King Saud University
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# 431 Histology team

# CARTILAGE

- Cartilage is a specialized type of C.T. with a rigid matrix.
- Cartilage is usually nonvascular (avascular).

| TYPE OF CARTILAGE | STRUCTURE | SITE | GROWTH |
|---|---|---|---|
| **Hyaline cartilage.** | 1-Perichondrium : Vascular C.T. membrane, has 2 layers:<br>*Outer fibrous layer (dense fibrous C.T).<br>*Inner chondrogenic layer: contains chondroblasts, they secretes matrix.<br><br>2-Cells :Chondrocytes (in lacunae)<br>A-young (small and single in lacunae)<br>B-mature (large and can be found either single or in group /cell nests. (without chondroblast)<br>(this is the main cartilage tissue)<br><br>3-Matrix: Basophilic and contain collagen type 2 | 1-Foetal skeleton.<br>2-Costal cartilages.<br>3-Articular surfaces of bones.<br>4-Nose, trachea & bronchi | -Appositional growth: by chondroblast leads to increase in width.<br><br>-Interstitial growth: by chondrocyte leads to increase in length. |
| Elastic cartilage. | Similar to hyaline cartilage + elastic fibres in the matrix. | -External ear.<br>-Epiglottis. | |
| Fibrocartilage | No perichondrium.<br>Chondrocytes separated by collagen (type1).<br>forming bundles (acidophilic) | E.g. Intervertebral disks. | |

# BONE

| | | | |
|---|---|---|---|
| | | | |

- C.T. with a hard matrix.

**Types:** 2 types

Compact and spongy (cancellous) bone

**Components:**

- **Bone Cells**: 4 types.
- **Bone Matrix:** hard because it is calcified (Calcium salts).

  It contains type I collagen fibers.

  It forms bone lamellae and trabeculae.
- **Periosteum.**
- **Endosteum.**

**Functions:**

- Body support.
- Protection of vital organs as brain & bone marrow.
- calcium store

**Growth of bones**

- **Appositional growth:**
  - Is produced by the activity of osteoblasts.

- It leads to increase in width.

- **Growth in length:**
  - Is produced by the activity of epiphyseal plate of cartilage.

- In bones only appositional growth is found, while growth in the length is in cartilage not bone.

**Cells of bone:**

| Type of cell | Origin | Function | Fate | comments |
|---|---|---|---|---|
| **Osteogenic Cells** | ****** | ***** | ***** | in periosteum & endosteum. |
| **Osteoblasts** | osteogenic cells. | They secrete the bone matrix & deposit Ca salts in it. | Change to osteocytes. | ***** |
| **Osteocytes** | osteoblasts | They maintain the bone matrix. | ****** | -Branched cells. -Present singly in lacunae. Their branches run in the canaliculi |
| **Osteoclasts** | Blood monocytes. | bone resorption | ****** | -multinucleated cells on bony surfaces, in Howship's lacunae. |

**Types of bone:**

| compact | spongy |
|---|---|
| **Periosteum**:(same as perichondrium) | **Periosteum:(same as perichondrium)** |
| **Endosteum** | **Endosteum** |
| **Bone Lamellae**.* | Irregular bone trabeculae and bone marrow spaces. |
| **Bone Cells.** | **Bone Cells.** |
| **Havarsian systems (osteons)** | No Haversian systems (no osteons). |

* **1- Haversian Systems (Osteons):**

- Longitudinal cylinders.
- Each is formed of concentric bone lamellae & a Haversian canal, running in the center.
- Volkmann's canals: connect the Haversian canals together. They run obliquely or transversely.

**2-External Circumferential Lamellae.**

**3- Internal Circumferential Lamellae.**

# Clinical application

## 1-Disk prolapse:

It occurs more often on the posterior portion of the intervertebral disks, particularly in the lumbar region.

*Dislocation of intervertebral disks will compress on the nerves and cause severe pain in the lower limbs.

## 2-Serum alkaline phosphatase:

Osteobalsts are rich in alkaline phosphatase enzyme.

So this enzyme will be indicator if osteoblasts activity is increased in any region.

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## 3-osteopetrosis (marble bone disease):

*genetic disorder.

*Osteoclasts will be inactive.

*it may cause anemia: because osteoclasts play a role in RBC formation by increasing bone marrow spaces.

Explanation: the osteoclast doesn't have a ruffled border so the cant eat up the bone leading to smaller bone marrow cavity

## 4-Osteoporosis:

Decrease in bone matrix (calcium salts and collagen type 1).

*Bone fracture will be easy.

## 5-Rickets (in children) and osteomalcia (in adult):

*Deficiency of vitamin D.

*Decrease absorption of calcium in intestine.

*poorly calcified bone matrix.

*its sever in adult more than children

- The highlighted parts doesn't mean the only thing to study
It just important to know