Air National Guard

Integrity - Service - Excellence

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

U.S. AIR FORCE

Chad Asplund, MD, MC, FS
Chief, Aerospace Medicine
Air National Guard
Past President, AMSSM
Trustee, ACSM

Chad Asplund, MD

- Has no relationships to disclose.

U.S. AIR FORCE

Objectives

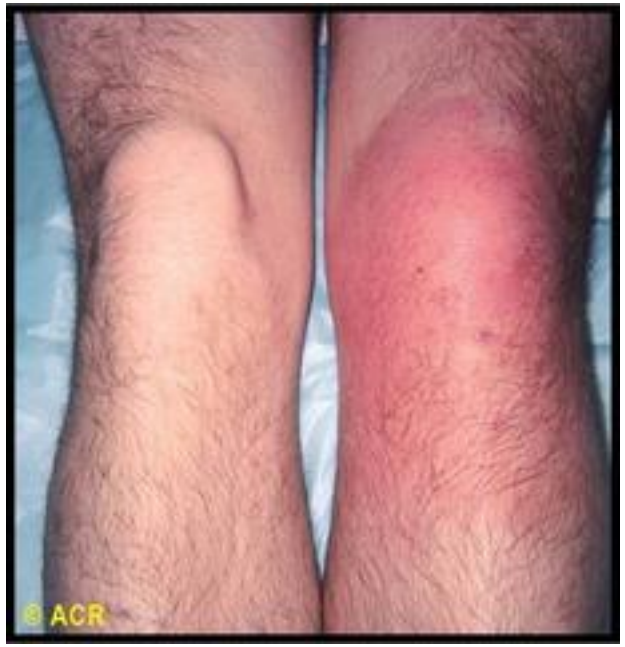
- After this lecture, you will be able to identify key signs and symptoms that should trigger you to think of “can’t miss” orthopedic and MSK injuries
- Utilize the mnemonic SCAReD OF to identify key MSK diagnoses

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



U.S. AIR FORCE

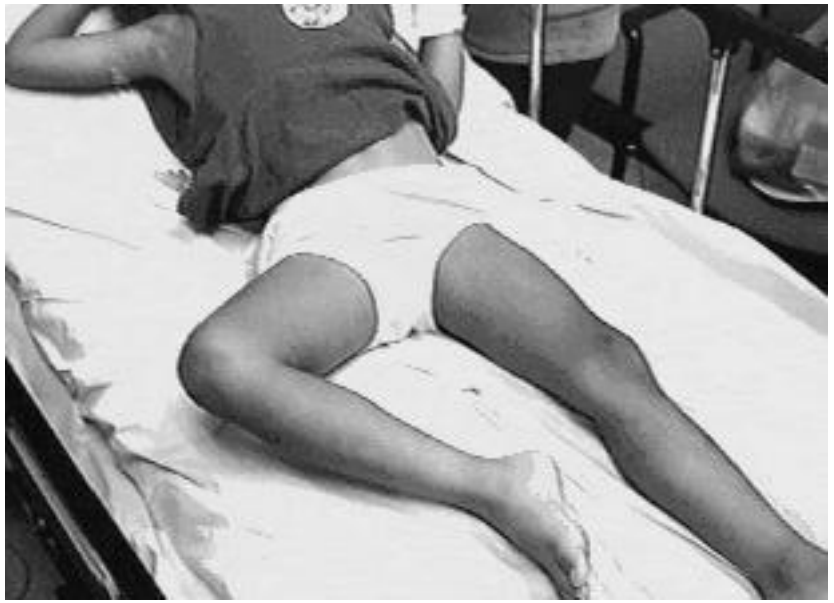
Septic Joint Labs

- 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

U.S. AIR FORCE

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

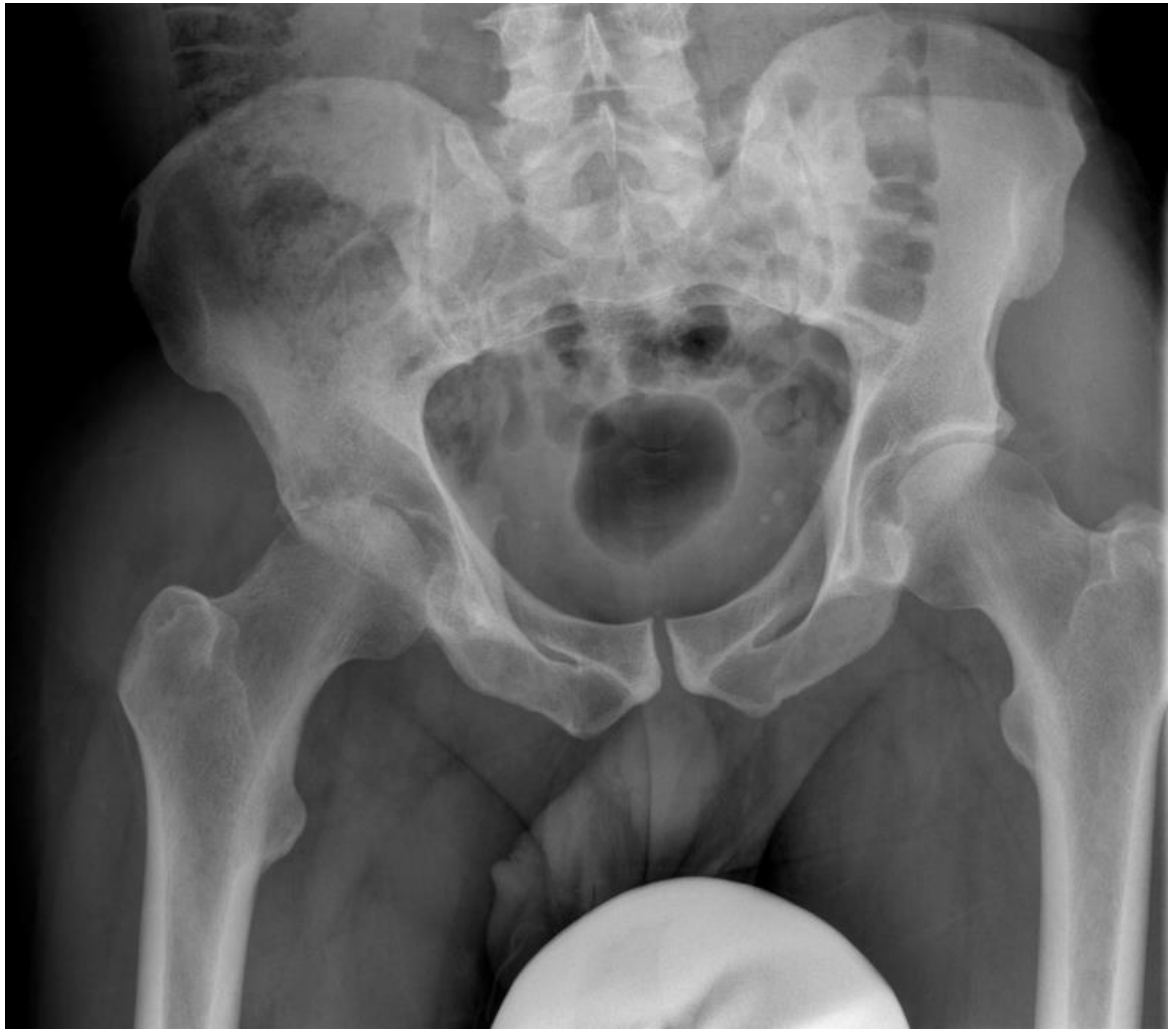


U.S. AIR FORCE

Imaging in Septic Hip

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

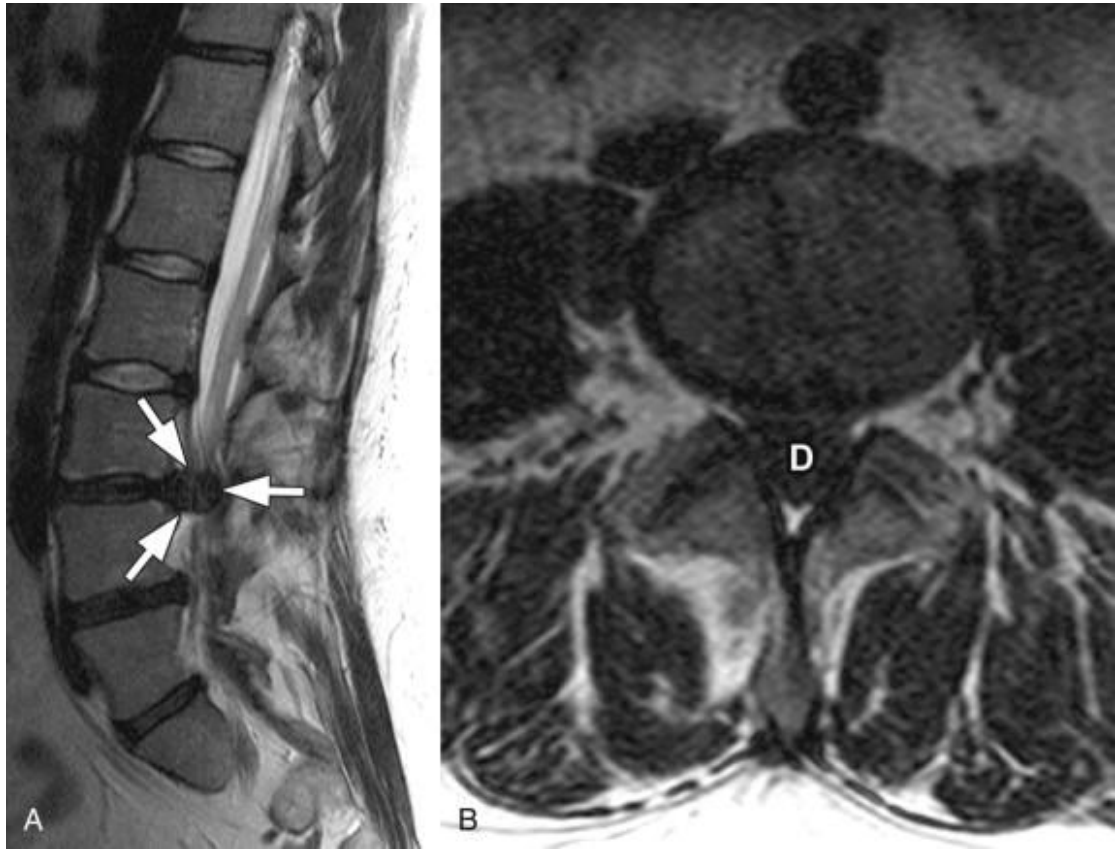
- Neg U/S does not rule out!
- Fluid will settle with gravity and may be posterior



U.S. AIR FORCE

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

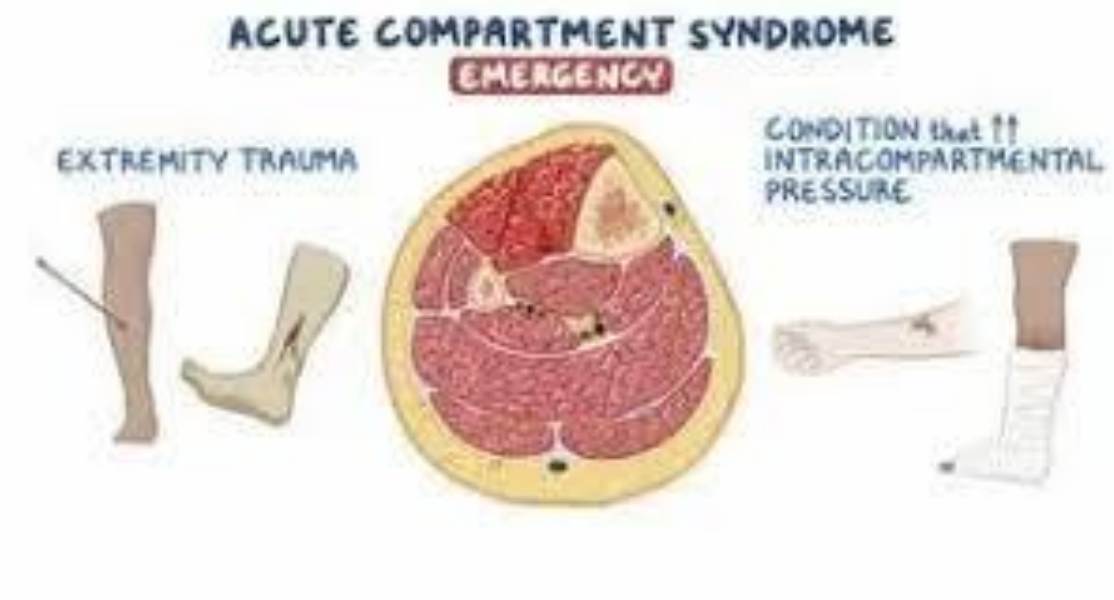
- A patient with new severe back pain must prove to you they don't have CES!
- If acute onset of severe back pain AND acute onset of:
  - Urinary leaking
  - Post void residual – POCUS - > 200 mL suspicious
- The ability to walk does not rule out CES
  - The location of the nerves that control bladder 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

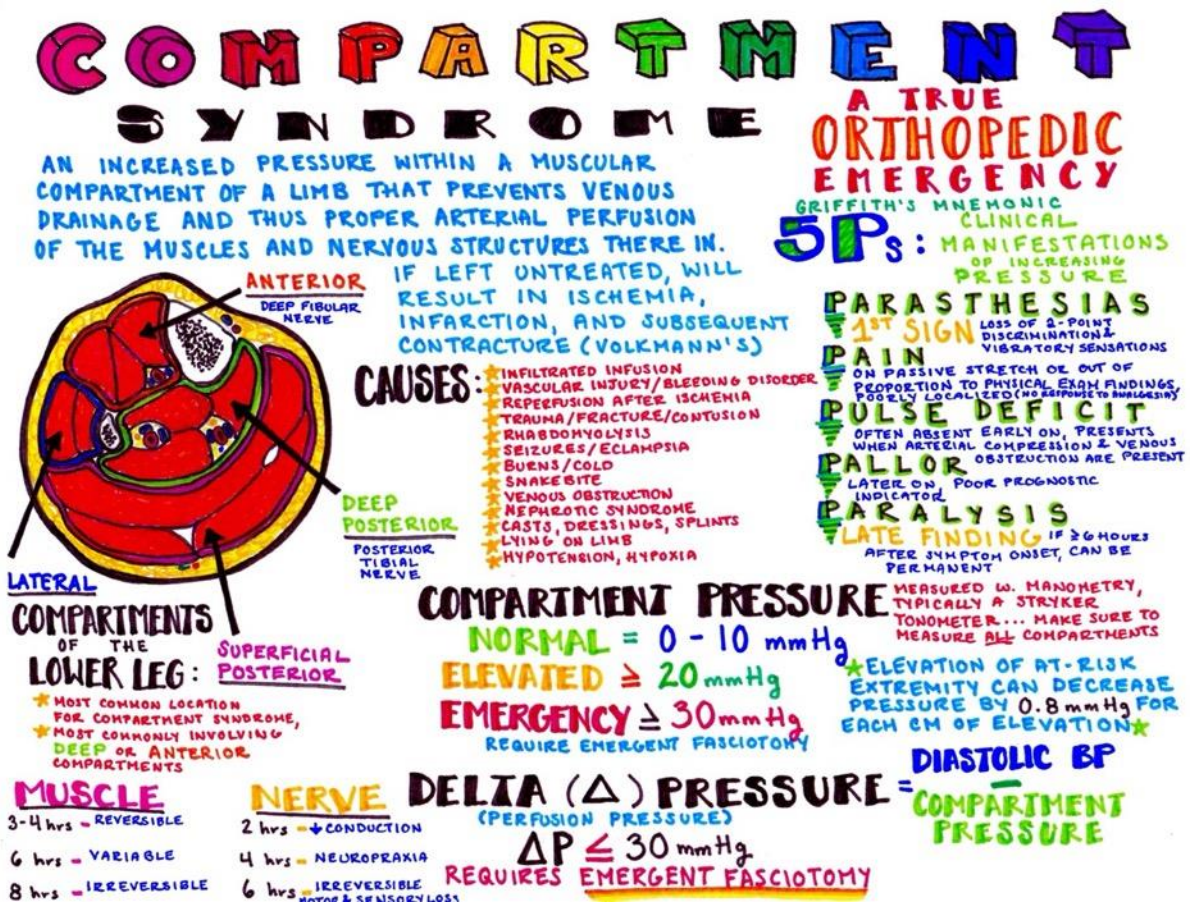
Compartment Syndrome

- 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



Compartment Syndrome

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

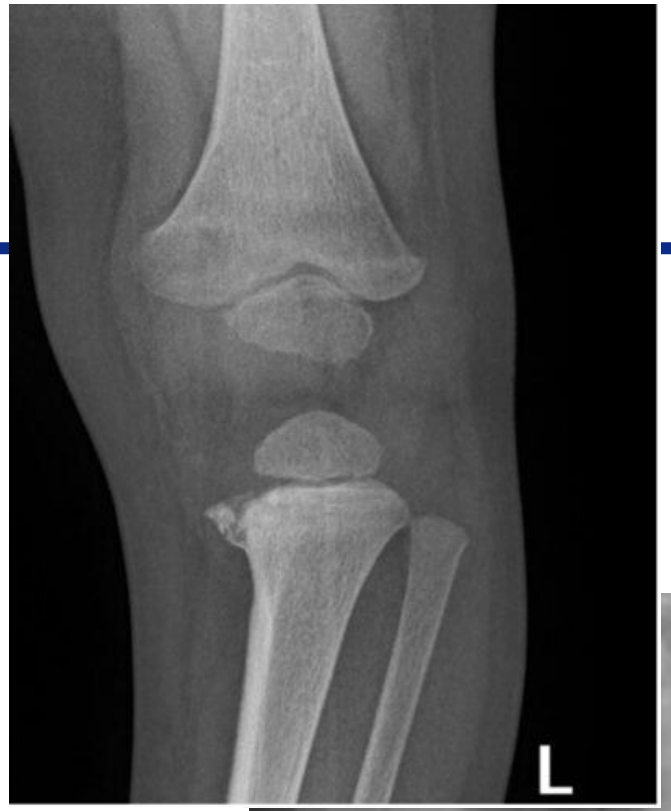


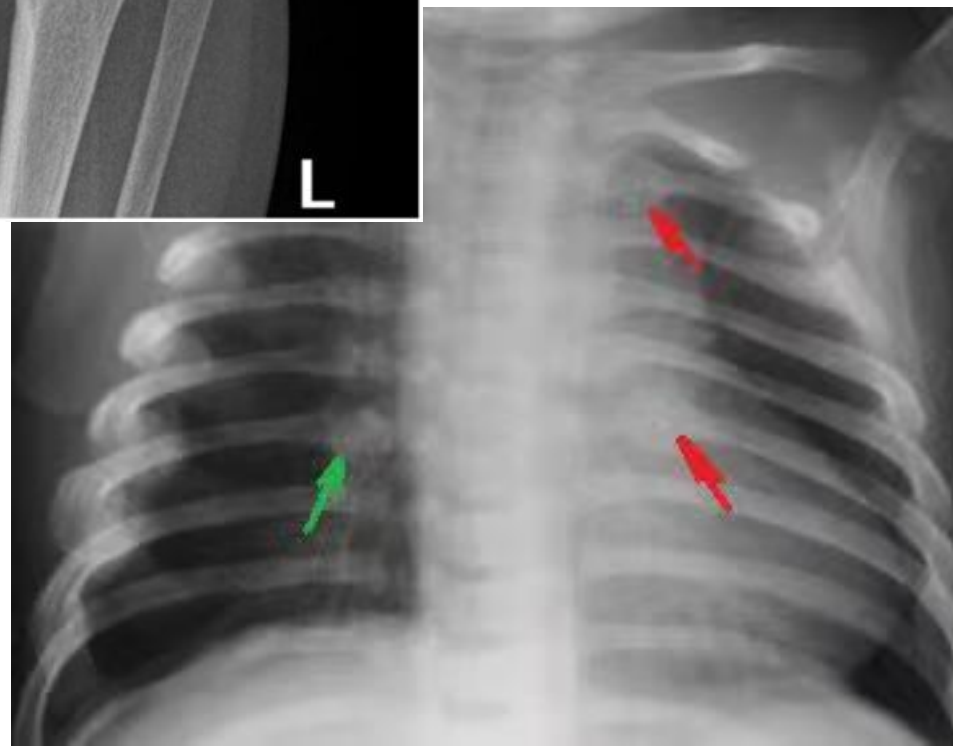
Bri ED Teaching

U.S. AIR FORCE

Abuse

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





U.S. AIR FORCE

Abuse – Non Accidental Trauma

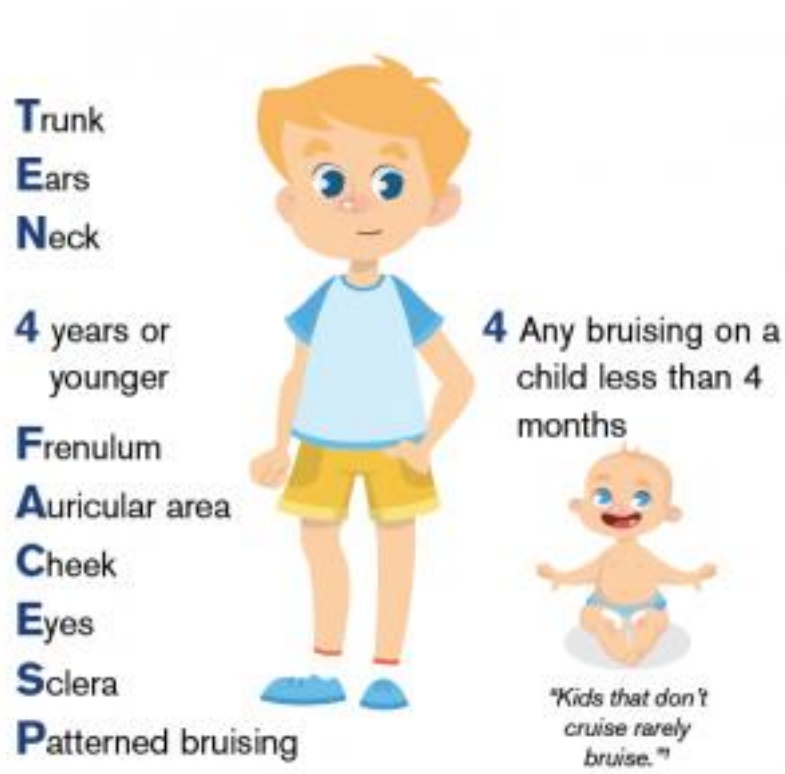
- Unusual location fractures:
  - Acromion, sternum, spinous processes
- Fractures of various ages
- History doesn't match injury
- Pediatric Pearls:
  - If they don't cruise, they don't bruise
  - Midshaft femur fracture in non-ambulatory child
- Elder Pearls:
  - Isolated ulnar shaft fractures - nightstick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

U.S. AIR FORCE

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]**



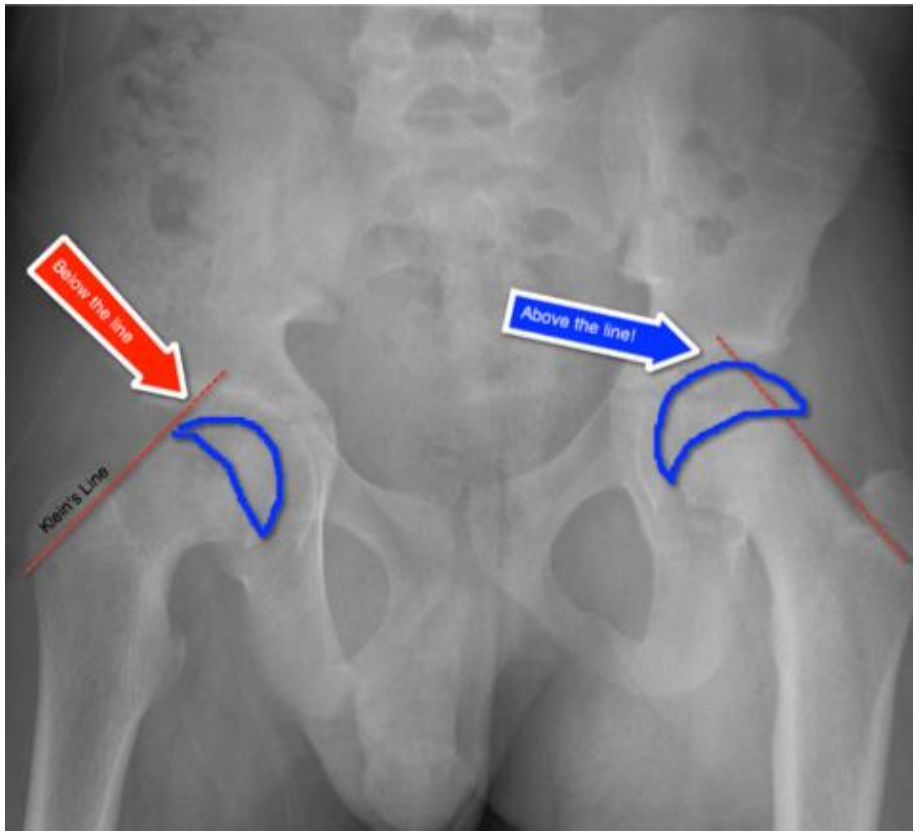
U.S. AIR FORCE

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 • Bruising in atypical distribution (on face, neck, ears, arms) • Ligature marks • Burns - cigarette pattern or hot water immersion • Multiple fractures in various stages of healing • Ocular hemorrhages • Intraoral trauma • Scalp hematomas or traumatic alopecia	• Unexplained sexually transmitted infections • Bruising/signs of trauma of genitals/inner thighs • Blood-stained undergarments • Difficulty walking/sitting	• Poor hygiene/dirty clothes • Pressure ulcers • Malnutrition/ dehydration • Unkempt fingernails • Poor oral hygiene • 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

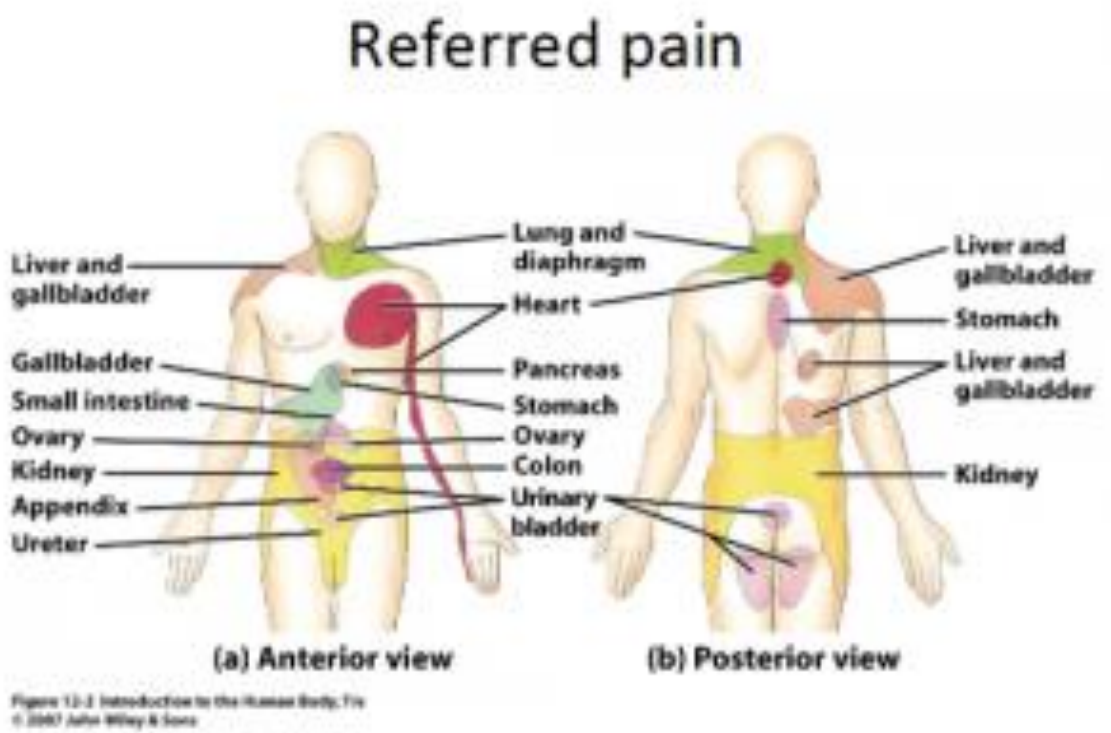


Referred Pain - Adult

- 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 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 Pearl: If clinical suspicion high, do stress views or CT scan

U.S. AIR FORCE

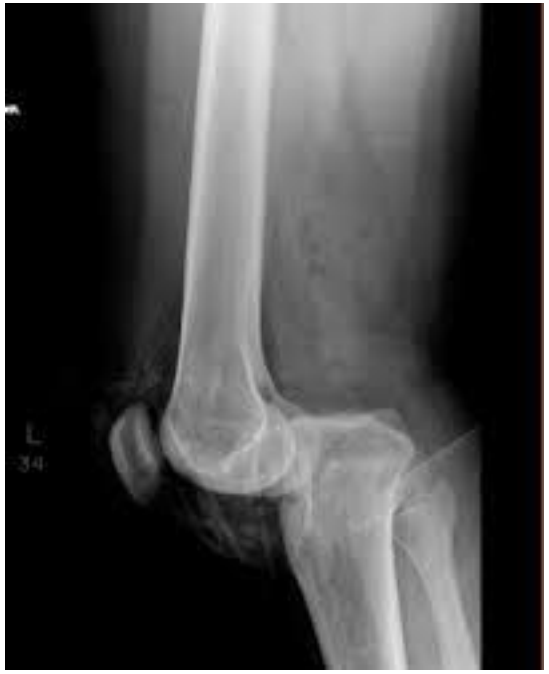
Report Wrong - Pearls for Primary Care

- 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

U.S. AIR FORCE

Dislocation/Subluxation

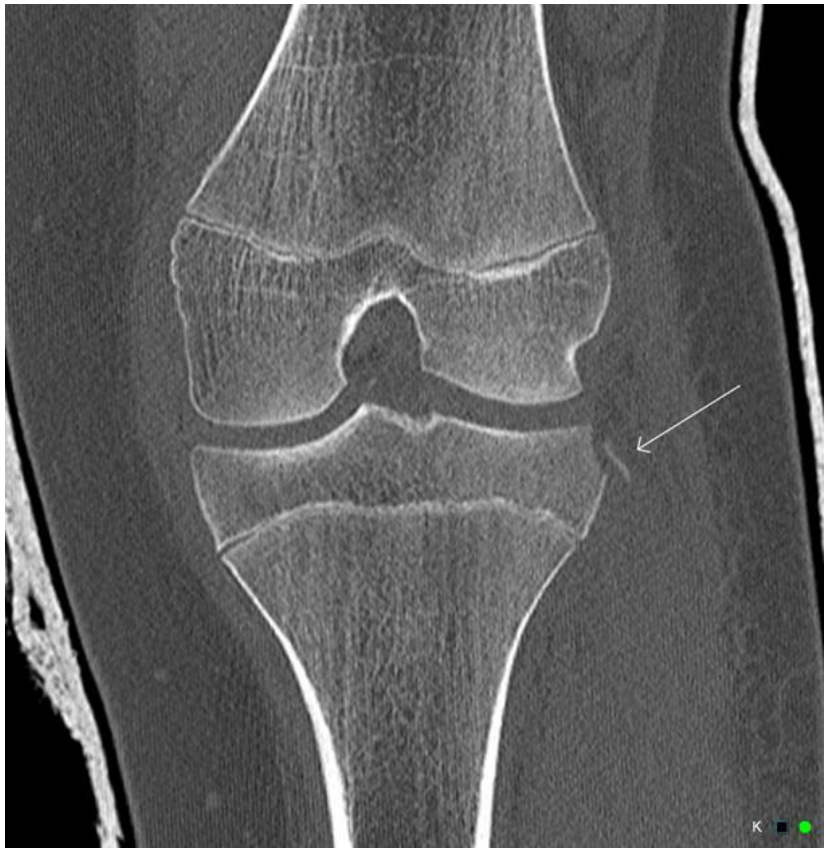
- 5 critical dislocations
  - Knee – true limb threat
  - Posterior shoulder
  - Pediatric elbow
  - Distal radial ulnar joint
  - Carpometacarpal



U.S. AIR FORCE

Dislocation - Knee

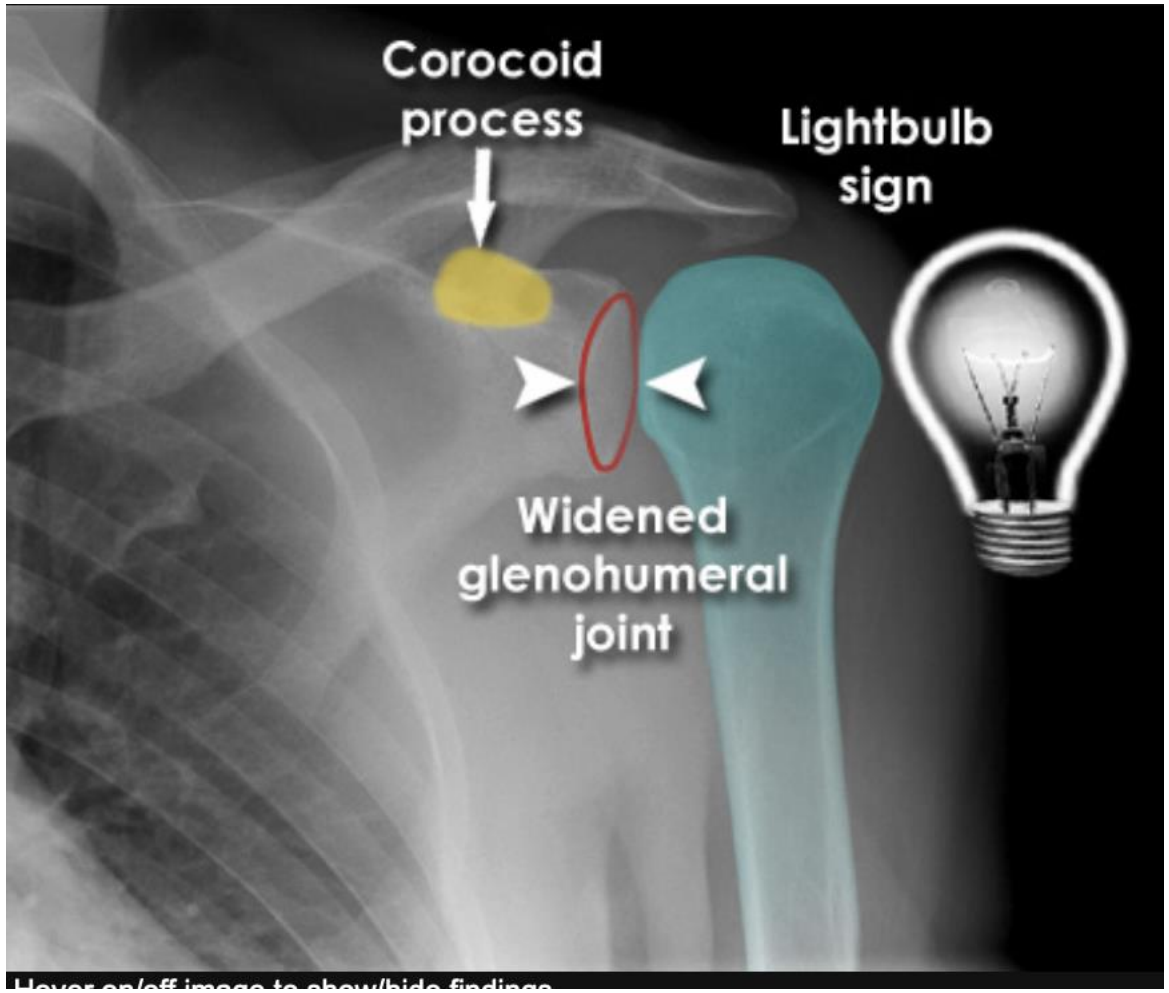
- Massive trauma
- 50% spontaneously reduce before getting to point of care
- Pearl: If highly unstable knee after high energy trauma or sports injury – ASSUME DISLOCATION → vascular evaluation



U.S. AIR FORCE

Dislocation – Shoulder (Posterior)

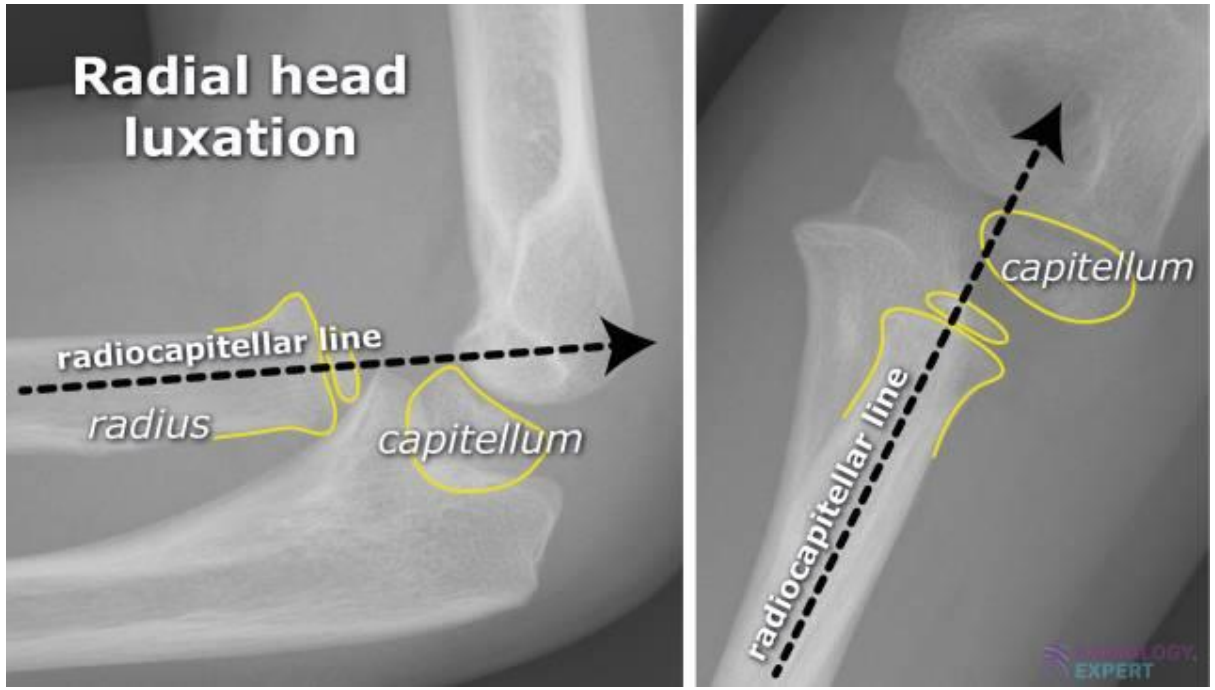
- Missed 50-80% of time
- Seizure or electric shock
- Standard AP xrays – look normal
- Lightbulb sign
- Vacant glenoid
- Pearl: Must get axillary or scapular Y view



U.S. AIR FORCE

Dislocation – Pediatric Elbow

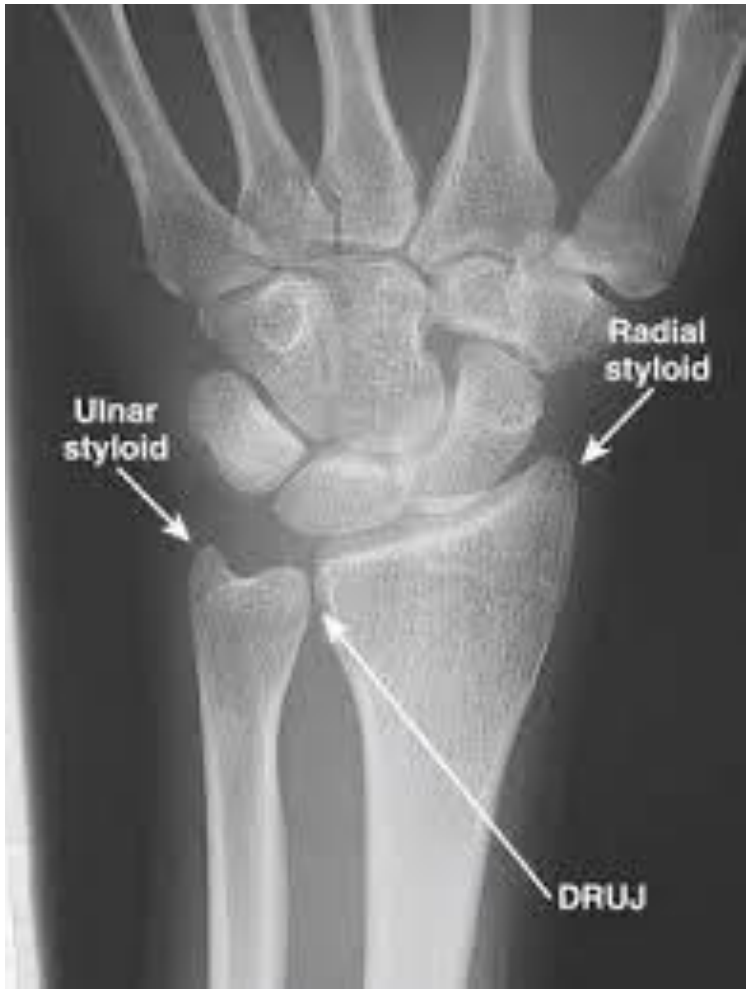
- If you draw a straight line through the center of the radius bone, it should intersect the capitellum
- Pearl: If it doesn't intersect the capitellum, the elbow is subluxed or dislocated
- Do vascular examination distal to elbow!



U.S. AIR FORCE

Dislocation - Wrist

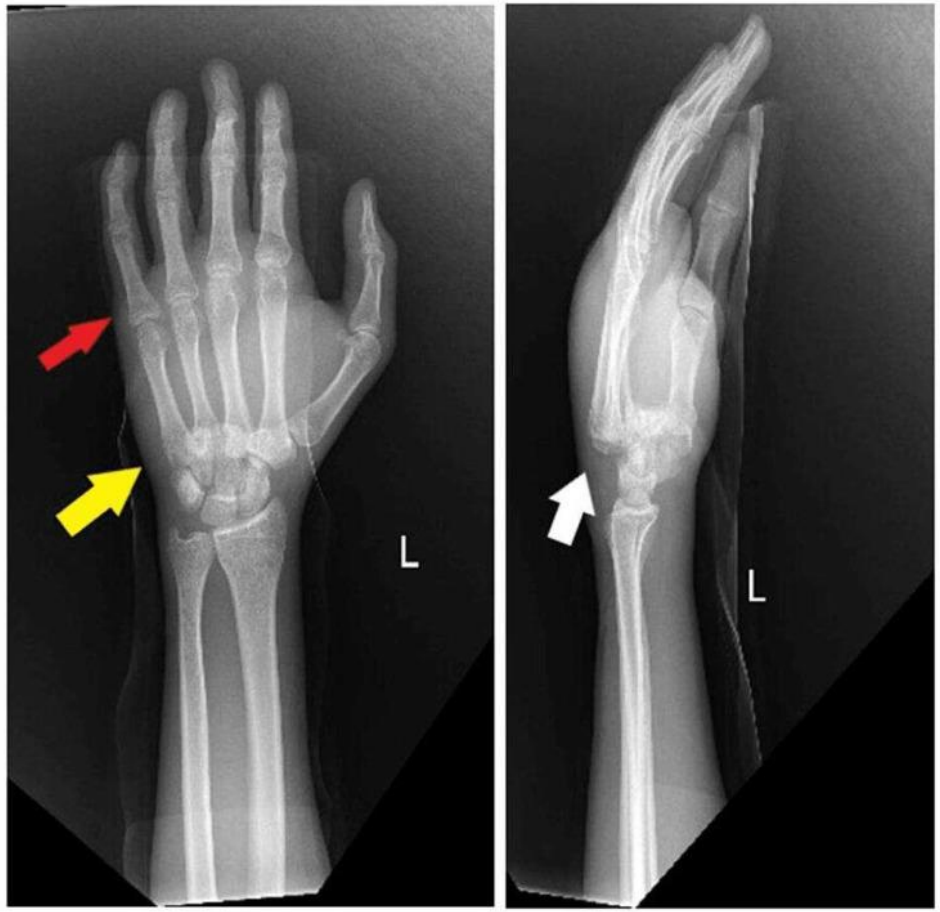
- Space between radius and ulna will be abnormally wide
- If missed – severe long term functional impairment
- Pearl: Always look at the DRUJ



U.S. AIR FORCE

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



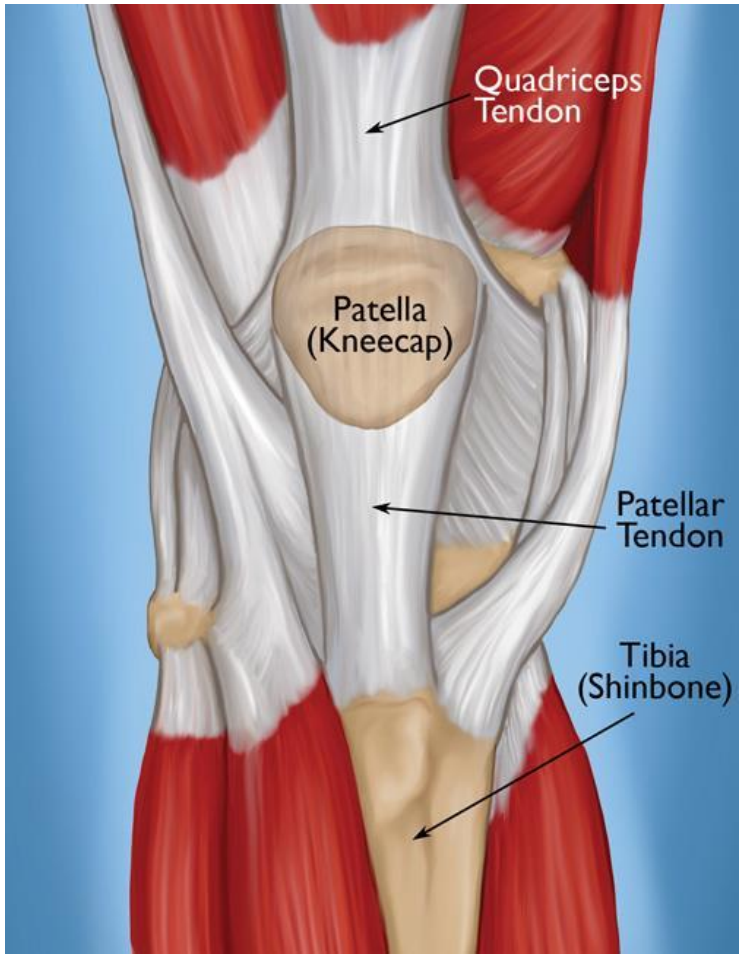
Operative Soft Tissue

- 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%

U.S. AIR FORCE

Operative Soft Tissue – Extensor Mechanism

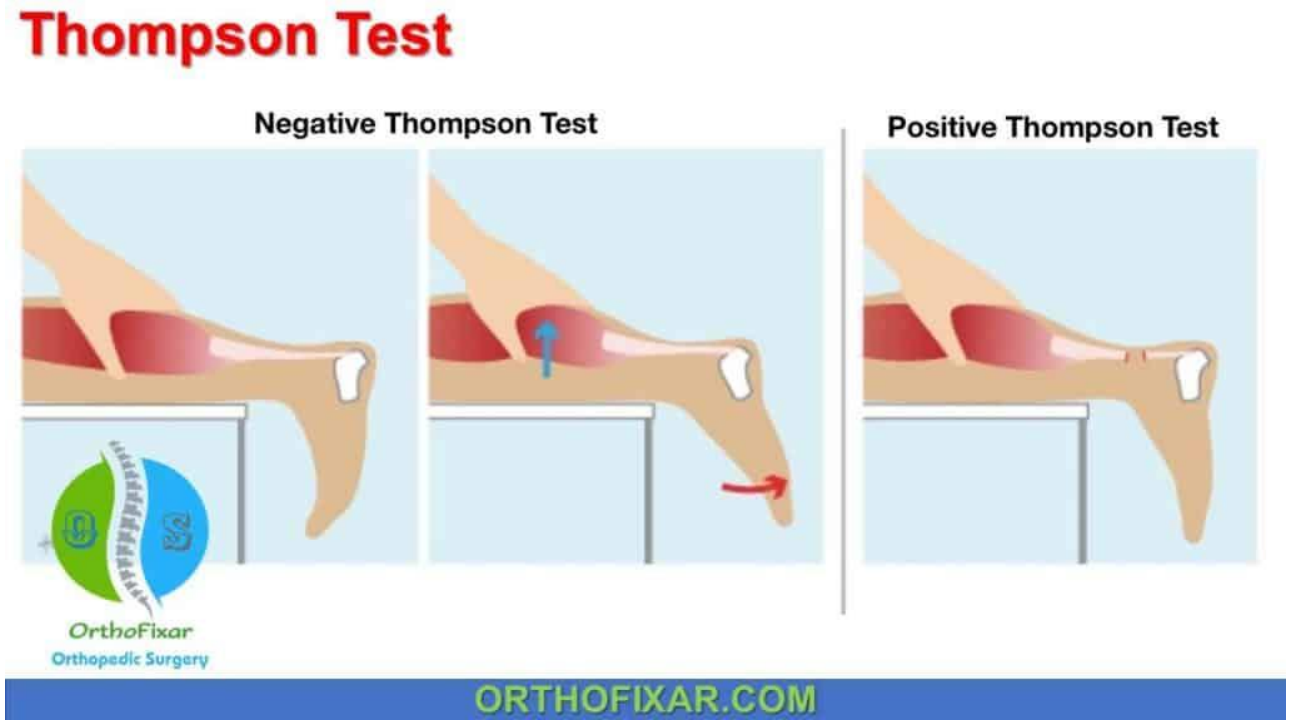
- Quad Tendon or Patellar Tendon
- Patient falls, knee swollen, xray negative = knee sprain
- Pearl: Must perform straight leg raise test! Can't lift heel off bed = extensor mechanism problem



U.S. AIR FORCE

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.

U.S. AIR FORCE

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

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

U.S. AIR FORCE

Questions?