



# Scalp

Edited Slides by Rama Abbady

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# Scalp

Scalp is the hairy area of the head; فروة الرأس

- It is the soft tissue that covers the skull cap

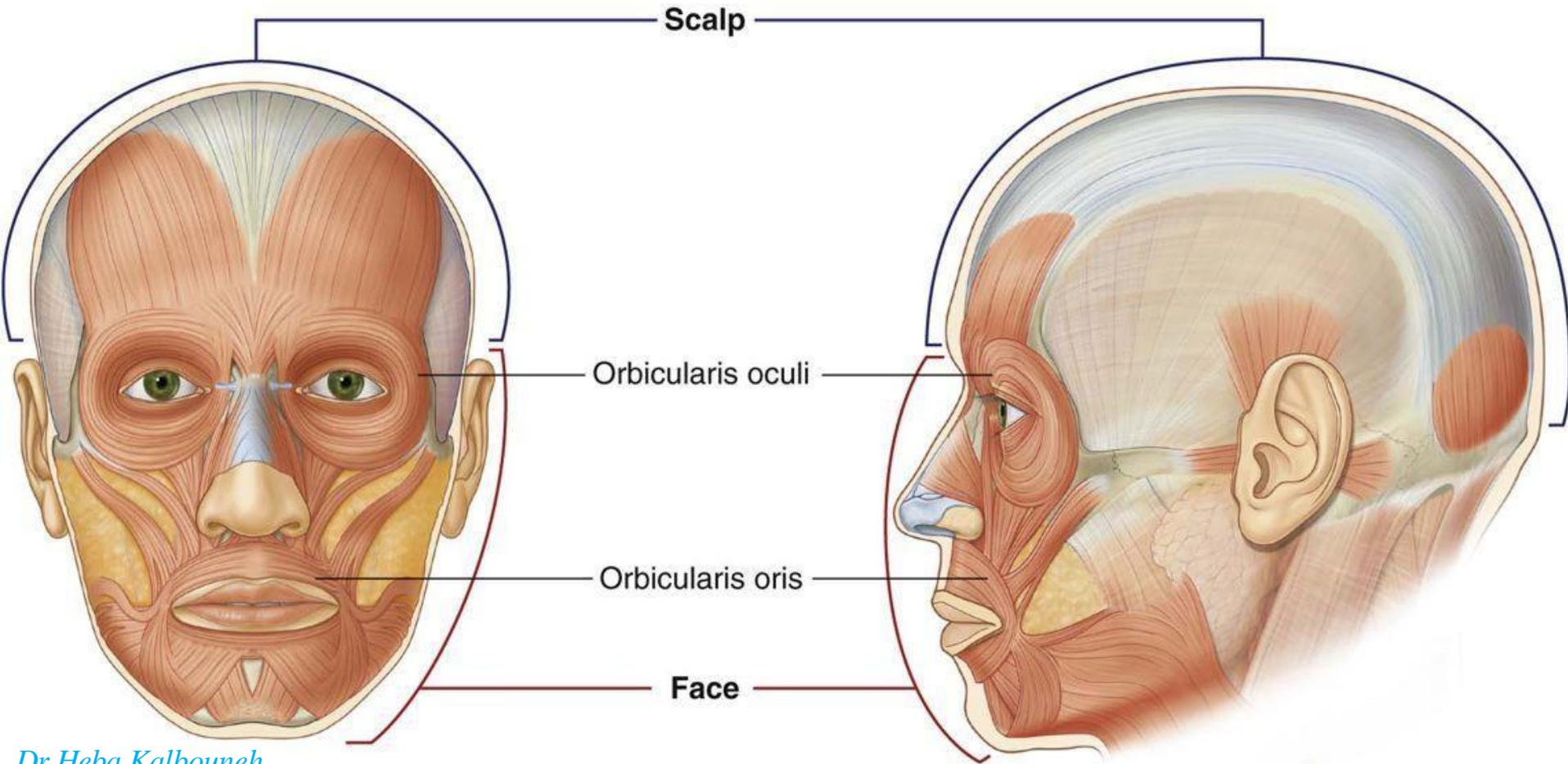
- Extension:

Front: superciliary arch **Frontal bone**

Back: superior nuchal line **Occipital bone**

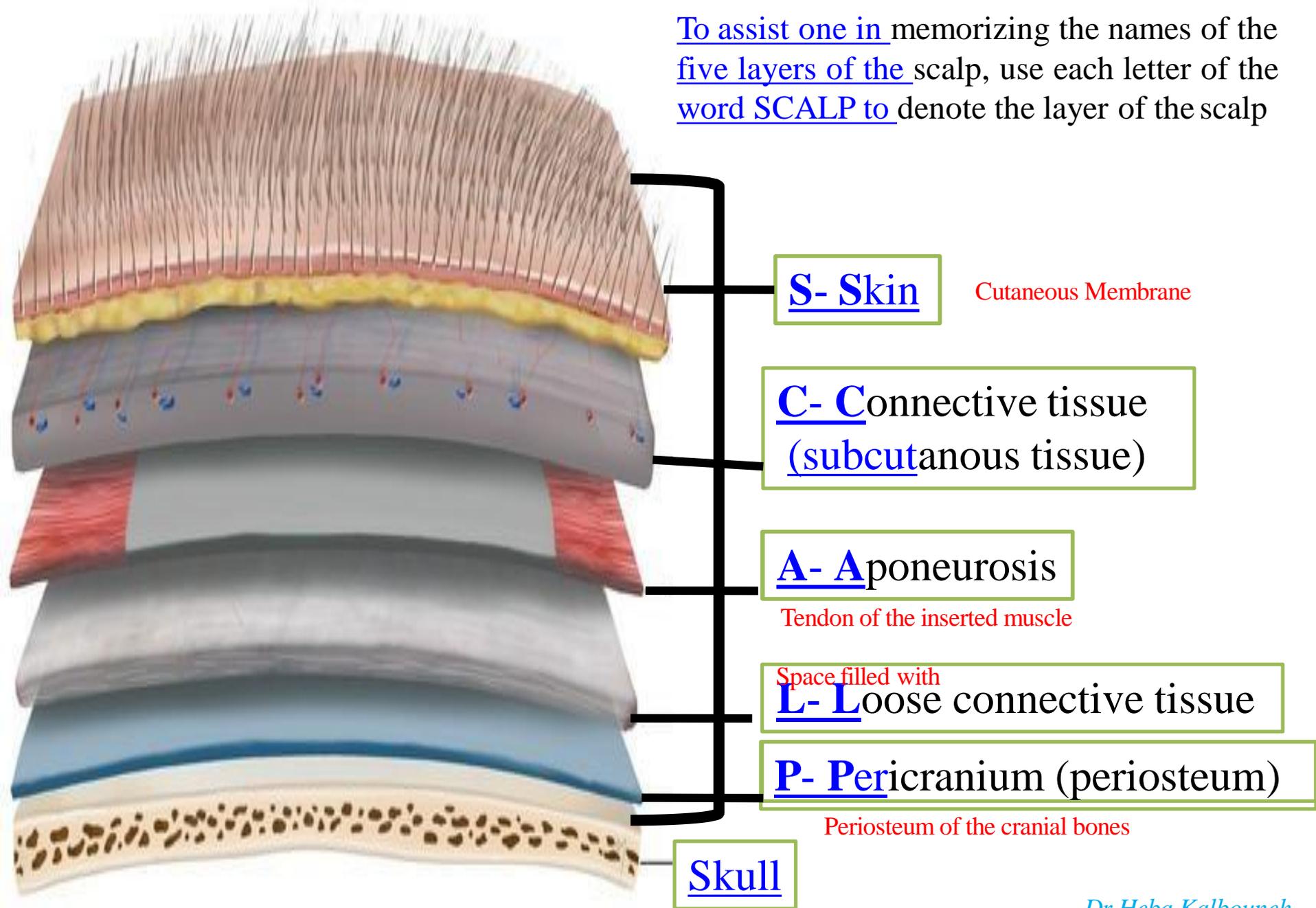
Sides: zygomatic arch **Zygomatic + temporal bone**

Highest point of the scalp is called **Vertex**



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To assist one in memorizing the names of the five layers of the scalp, use each letter of the word SCALP to denote the layer of the scalp

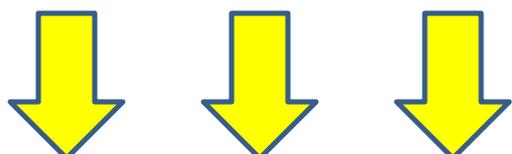


- Inside the skull is the cranial cavity which contains the brain
- The brain is surrounded by 3 layers of connective tissue called meninges, the outermost layer is called dura mater.

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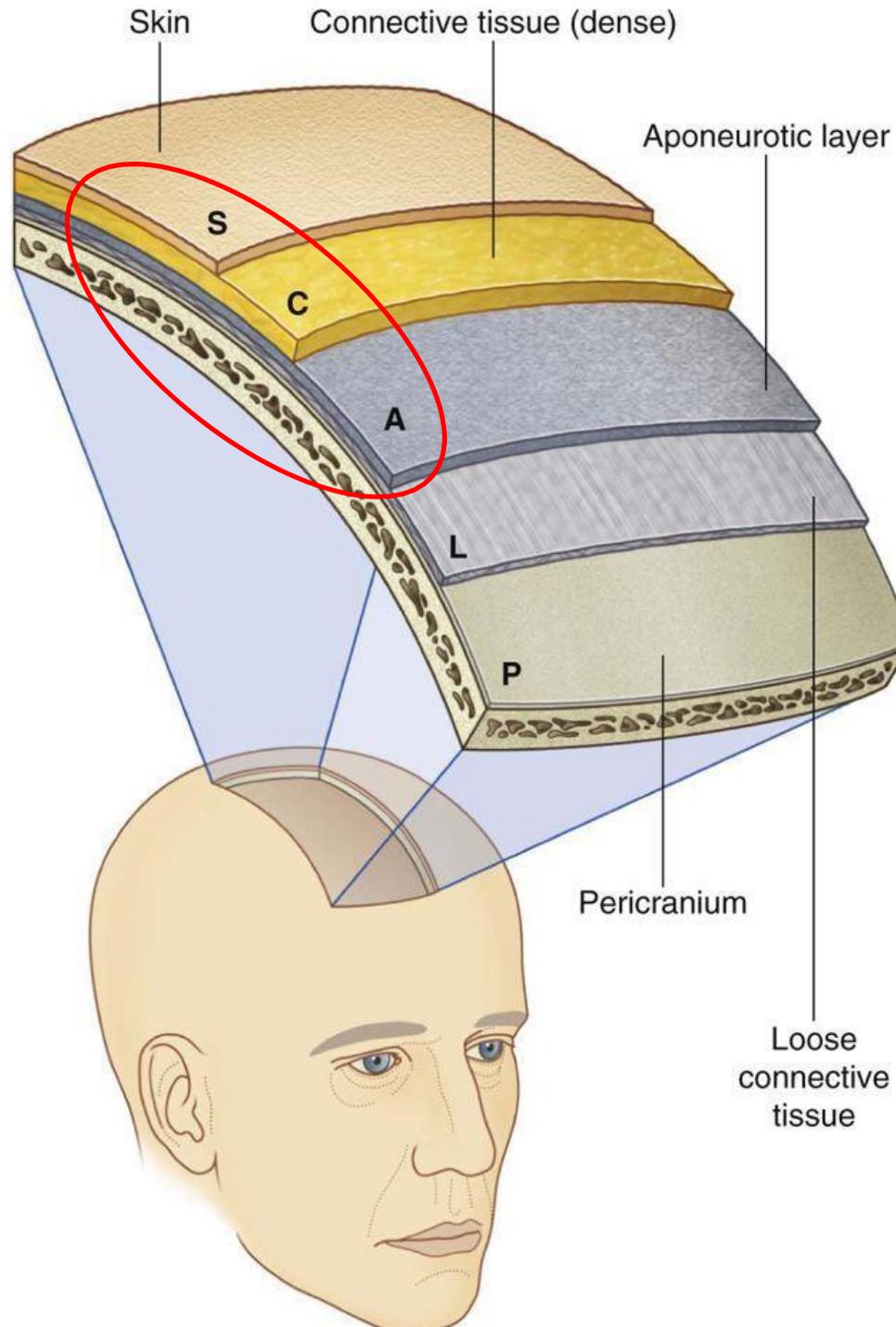
The SCALP consists of five layers:

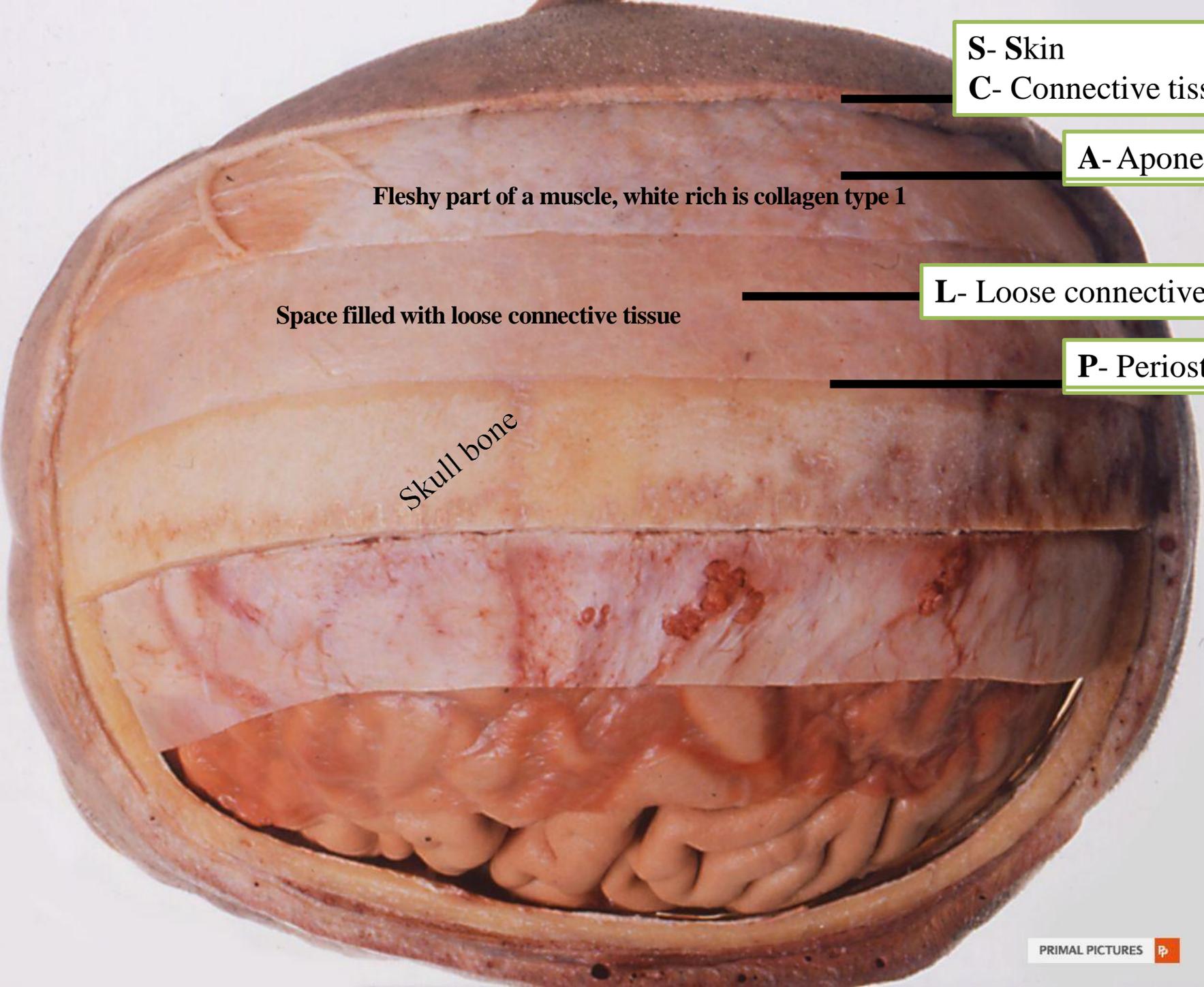
- S- Skin
- C-Connective tissue (dense)
- A-Aponeurotic layer
- L-Loose connective tissue
- P-Pericranium



The first three of which are intimately bound together and move as a unit

They move on the periosteum of the cranial bones





**S- Skin**  
**C- Connective tissue**

**A- Aponeurosis**

Fleshy part of a muscle, white rich is collagen type 1

**L- Loose connective tissue**

Space filled with loose connective tissue

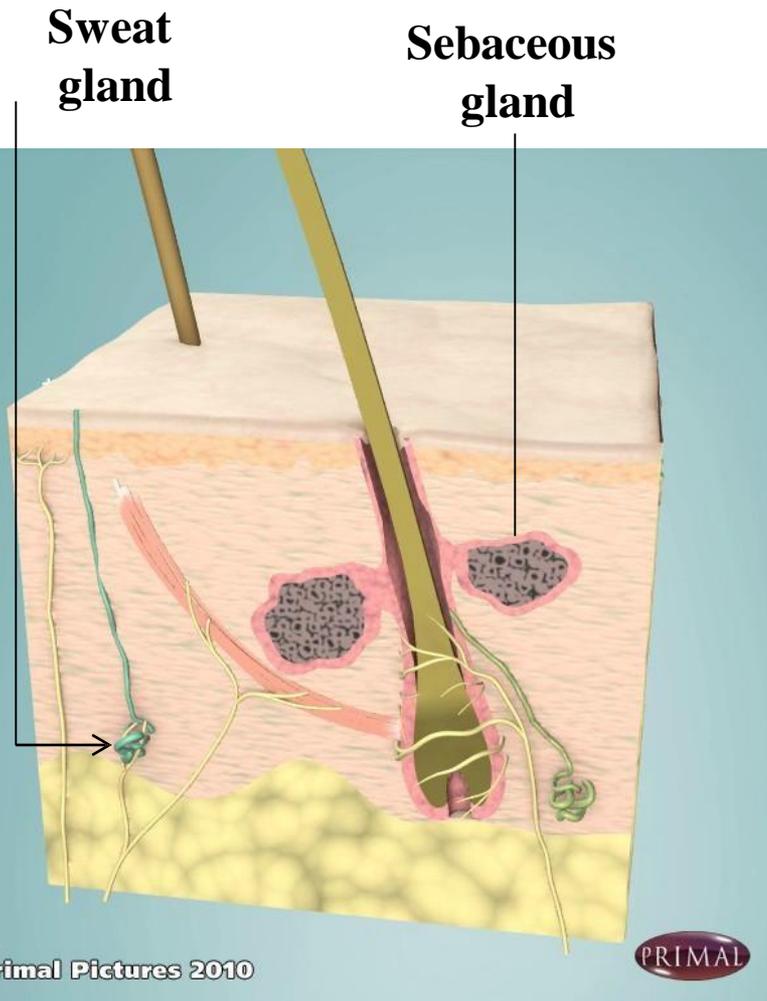
**P- Periosteum**

Skull bone

# 1- Skin

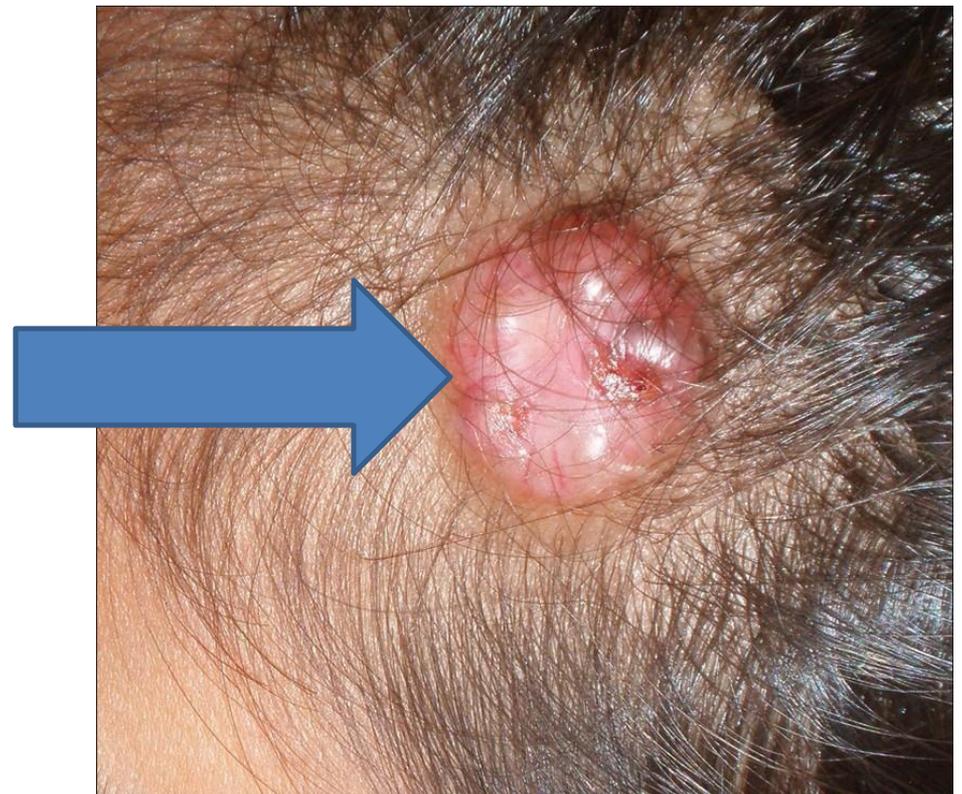
✓ Rich in **hair follicles, sebaceous glands and eccrine sweat glands**

The sebaceous gland secrete the oily material into the hair canal to lubricate the hair and the skin



Blockage of the ducts of the sebaceous gland or the hair canal with the oily material results in sebaceous cysts

Scalp is a common site for sebaceous cysts



-Accumulation of the oily material

## 2- Connective tissue

Made of fibrous septa which unite the skin to the underlying aponeurosis

Contains numerous blood vessels, nerves, and fat

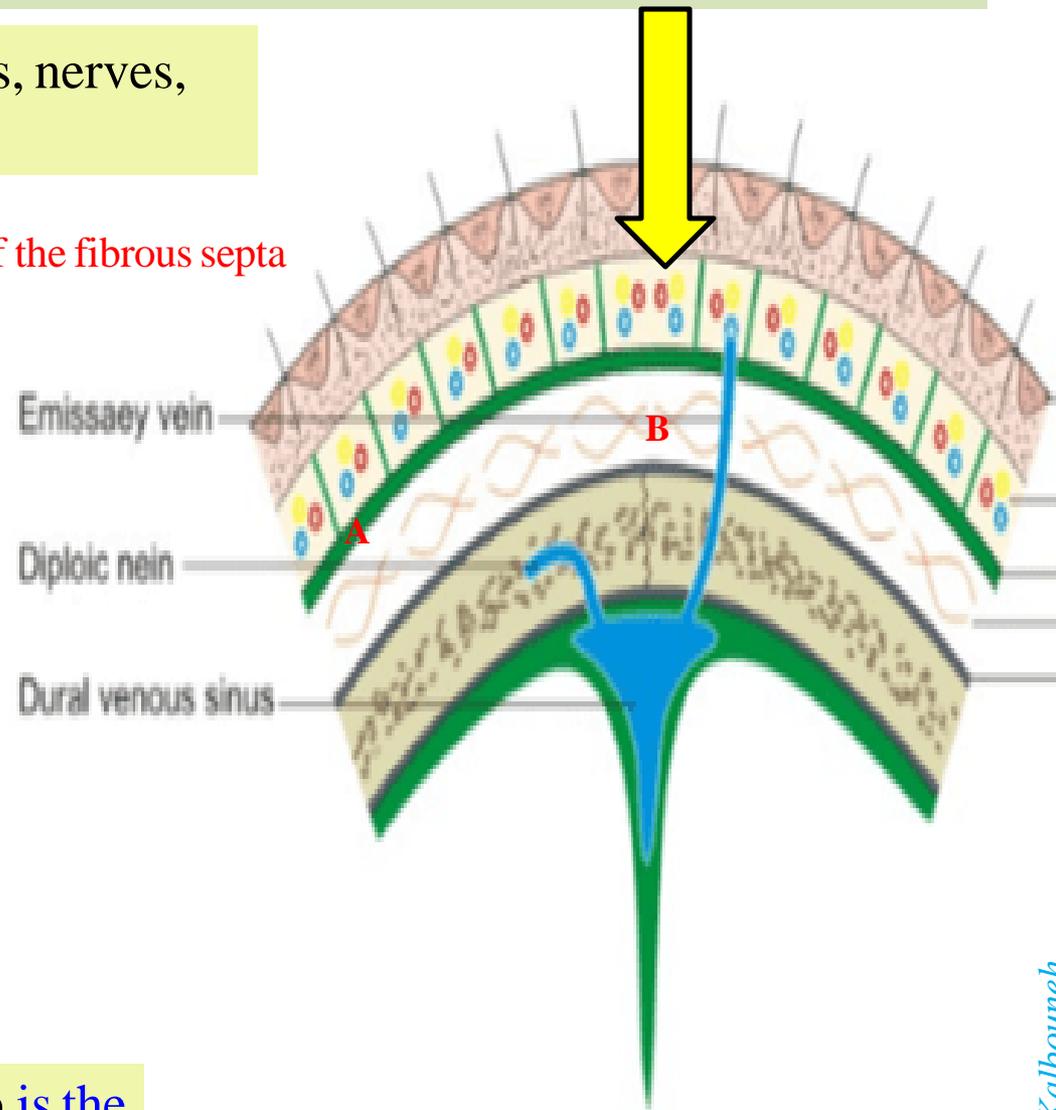
Thus wounds of the scalp bleed profusely but heal very rapidly

It is often difficult to stop the bleeding of a scalp wound

The blood vessels do not retract and close when lacerated because the connective tissue in which they are found holds them open

**Local pressure** applied to the scalp is the only satisfactory method of stopping the bleeding

-Also because of the fibrous septa



A: Aponeurosis

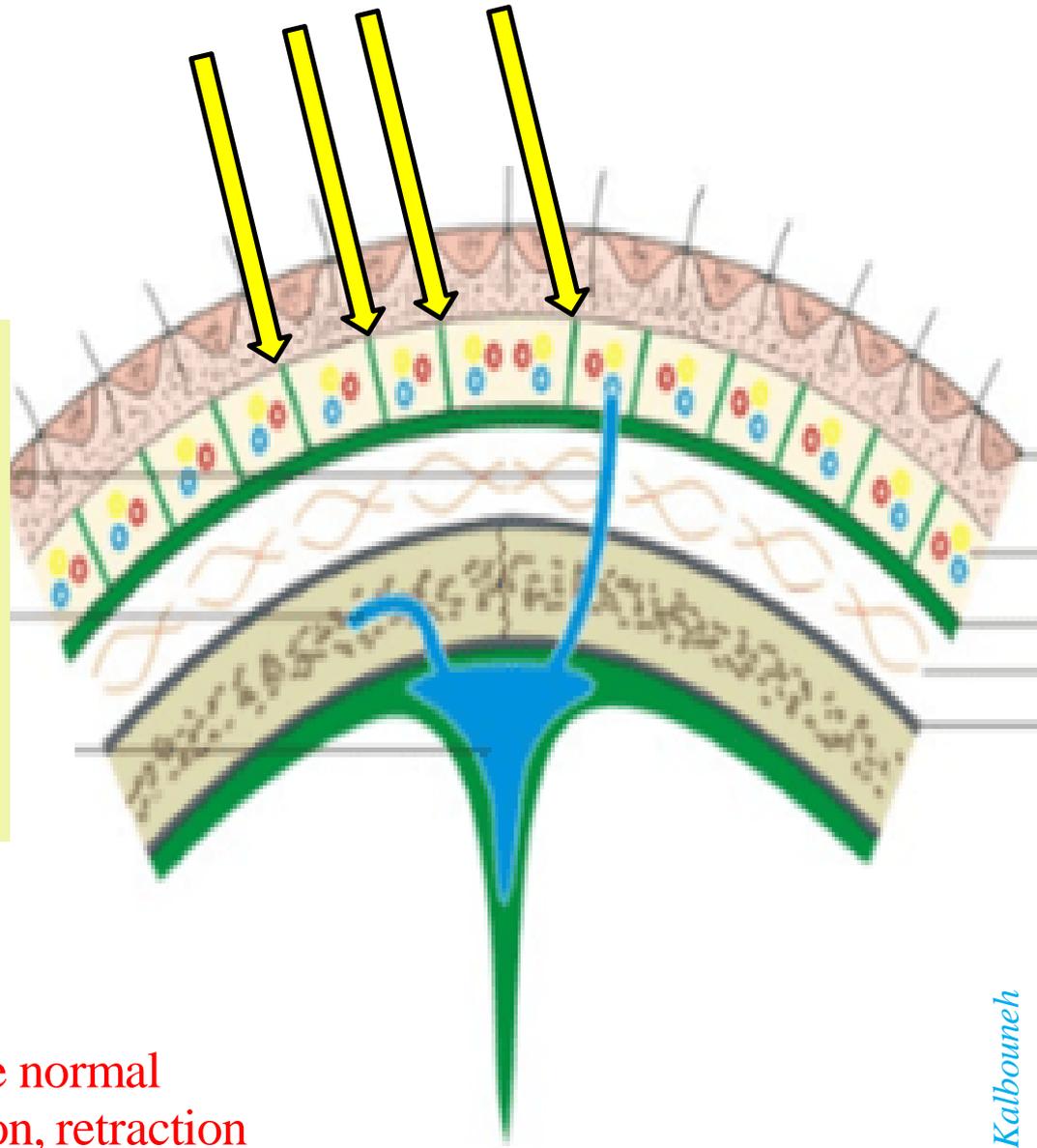
B: Space filled with loose connective tissue

Diploic vein: drains the diploe of the bone

# Fibrous septa



- 1- Unite the skin to the underlying aponeurosis of the occipitofrontalis muscle
- 2- Divide the connective tissue layer into small compartments
- 3- Hold the cut blood vessels open (in case of scalp wound)



- When a blood vessel is lacerated, the normal physiological response is : contraction, retraction and blood clot formation, BUT the fibrous septa here holds the cut blood vessel open → that's why the wound of the scalp bleed profusely
- In order to stop bleeding, local pressure must be applied
- Infection in this layer of the scalp is localized due to the fibrous septa

# Emissary veins

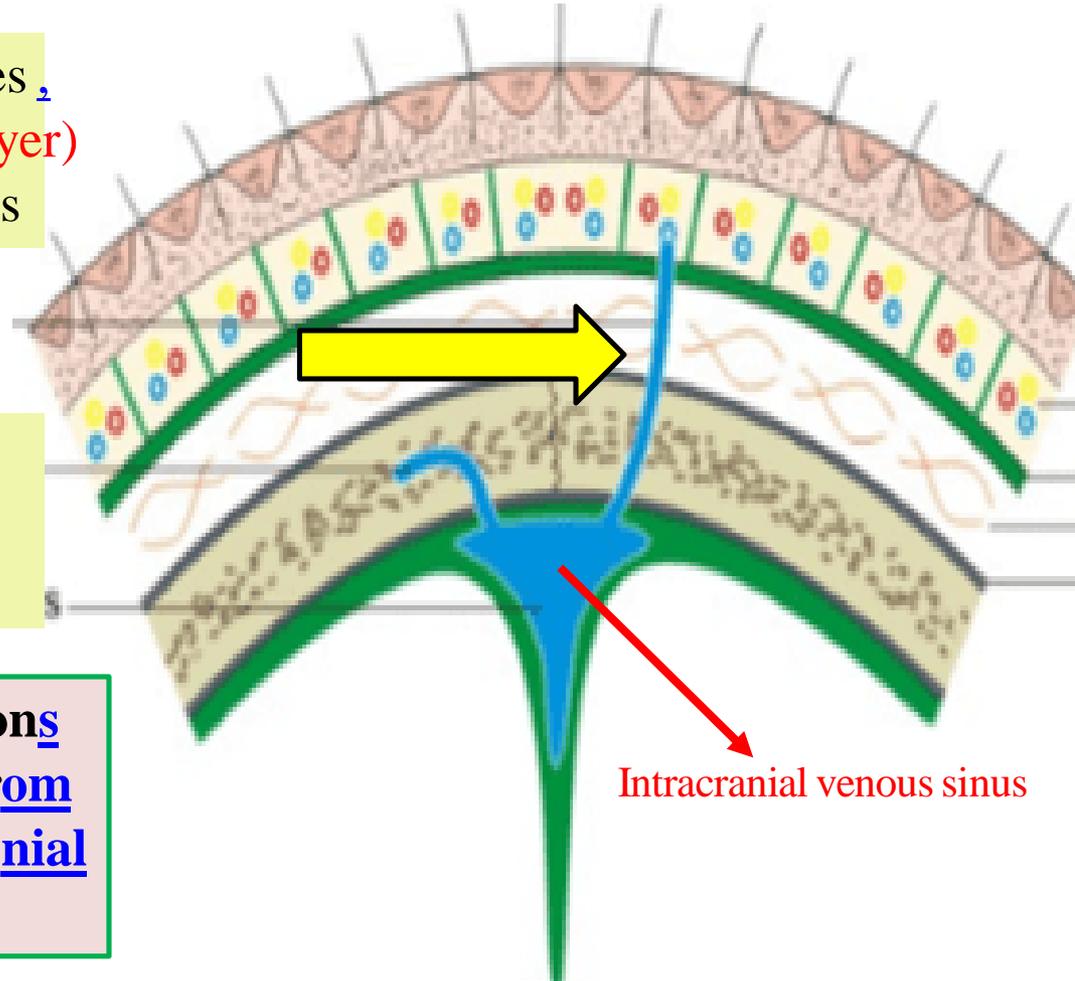


Emissary vein: connects an extracranial vein with an intracranial vein within the cranial cavity but outside the brain

**Emissary veins:** are devoid of valves, connects the veins of the scalp (2<sup>nd</sup> layer) with the intracranial venous sinuses



- 1- Equalize the pressure between intracranial and extracranial veins
- 2- Selective cooling of the head



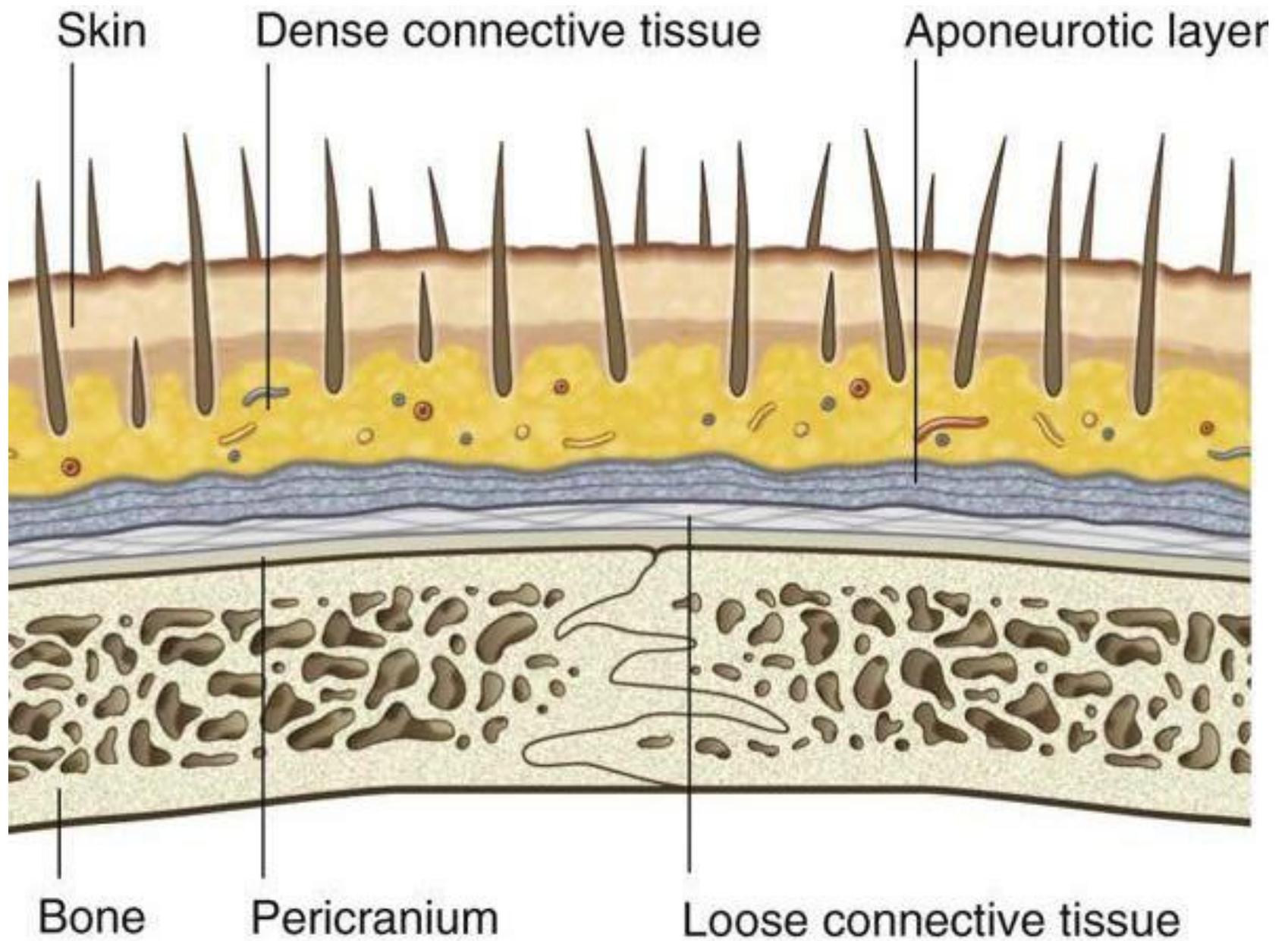
Intracranial venous sinus

*Emissary veins connect the veins outside the cranium to the venous sinuses inside the cranium*

**!!!!!!! Serve as routes where infections are carried into the cranial cavity from the extracranial veins to the intracranial veins.**

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This vein penetrates the connective tissue, aponeurosis, loose connective tissue, cranial bones and the intercranial cavity



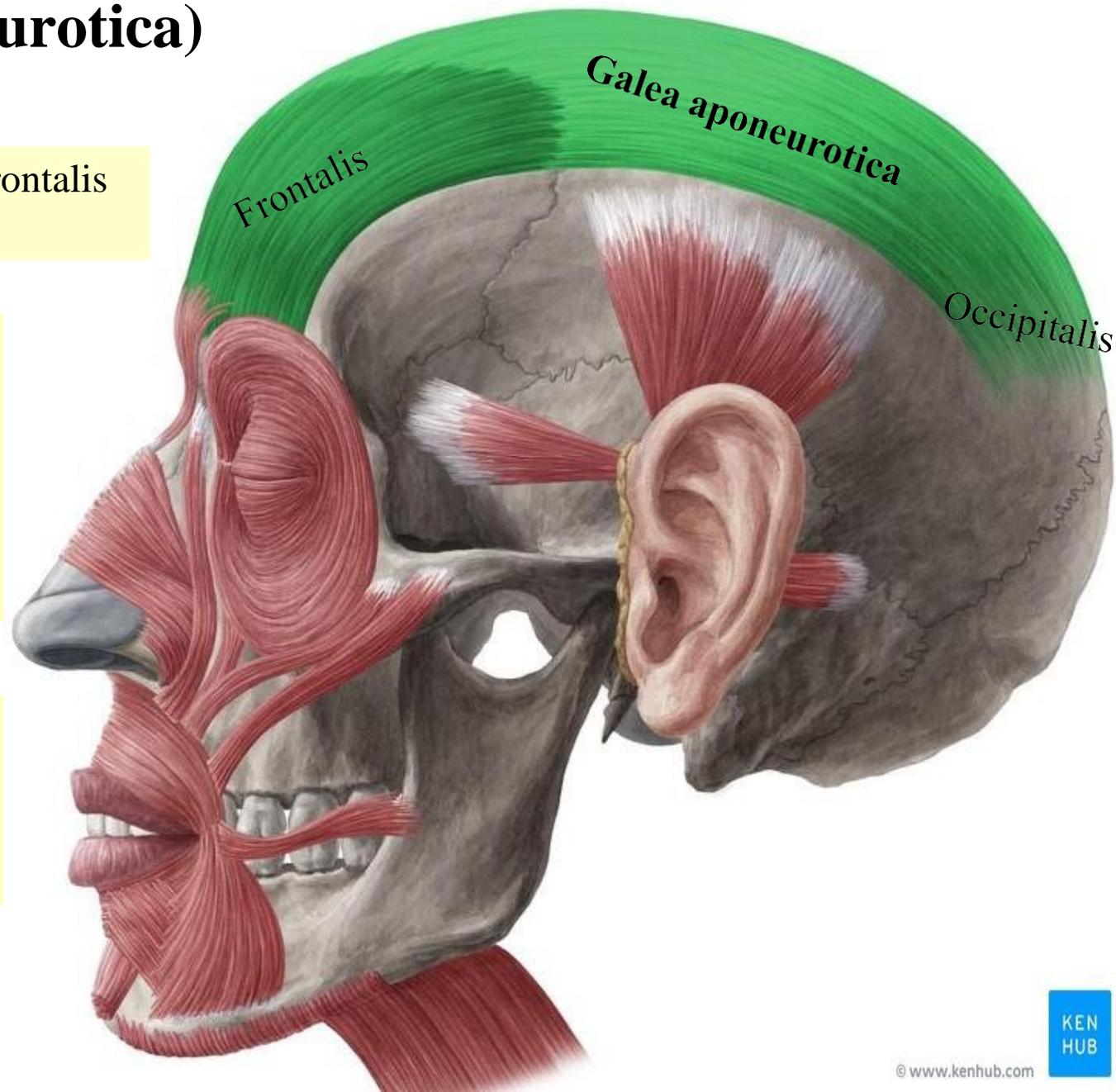
Under the subcutaneous tissue there is dense type of fat that is not affected by obesity

### 3- Epicranial aponeurosis (Galea aponeurotica)

Consists of the occipitofrontalis muscle

Occipitofrontalis has a frontal belly anteriorly and an occipital belly posteriorly and an aponeurotic tendon connecting the two

The lateral margins of the aponeurosis are attached to the temporal fascia



# Muscles of the Scalp

## Occipitofrontalis

### Origin:

Frontal belly: skin of the eyebrows

Occipital belly: highest nuchal line/  
superior nuchal line

### Insertion:

Epicranial aponeurosis

### Nerve supply:

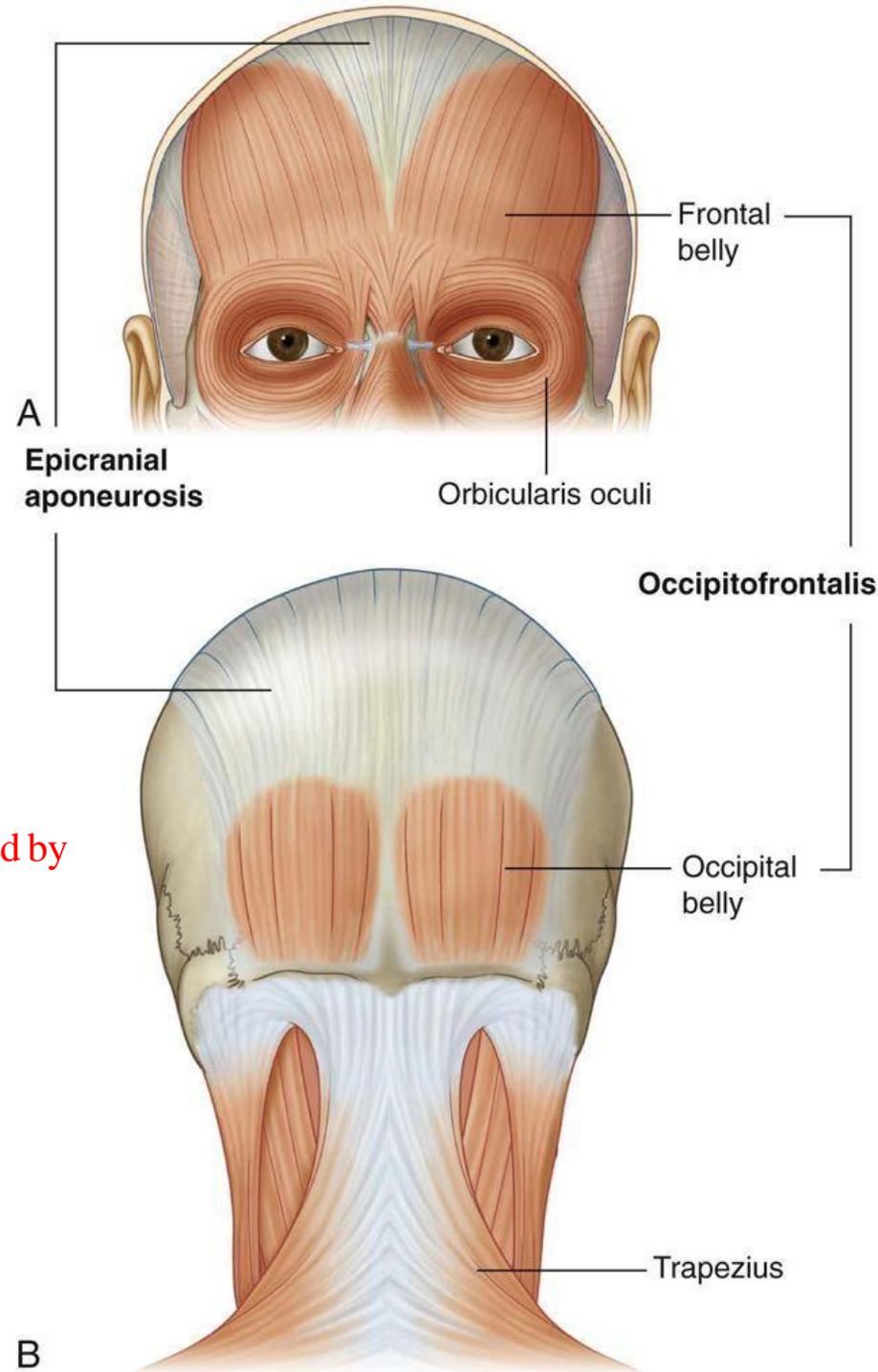
Facial nerve

(temporal and posterior auricular  
branches) **All the muscles of facial expression are supplied by  
the facial nerve**

### Action:

Moves scalp on skull

The frontal bellies of the occipitofrontalis  
raises the eyebrows in expressions of  
surprise or horror (wrinkling of forehead).

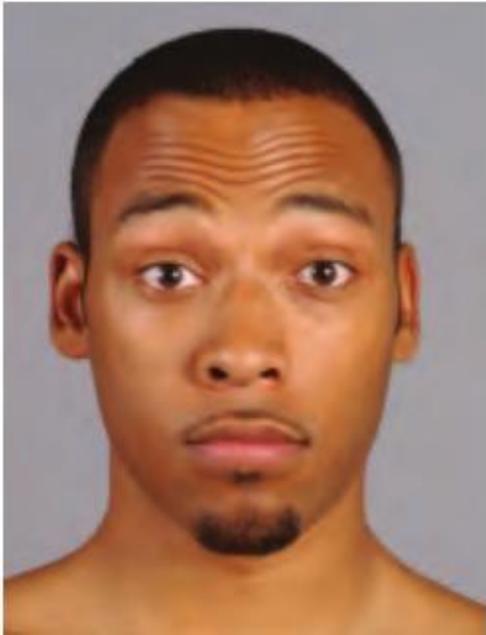


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**Contraction of muscles attached to the skin moves  
the skin producing facial expressions**

# Frontalis muscle & Galea aponeurotica

Contraction of this muscle produces transverse wrinkles



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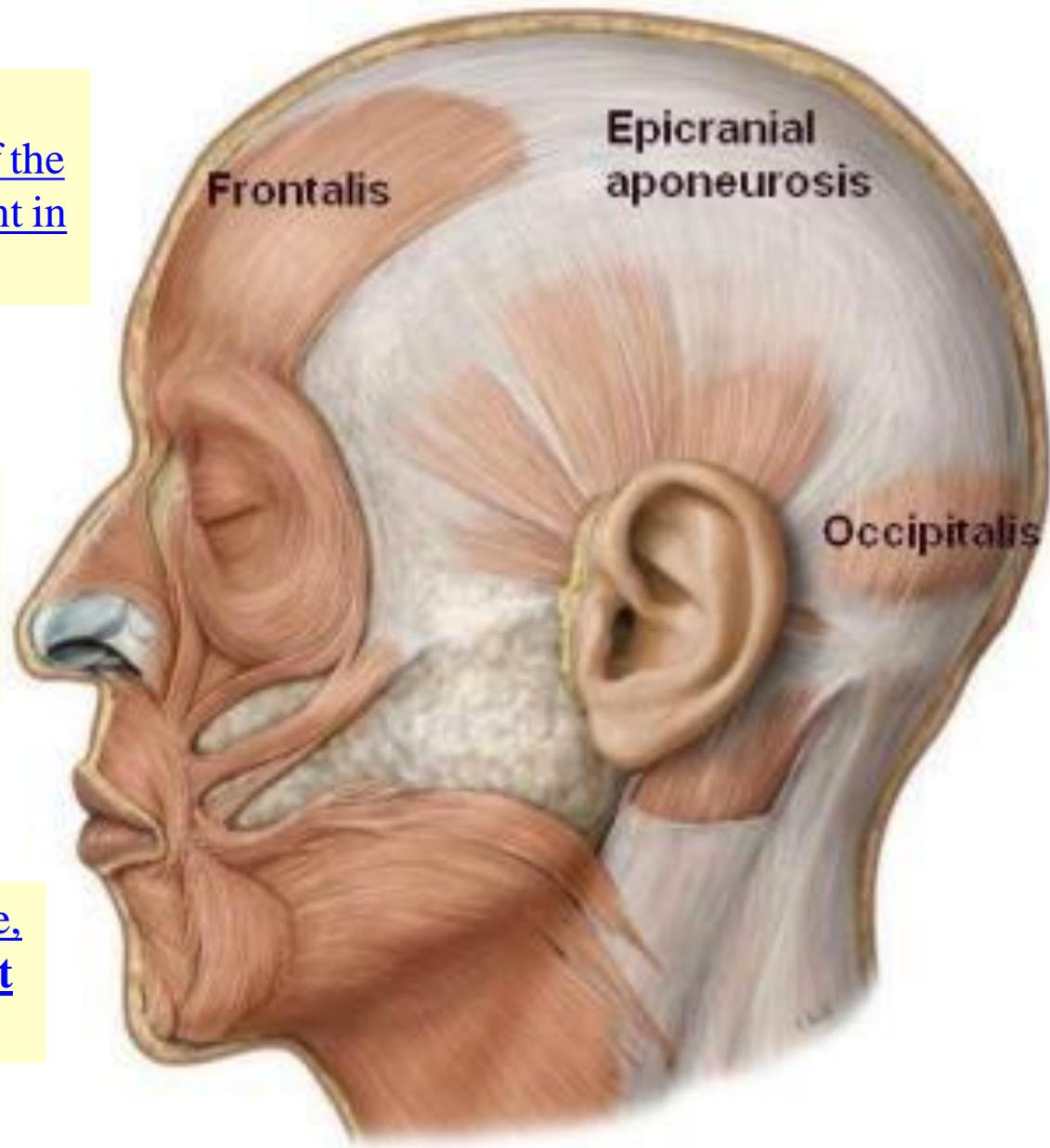
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The tension of the epicranial aponeurosis, produced by the tone of the occipitofrontalis muscles, is important in all deep wounds of the scalp.

The aponeurosis connects the frontalis and occipitalis muscles. If it is cut coronally, contraction of the muscle usually gapes the wound

For satisfactory healing to take place, the opening in the aponeurosis **must be closed with sutures**

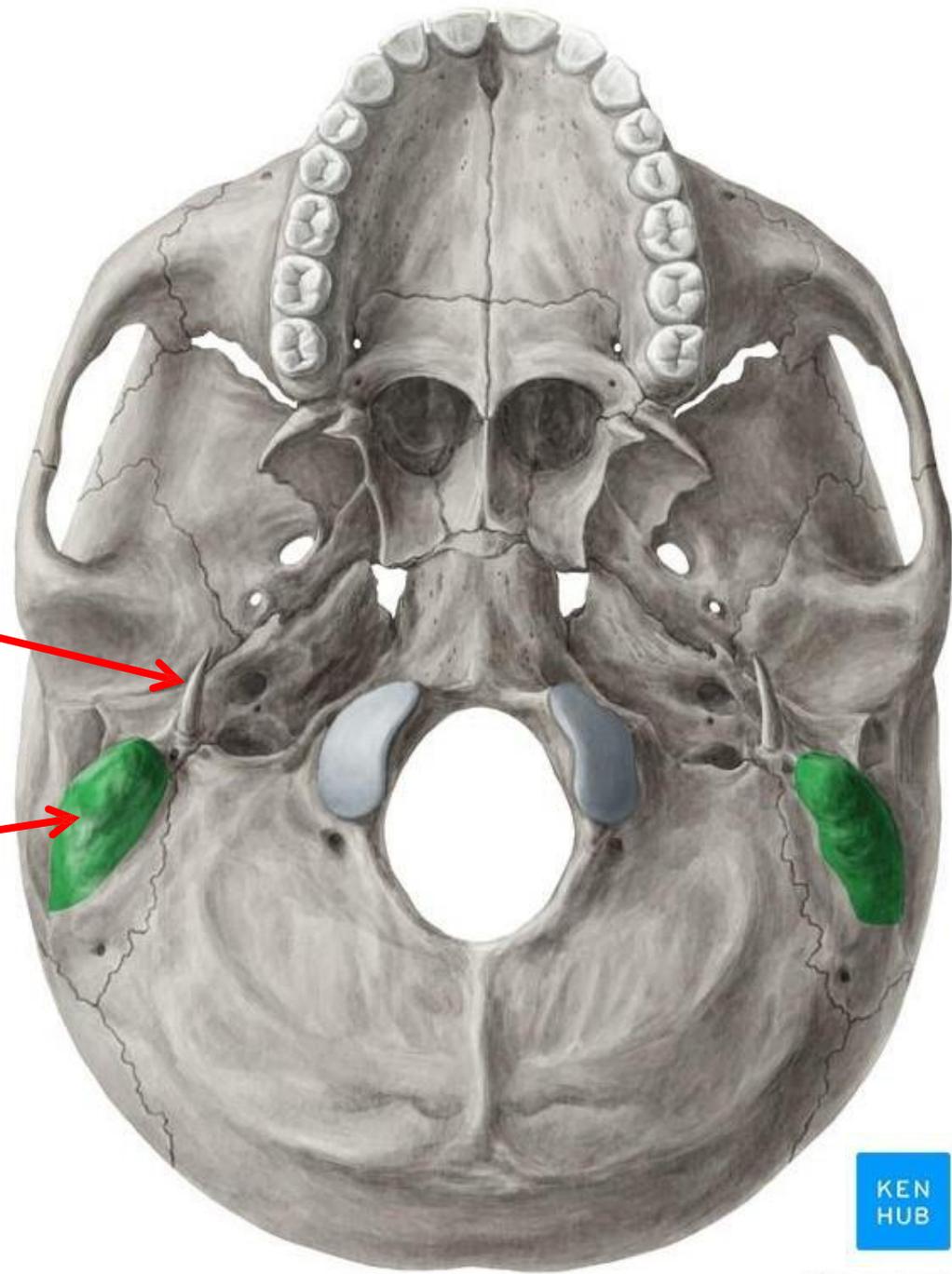


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Laterally, the aponeurosis of this muscle is attached to the superior temporal line

Styloid process of the temporal bone

Mastoid process



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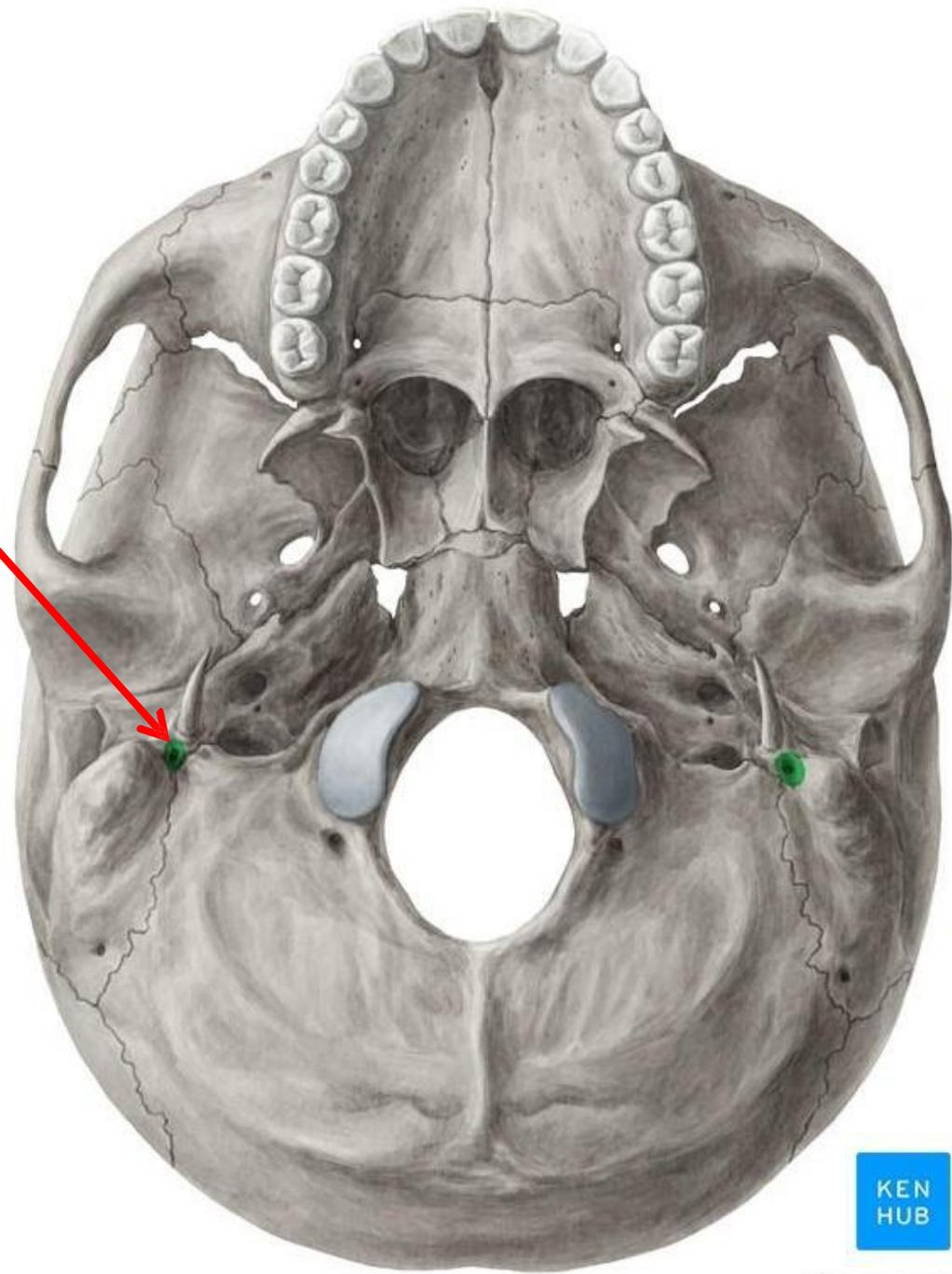
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**Course of facial nerve:**

- It leaves the cranial cavity by passing through two processes: styloid process & mastoid process
- The facial nerve emerges from the cranial cavity from the stylomastoid foramen

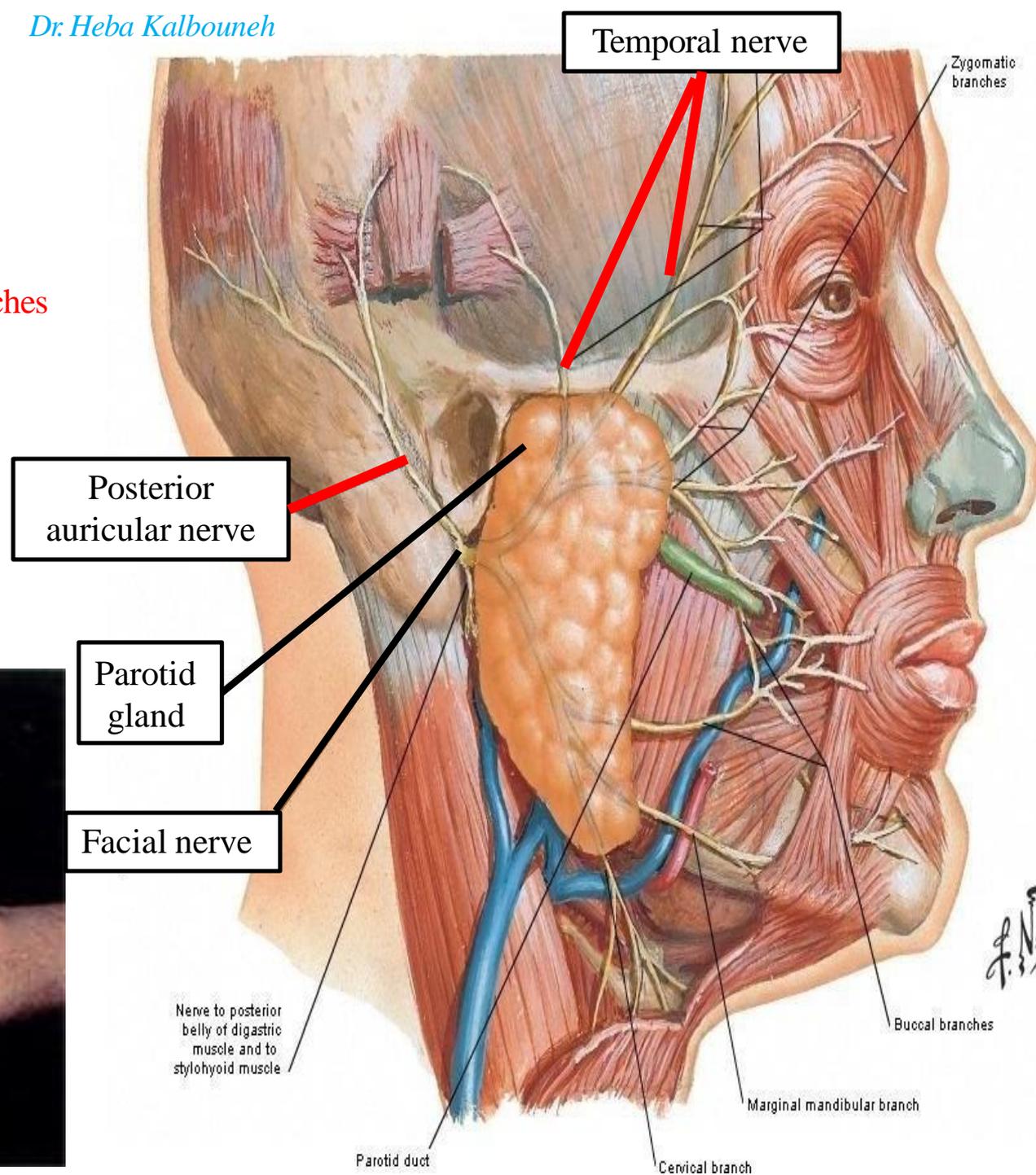
**The stylomastoid foramen** In the interval between the styloid and mastoid processes



# Facial Nerve

As the facial nerve runs forward within the substance of the parotid salivary gland it divides into its five terminal branches: **Motor branches**

- 1-The temporal
- 2-The zygomatic
- 3-The buccal (**Cheek**)
- 4 The mandibular
- 5 The cervical



-Before entering the parotid gland, the facial nerve gives a branch that runs posterior to the auricle called posterior auricular nerve which supplies the occipital belly

-The frontal belly is supplied by the temporal branch

## 4- Loose areolar tissue

The subaponeurotic space is the potential space beneath the epicranial aponeurosis and is filled with loose areolar tissue

(Spaced filled with loose connective tissue)

Remember the attachment of Epicranial aponeurosis layer!!!  
Frontalis muscle has no bony attachment



Blood accumulates in this layer spreads over the entire extent of the aponeurosis reaching the eyelid and presents as a **black eye**



## Blow on the skull

Hemorrhage in the 4<sup>th</sup> layer of the scalp may cause raccoon eye

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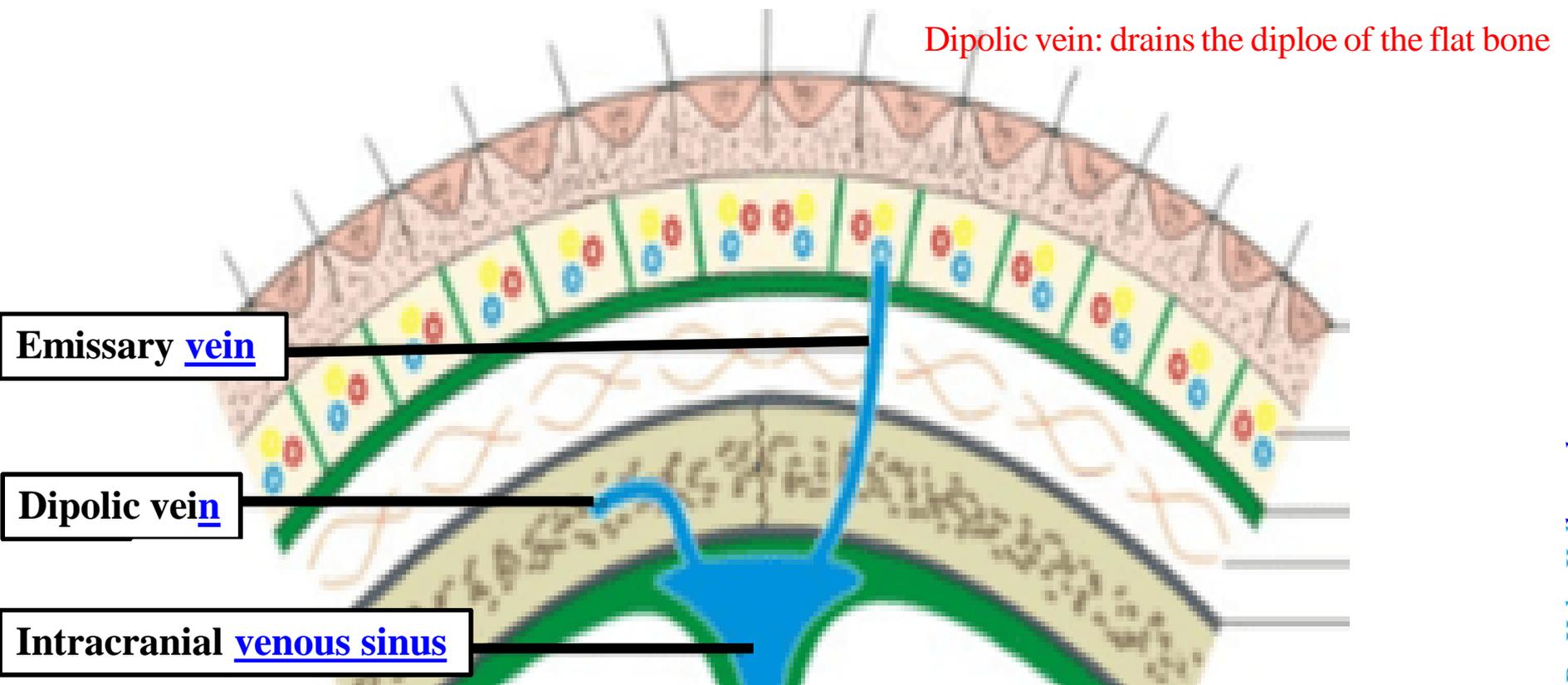
- Since the 4<sup>th</sup> layer of the scalp is a space, infection in this layer is diffused not localized
- Bleeding in the 4<sup>th</sup> layer of the scalp will diffuse in the space, but this diffusion is limited posteriorly and laterally but not anteriorly
- Posteriorly: the occipital belly is attached to the superior nuchal lines
- Laterally: the aponeurosis is attached to the superior temporal line
- Anteriorly: no bony attachment, so the blood passes and fills the upper and lower eyelids

The subaponeurotic space contains **emissary veins**

This layer is called the **dangerous area of the scalp**

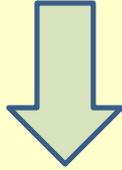
Infections in the subaponeurotic space can spread to intracranial venous sinuses through emissary veins (valveless)

Infection spreads by the emissary veins (valveless) to the skull bones, causing osteomyelitis **of the flat bone through the dipolic vein.**



## 5-Pericranium **Fibrous membrane**

- Is the periosteum covering the outer surface of the skull bones.
- Removable, except in the area of sutures
- The periosteum on the outer surface of the bones becomes continuous with the periosteum on the inner surface of the skull bones at the sutures .



THEREFORE if there is any fluid collection beneath the pericranium (Cephalhaematoma/ subperiosteal hematoma) it will take the shape of the related bone



-Bleeding under the periosteum takes the shape of the underlying bone (Subperiosteal hematoma/ Cephalhaematoma)

-Happens to the newborn because of the use of certain tools during delivery, which may cause bleeding of one of the periosteal vessels

# Nerve supply of the scalp

10 sets of nerves on each side of the scalp

5 in front the auricle

5 behind the auricle



4 sensory  
1 motor

4 sensory  
1 motor

Nerves **in front** the auricle

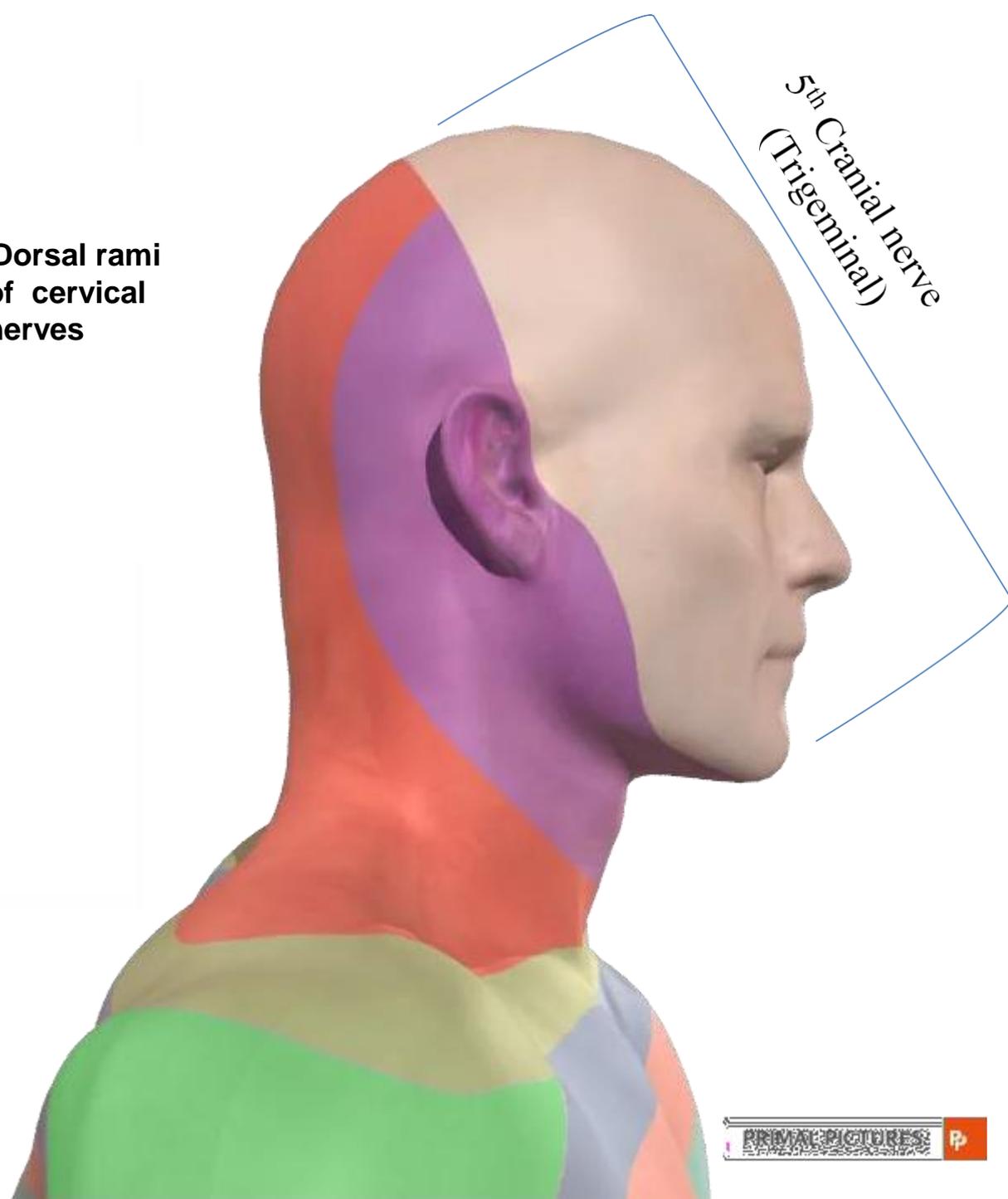
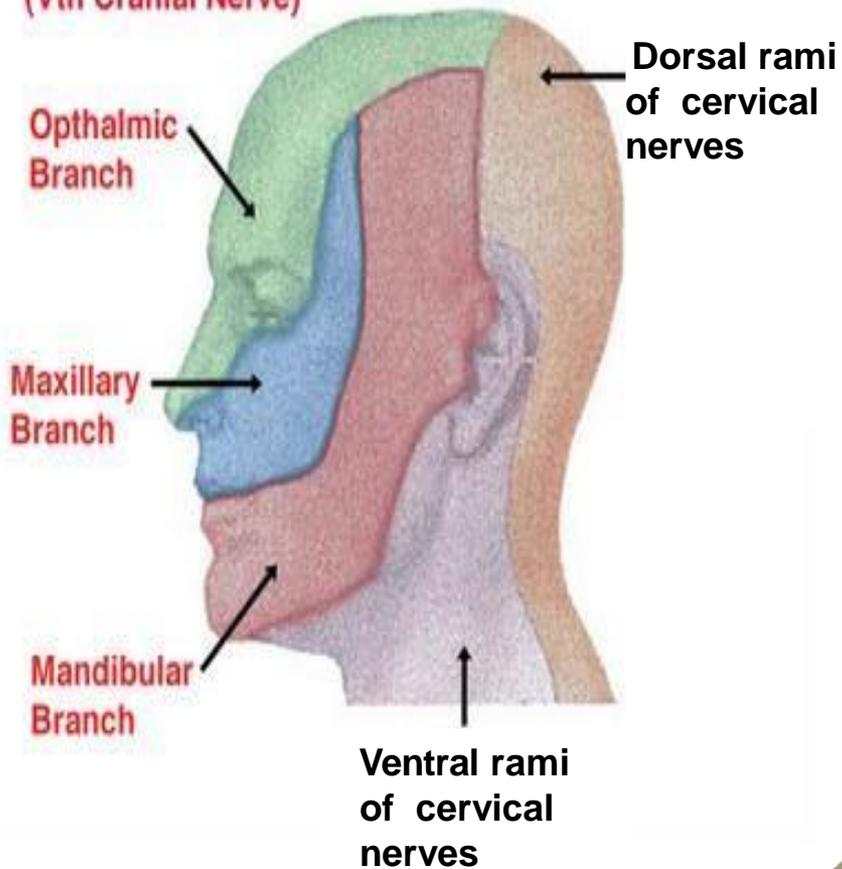
- 1 Supratrochlear nerve
- 2 Supraorbital nerve
- 3 Zygomaticotemporal nerve
- 4 Auriculotemporal nerve
- 5 **Temporal branch of facial nerve supplying the frontal belly of occipitofrontalis**

Nerves **behind** the auricle

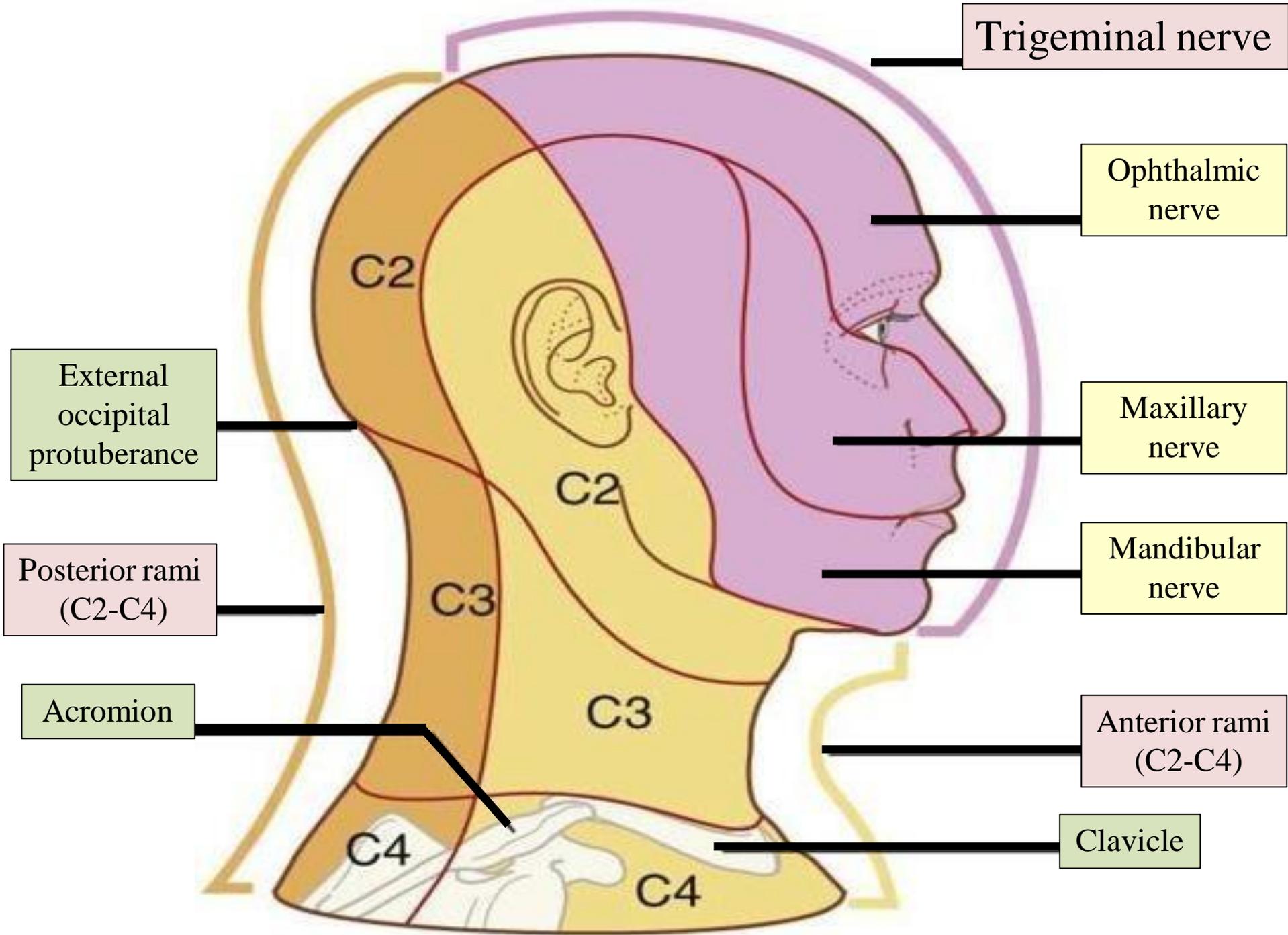
- 1- Great auricular nerve (ant rami C2 C3)
- 2- Lesser occipital nerve (ant rami C2 )
- 3- Greater occipital nerve (post rami C2 )
- 4- Third occipital nerve (post rami C3 )
- 5- **Posterior auricular branch of facial nerve supplying the occipital belly of occipitofrontalis**

-Sensory nerves behind the auricle only the lesser occipital and the greater occipital nerves are required

**Dermatomes served by the TRIGEMINAL NERVE (Vth Cranial Nerve)**

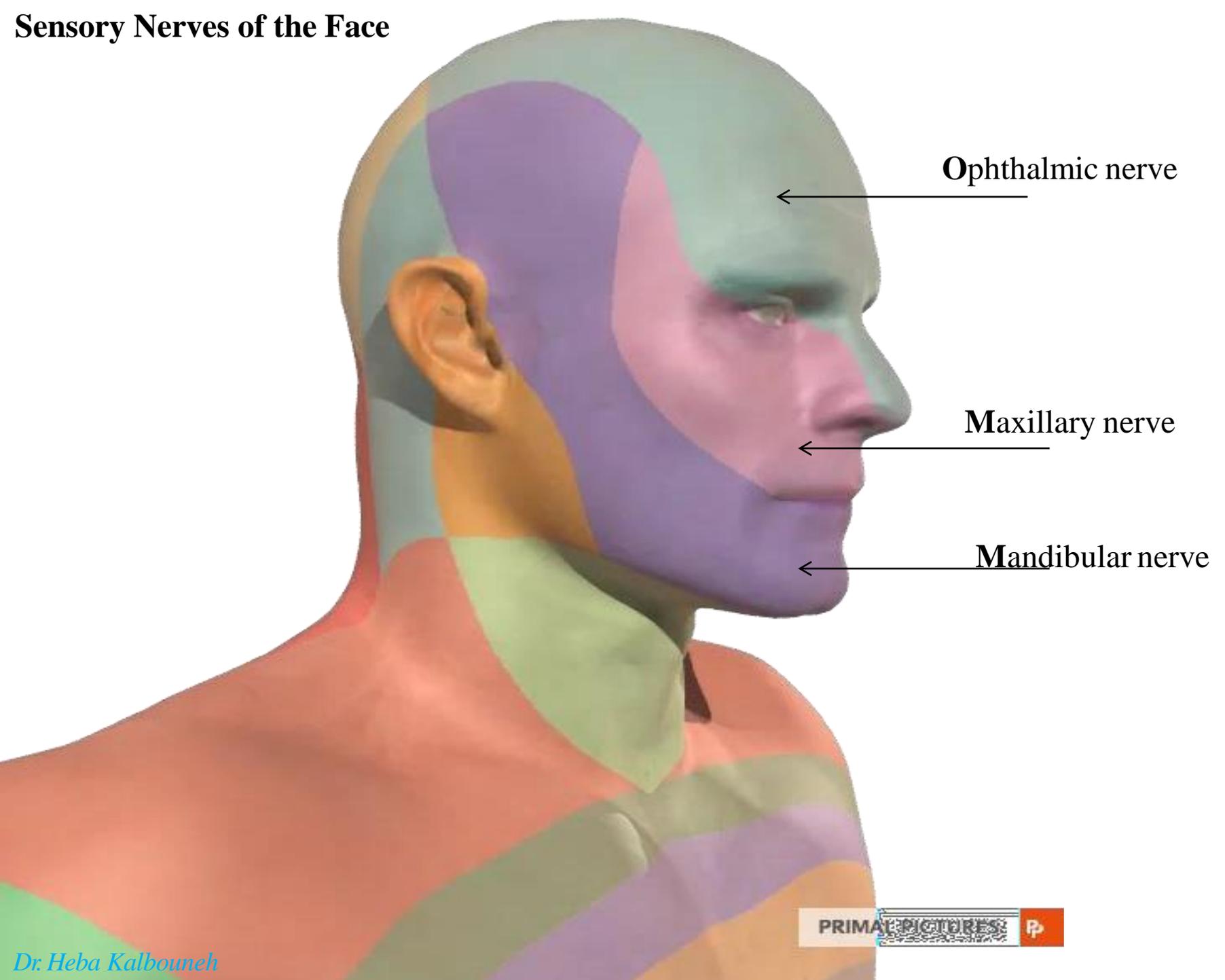


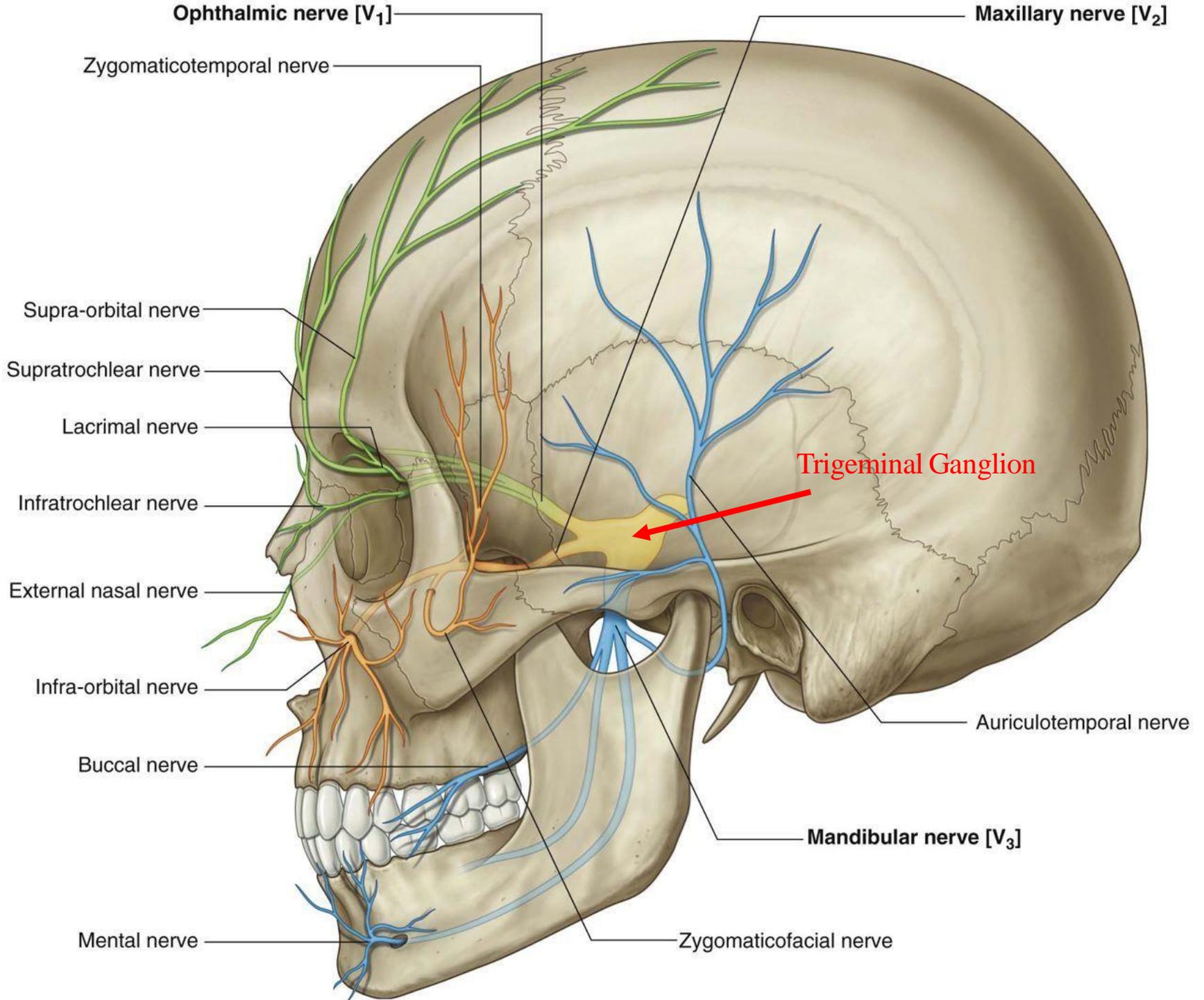
- Skin of the face is supplied by branches of the trigeminal nerve
- The neck and the posterior surface of the scalp are supplied by spinal nerves (cervical nerves)
- Posterior surface of the scalp + posterior aspect of the neck → supplied by dorsal rami (C2-C4)
- Anterolateral aspect of the neck → supplied by ventral rami (C2-C4)
- Ventral rami form plexuses except in the thoracic area
- The cervical plexus is formed by ventral rami of C1,C2,C3,C4



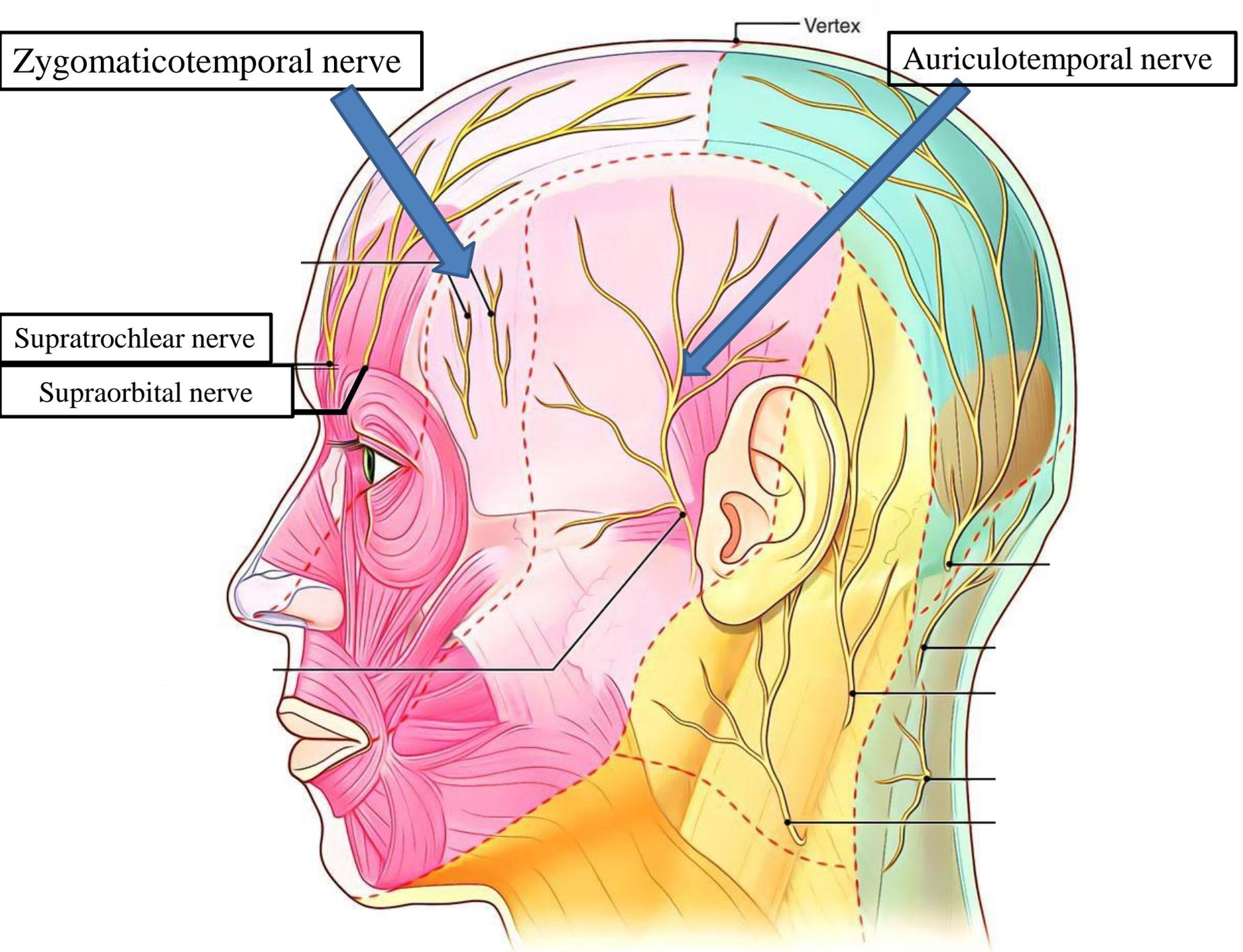
-Anterior + Posterior rami of (C2-C4) only, because C1 has no cutaneous nerves

# Sensory Nerves of the Face

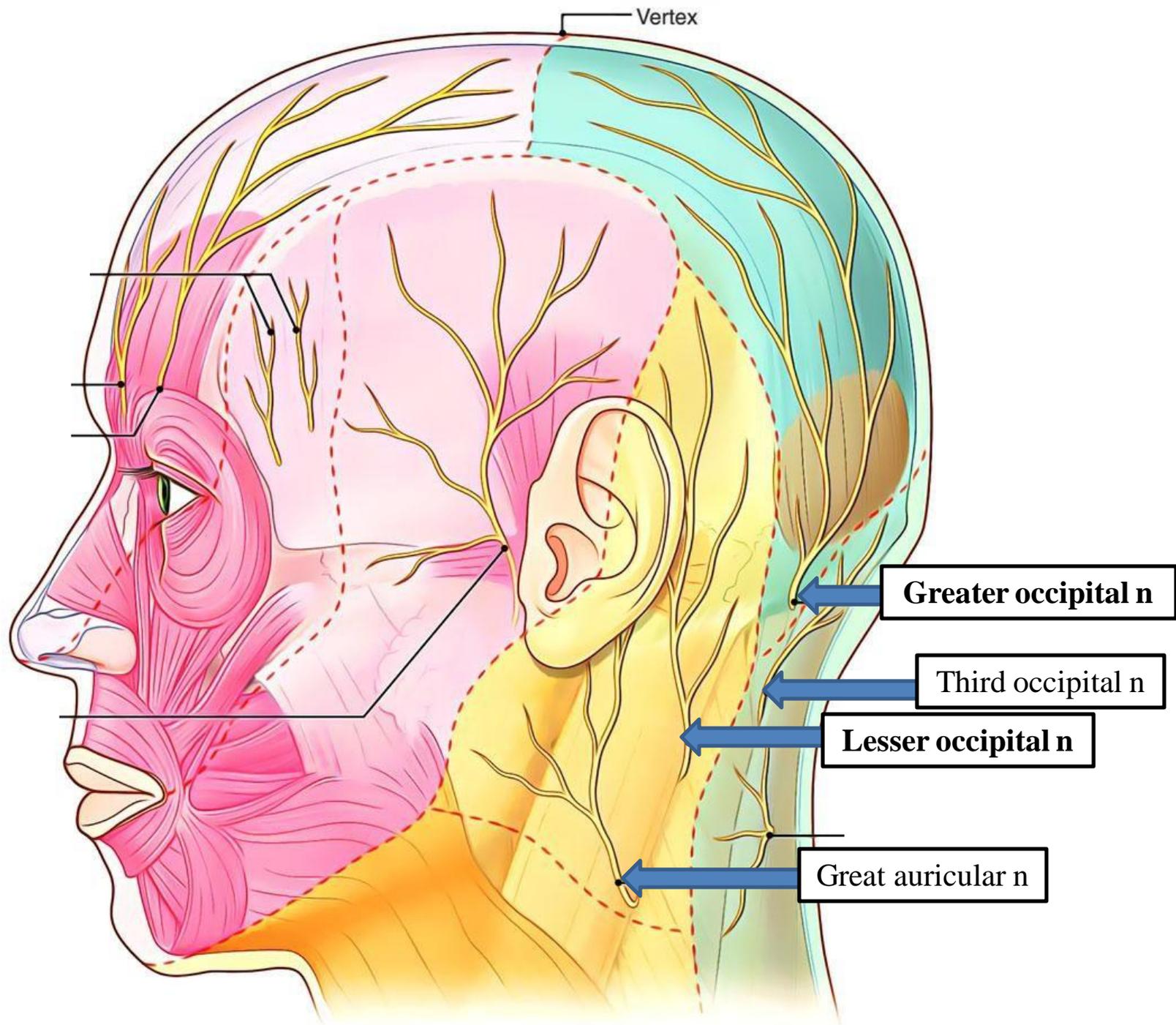




- The trigeminal nerve originates from the brain stem, it has a ganglion.
- The trigeminal ganglion is equivalent to the sensory ganglion in the dorsal root of the spinal nerves
- 3 branches originate from the trigeminal ganglion: ophthalmic, maxillary and mandibular.
- The ophthalmic branch leaves the cranial cavity through the superior orbital fissure.
- The maxillary nerve leaves through foramen rotundum, it then reaches the pterygopalatine fossa to pass through the inferior orbital fissure to reach the floor of the orbit. It then changes its name to infraorbital nerve which emerges on the face by entering through the infra-orbital foramen.
- The mandibular nerve leaves through foramen ovale and then passes through the infratemporal fossa.

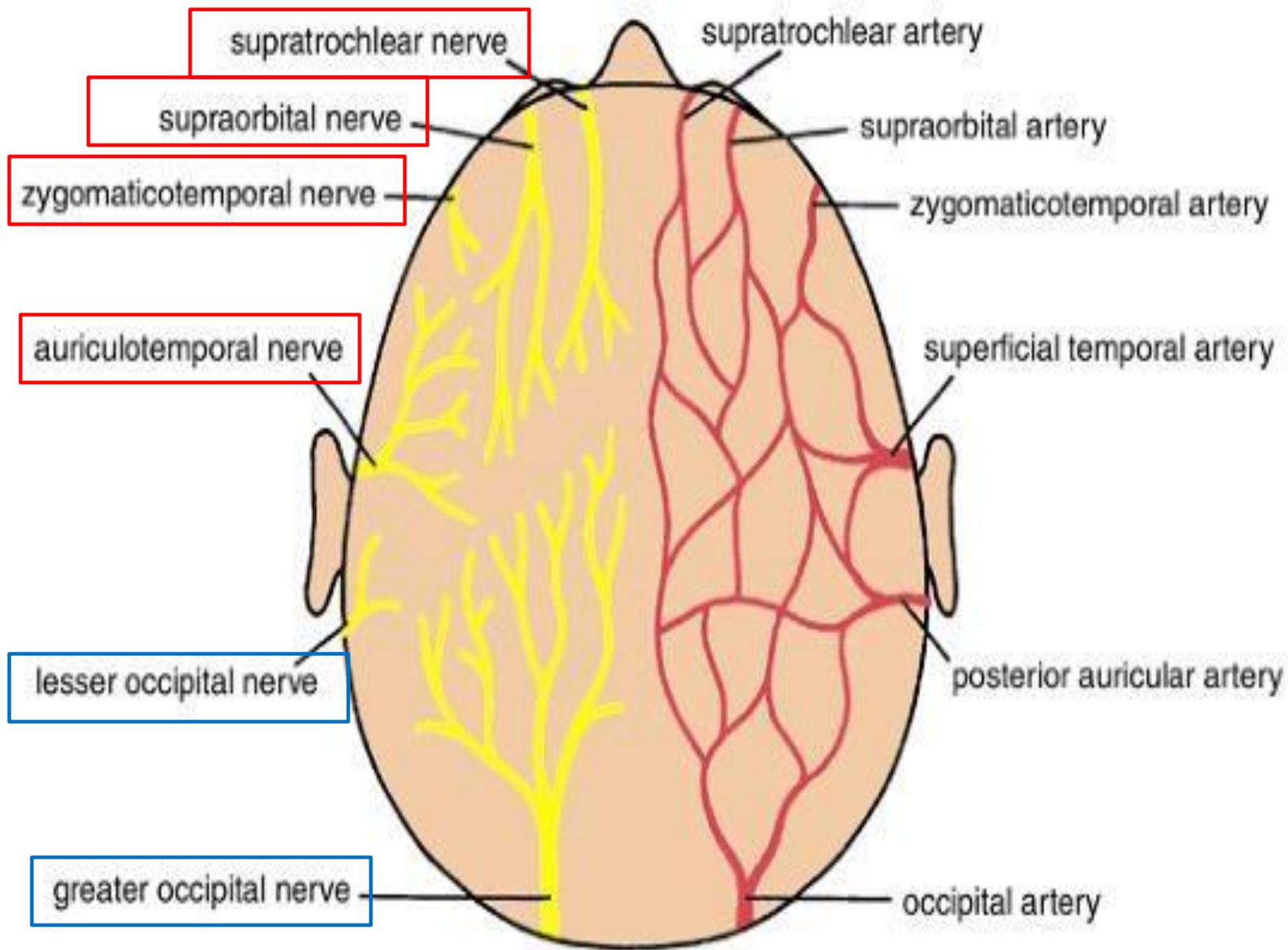


- The supraorbital and supratrochlear nerves are branches of the ophthalmic nerve
- The Zygomaticotemporal nerve is a branch of the maxillary nerve (covers the temporal area near the zygomatic bone)
- The auriculotemporal nerve is a branch of the mandibular nerve (covers the temporal area near the auricle)
- The supraorbital nerve leaves through the supraorbital foramen
- The nerve that passes above the trochlea is called the supratrochlear nerve. The trochlea is in the most superior, anterior, medial aspect of the orbit.



-Greater occipital nerve: covers large area of the occipit, a branch of the dorsal ramus of C2

-Lesser occipital nerve: a branch from the cervical plexus (ventral ramus of C2)



# Sphenoid bone

**Superior orbital fissure**  
(branches of ophthalmic nerve)

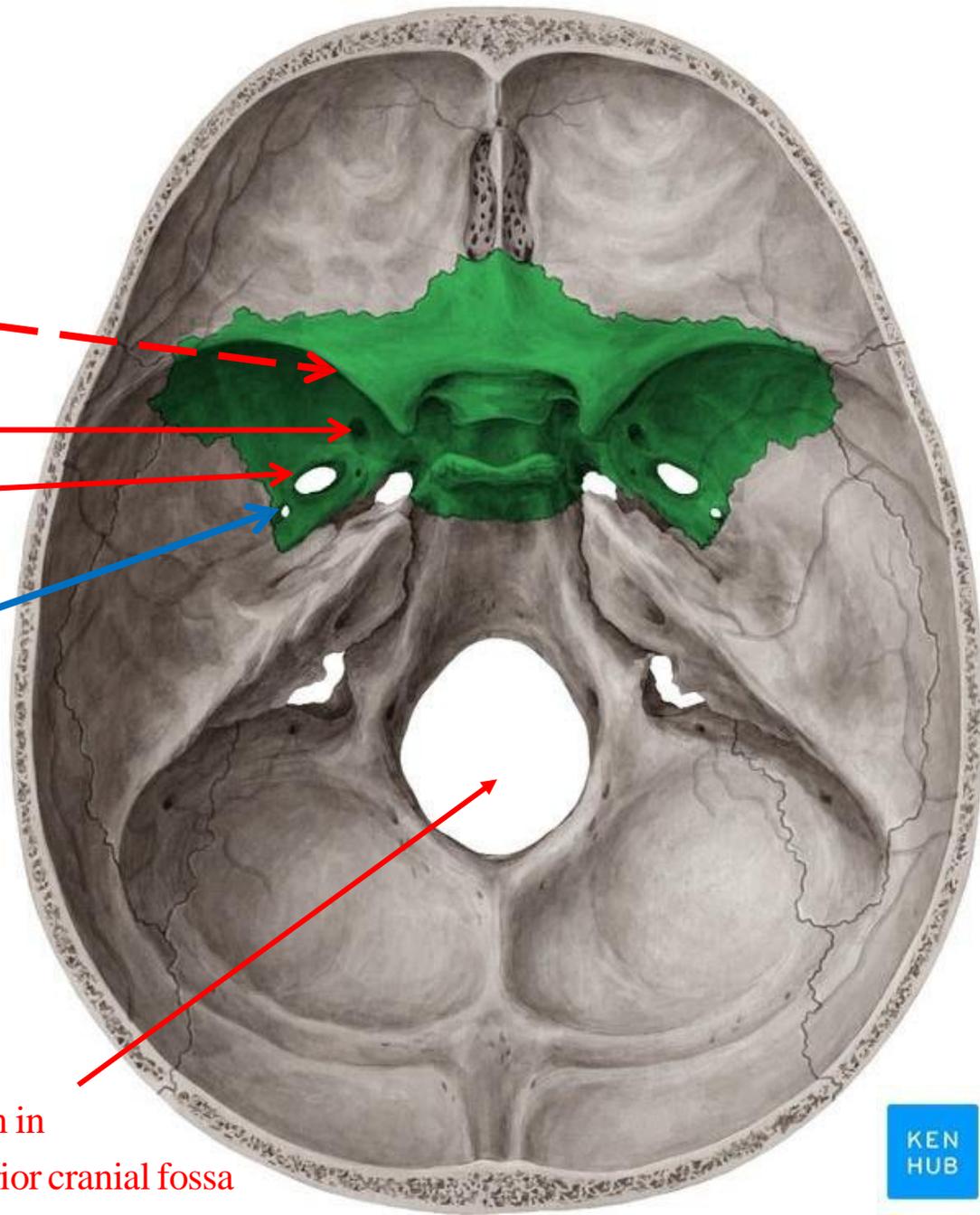
**Foramen rotundum**  
(maxillary nerve)

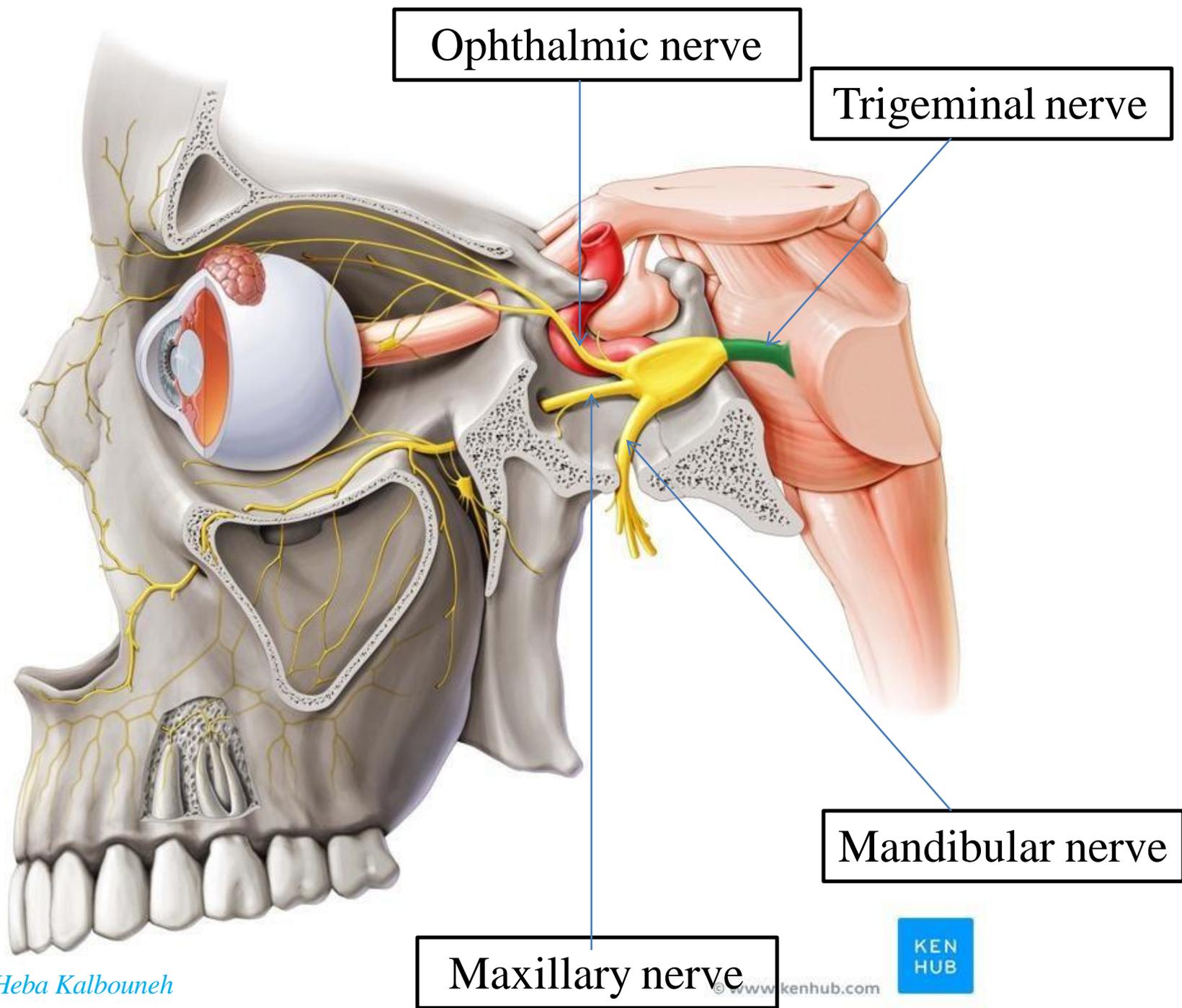
**Foramen ovale**  
(mandibular nerve)

**Foramen spinosum**

-The sphenoid bone has lesser wings, body and greater wings

Brain stem in  
the posterior cranial fossa





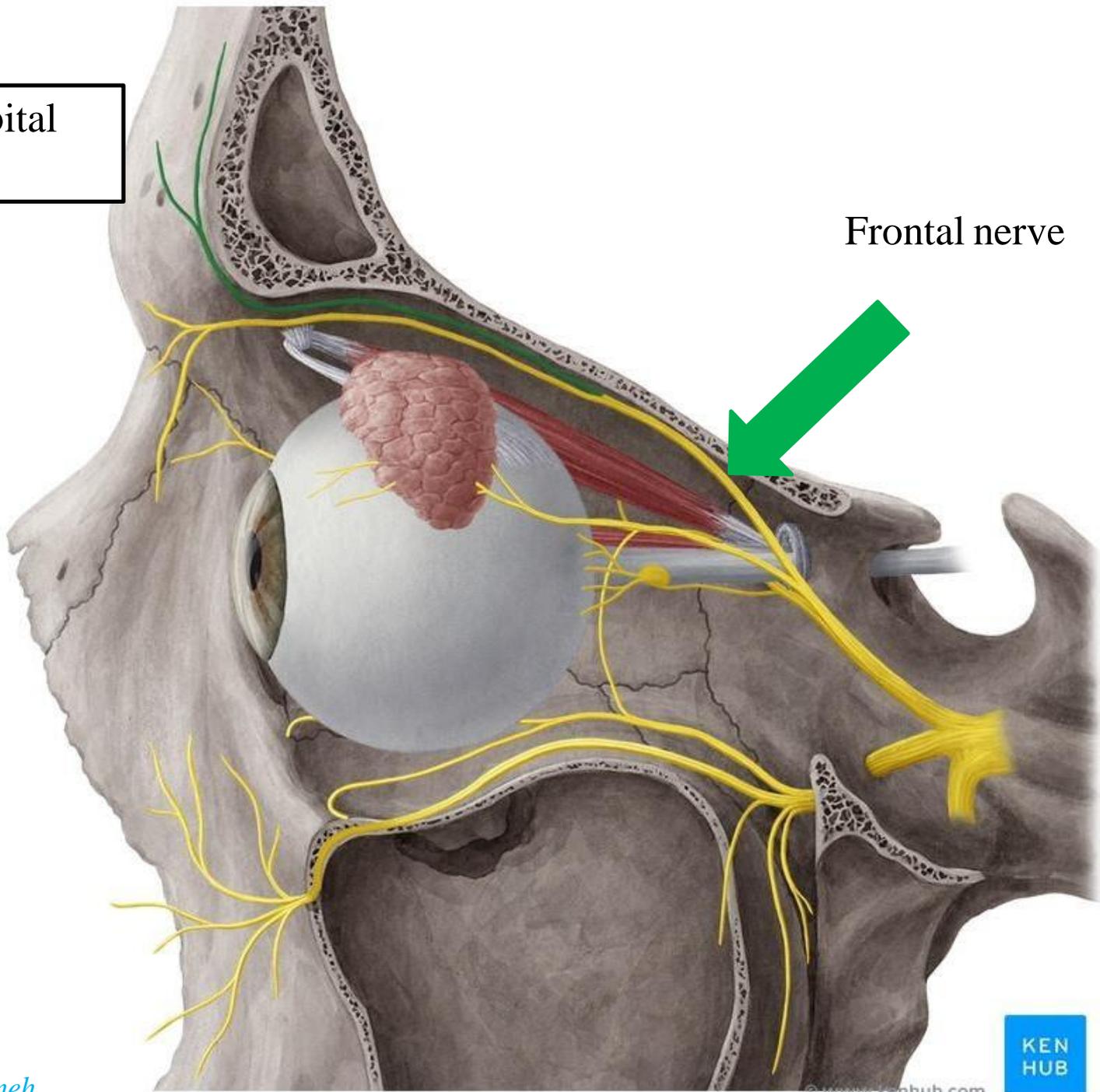
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The ophthalmic nerve gives 3 branches before entering the superior orbital fissure :

1. Frontal nerve (roof of the orbit)
2. Lacrimal nerve (the lacrimal gland)
3. Nasociliary nerve (Nasal wall of the orbit)

Supraorbital  
nerve

Frontal nerve

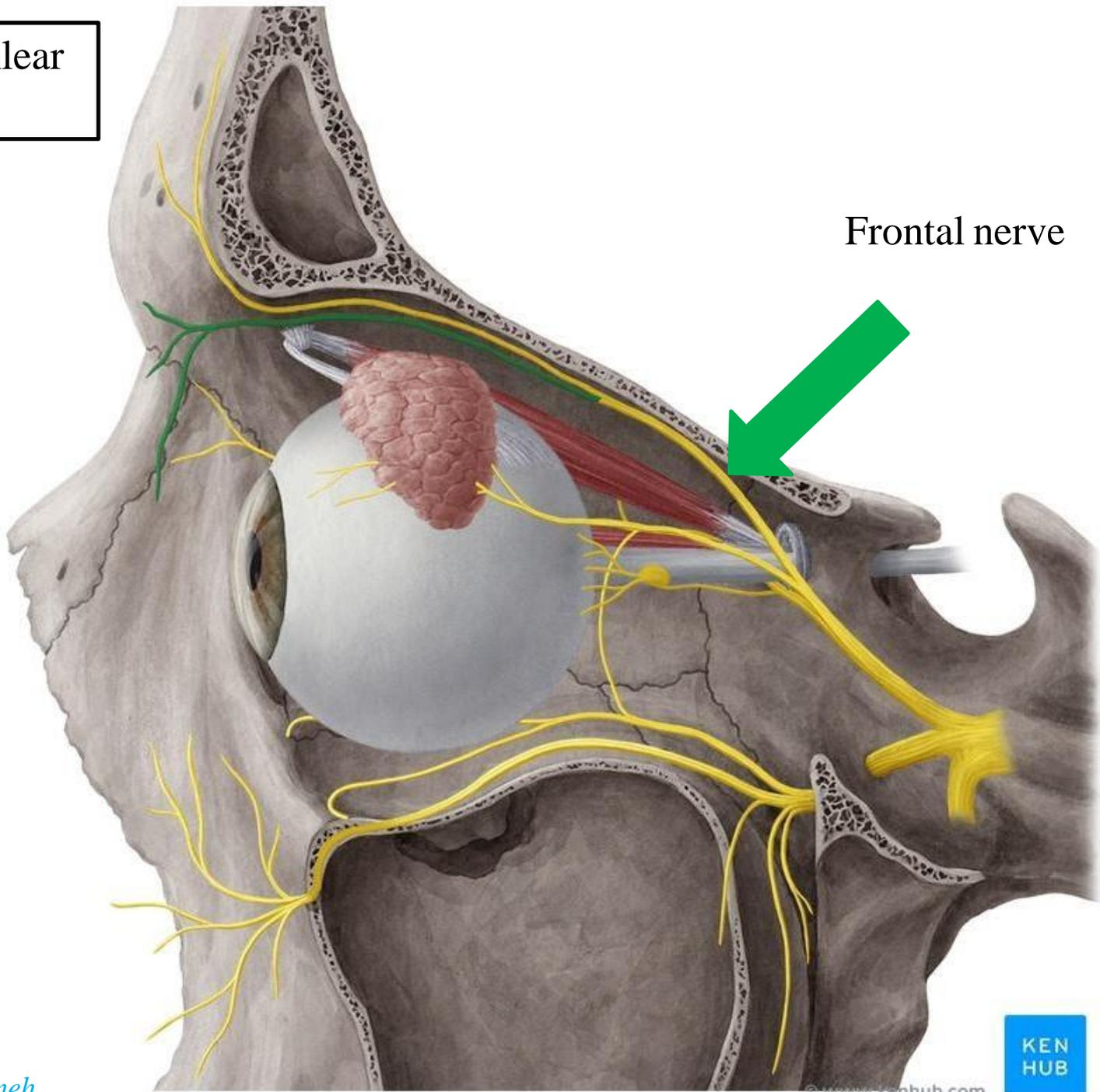


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Supratrochlear  
nerve

Frontal nerve



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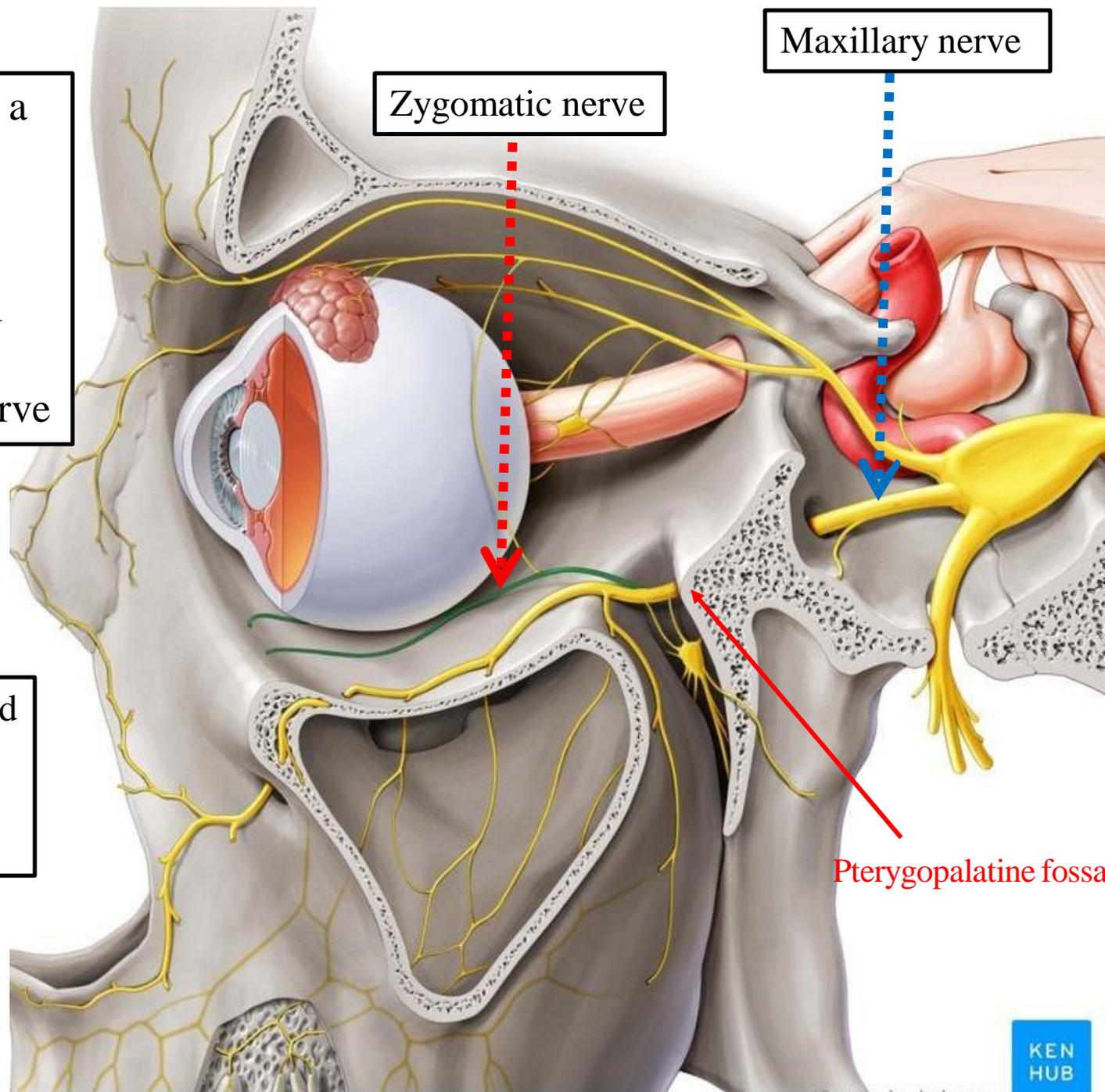
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Medial to the supraorbital nerve

The zygomatic nerve is a branch from maxillary nerve, it has two branches:

- 1 Zygomaticotemporal nerve
- 2 Zygomaticofacial nerve

The maxillary nerve and its zygomatic branch pass through inferior orbital fissure



The maxillary nerve leaves through foramen rotundum, it then reaches the pterygopalatine fossa to pass through the inferior orbital fissure to reach the floor of the orbit. It then changes its name to infraorbital nerve which emerges on the face by entering through the a canal called the infraorbital canal.

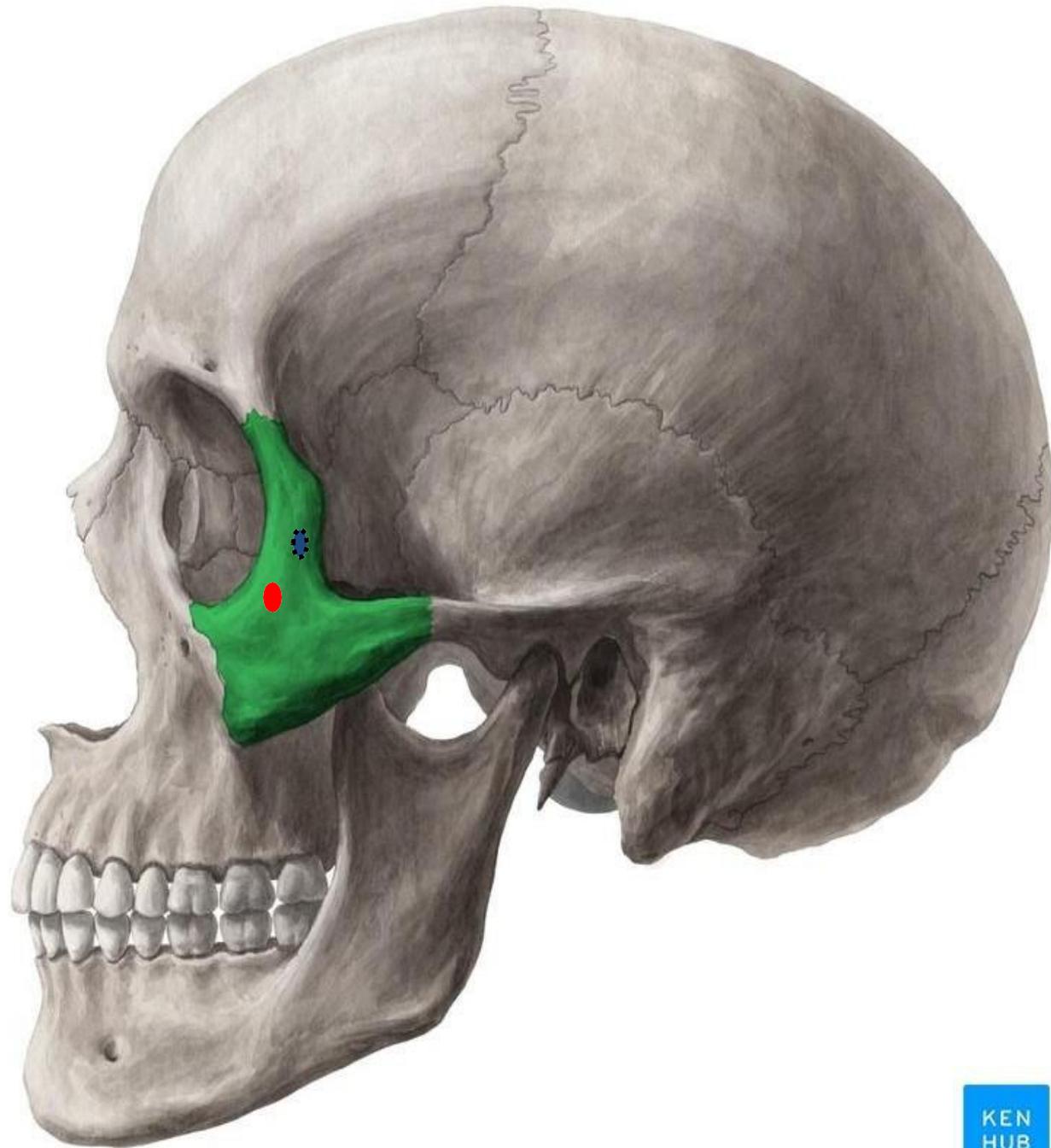
-The maxillary nerve gives a branch within the pterygopalatine fossa called the zygomatic nerve  
-The zygomatic nerve gives 2 branches while the maxillary nerve changes its name to infraorbital nerve after passing through the infraorbital foramen

## 1- The zygomaticotemporal nerve

- A branch of the zygomatic nerve ( maxillary nerve)
- Emerges in the temporal fossa through a small foramen on the posterior surface of the zygomatic bone. It supplies the skin over the temple  
**(Zygomaticotemporal foramen)**

## 2- The zygomaticofacial nerve

- A branch of the zygomatic nerve ( maxillary nerve)
- Passes onto the face through a small foramen on the anterior side of the zygomatic bone. It supplies the skin over the prominence of the cheek  
**(Zygomaticofacial foramen)**

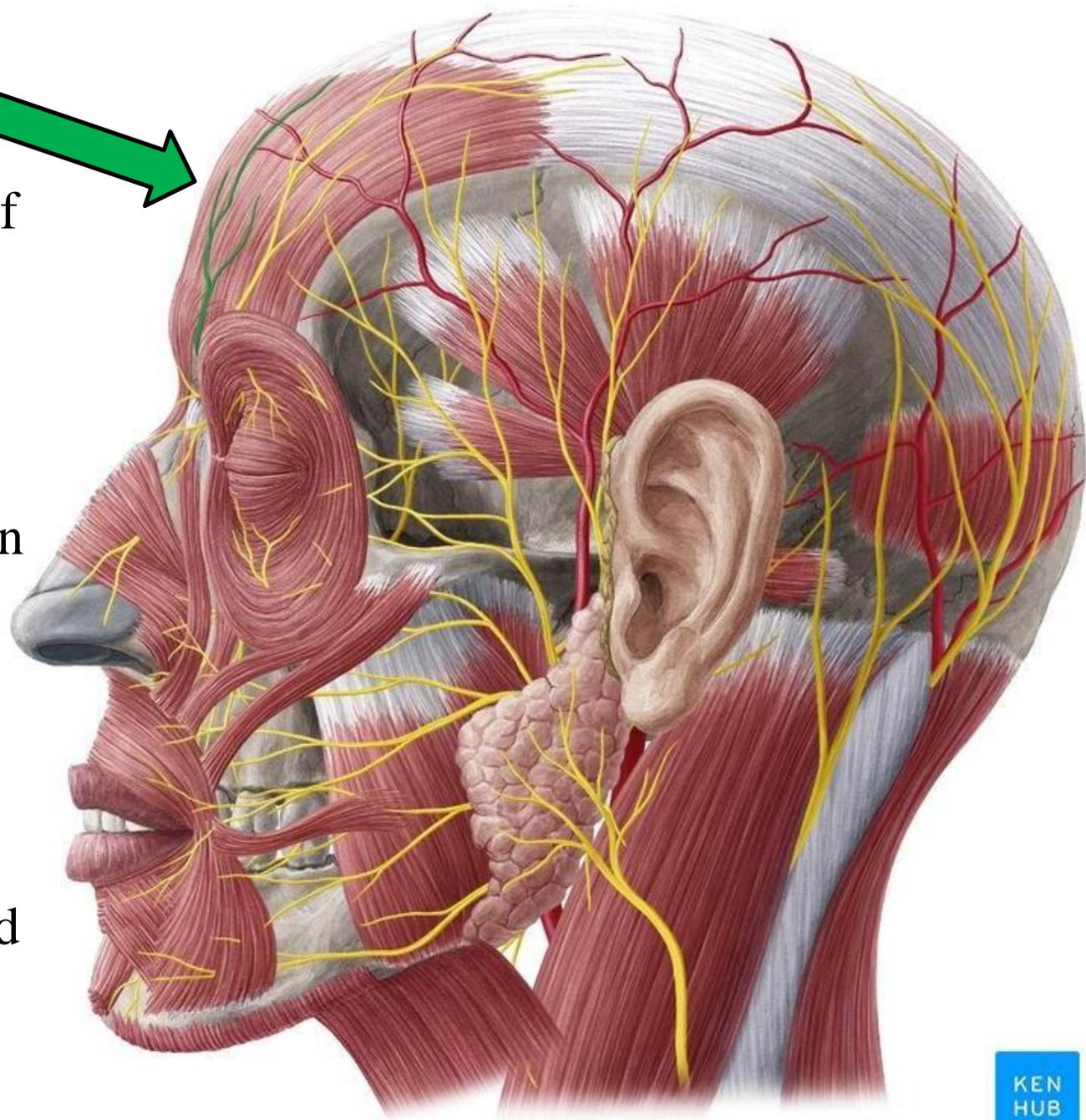
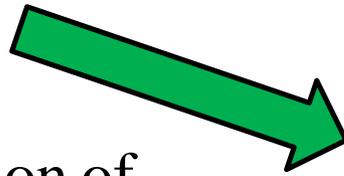


# Supratrochlear nerve

-A branch of the ophthalmic division of the trigeminal nerve  
(most medial)

-Winds around the superior orbital margin and ascends over the forehead close to the median plane

- It supplies the scalp nearly as far backward as the vertex.

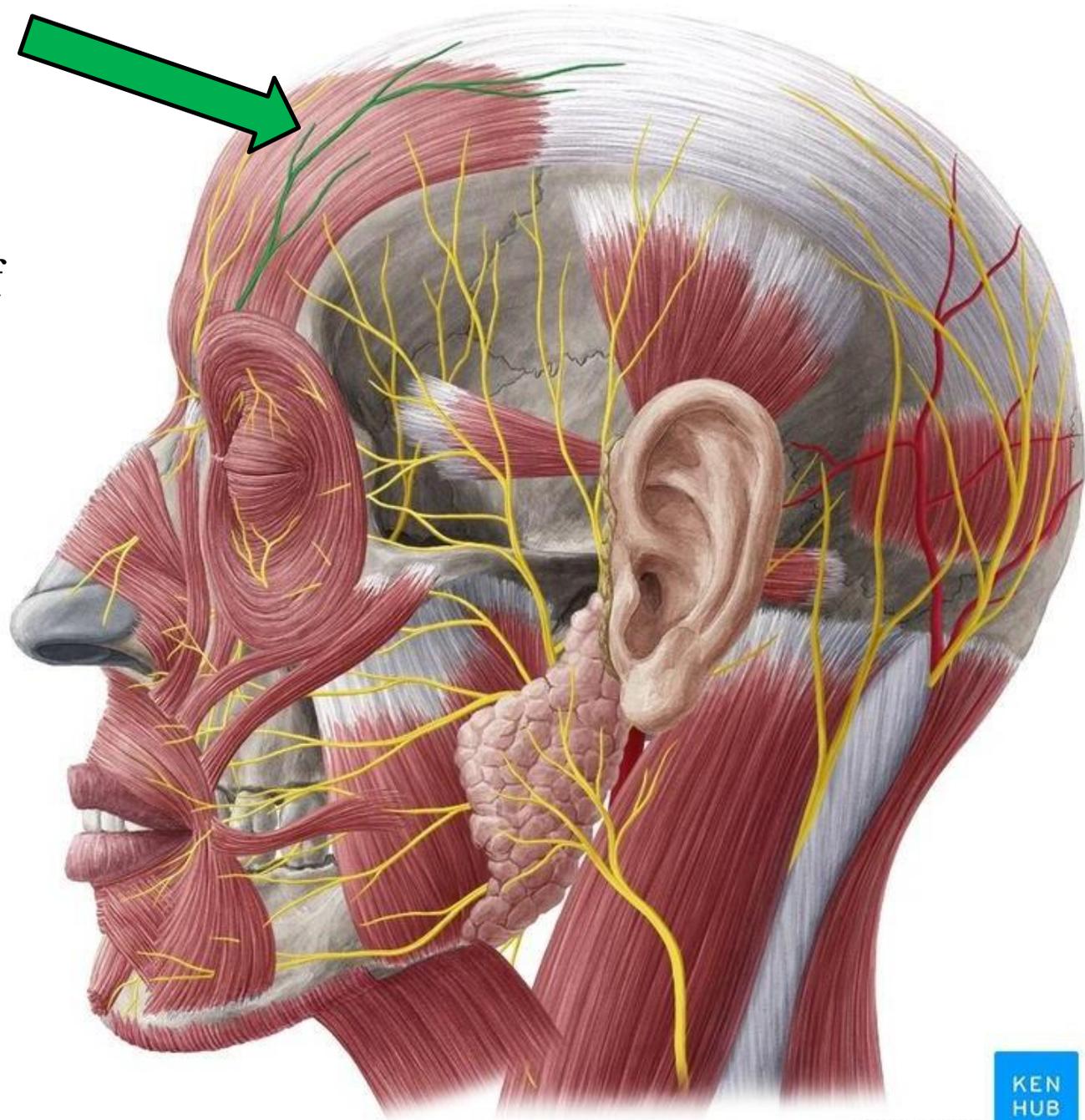


# Supraorbital nerve

-A branch of the ophthalmic division of the trigeminal nerve

-Passes through the supraorbital foramen and ascends over the forehead

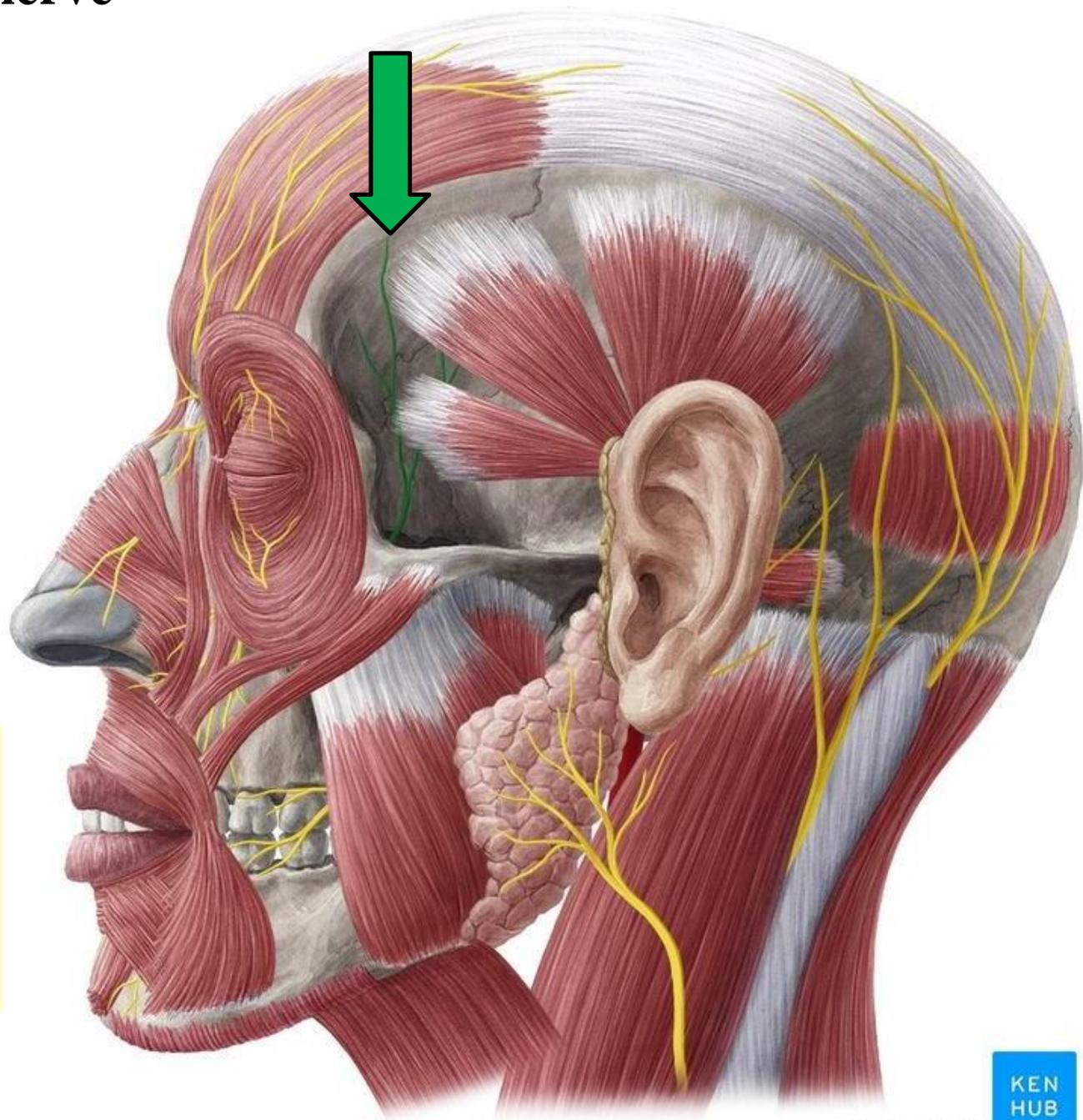
- It supplies the scalp as far backward as the vertex.



# Zygomaticotemporal nerve

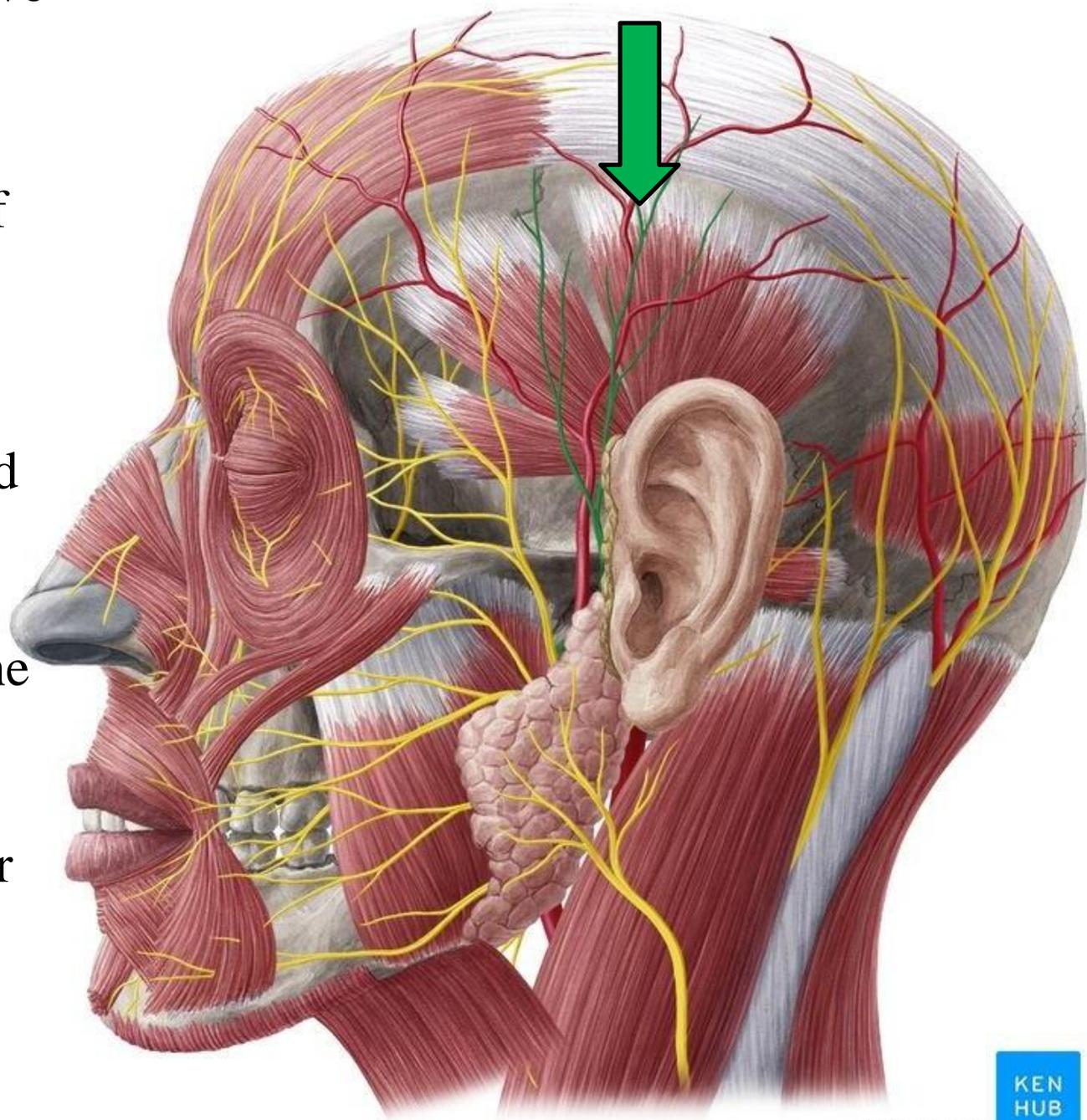
- A branch of the maxillary division of the trigeminal nerve
- Supplies the skin over the temporal region

Note:  
Zygomaticotemporal foramen (present on the posterior surface of zygomatic bone)



# Auriculotemporal nerve

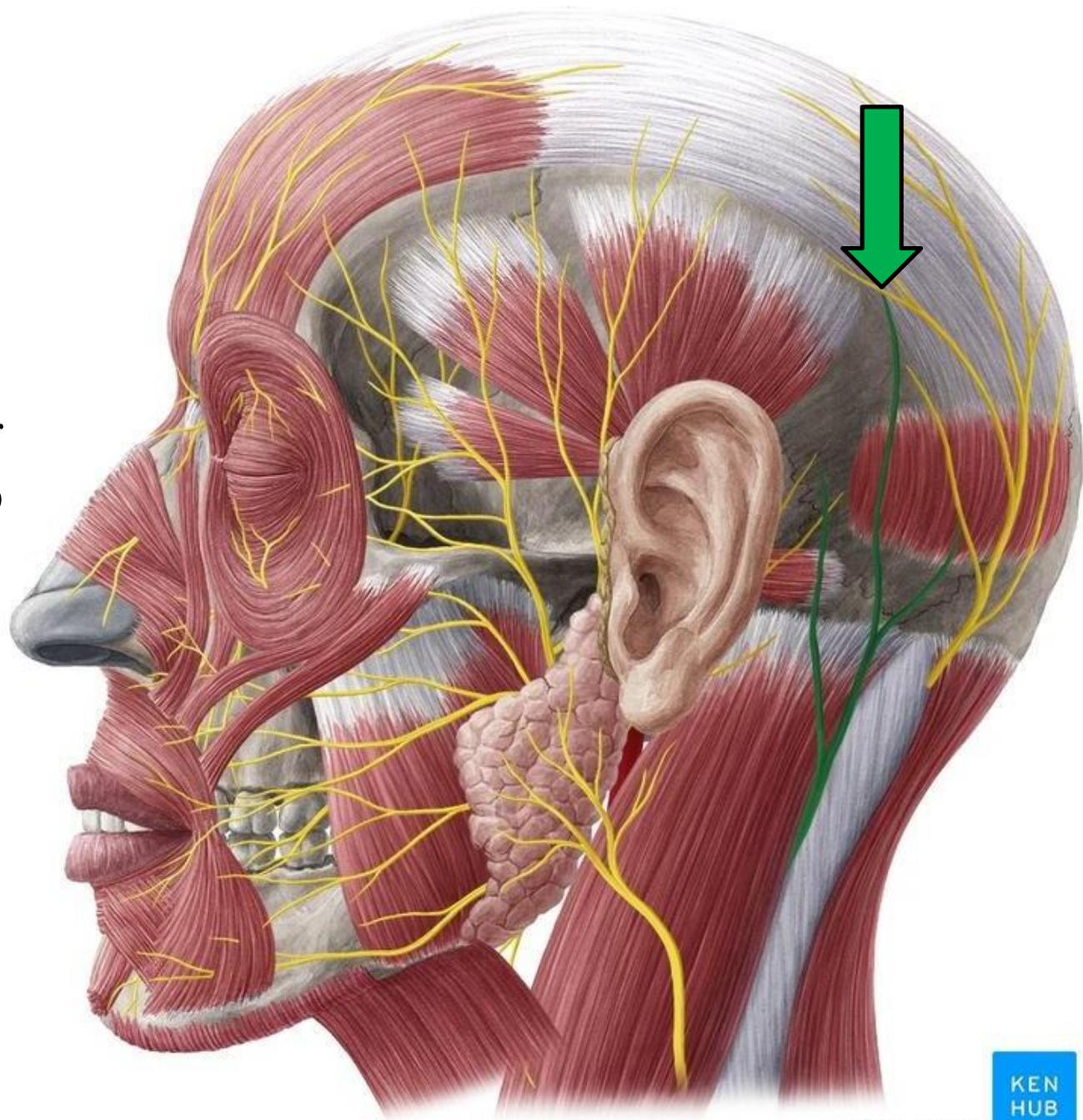
- A branch of the mandibular division of the trigeminal nerve
- Emerges from the upper border of parotid gland
- Ascends in front of the auricle
- Supplies the skin over the temporal region.



# Lesser occipital nerve

-A branch of the cervical plexus (C2)

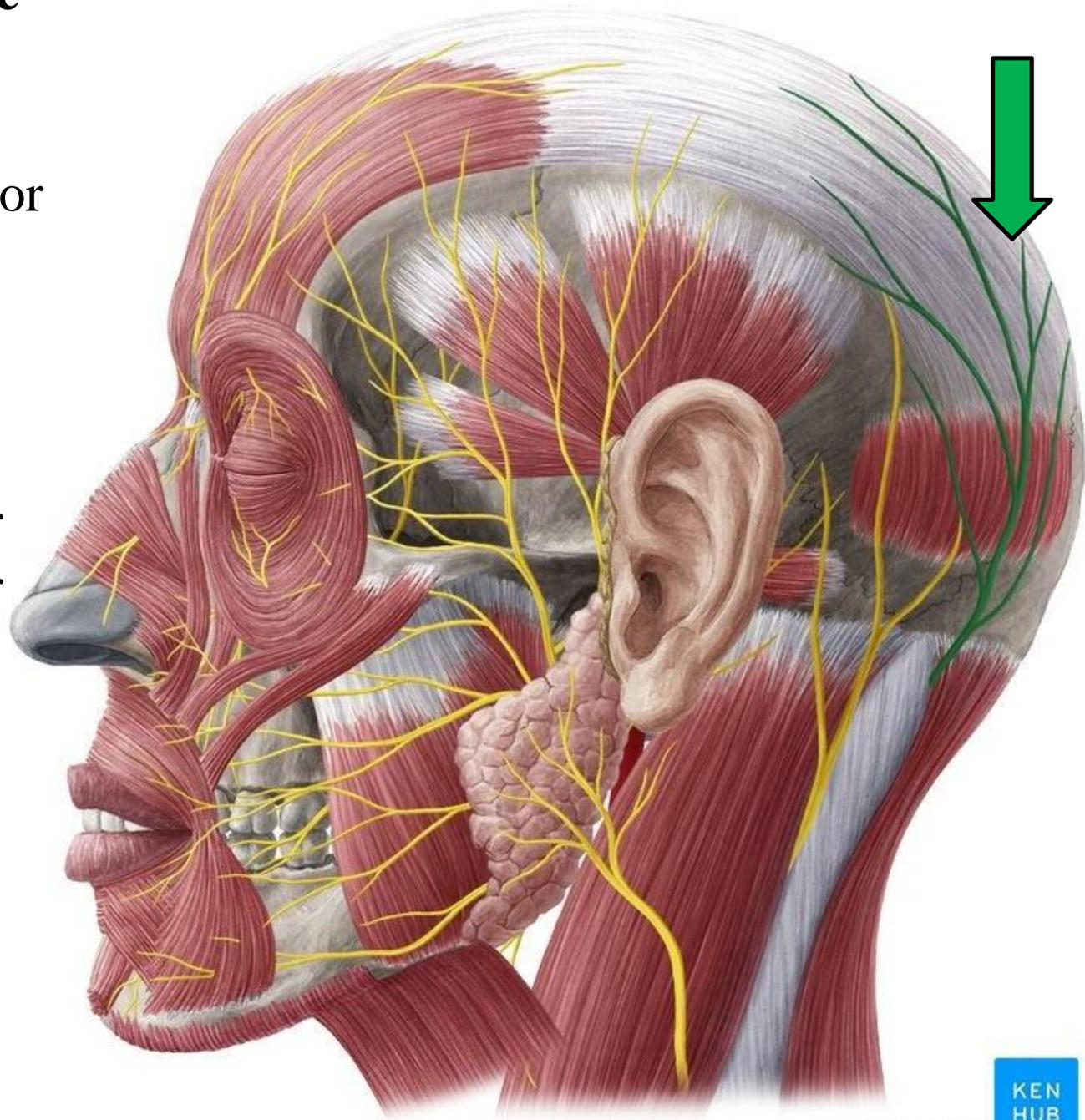
- Supplies the skin over the lateral part of scalp behind the auricle



# Greater occipital nerve

-A branch of the posterior ramus of the second cervical nerve (C2)

- Supplies the skin over the back of scalp as far forward as the vertex



# Blood supply of the scalp

5 sets of arteries on each side of the scalp

3 in front of the auricle

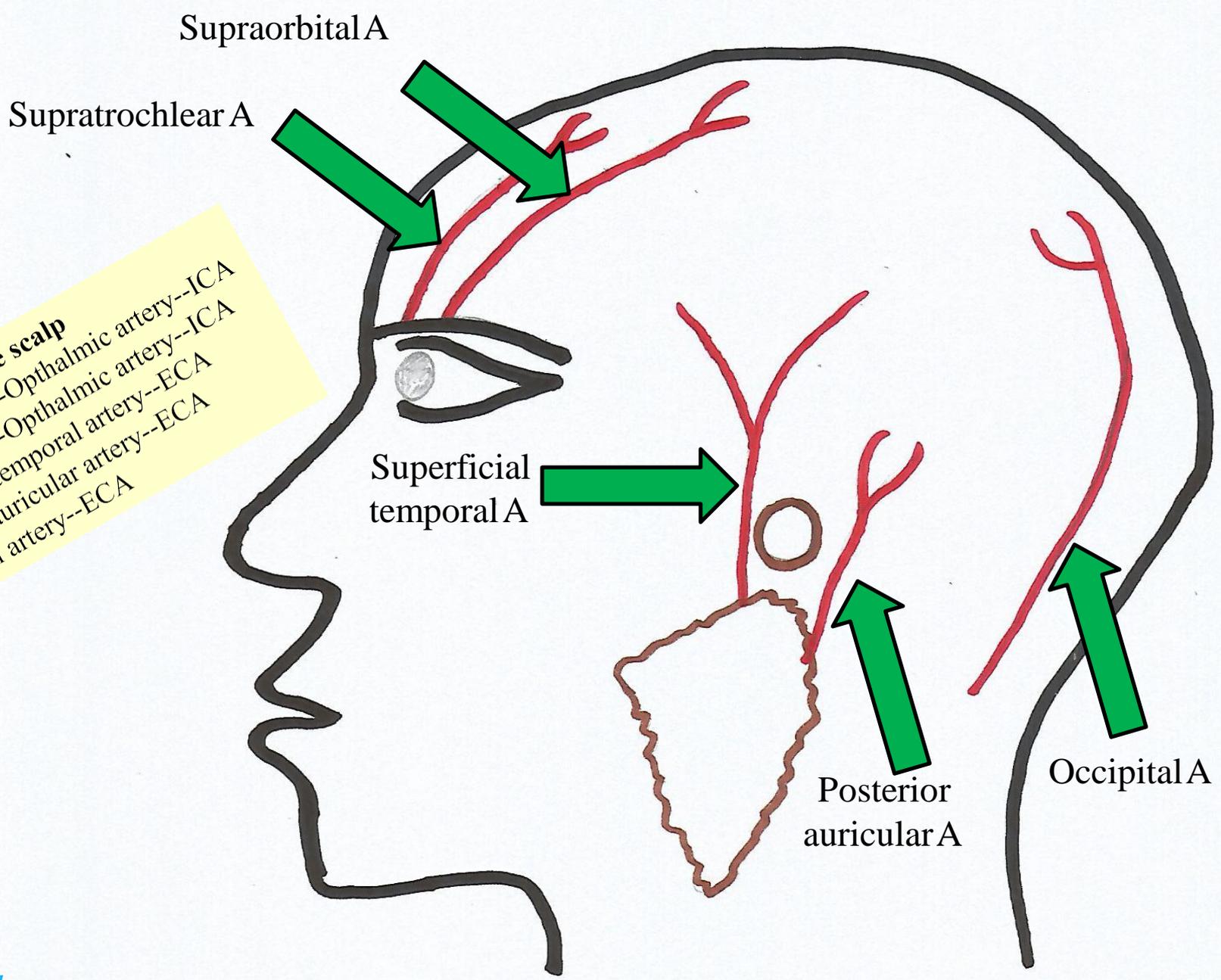


2 behind the auricle

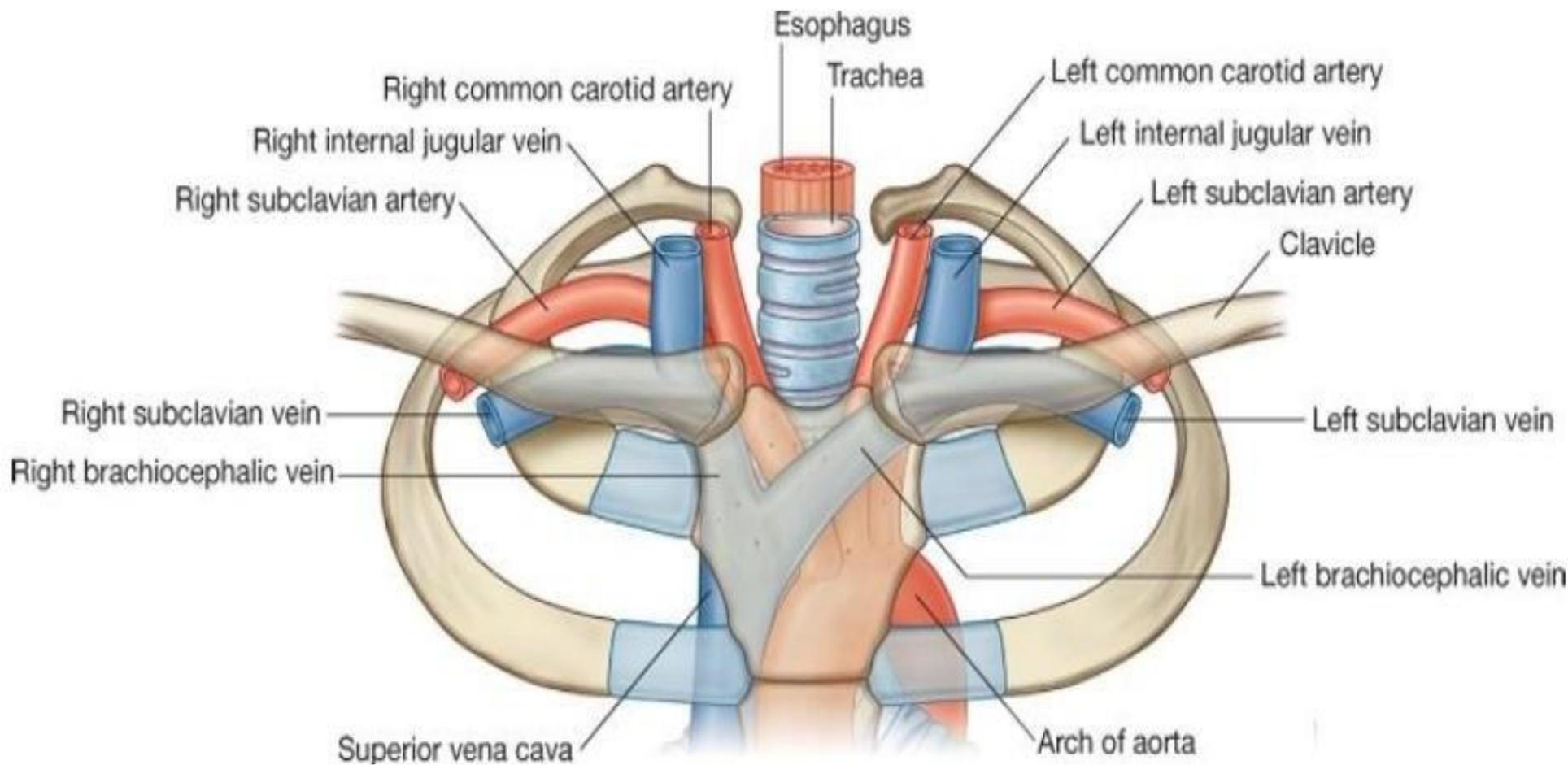
Out of 5

2 arteries (indirectly from internal carotid artery)

3 arteries (directly from the external carotid artery)



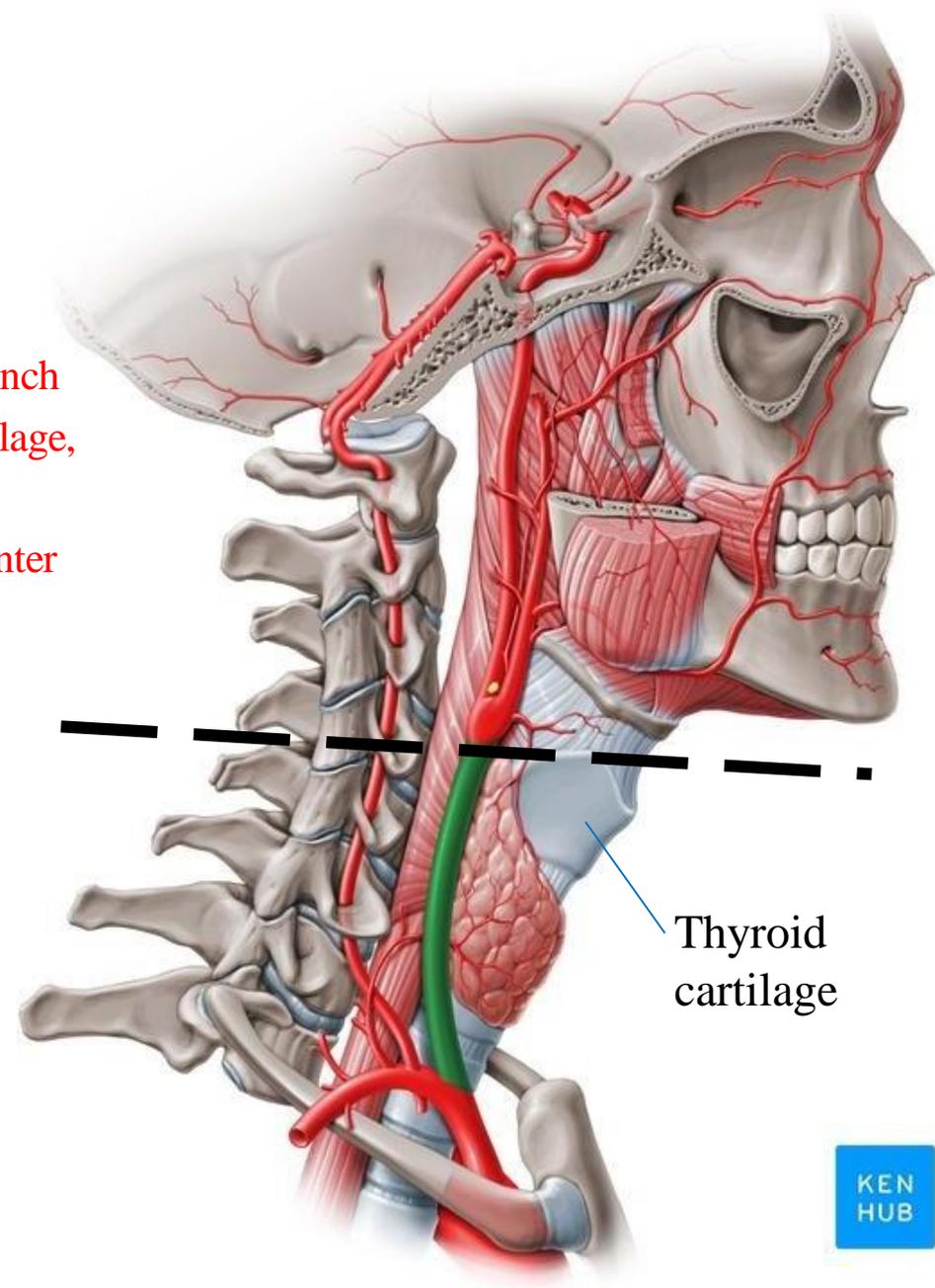
# Common carotid artery



- Right common carotid: from the brachiocephalic artery
- Left common carotid artery: from arch of the aorta
- **Begins:** sternoclavicular joint
- **Ends:** upper border of the thyroid cartilage (C4).
- **Divisions:** External and internal carotid arteries

# Common carotid artery

- It ascends upward inside the neck without giving any branch
- Just at the level of the superior border of the thyroid cartilage, it gives 2 branches :
  1. Internal carotid artery (pierces the base of the skull to enter the cranial cavity)
  2. External carotid artery (supplies superficial structures)



Thyroid  
cartilage

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# Internal carotid artery

Has no branches in the neck

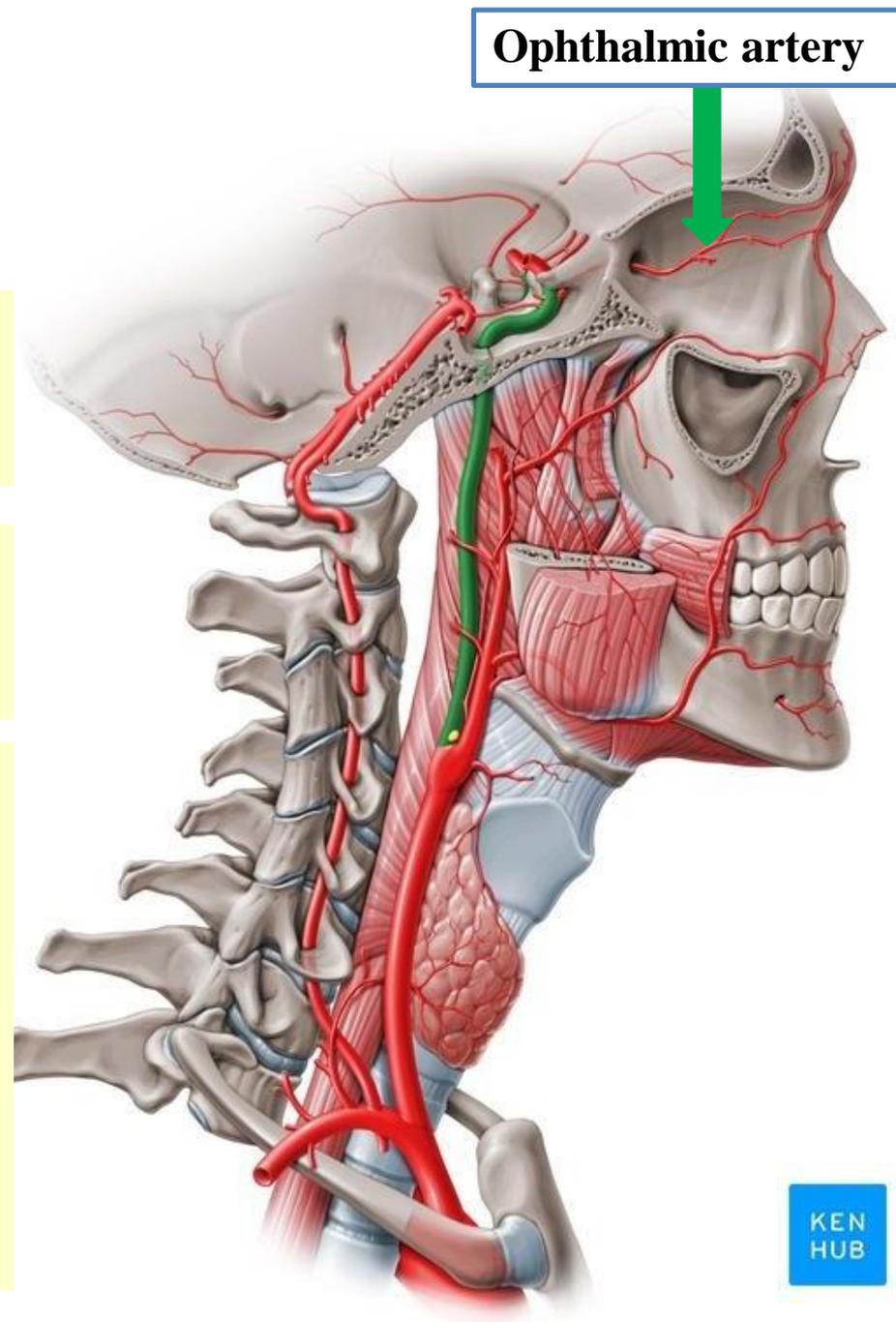
Enters the carotid canal in the skull

**Ophthalmic artery** is one of its branches

Ophthalmic artery enters the orbit through optic canal

It gives two branches:

- 1- Supraorbital artery
- 2- Supratrochlear artery



Ophthalmic artery

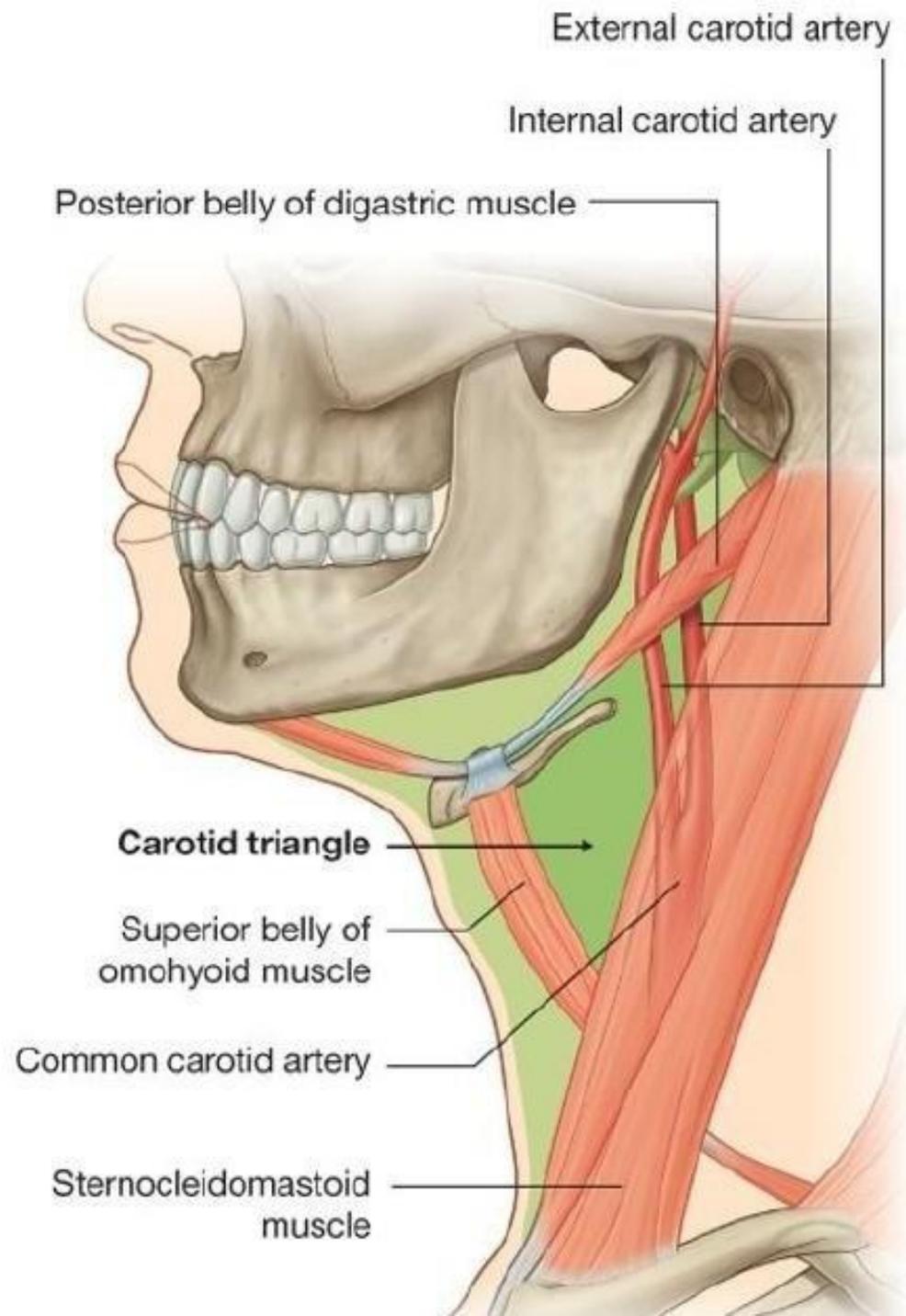
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- It pierces the base of the skull to enter the cranial cavity through carotid canal
- Supplies the brain

# External carotid artery

Medial to the internal carotid artery, then passes backward and lateral to it.



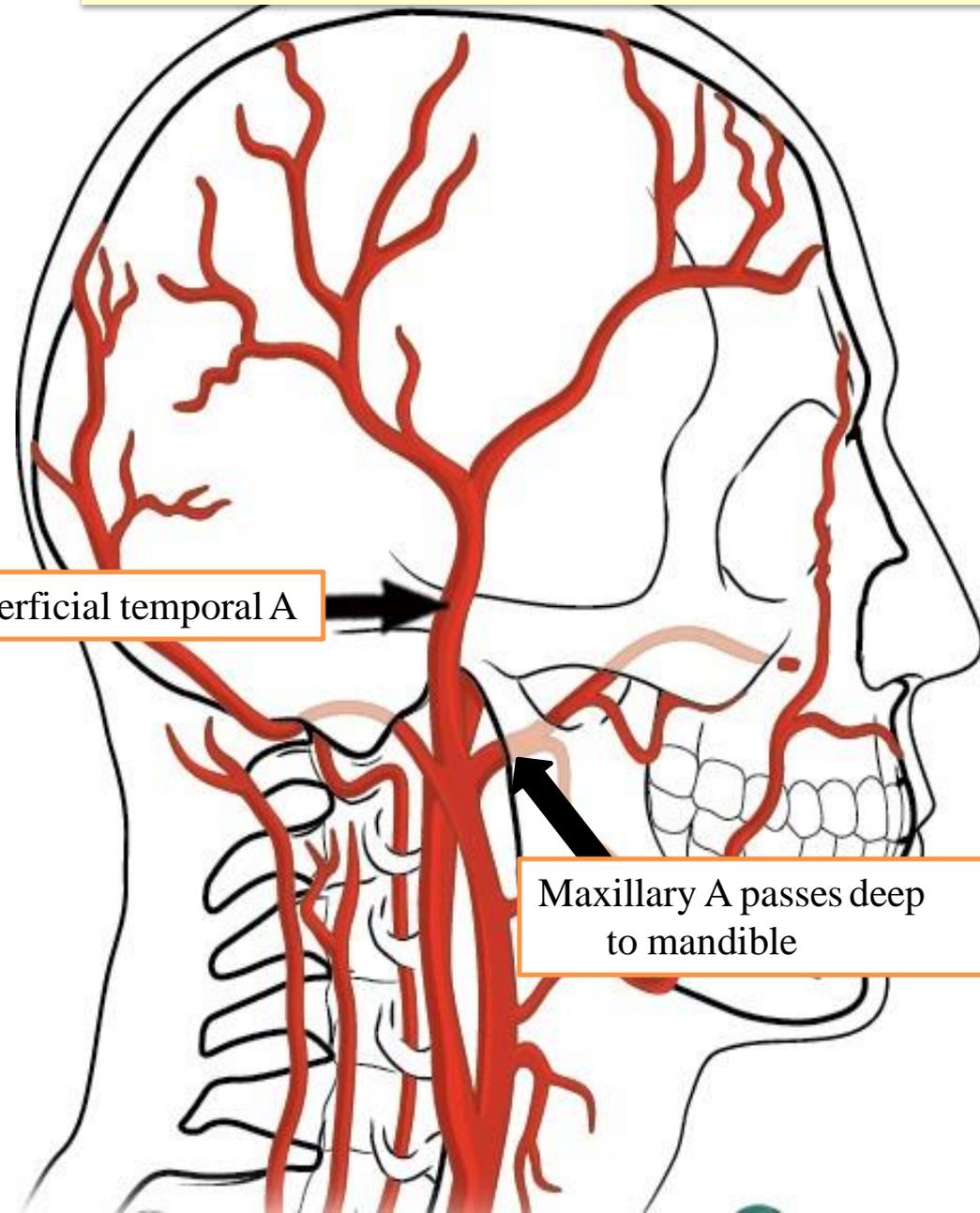
Some American Ladies Find Our Petra So Magnificent

# External carotid artery

## ❖ Branches:

- a. Superior thyroid artery
- b. Ascending pharyngeal artery
- c. Lingual artery
- d. Facial artery
- e. **Occipital artery**
- f. **Posterior auricular artery**
- g. **Superficial temporal artery**
- h. **Maxillary artery**

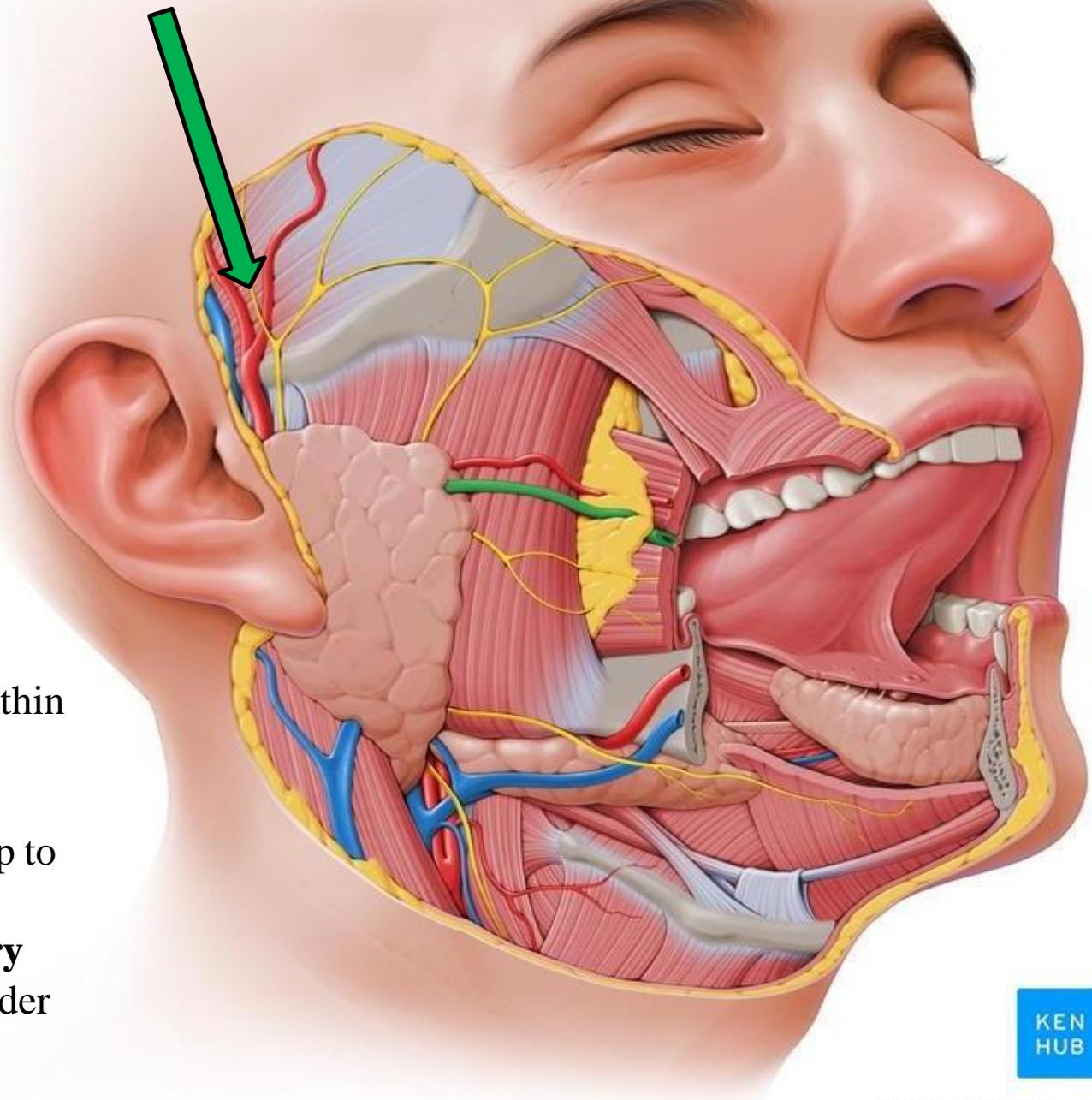
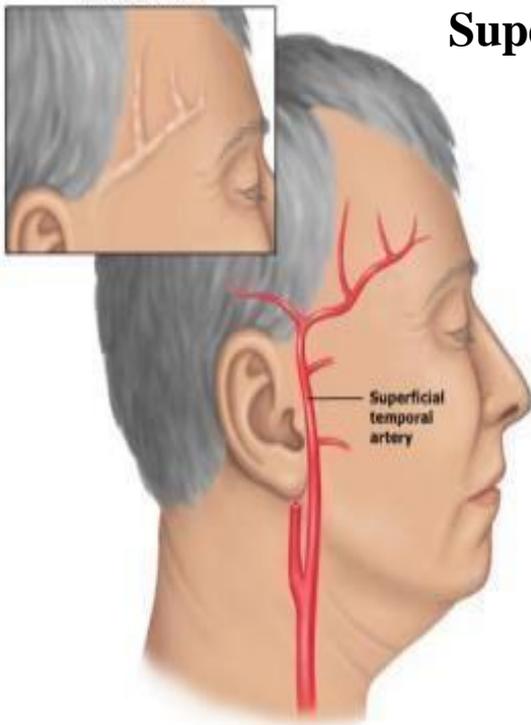
*These are the two terminal branches of ECA*



Dr. Heba Kalbouneh

-The occipital artery and the posterior auricular artery supply the side posterior to the auricle

## Superficial temporal artery



❖ The external carotid artery terminates as two branches (within the parotid gland):

1. Maxillary artery passes deep to the neck of the mandible
2. **Superficial temporal artery** emerges from the upper border of parotid gland

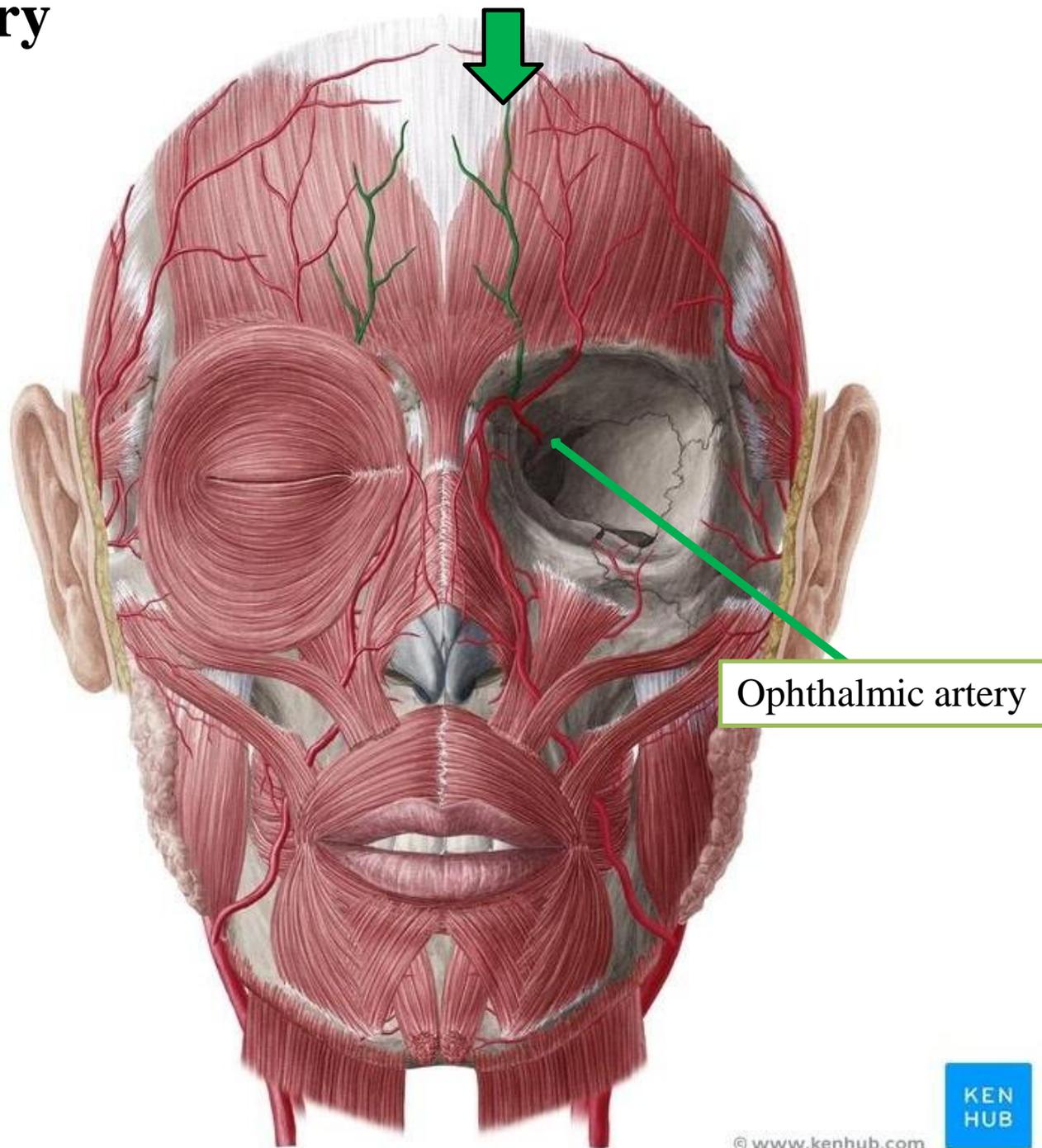
*Dr. Heba Kalbouneh*

-The external carotid artery ascends inside the neck and gives many branches there, it then enters the parotid gland

-Superficial temporal artery becomes more prominent as we age because it's superficial in location and due to loss of fat so it becomes more obvious at the temporal side

# Supratrochlear artery

- A branch of ophthalmic artery
- Ascends over the forehead in company with the supratrochlear nerve
- Supplies the upper eyelid, and the skin of the forehead and the scalp.



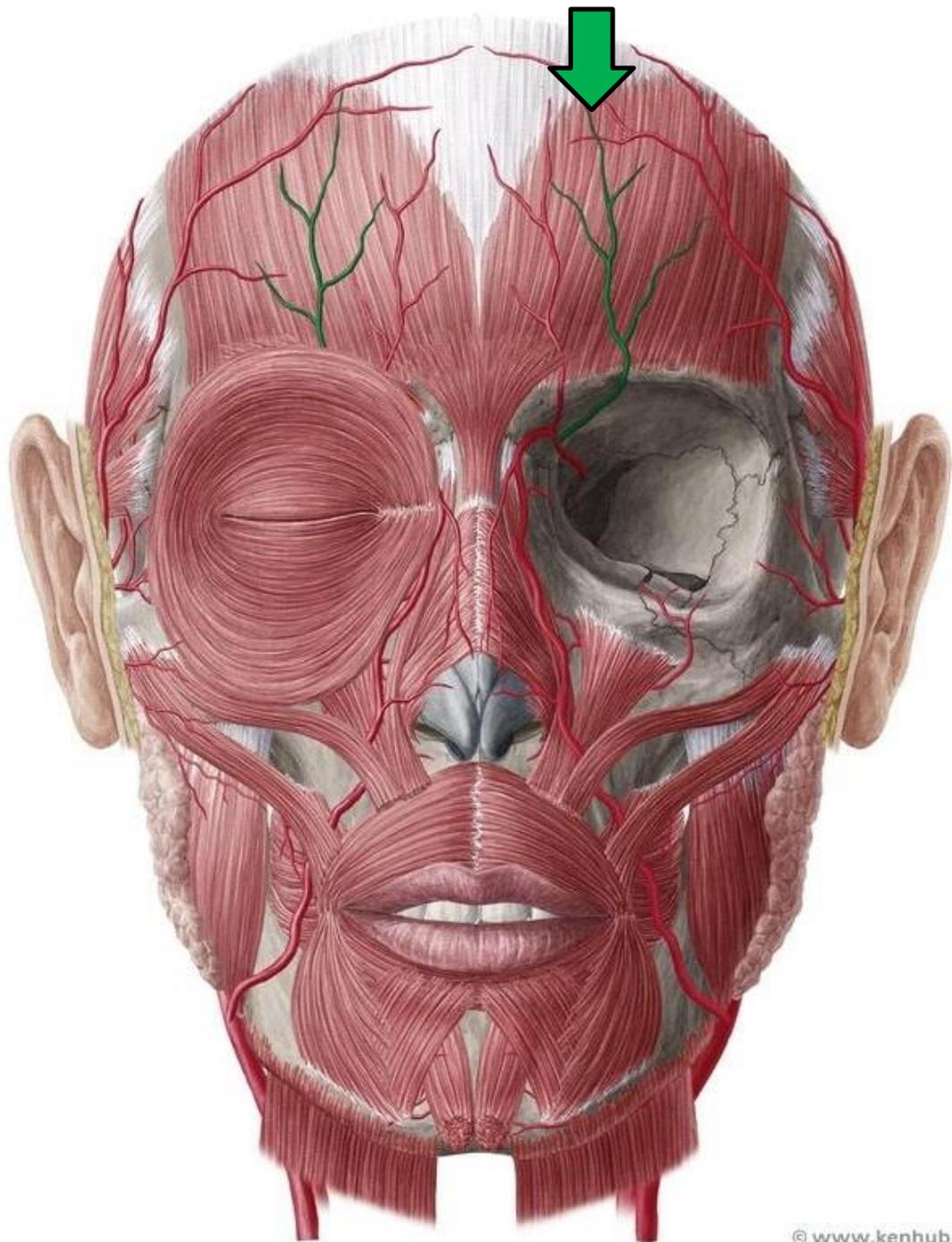
# Supraorbital artery

-A branch of ophthalmic artery

-Passes through the supraorbital foramen

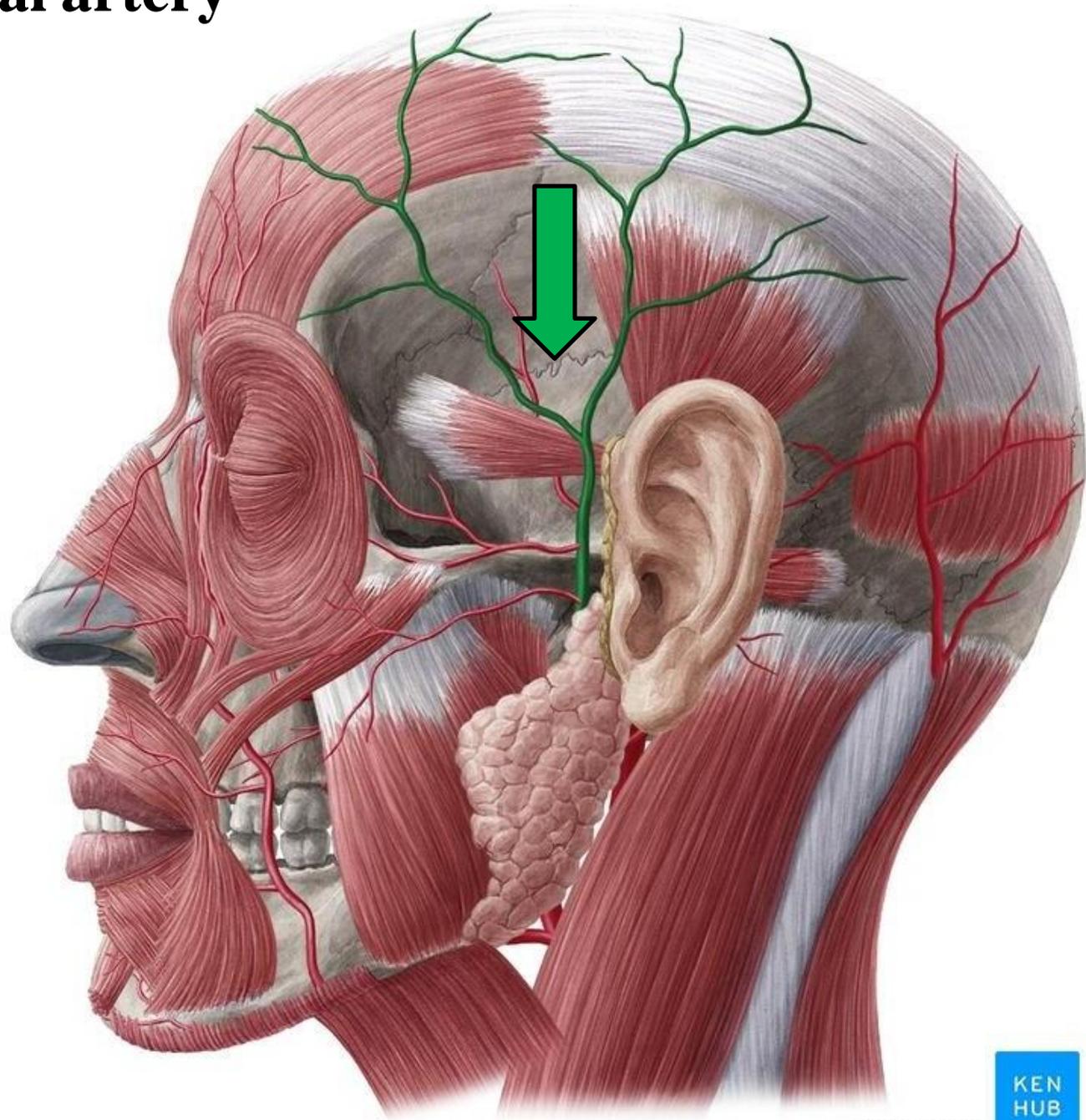
-Ascends over the forehead in company with the supraorbital nerves

-Supplies the upper eyelid, and the skin of the forehead and the scalp.



# Superficial temporal artery

- The smaller terminal branch of the external carotid artery
- Ascends in front of the auricle
- Crosses over the root of zygomatic arch (**pulse can be felt there**)
- It divides into anterior and posterior branches, which supply the skin over the frontal and temporal regions.



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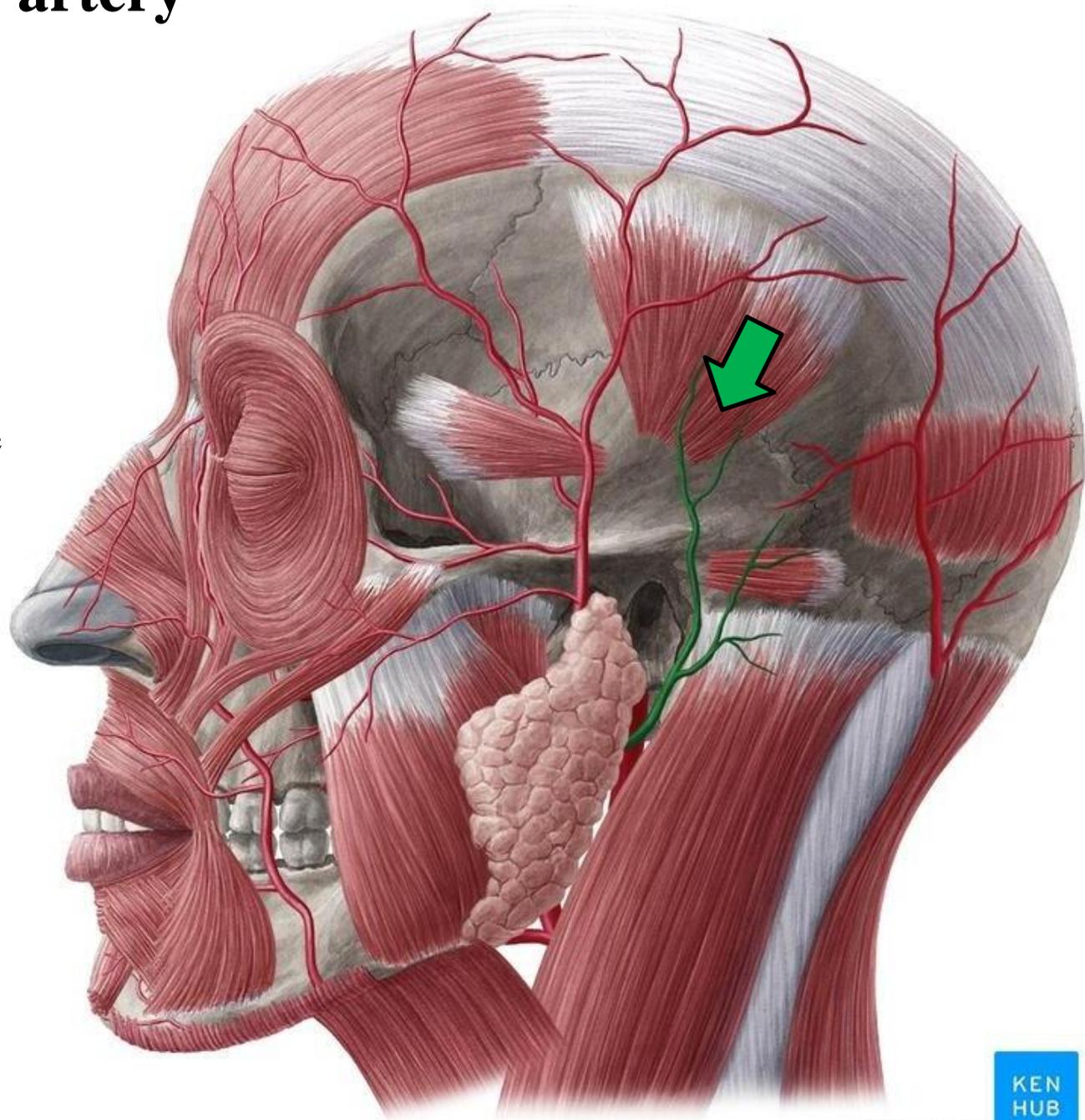
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# Posterior auricular artery

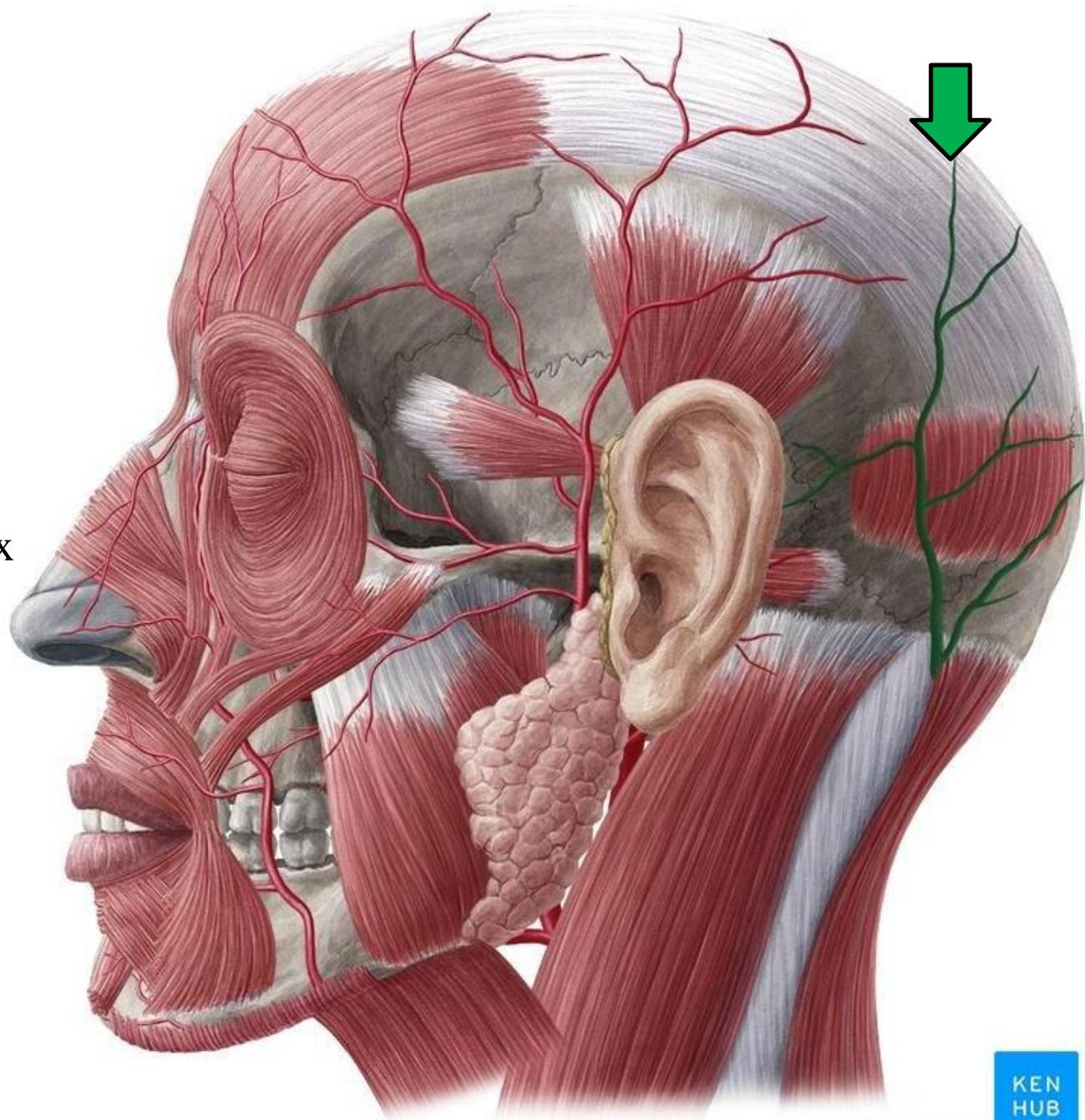
-A branch of External carotid artery

-Ascends behind the auricle to supply the lateral part of scalp behind the auricle

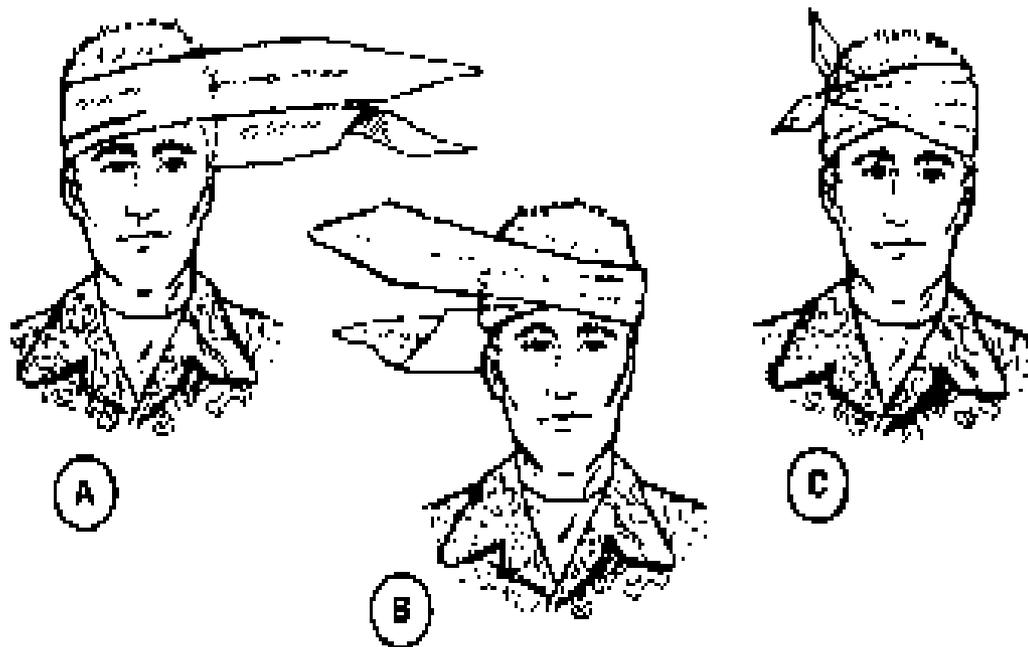


# Occipital artery

- A branch of External carotid artery
- Supplies the skin over the back of the scalp and reaches as high as the vertex



Anatomically, it is useful to remember in an emergency that all the superficial arteries supplying the scalp ascend from the face and the neck. Thus, in an emergency situation, encircle the head just above the ears (**auricle**) and eyebrows (**superciliary arches**) with a tie, shoelaces, or even a piece of string and tie it tight. Then insert a pen, pencil, or stick into the loop and rotate it so that the tourniquet exerts pressure on the arteries



*Figure 3-11. Cravat bandage applied to head illustrated A thru C.*