# Lecture (9)

# Imaging the Musculoskeletal System


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**Resources:**

- Lecture by dr. Ahmad Amer Albokai .
- Doctor's note .
- 429 team work .

## Imaging Modalities

### Plain Film:

- Most of bone pathology can be seen by plain films
- Certain areas (complex anatomy such as shoulder & pelvis) needs further imaging evaluation by CT or MRI; in particular in cases of trauma.

### CT:

- Useful in complex skeletal trauma
- is better in trauma because it is faster and show bone cortex and trabecular texture

### MRI:

- Useful in bone, joint, soft tissue, bone marrow changes, the joint

### Ultrasound:

- Tendons/ligaments/muscles.
- Detect fluid collections around joints or within muscles. Soft tissue masses and cysts
- initial for the soft tissue structures, architecture of the tendon and ligament
- fluid: hematoma in the soft tissue of the muscle

### Angiography:

- vascular structures, imp in surgical management (underlying pathology), not specific but high sensitivity, not a diagnostic modality
- important in surgical management of underlying pathology "tumors"
- important in interventional approach in vascular malformation in the limbs for example

### Nuclear Medicine:

- bone scan is very sensitive but non-specific

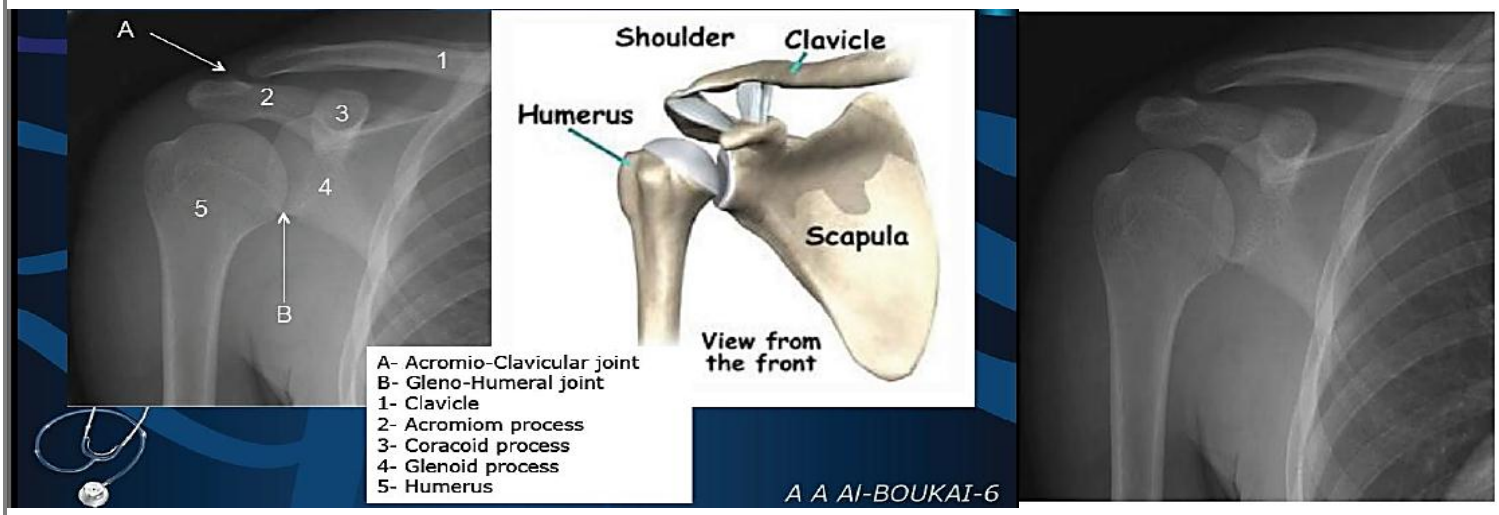
## Interpreting Images " important"

- Bone density ( is the bone whitish or more black )
- Bone texture
- Distortion /displacement of normal structures.
- Cortical outline of the bone.
- Articular surface of the joint.
- Pediatric: epiphyseal plate.

## Musculoskeletal radiological anatomy :

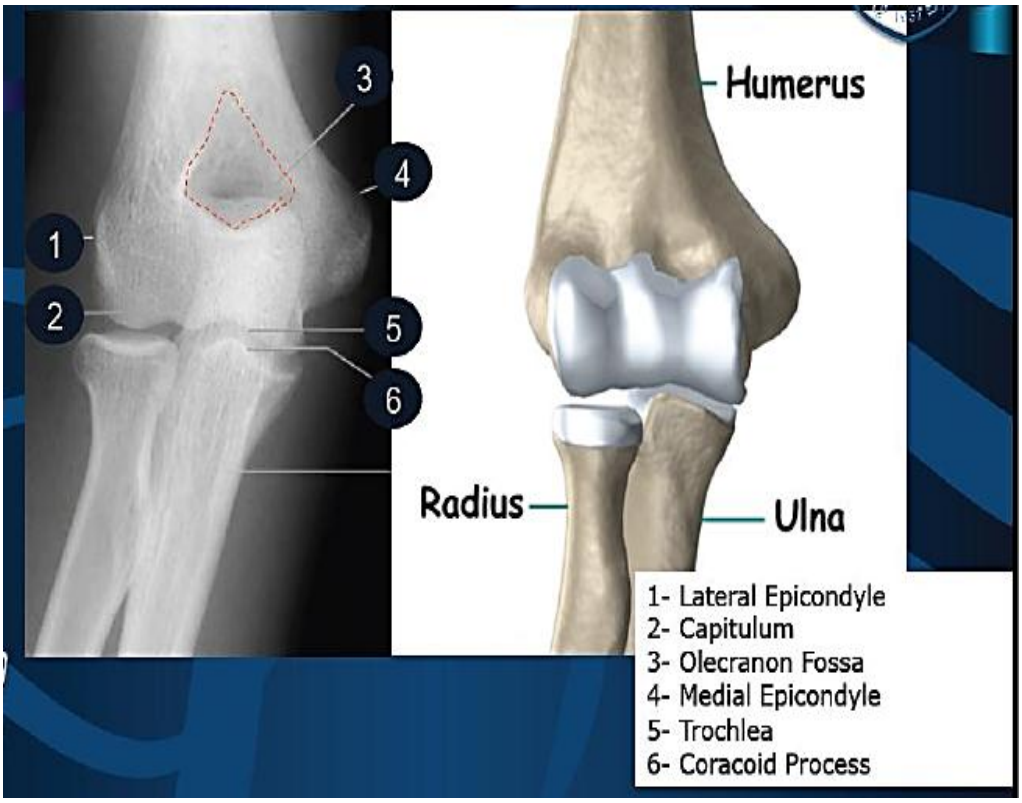
### Upper Limp :

#### (1) Shoulder joint




**Normal**

#### (2)



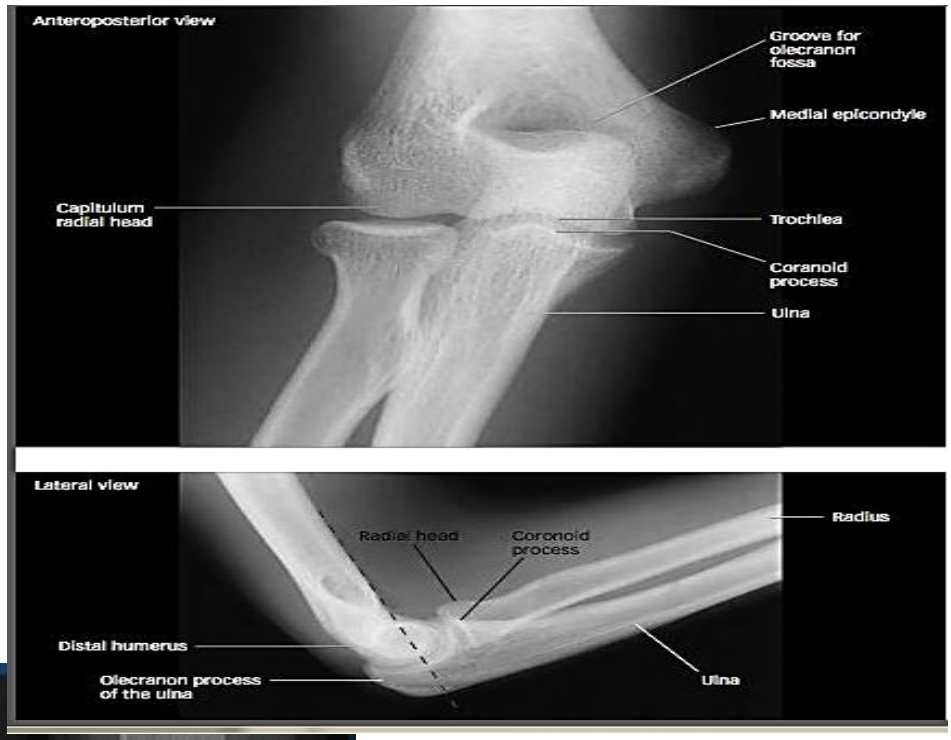

**Normal**

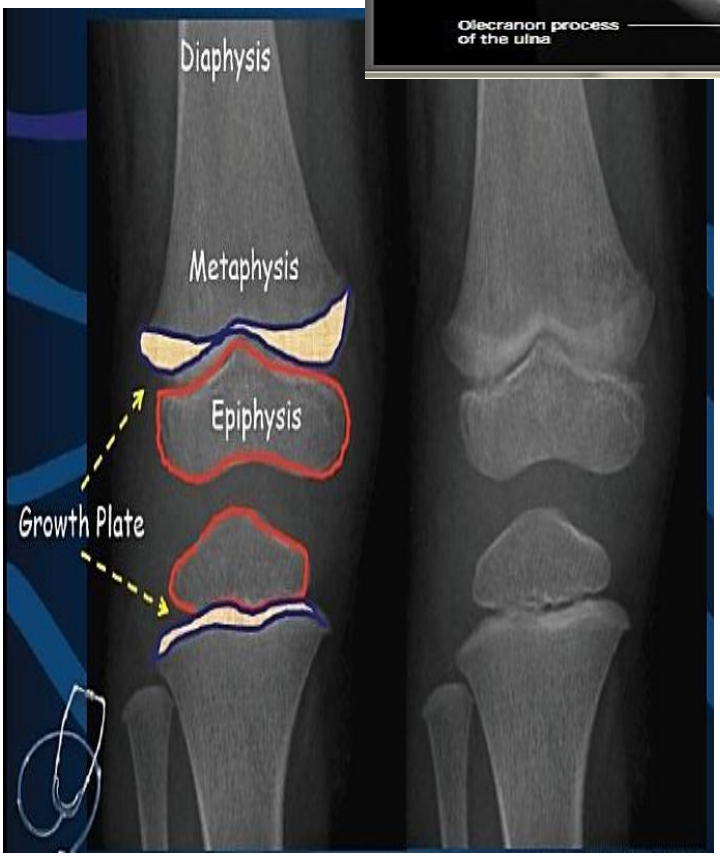
**Remember :**

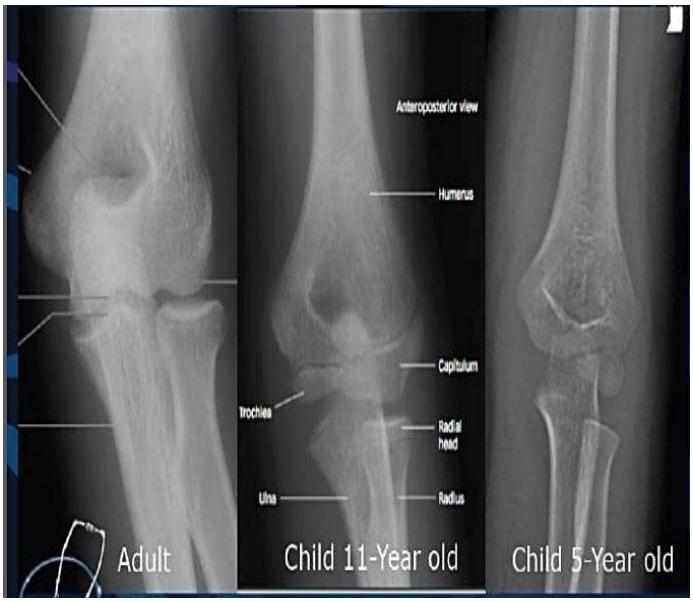
**the bony outline of the area we are looking at depends on the age of the patient. So you will not see the same picture in pediatric age group compared to adult. Why?**

**In pediatric/newborn/infant age group the bone will be not completely ossified as in adults. So the ossification will be more at the central portion of the long bones as well as the ends of the bone, while the growth plate will appear lucent due to the cartolegenouse texture of the reigion . when it fuse and disappear, the bone will be not elongate . This happens at age of 17 .**

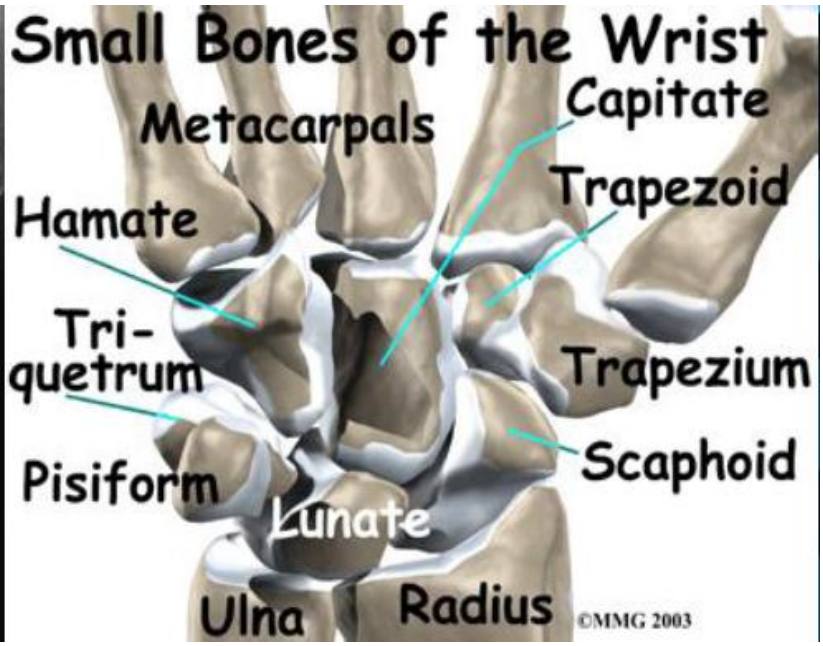
**So if you see a lucent line in the area of growth plate in pediatric bone → normal and there is no fracture but If you see it in adult bone →may be there is fracture or any other abnormalities .**



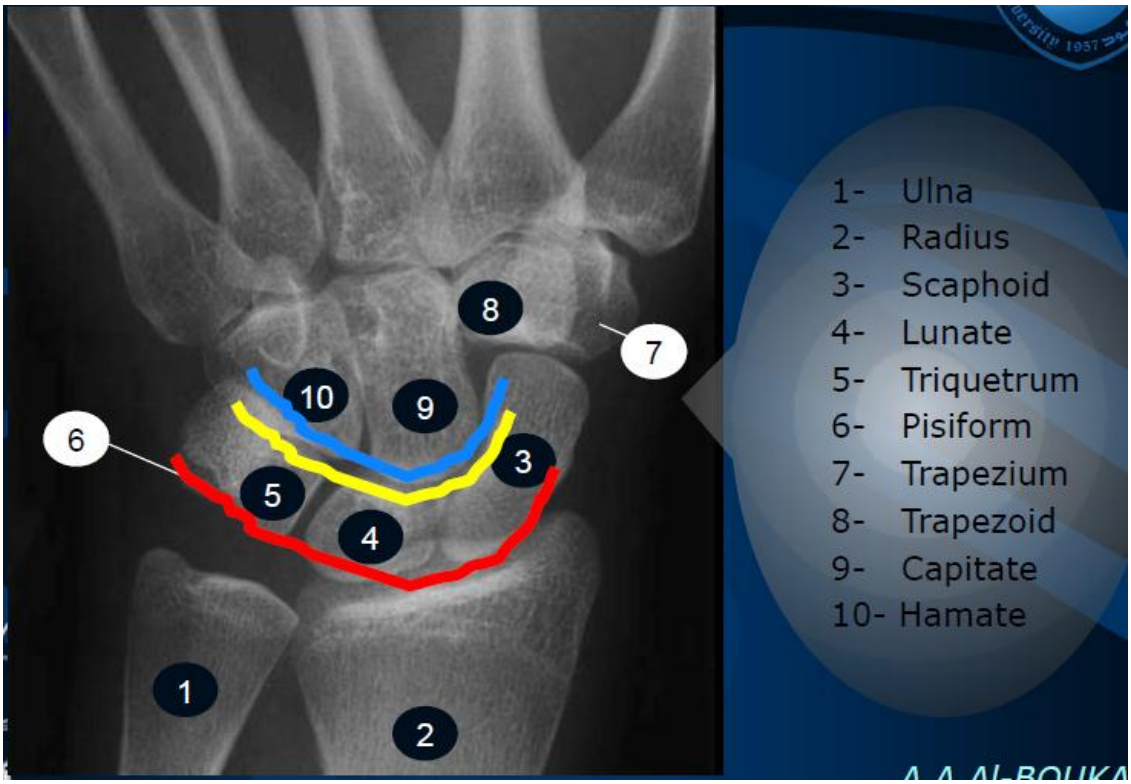
## Wrist joint

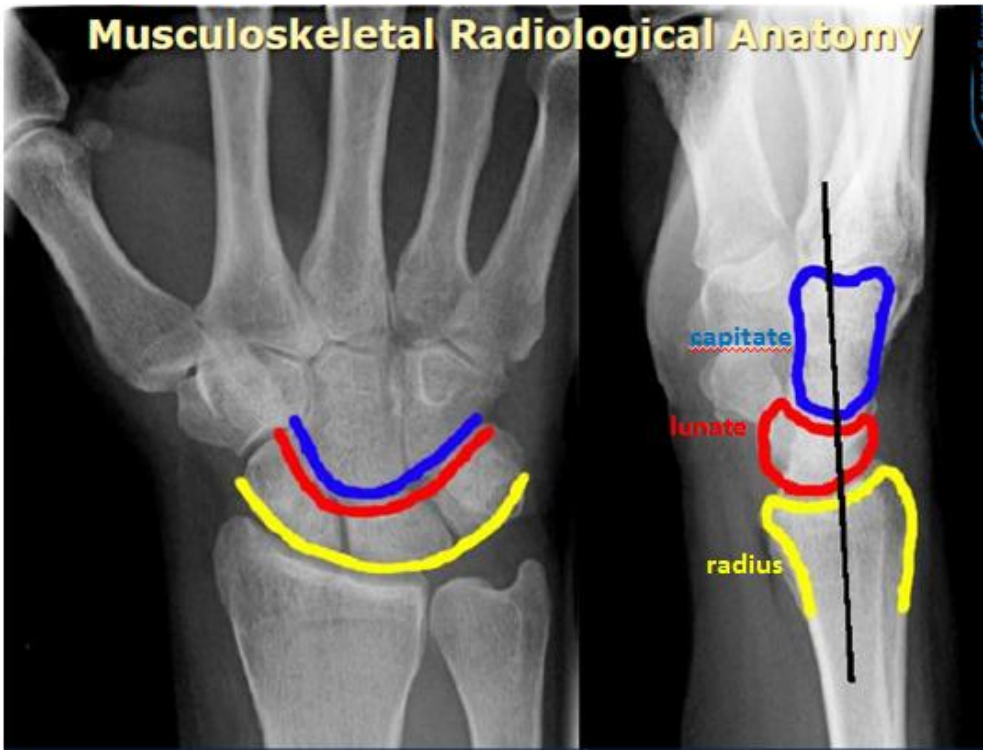



**normally we can draw 3 parellel lines (carpal arcs) between these bones which are**

1- **along the proximal row of carpal bones; proximal aspect**
2- **along the proximal row of carpal bones; distal aspect.**
3- **along the capitate and hamate proximally.**

**These 3 lines should remain unbroken**

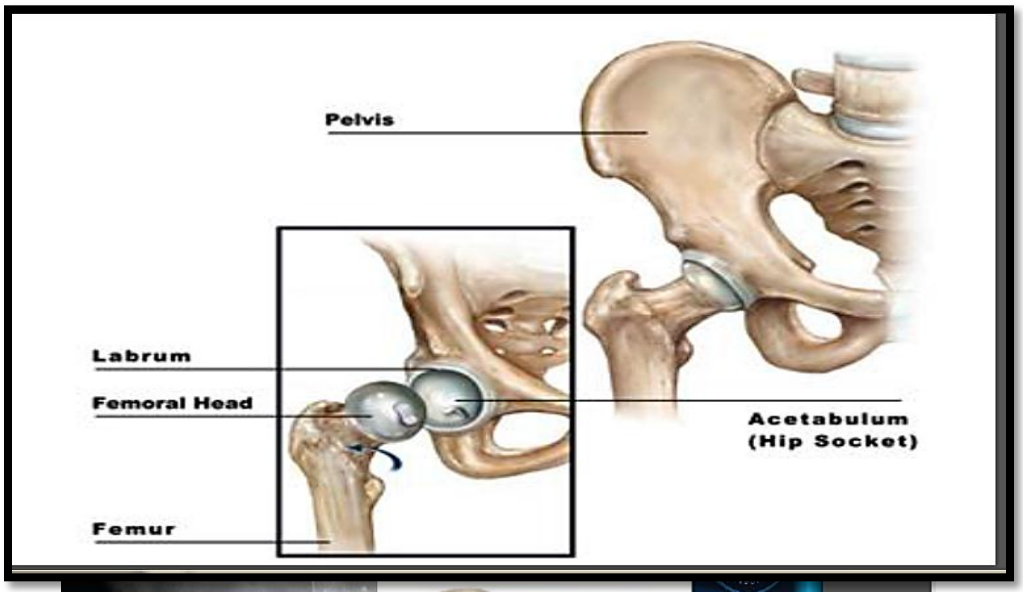


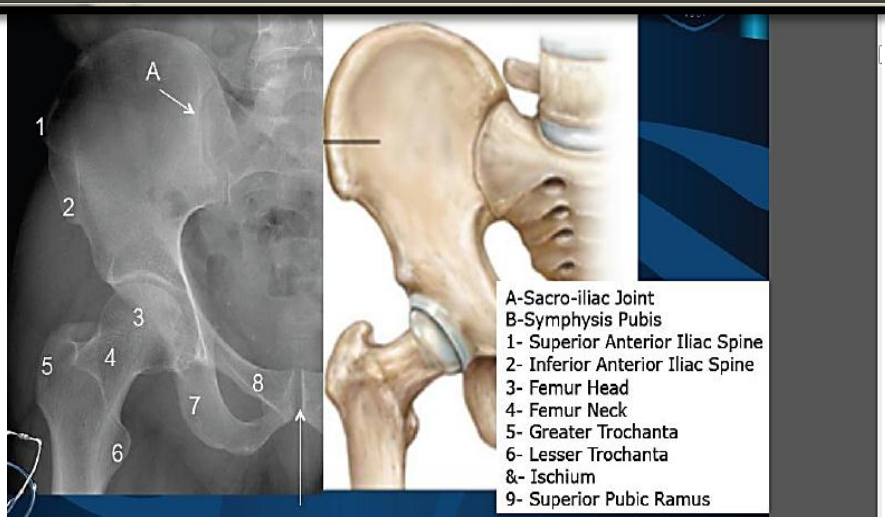



**In the lateral view : imagine the bones as a cup of coffee (capitate) sitting on a plate ( lunate) on a table (radius)**

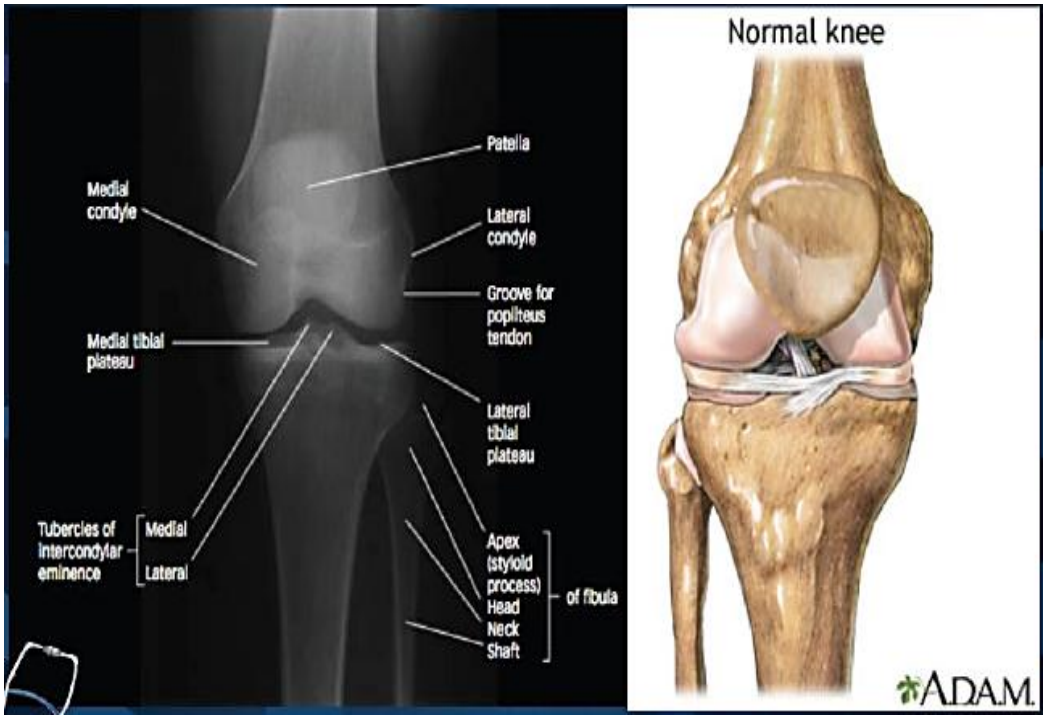
**Lower limp :**

**(1)**



**(2)**


Patella
Medial condyle
Lateral condyle
Groove for popliteus tendon
Medial tibial plateau
Lateral tibial plateau
Tubercles of intercondylar eminence
Medial
Lateral
Apex (styloid process)
Head
Neck
Shaft
of fibula
Normal knee
A.D.A.M.

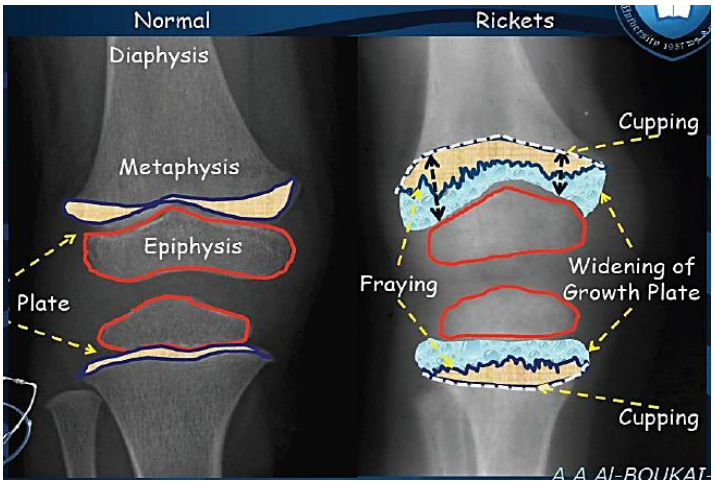
# Rickets disease

## What is rickets ?

**Rickets is a disease caused by deficiency of vitamin D leading to bony deformities and hypocalcemia .**

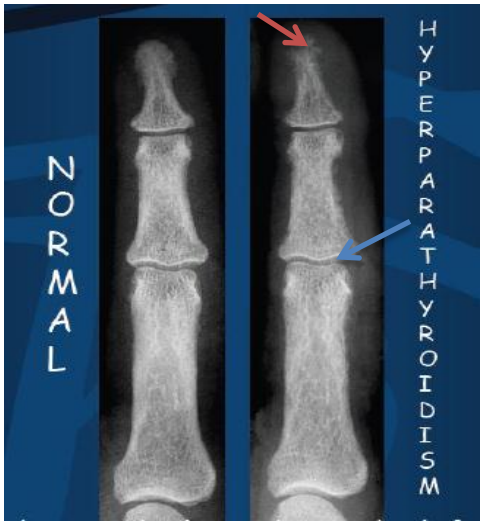
## Pathophysiological basis of radiographic findings in rickets :

- **Loss of orderly maturation and mineralization of cartilage cells at the growth plate resulting from vitamin D deficiency . thus, rickets is like osteomalacia in a growing skeleton.**
- **the most obvious change are at ' metaphysis – where rapid growth is occurring .**
- **'frayed' appearance with widening of growth plate ,due to lack of calcification of metaphyseal bone .**
- **Weight bearing & stress on uncalcified bone gives rise to 'splaying' and 'cupping' of metaphysis.**
- **Generalized reduction in bone density .**



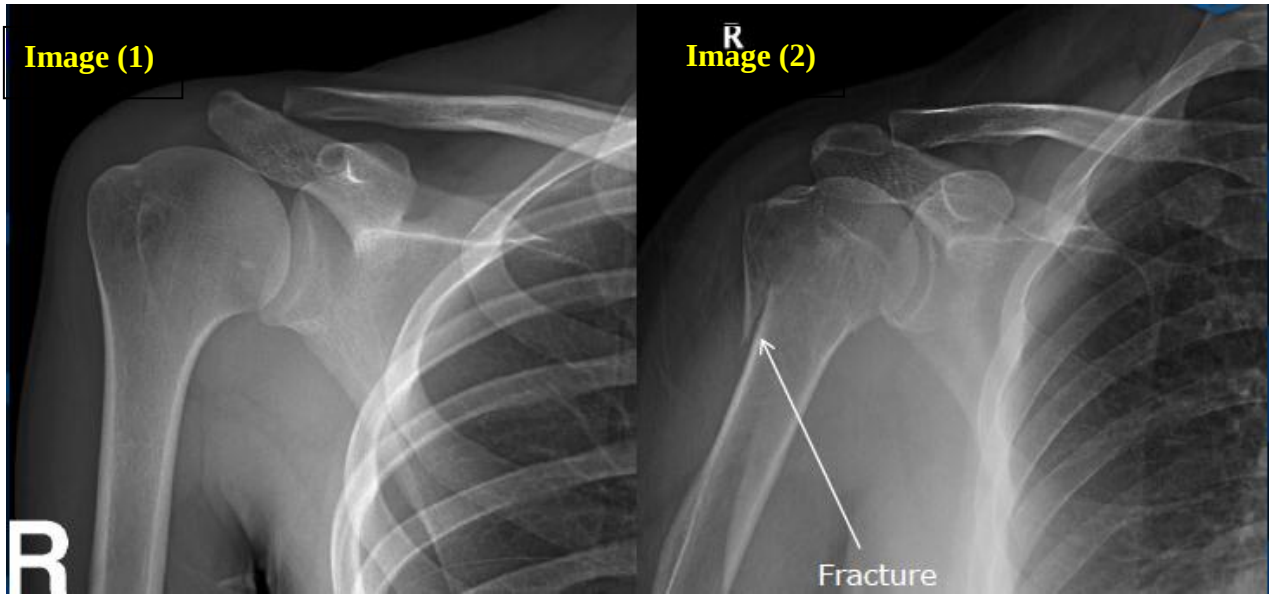

- Borders are not sharp, ill defined
- Trabecule is hazy, hazy texture
- Growth plate is widened
- Metaphyseal margin is irregular
- Cartilage invaginates the bone
- Patella is normally not ossified in a patient infants

## Hyperparathyroidism




- **Trabecular pattern is fuzzy, Cortical outline is not sharp looks irregular because of Increased parathyroid hormone secretion results in diffuse bone resorption and dimineralization, most apparent at areas of greatest surface area.**
- **Subperiosteal resorption: Classically at the distal phalangeal tufts (acroosteolysis, pink arrow) and along the radial margins of the second and third middle phalanges (blue arrow). Can also be seen along the medial aspect of the humerus, femur, and tibia, the superior and inferior aspects of the ribs and the lamina dura of the teeth.**

## Humerus fracture :

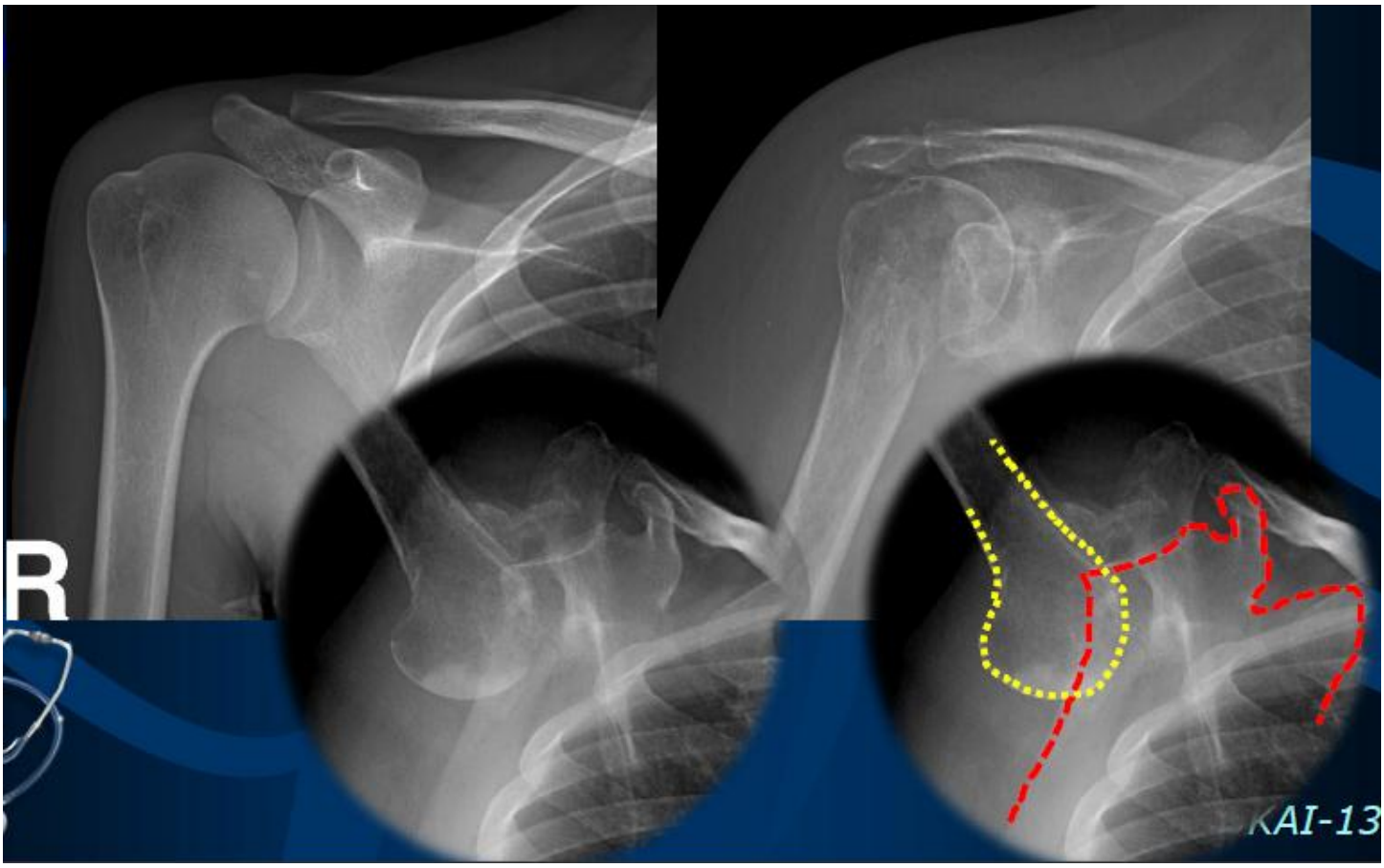



**In image (2) : we can say there is fracture because discontinuity of the cortical outline of humerus , there is a lucent line**

### Shoulder Dislocation :

- **In a shoulder dislocation, there is separation of the humerus from glenoid of the scapula at the glenohumeral joint.**

- **there is joints asymmetry.**
- **density of the bone is asymmetrical. There is reduction in bone density this is called ( osteoporotic changes)**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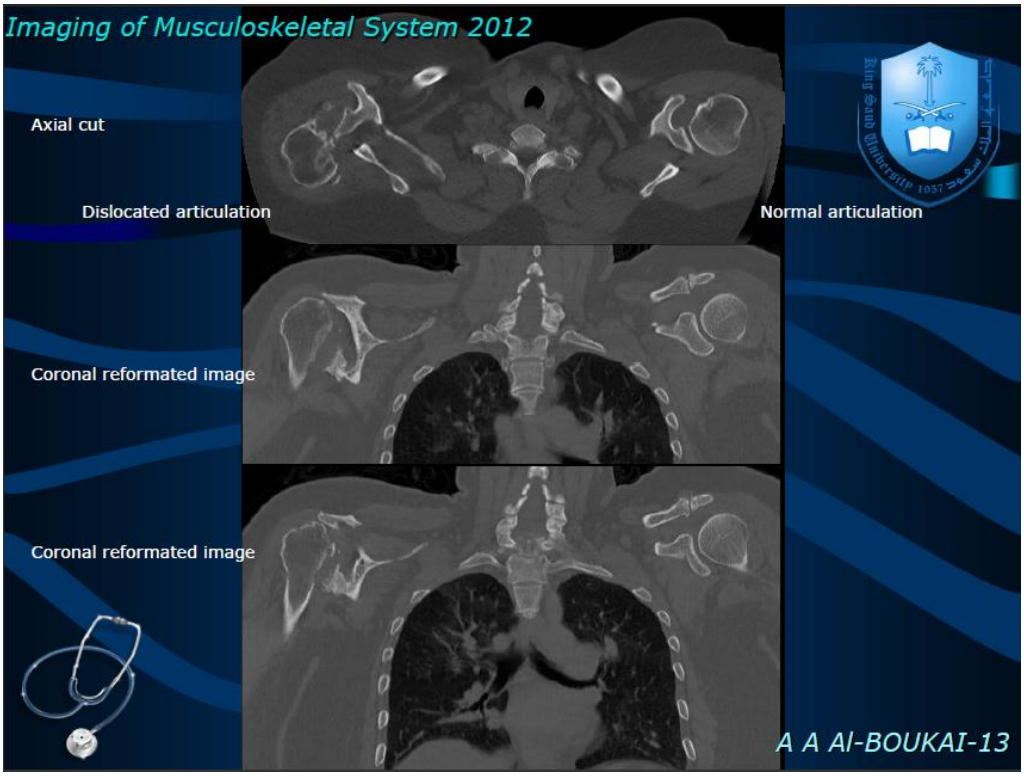
**CT scan**


Imaging of Musculoskeletal System 2012
Axial cut
Dislocated articulation
Normal articulation
Coronal reformated image
Coronal reformated image
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