



Histology Sheet No.

14

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Notes:

Dr. Ghada's speech is in black color.

Additional information is in light blue

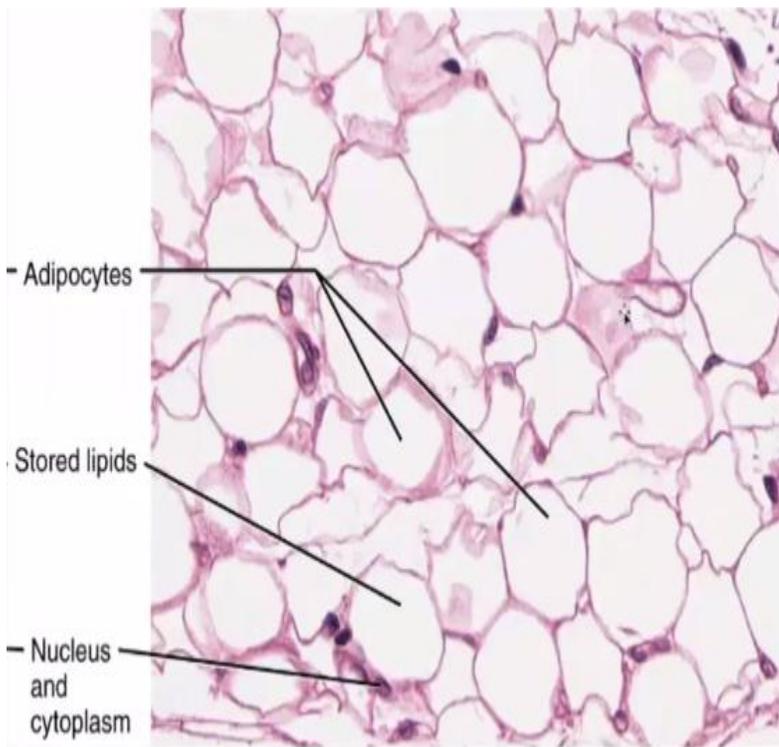
Dr. Hanan's speech is in green

General information:

1- adipose types: a) white(yellow) fat b) brown fat

2- cartilage types: a) hyaline (most common) b) elastic cartilage c) fibrocartilage

What is the type of tissue in these pictures?



White adipose tissue

The architecture (areolar, loose C.T. packed with adipocytes)

The cells have 1 vacuole of fat (whither the cells synthesis it by itself or pick it up from blood stream)

Has signet ring appearance (cytoplasm & nucleus are pushed to the periphery) & it include organelles.

White fat functions:

Food reservoir, insulate, protection & has an endocrine function to secrete leptin

Leptin

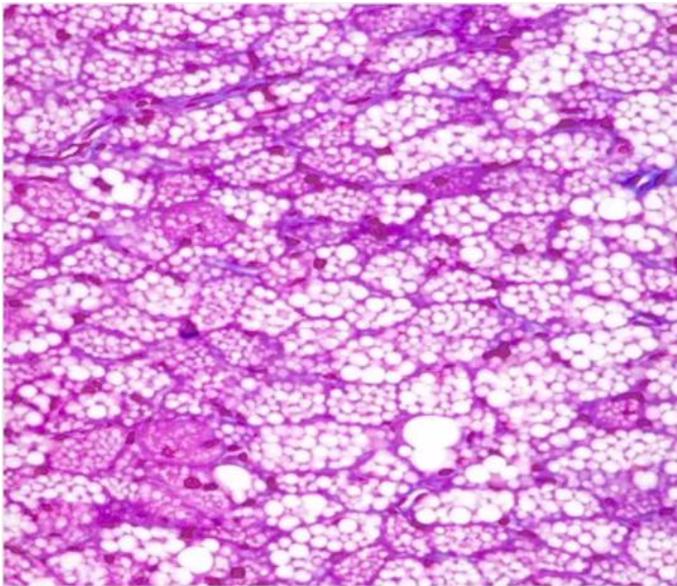
← (from the book) →

Required in the exam

Hormonal activity of white adipocytes themselves includes production of the 16-kDa polypeptide hormone leptin (Gr. leptos, thin), a “satiety factor” with target cells in the other brain regions, and ‘hypothalamus peripheral organs which helps regulate the appetite under normal conditions and participates in regulating the formation of new adipose tissue

MEDICAL APPLICATION

Leptin was discovered and is well studied in genetically obese mice, but such studies have not yet led to new treatments for human obesity. In most obese humans adipocytes produce adequate or excess quantities of leptin, but target cells are not responsive due apparently to insufficient or defective receptors or post-receptor signal transduction

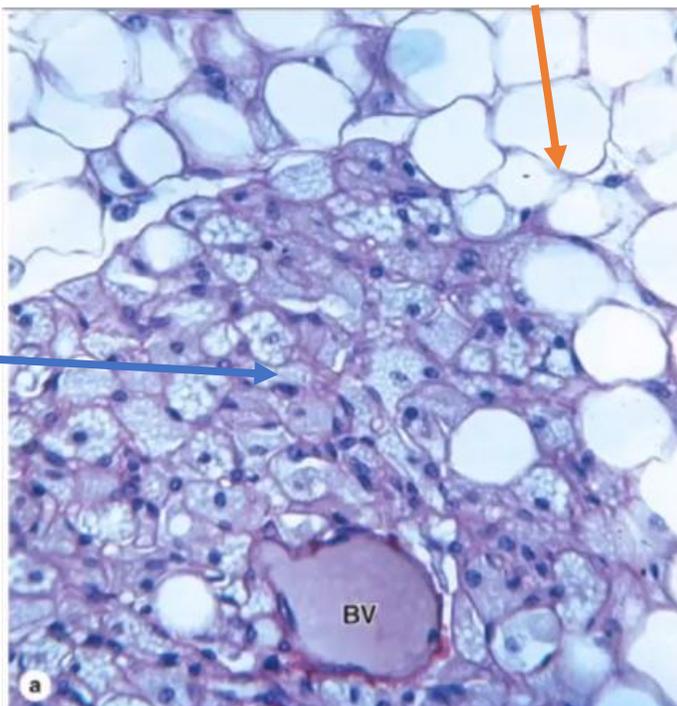


Brown adipose tissue

Stored fat in small vacuoles, many of them have a lot of blood vessels & mitochondria to generate heat (thermogenesis)

These cells are more relaxed in shape than white fat cells.

More blood vessels than white



Orange arrow → white fat cells (and there is few brown fat cells scattered between them)

Blue arrow → brown fat cells

(decrease when you get older)



The section is from trachea

The tissue is hyaline cartilage
(basophilia & isogenous groups)

(it is found in articular surfaces, rib cage, respiratory airways, frontal part of nose, temporary skeleton of embryo, epiphyseal plates which help in growing process, etc.)

Perichondrium (dense C.T + collagen I) we can see darkly stained nuclei in it, which are for fibroblasts or mesenchymal cells (indistinguishable except in the case of using Immunofluorescence or immunohistochemistry)

Orange arrow → chondroblasts

Black arrow area → chondrocytes (fully differentiated)

(prisoners in their lacunae)

The matrix around lacunae is basophilic (territorial matrix) away from it we have (interterritorial matrix) which is less basophilic.

The cells are present in groups of 2 or more called isogenous groups.

These groups are present in

(Hyaline > elastic > fibro) cartilages.

Elastic cartilage :

Has less isogenous groups

Has less basophilic stuff (more elastic fibers)

Has perichondrium

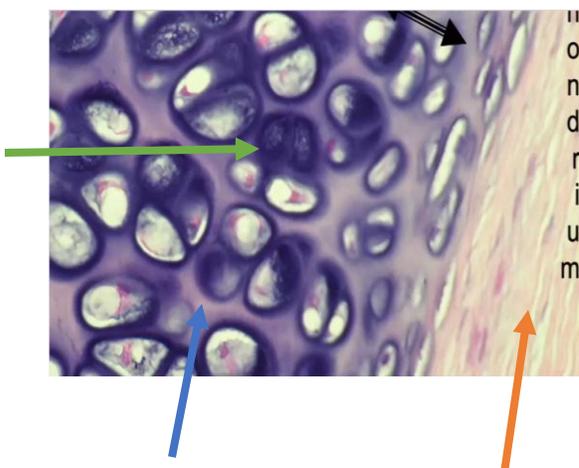
Fibrocartilage:

Has the least isogenous groups

Eosinophilic (has fibroblasts inside cartilage)

Hasn't perichondrium

Time is 15:00



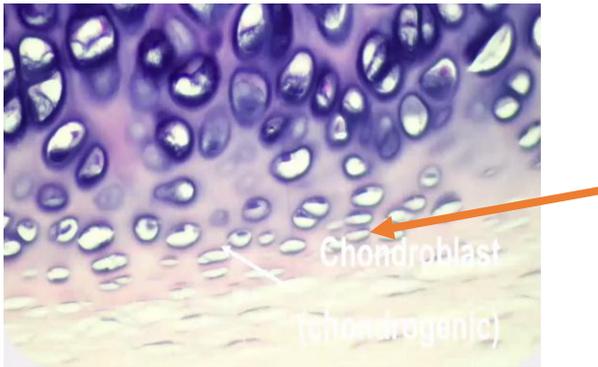
Just magnified picture

Orange arrow → perichondrium & collagen I

Blue arrow → cartilage

Green arrow → some cells are more bluish?

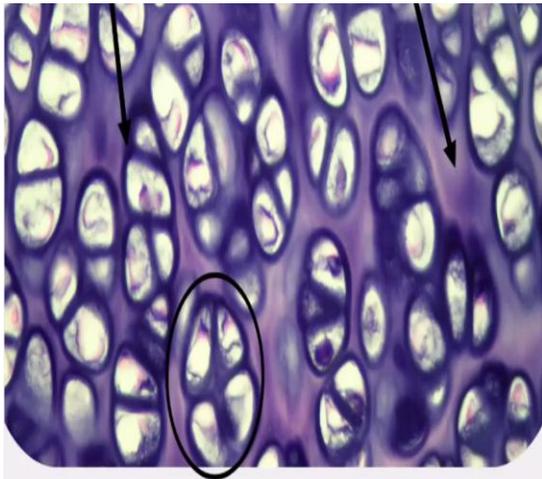
It depends on the sectioning stage here we see the periphery of this cell which is the most basophilic part of it.



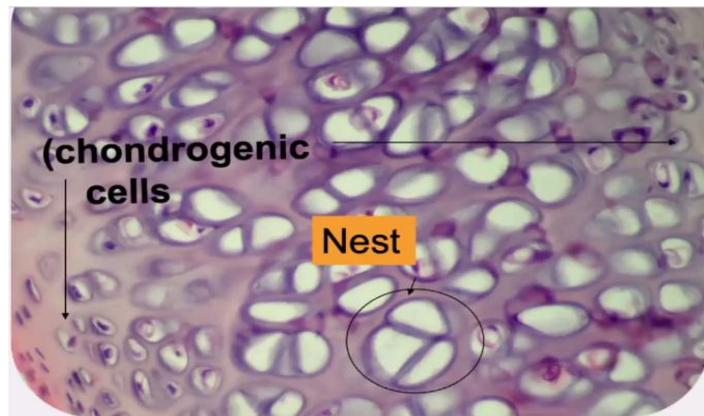
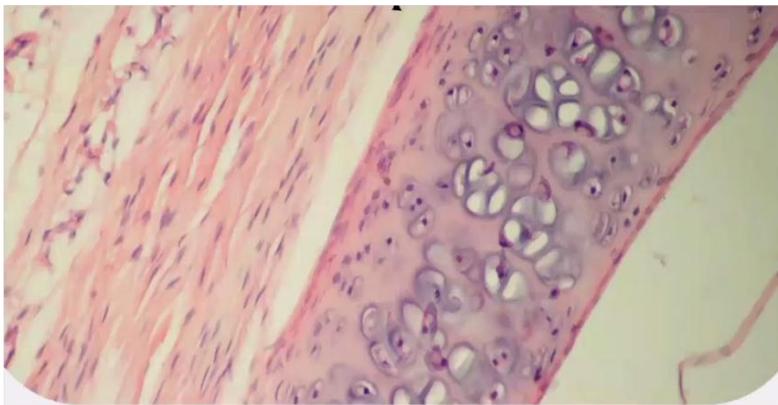
More magnified

Orange arrow → chondroblast

The closer cells to the perichondrium are less basophilic



The structure in the black circle is nest (isogenous group)

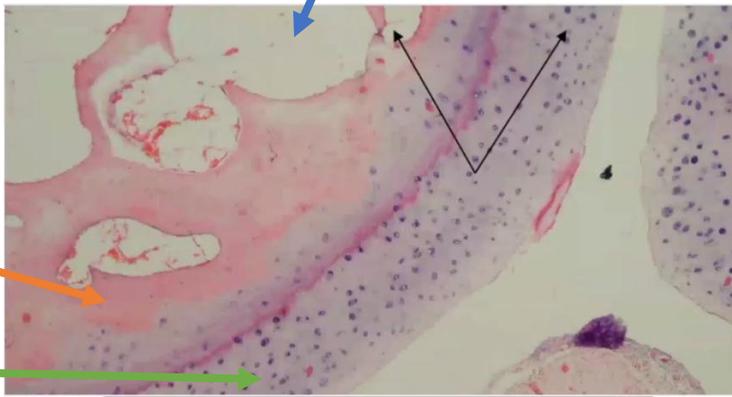


Hyaline cartilage

(we know that from the big amount of isogenous group)

The stain is less basophilic because we stain the section with hematoxylin for less time, although we still can see basophilia around chondrocytes.

Just magnified



Hyaline **articular** cartilage

Some signs: (green arrow point to it)

(doesn't have perichondrium, less cells & more matrix)

It has a lot of matrix to be tough so it can deal with the high stress on it.

Orange arrow → bone (pinkish)

(it has a lot of Ca, phosphate & collagen I to be tough)

Blue arrow → Cancellous bone (spaces)

Fill with bone marrow and fat (the combination ratio depends on age)

This section is from animal but it's similar to the human

Medical application:

Name: Osteoarthritis

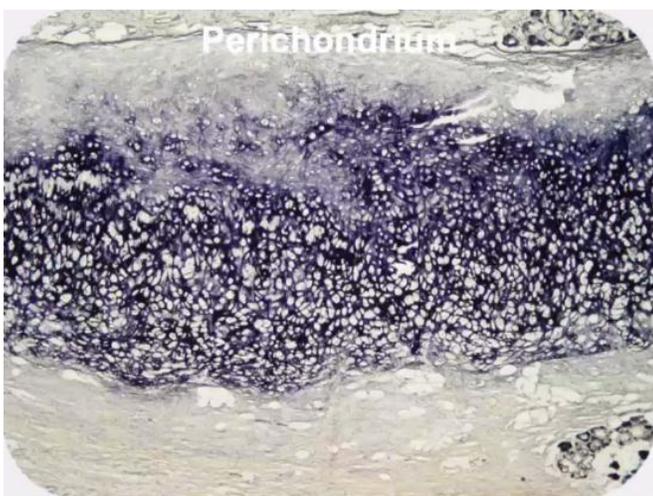
Reason: loss of cartilage layer

The initiation: loss of synovial fluid (which cushions the ends of bones and reduces friction when you move your joints)

Result: erosion of the cartilage which cause high friction between bones & pain when you move

Treatment: a) injection of mesenchymal stem cells to replace the damage tissue

b) joint replacement



The chondrogenic cells are peripheral fibroblasts and mesenchymal stem cells are deeper

Elastic cartilage (Van-Geison stain)

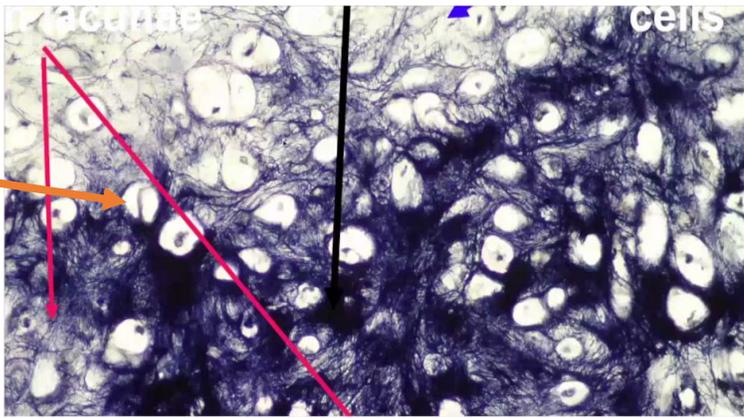
There are elastic fibers packed with cells through the whole section.

There aren't so much isogenous groups & we don't see any groups consist of 4 or 8 cells

We can find this tissue in:

(In the larynx, external part of the ear, epiglottis)

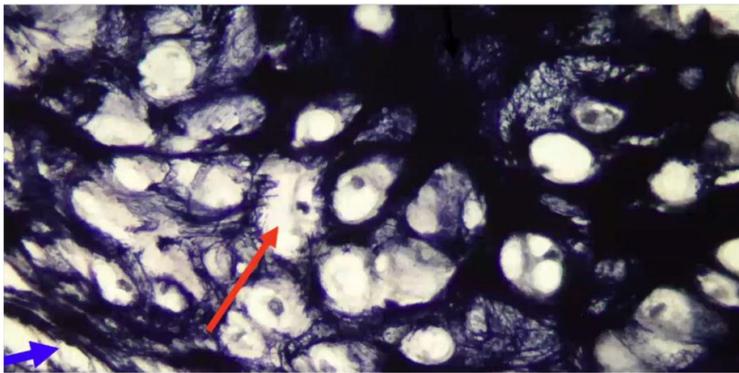
We need those parts in speaking, eating & breathing, so they are not hyaline because it classifies with age, we need them movable.



Closer picture

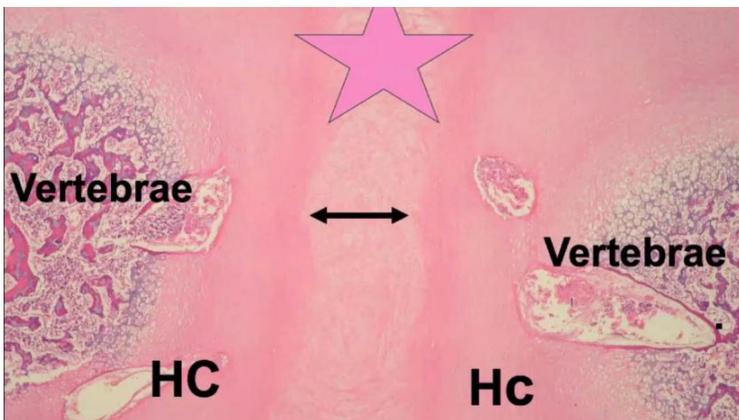
The shape of elastic fibers here is more interlacing shape rather than lamellae which we used to see in the arteries because here we don't need that function so we don't need that shape.

Orange arrow → small isogenous groups



We can see **chondrocytes** in this magnified image.

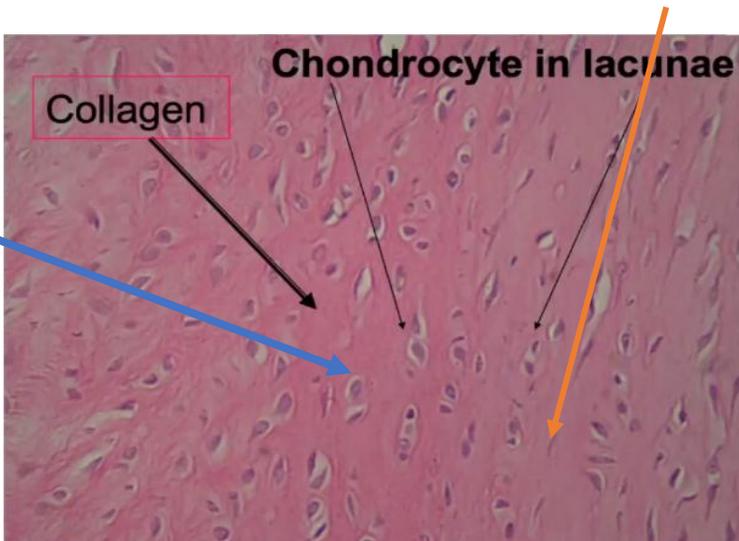
Time is 31:00



Fibrocartilage

We can find it between vertebrae (intervertebral discs)

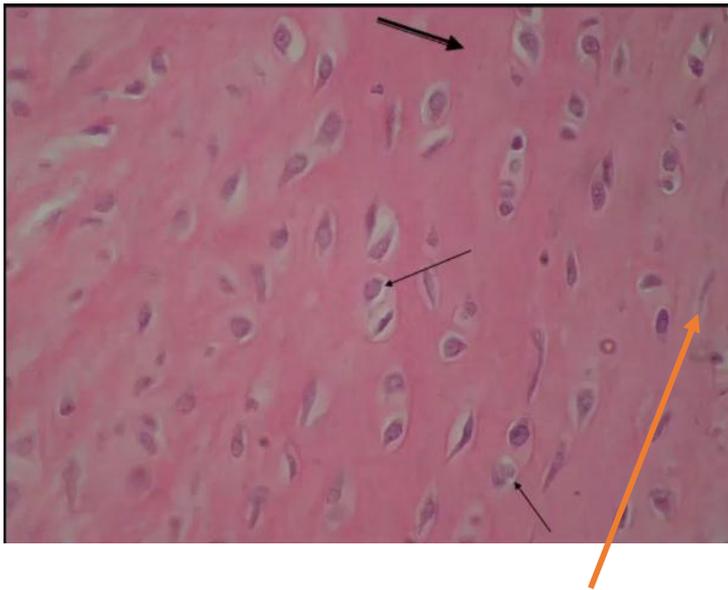
Also, in (pubic symphysis, in attachments of certain ligaments & the knee joint (meniscus))



Closer image therefore you can see the chondrocytes forming few isogenous in groups of 2 cells.

Orange arrow → fibroblasts with collagen I

Blue arrow → chondrocytes with collagen II (notice the difference in intensity of eosinophilia)



Magnified image has the same components

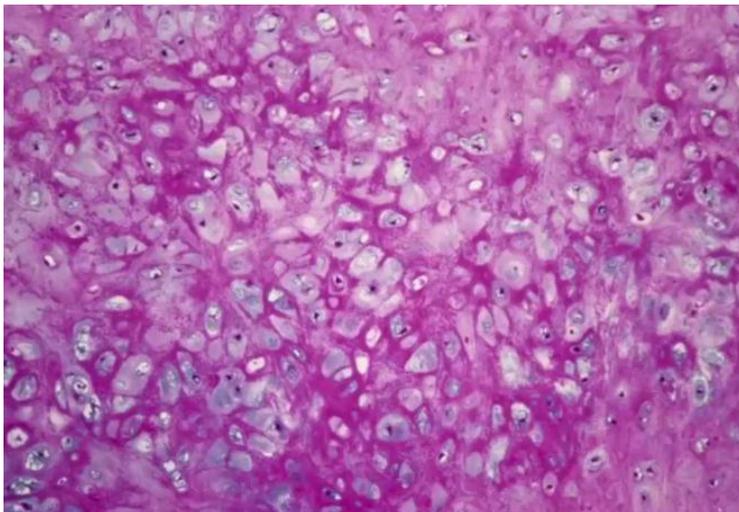
Orange arrow → fibroblast

(notice that fibroblasts have spindle shape & collagen I is less stained)

Fibrocartilage is a composition of dense CT and cartilage, this added much to its mechanical properties

The resistance is much stronger in it because it includes the collagen type 1.

So it is a tough and strong tissue that can withstand the strong forces applied to it.



Elastic cartilage (H&E stain)

Some signs:

Few isogenous groups, not homologous in intensity of eosinophilia)

The heterogeneous staining is a result of the unequal distribution of elastic fibers in the tissue

(more elastic fibers in the area → more eosinophilia)

Summary table:

Hyaline	Elastic	fibro	Tissue Aspect
Has a lot isogenous groups (2, 4 or 8 cells)	Less number of isogenous groups (2 or 4 cells) Has unequal distributed elastic fibers in it	The least number of isogenous groups Has fibroblast & collagen I in it	General appearance
Interterritorial matrix isn't as basophilic as territorial matrix (the nearest to the chondrocyte) <i>In the same matrix the stain is homologous</i>	Heterogenous staining because of the unequal distribution of elastic fibers which are eosinophilic	Have 2 phases: Heavily stained phase contains the chondrocyte & collagen type II Lightly stained phase contains the fibroblasts & collagen type I	Intensity of staining
Has perichondrium except in the articular cartilage	Has perichondrium	Don't have perichondrium	Perichondrium (in low magnification)

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