Ankle Sprain Essential Learning

- **Essential Learning Points: Ankle Sprains**
  - Have the patient describe the mechanism of injury as accurately as possible
  - Lateral ankle sprains account for 90% of cases (isolated anterior talofibular ligament in 75% of all ankle sprains)
  - Distal and proximal extremity exam is essential to identify associated injuries
  - Use the Ottawa Ankle Rule to help determine the need for plain films
  - Closely review the plain films (AP, lateral, mortise views) for subtle fractures and misalignment
  - Lace up ankle brace or a semi-rigid brace over a simple compression wrap is sufficient for most ankle sprains; crutches may be used as needed (emphasize early mobilization)
  - Promote early range of motion, weight bearing and physical rehabilitation to help the patient return to normal activities as soon as possible
  - Establish reasonable expectations for the recovery timeline; emphasize that it can take several weeks to return to full function and a small portion of patients may have persistent pain or instability symptoms for years
  - Pain management should consist of topical nonsteroidal anti-inflammatory drugs (NSAIDs) with or without menthol gel, oral NSAIDs +/- acetaminophen; for high grade injuries a short course of opioids may be considered

- **Deep Learning: Indications for Transfer to a Higher Level of Care**
  - Markedly abnormal vital signs
  - Multisystem trauma
  - Concern for open fracture or open joint
  - Concern for neurovascular compromise (paresthesia to area of swelling is common)
  - Unstable fracture or dislocation
  - Soft tissue injuries that are likely to require surgical repair (Achilles or other tendon rupture, multi-ligamentous ankle injury)

- **Deep Learning: Disease Characteristics of Ankle Sprains**
  - Lateral ankle sprain is the most common sprain sustained during sports, ranging from 70 to 90 percent of all sprains, depending on the demographic.
  - The anterior talofibular ligament is the only ligament injured in 73 percent of ankle sprains.
  - Ask about prior ankle sprains; this can increase the likelihood of a subsequent ankle sprain by 5 times.
  - The importance of determining mechanism:
    - The most common mechanism of ankle injury is inversion of the plantar flexed foot leading to injury of the lateral ligaments

        - The complex of lateral ankle ligaments consists of the anterior talofibular, calcaneofibular, and posterior talofibular ligaments
        - As more ligaments are injured, there is increased instability of the ankle joint.
        - Forced eversion of the ankle can cause isolated damage to the deltoid complex, but more typically results in an avulsion fracture of the medial malleolus, due to the strength of the deltoid ligament.
        - Deltoid ligament injuries are often a part of a multi-ligamentous injury; always consider a syndesmosis-deltoid injury.
        - Consider a high sprain with a mechanism of dorsiflexion and external rotation of the foot relative to the tibia or eversion of the ankle; more proximal syndesmotic structures include the anterior tibiofibular, posterior tibiofibular, transverse tibiofibular ligaments and the interosseous membrane.
    - Grading severity of an ankle sprain is based on clinical features and functional loss:
        - **Grade I:** mild stretch with microscopic tears, minimal swelling and minimal pain with weightbearing
        - **Grade II:** incomplete tear with mild/moderate instatibility, moderate swelling and moderate pain with weightbearing
        - **Grade III:** complete tear with significant instability, severe swelling and inability to bear weight

- **Deep Learning: What are the helpful physical exam maneuvers to help make the diagnosis?**
    - The physical exam is most accurate if performed soon after the injury, before joint effusion and localized swelling has accumulated, or at 4-5 days post injury
    - Ankle exam should always include:
        - Visual inspection for swelling, deformity, open wounds
        - Distal perfusion (DP, PD, digital cap refill)
        - Distal sensation (medial and lateral malleolus, 1st dorsal web space, lateral 5th toe)
        - Range of motion (may be limited by pain, effusion)
        - Strength (dorsiflexion, plantar flexion, inversion and eversion)
        - Focal tenderness (proximal tib/fib, posterior medial and lateral malleolus, base of 5th metatarsal, navicular)
        - Ankle stability (evaluate for anterior talofibular ligament and calcaneofibular ligament injuries)
            - Anterior drawer test
                - Excessive anterior displacement of talus relative to tibia
                - Sensitivity 98%, specificity 84% for ATFL injury
            - Talar tilt test
                - Excessive ankle inversion (>15°) compared to uninjured side
        - Syndesmotic stability
            - Hopkin's squeeze test
                - Compression of the tibia and fibula at midcalf level causes pain at the syndesmosis
        - Achilles tendon injury
            - Thompson test

        - Asymmetric or complete lack of plantarflexion of the foot with squeeze of the calf (patient lies prone with foot hanging off the bed)

- **Deep Learning: The Ottawa Ankle Rule**
    - Well validated gold standard clinical decision tool used to identify patients with ankle injuries who require plain films
    - Can reliably be applied to any patient ≥2 years old with traumatic ankle or midfoot pain/tenderness
    - A 2017 systematic review and meta-analysis report a pooled sensitivity of 99.4% and specificity of 35.3% making it an excellent test to rule out an ankle fracture and avoid unnecessary plain films.
    - How to use the Ottawa Ankle Rules (see MDCalc for more details)
        - Is there point tenderness along the distal posterior aspect of the medial or lateral malleolus? [needs XR ankle]
        - Is there point tenderness at the base of the 5th metatarsal or navicular bone? [needs XR foot]
        - Is there an inability to bear weight (4 steps, limping ok) BOTH immediately after the injury and at the time of evaluation?
        - If the answer to NO to all, no XR is needed
        - If any of the above are YES, get an XR of the ankle +/- foot +/- tib/fib depending on concern for fracture pattern
        - Use clinical judgment for patients with an unreliable examination.

- **Deep Learning: Basics of an ankle plain films** (refer to normal XR ankle from this case)
    - For an in-depth overview, see this stellar ALiEM post: https://www.aliem.com/emrad-ankle/ and this great Radiopaedia article: https://radiopaedia.org/articles/ankle-radiograph-an-approach?lang=us
    - The tibia-fibula-talus is a ringed structure, if one disruption exists there is likely a second (or more)
    - An x-ray of the ankle should have three views: AP, lateral, and mortise (15° internal oblique); check all views for signs of fracture or disrupted alignment
    - In the AP view:
        - The distal fibula should be slightly superimposed on the tibia
        - The lateral and medial malleoli should be in profile
        - The tibiotalar space should be open (although the full mortise isn't visible)
        - Measure the tibiofibular clear space:
            - Distance between the medial border of the fibula and the groove of the distal tibial prominence 1cm above tibial plafond
            - >6 mm (some sources 5.3 mm) is considered abnormal and can suggest a syndesmotic injury
    - In the lateral view
        - The following bones can be assessed: tibia, fibula, talus, cuboid, navicular, calcaneus, and fifth metatarsal
        - The distal fibula should be superimposed by the posterior part of the distal tibia
        - The talar domes should be superimposed

        - The joint space between the tibia and the talus should be uniform
        - Measure Bohler's angle:
            - Draw two tangent lines across the anterior and posterior borders of the calcaneus
            - Normal angle is 20-40°; < 20° suggests a calcaneal fracture
    - In the mortise view:
        - This aims to assess the articulation of the ankle joint
        - The lateral and medial malleoli should be in profile
        - The mortise should be uniformly visible
        - The base of the fifth metatarsal should be included in the view
        - Measure the medial clear space:
            - Measure the widest distance between the medial border of the talus and the lateral border of medial malleolus
            - Medial clear space > 4 mm can suggest a syndesmotic injury or deltoid ligament injury

- **Deep Learning: Supportive Care and Expectation Setting**
    - Pain Management (2020 ACP/AAFP Guidelines)
        - Protection, rest, ice, compression, and elevation (PRICE) for the first 1-2 days
        - Topical nonsteroidal anti-inflammatory drugs (NSAIDs) with or without menthol gel are first-line therapy to reduce or relieve symptoms, including pain; improve physical function; and improve the patient's treatment satisfaction (Grade: strong recommendation; moderate-certainty evidence)
        - Oral NSAIDs to reduce or relieve symptoms, including pain, and to improve physical function, or with oral acetaminophen to reduce pain (Grade: conditional recommendation; moderate-certainty evidence)
        - A short course of opioids for severe pain could be considered (Grade: conditional; low certainty evidence)
    - Ankle Support
        - For moderate to severe ankle sprains, an air stirrup brace combined with an elastic compression wrap, or a lace-up support alone, is more effective than an elastic compression wrap for reducing swelling and time to return to activities in patients with ankle sprain.
        - A lace-up support is superior to an air stirrup brace for reduction of acute swelling.
        - For severe/high grade ankle sprains in which the patient is unable to ambulate, a below the knee cast or splint for 10 days may provide slightly better pain control and return to activity
    - Benefits of Physical Therapy
        - Functional treatment and early weight bearing, compared with immobilization, leads to significant improvements in swelling, return to work, return to sports and satisfaction.
        - Functional treatment usually consists of three phases:
            - (1) the PRICE protocol is initiated within 24 hours of injury to minimize pain and swelling

            - (2) exercises to restore motion and strength usually begin within 48 to 72 hours
            - (3) endurance training, sport-specific drills, and training to improve balance
    - Counseling on recovery and prognosis
        - Most people with Grade I and II injuries can return to school or non-strenuous work within a few days; most people are able to return to full work and activities by three to four weeks.
        - For more severe injuries involving total disruption of ligaments (Grade III) and people who engage in strenuous work and sport, return to full activity may not be possible for six to eight weeks.
            - Reasonable work restrictions are working primarily while seated, avoiding any heavy lifting, and limiting standing or walking on uneven surfaces.
        - Before returning to sport, the athlete recovering from a sprain should have sufficient ankle stability and function to compete safely and avoid reinjury. Recovery should be at least 80% prior to fully participating in sports. Evaluation by a sports medicine specialist may be necessary.
        - For sport and other physically demanding activities that place stress on the ankle, ankle braces should be used (4 weeks for in-line sport and activity, 12 or more weeks for field sports and other activities that involve lateral motion or uneven terrain)
        - Longer term outcomes
            - Up to one third of patients with an ankle sprain continue to have some pain after one year.
            - 50-85% of patients report full recovery over the first three years.
            - Prior ankle sprain is associated with reinjury of either the ipsilateral or contralateral ankle
            - Up to 70 percent of ankle osteoarthritis is associated with prior sprain
            - Not using prophylactic bracing, not participating in an exercise-balance program, poor functional performance after a lateral ankle sprain, participating in sports, and higher BMI are risk factors for chronic ankle instability

- **Deep Learning: Can't Miss Orthopedic Injuries in Patients with Ankle Pain**
    - Maisonneuve fracture
        - A complex, unstable distal tibiofibular syndesmosis injury with a proximal spiral fibula fracture [requires ortho consult]
        - There is often an associated medial malleolus fracture or deltoid ligament rupture (may be identified on "stress" view)
        - Always assess for proximal fibular tenderness and consider tibia/fibula XR if you have reasonable concern for a medial ankle injury
    - Lisfranc injury
        - A disruption of the tarsal-metatarsal (TMT) joint with or without associated fracture that leads to midfoot instability [requires ortho consult]

        - The Lisfranc ligament is a major stabilizer of the TMT joint originating at the first cuneiform and inserting into the medial aspect of the base of the second metatarsal.
        - Injury is associated with axial loading of the midfoot, a crush injury or forced rotation.
        - Exam may show plantar midfoot ecchymosis and TMT joint pain with palpation, movement, or weight-bearing
        - XR foot AP view may show abnormal widening of the space between the first and second metatarsals and between the first and second cuneiform bones
            - Check for "fleck sign", a bony fragment between the first and second metatarsals
            - Weight-bearing XR or CT may be required
    - Calcaneal fracture
        - Associated with fall from height and axial load injuries
        - Suggested by Bohler's angle <20° (see above)
        - Calcaneal fractures should prompt careful spine evaluation for associated fractures (due to axial load)
    - Achilles tendon injury
        - Evaluate with Thompson test (see above)

- **Learning Objectives**
    - List a differential for emergent, urgent and benign causes of this presentation
    - Discuss which history and exam findings are most helpful to establish a diagnosis
    - Discuss which imaging tests may be needed
    - Review relevant clinical decision making tools
    - Discuss treatment options focused on symptom relief
    - Discuss best practices to promote recovery after the injury
    - Determine which patients require transfer to a higher level of care
    - Anticipate and practice structured responses for common patient questions

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- **Traditional Textbook Resources**

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- **Supplemental Resources for Learners**
  - FOAMed
    - https://www.ortho-teaching.feinberg.northwestern.edu/cases/index.html
    - https://www.aliem.com/emrad-ankle/
    - https://dontforgetthebubbles.com/ankle-x-ray-interpretation/
    - https://emergencymedicinecases.com/commonly-missed-ankle-injuries/
    - https://www.nuemblog.com/blog/high-ankle-sprain
    - https://coreem.net/podcast/episode-172-0-ankle-sprains/
    - http://www.emdocs.net/em3am-ankle-sprains/

Figure 1- XR Ankle Series (AP/Lateral/Mortise)

Return to learning points