Skull-2

Norma Basalis Interna

Norma Basalis Externa

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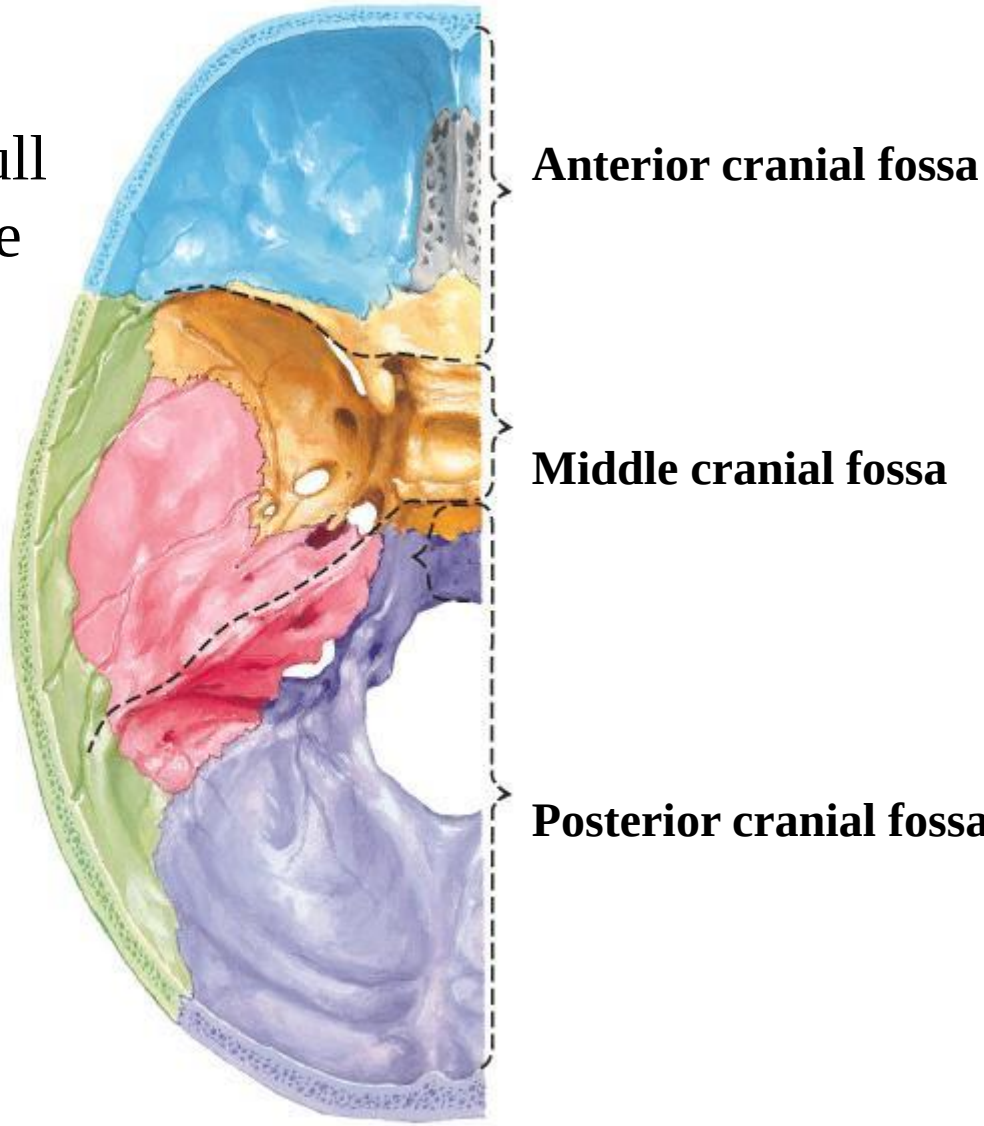
DDS, MSc, DMD/PhD
Professor of Anatomy, Histology and Embryology

Norma basalis interna

Base of the skull- superior view

The interior of the base of the skull is divided into three cranial fossae



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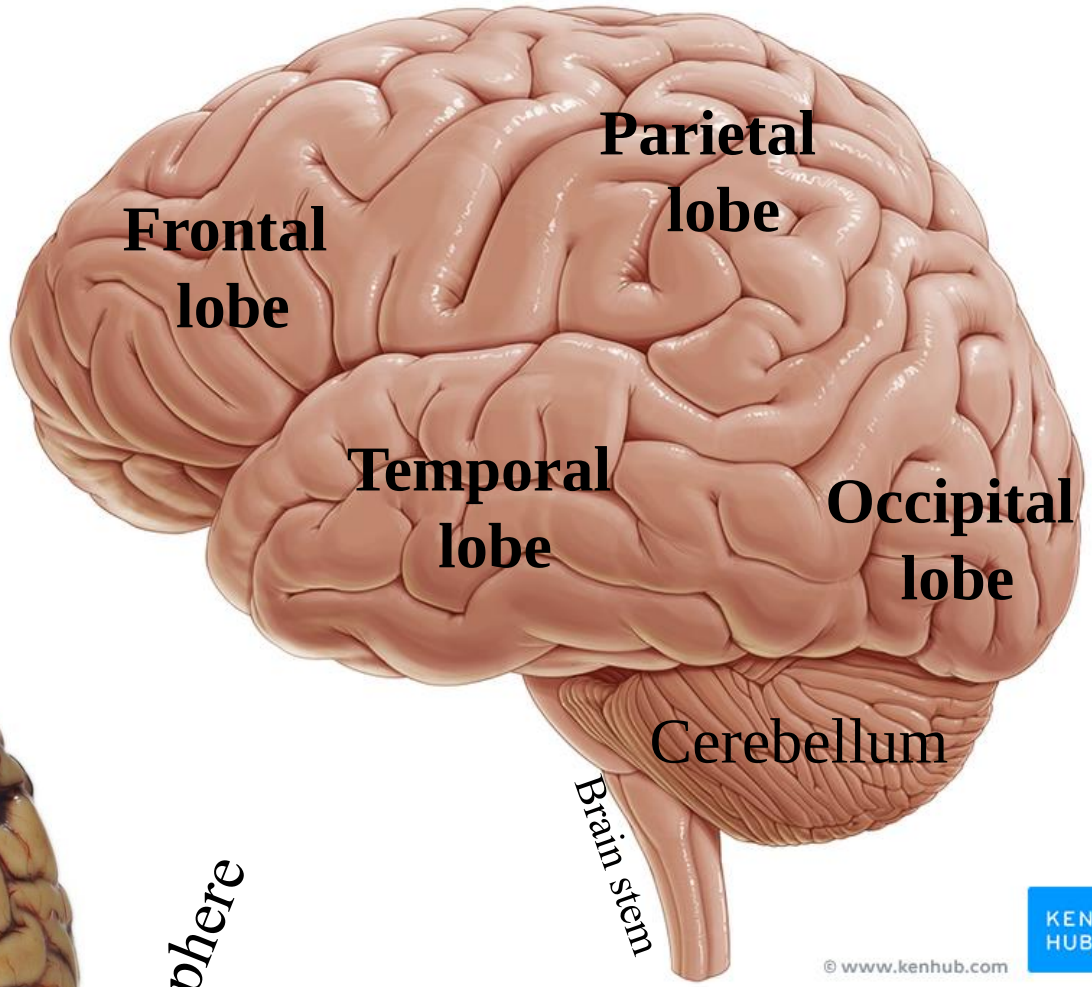
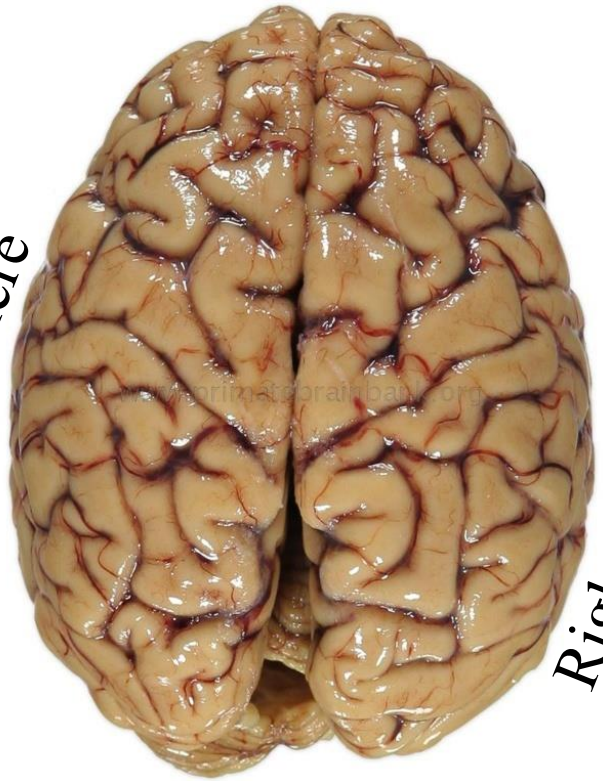
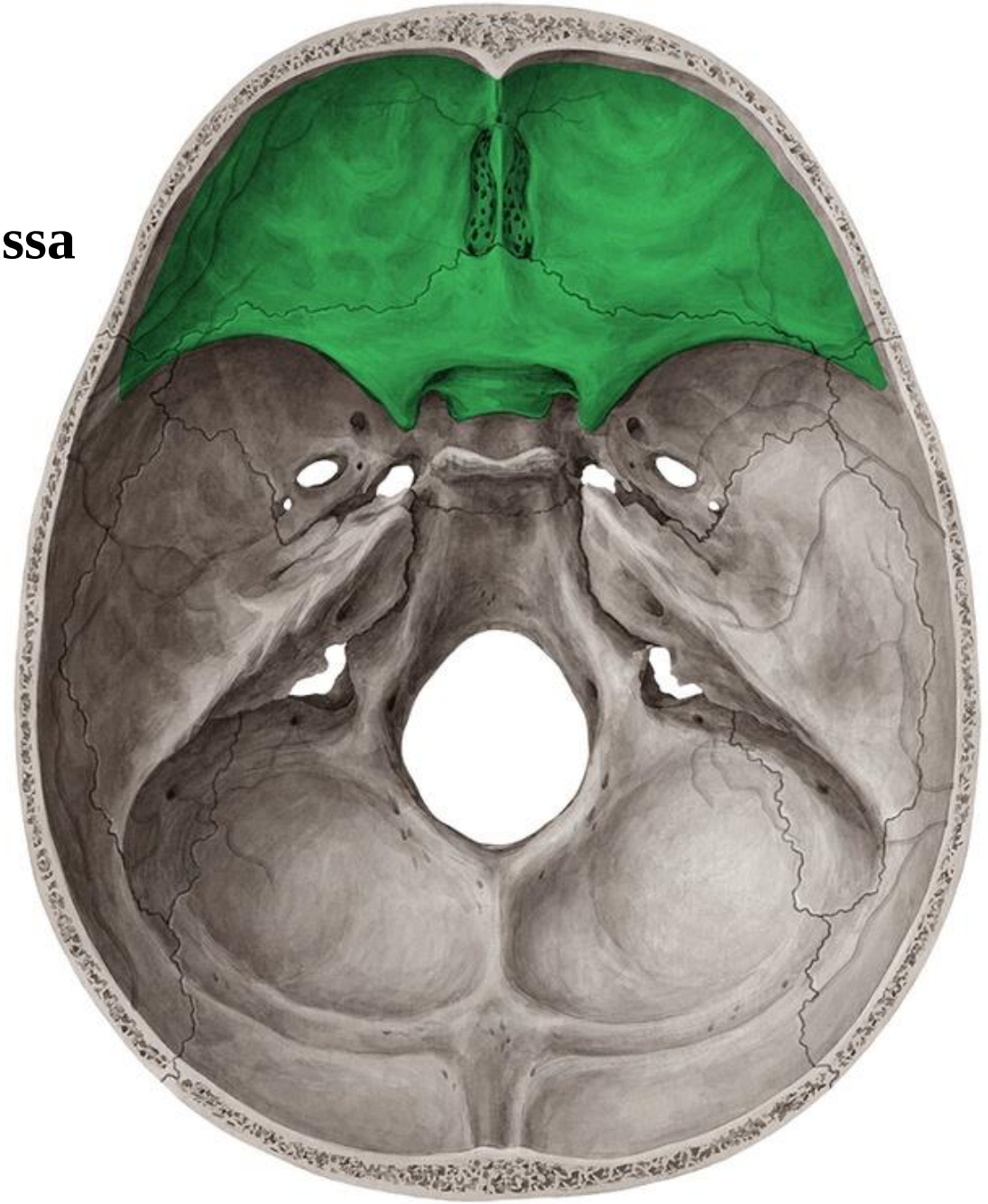




Anterior cranial fossa

Contains frontal lobes



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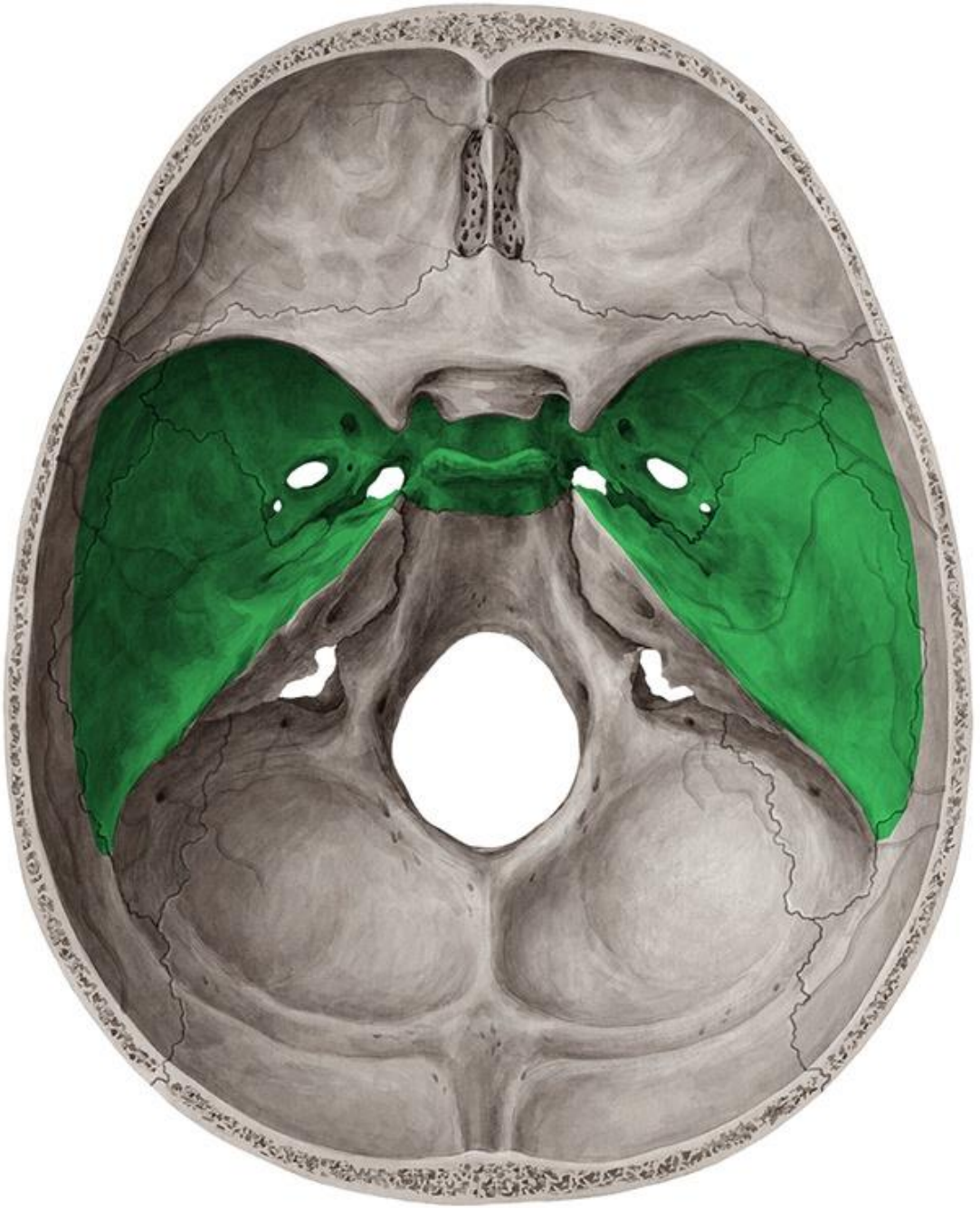
Middle cranial fossa

Contains temporal lobes



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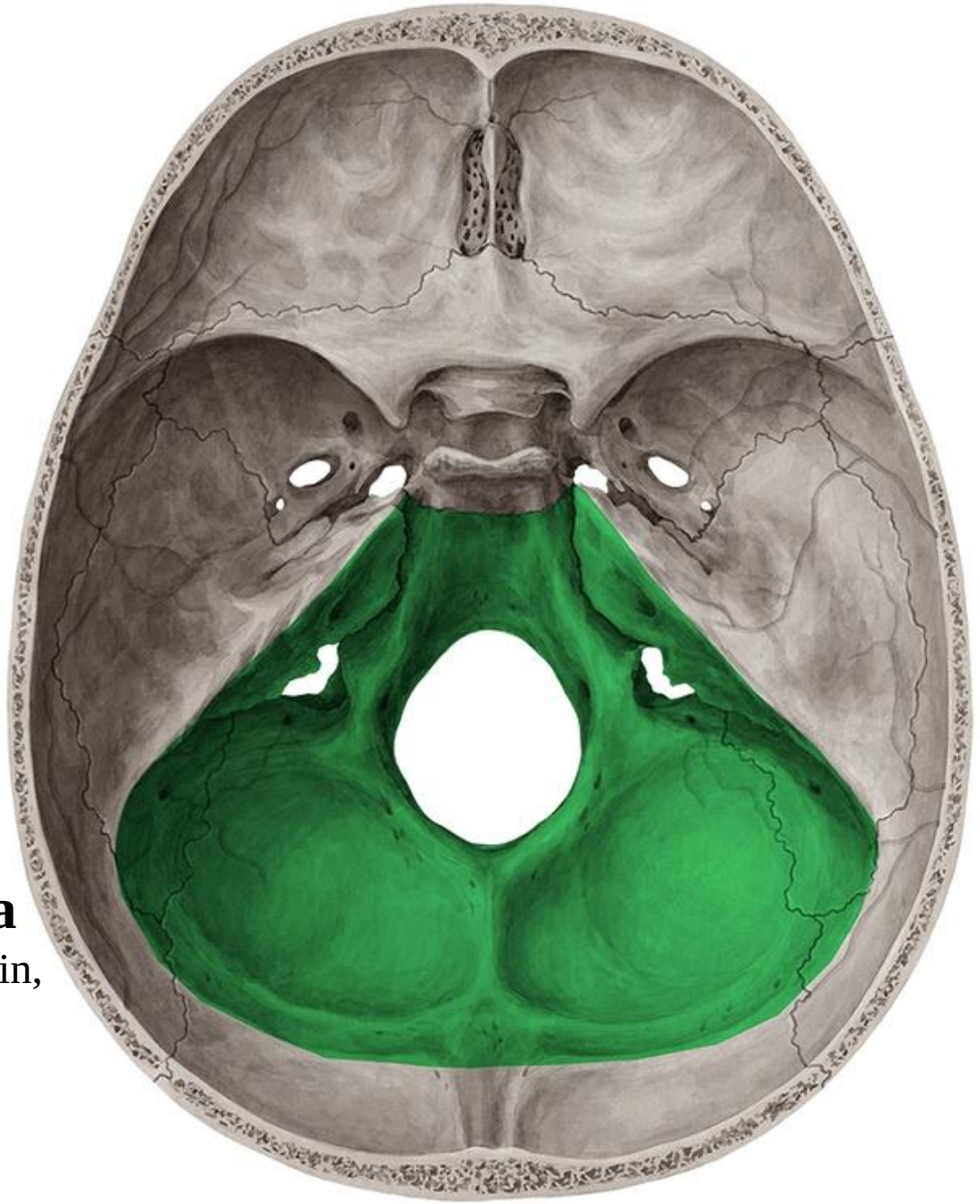

Posterior cranial fossa

Contains the brain stem (midbrain, pons and medulla oblongata) and cerebellum

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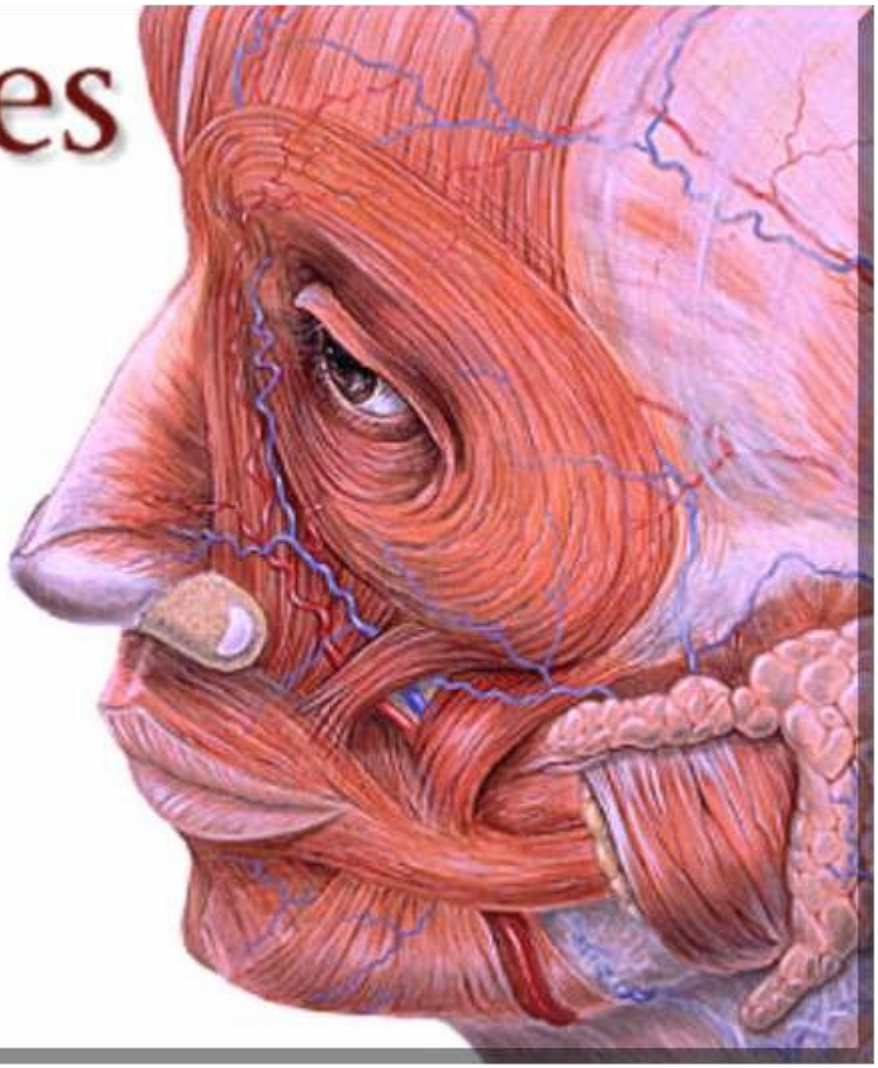
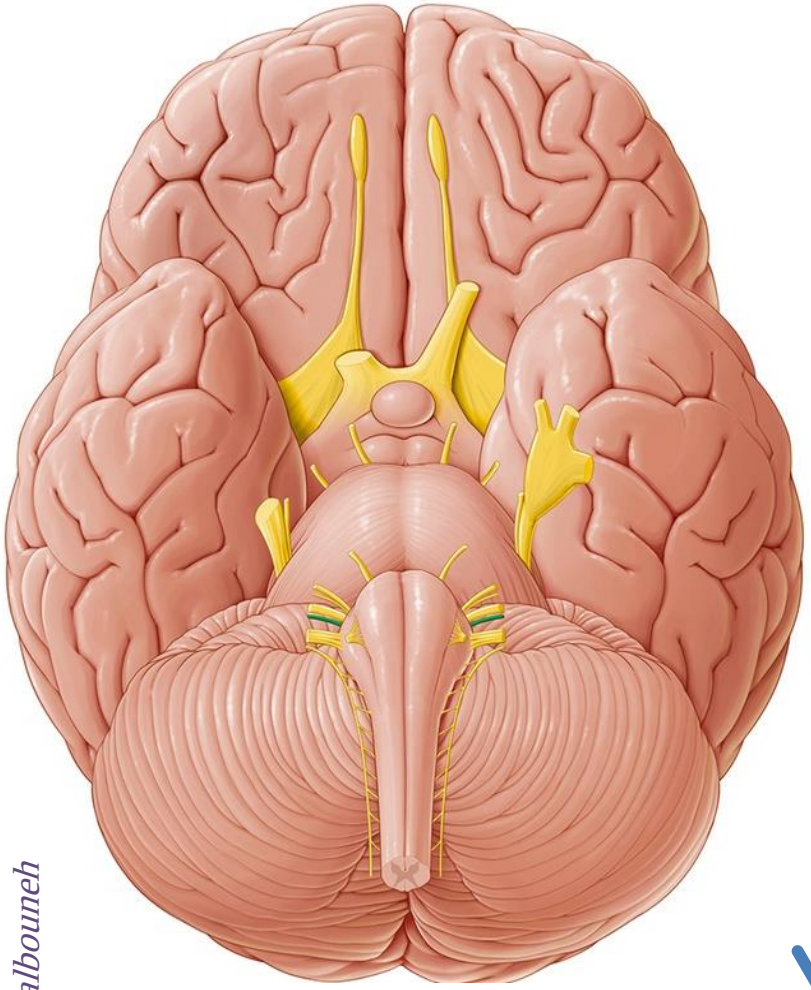
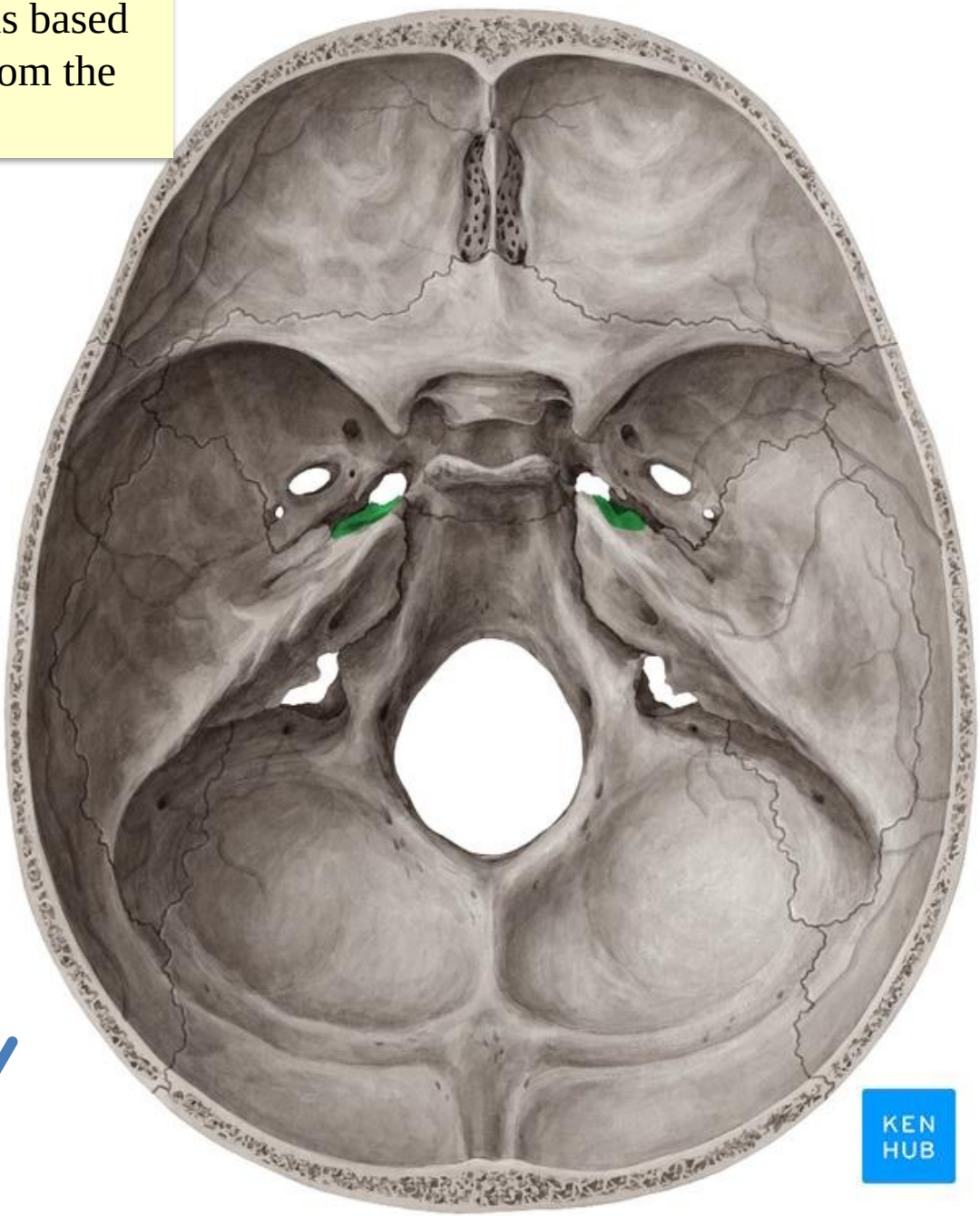
Cranial Nerves

I	Olfactory
II	Optic
III	Oculomotor
IV	Trochlear
V	Trigeminal
VI	Abducens
VII	Facial
VIII	Vestibulocochlear
IX	Glossopharyngeal
X	Vagus
XI	Accessory
XII	Hypoglossal



The numbering of the cranial nerves is based on the order in which they emerge from the brain, front to back





Inferior surface of brain

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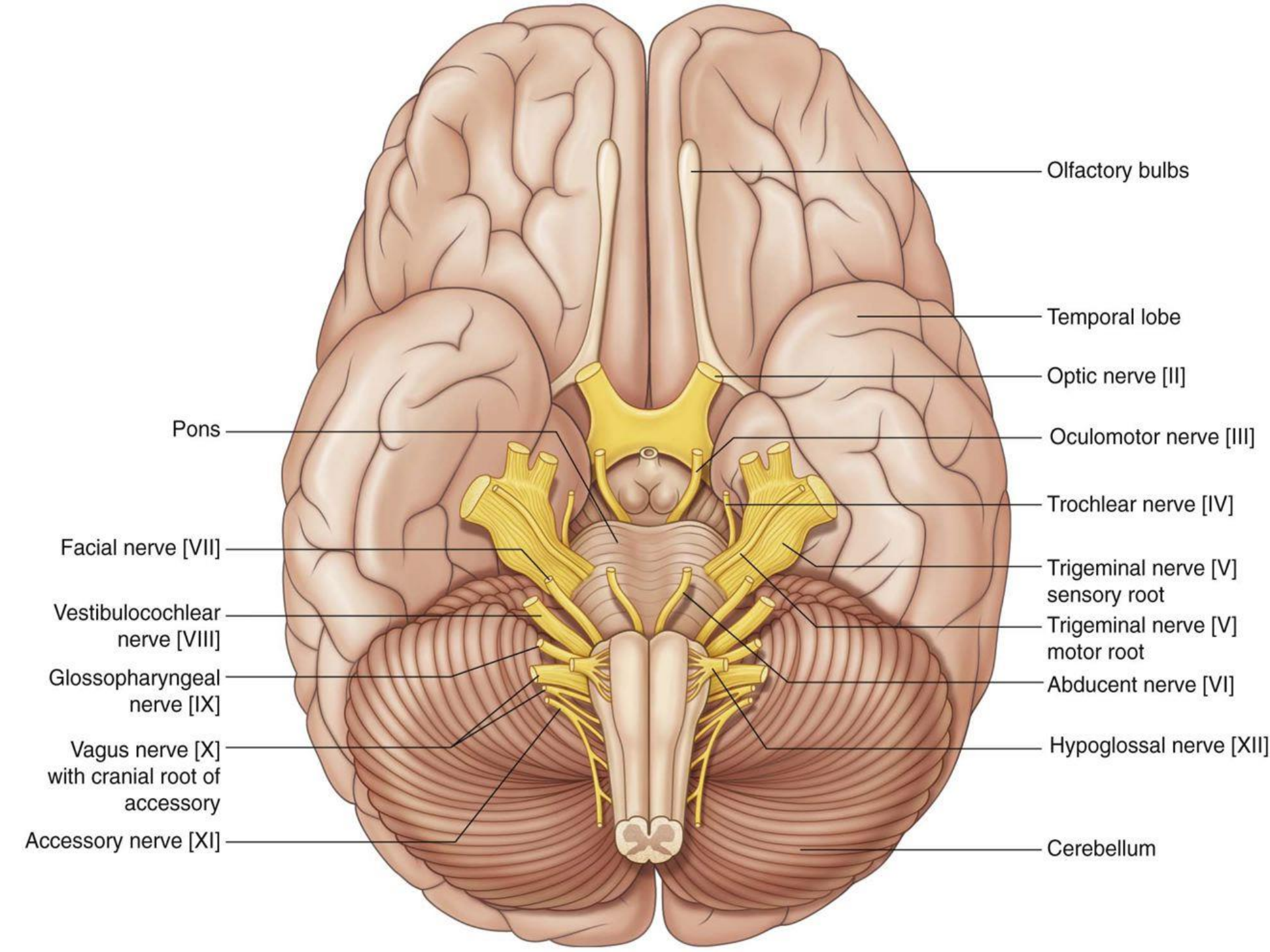
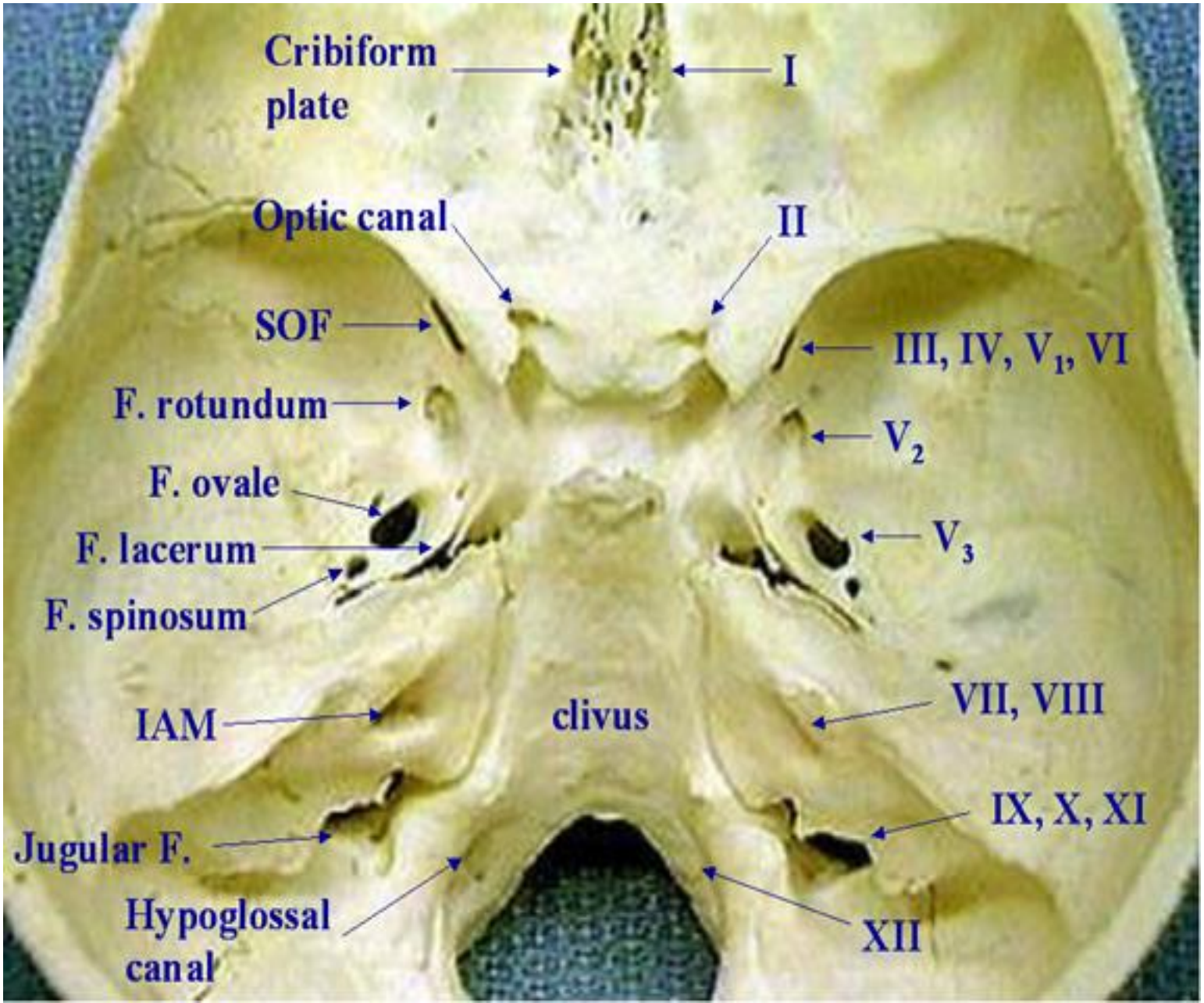

Olfactory bulbs
Temporal lobe
Optic nerve [II]
Pons
Oculomotor nerve [III]
Trochlear nerve [IV]
Facial nerve [VII]
Trigeminal nerve [V] sensory root
Vestibulocochlear nerve [VIII]
Trigeminal nerve [V] motor root
Glossopharyngeal nerve [IX]
Abducent nerve [VI]
Vagus nerve [X] with cranial root of accessory
Hypoglossal nerve [XII]
Accessory nerve [XI]
Cerebellum

Foramina of skull and cranial nerves passing through



Anterior cranial fossa

Formed by:
1- Frontal bone
2- Ethmoid bone in the midline
3-Two parts of the sphenoid bone, the body (midline) and the lesser wings (laterally)

Orbital plates of the frontal bone are thin plates of frontal bone, form the roof of the orbit
Frontal crest is a small crest projects from frontal bone
Crista galli is a sharp upward projection of the ethmoid bone in the midline
Cribriform plate of the ethmoid is a sieve-like structure lateral to crista galli

Note the anterior cranial fossa is above the nasal cavity and the orbits

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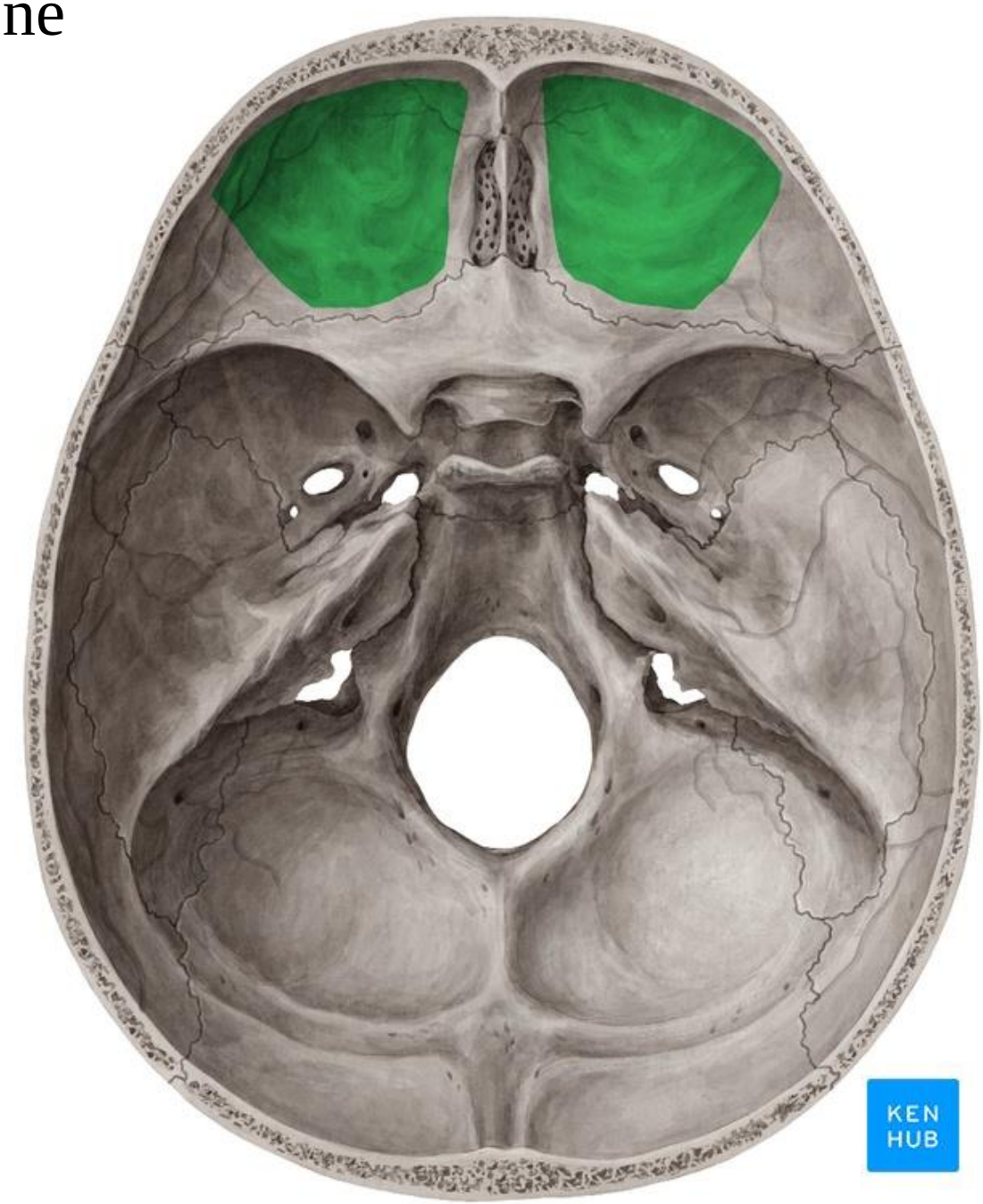
Orbital plates of frontal bone



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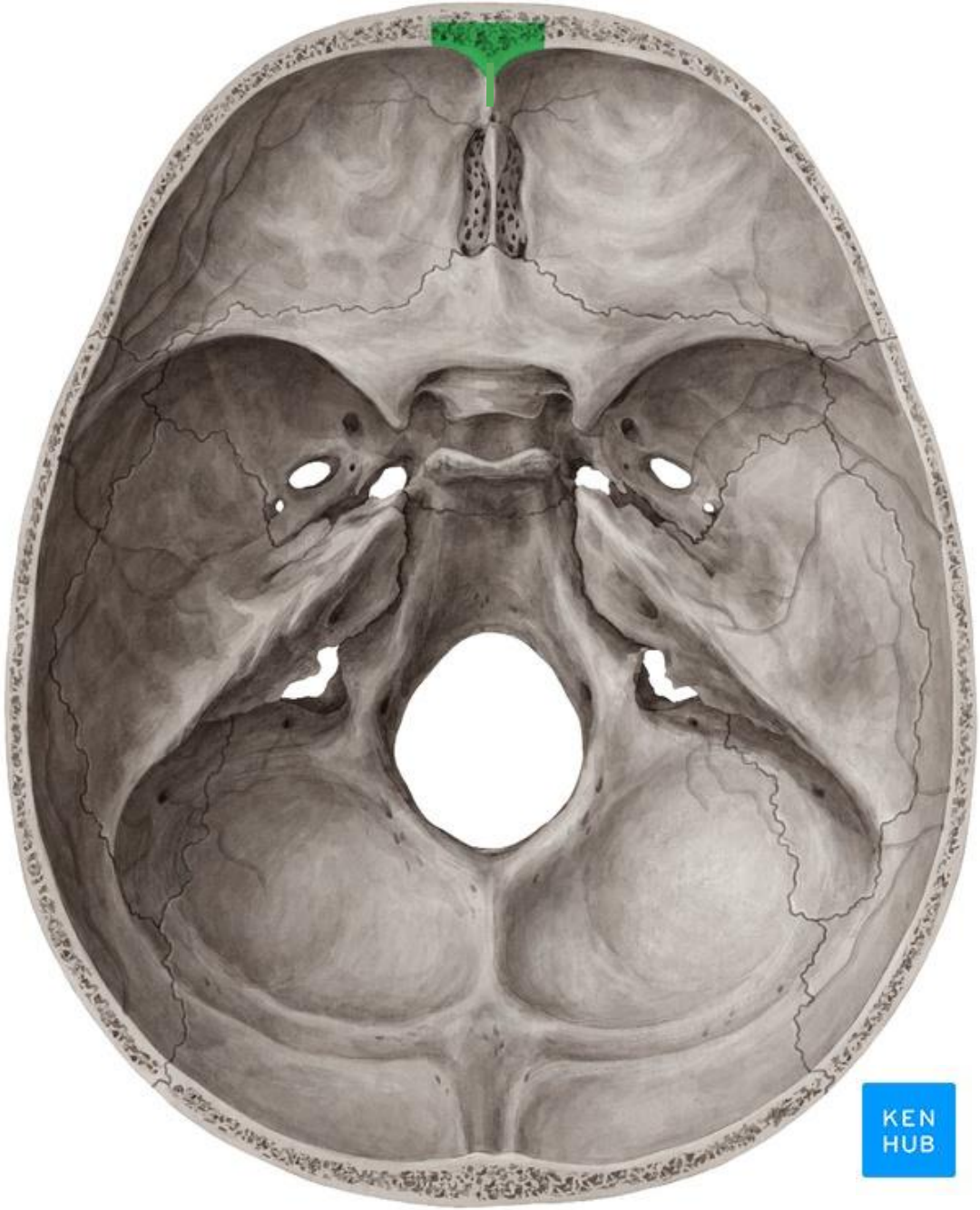
Frontal crest



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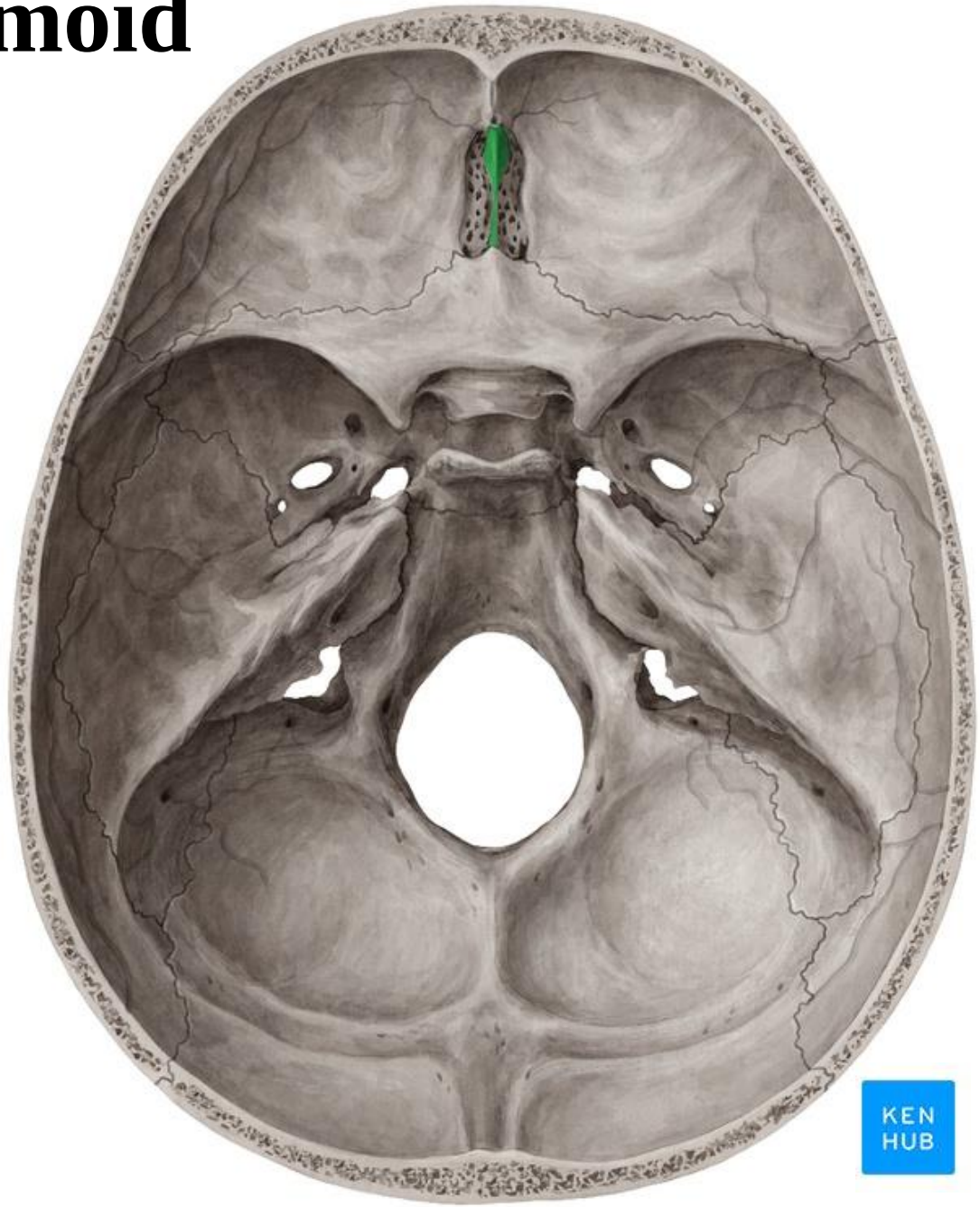
Crista galli of ethmoid

Latin: Crest of the rooster



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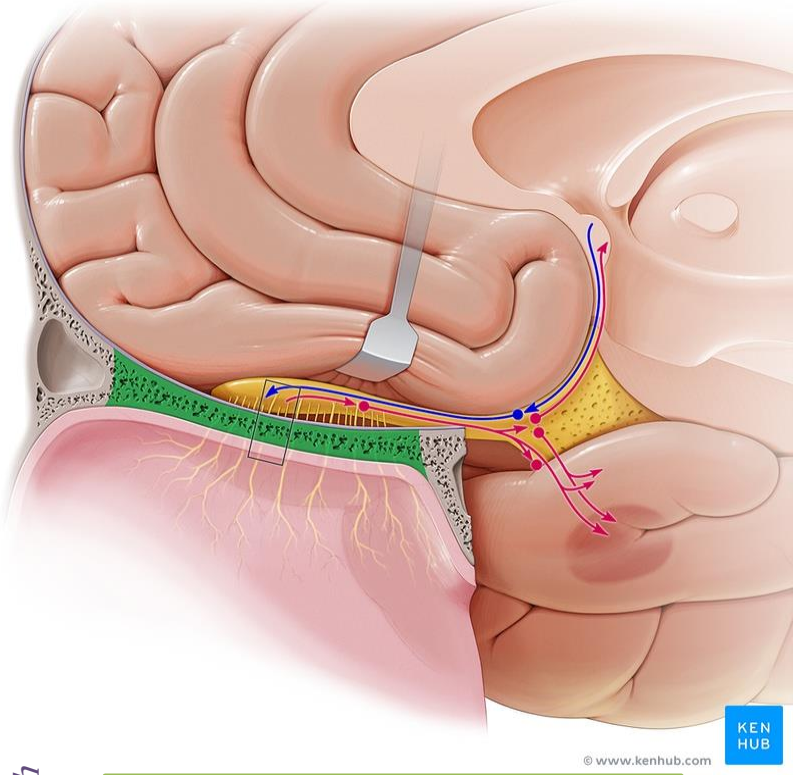
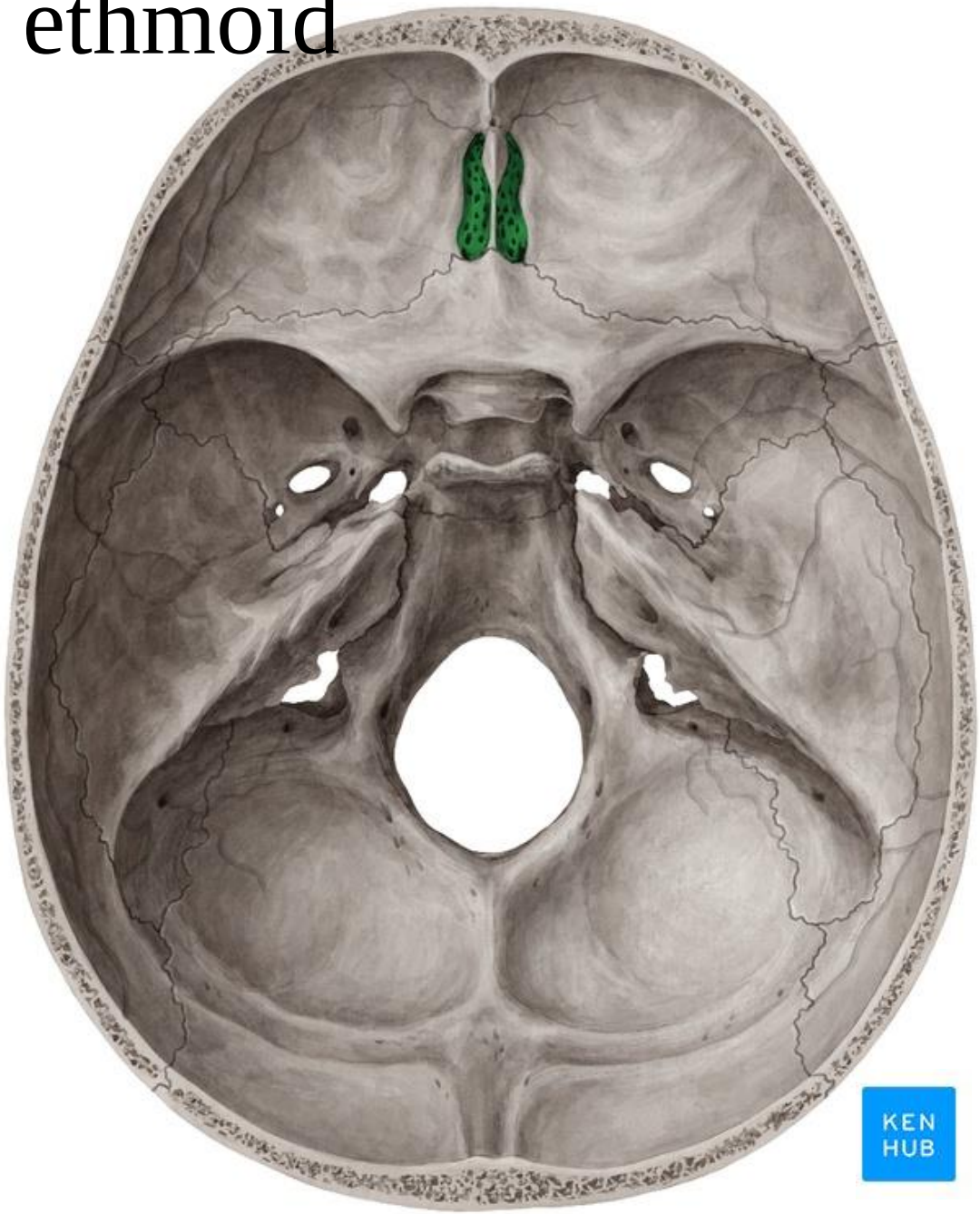
Cribriform plate of ethmoid





The small perforations in the cribriform plate are for the **olfactory nerves**.

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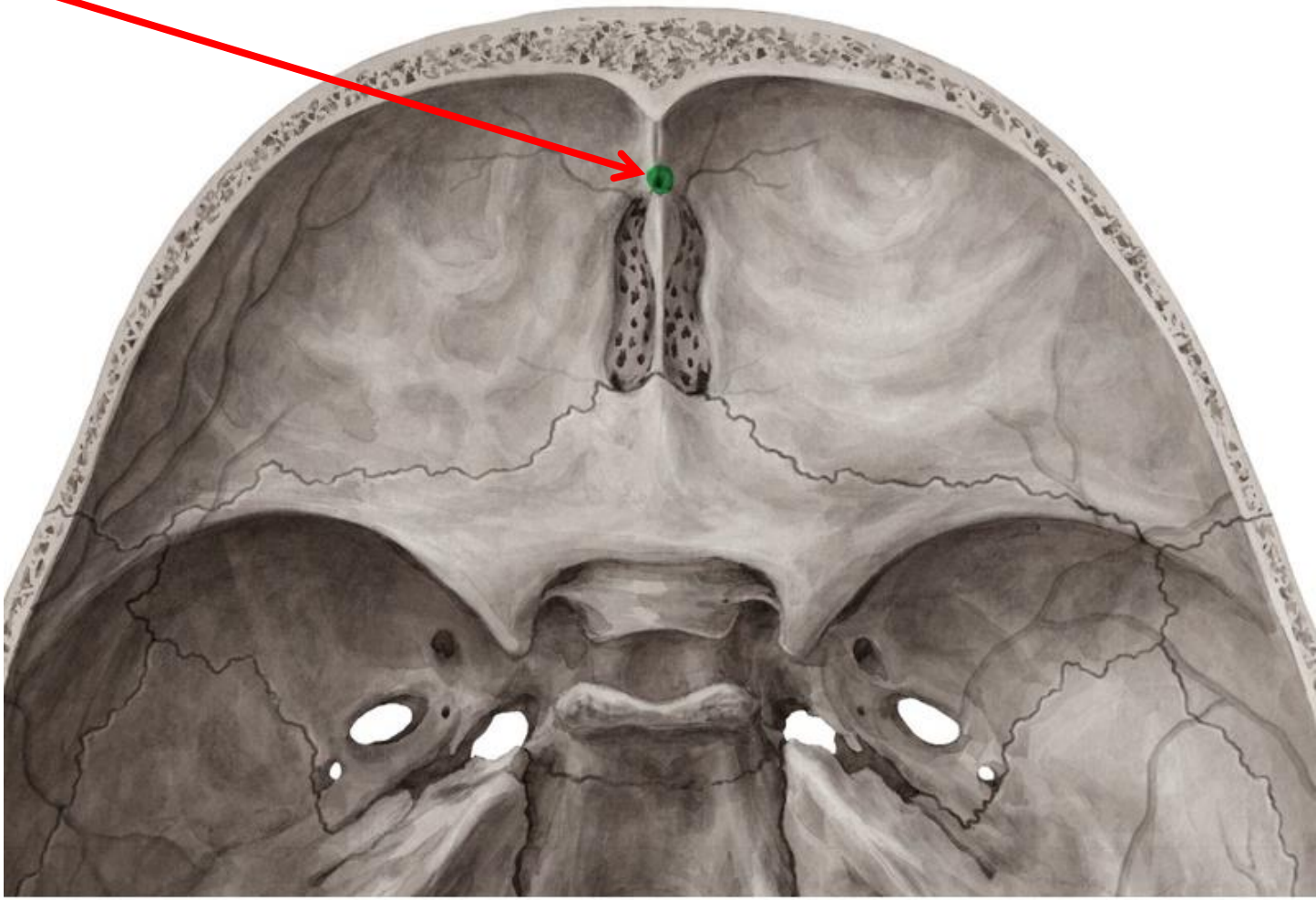
Foramen caecum



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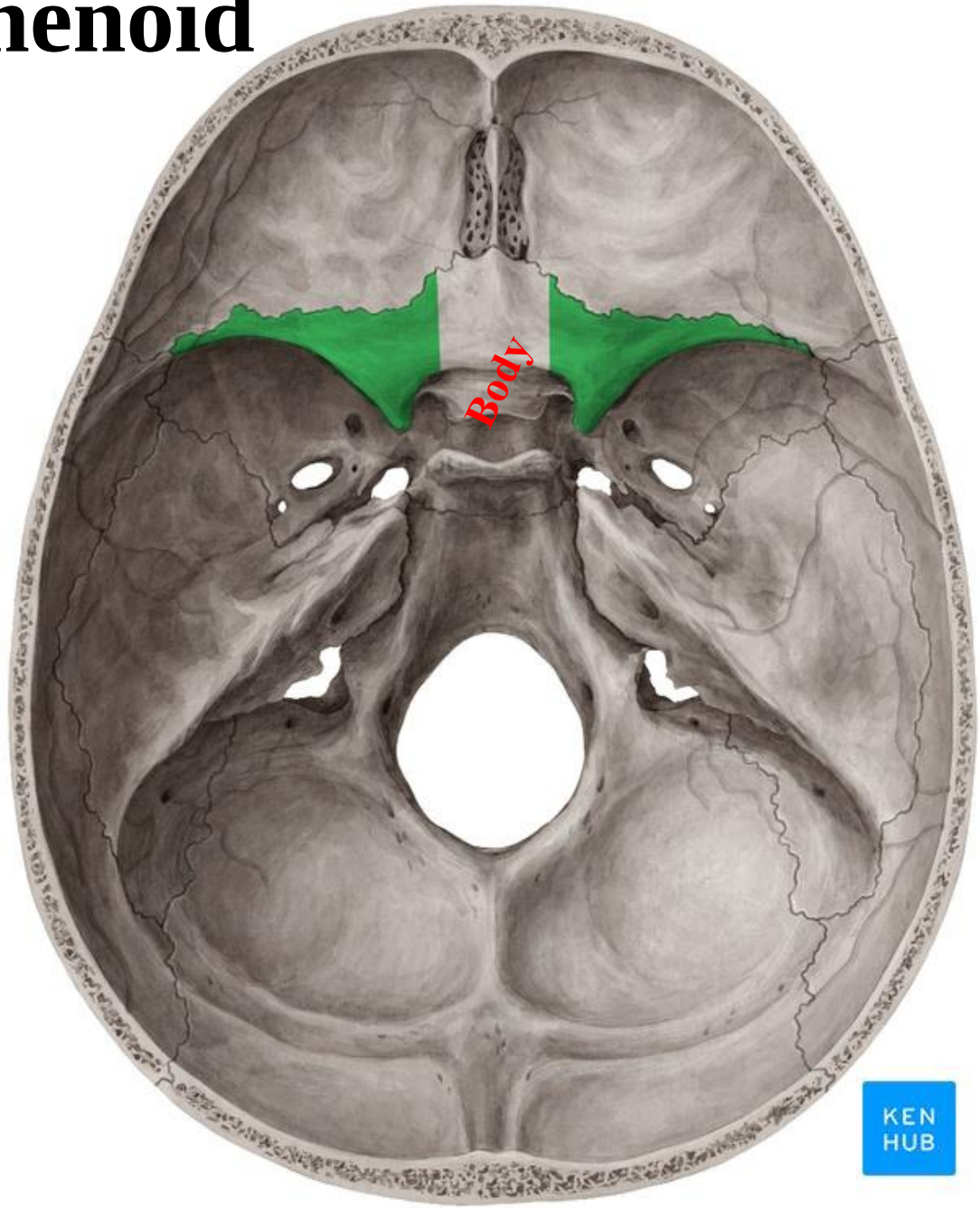
Lesser wing of sphenoid



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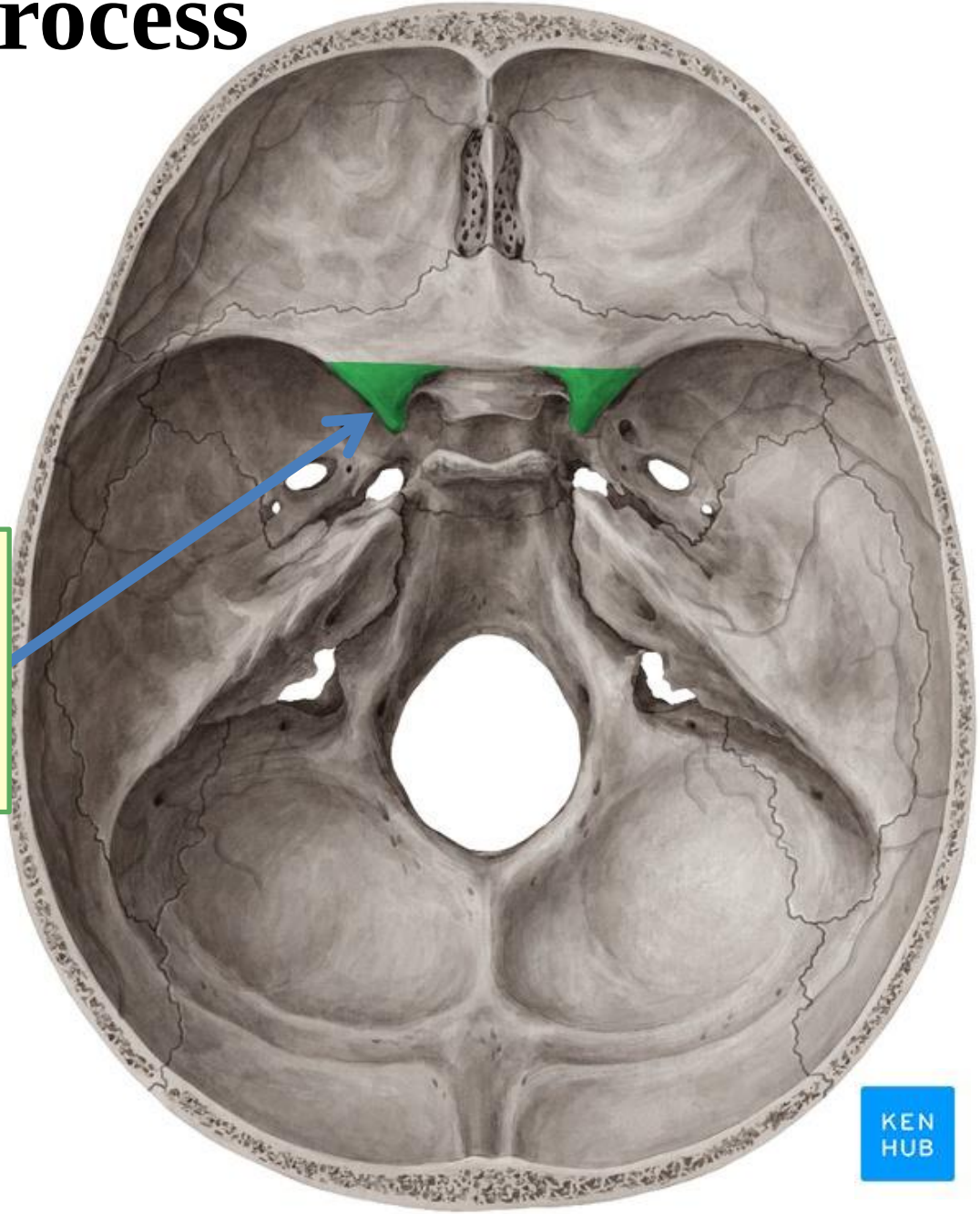
Anterior clinoid process

The medial ends of the lesser wing of the sphenoid form the **anterior clinoid processes**

Note:
Medial to Anterior clinoid process:
Optic canal
Lateral to Anterior clinoid process:
Superior orbital fissure



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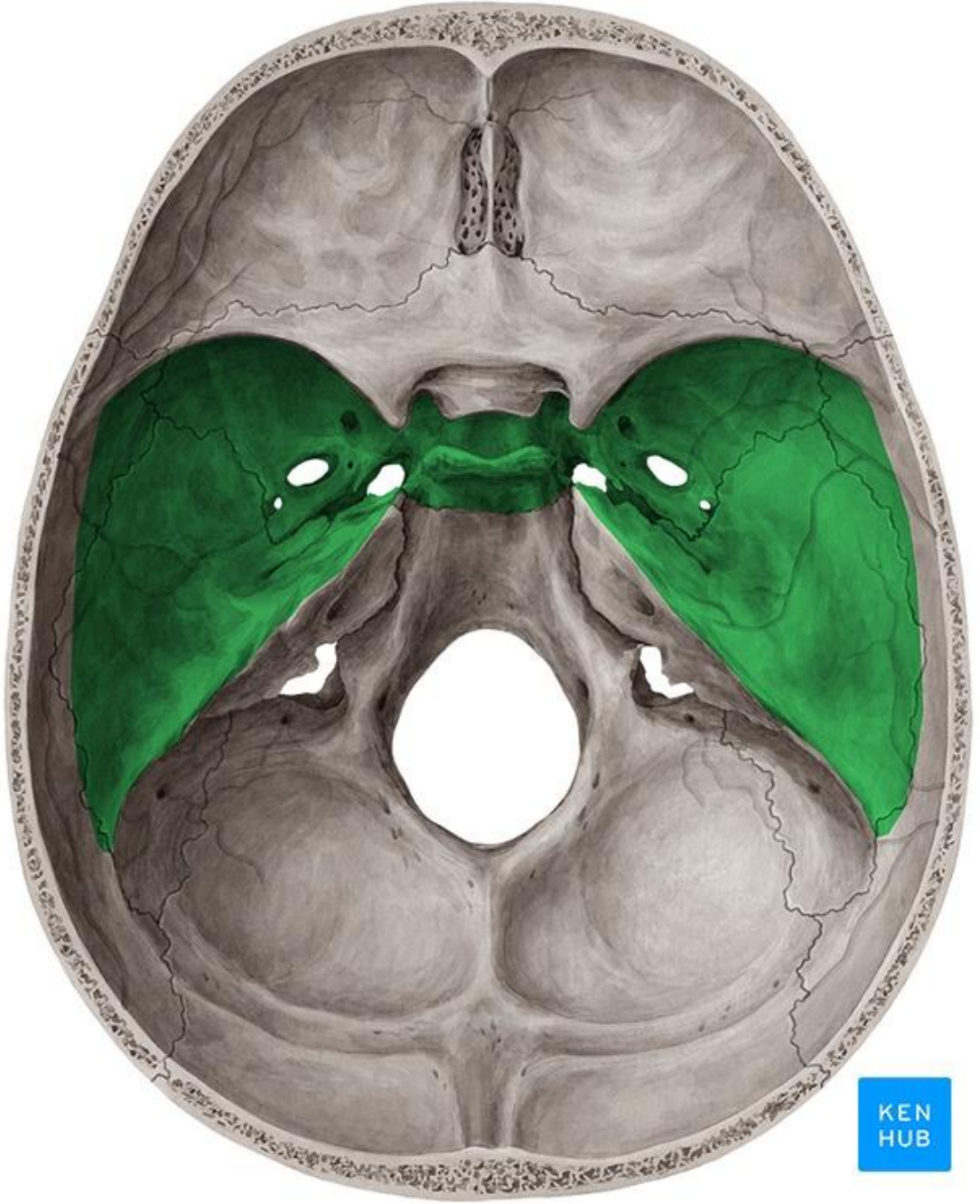
Middle cranial fossa

Formed by:
- Body of sphenoid
- Greater wing of the sphenoid
- Squamous and petrous parts of the temporal bone



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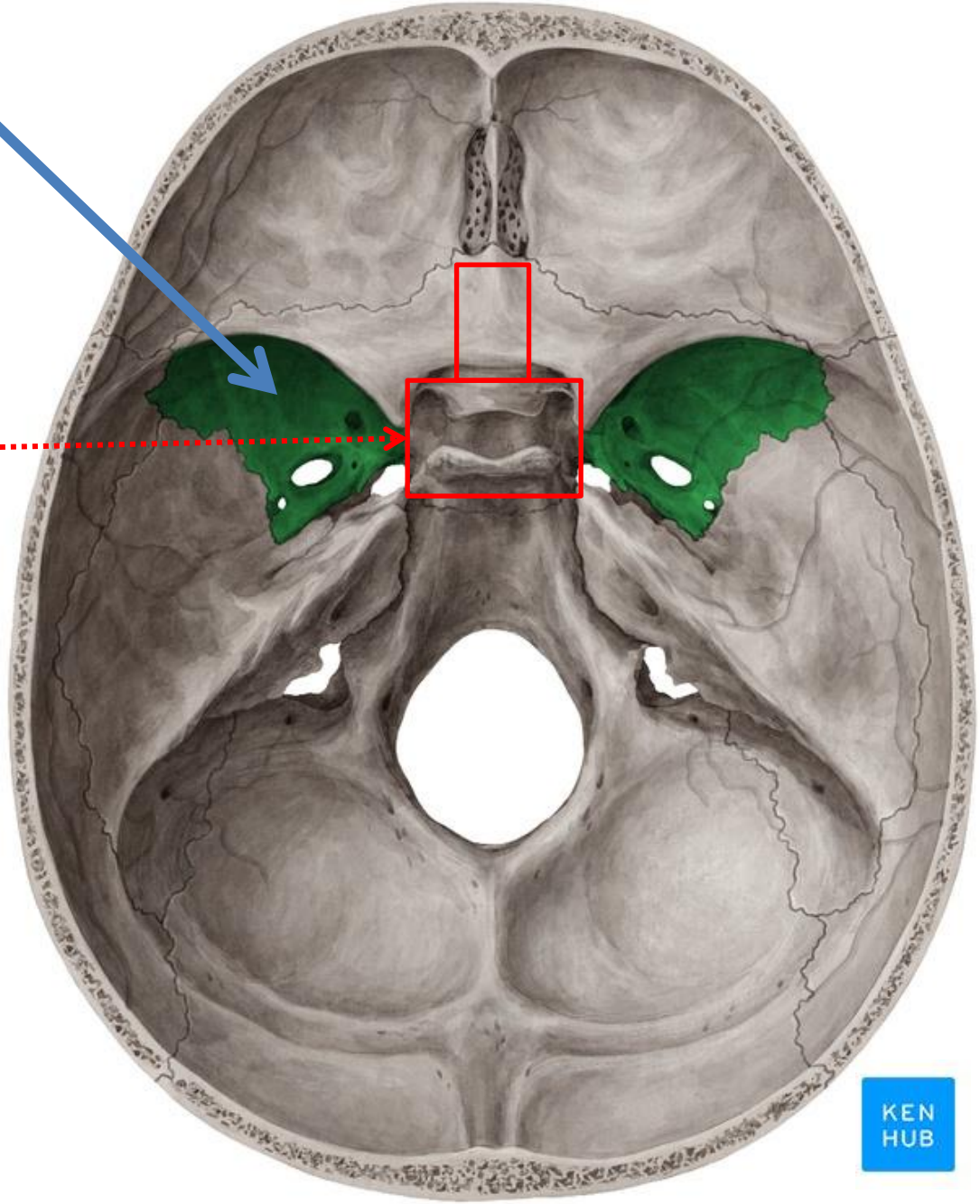
Greater wing of the sphenoid

Body of sphenoid



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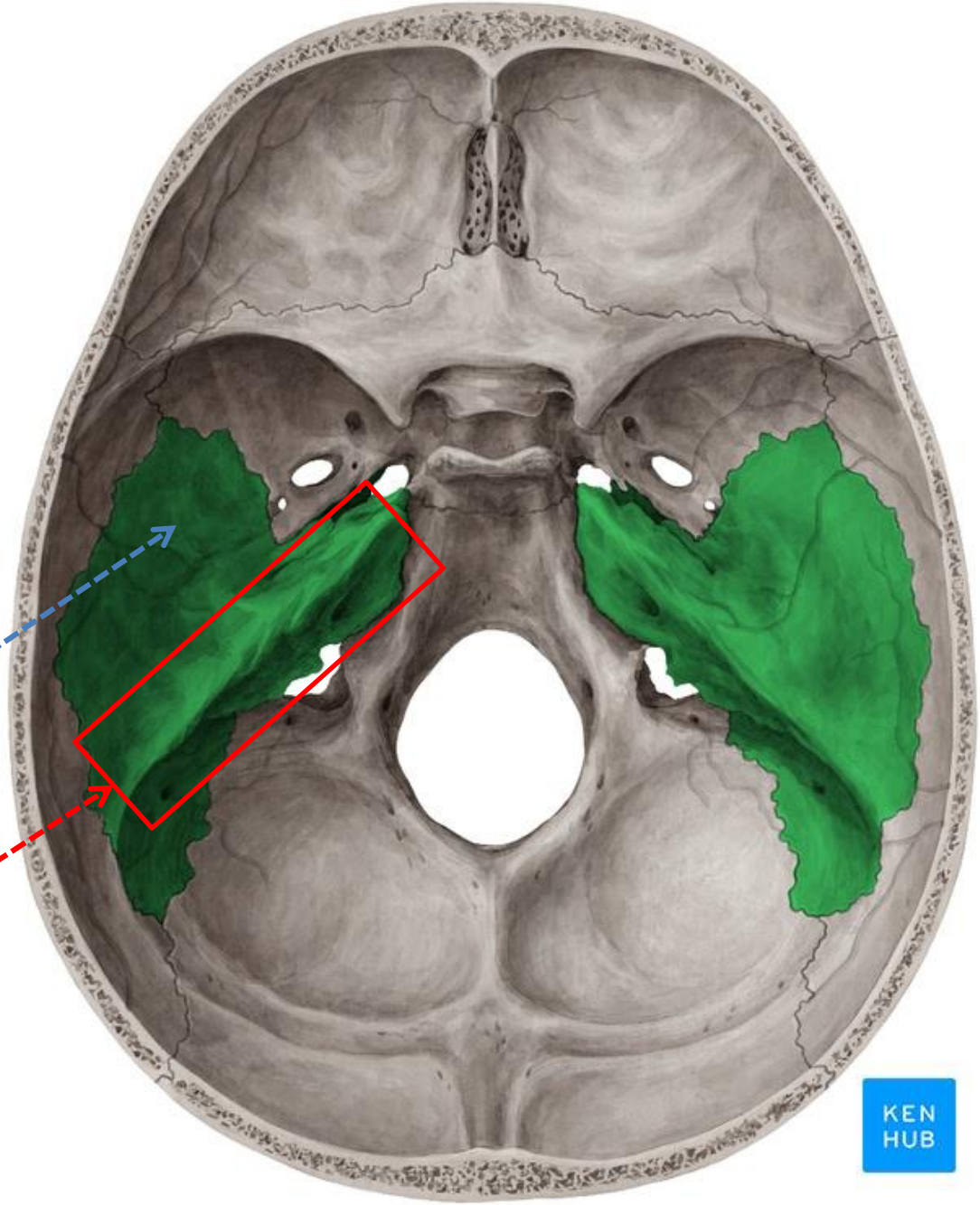
Squamous and petrous parts of the temporal bone



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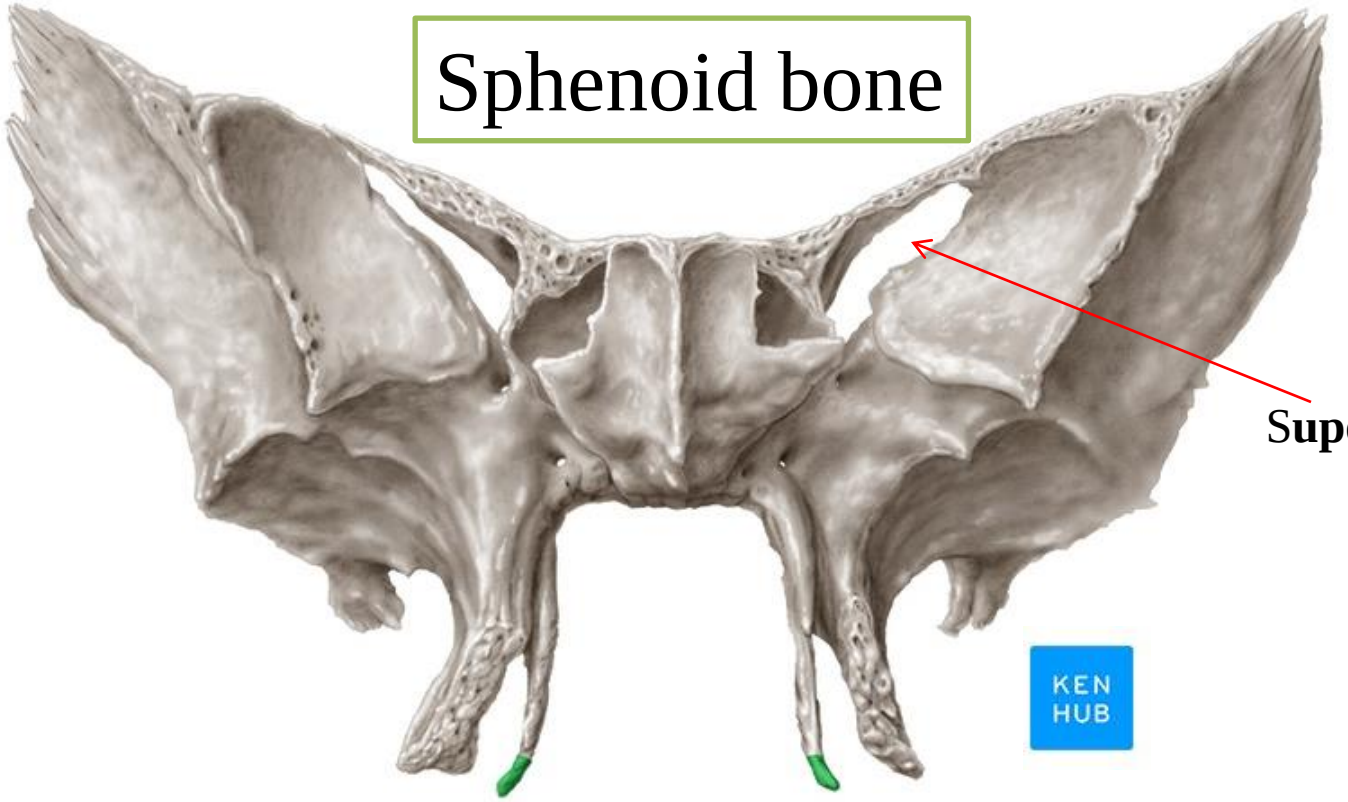
Resembles a bat having a centrally placed body with greater and lesser wings that are outstretched on each side

The **superior orbital fissure** is a slitlike opening between the lesser and greater wings of the sphenoid

The body of the sphenoid: contains the **sphenoid air sinuses**

Sphenoid bone



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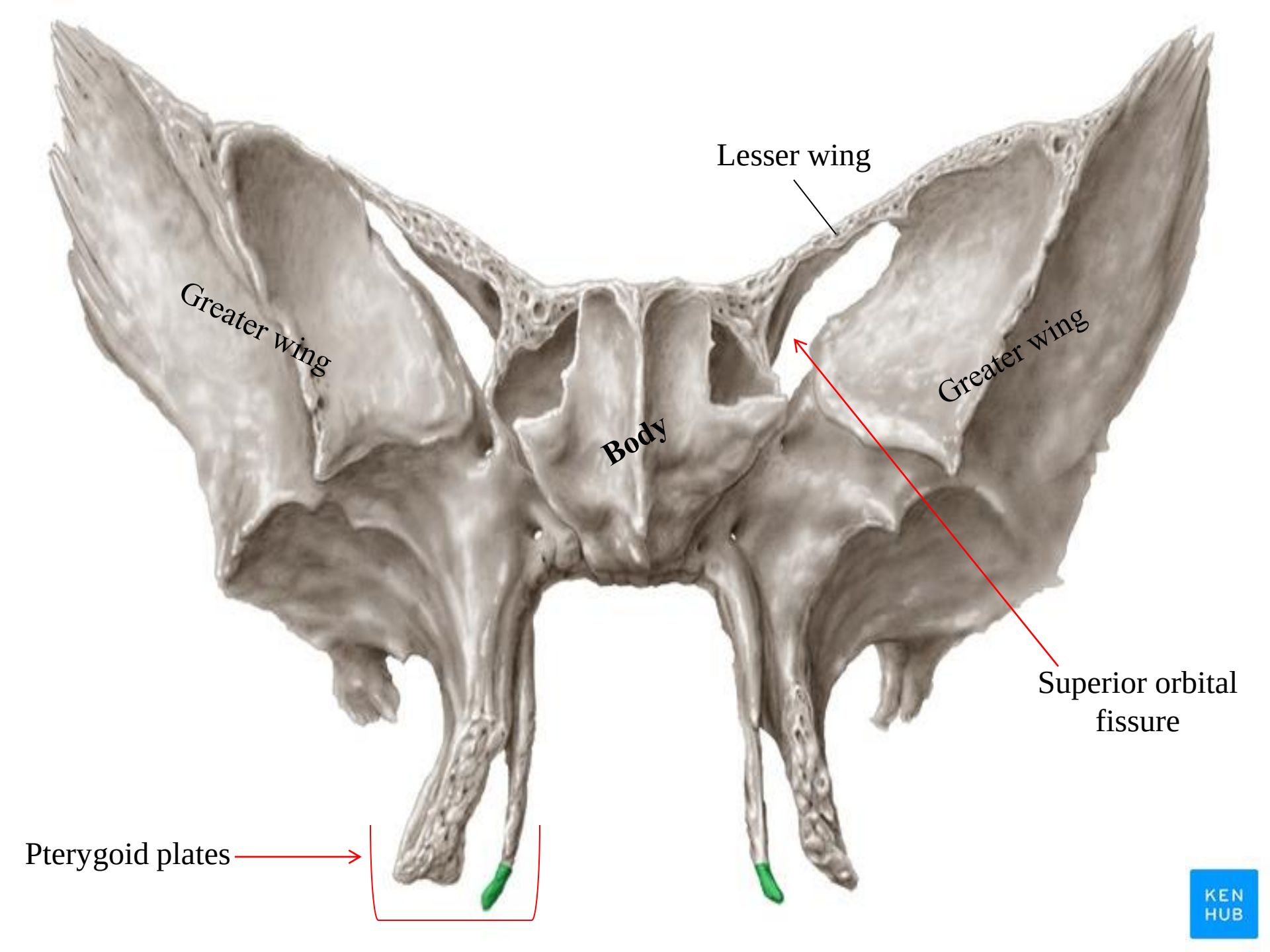
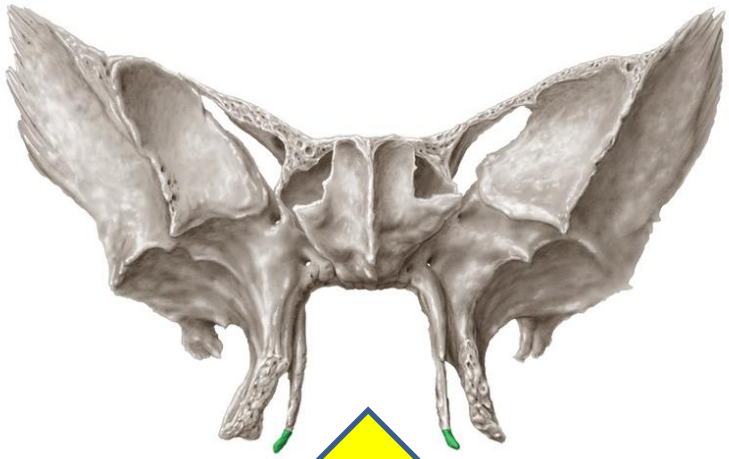
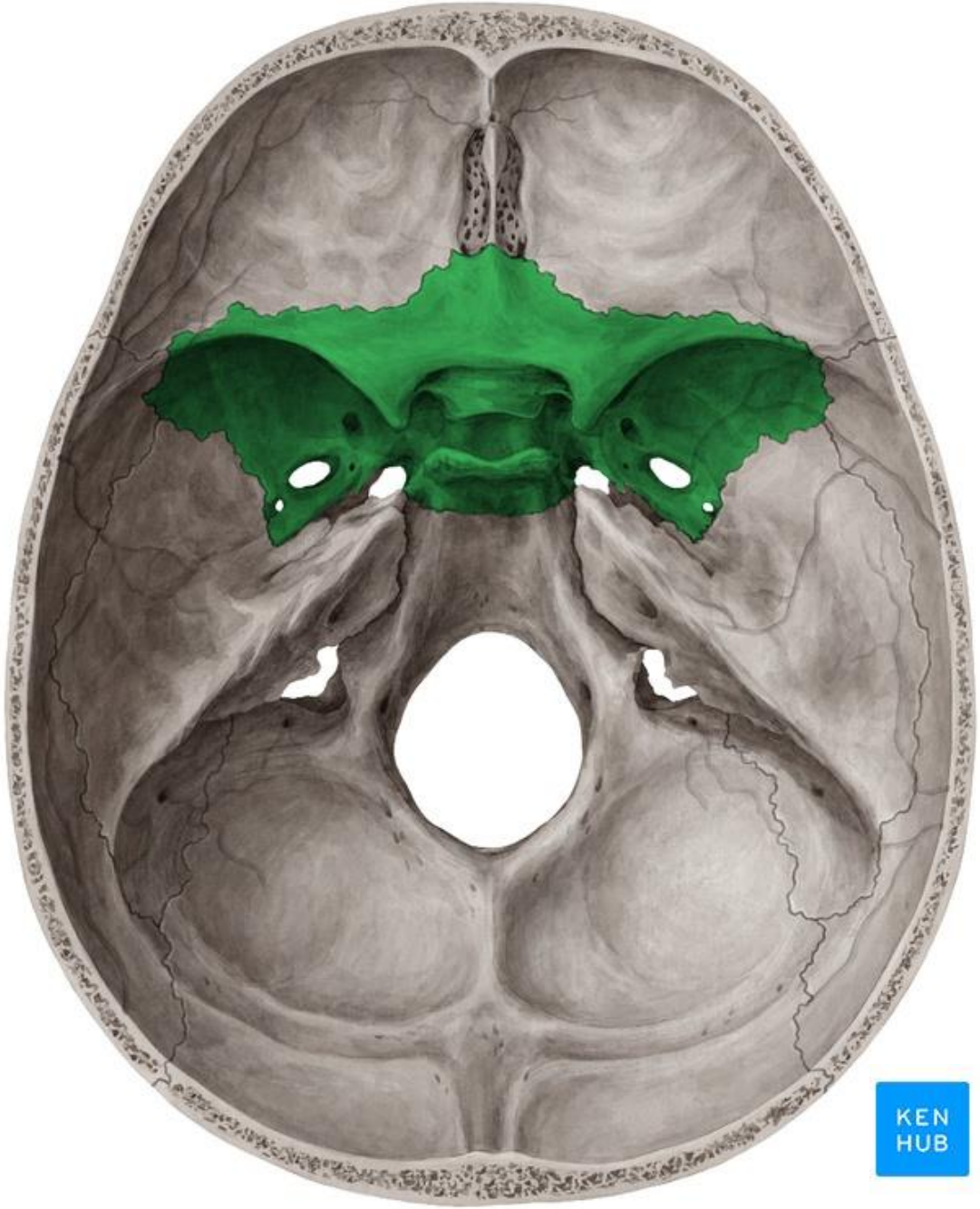

Lesser wing
Greater wing
Body
Greater wing
Superior orbital fissure
Pterygoid plates

Sphenoid bone



Anterior view



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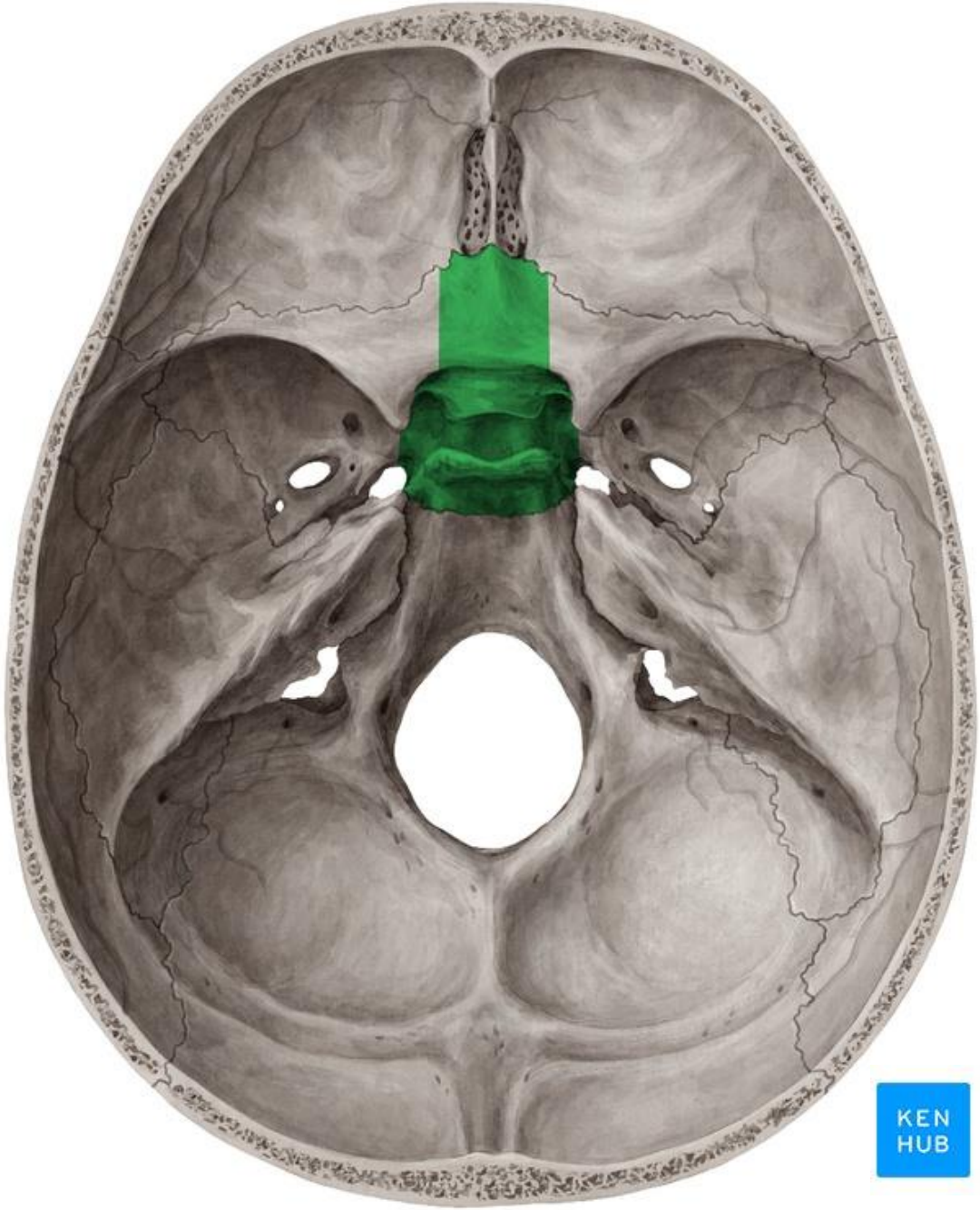
Body of Sphenoid bone



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Greater wing of Sphenoid bone

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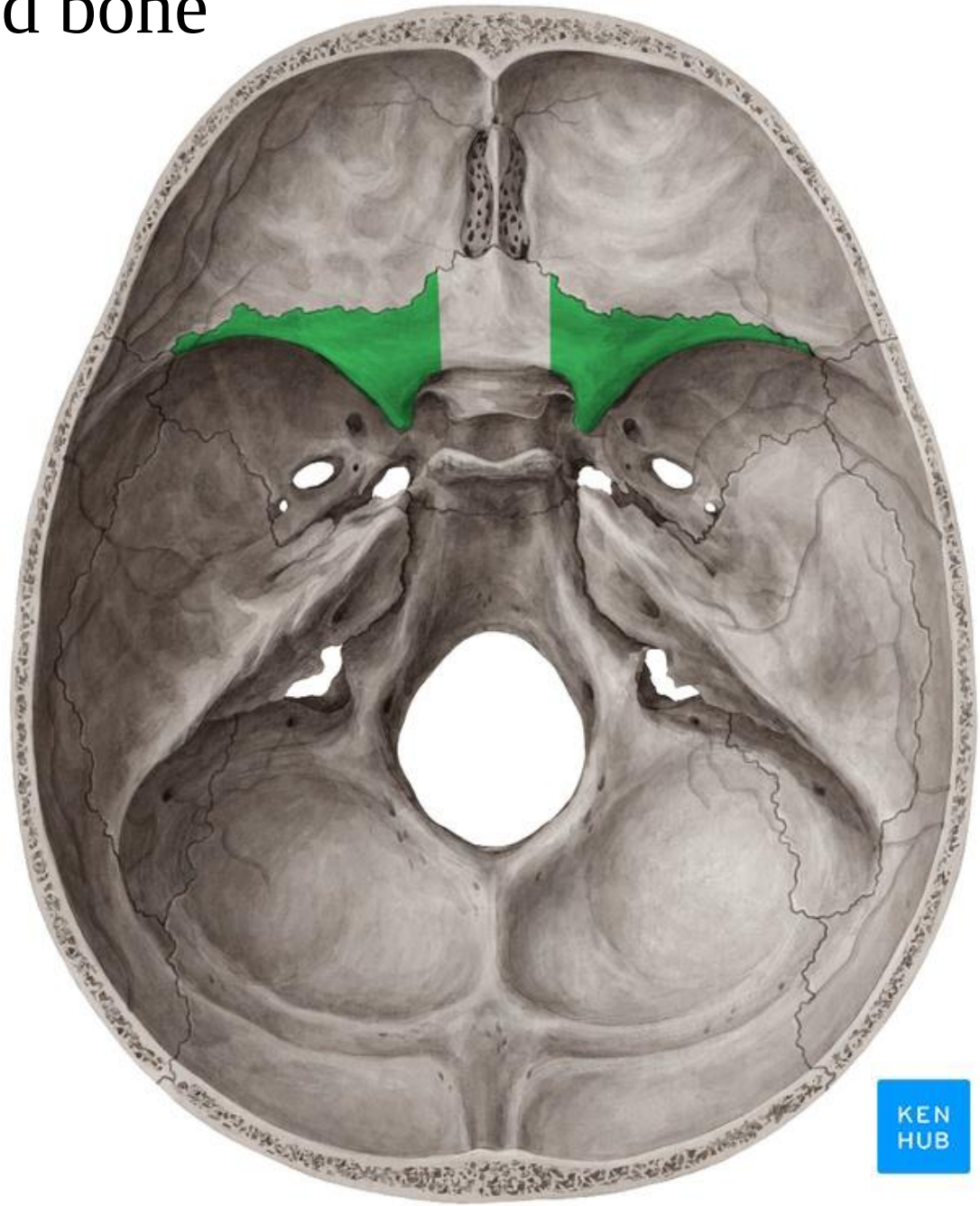
Lesser wing of Sphenoid bone



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Pterygoid plates

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Foramen rotundum: situated behind the medial end of the superior orbital fissure. Transmits the maxillary nerve

Foramen ovale: lies posterolateral to the foramen rotundum transmits the mandibular nerve

Foramen spinosum (small) lies posterolateral to the foramen ovale. Transmits the middle meningeal artery

Carotid canal: Transmits the internal carotid artery

Foramen lacerum lies at the apex of the petrous part of the temporal bone . In life is filled by cartilage and fibrous tissue, and only small blood vessels pass through this tissue

Meckel's cave: impression on the apex of the petrous part of the temporal bone for the trigeminal ganglion

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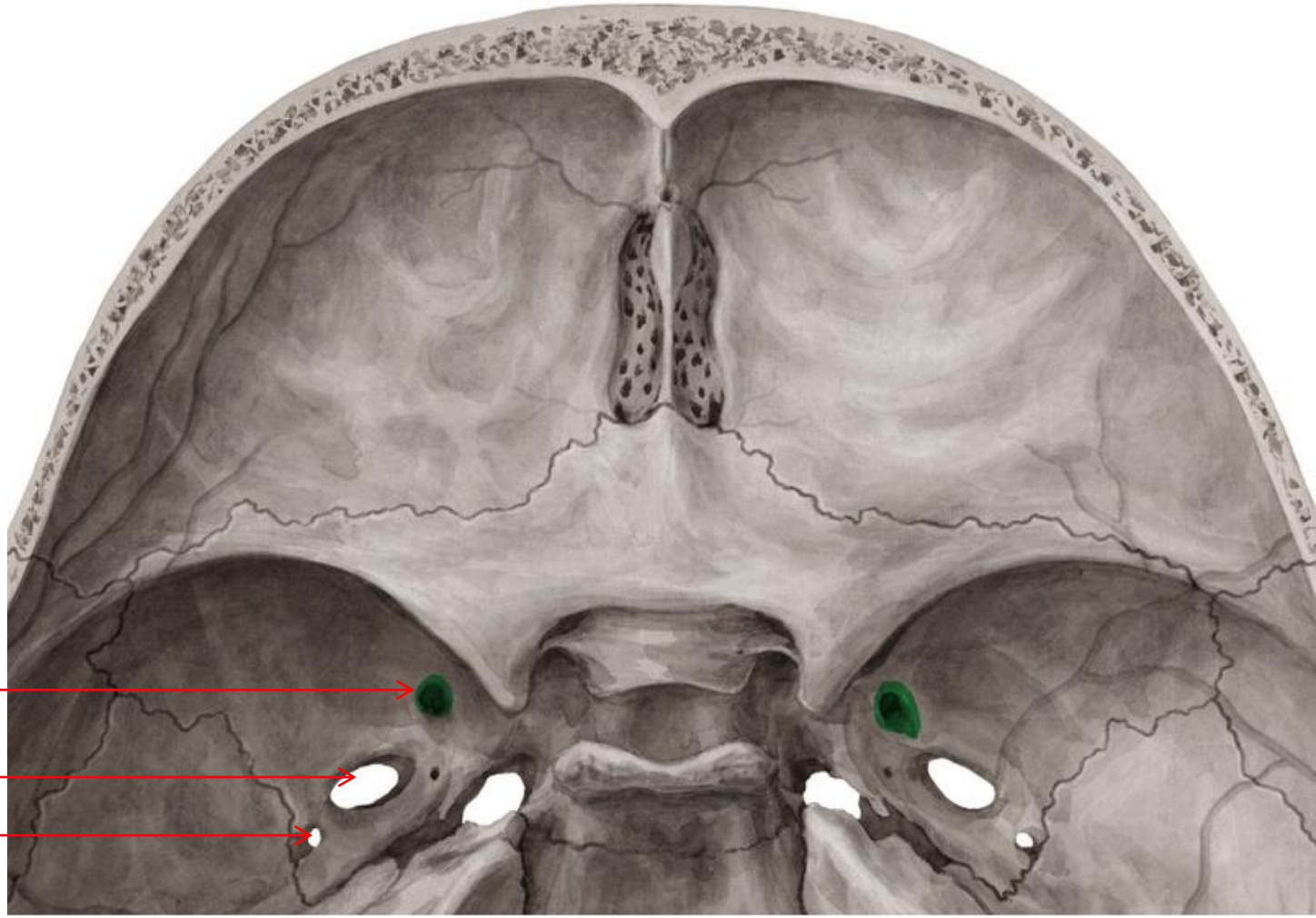

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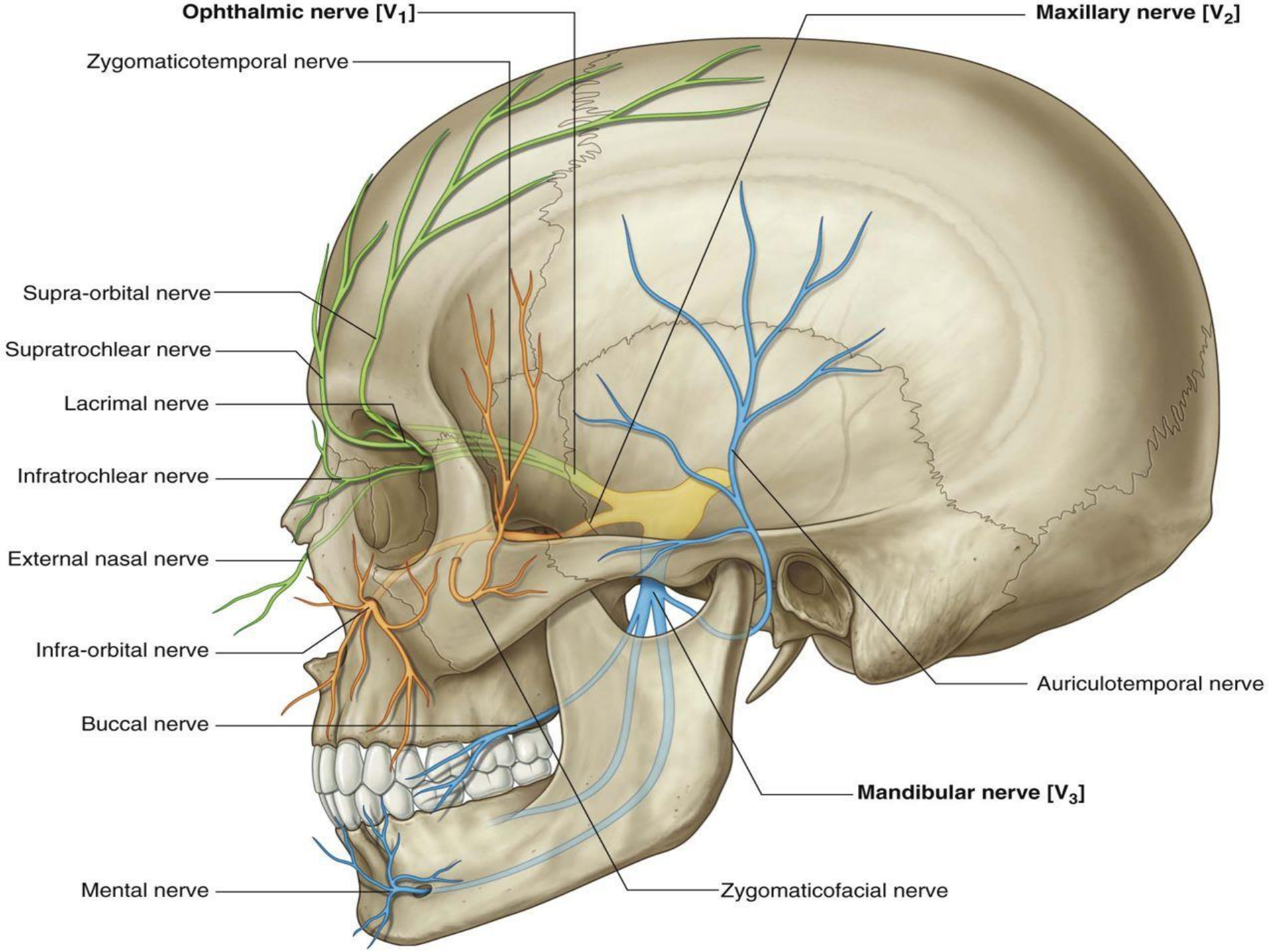
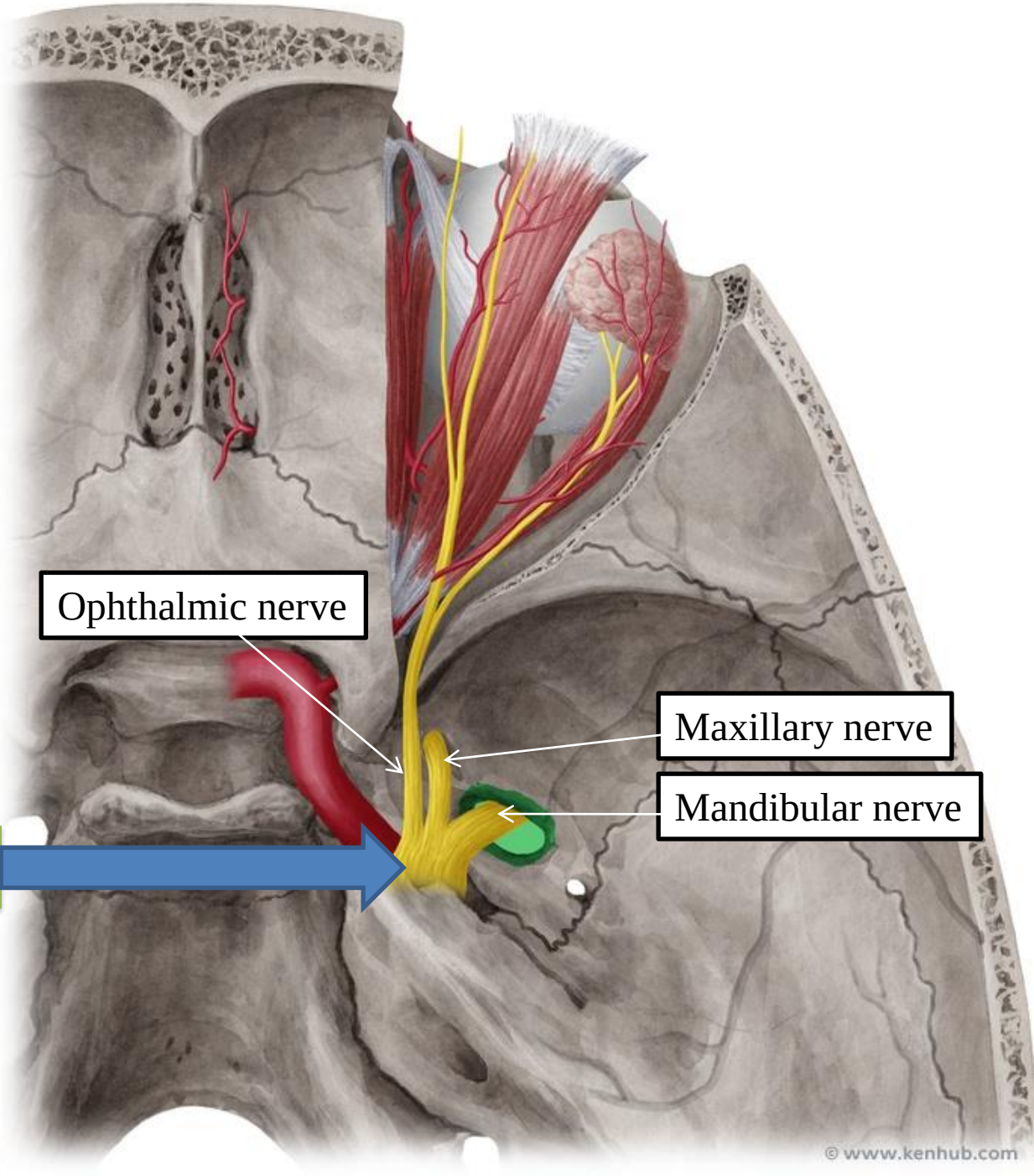

Ophthalmic nerve [V1]
Maxillary nerve [V2]
Zygomaticotemporal nerve
Supra-orbital nerve
Supratrochlear nerve
Lacrimal nerve
Infratrochlear nerve
External nasal nerve
Infra-orbital nerve
Buccal nerve
Mental nerve
Auriculotemporal nerve
Mandibular nerve [V3]
Zygomaticofacial nerve



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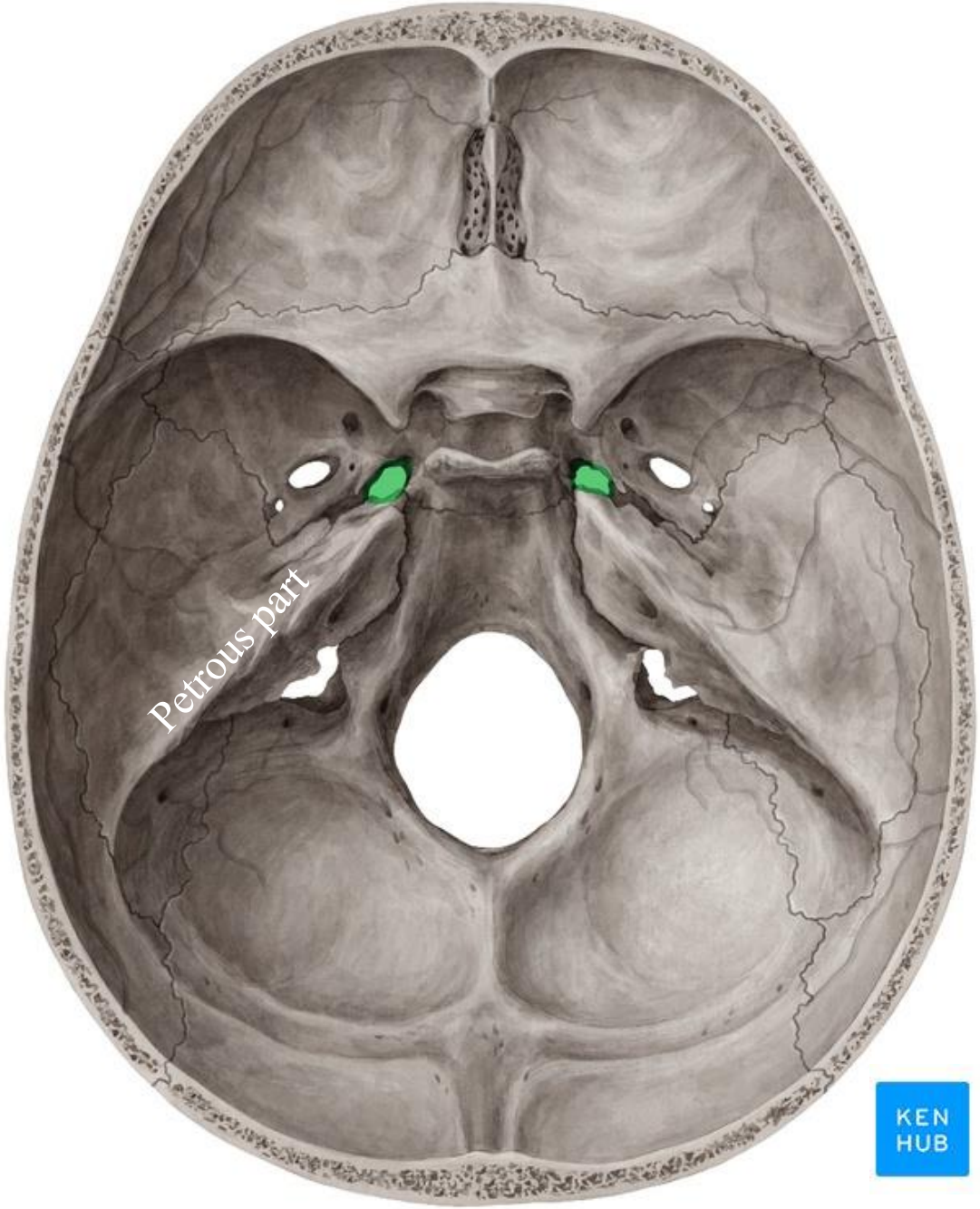
Foramen lacerum



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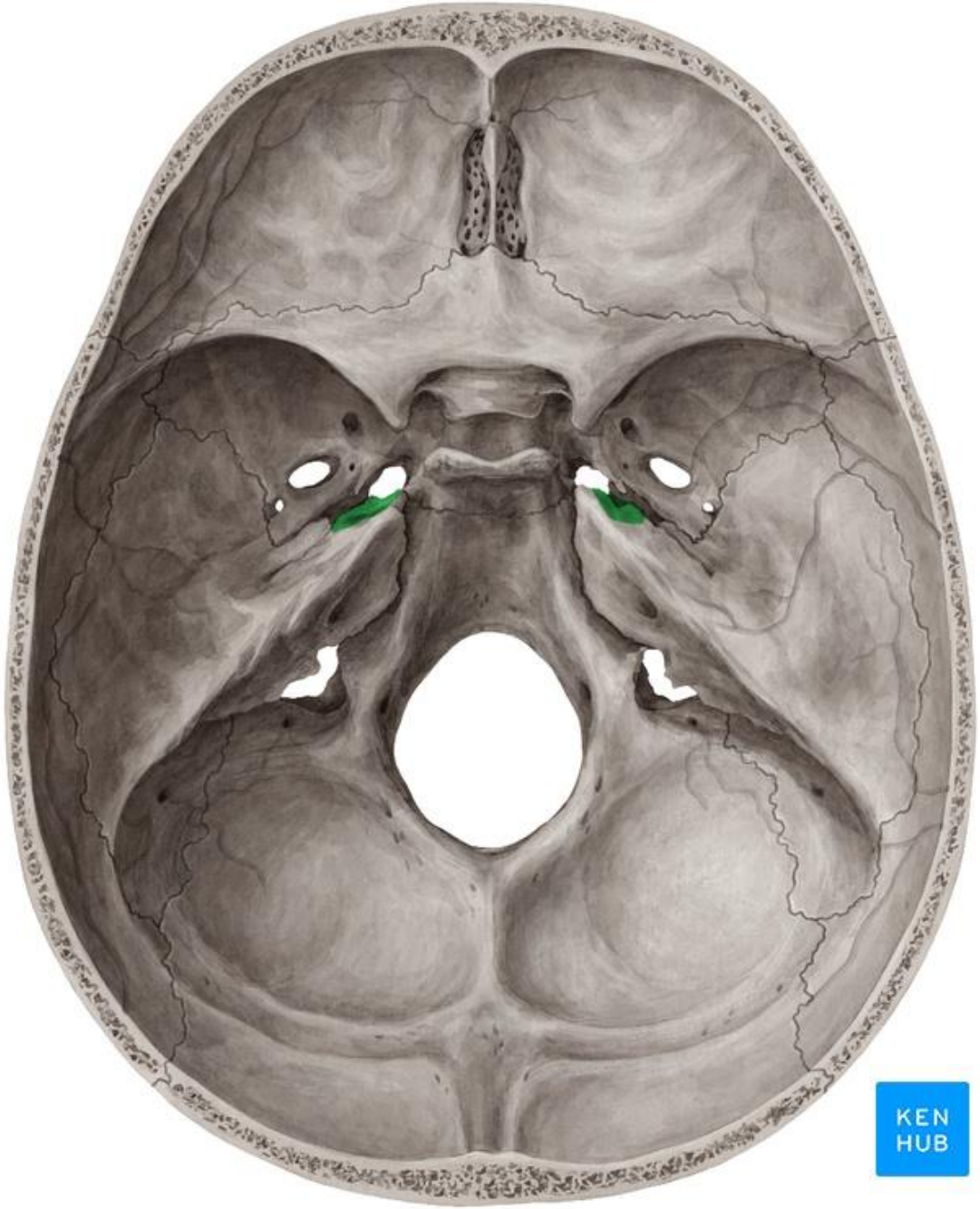
Meckl’s cave
(Trigeminal impression)



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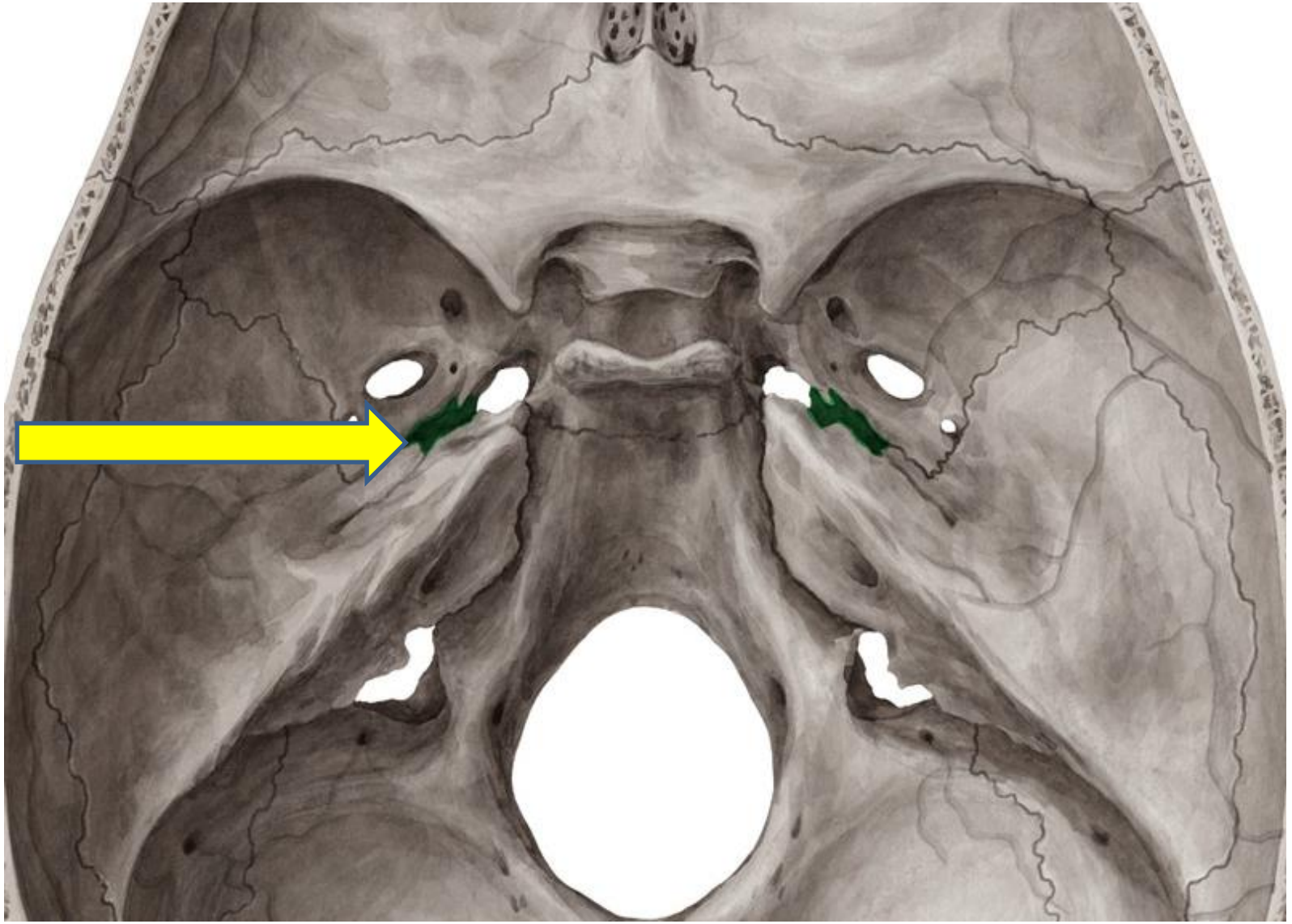
Carotid canal



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The median part of the middle cranial fossa is formed by the **body of the sphenoid**

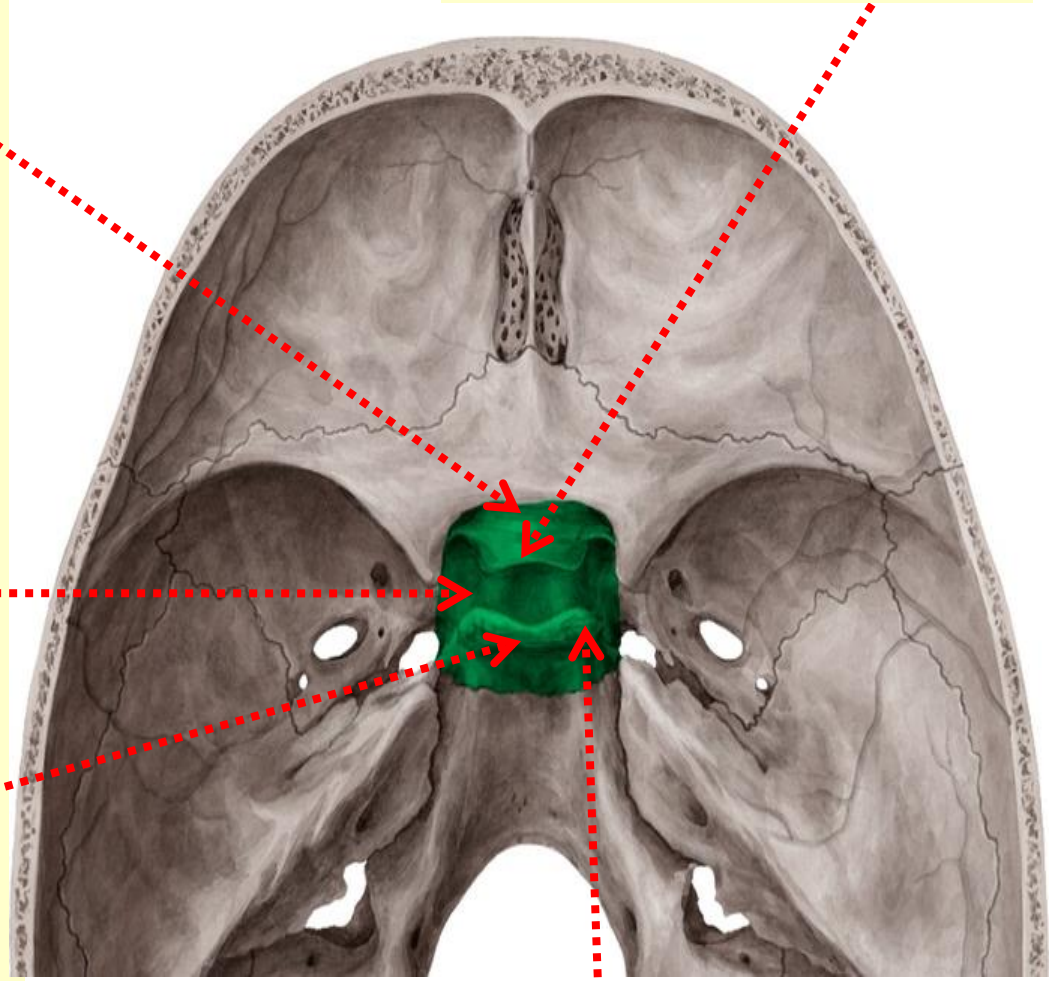
Sulcus chiasmaticus (chiasmatic groove) is related to the optic chiasma and leads laterally to the **Optic canal**

On the superior aspect of the body is a depression called the **Sella turcica** which contains the pituitary gland **(hypophyseal fossa)**

Posterior to the hypophyseal fossa is the **Dorsum sellae**

The superior angles of the dorsum sellae have two tubercles called the **Posterior clinoid processes**

In front of the hypophyseal fossa is the **Tuberculum sellae**



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The **sella turcica** (hypophyseal fossa) which CONTAINS THE **PITUITARY GLAND**

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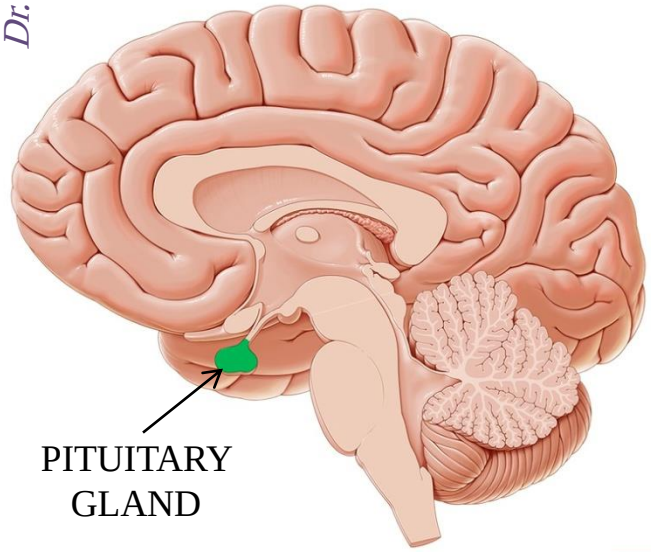
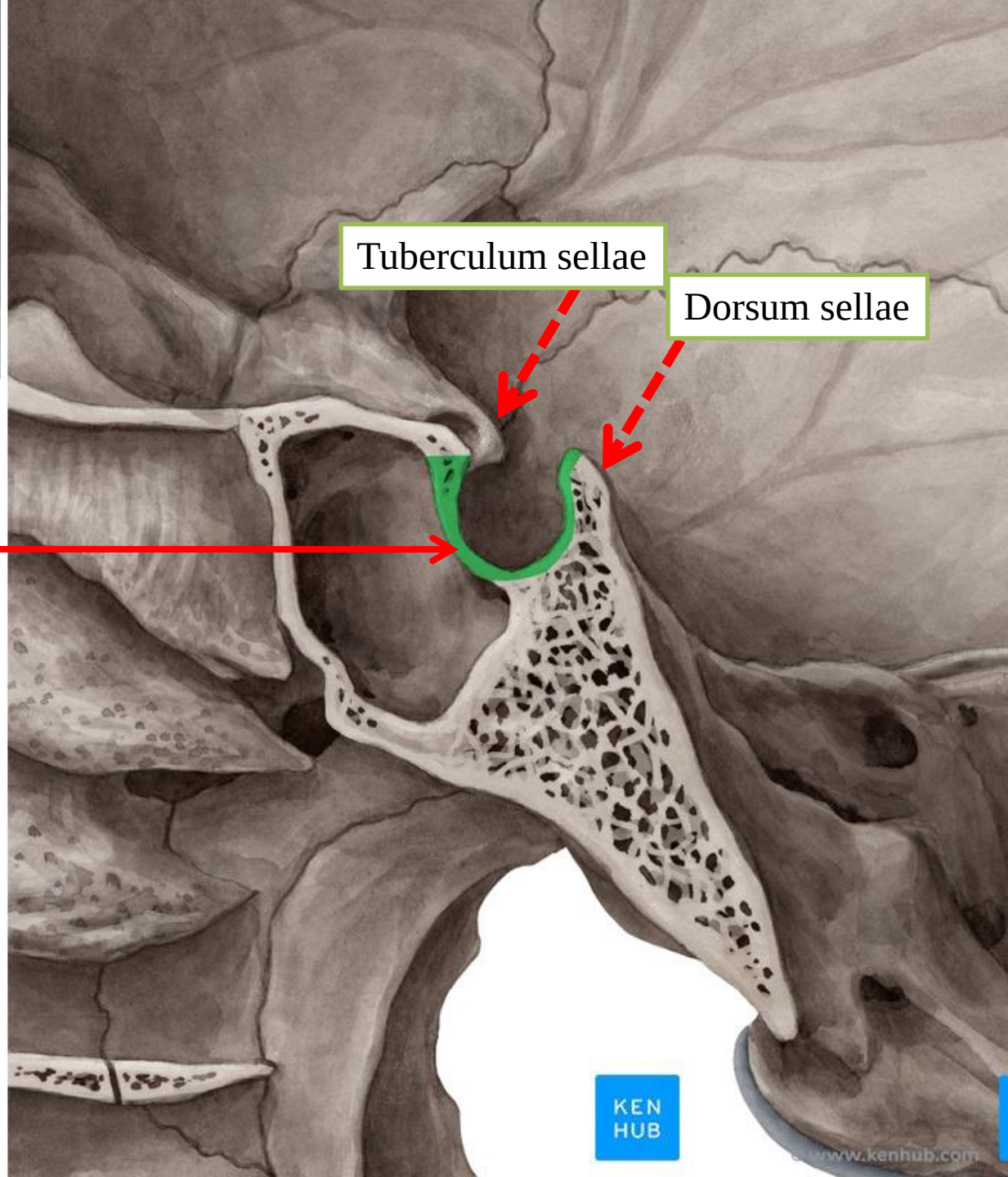
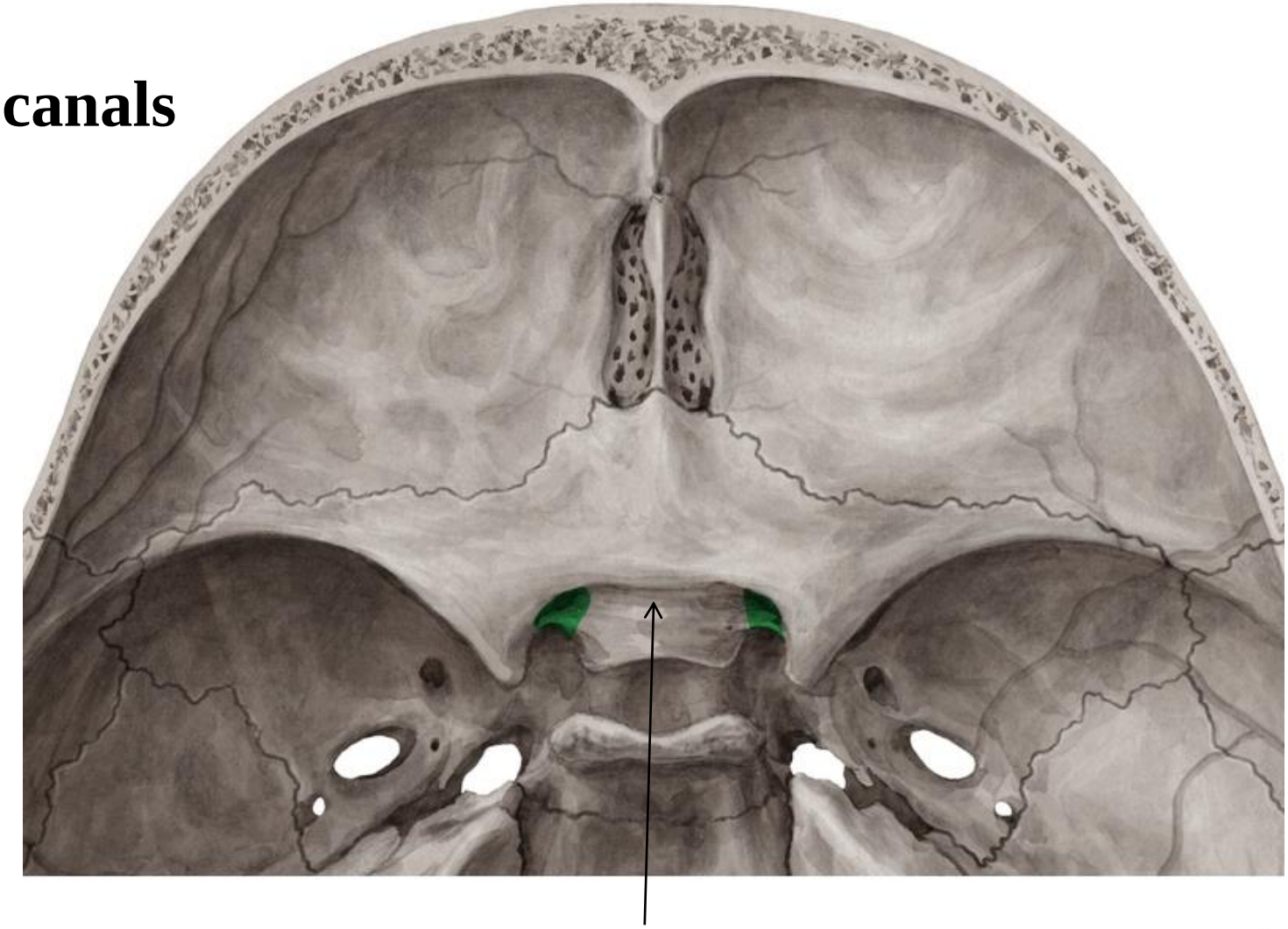




Optic canals



Sulcus chiasmaticus
(chiasmatic groove)

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Is the groove between the optic canals

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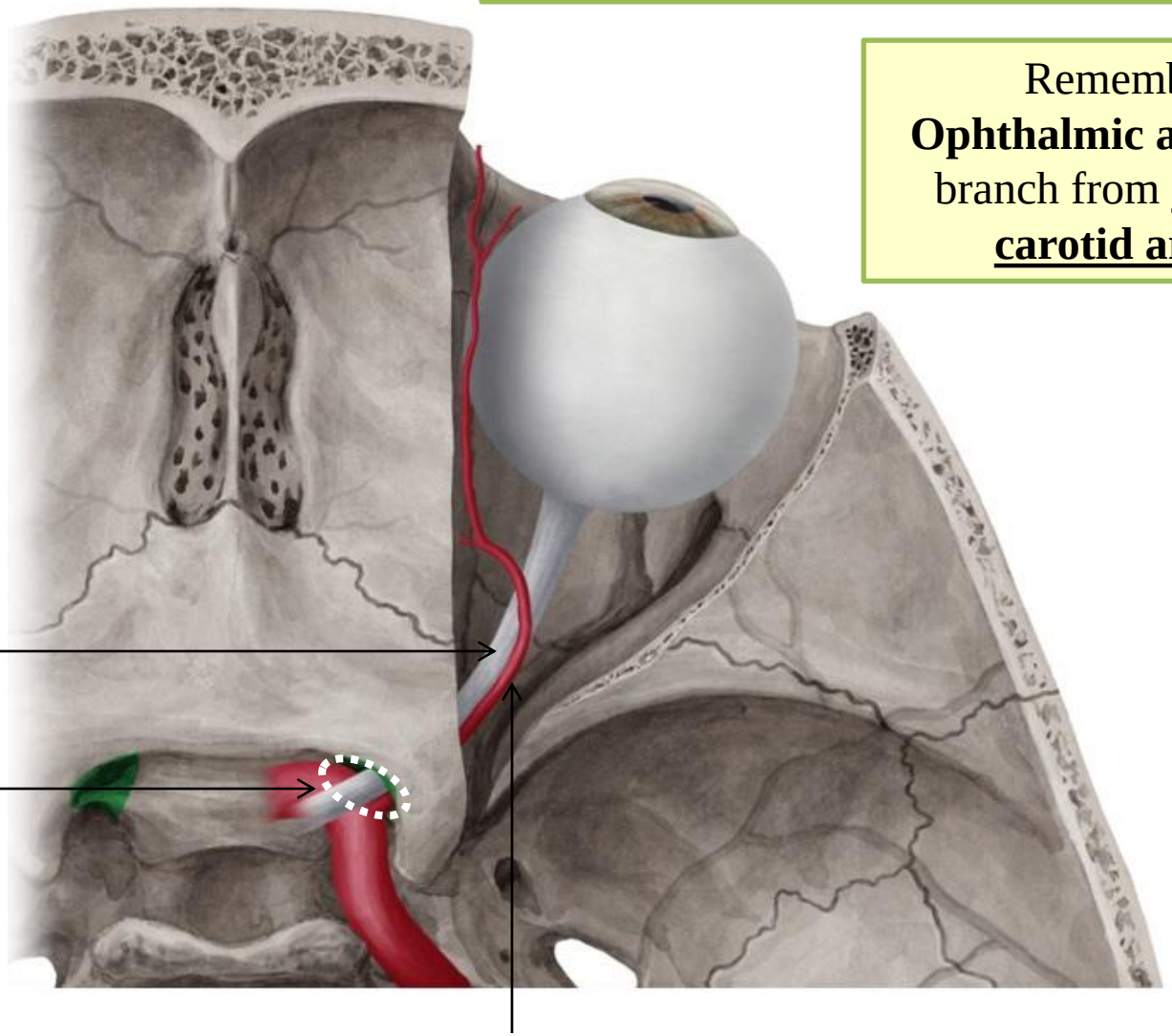
Optic canal transmits the optic nerve and the ophthalmic artery

Remember:
Ophthalmic artery is a branch from **internal carotid artery**



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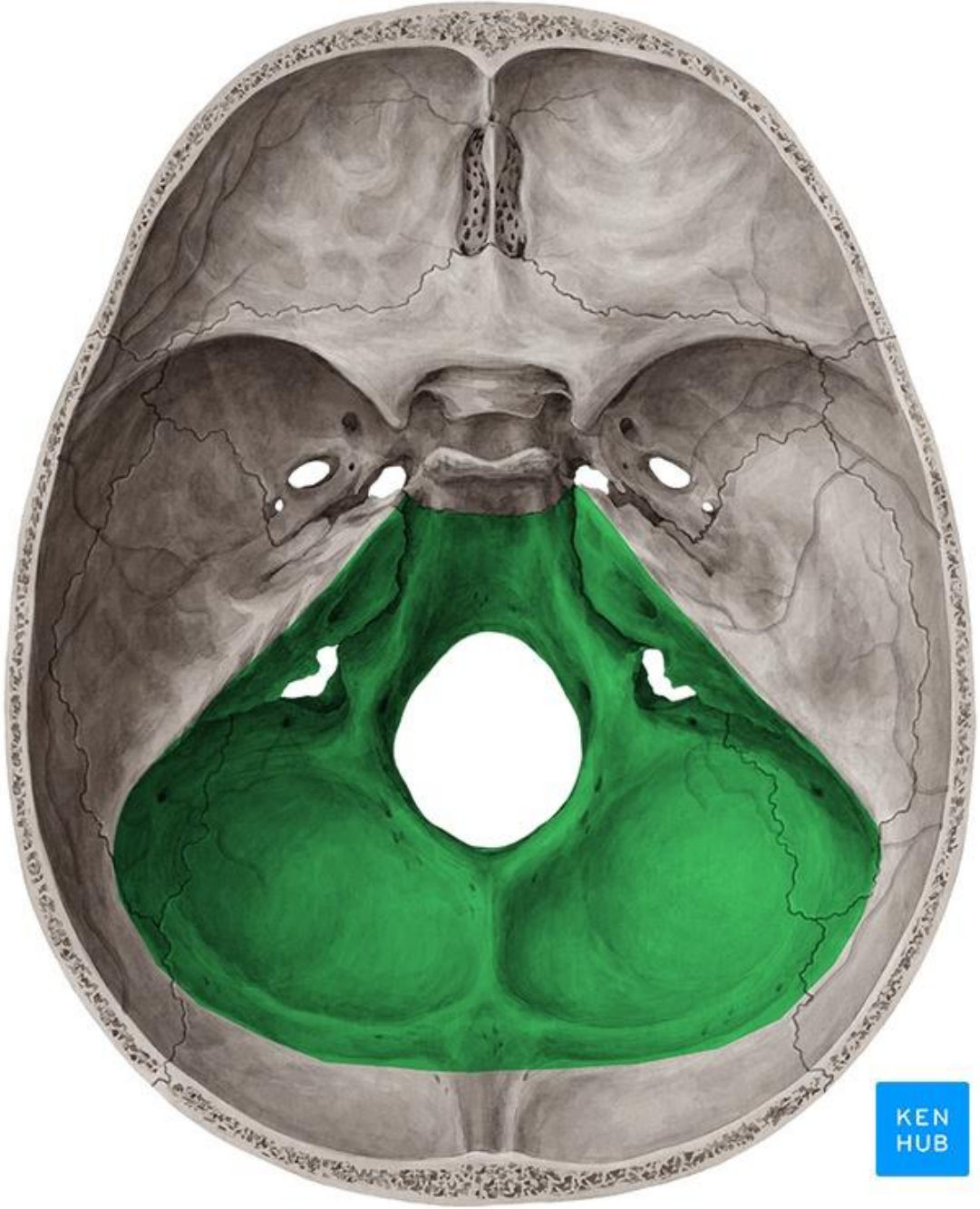
Posterior cranial fossa

Formed mostly by parts of temporal and occipital bones



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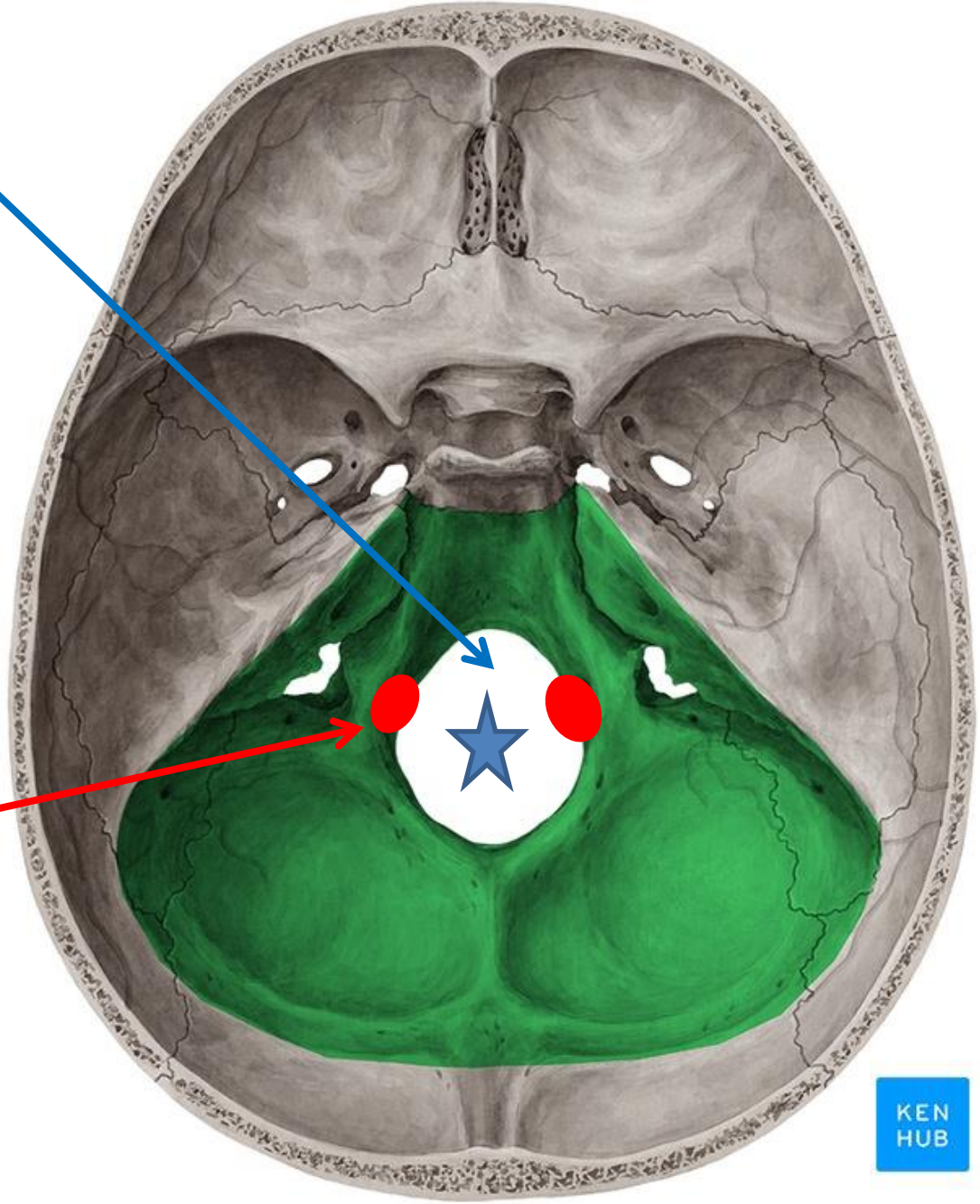
The foramen magnum transmits

1- Medulla oblongata and its surrounding meninges

2- Spinal roots of the accessory nerves

3- Two vertebral arteries.

The **hypoglòssal canal** is situated above the anterolateral boundary of the foramen magnum and transmits the **hypoglossal nerve**



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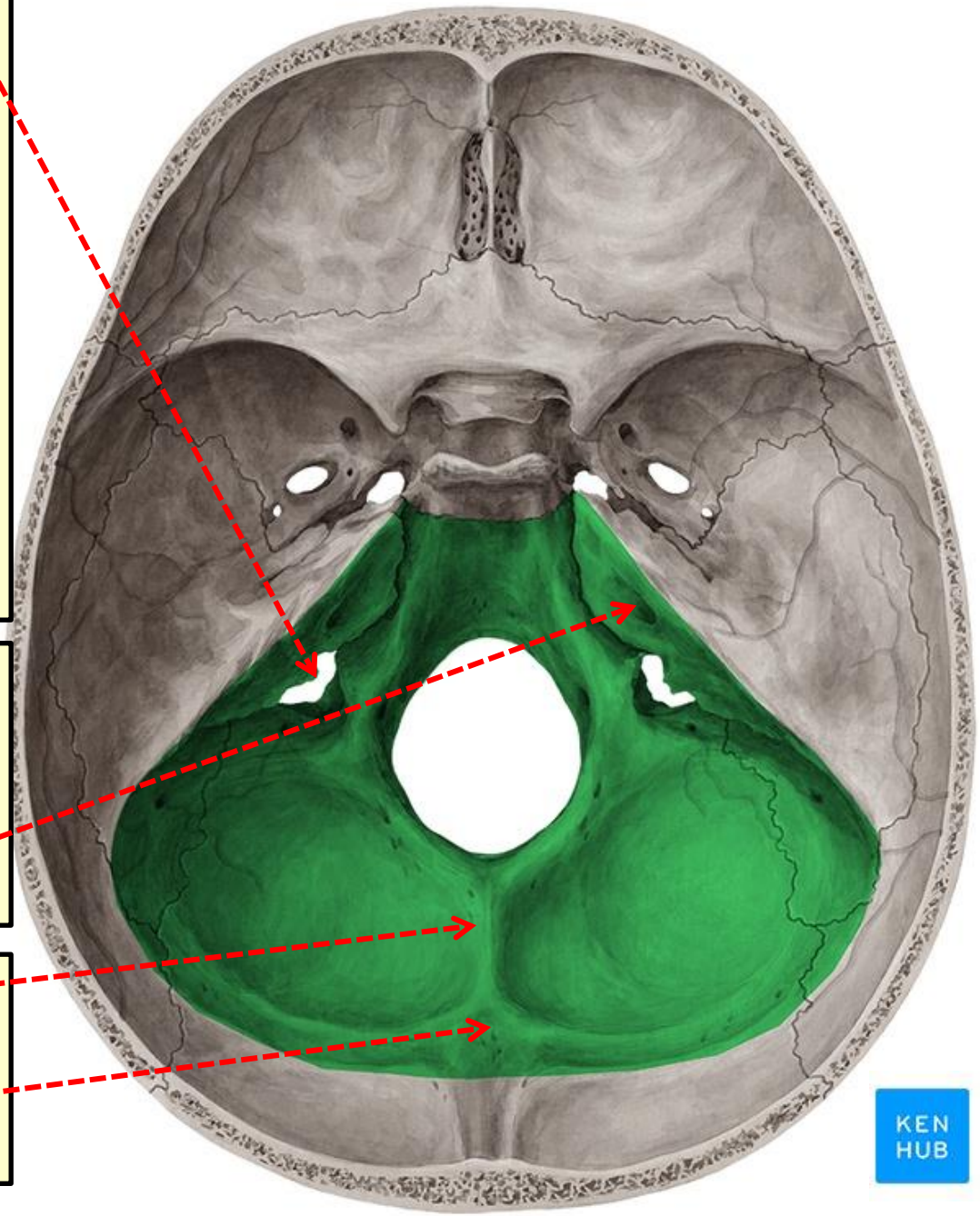
The **jugular foramen** lies between the petrous part of the temporal bone and the occipital bone.

It transmits the following structures
Anterior part: the inferior petrosal sinus
Middle part: the 9th, 10th, and 11th cranial nerves
Posterior part: the large sigmoid sinus. The sigmoid sinus turns down through the foramen to become the internal jugular vein.

The internal acoustic meatus (on the posterior surface of the petrous part of the temporal bone): transmits the vestibulocochlear nerve and the facial nerve (7th and 8th cranial nerves)

The internal occipital crest runs upward in the midline posteriorly from the foramen magnum to the **internal occipital protuberance**



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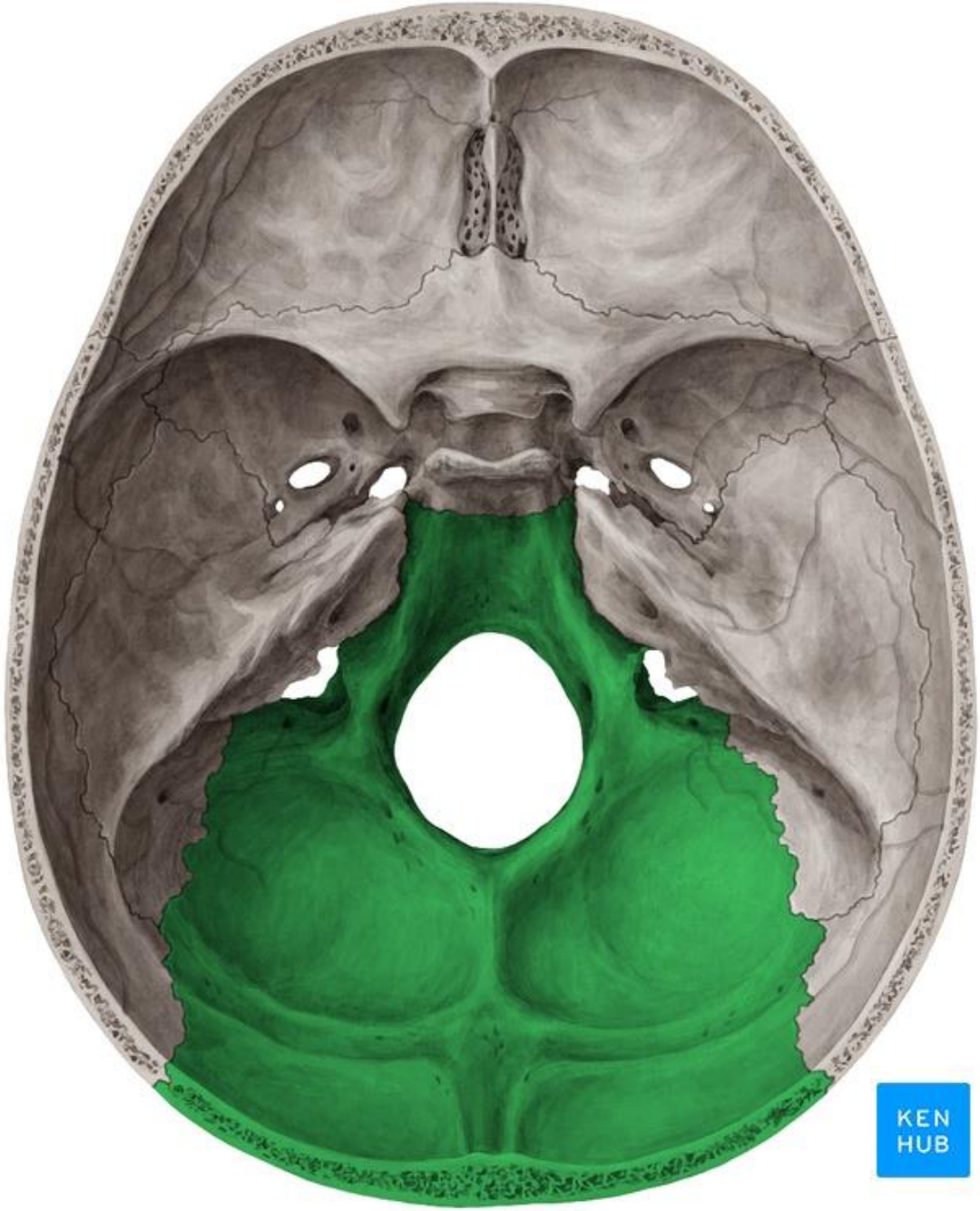
Occipital bone



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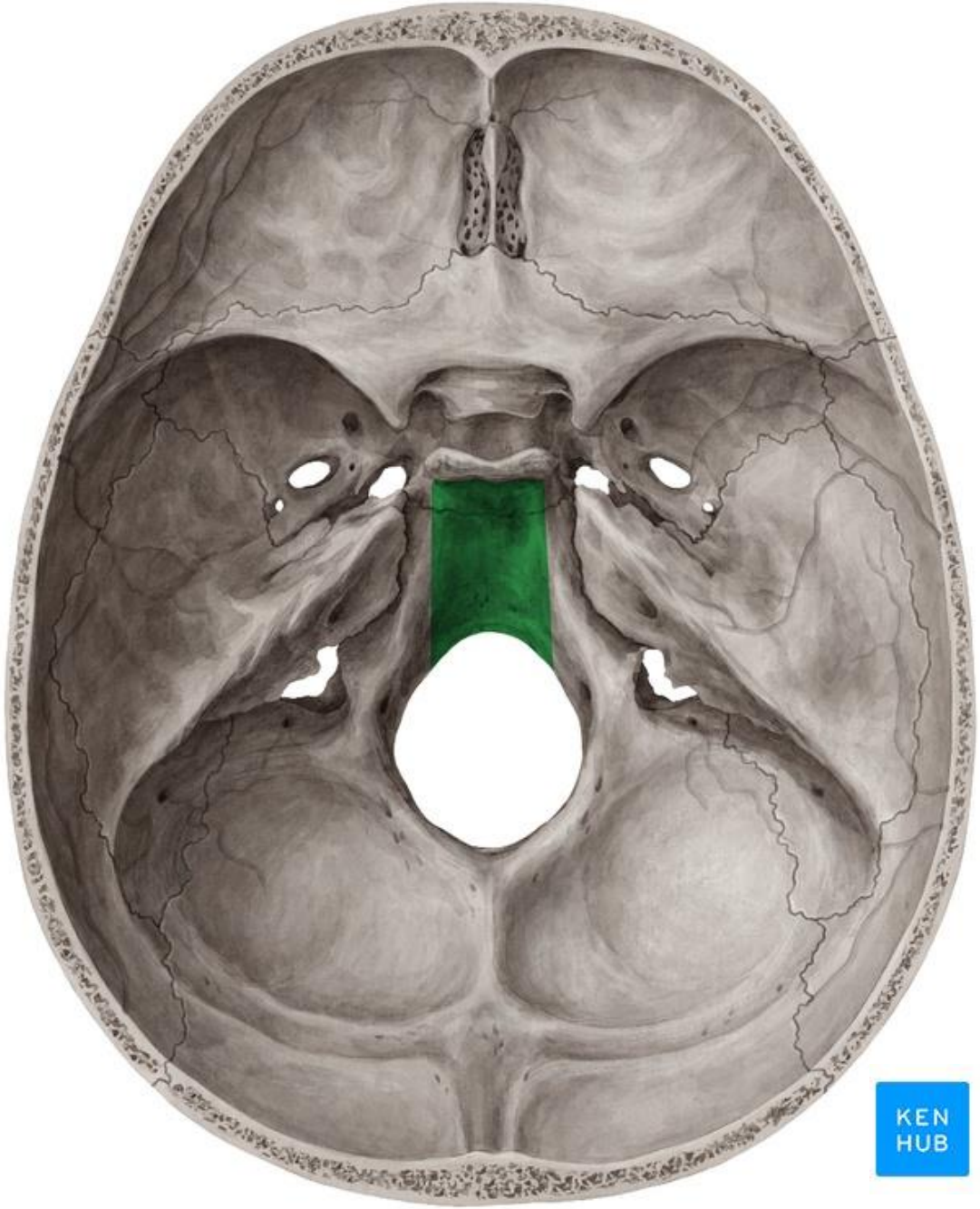
Clivus

is the sloping midline surface of the occipital bone anterior to the foramen magnum

Clivus: Slope



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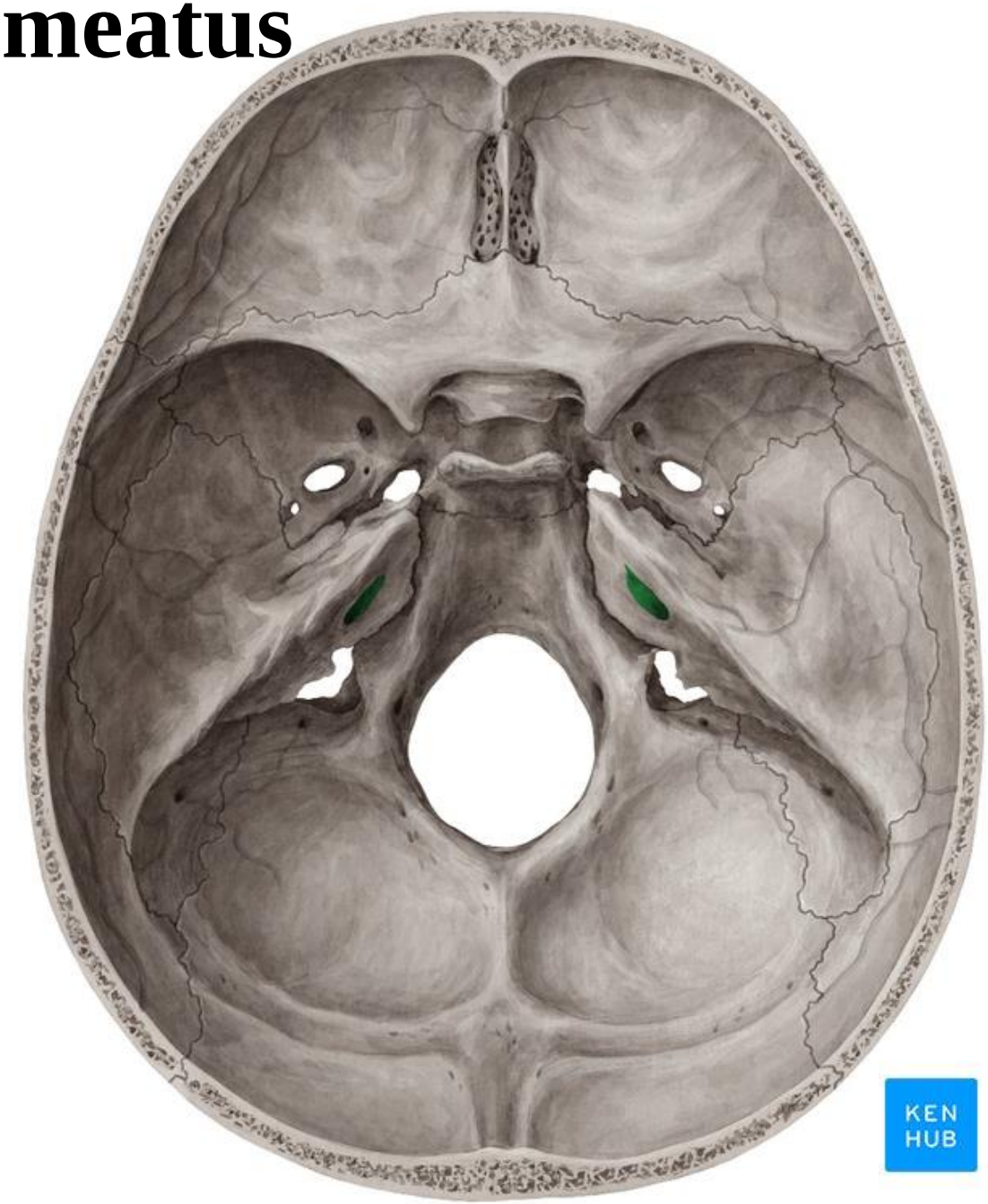
Internal acoustic meatus

Transmits the vestibulocochlear nerve and the facial nerve (7^{th} and 8^{th} cranial nerves)



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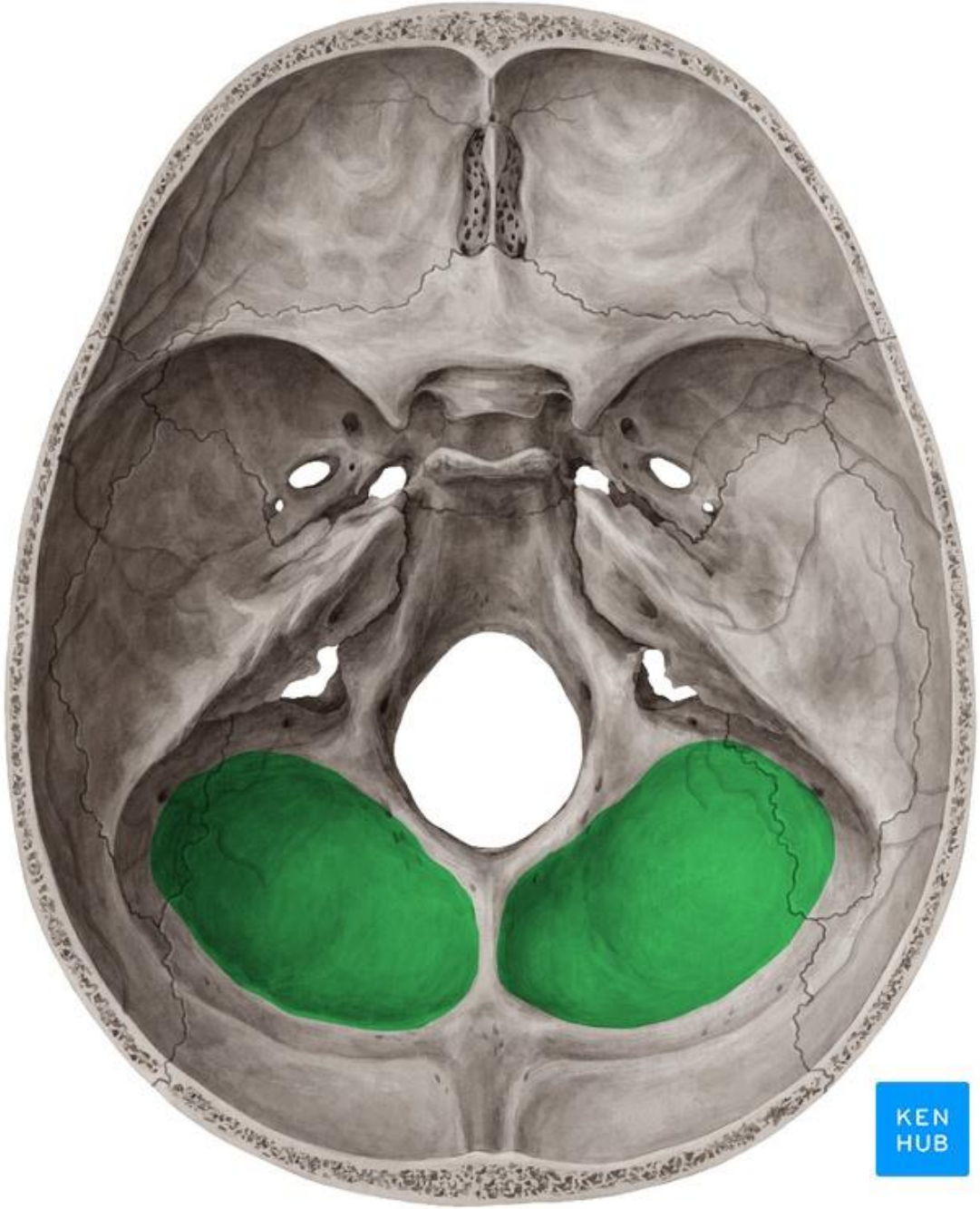
Cerebellar fossa



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Ethmoid bone

Delicate bone located between the two orbits

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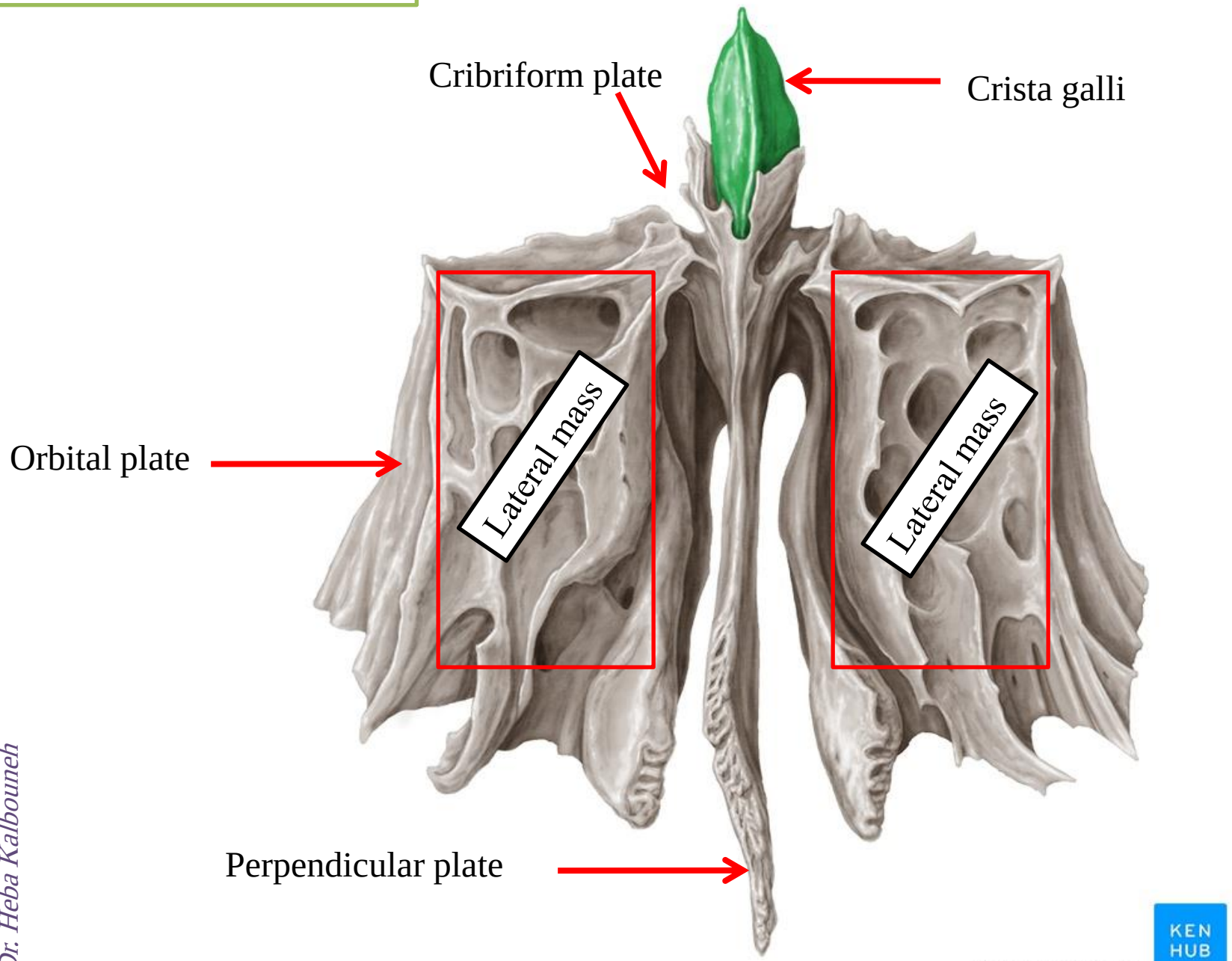
Ethmoid bone



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Norma Basalis Externa

Maxilla

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Palatine process of maxilla

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Palatine bone (horizontal plate)

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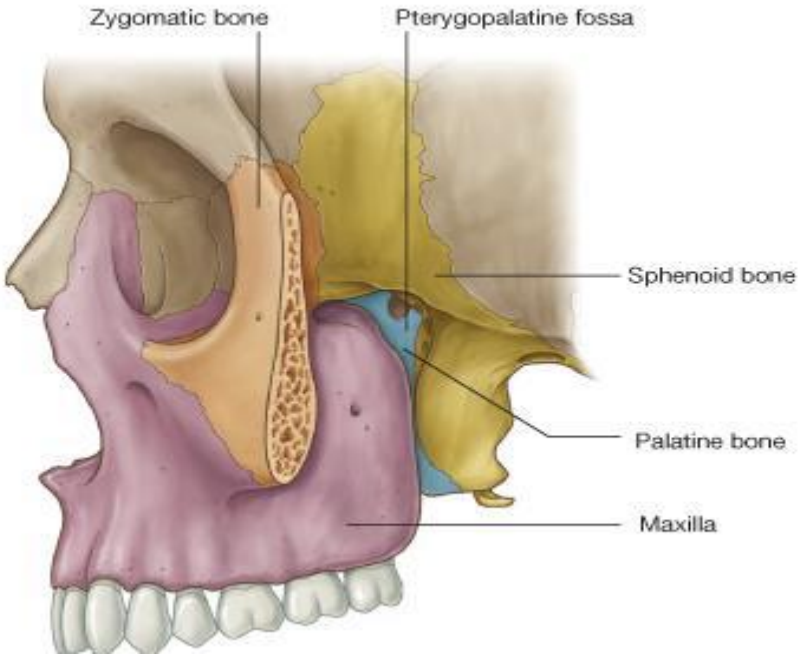
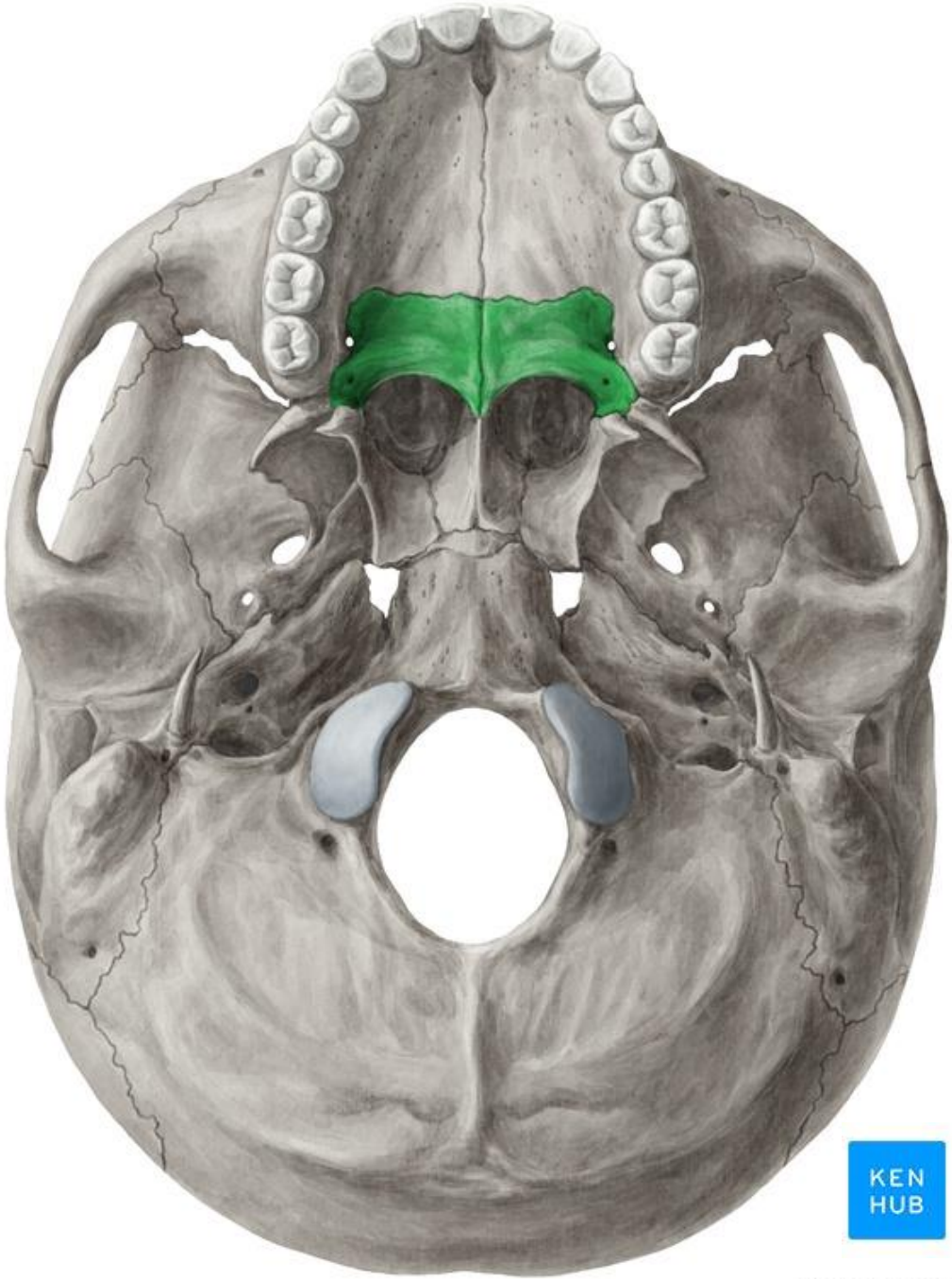
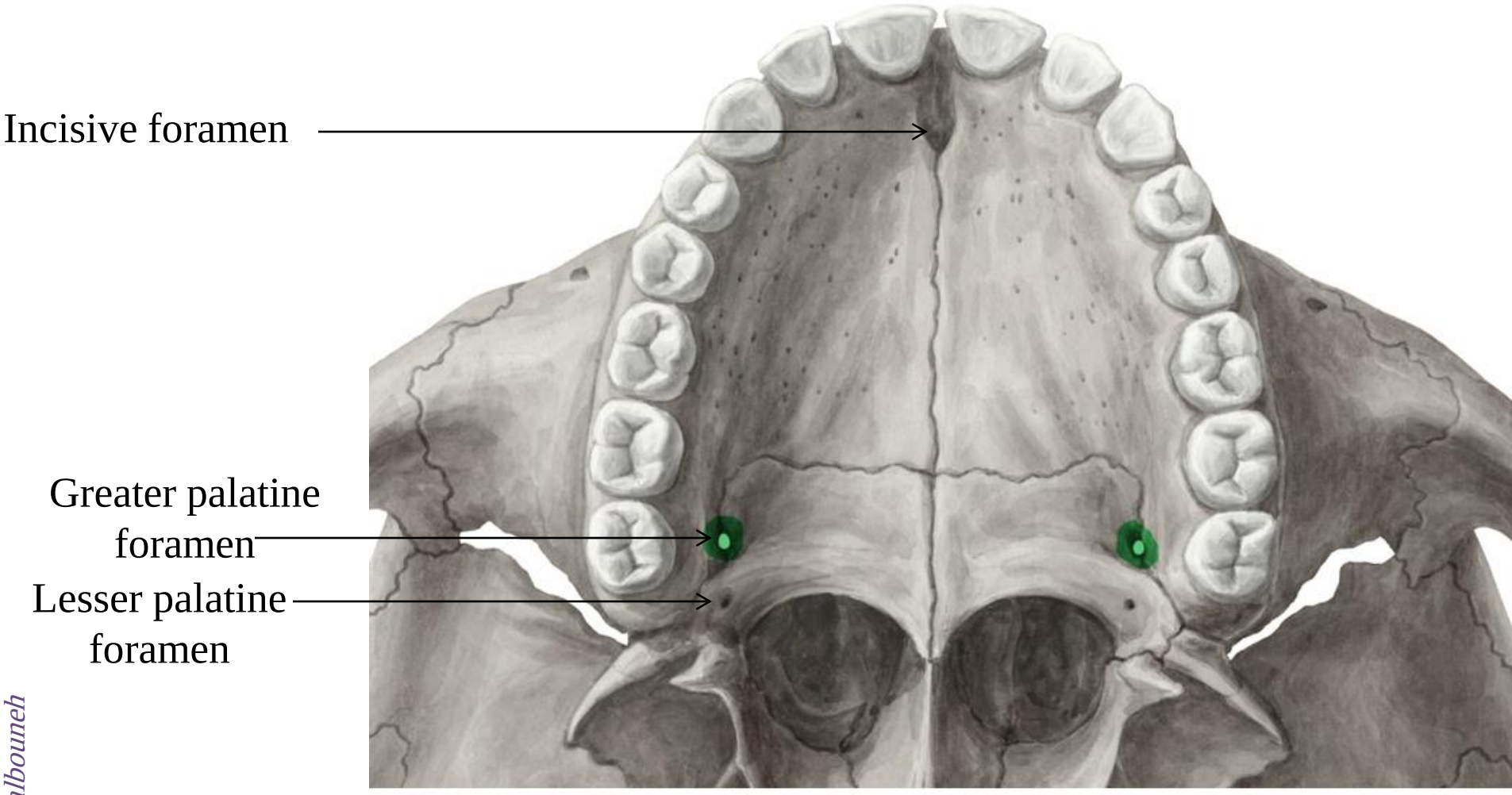
For respiratory system







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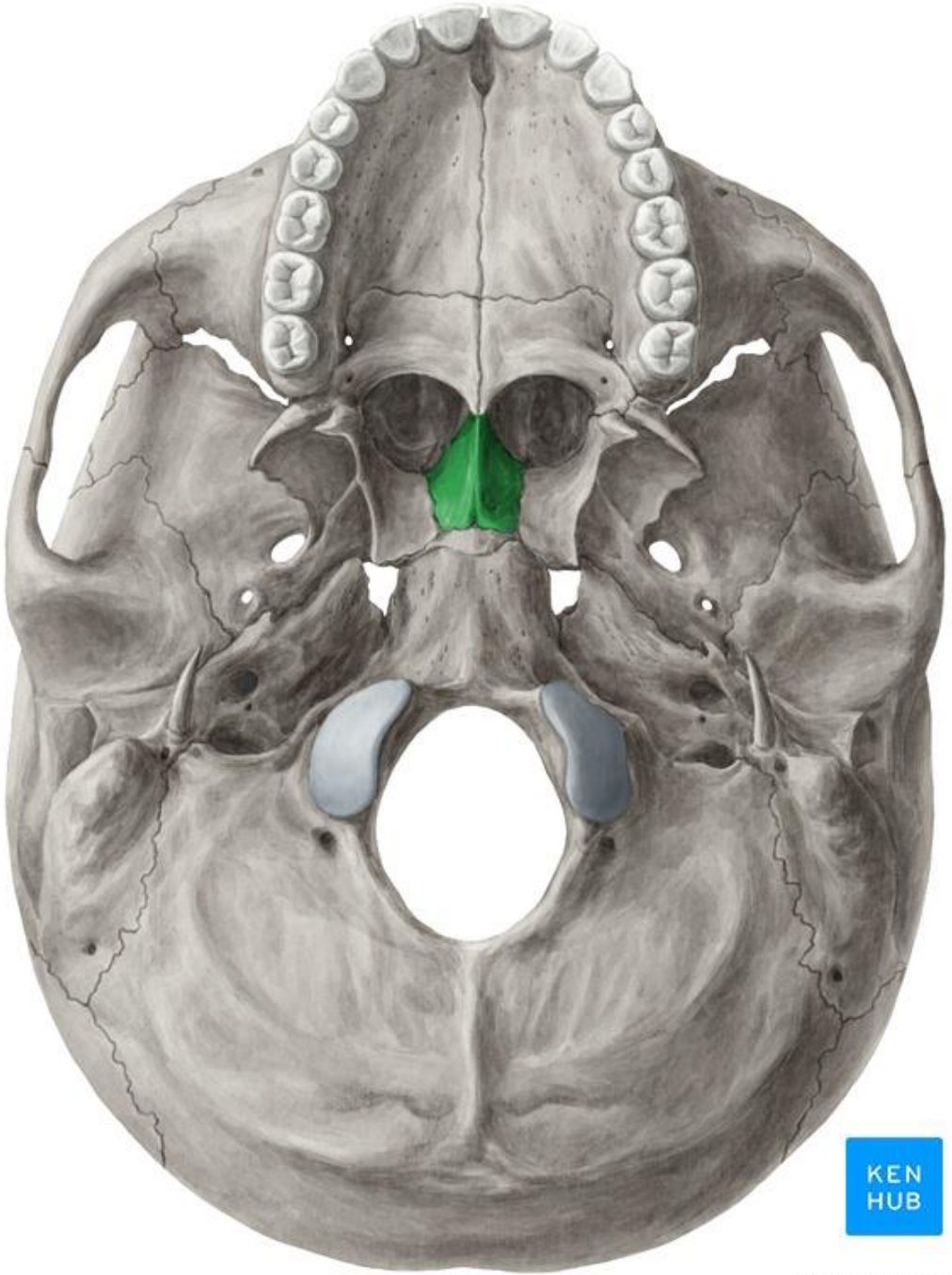
The vomer



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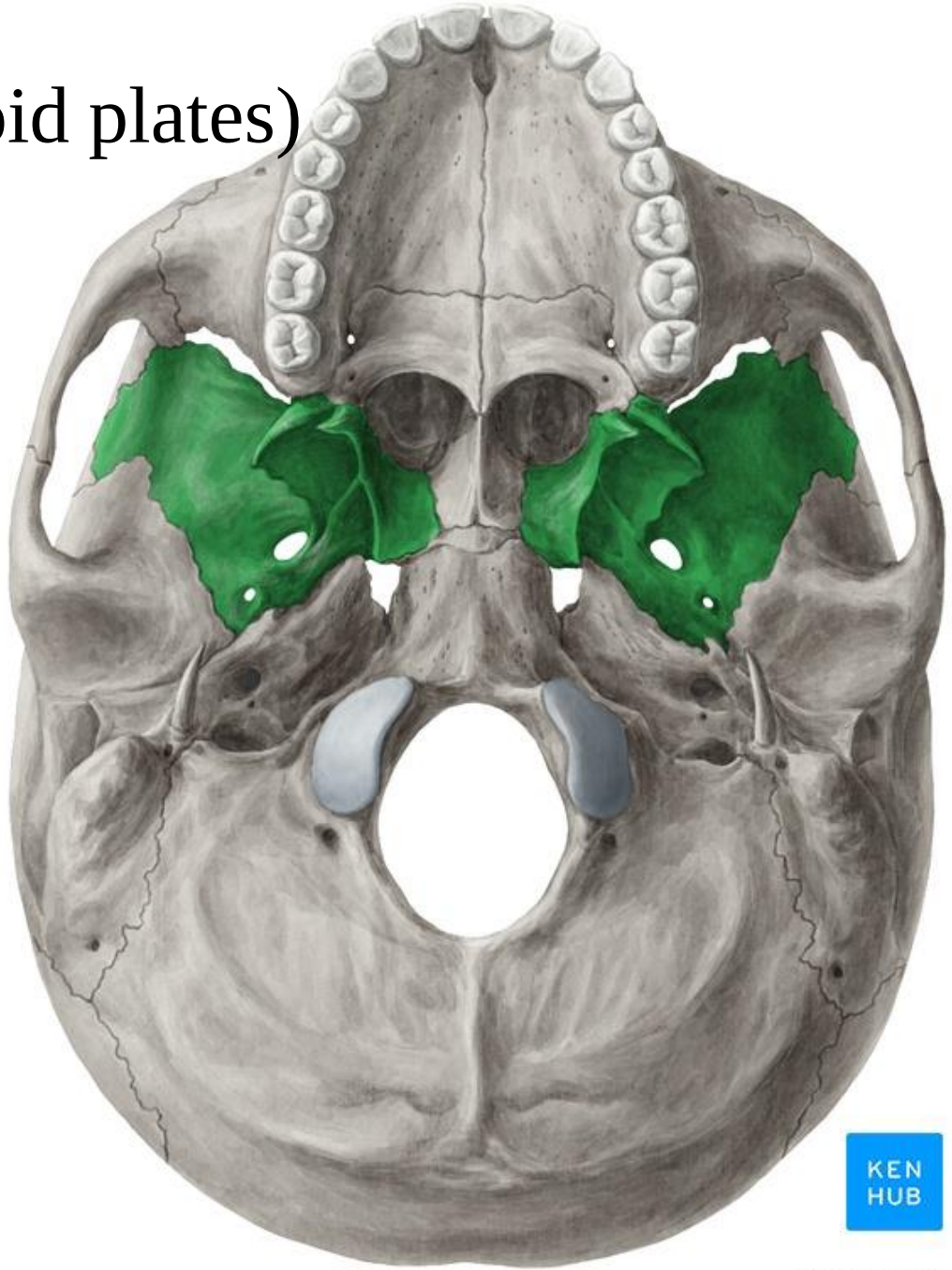
Sphenoid bone

(greater wing and pterygoid plates)



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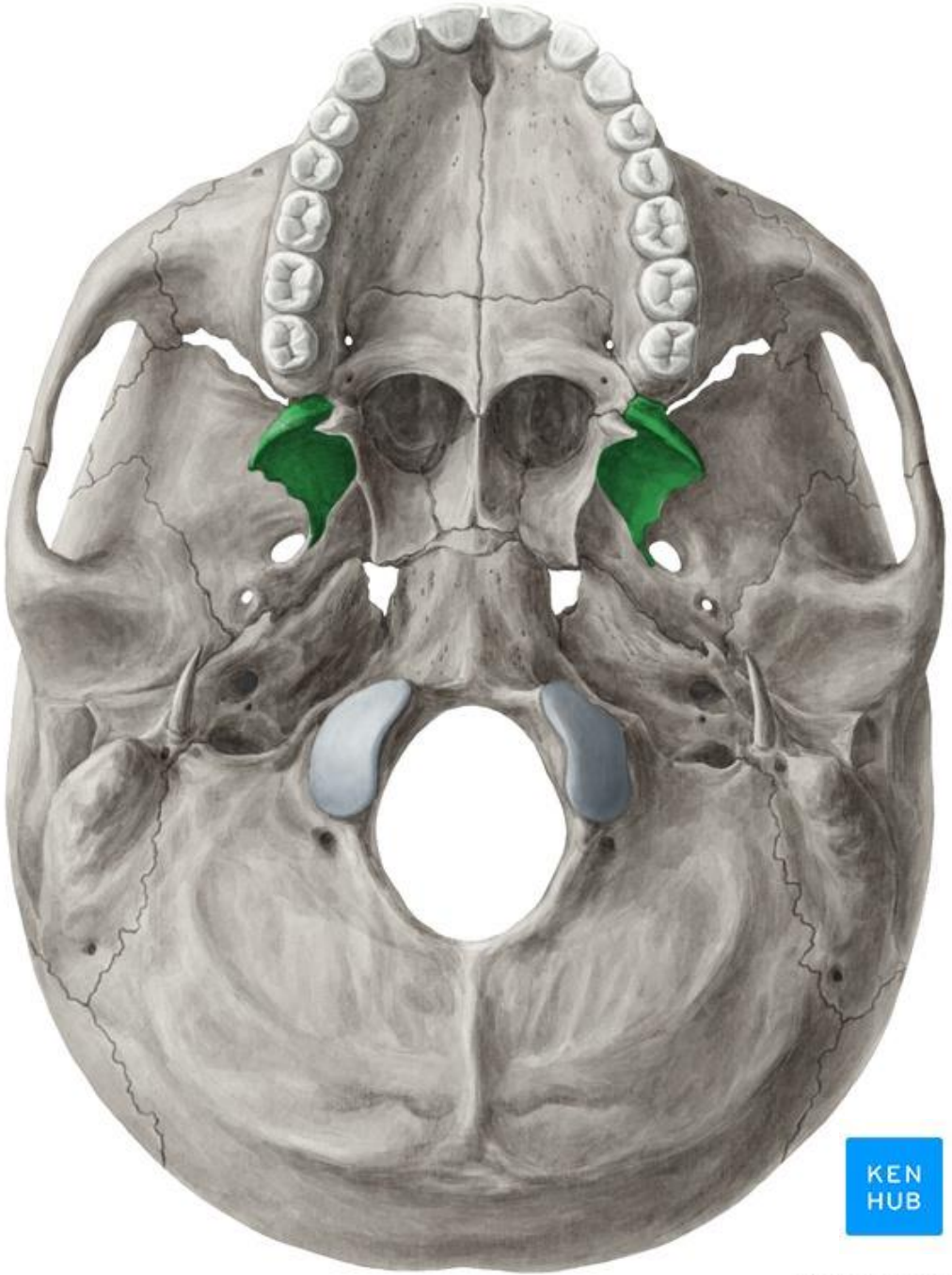
Lateral pterygoid plates of sphenoid



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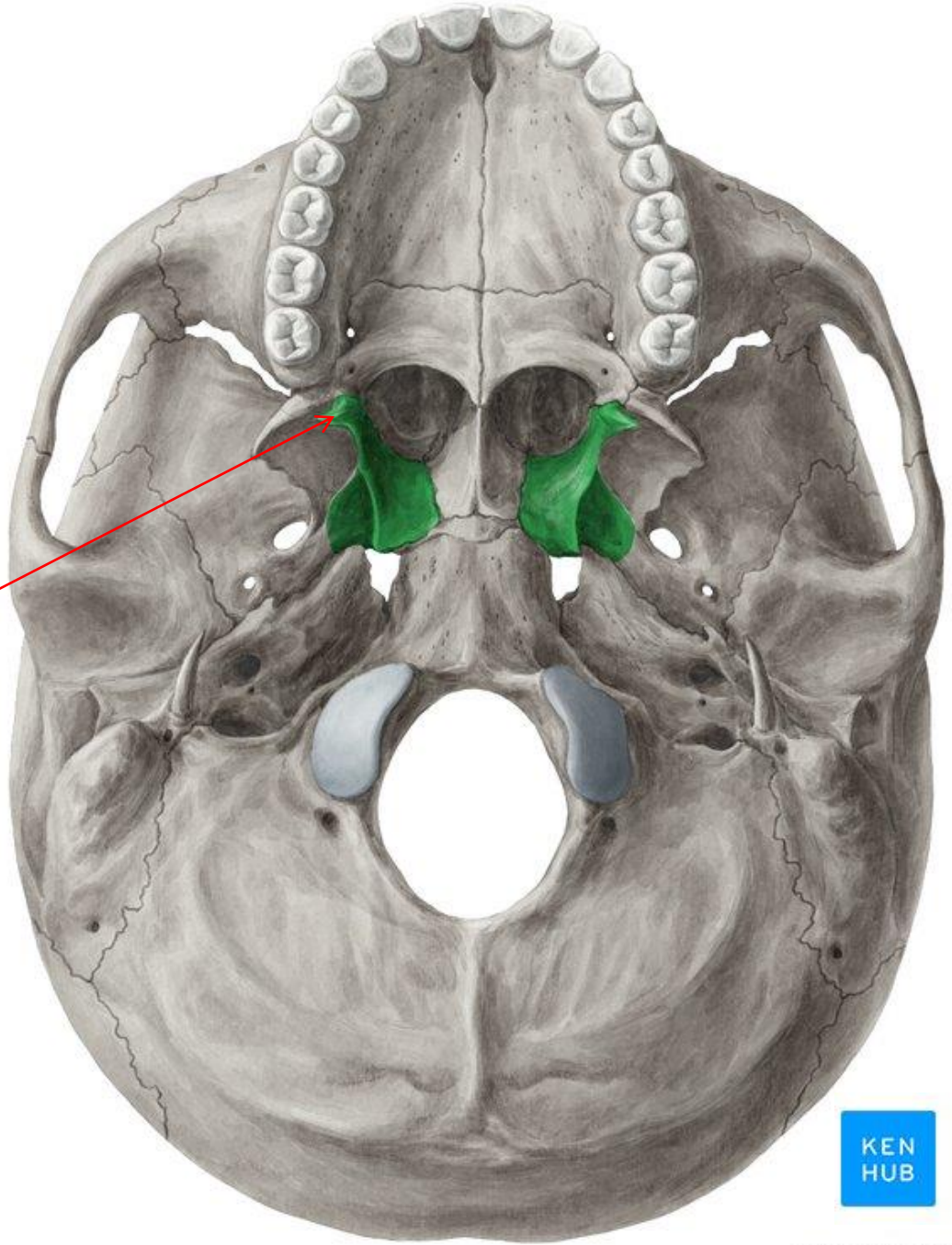
Medial pterygoid plates of sphenoid

Hamulus of Medial pterygoid plate of sphenoid



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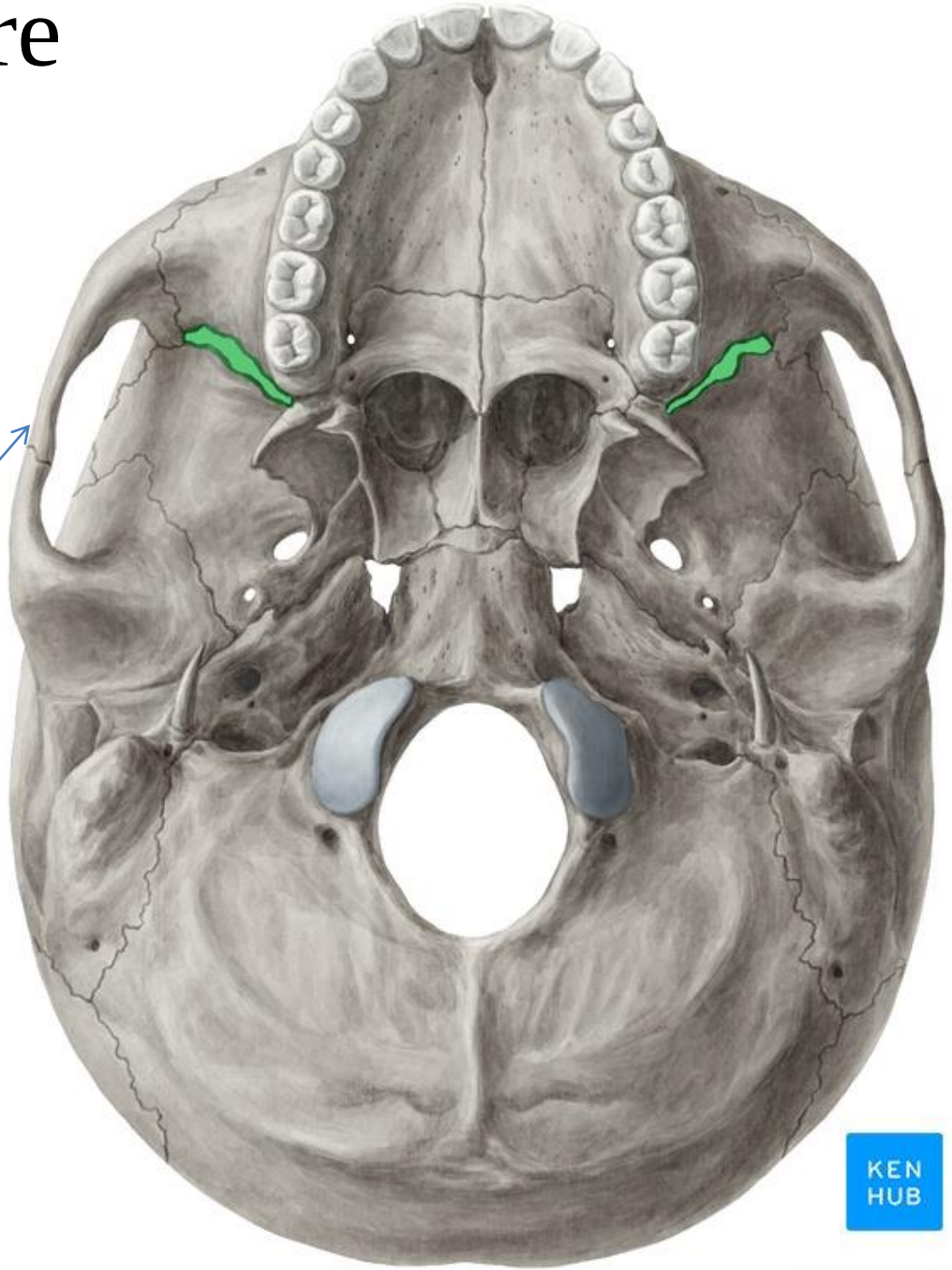
Inferior orbital fissure

It is formed between the greater wing of sphenoid bone and maxilla



Zygomatic arch

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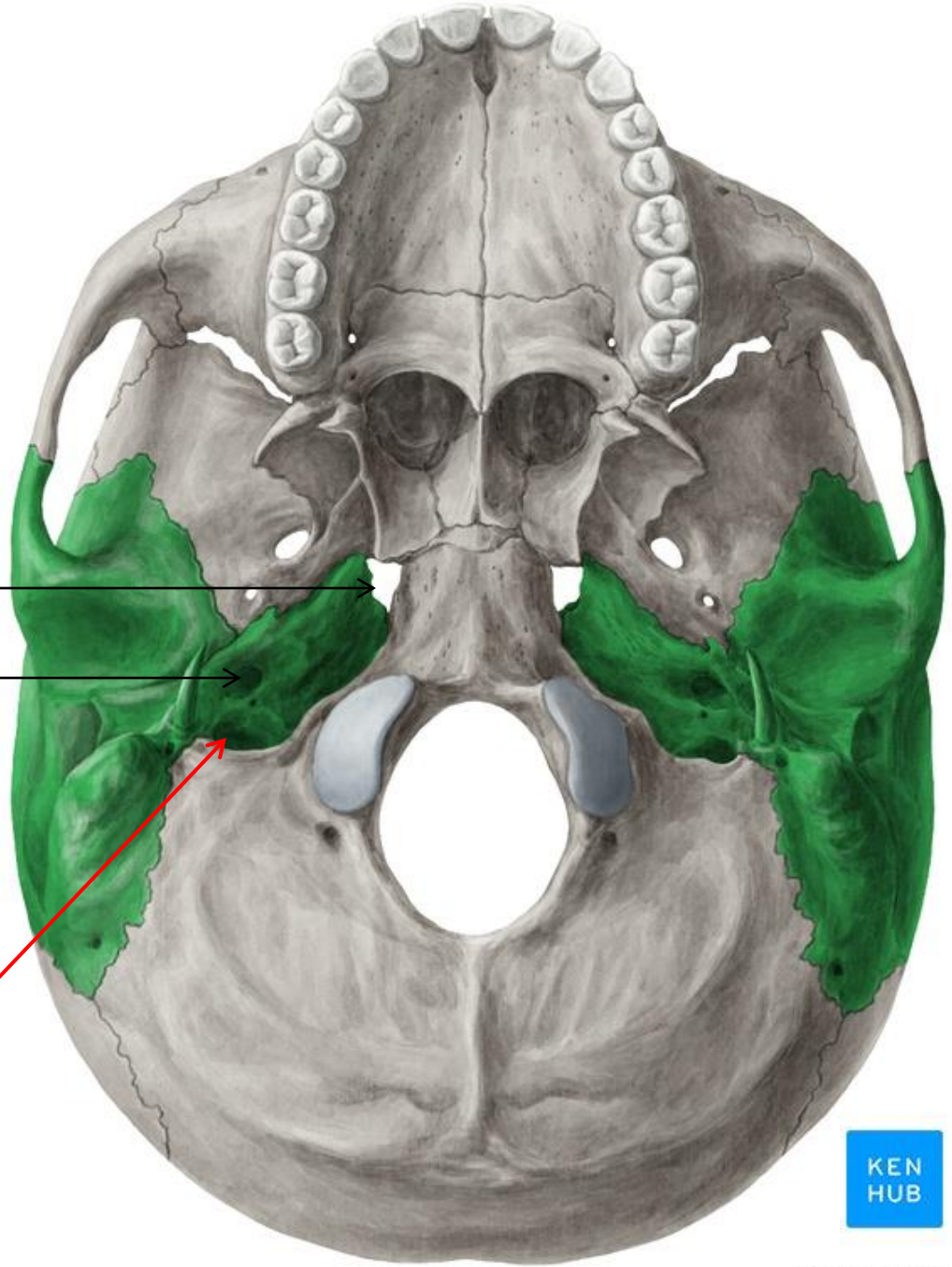
Temporal bone



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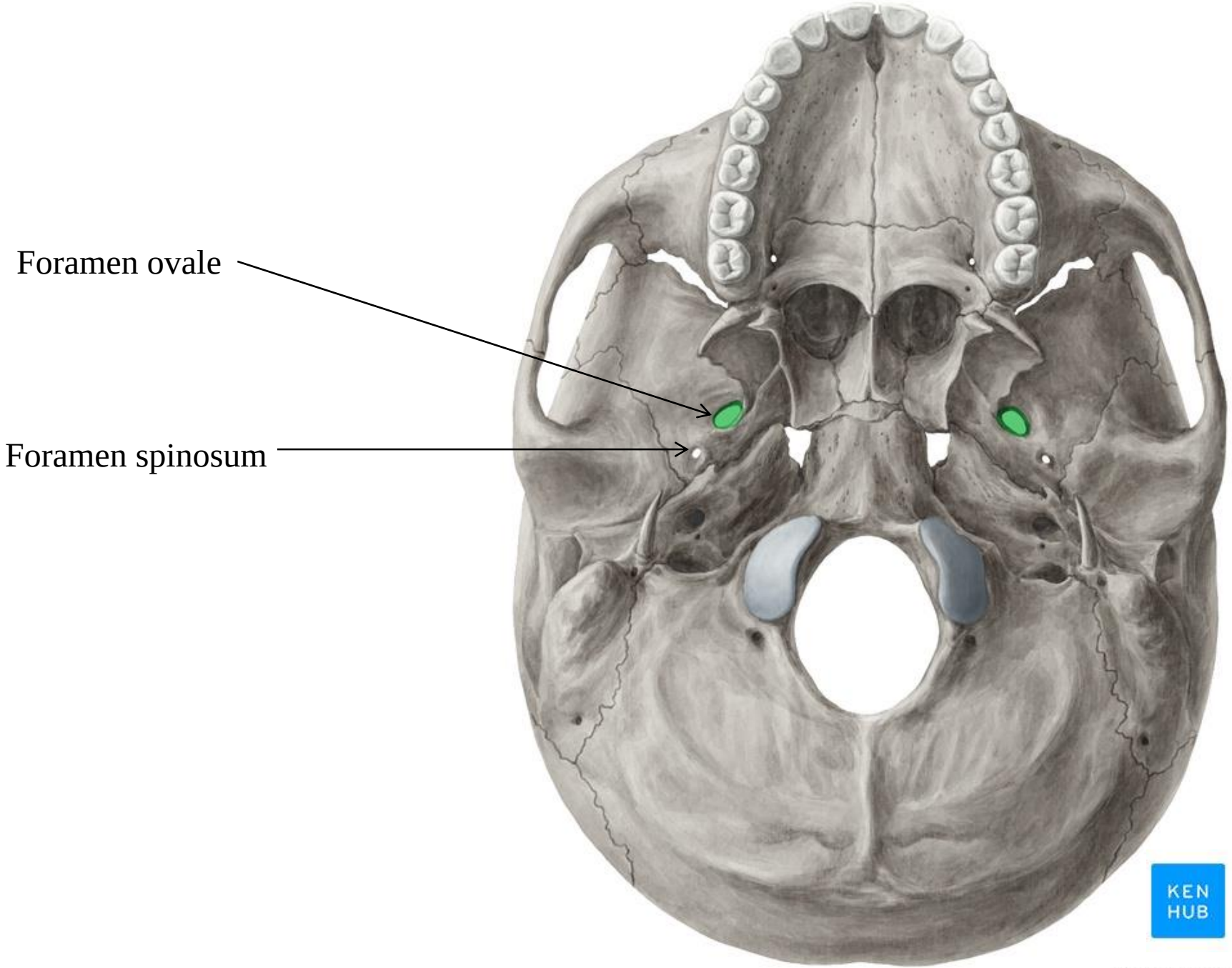

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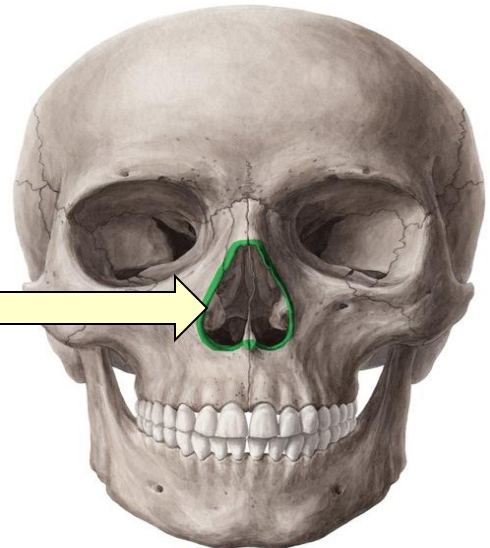
Choanae (posterior nasal aperture)

The mandibular fossa of the temporal bone and the articular tubercle form the upper articular surfaces for the temporomandibular joint.

External auditory meatus



Anterior nasal aperture

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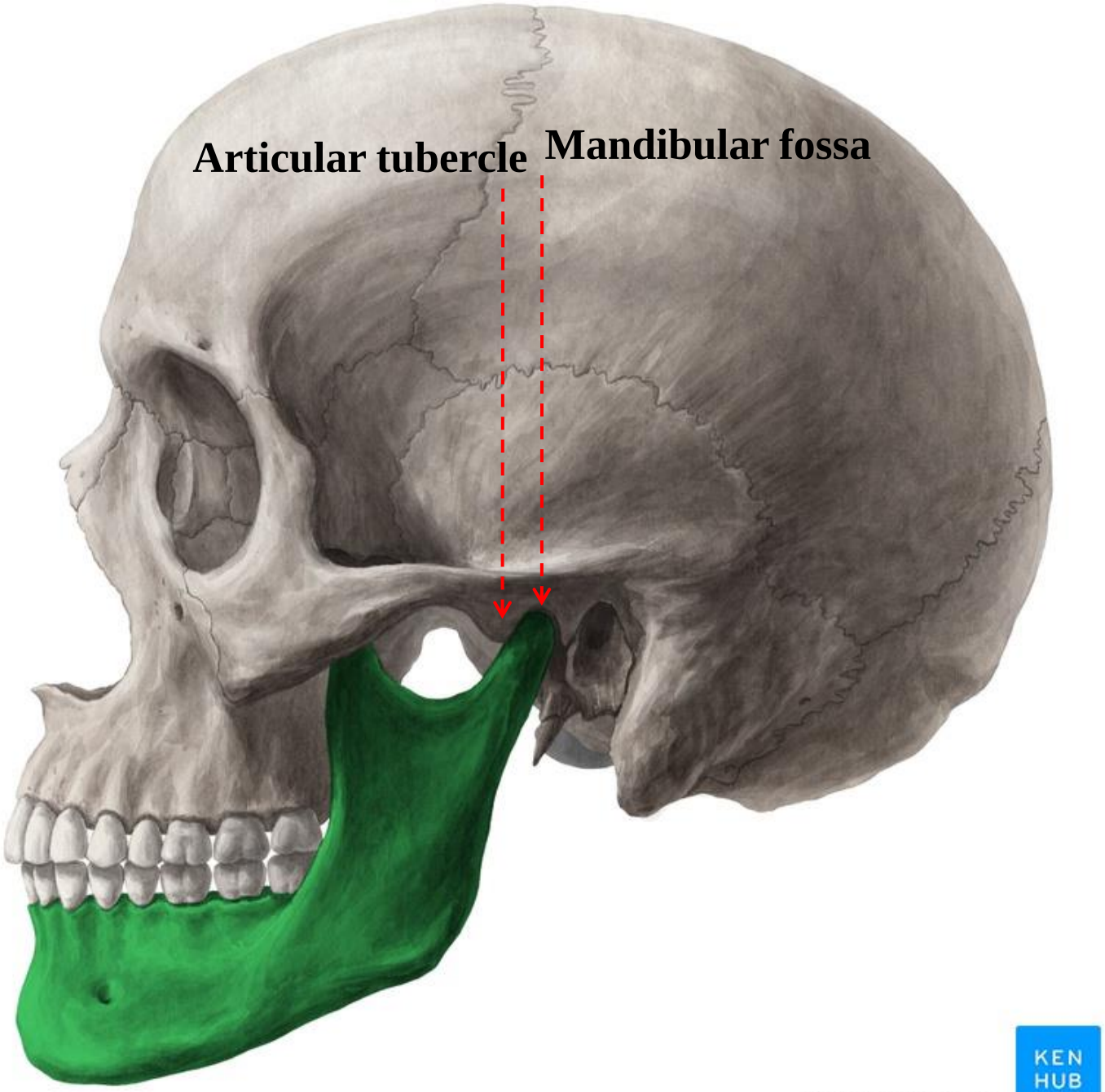

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Occipital bone

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Foramen magnum

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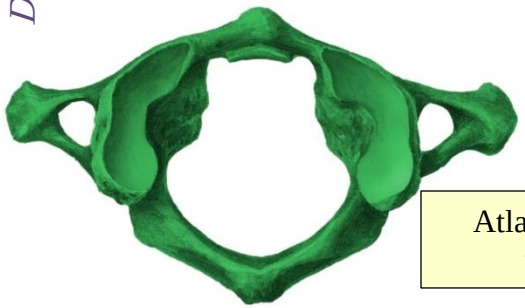
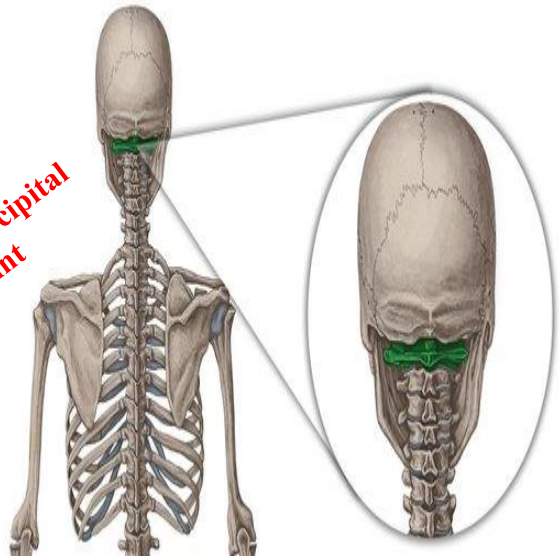
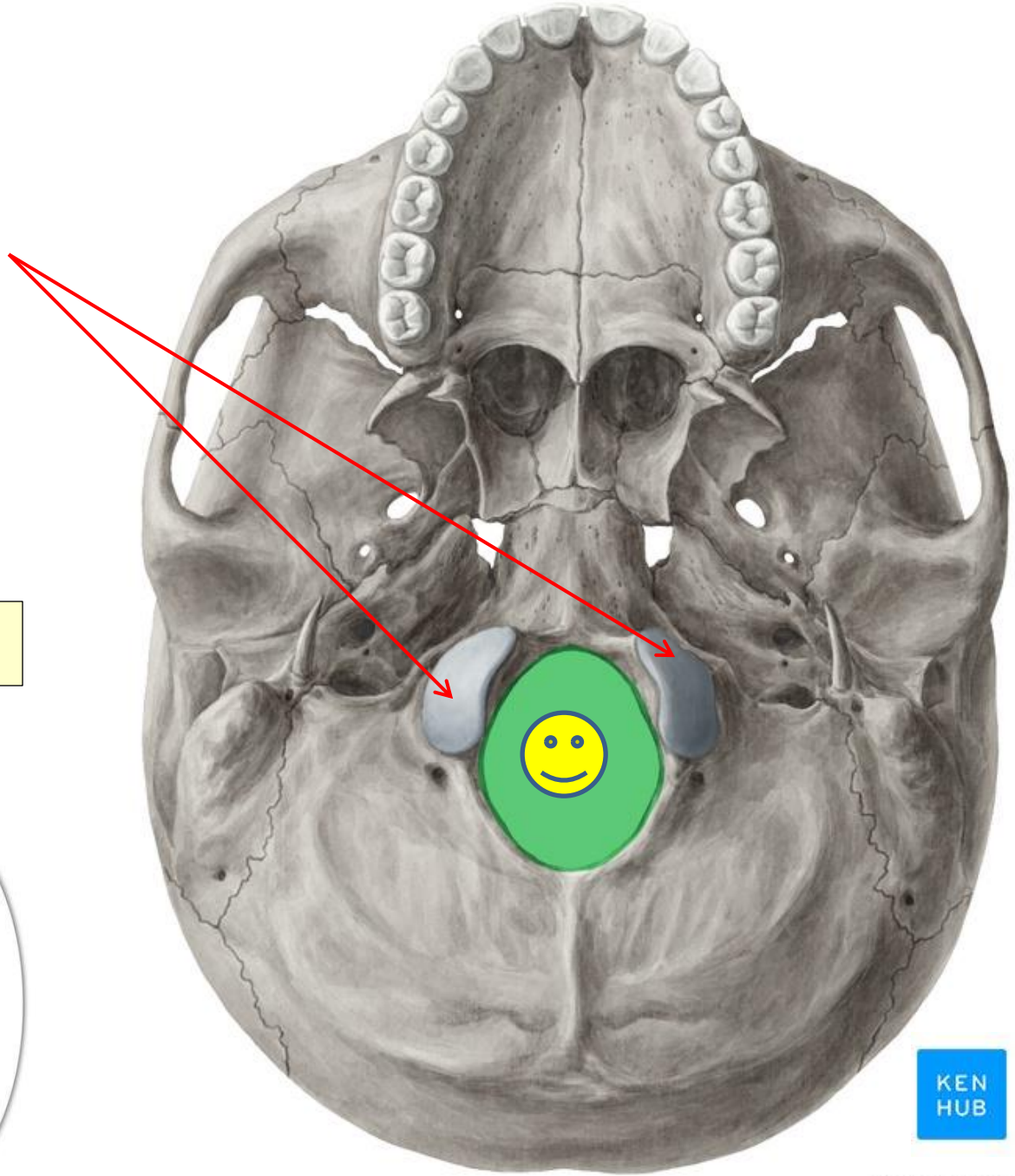
Chondyles of occipital bone (articulate with C1 vertebra)



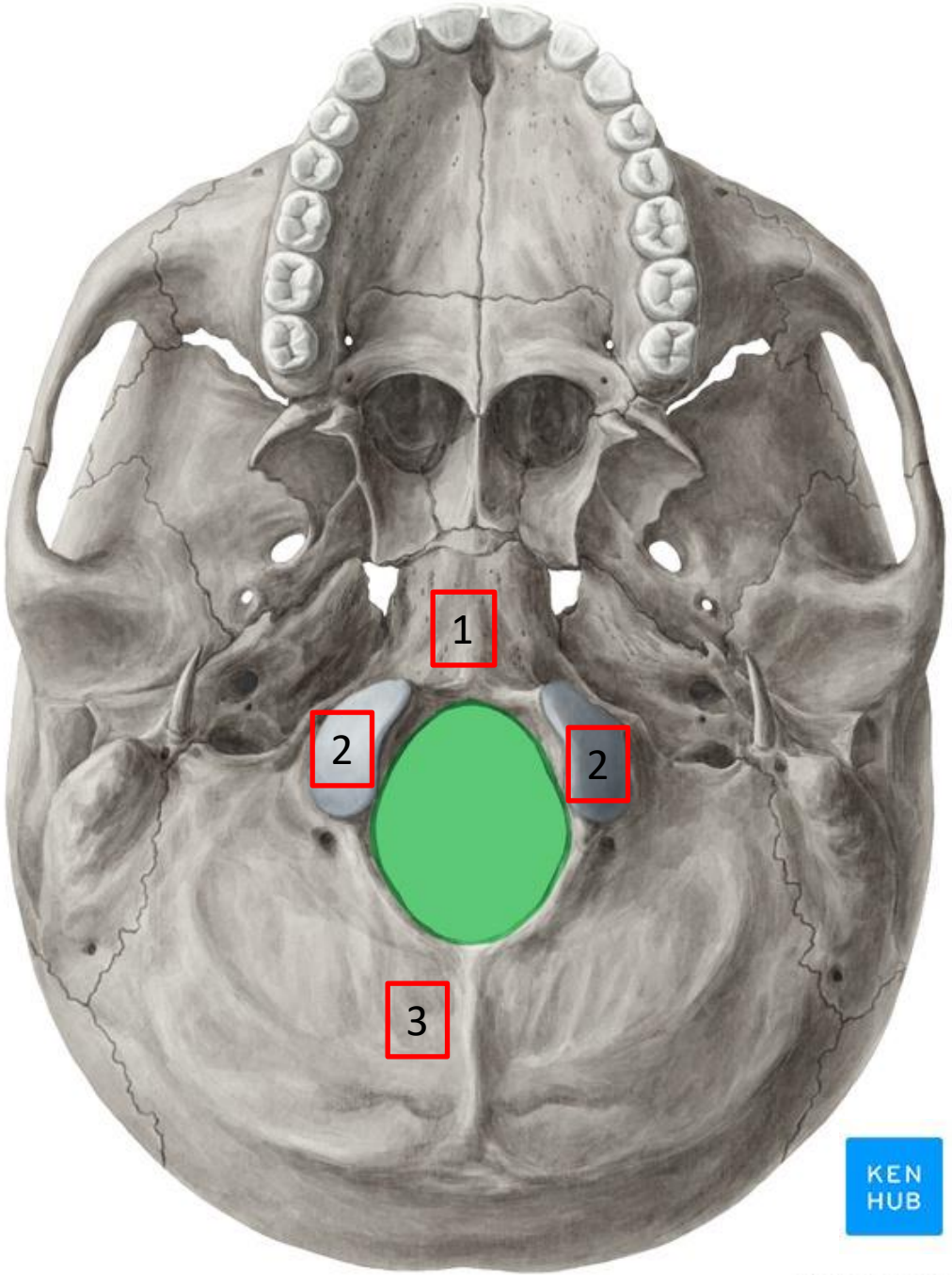
Atlas (**1st cervical vertebra)**





Parts of occipital bone:

1: Basilar part (in front the foramen magnum)
2: Occipital chondyles (sides of foramen magnum)
3: Squamous part (behind the foramen magnum)



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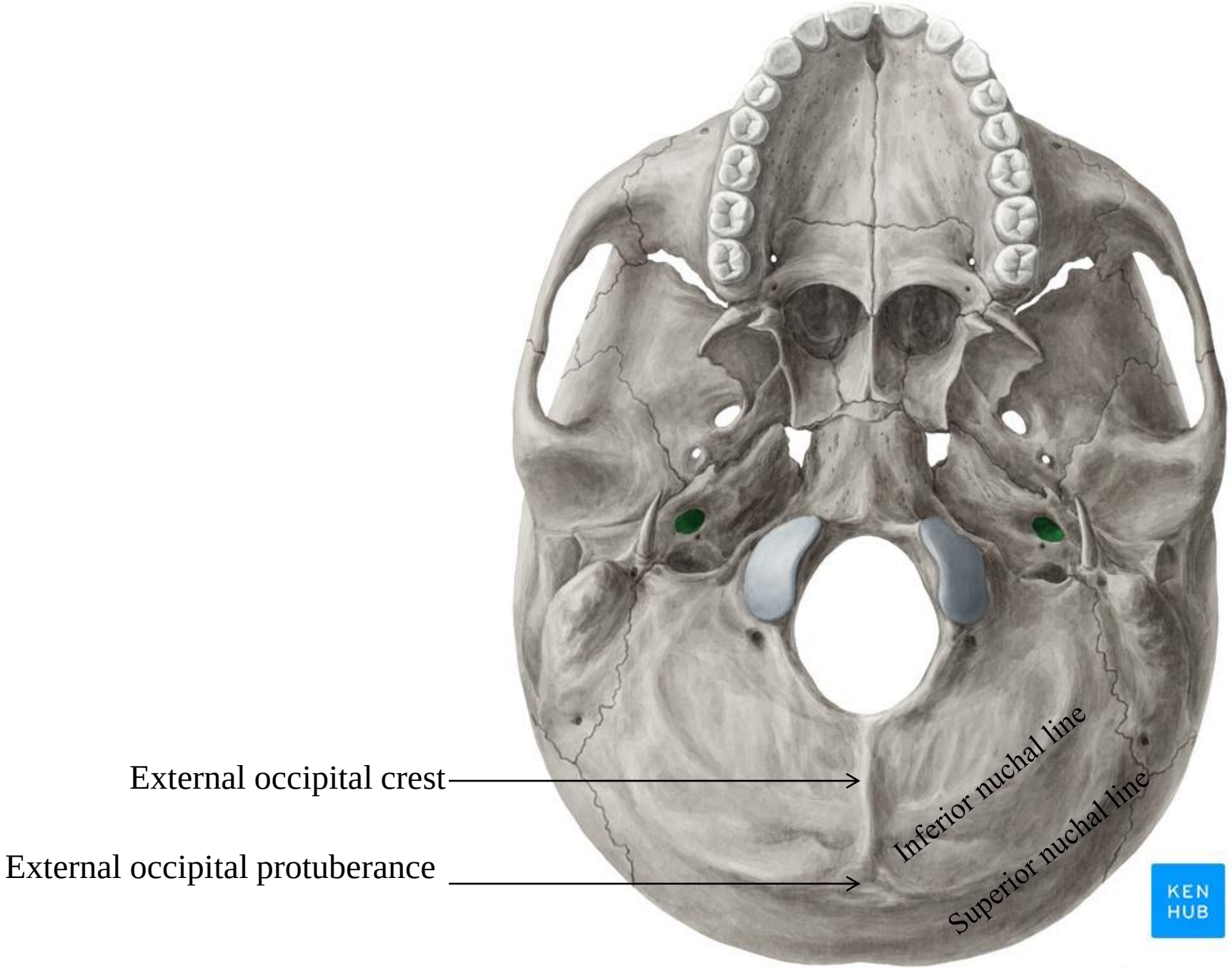

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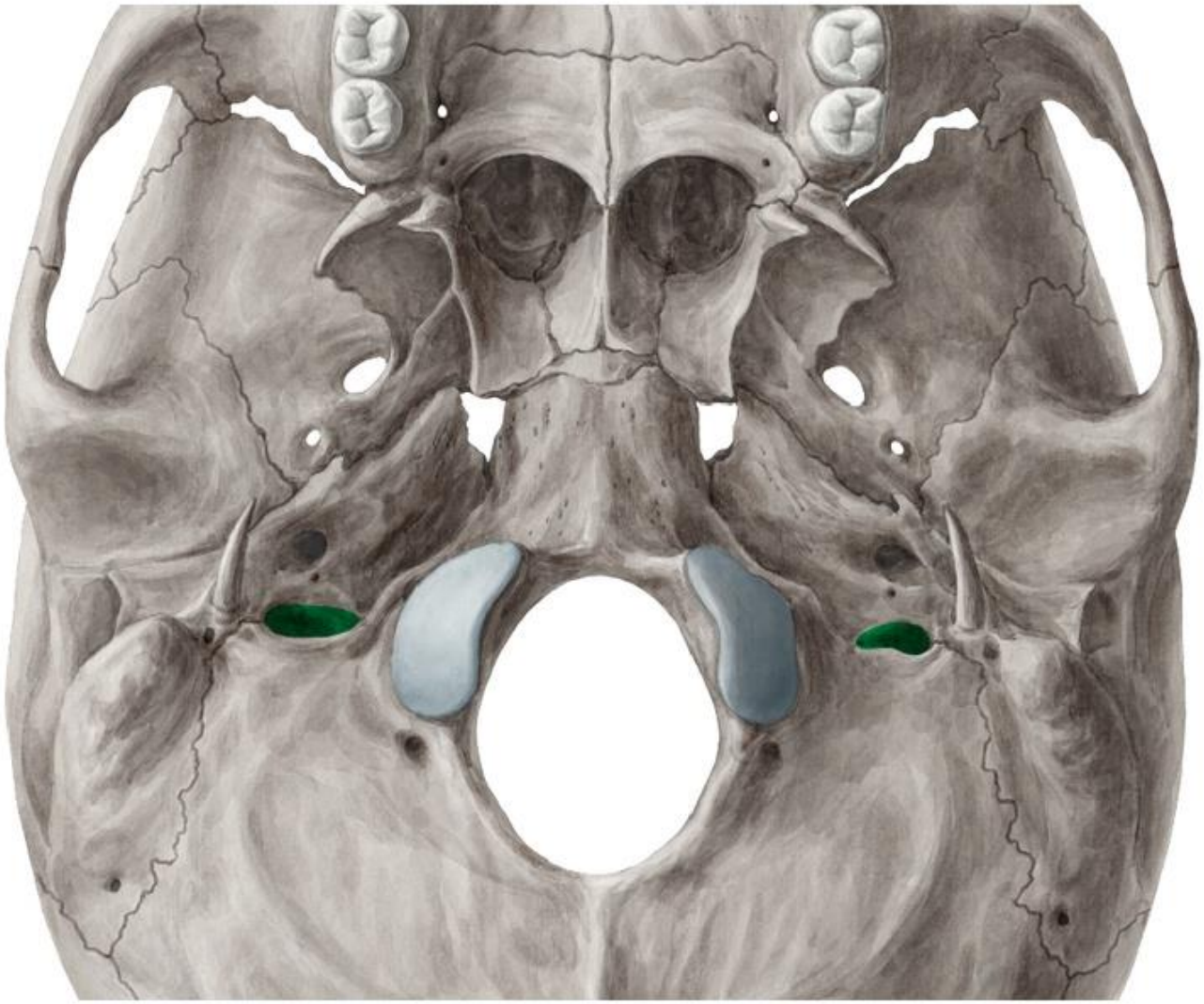
Jugular foramen



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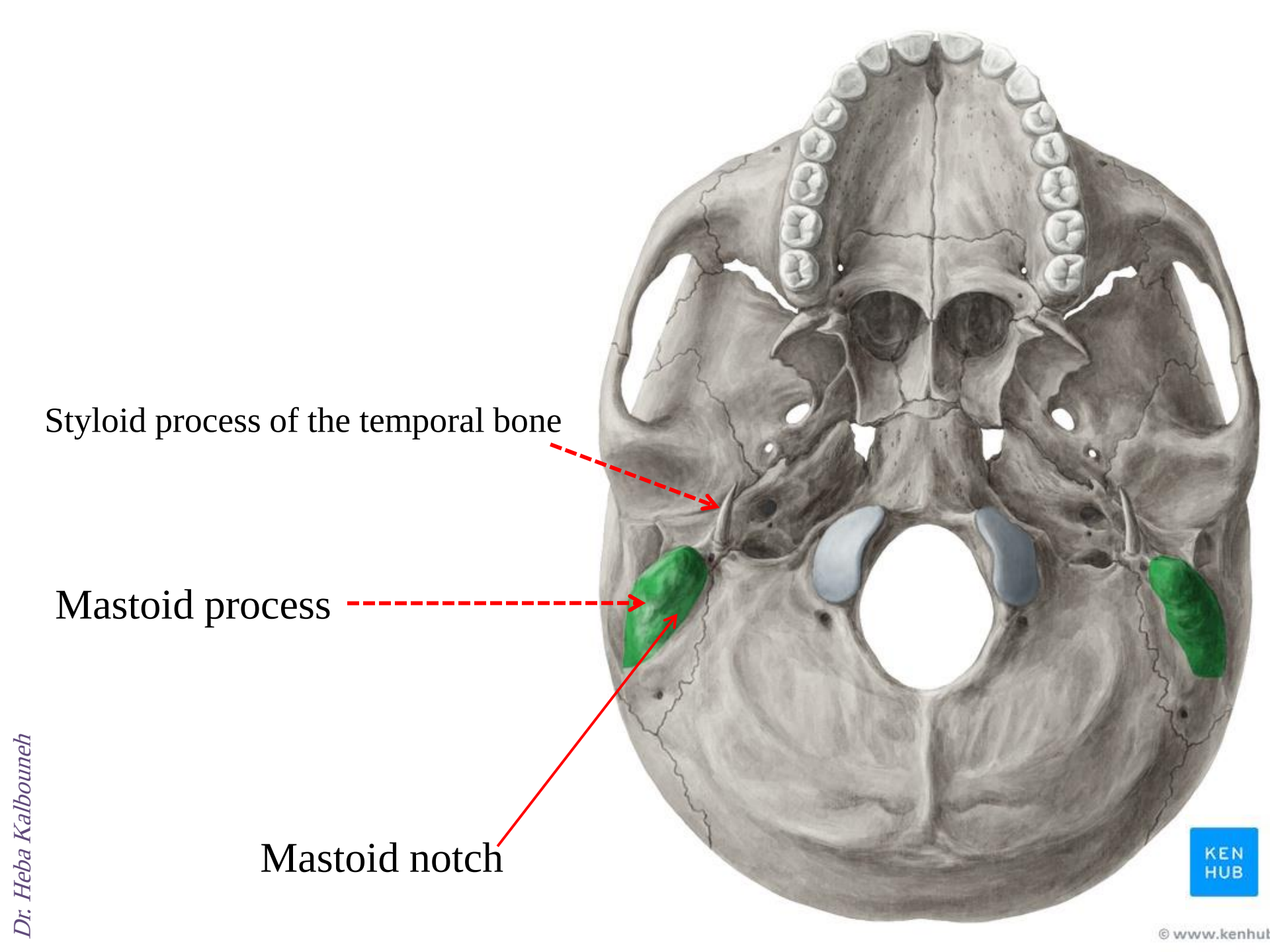

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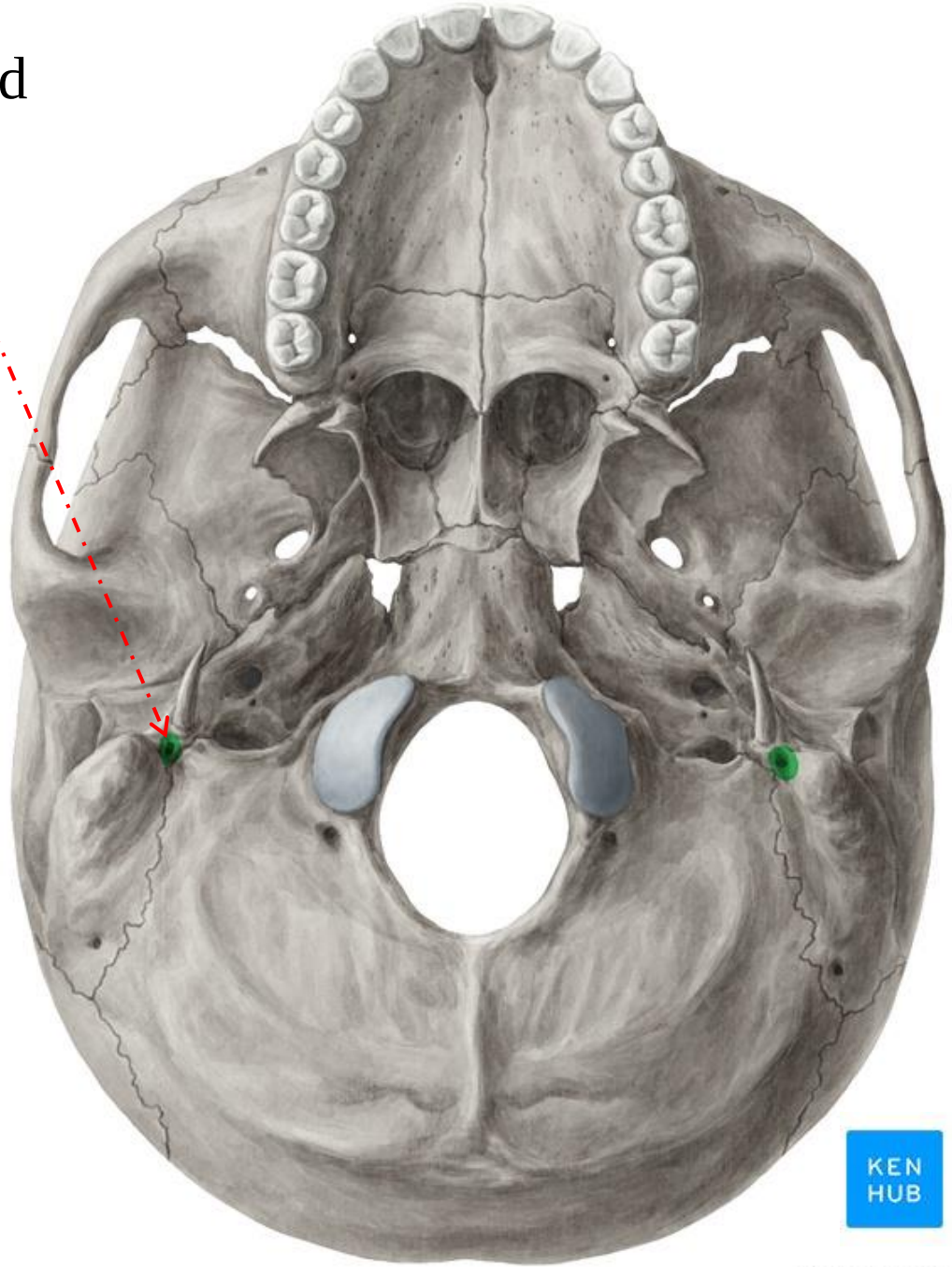
The **stylomastoid foramen**

In the interval between the styloid and mastoid processes

Transmits the facial nerve



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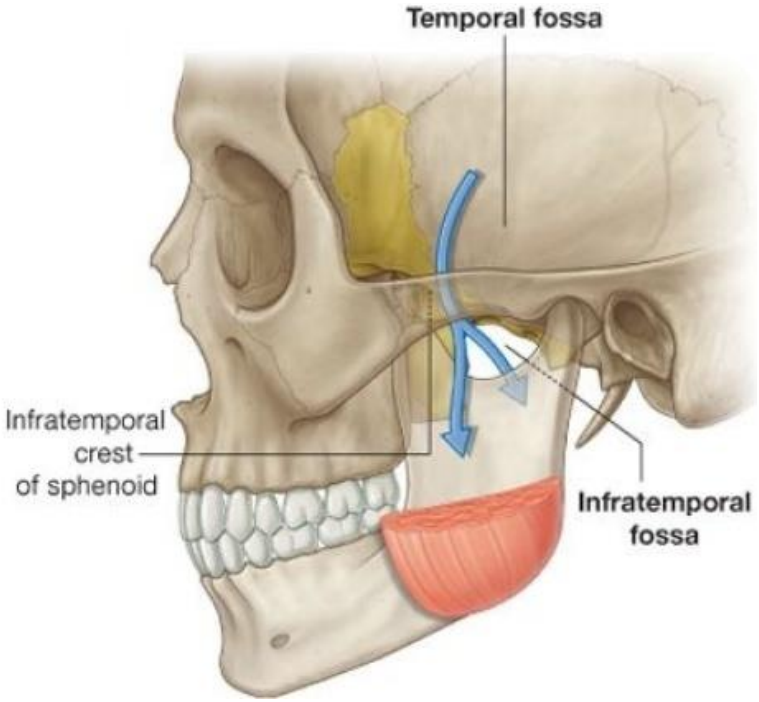
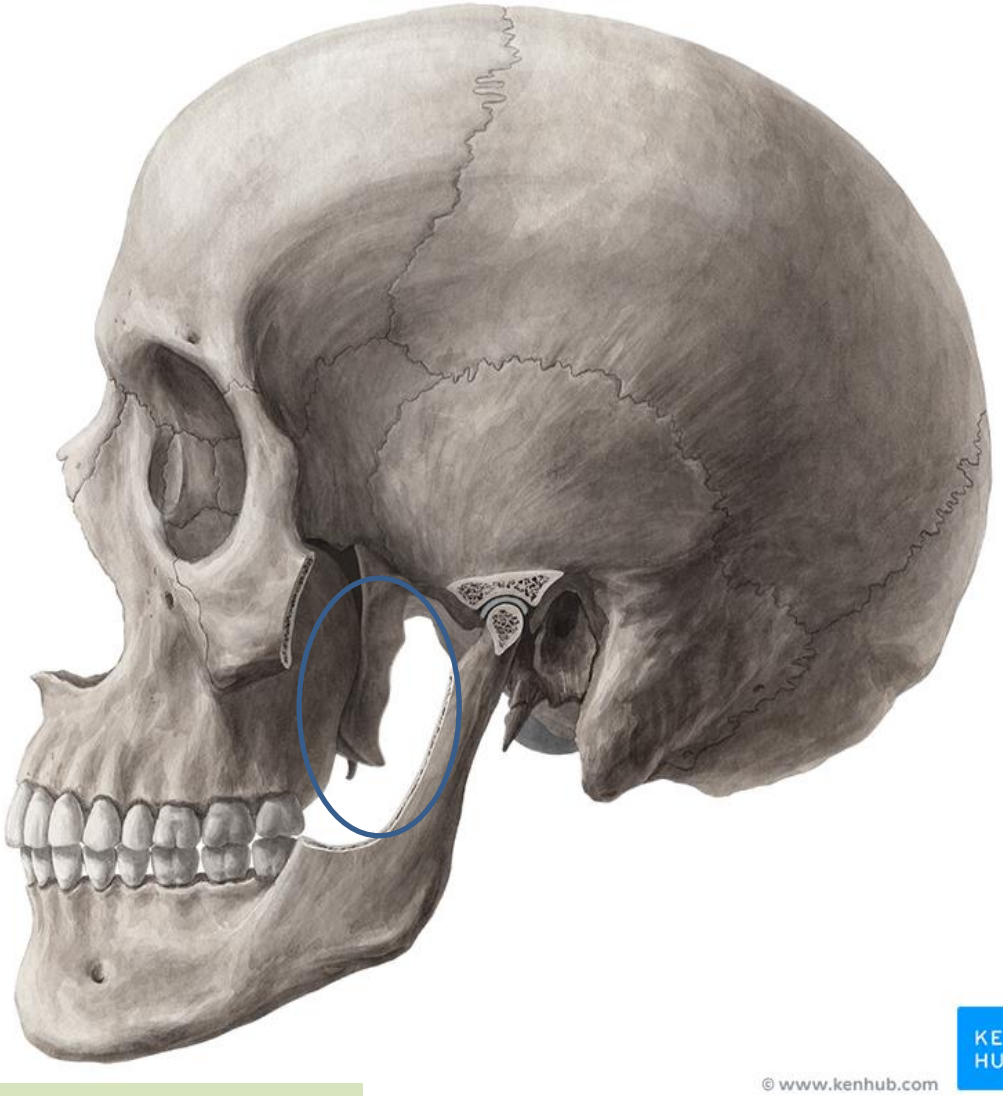
Infra temporal fossa

Boundaries

Anterior wall: back of the maxilla
Medial wall: lateral pterygoid plate
Roof: greater wing of sphenoid bone
Lateral wall: ramus of mandible





Communications

Temporal fossa: through the gap deep to the zygomatic arch
Orbit: through the inferior orbital fissure
Pterygo-palatine fossa: through the pterygo-maxillary fissure
Middle cranial fossa: through foramen ovale and spinosum

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Temporal and infratemporal fossae are interconnected spaces on the lateral side of the head

Temporal fossa is superior to the infratemporal fossa above the zygomatic arch

Pterygo-palatine fossa

Lies below the apex of the orbit

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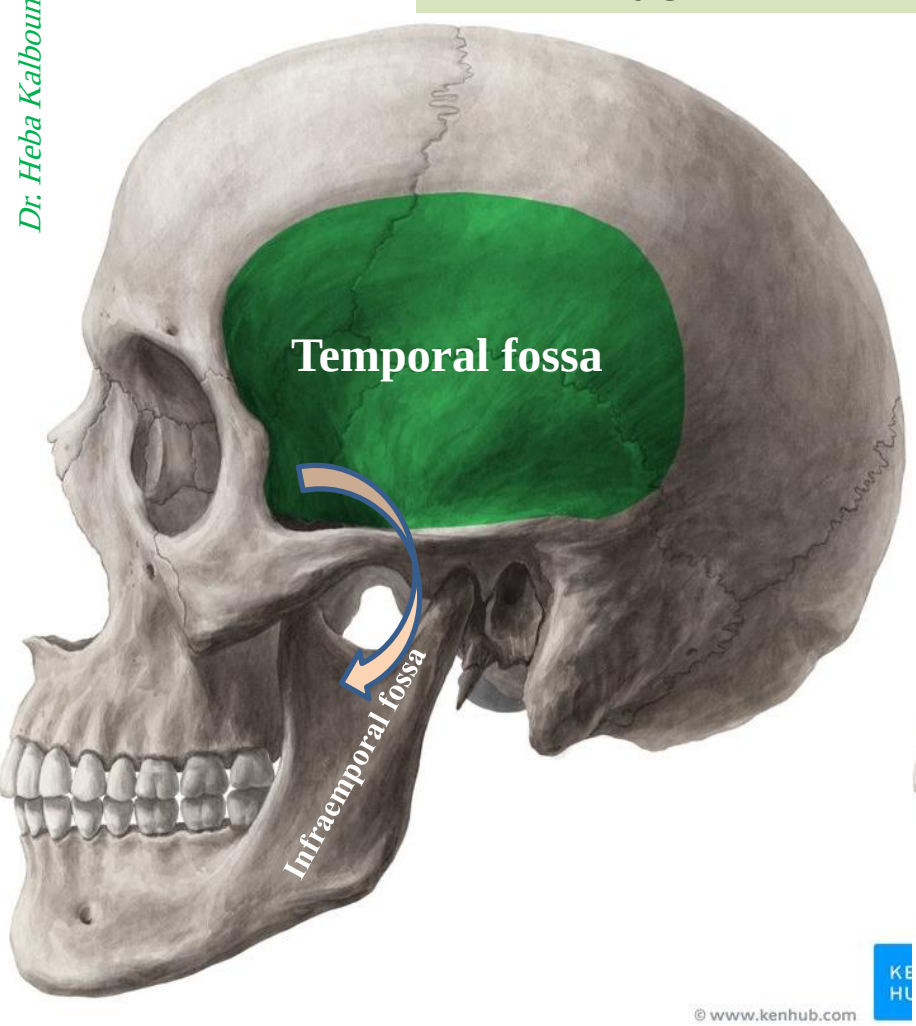

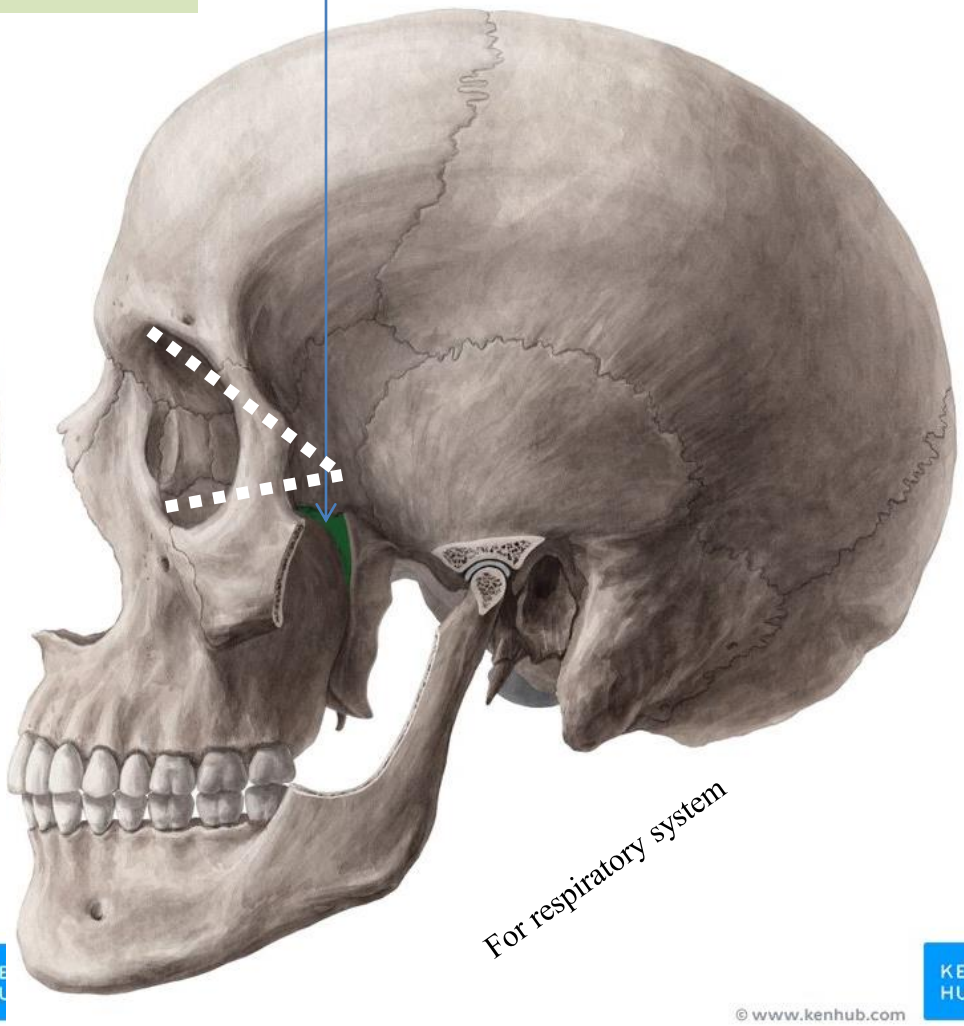

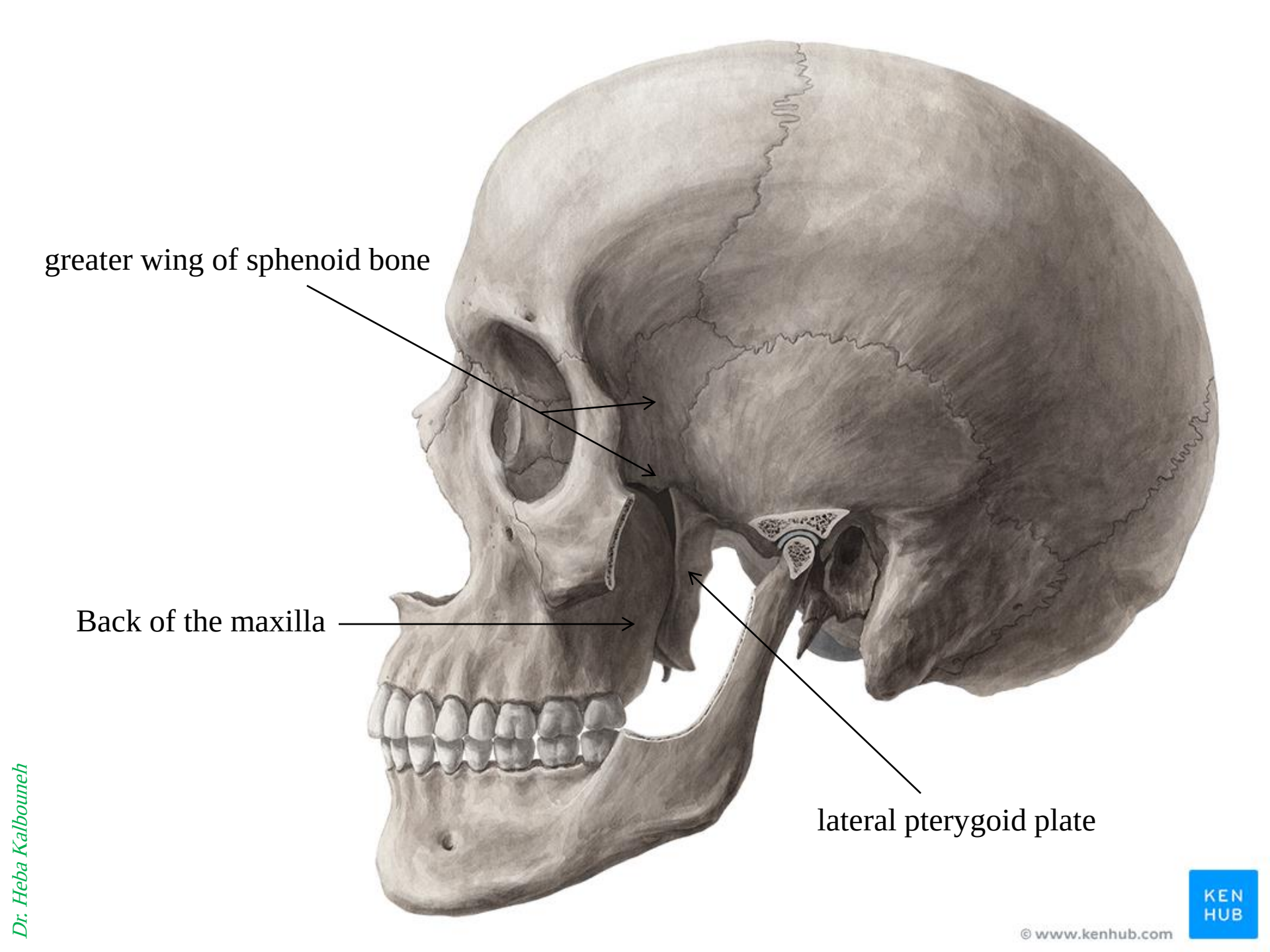

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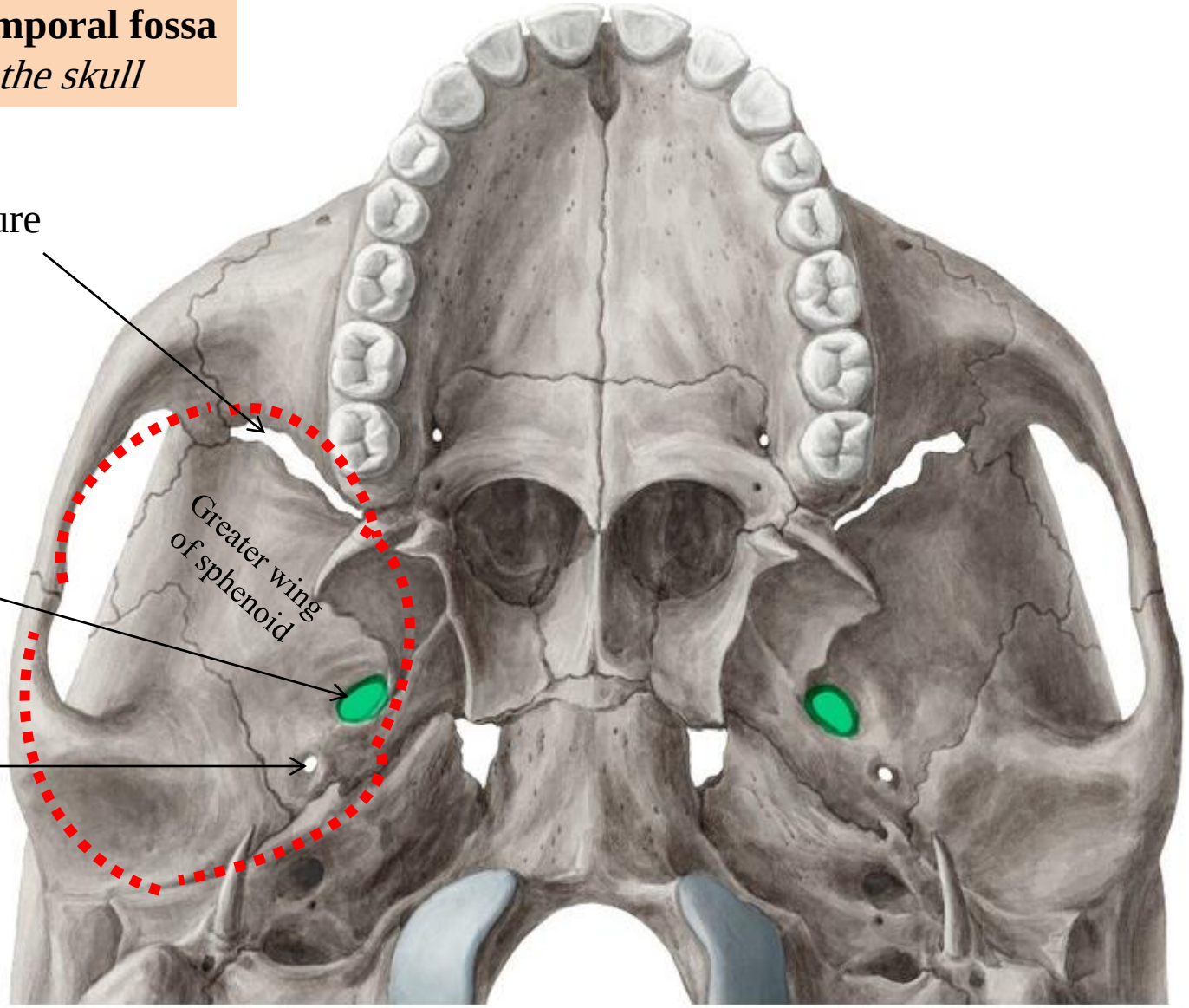
The roof of Infratemporal fossa

Inferior view of the skull



Note:
The foramen ovale and foramen spinosum open on its roof

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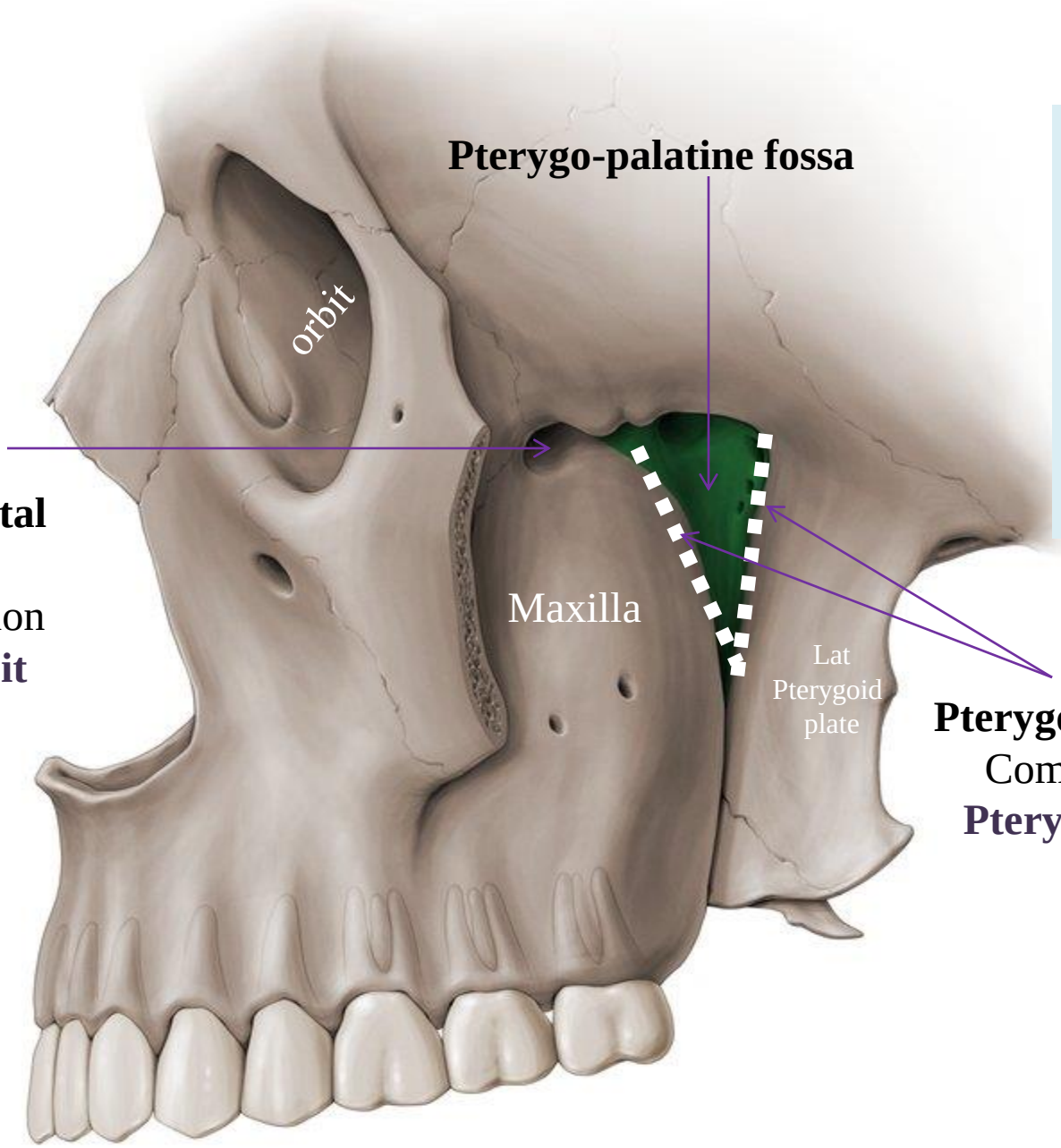

Pterygomaxillary fissure is a vertical fissure between the pterygoid plate and back of the maxilla. It leads medially into the pterygopalatine fossa

Inferior orbital fissure
Communication with the **orbit**

Pterygo-maxillary fissure
Communication with **Pterygo-palatine fossa**

The medial and anterior walls of Infratemporal fossa

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Norma basalis externa

Base of the skull- inferior view

The **hard palate** which is made of:

A-The palatal processes of the maxillae

B-The horizontal plates of the palatine bones

The choanae (posterior nasal apertures)

The vomer

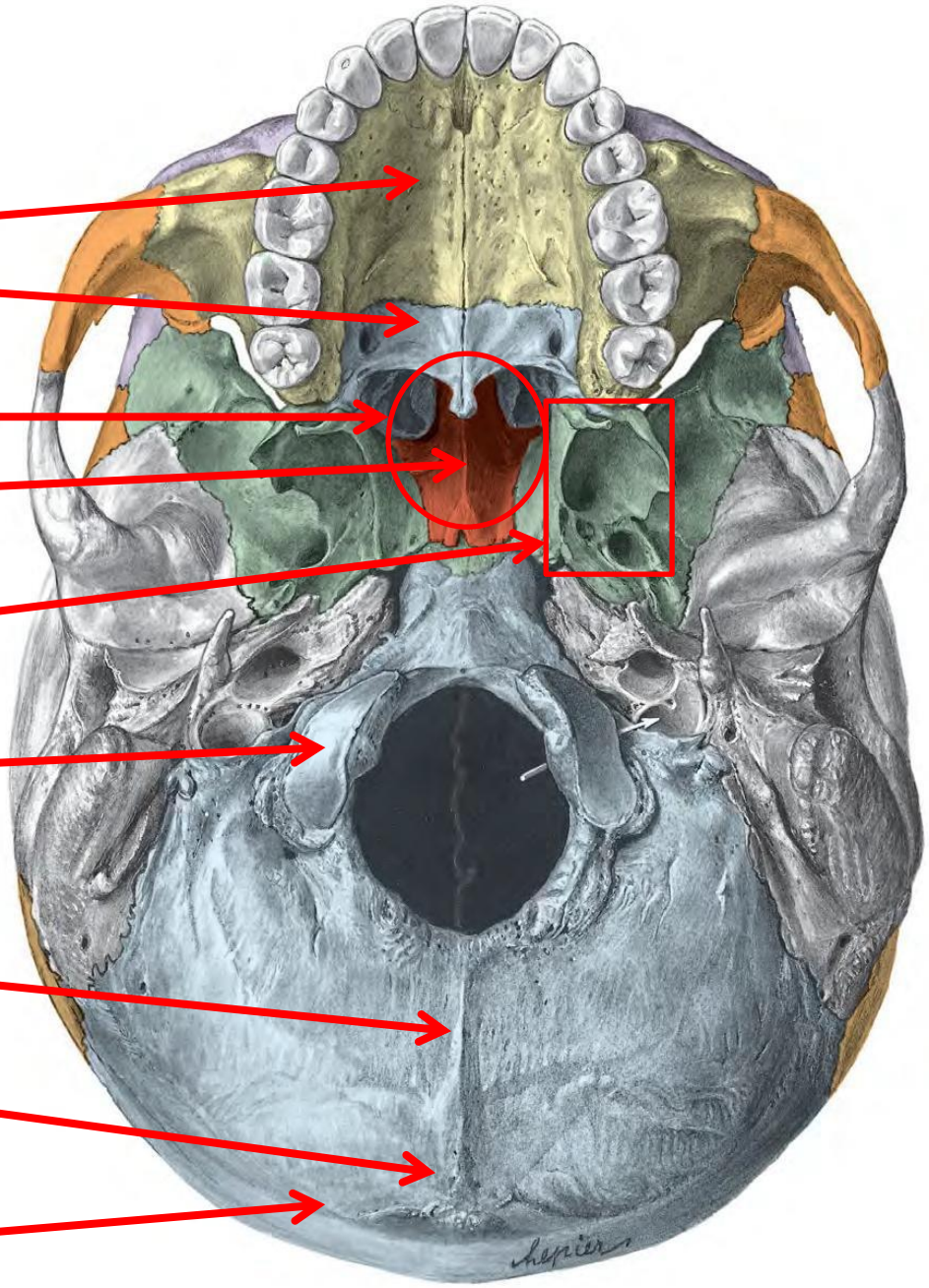
Medial and lateral pterygoid plates of the sphenoid bone

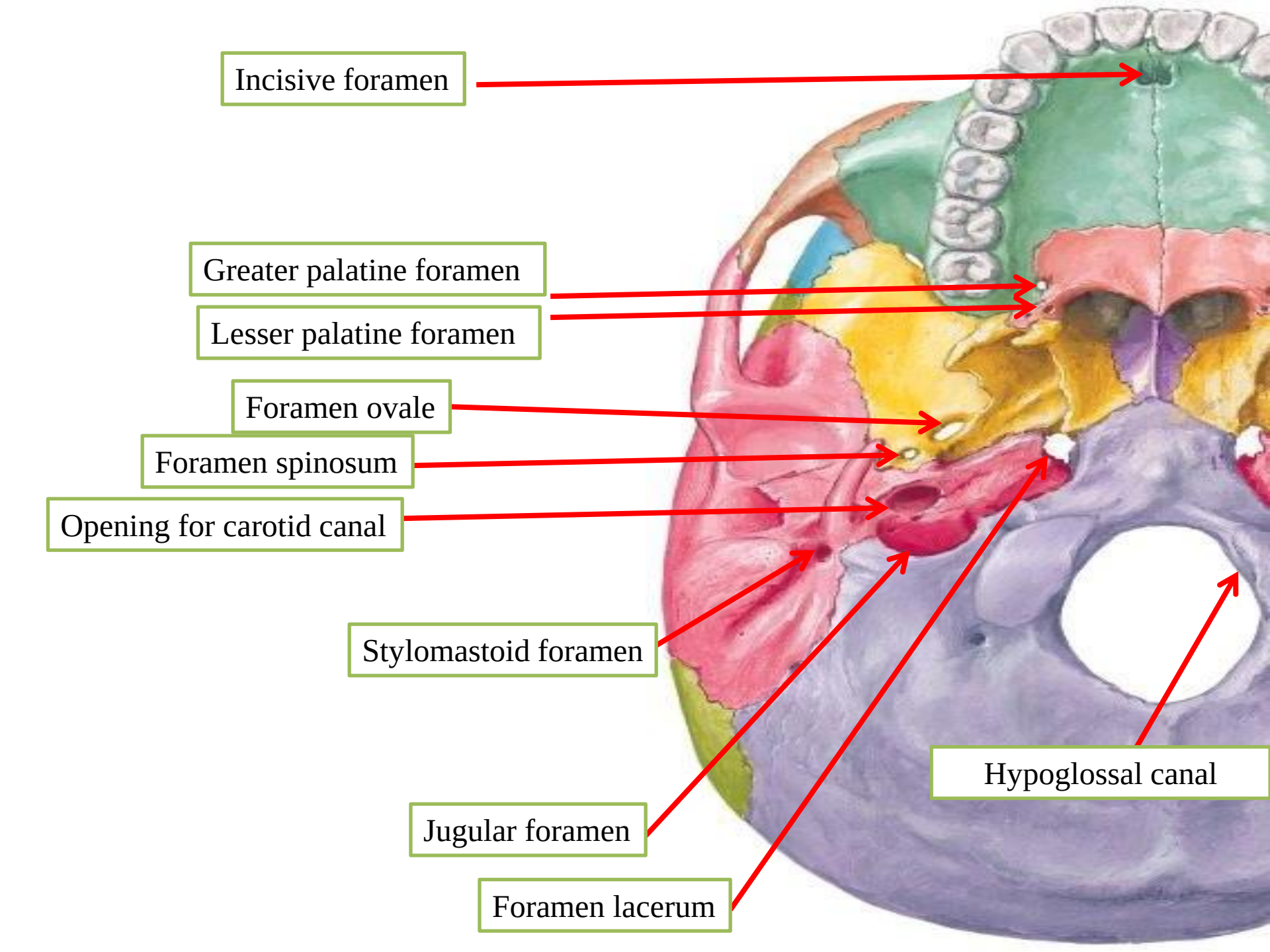
Occipital chondyles

External occipital crest

External occipital protuberance

Superior nuchal line




Incisive foramen
Greater palatine foramen
Lesser palatine foramen
Foramen ovale
Foramen spinosum
Opening for carotid canal
Stylomastoid foramen
Jugular foramen
Foramen lacerum
Hypoglossal canal