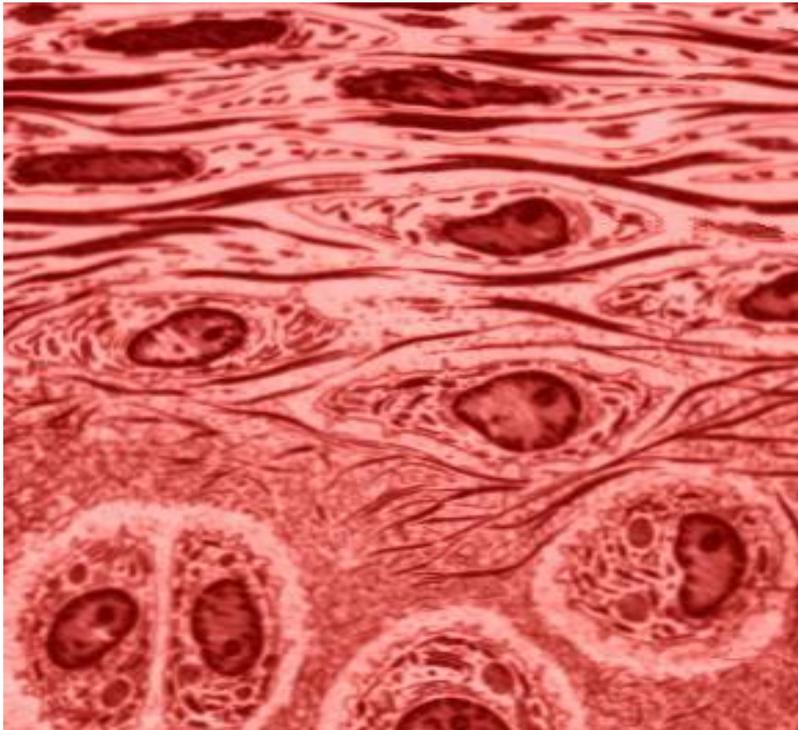




Medical Biology – Year 1



Chapter 2: Supporting C.T Cartilage

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Objectives

- Identify the Cartilage.
- Identify the component and function of the Cartilage.
- Describe the Growth and repair of cartilage
- Describe the Types of the cartilage tissue:



Cartilage

- ❑ **The cartilage** is **avascular**, flexible supporting connective tissue, develops from the mesenchymal embryonic layer, consists of cells, fibers and ground substance.
- ❑ The cartilage cells, **Chondroblasts and Chondrocytes**, receive their nutrients by diffusion from the blood vessels of the adjacent connective tissues.

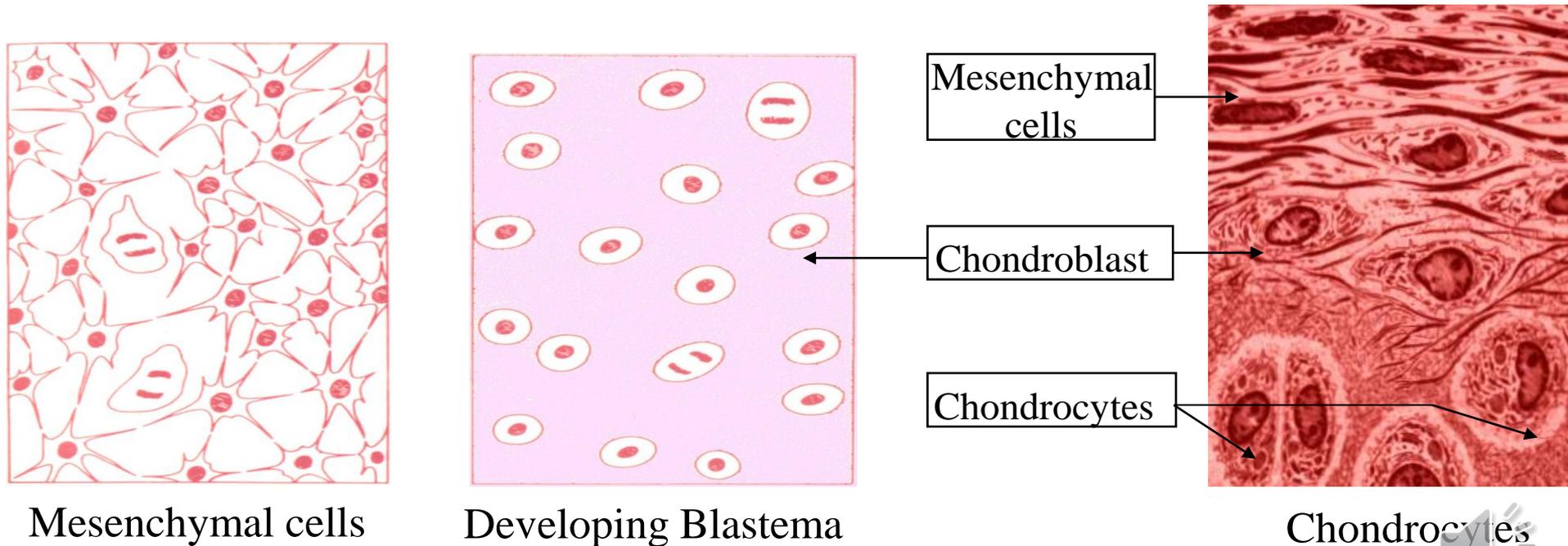
Cartilage Functions

- 1- Bearing mechanical stresses.
- 2- Support soft tissue.
- 3- Developmental and growth of long bones before and after birth.
- 4- Shock-absorbing and sliding area for joints and facilitates bone movements (Because it is smooth surfaced and flexibility).



The cartilage cells:

- **The cartilage cells** are derived from the **mesenchymal cells** by retraction of their cytoplasmic processes to become rounded cells called **blastema**.
- **The blastema** then develop to a **chondroblasts** as active cartilage cells consist of cytoplasm rich with rER to synthesis of the cartilagenous matrix (fibers and ground substance) around themselves.
- When the chondroblasts become completely surrounded by its own matrix, to form a lacuna, the cartilage cell then called **chondrocyte**.

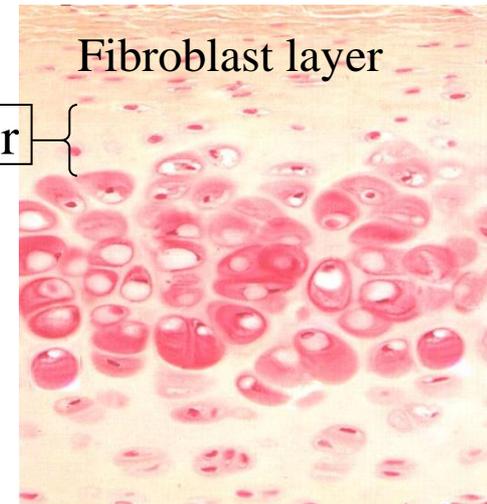


The perichondrium :

- All cartilage is covered by a layer of **dense irregular connective tissue (perichondrium)** (**except in the articular cartilage of joints & fibro cartilage**).
- It consists of two separate layers:
 - 1- The fibrous layer** (outer layer):- contains fibroblast, which produce collagenous fibers type (1).
 - 2- The chondrogenic layer** (inner layer):- that develop to chondroblasts through a successive stages.
- Contains blood, nerve supply, lymphatics.
- Function : It's essential for the growth & maintenance of cartilage.



Chondrogenic layer



Growth and repair of cartilage:

Cartilage is a vascular tissues that receives nutrients by diffusion through its matrix , cartilage grow by two mechanisms:

1- Interstitial or endogenous growth

2- Appositional or exogenous growth



1- Interstitial or endogenous growth

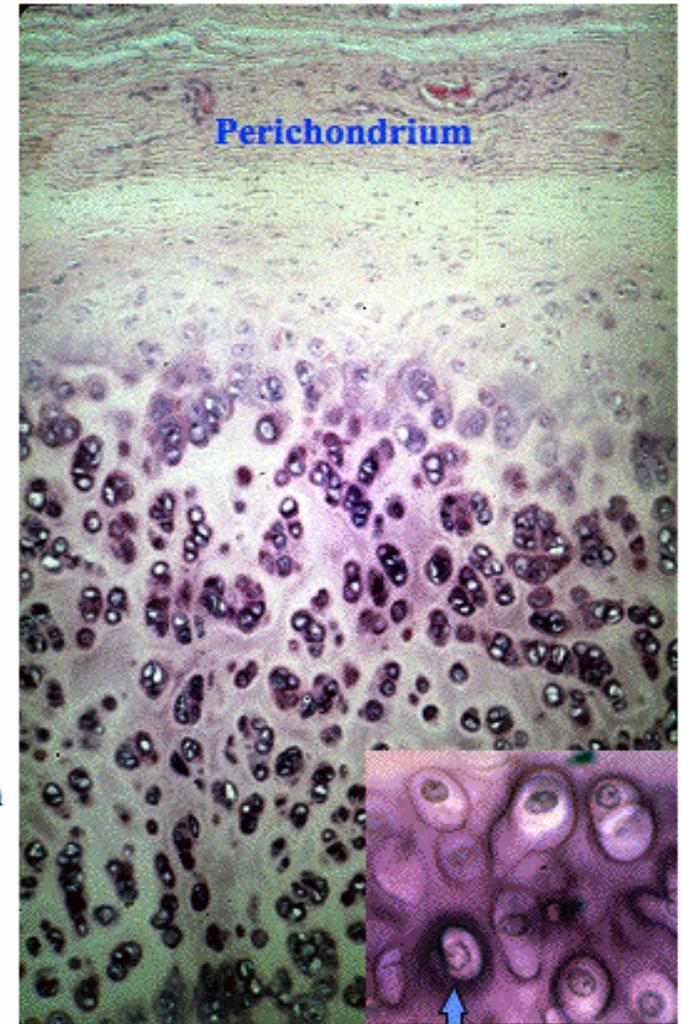
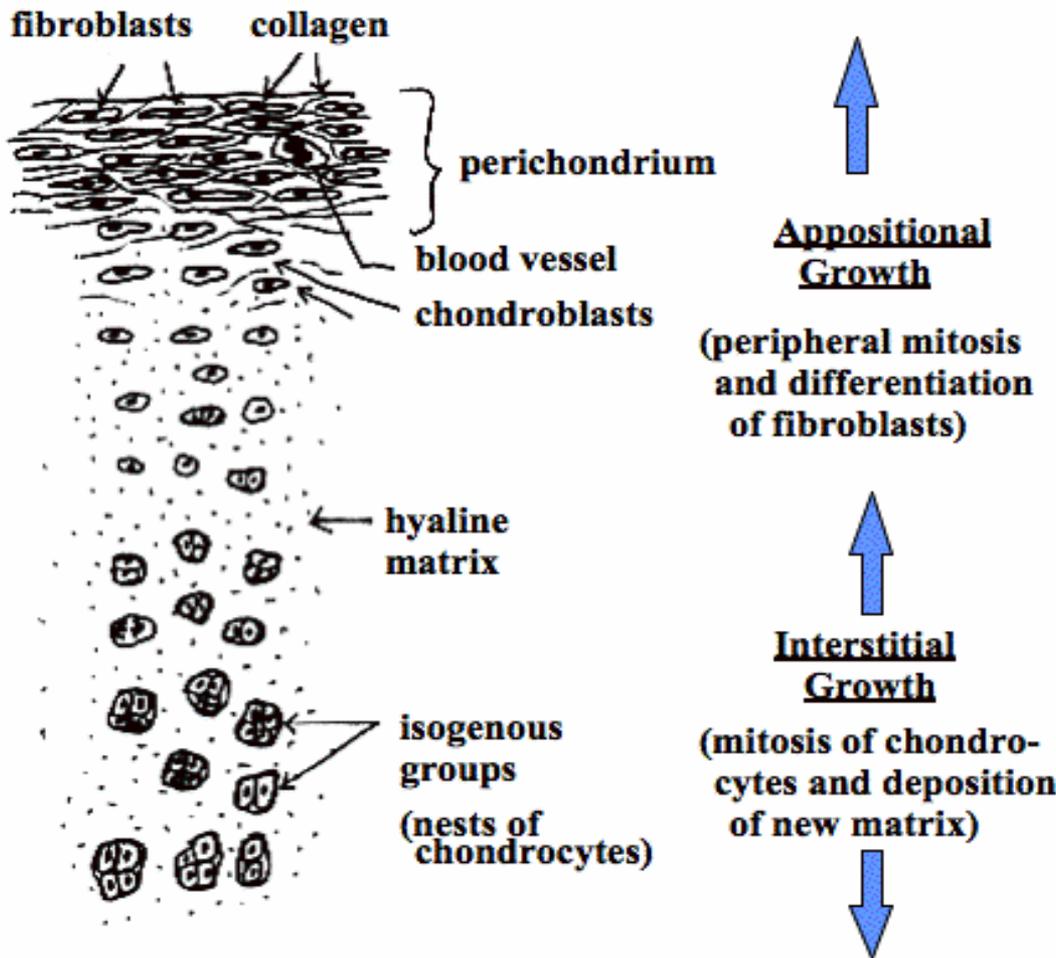
- **The interstitial** or endogenous growth is achieved by **dividing the chondrocytes** to create daughter cells occupy same lacuna that form a group of cells called **cell nest or isogenous group**.
- The newly formed chondrocytes of the isogenous group secrete matrix around themselves to separate the cells from the other by forming their own **lacuna**
- This growth occurs in epiphyseal plates and articular cartilage

2- Appositional or exogenous growth

- The **appositional growth** of the cartilage is completed by **differentiation of the mesenchymal cells** which are found in the perichondrium to **chondroblasts**, in the chondrogenic layer, to add a new layer of cartilage tissue to the preexisting cartilage.
- The **chondroblasts** secrete matrix around themselves to become mature cartilage cells, **chondrocytes** .
- This growth occurs during embryogenesis and subsequent juvenile development.



Growth of Cartilage



Territorial Matrix



Types of the cartilage tissue:

The cartilage tissue is classified according to the nature of the matrix and predominant of the fibers within the matrix into:

1-Hyaline cartilage

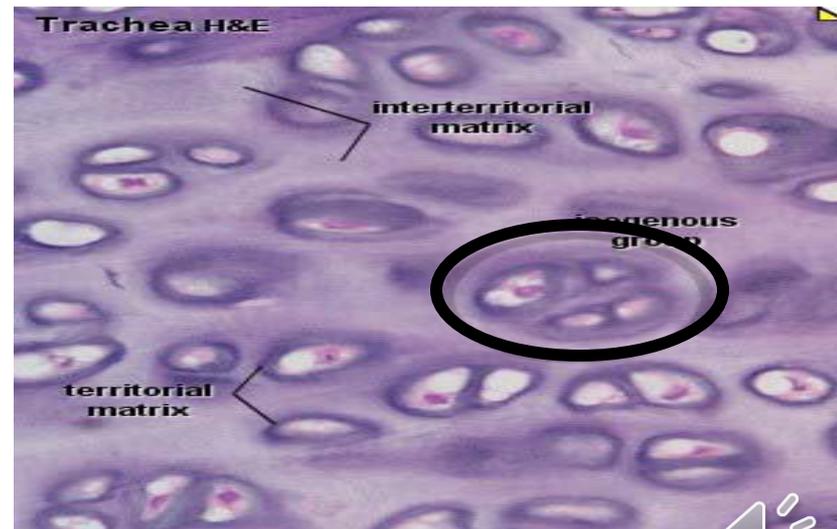
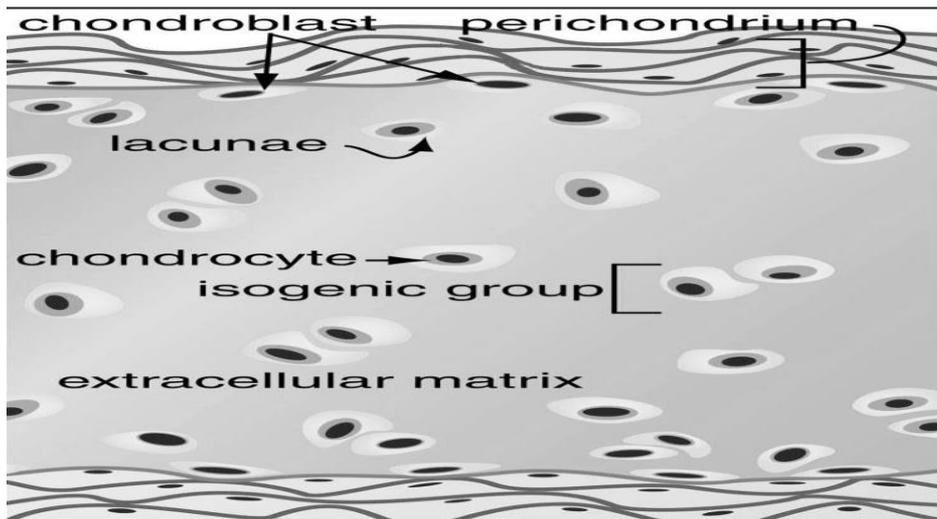
2-Elastic cartilage

3-Fibrocartilage



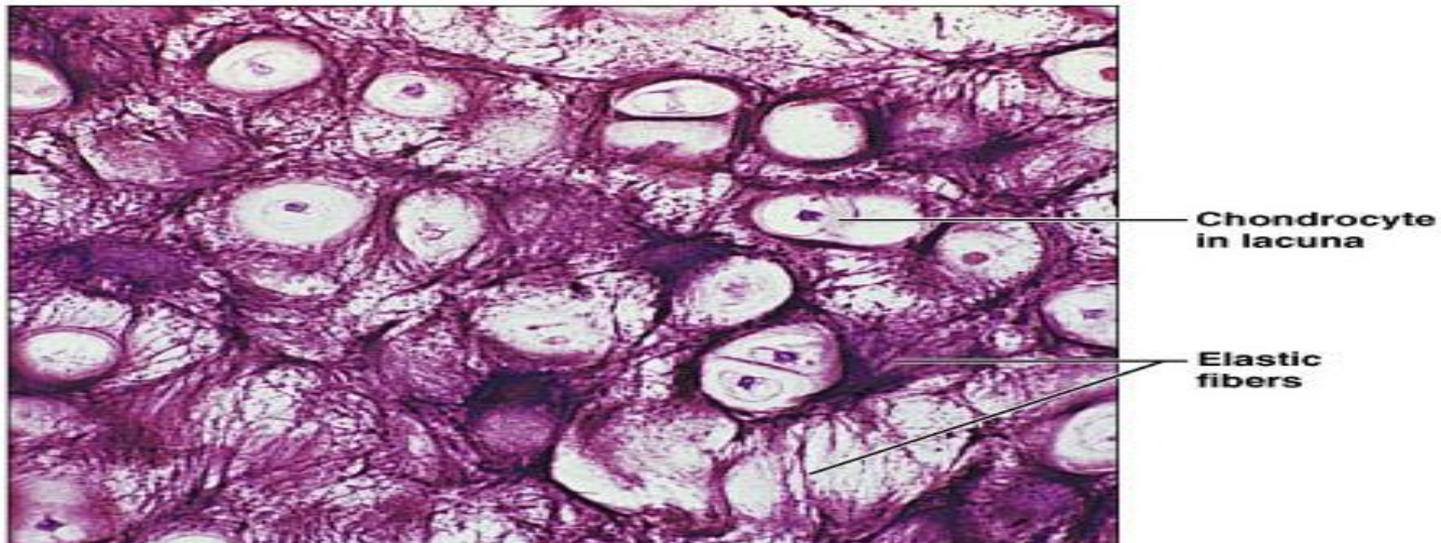
1- Hyaline cartilage

- Most abundant cartilage in the body
- The matrix Consists of fine **collagen fibrils (type II)** embedded in a gel-type matrix (white and transparent). **Chondrocytes** are found in isogenous groups
- Surrounding by **perichondrium**, play important role in the nourishment and growth of this type of cartilage.
- Found in embryonic **skeleton, at the ends of long bones, in the nose and in respiratory structures.**
- Function= flexible, provides support, allows movement at joints



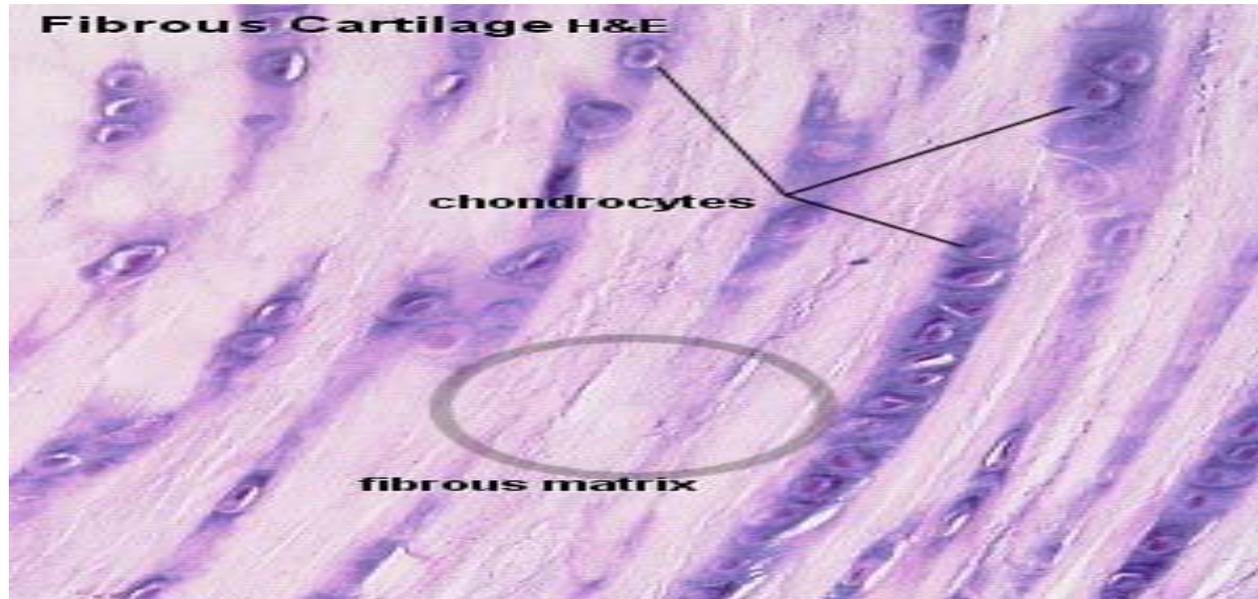
2-Elastic cartilage

- **The elastic cartilage** is similar in structure to the hyaline cartilage, but it contains a **network of elastic fibers surrounding the chondrocytes**. The chondrocytes are found as closely packed cells and singly in their lacunae.
- The **perichondrium**, which encloses the elastic cartilage, is also assists in the nutrition and growth of the cartilage tissue.
- found in **external ear, auditory tubes, epiglottis**.
- function = gives support, maintains shape, allows flexibility



3-Fibrocartilage

- The **fibrocartilage** is **irregular dense fibrous** tissue consists of **chondrocytes** embedded in a **thick collagen fibers type (1)** as short parallel rows of cells. The chondrocytes may also found singly, in pairs or in clusters of cells, embedded in a scanty ground substance.
- The fibrocartilage has **no perichondrium**, so it is usually found associated with other surrounding connective tissues, as in the **intervertebral disc, the knee** and other structure, where resistance, compression and tensile strength are needed.
- Function = support and fusion, and absorbs shocks.



Thank You

