CARTILAGE

DR SHAHAB

Associate Professor

Anatomy KGMC

Introduction

- **Cartilage** is a resilient and smooth elastic tissue, a rubber-like padding that covers and protects the ends of long bones at the joints,

- And is a structural component of the rib cage, the ear, the nose, the bronchial tubes, the intervertebral discs, and many other body components.

Cartilage

Functions

- Provides attachments
- Protects tissue Structural model for developing bone

General structure of cartilages

Mature cartilage cells are called chondrocytes The extracellular matrix of cartilage consists of

1. An abundance of collagen fibers (mainly type II)
2. A gel-like ground substance
3. Lacunae = cavities containing chondrocytes In addition, each of the three types of cartilages have unique characteristics.

Cells of the cartilage

- They are derived from undifferentiated mesenchymal cells.
- Young cells are small with branched cytoplasmic processes known as chondroblasts,they multiply to chondrocytes.
- Older and mature cells are called chondrocytes.
- Chondroblasts are bigger in size and are found in spaces ,called lacunae.
- They are found in groups of 2-4 cells together known as cell nest.
- They are responsible for the production of fibers and ground substance of the cartilage.
- Older mature cells are incapable of multiplication.

- The group of cells descended from a single paternal cells, located in lacunae and surrounded by special capsule are called *Isogenous group of the cells(IGC).*

Types of cartilage

- Hyaline cartilage
- Elastic cartilage
- Fibrous cartilage

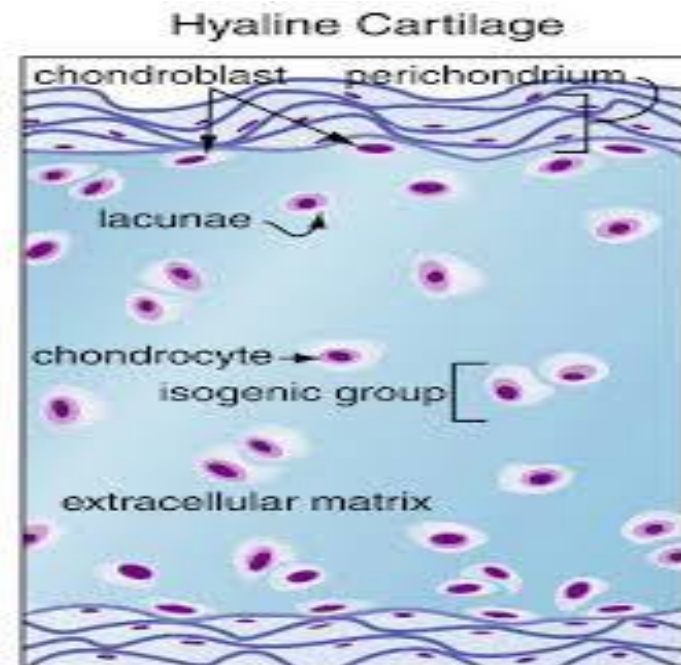# Histological features Hyaline Cartilage

- Hyaline cartilage contains very fine collagenous fibers and the ground substance gives hyaline cartilage a glossy appearance.

- Appears homogeneous as the collagen fibers present in them have the same refractive index as ground substance.

- Highly basophilic homogeneous matrix

- Perichondrium present

- Isogenous group of cells present

- Matrix around the cells is brighter and deep in color as compared to other areas ,this matrix is called *territorial matrix .*

- Two groups of cells are separated by a lighter colored matrix known as*, inter -territorial matrix*

Functions:

Hyaline cartilage provides durable protection and supports movable joints

Locations

- End of Bones
- Embryonic Skeleton
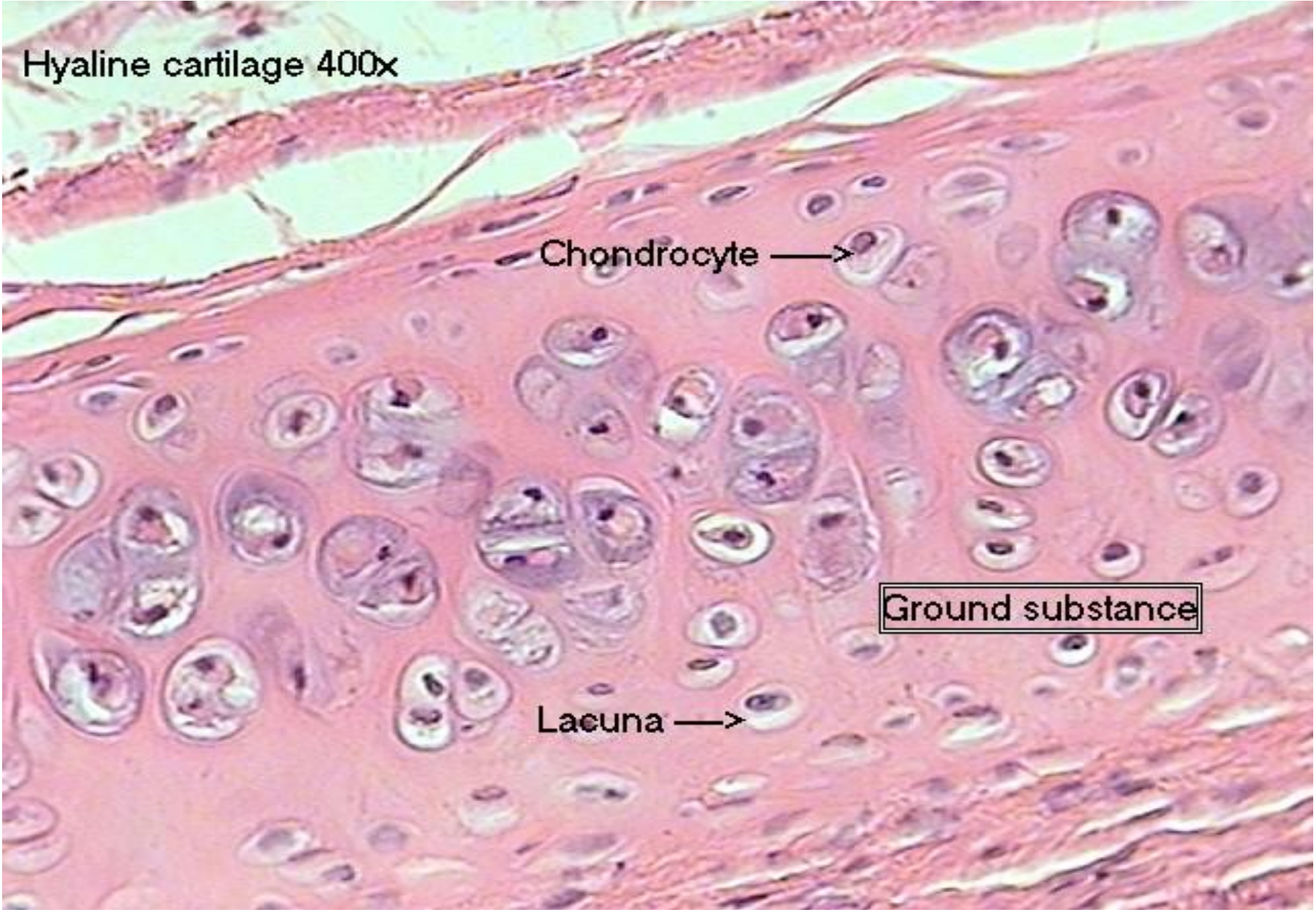- Costal Cartilages of the Ribs
- End of the nose
- Tracheal rings

Hyaline Cartilage

Hyaline cartilage 400x

Chondrocyte ——>

Ground substance

Lacuna ——>

Elastic Cartilage

- Elastic cartilage contains a *dense network of elastic fibers* in its extracellular matrix in addition to the gel-like ground substance and collagen proteins.

- Perichondrium present.

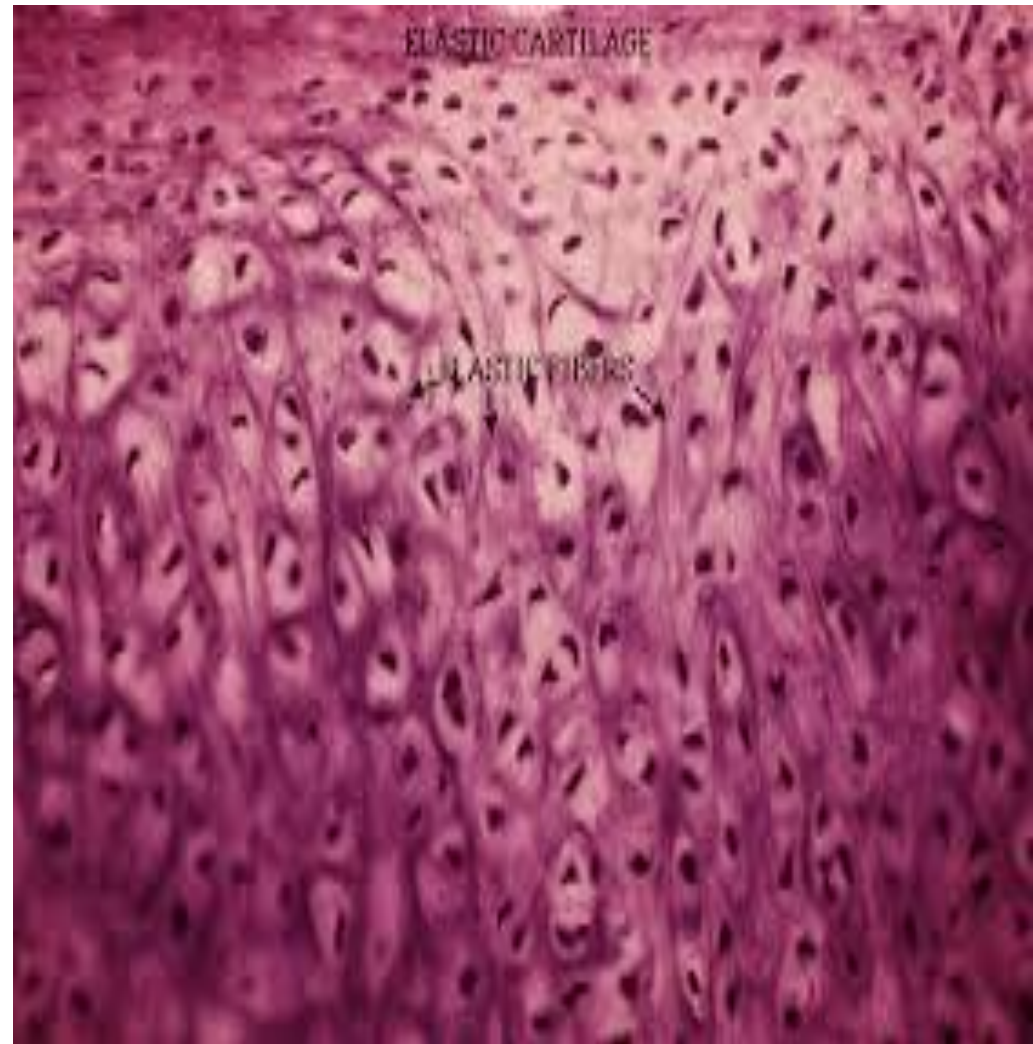- Chondrocytes are larger than those of hyaline cartilage and are present singly.

Elastic Cartilage (Epiglottis)

Perichondrium
Chondrocytes in lacunae
Perichondrium
Matrix
Elastic Fibers

Function

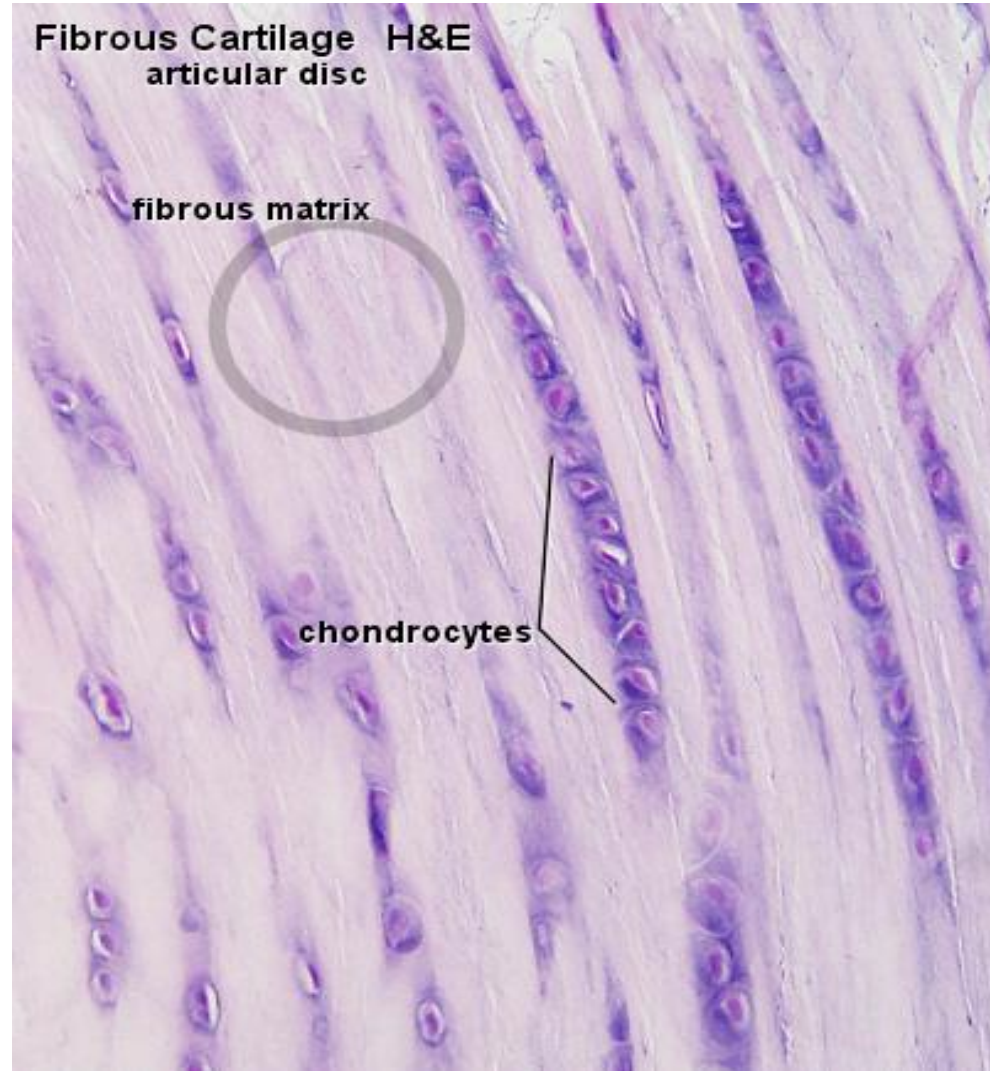Elastic cartilage provides flexible support that helps maintain the shape of the organs.

Locations

framework of external ear and portions of the larynx

Fibrocartilage

- Perichondrium is characteristically absent.

- Has thick bundles of collagen fibers

- Chondrocytes are present singly, in narrows rows between the bundles of collagen fibers.

Fibrous Cartilage   H&E
articular disc

fibrous matrix

chondrocytes

Function :

Fibrocartilage acts like a shock absorber

Locations:

- Within intervertebral discs

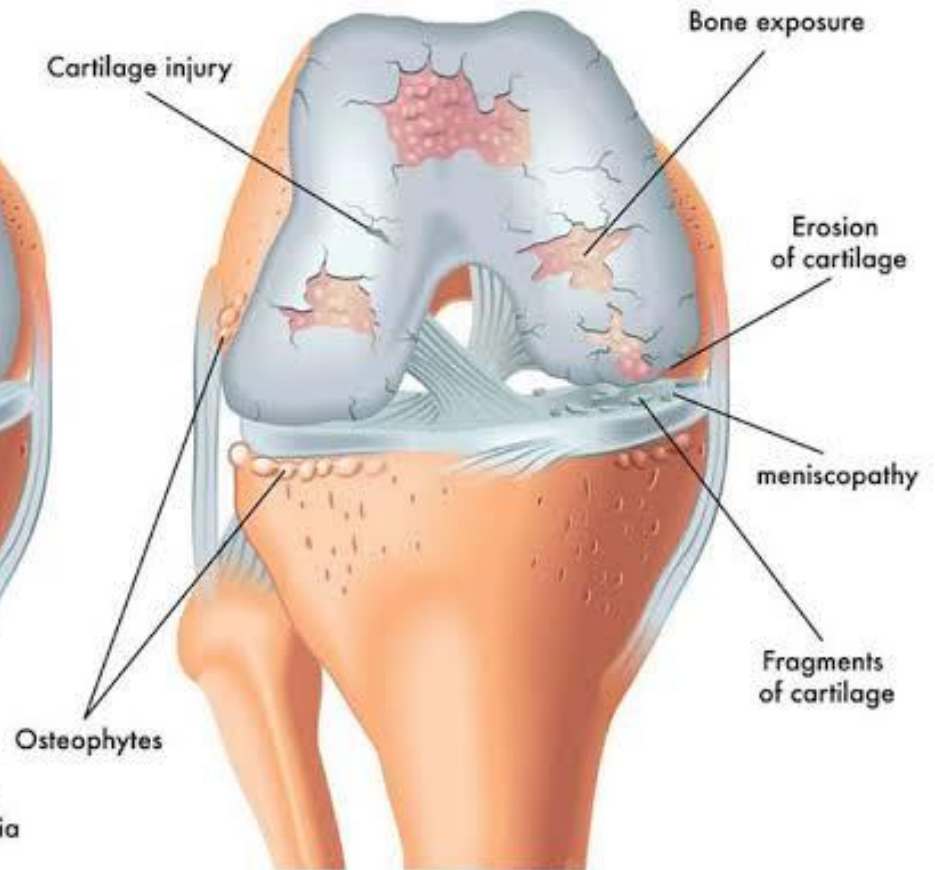- Meniscus of the knees

- Pubic symphysis

Applied Histology

- Osteoarthritis
- Achondroplasia
- Slip disc
- Hyaline cartilage have a tendency to ossify with age.

Normal knee

Arthrosis of the knee

Cartilage

Fibula

Tibia

Osteophytes

Cartilage injury

Bone exposure

Erosion
of cartilage

meniscopathy

Fragments
of cartilage

Achondroplasia

- Achondroplasia is an **autosomal dominant** condition
- It was discovered in 1994 by Dr. John Wasmuth
- It is caused by a **mutation** of the **fibroblast growth factor receptor-3 (FGFR3) gene on chromosome 4.**
- Achondroplasia is the most common form of Dwarfism
- Although there are over **200 types** of dwarfism, **two-thirds** have achondroplasia
- It affects 1 in 25,000
- 30,000 to 50,000 in U.S. have some form of Dwarfism
- It occurs in both sexes and all races
- Motor skills are temporarily delayed
- Cognitive skills/intelligence levels are **not** affected

Thank You