UR MEDICINE

MEDICINE *of* THE HIGHEST ORDER



MSK Radiology - Common Cases

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Ringside Physician for New York State and Seneca Nation Athletic Commissions

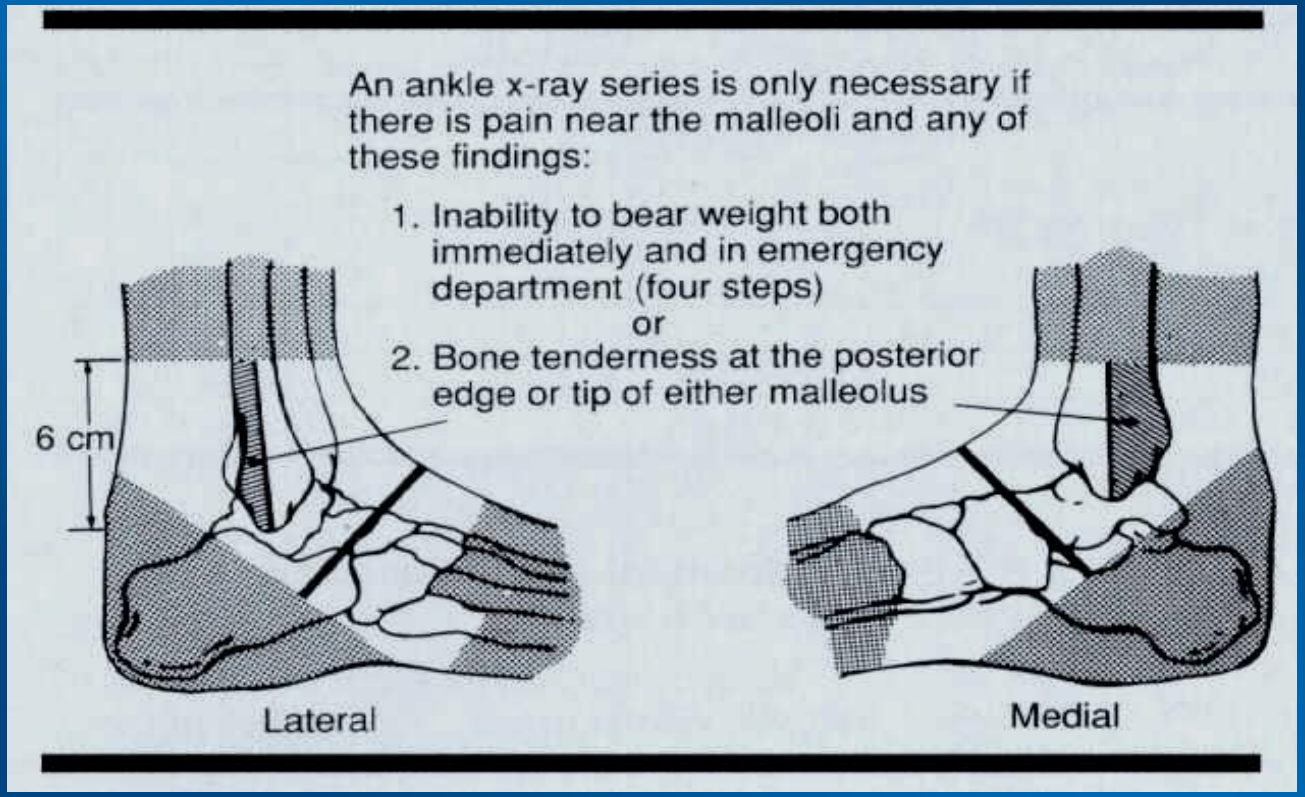
Goals and Objectives

- Describe the role of diagnostic imaging as an extension of the physical exam
- Review the indications for x-ray
- Describe different x-ray views, why they are used and their interpretations
- Differentiate indications and contraindications for advanced diagnostic imaging such as US, MRI, CT and nuclear
- Recognize the growing utility of point of care MSK ultrasound
- Discuss application of MSK radiology and findings in common cases

Case 1 – Ankle Pain

- 21 year male soccer player twists ankle while running, feels a pop
- PMHx unremarkable
- Having a hard time walking
- Physical exam shows tenderness over lateral malleolus
- Foot and ankle are swollen diffusely
- What to do next?

Ottawa Ankle Rules



Xray Basics

- "Plain film" / radiography / xray
- Oldest and most commonly used technology in medical imaging
- Discovered by Wilhelm Rontgen in 1895 earning Nobel Prize
- Utilizes electron sourced ionizing radiation to penetrate soft tissue and evaluate bone (50% total dose yearly)
- Same basic technology for "plain film", computed tomography (CT) and fluoroscopy

Image from Wikipedia

X-ray Radiation

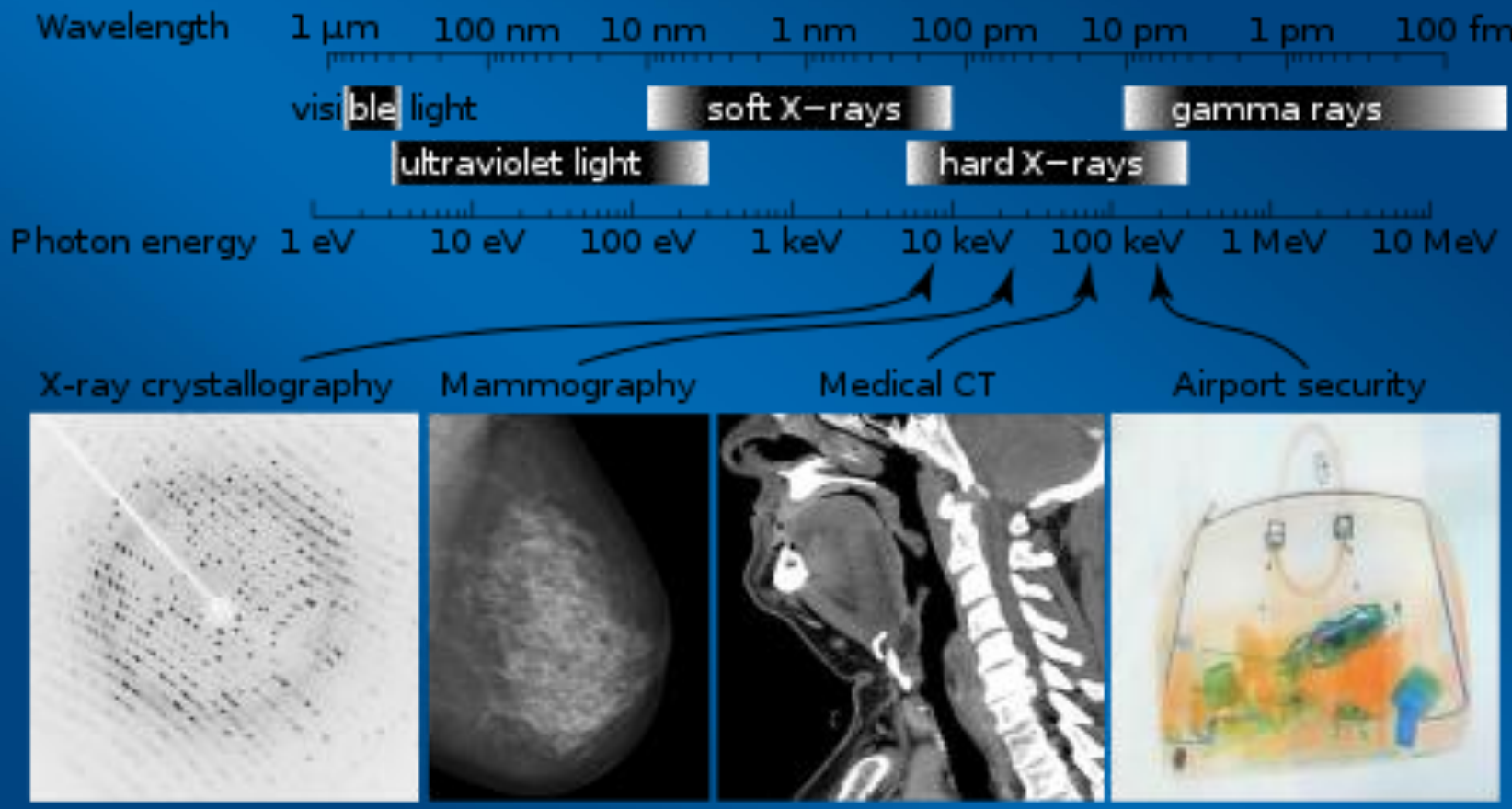


Image from Wikipedia

X-Ray Basics

- Any patient with "significant" trauma should have plain films done
- Consider imaging for pain > 6 weeks without trauma
- Any patient with concern for cancer or infection
- Quality of plain films altered by:
  - Positioning – often limited with injury/pain
  - Habitus
  - Atypical anatomy/biomechanics
- Always look at your own films!
  - Clinical correlation adds a lot to the image
  - Be clear when ordering "evaluate for "

X-Ray Basics

Findings in Fracture

- Cortical interruption
- Deformity
- Periosteal reaction (Stress or insufficiency)

Findings for Tendon and cartilage injury

- Enthesophytes (spurs)
- Calcific tendonitis
- High riding humeral head (RTC tear)
- Patella alta (quad or patellar tendon tear)
- Chondrocalcinosis (OA or CPPD)

Findings in OA

- Joint space narrowing
- Subchondral sclerosis
- Osteophytes (spurs)
- Subchondral cysts

Ankle/Foot

Why order plain films

- Trauma
  - Ottawa ankle and foot rules
- Chronic pain that isn't responding to conservative therapy

Why order MRI

- Pain that isn't responding to conservative therapy and more significant injury is suspected

Ankle/Foot

When to order plain films

- Immediately for any trauma that meets Ottawa Criteria or there is deformity, etc.
- After no improvement from a course of conservative treatment

When to order MRI

- After course of conservative treatment and a more significant injury is suspected

Ankle/Foot

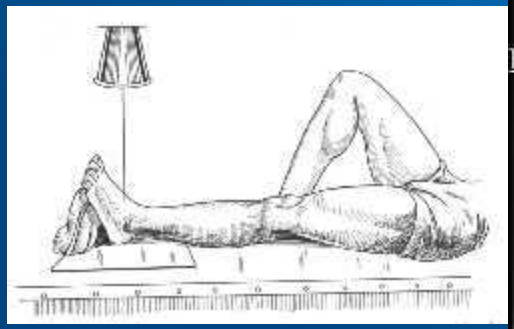
What films to order – Ankle

- AP, lateral and mortise – on all patients
- Weight bearing AP and lateral – if OA suspected

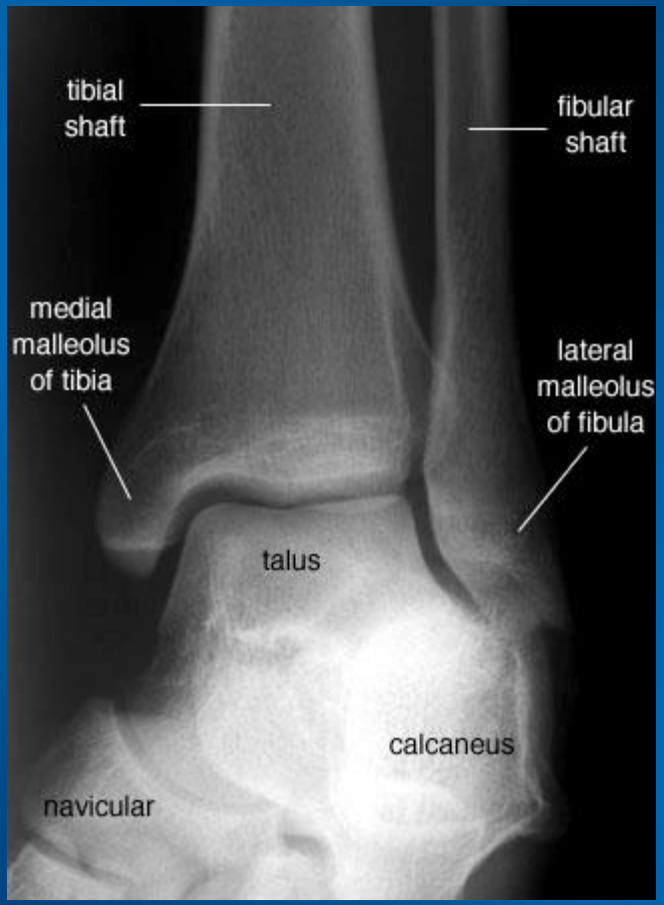
What films to order – Foot

- AP, lateral and oblique
- Weight bearing AP and lateral – if OA is suspected

AP and Lateral Views of the Ankle



Mortise View of the Ankle



15- 20 degree medial rotation

http://uwmsk.org/RadAnatomy.html

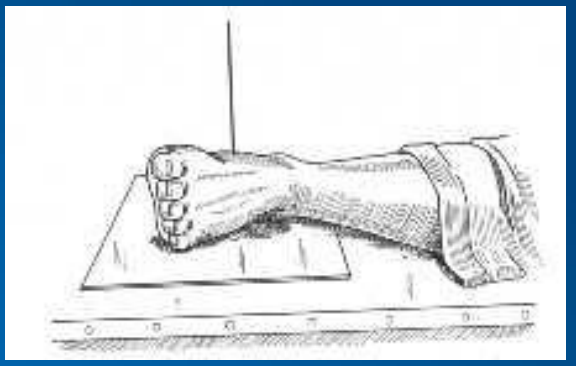
Ankle

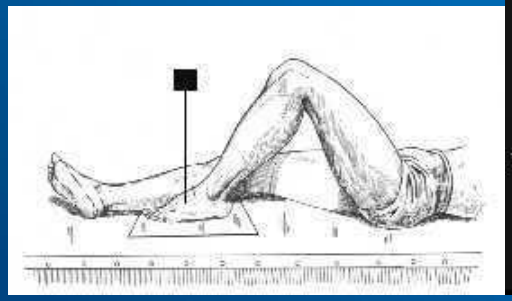
AP vs Mortise

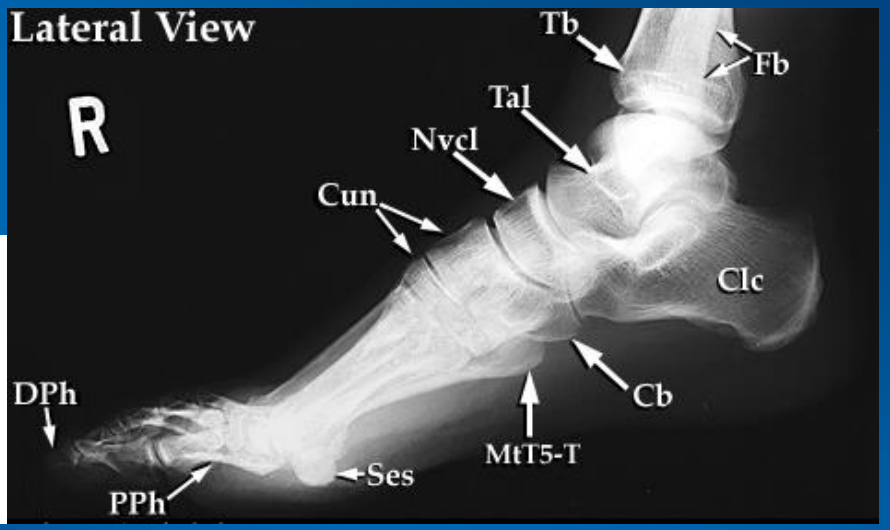
Foot

AP/lat/oblique

AP and Lateral of the Foot







www.e-radiography.net

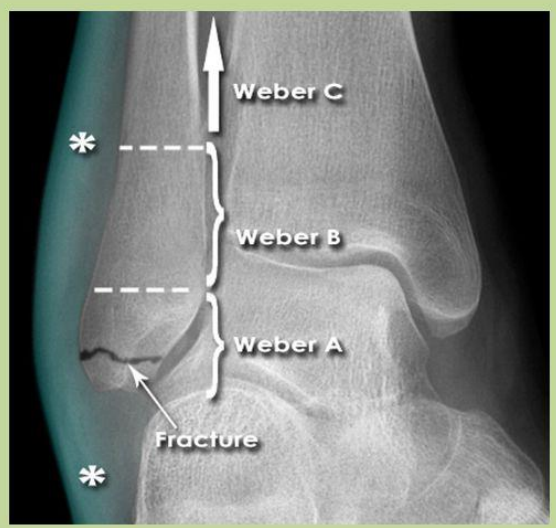
Oblique View of the Foot

www.e-radiography.net

What do you see?

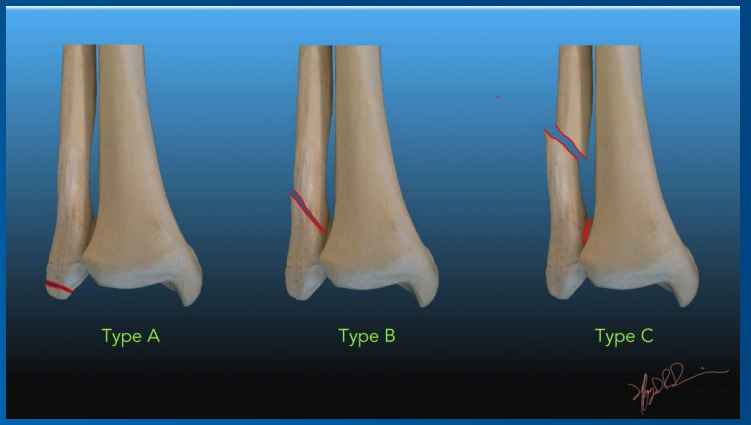
Weber Fracture Classification

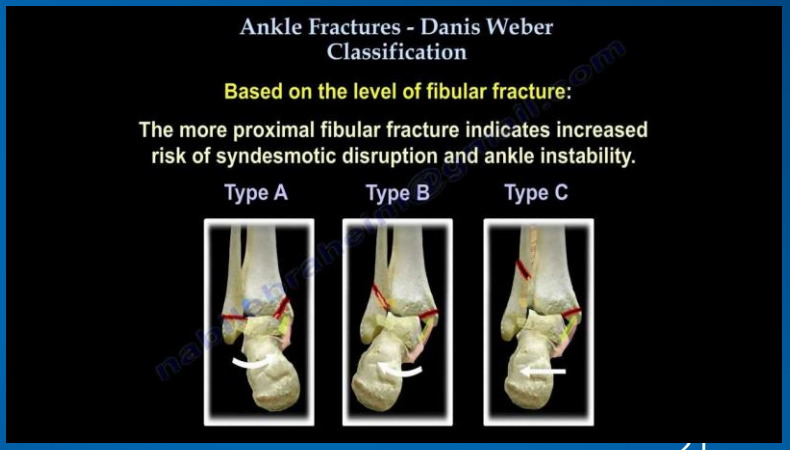
Ankle fracture



Denis –Weber classification

Bimalleolar feactur

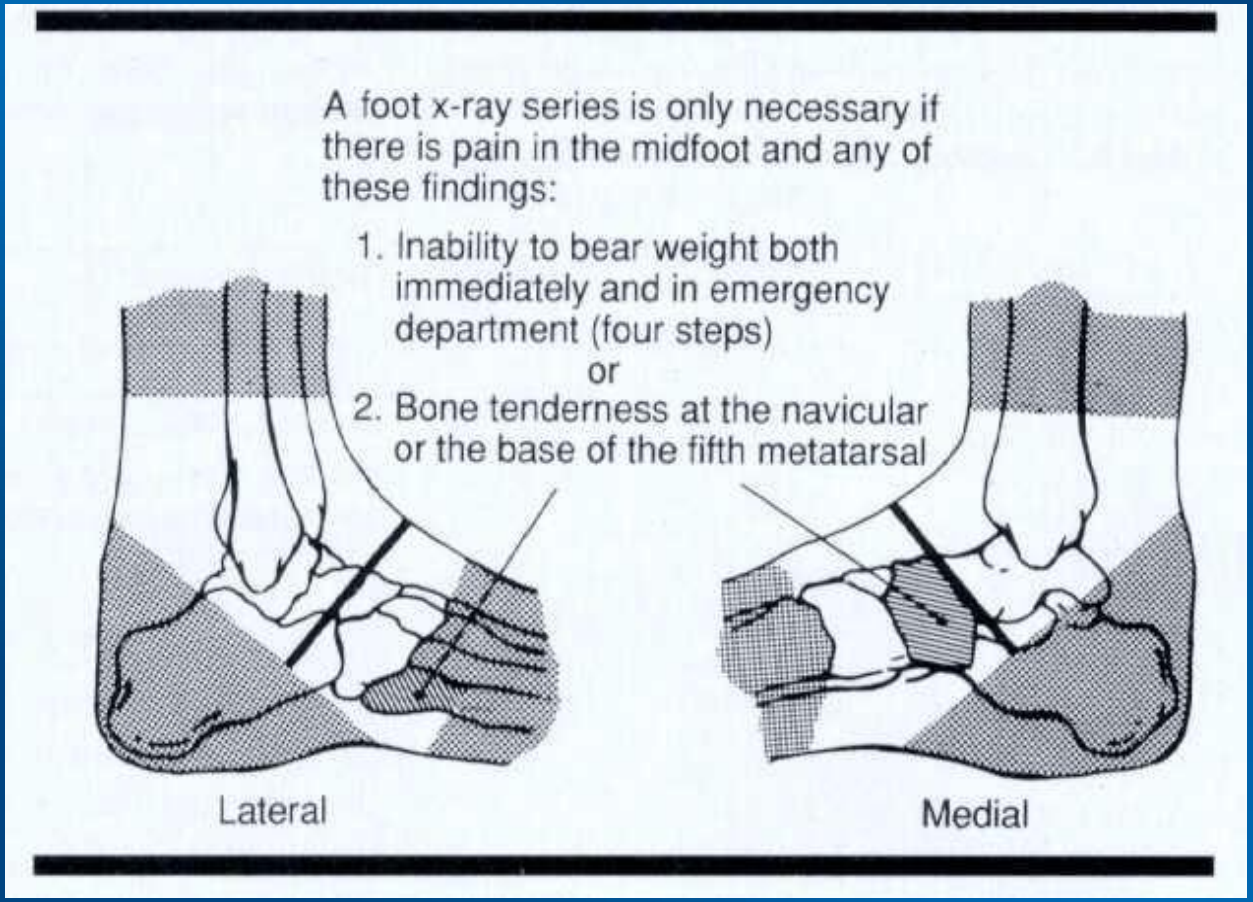




Case 2 – Foot Pain

- 23 year female dance twists ankle landing awkwardly from a leap, feels a sharp pain in her lateral foot
- PMHx unremarkable
- Having a hard time walking
- Physical exam shows tenderness over 5th Metatarsal
- Foot is mildly swollen
- What to do next?

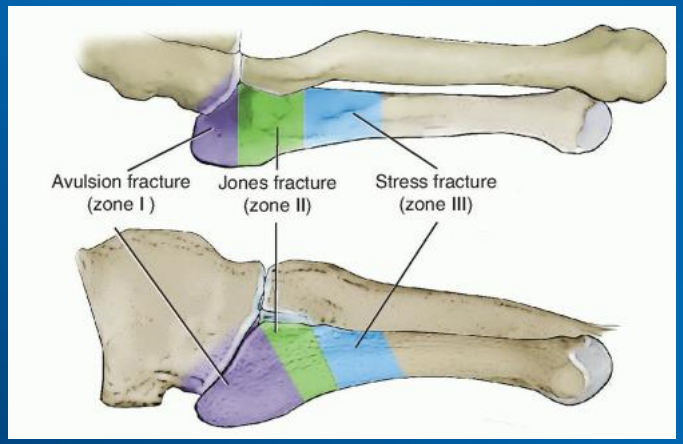
Ottawa Foot Rules

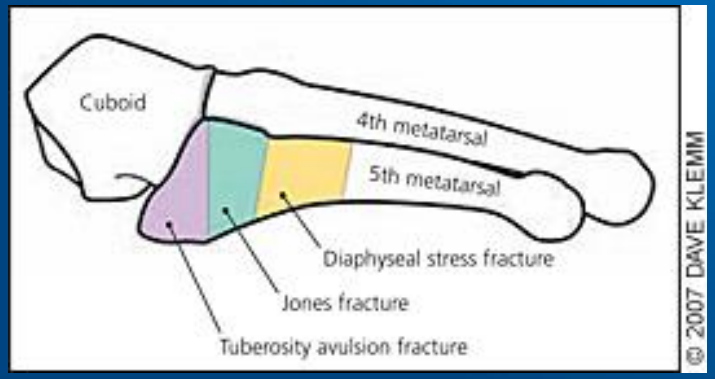


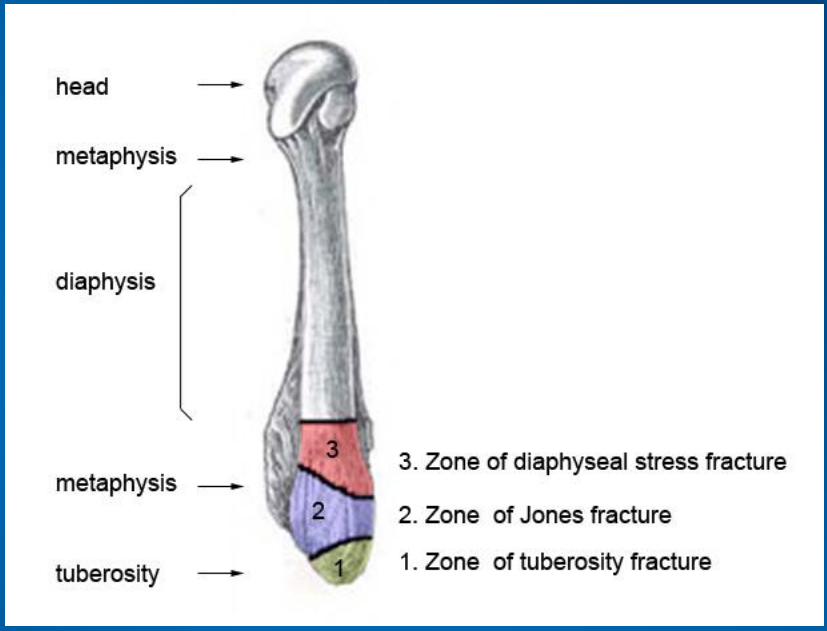
What do you see?

Other possible x-ray outcome

Types of Proximal 5th Metatarsal Fractures







Case 3 – Shin Pain

- 57 year white female runner complains of progressive left shin pain over several weeks, no trauma
- PMHx - postmenopausal
- Physical exam shows tenderness over midshaft tibia
- What to do next?

Tibial stress fracture

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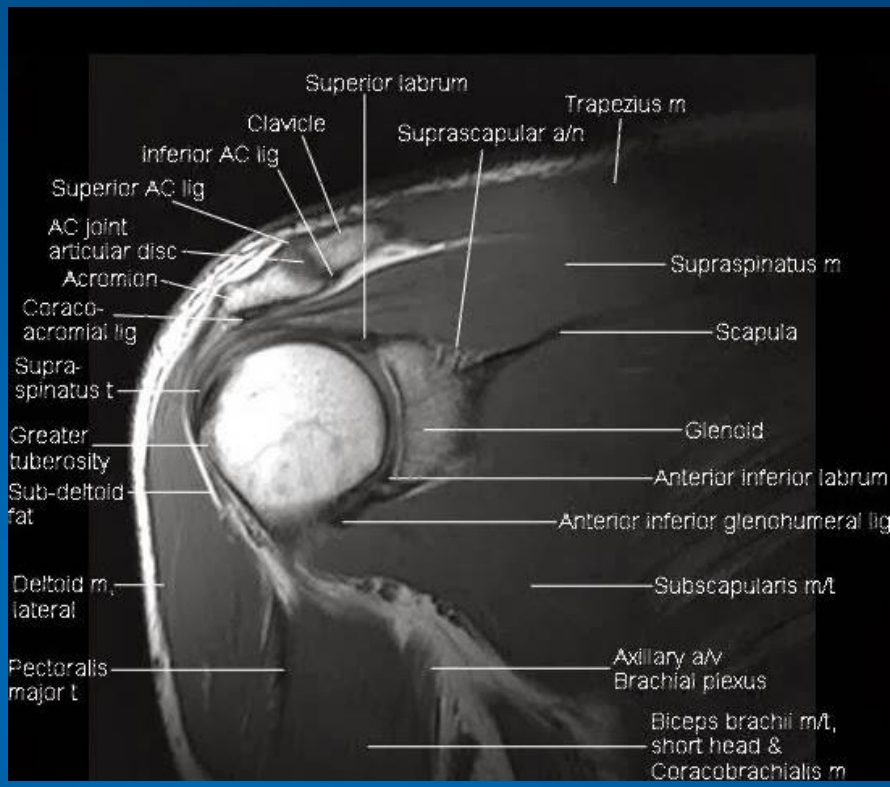
But what if it shows this….

Why get a CT scan?

- Calcaneal fractures
- Fracture severity for surgical planning (e.g. depressed tibial plateau)
- Neck fracture concern (time sensitive)
- If a patient can't have a MRI (pacemaker, metal)
- Sternoclavicular joint
- CT myelogram in spine
- CT with 3D reconstruction for complex anatomy

Why get an MRI?

- Soft tissue tears and strains, sprains
- Concern for missed fracture on x-ray including stress, insufficiency
- Concern for tumor (benign or malignant)
- Concern for infection



MR or CT with contrast

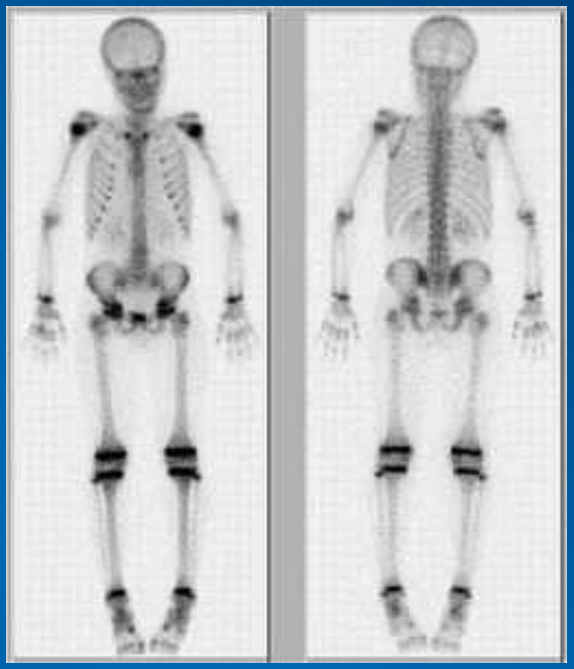
- IV contrast
  - Infection
  - Inflammation
  - Cartilage Degeneration (DGEMRIC)
  - Malignancy
  - Vascular injury
- Oral contrast
- Intraarticular - Arthrogram
- Myelogram

MRI safety considerations

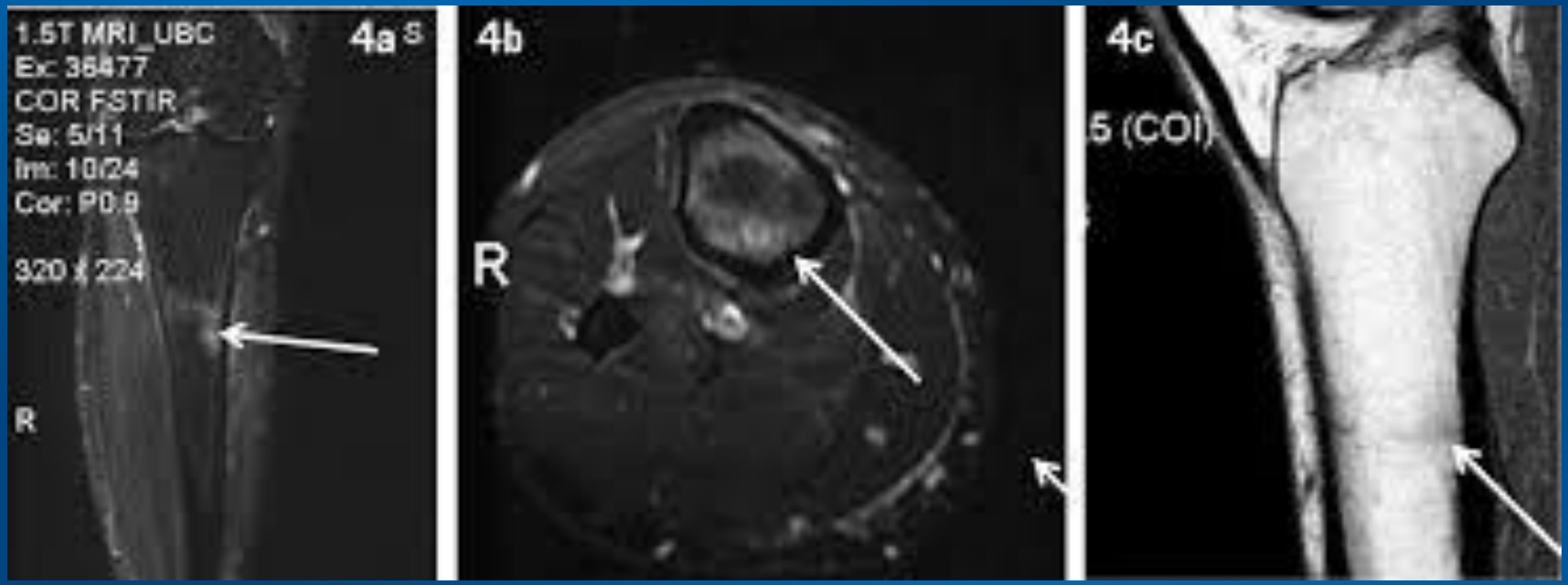
- Caution with CKD or AKI (GFR needs to be > 30) for contrast use
- Ask patient about metal fragments (bullets, shrapnel, shavings, etc) – may need xray first
- Metal contraindication if near vessels, nerves, eyes or hollow viscous, no concern in bone
- Pacemaker and AICD, aneurysm clips and pain pump safety- consult with manufacturer

Why get a Bone Scan?

- When you can't do an MRI and are concerned for fracture
- Rapidly becoming extinct in orthopaedics
- Continued use in oncology



Tibial Stress Fracture



Case 4 – Shoulder Pain

- 48 year male construction worker complains of acute on chronic right shoulder pain, sharp pain recently while lifting
- PMHx - smoker
- Physical exam shows + impingement and + drop arm test
- What to do next?

Shoulder

Why order plain films
- Trauma/acute injury – order at time of exam
- Look for fracture, dislocation
- Presentation of radicular symptoms
- Chronic pain >6 weeks that isn't responding to conservative therapy, looking for OA, crystal diseases, tumor, chronic RTC disease

Why order MRI
- Suspicion of RTC tear- order at time if suspected massive tear
- Chronic pain > 6 weeks with negative x-rays
- Suspicion of labral injury (get MRI Arthrogram)

Why order U/S
- Suspicion of RTC tear (only in some markets)
- Dynamic studies for impingement, biceps subluxation

Shoulder

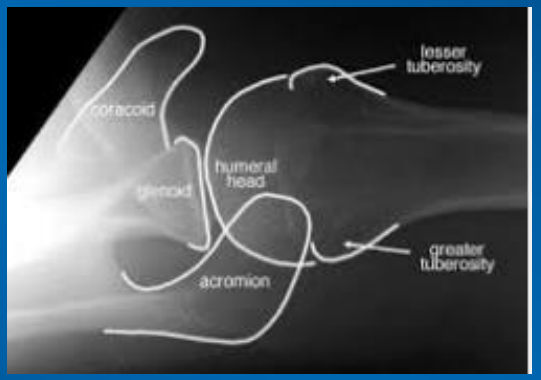
What films to order

- AP and a lateral view – on all patients
  - Lateral views include: axillary, scapular Y
- Supraspinatus outlet view – shoulder impingement/RC tendinopathy
- Clavicle views – with clavicle injury
- AC joint Views – with AC injury (shoulder separation

Shoulder views

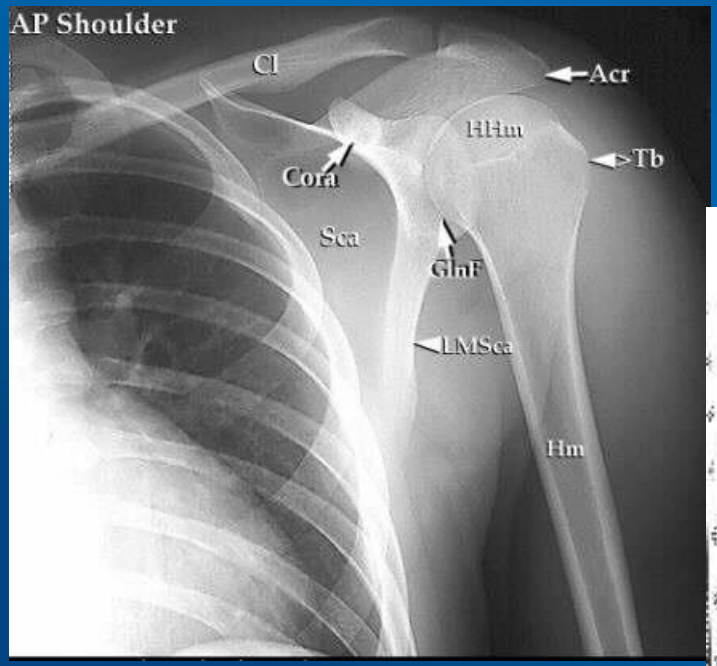
ER: can see Hill-Sachs/humeral head

Axillary view: Hill-Sachs, OA



Y/scapula view: scapular fractures

AP vs. "True AP"



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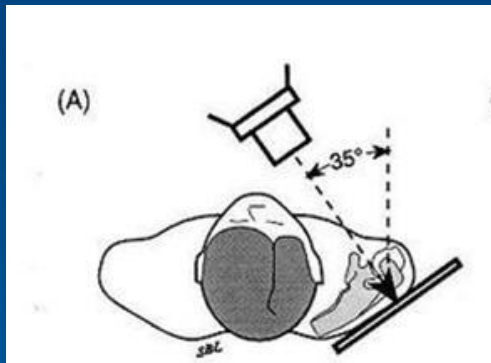
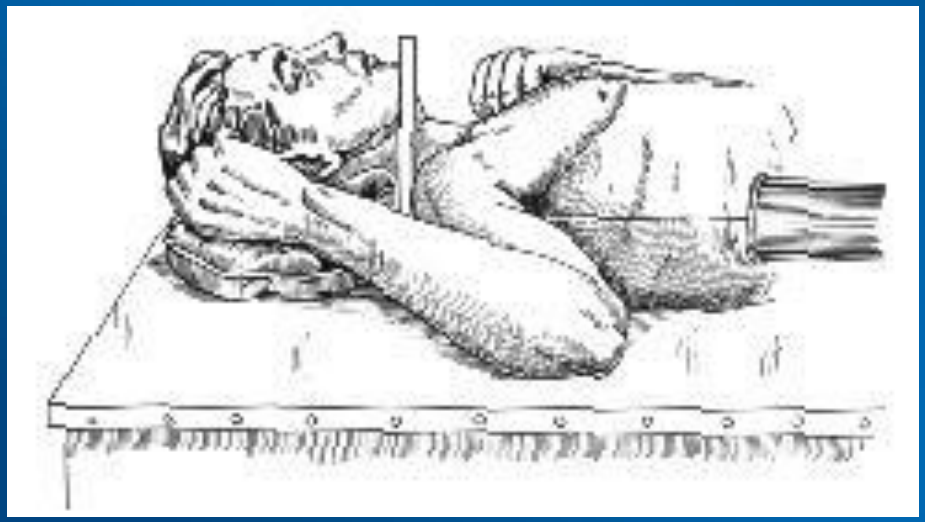


www.orthop.washington.edu

Axillary



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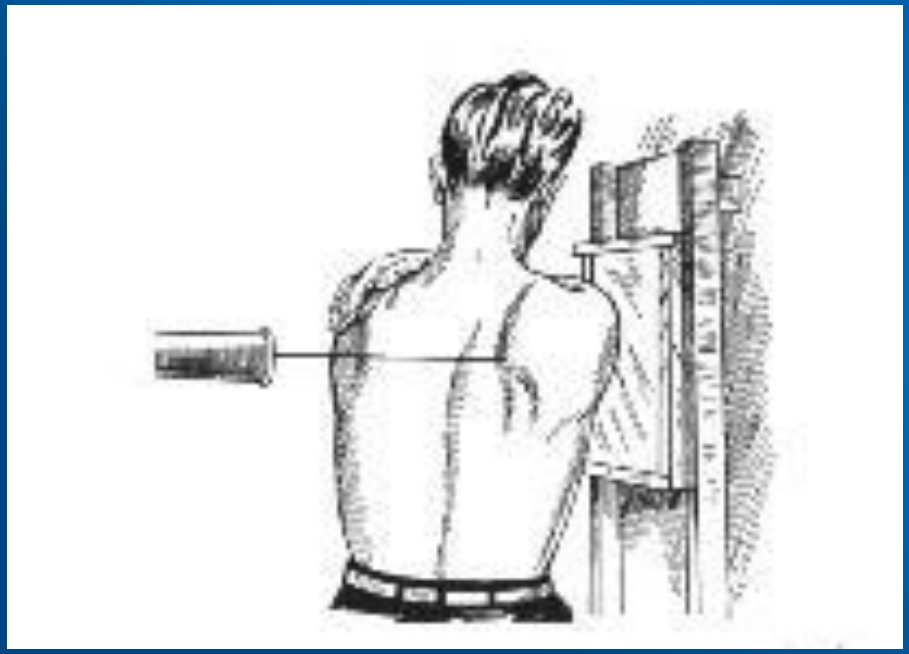
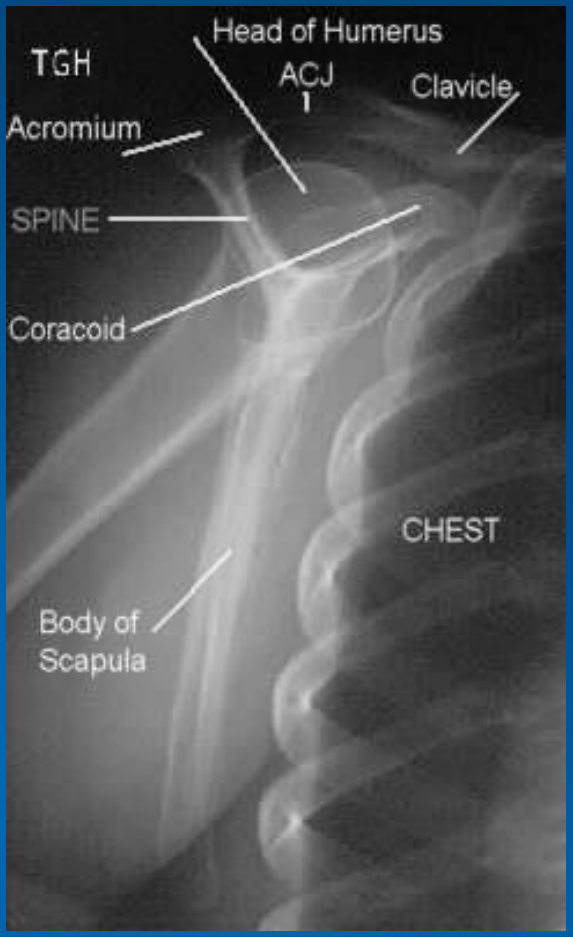
Scapular Y View





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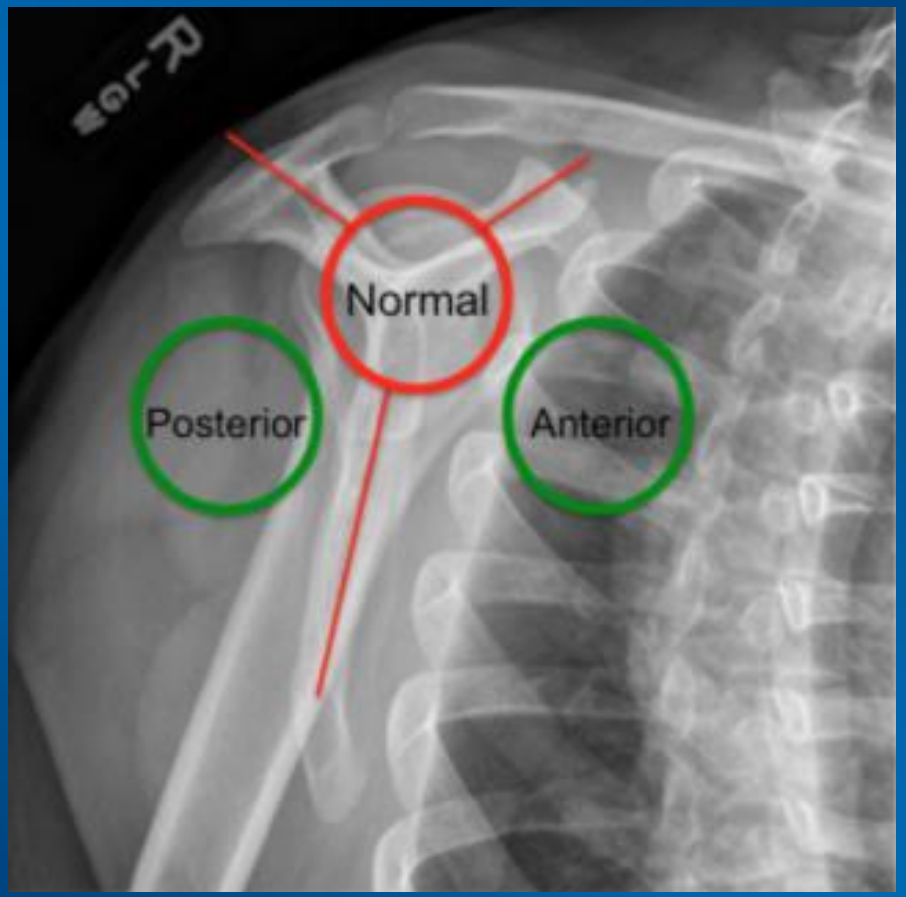
Scapular Y for dislocation



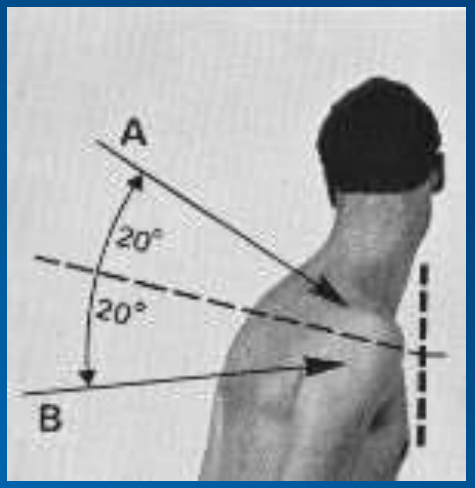
Supraspinatus Outlet View

www.ORIF.com

Clavicle

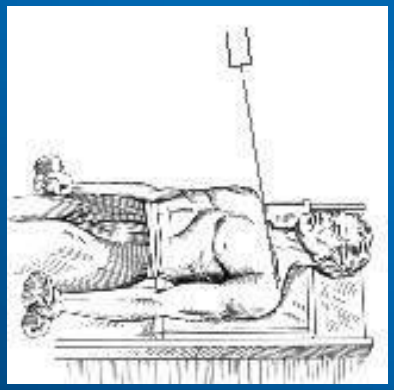
AP

Zanca view



AC Joint View

www.e-radiography.net

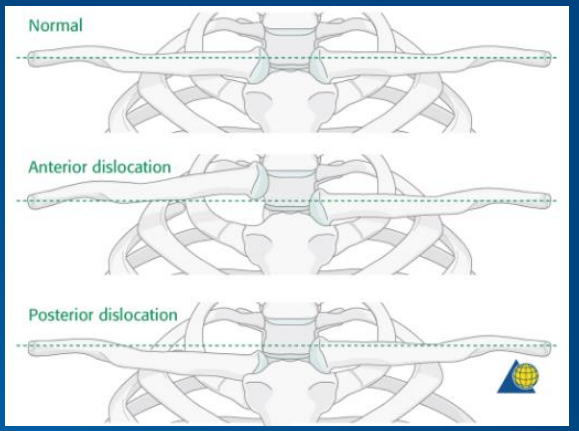


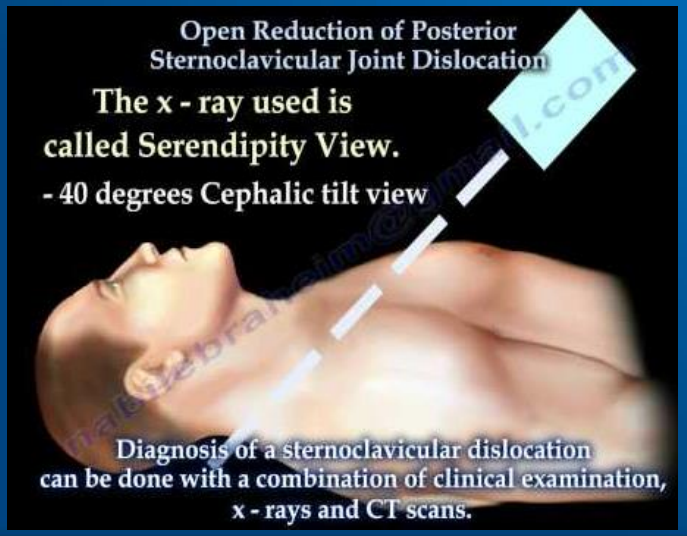
Sternoclavicular Joint

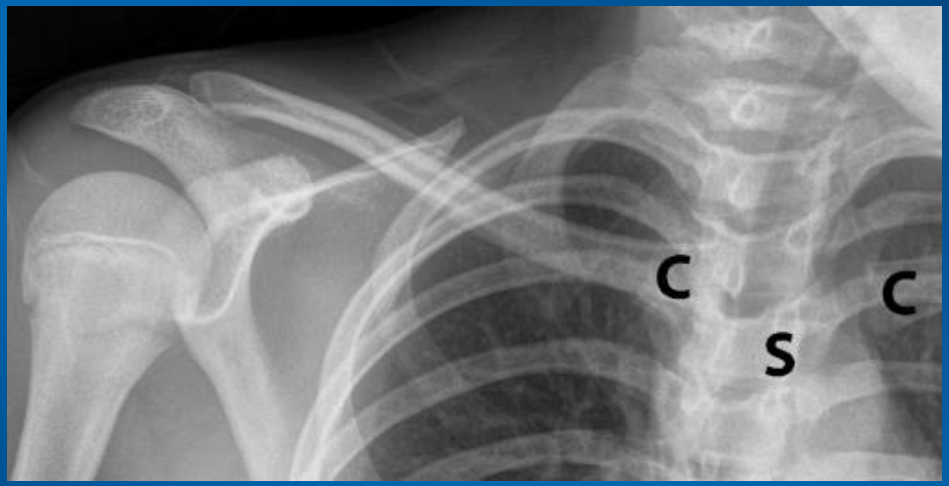
Anterior 2/3

CT is best for SC dislocation or fracture

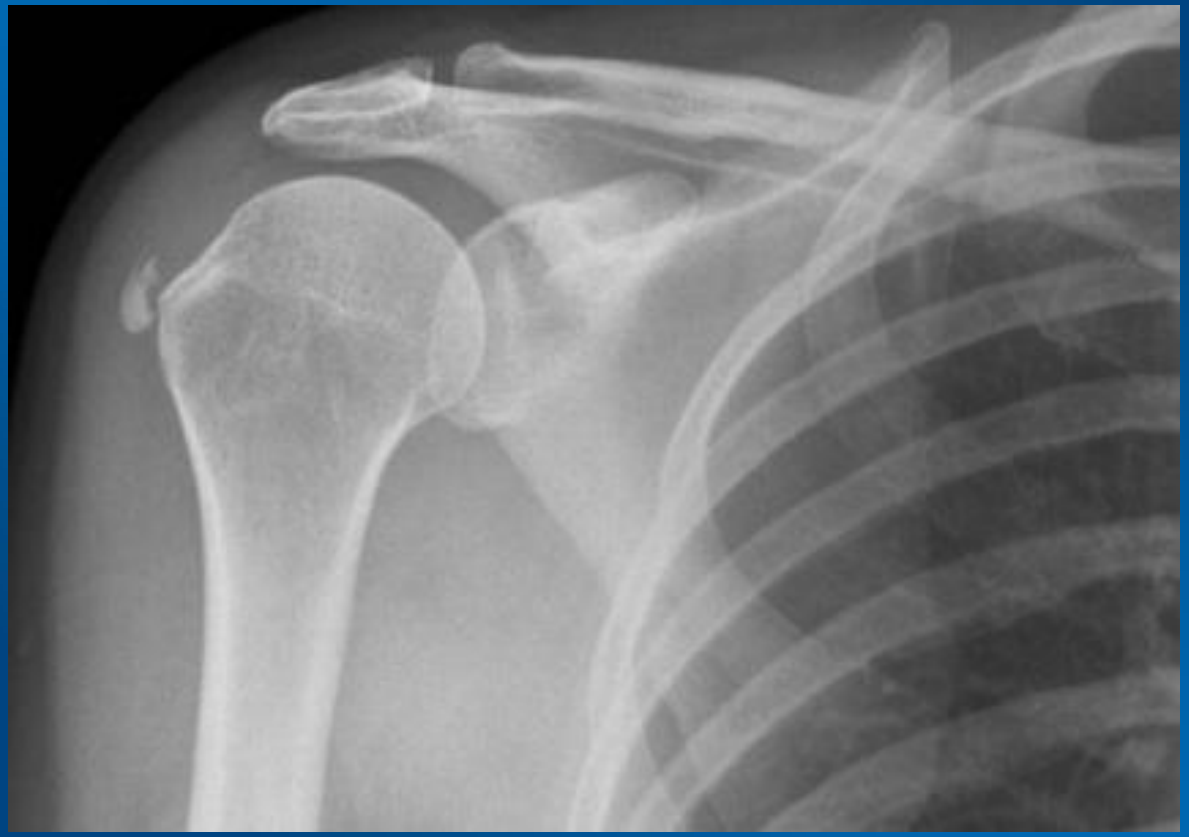
Serendipity view







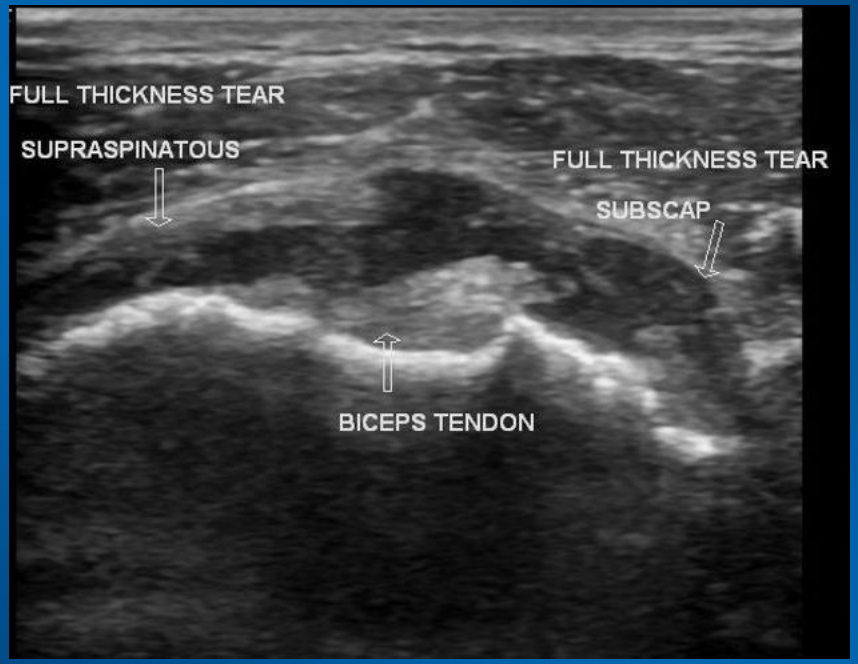
What do you see? What next?



Why get an US

- If you can perform the test yourself at time of service
  - Less expense
  - Faster to obtain
  - Excellent soft tissue resolution
  - Dynamic exam
- If patient cannot have an MRI for a soft tissue injury
- Operator dependent – not every radiology office can provide, emerging popularity with sports medicine, PMR, rheumatology and orthopaedics

Ultrasound results



Case 5 – Knee Pain

- 68 year male golfer complains of acute bilateral knee pain s/p fall while walking on the course
- PMHx – hip osteoarthritis
- Physical exam shows bilateral knees with mild effusions and joint line tenderness
- What to do next?

Knee

Why order plain films
- Trauma
- Chronic pain that isn't responding to conservative therapy

Why order CT
- Tibial plateau fracture

Why order MRI
- Suspect internal derangement that needs surgery
- Patient isn't responding to conservative treatment and something more serious is suspected

Knee

When to order plain films

- Immediately for any trauma –Ottawa Knee rules
- At presentation for suspected OA
- After course of conservative treatment for young patients

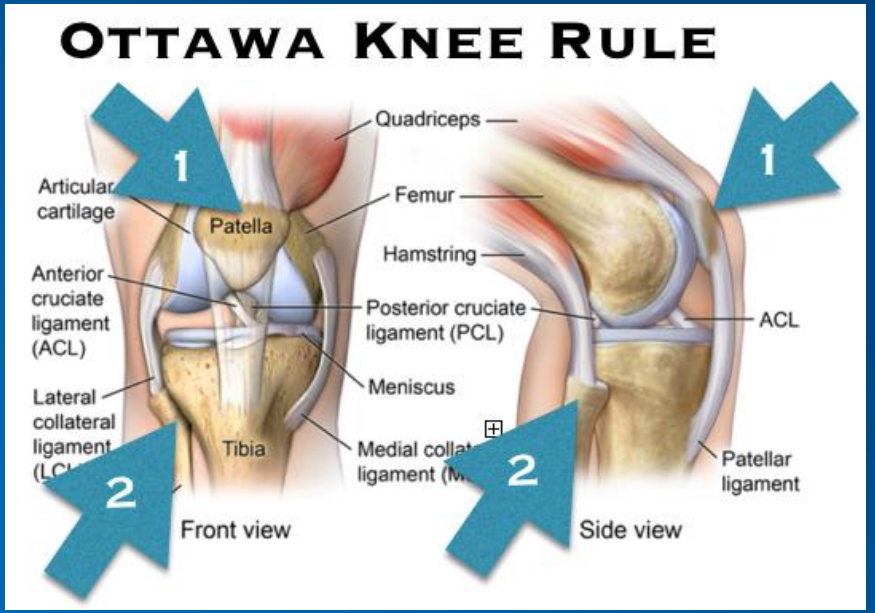
When to order MRI

- At presentation for probable internal derangement that needs surgery
- After course of conservative treatment that fails for young patients (not typically helpful if OA is the etiology)

Ottawa Knee Rules

XR knee for acute injury if meets 1 of the following criteria:

- >55 y/o
- Isolated tenderness of patella
- Tenderness of head of the fibula
- Inability to flex knee to 90 degrees
- Inability to bear weight for 4 steps



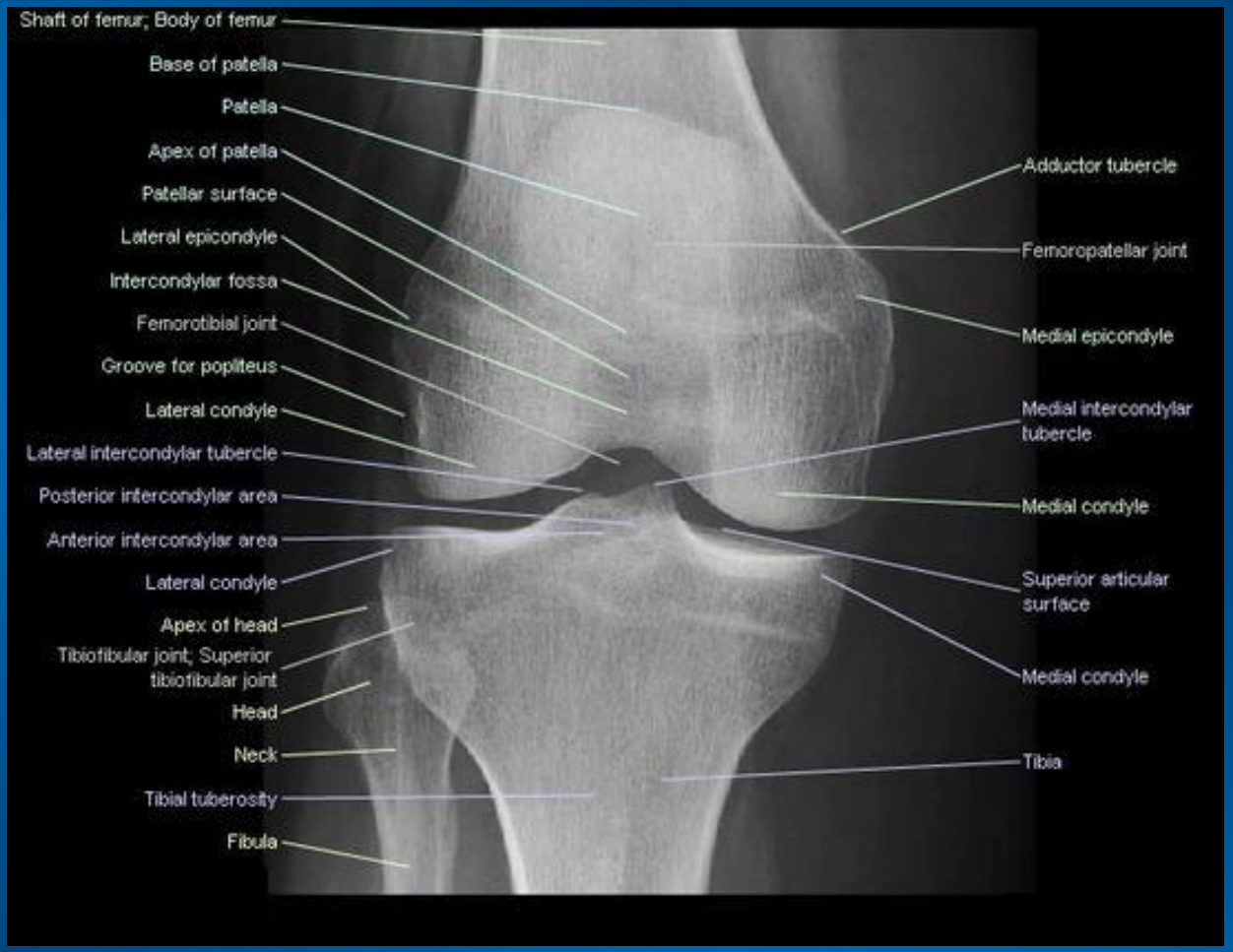
Knee

What films to order

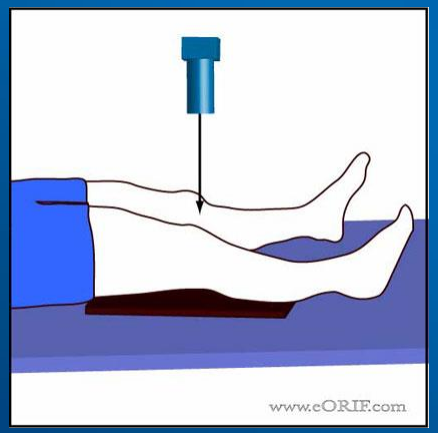
- AP, lateral, merchant – on all patients
- Weightbearing if possible
- Oblique view for trauma for fibular head and tibial plateau
- Weight-bearing PA (Skier's view or Tunnel or Rosenberg views) – on all patients over age 40 and those with suspected OA
  - With comparison view

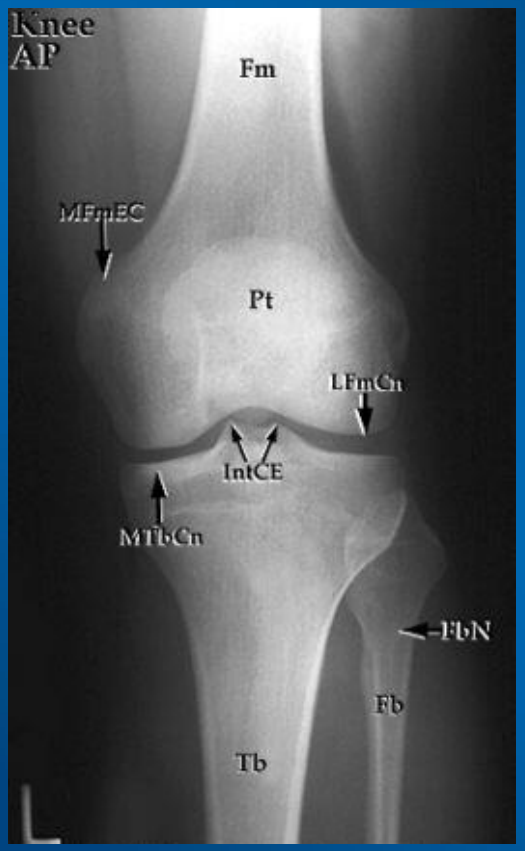
Knee AP

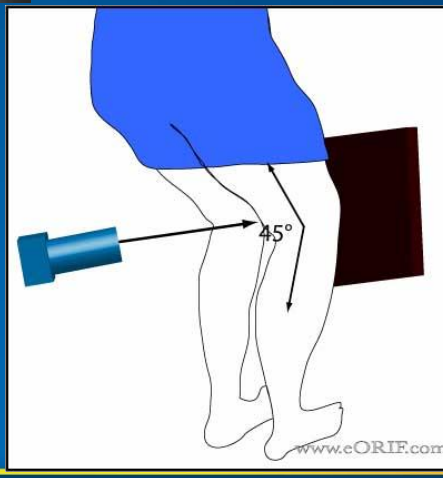
Arthritis views are weightbearing



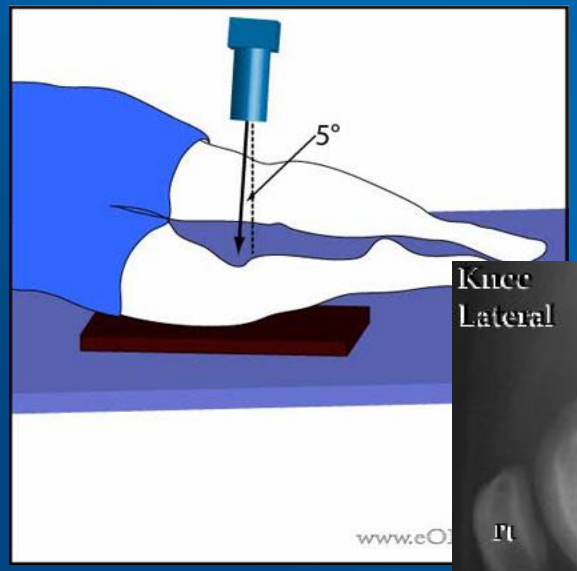
AP vs Tunnel (Flexion PA/ Skier's / Notch)

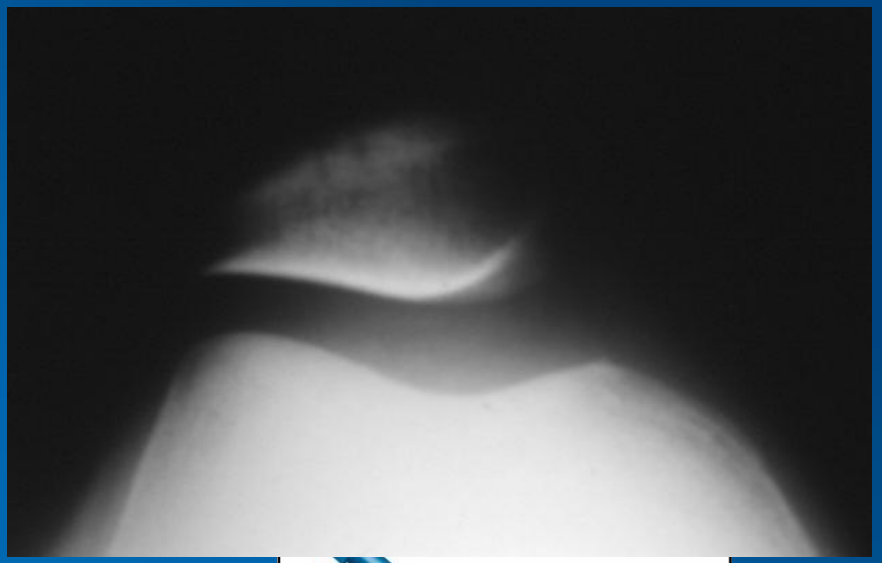


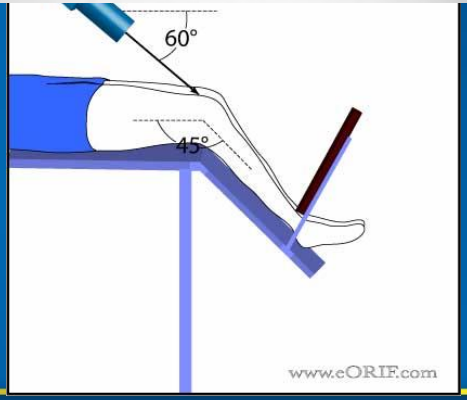




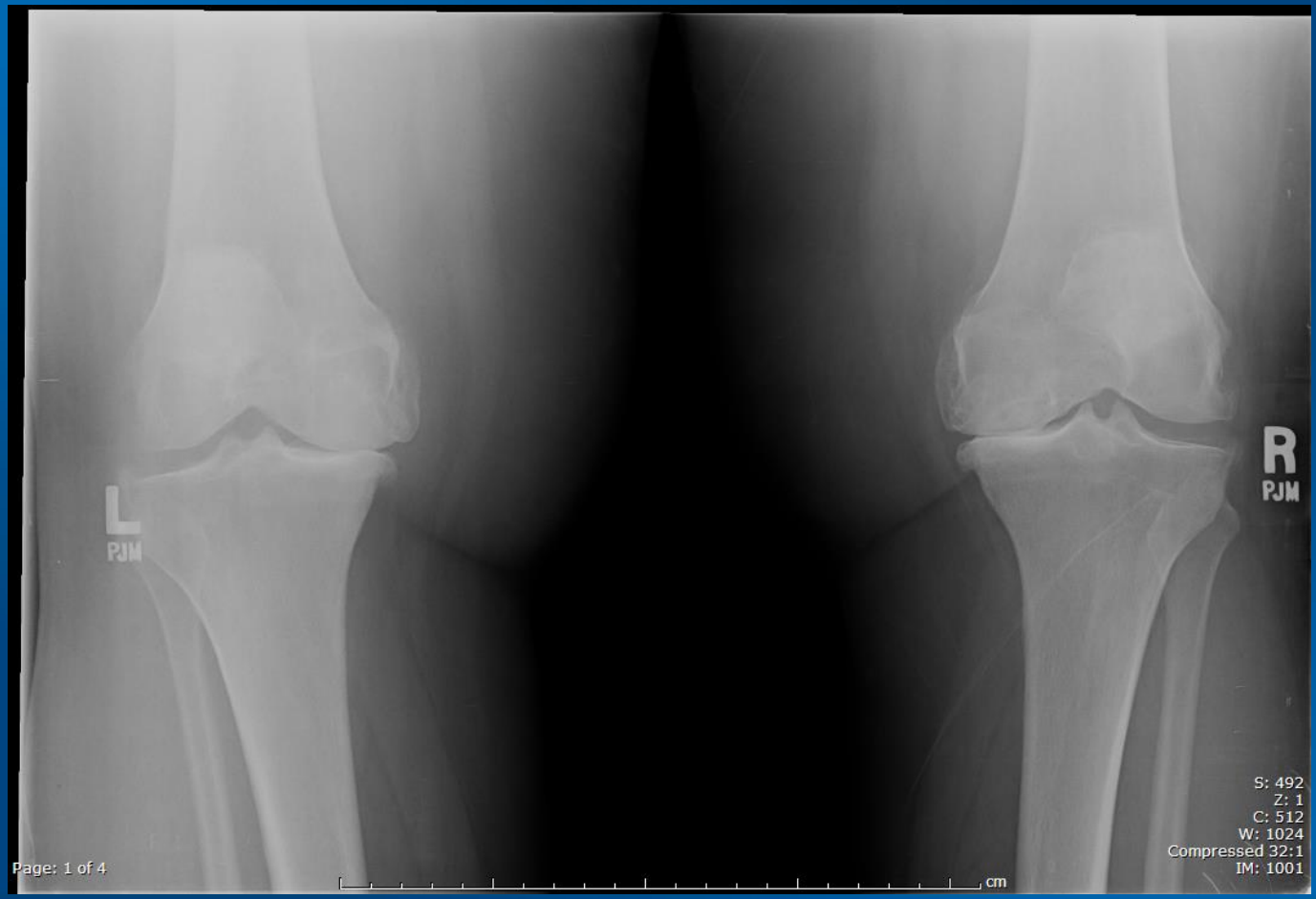
Lateral and Merchant Views







What do you see?



Cardinal signs of osteoarthritis

Case 6 – Wrist Pain

- 33 year female complains of acute left wrist pain following trauma – fall on outstretched hand ("FOOSH"
- PMHx - unremarkable
- Physical exam shows tenderness over anatomic snuffbox
- What to do next?

Hand/Wrist

Why order plain films

- Trauma/acute injury
- Chronic pain that isn't responding to conservative therapy

Why order MRI

- Suspicion of more significant soft tissue injury
- Suspicion of scaphoid fracture not seen on plain film
- Evaluation of AVN of scaphoid with nonunion

Why order CT

- Evaluation of nonunion of scaphoid

Hand/Wrist

When to order plain films

- Immediately for any trauma
- After course of conservative treatment for pain (acute or chronic without trauma)

When to order MRI

- After a course of conservative treatment if scaphoid fracture is suspected and plain films remain negative

When to order CT

- After course of appropriate treatment for scaphoid fracture and pain remains (nonunion vs. AVN)

Hand/Wrist

What films to order - Wrist

- PA, lateral and oblique views – on all patients
- Scaphoid view – if fracture suspected

What films to order – Hand

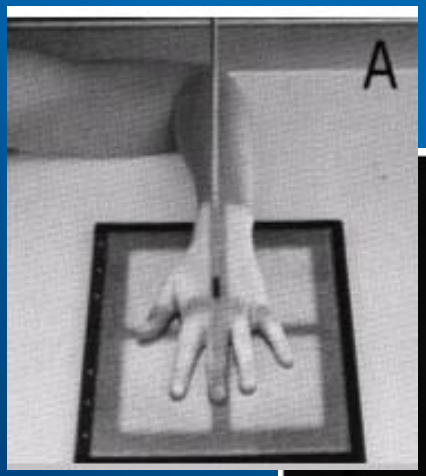
- PA, lateral and oblique views – on all patients
- Fingers – as warranted for finger injuries

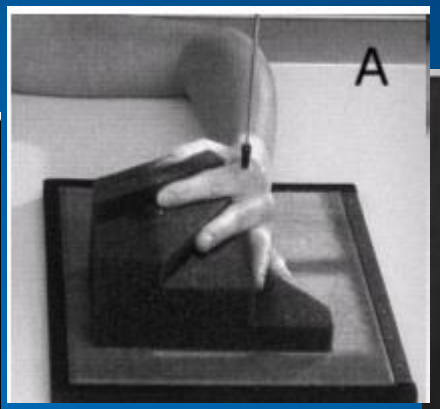
PA and Lateral Wrist Views

www.auntminnie.com
www.e-radiograph.net

Oblique Wrist and Scaphoid Views

PA and Fan Lateral Hand Views

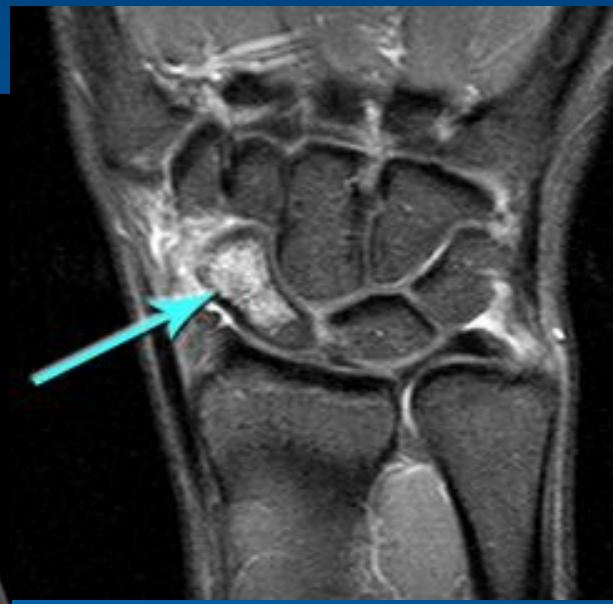




Oblique Hand View

Ball-Catcher (Norgaard's) View

- Hands are in a "ball-catching" position
- Best view to look for early erosions at the base corners of the proximal phalanges



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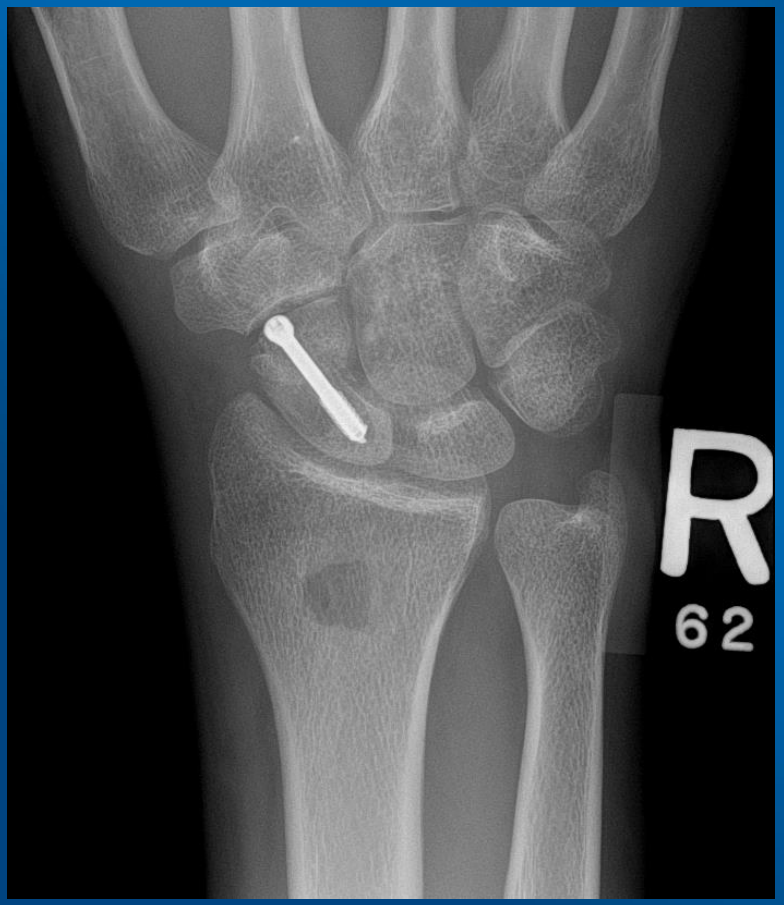
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Conclusion

Common cases to illustrate use of MSK Radiology

Important to order the proper views

Important to get weight bearing views for lower extremity OA eval

Get x-ray films regularly

Use judgement on when to get advanced imaging

Important to review your own films to correlate with what you are seeing clinically

Educational Websites

- http://www.learningradiology.com
- http://uwmsk.org/RadAnatomy.html
- https://radiopaedia.org/encyclopaedia/all/musculoskeletal
- https://skeletalrad.org/web-resources
- http://www.radiologyassistant.nl/en/
- http://www.wikiradiography.net
- http://xrayhead.com
- https://www.radiologymasterclass.co.uk/

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