



## EMERGENCY MEDICINE CASES

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### Episode 1: Occult Fractures & Dislocations

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**Expert Guests:** Dr. Arun Sayal & Dr. Nathalie Mamen

#### Case 1: Occult hip fracture

- 67y.o. woman with severe COPD on long-term steroids who fell from standing height
- Ambulating well at current time, but with groin pain

Pearls:

- Findings suspicious of hip fracture:
  - Triad of 1.new inability to weight bear, 2.hip pain on axial loading of leg, and 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.

☒ Lakshmanan et al. J Bone Joint Surg Br, Vol 89-B, Issue 10, 1344-1346



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- 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
- A proposed algorithm for suspected occult hip fracture:
  - In young patients with high-energy trauma, a fracture in the cortex will likely be seen
    - If x-rays are negative but clinical suspicion is high, move on to CT scan
  - In elderly with low-energy trauma, occult fractures are less likely to involve cortex
    - If x-rays are negative but clinical suspicion is high, move on to MRI (preferred) or 64-slice CT if MRI not available



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### Case 2: Snowboarder's fracture

- 18y.o. woman landed “funny” while snowboarding and had immediate left ankle pain
- Very swollen inferior and anterior to the tip of fibula, with tenderness over the anterior talofibular ligament (ATFL)

#### Pearls:

- Ankle sprain mimics:
  - 1. Snowboarder's fracture (lateral process of talus), 2. Posterior talus process fracture, 3. Achilles tendon rupture, 4. Anterior process calcaneus fracture, 5. Talar dome fracture

In snowboarder's fracture the feet are fixed in dorsiflexion, and the anterior foot usually everts as the snowboarder lands (very different mechanism than classic inversion ankle sprain). The fibula impacts the lateral process of the talus causing a fracture.

- Broden's view (Mortise view) x-ray:
  - Foot in plantar flexion; lateral aspect of the talus better visualized
  - The plantar talus should show a “symmetric V” in normal x-ray
    - An asymmetric “V sign” indicates a displaced fracture requiring surgery
- When in doubt, place a posterior slab and make the patient non weight-bearing until follow-up

### Case 3: Knee dislocation

- 40y.o. male in belted MVC (frontal collision at 80km/h)
- Severe knee pain and tenderness and limited ROM, but no deformity

#### Pearls:

- 50% self-reduce before presenting to the ED, and with distracting injuries can be easily overlooked



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- Common mechanisms: pedestrian-vs-car, contact sports injuries and knee-to-dashboard mechanism
- 1/3<sup>rd</sup> will have neurovascular injuries, with significant morbidity
- Knee-to-dashboard DDx:
  - Posterior hip dislocation, tibial plateau fracture, patellar fracture, knee dislocation, posterior acetabular fracture
- Physical exam:
  - Serial neurovascular exams:
    - Distal pedal pulses +/- Doppler assessment
    - if decreased sensation in peroneal nerve distribution, assume concomitant popliteal artery injury
  - Findings suspicious for occult knee dislocation:
    - 3 out of 4 knee ligament laxity (ACL, PCL, MCL, LCL)
- Adjuncts:
  - Ankle-Brachial Index (ABI): >90% is reassuring, and can be monitored serially
  - CT-angiogram if suspicious of vascular damage, and consult vascular
- Complications:
  - In patients with knee dislocation associated with vascular injury, 15% will develop ischemia when repair is delayed by >8hrs

### **Case 4: Scaphoid fracture**

- 10y.o. boy with FOOSH and lone snuff box tenderness

#### Pearls:

- Epidemiology: Less likely in children <15y.o., adults >50y.o., 15% of fractures will be occult on initial x-rays



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- Physical exam – 3 key maneuvers:
  - 1. Palpation of snuff box with wrist ulnarly deviated, 2. axial loading of thumb with pain in the anatomical snuffbox and 3. palpation of volar aspect of scaphoid with wrist radially deviated
  - 3 of 3 gives 90% risk of scaphoid fracture (70% with 2 of 3)
- X-ray imaging:
  - Order specific scaphoid views
  - Consider clenched fist view to splay carpals, especially if tenderness is more at the lunate bone
    - Might reveal a dynamic “Terry Thomas sign” (or “David Letterman” sign) if >3mm between scaphoid and lunate consistent with a scapho-lunate ligament tear
- In negative x-ray with high clinical suspicion:
  - Immobilization with thumb spica splint is most commonly used
  - precise position of immobilization does not effect outcome
  - Other options: CT in ED, Bone Scan at 72hrs, MRI
  - must weigh time off work/sport if immobilize vs expense and radiation exposure of early advanced imaging
- Follow-up:
  - Longer follow-up (10–14d) necessitates longer immobilization period, but allows for more time for the fracture to reveal itself compared to shorter period (7d)
  - many scaphoid fractures take up to 16 weeks to heal

### Case 5: Posterior shoulder dislocation

- 56y.o. male found down by wife, found to have glucose of 1 by EMS
- Holding bilateral shoulders in internal rotation, and there is resistance to external rotation attempts



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- 2–3% of shoulder dislocations, 15% bilateral and often missed on first visit (50–80%)
- Associated with 3 Es: epilepsy, ethanol and electricity
- Mechanism: axial force with shoulder internally rotated and abducted
- Clinical findings:
  - Prominent coracoid, and humeral head posteriorly displaced (vs. squared shoulder of anterior dislocation)
  - Patients hold arm internally rotated, and reversed Hill–Sachs lesion (engagement of humeral head on posterior glenoid rim) often prevents external rotation
- Diagnosis:
  - Axillary view on x-ray very useful, as well as the subtle “light bulb” sign on AP (loss of asymmetry of the humeral head created by greater tuberosity due to the internal rotation of the humerus)
- Reduction:
  1. Physician’s contralateral hand puts anterior pressure on the patient’s posterior humeral head (eg, left hand on right shoulder)
  2. Physician applies gentle longitudinal downward traction of patient’s arm
  3. Assistant externally rotates patient’s arm
- Immobilization:
  - Arm hanging in neutral position, with internal or external rotation (recent studies show external rotation may be better, but impractical)
  - Length in weeks: “8 minus decade of life, to max of 3”, maybe even shorter

### Case 6: Calcaneus fracture

- 29y.o. male jumped from height while under the influence of crack cocaine
- Tender to palpation L-spine and entire bilateral extremities, ankles and feet swollen, positive pulses
- X-rays all normal lower extremities, but multiple L-spine compression fractures

#### Pearls:

- Fall from height onto feet:
  - Look for associated injuries: spinal injuries (esp. L-spine), contralateral calcaneal fracture, and ankle fractures
  - Calcaneal injuries have high morbidity with 20% of patients debilitated at 3yrs
- Calcaneal fracture imaging:
  - Bohler’s angle on lateral view x-ray of foot measured between the line formed by posterior tuberosity of calcaneus apex to anterior process, and line formed by apex to anterior process (see image)
  - Normal is 20–40°, <20° suggestive of compression fracture of calcaneus



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- Harris view (axial view of calcaneus)
- Management:
  - Usually needs CT scan to determine whether fracture is extra-articular (conservative management) or intra-articular (operative management)
  - Any displacement typically requires operative repair