Ankle Anatomy and Exam
Goals and Objectives

- Better understand the prevalence of ankle injuries in athletics and its long term sequelae.
- Review the functional anatomy of the ankle.
- Review the clinical ankle exam and how to classify ankle sprains.
- Briefly discuss treatment of an acute ankle sprain.
Ankle Injury: What’s the problem?

- **Lateral ligament sprains**
  - the most frequent injury sustained by athletes
  - constitute 5-24% of all injuries sustained in an individual sport
  - produce 25% of all time loss due to an injury in football, b-ball, and CC

- **Lateral ligaments sprains**
  - account for 85% of grade-III ankle sprains
  - greater than 40% can potentially progress to chronic problems
Long term Sequelae of Sprains

- **Functional instability** and loss of normal ankle kinematics as a complication of ankle sprains may lead to chronic recurrent injury and early degenerative changes.

- Talar displacement of greater than 1mm reduces the ankle’s weight-bearing surface by 42%
Ankle Anatomy 101

- Review the following structures of the ankle joint
  - Osseous structures (bones)
  - Ligamentous structures
  - Tendons/muscles around the ankle
Bony Anatomy of Ankle

- Tibia and fibula bound together by the ant. & post. Tibiofibular ligaments and the interosseus membrane which runs between the long bones
- Collectively called the Syndesmotic ligament
The **Talus** is a wedged shaped bone
- Wider anteriorly than posteriorly
- Fits into the mortise formed by the bound tibia and fibula
- Allows plantar flexion and dorsi-flexion
Ligament Injuries

- **Lateral ankle sprains (85%)**
  - Plantar flexion and inversion

- **Syndesmotic sprains (10%)**
  - Dorsi-flexion and/or eversion

- **Medial ankle sprains (5%)**
  - Eversion
Lateral Ankle Ligaments

- Lateral complex
  - Ant. talofibular
  - calcaneofibular
  - Post. talofibular

- Syndesmosis
  - Ant. Inf. tibiofibular
  - Post.Inf. tibiofibular
Syndesmotic Structures

- Syndesmosis:
  - Ant. Inf. Tibiofibular ligament
  - Post. Inf. Tibiofibular ligament
  - Transverse tibiofibular ligament
  - Interosseous membrane
Medial Ankle Structures

- Major Ligament complex is called the **Deltoid Ligament**.
- It is the strongest of the ankle ligaments
- Navicular bone
  - post. Tibial tendon attaches
Major Functions of Ligaments

- Provide proprioceptive information for joint function
- Provide static stability to the joint and prevent excessive motion
- Act as guides to direct motion
Tendons of the Lateral Ankle

- **Peroneus brevis**
- **Peroneus longus**
  - Both serve as the major everters of the ankle
  - Also serve as plantar flexors
Ankle Tendons (medial side)

- **Major tendons**
  - **Anterior tibialis** (dorsi-flexor)
  - **Achilles tendon** (plantar flexor)
  - **Medial tendons**
    - **Posterior tibialis** (inverter and plantar flexor)
    - Flexor digitorum longus
    - Flexor hallucis longus
Anatomy Summary

• Osseous Structures (bare bones)
  – Tibia, fibula, talus

• Ligaments (static stabilizers)
  – Lateral, medial, syndesmotic

• Muscles/Tendons (dynamic stabilizers)
  – Plantar & Dorsi-flexors
  – Everters (peroneals)
  – Inverters (post & ant tibialis)
Clinical Exam of the Ankle

- History is always good!
  - What happened?
  - Which way did it bend?
  - Could you walk?
  - How much swelling/ecchymosis?
  - When did it happen?
  - What have you done for it?
  - Have you sprained it before?
Clinical Exam of Ankle

- Inspection & Palpation:
  - Most helpful during the acute phase
  - Remember your anatomy!
  - Palpate the structures you know
    - Boney prominences
    - Ligaments
    - Tendon insertions
Clinical Exam of the Ankle

- Check Range of Motion
  - Plantar and Dorsi-flexion
  - Inversion and Eversion
- Neurovascular status
- Strength?
  - Not helpful in the acute setting
- Ligamentous testing
  - May be very difficult to do in the acute setting
The Anterior Drawer

- Tests the integrity of the anterior talofibular ligament
Inversion Stress Test

- Tests the integrity of the calcaneo-fibular ligament
Evaluating for Syndesmotic injury

- 2 Tests for injury to the syndesmosis
  - The Squeeze test
  - External rotation test
Don’t forget the Achilles Tendon

- The Thompson Test
  - Tests the integrity of the Achilles tendon
  - Test patient prone with feet hanging off table
    • squeezing the gastrocnemius muscle should cause plantar flexion of the foot.....
    • If the Achilles tendon is intact!
  - It is poor form to miss this diagnosis
To X-ray or not to X-ray?

Let’s talk Ottawa Ankle Rules

- X-rays are indicated to rule out fx if:
  - Presents within 10 days of injury
  - Unable to bear weight at time of injury or in office
  - Tenderness of distal 6cm of malleoli on the post. Aspect.
  - Tenderness over the base of the 5th met or navicular bone
Classification of Ankle Sprains

- Several Classifications Exist based on:
  - Ligamentous injury and evidence of instability
  - Classification based on functional impairment
  - Number of ligaments involved
- Combination of the above
Grade I sprain (usually not seen in the office)

- **Ligament status**
  - partial tear of the ligament
  - mild tenderness and swelling
  - no instability on exam when stressing ligament

- **Functional status**
  - Slight or no functional loss
  - able to bear weight and ambulate with minimal pain
Grade II Ankle Sprain (what we will see a lot!)

- **Ligament Status**
  - Incomplete tear of the ligament
  - Moderate pain swelling and tenderness
  - Mild to mod. ecchymosis
  - Mild to moderate instability of the ligament

- **Functional status**
  - Some loss of motion and function
  - Patient has pain with weight-bearing and ambulation
Grade III Ankle Sprain

- Ligament Status
  - Complete tear and loss of integrity of a ligament.
  - Severe swelling (more than 4cm around the fibula)
  - Severe ecchymosis
  - Significant mechanical instability with ligament stressing

- Functional Status
  - Significant loss of function and motion
  - Patient is unable to bear weight or ambulate.
Prognosis inversely related to Grade

- **Grade I**
  - Require an avg. 11.7 days before full resumption of athletic activity

- **Grade II**
  - Require approximately 2-6 weeks

- **Grade III**
  - Avg duration of disability ranges 4.5-26 wks
  - Only 25-60% being symptom free 1-4 yrs after injury
Acute Treatment of Ankle Sprains

- **PRICEM**
- Protection: (orthosis or brace)
- Rest: limit wt. Bearing until non-painful
- Ice, Compression, and Elevation
  - Most important component acutely
  - Limiting inflammation and swelling has been shown to speed recovery
- Mobilize
  - early range of motion has also been shown to speed recovery
Ankle Braces
What does the Evidence show?

- What is the best treatment of Grade III sprains?
  - Meta-analysis of RCT’s from 1966-1998
    - outcomes
      - time lost, residual pain, and giving way
  - Recommendations for practice
    - Manage with aggressive functional tx or surgery followed by functional treatment
Additional Evidence

- What’s the best intervention to prevent ankle injuries?
- Cochrane Review 1997
  - 5 RCT/quasi-RCT
  - Concluded:
    - Found good evidence of a beneficial effect of semi-rigid orthosis or air-cast braces to prevent ankle sprains during high risk sports
    - Individuals with previous injuries showed greatest benefit.
Are Ankle Sprains Preventable

- *Meta-analysis by CDC of 113 studies*
- **Bottom line:**
  - The main risk factor for an ankle sprain is a previous injury.
  - Rehabilitating ankle sprains appears to prevent subsequent sprains.
Summary of Ankle Injuries

- Reviewed anatomy and clinical exam
- Ankle injuries are extremely common with high potential for long term sequelae.
- A thorough exam and early aggressive treatment including a rehabilitation program will lead to optimal results.