



General Anatomy

Lecture 5: Axial Skeleton: The Skull

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THE SKELETON

عظام عظام

- * It comprises cartilages, bones, ligaments & joints.
أربطة عظام
- * The bones are rigid and heavier than cartilages.
- * Cartilages are more flexible and lighter.
- * The younger the age, the greater is the contribution of cartilage to the skeleton.

4

ال skeleton هو عبارة عن مجموعة من ال bones مقربة من بعض من خلال ال cartilages ويعمل joints وهي ال joint مربوطين ببعض من خلال ال ligaments.

ال bone بتكون أقوى وأثقل من ال cartilage.

ال cartilage بتعطيني ليونة لحركة ال joints يعني بتكون more flexible and

كلما كان العمر أصغر كان ال contribution of cartilage اكبر... عشان هيك الكبار بالعمر هم اللي يعانون من خشونة في العظام.
يعني كلما زاد العمر زاد تاكل ال cartilage.

*** Divisions of the skeleton:**

- 1. Exoskeleton:** rudimentary in man.
It is represented by: nails & enamel of teeth .
- 2. Endoskeleton:** about 206 bones & is formed of:
 - a. The axial skeleton.
 - b. The appendicular skeleton.

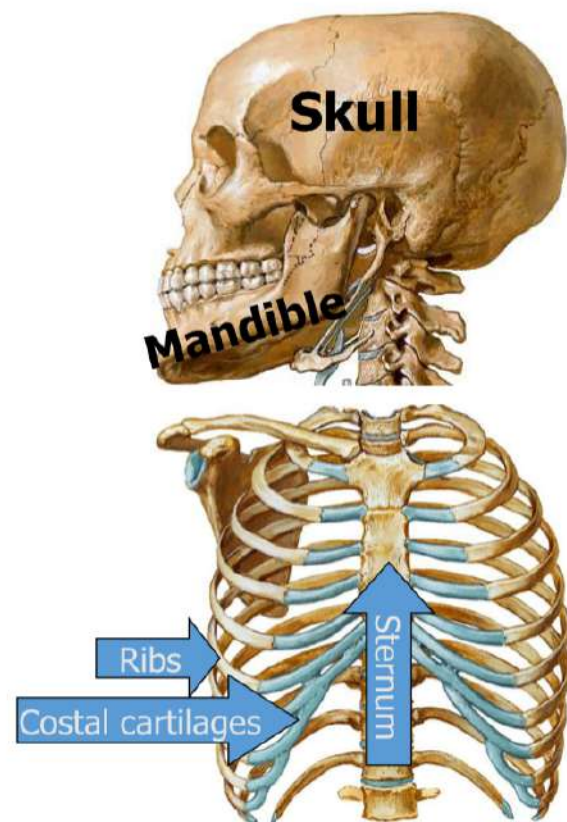
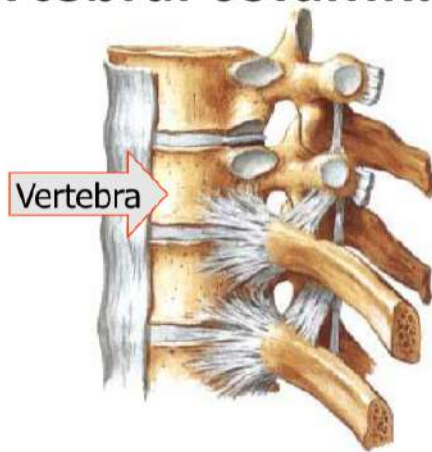
Regional classification of bones

*** The human skeleton is divided into:**

- 1. Axial skeleton:** which includes skull, vertebral column, ribs & sternum.
- 2. Appendicular skeleton:** which includes the bones of the appendages (upper & lower limbs) & their girdles (shoulder & pelvic).

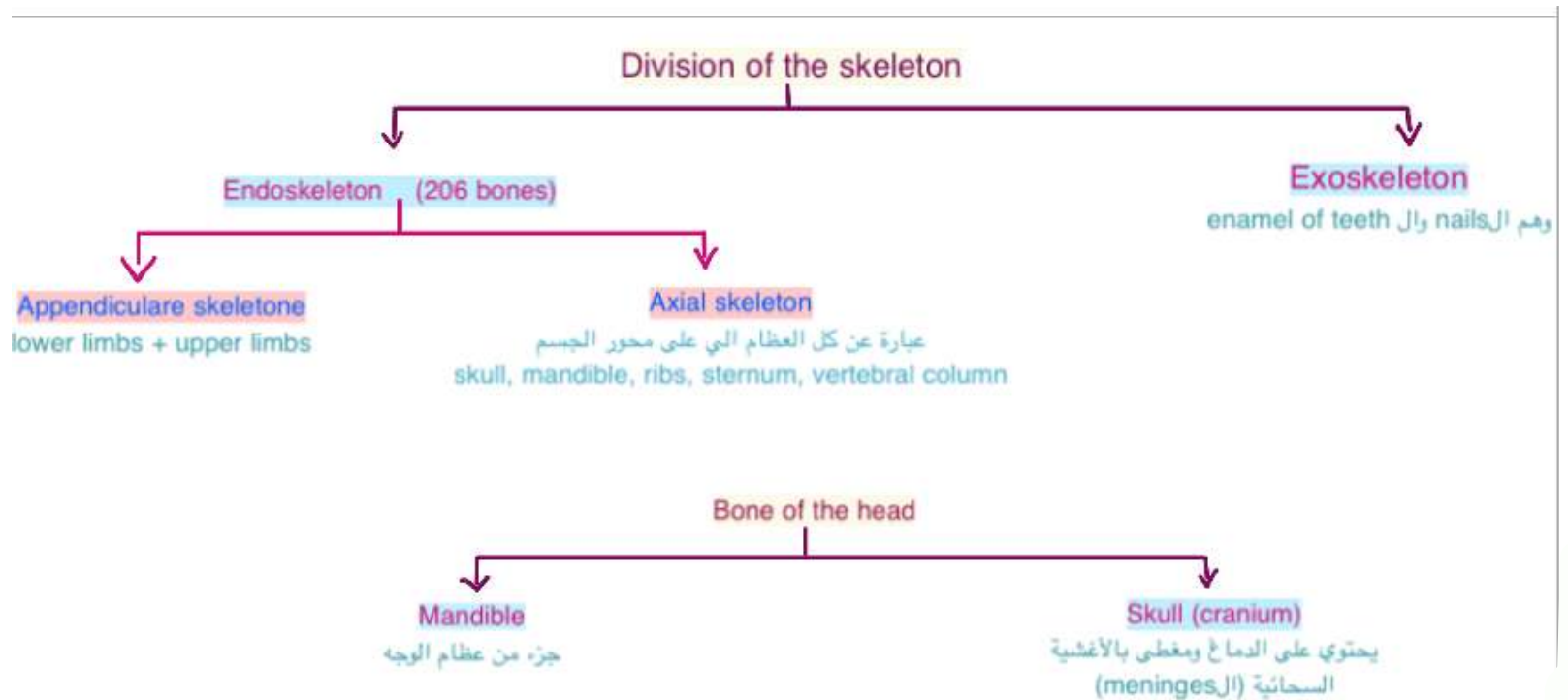
Axial skeleton

1. Skull & mandible.
2. Ribs.
3. Sternum.
4. Vertebral column.



*** The skull (cranium)**
(which contains the
brain + its meninges)
+ **the mandible** (part
of facial bones) →
form the skeleton of
the head.





Skull + Mandible → Head Skeleton

The skull

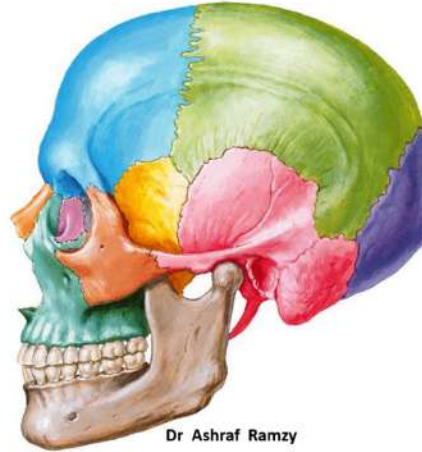
Is formed of 22 separate bones

One movable bone

The mandible

21 immovable bones

Articulating together by **sutures**
(which are fibrous joints)



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ههي عبارة عن Fibrous joint
ما بتتحرك

5 Unpaired bones(single bones)

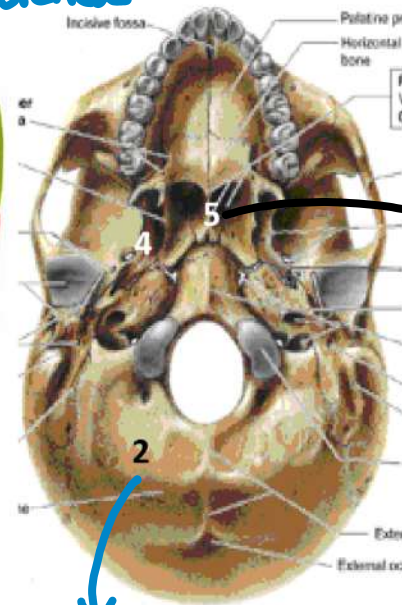
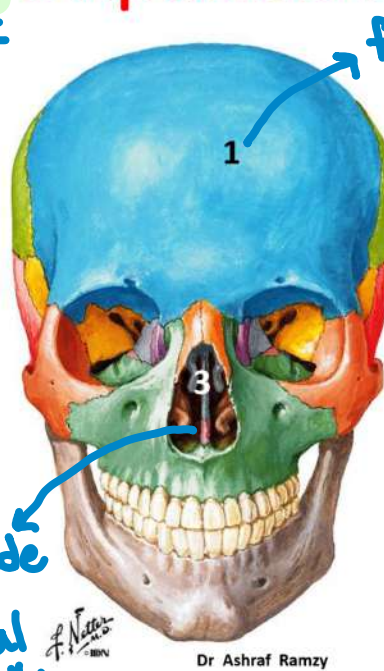
1. Frontal

2. Occipital

3. Ethmoid

4. Sphenoid

5. Vomer

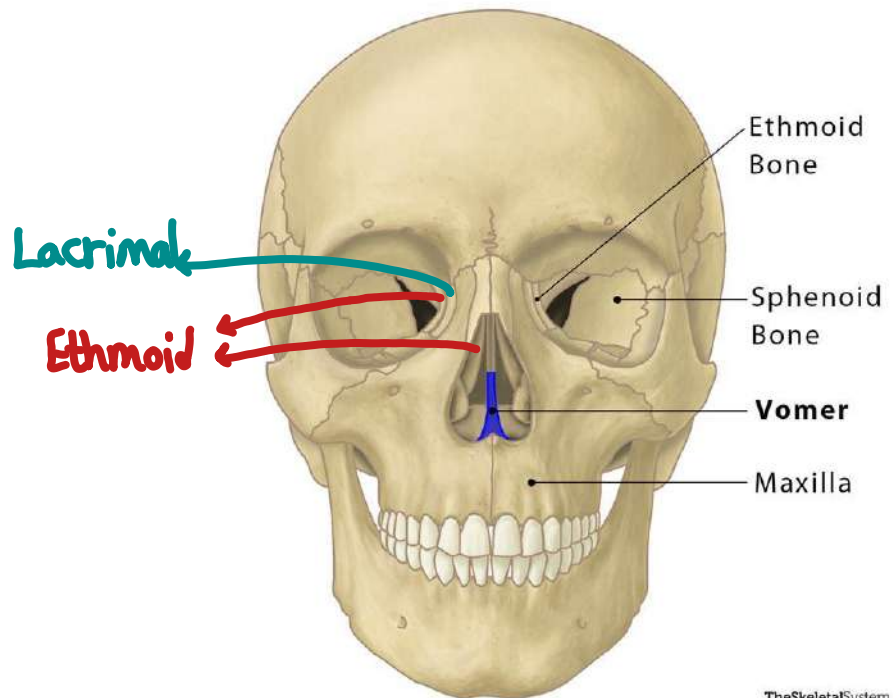


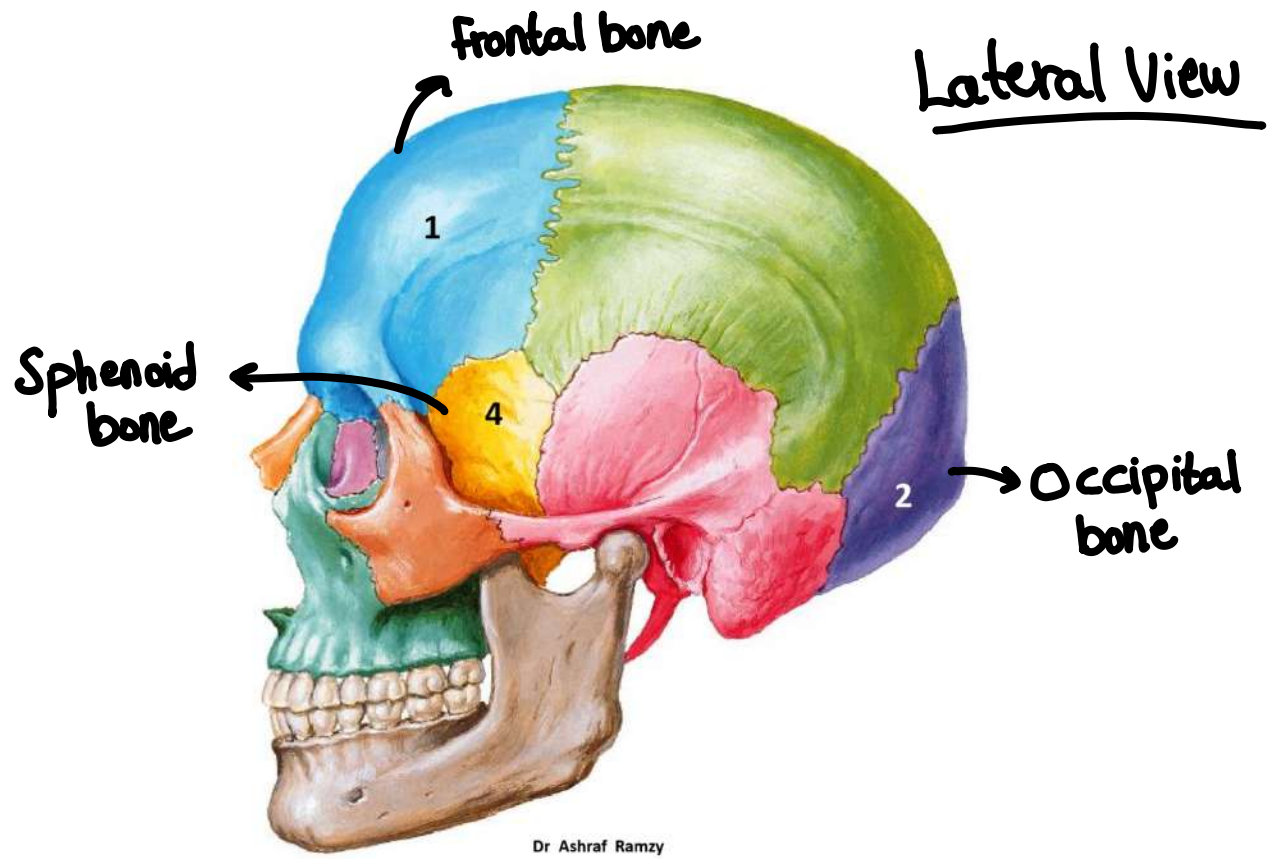
inside the nasal cavity
(تحتوى الأنف)
Related to the nose

back of the nose

back of the cranial cavity (base)

Vomer

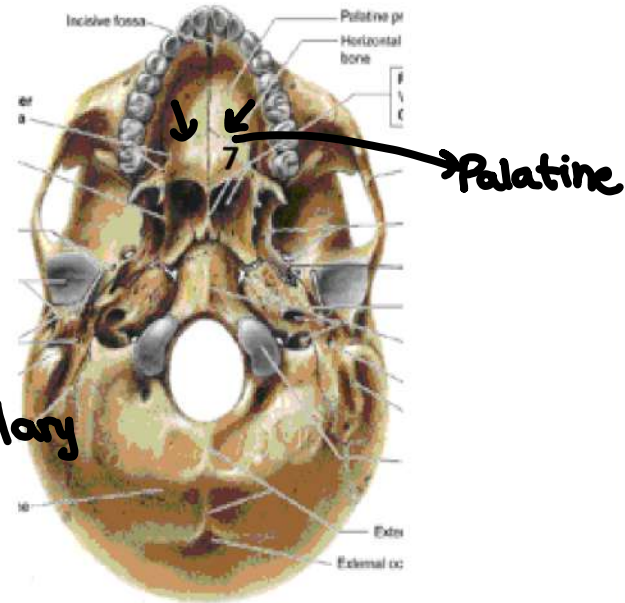
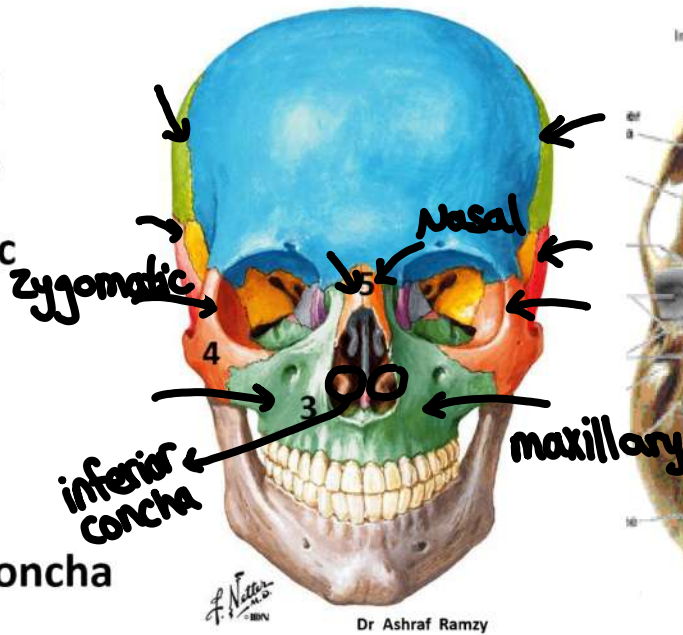




8 Paired bones

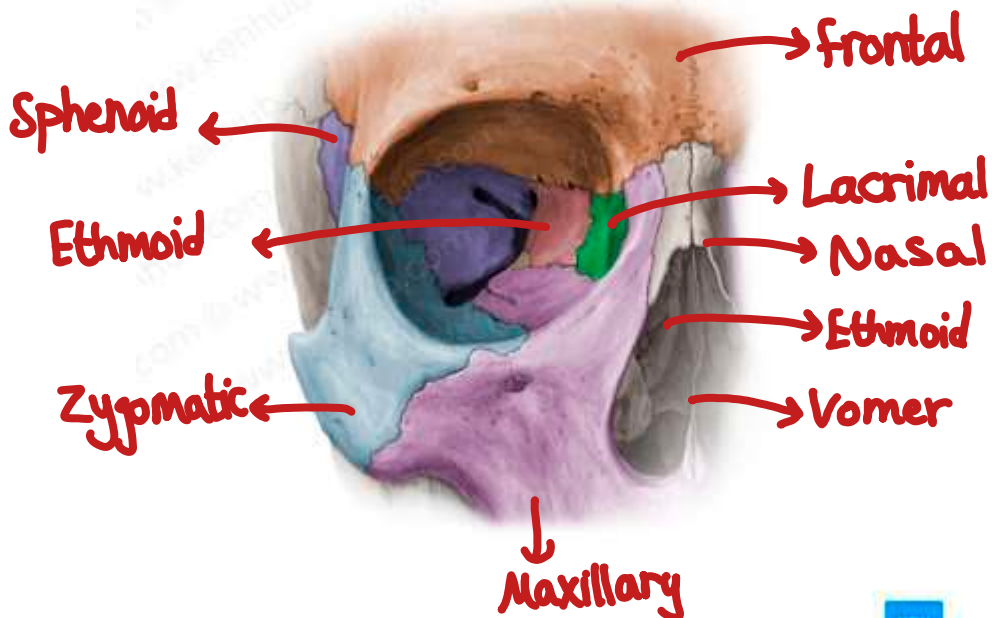
1. Parietal
2. Temporal
3. Maxillary
4. Zygomatic
5. Nasal
6. Lacrimal
7. Palatine
8. Inferior concha

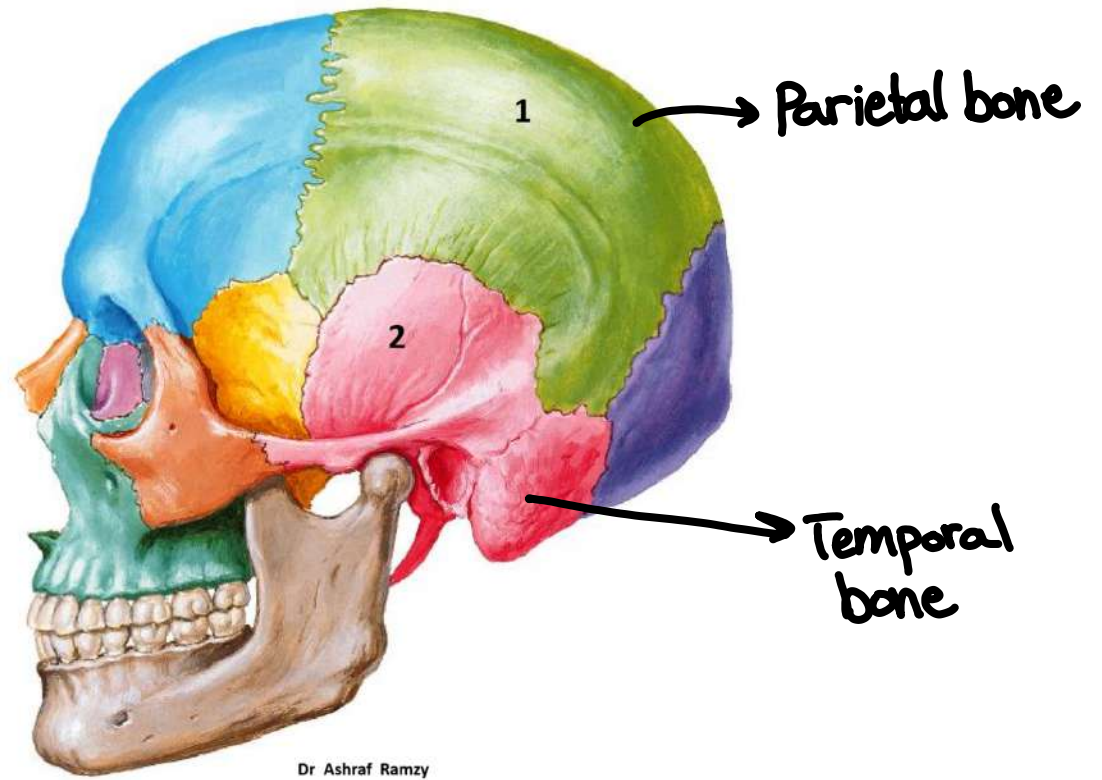
Related
to
eyes

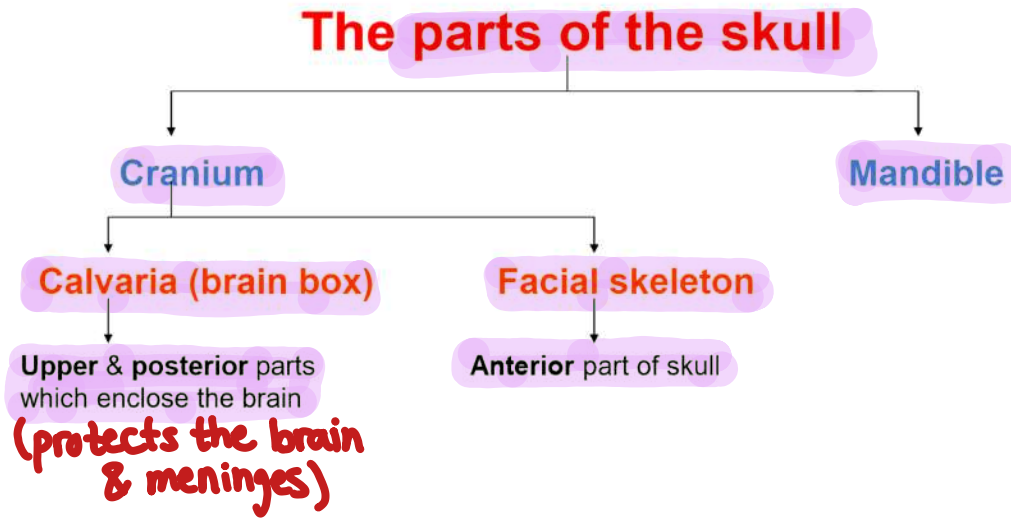


$\frac{5+8}{\downarrow}$
Related to nose

← كل جزء يكون من Embryological
Origin







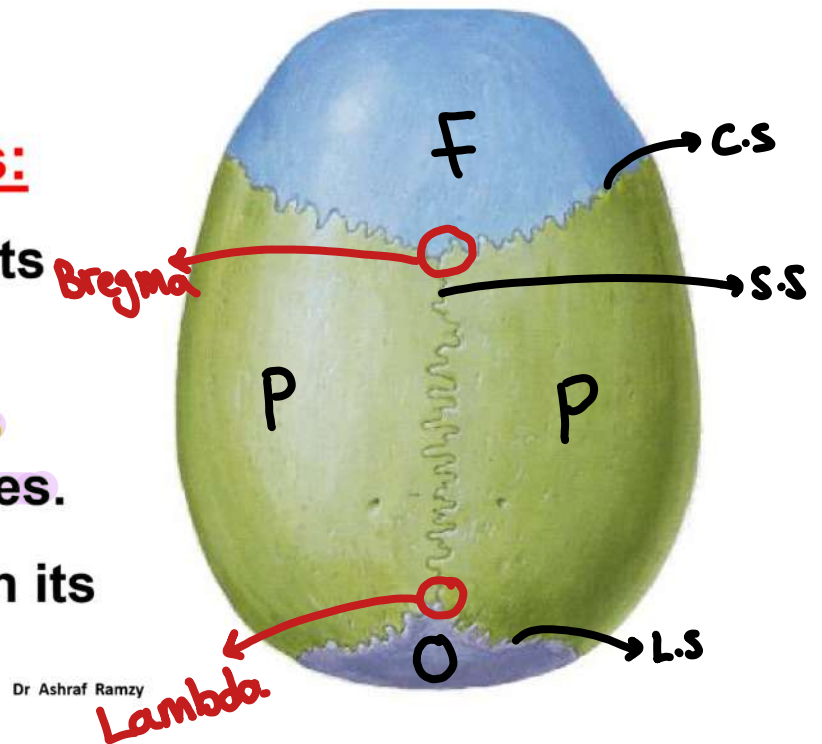
(Superior View of the skull)

Norma Verticalis
↓
View Superior ↙

* It is the **upper** aspect
(**vault**) of the skull.

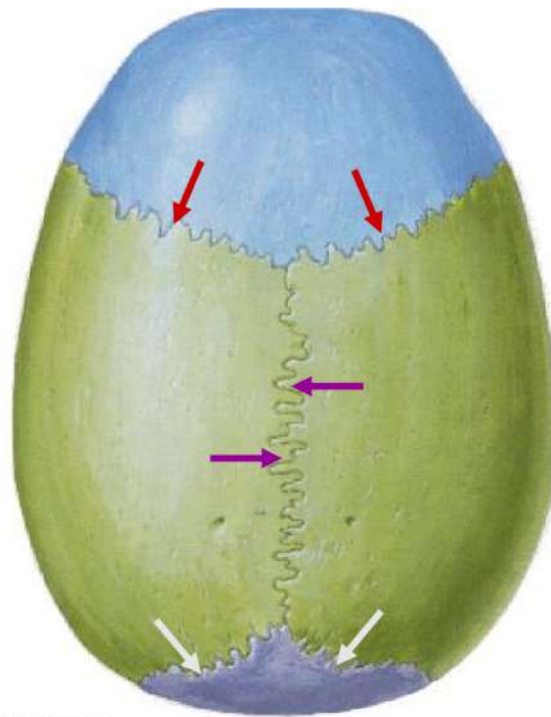
* **It presents 4 bones:**

1. The **frontal bone** in its anterior part.
2. The **2 parietal bones** behind the frontal bones.
3. The **occipital bone** in its posterior part.



*** It presents 3 sutures:**

1. The **coronal suture:**
between the frontal bone
and the 2 parietal bones.
2. The **sagittal suture:**
between the 2 parietal
bones.
3. The **lambdoid suture:**
between the occipital bone
and the 2 parietal bones.



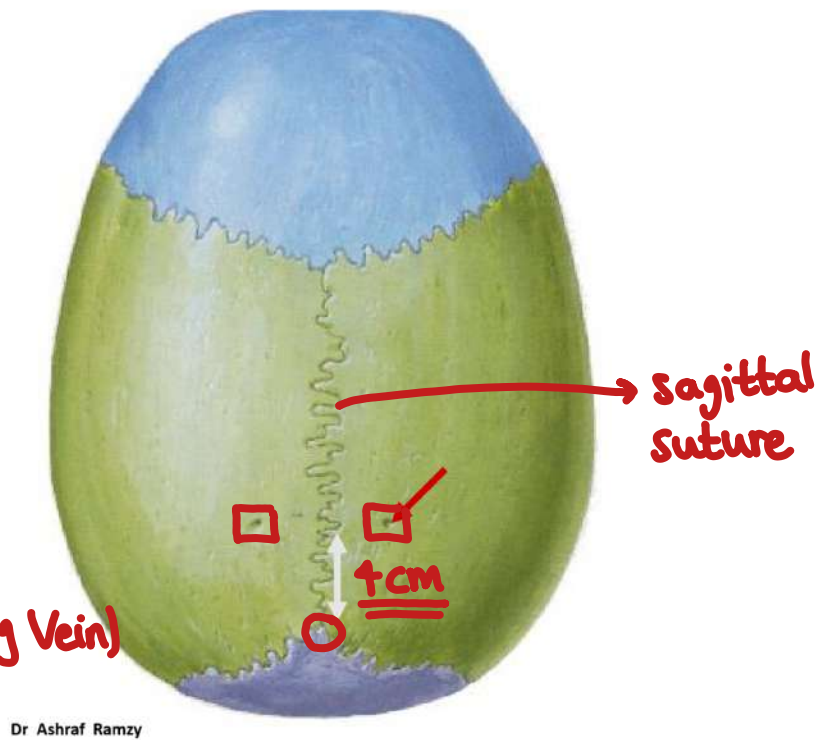
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* It presents 2
parietal emissary
foramina:

* One on each side of the sagittal suture, **4 cm** anterior to the lambda.

* It transmits an emissary vein. (connecting Vein)

↓
a vein that connects blood vessels inside the skull with blood vessels outside it

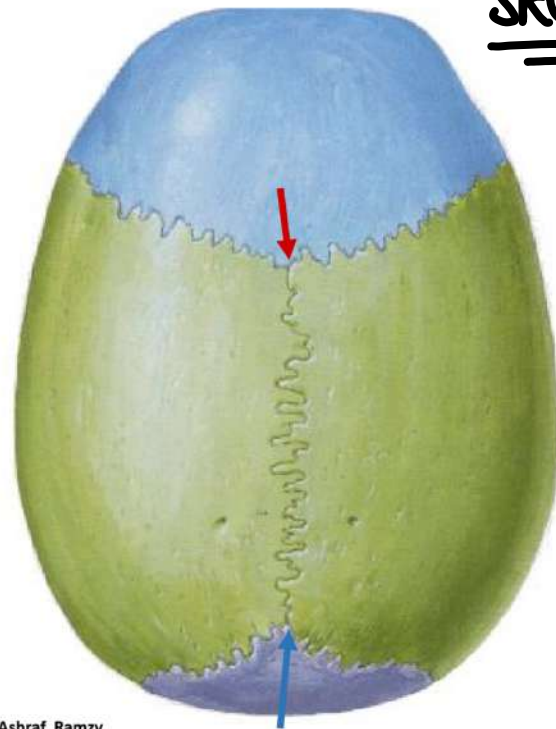


↓ Adult
Skull

* It presents 2
meeting points:

1. The **bregma** is the
meeting of coronal and
sagittal sutures.

2. The **lambda** is the
meeting of the lambdoid
and sagittal sutures.



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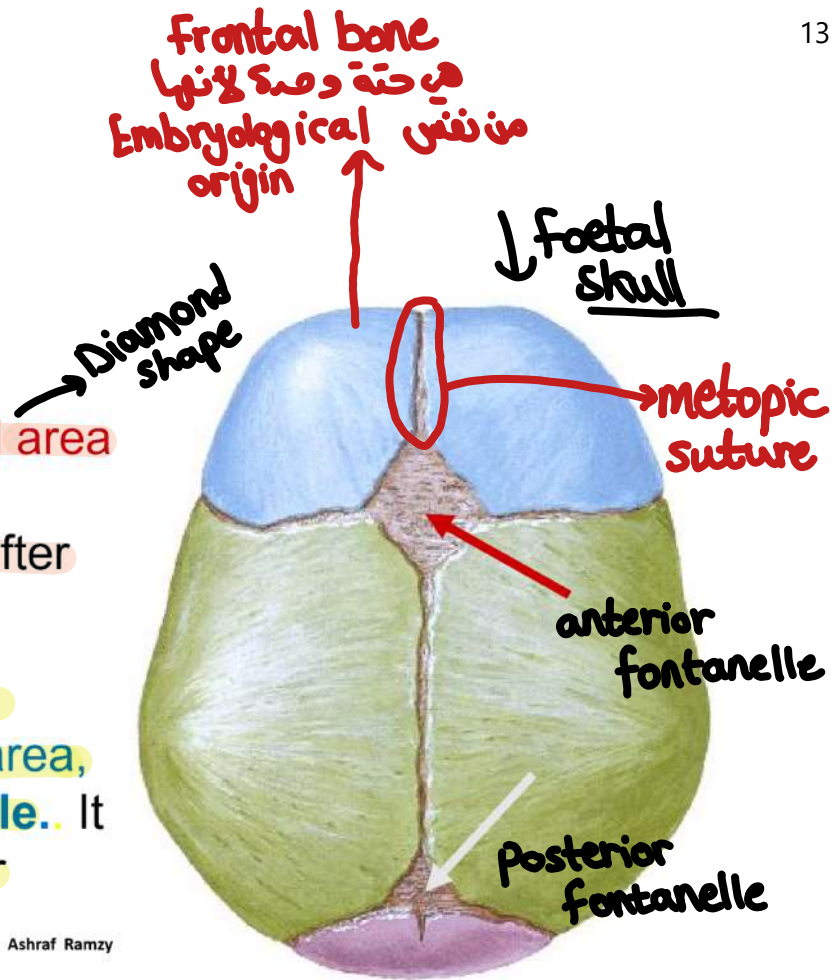
بحياة الجنين

* During foetal life:

1. The **bregma** is the site of membrane – filled **rhomboidal area** called **anterior fontanelle**. It usually closes **1.5 – 2 years** after birth.

2. The **lambda** is the site of a membrane – filled **triangular area**, called the **posterior fontanelle**. It usually closes **6 months** after birth.

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* Clinical importance of fontanelles: يمنع ويدخل مع بعون

1. They are present at birth to allow overlap of skull bones during delivery.

2. They give an idea about the intra cranial pressure:

- If the pressure \uparrow it bulges. يتمتد
- If the pressure \downarrow it sinks (dehydration). ينكمش

3. They help in diagnosis of some diseases:

- Premature closure causes craniostenosis \rightarrow microcephaly. تغلق مبكراً
- Delayed closure diagnoses rickets. تغلق متأخراً

4. They can be used as a site for IV injection (superior Sagittal sinus).

Intravenous \leftarrow

تحت
superior
anterior fontanelle

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Rickets



لين العظام



Microcephaly
 \downarrow
craniostenosis
(small head or skull)

(Anterior View or face View)

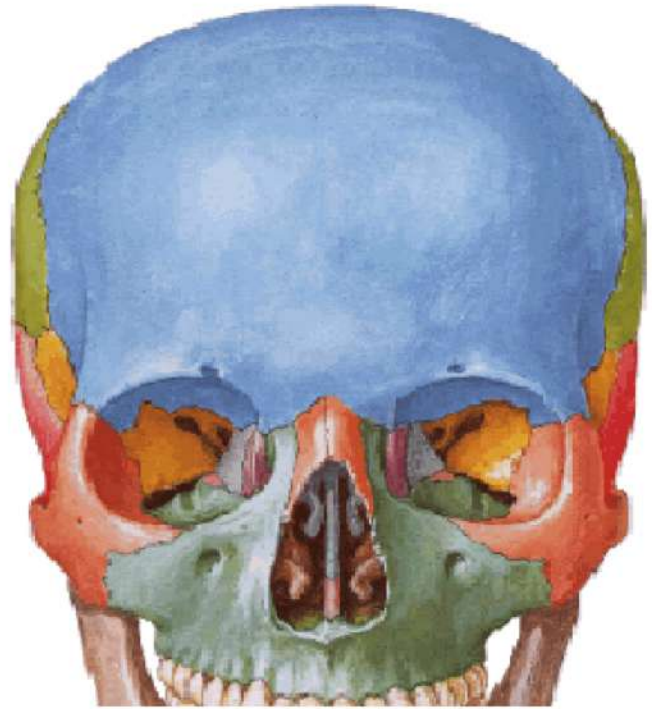
Norma **Frontalis**

↓
Anterior

*** It presents:**

*** 4 bones.**

*** 3 apertures**
(surrounding 3
cavities; 2 orbital
& 1 nasal).



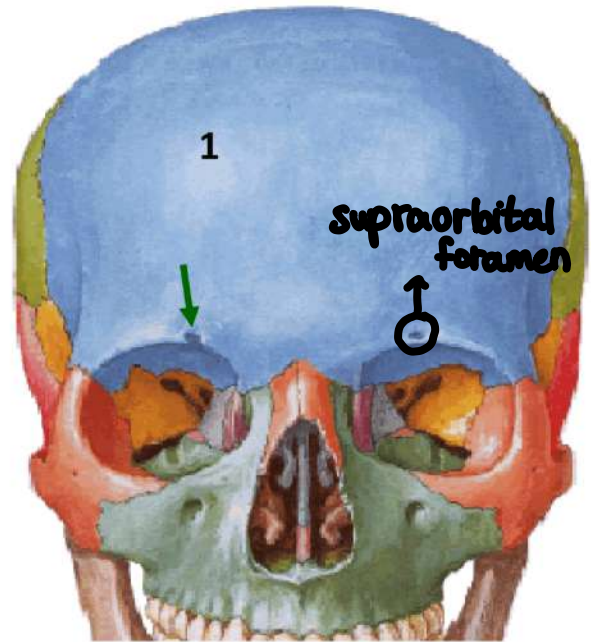
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1. The frontal bone:

* Before the age of 8 years, the frontal bone is formed of two halves separated by **metopic suture** which is completely ossified by 8 years.

* It persists in black race & in 8% of population.

* It is pierced by the **supraorbital foramen** (which gives passage to supraorbital nerve & vessels).



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Role

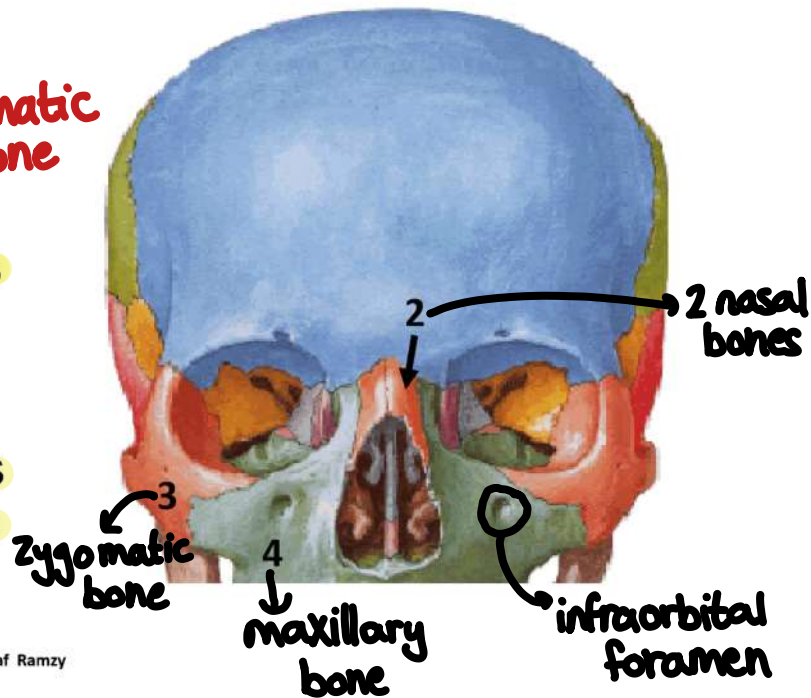
2. The 2 nasal bones: form the bridge of the nose.

3. Zygomatic bone:

4. The maxillary bone:

- It has a **body** which contains the maxillary air sinus.
- It is pierced by the **infra-orbital foramen** (which gives passage to infra-orbital nerve & vessels).

Role



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Orbit

← تجويف العين

(Posterior View)

Norma Occipitalis



Posterior

posterior part
↑ of the skull

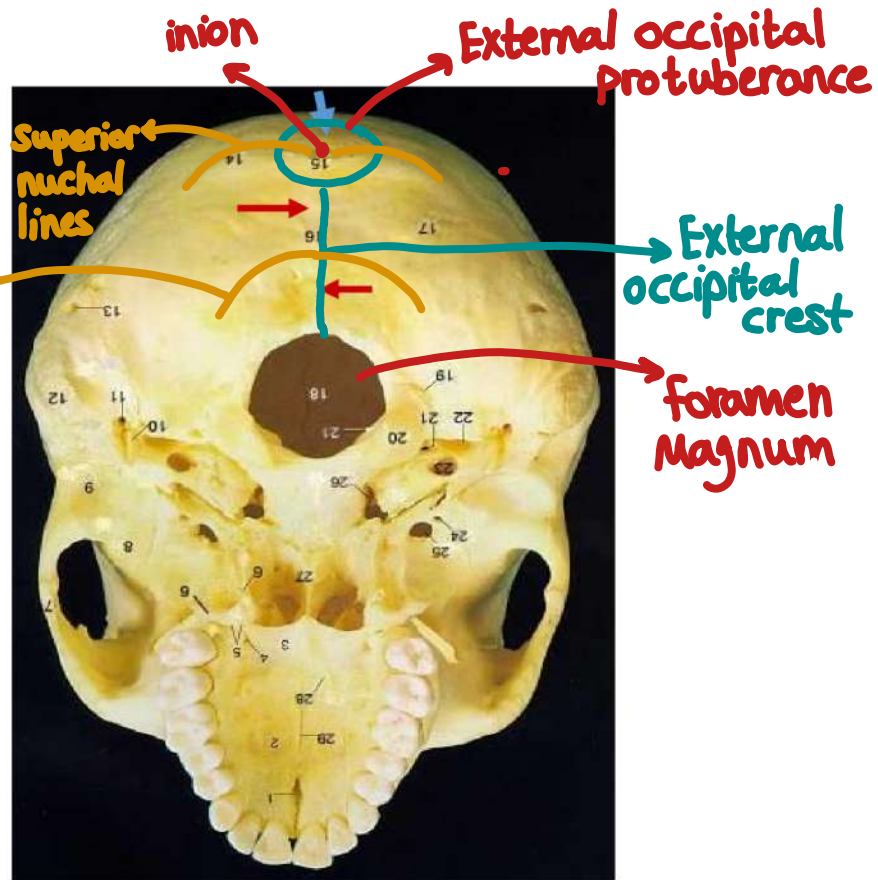
*** The occipital bone presents:**

1. External occipital protuberance: it is a median elevation on the occipital bone. Its most projecting point is called **inion**.

2. External occipital crest: extends from the protuberance to the foramen magnum.

معلمة

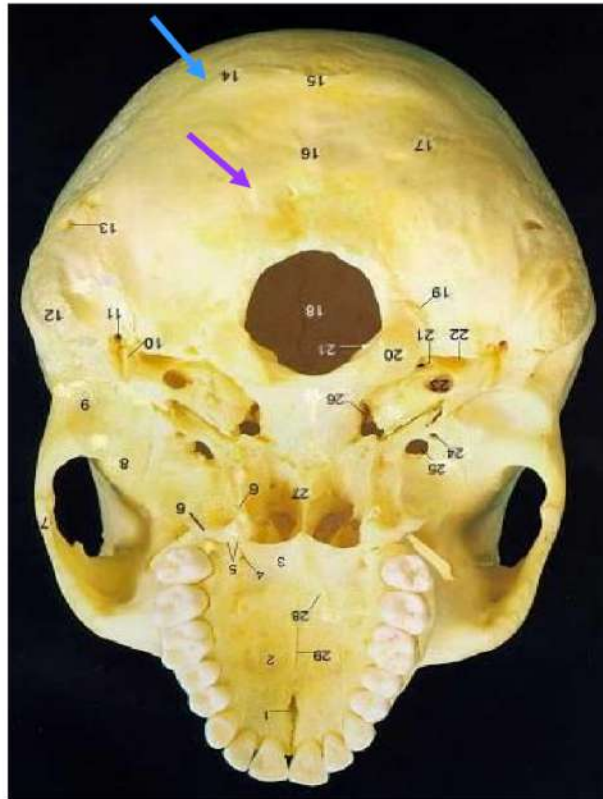
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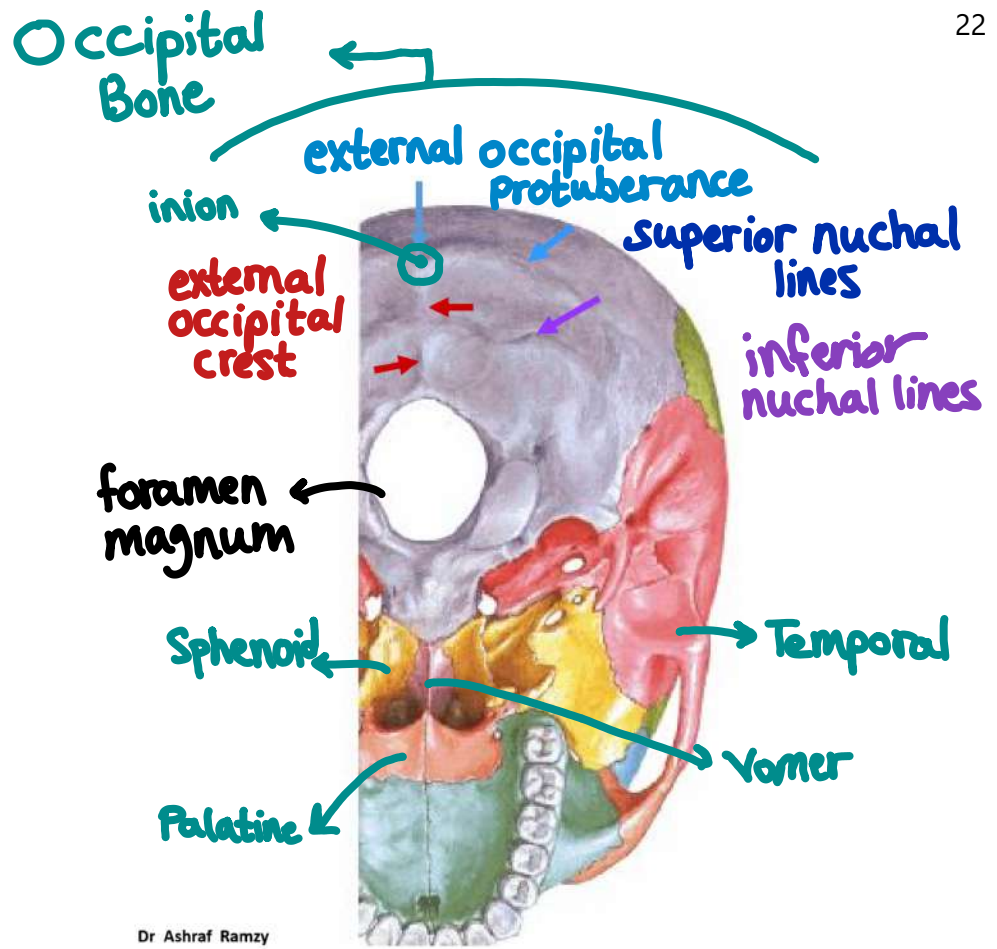


3. The superior nuchal lines: extends laterally from the protuberance.

4. The inferior nuchal lines: extends laterally from the crest & run parallel to and below the superior nuchal lines.

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(Lateral View)

Norma Lateralis

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*It is formed of: frontal, parietal, occipital, temporal, greater wing of sphenoid bone, maxilla and zygomatic bones.

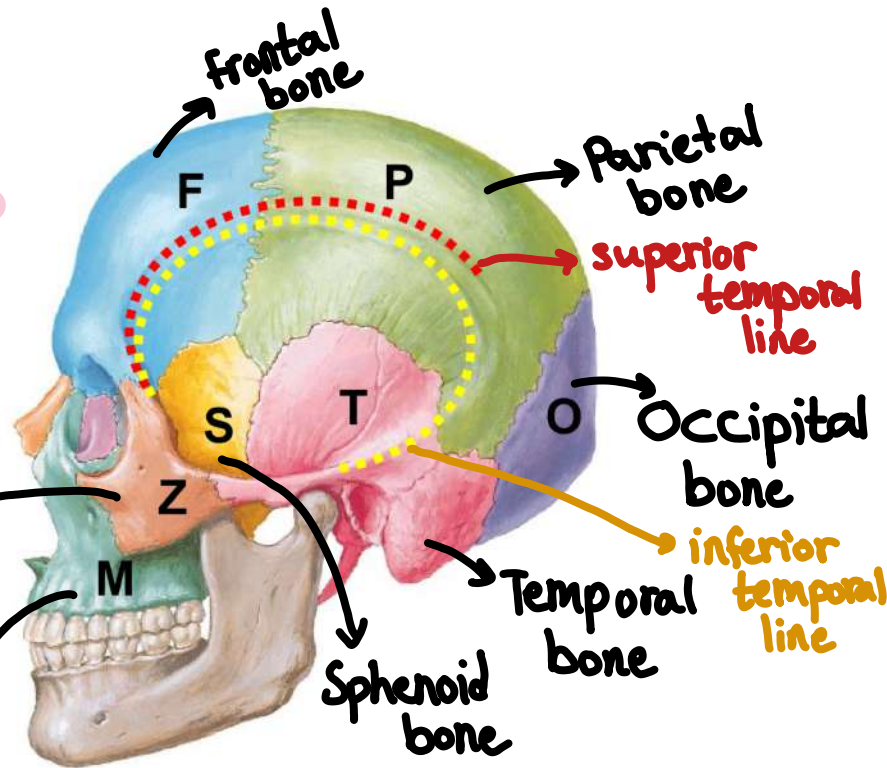
incomplete

*The superior temporal line: extends from zygomatic bone and passes backwards.

*The inferior temporal line: with the temporal fossa lies below it.

Zygomatic bone

Maxillary bone



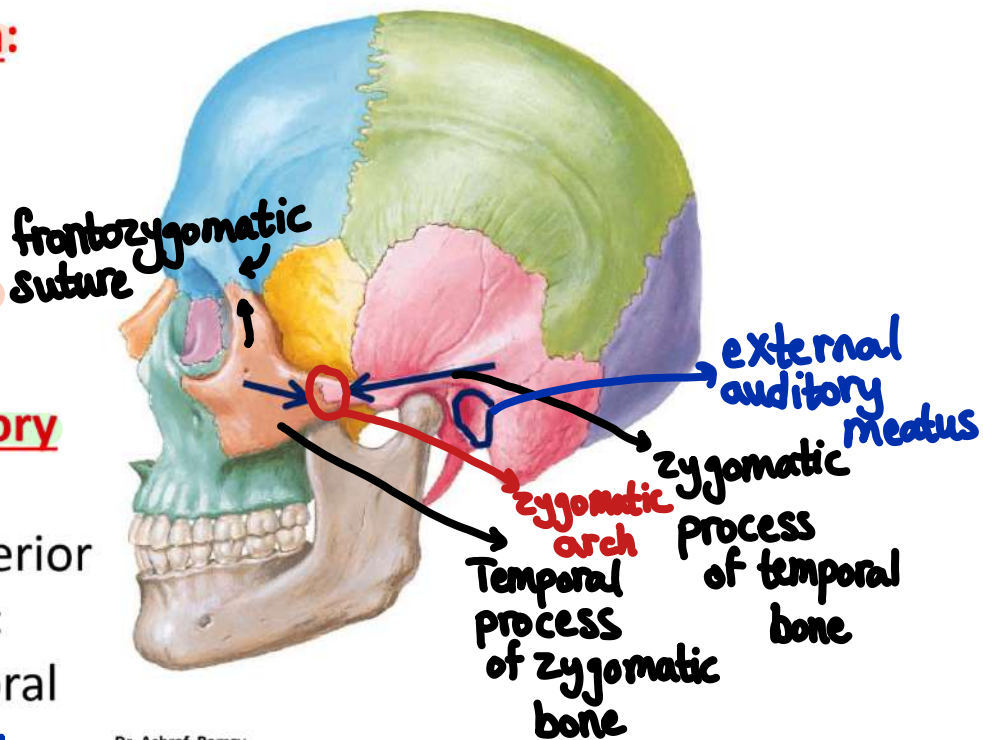
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* **The zygomatic arch:**

* Is formed by the temporal process of zygomatic bone and zygomatic process of temporal bone.

* **The external auditory meatus:**

* lies below the posterior part of the zygomatic process of the temporal bone. فتحة الأذن الخارجية



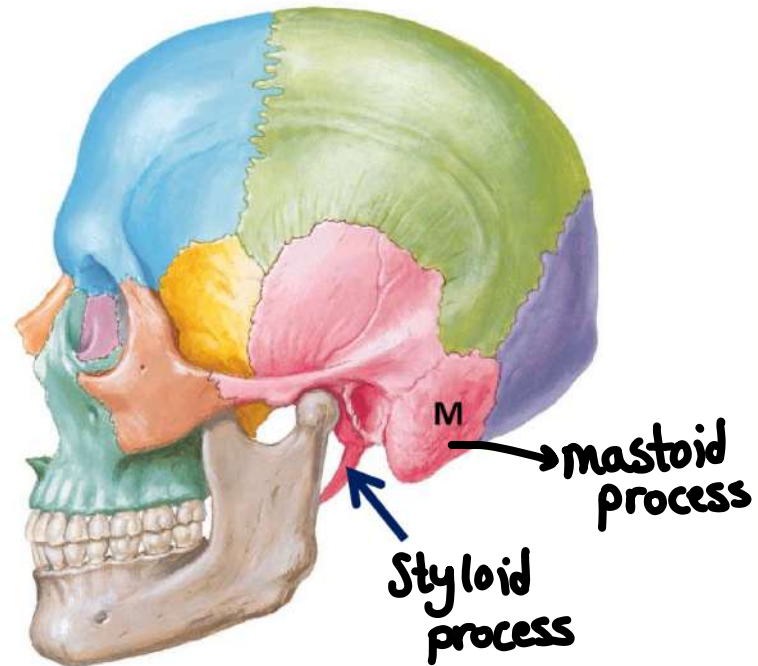
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*** The mastoid process (M):**

- * It is a part of the temporal bone.
- * It lies behind the external auditory meatus.

*** The Styloid process (↑):**

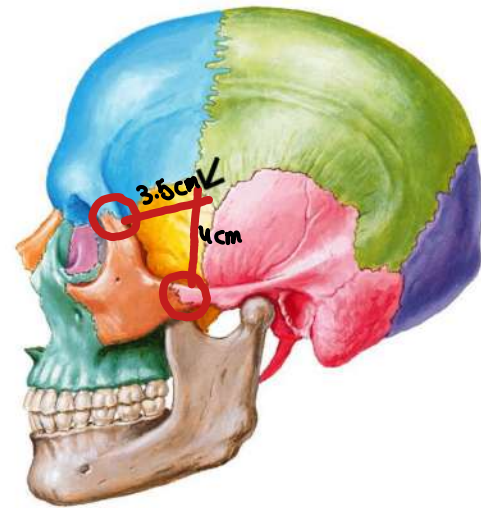
- * It is a slender projection of the temporal bone. → وضع



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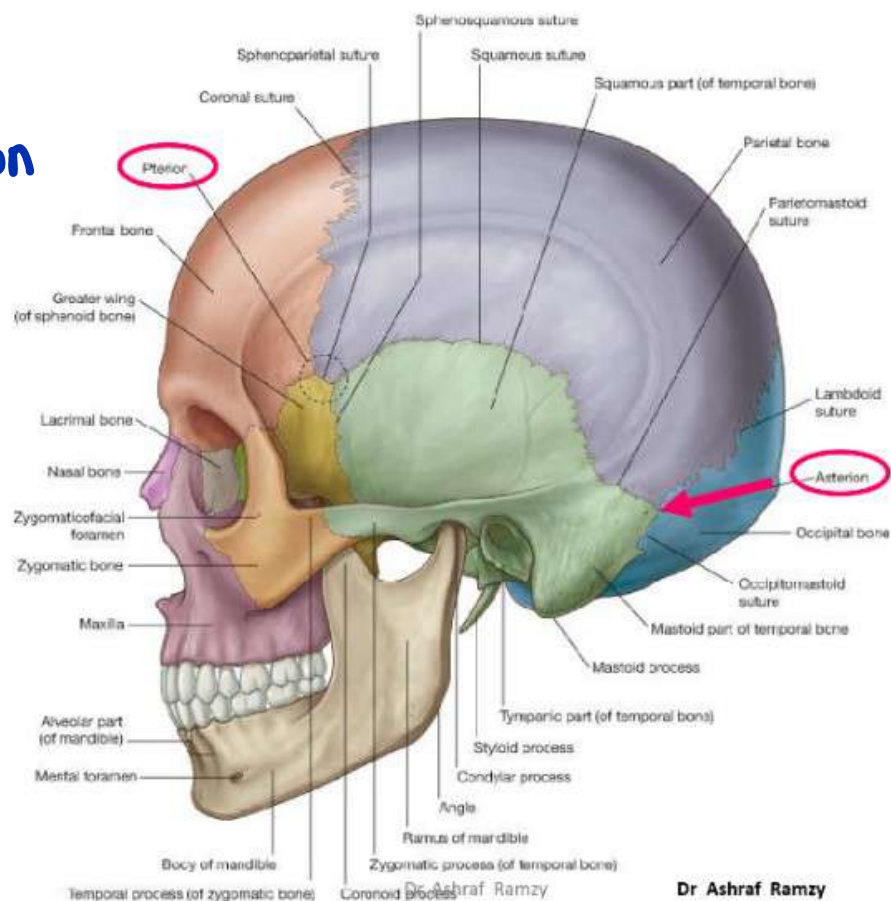
* **Pterion** (↓):

- * It is the meeting point of 4 bones, the frontal, parietal, temporal and greater wing of sphenoid.
- * It is an H-shaped suture.
- * It is the ossified anterolateral fontanelle at the age of 3 months.
- * The center of the pterion lies 4 cm above the mid-point of the zygomatic arch & 3.5 cm behind frontozygomatic suture.
- * It is related to the middle meningeal Artery
- * Since it is very thin, the pterion is the most frequently fractured part of skull in car accidents leading to hemorrhage (extradural hematoma) which compresses the motor area of the brain.



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Pterion

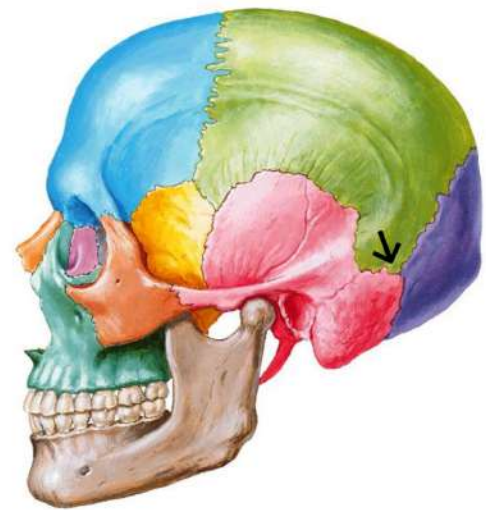


Asterion

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* **Asterion (↓):**

- * It is the meeting point of the parietal, occipital & mastoid part of temporal bones.
- * It is the site of posterolateral fontanelle which ossifies at the age of 3 months.



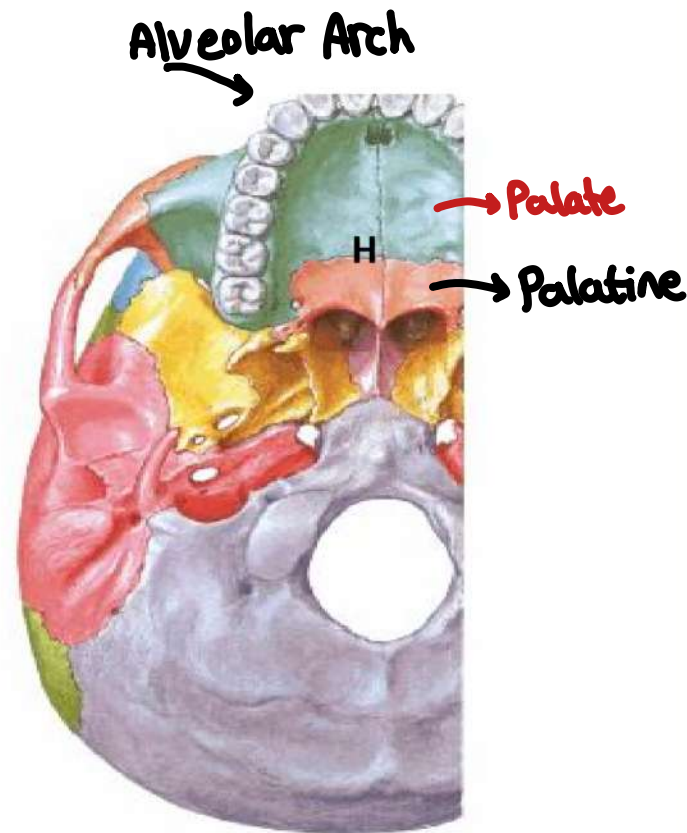
(inferior View)

Norma Basalis Externa

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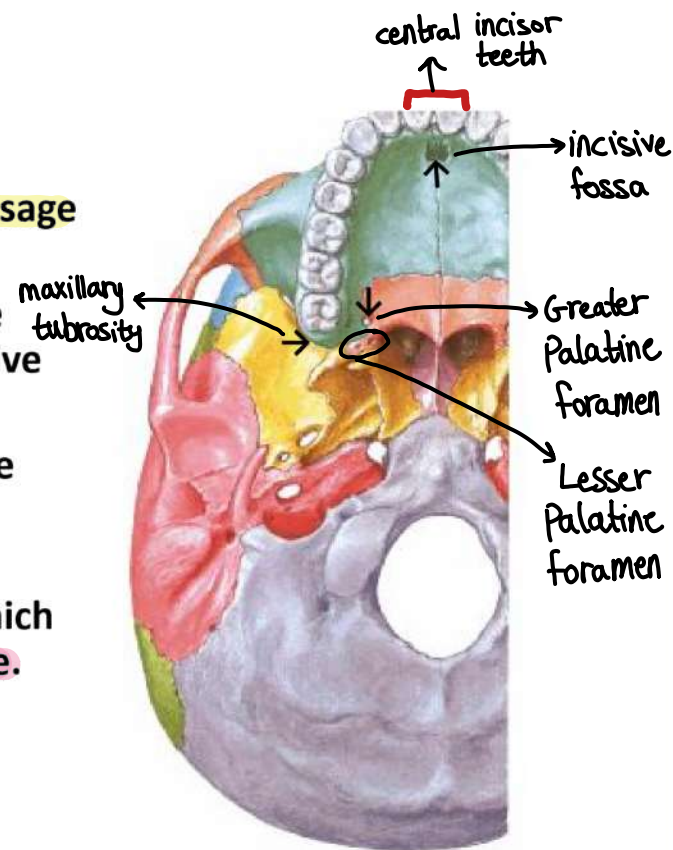
A. Anterior part:

- * It is formed by the **hard palate (H)**. سقف الحلق
- * The hard palate is bounded anteriorly by the **alveolar arch**, which has **16** sockets for the roots of the upper teeth.



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- * The **greater palatine foramen** (↓) lies in the posterior part of the hard palate. It gives passage to greater palatine nerve & vessels.
- * The **lesser palatine foramina**, usually two, lie behind the greater palatine foramen. They give passage to lesser palatine nerve & vessels.
- * The **maxillary tuberosity** (→) is present at the posterior end of the alveolar arch.
- * The **incisive fossa** (↑) lies posterior to the central incisor teeth. It contains foramina which serve as a connection between palate & nose.



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central
incisor
teeth

B. Middle part:

* In the **middle** it shows:

1. Vomer.
2. Body of sphenoid.
3. Basilar part of occipital bone.

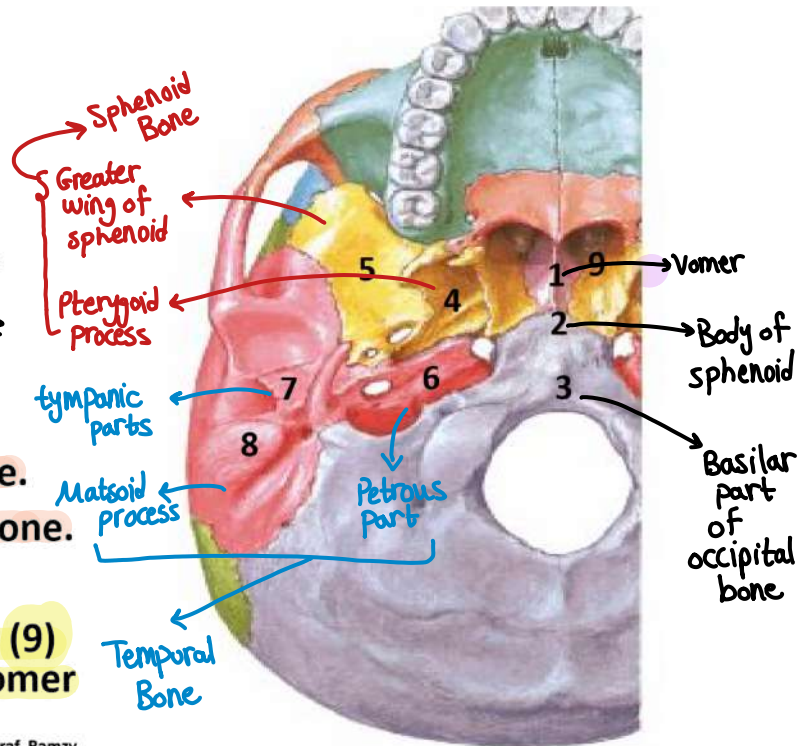
* **Laterally** it shows:

4. Pterygoid process. جند من Sphenoid
5. Greater wing of sphenoid.
6. Petrous part of temporal bone.
7. tympanic parts of temporal bone.
8. Mastoid process.

* It contains: Posterior nasal openings (9) (choanae) which are separated by vomer (part of nasal septum).

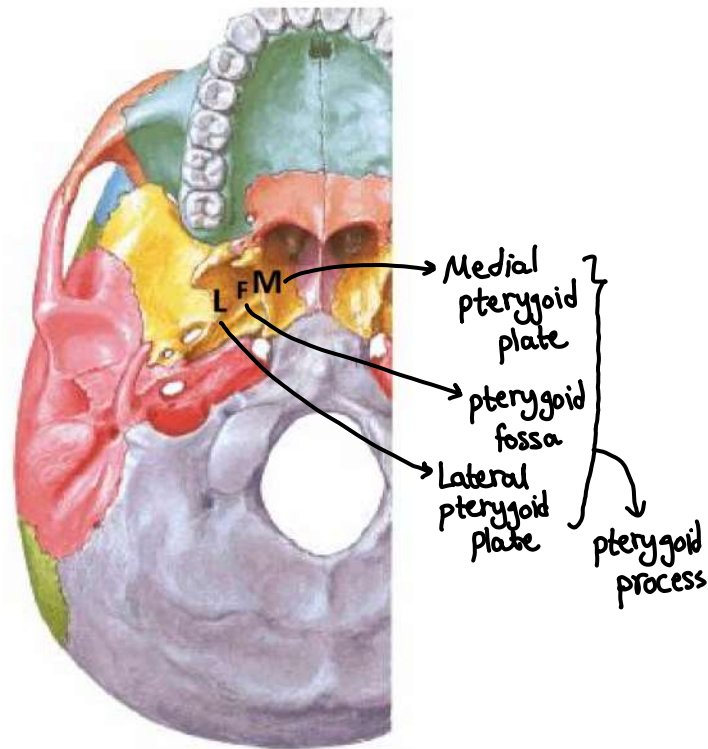
حاجز

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**** The pterygoid process of the sphenoid bone:**

- * It is formed of lateral pterygoid plate (L) and medial pterygoid plate (M) with the pterygoid fossa (F) in between.**



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**** The greater wing of sphenoid bone shows:**

1. Foramen ovale (↓):

* Gives passage to:

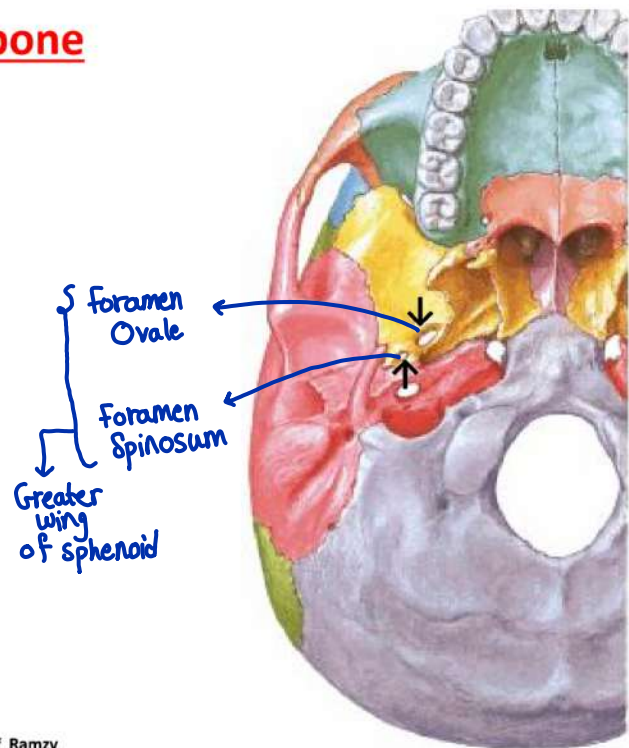
- a. Mandibular nerve.
- b. Lesser petrosal nerve.
- c. Accessory meningeal artery.

(MAL)

2. Foramen spinosum (↑):

* Gives passage to:

- a. Nervus spinosus.
- b. Middle meningeal artery.

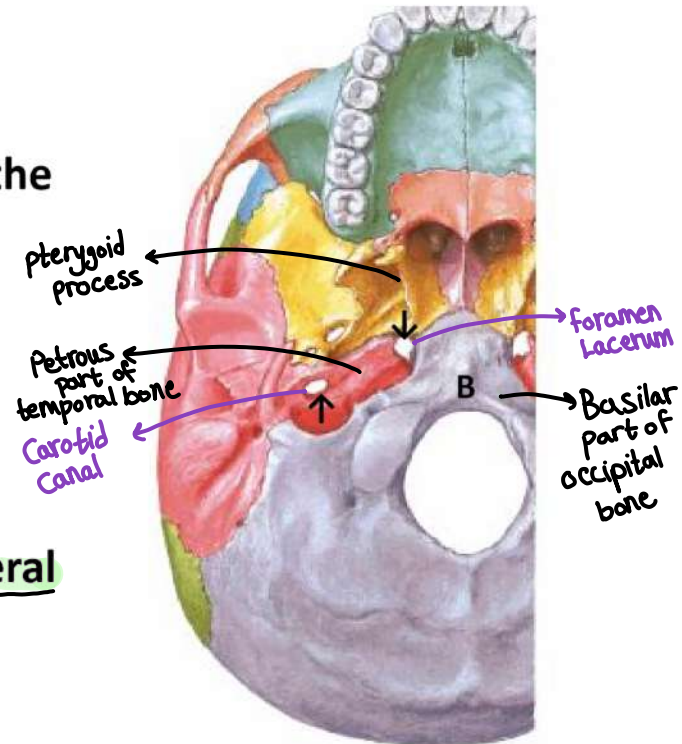


C. Posterior part:

**** The basilar part of occipital bone (B)** articulates anteriorly with the body of the sphenoid bone.

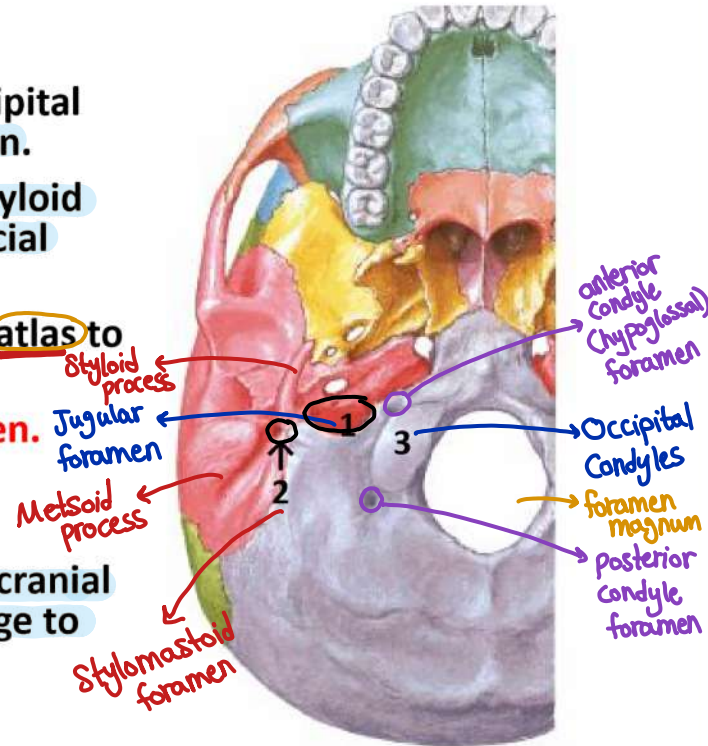
**** Foramen lacerum (↓)** lies between petrous part of temporal bone, basilar part of occipital and the pterygoid process. In life it is closed by cartilage plate.

**** The carotid canal (↑):** lies posterolateral to foramen lacerum. Gives passage to internal carotid artery.



**** Notice the following:**

1. The **jugular foramen**: lies lateral to the occipital condyle. Gives passage to internal jugular vein.
2. The **stylomastoid foramen**: lies between styloid and mastoid processes. Gives passage to facial nerve.
3. The **occipital condyles**: articulate with the atlas to form atlanto-occipital joint.
4. The **anterior condylar (hypoglossal) foramen**. Gives passage to hypoglossal nerve.
5. The **posterior condylar foramen**.
6. The **foramen magnum**: communicates the cranial cavity with the vertebral canal. Gives passage to brain stem which continues as spinal cord.



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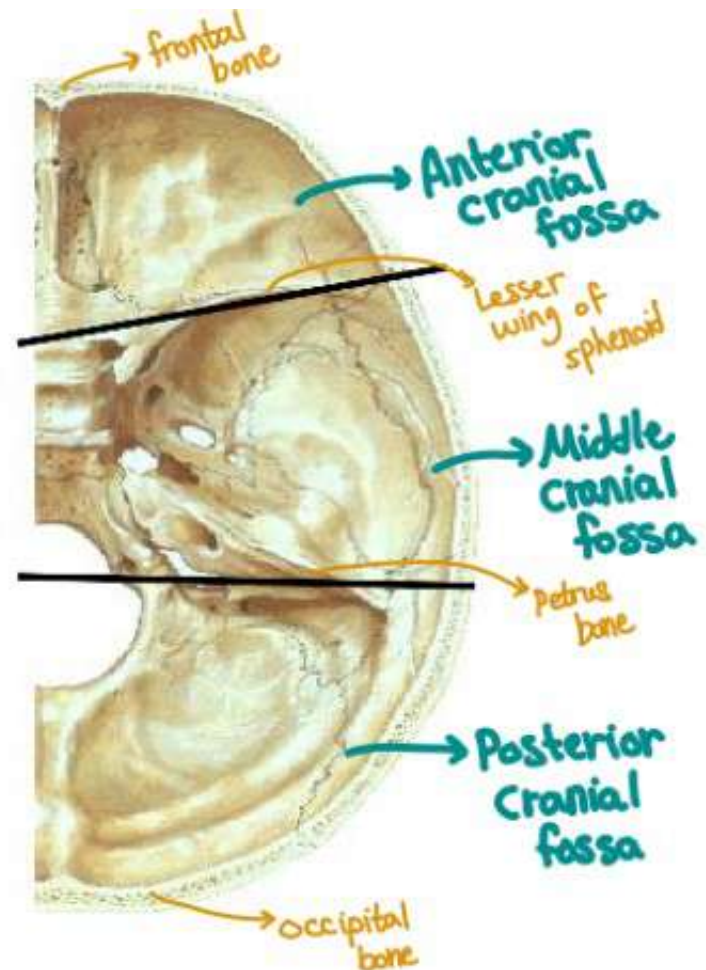
Atlas → first cervical Vertebra (C₁)

Cranial Cavity

Internal Structure of Base of Skull

* It is divided into:

1. Anterior cranial fossa.
2. Middle cranial fossa.
3. Posterior cranial fossa.



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Ant. Cranial Fossa

* It is formed by the following bones:

* In the **midline**:

1- Frontal bone.

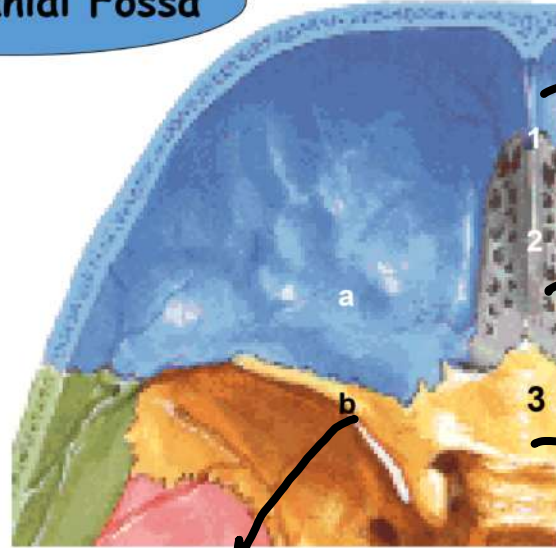
2- Ethmoid.

3- Sphenoid.

* On each side:

a. Frontal bone.

b. Sphenoid (lesser wing).



→ Frontal Bone

→ Ethmoid Bone

→ Sphenoid Bone

Lesser wing of sphenoid

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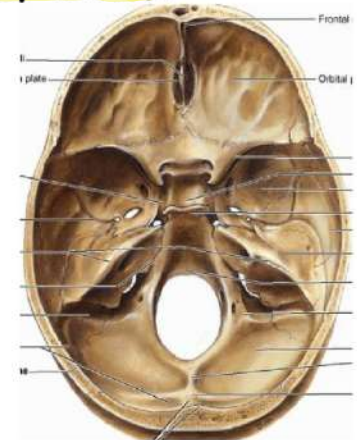
*** Midline structures of the anterior cranial fossa:**

1. Frontal crest.
2. Foramen caecum.
3. Crista galli.
4. Cribriform plate of ethmoid (gives passage to olfactory nerve).



foramen Caecum
frontal
Crest
Crista galli
Cribriform plate
of ethmoid

→ nerve of smell



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Middle Cranial Fossa

* Formed by the following bones:

* In the midline

Sphenoid (body).

* On each side:

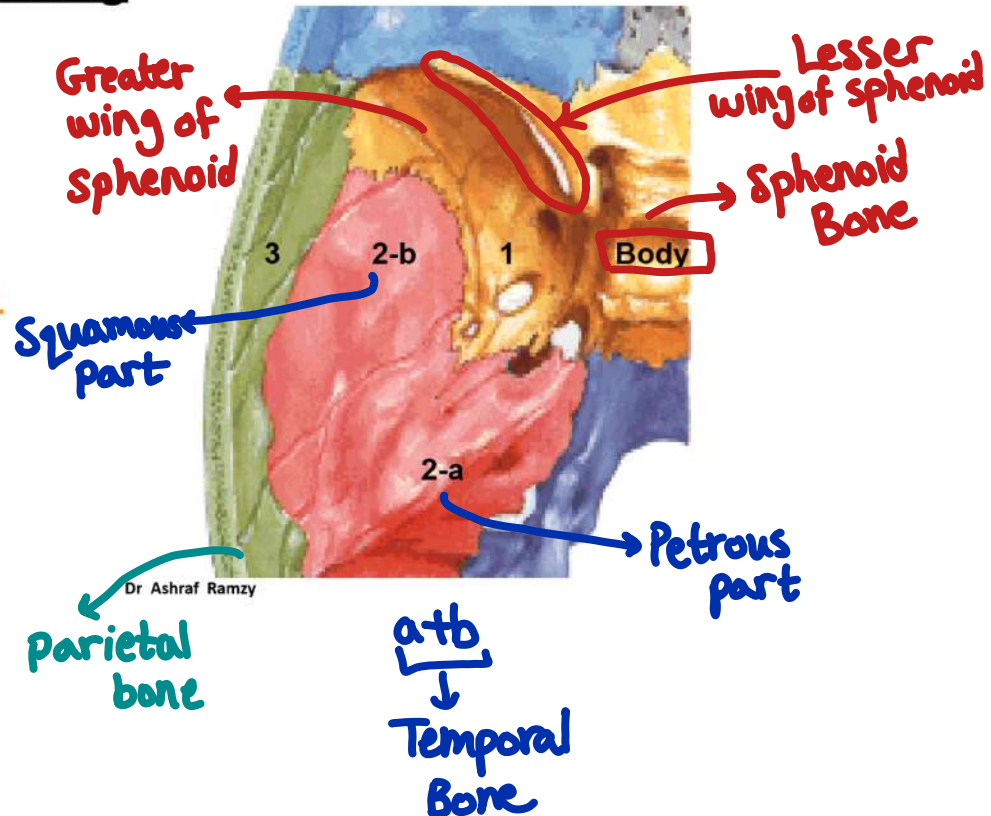
1- Sphenoid (greater wing).

2- Temporal bone:

a. Petrous part.

b. Squamous part.

3- Parietal bone.



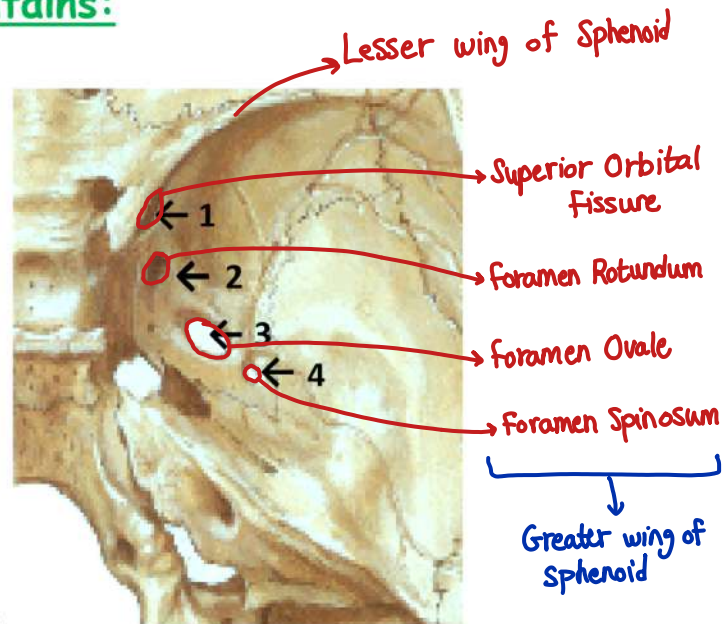
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Figure 1 shows a lateral view of a human mandible specimen. Three anatomical landmarks are identified and labeled with blue circles: 'Ls' (Lingual surface) on the lingual side, 'Gr' (Gonion) at the distal end, and 'B' (Body) on the anterior body. A scale bar at the bottom indicates a length of 10 cm.

* Middle cranial fossa shows:

Greater wing of sphenoid which contains:

1. **Sup. Orbital Fissure** → gives passage to nerves & vessels of orbit.
2. F. **R**otundum → gives passage to maxillary nerve
3. F. **O**vale.
4. F. **S**pinosum.



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Post. Cranial Fossa

* Formed by the following bones:

* In the midline:

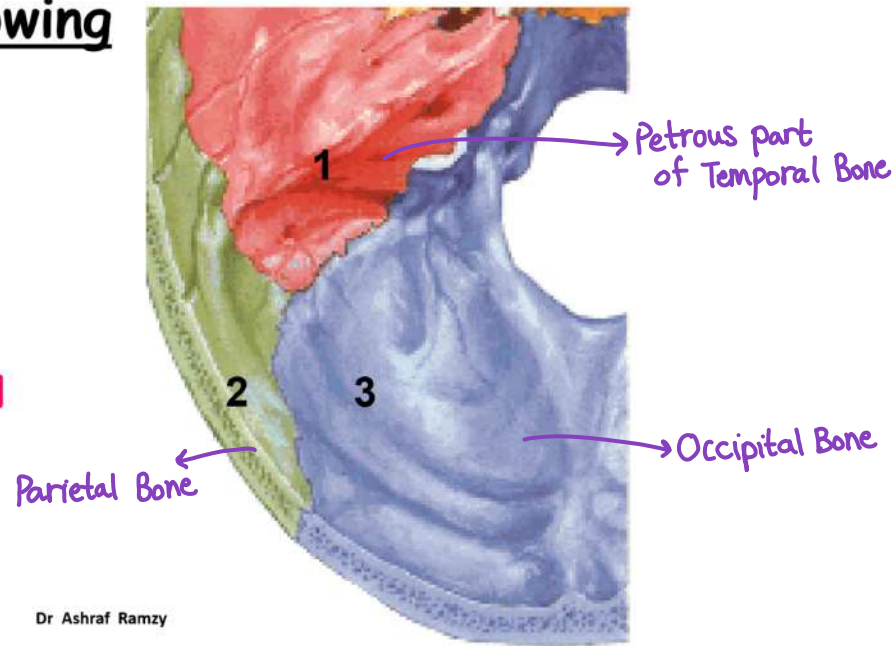
Occipital bone.

* Laterally-placed:

1- Petrous part of temporal bone.

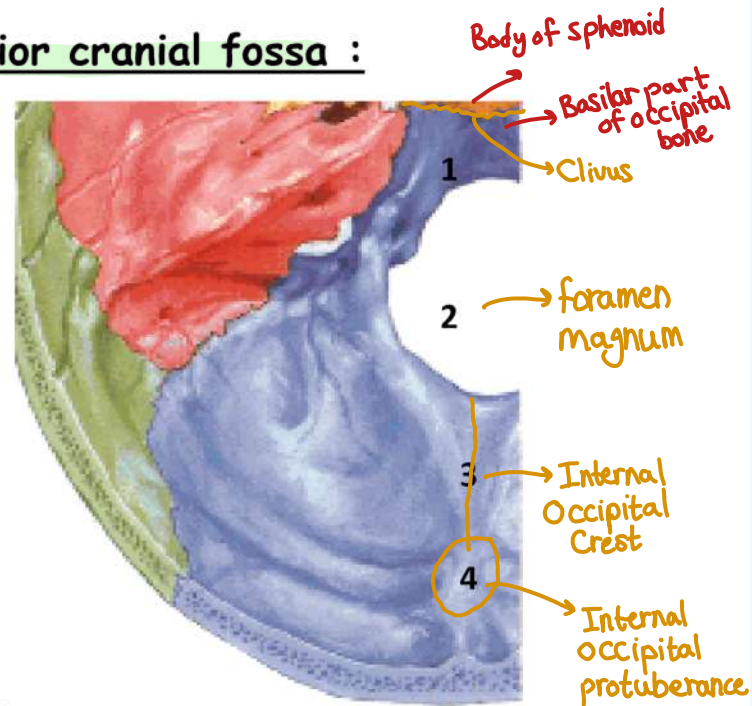
2- Parietal bone.

3- Occipital bone.



* Midline structures in the posterior cranial fossa :

1. Clivus (formed by: body of sphenoid + basilar part of occipital bone). → joint
2. Foramen magnum.
3. Internal occipital crest.
4. Internal occipital protuberance.



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* Laterally-placed structures in the post. cranial fossa:

* Two sulci & 3 foramina:

1. Transverse sulcus (contains transverse sinus). ^{Vein}
2. Sigmoid sulcus (contains sigmoid sinus).
3. Hypoglossal canal (gives passage to hypoglossal nerve).
4. Jugular foramen (gives passage to internal jugular vein).
5. internal auditory meatus → gives passage to 7th & 8th cranial nerves).
 ↓ facial nerve
 ↓ vestibulocochlear nerve

