# Air National Guard

*Integrity - Service - Excellence*

## Nothing to be SCAReD OF: Can't Miss MSK Diagnoses for Primary Care



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- Has no relationships to disclose.

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# Objectives

- After this lecture, you will be able to identify key signs and symptoms that should trigger you to think of “can’t miss” orthopedic and MSK injuries
- Utilize the mnemonic SCAReD OF to identify key MSK diagnoses

# SCAReD OF

- Septic Joint/Spinal Cord
- Compartment Syndrome
- Abuse (Child/Elder)
- Referred pain/Report is wrong
- Dislocation
- Operative soft tissue/Open fracture
- Fracture (occult)

# Septic Joint

- Key signs and symptoms:
  - Severe pain – triggered by even minimal active or passive ROM
  - Joint swelling/effusion
  - Warmth and erythema
  - Decreased mobility
  - Refusal to bear weight
  - Systemic Symptoms
  - Protective positioning



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# Septic Joint Labs

- Key labs?
- ESR/CRP – while you would expect the ESR/CRP to be elevated, likelihood ratios across studies are not very predictive
- Synovial fluid – synovial fluid analysis overall has a 70-80% sensitivity and if ABX given before tap may drop < 50%
- Pearl: Synovial lactate demonstrates excellent diagnostic accuracy for septic arthritis
  - Cultures take 48-72hrs, gram stains have low sensitivity
  - Lactate is a rapid rule in/rule out tool: > 10 mmol/L highly predictive, <4 mmol/L leans more towards other inflammatory causes

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# Septic Joint – Key Villian – The Hip

- Rarely appears swollen
- Key physical exam findings:
  - Externally rotated/flexed hip
  - Non-weight bearing
  - Pain out of proportion with any movement



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# Imaging in Septic Hip

- Joint space narrowing
- Boney erosion
- May see effacement of fat planes when compared to other side

- Neg U/S does not rule out!
- Fluid will settle with gravity and may be posterior



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# Spinal Cord – Cauda Equina

- Massive disk herniation, tumor, trauma or abscess compresses a bundle of nerve roots at lower end of spinal cord (L2-L5)
- Missing diagnosis can lead to permanent paralysis, permanent incontinence, and massive medico-legal liability



# Spinal Cord - Cauda Equina

- **You may miss CES if you don't actively hunt for red flags**

| Red Flag | Clinical Trap | Pearl |
|---|---|---|
| Urinary Retention | Patient complains of leaking urine | True CES causes urinary retention – the leaking is actually overflow |
| Saddle Anesthesia | Simply asking are you numb "down there" | Must physically test this – first clue – altered sensation to toilet paper when wiping |
| Bilateral Sciatica | Bilateral radiating leg pain | Std sciatica is almost always unilateral – if both legs, MUST think CES |
| Decreased sphincter tone | Skipping b/c it is uncomfortable | DRE/sphincter squeeze should be mandatory if any thought of CES |

# Spinal Cord – Cauda Equina

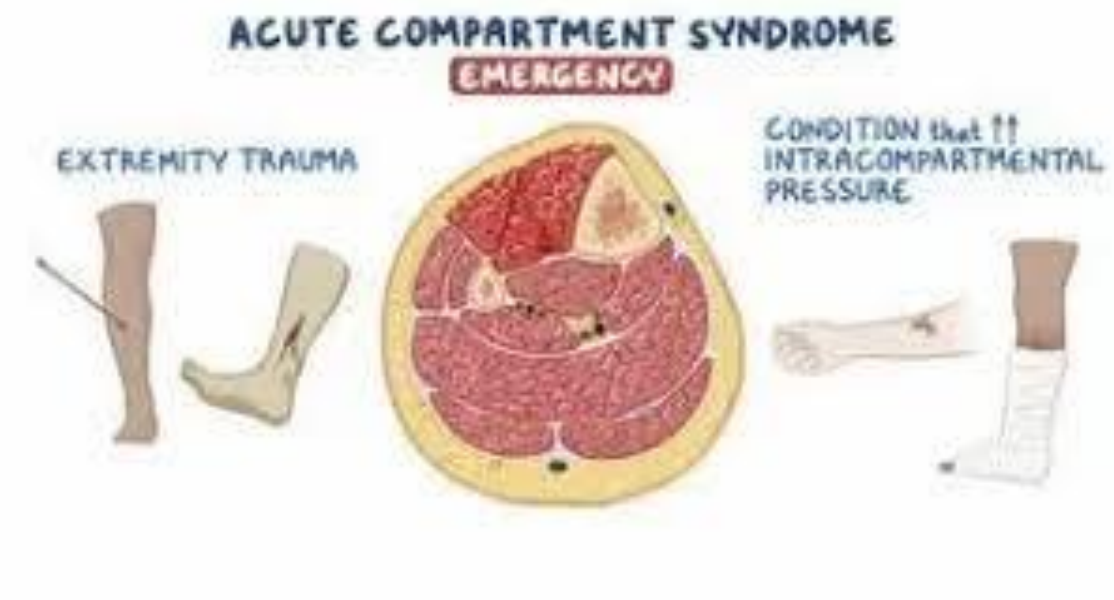
- A patient with new severe back pain must prove to you they don't have CES!
- If acute onset of severe back pain AND acute onset of:
  - Urinary leaking
  - Post void residual – POCUS - > 200 mL suspicious
- The ability to walk does not rule out CES
  - The location of the nerves that control bladder and bowels (S2-4) are located in central canal and are most vulnerable to central disk herniation – will fail before the nerves that control leg muscles

# Compartment Syndrome

- Myth of the 6 P's (pain, paresthesias, paralysis, pulselessness, pallor, poikilothermia)
  - Focus on first two P's
  - Pain out of proportion is usual first clue, may also have pins/needles
- High yield pearls:
  - Open fractures don't rule out compartment syndrome
  - Beware of regional anesthesia if used for reduction or manipulation of joint or fracture

# Compartment Syndrome

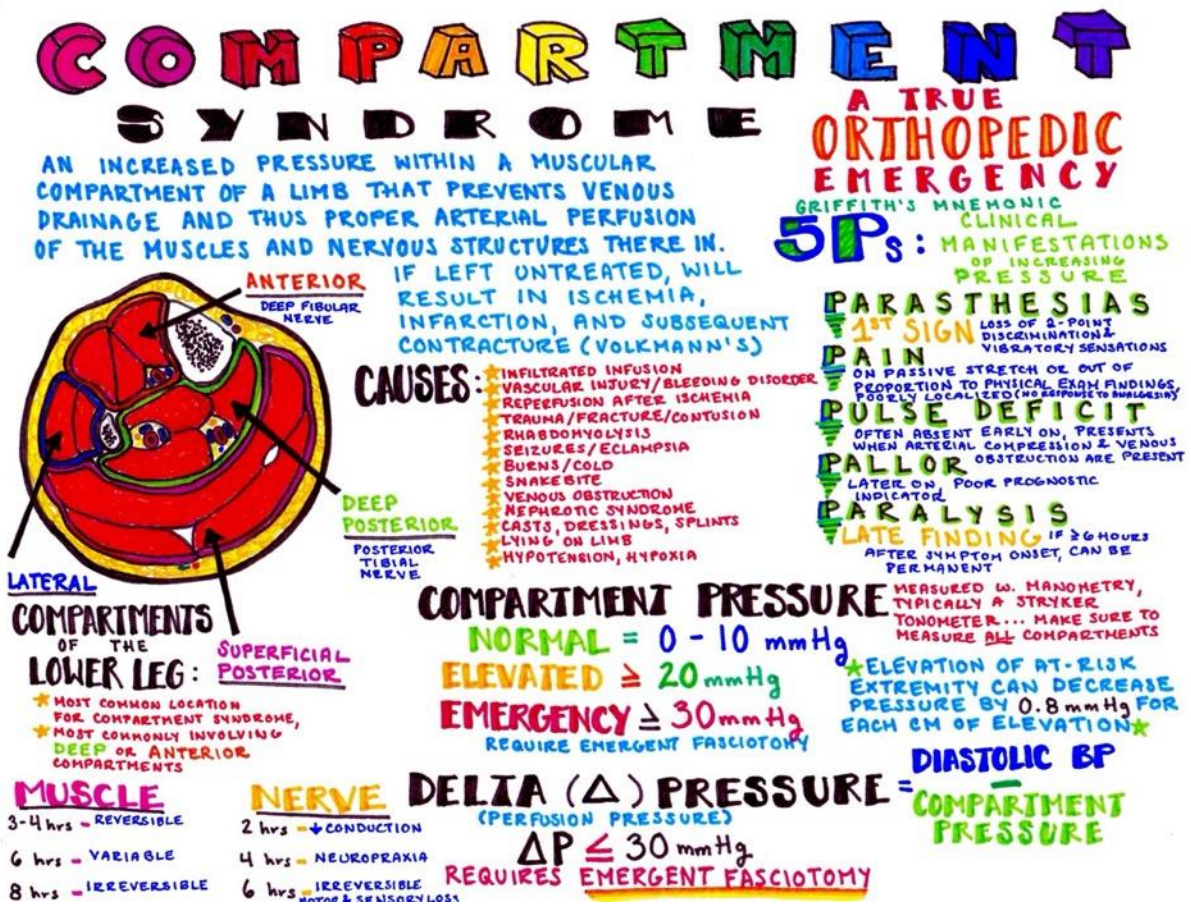
- Pitfalls
  - Relying on compartment pressure
  - Can be subjective
  - Don't rule out soley with "normal compartment pressure"
- Delta P may more predictive (especially in trauma patients): Diastolic BP – Compartment pressure
  - If > 30 mm Hg – emergent fasciotomy



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# Compartment Syndrome

- Injuries that can cause
  - Crush injuries
  - Burns
  - Overly tight bandaging
  - Prolonged compression during unconsciousness
  - Vascular surgery
  - Blood clot



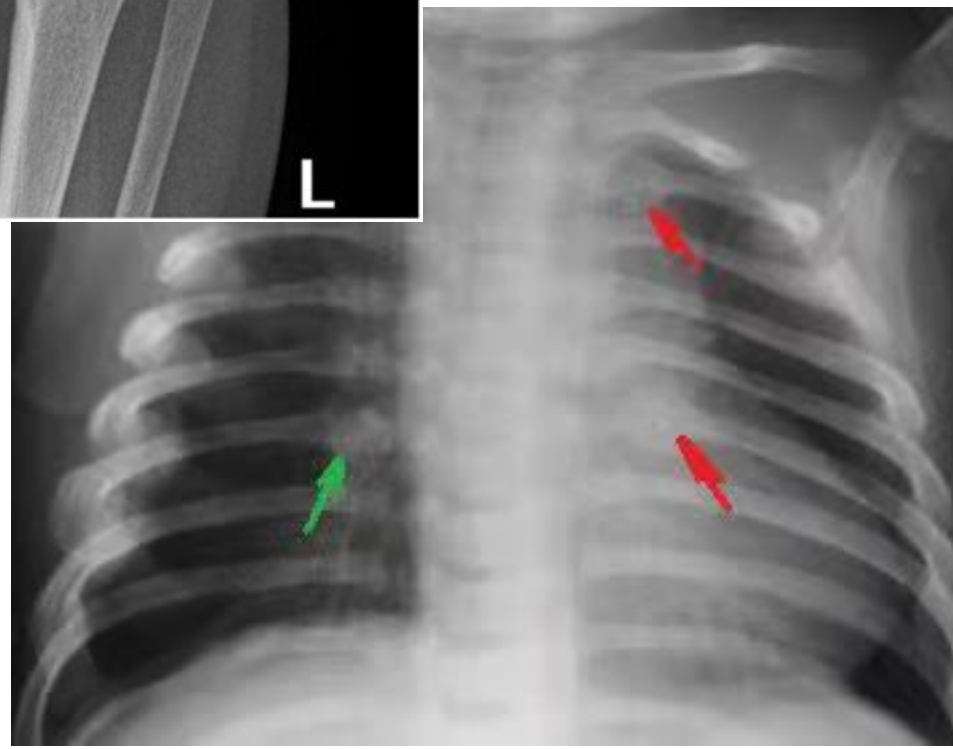

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# Abuse

- Xray findings consistent with non-accidental injury (NAI)
- Pediatric metaphyseal corner fracture
- Pediatric posterior rib fracture



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# Abuse – Non Accidental Trauma

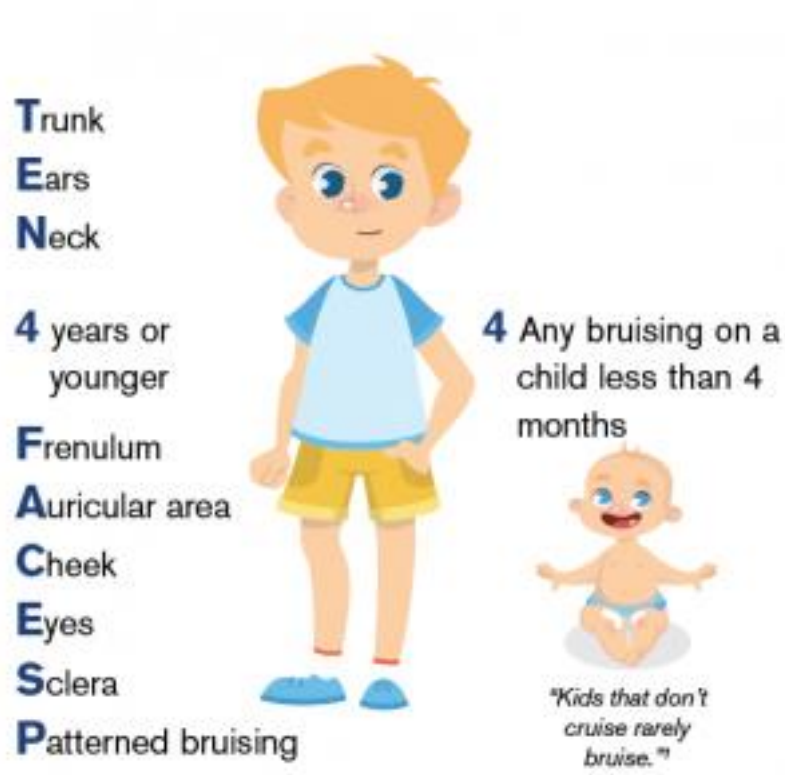
- Unusual location fractures:
  - Acromion, sternum, spinous processes
- Fractures of various ages
- History doesn't match injury
- Pediatric Pearls:
  - If they don't cruise, they don't bruise
  - Midshaft femur fracture in non-ambulatory child
- Elder Pearls:
  - Isolated ulnar shaft fractures - nightstick fractures
    - Unexplained fractures in non-weight bearing bones

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# Non Accidental Trauma

- **Red flags:**
  - Inconsistency in clin history
  - Pattern of injury inconsistent with Hx
  - Inj incomp with development
  - Poor caregiver-patient interaction
  - Multiple ERs

- **TEN-4-FACES – 87% Spec, 96% sens for ID NAT in children [Ped Annals, 2020]**



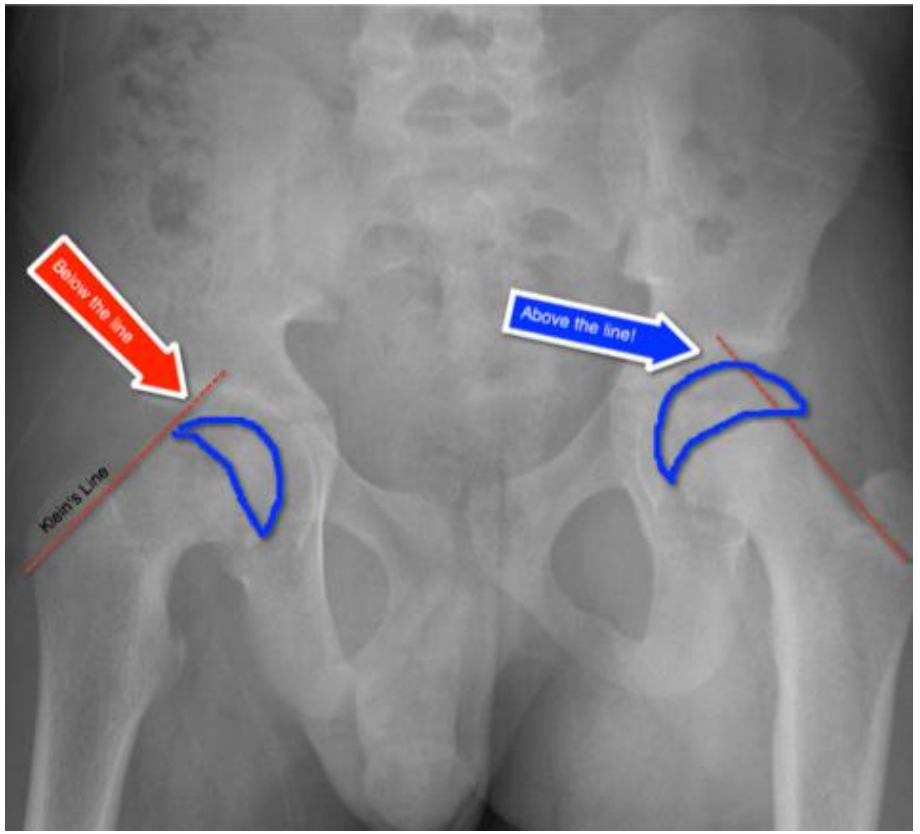
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# Non Accidental Trauma

| Physical Exams Signs of Elder Abuse by Type of Abuse | | |
|---|---|---|
| **Physical Abuse** | **Sexual Abuse** | **Neglect** |
| • Injuries in abnormal patterns - bite marks, in the shape of particular objects<br>• Bruising in atypical distribution (on face, neck, ears, arms)<br>• Ligature marks<br>• Burns - cigarette pattern or hot water immersion<br>• Multiple fractures in various stages of healing<br>• Ocular hemorrhages<br>• Intraoral trauma<br>• Scalp hematomas or traumatic alopecia | • Unexplained sexually transmitted infections<br>• Bruising/signs of trauma of genitals/inner thighs<br>• Blood-stained undergarments<br>• Difficulty walking/sitting | • Poor hygiene/dirty clothes<br>• Pressure ulcers<br>• Malnutrition/ dehydration<br>• Unkempt fingernails<br>• Poor oral hygiene<br>• Poor control of medical problems |

# Referred Pain - Pediatric

- Knee pain = hip pain
- SCFE – limp and atraumatic knee pain
- Toxic synovitis of hip – limp and knee pain after recent viral illness



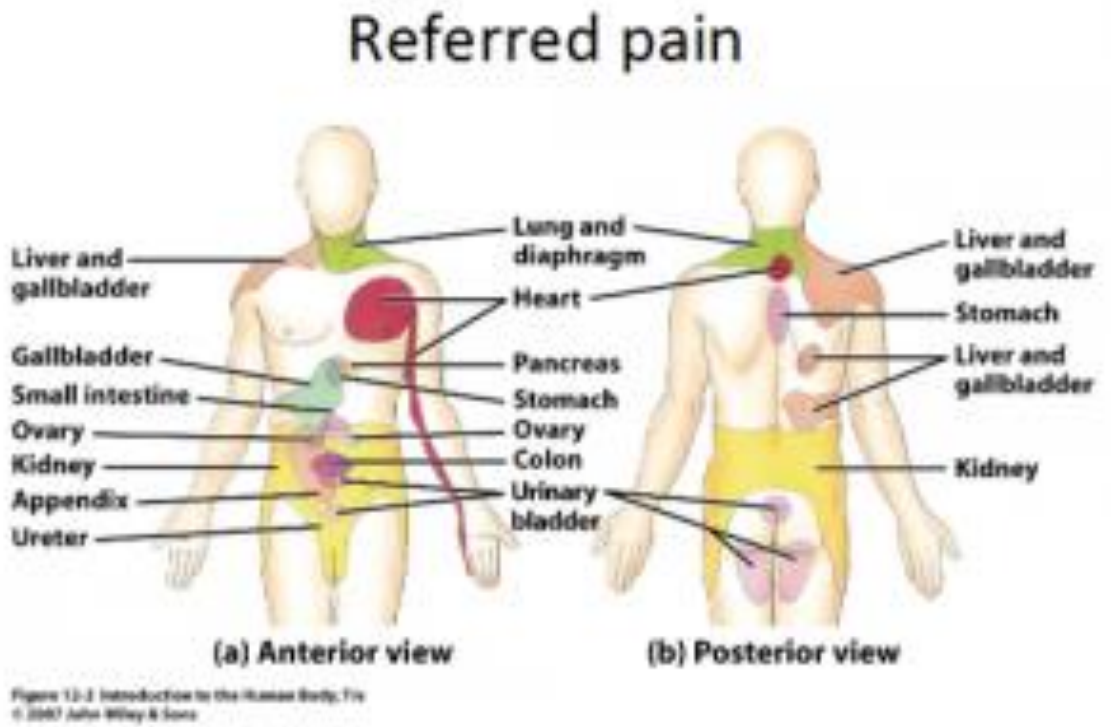
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# Referred Pain - Adult

- MSK complaints that are actually referred visceral, cardiac or spinal emergencies
- Left shoulder pain – spleen or cardiac
  - Kehr's sign – blood irritating diaphragm
- Right shoulder pain – gallbladder or liver
- Arm/Hand pain with normal exam
  - Think C-spine
- Knee pain
  - Just like kids if normal knee exam, think hip: Fracture or OA

# Referred Pain Pearl

- If patient has severe pain in a joint but your physical exam of that joint is normal
  - Examine joint above and below
  - Think referred pain patterns



# Report Wrong

- **Radiologists are experts, BUT they lack the benefit of seeing the patient, knowing the exact clinical context, palpating the area of injury**

| Clinical Scenario | Pitfall/Pearl |
|---|---|
| Severe snuffbox tenderness after FOOSH | Pitfall: Neg xray read – send patient home without splint<br>Pearl: Treat the patient not the picture – if you think scaphoid, treat scaphoid |
| High energy mechanism, midfoot pain and eccymosis | Pitfall: Missing LisFranc due to non-weight bearing films<br>Pearl: If clinical suspicion high, do stress views or CT scan |

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# Report Wrong - Pearls for Primary Care

- Garbage in, garbage out:
  - Be very specific on your imaging orders (i.e. FOOSH 3 weeks ago, snuffbox tenderness, concern for scaphoid fracture)
- Tincture of Time:
  - If still having pain 10-14 days after “negative” x-ray report – repeat xray
- Stress Fracture Trap
  - Standard radiographs not good at identifying stress fractures
  - If pinpoint pain, night pain or activity level that may support stress fracture – go to advanced imaging

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# Dislocation/Subluxation

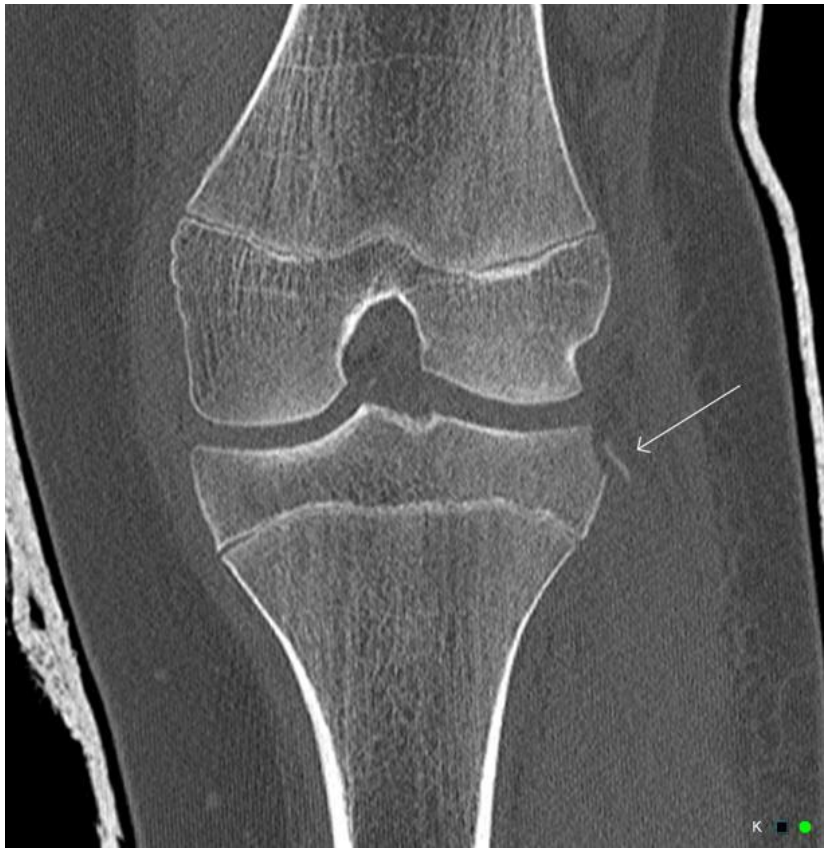
- 5 critical dislocations
  - Knee – true limb threat
  - Posterior shoulder
  - Pediatric elbow
  - Distal radial ulnar joint
  - Carpometacarpal



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# Dislocation - Knee

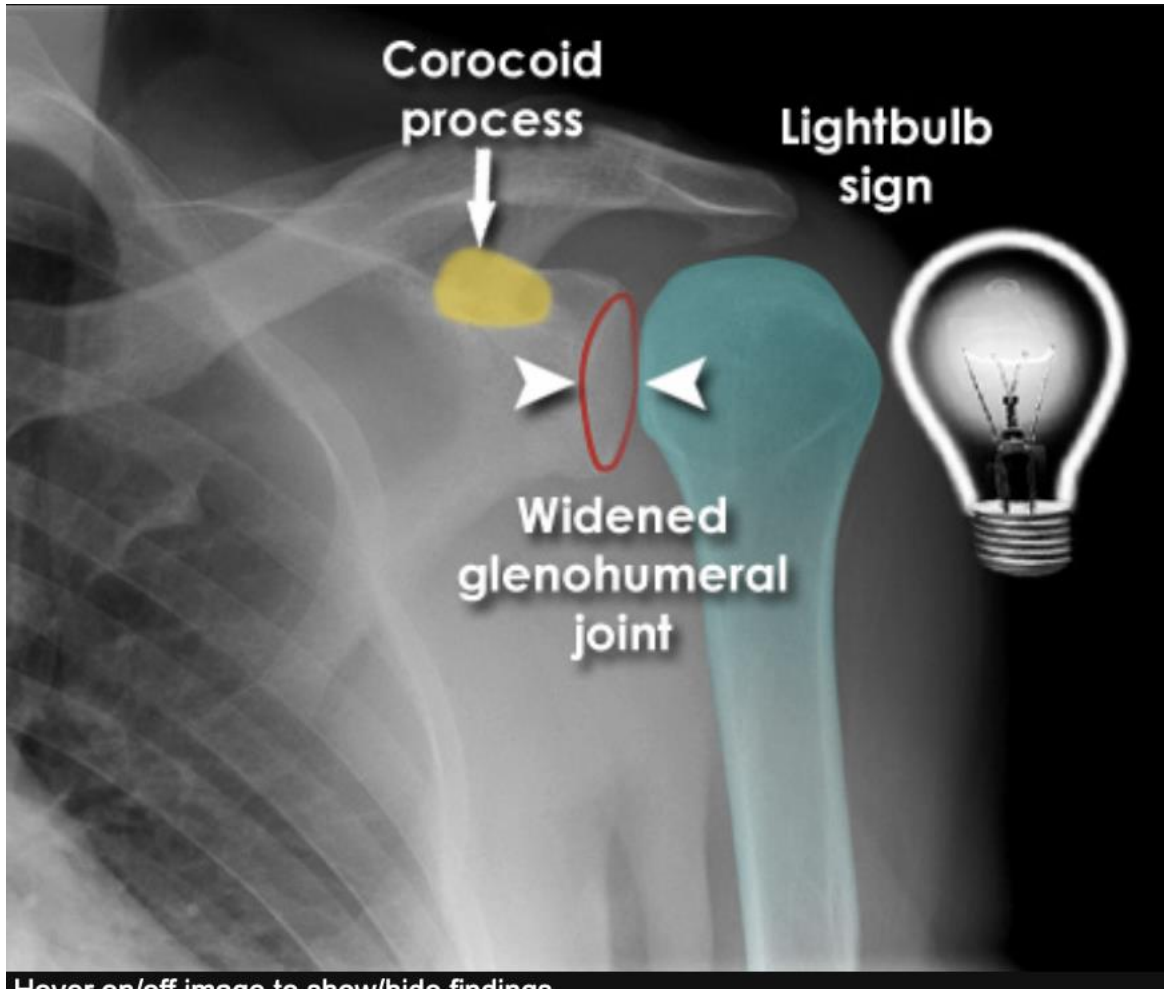
- Massive trauma
- 50% spontaneously reduce before getting to point of care
- Pearl: If highly unstable knee after high energy trauma or sports injury – ASSUME DISLOCATION → vascular evaluation



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# Dislocation – Shoulder (Posterior)

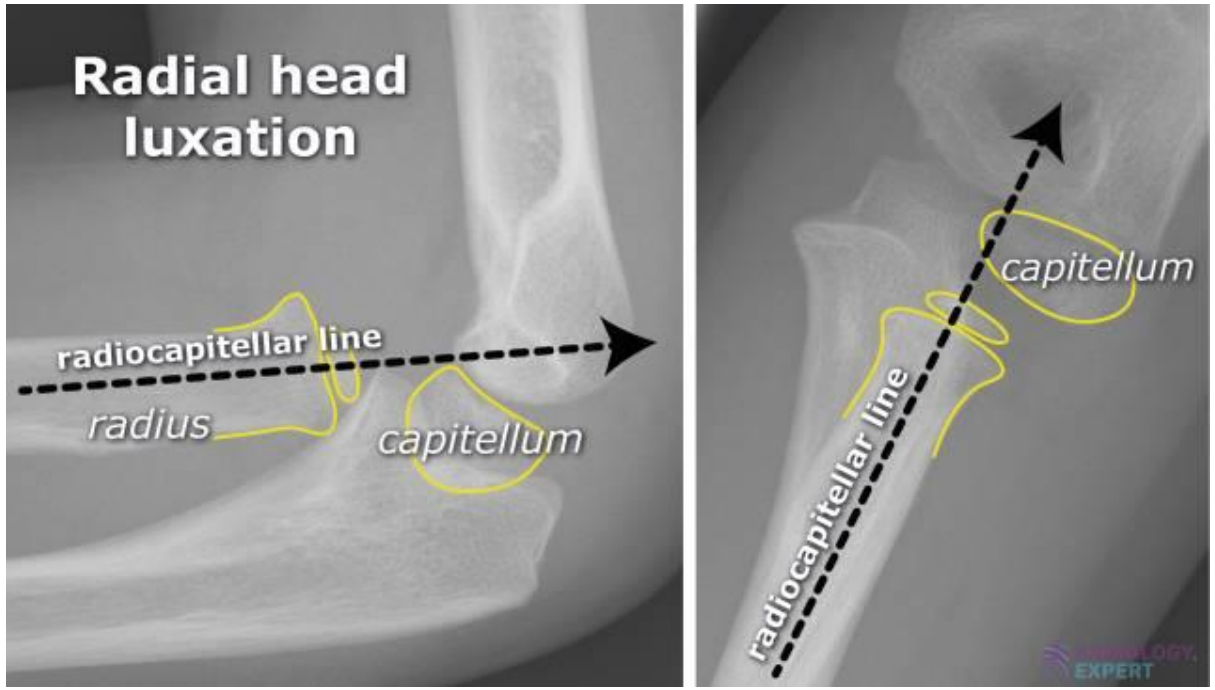
- Missed 50-80% of time
- Seizure or electric shock
- Standard AP xrays – look normal
- Lightbulb sign
- Vacant glenoid
- Pearl: Must get axillary or scapular Y view



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# Dislocation – Pediatric Elbow

- If you draw a straight line through the center of the radius bone, it should intersect the capitellum
- Pearl: If it doesn't intersect the capitellum, the elbow is subluxed or dislocated
- Do vascular examination distal to elbow!



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# Dislocation - Wrist

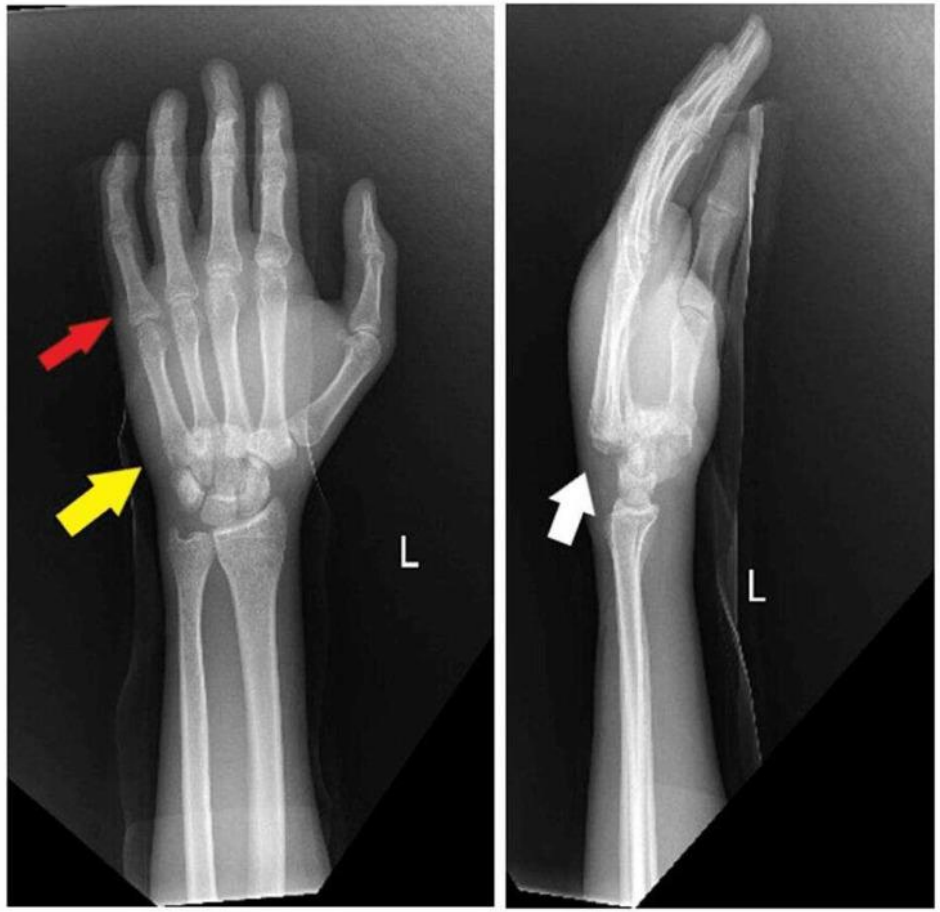
- Space between radius and ulna will be abnormally wide
- If missed – severe long term functional impairment
- Pearl: Always look at the DRUJ



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# Dislocation – Carpal Metacarpal

- Base of 4th and 5th metacarpal bones should only slightly overlap the hamate
- If missed: Loss of grip strength, full hand function
- Pearl: If patient punched wall and hand is swollen – look very carefully at these bones



# Operative Soft Tissue

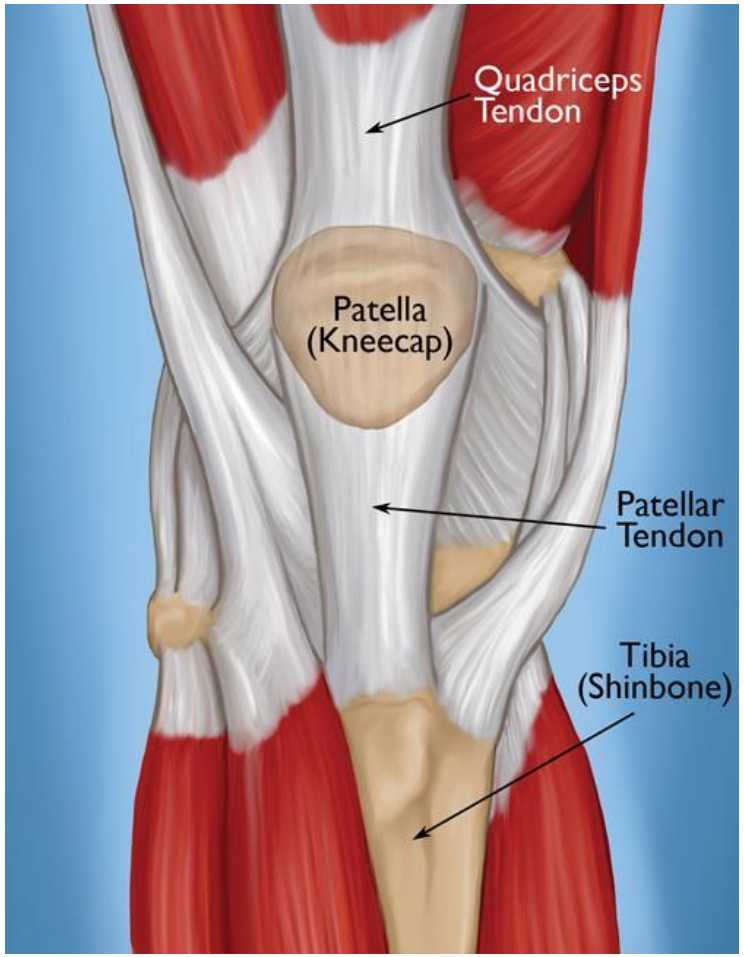
- High Pressure Injection Injury
  - Accidentally injects finger with grease gun, sprayer or hydraulic fluid
  - Wound looks like pinprick - minimal

- Pearl:
- An injection injury in an industrial worker = emergency
- Surgical emergency with amputation rate up to 50%

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# Operative Soft Tissue – Extensor Mechanism

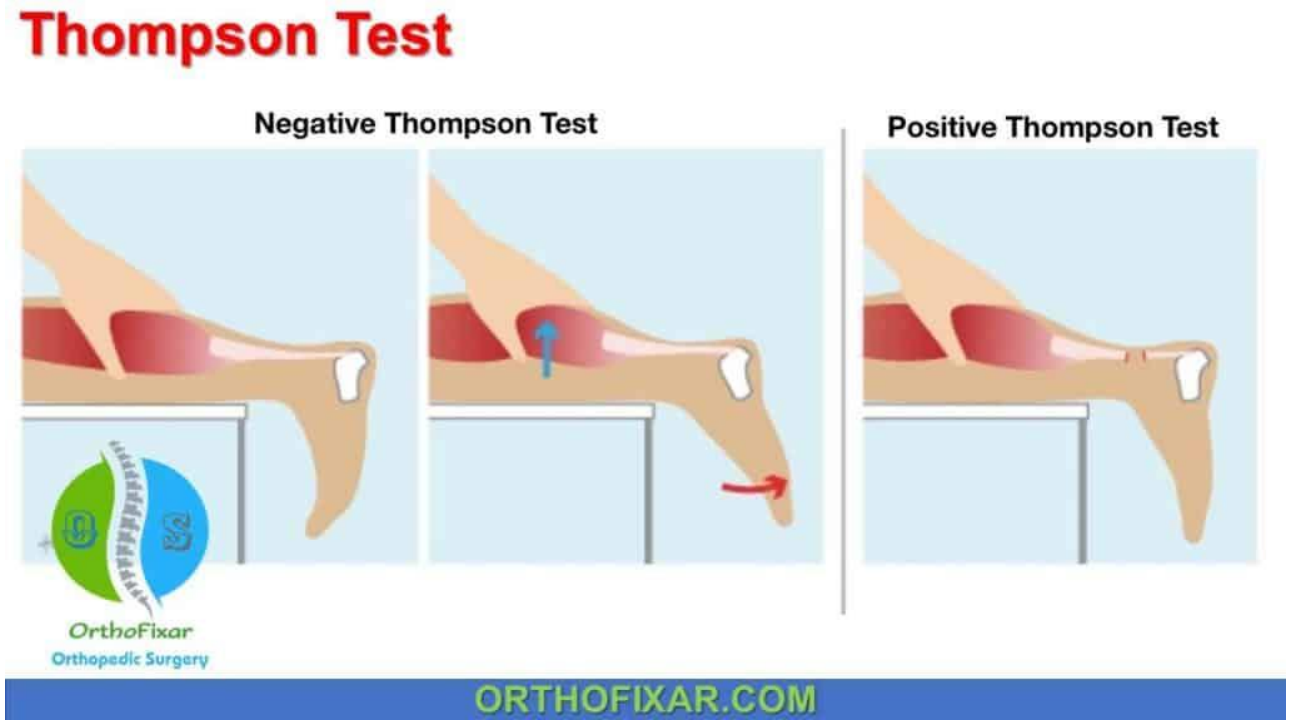
- Quad Tendon or Patellar Tendon
- Patient falls, knee swollen, xray negative = knee sprain
- Pearl: Must perform straight leg raise test! Can't lift heel off bed = extensor mechanism problem



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# Operative Soft Tissue - Achilles

- Weekend warrior feels “kick in back of leg” ”shot in back of leg”, calf cramp while playing basketball
- Xray normal
- Pearl: Thompson test



# Open Fracture

| Pittfall | Pearl |
|---|---|
| Bone isn't sticking out, so it's not an open fracture | Any laceration or puncture wound near a fracture site is an open fracture until proven otherwise |
| Just a tiny scrape | Size does not dictate severity. A small puncture wound over a tibial fracture from high energy mechanism = high risk for infection |
| Floating Open Fracture | When a bone breaks, the surrounding skin can shift or stretch – although laceration appears distant from fracture line on xray – they still may connect under the skin |
| Subtle Open Fracture | Tuft fracture – crush injury to fingertip where nailbed is torn. |

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# Fracture Occult

| Occult Fracture | Clinical Setup | Pearl |
|---|---|---|
| Hip fracture (femoral neck) | Elderly patient falls, normal xray, but persistent groin pain and can't bear weight | If elderly patient can't walk after a fall and xray is negative – get advanced imaging |
| Scaphoid fracture | FOOSH – anatomic snuffbox tenderness | Place patient in thumb spica and repeat xray in 10-14 days or get an MRI |
| Radial Head fracture (adult) | Falls on extended elbow | Sail sign – place in sling |
| Supracondylar fracture (peds) | Child falls on extended arm | Look at posterior fat pad – splint at 90 degrees refer to ortho |
| Stress fracture (metatarsal/tibia) | Runner or military recruit worsening foot/shin pain | If pinpoint tenderness, rest pain and positive hop test = stress fracture |

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# Summary and Key Takeways

- **Septic Joint – high suspicion for atraumatic, painful immobile joints – remember lactate**
- **Dislocations – maintain high level of suspicion – refer early**

Treat the patient, not the picture! A thorough physical exam and a high index of suspicion will save limbs, joint functions and lives!

**the development**

- **Report Wrong/Referred Pain – don't trust a negative xray if the exam/story screams fracture**

**clinical suspicion, low threshold to repeat or advance imaging**

# Questions?


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