بسم الله الرحمن الرحيم

Bone & ALVEOLAR PROCESS

(part 1)

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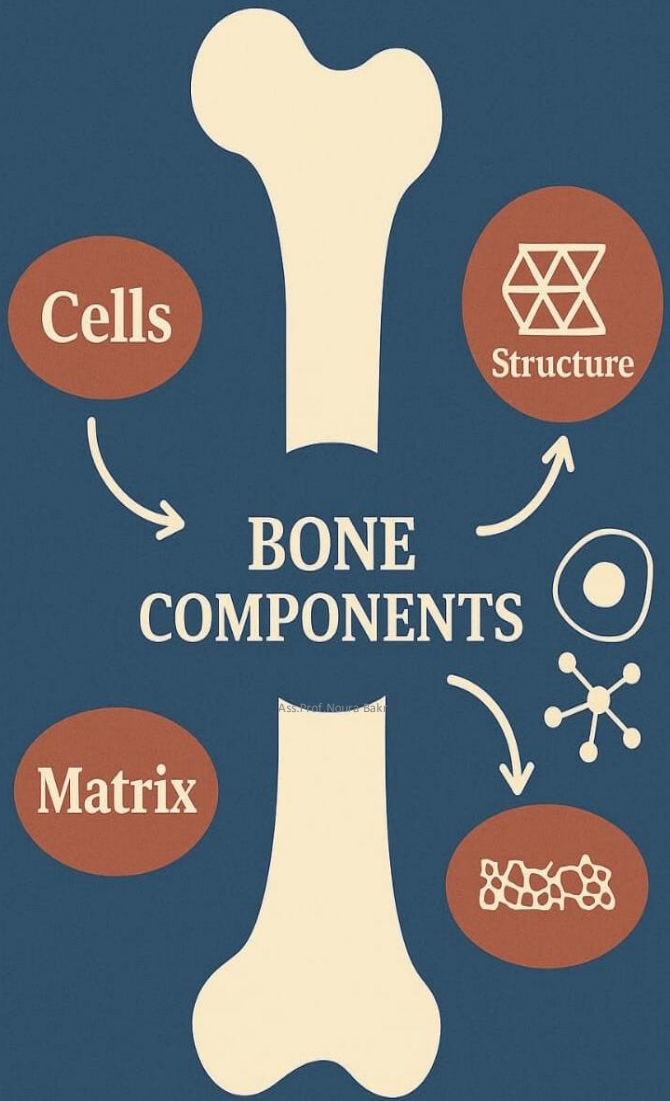
Basic items

- *Bone structure & cells*
- *Bone types & histologic structure for each types*
- *Incremental lines of bone & its indication*
- *Alveolar bone process micro and macro structure*
- *Bundle bone & clinical , histological, functional and radiographical name*
- *Cortical plate and its clinical significance*
- *Central spongiosa, histological & radiographic*



BONE MATRIX

ALL TISSUE (Enamel, Dentin, Cementum)
* Except pulp and PDL

1 - Organic Component

Soft, A.A.↑

- Collagen Fibers — more than 27 type.
- Ground Substance — Jell like structure, GAGs: glycoproteins

2- Inorganic Component

Hard

Hydroxyapatite Crystals ($Ca_{10}(po_4)_6(oh)_2$)

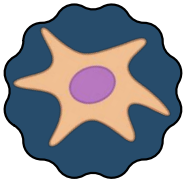
Bone is in Dynamic Condition

Destruction = Formation

* Blast cells ↑, formation ↑
  ↳ Lead to Giant Bone cell
* Clast cells ↑, Destruction ↑
  ↳ Lead to Osteopetrosis (Marbel Bone)

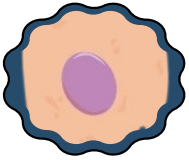
BONE CELLS

Function •



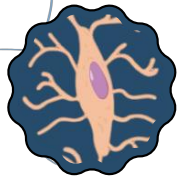
OSTEOPROGENITOR

divide by mitosis to give any other type of bone cells



OSTEOBLASTS Formative

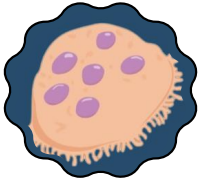
1-bone formation.
2-secreteion of growth factors.
3-controlling influence in activating osteoclasts.



OSTEOCYTES

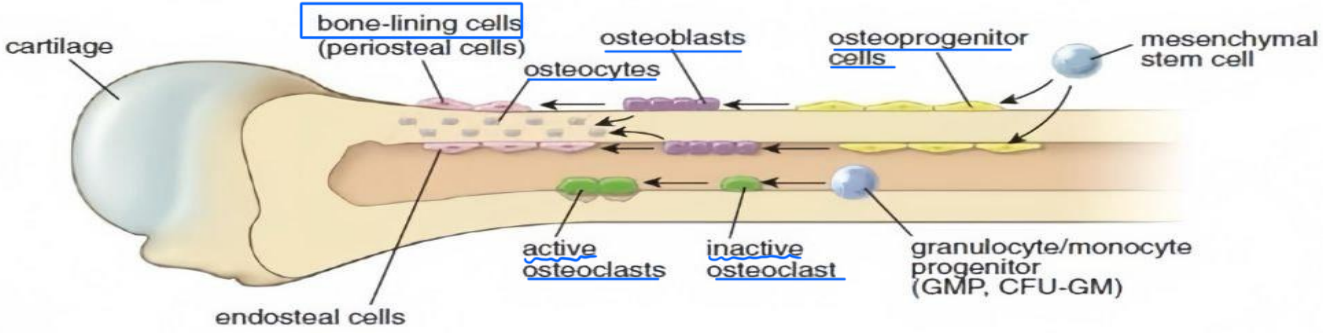
- Dentric cell
- Many processes

1-maintain bone integrity.
2-maintain bone vitality.



OSTEOCLASTS Destructive

resorption of the bone by acid phosphate enzyme.



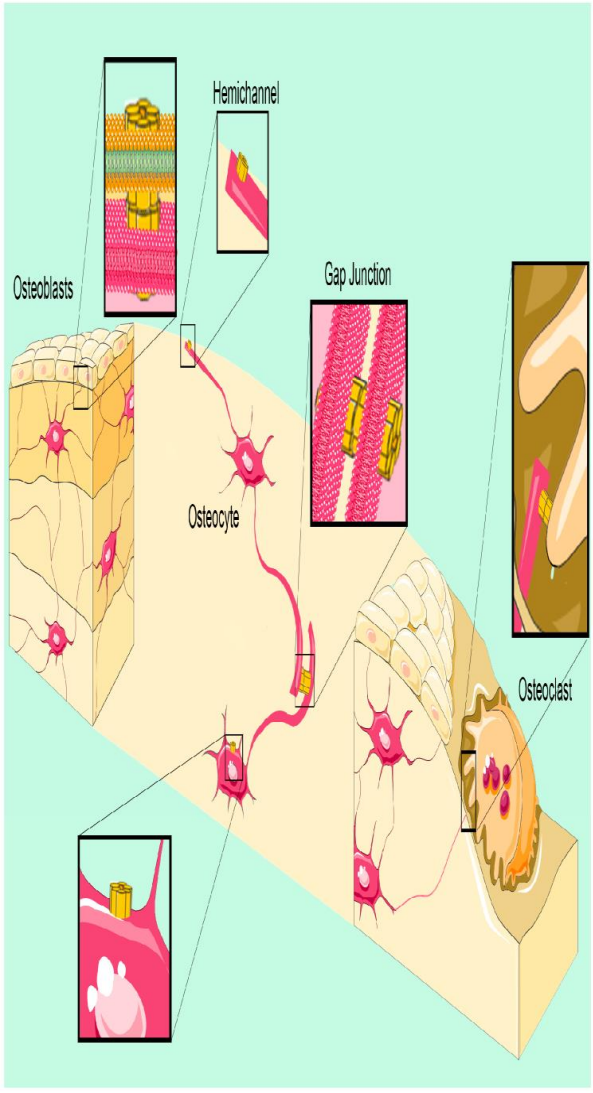
➤The Remodeling Cycle

Bone is a dynamic tissue that undergoes constant remodeling—balance between breaking down old bone and building new bone.
This process is directly tied to hormonal metabolism:

- **Resorption (Releasing Calcium):** Specialized cells called **osteoclasts** break down bone tissue(Acid phosphatase E).
- **Formation (Storing Calcium):** Specialized Cells called **osteoblasts** build new bone matrix and mineralize it by depositing calcium and phosphate from the blood (Acid Alkaline phosphatase E

Osteocyte cells

They are osteoblast entrapped cell within the bone matrix.



Function: -

- maintenance of bone matrix, and prevent hypermineralization. (formation of functional syncytium (osteocyte – osteoblast copmlex) to prevent (sclerosis)
- Help in Ca release from bone to blood. like parathyroid and Vit D
- controlling bone remodeling.
- Contain alkaline phosphatase to prevent dissolution of bone salts

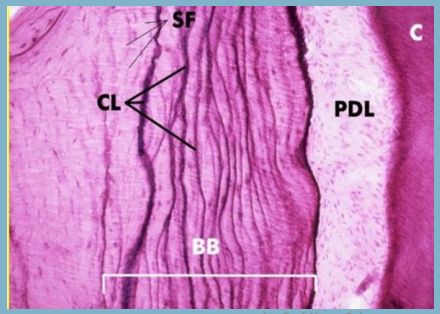
HISTOLOGICAL STRUCTURE

Formation cell
organic — inorganic

Incremental Lines of The Bone

layer by layer

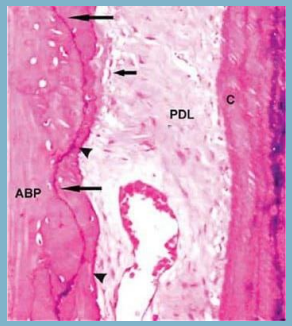
* Between the layer and the other line demarcation



Resting line — Formation

Dark blue lines represent periods of rest of osteoblasts (rythmic manner of bone formation.

* Cancer cells (crazy cells) don't take rest (pathologic)



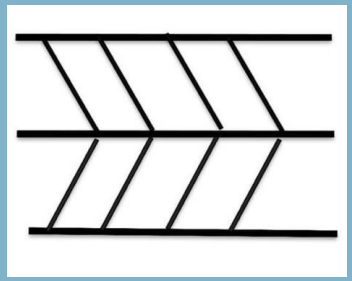
Reversal line — Resorption

↳ Rat tooth appearance

Blue scalloped lines represent post osteoclastic activity.

Giant cell / Multinucleated

(Destruction > Formation (power lacunae marked))



Faint Line

Appear by Silver stain; due to abrupt change in direction of collagen fibres of each successive lamella

- One Direction → Easy to destruct (No Framework)

TYPES OF BONE

1 – LAMELLAR BONE

2 – Non LAMELLAR BONE (WOVEN BONE).

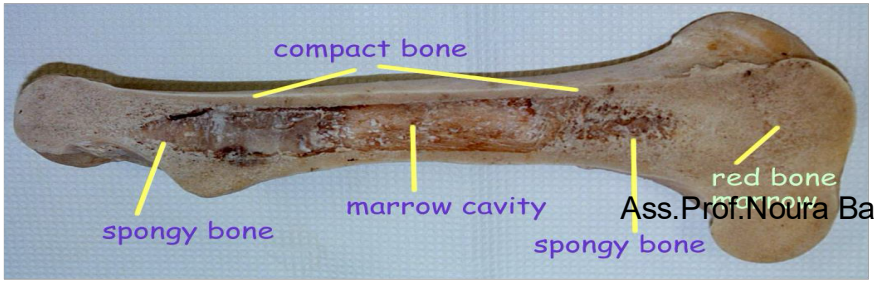
3 – BUNDLE BONE.

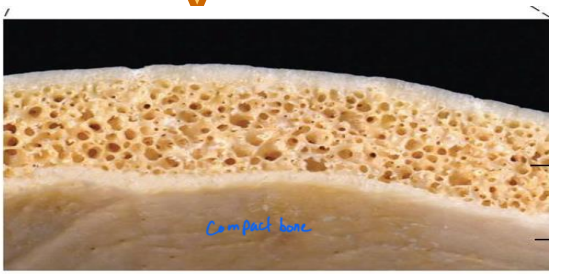
1- lamellar Bone

layers

Compact bone

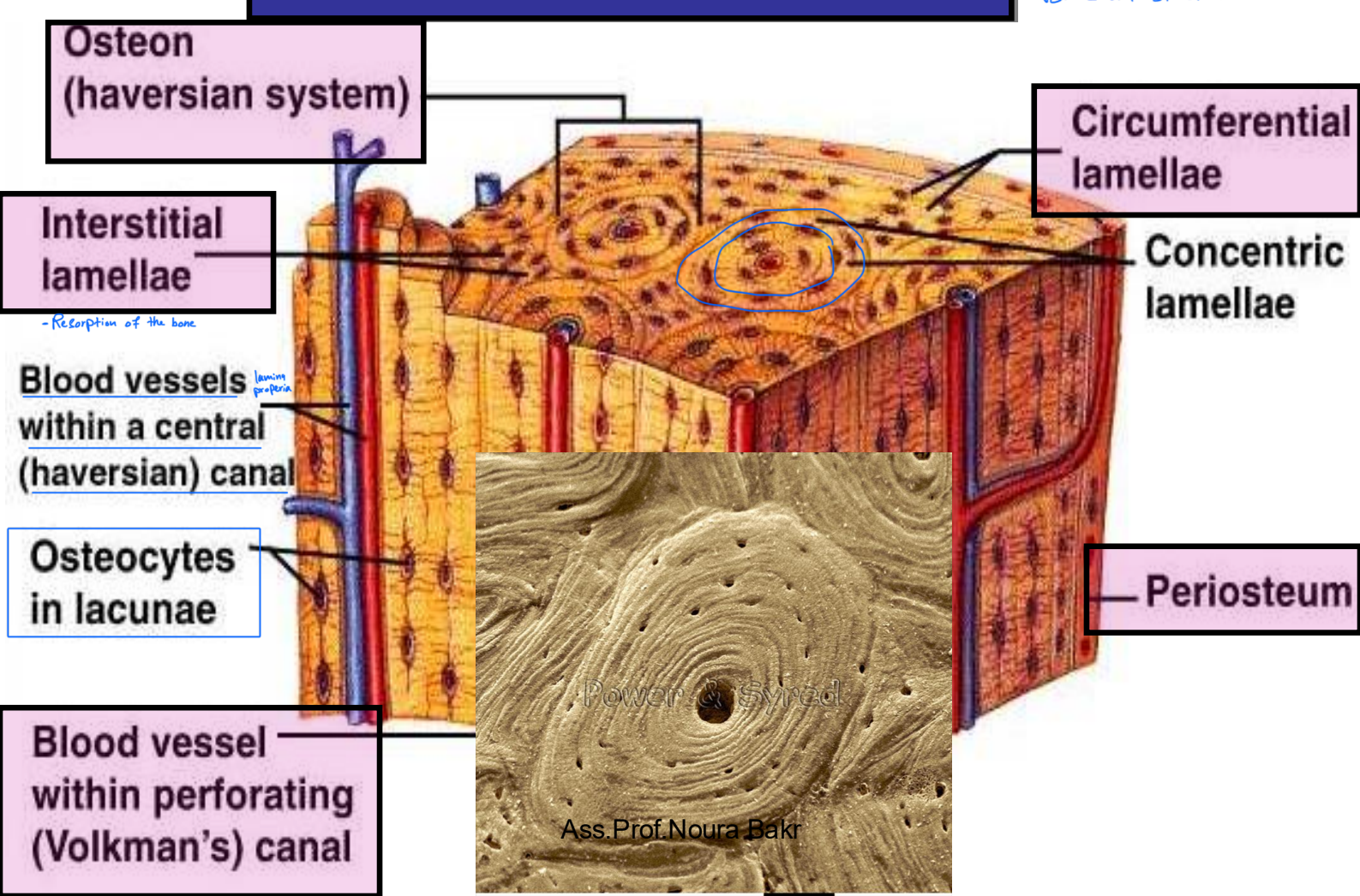
Spongy bone



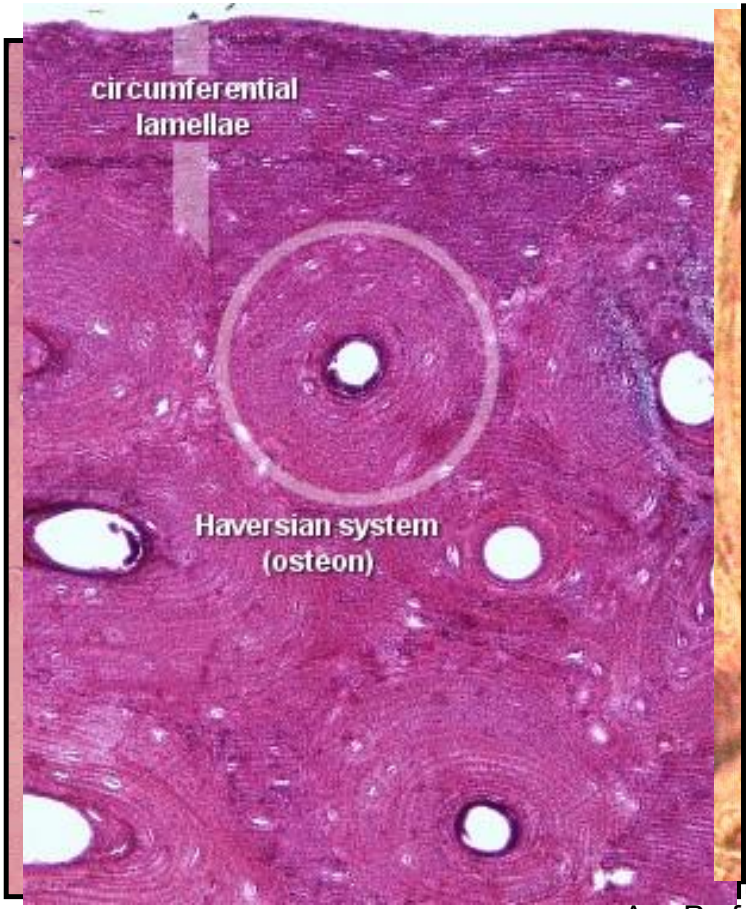


A – COMPACT BONE

* Basic Unit Structure

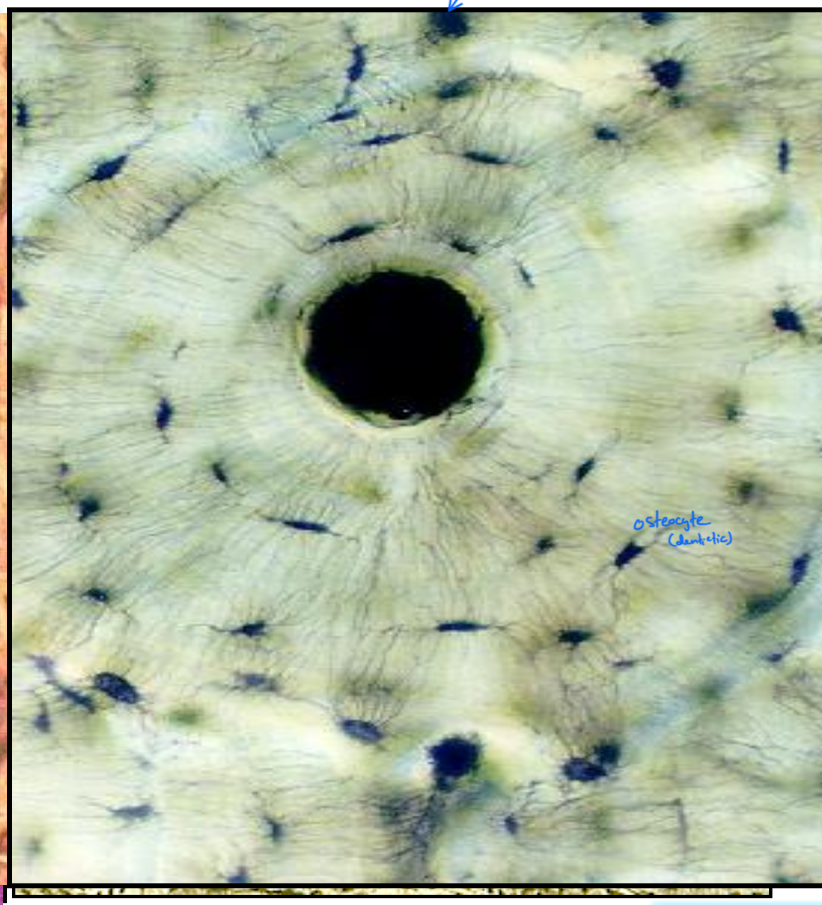


Compact Bone



DECALCIFIED SECTION

Without Ca^{++} Removal



GROUND SECTION

Microtome cutting layer by layer

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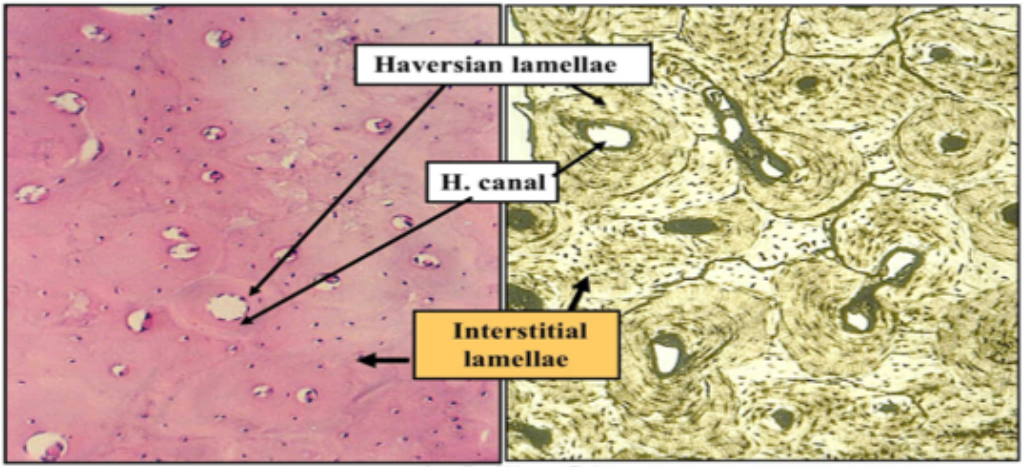
Compact Bone



DECALCIFIED SECTION

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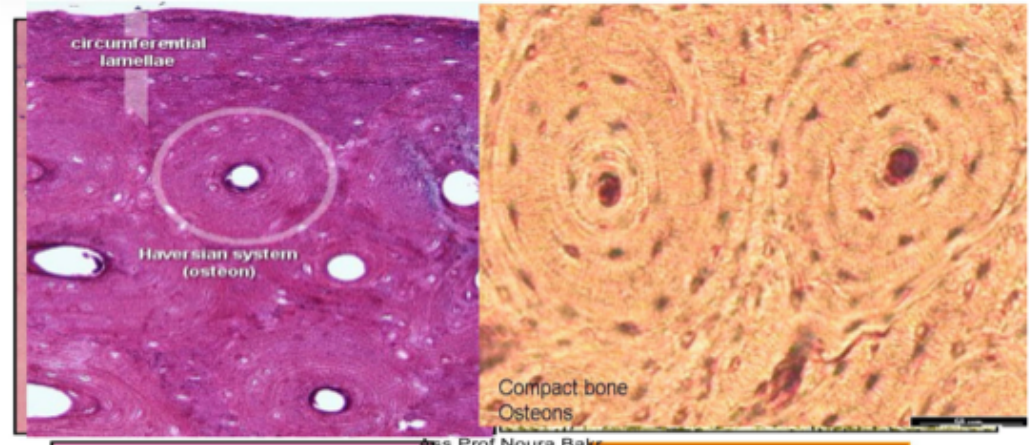
GROUND SECTION



DECALCIFIED SECTION

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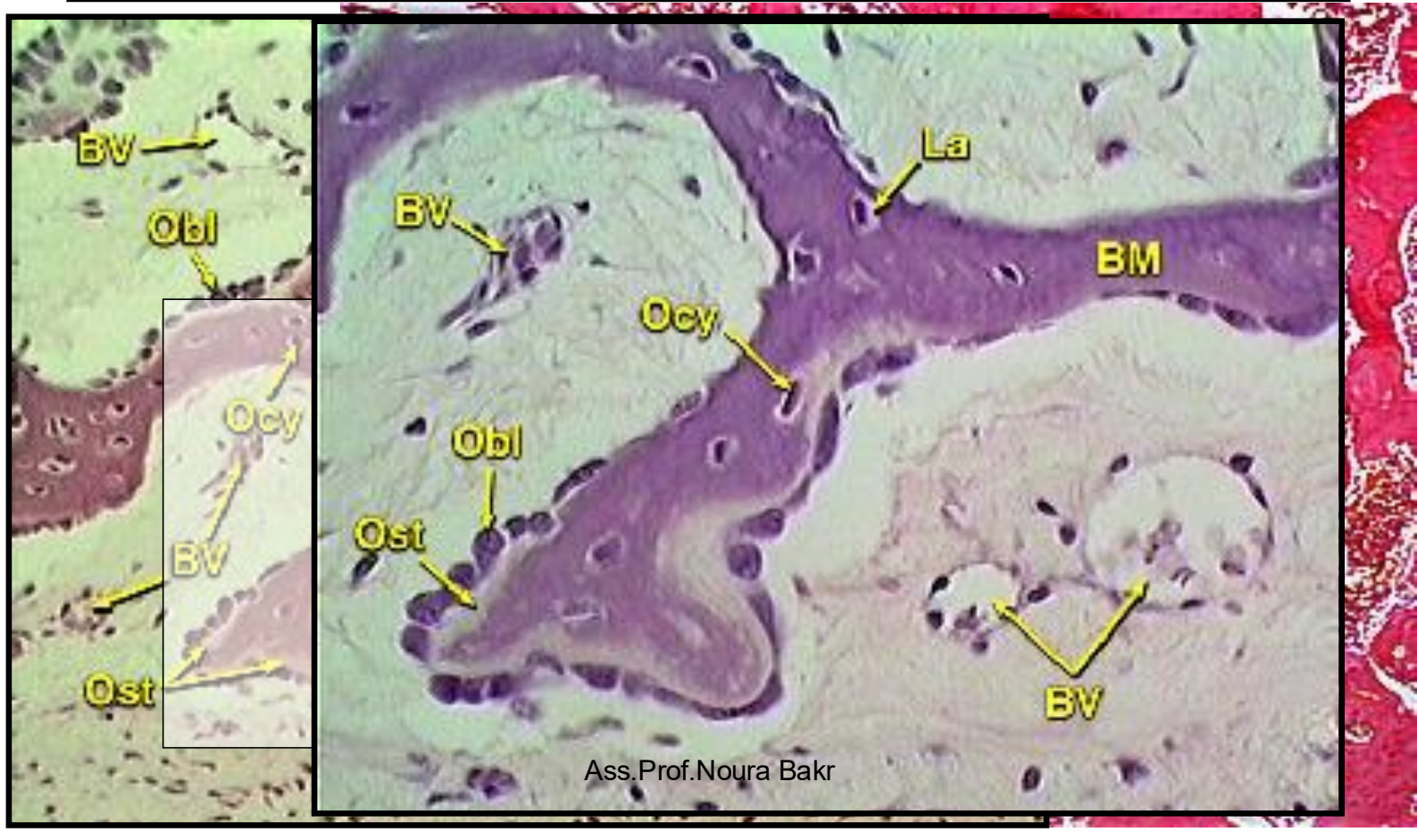
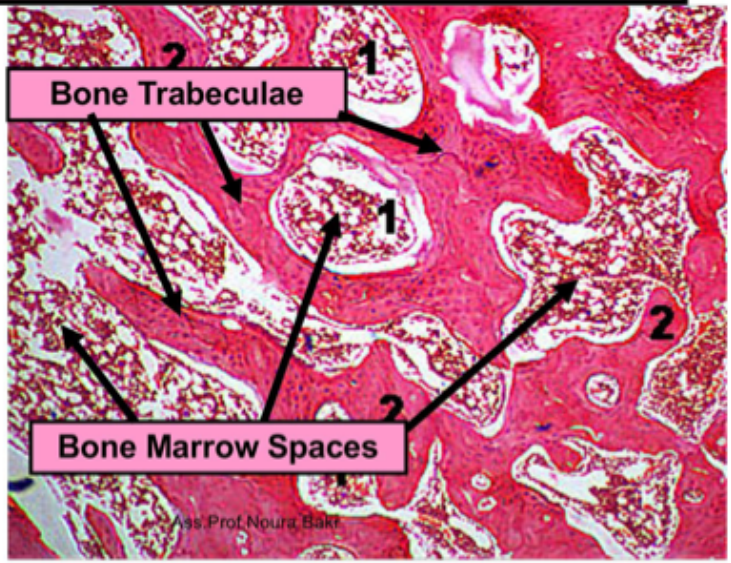
GROUND SECTION

B - SPONGY BONE

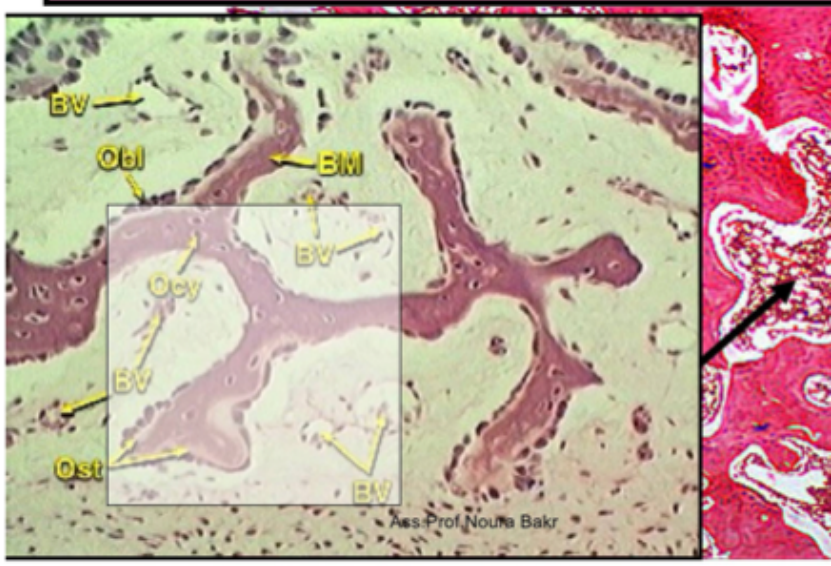


B - SPONGY BONE



- Has bone marrow + Matrix
- The Matrix has bone trabecule (Irregular)
- Opposite to compact bone which it is regular. (osteon)

B - SPONGY BONE



☆ Helps in implant
* Mediate or delayed tooth extraction
*In Delayed extraction, drilling is needed to destruct the bone
- Any mistake could lead to unstable implantation and problem in eating
* Can't plant in woven bone

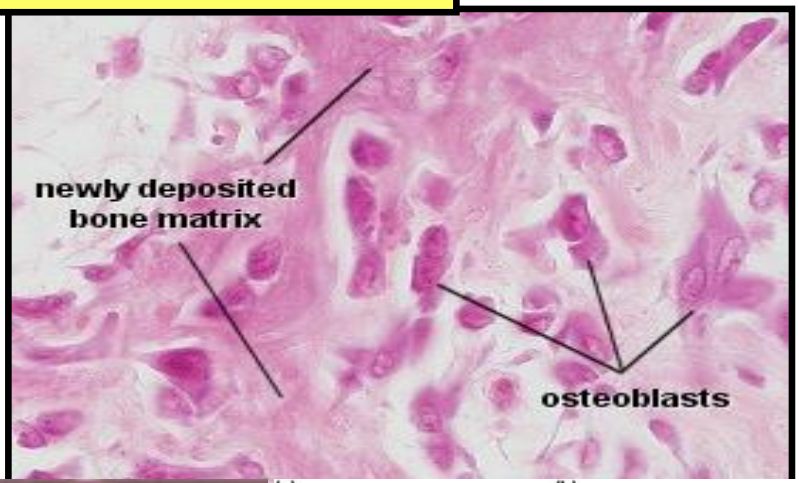
2 - Woven Bone

- New bone is formed
- Few cells and collagen fibers

FOUND in areas where bone is laid for the first time in a new situation:

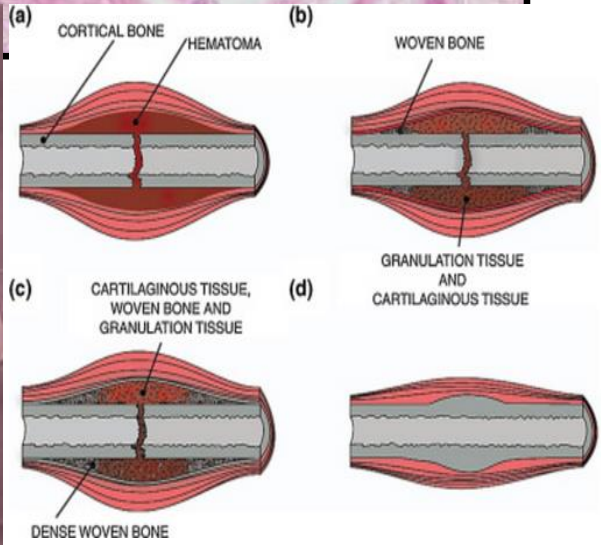
- **Bone of the foetus = *Embryonic bone.***
- **Callus of fracture = *Bone of emergency.***
- **Healing sockets after tooth extraction.**

* Dry socket → No extraction → No Bone, have woven (Don't have facilities of Normal Bone)



Callus formation :
1- Blood clot
2- Incorporated bone formation
3- Bone orientation

* Socket form bone = healing
*To Not Remove The Blood Clot
Instructions after tooth Extraction :
1- No smoking
2- No hot drink / Food
3- No mouth rinsing
4- close the place of Extraction / No removal



- No bone formation after 21 years
  ↳ No organic / part material is found to help in the formation
- Bone formation is at it's low at 18-21 years

WOVEN BONE (Histology)

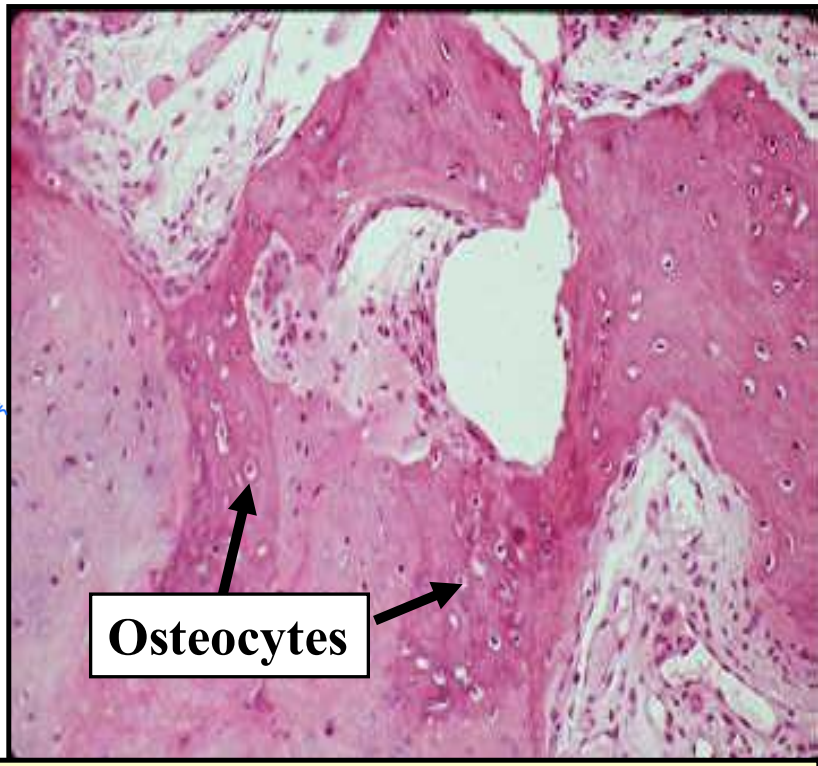
1 – Great number, larger size and irregular arrangement of *osteocytes.*

2 –Numerous and irregularly arranged *collagen fibers.*

3 – Higher *proteoglycans.* GAG glycoprotein

4 – Increase in the organic substance and decrease in the inorganic contents.

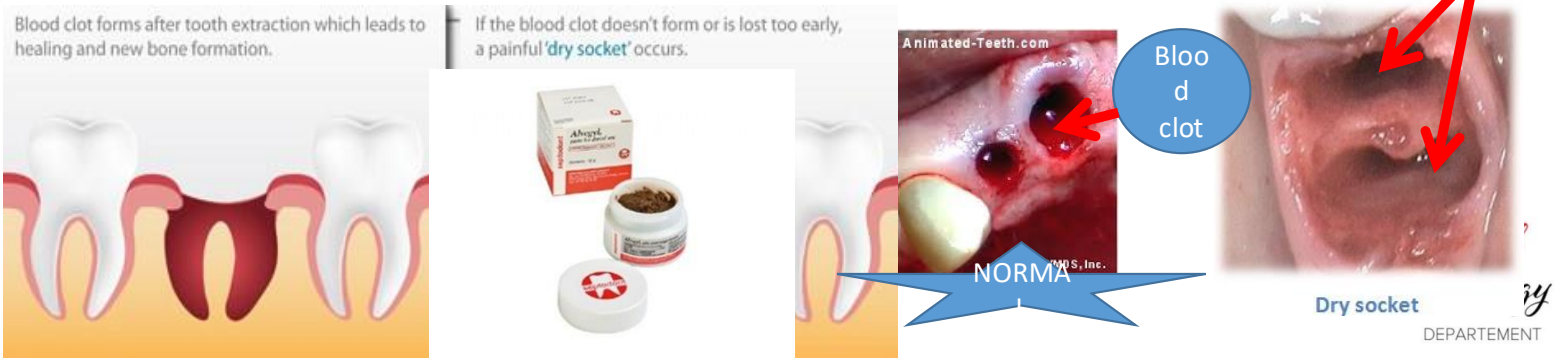
5 –Also it is more radiolucent in the X-ray



Note: *The bone of emergency* never change directly into lamellar bone but it must be resorbed and then replaced by lamellar bone.

Clinical consideration failure of woven bone formation after tooth extraction in the socket

- **Dry socket** formation due to failure of blood clot formation with subsequent failure of woven bone formation.
- The **dry socket** leaves underlying nerves exposed, which is very painful. The condition is treated by a dentist who cleans the wound and places a special dressing (Alveogel) into the **socket.**

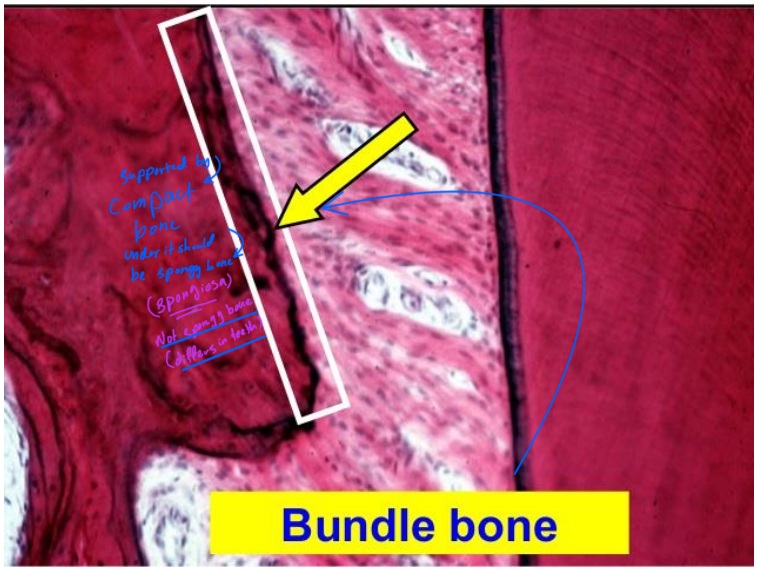


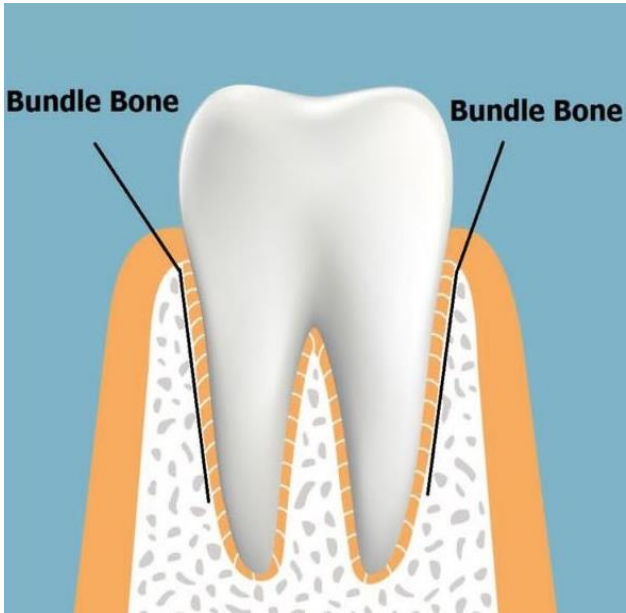
3- BUNDLE BONE

→No minerals / Radio-lucent, black in X-ray

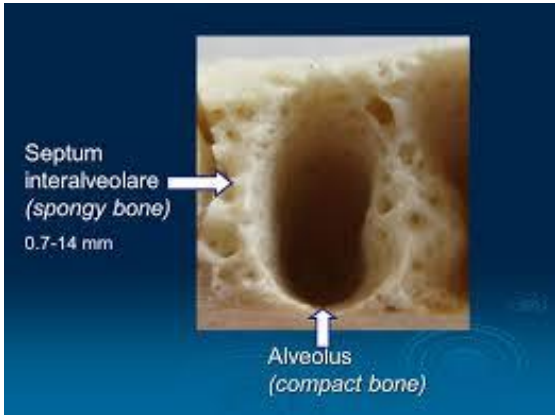
- Found adjacent to the periosteum and PDL forming the inner wall of the socket.
- It has coarse collagen fibres arranged parallel to each other and perpendicular to Sharpey's fibres. With PDL (change in direction)

↳partial mineralization

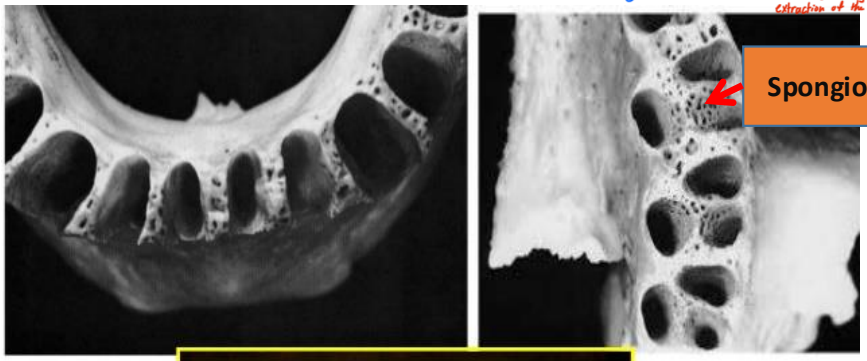


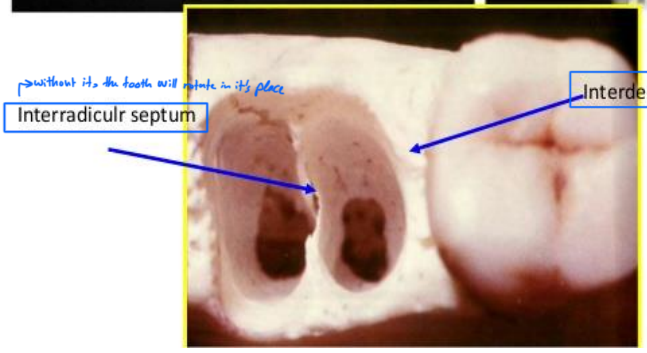


Roots of adjacent teeth are separated by inter-dental septa while roots of the same tooth are separated by inter-radicular septa.



↳more spongy bone (can get extracted easily during the extraction of the tooth).



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YOU