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PART FOUR : CARTILAGE AND BONE

CARTILAGE

It is avascular,
With no nerve fibers &
No lymphatic vessels.

TYPES OF CARTILAGE

- 1- Hyaline cartilage.**
- 2- Elastic cartilage.**
- 3- Fibrocartilage.**

Hyaline cartilage

- Most abundant cartilage in the body.

Sites (Distribution):

- 1- Articular cartilage of most bones.
- 2- Nose, larynx, trachea, bronchi.
- 3- Costal cartilage.
- 4- Fetal skeleton.

Structure of hyaline cartilage:

(A) Perichondrium:

1- Outer fibrous layer:

Dense collagenous (fibrous) C.T.
(Contains blood vessels).

2- Inner chondrogenic layer:

Contain chondroblasts.

N.B. Articular cartilage is devoid of Perichondrium.

(B) Chondrocytes:

1- Young Chondrocytes:

*are oval and peripherally located.
single in lacunae.

*are found

2- Mature Chondrocytes:

Are found single in lacuna or in cell nest (isogenous group).

Nucleus: central, rounded, vesicular.

Cytoplasm: * Abundant rER (Basophilic cytoplasm).

- * Well-developed Golgi apparatus.

- * Mitochondria.

- * Abundance of glycogen.

- * Frequent large lipid droplets.

(C) Cartilage Matrix:

L/M:

Pale basophilic.

Territorial matrix.

Interterritorial matrix.

Components:

Collagen type II fibrils.

Growth of cartilage:

1- Appositional growth:

By chondroblasts in perichondrium

(Increase in width).

2- Interstitial growth:

By mitosis of chondrocytes

(Increase in length).

ELASTIC CARTILAGE

L/M structure:

It is identical to hyaline cartilage EXCEPT that it contains an abundant network of

elastic fibers.

Distribution (sites):

1- Ear pinna.

2- Epiglottis.

FIBROCARILAGE

L/M structure:

Chondrocytes are usually arranged in rows

separated by bundles of coarse collagen fibers type I (acidophilic).

N.B. No Perichondrium.

Distribution (sites):

e.g. Intervertebral disk,

Symphysis pubis.

Intervertebral disk:

- Contain a gelatinous center called the nucleus pulposus, which is composed of cells from the notochord and laying in hyaluronic acid-rich matrix.
- The nucleus pulposus is surrounded by the annulus fibrosus, which are layers of Fibrocartilage.

BONE

Structure:

(A) Bone matrix

L/M: Bone lamellae separated by osteocytes inside lacunae.

Bone lamellae form trabeculae.

Composition:

1- Organic matrix:

a- Fibers are mainly type I collagen.

b- Ground substance: e.g. GAG.

2- Inorganic matrix: Ca phosphate.

(B) Cells of bone

(1) Osteoprogenitor cells:

Sites:

- Periosteum (inner layer)
- Endosteum
- Lining of Haversian canals.

Fate: Osteoblasts.

(2) Osteoblasts:

L/M: Cuboidal or low columnar.

Function: Synthesis of bone matrix.

(3) Osteocytes:

L/M: Flattened cells,

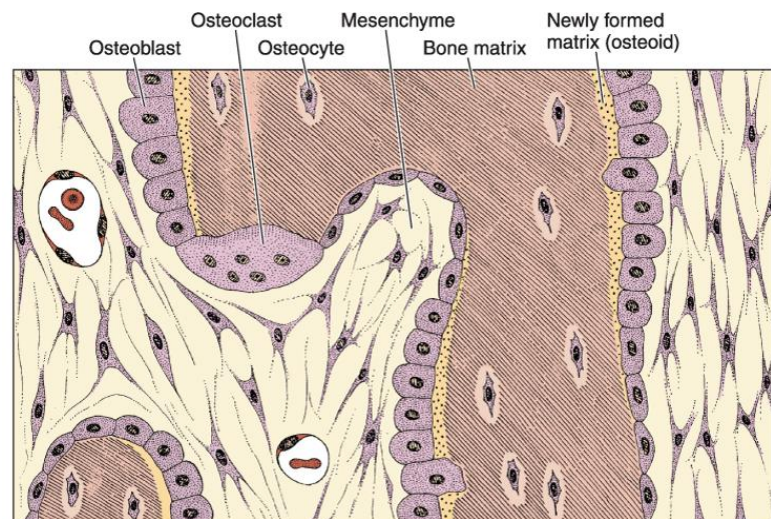
Located in lacunae,
their cytoplasm processes are
Found in canaliculi.
Function: Bone maintenance.

(4) Osteoclasts:

L/M: Multinucleated cells,
are found in howship's
lacunae.

Origin: From monocytes.

Function: Resorption of
bone.



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(c) Periosteum:

1- Outer fibrous layer.

2- Inner osteogenic layer:

Contains
Osteoprogenitor cells.

(D) Endosteum:

Contains
Osteoprogenitor cells.

Types of bone:

1- Compact bone.

2- Cancellous (spongy) bone.

COMPACT BONE:

1- Periosteum.

2- Endosteum.

3- Bone cells.

4- Bone matrix:

a- Outer circumferential bone lamellae.

b- Inner circumferential bone lamellae.

c- Interstitial bone lamellae.

d- Osteons (Haversian canal systems).

OSTEONS:

Are cylindrical longitudinal structures, each is composed of:

1- concentric bone lamellae &

2- Haversian canal running in the center.

N.B. Volkmann's canal:

Oblique or transverse canals

Interconnect neighboring haversian's canals

CANCELLOUS BONE **(SPONGY BONE)**

1- Periosteum.

2- Endosteum.

3- Bone cells.

4- Bone lamellae:

- * Branching trabeculae, each of which is

- Composed of irregularly arranged bone lamellae.

- * No Haversian systems (i.e. no Osteons).

5- Bone marrow cavities (spaces) are irregular

- Space in between bone trabeculae of spongy bone.