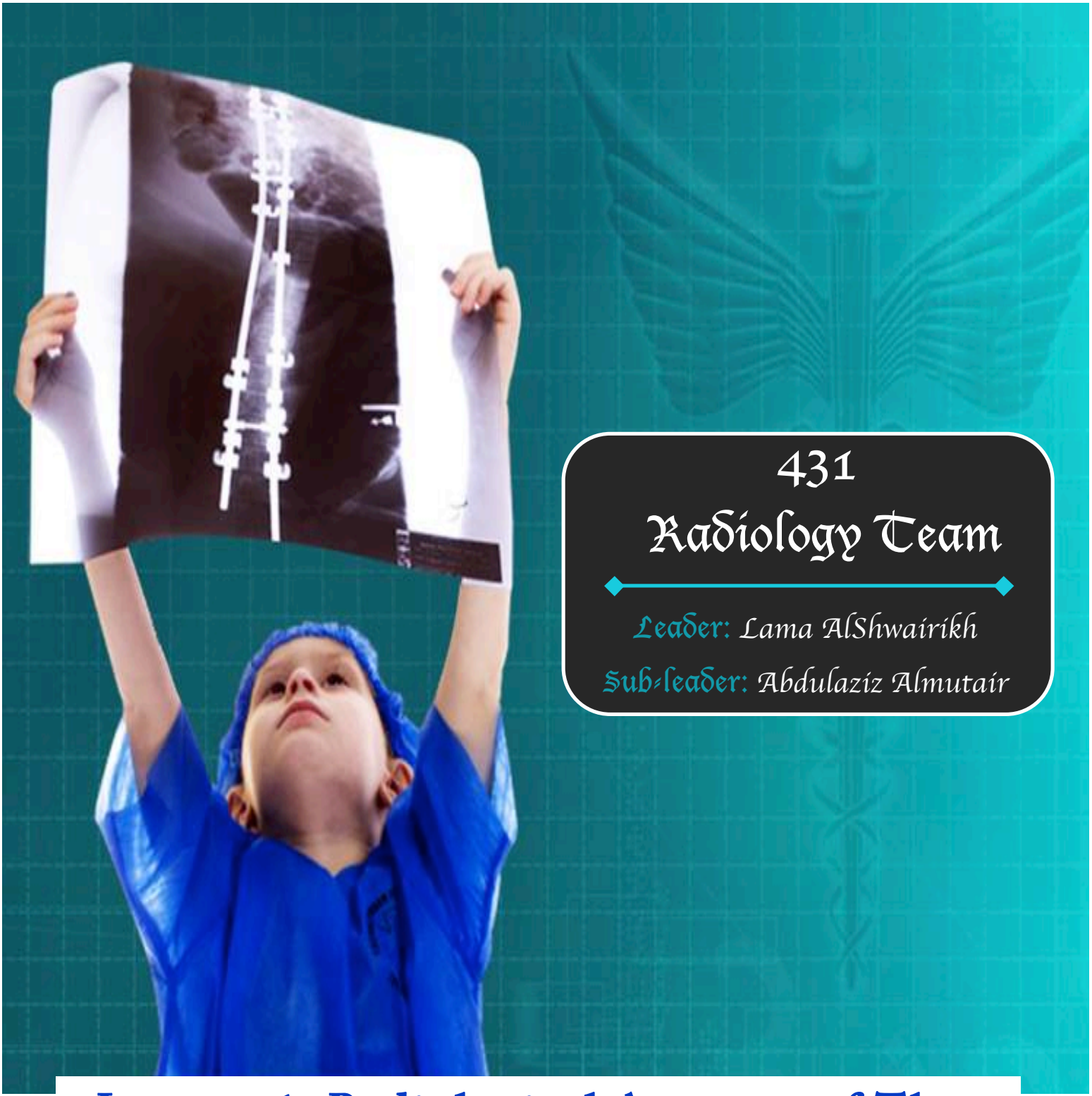

431

Radiology Team

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Lecture 1: Radiological Anatomy of The Skeletal System

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Revised By: Sara Almurairi & Lama Alshwairikh

◆Important ◆Doctor's notes ◆Team's notes

We thank 430 & 429 Teams for their helpful notes

Objectives:

The main focus and objectives of this lecture is to help students to be competent in looking at MSK images and interpreting findings, by learning:

*Normal radiological anatomic landmarks.

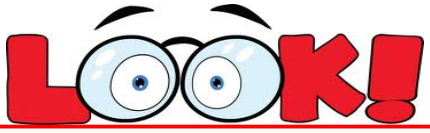
*System of analyzing findings.

*"Where to look and what to look for".

*Recognize features of certain disease entity.

Images From Slides

Extra Images



What to look at/for:

1-Bone density. (Normally, bone should be more dense than the adjacent soft tissue)

2-Bone texture. (Normally, the cortical outline can be differentiated from the medulla)

3-Cortical outline and margins of the bones. (Normally, sharp and intact throughout the bone)

4-See if the alignment is preserved or distorted.

5-Soft tissue surrounding these bony structures.

6-Distortion/Displacement of normal structures.

7- Pediatrics: epiphyseal plate.

Imaging of Musculoskeletal System

* Plain film:

Remains the cornerstone modality used to assess musculoskeletal system (First line).

* Computed tomography (CT):

Delineate the anatomy more clearly. It is usually used to evaluate patients with trauma in relation to complex anatomical regions such as the shoulder or pelvis.

* Magnetic resonance imaging (MRI):

Delineate the anatomy more clearly. It is important to evaluate the bone marrow (soft tissue component within bone marrow), joints, ligaments, tendons and muscles.

* Ultrasound:

To obtain the images, it utilizes the sound waves and needs soft tissue media to travel through, so it will not be sufficient to evaluate bones (e.g. in fractures). However, it could help in evaluating the surrounding soft tissues such as: the muscles, tendons, ligaments, and superficial structures in particular such as the ligaments/tendons around the ankle or wrist joints. It also helps in evaluating traumatic patients with soft tissue swelling to see if there is underlying hematoma, blood/fluid collection within the muscle or cystic lesion around the joints.

* Angiography:

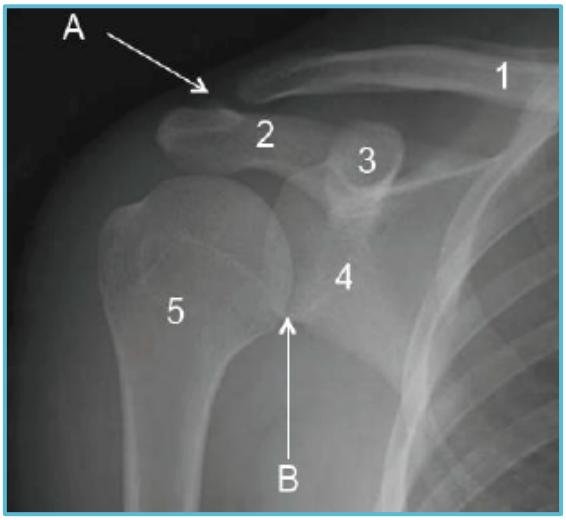
Evaluates or maps out vascular structures (arteries, veins and even lymphatic), in particular in surgical cases such neoplastic or mass lesion.

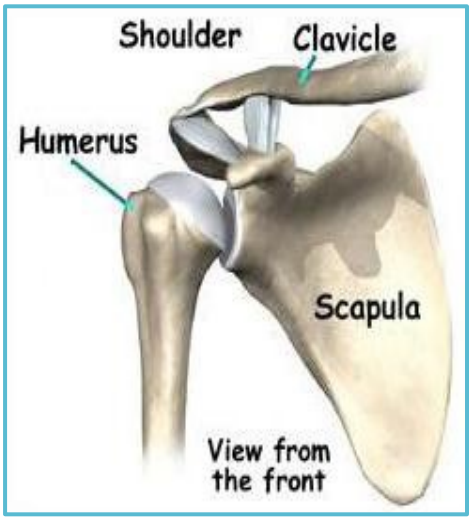
If the lesion is hyper-vascular like angiosarcoma, before the surgery we first need to know the vessels that are feeding the lesion to embolize them and minimize the bleeding post surgery and help in shrinking the tumor.

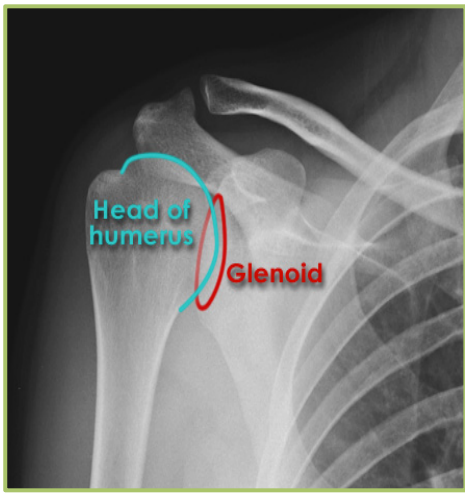
* Nuclear medicine:

Advantages: (isotope scan) used in metabolic, vascular and neoplastic lesions as it helps in differentiating between infectious, neoplastic and inflammatory processes, where the plain film image might be doubtful.

Disadvantages: sensitive in delineating pathology but NON-specific.

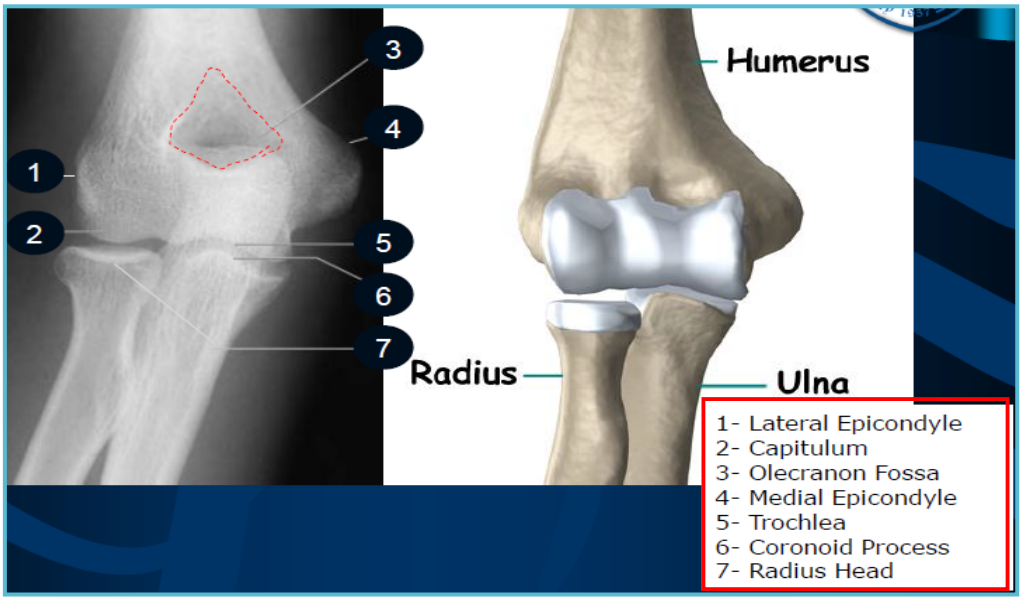






2 major joints:
A- Acromio-Clavicular joint (between the acromion process and the clavicle. Appears lucent; black area)
B- Gleno-Humeral joint (between the glenoid process of the scapula and the humeral head. It gives full range of motion)
*In x-ray: the joint appears as a lucent area in between the two articular surfaces.

1- Clavicle
2- Acromiom process (posterior): it articulates with lateral aspect of clavicle.
3- Coracoid process (anterior).
4- Glenoid process of the scapula.
5- Humerus.

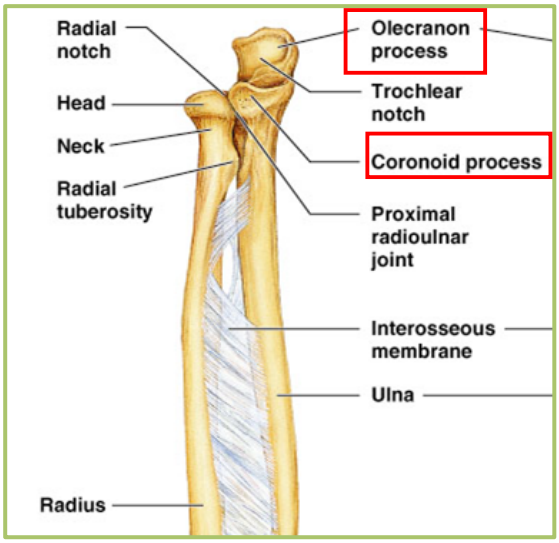


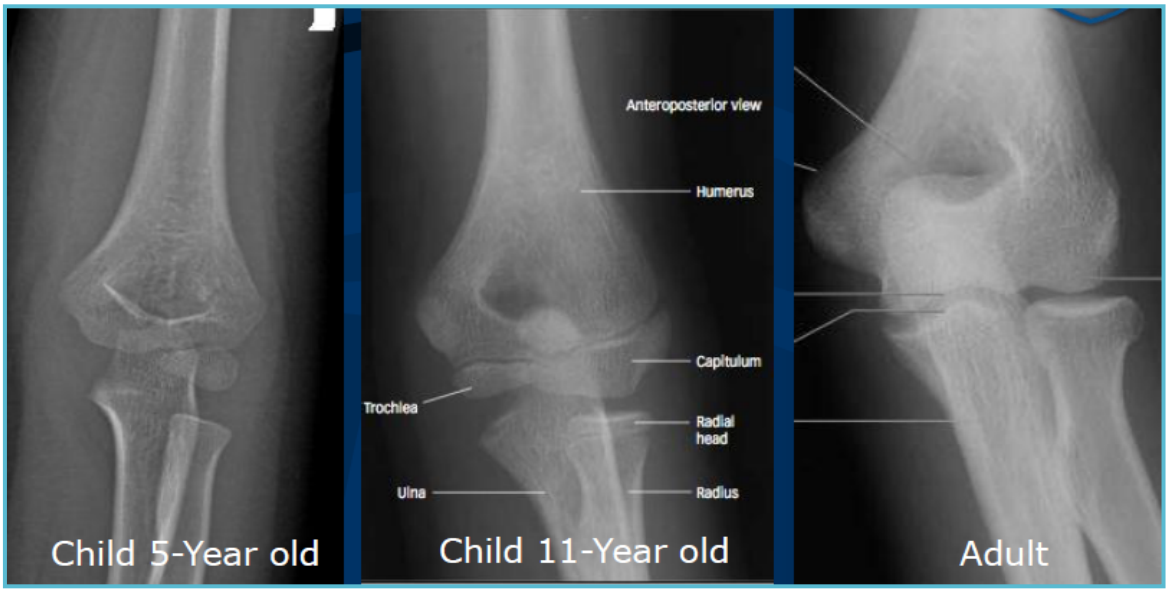
There are two joints in the elbow region:
1-Radio-humeral joint
2-Ulnar-humeral joint

Radius in is the lateral aspect and ulna is in the medial aspect of the elbow joint.

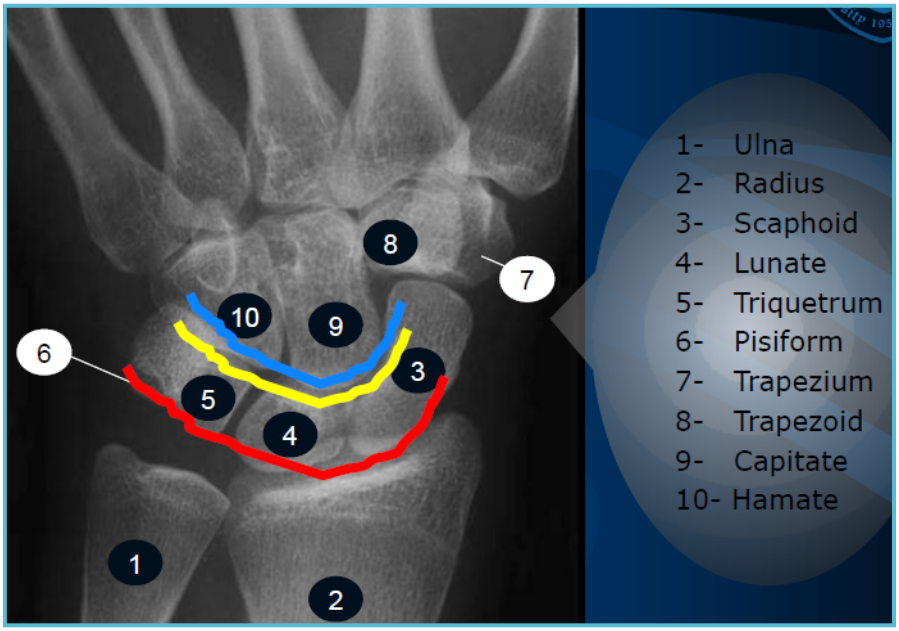
In imaging, you can see a triangular fossa at the level of the epichondyler region (or suprachondyler region) it's called the suprachondyler fossa and has anterios and posterior surfaces. The posterior surface is larger and accomodates the olecranon process of the ulna, and the anterior accomodates the coronoid process.

The ulna has 2 processes:
Olecranon: goes into the suprachnodyler fossa in extension.
Coronoid: goes into the suprachnodyler fossa in flexion.





In children we can clearly see the growth plate (epiphyseal plate), which appears as a lucent line between the proximal part of the humerus and the epiphyseal center (so don't mistake it with a fracture). In adults (after puberty) it's fused together.



Pneumonic to help you remember:

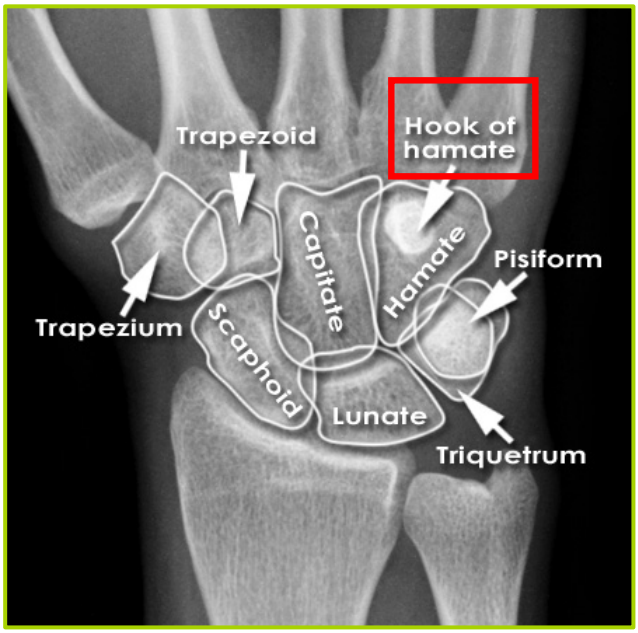
"She Looks Too Pretty; Try To Catch Her"
Proximal row then distal row, both lateral-to-medial:
Scaphoid
Lunate
Triquetrum
Pisiform
Trapezium
Trapezoid
Capate
Hamate

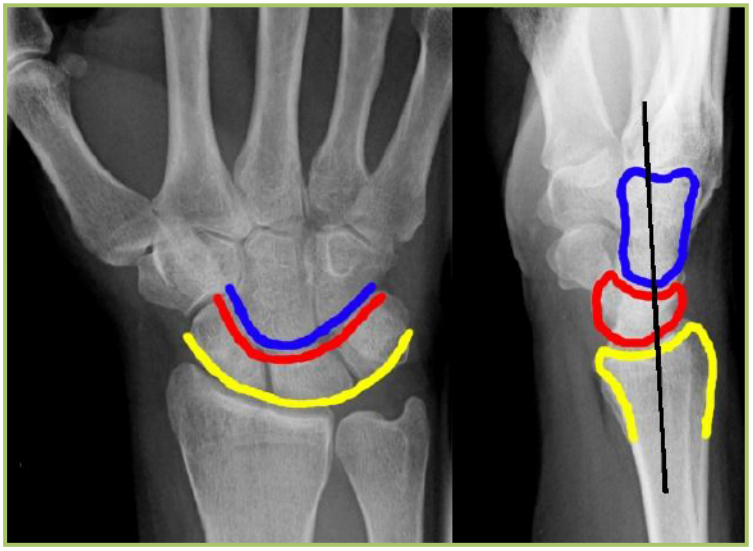
Eight carpal bones arranged in two rows (proximal and distal), four bones in each one.
The most anterior & smallest carpal bone is the pisiform.

In the frontal projection (epi projection):
The scaphooid and lunate: articulate with radius.
The triquetrum: is in relation to the ulna, and the pisiform is anteriorly. (The pisiform and triquetrum overlap)

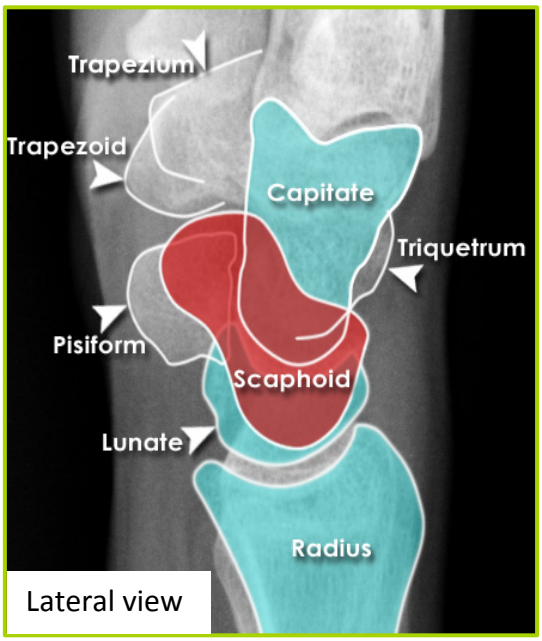
Distal row:
The trapezium and trapezoid: articulation with the first and second metacarpal bones.
The capitate and hamate: related to the rest three metacarpal bones.

In relation to the hamate:
.Oval shape structure: hook of hamate





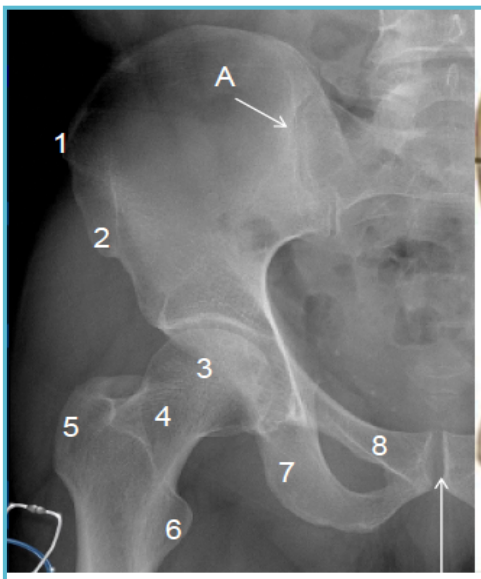
Lateral view

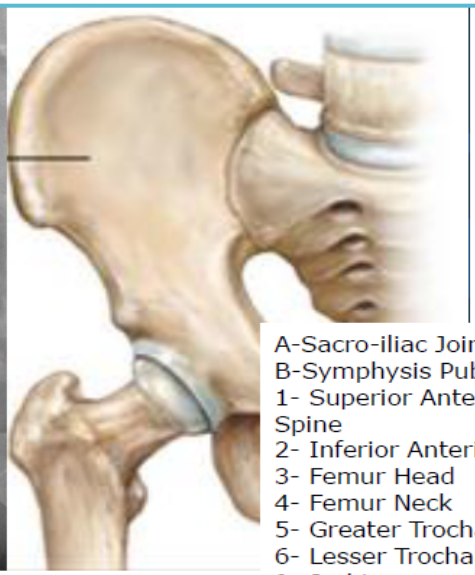


Lateral view

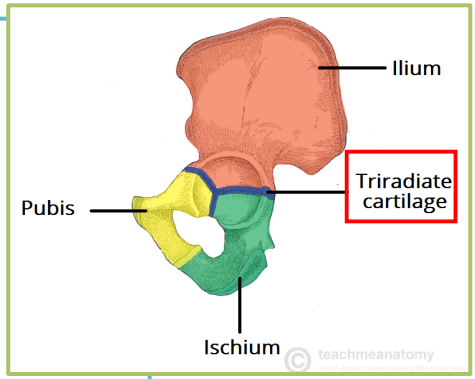
In the lateral view there is a vertical alignment between the radius, lunate and capitate (vertical orientation).

Whenever we have disturbance in the line it indicates either dislocation or subluxation of one of these bones.



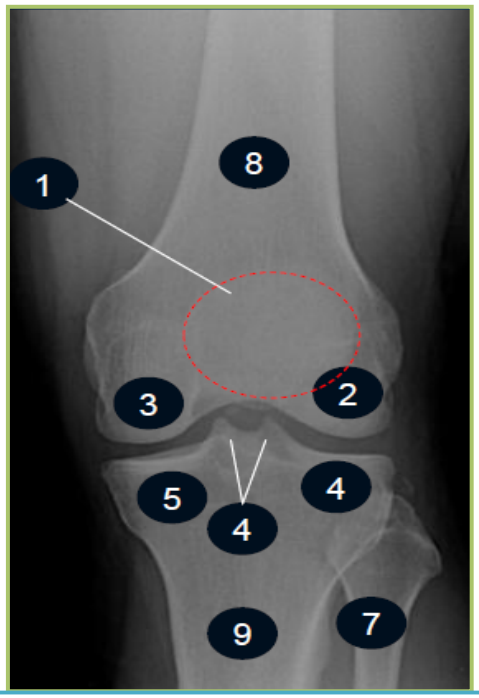


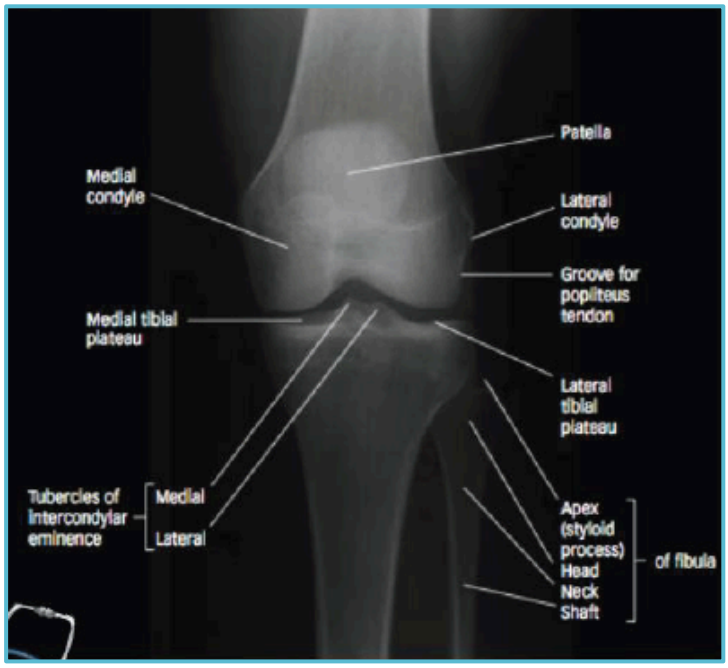
A-Sacro-iliac Joint
B-Symphysis Pubis
1- Superior Anterior Iliac Spine
2- Inferior Anterior Iliac Spine
3- Femur Head
4- Femur Neck
5- Greater Trochanta
6- Lesser Trochanta
&- Ischium



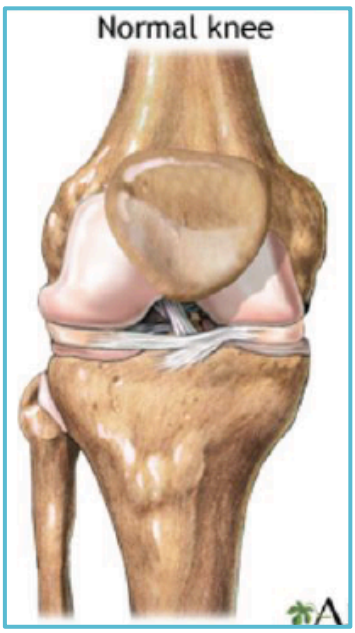
Iliac bone has three bony components: Iliac plate, pubic ramus and ischium. They join in the triradiate cartilage region and form the acetabulum (hip socket) that accommodates the femoral head and forms the hip joint.

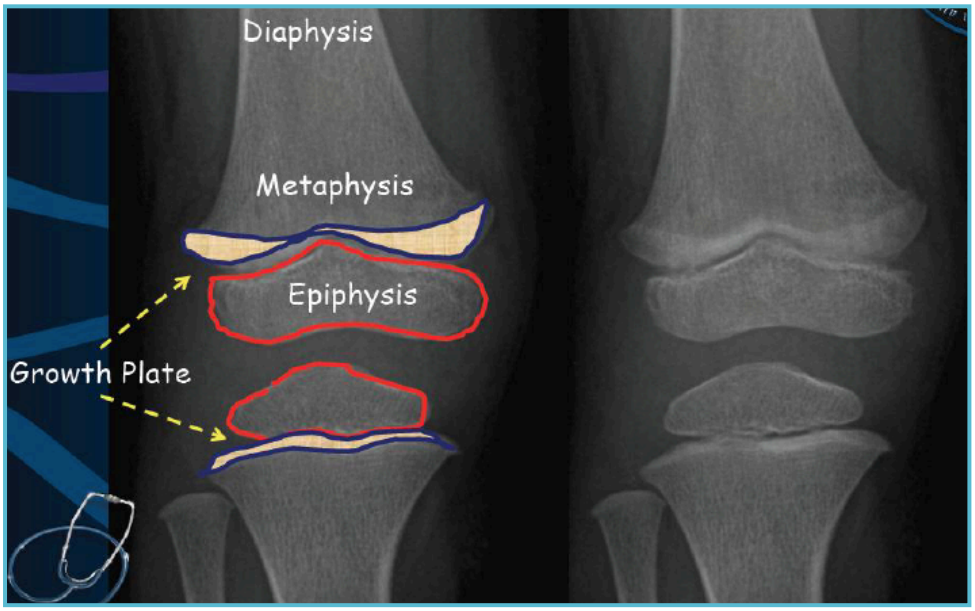
In pediatrics, the triradiate cartilage region is not fused and a portion defect will be seen on x-ray.





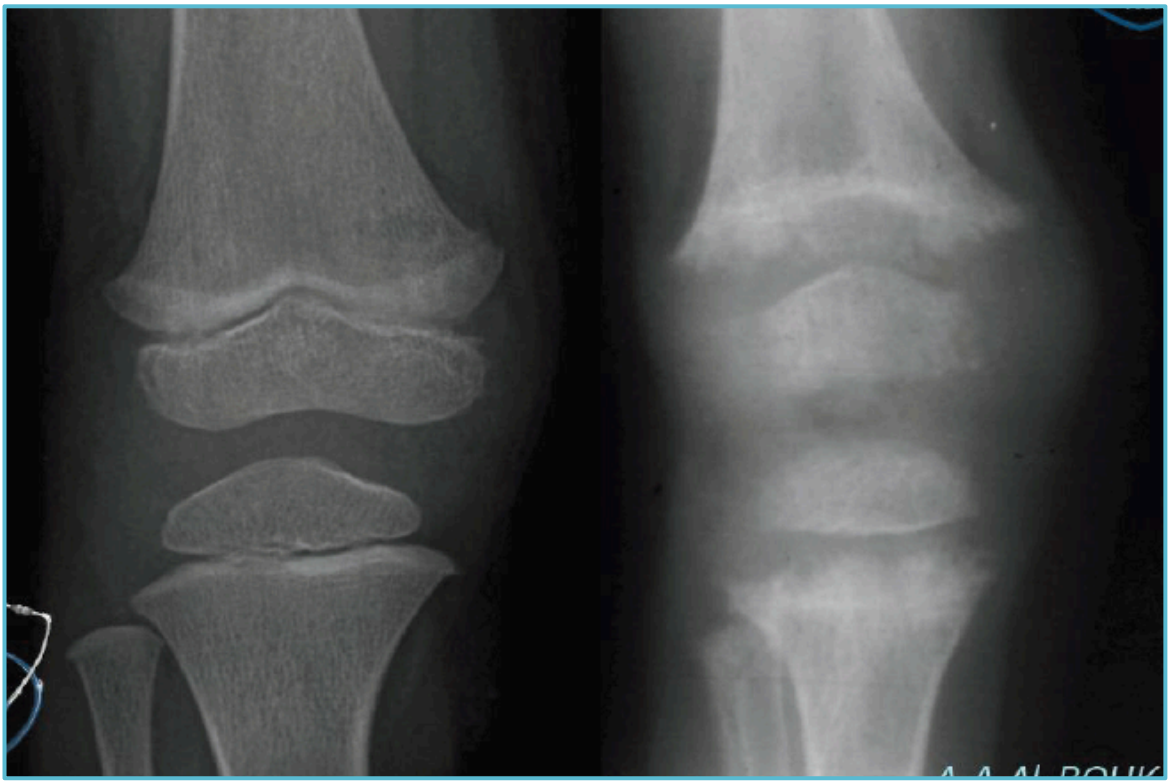
1) Patella (anterior to the knee joint)
2) Lateral condyle
3) Medial condyle
4) Lateral tibial plateau
5) Medial tibial plateau
6) Tibial eminence
7) Fibula
8) Femur
9) Tibia



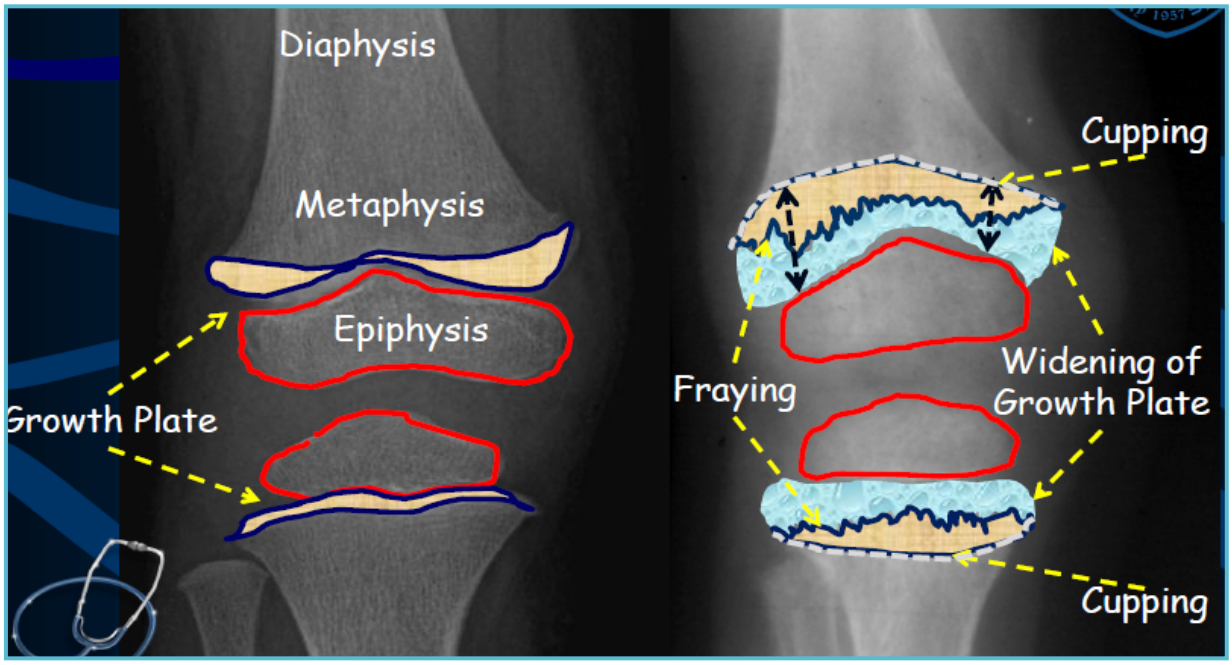


Pediatric image (growth plate is clear)

It's a normal knee joint for a child because the growth plate is not fused yet. Again, don't mistake the lucent growth plate in children with traumatic injury.

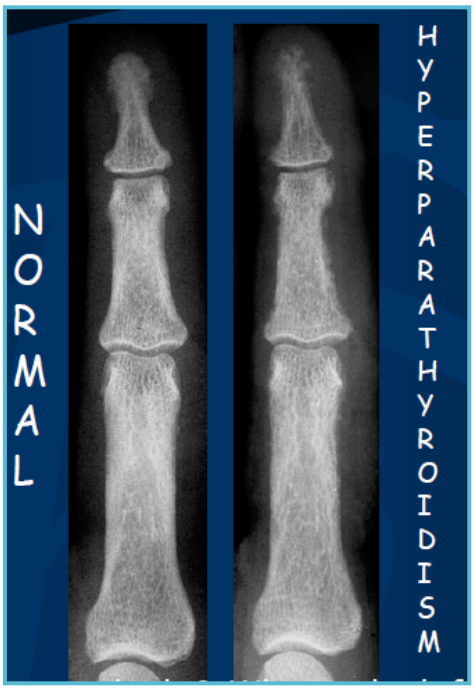


Normal Rickets



Normal Rickets

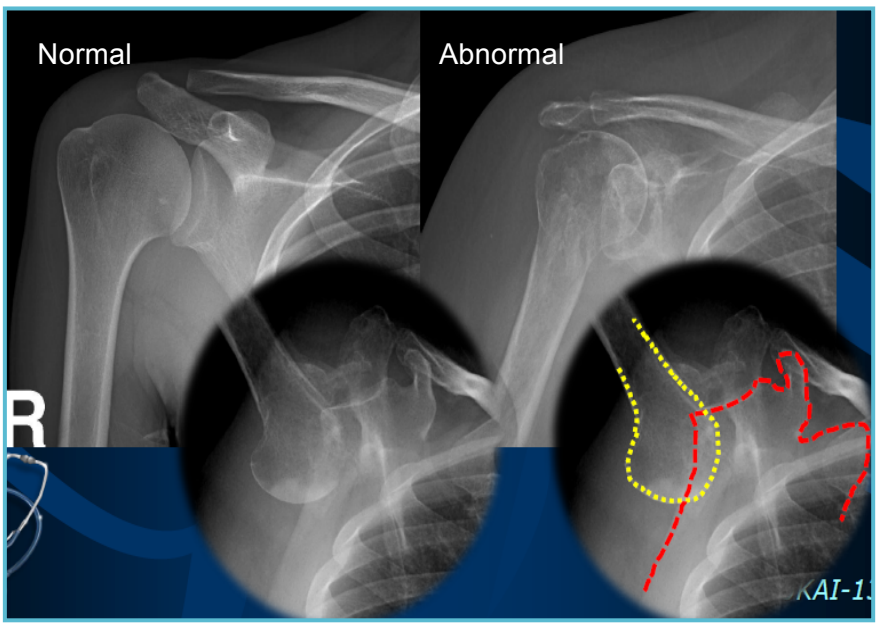
- Growth plate is widened.
- Metaphases are cupped.
- Irregular sclerotic shaggy epiphyseal outline.
- Borders are ill defined and not sharp.
- Trabecule is hazy, hazy structure.

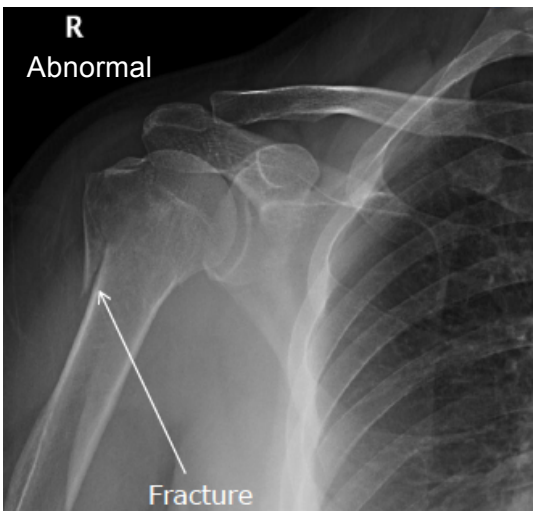


The left image: the cortical outline of the phalanges is sharp.

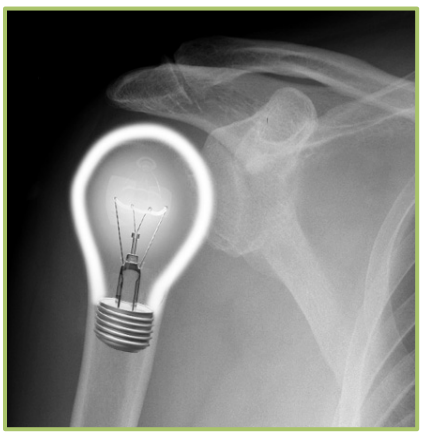
The right image: The cortical outline of the phalanges is irregular (indicating presence of bone resorption secondary to hyper-parathyroidism)

In the shoulder region, we need to look at the humerus, glenoid process of the scapula, acromiom and clavicles. Regarding the joints, we have acromioclavicular and gleniohumeral joint.



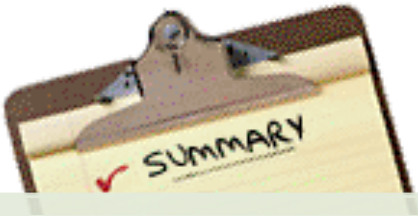


In the abnormal image: there is disruption of the cortical humerus outline and glenoid. Humeral head is displaced. This is a posterior shoulder dislocation with fracture.



Posterior shoulder dislocation - AP view

- The glenohumeral joint is widened
- Cortical irregularity of the humeral head indicates an impaction fracture
- Following posterior dislocation the humerus is held in internal rotation and the contour of the humeral head is said to resemble a 'light bulb'
- **NOTE** - Any X-ray acquired with the humerus held in internal rotation will mimic this appearance



Plain film	• The cornerstone modality.
CT	• Useful in complex skeletal trauma.
MRI	• Evaluates bone marrow.
Ultrasound	•Soft tissue structures. •Detects fluid collections around joints or within muscles.
Angiography	• Evaluates (maps out) vascular structures and important in surgical cases.
Nuclear Medicine	• Sensitive but is relatively non-specific.

MCQs:

1-The main modality used to assess musculoskeletal system:

A- X-ray
B- CT scan
C- MRI
D- Nuclear medicine

2-The lateral aspect of clavicle articulates with:

A- Sternum
B- Coracoid process
C- Glenoid labrum
D- Acromion

3-The pisiform bone is located at:

A- Carpal bones
B- Foot
C- Knee
D- Skull

4-The best imaging modality for bone marrow is:

A- CT scan.
B- MRI.
C- X-ray.
D- Ultrasound.

Good Luck!

Answers:

1- A
2- D
3- A
4- B