بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

ANATOMY

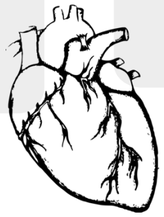
وَلَقَدْ خَلَقْنَا الْإِنسَانَ وَنَعْلَمُ مَا تُوَسْوِسُ بِهِ نَفْسُهُ ۖ وَنَحْنُ أَقْرَبُ إِلَيْهِ مِنْ حَبْلِ الْوَرِيدِ

MID | Lecture 2

Skeletal system

Written by : Dareen Alhababseh
Rand Alkhateeb

Reviewed by : Hamzeh Bani Ata



Introduction to Anatomy

1st year Medical Students

2025-2026
Second Semester

Dr. Abedallah Hamida, MBBS, PhD

Department of Anatomy-School of Medicine

The University of Jordan

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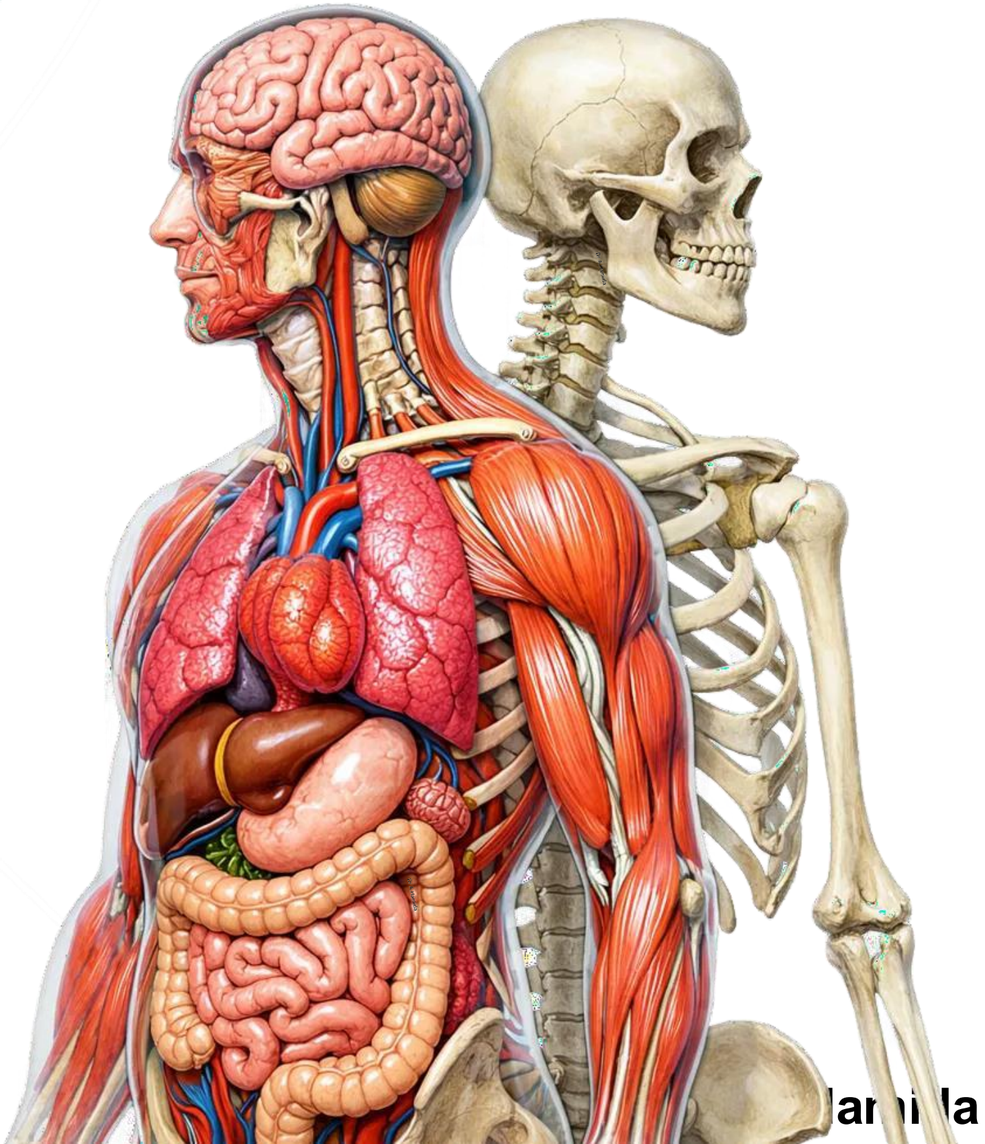
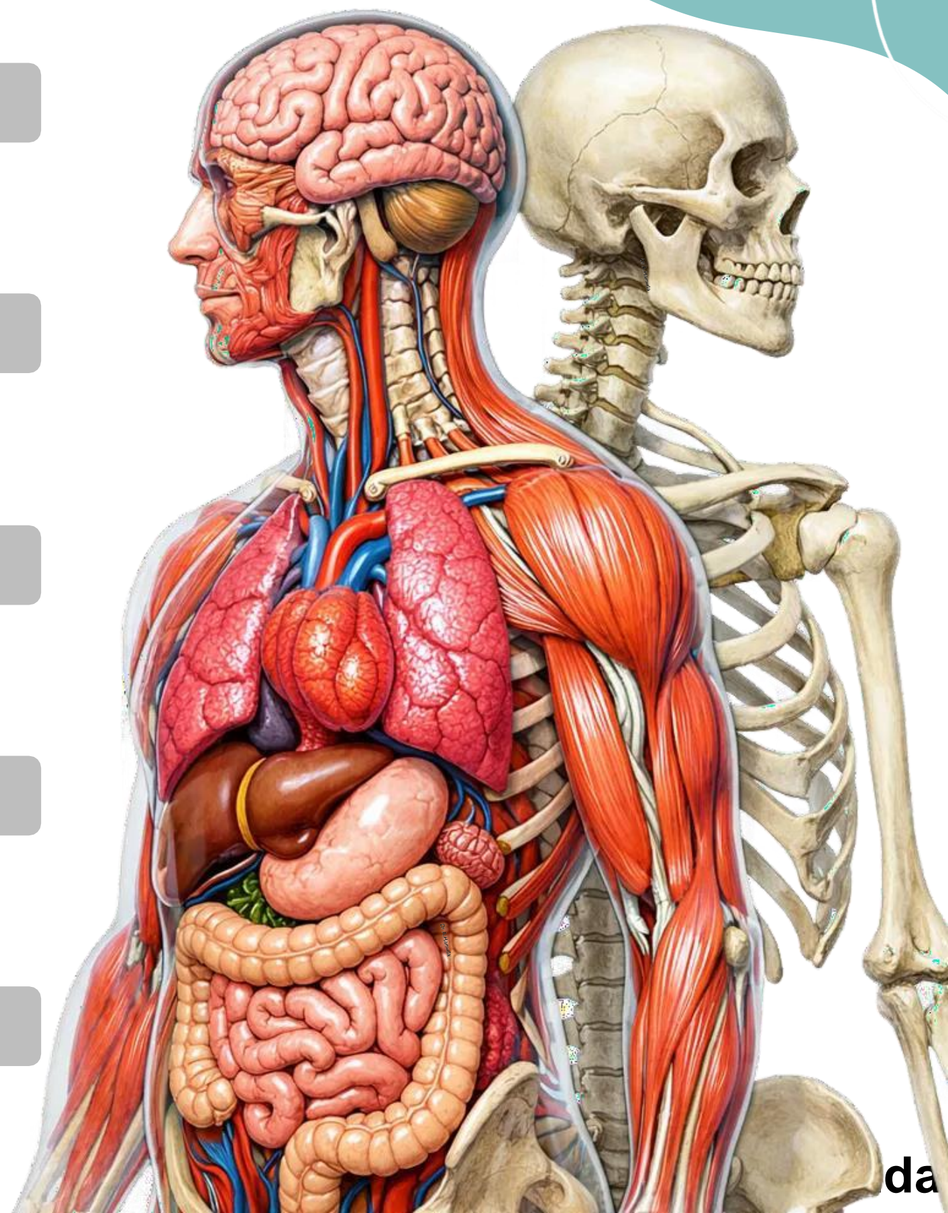


Course Outline:

Gross lecture-2

1. Introduction and Terminology
2. Skeletal System
3. Cardiovascular System
4. Lymphatic System
5. Nervous System
6. Muscular System
7. Respiratory System
8. Digestive System
9. Urinary System
10. Endocrine System



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2 Skeletal System

We have four types of tissues:
* Connective tissue
* Epithelial tissue
* Muscle tissue
* Skeletal tissue

Gross lecture-2

➢ **The skeletal system is classified based on the type of skeletal tissue into:**

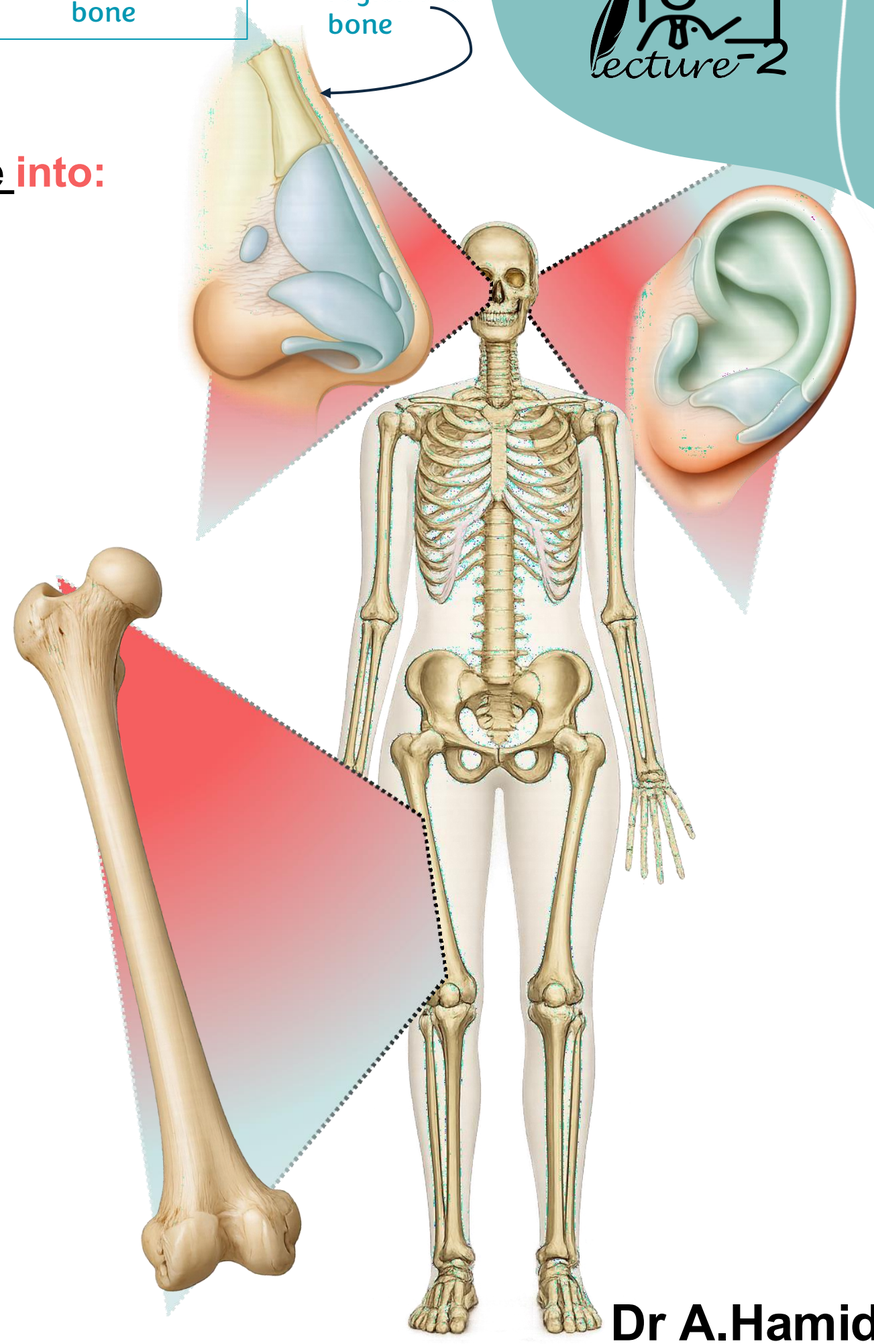
The tissue that form the skeletal system

1. **Cartilages:**
   - **A resilient, semi-rigid form of connective tissue that forms parts of the skeleton where greater flexibility is required.**
   - **The bones of a newborn are soft and flexible because they are mostly composed of cartilage**

For example the tip of the nose and the ears

2. **Bones:**
   - **A calcified, living, hard form of connective tissue that forms most of the adult skeleton.**

**The difference between cartilage and bone is that cartilage is flexible and semi-rigid, whereas bone is hard and rigid.



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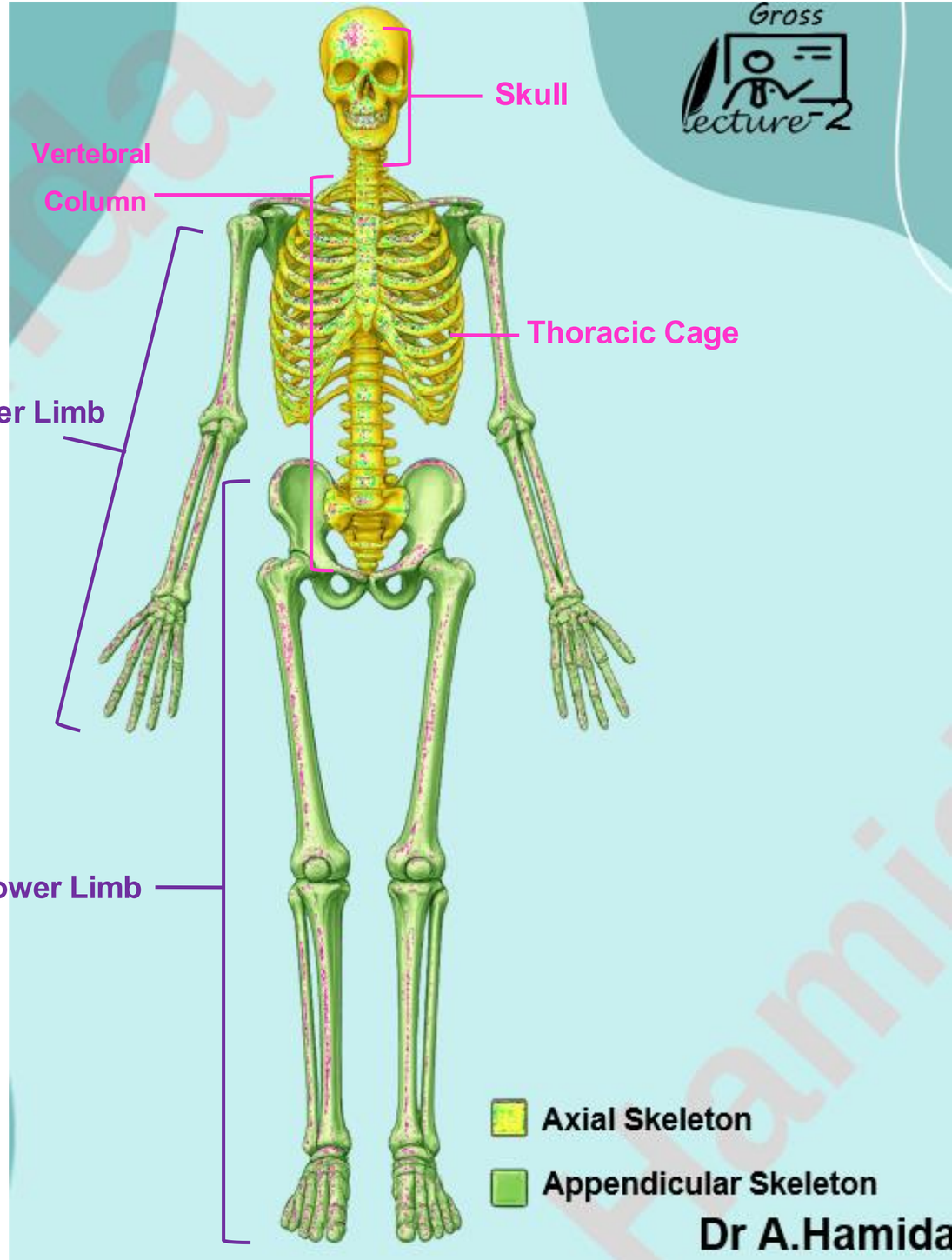
Skeletal System

- The human skeletal system consists of **206 bones**
- The skeletal system is classified functionally into:

1. **Axial Skeleton :**
   - Consists of the bones and cartilages that lie close to the central axis of the body.
   - It includes the bones of the
     1. Skull
     2. Thoracic Cage — The bones that surround the thoracic cavity
     3. Vertebral Column — Forms the vertebral canal that encloses the spinal cord

2. **Appendicular Skeleton :** — Attached to the axial skeleton
   - It is bilaterally symmetrical and consist of the bones and cartilages of the:
     1. Upper Limbs (or extremities)
     2. Lower Limbs (or extremities)



2 Skeletal System

Gross lecture-2

Two bones can't be in direct contact with each other there must be cartilage or fluid between them

➢ Joints Articulation of two bones or more

- **It is a junction between two or more bones.**
- **Joints is classified structurally into (based upon the type of connecting tissue):**

1. Fibrous Joint:

- **The bones are held together by fibrous connective tissue.**

An example of this is the joints found in the skull.

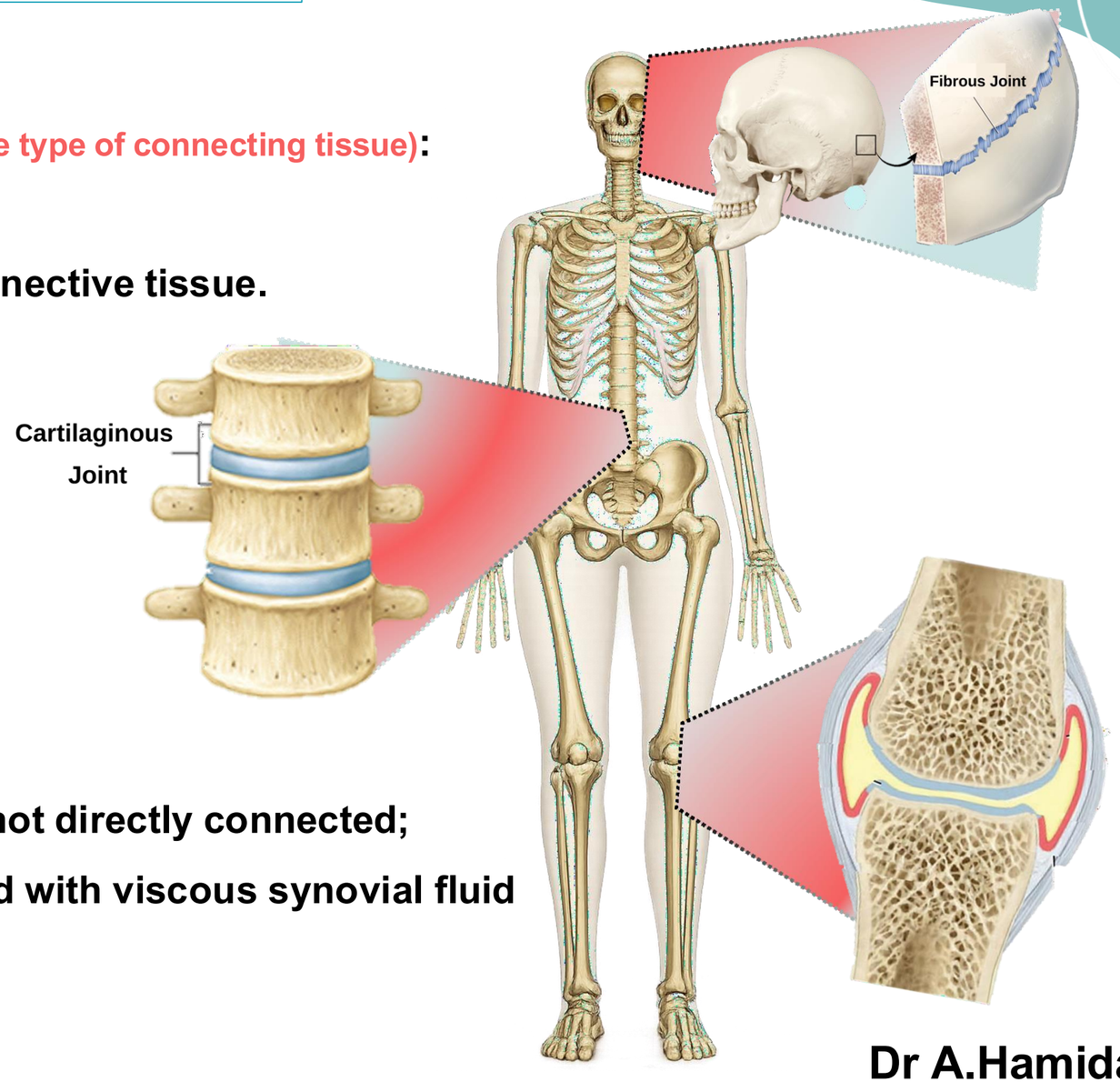
2. Cartilaginous Joint:

- **The bones are held together by cartilage.**

An example of this is the joints that are found in the vertebral column (discs)

3. Synovial Joint:

- **The articulating surfaces of the bones are not directly connected; instead, they are separated by a cavity filled with viscous synovial fluid that acts as a lubricant.**



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2 Skeletal System

Gross lecture-2

System Outline:

2.1 Axial Skeleton

2.2 Appendicular Skeleton

2.3 Joints

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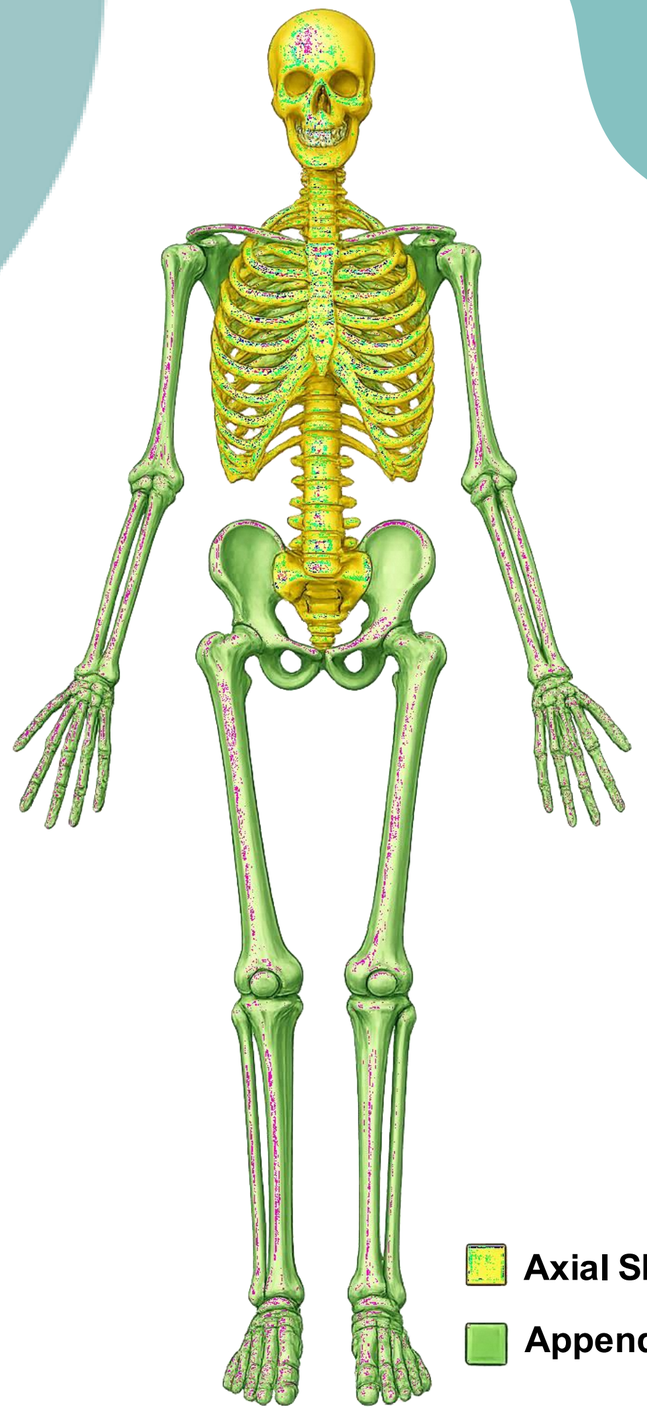
2

Gross lecture-2

Skeletal system

1. Axial Skeleton-1



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2 Skeletal System

Gross lecture-2

- The human skeletal system consists of **206 bones**
- The skeletal system is classified functionally into:

1. **Axial Skeleton :**
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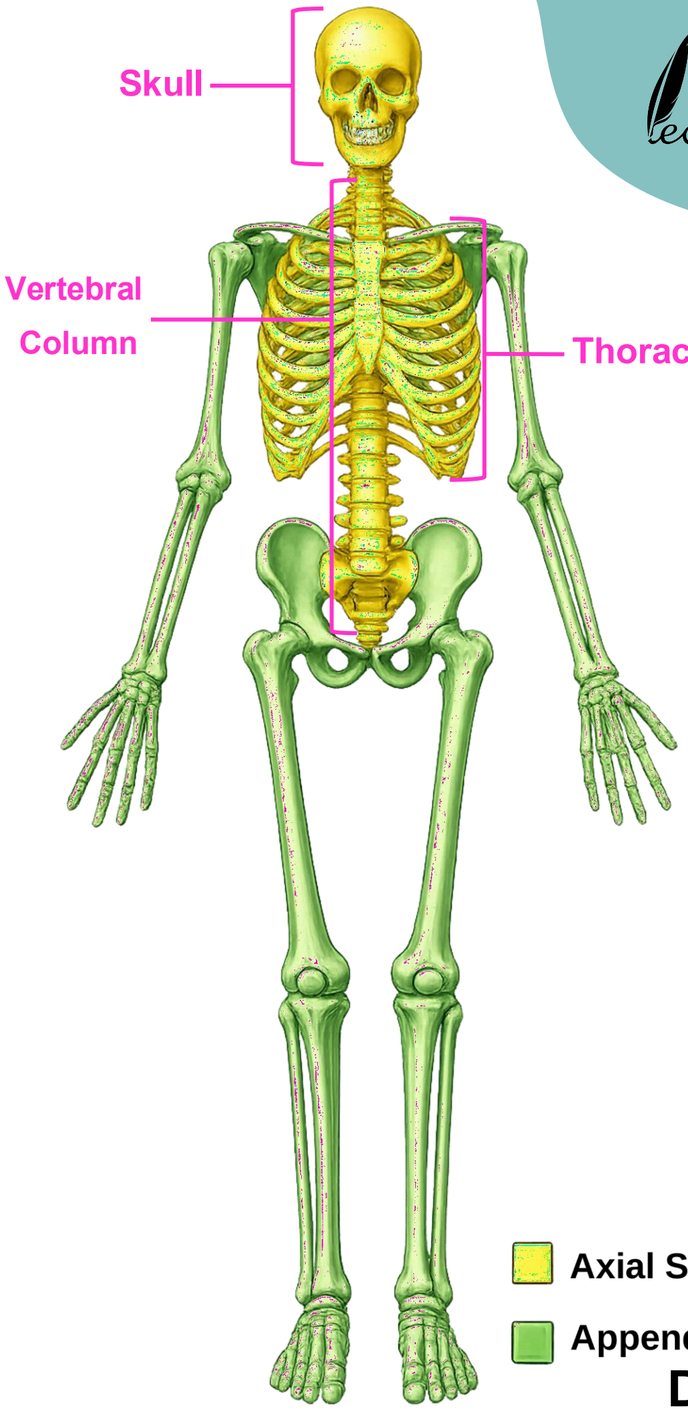
   - It includes the bones of the
     1. Skull
     2. Thoracic Cage
     3. Vertebral Column

2. **Appendicular Skeleton :**
   - It is bilaterally symmetrical and consist of the bones and cartilages of the:
     1. Upper Limb
     2. Lower Limb



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2.1 Skeletal System–Axial Skeleton

Gross lecture-2

Lecture Outline:

- 2.1.1 Skull
- 2.1.2 Vertebral Column
- 2.1.3 Thoracic Cage

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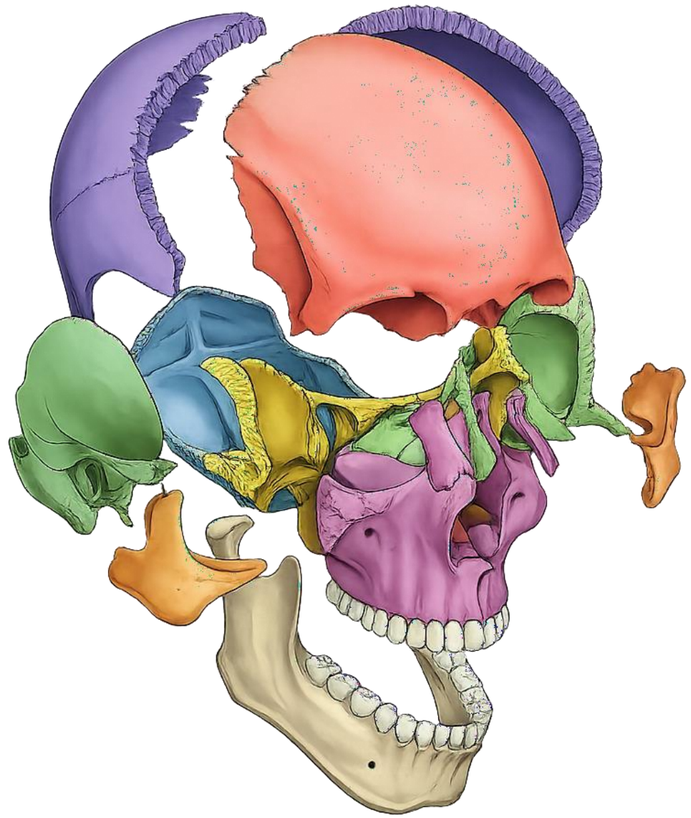
2.1.1

Skull

These bones must have an articulation between them. When the articulation between skull bones is made of fibrous tissue, we call the joints here fibrous joints (sutures)

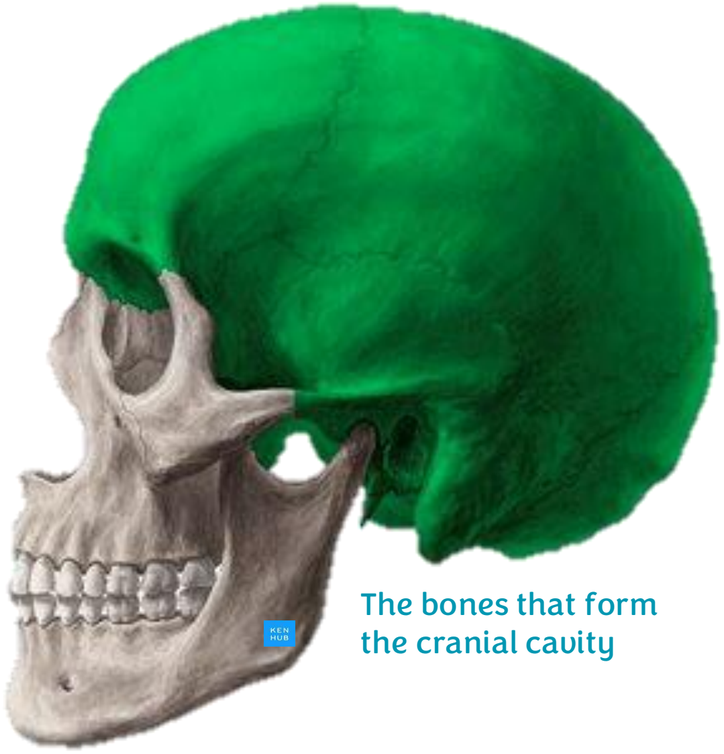
Gross lecture-2

➢ **It consists of 22 bones**



➢ **The bones of the skull can be divided into:**

1. Cranial bones



The bones that form the cranial cavity

2. Facial bones

The bones that form the face region

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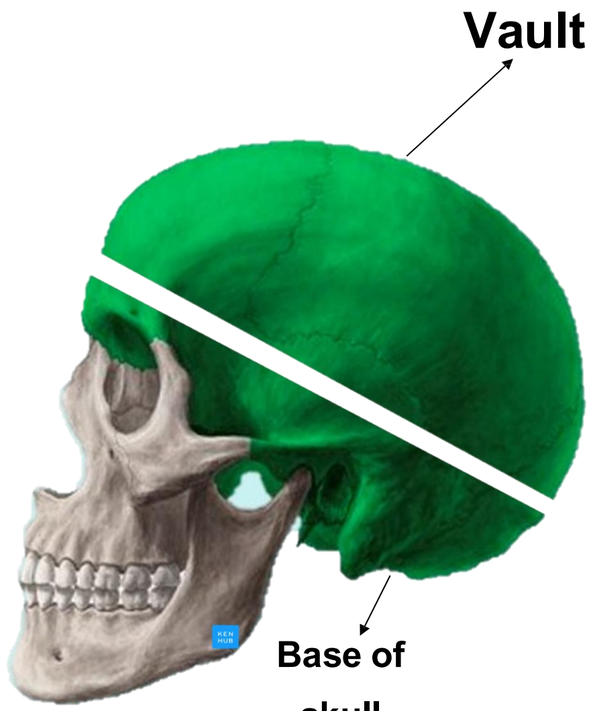
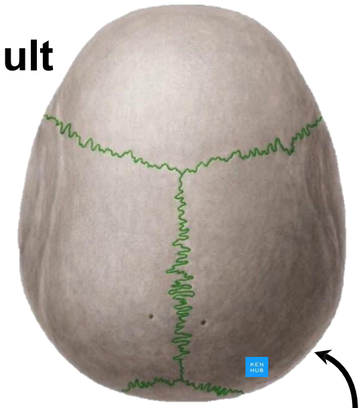
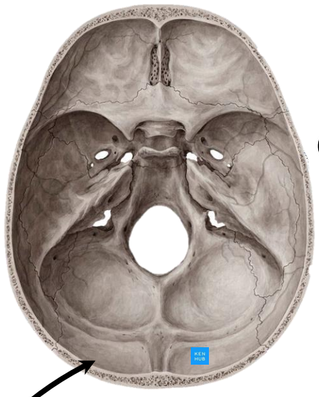
2.1.1 **Skull**

Gross lecture-2

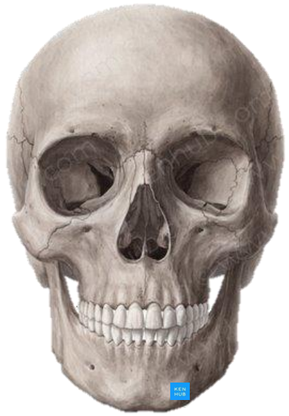


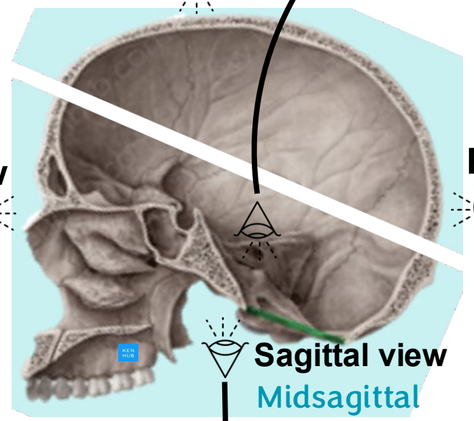
Lateral view

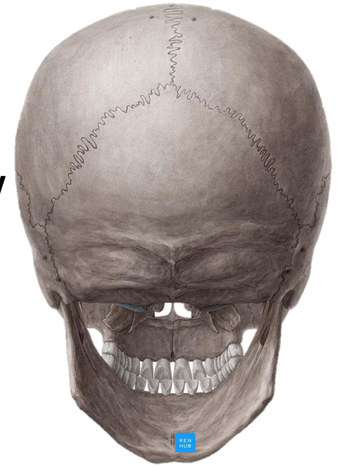




We call it the cranial floor because it forms the base of the cranial cavity. The roof of the cavity is called the cranial vault, while this part forms the floor, hence the name cranial floor.







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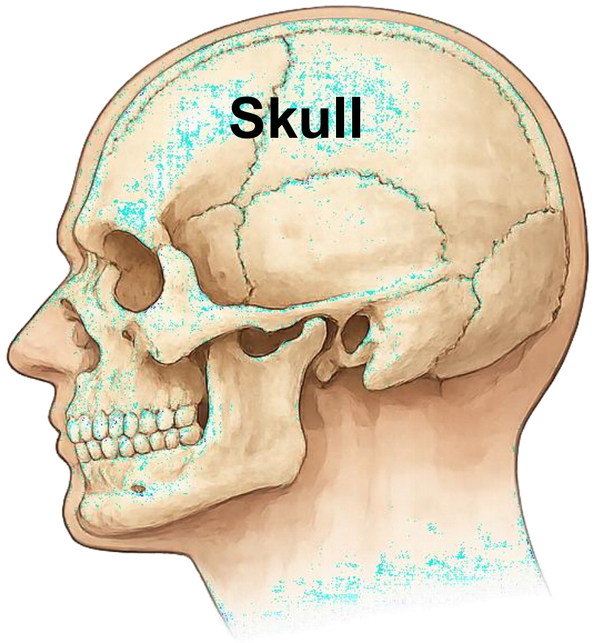
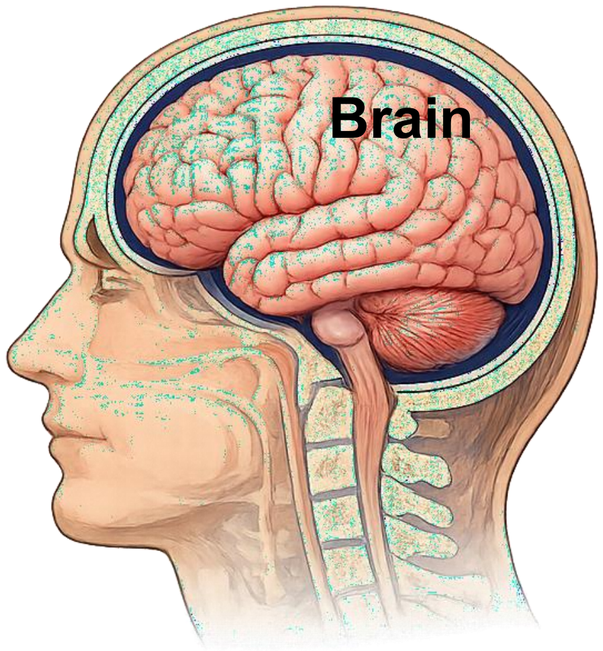
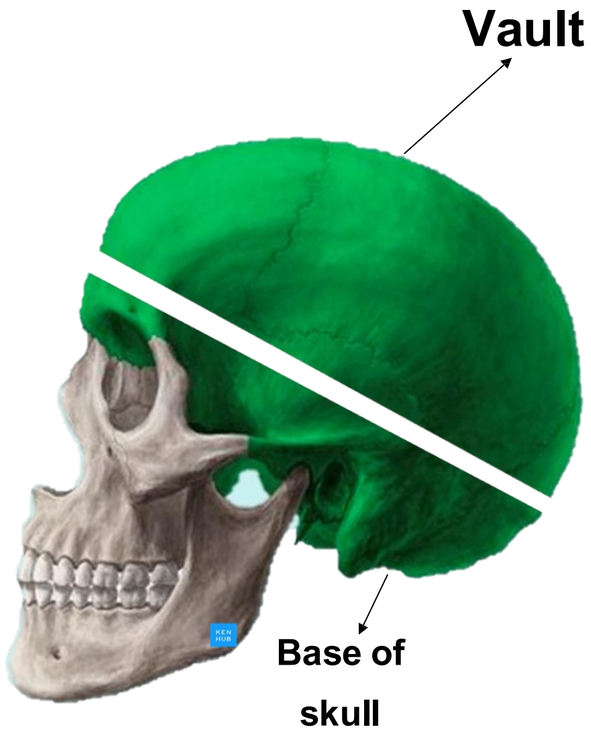
➢ The cranial cavity is the main cavity of the skull.

- The roof is formed by skull cap (vault of the skull).
- The floor is formed by the superior surface of the base of the skull.





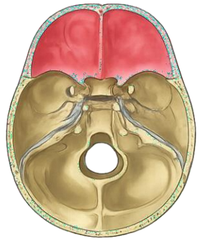


Cranial Cavity

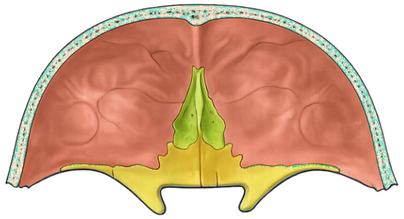
➢ **The cranial cavity is the main cavity of the skull.**

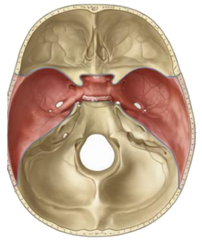
- **The floor is divided into three descending levels, known as the anterior, middle, and posterior cranial fossae.**

Any slight depression or small cavity in the cranial floor is called a fossae

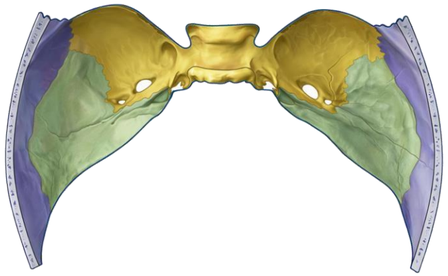


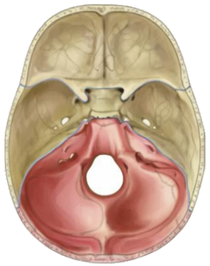
Anterior cranial fossa
باتجاه الـ
anterior



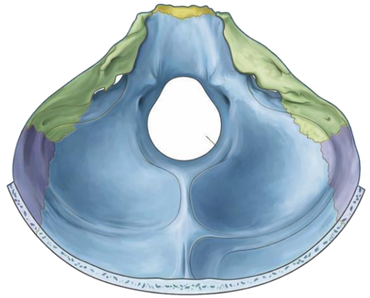


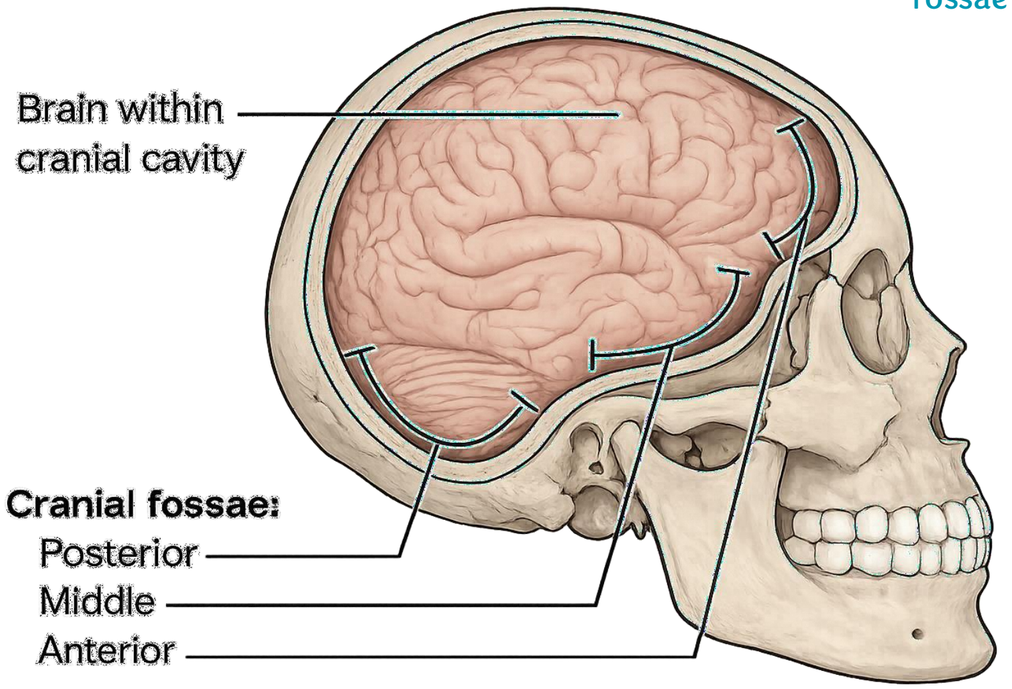
Middle cranial fossa
Between them





Posterior cranial fossa
باتجاه الـ
posterior





Lateral view

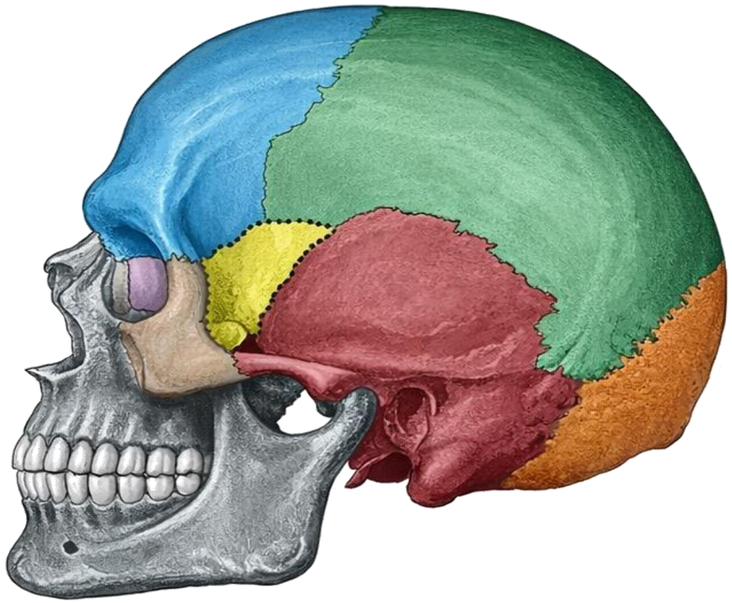
2.1.1 Skull

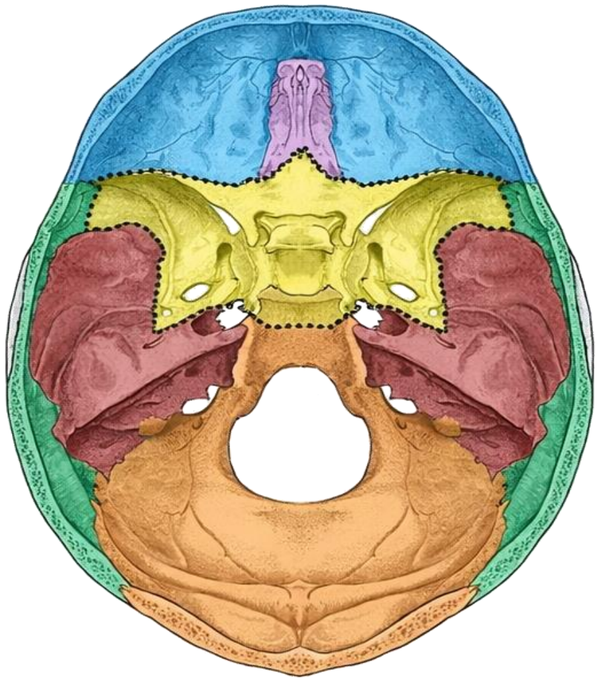
1. Cranial Bones

Gross lecture-2

➢ **Cranial bones consist of 8 bones:**

1. **Frontal Bone** (single)
2. **Parietal Bone** (paired)
3. **Occipital Bone** (single)
4. **Temporal Bone** (paired)
5. **Sphenoid Bone** (single)
6. **Ethmoid Bone** (single)





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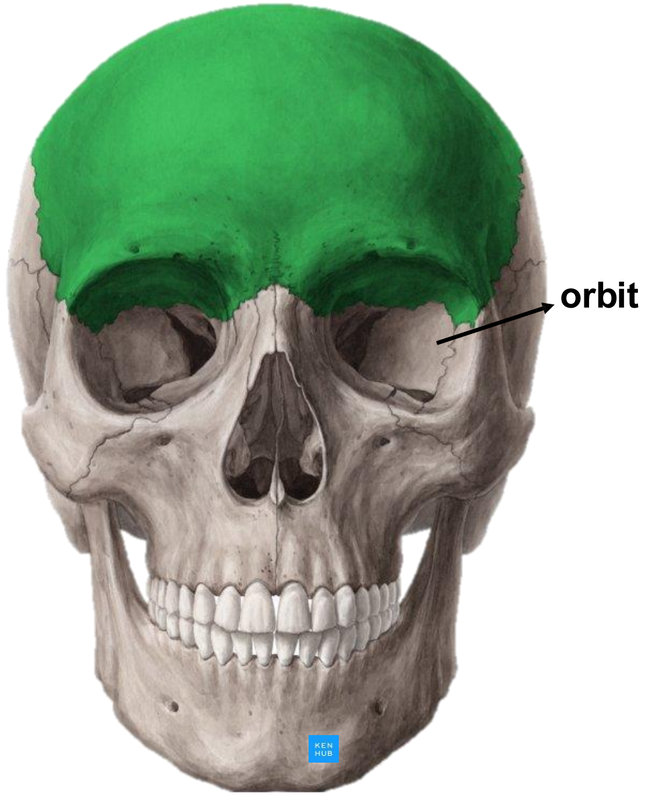
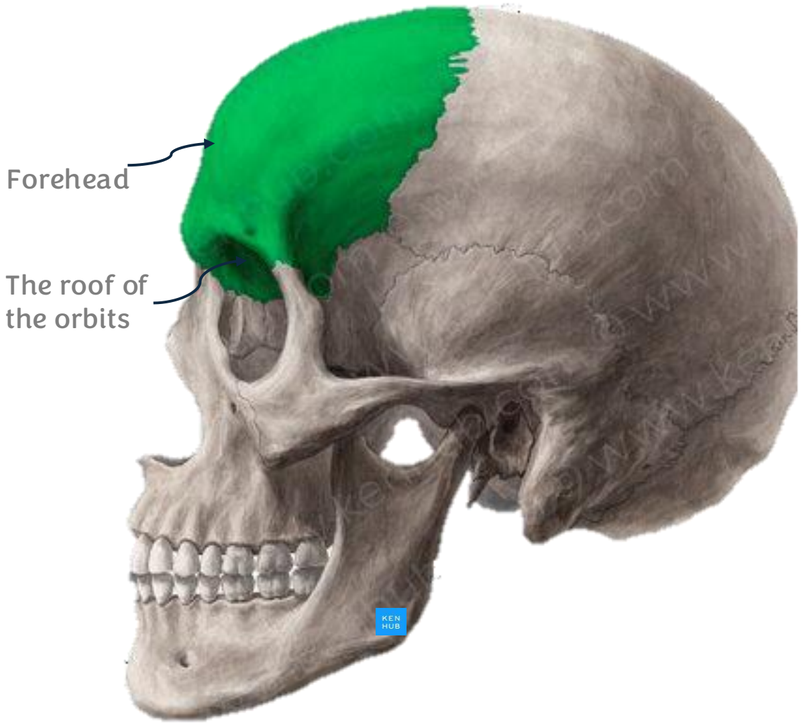
1. Cranial Bones

1. Frontal Bone (single)

- **Forms the forehead, the roofs of the orbits (eye sockets), and most of the anterior part of the cranial floor.**

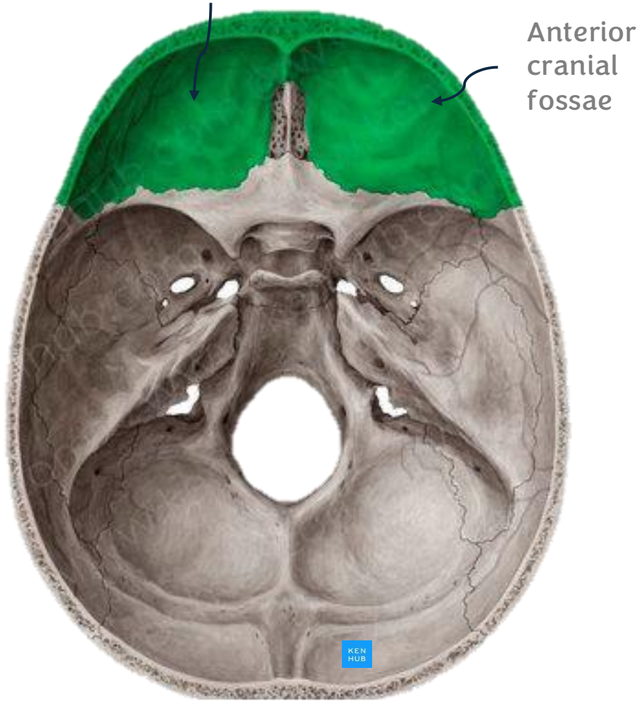


Anterior view



Lateral view

لو جبت أداة وعملت ثقب
هون رح انزل على الـ
orbital cavity



Interior view

(Cranial floor)

1. Cranial Bones

Right and left

2. Parietal Bone (paired)

Directly behind the frontal bone

- **Forms the greater portion of the sides and roof of the cranial cavity.**

Lateral view

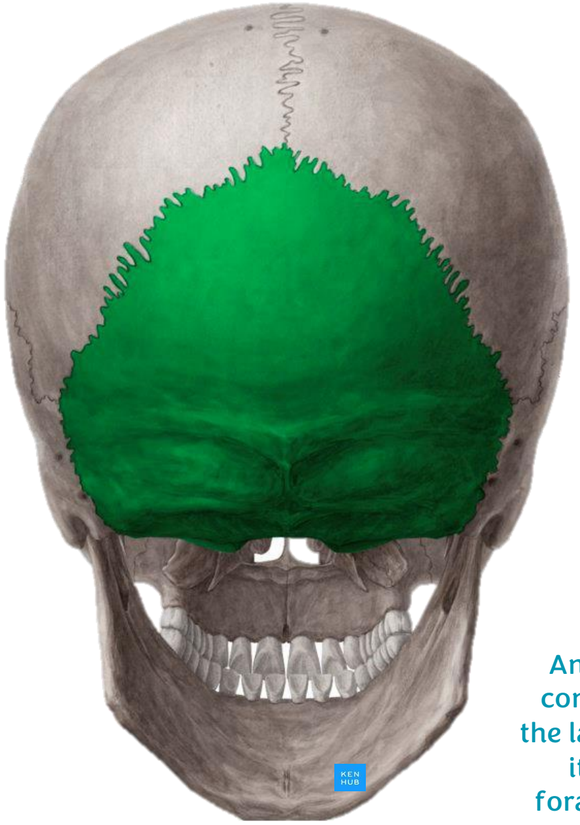
Top view

1. Cranial Bones

Gross lecture-2

3. Occipital Bone (single) Behind the parietal bone

- **Forms the posterior part of the cranium and most of the posterior part of the base and cranial floor.**
- **It is characterized by the presence of a large foramen known as foramen magnum.**

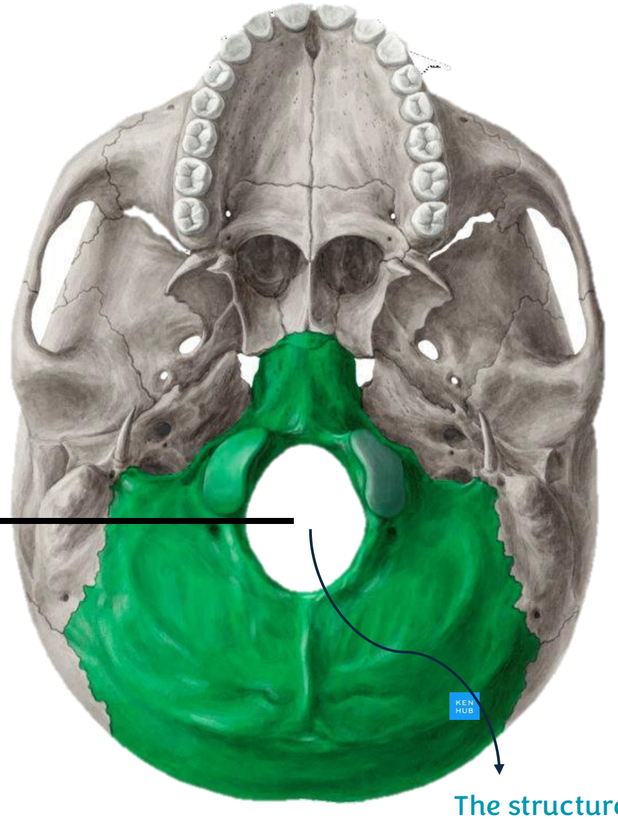


Posterior view

Any opening in a bone or elsewhere in the body is called a foramen.

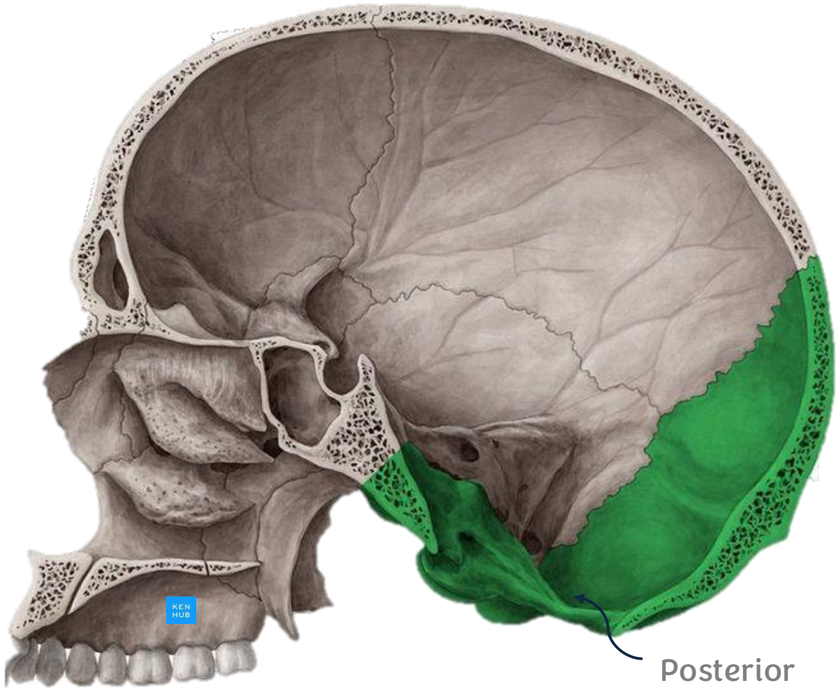
foramen magnum

And because it is considered one of the largest foramina, it is called the foramen magnum.



The structure that emerges from it is the spinal cord.

Inferior view (Base of skull)



Posterior cranial fossae

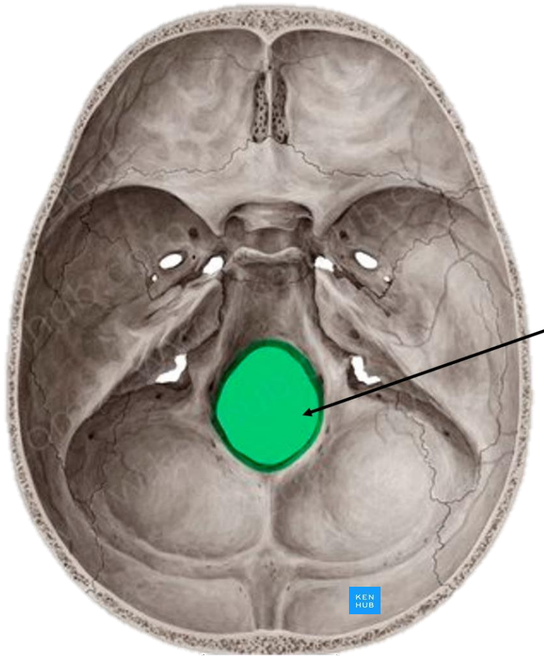
Sagittal view

1. Cranial Bones

➢ Foramen Magnum

- **A large oval opening in the occipital bone at the base of the skull.**
- **Provides a passage for the spinal cord as a continuation of the brain**

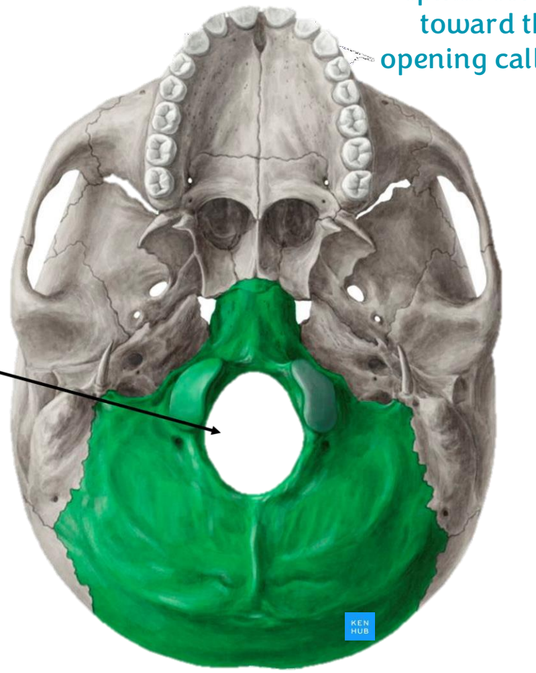
Here we have the *cranial cavity*, which contains the brain. The brain continues downward as the spinal cord. The passage through which the spinal cord exits the cranial cavity toward the vertebral canal is an opening called the foramen magnum.



Interior view

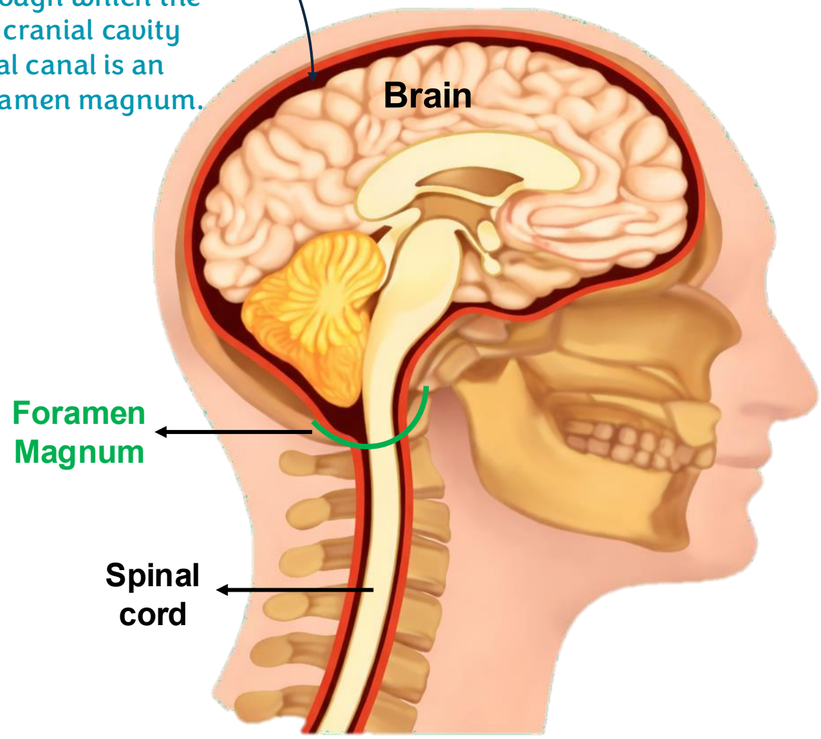
(Cranial floor)

Foramen Magnum



Inferior view

(Base of skull)



Sagittal view

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1. Cranial Bones

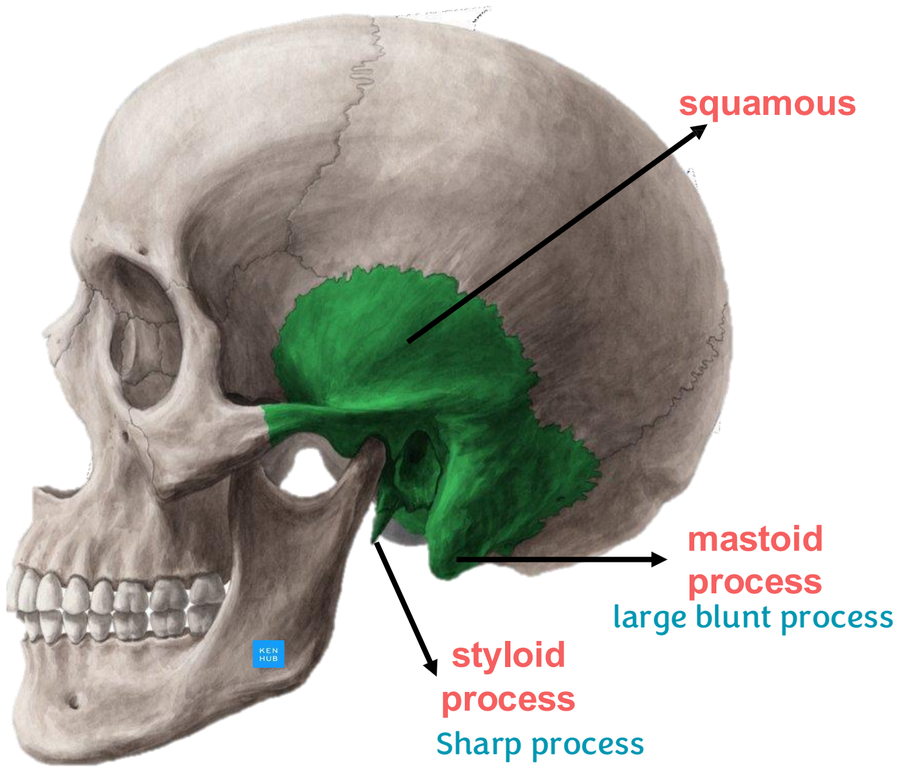
Gross lecture-2

4. Temporal Bone (paired)

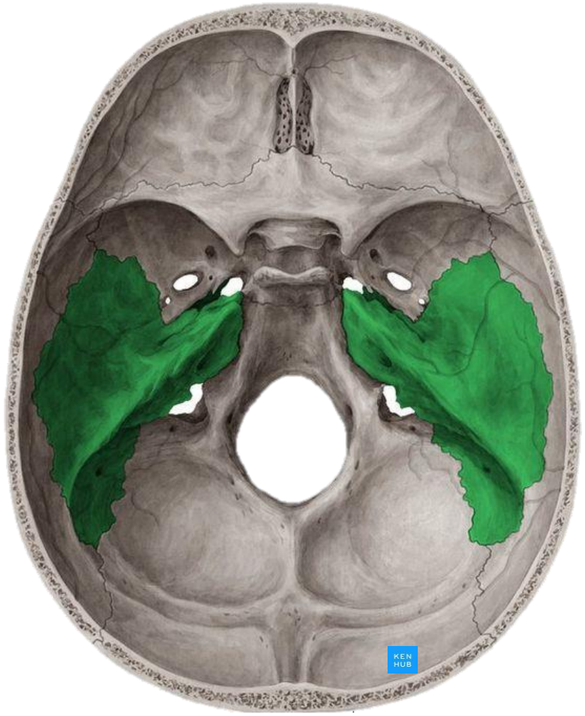
- Forms the inferior lateral aspects of the cranium and middle part of the cranial floor and base.
- There are two projections on the inferior surface of the temporal bone:

  the styloid process and the mastoid process (Any projection that extends from a bone is called a process.)

  Very important to know them



Lateral view



Cranial floor

Inferior view

(Base of skull)

*** The general importance of a process is that it serves as a site for muscle attachment. For example, the sternomastoid muscle originates from the mastoid process. How do we know this? Because it has an attachment to the mastoid process.

1. Cranial Bones

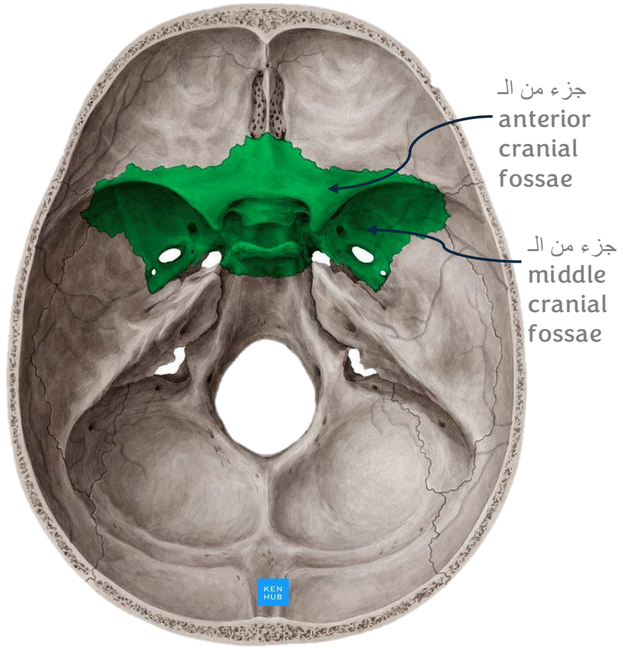
Gross lecture-2

5. Sphenoid Bone (single)

- **Lies at the middle part of the base of the skull.**
- **Considered the keystone of the cranial floor because it articulates with all the other cranial bones, holding them together.** (All the skull bones are attached to the sphenoid bone. Therefore, if we remove this bone, the entire skull would collapse.)

It resembles a butterfly.

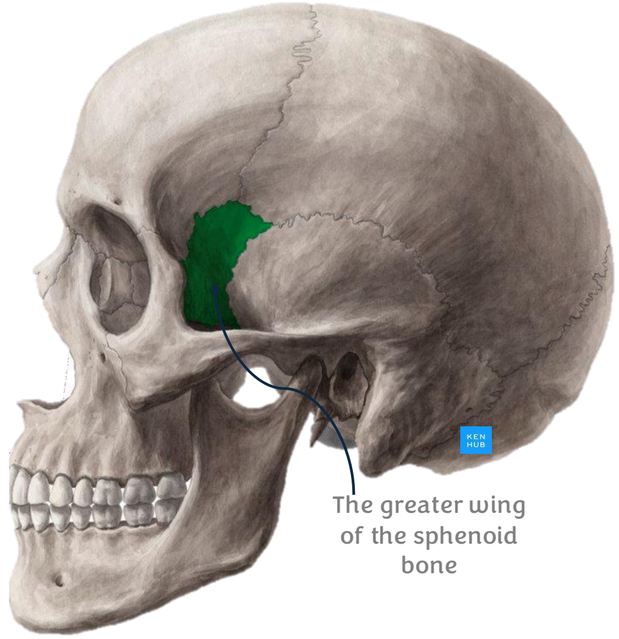
**We can see the sphenoid bone in the middle cranial fossae, and it also forms part of the anterior cranial fossae. From below, we can see it as well, and a small part of it appears in front of the temporal bone. Because it has wing-like projections, we call these the greater wings of the sphenoid, which are located on the lateral side of the skull.



Cranial floor

Inferior view

(Base of skull)



Lateral view

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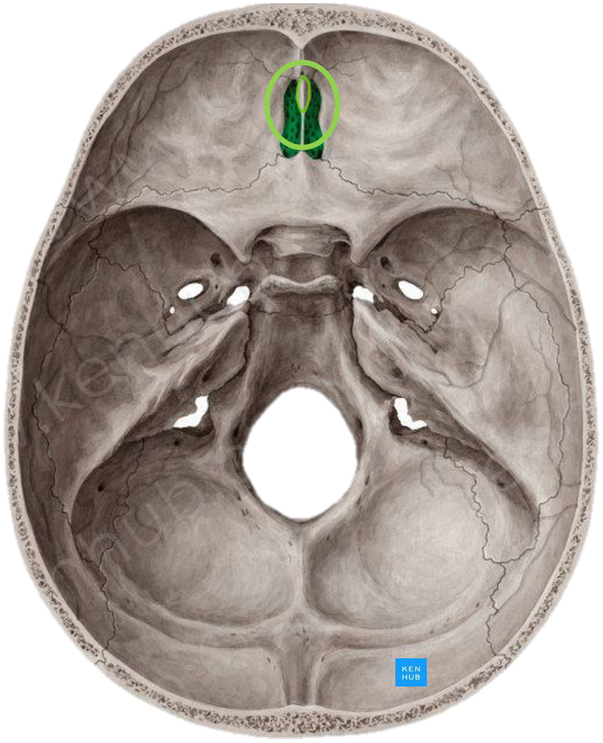
1. Cranial Bones

Gross Lecture-2

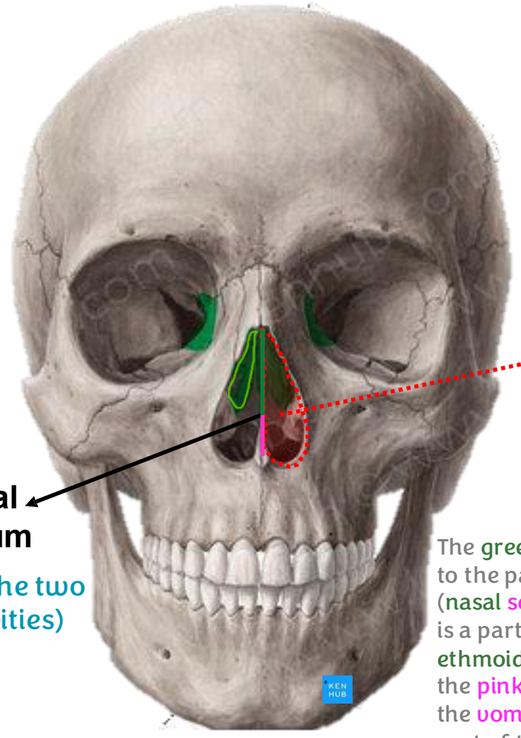
6. Ethmoid Bone (single)

- Located between two orbital cavities.
- Forms part of the anterior portion of the cranial floor, superior portion of the nasal septum and superior sidewalls of the nasal cavity.



Cranial floor

**We have two nasal cavities (right , left)



Nasal septum "وتيرة"

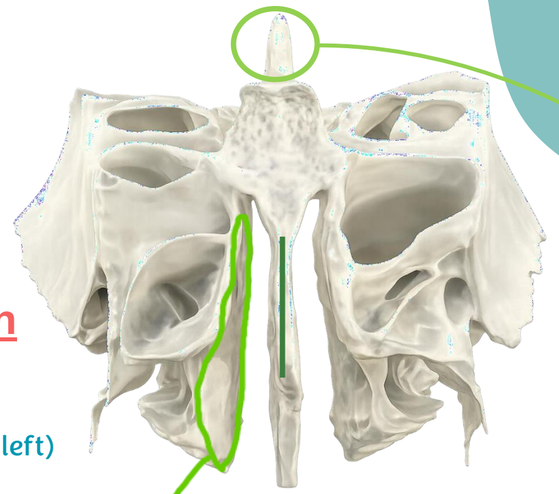
(Between the two nasal cavities)

Nasal cavity

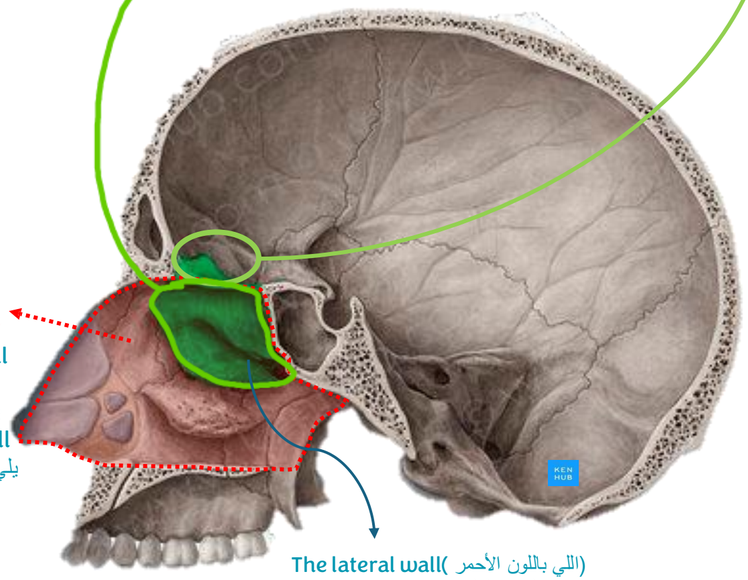
Has a wall جاي لبرا called the lateral wall يلي مظلل بالأحمر

The green line refers to the part of the (nasal septum) that is a part of the ethmoid bone, while the pink line refers to the vomer that is also part of the (nasal septum)

Anterior view



This part of the ethmoid bone extends to the anterior portion of the cranial floor(anterior cranial fossa)



The lateral wall(اللي باللون الأحمر) الجزء العلوي منه بعملي إياه الـ Ethmoid bone (اللي باللون الأخضر)

Sagittal view

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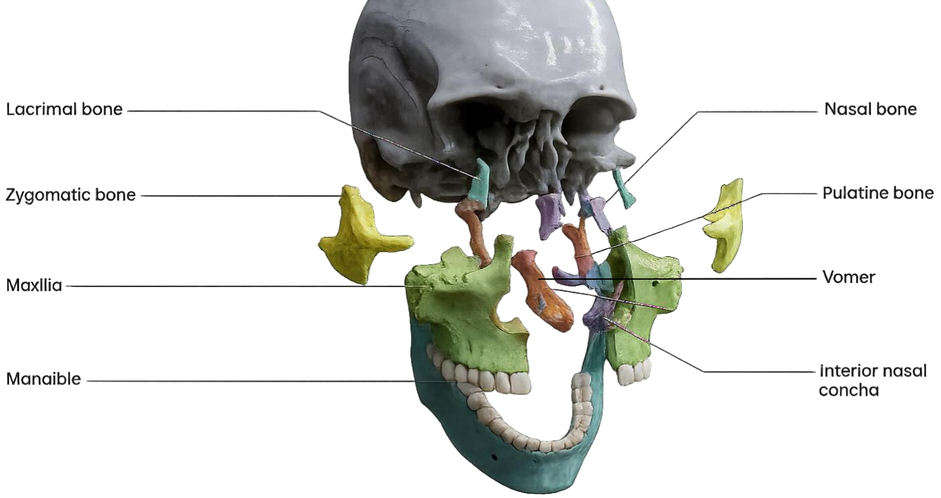
2.1.1 **Skull**

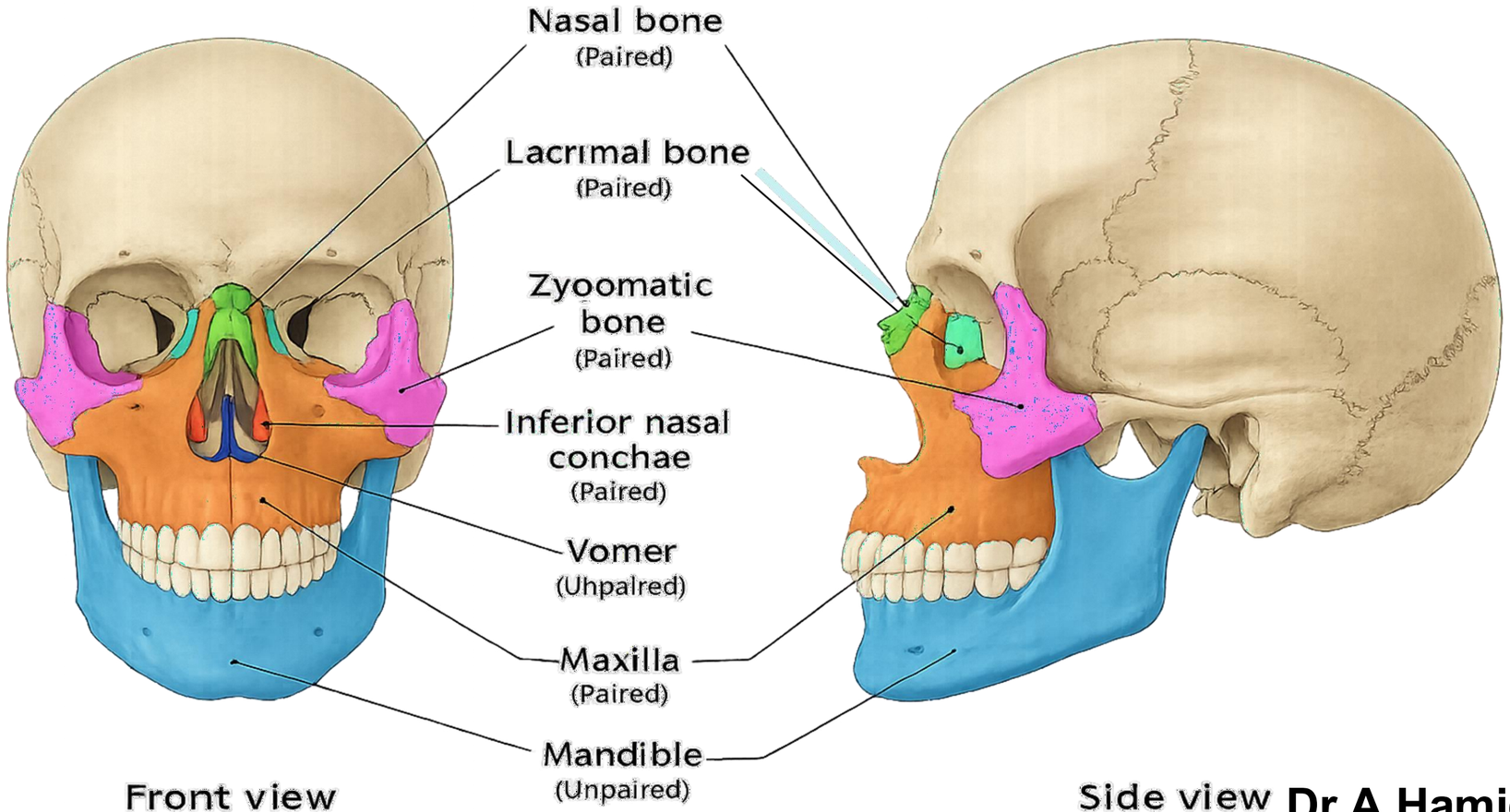
2. Facial Bones

Gross lecture-2

➢ **Consists of 14 bones**

1. **Zygomatic Bones** (paired)
2. **Maxillae** (paired)
3. **Nasal Bones** (paired)
4. **Lacrimal Bones** (paired)
5. **Vomer** (single)
6. **Palatine Bones** (paired)
7. **Inferior conchae** (paired)
8. **Mandible** (single)





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2. Facial Bones

1. Zygomatic Bones (paired)

- The two zygomatic bones, commonly called cheekbones, form the prominences of the cheeks.

Anterior view

Lateral view

2. Facial Bones

Gross lecture-2

2. Maxillae (paired)

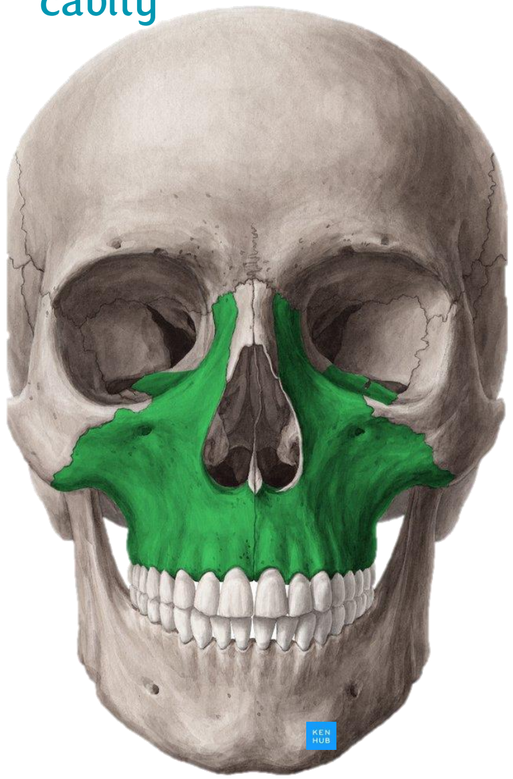
- The paired maxillae unite to form the upper jawbone.
- Form most of the hard palate.

The hard palate separates the nasal cavity from the oral cavity

While the soft palate is the part that has the uvula(if you touch the roof of your mouth with your tongue you will be able to feel the hard bones that are part of the maxilla, then you can feel the soft layer behind it (the soft palate, you can't see it here because it's not a bone obviously)

Anterior view

Posterior view

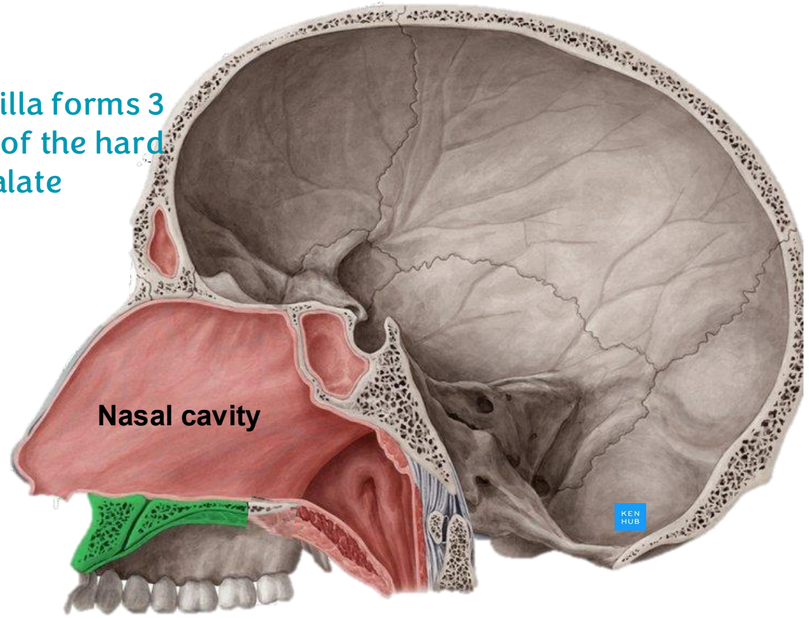


Anterior view

Inferior view

(Base of skull)

The maxilla forms 3 quarters of the hard palate



Sagittal view

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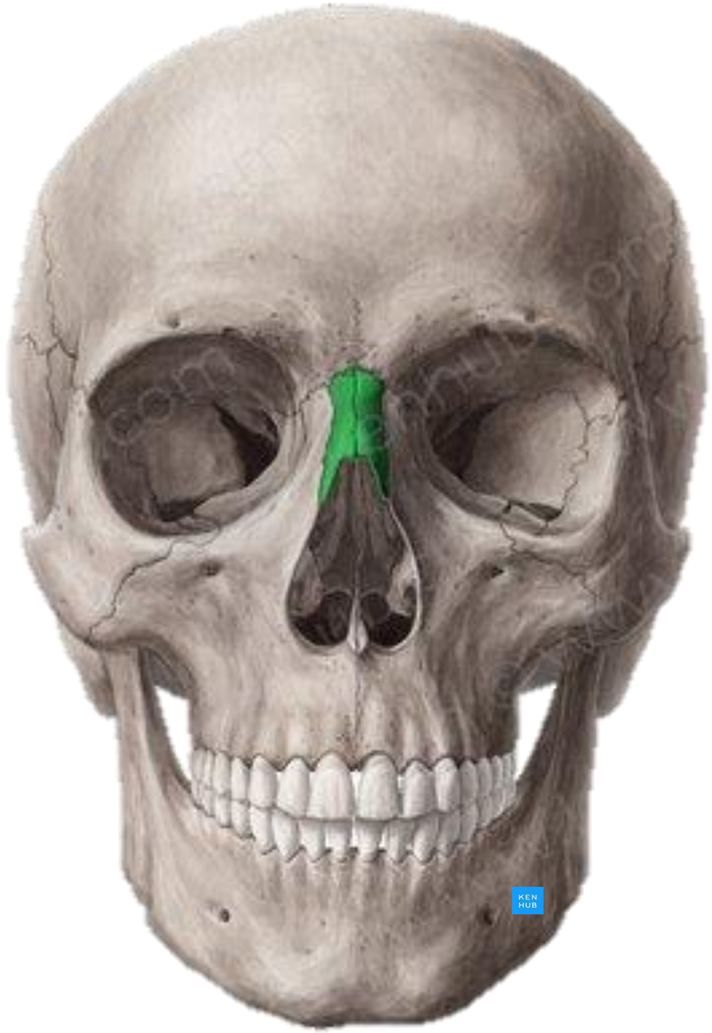
2. Facial Bones

Gross lecture-2

3. Nasal Bones (paired)

- **Form the bridge of the nose**



Anterior view

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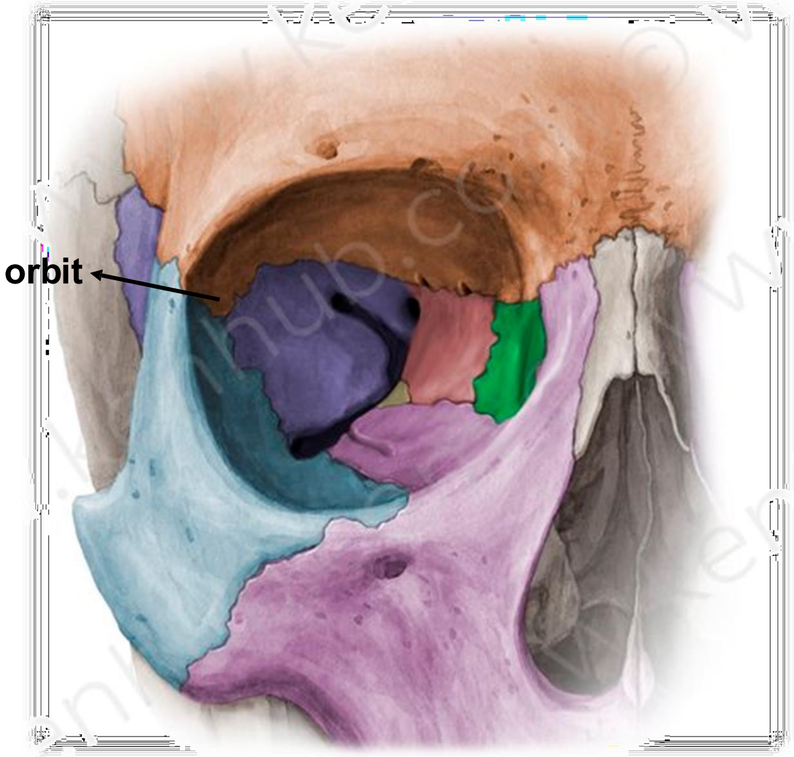
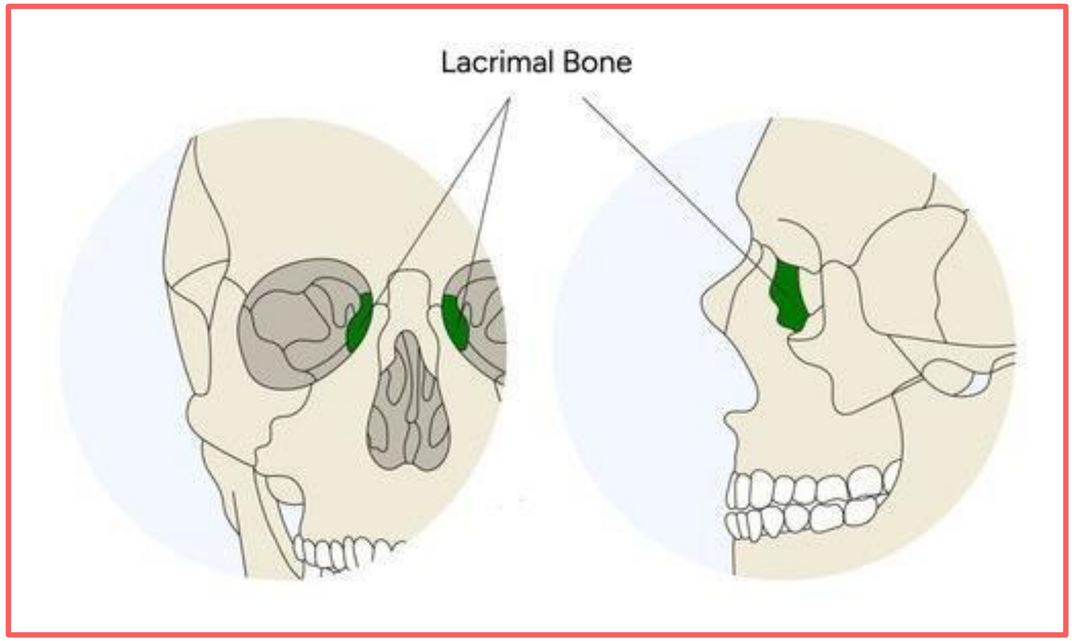
2. Facial Bones

4. Lacrimal Bones (paired)

- **Form a part of the medial wall of each orbit**

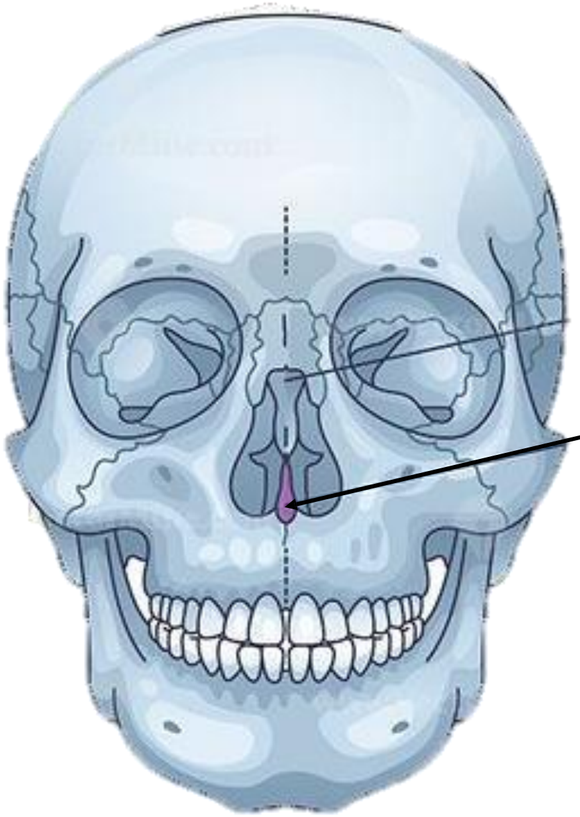
The green part is the right lacrimal bone, the one that is behind it is a part of the ethmoid bone





5. Vomer (single)

- **Forms the inferior portion of the bony nasal septum (the partition that divides the nasal cavity into right and left sides)**

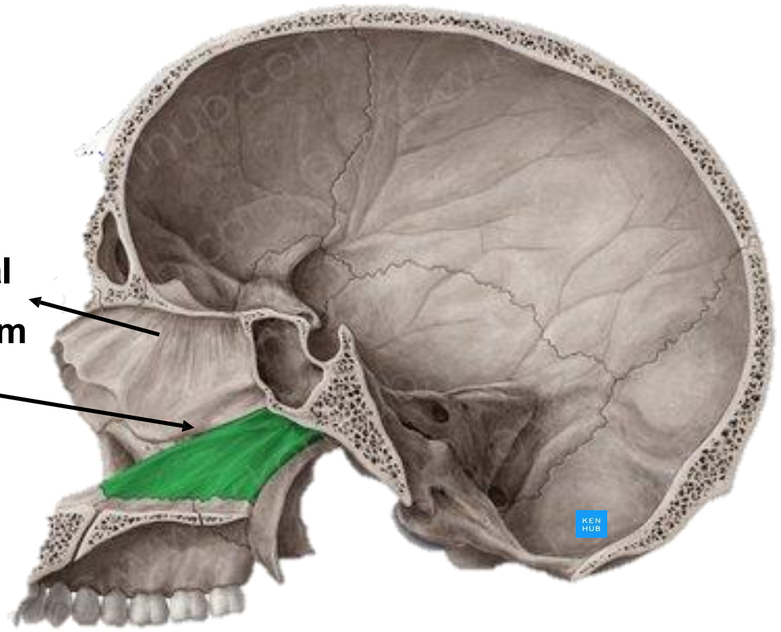


Anterior view

Part of the ethmoid bone

Vomer

Nasal septum



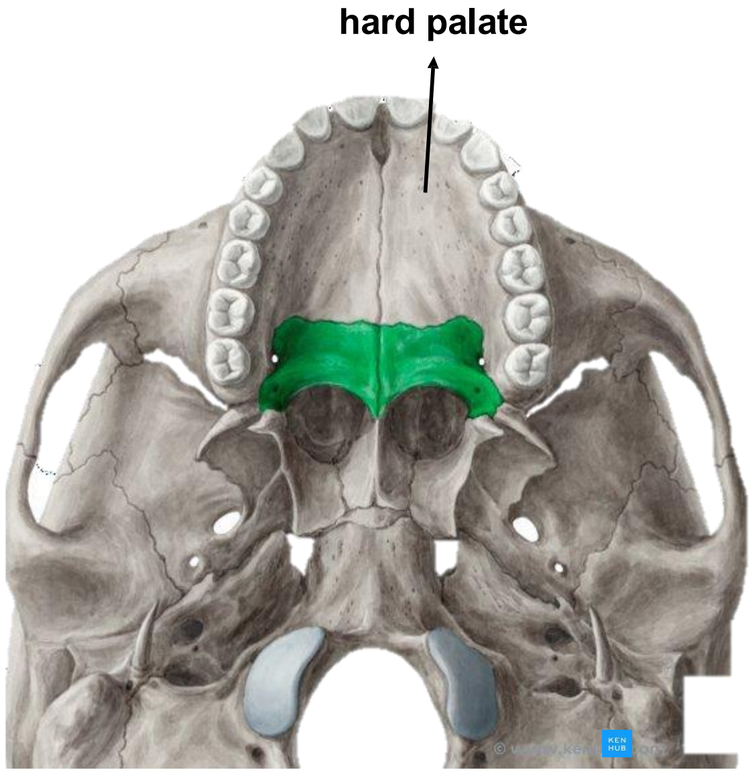
Sagittal view

2. Facial Bones

6. Palatine Bones (paired)

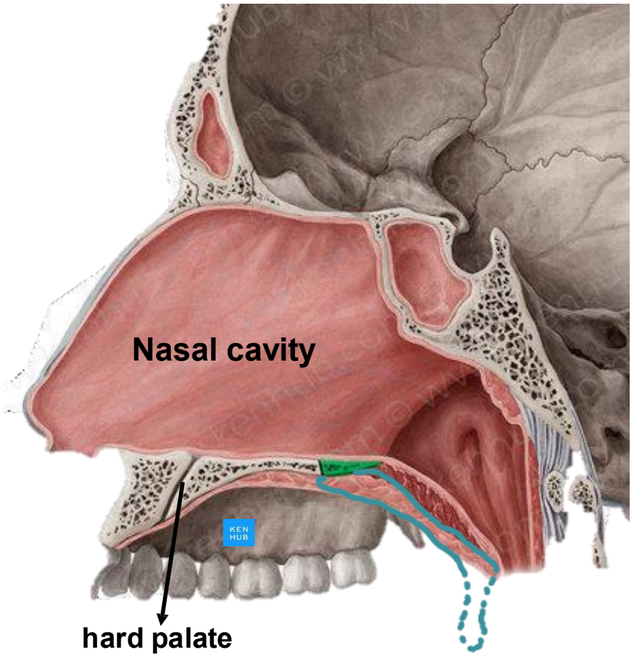
- **Form the posterior portion of the hard palate.**

The forth quarter of the hard palate



Inferior view

(Base of skull)



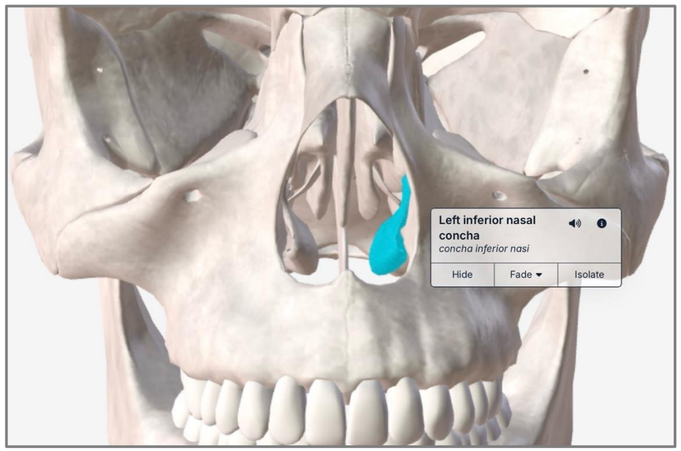
The soft palate

Sagittal view

7. Inferior conchae (paired)

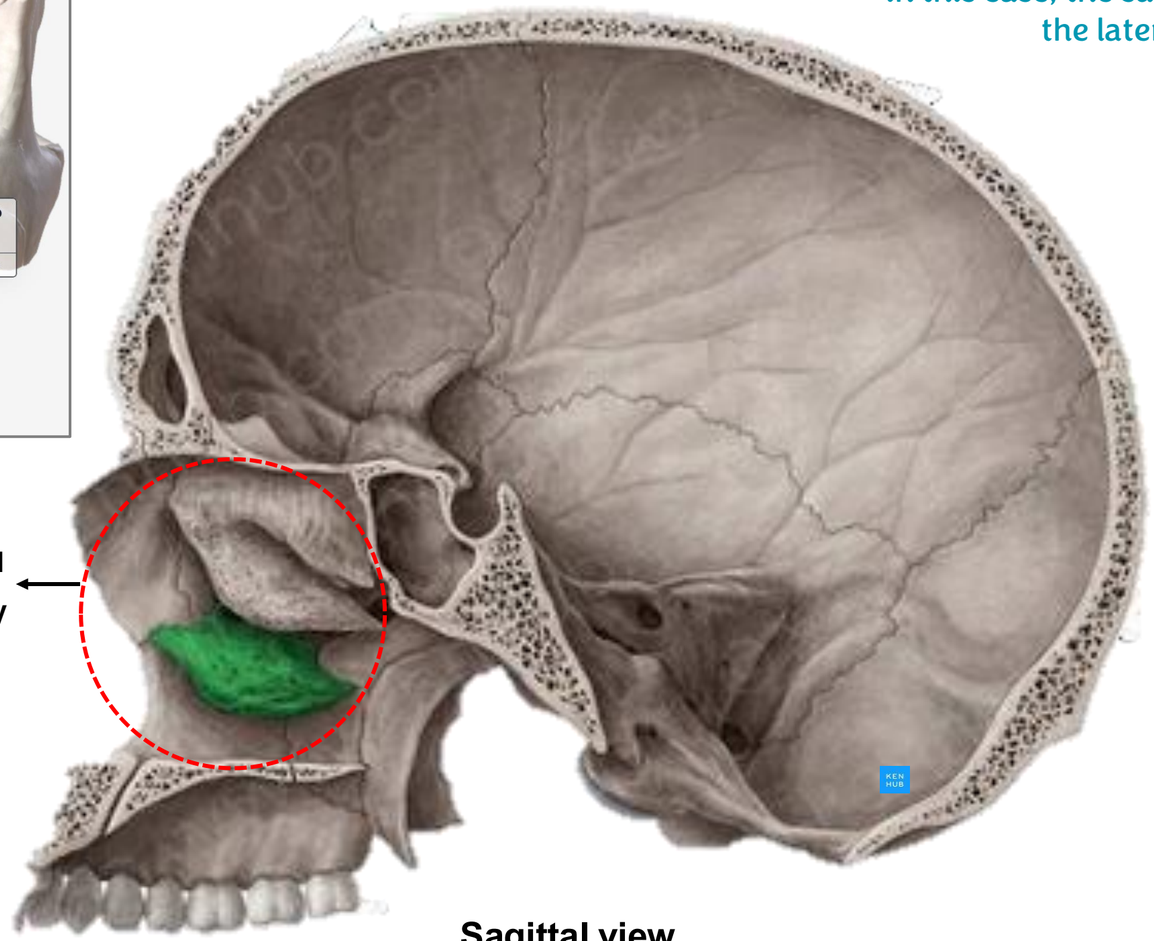
- **Form a part of the inferior lateral wall of the nasal cavity and project into the nasal cavity.**

It's twisted

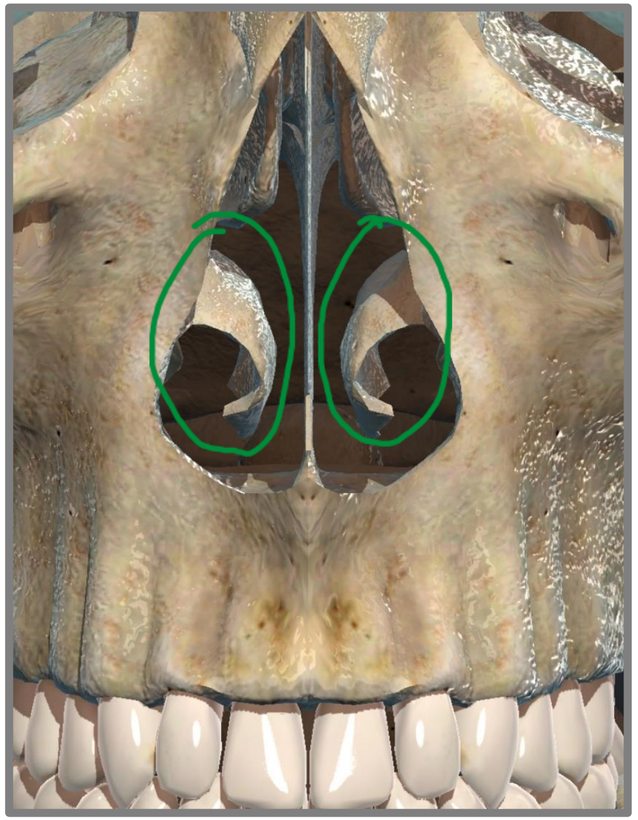


Since we have inferior conchae, we shall have superior conchae, in this case, the superior conchae and the middle conchae are the lateral part of the ethmoid bone itself

Nasal cavity



Sagittal view



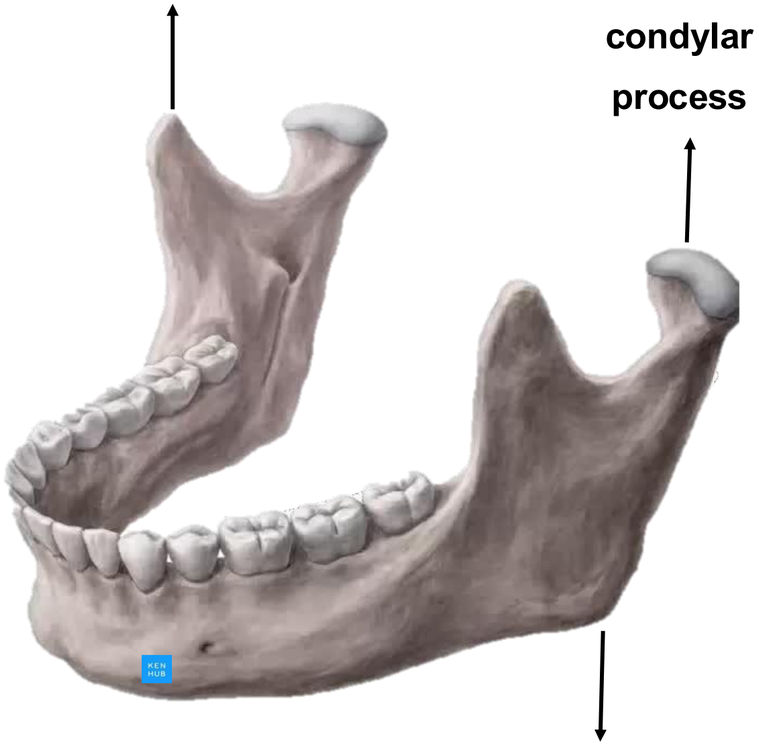
2. Facial Bones

8. Mandible (single)

- Forms the lower jawbone.
- It is the largest, strongest facial bone.

Anterior view

Lateral view



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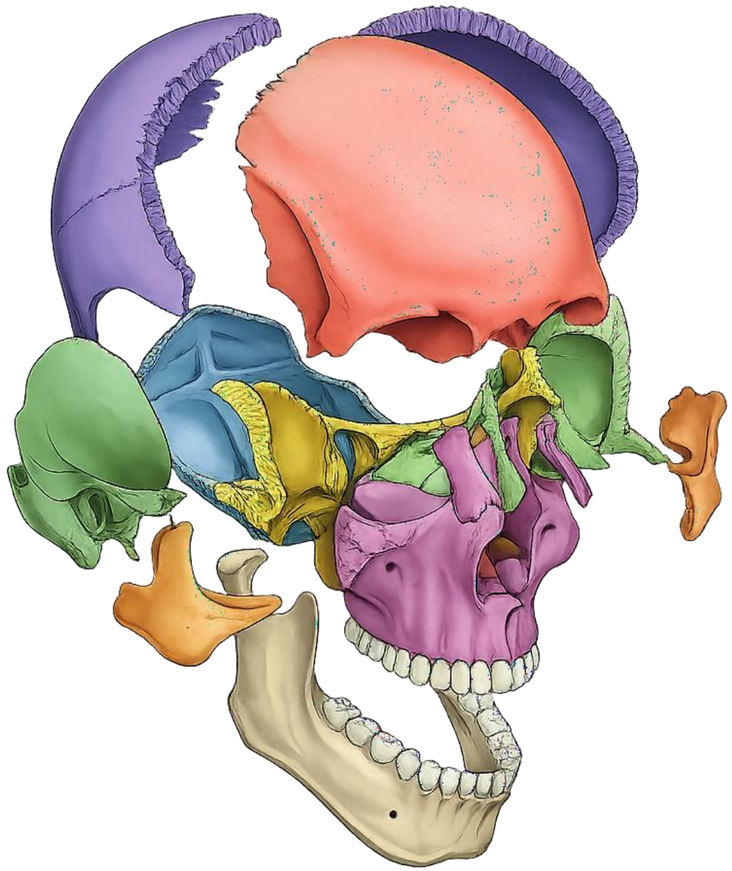
Gross lecture-2

- **Skull bones are joined by immobile fibrous joints called sutures.**

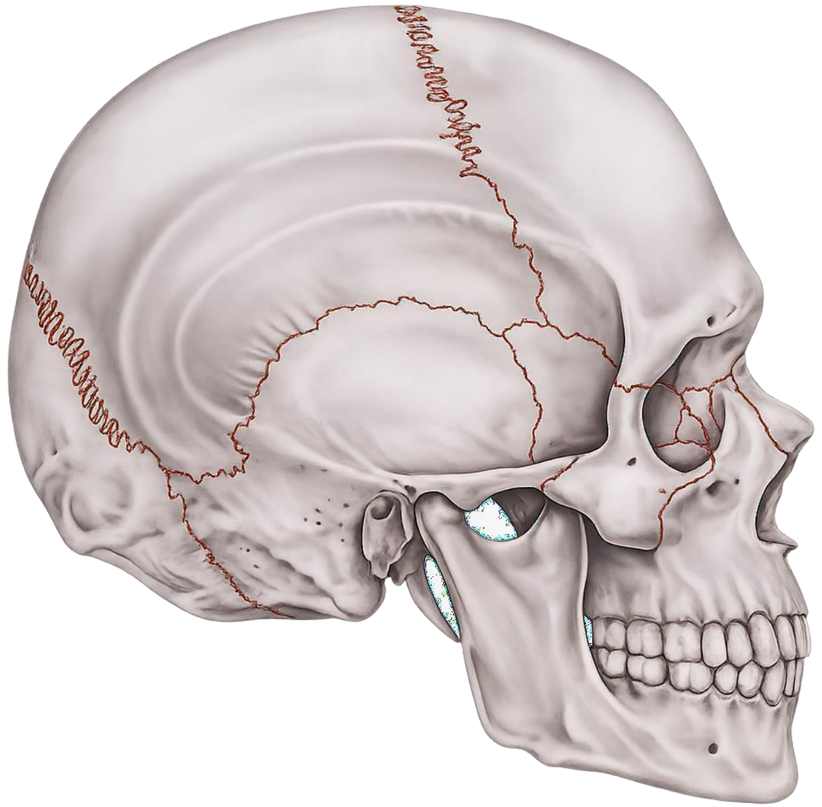
  (except for the mandible, which articulates with the cranium via a synovial joint)

- **Sutures are not straight, it follow irregular, tightly twisting paths.**

  (These twisting lines serve to tightly interlock the adjacent bones, thus adding strength to the skull for brain protection)



The sutures form The zigzag shape to enhance stability and strengthens the attachment between the bones



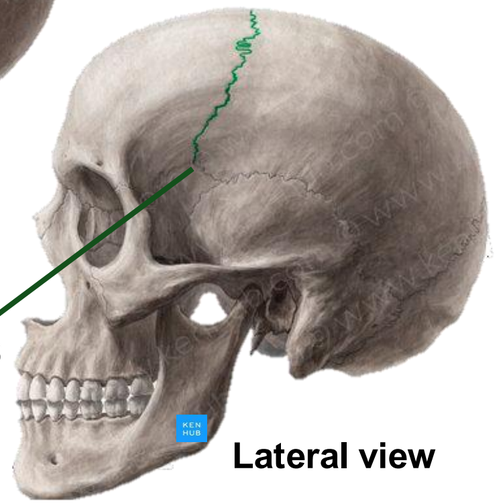
Gross lecture-2

➢ Major Skull Sutures

1. Coronal Suture:

Unites the frontal bone and both parietal bones.

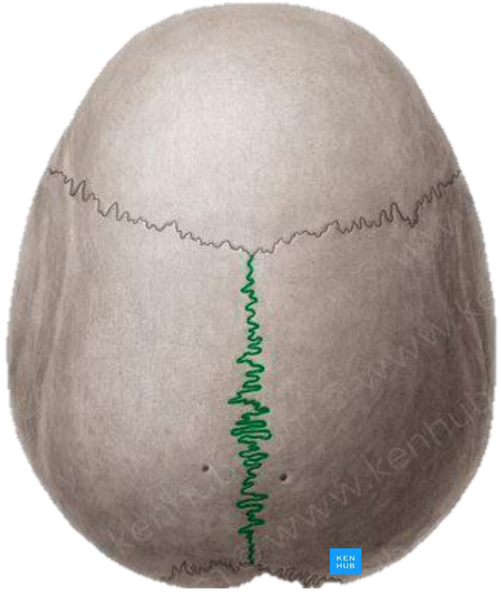
Superior view (Vault)



Lateral view

2. Sagittal Suture:

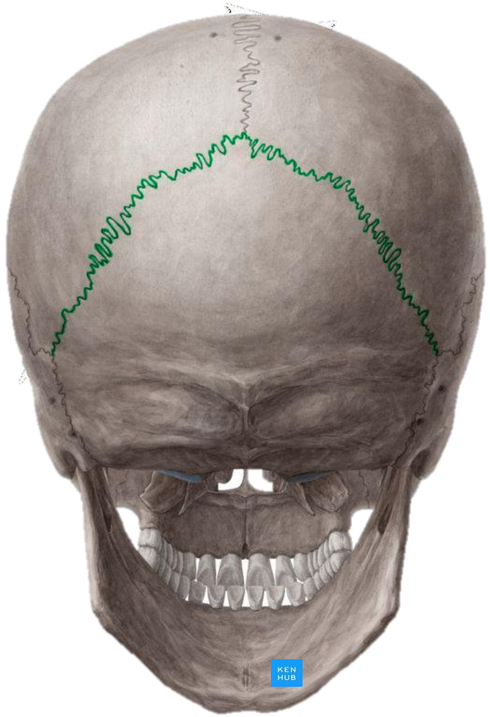
Unites the two parietal bones along the superior midline of the skull.



Superior view (Vault)

3. Lambdoid Suture:

Unites the two parietal bones to the occipital bone.



Posterior view

Gross lecture-2

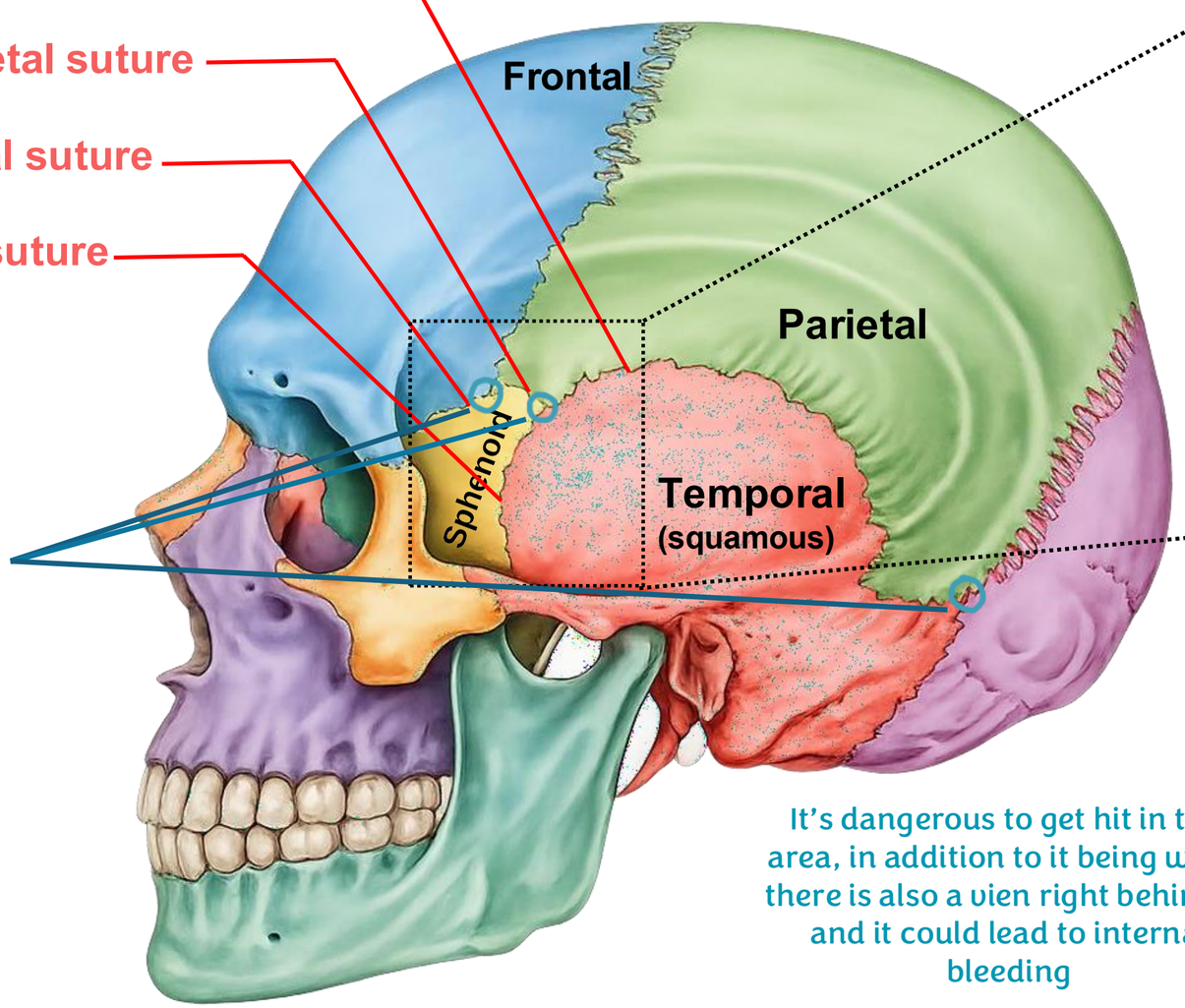
➢ Major Skull Sutures

Squamous suture

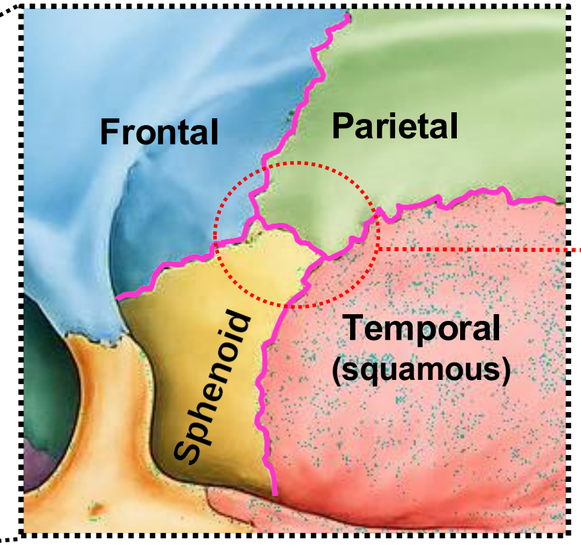
Sphenoparietal suture

Sphenofrontal suture

Sphenosquamosal suture



The regions that are circled are where every suture starts or ends



Pterion

Because it has a lot of joining sides (sutures of many bones)

- **A small, H-shaped suture region on the lateral aspect of the skull where four bones meet: the frontal bone, parietal bone, squamous part of the temporal bone, and the greater wing of the sphenoid bone.**

It represents the weakest area of the skull.

It's dangerous to get hit in this area, in addition to it being weak, there is also a vien right behind it, and it could lead to internal bleeding

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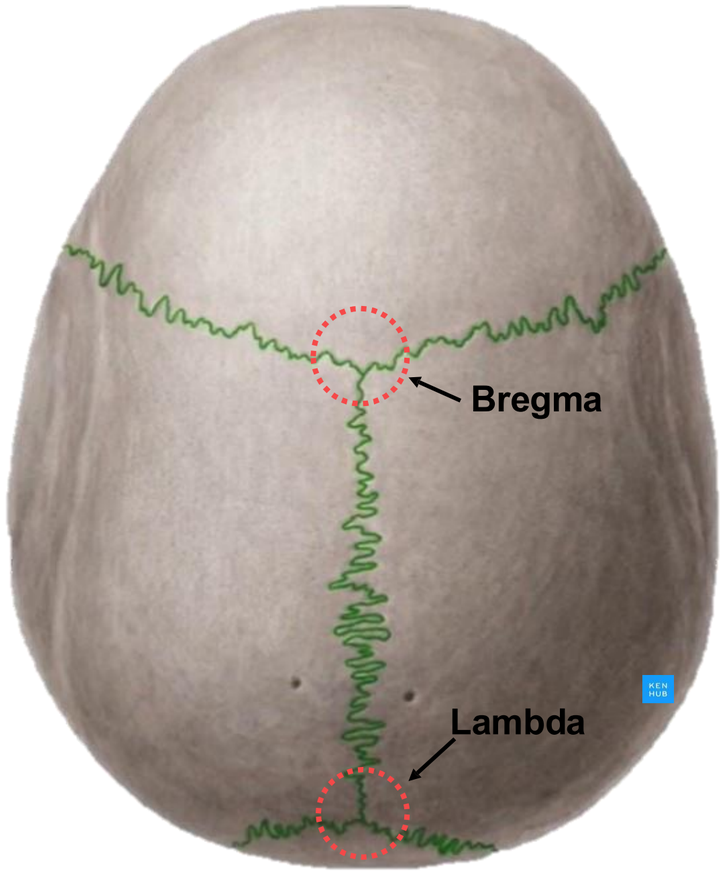
Joints of the skull (Sutures)

- The junction of the sagittal and coronal sutures is the **Bregma**.
- The junction of the sagittal and lambdoid sutures is the **Lambda**

You will find it only in the adults



Superior view

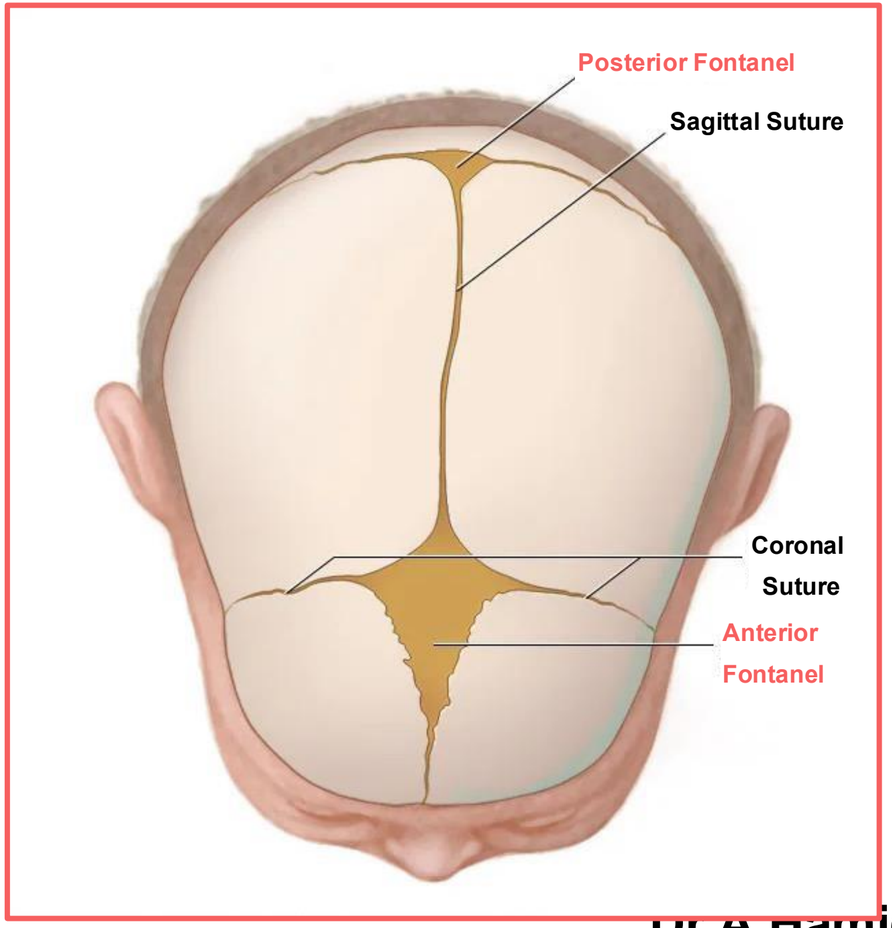
(Vault)

2.1.1 Skull Fontanels

- Soft spots in the skull of an infant, covered with tough, fibrous membrane where ossification is incomplete تكون العظام
- As bone formation continues after birth, the fontanels are replaced with bone by ossification and become sutures.

We will still have ossification in our bones all around our skeletal system until we reach to be approximately 25 years old (we will still have cartilages for sure)

1. **Anterior Fontanel:** النافوخ بمعنى اخر
   - The largest fontanel, roughly diamond-shaped.
   - Located at the junction of the two parietal bones and the frontal bone.
   - Closes between 18 to 24 months after birth. Could take more or less time depending on genetic aspects
2. **Posterior Fontanel**
   - Smaller than the anterior fontanel, triangular in shape.
   - Located at the junction of the two parietal bones and the occipital bone.
   - Closes around 2 months after birth. Some newborn babies could have it closed already before birth



- **Function**

1. Allow room for the baby's brain to grow. Because the development of the brain tissue is faster than the development of the baby's skull's bones
2. Enable compression of the head during delivery.

For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			

Additional Resources:

رسالة من الفريق العلمي: