays



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



Figure 4. A 20-year-old male college student sustained a Maisonneuve fracture of the ankle while playing intramural basketball. An anteroposterior (AP) radiograph (a) demonstrates an avulsion fracture of the tip of the malleolus (arrow) with widening between the distal tibia and fibula (arrowhead). Note that no fracture of the fibula is evident. An AP radiograph of the midshaft of his tibia and fibula (b), however, reveals a midfibular fracture (arrow). The fracture was secured with screws transfixing the tibia and fibula to allow for proper ligament healing.

"...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: Courtesy of David B. Thordarson, MD



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 tendemess 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



Figure 1: Courtesy of

Figure 1. This oblique radiograph shows a metaphyseal avulsion fracture of the proximal fifth metatarsal (dancer's fracture) in the right foot of a 20-yearold female runner (arrow). Conservative treatment is generally recommended for fractures in this area.

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: Courtesy of Matthew S. Shapiro, MD



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: Courtesy of Matthew S. Shapiro, MD



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



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.

Inversion and dorsiflexion

Snowboarding

Figure 2: Mary Albury-Noyes



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. Janes, 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



FIGURE 3. From a neutral position (A), a subluxated peroneal tendon may be displaced over the lateral malleolus or snap anteriorly when the examiner applies eversion against resistance (B). Tenderness is generally found posterior to the lateral malleolus.

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





FIGURE2. 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 talofibular ligament (eraser location) and the sinus tarsi (dot), one at a time. Individual palpation avoids the excruciating pain from compressing the two structures simultaneously.