BONE

Bone is a specialized connective tissue

Functions

1- Provides solid support for the body

2- Protects vital organs such as brain, heart, lung and bone marrow.

3- Serves as a reservoir of calcium, phosphate, and other ions

4- Has a role in body movements.

5- Bone marrow is where blood cells are formed.

So bone confers mechanical and metabolic functions to the human body.

Bone composed of:

A- Bone matrix

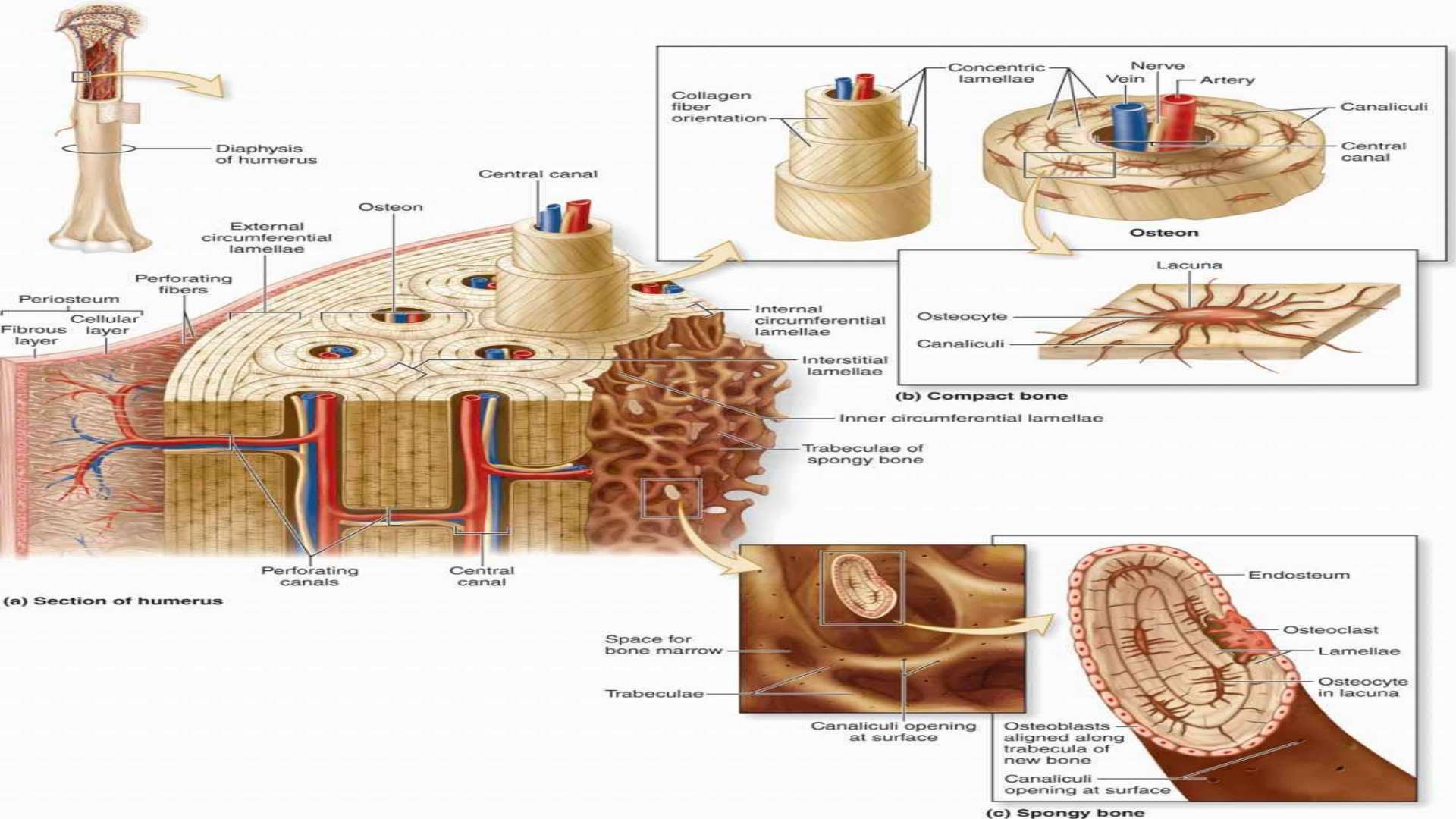
B- Three type of cells :

1- Osteocytes (bone cells) which are found in cavities (lacunae) between bone matrix layers (lamellae).

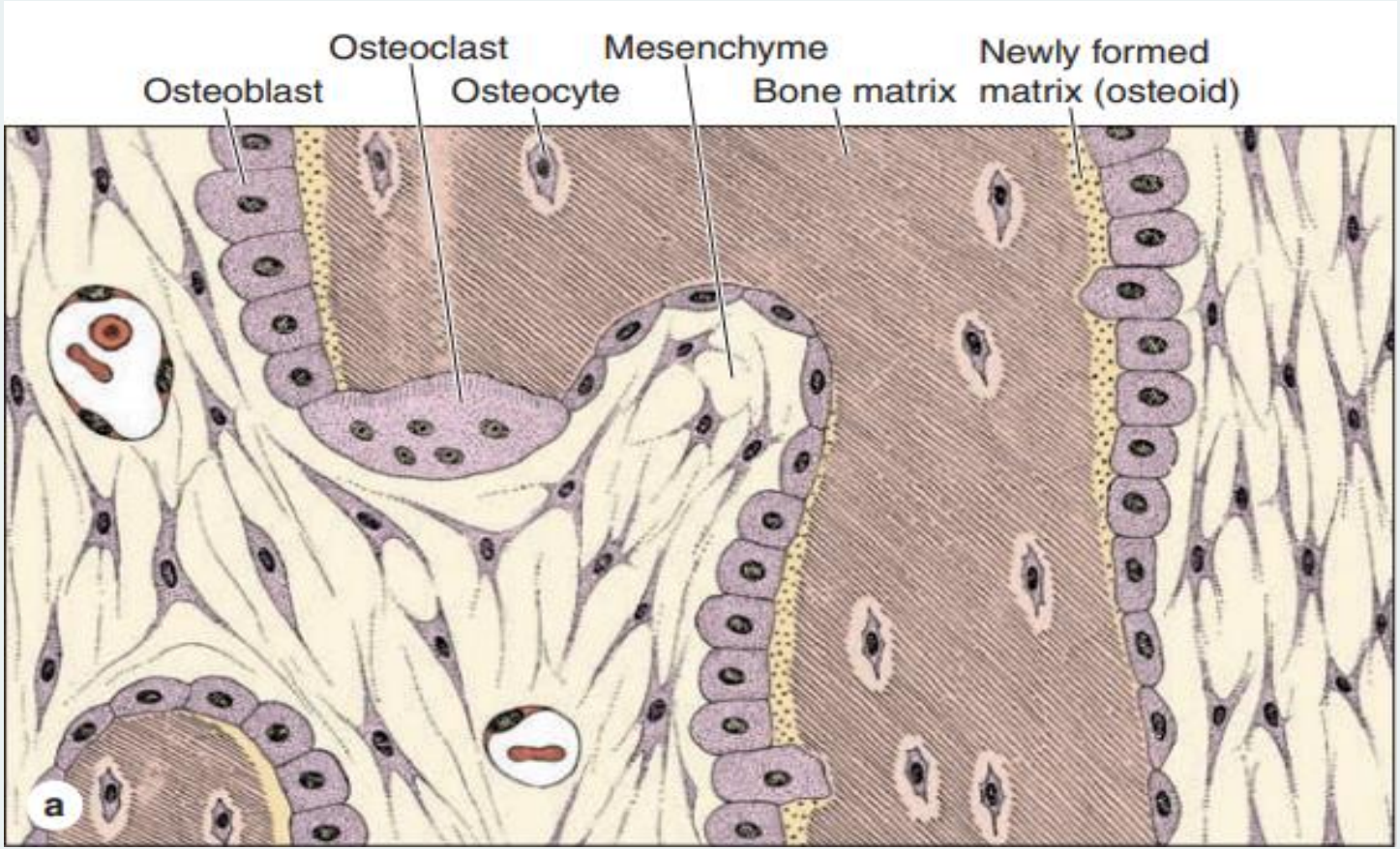
2- Osteoblasts (growing cells) which synthesize and secrete the organic components of the matrix

3- Osteoclasts which are giant, multinucleated cells involved in removing calcified bone matrix and remodeling bone tissue

Note: all bones lined on their internal and external surfaces by endosteum and periosteum respectivelly

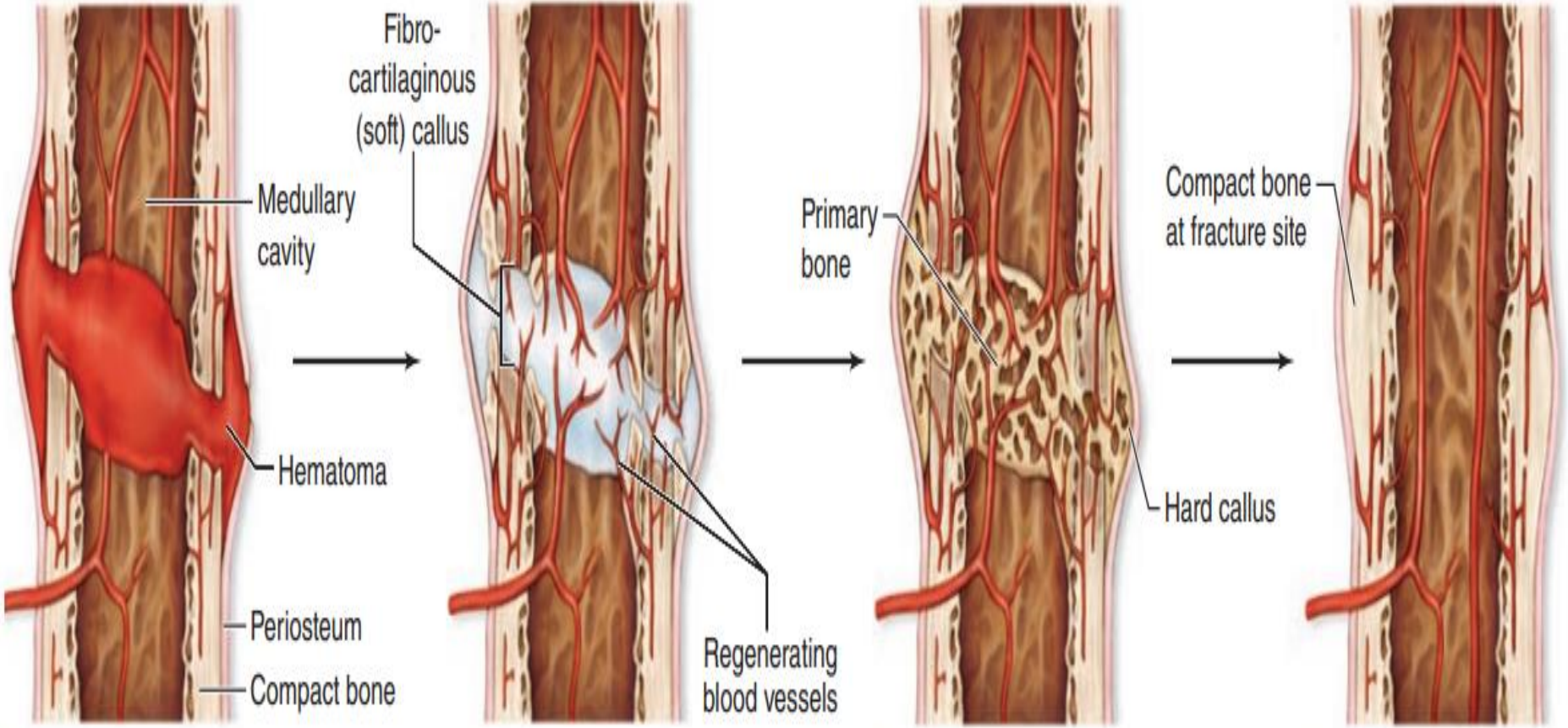

Diaphysis of humerus
Central canal
Osteon
External circumferential lamellae
Perforating fibers
Periosteum
Cellular layer
Fibrous layer
Internal circumferential lamellae
Interstitial lamellae
Inner circumferential lamellae
Trabeculae of spongy bone
Perforating canals
Central canal
(a) Section of humerus
Collagen fiber orientation
Concentric lamellae
Nerve
Vein
Artery
Canaliculi
Central canal
Osteon
Lacuna
Osteocyte
Canaliculi
(b) Compact bone
Space for bone marrow
Trabeculae
Canaliculi opening at surface
Endosteum
Osteoclast
Lamellae
Osteocyte in lacuna
Osteoblasts aligned along trabecula of new bone
Canaliculi opening at surface
(c) Spongy bone

Osteoblasts, osteocytes, and osteoclasts



Bone repair

The rate of bone turnover are very active in children, 200 times faster than that of adult. Bone renewed in adult in process of bone remodeling that involves localized cellular activities for bone resorption, bone formation and formation of fibrocartilage.



1 A fracture hematoma forms.

2 A fibrocartilaginous (soft) callus forms.

3 A hard (bony) callus forms.

4 The bone is remodeled.

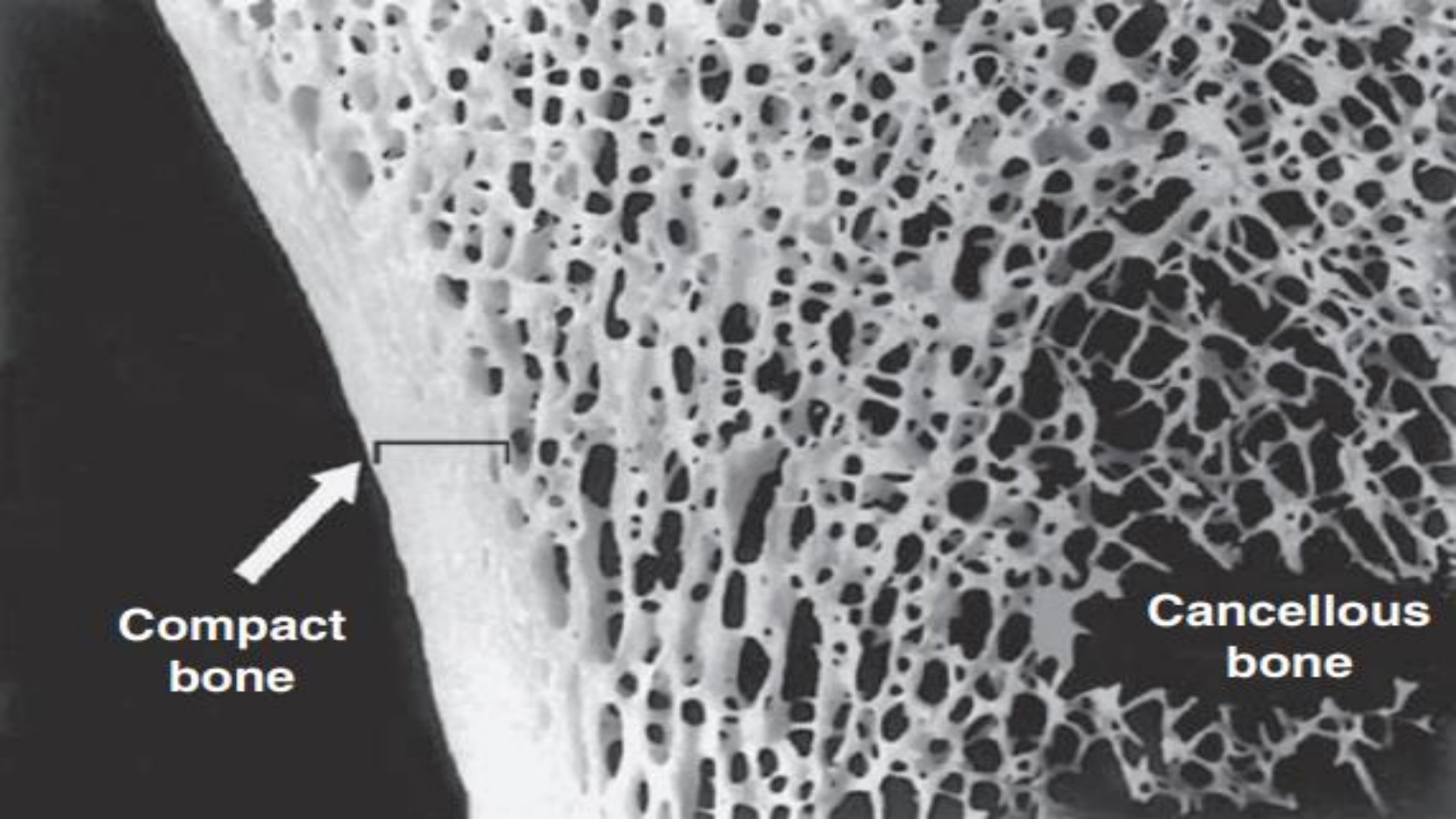
Metabolic Role of Bone

- The skeleton serves as the calcium reservoir, containing 99% of the body's total calcium.
- The principal mechanism for raising blood calcium levels is the mobilization of ions from hydroxyapatite to interstitial fluid, primarily in cancellous bone.
- Hormones that affecting calcium deposition and removal from bone are PTH, calcitonin, growth hormone and sex hormones.

TYPES OF BONE

Gross observation of a bone in cross section shows

- a dense area near the surface corresponding to compact (cortical) bone, which represents 80% of the total bone mass,
- deeper areas with numerous interconnecting cavities, called cancellous (trabecular) bone, constituting about 20% of total bone mass.


Compact bone
Cancellous bone

JOINTS

- Joints are regions where adjacent bones are meet and held together firmly by other connective tissues, allowing the potential for bending or movements in that part.
- The type of joint determines the degree of movement between the bones.

Joints are classified as :

A- Synarthroses: allow very limited or no movement

Major subtypes of synarthroses include the following:

1- Synostoses: involve bones linked to other bones and allow essentially no movement. Ex. skull bones

2- Syndesmoses: join bones by dense connective tissue only,or thick pad of fibrocartilage. Ex. pubic symphysis

3- Synchondroses: bones are joined by hyaline cartilage ex. first rib to the sternum

B- Diarthroses: permit free bone movement such as the elbow and knee generally unite long bones and allow great mobility.

Thank you