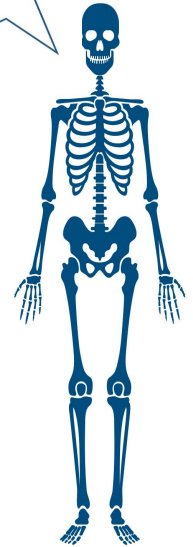
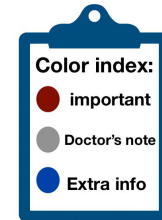


Lecture 1 :

Integrated Cartilage & Bone



Histology team
MED 439



musculoskeletal
block

Objectives:

1

Describe the microscopic structure, distribution and growth of the different types of:

(1) Cartilage

(2) Bone.

**Any future corrections
will be in the editing file
:Click [Here](#)**

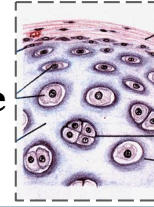
CARTILAGE

-Cartilage is a is a specialized type of **C.T** , with a rigid matrix.

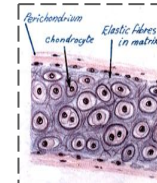
-Cartilage is usually nonvascular (**avascular**)
(doesn't contain blood vessels and nerves)

-There are three type of cartilage

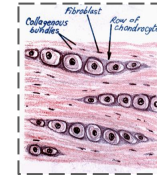
Hyaline cartilage



Elastic cartilage



Fibrocartilage



Hyaline cartilage

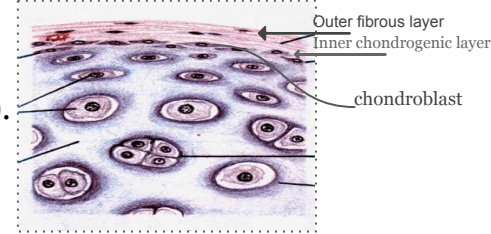
Structure of hyaline cartilage

Perichondrium: Vascular C.T. membrane formed of 2 layers:

1- Outer fibrous layer (rich of blood vessels): dense fibrous C.T.

2- Inner chondrogenic layer: contains chondroblasts (no lacunae = الفراغ المحيط بالخلية).

Function of chondroblast 1/ They secrete cartilage matrix and ,
2/ give rise to chondrocytes.



Cells

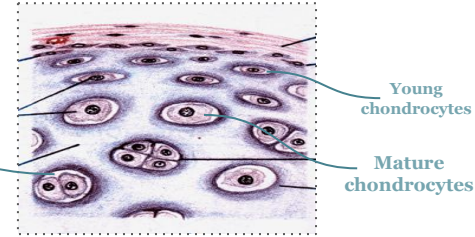
Cells (Chondrocytes): Found in spaces called lacunae.

-Young chondrocytes:

are small & present singly in their lacunae.

-Mature chondrocytes (One capsule contains more than one cell ، كائنها عش طور) :

are large, and are found singly or in groups of 2, 4 or 6 cells in their lacunae (cell nests).



Matrix

-Homogeneous (مافيه شوائب) and **basophilic**.

-Contains collagen type II.

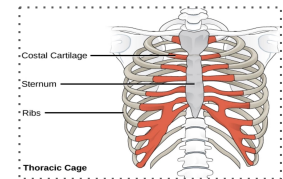
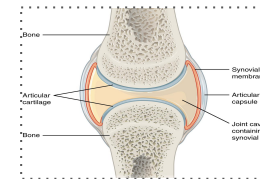
Site

-Foetal skeleton.

-Costal cartilages. (Costal means relating to the ribs)

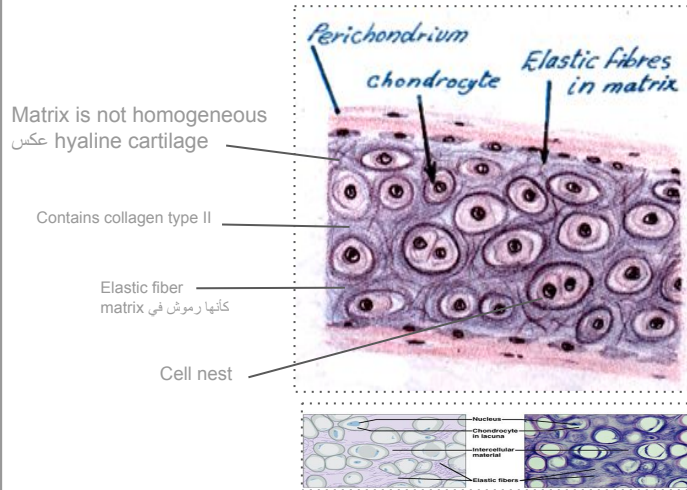
-Articular surfaces of bones.

-Nose, trachea & bronchi.



Elastic cartilage

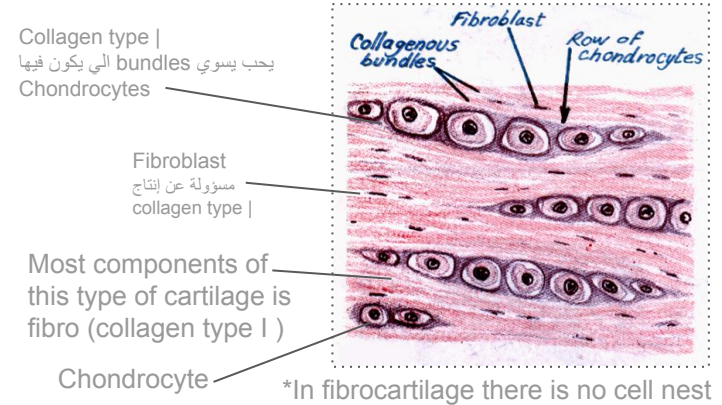
- Similar to hyaline cartilage + **elastic fibres in the matrix.** (Have same characteristic of hyaline cartilage .
الفرق الوحيد هو وجود elastic fiber)



Structure

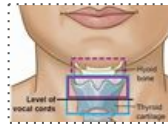
Fibrocartilage

- **No perichondrium.**
- Rows of chondrocytes in lacunae separated by parallel bundles of **collagen fibers (type I).**

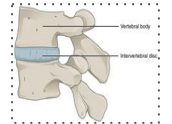


Site

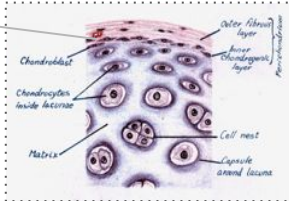
- External ear.
- Epiglottis. (لسان المزمار)



- Intervertebral disks



Growth of cartilage

	Appositional growth	Interstitial growth
produced by	the activity of Chondroblasts in the inner chondrogenic layer.	division and activity of mature chondrocytes.
It leads to	<p>Increase in width (thickness) .</p> <div style="display: flex; align-items: flex-start;"> <div style="border: 1px solid gray; border-radius: 15px; padding: 5px; margin-right: 10px;"> <p>كل ما كبر الشخص كل ما قلت Layers of chondroblast</p> </div> <div style="border: 1px solid gray; border-radius: 15px; padding: 5px; margin-right: 10px;"> <p>Layer of chondroblast تزيد في حالتين ١/ مرحلة الطفولة ٢/ حالات الإصابة مما يؤدي إلى زيادة thickness</p> </div> <div style="border: 1px dashed gray; padding: 5px;">  </div> </div>	<p>Increase in length.</p>

BONE

-Bone is a specialized type of C.T. with a hard matrix.

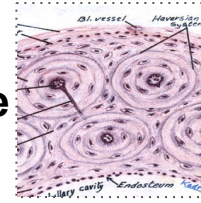
- rich in blood vessels and nerves

-consist of collagen type I

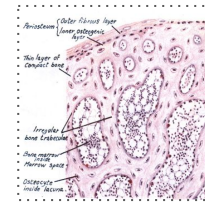
- consist of calcium

- there is two type of bone

Compact Bone



Spongy Bone



Component of bone

1 / matrix of bone

(calcified osteoid tissue)

- 1- hard because it is calcified (**Calcium salts**)
- 2-It contains type **I Collagen** fibers
- 3-it forms **bone lamellae** and **trabeculae**

2 / cell

There are 4 type of cells

Osteogenic Cells

- in periosteum and endosteum
- Fate:**give rise to **osteoblasts**

Osteoblasts

- in periosteum & endosteum
- origin:**osteogenic cells
- Fate:**change to **osteocytes**
- Function:**they secrete the **bone matrix** & deposit **Ca salts** in it



Osteocytes

- Branched cells**
- present singly in lacunae
- their branches run in the canaliculi
- Origin:**Osteoblasts
- Function:**they maintain the bone matrix



Osteoclasts

- Large **multinucleated cells** on surfaces, in Howship's lacunae
- they have striated or ruffled border
- Cytoplasm is rich in lysosomes
- Origin:** **blood monocytes**
- Function:** **bone resorption**



3 / Periosteum

membrane that covers the outer surface of all bones,

4 / Endosteum

The endosteum (plural endosteia) is a thin vascular membrane of connective tissue that lines the inner surface of the bony tissue

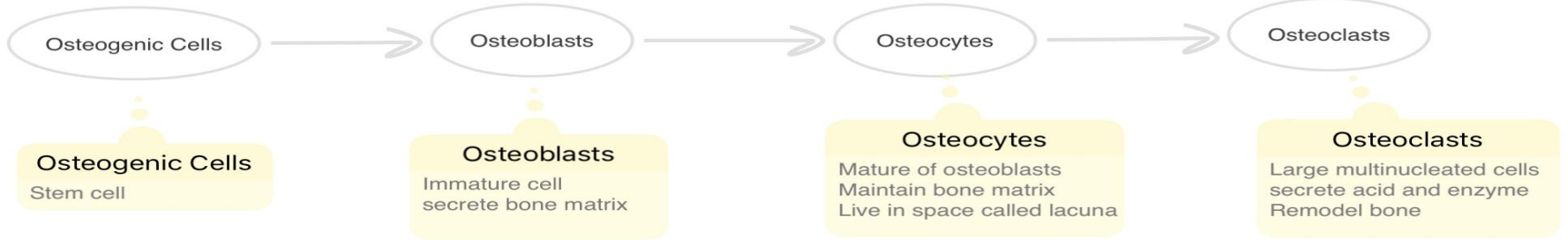
Function

1/ Body support

2/ Protection of vital organs

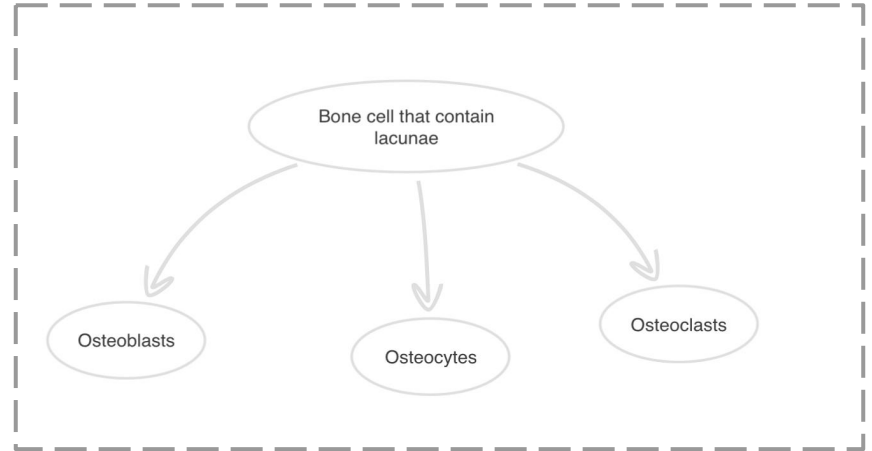
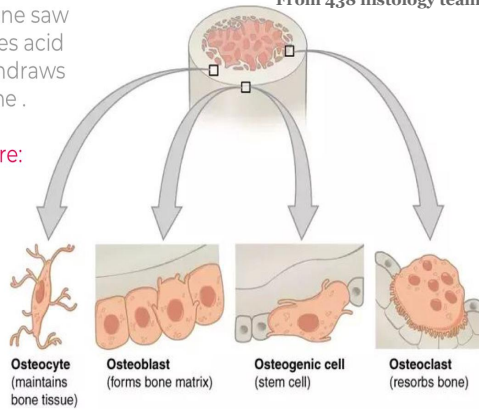
3/ Calcium store

Summary of bone cell



Osteoclasts have one smooth border and one saw like border (because of microvilli). It secretes acid (carbonic acid-carbonate+hydrogen) it withdraws calcium so it remodels and shapes the bone .

Note: the bone cells that contain lacunae are: **Osteoblasts, osteocytes and osteoclasts**



Type of bone

Compact bone

Spongy bone

Site

In the diaphysis of long bones.

In flat bones & epiphysis of long bones.

Consist of

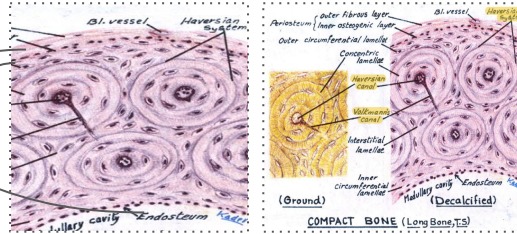
1-Periosteum

- A) Outer fibrous layer
- B) Inner osteogenic layer

2-Endosteum

3-Bone Lamellae

4-Bone Cells



1- Periosteum

2-Endosteum

3-Irregular bone trabeculae (are formed of irregular bone lamellae separated by osteocytes inside lacunae)

4-Many irregular red bone marrow spaces

5-Bone Cells

Characteristics

Bone Lamellae :

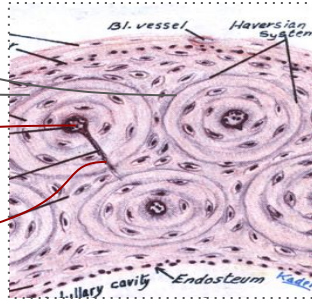
1-Haversian Systems (Osteons) = (unit of compact bone) :

- Longitudinal cylinders.
- Each is formed of:
 - a Haversian canal (blood vessels, nerve فيها) in the center, surrounded by concentrically arranged bone lamellae separated by osteocytes in lacunae.
 - Volkmann's canals: connect the Haversian canals together. They run obliquely or transversely.

2-External Circumferential Lamellae.

3-Internal Circumferential Lamellae.

4-Interstitial Lamellae: between osteons.

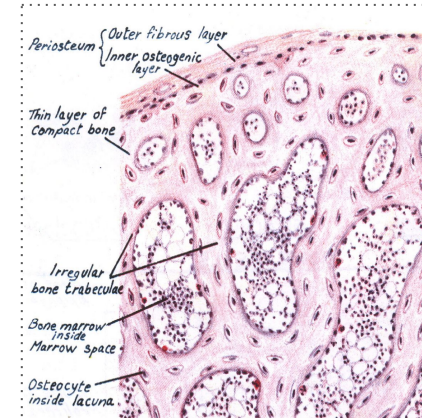


Compact bone consist of two canal :

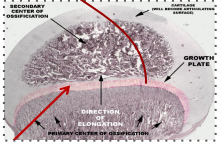
- 1/ Haversian canal
- 2/ Volkmann's canals

Unit of compact bone is called an **osteon**

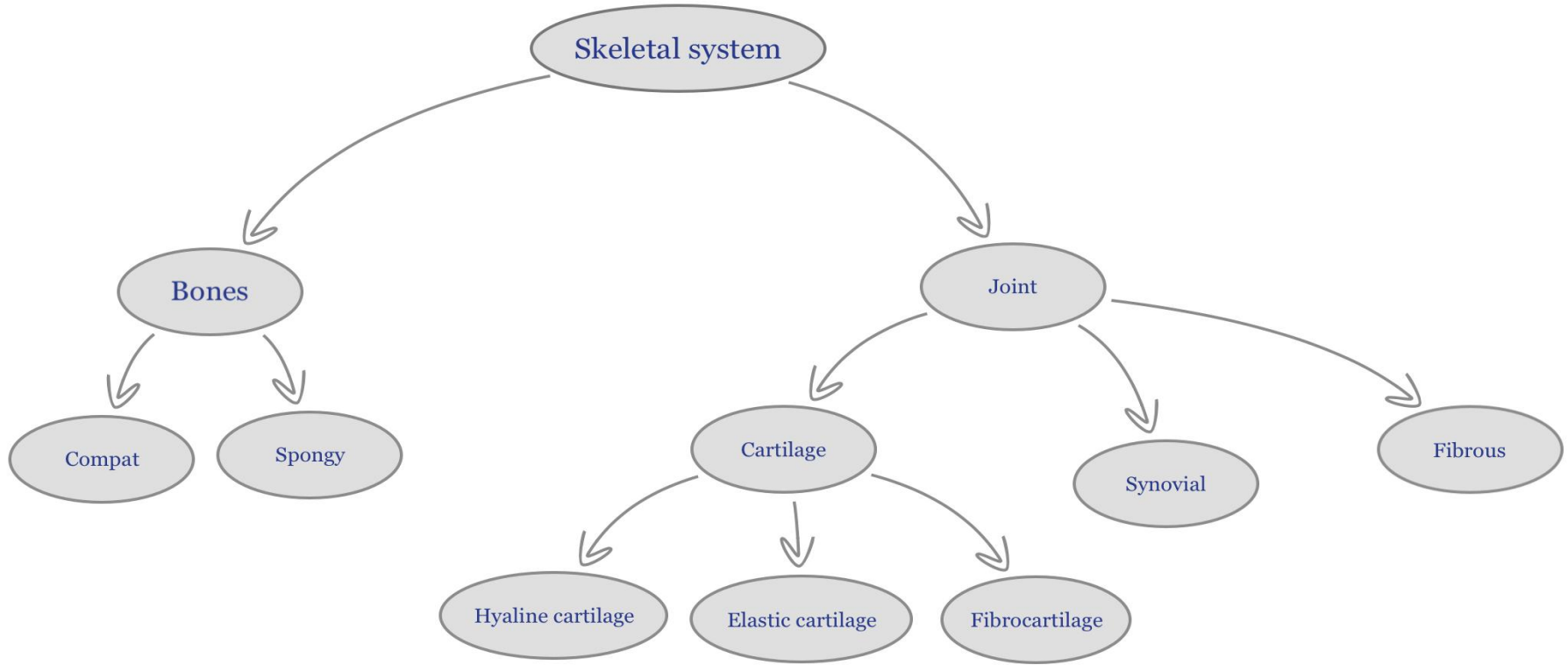
No Haversian systems (no osteons).



Growth of Bone

	Appositional growth	Interstitial growth
produced by	the activity of osteoblasts .	the activity of epiphyseal plate of cartilage <div data-bbox="1155 668 1425 838" style="border: 1px dashed black; padding: 5px; display: inline-block;">Function of Epiphyseal plate: Increase length of bone</div>  <p>The diagram shows a cross-section of an epiphyseal plate. A red arrow points from the text 'epiphyseal plate of cartilage' to the growth plate. Another red arrow points from the text 'Increase length of bone' to the growth plate. Labels include 'DIRECTION OF BONE LENGTHENING', 'GROWTH PLATE', 'ARTICULAR SURFACE', and 'ARTICULAR SURFACE'.</p>
It leads to	Increase in width	Increase in length .

Summary



MCQs:

Q1: function of osteocytes?

- A) secrete the bone matrix
- B) maintain the bone matrix
- C) bone resorption
- D) change shape of cell

Q2: origin of osteoclasts ?

- A) osteoblasts
- B) mast cells
- C) blood monocytes
- D) osteogenic cells

Q3: Haversian Systems are only found in ...?

- A) Hyaline cartilage
- B) Spongy bone
- C) Elastic cartilage
- D) Compact bone

Q4: Appositional growth in bone Produced by.....and lead to increase in ?

- A) osteoblast - length
- B) osteoblast - width
- C) epiphyseal plate - length
- D) epiphyseal plate - width

Q5: The matrix of Hyaline cartilage is ?

- A) Heterogeneous and basophilic
- B) Homogeneous and basophilic
- C) Homogeneous and eosinophilic
- D) Heterogeneous and eosinophilic

Q6: Increase of the bone length is produced by the activity of ... ?

- A) mature chondrocytes
- B) osteoblasts
- C) epiphyseal plate
- D) Chondroblasts

Q7: Interstitial growth of cartilage it leads to?

- A) Increase in width
- B) Increase in length
- C) Decrease in length
- D) Increase in width & length

Q8: The site of fibrocartilage is?

- A) External ear
- B) Intervertebral disks
- C) Nose
- D) costal cartilages

8-B
7-B
6-C
5-B
4-B
3-D
2-C
1-B



Team leaders



Fatimah Alhelal

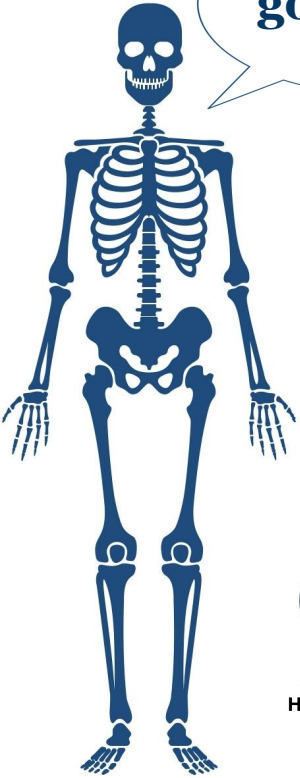
Albara Aldawoud

Team members

- Afnan AlMohsen
-  Nourah Alklaib
-  Sumo Abdulrahman
- Mariam Alruhaimi
-  Joud Alarifi

- Yazeed Alomar
- Abdulmohsen Albeshar
- Mohamed Albabtain
- Mohammed Ben Hajji
- Mohamed Alquhidan
-  Nawaf Alshahrani
- Abdullah Alburikan

good luck



Histology team
MED 439



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