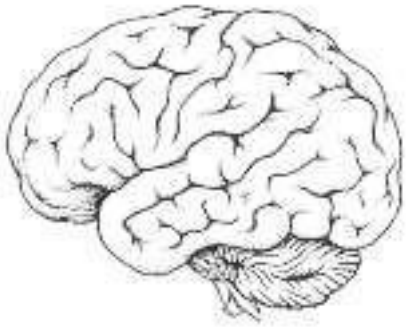
BAU-Medicine



Sheet No. 23

Lecture Title : Face, Scalp & Cervical Plexus

Lecture Date : 22.3.2021

Written By: Shahd Khalil

Edited By:Maya Taan

دعاء لزميلنا رشيد:

اللهمّ افسح له في قبره مدّ بصره، وافرش قبره من فراش الجنّة ,اللهمّ أعذه من عذاب القبر، وجفاف

Lecture Objectives

Review the general anatomical features of **the face and scalp**.

Describe blood supply, innervation, and lymphatic drainage of the face and scalp.

Make a list of contributing roots to **cervical plexus**.

Discuss the general arrangement.

Describe the location of this plexus.

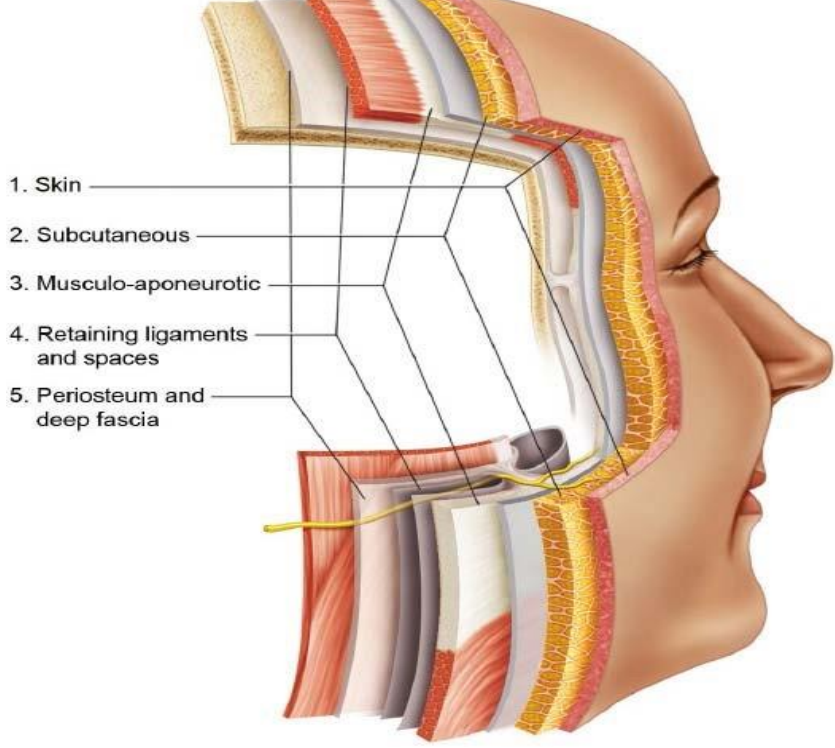
Make a list of the outcoming nerves.

Follow the branches to their target organs.

Make a list of the cutaneous nerves.

Follow the cutaneous branches to their destinations.

Facial Layers



Layer 1: Skin

Layer 2: Subcutaneous layer (Layer 2)

-Contains Superficial fat compartments

Layer 3: Superficial musculo-aponeurotic system (SMAS)

Layer 4: Retaining ligaments and deep compartments

-This layer fixates SMAS into the deeper layers

-Deep fat compartments

Layer 5: Deep fascia &/or periosteum

Layers of the Scalp

1. Skin
2. CT (subcutaneous layer)

   - Rich in BVs, lymphatics and nerves.

   - Any injury to the scalp causes extensive bleeding due to the extensive plexuses of BVs.

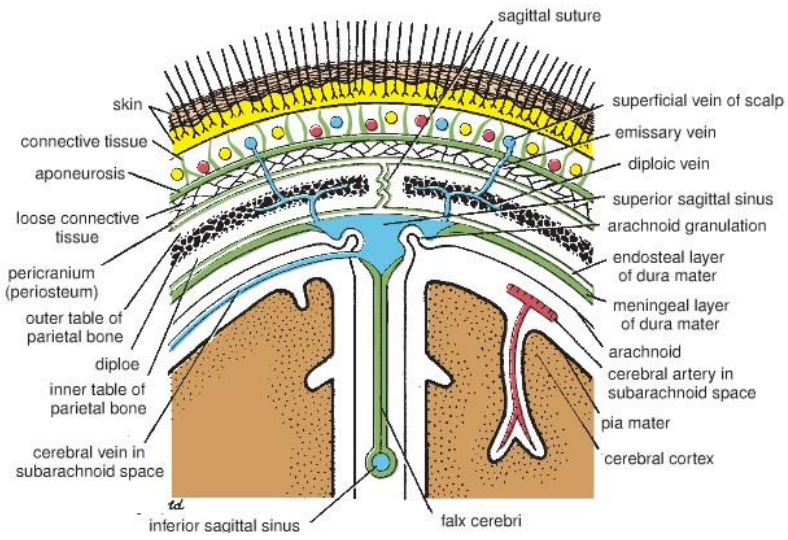
3. Aponeurosis of **occipitofrontalis muscle**
4. Loose CT

- Allows movement of above layers

5. Periosteum

Sheet Note:

- There is a lot of conflict in classifying facial layers due to the newly developed research concerning Botox & fillers used worldwide.
- **SMAS** contains the muscles involved in wrinkle formation making it the target for Botox.
- Fillers are injected in **Deep & Superficial fat compartments.**
- Make sure to notice in the picture above that in the scalp the layers end as periosteum whereas in the face they end as deep muscles & fascia.

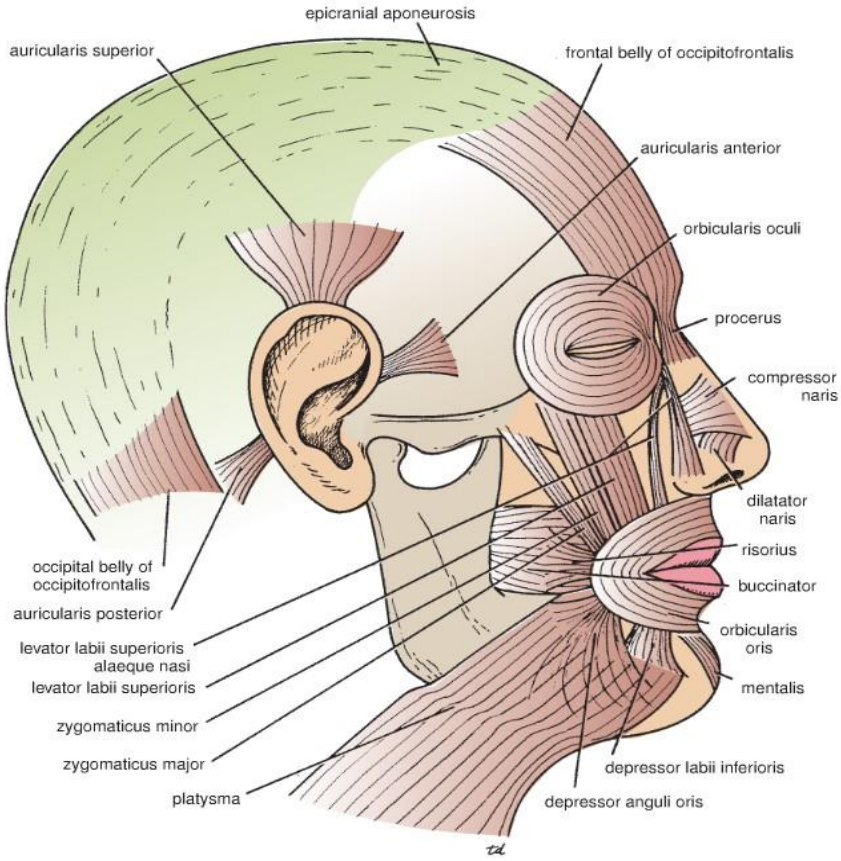


Muscles of the External Ear

- At the level of the occipitofrontalis aponeurosis there is a group of muscles controlling the ear which are considered part of facial expression muscles which are:

  Auricularis anterior, posterior & superior (they are part of the facial expression muscles).

Muscles of Facial Expression



- Their major function is to control the openings of the face {Orbital, Oral cavity, Nasal Cavity, Ear}.
- some people can control their ear muscles.
- They majorly originate from fascia or skull bones & insert onto skin
- Encircle eyes, nose & mouth
- Express emotions
- Innervated by Facial Nerve (VII), the fibers modality is SVE.
- Damage to CN VII leads to Bell's palsy (facial paralysis)

Facial Muscles

Sheet Note:

O: Origin

I: Insertion

First: Superior part of the facial expression muscles:

1. **Occipitofrontalis Muscle:**

   This muscle is composed of two bellies; occipital & frontal & in between they insert into the occiptiofrontalis aponeurosis.

   - Occipital part (Posterior belly) **O:** Superior Nuchal line of occipital bone

   - Frontal part (Anterior belly) **I:** Bone, muscle (orbicularis oculi) & deep fascia in the superciliary region (eyebrows).

- The frontal part helps in furrowing the forehead as it overlaps with other facial muscles in the superciliary region(eyebrows) including Orbicularis Oculi (the orbital part), Corrugator Supercilii, & to a small extent Procerus.

2. **Corrugator Supercilii:**

   O: Superciliary ridge above superior margin of orbit

   I: Deep fascia with other muscles (frontal part of occipitofrontalis)

   Its contraction leads to vertical furrowing of forehead.

3. **Orbicularis Oculi:**

   directly controls the opening of the eyes.

   their fibers are circular hence their contraction decreases the opening of the circle.

   It is composed of two parts:

   a. External Orbital part: Tightens the orbital circumference while the opening stays open.

   b. Internal Palpebral part: its contraction leads to forced closure of the eye in response to dirt or strong wind {Remember that this opposes the action of levator palpebrae superioris.}

      Each part can contract by itself or they can contract together.

4. Procerus:

   O: Root of nasal bridge.

   I: Fascia & skin inferiorly.

   Its contraction leads to horizontal furrowing in bridge of nose.

The superior part muscles arrangement from superficial to deep:

Orbicularis Oculi → Frontalis part of occipitofrontalis → Corrugator Supercilii

Second: Middle part of the facial expression muscles (controls the oral cavity):

1. **Levator Labii superioris alaeque nasi:**

   Some of its fibers insert in upper Orbicularis oris and elevates the upper lip while a small part of its fibers inserts in the ala of the nose which helps in elevating & opening the nostrils. It is superficial to Orbicularis oris. Also nasalis muscle increases the opening of the nostrils.

2. **Orbicularis Oris:**

   Upper & Lower parts O: Maxilla & Mandible (Respectively) & deep fascia of the face.

   I: Medial & Lateral canthi of the mouth forming the bulk of the lips.

   Its contraction leads to closure & protrusion of mouth.

3. **Zygomaticus Major & Minor:**

   O: Zygomatic bone I: Angle of the mouth

   Zygomaticus Major is lateral to Zygomaticus Minor.

   Their fibers orientation is Superior Lateral hence their contractions moves the angle of the mouth Superior Lateral. They help in smiling & opening of nasal cavity.

4. **Levator Labii Superioris:**

   O: Maxilla above infraorbital foramen below inferior margin of orbit

   I: Upper lip

5. **Levator Anguli Oris:**

   O: Maxilla inferior to infraorbital foramen I: Angle of the mouth

6. **Risorius:**

   O: Deep fascia I: Angle of mouth

   Helps in smiling.

7. **Buccinator:**

   O: Posterior ramus of Mandible & surrounding fascia I: Deepest angle of mouth

   Its contraction helps in blowing & whistling.

The Middle part muscles arrangement from superficial to deep:

Levator Labii Superioris alaeque nasi → Orbicularis Oris → Zygomaticus minor & major + Levator Labii Superioris → Levator Anguli Oris → Buccinator

Third: Inferior part of the facial expression muscles:

1. **Platysma:**

   Its contraction tenses the superficial part of the skin in the cervical region & upper shoulders.

   O: deep fascia

   I : inserts with the orbicularis oris muscle

2. **Depressor Anguli Oris:**

   O: Anterior part of the body of the Mandible I: Angle of the mouth

3. **Depressor Labii inferioris**

4. **Mentalis:**

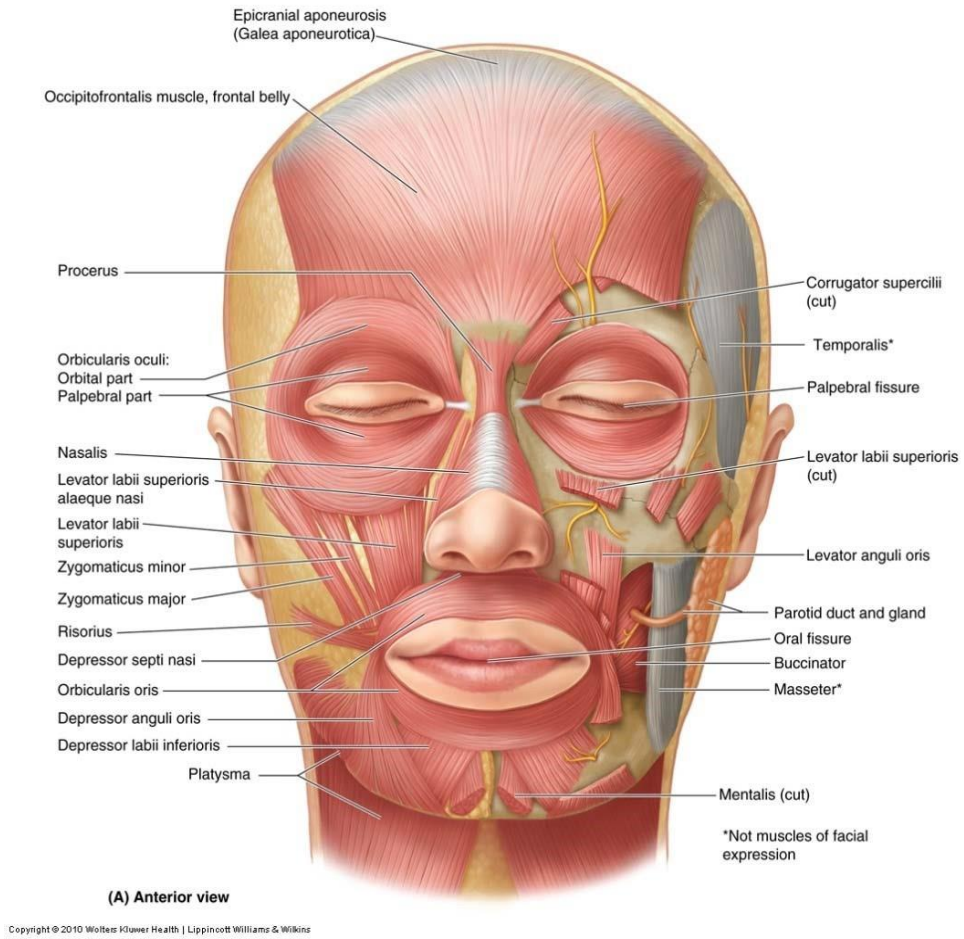
   O: Inferior of the Mandible I: Deep fascia of the chin

   Its contraction leads to protrusion of lower lip & elevates the chin.

#Note: the superficial & deep compartments of fat are found within these layers of muscles.

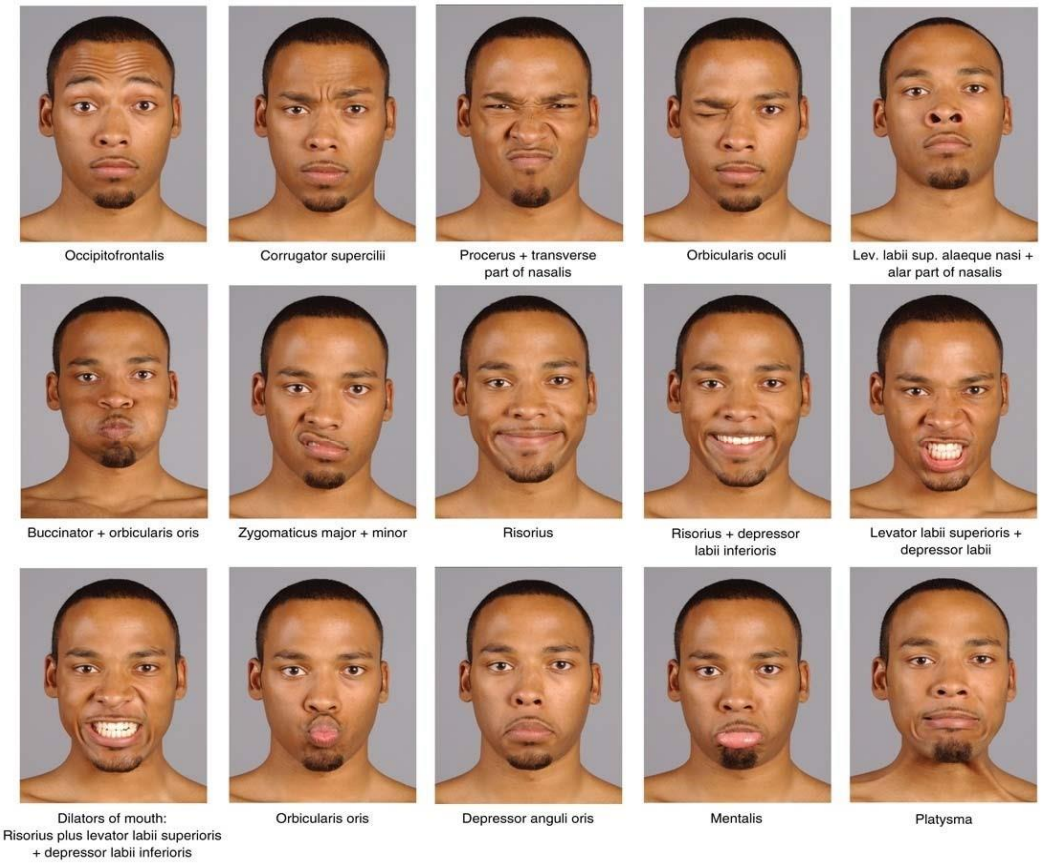
The Inferior part muscles arrangement from superficial to deep:

Platysma → Depressor Anguli Oris → Depressor Labii inferioris → Mentalis



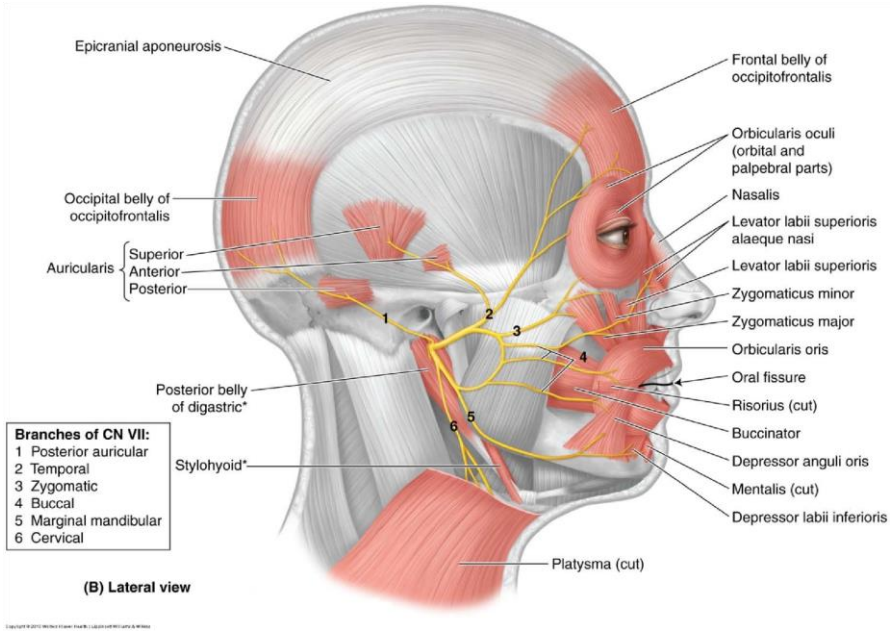
Muscle	Origin	Insertion	Nerve Supply	Action
Muscle of Scalp				
Occipitofrontalis				
Occipital belly	Highest nuchal line of occipital bone	Epicranial aponeurosis	Facial nerve	Moves scalp on skull and raises eyebrows
Frontal belly	Skin and superficial fascia of eyebrows			
Muscles of Facial Expression				
Orbicularis oculi				
Palpebral part	Medial palpebral ligament	Lateral palpebral raphe	Facial nerve	Closes eyelids and dilates lacrimal sac
Orbital part	Medial palpebral ligament and adjoining bone	Loops return to origin	Facial nerve	Throws skin around orbit into folds to protect eyeball
Corrugator supercilii	Superciliary arch	Skin of eyebrow	Facial nerve	Vertical wrinkles of forehead, as in frowning
Compressor nasi	Frontal process of maxilla	Aponeurosis of bridge of nose	Facial nerve	Compresses mobile nasal cartilages
Dilator naris	Maxilla	Ala of nose	Facial nerve	Widens nasal aperture
Procerus	Nasal bone	Skin between eyebrows	Facial nerve	Wrinkles skin of nose
Orbicularis oris	Maxilla, mandible, and skin	Encircles oral orifice	Facial nerve	Compresses lips together
Dilator Muscles of Lips				
Levator labii superioris alaeque nasi	Arise from bones and fascia around oral aperture and insert into substance of lips		Facial nerve	Separate lips
Levator labii superioris				
Zygomaticus minor				
Zygomaticus major				
Levator anguli oris				
Risorius				
Depressor labii inferioris				
Depressor anguli oris				
Mentalis				
Buccinator	Outer surface of alveolar margins of maxilla and mandible and pterygo-mandibular ligament		Facial nerve	Compresses cheeks and lips against teeth

Facial expression Muscles Functions



Facial expression Muscles Innervation

They are mainly innervated by Facial nerve VII (as discussed in previous lectures).



Muscles of Mastication

- Help in mastication hence they move the mandible.
- The only movable joint in the skull is the temporomandibular joint (TMJ).
- In order to move the TMJ all of these Muscles insert in the Mandible and originate from other bones.
- They are innervated by Mandibular branch or CN V.

1. **Temporalis:**

   O: Temporal fossa I: Coronoid process of Mandible

   It passes from below the zygomatic arch.

   Anterior fibers elevate the Mandible

   Posterior fibers elevate & retract the Mandible.

2. **Masseter:**

   O: Zygomatic bone I: Angle of Mandible Externally

   It helps in elevation of Mandible

The ramus of the mandible is located between the Masseter externally & the Medial Pterygoid internally.

3. **Medial Pterygoid:**

   O: Pterygoid & Maxilla I: Angle of Mandible Internally

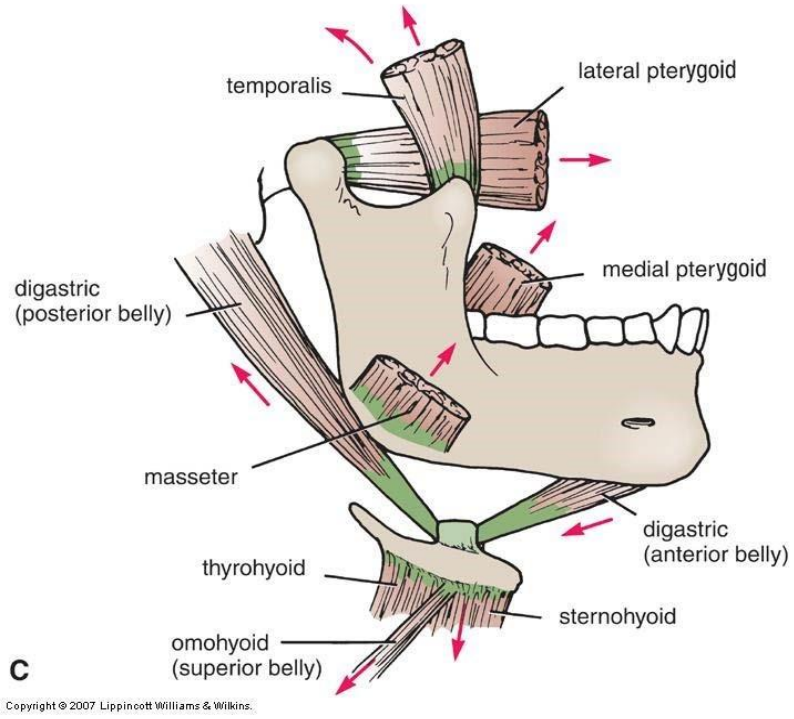
   It helps in elevation of Mandible.

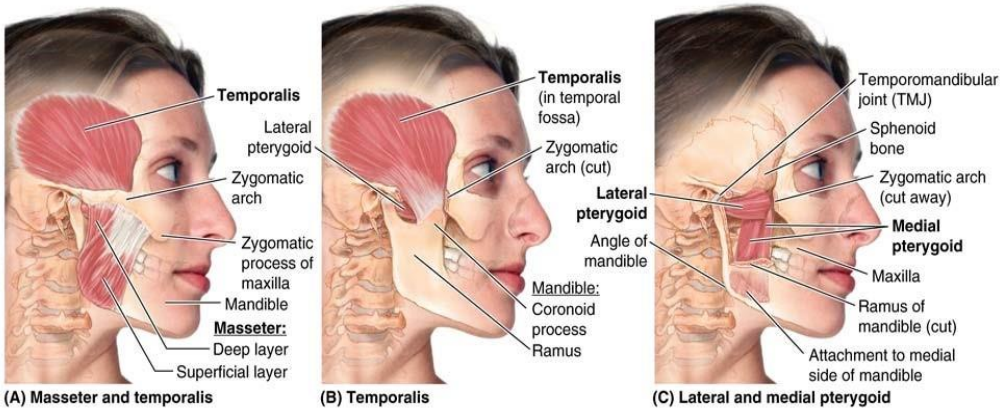
4. **Lateral Pterygoid:**

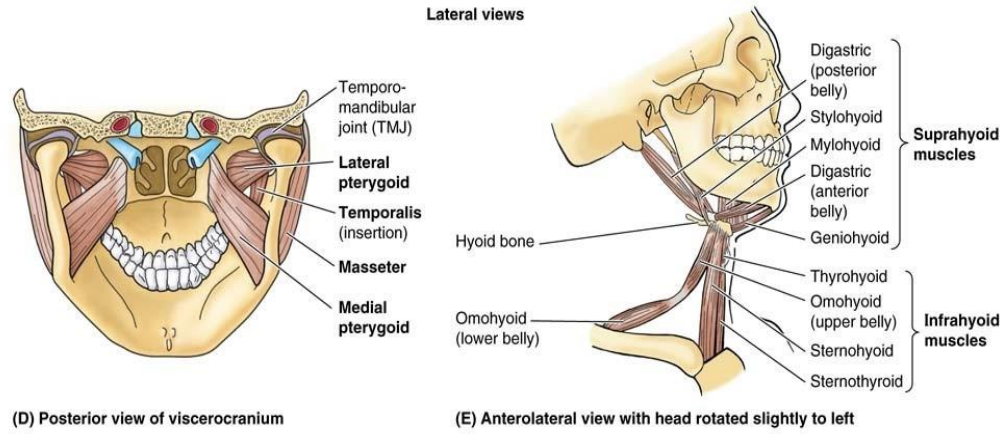
   O: Pterygoid & Maxilla I: Neck of Mandible & disc of TMJ

   Bilateral contraction: Protrusion of Mandible & rotation of the Mandible around the mandibular fossa leading to opening of mouth.

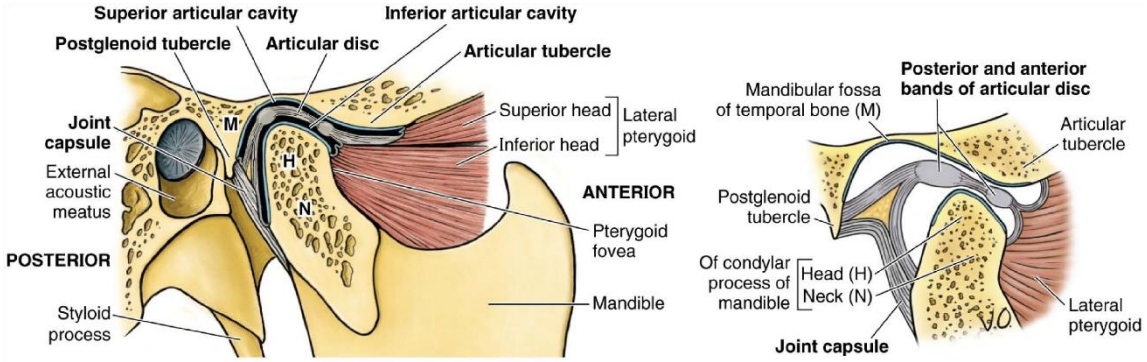
   Unilateral Contraction: leads to deviation in the opposite side; for example, if the left lateral pterygoid contracts the mandible moves to the right.(This happens because its origin is medial to its insertion.)





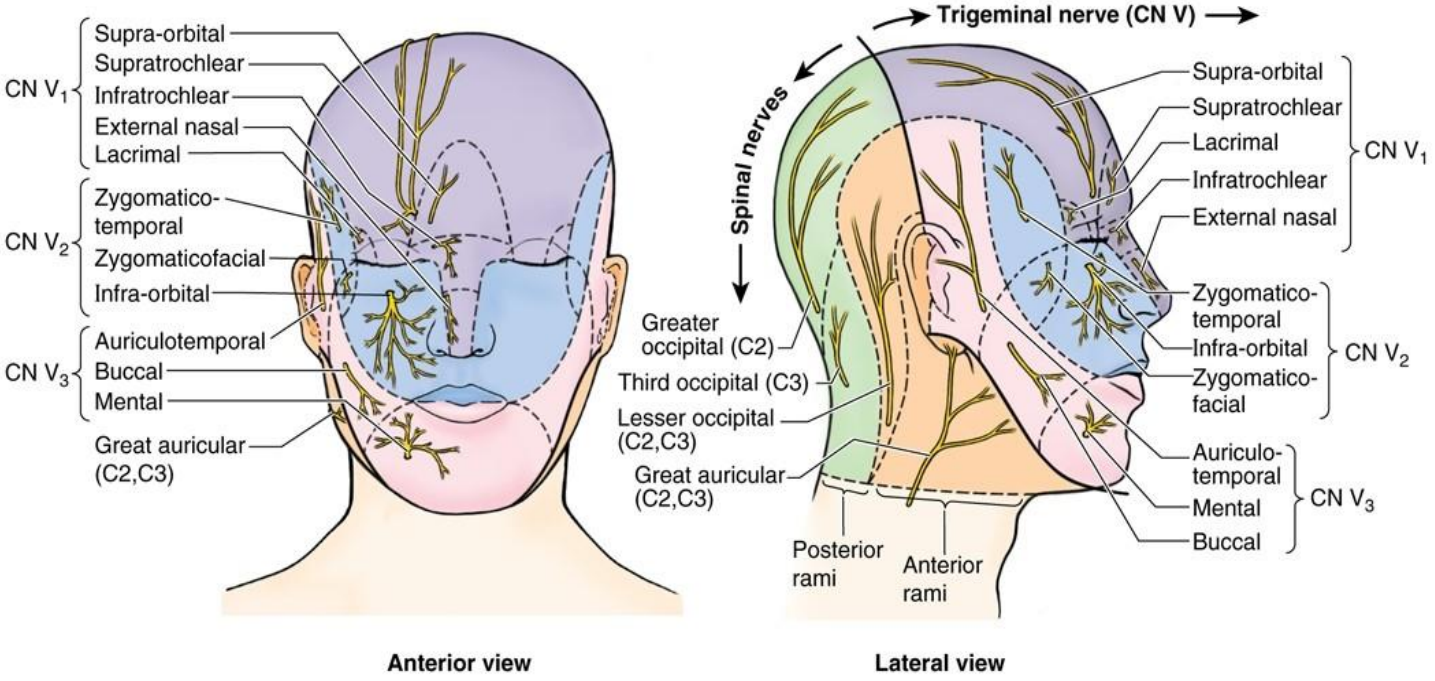


Lateral Pterygoid



Muscle	Origin	Insertion	Nerve Supply	Action
Muscles of Mastication				
Masseter	Zygomatic arch	Lateral surface ramus of mandible	Mandibular division of trigeminal nerve	Elevates mandible to occlude teeth
Temporalis	Floor of temporal fossa	Coronoid process of mandible	Mandibular division of	Anterior and superior fibers
Lateral pterygoid (two heads)	Greater wing of sphenoid and lateral pterygoid plate	Neck of mandible and articular disc	Mandibular division of trigeminal nerve	Pulls neck of mandible forward
Medial pterygoid (two heads)	Tuberosity of maxilla and lateral pterygoid plate	Medial surface of angle of mandible	Mandibular division of trigeminal nerve	Elevates mandible

Cutaneous Nerves of Face and Scalp



Anterior Part : Trigeminal nerve (GSA) & its branches.

Most Posteriorly: Posterior Rami of Cervical Nerves (Greater Occipital {C2} & Third Occipital {C3})

Posterior Part: Anterior Rami of Cervical nerves (Lesser Occipital & Greater Auricular)

Arterial Supply for Face & Scalp

- The major arterial supply is External Carotid Artery & its branches:

- **Facial Artery (course):**

Branches from ECA → Deep to Submandibular gland → at the lower edge of Mandible becomes superficial (between Masseter & Deep Angular oris) {here if you clench the masseter you can feel its pulsations just anterior to it} → Deep to Facial Expression Muscles & branches into:

a. Superior & Inferior Labial A: Upper & Lower Lips.

b. Lateral Nasal A: Nose

c. Ends as Angular A: Medial eye & lateral nose.

- **Angular artery anastomoses with Supra orbital & Supra trochlear Arteries (which are branches of ophthalmic A of ICA.**
- **This is the only anastomoses in the head region from ICA.**
- **If filler was injected in Angular A it could lead to blindness as the chemical could reach ophthalmic & Central Retinal Arteries.**

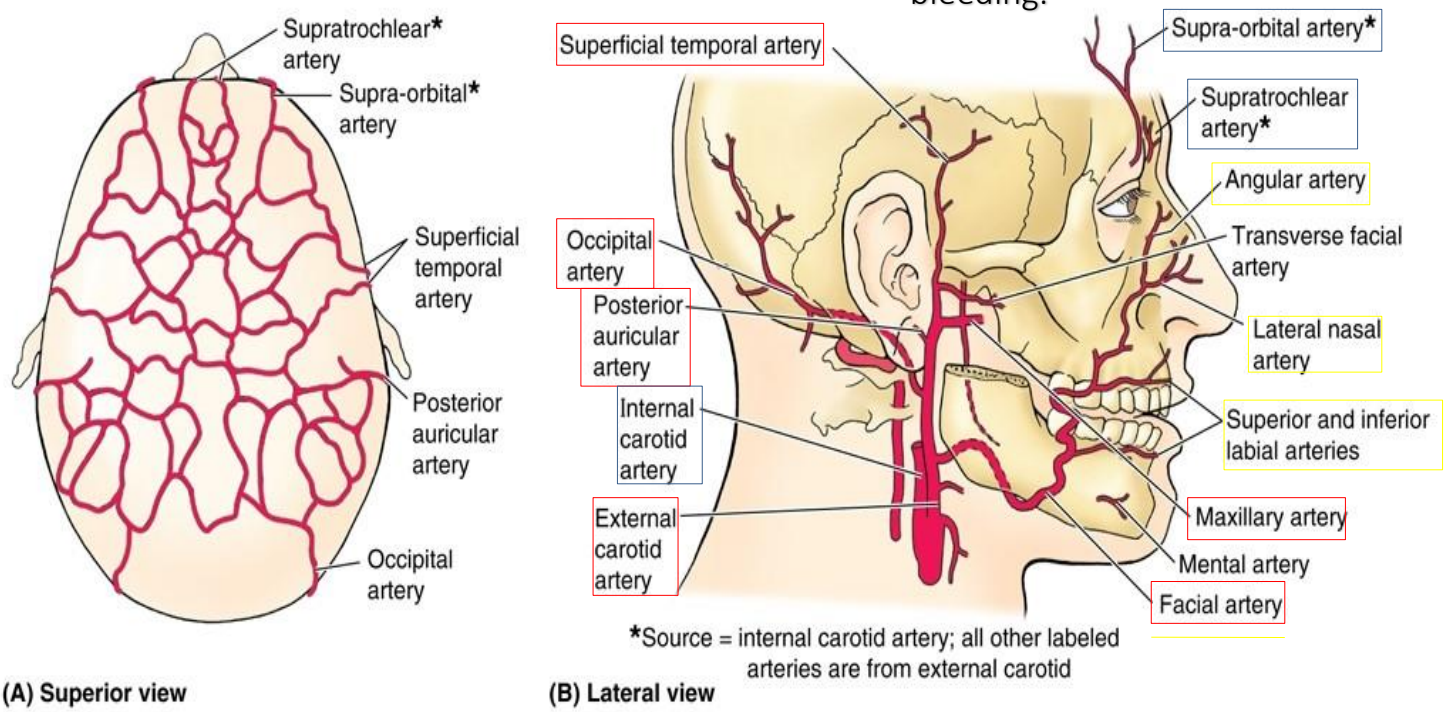
-Superior temporal A: Superior head & forehead

- Occipital A: Posterior part

-Transverse Facial A

-Maxillary A: travels through the pterygopalatine fossa to supply Nasal Cavity, Oral Cavity & Pharynx.

As can be seen in the picture below the ends of these arteries anastomose with each other in the scalp forming extensive plexuses hence any small injury in this region leads to extensive "overrated" bleeding.



This figure summarizes the arterial supply of face & scalp.

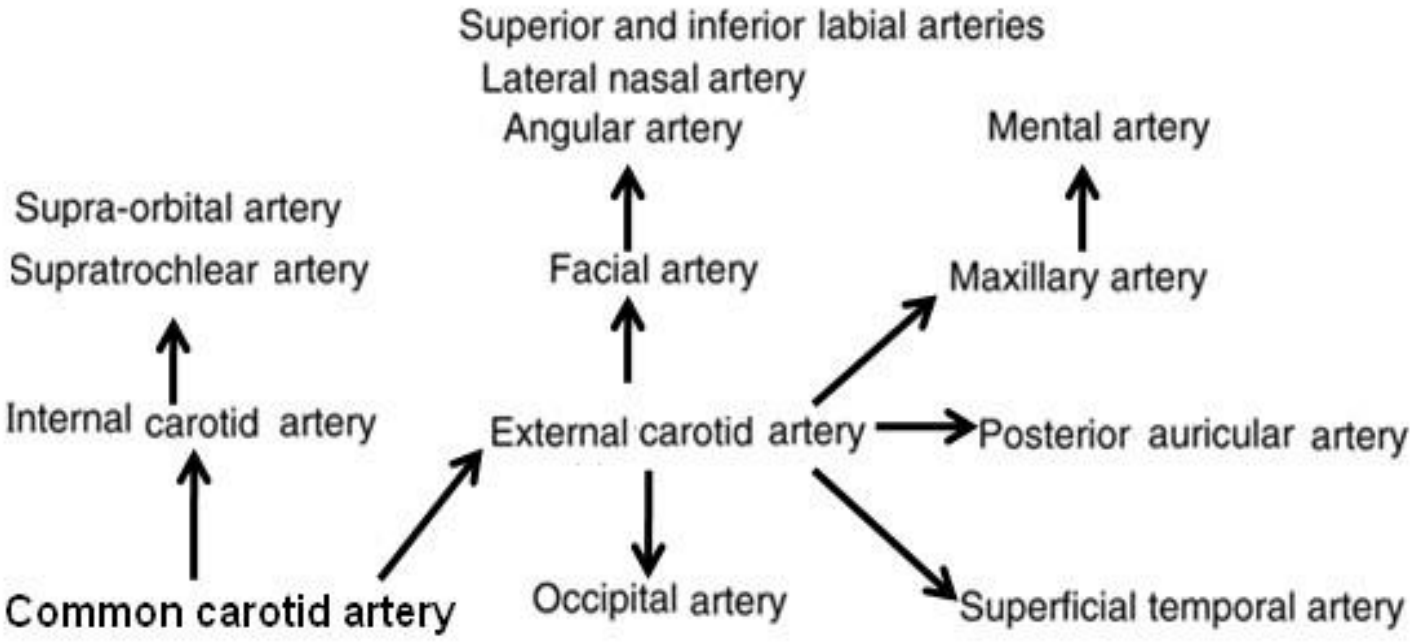
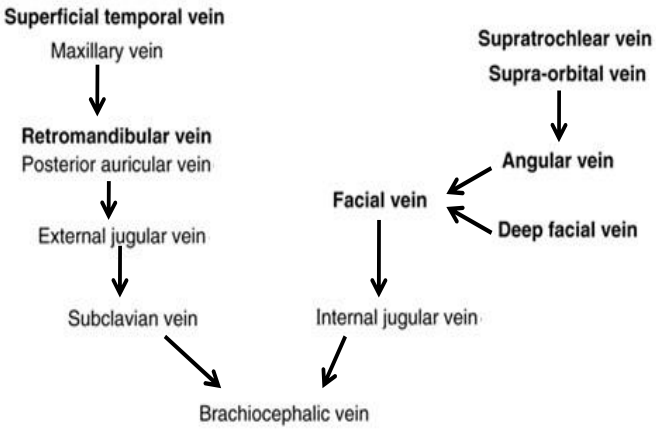


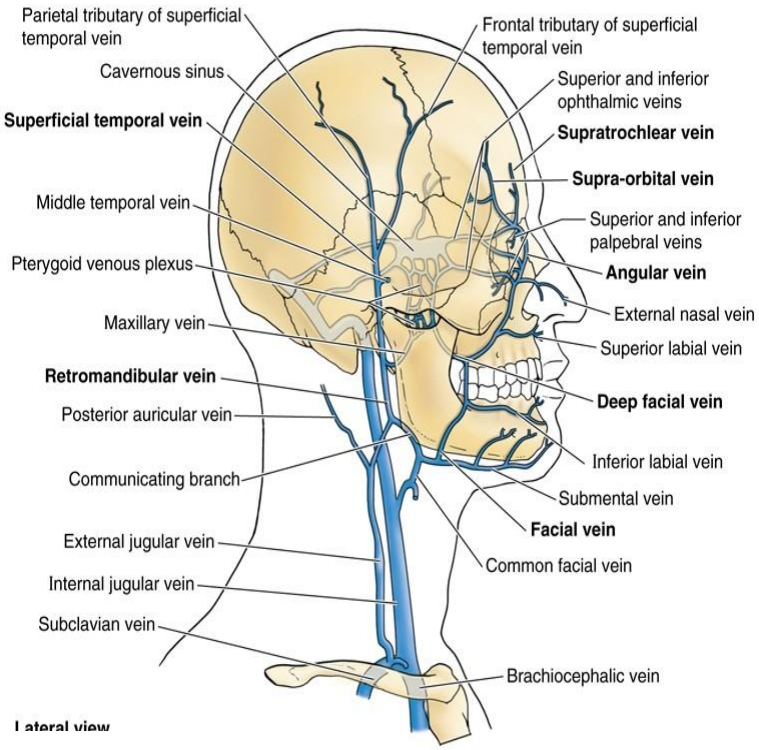
TABLE 7.5. SUPERFICIAL ARTERIES OF FACE AND SCALP

Artery	Origin	Course	Distribution
Facial	External carotid artery	Ascends deep to submandibular gland; winds around inferior border of mandible and enters face	Muscles of facial expression and face
Inferior labial	Facial artery near angle of mouth	Runs medially in lower lip	Lower lip
Superior labial		Runs medially in upper lip	Upper lip and ala (side) and septum of nose
Lateral nasal	Facial artery as it ascends alongside nose	Passes to ala of nose	Skin on ala and dorsum of nose
Angular	Terminal branch of facial artery	Passes to medial angle (canthus) of eye	Superior part of cheek and inferior eyelid
Occipital	External carotid artery	Passes medial to posterior belly of digastric and mastoid process; accompanies occipital nerve in occipital region	Scalp of back of head, as far as vertex
Posterior auricular	External carotid artery	Passes posteriorly, deep to parotid gland, along styloid process between mastoid process and ear	Scalp posterior to auricle and auricle
Superficial temporal	Smaller terminal branch of external carotid artery	Ascends anterior to ear to region and ends in scalp	Facial muscles and skin of temporal frontal and temporal regions
Transverse facial	Superficial temporal artery within parotid gland	Crosses face superficial to masseter and inferior to zygomatic arch	Parotid gland and duct, muscles and skin of face
Mental	Terminal branch of inferior alveolar artery	Emerges from mental foramen and passes to chin	Facial muscles and skin of chin
Supra-orbital[a]	Terminal branch of ophthalmic artery	Passes superiorly from supra-orbital foramen	Muscles and skin of forehead and scalp and superior conjunctiva
Supratrochlear[a]		Passes superiorly from supratrochlear notch	

Venous Supply of face & scalp

-Note that the External jugular vein can also drain in the Internal Jugular vein. - All the venous drainages are connected which could form an access for infection to reach inside the cranial cavity.





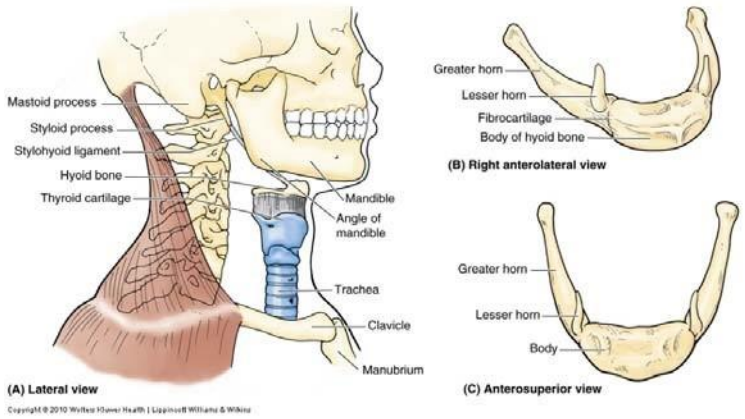
Lateral view

TABLE 7.6. VEINS OF FACE AND SCALP

Vein	Origin	Course	Termination	Area Drained
Supratrochlear	Begins from venous plexus on forehead and scalp, through which it communicates with frontal branch of superficial temporal vein, its contralateral partner, and supra-orbital vein	Descends near midline of forehead to root of nose, where it joins supra-orbital vein	Angular vein at root of nose	Anterior part of scalp and forehead
Supra-orbital	Begins in forehead by anastomosing with frontal tributary of superficial temporal vein	Passes medially superior to orbit; joins supra-trochlear vein; a branch passes through supra-orbital notch and joins with superior ophthalmic vein		
Angular	Begins at root of nose by union of supratrochlear and supra-orbital veins	Descends obliquely along root and side of nose to inferior orbital margin	Becomes facial vein at inferior margin of orbit	Anterior part of scalp and forehead; superior and inferior eyelids and conjunctiva; may receive drainage from cavernous sinus
Facial	Continuation of angular vein past inferior margin of orbit	Descends along lateral border of nose, receiving external nasal and inferior palpebral veins; then passes obliquely across face to cross inferior border of mandible; receives communication from retromandibular vein (after which, it is sometimes called common facial vein)	Internal jugular vein opposite or inferior to level of hyoid bone	Anterior scalp and forehead; eyelids; external nose; anterior cheek; lips; chin; and submandibular gland
Deep facial	Pterygoid venous plexus	Runs anteriorly on maxilla superior to buccinator and deep to masseter, emerging medial to anterior border of masseter onto face	Enters posterior aspect of facial vein	Infratemporal fossa (most areas supplied by maxillary artery)
Superficial temporal	Begins from widespread plexus of veins on side of scalp and along zygomatic arch	Frontal and parietal tributaries unite anterior to the auricle; crosses temporal root of zygomatic arch to pass from temporal region and enter substance of the parotid gland	Joins maxillary vein posterior to neck of mandible to form retromandibular vein	Side of scalp; superficial aspect of temporal muscle; and external ear
Retromandibular	Formed anterior to ear by union of superficial temporal and maxillary veins	Runs posterior and deep to ramus of mandible through substance of parotid gland; communicates at inferior end with facial vein	Unites with posterior auricular vein to form external jugular vein	Parotid gland and masseter muscle

Neck

Hyoid Bone



- Position at level of C3

  -Between mandible & thyroid cartilage.

- Has a U shape.
- It is suspended as it had no attachment with any other bone.
- Stylohyoid ligament connects between styloid process & lesser horn of hyoid. (For fixation)
- Parts

  -Body

  -Lesser horn

  -Greater horn

Neck Muscles

- Superficial mm. of the side of the neck
  1. Platysma – VII
  2. Sternocleidomastoid (SCM) - XI
- Suprahyoid mm.
  1. Stylohyoid - VII
  2. Digastric

     O: Mastoid I: Mandible

     Posterior belly - VII

     Anterior belly - V

     Its two bellies are connected by a sling that connects with the hyoid bone to elevate it.

- **Platysma & SCM are superficial to Suprahyoid & Infrahyoid muscles.**
- **Geniohyoid & digastric are superficial to the muscles supporting floor of the mouth & mylohyoid.**
- **Elevation of hyoid elevates larynx.**

3. Geniohyoid – C1

   O: Geniod tubercles in anterior mandible I: Anterior of hyoid bone

   Its anterior to the anterior belly of digastric muscle

4. Mylohyoid – V (Wide Muscle)

   It is the separation of the floor of the mouth above & the neck below.

   O: Mylohyoid line of body of mandible I: Hyoid bone

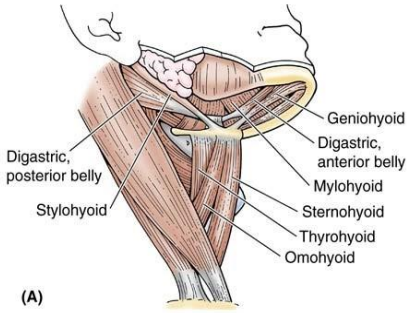
- Infrahyoid mm.

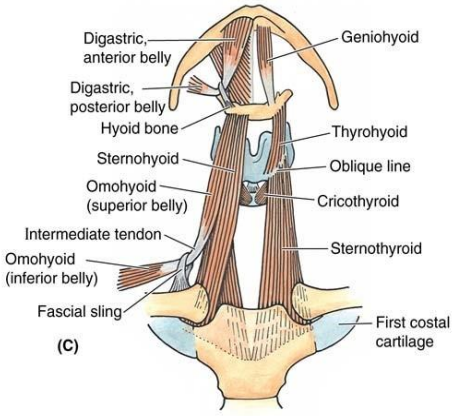
  These Muscles depress hyoid bone which leads to depression of thyroid, larynx & Mandible.

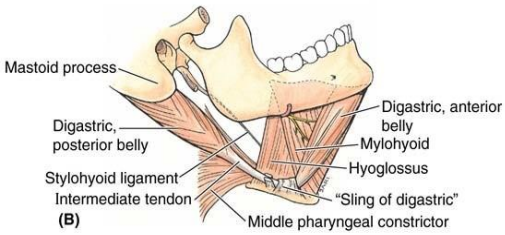
1. Omohyoid - AC

   Two bellies: Superior Belly & Inferior belly that inserts into Scapula. Between them is a sling that connects to the clavicle.

2. Sternohyoid - AC
3. Sternothyroid - AC
4. Thyrohyoid – C1







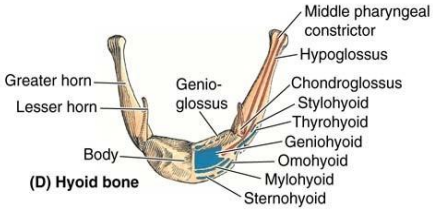


Table 13-3 Muscles of the Neck

Muscle	Origin	Insertion	Nerve Supply	Action
Platysma	Deep fascia over pectoralis major and deltoid	Body of mandible and angle of mouth	Facial nerve, cervical branch	Depresses mandible and angle of mouth
Sternocleido-mastoid	Manubrium sterni and medial third of clavicle	Mastoid process of temporal bone and occipital bone	Spinal part of accessory nerve and C2 and 3	Two muscles acting together extend head and flex neck; one muscle rotates head to opposite side
Digastric				
Posterior belly	Mastoid process of temporal bone	Intermediate tendon is held to hyoid by fascial sling	Facial nerve	Depresses mandible or elevates hyoid bone
Anterior belly	Body of mandible		Nerve to mylohyoid	
Stylohyoid	Styloid process	Body of hyoid bone	Facial nerve	Elevates hyoid bone
Mylohyoid	Mylohyoid line of body of mandible	Body of hyoid bone and fibrous raphe	Inferior alveolar nerve	Elevates floor of mouth and hyoid bone or depresses mandible
Geniohyoid	Inferior mental spine of mandible	Body of hyoid bone	First cervical nerve	Elevates hyoid bone or depresses mandible
Sternohyoid	Manubrium sterni and clavicle	Body of hyoid bone	Ansa cervicalis; C1, 2, and 3	Depresses hyoid bone
Sternothyroid	Manubrium sterni	Oblique line on lamina of thyroid cartilage	Ansa cervicalis; C1, 2, and 3	Depresses larynx
Thyrohyoid	Oblique line on lamina of thyroid cartilage	Lower border of body of hyoid bone	First cervical nerve	Depresses hyoid bone or elevates larynx
Omohyoid				
Inferior belly	Upper margin of scapula and supra-scapular ligament	Intermediate tendon is held to clavicle and first rib by fascial sling	Ansa cervicalis; C1, 2, and 3	Depresses hyoid bone
Superior belly	Lower border of body of hyoid bone			

- Anterior and lateral vertebral Neck Muscles mm

1. Scalenus Anterior

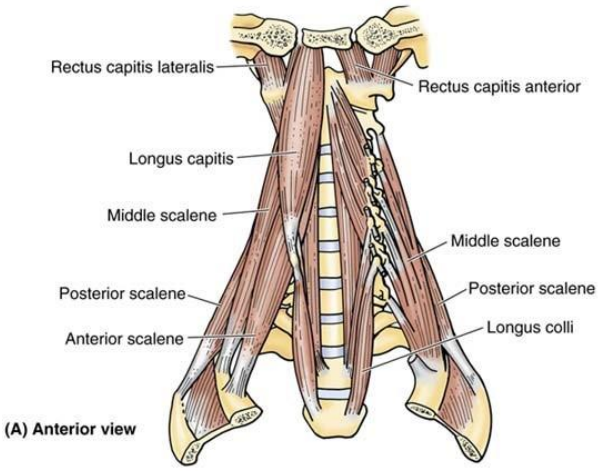
   Posterior to it : Subclavian Artery & Brachial Plexus

   Anterior to it: Subclavian Vein

2. Scalenus medius

   It is on the same level as Levator Scalene Muscle.

3. Scalenus Posterior



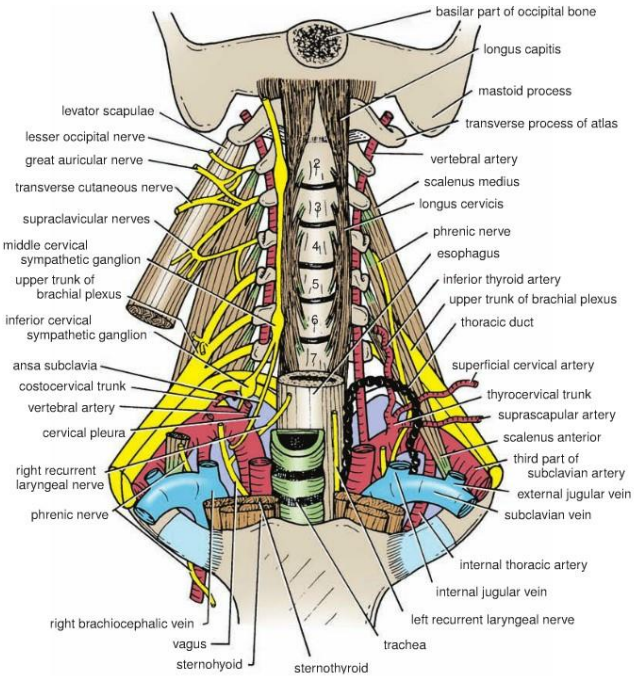
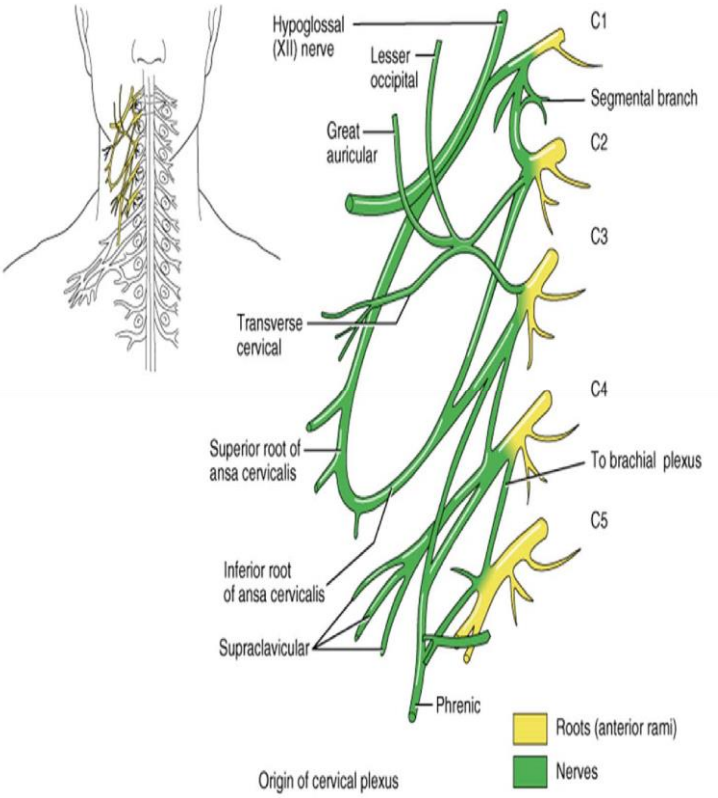


Table 13-3 Muscles of the Neck

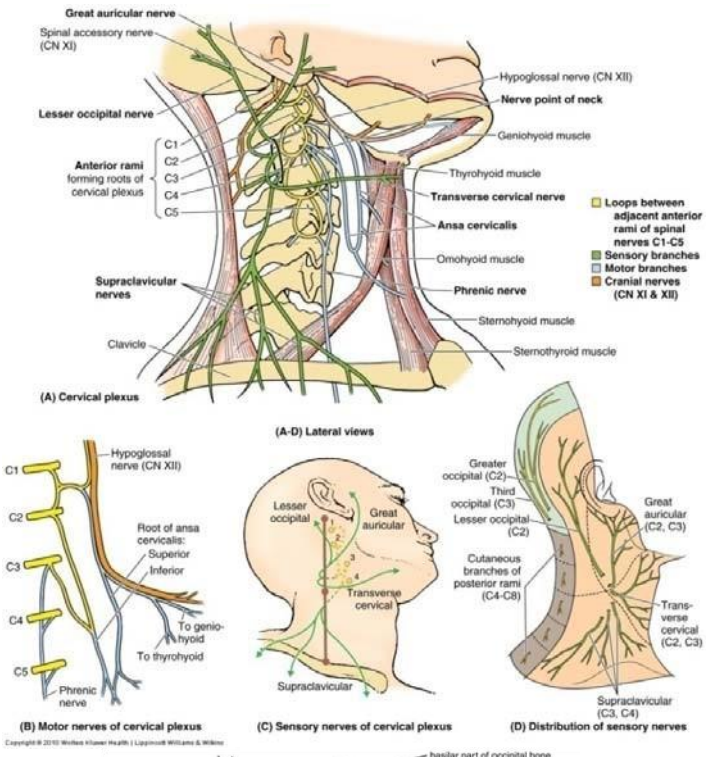
Muscle	Origin	Insertion	Nerve Supply	Action
Scalenus anterior	Transverse processes of third, fourth, fifth, and sixth cervical vertebrae	First rib	C4, 5, and 6	Elevates first rib; laterally flexes and rotates cervical part of vertebral column
Scalenus medius	Transverse processes of upper six cervical vertebrae	First rib	Anterior rami of cervical nerves	Elevates first rib; laterally flexes and rotates cervical part of vertebral column
Scalenus posterior	Transverse processes of lower cervical vertebrae	Second rib	Anterior rami of cervical nerves	Elevates second rib; laterally flexes and rotates cervical part of vertebral column

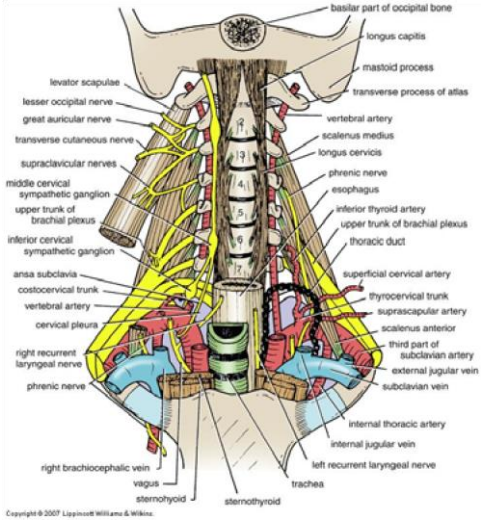
Cervical Plexus

- Ventral rami of spinal nerves (C1 to C5)
- Supplies parts of head, neck & shoulders
- Relations:
    - Anterior to levator scapulae m. and middle scalene m.
    - Posterior to the sternocleidomastoid m.
    - Subcutaneous branches emerge behind the lateral border of the sternocleidomastoid m.

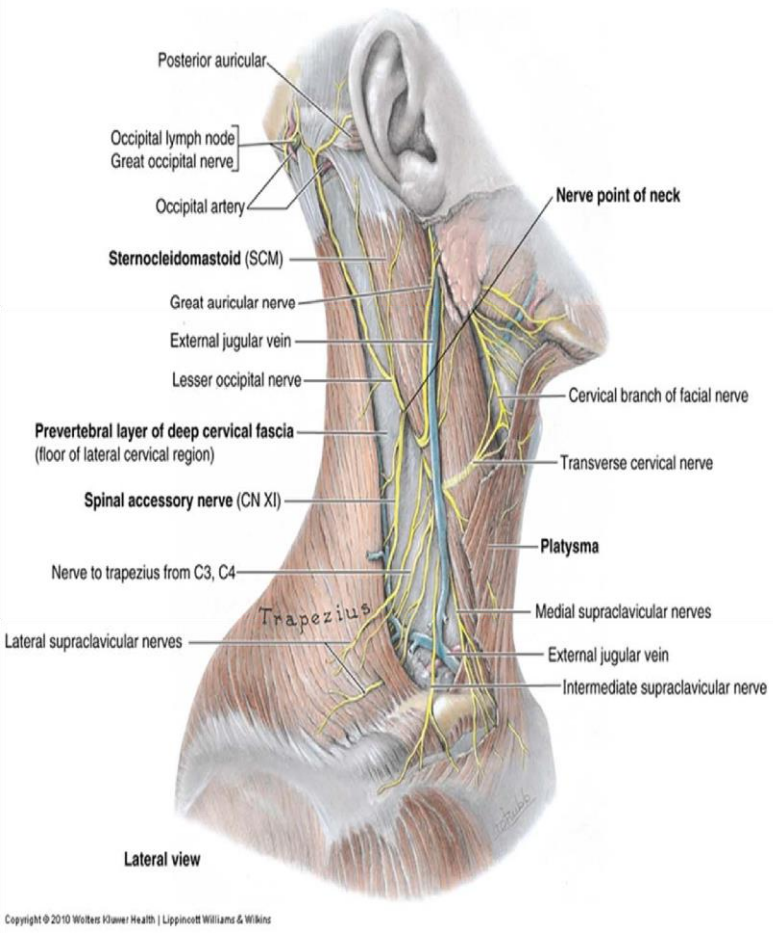


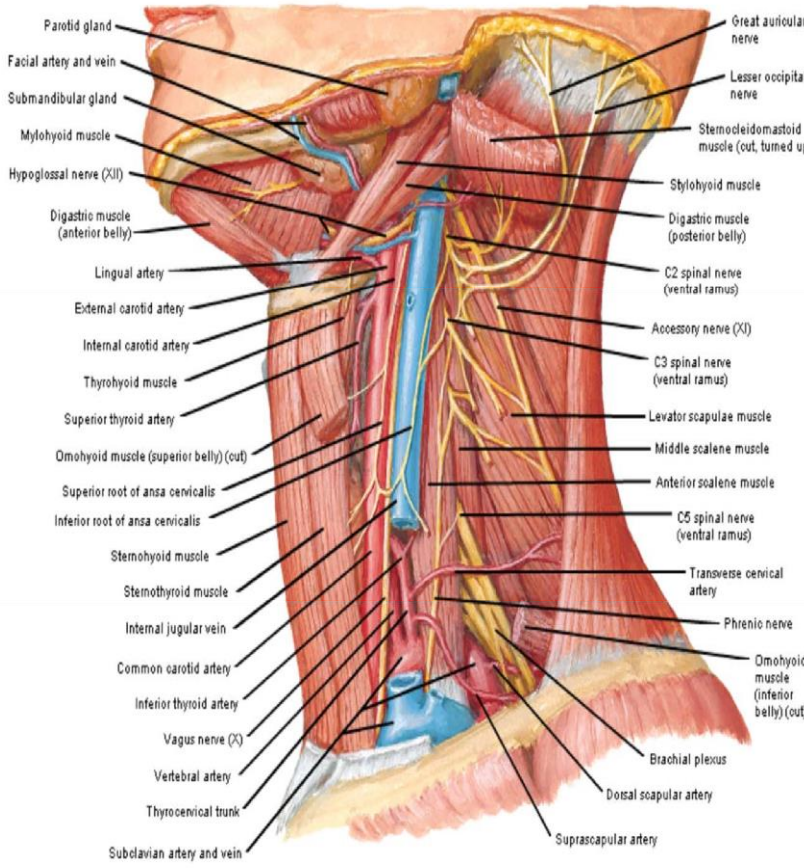
Origin of cervical plexus





Cervical Plexus Relations





Cervical Plexus Relations

- Cutaneous branches:
  - Lesser occipital n. (C2)
  - Greater auricular n. (C2-C3)
  - Transverse cervical n. (C2-C3)

    Innervates anterior part of cervical region.
  - Supraclavicular n. (C3-C4)

    Innervates cervical region close to the shoulder.

- Muscular branches
  - Ansa cervicalis (Infrahyoid mm.) is made up of:
    1. Descending branch from hypoglossal n. (C1){Superior Limb of AC}

    (C1 fibers merge with hypoglossal nerve to reach Geniohyoid & Thyrohyoid Muscles.)

    2. Descending cervical n. (C2-C3) {Inferior limb of AC}
  - Phrenic n. (C3-C5) Innervates diaphragm

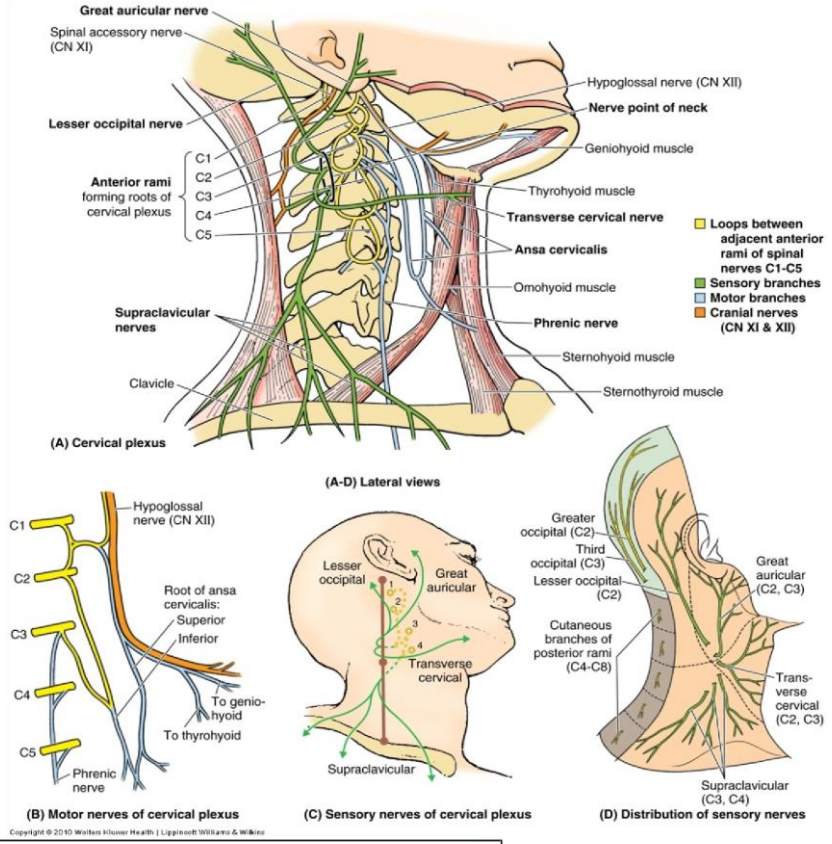


Table 17-1 Summary of the Branches of the Cervical Plexus and Their Distribution

Branches	Distribution
Cutaneous	
Lesser occipital	Skin of scalp behind ear
Greater auricular	Skin of parotid salivary gland, auricle, and angle of jaw
Transverse cutaneous	Skin over side and front of neck
Supraclavicular	Skin over upper part of chest and shoulder
Muscular	
Segmental	Prevertebral muscles, levator scapulae
Ansa cervicalis (C1, 2, 3)	Omohyoid, sternohyoid, sternothyroid
C1 fibers via hypoglossal nerve	Thyrohyoid, geniohyoid
Phrenic nerve (C3, 4, 5)	Diaphragm (most important muscle of respiration)
Sensory	
Phrenic nerve (C3, 4, 5)	Pericardium, mediastinal parietal pleura, and pleura and peritoneum covering central diaphragm

Thank You