

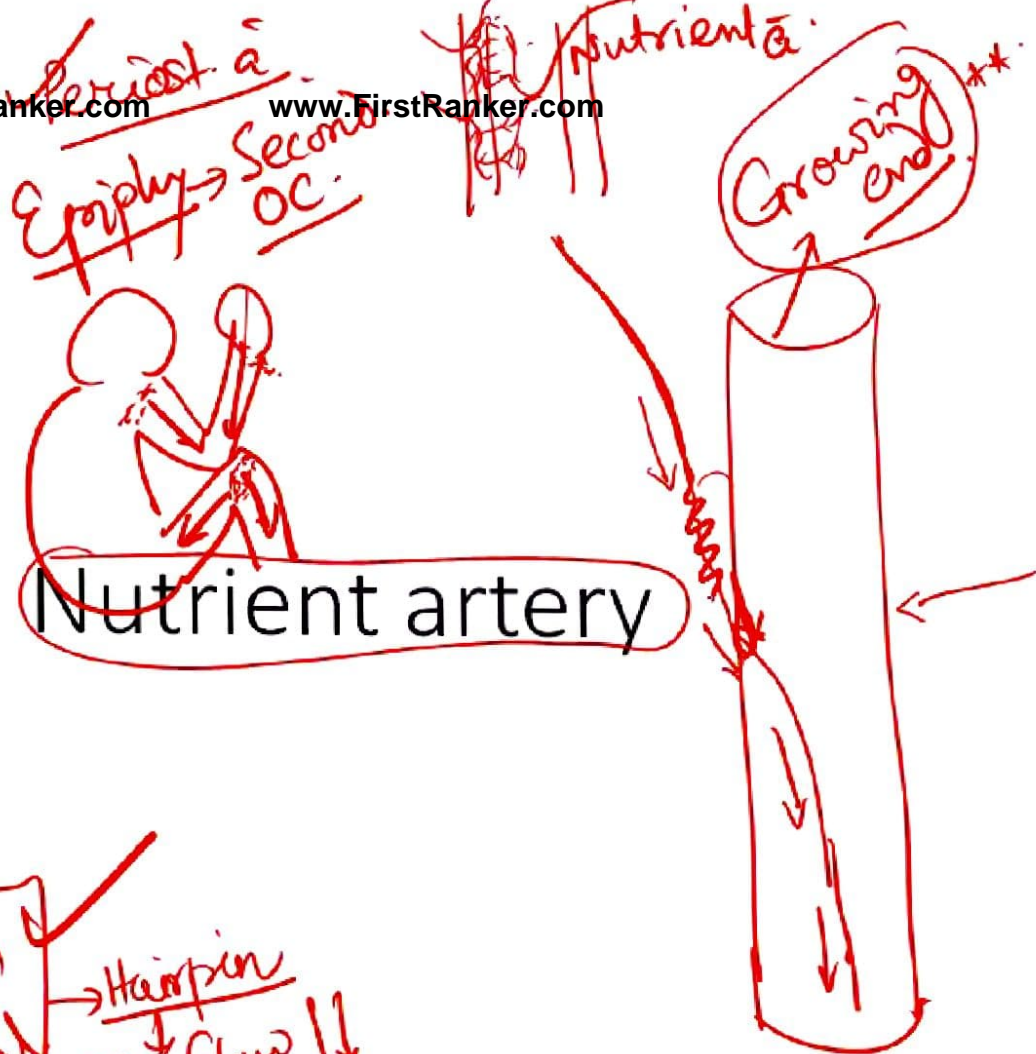
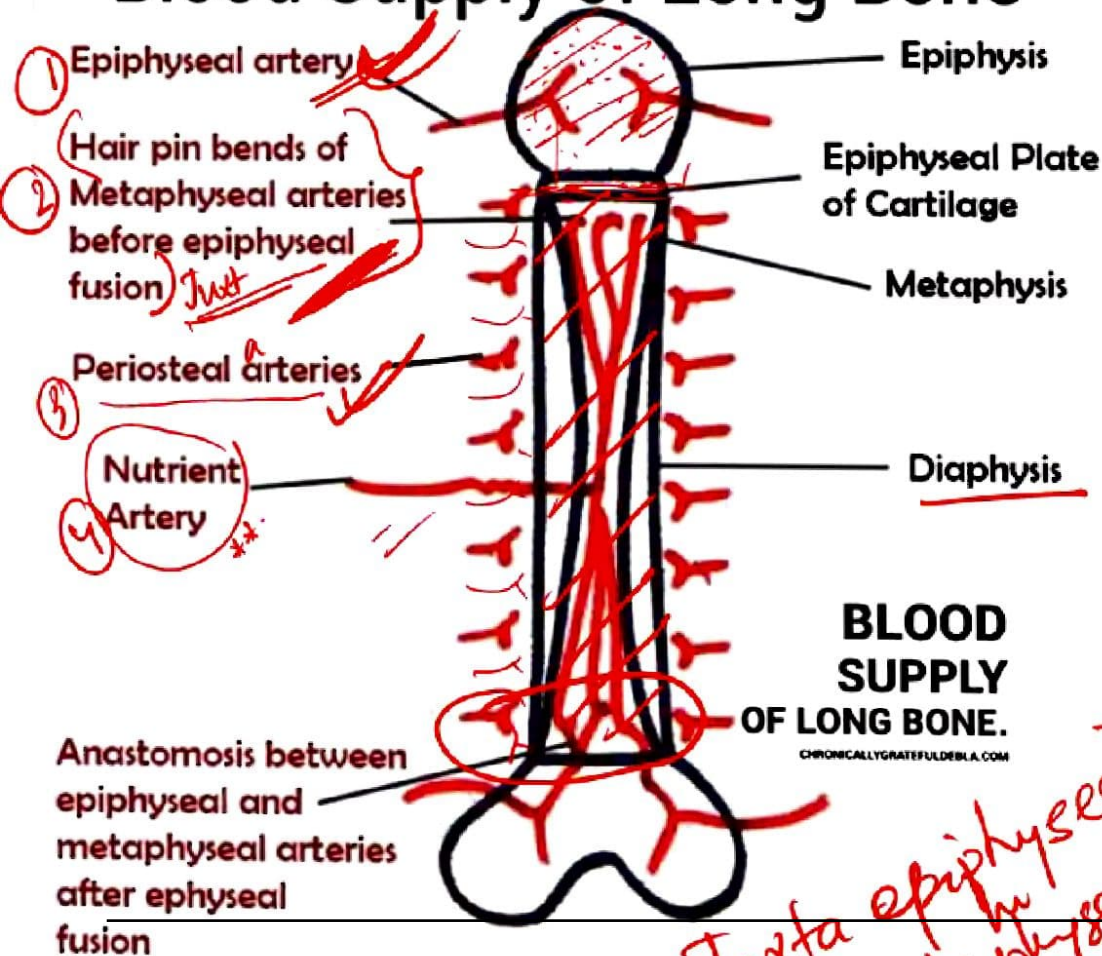
- **phagocytic cells which are capable of eroding bone.** These are important, along with osteoblasts, in the constant turnover and remodelling of bone
- Their cytoplasm contains numerous mitochondria and vacuoles, many of which are acid phosphatase-positive lysosomes – dissolve bone minerals by proton H^+ release to create an acidic local environment - (remove organic matrix) by secreting lysosomal (cathepsin K) and non-lysosomal (e.g. collagenase) enzymes. Ca^{2+}
- Osteoclasts also participate in the long-term maintenance of blood calcium homeostasis by their response to **parathyroid hormone and calcitonin**
- Osteoclasts are stimulated to resorb bone by signals from PTH and 1,25-dihydroxy (vitamin D3) (calcitriol). **Calcitonin**, produced by C cells of the thyroid follicle, **reduces osteoclast activity**. $\uparrow Ca^{2+} \uparrow \uparrow$
 $\downarrow Ca^{2+}$
- **Osteoclast differentiation inhibitors** are used as **therapeutic agents** for bone loss associated disorders, e.g. osteoporosis, rheumatoid arthritis, Paget's disease, periodontal disease and osteosarcoma.

- The outer surface of bone is covered by this condensed collagenous layer
- The periosteum is attached to underlying bone by thick collagen fibres (Sharpey's fibres), which penetrate deep into the outer cortical bone.
- It is absent from articular surfaces, and from the points of insertion of tendons and ligaments.
- It is highly active during fetal development, when it generates osteoblasts for the appositional growth of bone. These cells form a layer, 2-3 cells deep, between the fibrous periosteum and new woven bone matrix.
- Osteoprogenitor cells within the mature periosteum are indistinguishable morphologically from fibroblasts. Periosteum is important in the repair of fractures; where it is absent (e.g. within the joint capsule of the femoral neck) fractures are slow to heal.
- It is highly vascular – important for fracture healing, provide nutrition
- Rich nerve supply – pain sensitive

Blood Supply of Long Bone

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Justa epiphyseal or metaphyseal

→ Hairpin

↓ Blood flow ↓↓

↓ infec, tumor growth

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- found in the nasal septum, larynx, tracheal rings, most articular surfaces and the sternal ends of the ribs.
- It also forms the precursor of bone in the developing skeleton.
- Mature hyaline cartilage is characterised by small aggregates of chondrocytes embedded in an amorphous matrix of ground substance, reinforced by collagen fibres.
- **Components** - Outer **perichondrium**, **The chondrocytes** arranged in clusters, usually 2 - 4 cells, each cluster being separated from its neighbours by amorphous cartilage matrix
- **The perichondrium is composed of parallel collagen** fibres containing inactive fibrocytes - these cells transform into small **chondroblasts (which are in the process of enlarging, dividing and synthesising new cartilage matrix)**.
- The matrix of hyaline cartilage appears fairly amorphous, since the ground substance and collagen have similar refractive properties - **With the exception of articular cartilage, the collagen of hyaline cartilage, designated as type II collagen, is not cross-banded and is arranged in an interlacing network of fine fibrils. This collagen cannot be demonstrated by light microscopy**

- It is found in intervertebral discs, some articular cartilages, the pubic symphysis, in association with dense collagenous tissue in joint capsules, in ligaments and in the connections of some tendons to bone.
- It consists of alternating layers of hyaline cartilage matrix with thick layers of dense collagen fibres, orientated in the direction of the functional stresses.



is in the external ear and external auditory canal, the epiglottis, parts of the laryngeal cartilages and in the walls of the Eustachian tubes.



- The histological structure of elastic cartilage is similar to that of hyaline cartilage. Its elasticity is derived from the presence of numerous bundles of branching elastin fibres in the cartilage matrix.
- This network of elastin fibres (~~stained black in this preparation~~) is particularly dense in the immediate vicinity of the chondrocytes. Collagen (stained red) is also a major constituent of the cartilage matrix and makes up the bulk of the **perichondrium**, intermingled with a few elastic fibres.
- Development and growth of elastic cartilage occurs by both interstitial and appositional growth, in the same manner as for hyaline cartilage.

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Classification of Joints

- **Functional classification**
(Focuses on amount of movement)
 - ***Synarthroses*** (immovable joints)
 - ***Amphiarthroses*** (slightly movable joints)
 - ***Diarthroses*** (freely movable joints)
- **Structural classification**
(Based on the material binding them and presence or absence of a joint cavity)
 - ***Bony fusion***
 - ***Fibrous***
 - ***Cartilagenous***
 - ***Synovial***

❖ Fibrous

(Fixed)

A. Sutures

1. Plane
2. Squamous
3. Serrate
4. Dentate
5. Schindylesis

B. Gomphosis

C. Syndesmosis

❖ Cartilaginous

(Slightly movable)

A. Primary

Cartilaginous joints
(Synchondrosis)

B. Secondary

Cartilaginous joints

(Symphysis)

❖ Synovial Freely

(movable)

1. Plane

2. Hinge

3. Pivot

4. Bicondylar

5. Ellipsoid

6. Saddle

7. Ball and socket