Musculoskeletal

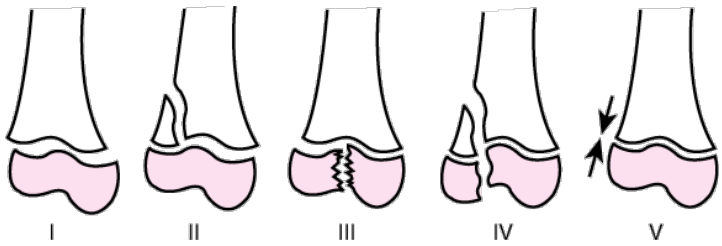
Basic Extremity Evaluation

- Age, hand dominance, and occupation
- Joint above and joint below (determine which x-rays to order; assess for occult injury which may be missed due to distracting, obvious injury)
- Sensory
- Motor
- Vascular
- Skin (open joint, open fracture, cortical violation issues) – need to document BEFORE you put a plaster/splint/cast on the person
- Compartments (evaluation for compartment syndrome and document “soft” if true)

Pediatric Specific Fractures

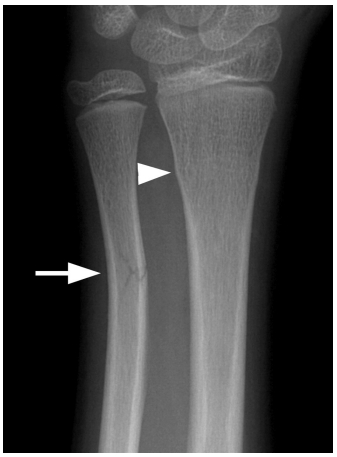
Salter-Harris Classification

- “SALTR” (slip, above, lower, through, ram)
- Epiphyseal plate is weak and can give way before the bone in an immature skeleton
- Potential for growth disturbance increases as you go up in the classification (very bad with LE injuries)
- SH II is the most common
- SH V rare (1-2%)
- SH V and I can have normal x-rays



Incomplete Fracture In Kids

- Torus or buckle fracture
- Greenstick fracture (one cortex) due to bowing and flex of immature bone
- Salter-Harris patterns
- (Thin arrow = greenstick fx, fat arrow = buckle fx)



Child Abuse Fractures

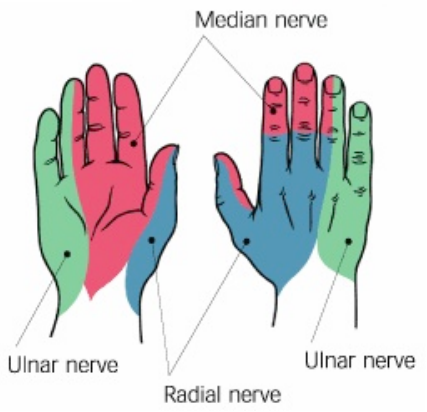
- Any long bone fracture age <1yo (do not have the force to break this bone when not ambulatory)
- “Bucket handle” metaphyseal “corner fracture”
- Posterior rib fractures
- Lateral/parietal skull fractures (highly suggestive of abuse)
- In History/PE: story inconsistent with injury, etc
- Mandatory reporting
- Child Protective Services involvement mandated

Upper Extremity

Radial, Ulnar And Median Nerves

- Sensory as shown below
- Motor
    - Extensors: radial nerve

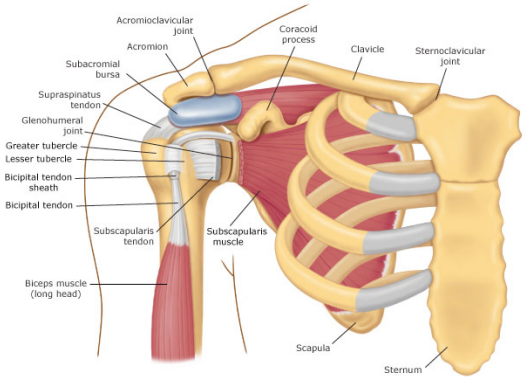
    - Intrinsic muscles: ulnar nerve
    - “Tea drinking” median nerve (pincer grasp, flexor at wrist/elbow, pronators)
- **Recurrent median nerve**: million-dollar nerve; easily injured; responsible for “**thumb OAF**” (opposition, abduction, flexion) and innervates the thenar eminence: **pure motor nerve**



The Shoulder And Humerus

Shoulder Anatomy

- Most mobile joint of body with a huge ROM = lots of dislocations
- Shallow glenoid = low bony stability
- Rotator cuff
    - SITS: supraspinatus, infraspinatus, and teres minor attach to the greater tuberosity of humerus, the last, subscapularis attaches to lesser tuberosity
- AC joint is vulnerable, especially to direct blow
- Soft tissues: capsule, labrum, bursa, and ligamentous are ALL important because of high mobility



Disorders Of The Shoulder

- Shoulder x-rays: AP, Lateral, Transcap, Y, IR, ER, AO views, axillary views

Adhesive Capsulitis (Frozen Shoulder)

- Formation of adhesions between the joint capsule and humeral head
- Stiffened glenohumeral joint with significant loss of ROM
- May follow injury or occur on its own
- Codman's exercises: swing arm in pendulum motion with light hand held weights for five minutes 1-2x/day

Rotator Cuff Injuries

- SITS muscles: supraspinatus tendon (most commonly injured), infraspinatus tendon, terres minor muscle, subscapularis muscle
- Associated with repetitive eccentric overload, glenohumeral instability and poor muscle strength
- Clinical Presentation: cannot ABduct and externally rotate arm; dull aching in the shoulder
- Imaging: x-ray to rule-out other disorders; MRI to diagnose tears
- Treatment: cease aggravating movements; NSAIDs; local steroid injections; physical therapy; arthroscopic decompression; surgical repair

Impingement Syndrome

- Source of chronic pain
- Humeral head impinges
- Pain on PASSIVE ROM with abduction

Thoracic Outlet Syndrome

- EAST/Adsons test (elevated arm stress test: one arm may become painful or

pale)

Upper Extremity DVT

- Paget-schroetter syndrome (see with weightlifters) or exertional DVT

Dislocations (see below)

- ANT 95%, POST 4%
- Luxatio erecta (forearm to forehead and can not lower the arm)

Proximal Humeral Fracture

- Neer classification - see below

Clavicle Fracture

- Usually caused by a fall on an outstretched hand (FOOSH)
- Most common fracture in children and adolescents
- Physical Exam and Work-up: visible deformity usually present; look for tenting of skin; look for brachial plexus injuries (sensory/reflex abnormalities, pain, weakness); AP x-ray to visualize fracture
- Treatment: children - figure-of-eight sling for 4-6 weeks; adults - sling for 6 weeks

AC Separation (I, II, III Degree)

- Tearing of the acromioclavicular and/or coracoclavicular ligaments
- Usually caused by fall/impact to end of shoulder
- Clinical Presentation: may have obvious step off at AC joint
- Imaging: AP view of shoulder usually adequate; for subtle separations stress films may be indicated
- Treatment: mild to moderate separation - sling and analgesia; moderate to severe separation - surgical repair

Calcific Tendonitis

- MRI or special views to evaluate

Shoulder Dislocations

- Anterior (sub-glenoid) is the most common
    - Associated with greater tuberosity fracture AND proximal humeral fracture
    - Common in QB position, paddlers, rebounders, etc
- Posterior dislocations (seizure, ECT, lightning)
    - Posterior: difficult to identify on x-ray

- Thorough neurovascular evaluation must be done before reduction attempt!
    - Rule out injury to axillary nerve, musculocutaneous nerve, brachial plexus or axillary artery
- Imaging: AP x-ray and “Y” view
    - Hill-Sachs lesion: humeral head deformity found in recurrent dislocations
    - Bankart’s lesion: tear of glenoid labrium (seen on MRI)
- Treatment: reduction and immobilization
    - Post-reduction films must be obtained; post-reduction neurovascular exam must be documented
    - Immobilize x 3 weeks for patients < 40yo and 1 week for patients > 40yo then begin physical therapy

Humerus Fractures

Humeral Head Fractures

- Common in older adults with osteoporosis; most common in females
- Rule out injuries to brachial plexus and/or axillary artery!
- Imaging: AP, lateral and “Y” views
    - Neer classification system: based on whether one of the four major anatomical components of the proximal humerus is displaced (4 components: the anatomical neck, the surgical neck, the greater tuberosity, and the lesser tuberosity)
- Treatment: closed reduction with sling for non-displaced fractures; early mobilization with pendulum exercises to prevent frozen shoulder
    - ORIF for displaced fractures

Humeral Shaft Fractures

- Mechanism of injury: MVA, FOOSH, penetrating injuries (GSW)
    - Mechanism of injury dictates amount of comminution and soft tissue damage
- Spiral groove
- Rule out radial nerve injury! (wrist drop)
- Imaging: AP and lateral view with elbow and shoulder
- Treatment: sling alone or coaptation splint (may be followed by hanging cast or operative repair)

Distal Humerus Fractures (Supracondylar Humerus Fracture - SCHFx)

- Mechanism of injury: FOOSH with hyperextension of elbow
    - Common in children (may be occult)

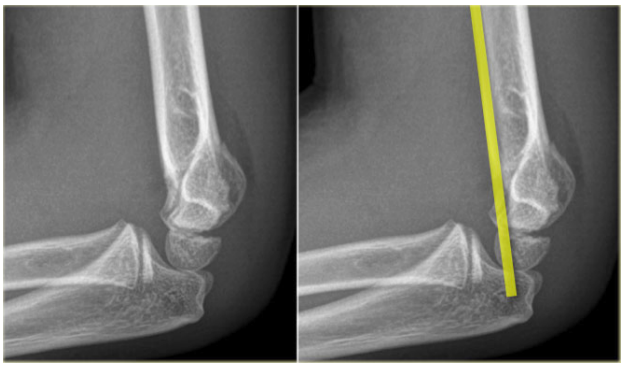
- Must rule out brachial artery injury! (do full neurovascular exam)
- Imaging: AP and lateral x-ray
- Treatment: closed reduction with posterior splint for children, ORIF for adults
- SCHFx grade III: admit for vascular checks

The Elbow

Fractures And Dislocation

General

- Imaging: look for fat pads and anterior humeral line (see image below)
    - Posterior fat pad is ALWAYS ABNORMAL



Anterior humeral line does NOT line up appropriately (should intersect the fist 1/3 of the capitellum)

Radial Head Fractures

- Mechanism of injury: FOOSH
- Most common elbow fracture in adults
- Clinical Presentation: tenderness to palpation of lateral elbow; pain worsens with forearm rotation
- Imaging: AP and lateral x-ray of elbow; fracture may be occult in adults so look for elevated anterior and posterior fat pads (sail sign) suggesting hemarthrosis (may be only evidence of occult fracture)
- Treatment: depends on type of fracture; NSAIDs/analgesia, ice for all
    - Non-displaced fracture with full ROM: sling +/- posterior splint x 24-48 hours with early range of motion exercise
    - Displaced or complex fractures: posterior splint and sling with rapid

orthopedic referral

Other

- Elbow dislocation: POST > ANT (associated with coronoid process fracture)
    - Elbow dislocation: consider angio!
- Coronoid process fracture: common with dislocation
- Trochlear fractures: surgical repair
- Students Elbow (traumatic olecranon bursitis)

Epicondylitis

Lateral = Tennis Elbow

- Most common overuse injury of the elbow; most commonly in 4th decade of life
- Clinical Presentation: lateral elbow pain, exacerbated by repetitive movements; pain with resisted wrist **extension** with the elbow in full extension; pain with passive terminal wrist **flexion** with the elbow in full extension
- Treatment: stop aggravating activity for 6 weeks; braces; physical therapy; steroid injections for short-term relief; NSAIDs/analgesia; surgery if all else fails

Medial = Golfer's Elbow (Little League Elbow)

- History of repetitive stress
- Clinical Presentation: tenderness over medial epicondyle; pain with resisted wrist **flexion** with the elbow in full extension; pain with passive terminal wrist **extension** with the elbow in full extension
- Treatment: RICE, NSAIDs, stop aggravating activity, physical therapy, braces

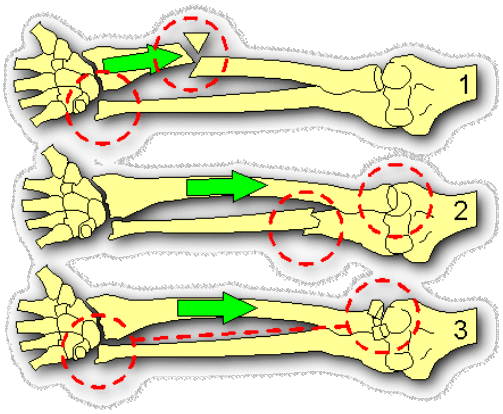
Nursemaid's Elbow

- Clinical diagnosis: no films
- Radius jumps annular ligament
- Radial line misses capitellum if you did get a film
- Age 2-5
- Yank or pulling injury
- Reduction: supination + pronation OR extension + "rocking" → click felt under your thumb
- Most patients will move elbow spontaneously by 30 min post reduction

The Forearm And Wrist

The Forearm

- The forearm is a ring made by joint capsules, IOM (intraosseous membrane), ligaments and triangular fibrocartilage complex (TFCC)
    - Hard to break a ring in one place → both bones fracture (check joint above and joint below)
- Galleazi fracture (#1 below): radius fracture with distal radius ulnar joint (DRUJ) injury; requires ORIF
- Monteggia fracture (#2): ulnar fracture with radial head dislocation; requires ORIF
- Essex-Lopresti fracture (#3): crush to radial head with DRUJ dislocation; ORIF
- Mnemonic for 1 and 2: GRUM



Nightstick Fracture

- Exception to the ring rule
- Direct blow to mid-shaft ulna (resulting in a mid-shaft ulna fracture)
- Does NOT disrupt joint on either side
- Treatment: Ace wrap + analgesia
- Don't' miss a Monteggia!

Distal Radius Fracture

- Very common due to FOOSH
- Median nerve injuries DO occur
- **Colles' fracture**: distal radius fracture with dorsal angulation; +/- ulnar styloid; dinner fork deformity

- Barton's fracture
- Smith's fracture: reverse Barton's
- Chauffers fracture: radial styloid
- Closed reduction in some, ORIF in others, be alert for INTRA-articular components

The Wrist

- **Triquetral Fractures**: dorsal chip fracture due to FOOSH
- **Hook of Hamate**: order carpal tunnel view
- **Scaphoid Fracture**: most commonly fractured carpal bone
    - High risk for avascular necrosis or nonunion due to poor blood supply to proximal pole of scaphoid
    - Clinical Features: snuff box tenderness; axial load; tubercle tender
    - Imaging: AP, lateral and scaphoid views; often occult, even with 6 view of wrist
    - Treatment: long-arm thumb spica cast if displaced, short-arm thumb spica if non-displaced and referral to orthopedist (displacement of 1mm or greater requires ORIF); if initial x-ray is negative but high clinical suspicion for fracture then cast and refer to ortho
- **Scapholunate Dissociation**: Terry Thomas (David Letterman) sign (>3mm with TTP)
- Guyon's canal (ulnar nerve) and "handle bar neuropathy"
- All other wrist bone fractures are more rare

The Hand

Metacarpals

- Rotational deformities MUST be identified and fixed
- Acceptable angulation (10-20-30-40 degrees, index to small respectively)
- Spiral injuries need fixation
- **Boxer's fracture**: fracture 5th metacarpal neck
    - Assess for puncture wound requiring antibiotic treatment if fracture caused by a punch to the mouth
    - Angulation of 30-40 degrees should be reduced → ulnar splint placed
- Clenched fist injury: open MCP joint (washout + antibiotics)

Key Finger Diagnoses

Jersey Finger

- Rupture of the flexor digitorum profundus tendon
- DIP joint forcefully hyperextended
- Clinical Features: acute pain and swelling over the volar DIP joint and distal phalanx; inability to actively flex the DIP joint
- Treatment: aluminum splint in slight flexion

Boutonniere's Deformity

- Central slip extensor tendon avulsion

Mallet Finger

- DIP extensor tendon
- Clinical Features: inability to extend the DIP joint fully → flexed DIP at rest
- May have avulsion fracture

Tuft Fracture

- Fracture of distal phalanx
- Lacerations of nail bed are possible

Bull Rider's Thumb

- Tear or sprain of radial collateral ligament (RCL)

Gamekeepers Thumb

- Tear or sprain of ulnar collateral ligament (UCL)
- Clinical Features: weakness of pinch
- Treatment: partial rupture treated with thumb spica cast; total rupture requires surgical repair

Flexor Tenosynovitis

- **Kanaval's signs** (FTS: flexor tendon sheath)
    - Fusiform soft tissue swelling
    - Hand held in flexion (roomier FTS compartment)
    - Severe pain on passive extension
    - Pain on palpation of proximal FTS (palm or wrist as shown)

    - Erythema is NOT one of the signs although often present *(test question)
- **X-rays are negative**
- Treatment: surgical intervention and antibiotic therapy

Work-Related Cumulative Trauma

De Quervain's Tenosynovitis

- Entrapment tendonitis/tenosynovitis of the abductor pollicis longus and extensor pollicis brevis tendons at the styloid process of the radius
- Clinical Features: (+) Finkelstein test
- Treatment: steroid injection (first extensor compartment)

Trigger Finger

- Noninfectious inflammation of the flexor tendon sheath
- Catch tendon on A or C pulley, causing the finger to lock in flexion
- Diabetics predisposed to trigger finger
- Treatment: acutely with ice, rest, immobilization, steroid injection

Carpal Tunnel Syndrome

- Compression of median nerve as it travels through carpal tunnel
- Associated with repetitive wrist flexion/extension and specific diseases: diabetes, HYPOthyroid, pregnancy
- Clinical Features: most commonly - pain and/or parasthesia along median nerve distribution (the first three digits and the radial half of the fourth digit); night pain; later in disease process - clumsiness, weakness, thenar atrophy
- Exam: Tinel's (tingling when tap volar aspect of wrist), Phalen's (inverted prayer >1 min), and Median nerve compression test may be positive
- Treatment: activity modification, NSAIDs, volar wrist splint; steroid injections; surgical decompression

Ulnar Neuropathy at Guyon's Canal

- Jack hammer or chain saw vibration

High-pressure Injection Injury

- Paint gun or grease gun
- Puncture wound can look innocuous
- Extensive deep tracking → surgical debridement required FAR BEYOND initial presentation

- Radiographs may show paint or grease proximally
- Emergent ORTHO consult

Compartment Syndrome

- The 5 Ps: **PAIN (first),** paresthesias, pallor, paralysis, **pulseless (late)**
- Muscle compartment pressure (P) > MAP = ischemia
- High risk
    - Both bones fracture in pediatrics
    - Supracondylar humeral fracture in PEDIATRICS (pseudo-compartment resulting in Volkmann's ischemia/contracture)
    - Tib-fib fracture in ADULTS (anterior is most common)
- Cast syndrome: swelling in cast can cause compartment syndrome → cast checks!

Back/Spine

Spine Anatomy

- C1-C7 (cervical)
- T1-T12 (thoracic)
- L1-L5 (lumbar)
- Sacrum
- Coccyx
- Nerves exit at each level (susceptible to impingement)

Mechanical Low Back Pain

- **Search for RED FLAGS**
    - Trauma, fever, surgery, focal neuro deficits, HIV, TB, CA (or symptoms of: weight loss, etc), age >55, symptom duration >4weeks
- No red flags → no x-rays; pain control; activity as tolerated (NO bed rest only)
    - Minimize time off work with light duty and get active ASAP (back rehabilitation exercises)
    - Do NOT over medicate (short course is the key)
- Most LBP is self limited, avoid excess work-up
- Sciatica: pain in the distribution of the sciatic nerve → buttock, posterior thigh, lateral malleolus to dorsum of foot and entire sole

- **If RED FLAGS → begin work-up: start with plain films, +/- labs**

Ankylosing Spondylitis

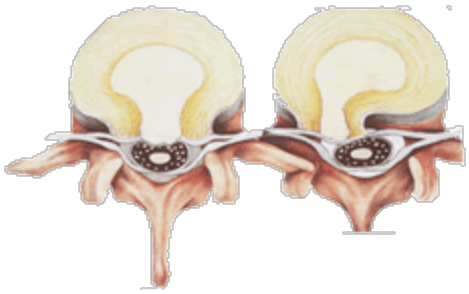
- HLA-B27 genetics; spondyloarthropathy
- 3rd - 4th decade of life; men > women
- Onset of back pain, stiffness and hip pain; sacroiliitis at the start
- AM stiffness, better later (the opposite of mechanical LBP)
- Iritis in 25%
- Imaging: BAMBOO spine
- Decreasing ROM as disease progresses → fusion of vertebrae
- Treatment: physical therapy, NSAIDs

Cauda Equina

- Compression of lower cord in the “horse’s tail” section
- Etiologies
    - Herniated central disc (most common cause) = herniated nucleus pulposus
    - Also cancer, DJD, AS
- Clinical Features
    - Bowel/bladder dysfunction
    - Sexual dysfunction
    - Saddle anesthesia
    - Severe LBP with BILATERAL symptoms (unlike sciatica)
- Diagnosis: post-void residual (more sensitive)
- Treatment: surgical emergency

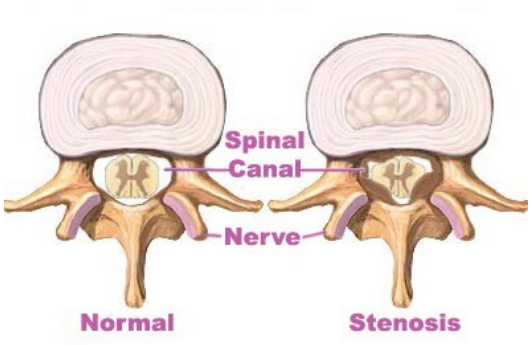
Herniated Disc

- Unilateral pain and radiation in most cases
- Disc level determines symptom location
- HNP = herniated nucleus pulposus
- Plain films are NEGATIVE
- CT or MRI are much better



Spinal Stenosis

- Nerve compression resulting from narrowing of spinal canal or neural foramina
- Symptomatic in late middle age; men > women
- Chronic debilitating process
- Cervical or lumbar spine usually affected
    - Lumbar more commonly; cervical more serious
- Clinical Features: neurogenic claudication (symptoms/pain exacerbated with walking, standing, and/or maintaining certain postures, and relieved with sitting or lying)
    - Check for muscle wasting, myelopathy
- Imaging: MRI, CT myelography and plain CT
- Treatment: conservative → PT before surgery, which does not always help
    - Surgery reserved for MOTOR symptom progression and myelopathy



Scoliosis And Kyphosis: Curvatures Of The Spine

Scoliosis

- Lateral curvature of the spine (side-to-side curve)
- Congenital (most), neuromuscular, degenerative, idiopathic
    - Idiopathic adolescent scoliosis is common, especially in girls between

onset of puberty and cessation of spinal growth

- Clinical Features: asymmetry in height of shoulders and iliac crests; asymmetric scapular prominence; flank crease with forward bending
- Imaging: standing AP x-rays of spine
- Treatment: curves 20 degrees or greater are referred to orthopedist for management

Kyphosis

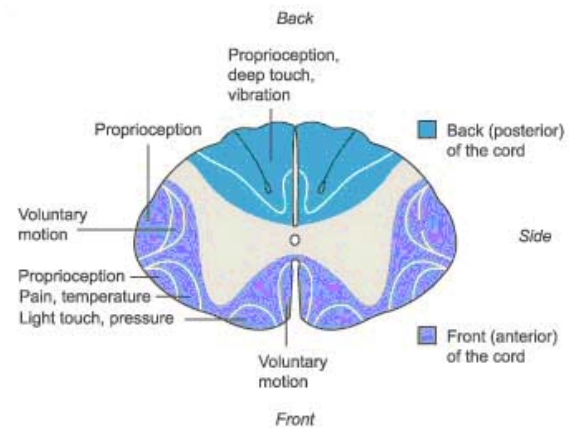
- Excessive forward curvature of the thoracic spine
- Often in elderly
- Juvenile kyphosis (Scheuermann's disease): idiopathic
- Pott's disease: progressive kyphosis caused by tuberculosis of the spine

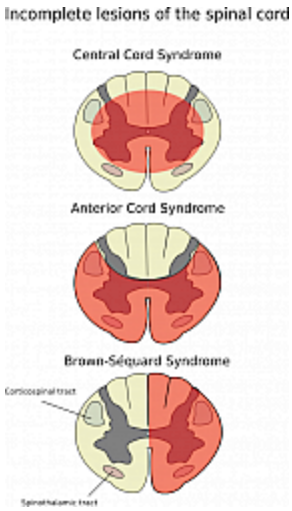
Cervical Spine Fractures

- Mnemonic that encompasses 95% of unstable c-spine fractures: "**J**efferson **B**it **A** **H**angman's **T**it"
    - **J**efferson - burst fracture of C1
    - **B**it - bifacet dislocation/fracture
    - **A** - any fracture dislocation
    - **H**angman's - middle and post column of C2
    - **T**it - teardrop fracture, usually flexion

Cord Syndromes

- Central cord: elderly, frail; pinch cord with thick ligament; UE weakness > LE
- Anterior cord: pain and temp out; vibration/proprioception in
- Posterior column: syphilis, B vitamin deficiency, (not trauma); proprioception is out
- Brown-Sequard: penetrating trauma usually with ipsilateral motor and contralateral sensory loss
- Cauda equina: see above





The HIP

- Stable joint: deep ball and socket joint with a thick capsule surrounded by heavy muscle anterior and posterior
    - Often posterior column needs to be fractured to dislocate the hip
- SOCKET: acetabulum
- BALL: femoral head

SCFE (Slipped Capital Femoral Epiphyses)

- Weight causes epiphyseal plate failure resulting in displacement of the femoral head
- Age 12-14yo; boys > girls
- Obese, young males who may present with hip/knee pain/limp
- Imaging: x-ray shows displacement of the epiphysis; best views are frog-leg lateral pelvis and lateral hip

- Treatment: surgical pinning; crutches and non-weight bearing before and after surgery

Legg-Calve-Perthes (LCP)

- LCP = AVN (avascular necrosis) in pediatrics
- Peak age 4-8yo
- Moth eaten joint
- Clinical Features: persistent pain and muscle spasm; limp; loss of hip ROM
- Treatment: NSAIDs and abduction braces

Avascular Necrosis (AVN) Of The Hip

- Loss of blood supply results in joint surface decay and femoral head collapse
- Causes: steroids, injury/dislocation, sickle cell disease, ETOH abuse, pancreatitis, RA, history of trauma, radiation therapy
- Clinical Features: chronic limp with hip/groin pain; pain may radiate to the knee; loss of ROM
- Imaging: MRI for early detection
- Treatment: protected weight bearing; surgery (may result in eventual TOTAL hip replacement)

Pelvic Fractures

Stable Fractures

- Stable avulsion apophyseal fractures
- Stable 1 ring fractures

Unstable Fractures

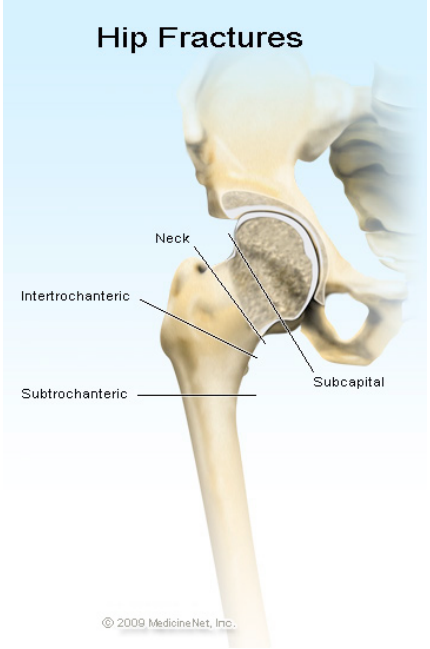
- Unstable fractures are life-threatening injuries
- Ex: Malgaigne's, open book fracture
- 1,000cc – 2,000cc of blood loss
- Most bleeding is VENOUS and is posterior/retroperitoneal
- Treatment: pelvic binders OR surgery OR angio
    - Remember: resuscitate, type and cross, stop the bleeding

Developmental Dysplasia of the Hip

- Leg length discrepancy
- DDH is part of infant screening
- Family history may exist
- Barlow test, Ortolani test to evaluate
- If identified, treatment includes a Pavlik brace (or Abduction braces)

Hip Fractures

- Neck: elderly females
- Intertrochanteric fracture (between the greater and lesser trochanter): most common
- Subtrochanteric: high forces (MVC)
- Treatment: surgical
    - Repair can be quick, 2-3 screws if non-displaced neck or require ORIF if displaced or more serious
- **Occult fractures of hip: 4%** (important to have a high suspicion and a low threshold to get a more advanced form of imaging for evaluation)
- If needed: CT or MRI (better)
- **Comorbidities require admission to internal medicine** for elderly patients with neck fracture



Elderly and Hip Fractures

- Osteoporosis

- Pathologic fractures (CA and mets)
- Uneven floor surfaces and bad footwear/vision
- Medications: sedatives/hypnotics, pain meds, psych meds
- CV disease and syncope related falls
- Many have a high mortality given age going into surgery

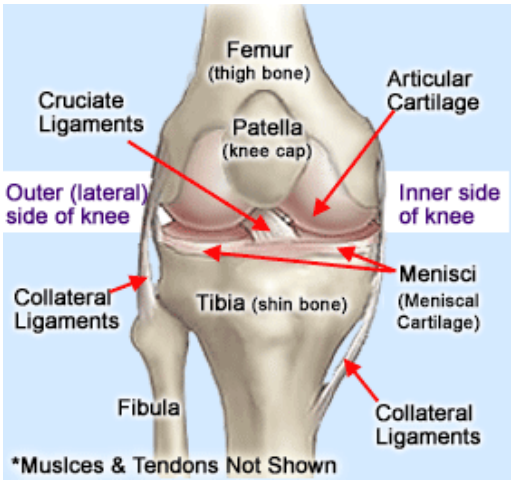
Hip Dislocations

- **90% posterior**
- Typical position: internal rotation and flexed
- Knee versus dashboard +/- patella fracture
- Other major trauma mechanism
- Relocate ASAP to avoid AVN
- Posterior column fractures common
- Procedural sedation required

Femur Fractures

- Mechanism of injury involves high forces
- 3 zones of injury: midshaft, femoral, condyles
    - Mid-shaft fracture is most common
- May bleed 1500cc (T&C)
- Compartment syndromes are rare unless coagulopathy involved
- Supra condylar fracture (type A is extra-articular, B is unicondylar, C is bicondylar intra-articular)

The KNEE



- Note: popliteal artery behind the knee (prone to vascular injury with knee dislocations)
- Knee not well defined for bipedal locomotion (has to bear tremendous weight and force – muscles and tissue around the knee have a huge responsibility for support at knee, making it a very vulnerable joint with any trauma).

Important Elements of the Knee H&P

- Acute onset of pain within 72 hours of injury
- Audible “pop” and immediate swelling with twisting or forced hyperextension
- Direct blow to anterior tibia, forced hyperextension, or axial load
- Direct blow to the medial or lateral aspect of the knee
- Varus or valgus stress to knee
- Twisting injury – painful popping/catching, delayed swelling
- Direct blow to patella or hyperflexion
- Prior knee surgery

Ottawa Knee Rule

General

- Less useful than Ottawa Ankle Rule (both designed to limit x-ray use)
- Ligamentous injuries of the knee do matter, so fractures are not the only concern
- Might save films in minor injuries
- Testable information about “conserving healthcare resources”
- Asks you to make clinical decisions and to do a good exam (the most important part of using it)

Ottawa Knee Rule - acute pain/injury

- Age >/= 55
- Isolated patellar tenderness
- Tenderness at head of fibula
- Inability to flex knee 90 degrees
- Inability to bear weight (4 steps) immediately after injury and in emergency department

Key Knee Diagnoses

- **Patellar Tendon Rupture**: risk factors - patella alta, fluoroquinolones, steroids
- **Aserine Bursitis**: distal to joint where sartorius muscle inserts distally at tibia (2/2 trauma/gout)
- **Gout**: crystals in WBC (needles with negative birefringence)
- **Pseudo Gout:** calcium pyrophosphate deposition in joint AKA chondrocalcinosis; rhomboid crystals with positive birefringence
- **Fullness behind the knee:**
    - **Baker's Cyst** +/- rupture (seen on US)
    - **DVT** (diagnosed by US)
    - **Tennis Leg**: ruptured medial head gastrocnemius behind the knee
- **Osgood-Schlatter Disease**
    - Tibial tuberosity apophysitis due to trauma or overuse
    - Males > females; age of onset 8-15yo
    - Clinical Features: anterior knee pain; localized tenderness and swelling over tibial tubercle; pain with activity, relieved with rest
    - Treatment: cease offending activity for several months; stretch, ice, NSAIDs after exercise

Meniscus Injury

- Mechanism of injury: excessive rotational force of femur on the tibia
    - Medial meniscus most commonly injured
- Clinical Features/Exam: joint line tenderness; patient reports clicking/locking, sensation of knee giving way
    - May have effusion acutely or after several hours
    - Appley's Grind Test, McMurray's Test
- Imaging: MRI
    - Exam > MRI for lateral meniscus
- Treatment

- Conservative: RICE, NSAIDs, quad strengthening exercises, activity mod
- If fail conservative therapy, arthroscopic repair is possible

Cruciate Ligament Injuries

- Anterior cruciate ligament (ACL) most commonly injured
- MOI: pivoting motion while running, jumping or performing cutting exercises
- Clinical Features/Exam: audible “pop”; sensation of knee instability
  - Hemarthrosis
  - Lachman’s test, anterior drawer test
- Imaging: x-ray to rule-out associated fracture; MRI
- Treatment: bracing, physical therapy; surgical repair

Tibial Plateau Fracture

- High forces involved in mechanism of injury
  - Auto vs pedestrian is classic (bumper into knee)
- Imaging: x-ray can be tricky, get plateau views or obliques
  - Once known, CT is becoming standard to describe fracture pre-op
- Treatment: ORIF is virtually always needed
- Note: worry about the popliteal artery

Dislocated Patella

- A **MINOR** issue
- Usually relocates easily (extend)
- Happens in people with “lax” joints with minor trauma

Knee Dislocation

- Dislocated knees are **MAJOR**
- Vascular injuries are common
- Some CTA all dislocated knees to r/o **popliteal artery injury**
- Most spontaneously relocate
- Bi-cruciate ligament instability means a dislocated knee

Open Knee

- Laceration near joint
- Fat oozing from wound (fracture)
- Air in the joint on plain film
- Saline arthrogram OR methylene blue arthrogram (use adequate volume) to assess
- If “open”: ABX and ORTHO consultation indicated
- Standard is to wash it out in the OR to prevent pyoarthrosis
- Bad patella fractures require ORIF due to distraction, failure of extensor, and joint violation

Nerve Injury At The Knee

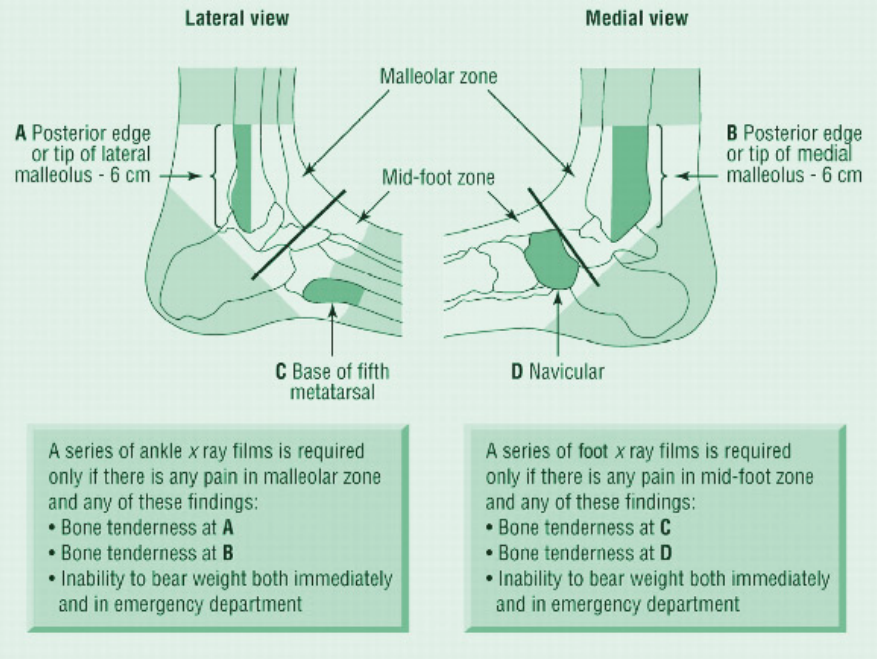
- Lacerations and proximal fibular fractures (and plateau fractures)
- Even blunt force trauma with contusions
- Common peroneal nerve injury OR any of the three branches
- **Deep peroneal nerve: dorsiflexors and sensory to 1st web space (foot drop)**

The Ankle And Foot

Ankle Sprain/Strain

Ottawa Ankle Rules

- Must do the physical exam correctly or the rules will fail
- Unable to bear weight (4 steps) + exam criteria below (see diagram)



Sprain/Strain

- Usually lateral ligaments
- Clinical Features/Exam: may hear audible “pop” at time of injury; ecchymosis and tenderness; anterior drawer test to assess stability of ankle joint
- When no x-ray indicated per Ottawa ankle rules, manage symptomatically: RICE, crutches, splint or Cam-walker as needed
- Strengthen ankle before re-injury
- Wear appropriate shoes and sneakers WITH ankle support

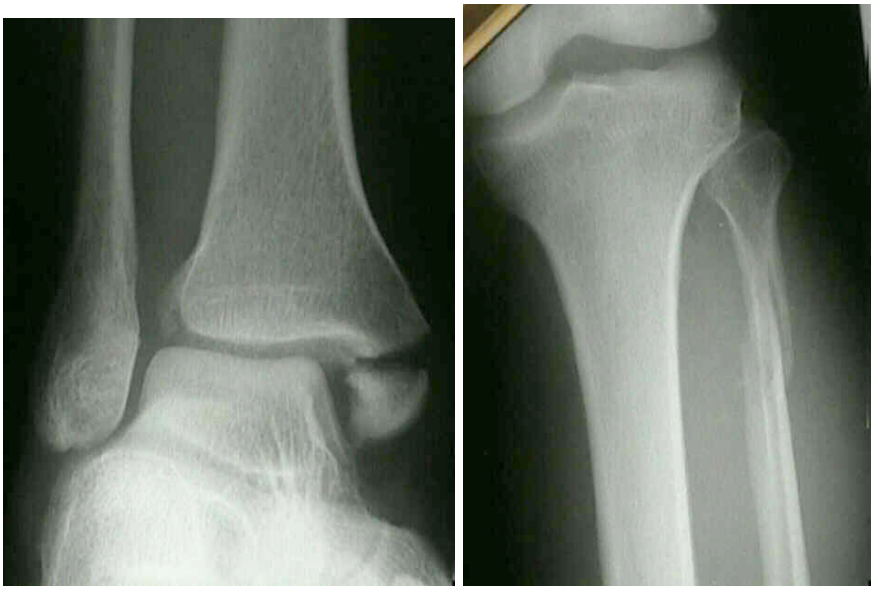
Snowboarder’s Fracture

- Lateral process of the talus
- Easy to “miss”
- Rarely seen in those NOT skateboarding or snowboarding
- MOI: eversion and axial loading
- History is KEY
- Exam is difficult because it is tucked in under the lateral malleolus

Maisonneuve Fracture

- **Medial malleolus OR deltoid ligament injury + Proximal fibular fracture** (remember to examine the joint above!)

- Mortise often open or unstable
- Treatment: if dispo HOME, **non-weight bearing** status; ORIF
- Peroneal nerve involvement rare



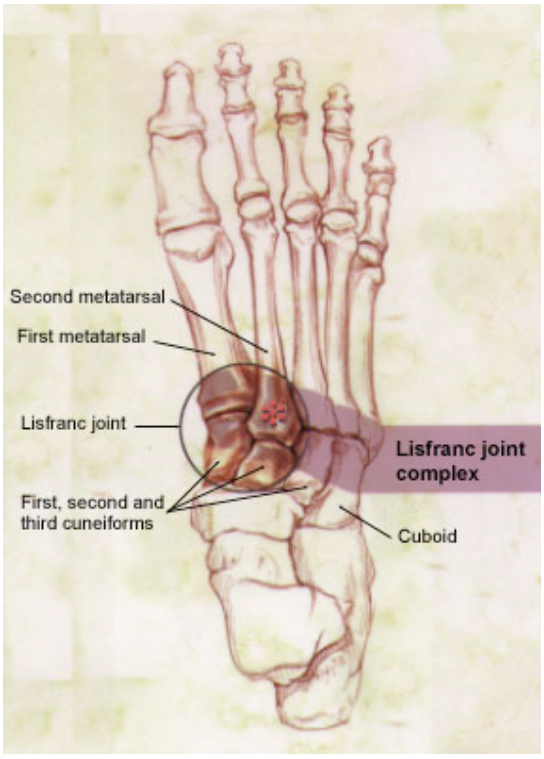
Eponyms of the Ankle and Foot

- **Tillaux Fracture**: S-H III of the distal 1/3 tibia joint (teenagers)
- **(Plafond) Pilon Fracture**: talus splits ankle apart with distal tibia fracture +/- fibula fracture
- **Triplanar or Trimal Fracture**: fracture of the lateral malleolus, the medial malleolus and the distal posterior aspect of the tibia (posterior malleolus); ORIF and non-weight bearing
- **Pilots Fracture**: talar neck/body
- **Lisfranc Fracture**: 2nd MT; unstable arch of foot (see below)
- **Dancer's Fracture**: avulsion fracture of the base of the 5th MT; cast
- **Jones Fracture**: fracture of proximal diaphysis of 5th MT; initial treatment posterior splint with non-weight bearing; surgical (high rate of nonunion)
- **Maisonneuve Fracture** (see above)

Lisfranc Injuries

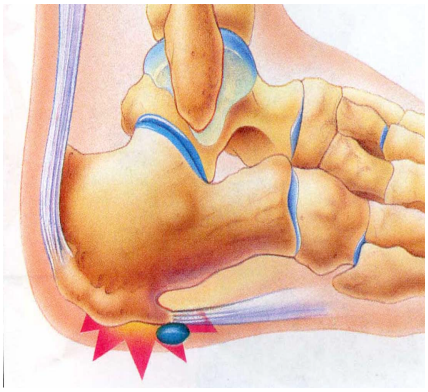
- Arch of foot destroyed because Lisfranc joint is the keystone; **unstable foot**
- "Fleck sign" seen in isolated injuries WITHOUT fracture (fleck of bone)
- Most need surgery
- When subtle OR ligamentous only: EASY to "miss"

- First and second cuneiforms MUST line up (check oblique too)



Plantar Fasciitis and Heel Spurs

- Heel spurs and plantar fasciitis are not always directly related
- **Plantar Fasciitis**: caused by micro-tears in the plantar fascia at the calcaneal insertion
    - Clinical Features: pain with first few steps in the morning; heel pain at night
    - Treatment: physical therapy, stretching, heel pads, arch supports, massage; steroid injections (used with caution d/t risk of fascia rupture)
    - Many causes of plantar fasciitis (policeman's heel) have NO spur
- **Heel Spur**: small osteophyte on the calcaneus
    - Many heel spurs are incidental and no heel pain is identified
- Tempting to link these two more strongly



Achilles Tendon Rupture

- Etiologies: fluoroquinolone or steroid use; MOI often involves basketball
- Audible “pop” often
- Partial tears diagnosed by ultrasound
- Treatment: splint in equinus (toes pointed so it will heal so does not rupture completely); surgical repair if complete

ID, Neoplasms, Osteoarthritis, Osteoporosis

Infectious Disease

Bacterial Infections of Bones and Joints

Bizz-buzz Bugs

- Vibrio vulnificans: Katrina calf
- Mycobacterium marinum: fish tank granuloma
- Sporothrix: rose thorn injury
- Pasturella multocida: dog and cat bite with rapid evolution
- Salmonella (non-typhi): reptile bites and exposures
- Salmonella osteomyelitis: Sickle cell disease
- Erysipelothrix rhusiopathias: fish mongers hand (fins slice your webspace)
- Bartonella Hensale: cat scratch dz
- Eikenella c: human bite
- **STAPH & STREP: most common!**

Osteomyelitis

- General
  - Definition: inflammatory process of the bone due to infection with pyogenic organisms
  - Classified according to duration (acute, chronic), cause, site of infection, type of patient (adult, child, immunocompromised)
    - Chronic osteomyelitis: infection which persists/recurs, regardless of etiology and despite appropriate initial treatment
  - Mono- or polymicrobial → most common organisms are **Staphylococcus aureus**, coagulase-negative staphylococci, and aerobic gram-negative bacilli
- Causes
  - Hematogenous: bacterial seeding from the blood; most commonly affects long bone metaphysis in children
  - Direct/Contiguous: direct - inoculation of bacteria by direct contact with tissue during trauma or surgery; contiguous - spread from a contiguous site of infection (joint or soft tissue)
- Risk Factors: **diabetes mellitus**, **sickle cell disease**, **peripheral vascular disease**, immunosuppression, IV drug use, ETOH abuse, AIDS, chronic steroid use, prosthetic joint, open fracture, orthopedic surgery
- Clinical Features
  - Acute Osteo: pain; loss of motion; local tenderness, swelling, erythema; fever
  - Chronic Osteo: recurrent pain, erythema, edema; malaise, anorexia, fever, fatigue; draining sinus tract (pathognomic of chronic osteomyelitis); non-healing ulcer
  - Diabetics: high suspicion for osteo with foot ulcers > 2 x 2 cm or if bone is palpable on exam
- Diagnostic Work-up
  - Labs: WBC, CRP, ESR, blood cultures, bone biopsy (for pathogen identification)
  - Imaging: MRI best for early detection; bony changes may not be evident on x-ray for 10-14 days
    - X-ray findings of acute osteo: overlying soft tissue edema
    - X-ray findings of chronic osteo: cortical erosion, periosteal elevation, mixed lucency and sclerosis; sequestra (a piece of dead bone)
- Treatment
  - Prolonged course of antibiotics
    - Antibiotics chosen based on organism (if no culture done then use

broad spectrum abx), susceptibility and patient comorbidities
        - Usually IV for a period followed by oral
        - Duration of therapy controversial
    - May require surgical debridement of necrotic tissue
    - Address related issues (fracture, open wound, hardware)

Septic Arthritis

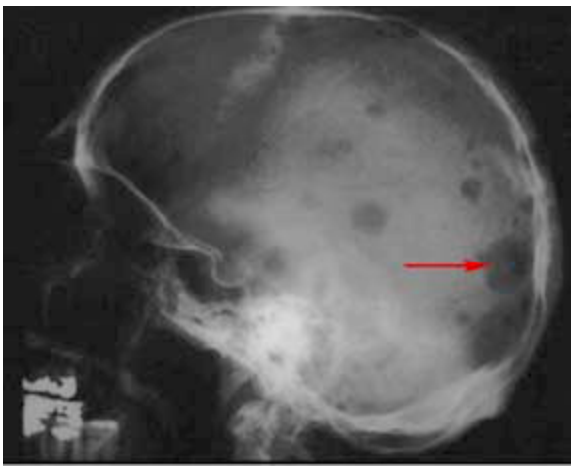
- General
    - Infection in a joint; usually monoarticular (most commonly the knee)
    - Usually from hematogenous spread of bacteria (also from bite, trauma or iatrogenic source)
    - Usually bacterial (may be fungal or mycobacterial)
        - Staph aureus is most common pathogen
        - Consider N. gonorrhea in sexually active young adults
- Predisposing Risk Factors: age greater than 80yo, DM, RA, prosthetic joint, recent joint surgery, skin infection (i.e. cellulitis), cutaneous ulcers, IV drug abuse, ETOH abuse, intra-articular injection
- Clinical Features
    - Acute joint pain, swelling, warmth; fever; effusion; tenderness to palpation; severe pain with minimal ROM of joint; limited ROM
- Diagnostic Work-up
    - Definitive diagnostic test: arthrocentesis → presence of bacteria in synovial fluid indicates septic arthritis
        - Gram stain, culture, and leukocyte count and differential of the aspirated fluid
        - Joint fluid analysis indicative of septic arthritis: clarity - purulent/opaque; color - yellow to green; WBCs >50,000; PMNs 75%; glucose < 25; culture positive
    - Blood cultures, CBC
    - Imaging: x-ray shows soft tissue swelling; look for osteomyelitis
- Treatment
    - Aggressive antibiotic therapy: IV followed by course of PO
    - Arthrotomy may be required (surgical drainage and debridement of infected joint)

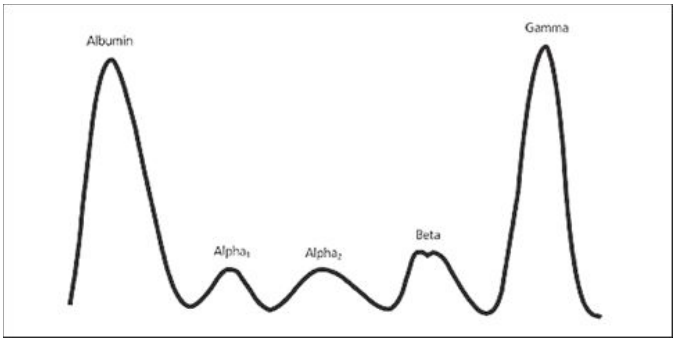
Neoplasms

Multiple Myeloma

- **Most common primary bone cancer**

- Myeloma related organ dysfunction is often found BEFORE the diagnosis is made
- Labs: Bence-jones protein; hypercalcemia in some (kidney stones, constipation); proteinuria
- Imaging: thick skull with punched out lesions (shown)
- M-spike (shown)
- Mnemonic **"CRAB": hypercalcemia, renal failure, anemia, bony pain**





Bone Cancers

- **Ewings Sarcoma**: age 5-25yo; diffusely located
- **Osteosarcoma:** metaphysis of long bones (distal femur, proximal femur/tibia); age 10-20yo
- **Chondrosarcomas**: age >60
- **Mets to bone**: more common than primary bone CA
    - "**P**ainful **b**ones **k**ill **t**hese **s**uckers" (**p**rostate, **b**reast, **k**idney, **t**hyroid, **s**kin)
    - Spine: most common met site
- Night pain: think malignancy (with primary and metastatic bone pain)

Benign Processes of Bone and Soft Tissue

- More common than malignant

- Bone
    - **Enchondroma**: benign cartilaginous tumor found within the bone
    - **Osteoma**
    - **Aneurysmal bone cyst** (ABC)
- Soft tissue
    - **Lipoma**: soft, non-tender, mobile
    - **Ganglion cyst**: soft, non-tender; usually on the dorsum of the hand or wrist
- Biopsy may be needed

Osteoporosis And Osteoarthritis

Osteoporosis

- Total bone volume is decreased, but it is of normal quality
- Increased incidence of fractures due to weakening
- Primary Osteoporosis
    - Type I (postmenopausal): primarily women; related to loss of estrogen; most prevalent form
    - Type II (senile): old age; men and women; related to poor calcium absorption
- Secondary Osteoporosis
    - Bone loss is caused by other disease processes (i.e. corticosteroid use, malignancies, GI disorders)
- Risk Factors
    - Modifiable: ETOH, tobacco, low BMI, sedentary, low Ca and Vitamin D intake, steroids
    - Non-modifiable: age, gender, white or Asian race
- Labs: calcium, phosphate, alkaline phosphatase
- Imaging: bone density scan (dual energy x-ray absorptiometry [DXA])
    - Usually done of hip +/- spine
- Treatment
    - Prevention: weight bearing exercises; calcium, vitamin D and phosphorous supplements; smoking cessation; limit ETOH use
    - After diagnosis: bisphosphonate drugs (Fosamax) are first-line
- Screening
    - All women 65 years and older regardless of risk factors
    - Postmenopausal women less than 65 years if one of the above risk factors is present
    - Men with clinical manifestations of low bone mass (i.e. radiographic osteopenia, fracture without significant trauma) or significant risk factors

for fracture (i.e. long-term glucocorticoid therapy, androgen deprivation therapy for prostate cancer, hyperparathyroidism)
    - Men and women with low bone mass and risk factors for ongoing bone loss: repeat DXA scan every 2 years
    - Women > 65yo with low bone mass and no risk factors for ongoing loss: repeat scan every 3-5 years
    - Women > 65yo with normal bone mass and no risk factors: repeat scan in 10-15 years

Osteoarthritis (OA)

- Most common adult arthropathy (especially in elderly)
- Degenerative; progressive loss of articular cartilage → joint destruction
- Commonly affects weight bearing joints (hip, knee), spine, wrist, distal interphalangeal (DIP) joints and proximal interphalangeal (PIP) joints
- Clinical Features
    - Joint pain which worsens throughout the day, decreased joint ROM, crepitus
    - Heberden's nodules (DIP) and Bouchard's nodules (PIP)
- Imaging: x-ray shows chondromalacia and joint loss
- Treatment: weight loss, moderate exercise, Tylenol as anchor treatment, NSAIDs (in moderation), steroid injections, braces/canes
    - Total joint replacement may be indicated for advanced disease

Rheumatology

Fibromyalgia

- Central pain disorder with multiple trigger points
- Clinical Features: nonarticular musculoskeletal pains, aches; fatigue; sleep disturbance; multiple tender points on exam
- Associated with anxiety, depression, IBS
- Should rule out thyroid disease
- Treatment: antidepressants (SSRIs, TCAs), lyrica

Gout

- Systemic disease of altered purine metabolism → urate crystal deposition into synovial fluid of joints
    - Usually in 1st MTP joint (manifestation in 70% of cases), but also knees,

ankles, elbows
    - Negatively birefringent crystals
- Men > women (9:1)
- Clinical Features
    - Classic history: red painful toe with difficulty walking, sudden onset
    - Sudden onset of pain, swelling, redness, exquisite tenderness at joint
    - Tophi: accumulation of urate crystals adjacent to joint
        - Tophaceous gout can lead to chronic joint deformities
- Diagnostic Work-up
    - Joint fluid aspiration: diagnostic if rod-shaped, negatively birefringent urate crystals are seen
    - Labs: serum uric acid not helpful
    - X-ray may show erosions
    - Can be diagnosed based on clinical criteria
- Treatment
    - Dietary restrictions: decrease red meats, ETOH and other foods containing purines
    - NSAIDs (indomethacin 25-50mg TID until symptoms resolve)
    - Oral colchicine
    - Corticosteroid joint injections
    - Long-term prophylaxis: allopurinol, probenecid (antihyperuricemic therapy, not effective to treat acute gouty attack)

CPPD Disease: Pseudogout

- Calcium pyrophosphate dihydrate (CPPD) disease
- Deposition of calcium pyrophosphate in joints (usually lower extremity joints)
- Can mimic gout in presentation
- Diagnosis: rhomboid shaped crystals found in synovial fluid aspiration
- Plain films show chondrocalcinosis (linear calcification in articular cartilage)
- Treatment: NSAIDs, intra-articular steroid injections, colchicine

Polyarteritis Nodosa

- Small and medium artery inflammation
    - Affects the skin, kidney, peripheral nerves, muscle and gut
- Men > Women (3:1); usual onset age 40-60
- Associated with intra-renal aneurysm
- Clinical Features
    - Anorexia, abdominal pain, weight loss, peripheral neuropathy, arthralgia, palpable purpura

    - Livedo reticularis (a lacy rash over extremities)
- Case: rash, CRP/ESR elevation, ANCA positive
- Diagnosis: vessel biopsy or angiography
- Treatment: high dose corticosteroids; cytotoxic drugs and immunotherapy may be used

Polymyositis

- Inflammation of striated muscle
    - Affects proximal limbs, neck, pharynx and skin (dermatomyositis)
- Women > Men (3:1)
- Strong association with malignancy
- Clinical Features
    - History: proximal limb and neck weakness, dysphagia and possible rash
    - Heliotrope rash around eye → dermatomyositis
- Labs: elevated CK and aldolase
- Diagnosis made by muscle biopsy
- Treatment: high dose steroids, methotrexate until symptoms resolve

Polymyalgia Rheumatica

- History: pain, stiffness in neck, shoulder and pelvic girdle with fever, fatigue, weight loss, depression
    - Stiffness worst in AM and after rest
    - Musculoskeletal symptoms are bilateral, proximal and symmetrical
- Women > Men (2:1)
- Associated with temporal arteritis
- Labs: elevated ESR
- Treatment: corticosteroids

Reactive Arthritis (Reiter Syndrome)

- Seronegative arthritis (RF negative)
- Clinical Features: urethritis, conjunctivitis, post-infectious arthritis, mucosal ulcers
    - *Asymmetric* arthritis that involves large joints below waist
    - Mucocutaneous lesions common (stomatitis, balanitis)
- Occurs after STI (chlamydia) or GI bugs (*Shigella, Salmonella, Yersinia, Campylobacter*)
- Lab: 50-80% HLA-B27 positive; synovial fluid culture negative
- Treatment: NSAIDs and physical therapy

Rheumatoid Arthritis

- Chronic, systemic, inflammatory disorder primarily involving joints (also has other systemic manifestations)
- Progressive, destructive disease → destruction of joints due to erosion of cartilage and bone → deformity
- Females > Males (3:1); onset usually 40-60yo
- Clinical Features
    - Diagnostic criteria: morning stiffness for > 1 hour for > 6wks; swelling of > 3 joints for > 6wks; symmetric joint swelling > 6wks; arthritis of hand joints; subcutaneous nodules; elevated RF/anti-CCP; x-ray showing joint erosion or bony decalcification
        - 4 or more criteria must be present for diagnosis
    - DIP joints in hands usually spared
    - Extra-articular involvement: skin, eyes, lungs, liver, blood, kidneys, heart
- Diagnostic Work-up
    - Labs: RF (rheumatoid factor) and anti-CCP antibodies positive in 70%; elevated CRP and ESR
    - Do arthrocentesis to exclude gout or septic arthritis
    - X-ray: joint erosion or bony decalcification
- Treatment
    - Refer to Rheumatologist
    - PT/OT
    - NSAIDs
    - DMARDs (disease-modifying antirheumatic drugs)
        - Non-biologic: methotrexate, sulfasalazine, hydroxychloroquine, leflunomide, and minocycline
        - Biologic: etanercept, infliximab
    - Glucocorticoids (prednisone)
    - Combination of therapies likely required

Juvenile Idiopathic Arthritis

- 3 *major* subtypes: systemic (15%), polyarticular (35%) and pauciarticular (50%)
- Nomenclature and classification of childhood onset idiopathic arthritis (formerly JRA) are changing and evolving → many children may not fit exactly into one subtype or may exhibit symptoms which overlap categories

Systemic Onset Juvenile Idiopathic Arthritis

- Formerly Still's disease
- Female = Male; onset age < 17yo
- Clinical Features
    - High spiking intermittent, daily **fevers** (39-40C), **myalgias**, **polyarthralgias** and salmon-pink macular **rash** (worse with heat/fever, may be elicited by stroking the skin [Koebner's phenomenon])
    - Minimal articular findings but when arthritis does manifest it may involve any number of joints
    - Hepatosplenomegaly, lymphadenopathy, small pericardial effusion
- Labs: leukocytosis, anemia, elevated ESR and CRP, thrombocytosis; ANA and RF USUALLY negative
- Treatment
    - NSAIDs; for severe disease or failure of NSAIDs alone then glucocorticoids, methotrexate; referral to Rhematologist

Polyarticular Onset Juvenile Idiopathic Arthritis

- Females > Males; onset peak age 2-5 and 10-14 years
- Clinical Features
    - Symmetric arthritis involving 4 or more joints
    - Knees, wrists, fingers and ankles most commonly involved; small joints; joint pain, stiffness, inflammation; progressive
- Labs: mild anemia, elevated ESR; many in the younger group are ANA positive (indicates higher risk for uveitis); RF present in 10-20% of those >10yo
- Treatment
    - First-line: NSAIDs, second-line: DMARDs (methotrexate)

Pauciarticular Onset Juvenile Idiopathic Arthritis

- Females > Males; onset peak age 2-3 years, rare > 10yo
- Clinical Features
    - Arthritis in 4 or less joints
    - Affects the large joints (knees, ankles, wrists, elbows; rarely hip); joint swelling and tenderness
    - Classic history: young girl who "walks funny" in the morning but soon improves → seek medical evaluation for single swollen joint
- Most common complication: uveitis (affects about 20%) → routine screening necessary (especially if ANA +)
- Labs: ESR, CRP negative; CBC usually normal; RF negative; ANA often positive (higher risk for uveitis)
- Treatment: NSAIDs, intraarticular glucocorticoids; DMARDs rarely used

Psoriatic Arthritis

- Inflammatory arthritis associated with psoriasis
- Skin lesions USUALLY precede joint disease
- Clinical Features
    - Joint pain and stiffness; morning stiffness > 30min; symmetric polyarthritis closely resembling RA or may be asymmetric; involves fewer joints; distal joint involvement
    - Flexor-tendon arthritis and tenosynovitis of hands
    - Sausage-finger appearance (dactylitis): uniform soft tissue swelling of fingers or toes
    - Pitting of nails; onycholysis (separation of nail from bed)
- Diagnostic Work-up
    - Labs: ESR elevated, anemia (normocytic, normochromic), RF USUALLY negative; ANA (+)
    - X-ray: simultaneous erosive changes and new bone formation in distal joints; lysis of the terminal phalanges; pencil in cup deformities
- Treatment
    - NSAIDs
    - If no response to NSAIDs → DMARDs (methotrexate most common)
    - NO corticosteroids (risk for developing pustular psoriasis); NO antimalarials

Systemic Lupus Erythematosus (SLE)

- Autoimmune chronic inflammatory disease which involves multiple organ systems
- Females > Males; peak age 20-30yo
- Periods of remission and chronic and acute relapses
- Clinical Features
    - Diagnosis based on at least 4 of the following findings: malar rash, discoid rash, photosensitivity, oral ulcers, arthritis, serositis (lung and heart), renal disease, ANA, hematologic disorders (anemia, thrombocytopenia), immunologic disorders, neurologic disorders (seizures, psychosis without other cause)
    - History: fatigue, fever, weight loss, myalgias
    - Must exclude drug-induced lupus (offending agents include isoniazid, methyldopa, procainamide, hydralazine, quinidine)
- Diagnostic Work-up
    - Labs: CBC, chem 7, UA, ESR, serum complement (C3, C4), ESR, CRP;

ANA (+); anti-double stranded DNA (markers for disease progression)

- Treatment
    - Lifestyle: protection from sun exposure, exercise routine, immunizations
    - Pharmacologic treatment of specific organ involvement: NSAIDs (musculoskeletal complaints); glucocorticoids (prednisone) for disease flares; antimalarials (cutaneous and musculoskeletal complaints); immunosuppressive medications for significant organ involvement and/or inadequate response to steroids (methotrexate)

Scleroderma

- AKA systemic sclerosis
- Deposition of collagen in skin and other organs → thickened, hardened skin
- Female > Male (4:1); peak onset age 30-50yo
- Natural history → pulmonary hypertension
- Clinical Features: skin involvement in 95% of patients
    - Fatigue, stiff joints, pain, sleep disturbances, loss of strength
    - Limited Scleroderma: sclerotic skin of hands, distal forearm, face and neck; vascular manifestations
        - **CREST**: **C**alcinosis, **R**aynaud's phenomenon, **E**sophageal dysmotility, **S**clerodactyly, **T**elangiectasias (syndrome a/w limited scleroderma)
    - Diffuse Scleroderma: sclerotic skin on the chest, abdomen, or upper arms and shoulders + heart, lungs, GI tract and kidney involvement
- Diagnostic Work-up
    - Labs: may be ANA positive; anticentromere antibody (ACA) a/w limited sclerosis
    - Monitor for onset of HTN indicating renal involvement
- Treatment
    - No cure
    - Treat symptomatically and treat specific organ disease processes (i.e. acid reflux, Raynaud's, pulmonary HTN)

Sjogren's Syndrome

- Autoimmune chronic inflammatory disorder that destroys salivary and lacrimal glands
- Primary disorder or secondary disorder associated with other rheumatic conditions (**RA**, SLE, scleroderma)
- Clinical Features

    - Mucous membranes most affected: dry eyes (xeropthalmia or keratoconjunctivitis sicca) and dry mouth (xerostomia)
    - Possible parotid gland enlargement
- Diagnostic Work-up
    - Labs: anti-Ro and anti-La antibodies present in about 50% of cases; RF (+) in 70% of cases; ANA (+) in 60% of cases
    - Schirmer's test: evaluates tear production → filter placed in lower eyelid for 5 minutes → wetting of < 5mm of paper is abnormal
    - Salivary gland biopsy: biopsy taken from lower lip and examined for lymphocytic infiltration and gland fibrosis to confirm Sjogren's
- Treatment
    - Symptomatic: keep mucosal surfaces moist (artificial tears and saliva, vaginal and ocular lubricants); increased fluid intake
    - Pilocarpine (muscarinic agonist) to increase salivary secretion (many side effects)
    - Immunosuppressive therapy: antimalarials, methotrexate