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The EM Educator Series

Mini-Case: Adult Orthopedic Misses

Author: Alex Koyfman, MD (@EMHighAK) // Edited by: Brit Long, MD (@long_brit) and Manpreet Singh, MD (@MprizzleER)

Mini-Cases:
#1: A 26-year-old female was running in a field and stepped into a hole. Since then, she has experienced severe midfoot pain, and you see bruising across the sole of her foot.

#2: A 62-year-old male presents after MVC with significant knee pain. His knee displays significant laxity in the ACL, PCL, and MCL. He has poor pulses distally in the affected leg compared with the other.

Questions for Learners:

What should you consider with the following? What is the typical presentation? What is the evaluation and management?

1) Foot – Lisfranc / calcaneus / Jones

2) Ankle – syndesmosis / Tillaux / Maisonneuve / talus / Achilles

3) Knee – dislocation / quadriceps tendon / patella tendon / tibial plateau / septic arthritis / open joint

4) Hip / pelvis – occult hip fx / pelvic apophyseal / occult pelvic fx(s)

5) Shoulder/clavicle – posterior shoulder dislocation / sternoclavicular dislocation / SC joint septic arthritis

6) Biceps tendon rupture

7) Elbow – radial head

8) Wrist/Hand – scapholunate / DRUJ / scaphoid / triquetrum / hamate / fight bite / tendon lacerations

9) Compartment syndrome

Suggested Resources:

- ✓ Articles:
  - emDOCs – Foot Injuries in the ED
  - emDOCs – Knee Dislocation: Pearls and Pitfalls
  - emDOCs – Septic joint: Reminders, Updates, and Pitfalls
  - emDOCs – Snap, Crackle, POP! Open joint: ED evaluation and management

- emDOCs – Wrist and Distal Forearm Injuries: Pearls & Pitfalls
- LITFL – Posterior Shoulder Dislocation
- LITFL – Sternoclavicular Joint Dislocation
- LITFL – Compartment Syndrome

✓ Podcasts:

- EM Cases – Commonly Missed Ankle Injuries
- EM Cases – Occult Knee Injuries Pearls and Pitfalls
- EM Cases – Hand Emergencies
- EM Cases – Commonly Missed Uncommon Orthopedic Injuries
- EM Cases – Commonly Missed Uncommon Orthopedic Injuries Part 2
- EM Cases – Occult Fractures and Dislocations
- Core EM – The Lisfranc Injury
- Core EM – Radial Head Fracture

Answers for Learners:

What should you consider with the following? What is the typical presentation? What is the evaluation and management?

1) **Foot – Lisfranc / calcaneus / Jones**

Lisfranc:

- A Lisfranc injury is a midfoot injury that results in displacement of one or more of the metatarsal bones from tarsus.
- XR will show widening of the space between the 1st and 2nd metatarsals. Getting contralateral XR may help you identify this. Non-displaced injury (<1 mm between the bases of the first and second metatarsals) is with a non–weight-bearing splint, rest, ice, and elevation.
- Even if you don't see that widening on the XR, the patient could still have a Lisfranc injury. If they cannot walk due to pain, get a weight bearing XR or CT scan to look further.
- Once the injury is identified, the patient must be strict non-weightbearing. Place them in a posterior splint and get orthopedics involved either in the ED or for prompt follow up as the patient will probably need surgery.
- Orthopedic re-evaluation at 2 weeks and gradual progressive weight bearing can be attempted after 6 weeks.
- Beware of compartment syndrome in significant Lisfranc injuries!

Calcaneus:

- Frequently mistaken for ankle sprain because of "negative" x-ray.
- At a teaching hospital ED, the "miss rate" was 3rd greatest for calcaneal fractures at 10%.
- Look for heel tenderness and subtle x-ray findings.
- Bohler's Angle:
    - Normal between 25 and 40 degrees.
    - If angle is <25 degrees, suspect a fracture.
    - Comparison view is helpful if the diagnosis is in question.
- Orthopedics should be consulted in the ED for intra-articular and displaced
- Beware of spine injuries and compartment syndrome of the foot.
- Leg elevation will minimize edema and the risk of compartment syndrome.
- If in doubt, place a splint, make it non-weight bearing, and discharge with orthopedic follow-up.

Jones:

- First described by an orthopedic surgeon, Robert Jones. He sustained the injury and subsequently published his experience. Descriptions of this fracture in the literature are often confusing.
- Jones fractures do not result from a simple avulsion injury.
- Clarification: A Jones fracture is a transverse fracture that lies distal to the styloid process of the fifth metatarsal, i.e. distal to the articulation between the bases of the 4th and 5th metatarsals. Characteristically it is positioned within 1.5 cm of the tuberosity.
- Tuberosity or styloid fractures (Pseudo-Jones): Treated with walking cast and analgesia. Weight bearing as tolerated.

- Jones fractures: Treated with 6-8 weeks of non-weight bearing cast for non-displaced. At risk of nonunion. Displaced fractures need operative management.

2) **Ankle – syndesmosis / Tillaux / Maisonneuve / talus / Achilles**

Talus

- Blood supply runs through the neck and the posterior part of the talus, forming an anastomosis in the middle. Disruption will put the talus at risk of AVN.
- Major talus fractures are those involving the neck or body of the talus, which can result in avascular necrosis. Require large amount of force.
- Minor talus fractures involving lateral process are sometimes called "snowboarder's ankle," and are commonly mistaken for a lateral ankle sprain.
- Posterior process fracture can mimic ankle sprain.
- Major talar fractures require precise open reduction and internal fixation.
- Many minor talar fractures heal with casting, and the initial treatment should be with a non-weight-bearing below-knee cast or posterior plaster slab.
- Other minor fractures, such as displaced lateral process fractures, require operative fixation because of their articular involvement.

3) **Knee – dislocation / quadriceps tendon / patella tendon / tibial plateau / septic arthritis / open joint**

Knee Dislocation

- Assume all patients with suspected knee dislocation have vascular injury until proven otherwise.
- Obese individuals may have knee dislocations with minor mechanisms, even higher index of suspicion in these individuals.
- Nearly half of all knee dislocations spontaneously reduce prior to ED presentation.
- Posterior knee dislocations are more commonly associated with popliteal artery injury.
- A normal physical examination alone does not reliably exclude vascular injury.
- Delay of popliteal artery repair beyond 8 hours invariably leads to limb amputation, act quickly!
- Posterolateral dislocations are irreducible by closed reduction.
- Peroneal nerve injury is the most commonly associated neurologic problem in knee dislocations.

Septic Arthritis

- Failing to consider septic arthritis in a oligoarticular/polyarticular presentation
- Relying solely on history, physical examination, ESR, and CRP to rule out septic arthritis
- Not recognizing non-bacterial etiologies of septic arthritis
- Allowing an uncomplicated cellulitis or therapeutic INR to thwart joint aspiration
- Not considering MRSA in initial antibiotic choice
- Not considering the overlap in clinical presentation and both serum and synovial studies in differentiating septic and noninfectious arthritis
- MRSA presenting with low synovial fluid cell counts
- Not performing arthrocentesis of a prosthetic joint in consultation with the treating surgeon

4) **Hip / pelvis – occult hip fx / pelvic apophyseal / occult pelvic fx(s)**

- "Findings suspicious for hip fracture:
    - Triad of
        1. New inability to weight bear
        2. Hip pain on axial loading of leg
        3. Inability to straight leg raise are highly specific for hip fracture
    - Groin pain
    - Percussion test:
        - Percuss patella bilaterally while listening with stethoscope on symphysis pubis. Unilateral diminished sound (due to effusion) should increase suspicion.
    - Don't forget hip injury can present as knee pain, especially in children and elderly

- Pelvic ring and femoral neck fractures are mutually exclusive: In a study with >100 elderly patients unable to weight bear after a fall, no patient with a fracture of the femoral neck had an associated fracture of the pelvic ring or vice versa found on MRI.

- Imaging choices in occult hip fracture:
    - CT scan: in general, very good at identifying fractures involving bone cortex. Most studies compare 4-slice CT vs MRI and show that MRI is far superior for identifying occult hip fractures. However, newer-generation CT scans (64-slice) may be as sensitive and specific for hip fractures compared to MRI, especially when 3D reconstructions are available (no studies to confirm this yet).
    - MRI: The gold standard. Allows better look at bone marrow (trabecular bone), but might overcall certain injuries that are not clinically relevant.
    - Bone scan: Very sensitive at 48-72hrs (24hrs for newer 3-phase array scans) but not specific and poor localization, and potential for complications while patient is bedridden waiting for scan (VTE, pneumonia, pressure ulcers, delays to surgery).
    - Ultrasound: May demonstrate effusion in occult hip fracture
        - A study from Israel had 100% sensitivity for identifying post-traumatic hip fracture, but not ready for 'prime time'
        - Safran et al. J Ultrasound Med 2009; 28:1447–1452"

5) **Shoulder/clavicle – posterior shoulder dislocation / sternoclavicular dislocation / SC joint septic arthritis**

- See LITFL – Posterior Shoulder Dislocation and LITFL – Sternoclavicular Joint Dislocation

6) **Biceps tendon rupture**

- Distal Biceps Tendon Rupture is almost exclusively a male injury and occurs in a younger age group compared to the proximal biceps rupture. It is important to distinguish these injuries as their management and outcomes are different.
- Proximal biceps tendon ruptures typically occur in older patients with age-related degeneration of the tendon and who often have rotator cuff symptomology. There is usually no obvious mechanism.

- Distal biceps tendon ruptures typically occur in younger patients, such as construction workers or weight lifters with chronic repetitive microtrauma that causes weakening of the tendon that attaches to a well-built muscle. This large bicep muscle is capable of a sudden massive eccentric contraction that tears the tendon. This occurs almost exclusively in males.
- In both distal and proximal biceps tendon ruptures, a 'Popeye' sign (named after the old cartoon 'Popeye The Sailor Man') is typical.
- In a distal biceps tendon rupture, you will often see ecchymosis on the anterior aspect of the elbow. There is usually decreased force of supination and/or pain with supination.
- Look for the Hook Sign: use your index finger and go lateral to the insertion of the biceps and hook your finger around the biceps tendon. If there is no Hook Sign (an empty space) – there is likely a distal biceps rupture.
- Patients with a distal biceps tendon rupture should be immobilized, with early referral to orthopedics, as surgical repair within 2 weeks is desirable to avoid tendon retraction.

7) **Elbow – radial head**

- Radial Head Fractures are one of the most commonly missed fractures of the upper extremity. An understanding of the physical examination and radiograph findings is essential.
- Remember the A-B-C (Alignment, Bones, Cartilage/soft tissue) approach to adult elbow radiographs.
- It is appropriate to discharge patients with nondisplaced radial head fractures in a sling with recommendations for early mobilization and orthopedic follow up.

8) **Wrist/Hand – scapholunate / DRUJ / scaphoid / triquetrum / hamate / fight bite / tendon lacerations**

- See emDOCs – Wrist and Distal Forearm Injuries: Pearls & Pitfalls

9) **Compartment syndrome**

- See LITFL – Compartment Syndrome