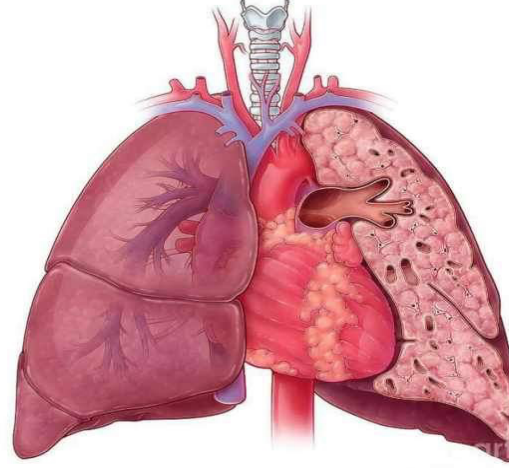


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لجان الدفعات



تفريغ أناتومي



Skeletal System | part 1

موضوع المحاضرة

9

رقم المحاضرة :

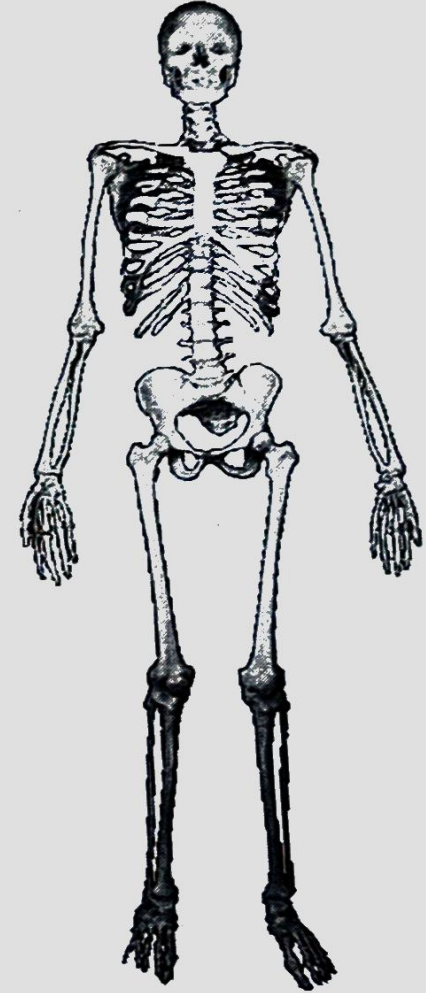
Yasmeen Alharahshah

إعداد الصيدلانية :

The Skeletal System

Dr. Mustafa Saad
(2021)

اللهم ارفع من مقامِي ، مقام الدِّين ، مقام الخُلَفَ ، مقام العلم
مقام العِزِّ ، اللهم ارفع مقامِي ومكانِي ، وقَدْرِي .



Divisions of the Skeletal System

الوظيفة الرئيسية
support

- The human **skeleton** ^{يتكون الهيكل العظمي} consists of **206 bones**
- Bones of the skeleton are grouped into two principal divisions:

□ **Axial skeleton**

- Consists of the bones that lie around the longitudinal axis of the human body: **Skull bones**, **auditory ossicles** (ear bones), **hyoid bone**, **ribs**, **sternum** (breastbone), and **bones of the vertebral column**.

- The primary function is protection of vital organs.

□ **Appendicular skeleton**

- Consists of the bones of the **upper** and **lower limbs** (extremities), plus the bones forming the **girdles** that connect the limbs to the axial skeleton. The primary function of this **division is movement**.

أنسجة العظم

Bone tissue

→ support connective tissue

Bone is a structural type of connective tissue characterized by the presence of a **calcified** extracellular matrix (called bone matrix) and three types of cells: **Osteoblasts**, **Osteocytes** and **Osteoclasts**.

تحتوي على
كافة مكونات
من الكالسيوم

مصفوفة
العظام

تحتوي على
كافة مكونات
من الكالسيوم

مسؤولية عن البناء (building)

مسؤولية عن الهدم

(destruction)

Functions of bones:

1) Support **fleshy structures** → (يتكون عظمة (طرية) دعم الهياكل اللينة)

2) Protect **vital organs** (example: the skull protects the brain). → (تحمي الأعضاء الحيوية الداخلية)

3) Assist in movement.

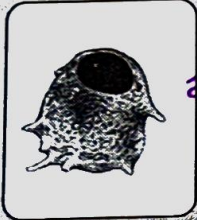
4) Synthesis of blood elements. → (تركيب عناصر الدم)

5) Storage of fat.

6) Storage of minerals (**calcium** and **phosphate**).

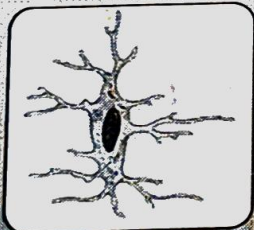
تخزين العظام (تصنيع الدم).

Cells of bones:



Osteoblasts

- مسؤول عن البناء
① extracellular matrix
② calcification of extracellular matrix
- Responsible for the synthesis of the bone matrix
 - Responsible for the calcification of bone matrix
- ↓ تكلس



Osteocytes

- الحفظ
- Maintain the bone
 - Located inside spaces called lacunae
- ↓ تغار



Osteoclasts

- الدمار
تدمير
- Responsible for the resorption (destruction) of bone
 - A type of macrophage
- (تسمى macrophage العظم)

↓ بعمل البلعة
(phagocytosis)

تحتوي المادة الحبيبة عظام الكالسيوم والكلولامين

Bone matrix:

- Bone matrix is formed of various organic and inorganic molecules (mainly Ca^{2+} compounds).
- Collagen fibers is abundant in bone matrix.

Periosteum:

تغطي العظم (outside)

سويكة A thick connective tissue layer that covers the bone.

- It's important in (1) the nourishment of bones, (2) the formation of bones and in (3) fracture repair. (Building of bone).

إصلاح العظام

Endosteum:

داخل

رقبة A thin tissue layer that lines the cavities inside the bone.

تبطن

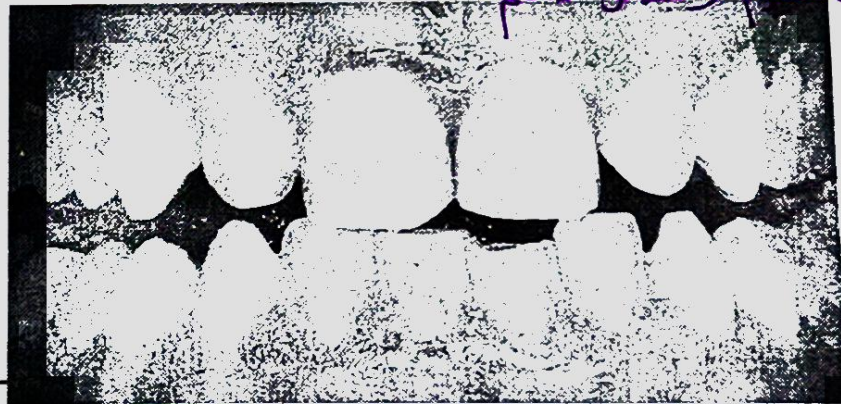
ترتبط بعد كبر من الكالسيوم Ca^{+2}

Tetracycline and Bones

- Tetracycline is a fluorescent substance and it binds with great affinity with Ca^{2+} in recently deposited bone matrix.

Tetracycline must not be given to a pregnant or lactating women or to a child whose teeth are erupting, because it may bind to Ca^{2+} of the newly forming teeth of the child leading to the permanent discoloration of the teeth.

Fig.1: Teeth with brownish discoloration due to use of tetracycline.



لونها بني بسبب استخدام الـ tetracycline

Classification of bones

According to Gross Morphology:

○ In a section of bone we have:

العظمي

1. **Compact bone:** part of the bone appear as a dense area with generally no cavities. تجاوز

الكهفوني

2. **Spongy bone:** part of bone that have several, small, interconnected cavities. تجاوز مترابطة .

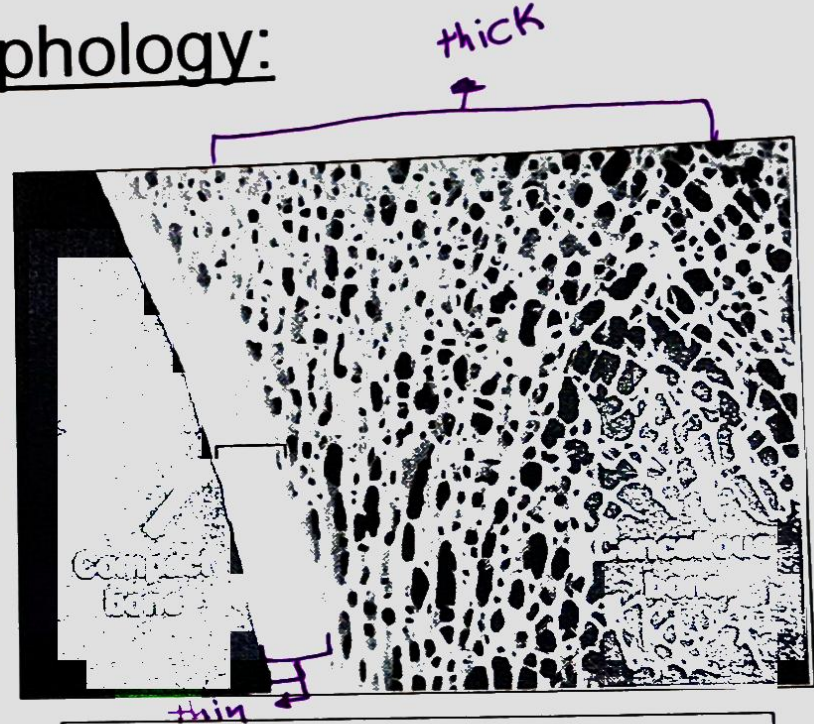


Fig.2: Compact and cancellous bone.

* دايمًا ال spongy يتكون من جوا (inside) وال Compact يتكون من الخارج

According to Histological Features:

الاختلاف يعتمد على حسب
ترتيب الألياف

1. **Primary (woven)** bone in which the collagen fibers of the matrix have no specific arrangement. → (irregular)

ليس لها ترتيب محدد

2. **Secondary (lamellar)** bone in which the collagen fibers are arranged in layers called lamellae. (regular)

- In secondary bone, the lamellae usually form concentric circles around a central cavity in what's called Osteons. In the osteons, osteocytes are found in spaces called lacunae connected to each by canaliculi.

عظام

ثغرات

قنوات



Fig.3: Osteon.

According to Shape: بناء على شكل العظم

1. Long Bones

- Greater length than width and are slightly curved for strength. طوله أكبر من العرض و منحنية قليلاً لأنه كلما كان استقامة أكثر كلما كانت أسهل

- Has two expanded **epiphyses** formed mainly of spongy bone surrounded by a thin layer of compact bone. (الكسر)

- The middle tube-like shaft is called **diaphysis** and is formed of mainly compact bone with a thin layer of spongy bone surrounding a central cavity, the **medullary cavity**.

- Femur, tibia, fibula, humerus, ulna, radius, phalanges.**

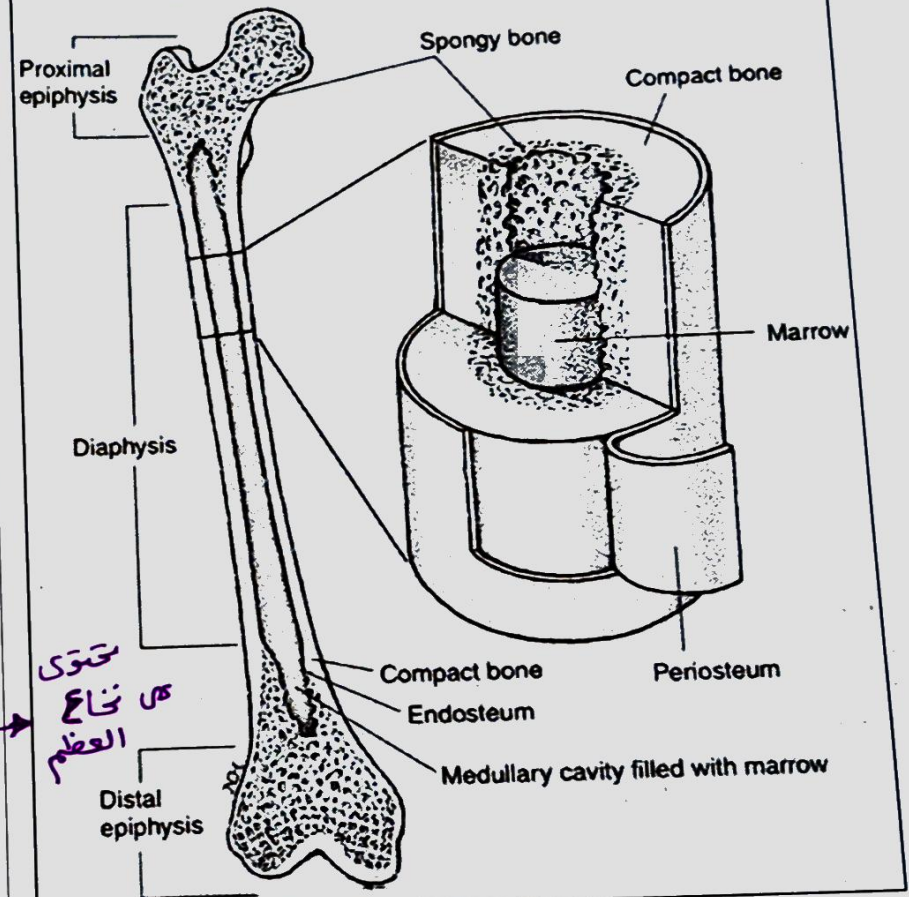


Fig.4: Parts of long bones.

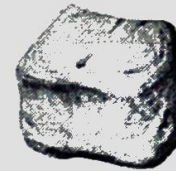
Carpal bones: عدد 8 ورايح تحفظوهم

SLTP
TTCH

افضلهم
رايح يوفوهم
لقدام
صلايد
ع

2. Short bones

- طول متساوية
Cube-shaped and are nearly equal in length and width
① ② ③
• Carpal bones, navicular, cuboid



Short bone
(trapezoid, wrist bone)

3. Flat bones

- متوازية
Thin and composed of two nearly parallel plates of compact bone tissue enclosing a layer of spongy bone tissue
• Cranial bones, sternum, ribs, scapulae



Flat bone (sternum)

4. Irregular bones

- من تابعة لأي شكل
Complex shapes and cannot be grouped into any of the previous categories
• Vertebrae, hip bones, some facial bones, calcaneus



Irregular bone (vertebra)

5. Sesamoid bones

- محمية
Found within tendons. Protect the tendons from excessive wear
→ تاكلى
• Patellae
→ مفرد



Sesamoid bone (patella)

(الصابونة)

نمو العظم

يا اما يتكون بشكل طولي او عرضي

Bone Growth

على الاطراف يتكون

- ❑ Increase in length of bones occur at site of epiphyseal plate (made of **hyaline cartilage**) before they're closed. After closure of the plates during adulthood, no further increase in bone length can occur. The time of closure of the plate is specific for the bone. This can be used to determine the age of the person.
- ❑ Increase in width of bone can occur throughout life.
- ❑ Bone growth is affected by several hormones in the body, like **growth hormone**.

عظروف زجاجي

البونج

يمكن زياده بني وحن العظام طول العمر

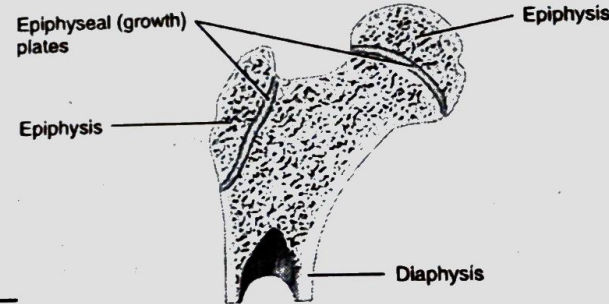
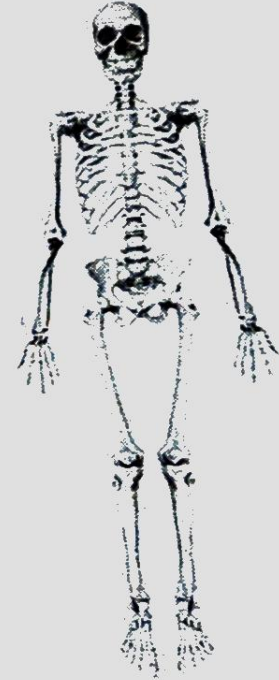


Fig.5: Epiphyseal growth plate.

بعض معين (البونج) ال Cartilage
راع يسكن فبالقاي العظم
ما راع بطول وراع بين النخو
بها د العن

■ The Axial Skeleton

Axial Skeleton



The Skull →

الحففة

الطار العظمي للرأس

- The skull is the bony framework of the head. It's formed of 22 bones divided into two sets:

عظام الحففة
1. عدد 8

Cranial bones

- Eight cranial bones that form the cranial cavity which encloses the brain.

حفظ

الحففة

- Frontal bone, two parietal bones, two temporal bones, the occipital bone, the sphenoid bone and the ethmoid bone.

6 أزواج
8 مفردات

2. Facial bones

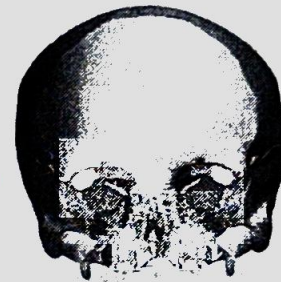
- Fourteen facial bones that form the face.

عظام الانف

- Two nasal bones, two maxillae, two zygomatic bones, two lacrimal bones, two palatine bones, two inferior nasal conchae, vomer and the mandible.

↓
يفصل بين الانف والعين واليسار

↓
فك سفلي



خصائص الجمجمة

Features of the Skull

الكواس الخاصة

- The cranial and facial bones protect the brain and special sense organs.

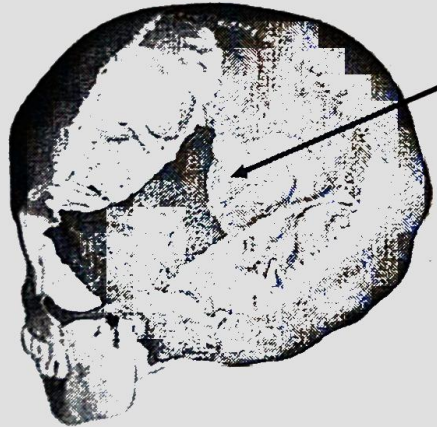
- Bones of the skull are attached to each other by **immovable joints** called **suture**, except the **mandible** which is attached to the skull by a

مفاصل غير متحركة

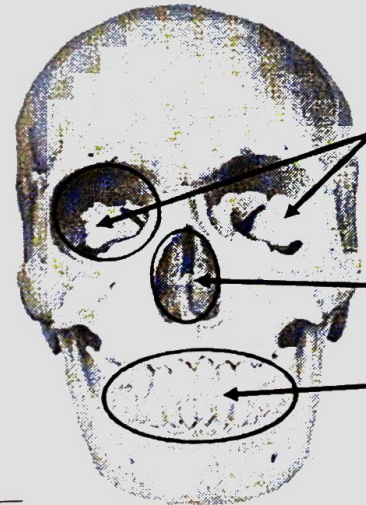
- movable joint.

- Cavities of the skull:

الفك السفلي
العظمة الواحدة
المرتبطه بفصل متحرك



(1) The cranial cavity
تجويف الجمجمة



(2) The orbits (eye sockets)
مآخذ العين

(3) Nasal cavity
تجويف الأنف

(4) Oral cavity
تجويف الفم

(5) Paranasal sinuses
المجيوب الأنفية

(6) Middle and inner ear cavities within the petrous part of the temporal bone

Cranial Bones:

□ Temporal Bones

- Form the lateral aspects and floor of the cranium.
- Consists of (5) parts: squamous part, petrous part, tympanic part, mastoid part, and the styloid process.

□ Occipital Bone

- Forms the posterior part and most of the base of the cranium.
- The perceptible protrusion on the back of the head is the *external occipital protuberance*.
- The foramen magnum, the largest foramen in the skull, is located in this bone.

□ Sphenoid Bone

- Called the 'Keystone' bone because it's attached to all other cranial bones.
- Has a body and two wings – butterfly bone.

