وَقُل رَّبِّ زِدْنِي عِلْمًا

النادي الطبي

PERIPHERAL NERVOUS SYSTEM

SUBJECT : Anatomy

LEC NO. : 4

DONE BY : Batool Alzubaidi & Hashem Ata

#كلينيكال_إلا_شحطة

Face, scalp & trigeminal nerve.

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objects

1-Describe general features of the major openings of facial skeleton.

2-Discuss briefly how the face is developed.-Review the trigeminal nerve and describe nerve supply of the face.

3-Explain the importance of blood supply and lymph drainage of the face.

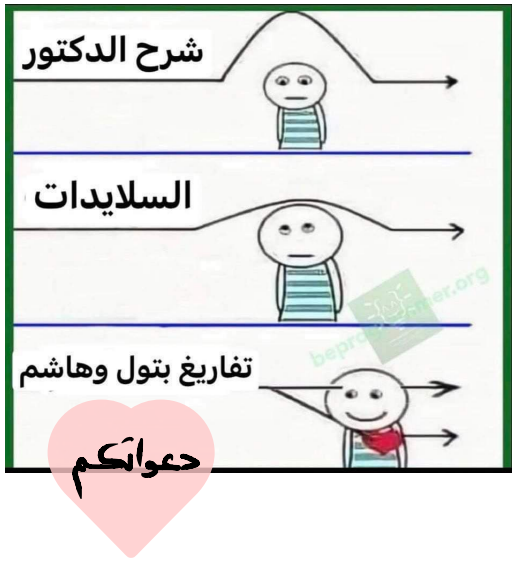
4-Follow up the course of facial nerve from its point of central connections, exit and down to its target areas. Make a list of types of nerve fibers it contains.

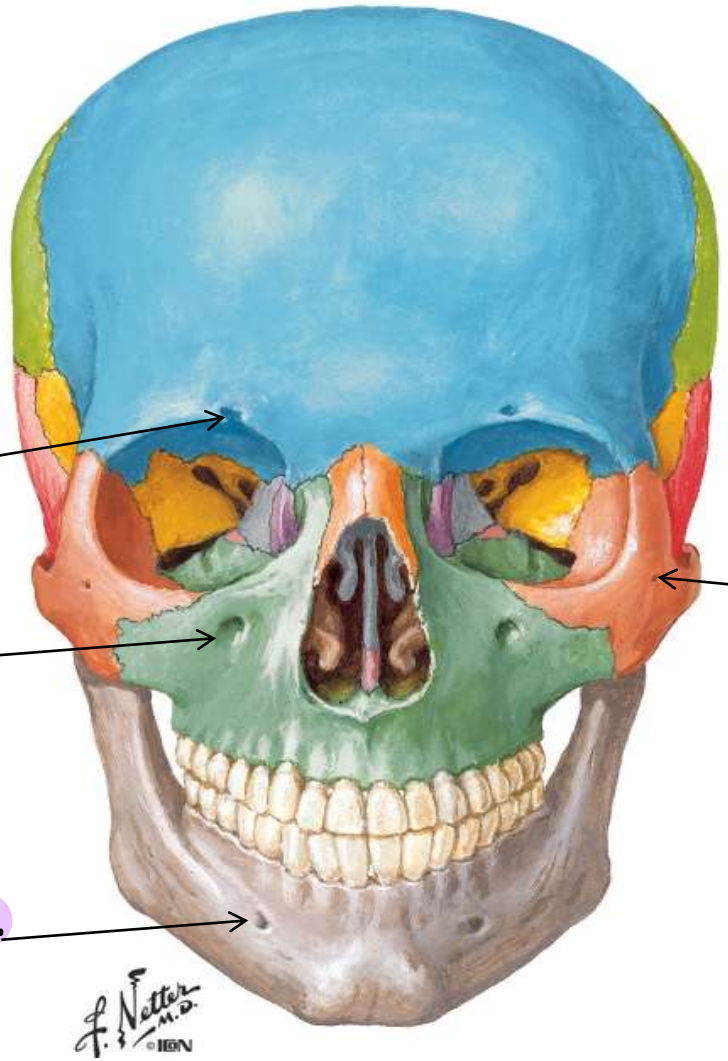
5-Describe the basic structure of the scalp. Make a list of its layers.

6-Describe briefly the muscles, nerve supply and spaces between layers.

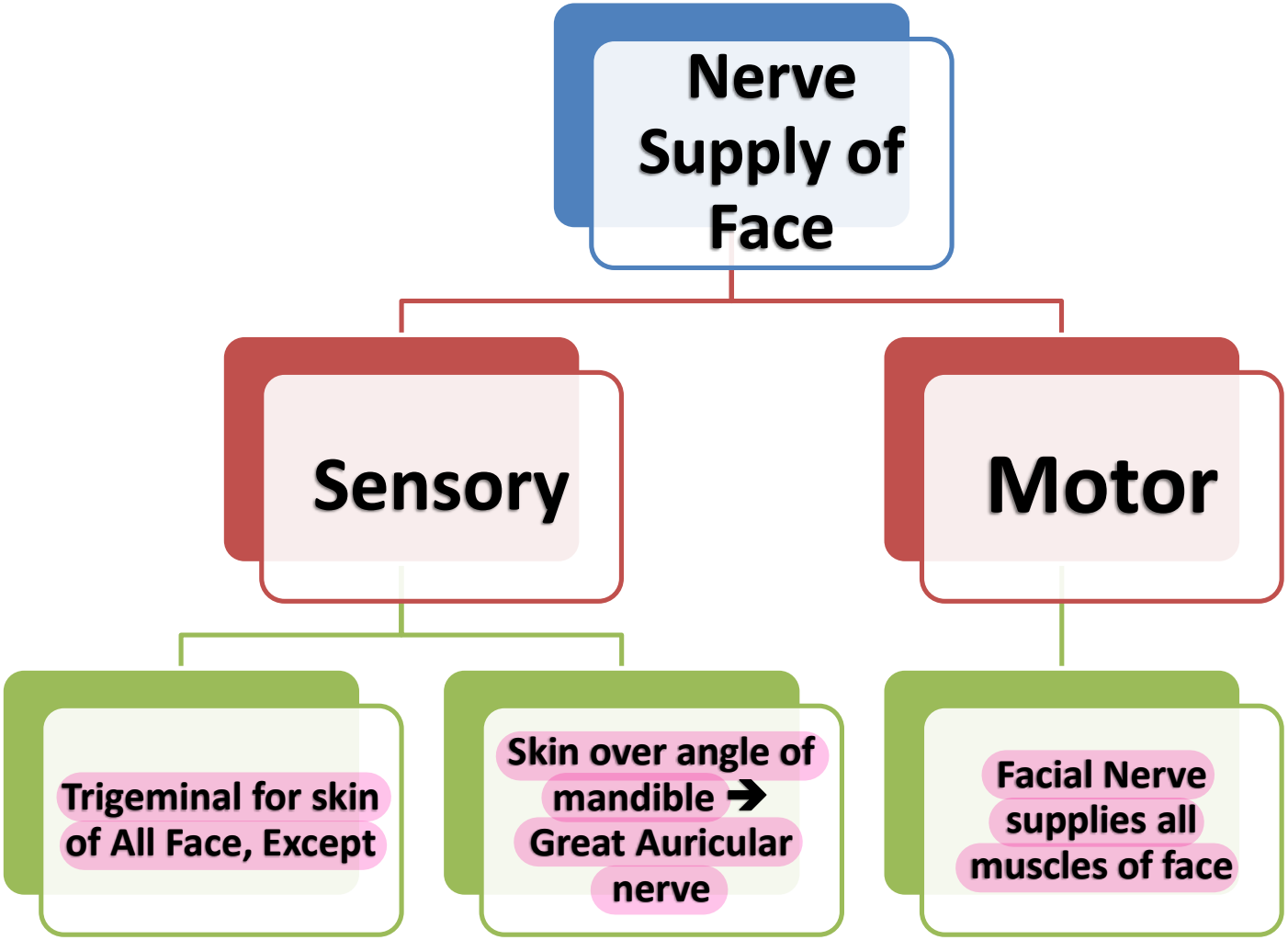
7-Make special note of the venous drainage of face and scalp.

Norma frontalis





- supraorbital foramen.
- Infraorbital foramen.
- Mental foramen.
- Zygomaticofacial foramen.


Nerve Supply of Face
Sensory
Motor
Trigeminal for skin of All Face, Except
Skin over angle of mandible ➔ Great Auricular nerve
Facial Nerve supplies all muscles of face

Trigeminal Nerve

It is the largest cranial nerve.

Sensory root larger than the motor

It is a mixed nerve carrying sensory and motor fibers.

Skin over angle of the mandible

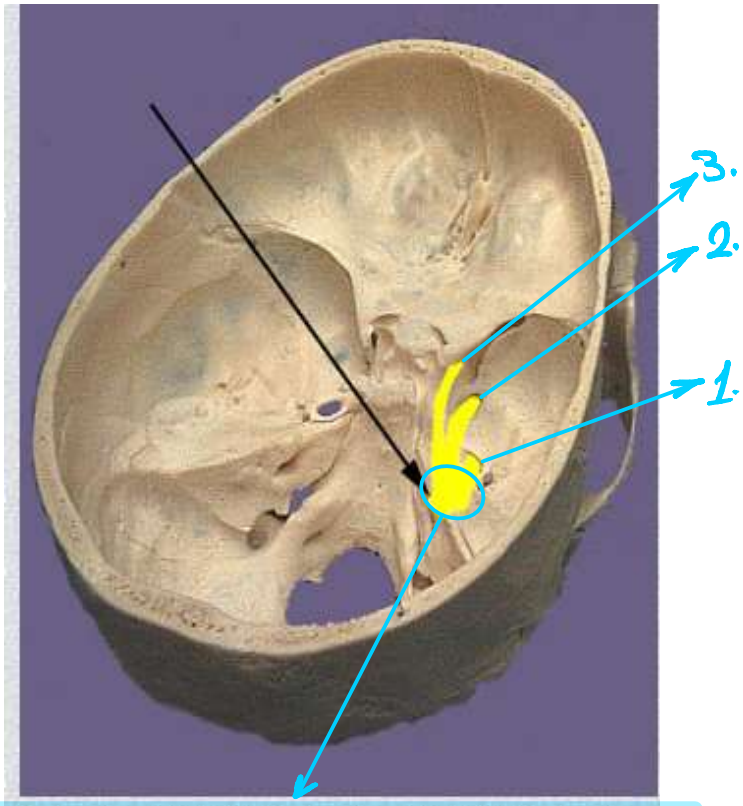
It is sensory to skin of scalp, face (except.....)

It carry the sensation of the teeth, oral and nasal cavities

It is motor to the 4 muscles of mastication + mylohyoid, anterior belly of digastric, tensor palate & tensor tympani.

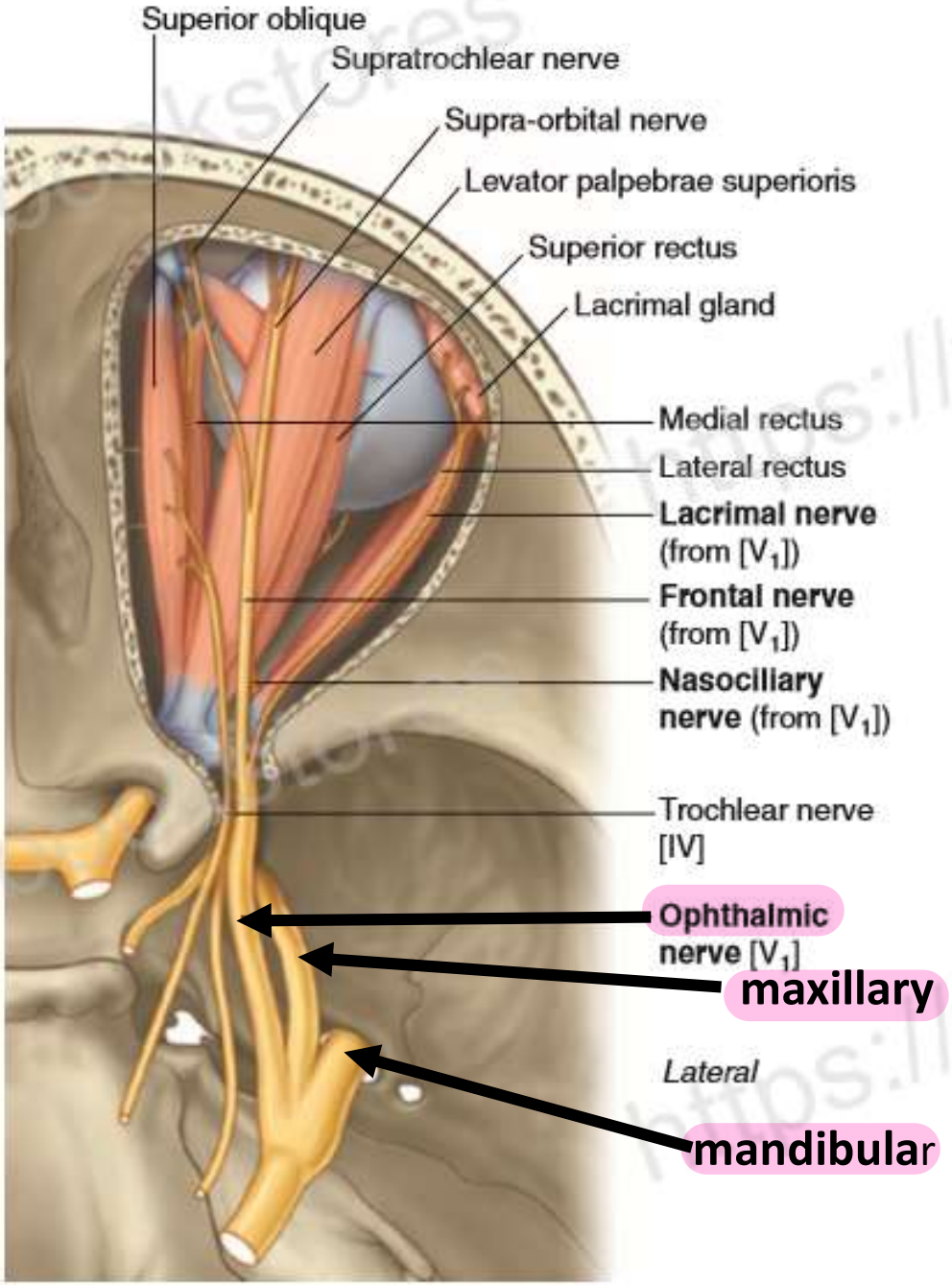
Site of Trigeminal Nerve

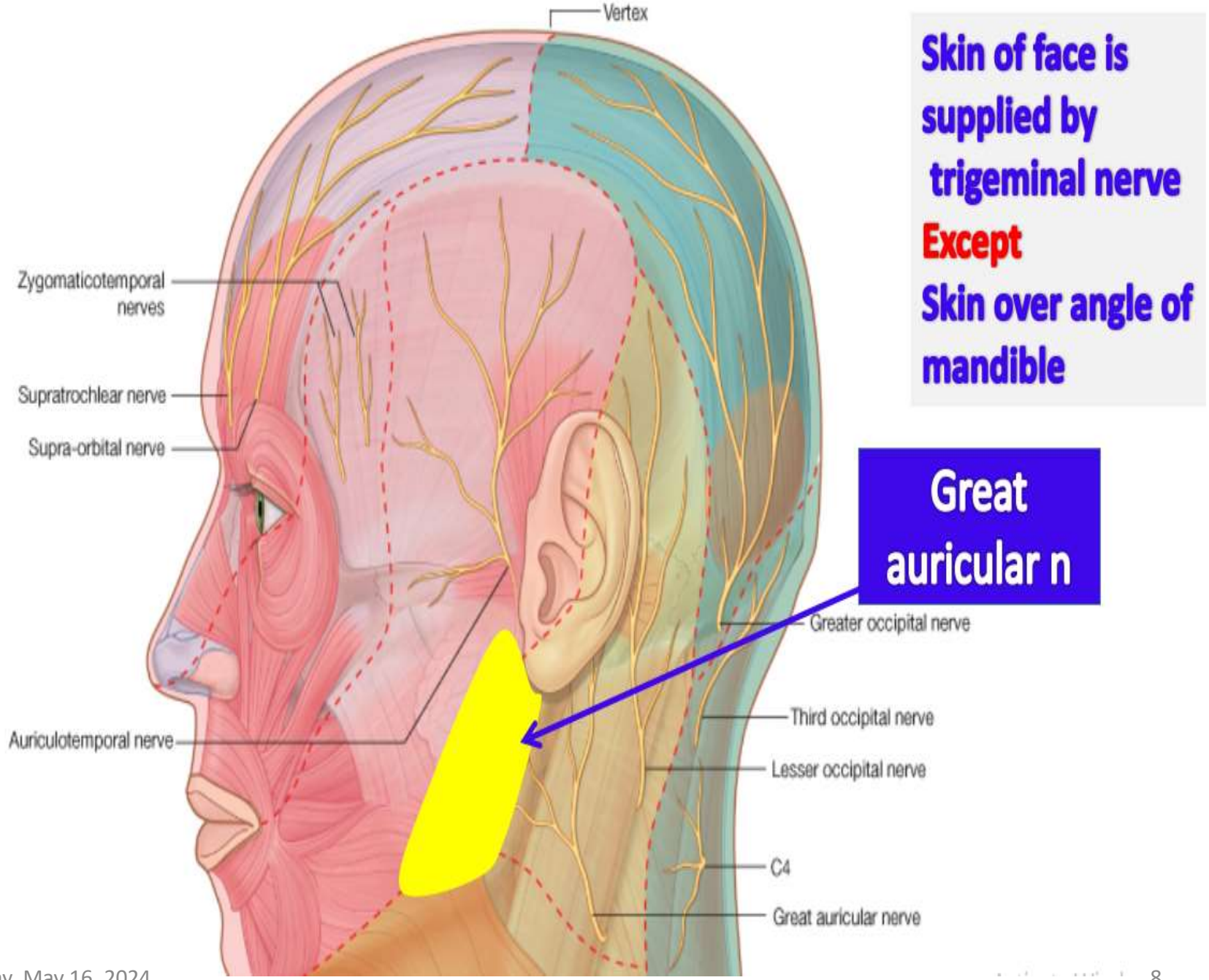
- **Trigeminal impression:** a small depressed area near the apex, it lodges the trigeminal ganglion.



Called Trigiminal cave » 3 branches coming out

1- mandibular from foramen ovale
2- maxillary from foramen rotundum
3- ophthalmic from superior orbital fissure


Superior oblique
Supratrochlear nerve
Supra-orbital nerve
Levator palpebrae superioris
Superior rectus
Lacrimal gland
Medial rectus
Lateral rectus
Lacrimal nerve (from [V1])
Frontal nerve (from [V1])
Nasociliary nerve (from [V1])
Trochlear nerve [IV]
Ophthalmic nerve [V1]
maxillary
Lateral
mandibular



Skin of face is supplied by trigeminal nerve

Except

Skin over angle of mandible

Great auricular n

Sensory nerve supply of face

By branches of trigeminal

Ophthalmic division

- supratrochlear
- supraorbital
- palpebral br. of lacrimal
- infratrochlear
- external nasal

Maxillary division

- zygomaticofacial
- zygomaticotemporal
- infraorbital

Mandibular division

- mental
- buccal
- auriculo-temporal

Sensory nerve supply of face

Trigeminal

الخط الواصل بين
النجمتين الي لونهم ازرق

بنرسم خط من ال tip of the nose و الخط هاد بطلع
عند ال medial angle of the eye و يطلع لفوق لحد
ال vertix الي هي اكتر نقطة بالنص عالية بال skull

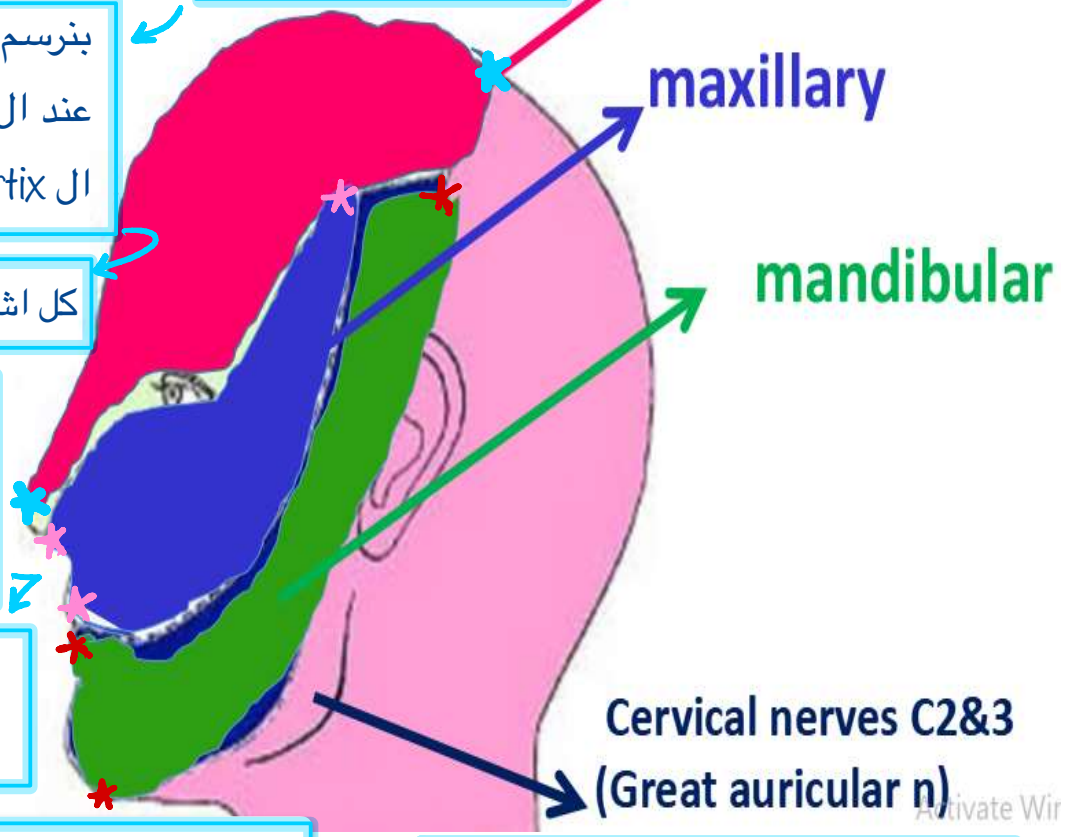
كل اشي فوق هاد الخط ال supply الف بال ophthalmic

من قدام ال tip of the nose ل angle
of the mouth بعدين بطلع لفوق و انا
بمشي من ال lateral angle of the eye

ال area الي بين هدول الخطين بال supplied
maxillary (انتبهوا على النجوم الزهرية)

من ال inferior lip لحد ال chin بعدين بطلع لفوق و بياخد منعه ال
anterior part of the auricle (ما عدا ال angle of the mandible)

المنطقة هاي supplied بال mandibular
(انتبهوا على النجوم الحمر)



في منطقة بال orbit اسمها ال trochleaبعدي عليها ال superior oblique muscle الي supplied ب trochlear nerve هاي ال trochlea في فوقها foramen بطلع منه nerve الي هو supratrochlear بكون medial to supraorbital و بوصل لل vertex

1. Ophthalmic division

1-supratrochlear

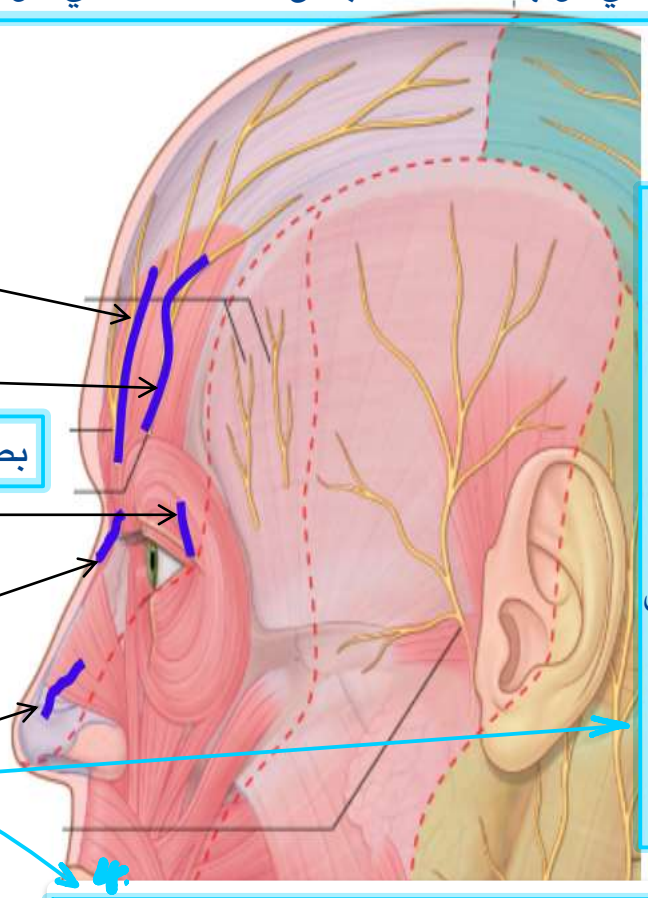
2-supraorbital

2. بطلع من ال supraorbital foramen و بطلع بال forhead ناحية ال lateral

3-palpebral br of lacrimal

4-infratrochlear

5-external nasal



5. بيطلع من ال nose بين ال cartilage and bone و بنزل يعمل supply to tip of the nose

3. بال lateral aspect of the eye عنا ال lacrimal gland المسؤولة عن الدموع و هاي ال gland بروحلها branch of ophthalmic nerve بشكل عام و بعدها بطل منه branch اسمه palpebral branch of lacrimal nerve بعمل supply to the skin over lacrimal gland (كلمة palpebral يعني eye lid)

4. ال trochea زي ما في supratrochear foramen الي طلع منه ال supratrochlear nerve في infratrochlear foramen بطلع منه infratrochlear nerve بغذي ال dorsal aspect of the nose and medial part of the angle of the eye

Maxillary division

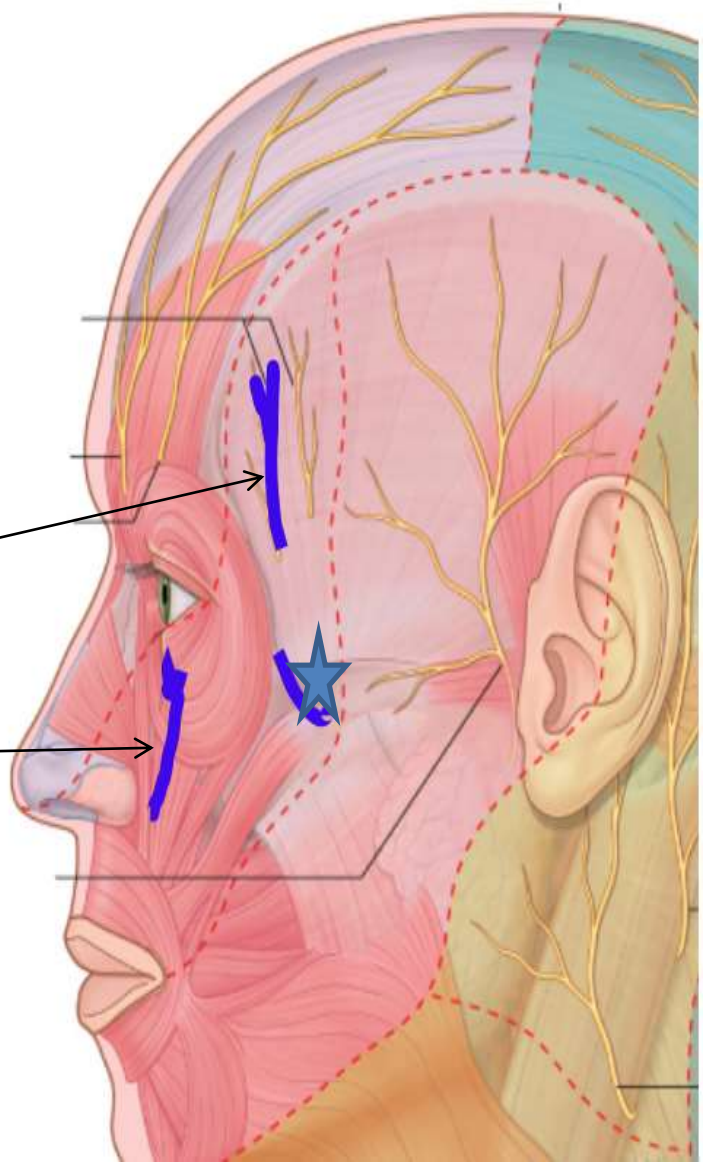
1-zygomaticofacial

Non hairy part of the scalp

2-zygomaticotemporal

3-infraorbital

بطلع من ال infraorbital foramen بغذي المكان تاعه مع ال ala of the nose الي هي ال wing of the nose



Mandibular division

1-mental

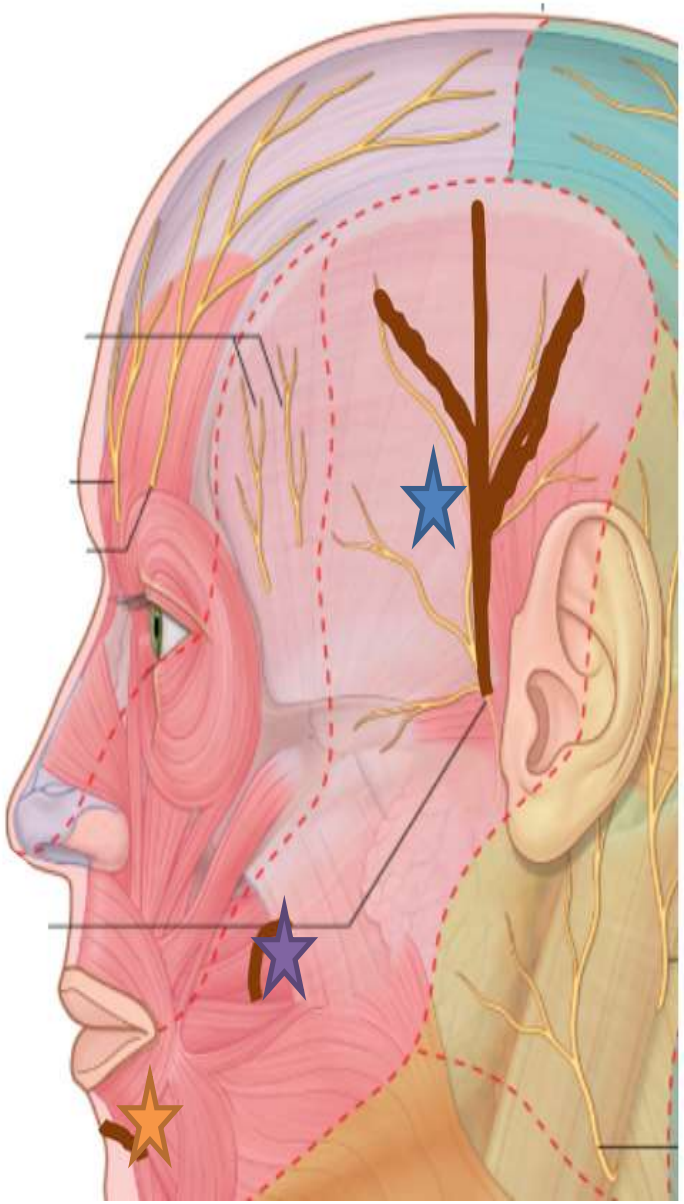
Supplies skin over the chin

2-buccal

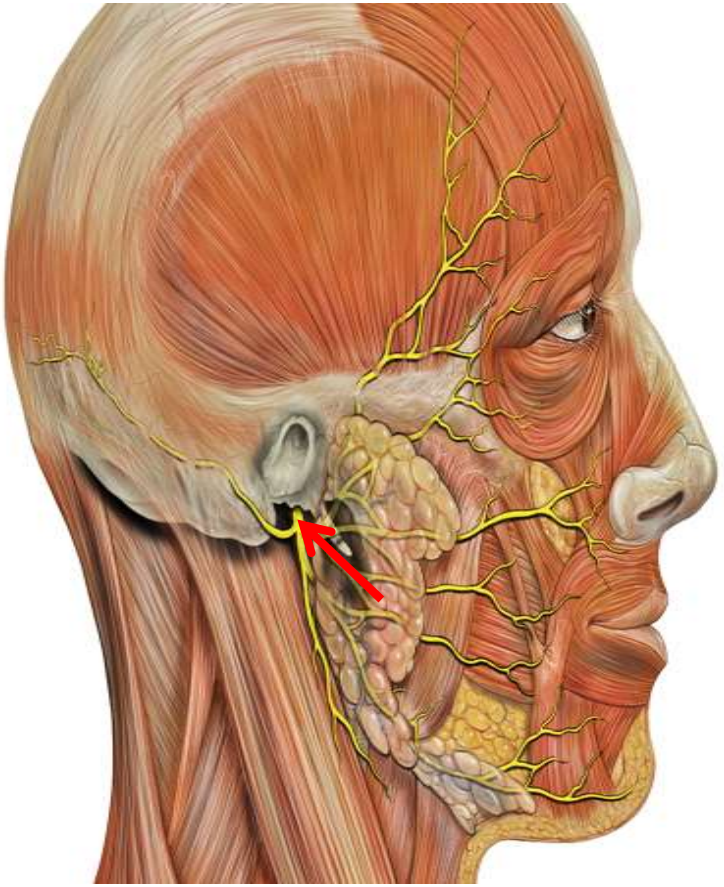
Supplies the skin over buccal area (cheek area)

3-auriculotemporal

امام الاذن و بغذي الجزء الامامي من ال auricle

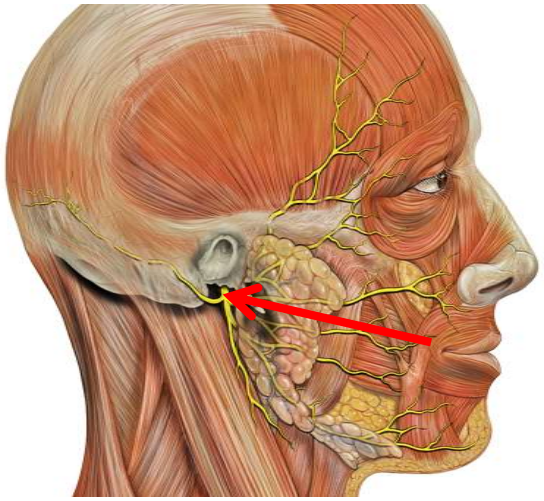


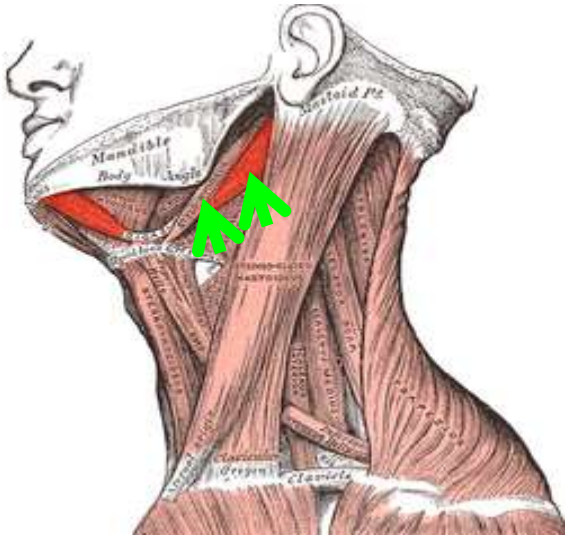
Facial nerve



leaves the skull through the stylomastoid foramen.

راح يعطي branch اسمه ال posterior auricular branch للخلف و يغذي العضلة الي بالخلف تاع ال scalp الي هي occipito- occipital belly of digastric muscle and stylohyoid و بغذي لل frontalis muscle





- All sensory & parasympathetic fibers leave the facial n within the petrous bone
- Therefore at the stylomastoid foramen ➔ facial n is purely motor

After exit from stylomastoid foramen , facial n gives :

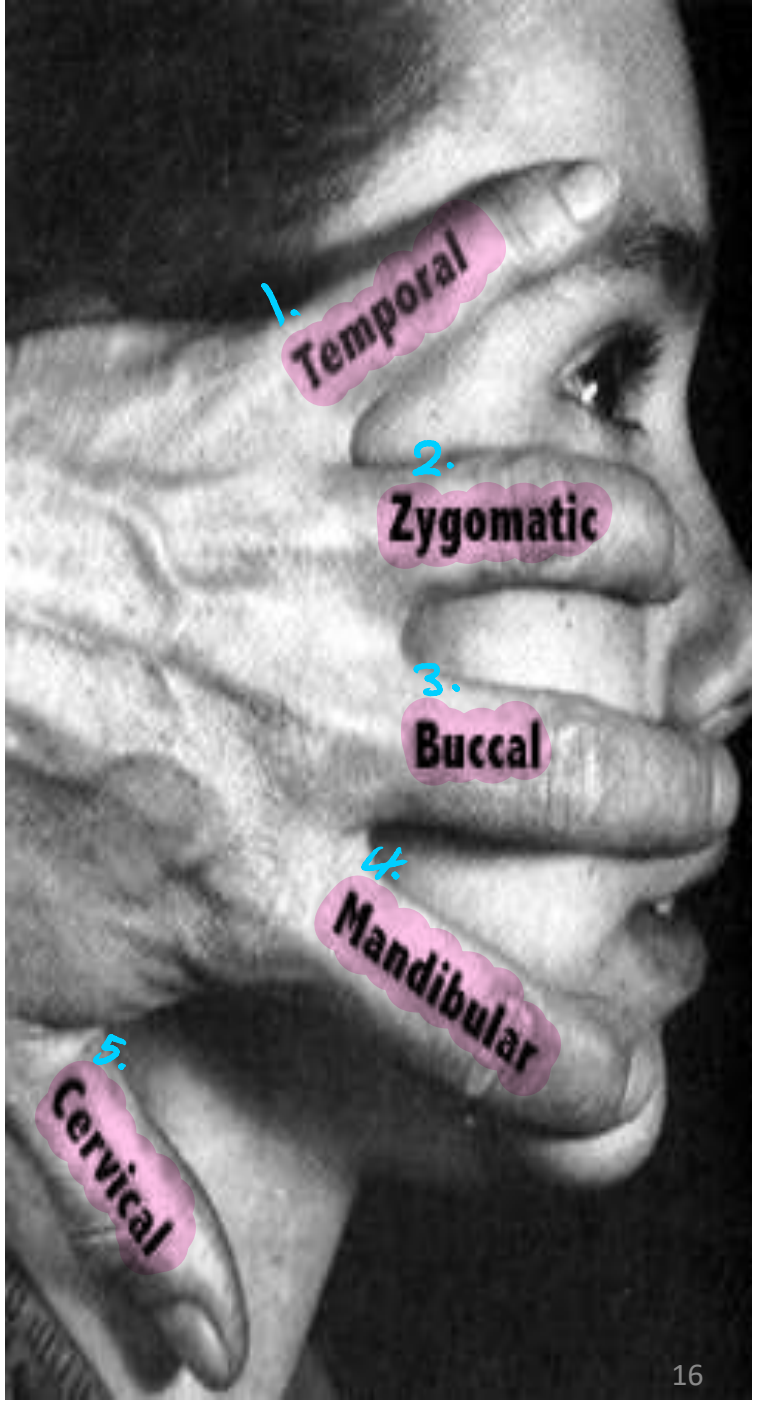
1) Post auricular n to occipitalis
2) Br to post belly of digastric
3) Br to stylohyoid

بكون ماشي على ال medial wall of middle ear بعدها على ال posterior wall of middle ear
اعطال branches تاعت ال sensory and parasympathetic زي ال greater petrosal and
و بس يطلع راح يغذي muscle فقط nerve to stapedius muscle and chorda tympani

هاد الاشي مهم لانه لو كان في tumor or abscess inside the gland لو فتحت بالمشرط و عملت lesion vertically بتكون عرضة انك تقطع هاي ال branches عشان دايما اي جراح بده يفتحها بعمل فتحات horizontally بكونوا parallel to fibers

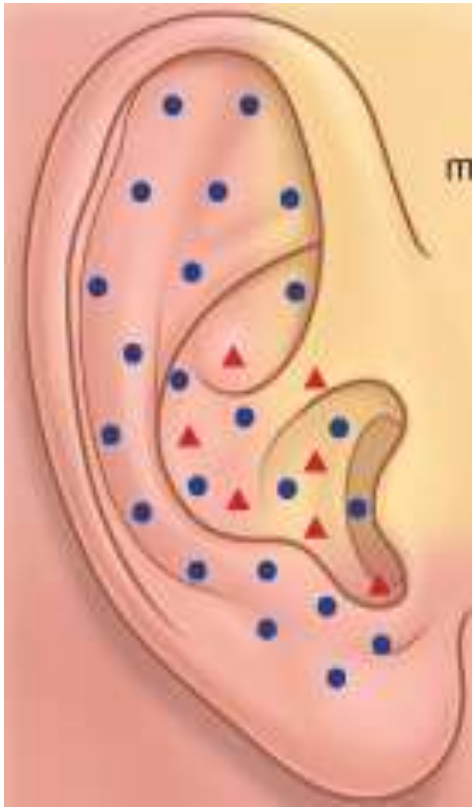
It gives it's terminal branches inside substance of parotid gland

Facial n enters parotid gland and divides into its 5 terminal branches which emerge from anterior border of parotid to supply muscles of facial expression



Just remember

Facial nerve carries general sensation from concha of ear to Spinal N of trigeminal



ال herpes بعمل lower motor neuron
لما يصيرله facial nerve بال lesion
او اي اشي و هو stress ب activation
بحب يعمل rupture to skin وين مكان هاد
ال rupture بكون لل skin الي هاد ال
عامله nerve supply عشان هيك بس بدك
تدور على vesicles تعون دور بال concha

Herpes zoster affecting the facial nerve may cause skin eruption on concha of the ear

Layers of the face:

- **Skin:** has rich blood supply (rapid healing)
- **Superficial fascia :** contains muscles, vessels and nerves of the face
- **No deep fascia** in most of the face (**to allow for facial expressions**)

الجزء الوحيد الي فيه deep fascia جزء من الخلف اسمه ال buccal fascia

Muscles of the face (muscles of facial expression)

are characterized by :

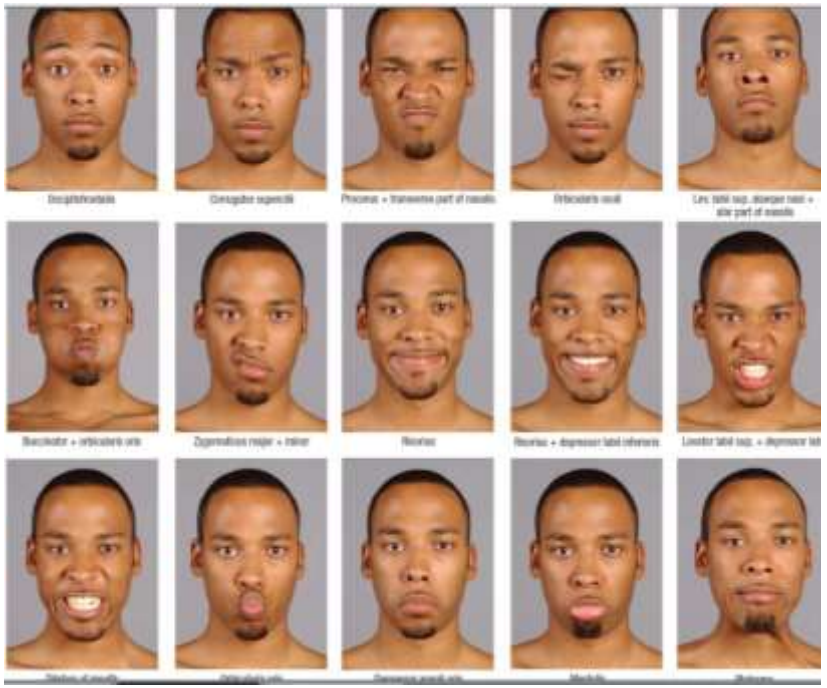
1- Present in the superficial fascia

2- Arranged around orifices (openings)

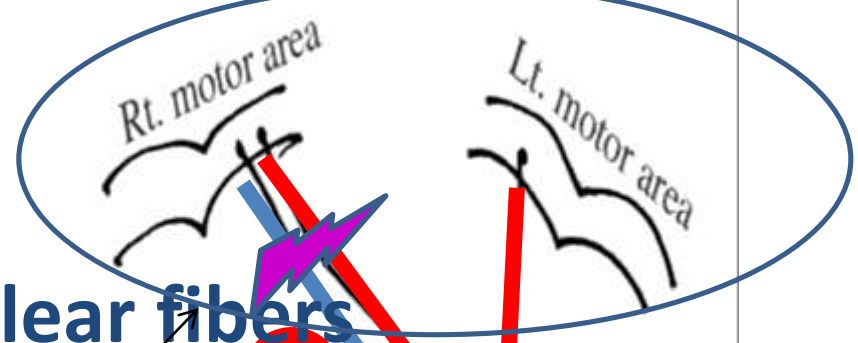
3- May have bony origin ,but insert into skin

4- Supplied by facial nerve

5- Produce the different facial expressions



Facial Nerve VII Lesions



Cortico-nuclear fibers

Upper motor neurone lesion

UMNL

لما يصير ال lesion بال cortex لحد ما اوصل ال nucleus

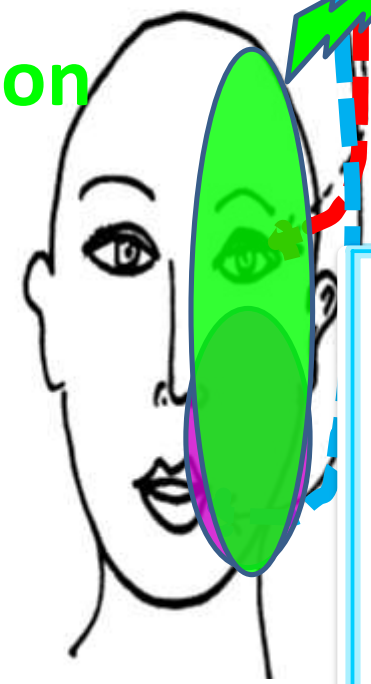
Lower motor neurone lesion

LMNL

لما يكون ال lesion بال nucleus او بال nerve نفسه

تعالوا نتذكر انه في nucleus of facial nerve موجودة بال pones و ال upper part of the nucleus الي مسؤول عن ال upper part of the face (الي باللون الاحمر) بتاخد corticonuclear bilateral من التنين motor areas و اسمه ال corticonuclear pathway

Facial motor N



Facial nerve

عشان بياخد bilateral صعب انه بال upper part of the face يصير فيه upper motor neuron اما ال lesion ال lower part of the مسؤول عن ال lower nucleus بياخد فقط من part of the face ال contralateral area

Lesions of Facial Nerve

Supra nuclear lesion:

- It is UMNL
- Only the lower part of face of contralateral (opposite side) is paralyzed

Nuclear and infranuclear:

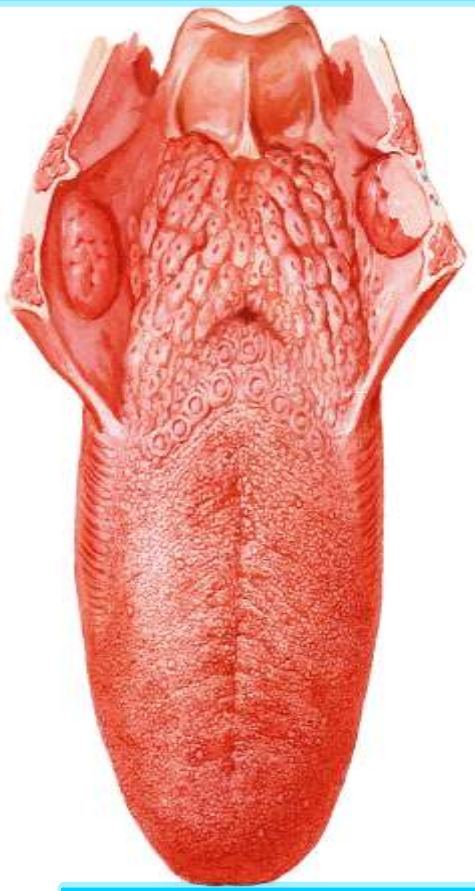
- All muscles upper & lower face ipsilateral (on same side) are paralyzed
- If lesion is at stylomastoid foramen: only motor paralysis ipsilateral

↓

greater petrosal and nerve to stapedius muscle and chorda tympani will not be affected

How to test for integrity of Facial Nerve?

هاد الجزء هو ال upper part of the face فلو المريض ما كان قادر يحركه معناها عنده upper motor neuron lesion بس عشان يظهر لازم يكون ال lesion bilateral



Raise the eyebrows.

راح يقدر يحس بالطعم لانه chorda tympani سليمة

Taste ➔ by putting salt /sugar/vinegar on ant. 2/3 of tongue

Close the eyes tightly

Smile & show the teeth

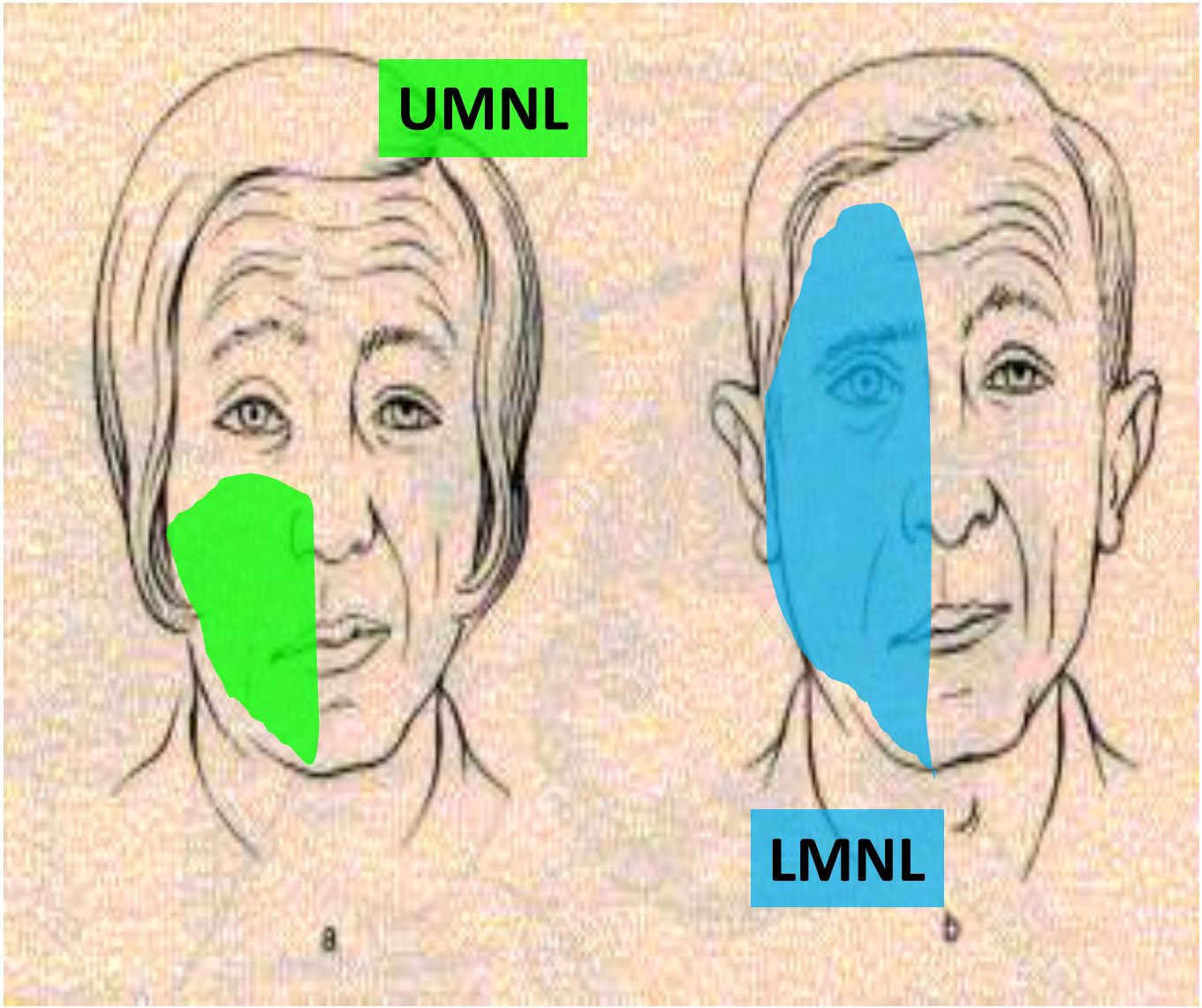

LMNL of left facial nerve
جاي paralysis ال لانه lower ليش
ب both parts upper and lower
Smile or show me your teeth:
Note level of right & left angles of mouth
Raise your eyebrows :
note wrinkles in forehead

اخطر اشي بهاد الاشي هو العين
لانه مش قادر يسكرها فممكن
يصيرله فيها dehydration
وinflammation بال cornea اسمها
keratitis و ممكن المريض يخسر
عينه.. عشان هيك لازم اي مريض
بعاني من هيك مشكلة تهتم بال eye
care و تتجنب ال dehydration

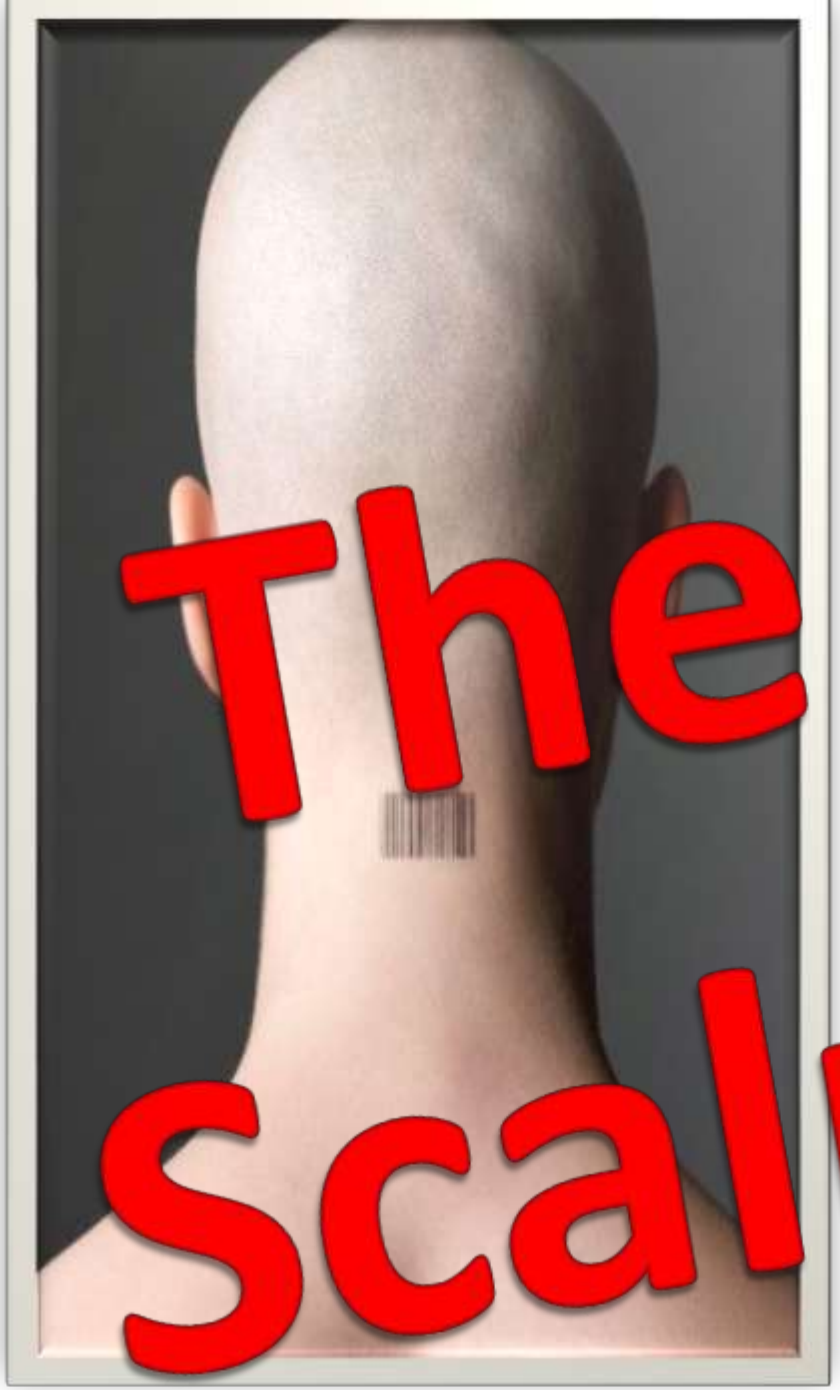
Close your eyes

Close your eyes & smile to show me your teeth

LMNL of left facial nerve


UMNL
LMNL

The scalp


The
Scalp

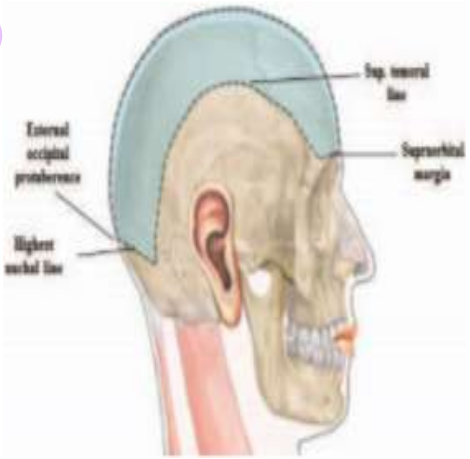
DEFINITION: It is the soft tissue that covers the vault of the skull.

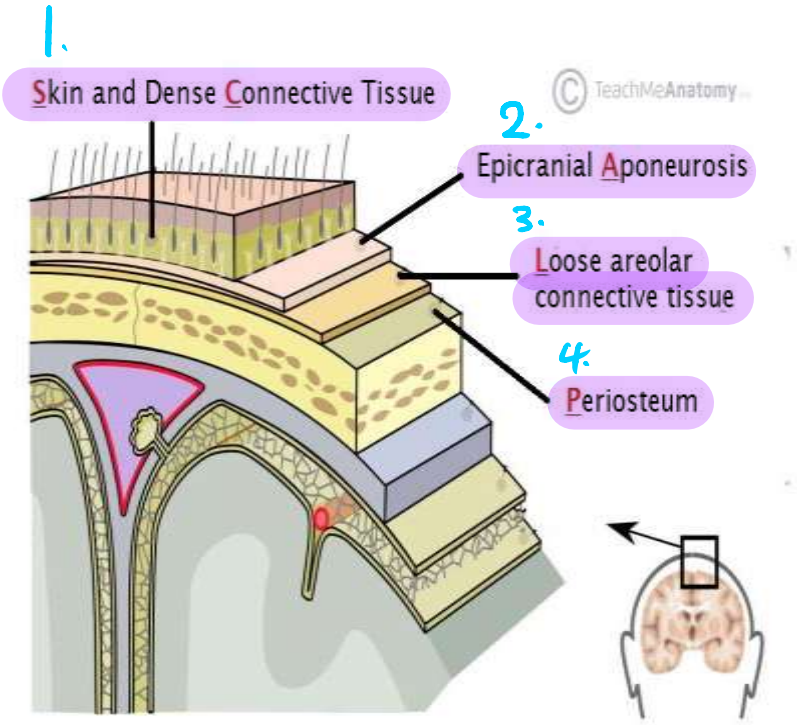
Extension

Anteriorly: Supra- orbital margin.

Posteriorly: External occipital protuberance and highest nuchal line.

Laterally: Superior temporal line.

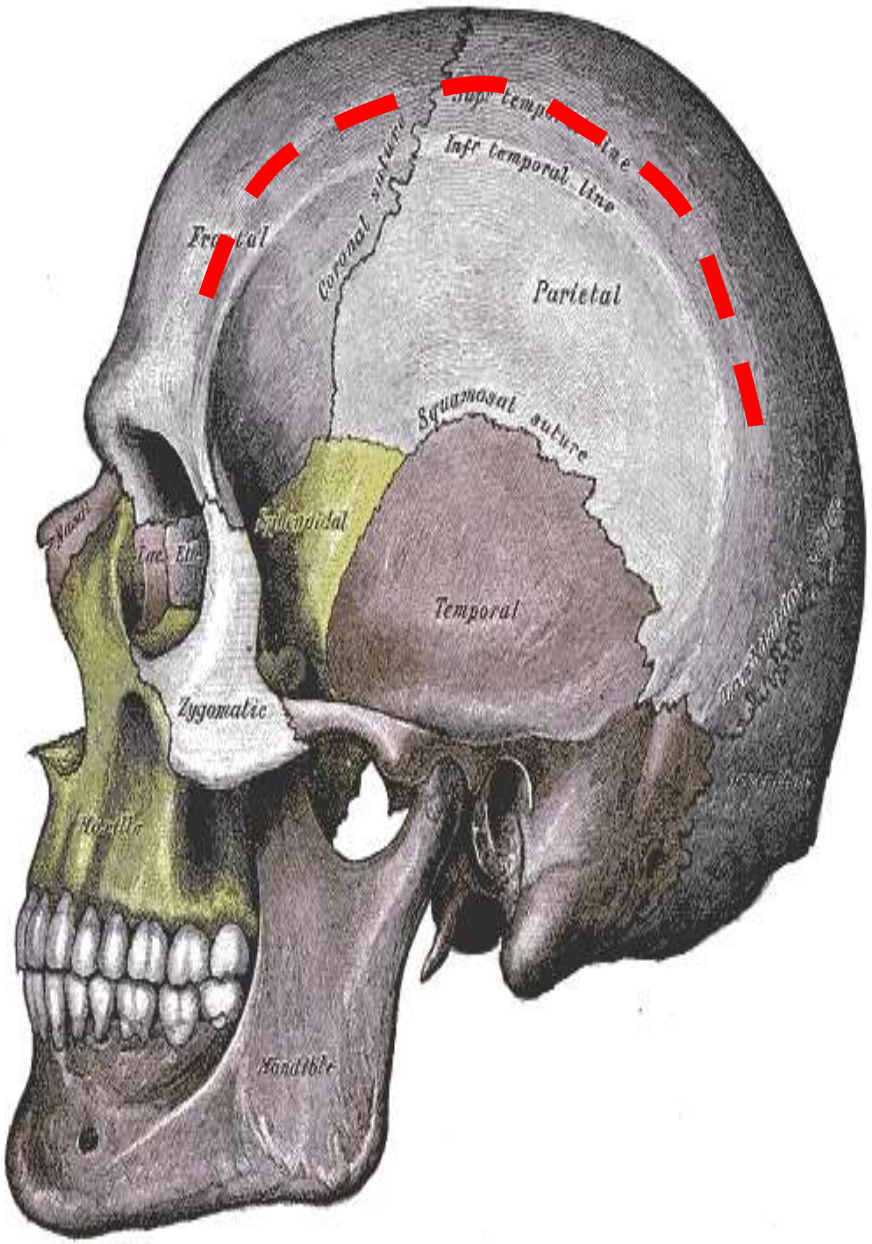




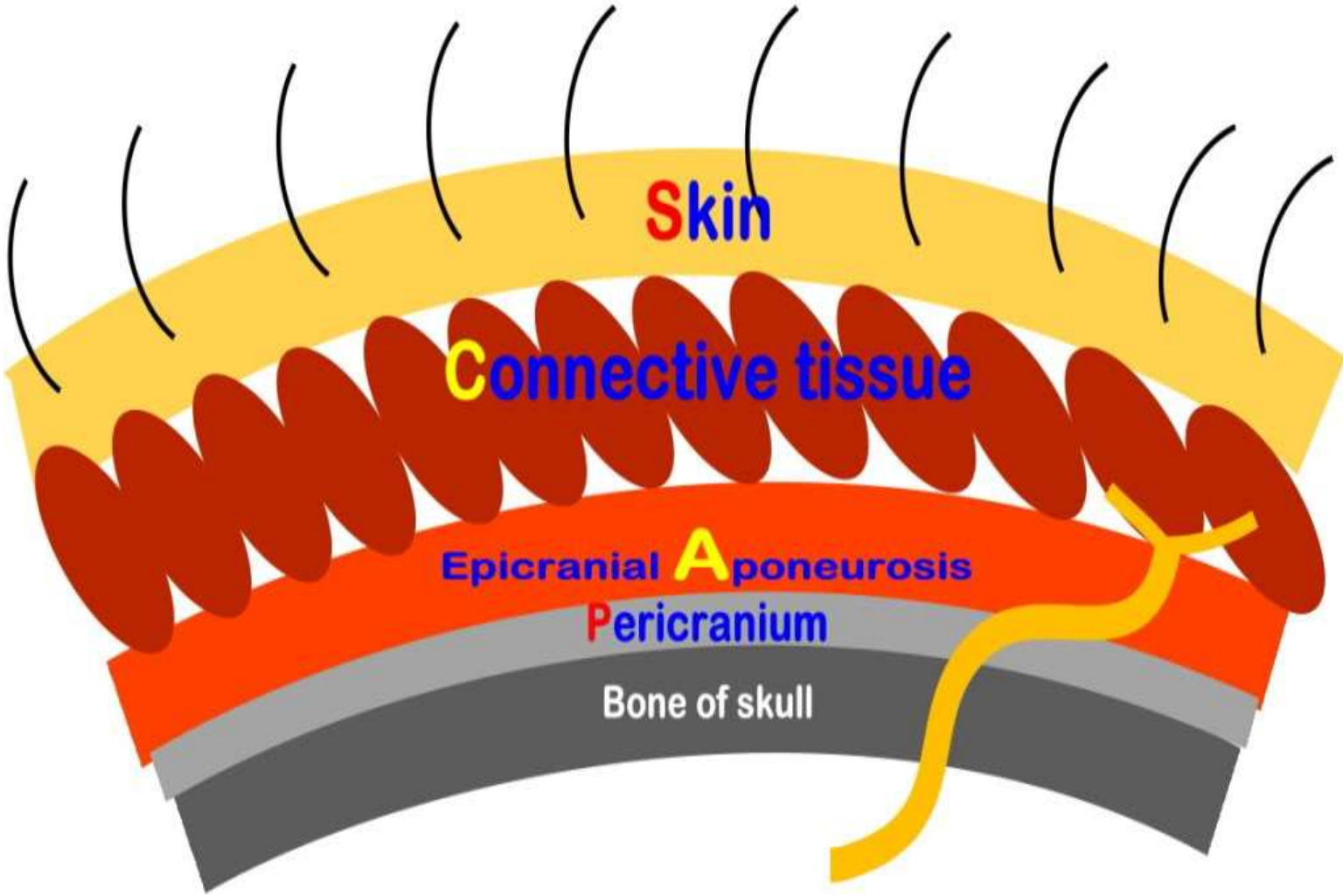
The scalp is the soft tissue that covers the vault of skull (skull cap)

It extends from superior orbital margin to highest nuchal line

Scalp is attached laterally to the superior temporal lines



LAYERS OF SCALP



1-Skin

Hairy

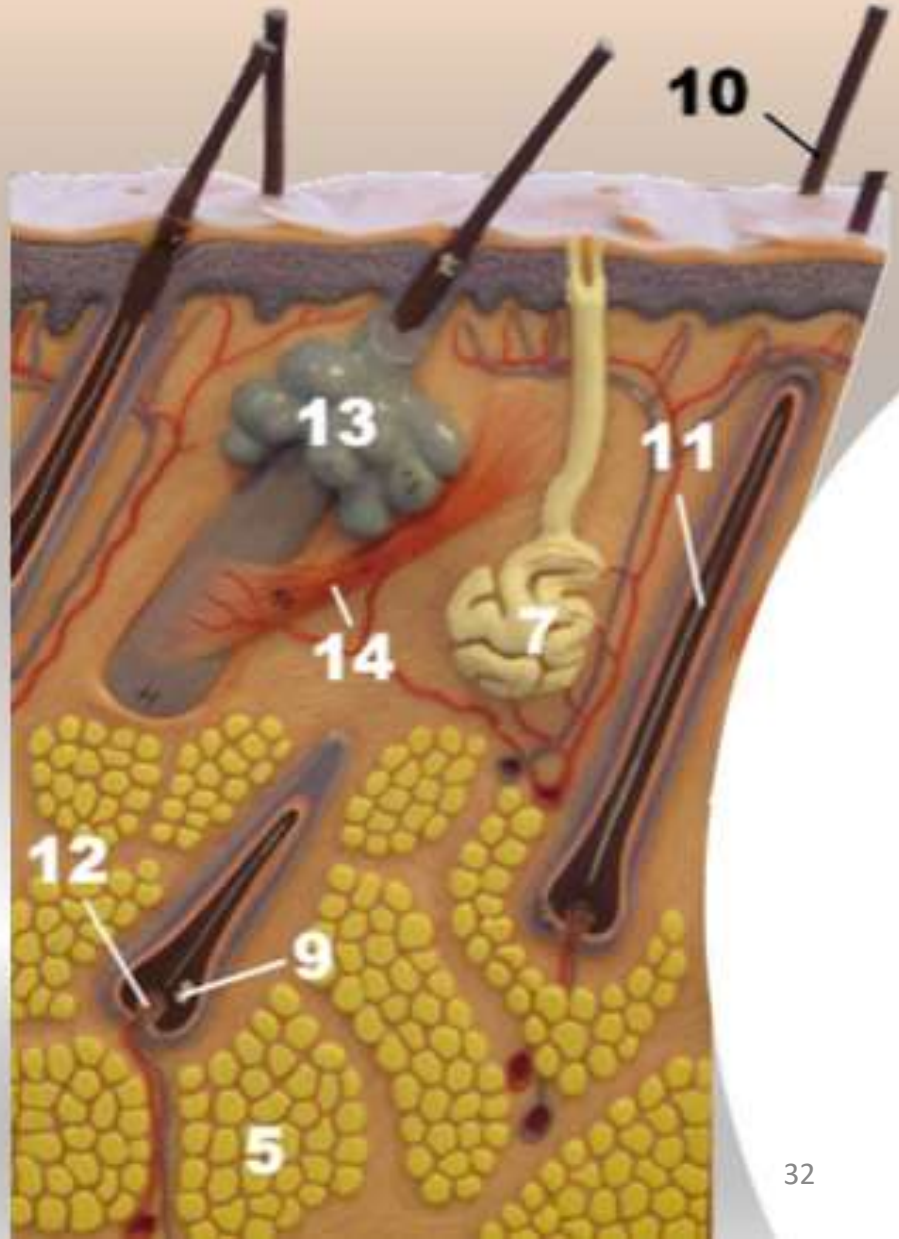
Vascular

Sweat glands

Sebaceous glands

الي بتطلع ال dandruff الي هي قشرة الراس

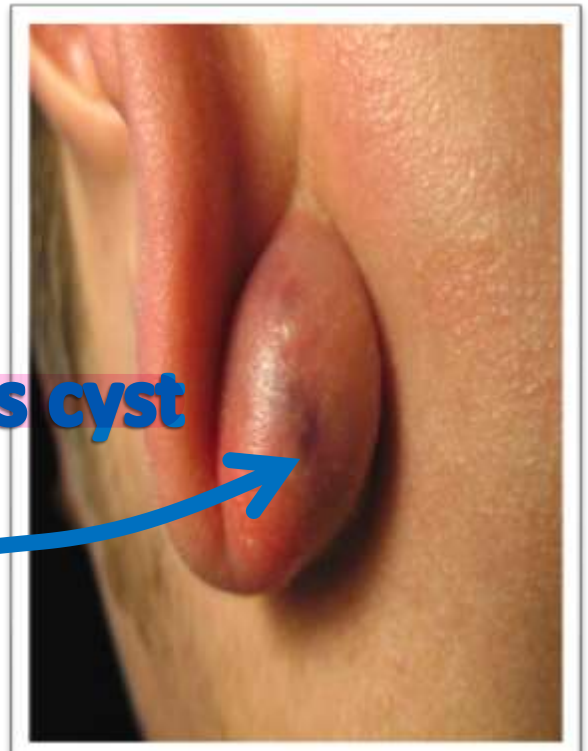
Clinical correlates



ال cyst بتطلع اذا تسكرت ال gland ب اي مكان بال scalp

a sebaceous cyst of the scalp

an infected sebaceous cyst behind the ear



2- Connective tissue

- Dense
- Rich vascular and nerve supply
- Connects layer 1 (.....) and 3 (.....) through septa

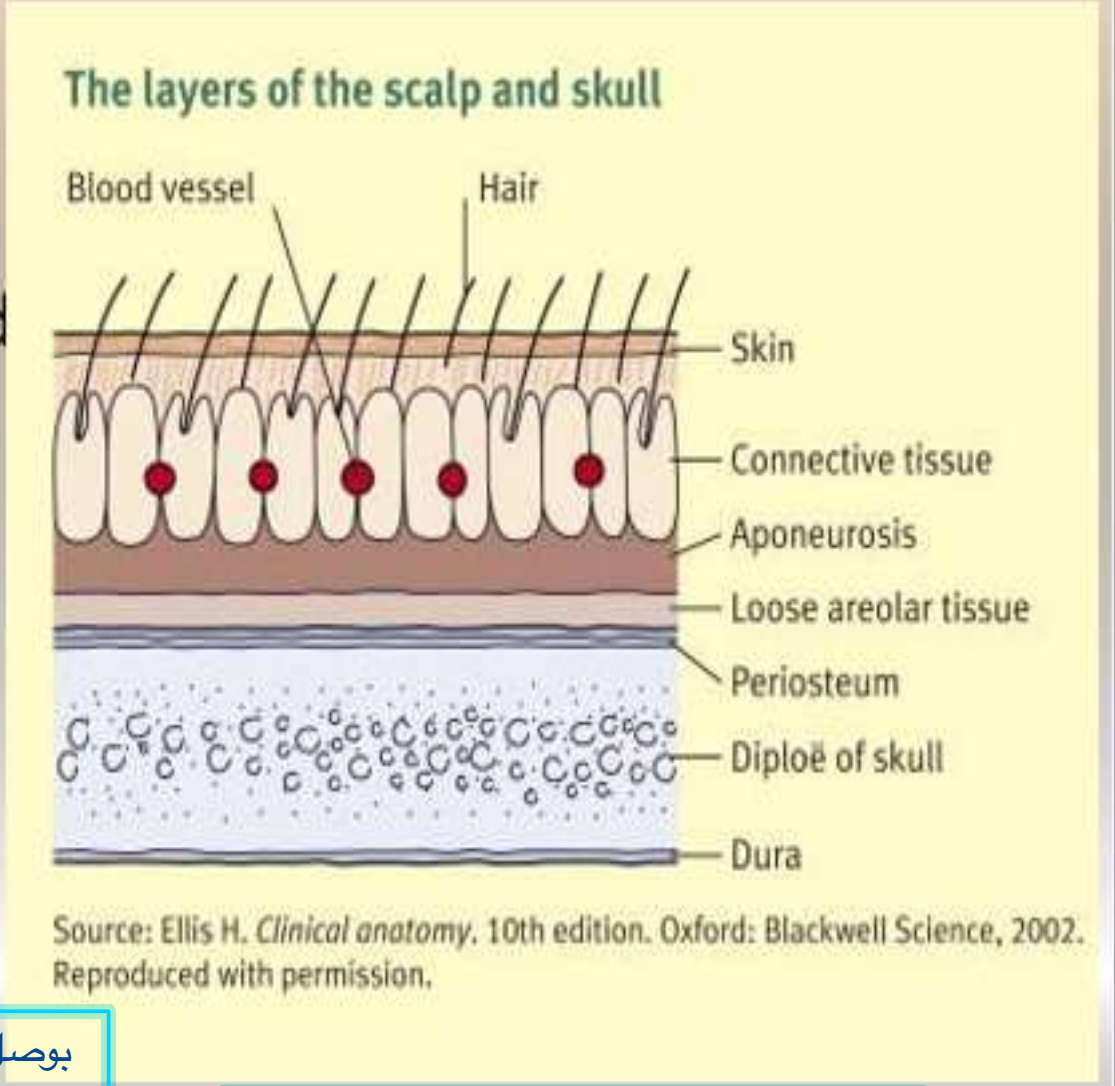
Clinical correlates:

- Wounds:

Profuse bleeding, No gapping

- Infection:

Localized, Painful



بوصل ال skin بال aponeurosis، انت لو جربت تحرك فروة راسك راح تتحرك معك بس الحركة بتكون limited

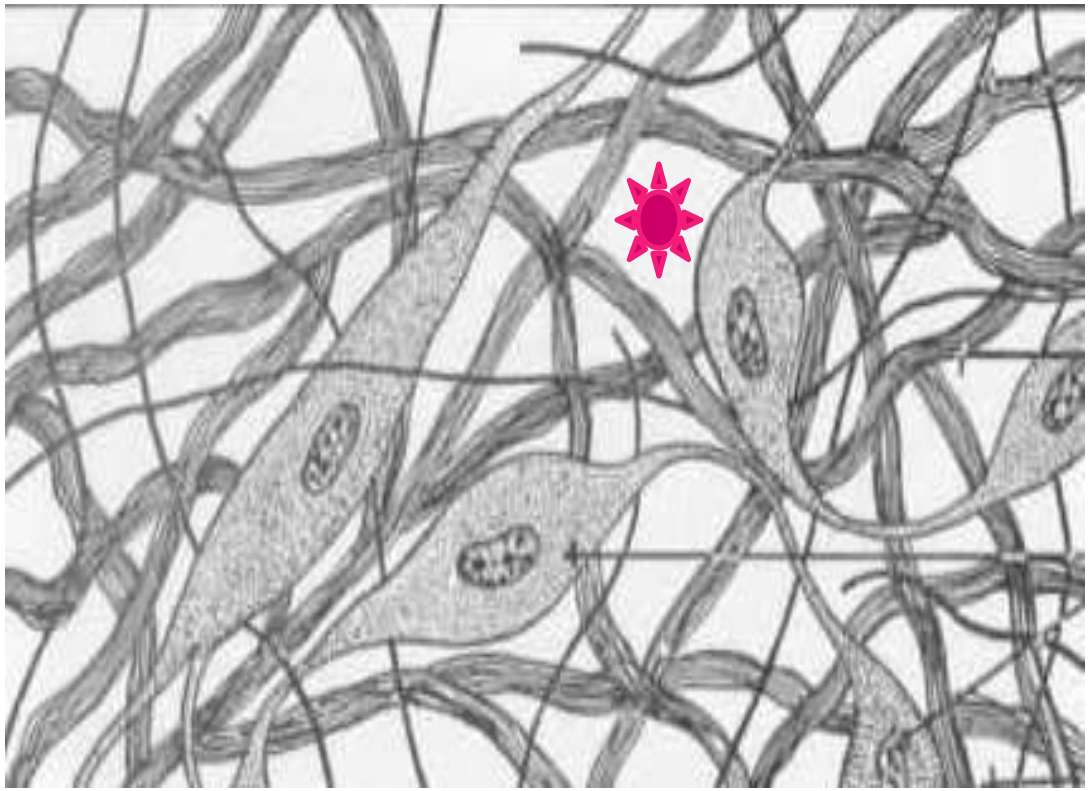
اول ٣ طبقات بعملوا sliding على اخر طبقتين

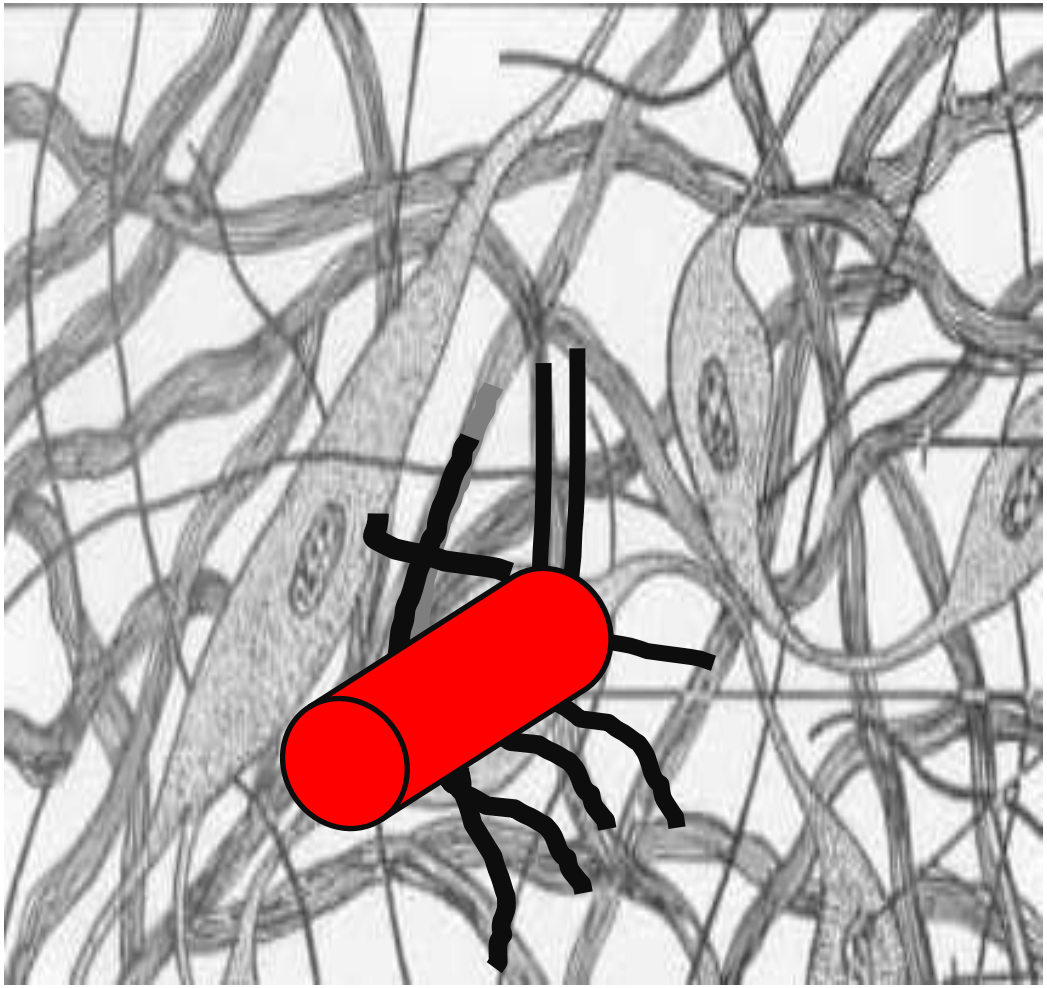
Infection in this layer remains

localised →

لانه مليان septum ف كانه
بكون محشور بمكان معين

because of the dense connective tissue





اول mechanism of
ل homeostasis
انه bleeding يصير
يصير
vasoconstriction
بس وجود ال dense
connective tissue
هاد بمنع يصير
عندي construction
عشان هيك ال
بكون رهيب bleeding

Dense CT is adherent to the walls of arteries so if an artery is cut, it bleeds profusely (sooo much) as the dense CT prevents the artery from contraction or retraction.

Control bleeding from scalp by direct pressure on the wound

Control porfuse bleeding from scalp by application of encircle pressure around the thehead to press the ascending arteries

3- Aponeurosis

Occipito-frontalis muscle

Origin

Frontal bellies:

Wide, United, Skin of eye brows

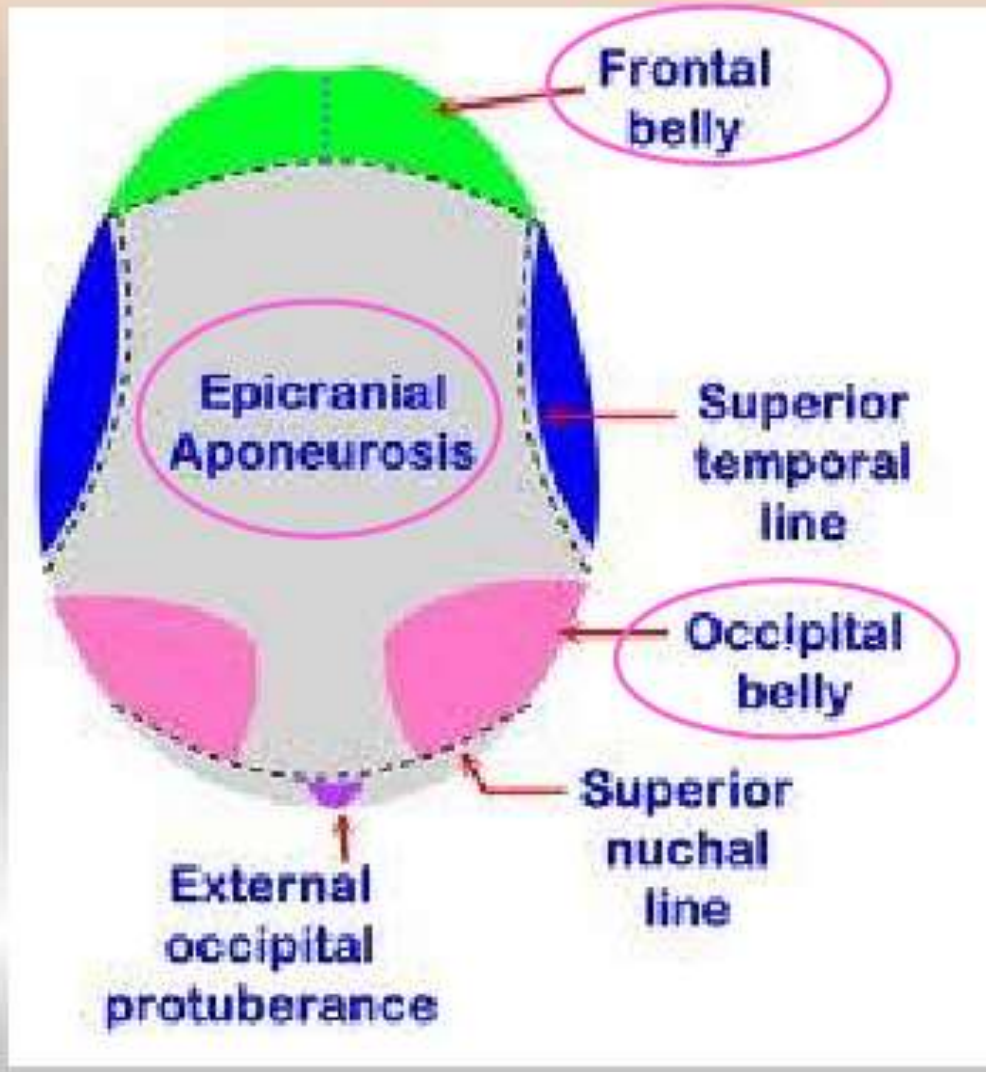
Occipital bellies:

Narrow, Separate, Highest nuchal line

Insertion

Attached to bone

Epicranial aponeurosis (*Attachments*)



Occipito-frontalis muscle

Origin:

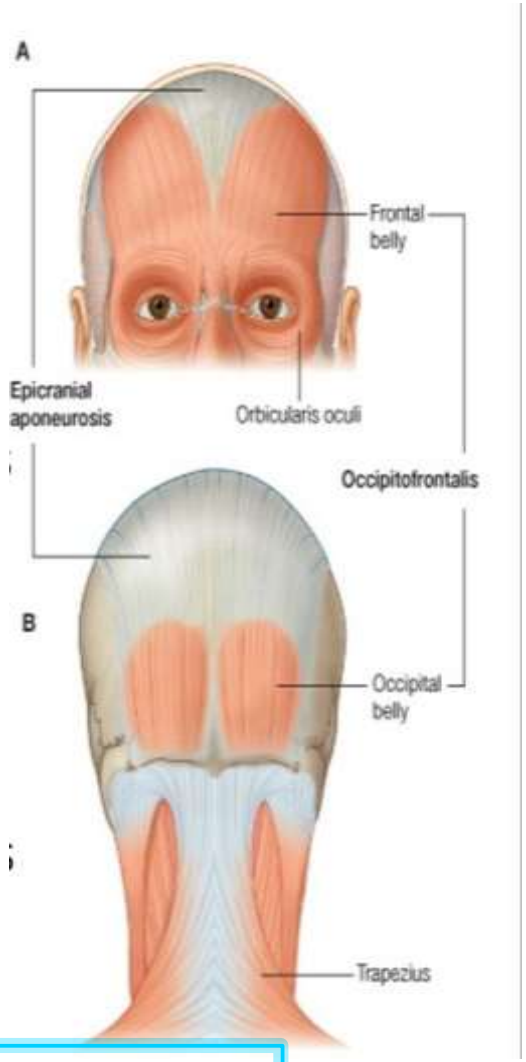
Frontal bellies: are wider, partly united in midline, each arises from the skin of eyebrow.

Occipital bellies: are narrower separated from each other by an extension of epicranial aponeurosis, each arises from lateral 2/3 of the highest nuchal line.

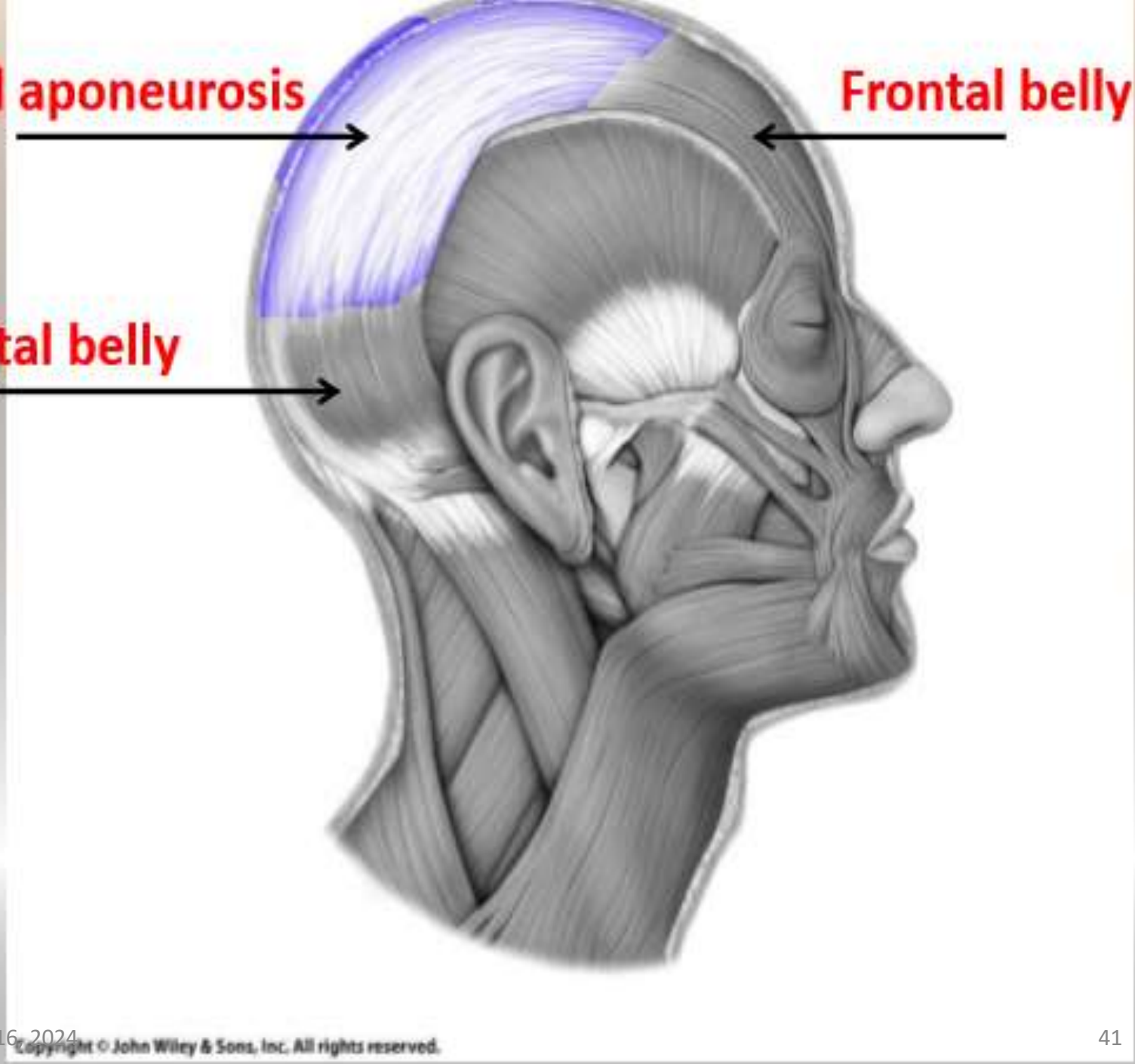
Insertion:

Epicranial aponeurosis

A wound reaching this layer gaps because of contraction of the muscle)



بهاي الحالة لازم يتخيط الجرح لانه لو انترك راح يصير fibrosis و يترك براسه شكل غريب



Nerve supply

Frontal bellies by temporal br. of facial nerve.

Occipital bellies by post auricular br. of facial nerve.

Action:

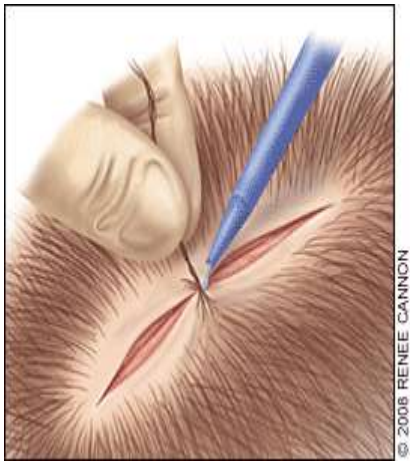
a) Frontal bellies: pull the scalp forward and raise the eyebrows producing transverse wrinkles in the forehead skin.

b) Occipital bellies: pull the scalp backwards

الحركة هاي ضعيفة عند الانسان بس بتلاقيها قوية عند البسس مثلا

- A wound reaching this layer gaps because of contraction of the muscle

Wound gaping



4- Loose connective tissue

- Continous anteriorly with skin of eye lid

- ***Clinical correlates:***

1- Loose: Spread of blood or pus (Direction??)

Black Eye

2- Contains emissary veins : Dangerous layer. *Why??*

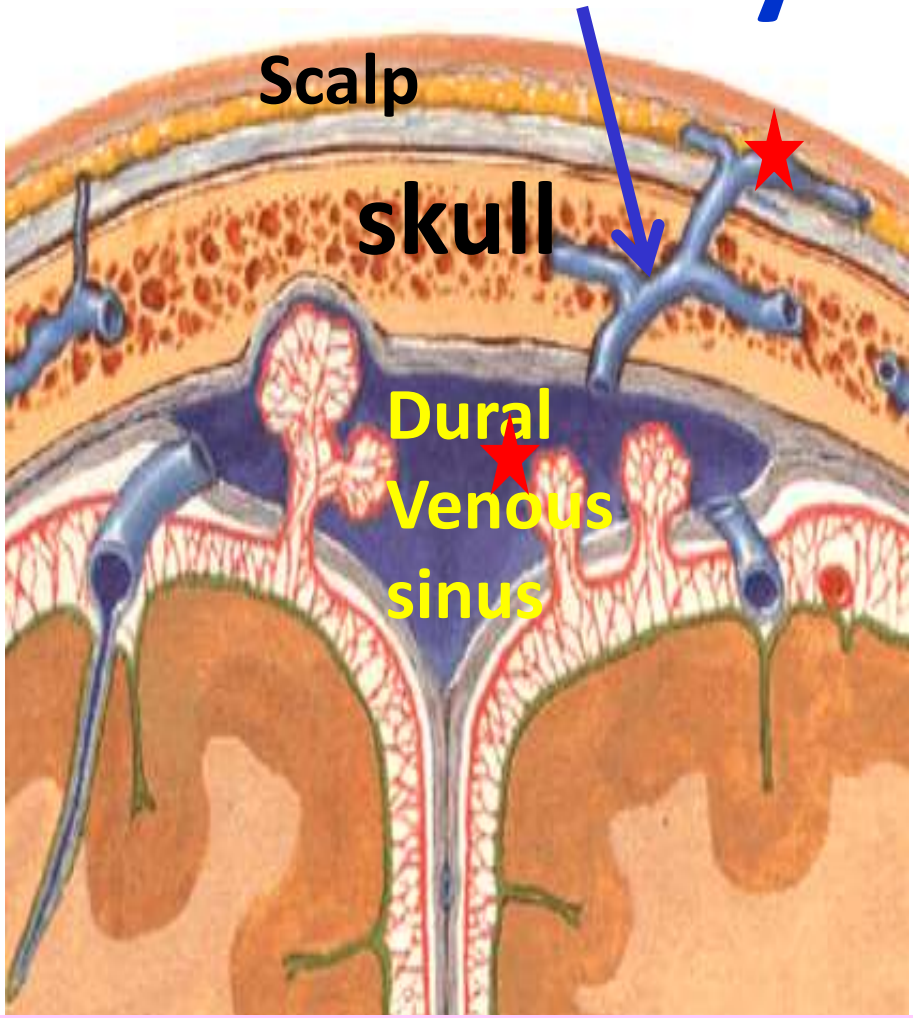
له علاقة superficially بال scalp و deeply بتصب ب superior sagittal sinus

This is where the scalp is mobile
(so it is the site of de-scalping!)

It is the site of collection of fluid, pus and blood, which can spread to the eyelids → black eye

Contains emissary veins
(so infection may extend to intracranial venous sinuses)

Emissary Vein



Emissary veins connect veins outside the skull with dural venous sinuses inside the skull .

Function of Emissary Veins

Emissary veins have NO valves .

They help to keep intracranial pressure constant.

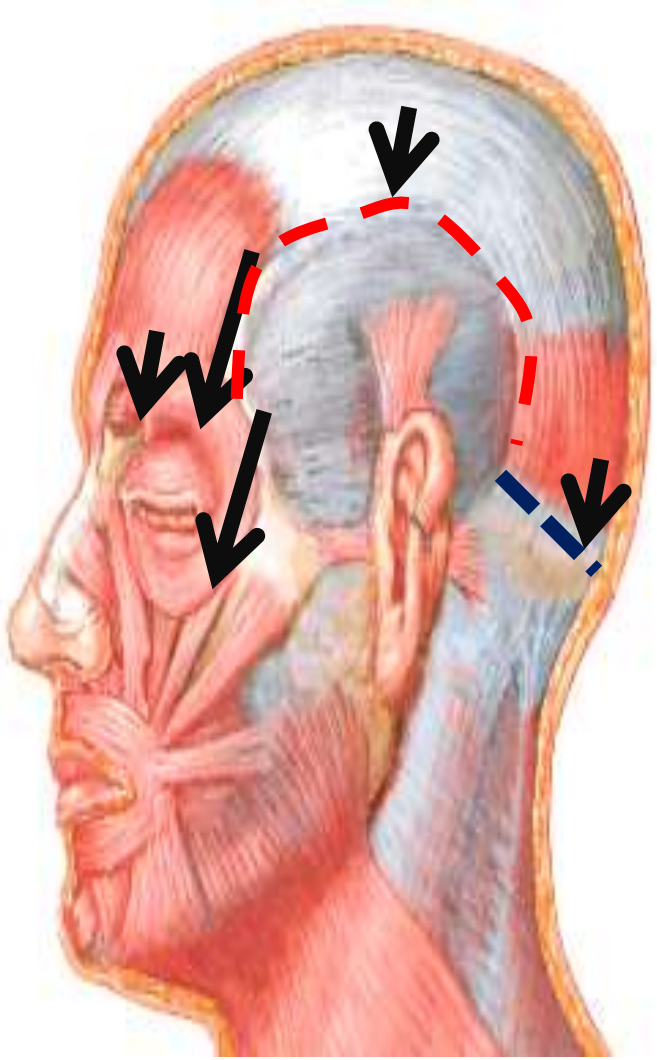
Danger of Emissary Veins

They transmit infection from outside the skull to the inside.

Why is loose CT layer considered the dangerous area of scalp?

- **Allows spread of infection from outside to inside of skull due to presence of emissary veins .**

- **Allows collection of blood & pus .**



Blood or pus collected in the loose areolar CT layer cannot pass to back of neck because of attachment of occipital bellies of occipito-frontalis to the highest nuchal line , but can pass anteriorly since frontal bellies are not attached to bone (but to skin of eyebrows) therefore blood can enter the eyelids resulting in

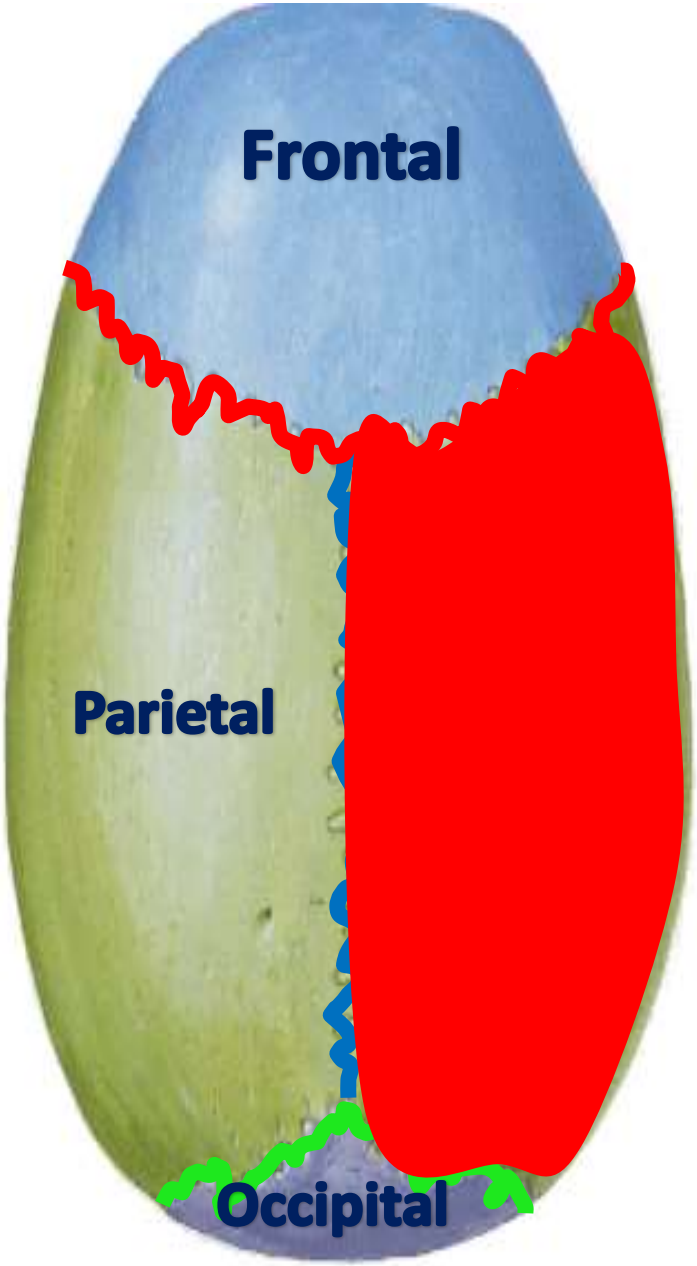
"Black eye"

The 5th layer: Pericranium

It is the periosteum of the skull bones; at the sutures it is continuous with the sutural ligaments and it is continues with the inner perioesteum at skull foramina.

Hemorrhage beneath this layer leads to a collection of blood (hematoma) that takes the shape of the underlying skull bone

Subperiosteal bleeding takes the shape of the underlying bone



NERVE SUPPLY

By 10 nerves (5 pre-auricular & 5 are retro-auricular: 4 sensory & 1 motor)

NERVE SUPPLY

By *10* nerves *(5 pre-auricular & 5 are retro- auricular: 4 sensory & 1 motor)*

In Front of the auricle

4 Sensory nerves: (branches of *trigeminal* nerve)

1. **Supratrochlear n.** (from *ophthalmic* n.) supplies skin of fore head
2. **Supraorbital n.** (from *ophthalmic* n.) supplies skin of forehead up to the vertex
3. **Zygomaticotemporal n.** (from *maxillary* n.) supplies non-hairy part of temporal region
4. **Auriculotemporal n.** (from *mandibular* n.) supplies the hairy

1 Motor nerve:

Temporal branch of facial nerve supplies frontal belly of occipito-frontalis.

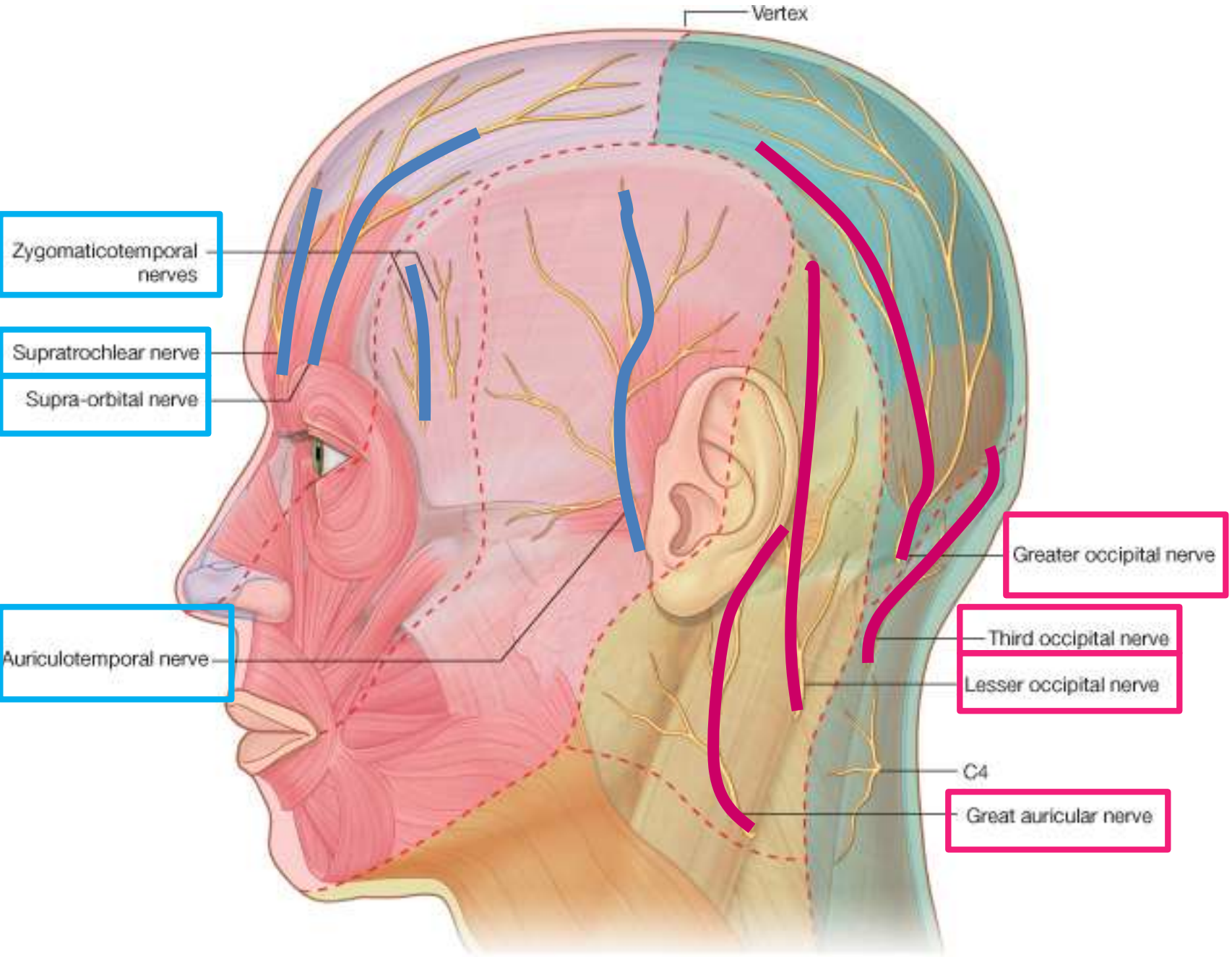
Behind the auricle

4 Sensory nerves: (branches of *cervical* spinal nerves)

1. **Great auricular n.** *(C 2,3)* supplies skin of scalp behind auricle.
2. **Lesser occipital n.** *(C 2)* supplies skin of scalp behind auricle.
3. **Greater occipital n.** *(C 2)* supplies skin of scalp up to vertex.
4. **Third occipital n.** *(C 2)* supplies skin of lower part of occiput.

1 Motor nerve:

Posterior auricular branch of facial nerve supplies occipital belly of occipitofrontalis.


Vertex
Zygomaticotemporal nerves
Supratrochlear nerve
Supra-orbital nerve
Auriculotemporal nerve
Greater occipital nerve
Third occipital nerve
Lesser occipital nerve
C4
Great auricular nerve

Summary of important points

- ***The scalp is formed of 5 layers.***
- ***Infection of scalp remains localised if in the dense CT layer but spreads if reaches loose CT layer***
- ***Emissary veins can transmit infection from scalp to the cranial cavity.***
- ***Scalp is richly supplied by arteries derived from external & internal carotid***
- ***Bleeding is profuse from scalp wounds because of the rich blood supply & arteries are prevented from contraction or retraction because of the dense CT attached to their walls***
- ***Nerves supplying scalp are branches of trigeminal (infront of auricle) & cervical spinal nerves(behind auricle)***

Examples of questions to assess the ILOs

MCQ

Infection in which layer of the scalp tends to spread ?

A. Skin

B. Dense connective tissue

C. Aponeurosis

D. Loose connective tissue

E. Pericranium

- A 53-year-old banker develops paralysis on the right side of his face, which produces an expressionless and drooping appearance. He is unable to close the right
- eye and also has difficulty chewing and drinking. Examination shows loss of the blink reflex in the right eye to stimulation of either right or left cornea. Lacrimation
- appears normal on the right side, but salivation is diminished and taste is absent on the anterior right side of the tongue. There is no complaint of hyperacusis.
- Audition and balance appear to be normal. Where is the lesion located?
- a. In the brain and involves the nucleus of the facial nerve and superior salivatory nucleus
- b. Within the internal auditory meatus
- c. At the geniculate ganglion
- d. In the facial canal just distal to the gems of the facial nerve
- e. Just proximal to the stylomastoid foramen

A 44-year-old attorney presents to a family practice office with a hat on her head and wearing dark sunglasses even though it is an overcast January day. Upon taking off her glasses and hat a series of vesicles are visible above her left eye continuing to her hairline. The vesicles stop at the midline of her forehead, but extend onto the dorsal surface of her nose and onto her left upper eyelid. There are no vesicles around or above her ears. She reports that she had pain in a similar pattern for a couple of days before the vesicles suddenly appeared. She can think of no change in habits or travel to account for the vesicles; she has infrequently left her home and office during the past 2 weeks since she is preparing for a case before the Cailfiornia Supreme Court. She had both chickenpox and mumps as a child. What is the working diagnosis and explanation for the unique pattern of the vesicles?

a. Herpes zoster affecting the mandibular division of the trigeminal cranial nerve

b. Herpes zoster affecting the ophthalmic division of the trigeminal cranial nerve

c. Herpes zoster affecting the zygomatic branch facial cranial nerve

d. Mumps affecting the maxillary division of the facial cranial nerve

e. Mumps affecting her parotid salivary gland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Thank you