



Al-Mustaql University College

Special radiological procedure /2

Lecture 13

IMAGING MODALITIES OF BONES & JOINTS

إعداد

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Imaging modalities

- ▶ 1- X-ray : depending on density
- ▶ 2- CT : depending on density (HU)
- ▶ 3-MRI : depending on intensity of (H+)
- ▶ 4-DEXA : depending on density
- ▶ 5-PET- CT depending on uptake of radionuclide contrast agent .

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- ▶ Tissues with greater density will absorb more of the xray so less of the beam reaches the film plate. The resultant image is therefore **lighter**. Tissues with less density will allow more xray to reach the film so it will be **darker**. This is called **radiodensity and is determined by:**

- *composition of the structure

- *thickness of the structure

BODY COMPOSITION

AIR: Black

Examples- trachea, lungs, stomach,
digestive tract

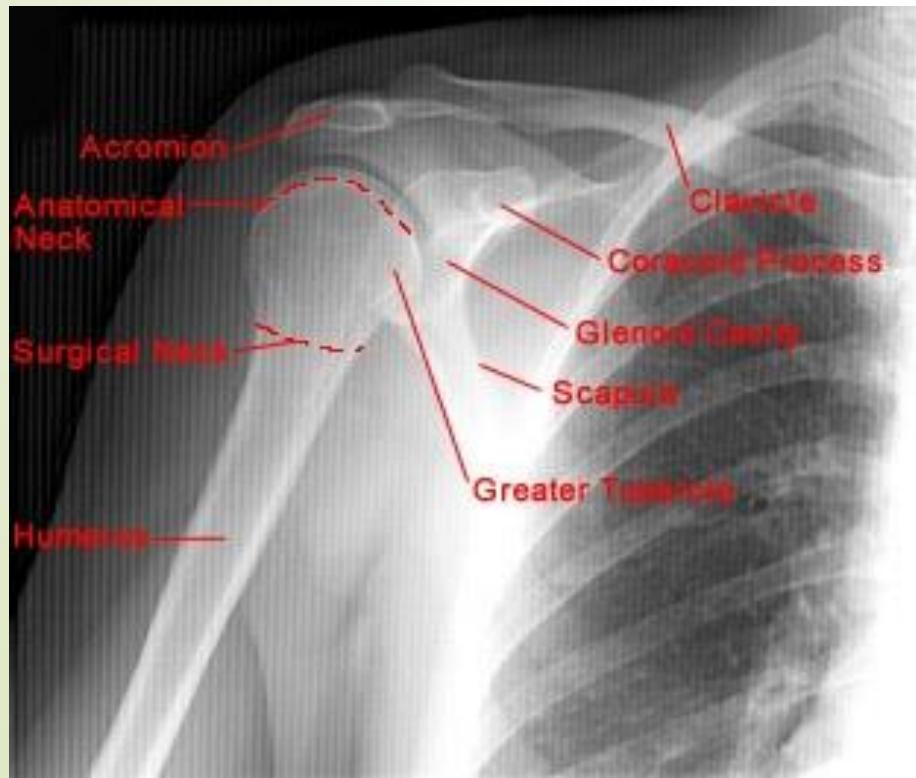
FAT: Gray black

Examples- subcutaneously along
muscle sheaths; around
viscera

WATER: Gray

Examples: Muscles, nerves, tendons,
ligaments, vessels

(All of these structures have the same density and therefore are hard to distinguish on plain xrays.)



ROUTINE RADIOLOGIC EVALUATION

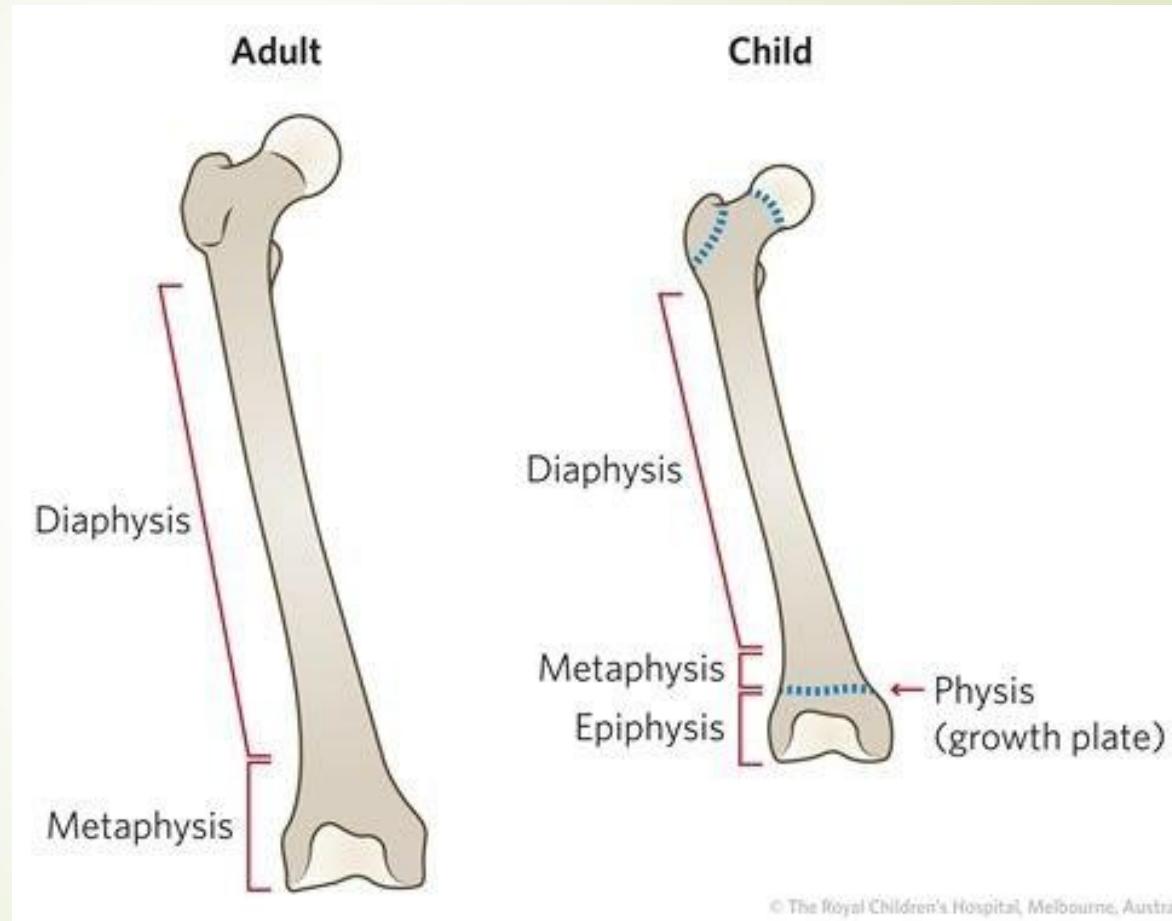
Consists of the angles of projection that best demonstrate the anatomy while utilizing the least amount of exposures.

Common Views:

- Anteroposterior (AP)
- Lateral (for liner displacement)
- Oblique (R and L)

PROCESSES OF BONE GROWTH

- ▶ **Ossification**: Process of replacing cartilaginous model with bone
- ▶ **Endochondral Ossification**: How bones grow in length
- ▶ **Intramembranous Ossification**: How bones grow in width
- ▶ **Physis**: The growth plate evidenced by the “open space”



Bone ossification



Joint types

A joint is a point where two bones make contact. Joints can be classified either histologically on the dominant type of connective tissue functionally based on the amount of movement permitted. Histologically the three joints in the body are **fibrous**, **cartilaginous**, and **synovial**.

1-Fibrous Joint: Fibrous joints are usually immovable (synarthroses) and have no joint cavity. They are subdivided further into **sutures**, **gomphoses** which is between the **teeth and their sockets** in the mandible and maxillae, and **syndesmoses** which are slightly movable joints like, **middle radio-ulnar joint**.

Joint types

- ▶ **2- Cartilaginous Joint** :A classic example is a pubic symphysis.
- ▶ **3-Synovial Joint** :Some synovial joints also have associated fibrocartilage, such as menisci, between articulating bones.
- ▶ **A-Synovial: Hinge** : the elbow, knee, ankle, and interphalangeal joints.
- ▶ **B-Synovial: Condyloid** :metacarpophalangeal joints
- ▶ **C-Synovial: Saddle** : the first carpometacarpal joint between the trapezium (carpal)

- **D-Synovial: Planar** :intercarpal joints, intertarsal joints, and the acromioclavicular joint.
- **E-Synovial: Pivot** :atlantoaxial joint between C1 (atlas) and C2 (axis) of the vertebrae
- **F-Synovial: Ball and Socket** :glenoid cavity & acetabulum

Clinical joint diseases:

- ▶ **1-Fibrous**
- ▶ Sutures, the immobile fibrous joints that bind the bony plates of the skull, can fuse too early in development, a condition termed craniosynostosis.

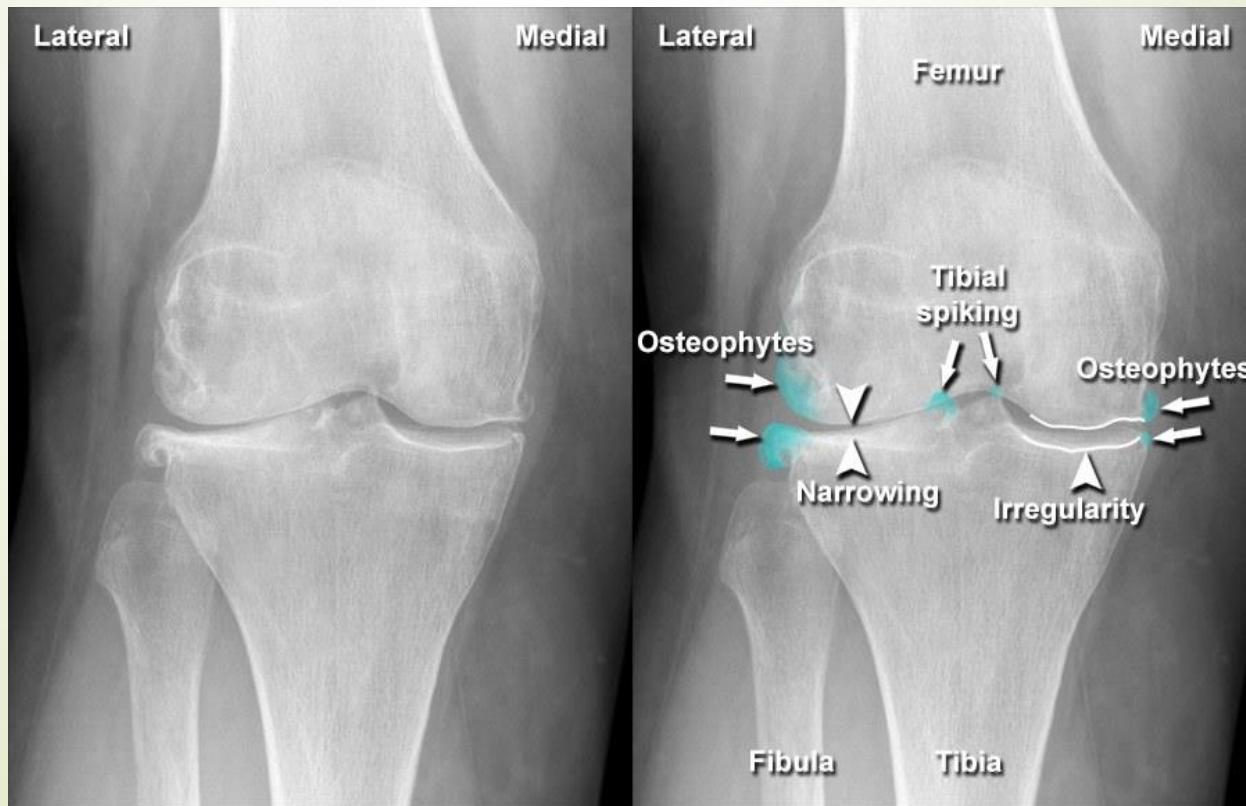


- ▶ **2- Cartilaginous**
- ▶ Epiphyseal plates, an example of temporary synchondroses, are vulnerable to damage when there is an injury to the associated growing long bone. Such damage to the cartilage would stop bone lengthening and stunt bone growth.



► 3- Synovial

Arthritis is inflammation of the synovial joint. There are many types of arthritis, distinguished by different mechanisms of injury. The most common type of arthritis is osteoarthritis, which, by definition, is gradual damage to and subsequent thinning of the articular cartilage



Terminologies of the msk

- ▶ **Bursa** is a fluid-filled, fibrous sac located between some tendons and bones that act as a small cushion which allows the tendon to move over bone.
- ▶ **Diaphysis** is the straight shaft of a long bone.
- ▶ **Ossification** is the formation of the bone matrix
- ▶ **Osteoblasts** are the cells that lay down and secrete new bone cells for the formation of the bone.
- ▶ **Osteoclast** are the major bone cells that dissolve, digest and reabsorb bone
- ▶ **The osteocytes** are bone cells responsible for the maintenance of the bone matrix. (BLAST+CLAST)
- ▶ **Osteogenesis** is the development of bone tissue.
- ▶ **The periosteum** is a thick fibrous connective tissue that covers the bone.
- ▶ **Bone hypo/hyperplasia** : a lack/increase of cells in an organ or tissue.



Source for terminologies :

<https://nursecepts.com/medical-terminology-of-the-musculoskeletal-system/>