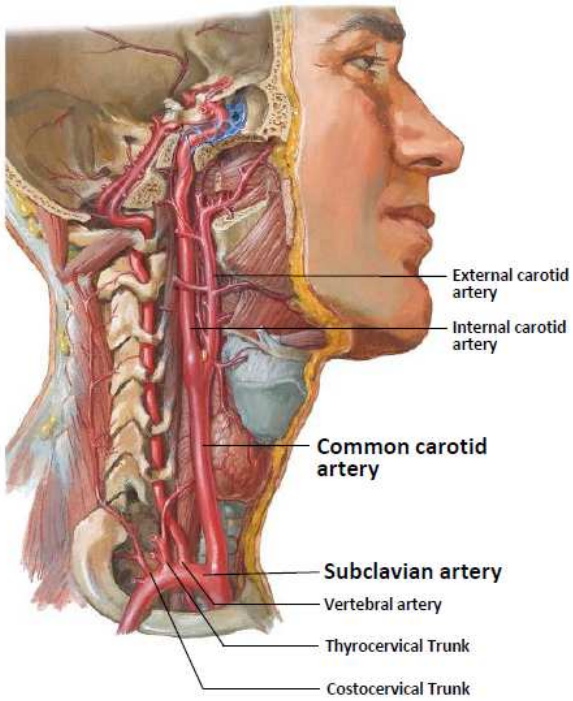
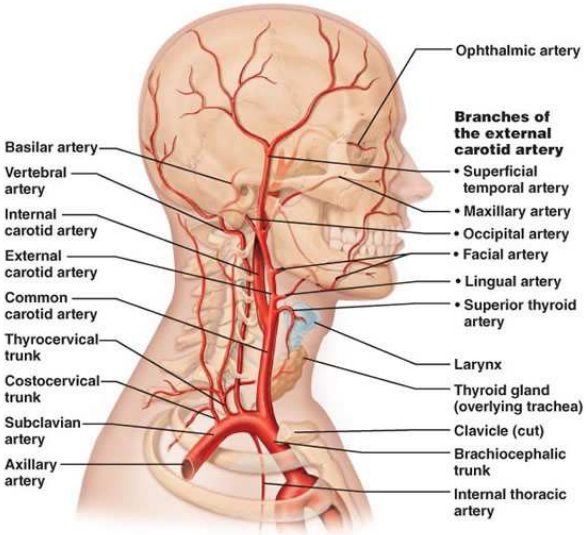
L2 Vasculature and Lymphatics of Head and Neck

A. Arterial Supply to Head and Neck

1. Arterial Supply to Head and Neck

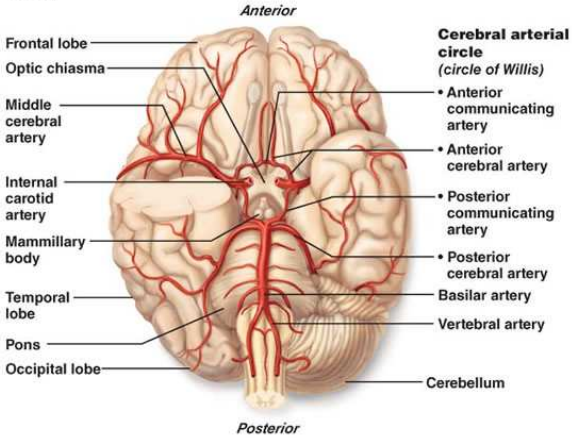
- Head and neck regions are supplied by branches of **common carotid** and **subclavian arteries**
- **Common carotid artery** gives
  - **External carotid artery**
  - **Internal carotid artery**
- **Subclavian artery** gives
  - **Vertebral artery**
  - **Thyrocervical trunk**
  - **Costocervical trunk**
- Regions of blood supply in H&N:
  - Each region supplied by 1 or 2 major arteries and supplemented by minor arteries
  - Extensive anastomoses present





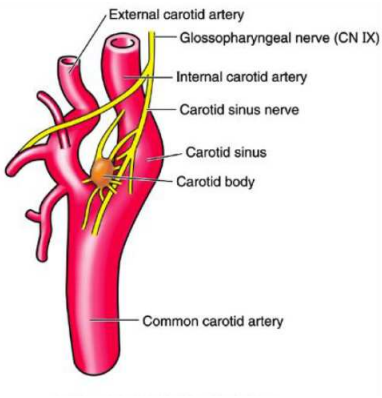
(b) Arteries of th e head and neck, right aspect

(c) Colorized arteriograph of the arterial supply of the brain

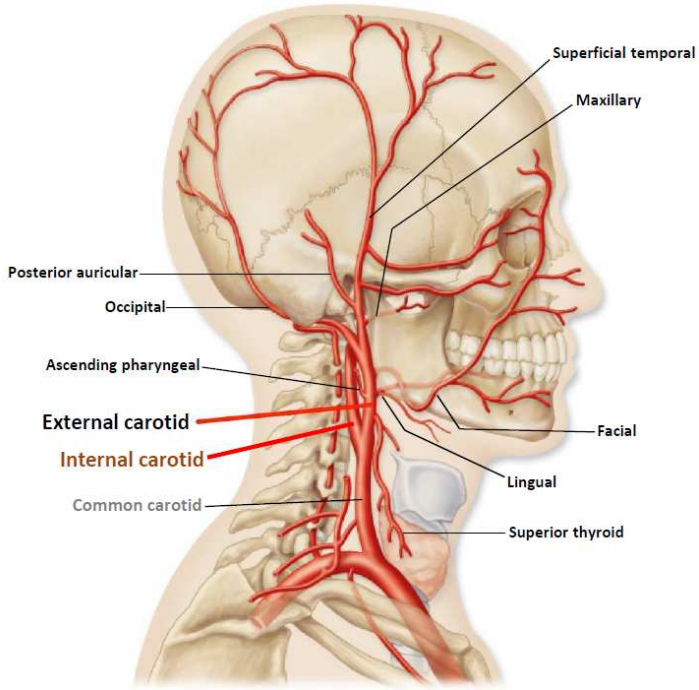


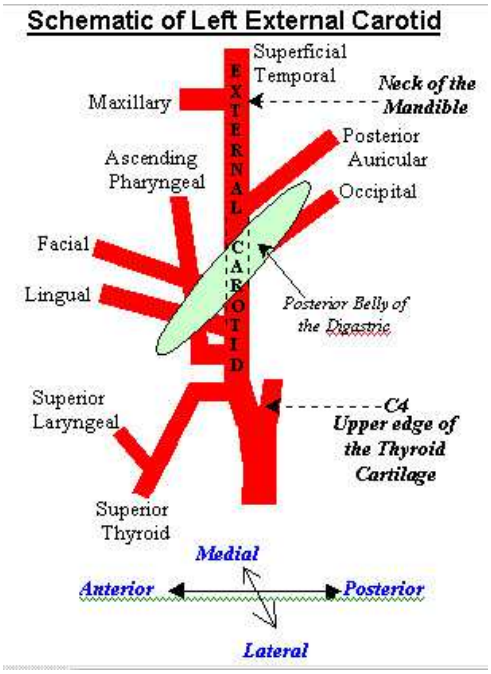
(d) Major arteries serving the brain (inferior view, right side of cerebellum and part of right temporal lobe removed)

a. Carotid System



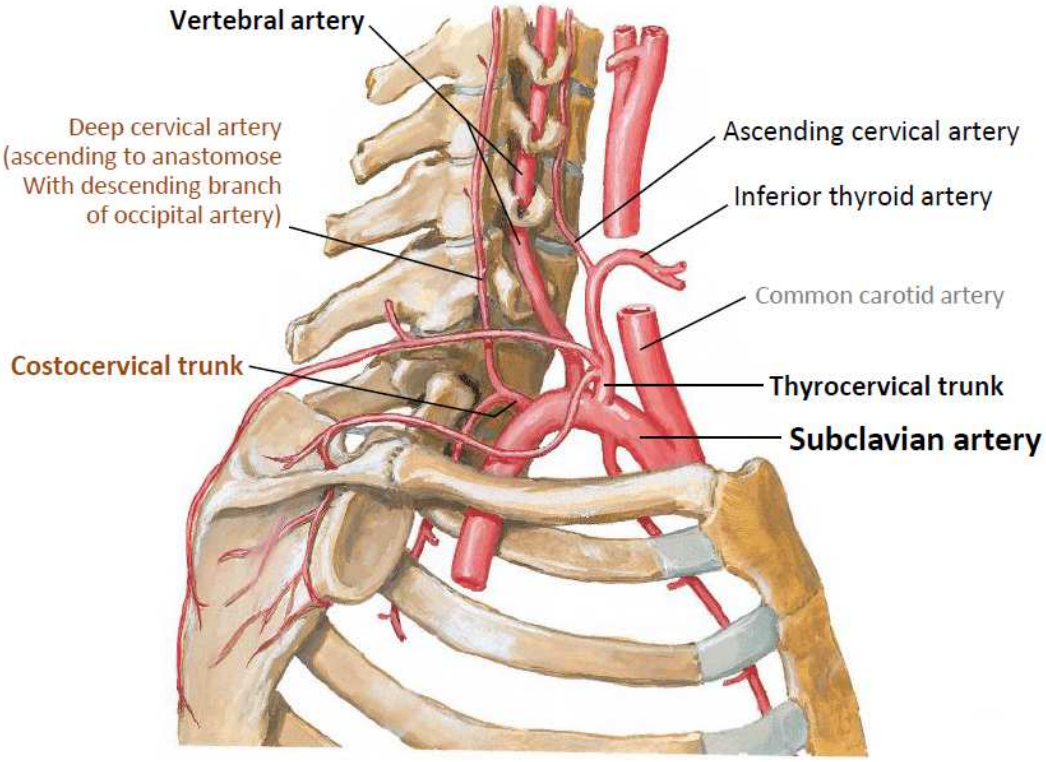
- **Common carotid artery** bifurcates at superior border of **thyroid cartilage** (C4)
- At the bifurcation,
  - **Carotid sinus**: slight dilatation of proximal part of internal carotid artery as a <u>baroreceptor</u>
    - → **Carotid sinus syncope**: fainting due to overstimulation
    - → **Carotid sinus massage**: maneouver to test autonomic function
  - **Carotid body**: ovoid mass of tissue located on medial wall of the bifurcation functioning as a <u>chemoreceptor</u>
- **Internal carotid artery** gives off <u>NO</u> branches in the neck to supply the brain and orbit
- **External carotid artery** gives off 8 branches supplying majority of the <u>superficial</u> structures of the head:
  - Anterior branches:
    - → **Superior thyroid** to thyroid gland and infrahyoid muscles
    - → **Lingual** to the tongue
    - → **Facial** rounding inferior margin of mandible to the face
  - Posterior branches:
    - → **Occipital** to posterior part of scalp
    - → **Posterior auricular** rising between mastoid process and external auditory meatus
  - Medial branch:
    - → **Ascending pharyngeal** turning medially to rise along pharynx
  - Terminal branches: at parotid gland
    - → **Superficial temporal** to temporal part of the scalp
    - → **Maxillary** through maxilla to the face





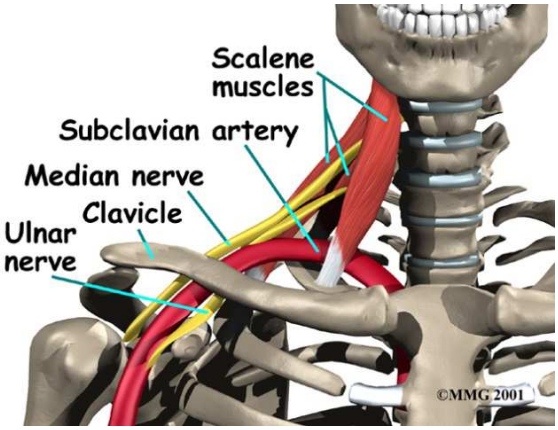
**Mnemonic: <u>S</u>ome <u>A</u>natomists <u>L</u>ike <u>F</u>reaking <u>O</u>ut <u>P</u>oor <u>M</u>edical <u>S</u>tudents. S/A/L/F/O branch off in carotid triangle.*

b. Branches of Subclavian Artery



- Branches from the 1st part:
  - **Vertebral artery** to the brain
  - **Internal thoracic artery**
  - **Thyrocervical trunk**:
    - → **Inferior thyroid a**. to thyroid gland
    - → **Ascending cervical a**. running just anterior to transverse processes
    - → **Suprascapular a.** as part of scapular anastomosis
    - → **Transverse cervical a.** to trapezius, SCM and scapular anastomosis
- Branch from the 2nd part: **costocervical trunk** (only branch)
  - **Deep cervical a.** running posterior to transverse processes
  - **Highest intercostal artery** to thoracic wall
- Branch from 3rd part: **dorsal scapular artery** to scapular anastomosis

The **subclavian artery is divided into three parts by the **scalene anterior** muscle.*
The second part runs under scalene anterior.



2. Regions of Blood Supply in Head

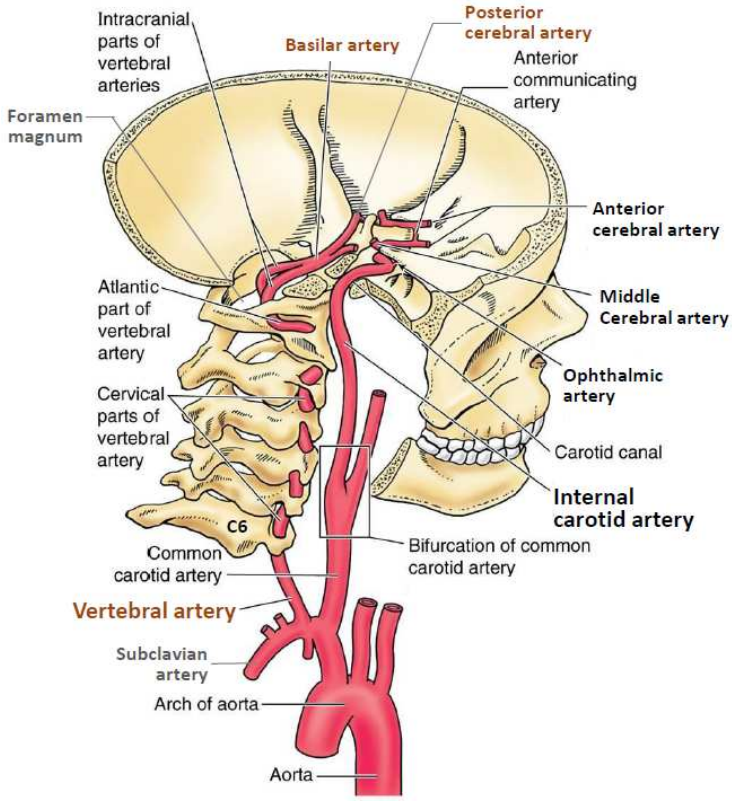
- Three main regions of blood supply in head:

Cranial cavity and orbit	Cranial cavity	**Vertebral + Internal carotid**
	Orbit	**Ophthalmic**
Superficial regions	Face	**Facial, supf. temporal, maxillary** **Ophthalmic**
	Temporal	**Superficial temporal**
	Scalp	**Occipital, post. auricular, supf. temporal** **Ophthalmic**
Deep Facial regions	Infratemporal	**Maxillary**
	Nasal and PN sinuses	**Maxillary, facial** **Opththalmic**
	Oral cavity	**Facial, maxillary, lingual**

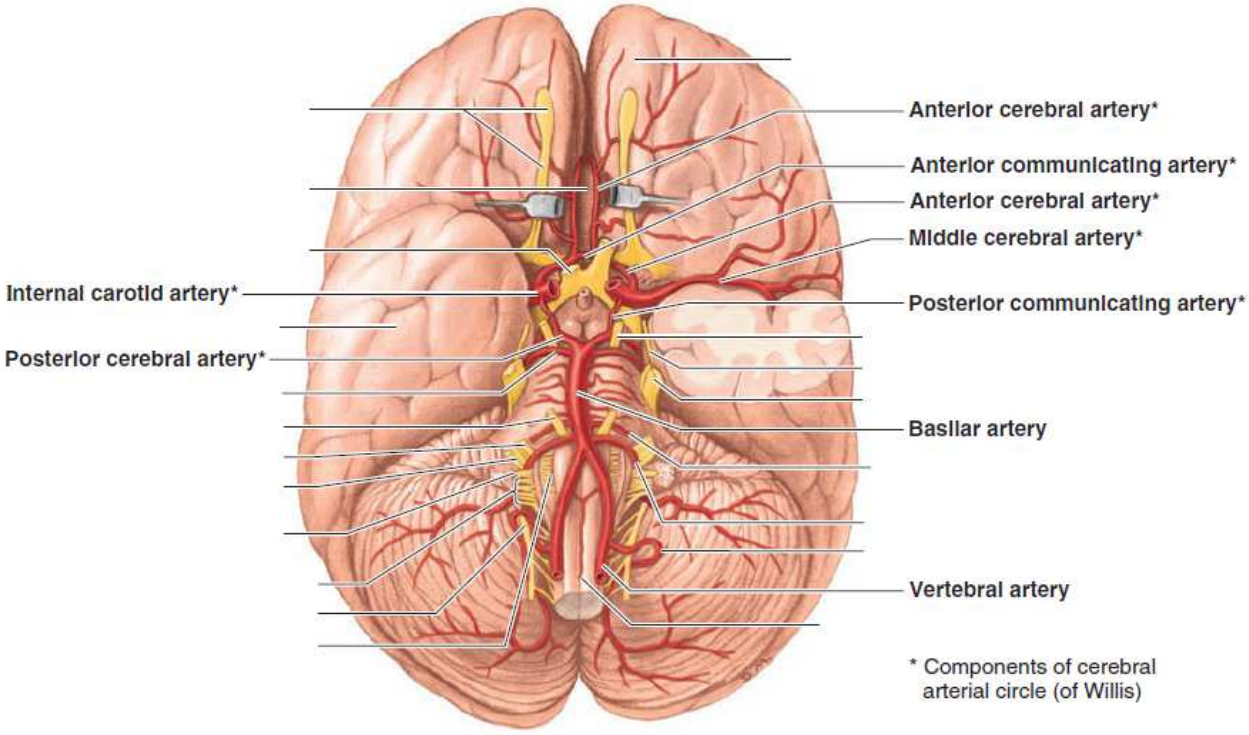
a. Cranial Cavity and Orbit

i. Cranial Cavity

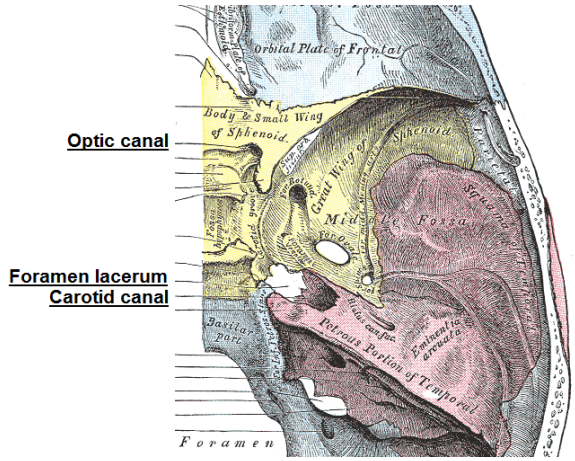
- Supplied by **internal carotid artery** and **vertebral artery**
- **Internal carotid artery**:
  - Enters neurocranium through **carotid canal** of petrous part of temporal bone
  - Emerges at **foramen lacerum**
  - Surrounded by a plexus of SN nerves from **superior cervical ganglion**
  - Branches:
    - → **Anterior** and **middle cerebral artery** → brain
    - → **Ophthalmic artery** → eyes, orbit, face and forehead



- **Vertebral artery** from **subclavian a.**
  - Ascends through **foramina transversarium** of C1-6
  - Enters cranial cavity via **foramen magnum**
  - Bilateral vertebral aa. join to form **basilar artery** and gives off two **posterior cerebral arteries** to supply the brain

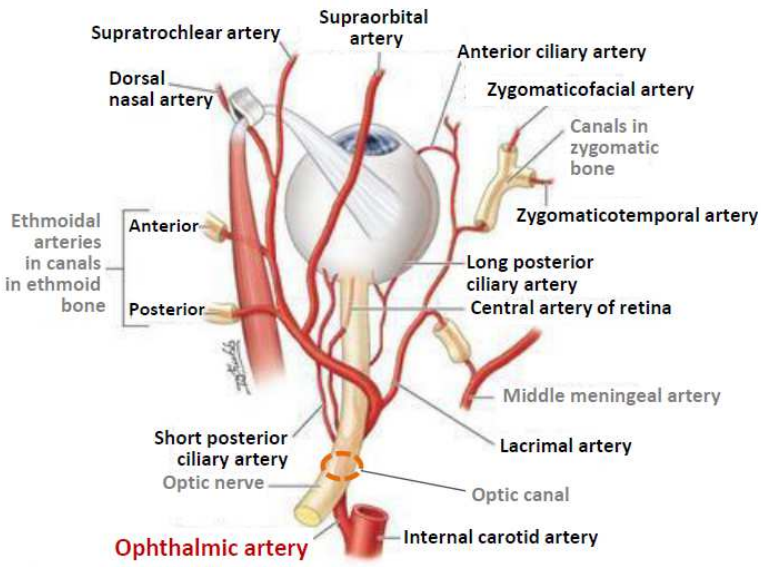


- **Circle of Willis**: a circular anastomosis formed by branches of ICA and vertebral artery for supplying blood to the brain
- Formed by:
  - **Anterior cerebral arteries**
  - **Anterior communicating artery** joining bilateral ant. cerebral aa.
  - **Internal carotid artery**
  - **Posterior cerebral arteries**
  - **Posterior communicating artery** joining bilateral post. cerebral aa.

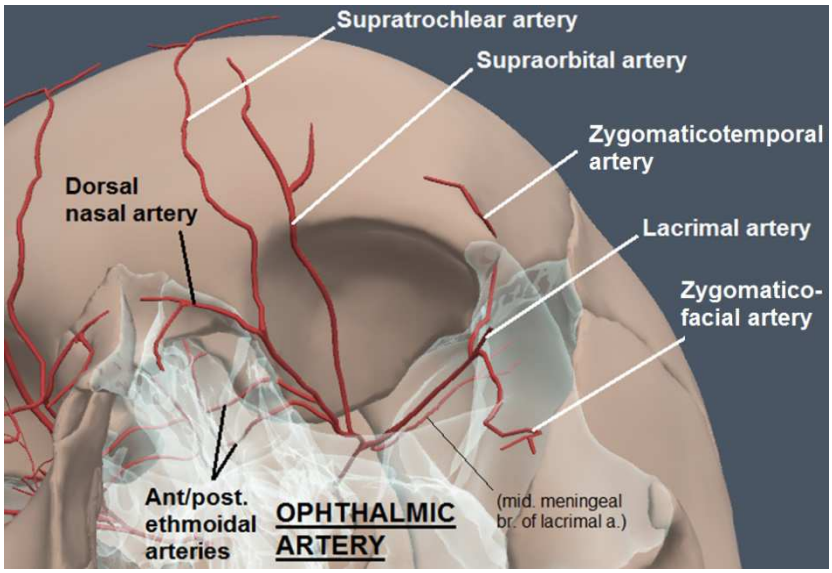


ii. Orbit

- Chief supply by **ophthalmic artery**:
  - Enters orbit through **optic canal** together with optic nerve
- **Ocular branches** supplying the eye:
  - **Central artery of retina**
    - → Pierces optic n. and runs within it
    - → Emerges at the optic disc to supply **retina**
    - → An <u>end artery</u>: only blood supply to retina
      - → blindness if blocked
  - **Anterior** and **posterior ciliary artery** → pierces sclera to supply choroid of the eye



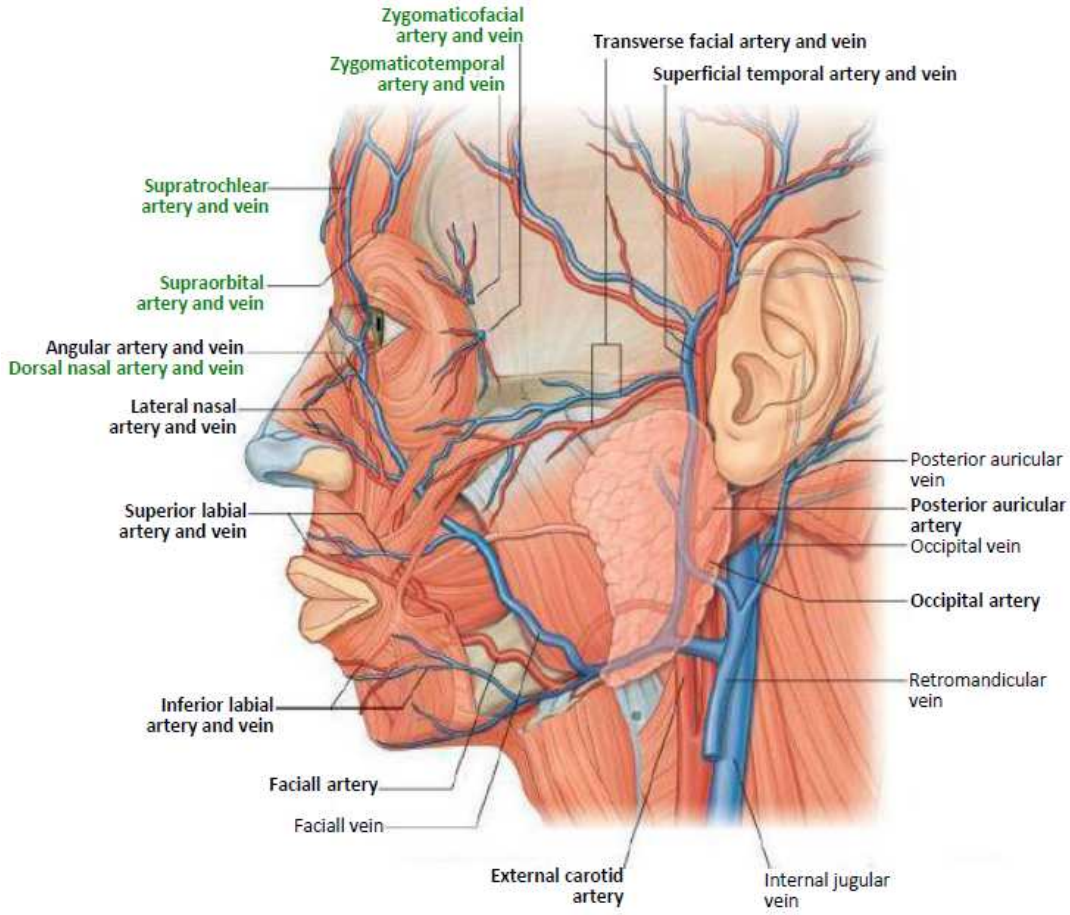
- **Orbital branches** supplying the orbit and surrounding structures:
  - Superiorly: **supratrochlear** and **supraorbital aa.** to forehead
  - Laterally: **lacrimal a.** then giving off **zygomaticofacial** and **zygomaticotemporal aa.** after passing through zygomatic bone
  - Medially:
    - → **A/P ethmoidal aa.** into the ethmoidal sinus and nasal cavities
    - → **Dorsal nasal a.** to dorsal surface of the nose

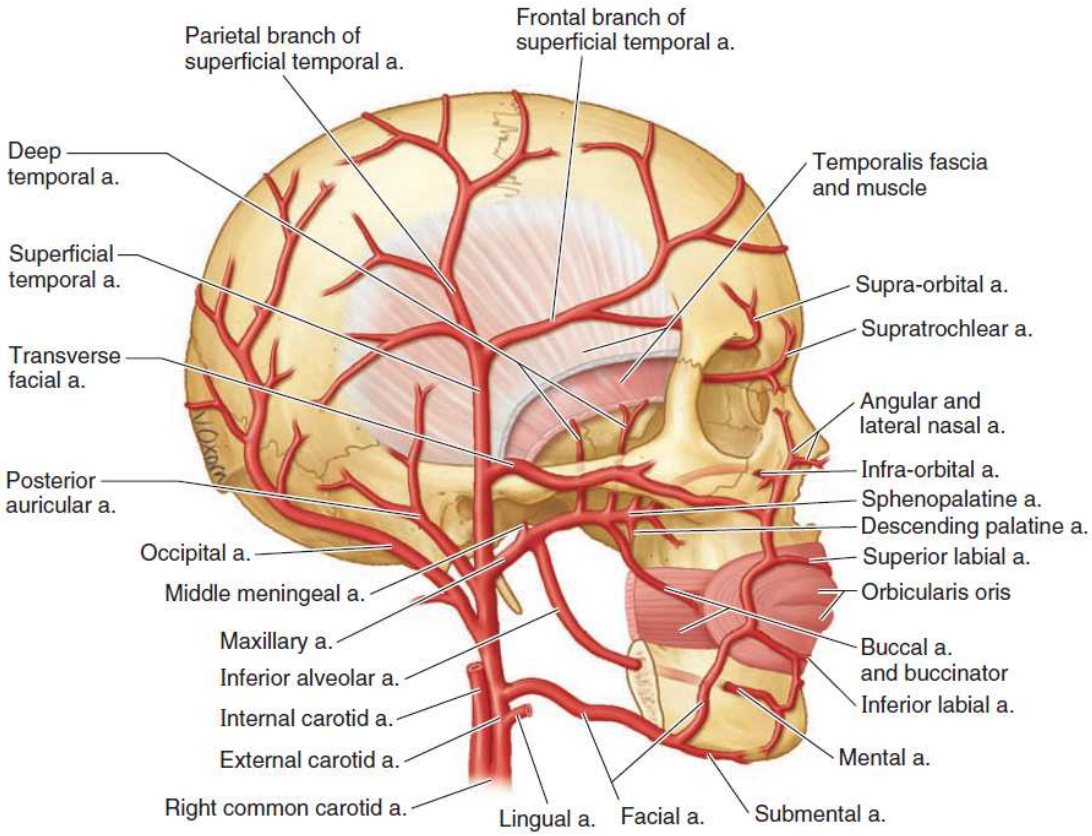


**Note that all orbital branches except A/P ethmoidal eventually emerges onto face.*

b. Superficial Structures

i. Face

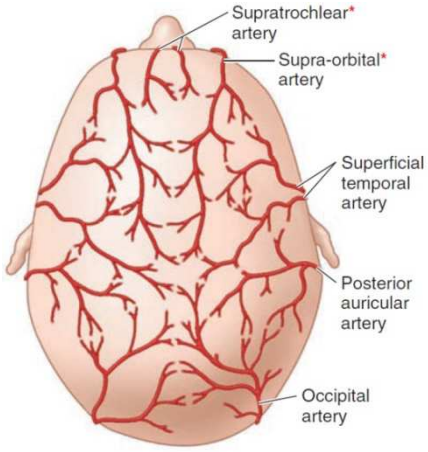




- Supplied by branches of **facial**, **superficial temporal**, **maxillary** and **ophthalmic arteries**
- Branches of **facial artery**:
  - **Superior labial a.** → upper lip, nose
  - **Inferior labial a.** → lower lip
  - **Lateral nasal a.** → skin on ala and dorsum of nose
  - **Angular a.** (terminal branch) → medial angle of eye
- Branch of **superficial temporal artery**:
  - **Transverse facial artery** running along zygomatic bone → parotid gland and musculocutaneous structures of face
- Branches of **maxillary artery**:
  - **Infra-orbital a.** through the maxilla bone emerging at the infra-orbital foramen
  - **Buccal a.** → cheeks
  - **Mental a.** as terminal br. of inferior alveolar a.
- Branches of **ophthalmic artery**:
  - **Supratrochlear** and **supraorbital aa.** → forehead
  - **Dorsal nasal a.**
  - **Zygomaticofacial** and **zygomaticotemporal aa.**

Nerve	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		Passes posteriorly, deep to parotid gland, along styloid process between mastoid process and ear	Auricle and scalp posterior to auricle
Superficial temporal	Smaller terminal branch of external carotid artery	Ascends anterior to ear to temporal region and ends in scalp	Facial muscles and skin of 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	Terminal branch of ophthalmic artery, a branch of internal carotid artery	Passes superiorly from supra-orbital foramen	Muscle and skin of forehead and scalp
Supratrochlear		Passes superiorly from supratrochlear notch	Muscles and skin of scalp

ii. Scalp



- Branches of external carotid artery:
  - **Occipital artery**
  - **Posterior auricular artery**
  - **Superficial temporal artery**
- Branches of ophthalmic artery (from ICA):
  - **Supratrochlear artery**
  - **Supra-orbital artery**

**Extensive anastomoses present between arteries and veins in the face and scalp.*

For instance,

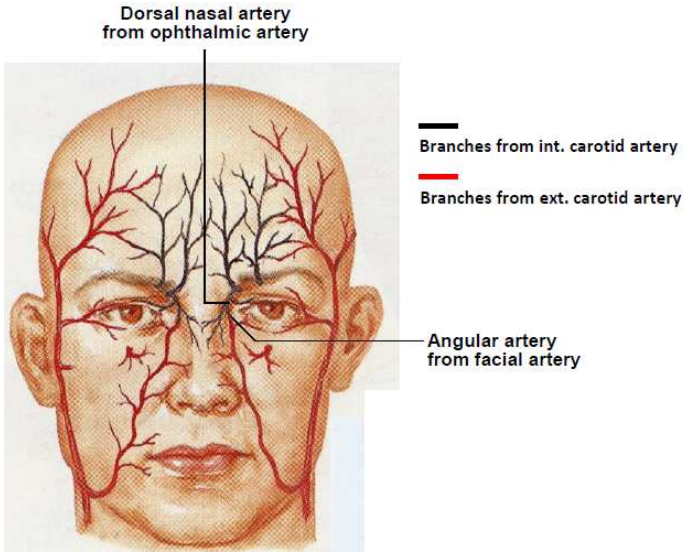
Two ipsilateral arteries:

- ***Superficial temporal** and **posterior auricular aa.***
- ***Superficial temporal** and **supraorbital aa.***
- ***Angular** and **dorsal nasal aa.***

Same artery with its contralateral counterpart:

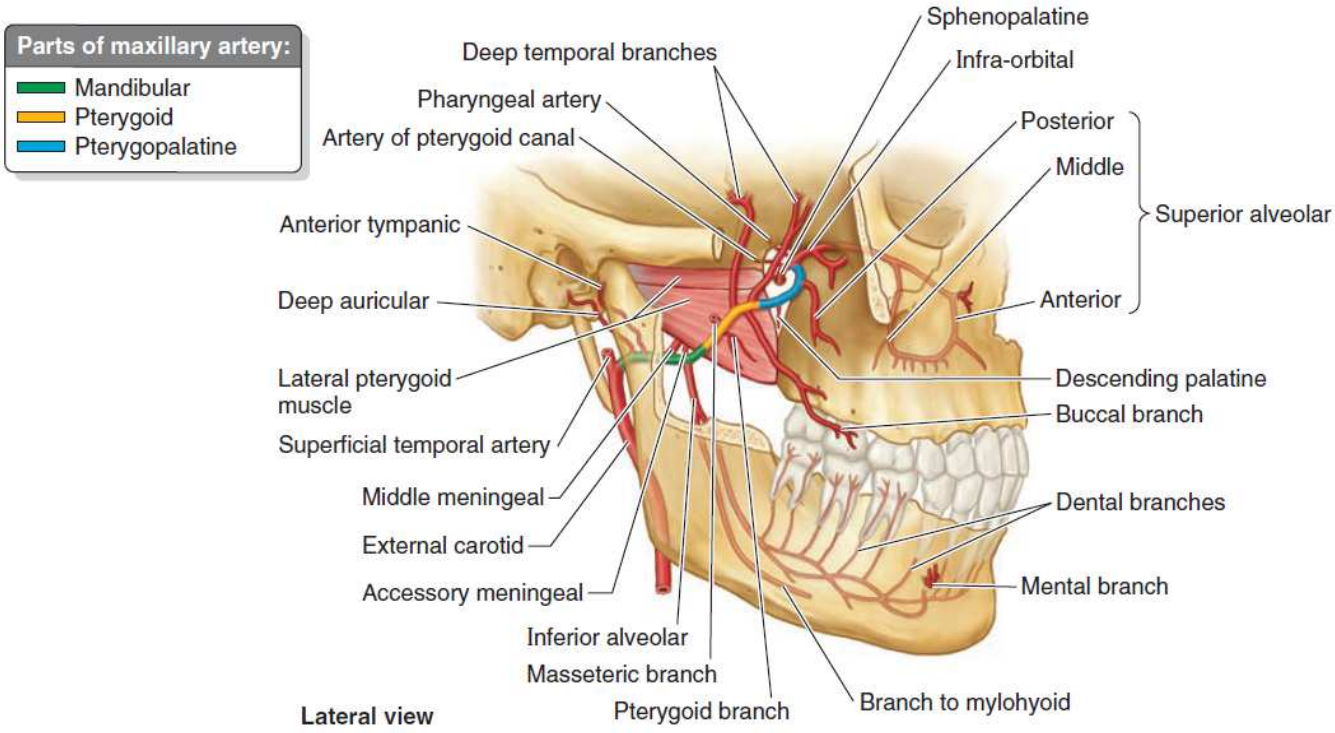
- ***Right** and **left superficial temporal aa.***

(List not exhaustive)



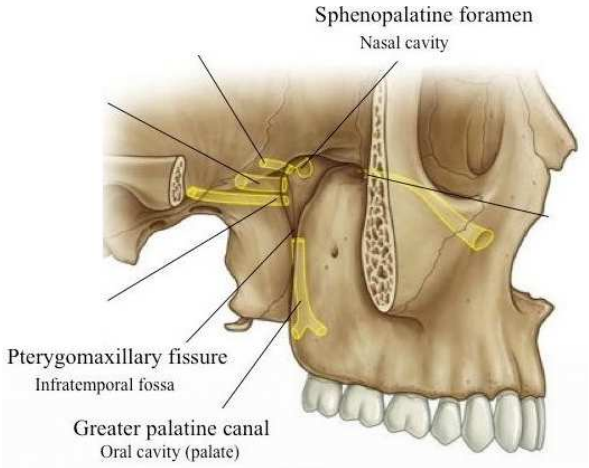
c. Deep Facial Regions

i. Infratemporal Region



- **Maxillary artery**: major artery to the deep facial regions
- Course:
  - Arises posterior to neck of mandible and passes under it
  - Passes through infratemporal fossa either superficial or deep to **lateral pterygoid muscle** (a muscle of mastication)
  - Passes through **pterygomaxillary fissure** into **pterygopalatine fossa**
- Divided by the **lateral pterygoid muscle** into three parts
- **First (retromandibular) part** behind neck of mandible → branches pass through foramen and fissures
  - **Middle meningeal a.** → foramen spinosum → dura and calvaria
  - **Accessory meningeal aa.** → foramen ovale → cranial cavity
  - **Ant. tympanic a.** → petrotympanic fissure → tympanic membrane
  - **Deep auricular a.** → external auditory meatus
  - **Inferior alveolar a.** → mandibular foramen → mandible, gingivae, teeth and floor of mouth
- **Second (pterygoid) part** supplies muscles
  - **Deep temporal aa.** → temporalis
  - **Pterygoid aa.** → medial and lateral pterygoid muscles
  - **Buccal a.** → buccinators and mucosa of cheek
  - **Masseter a.** → masseter muscle

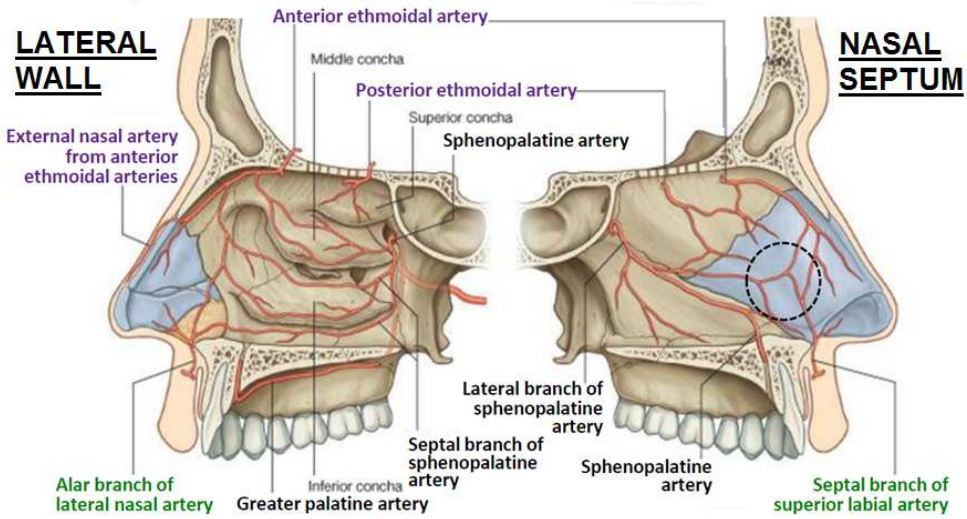
- **Third (pterygopalatine) part** with branches passing through foramen or fissures
  - **Sphenopalatine a.** → pterygomaxillary fissure → pterygopalatine fossa → **sphenopalatine foramen** → nasal cavity
  - **Infraorbital a.** → infraorbital foramen → face
  - **Posterior superior alveolar a.** → alveolar foramen → upper molars
  - **Descending palatine a.** → pterygomaxillary fissure → pterygopalatine fossa → greater palatine canal → palate



Pathways of Pterygopalatine Fossa

**Sphenopalatine foramen* *is a gap formed when the superior margin of perpendicular plate of palatine bone fits onto anterior surface of sphenoid bone. It leads from pterygopalatine fossa medially into the nasal cavity.*

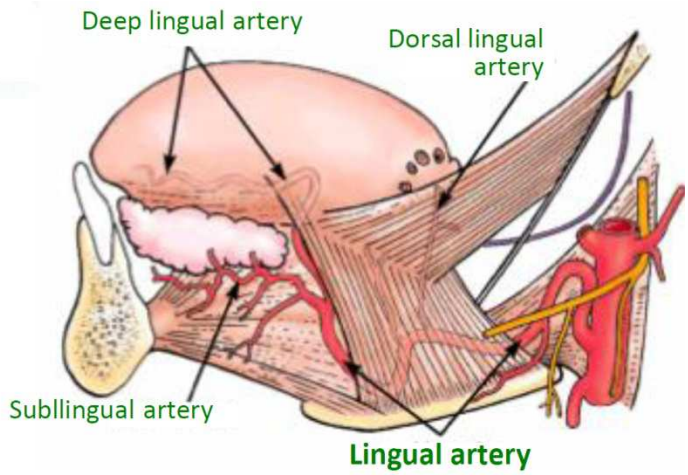
ii. Nasal Cavity and Paranasal Sinuses



- Supplied by branches of **maxillary**, **facial** and **ophthalmic arteries**
- Branches of **maxillary artery**:
  - **Sphenopalatine artery** from sphenopalatine foramen
    → Lateral br. crosses roof of nasal cavity onto nasal septum
  - **Greater palatine artery**: a direct continuation of descending palatine artery
- Branches of **facial artery**:
  - **Superior labial artery** giving a **septal branch**
  - **Lateral nasal artery** giving an **alar branch**
- Branches of **ophthalmic artery**: **anterior** and **posterior ethmoidal arteries**

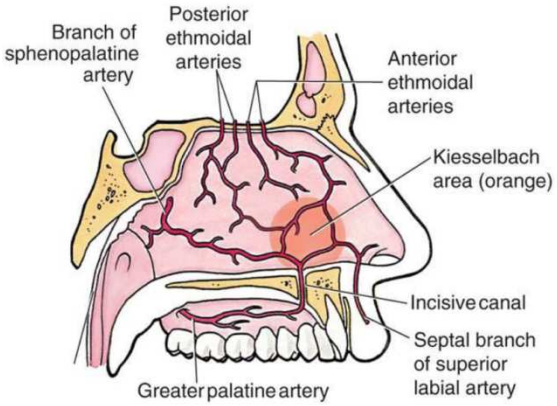
Kiesselbach area* *refers to anterior 1/3 of nasal septum where four arteries anastomose to give a rich blood supply.* ***Epistaxis* *frequently occurs there.*

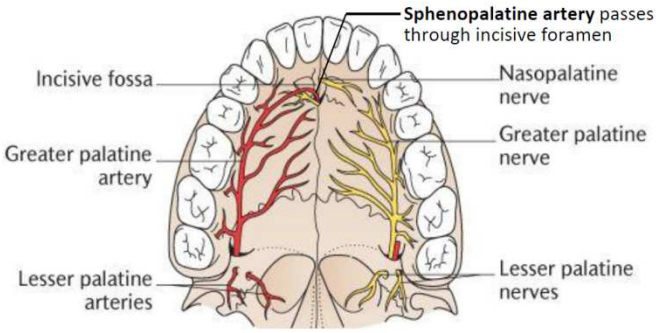
iii. Oral Cavity



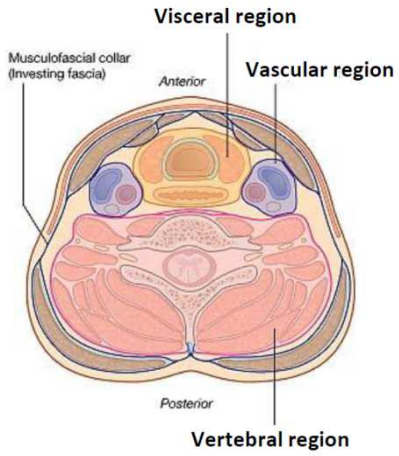
- Supplied by branches of **facial**, **maxillary** and **lingual arteries**
- Branches of **facial artery** to lips
  - **Superior labial artery**
  - **Inferior labial artery**
- Branches of **maxillary artery** to teeth
  - **Superior alveolar artery**
  - **Inferior alveolar artery**
- Branches of **lingual artery** to tongue
  - **Dorsal lingual artery** to root of tongue
  - **Deep lingual artery** to anterior part of tongue
  - **Sublingual artery** to sublingual gland and floor of mouth

(1) Palate





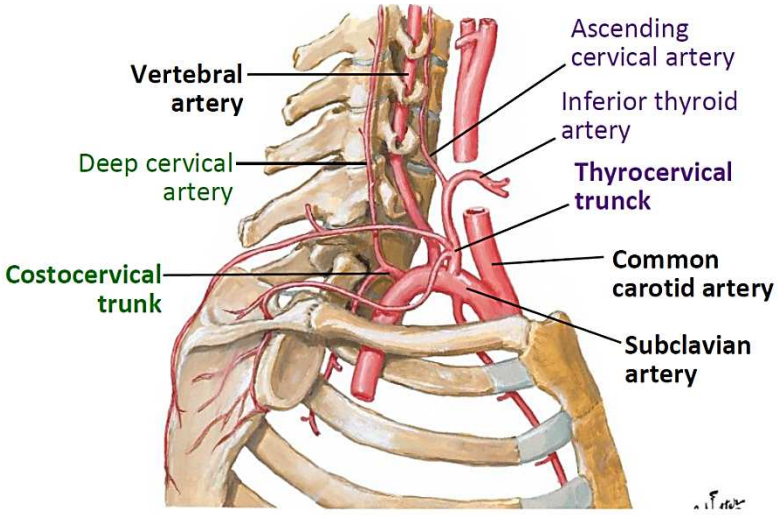
- Supplied by branches of **maxillary artery**
- **Sphenopalatine artery** entering via **incisive foramen** after passing through nasal cavity
- **Descending palatine artery** gives two terminal branches:
  - **Greater palatine artery** passes through greater palatine foramen and passes along the palate forward to join the sphenopalatine a.
  - **Lesser palatine artery** passes through lesser palatine foramen and supplies the soft palate

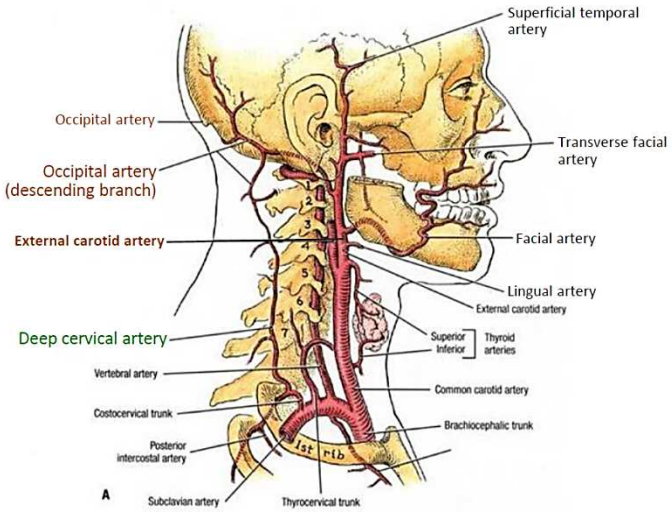


3. Regions of Arterial Supply in the Neck

- Supplied by branches of **external carotid** and **subclavian arteries**
- Can be divided by fascial sheaths into:
  - **Vertebral region**
  - **Visceral region**
  - **Vascular region** (supplied by the vessels inside)

a. Vertebral Region



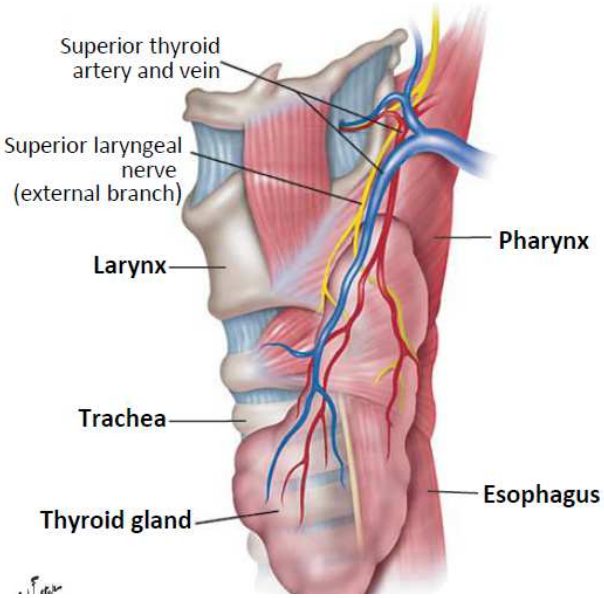


- Supplied by branches of **vertebral a.**, **thyrocervical** and **costocervical trunks**
- **Vertebral artery** through foramen transversarium
- Branches of **thyrocervical trunk**:
  - **Inferior thyroid artery**
  - **Ascending cervical artery** anterior to transverse process
- Branch of **costocervical trunk**:
  - **Deep cervical artery** posterior to transverse process

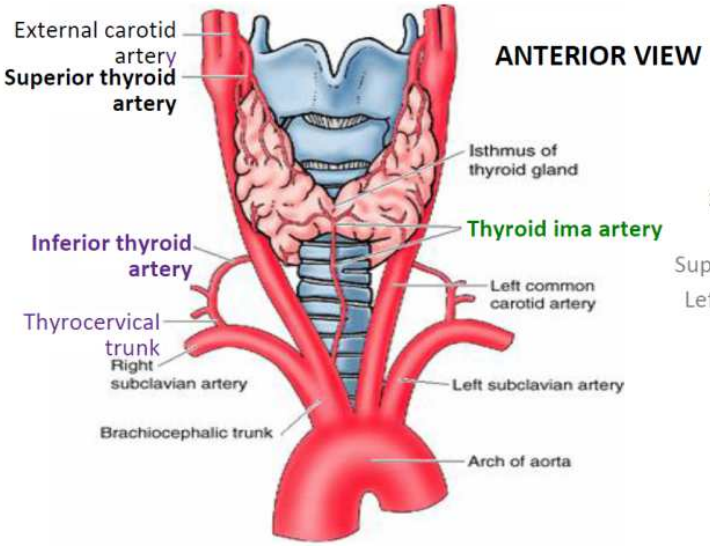
Note that **deep cervical artery anastomose with descending branch of **occipital artery** as it ascends through posterior aspect of the neck.*

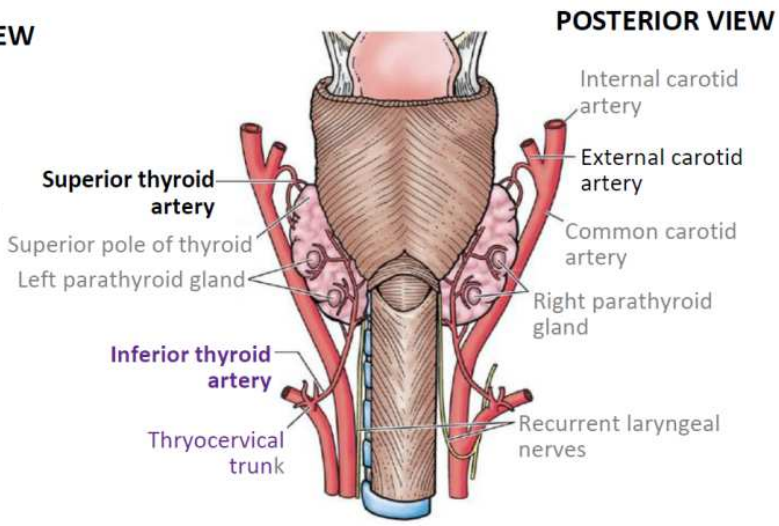
b. Visceral Region

- Divided into three layers:
  - **Endocrine layer**: thyroid and parathyroid
  - **Respiratory layer**: larynx and trachea
  - **Alimentary layer**: pharynx and esophagus



i. Endocrine Layer

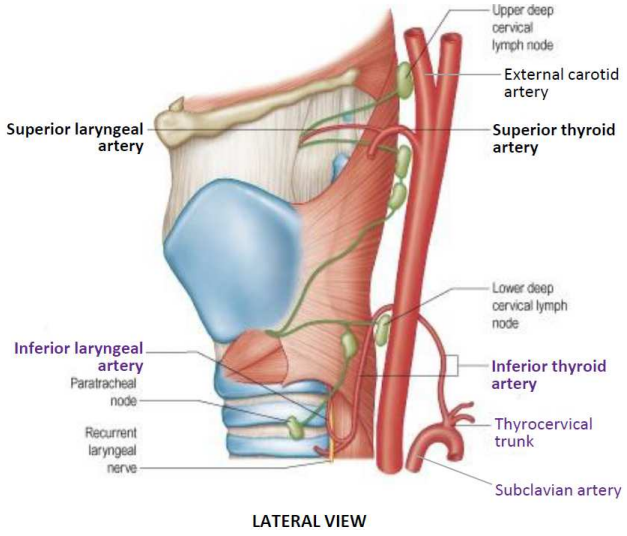




- **Superior thyroid artery** from **external carotid artery** → upper part
- **Inferior thyroid artery** from **thyrocervical trunk** → lower part + parathyroid
- **Thyroid ima artery**: an anatomical variant
  - Only present in 3-10% of population
  - Arises directly from **subclavian a.**
  - Supplies the lower part of thyroid
  - May be damaged in **tracheotomy**

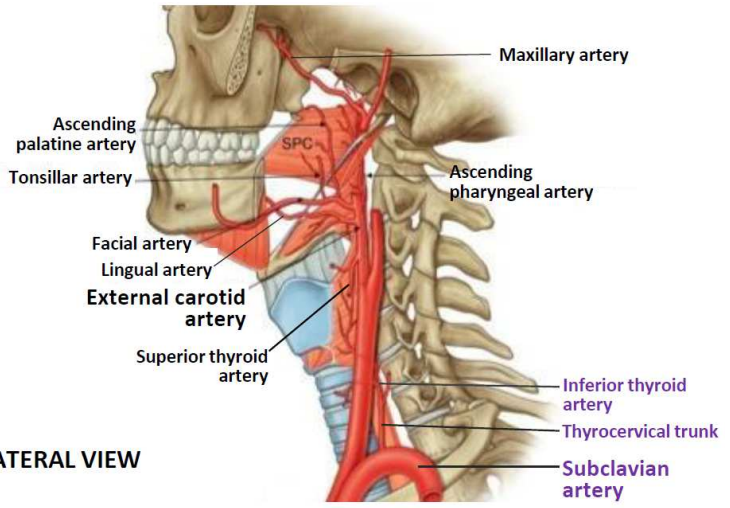
ii. Respiratory Layer

- **Superior laryngeal artery**
  - From **superior thyroid artery**
  - Passes through **thyrohyoid membrane**
  - Supplies superior part of larynx
- **Inferior laryngeal artery**
  - From **inferior thyroid artery**
  - Supplies inferior part of larynx



iii. Alimentary Layer

- Branches of external carotid a.:
  - **Ascending pharyngeal a.**
  - **Facial a. → ascending palatine** and **tonsillar aa.**
  - **Lingual a.**
  - **Superior thyroid a.**
  - **Maxillary a.**
- Branch of subclavian a.:
  - **Pharyngeal br. of inferior thyroid a.**



4. Summary of Arterial Supply of the Head and Neck

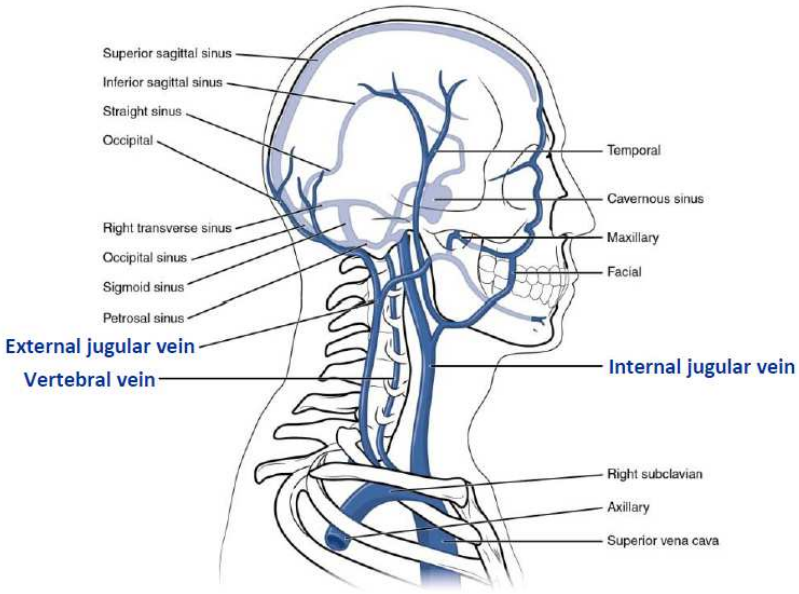
Region	Structure	Arteries
Cranial cavity and orbit	Brain	**ICA** → anterior and middle cerebral **Vertebral** → **basilar** → posterior cerebral
	Eye	Ocular br. of **ophthalmic** (central a. of retina, ant/post ciliary)
	Orbit	Orbital br. of **ophthalmic**
Head superficial	Facial	**Ophthalmic** → supraorbital, supratrochlear, dorsal nasal, zygomaticofacial, zygomaticotemporal **Facial** → sup/inf labial, lateral nasal, angular **Maxillary** → infraorbital, buccal, mental **Superficial temporal** → transverse facial
	Temporal	**Superficial temporal**
	Scalp	**Ophthalmic** → supraorbital, supratrochlear **Superficial temporal**, **posterior auricular**, **occipital**
Deep facial	Infratemporal	Branches of **maxillary**
	Nasal cavity and PN sinus	**Ophthalmic** → ant/post ethmoidal **Maxillary** → sphenopalatine, greater palatine (from descending palatine) **Facial** → lateral nasal, superior labial
	Oral cavity	**Facial** → superior and inferior labial **Maxillary** → superior and inferior alveolar **Lingual** → dorsal lingual, deep lingual and sublingual
	Palate	**Maxillary** → sphenopalatine, descending palatine (greater and lesser palatine)
Neck vertebral	Neck vertebral	**Vertebral** **Thyrocervical** → inf. thyroid, ascending cervical **Costocervical** → deep cervical
Neck visceral	Endocrine	**Superior thyroid** **Thyrocervical** → inferior thyroid
	Respiratory	**Superior thyroid** → superior pharyngeal **Thyrocervical** → inferior thyroid
	Alimentary	**Ascending pharyngeal**, **lingual**, **sup. thyroid**, **maxillary** **Facial** → ascending palatine, tonsillar **Thyrocervical** → inferior thyroid → pharyngeal branch

Colour code: branches of **ICA, **ECA**, **SCA***

B. Venous Drainage in Head and Neck

1. Overview on Venous Drainage in Head and Neck

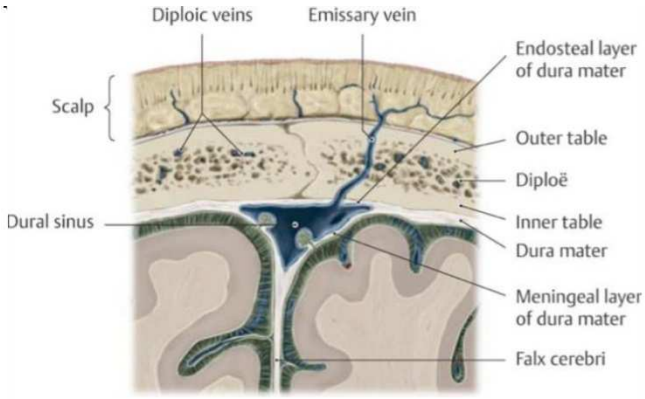
- **Brain** and **meninges** drain via:
  - **Cerebral veins**
  - **Dural venous sinuses**
- **Head** and **face** drain via:
  - Veins following arteries with same name as their counterparts
- **Neck** drains via:
  - **Anterior jugular veins**
  - **External jugular veins**
  - **Internal jugular veins**
  - **Vertebral veins**
- Various anastomoses and variability occur in venous channels in head and neck

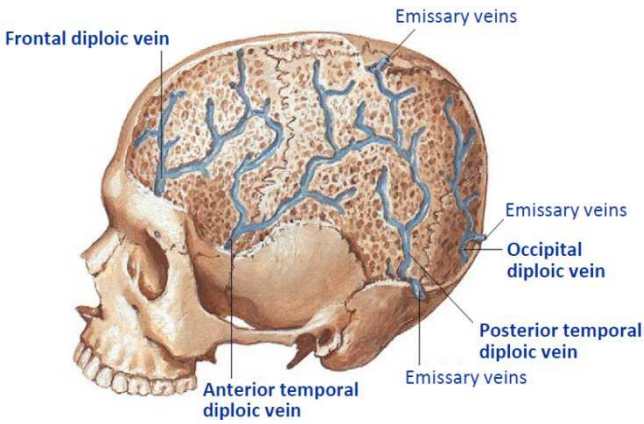


2. Venous Drainage of Head

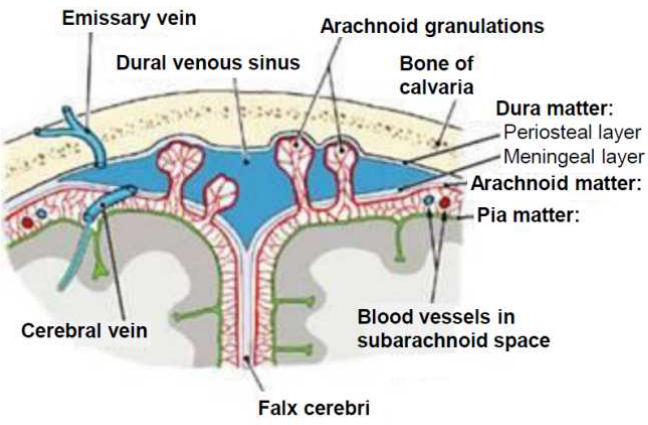
a. Venous Drainage of the Skull

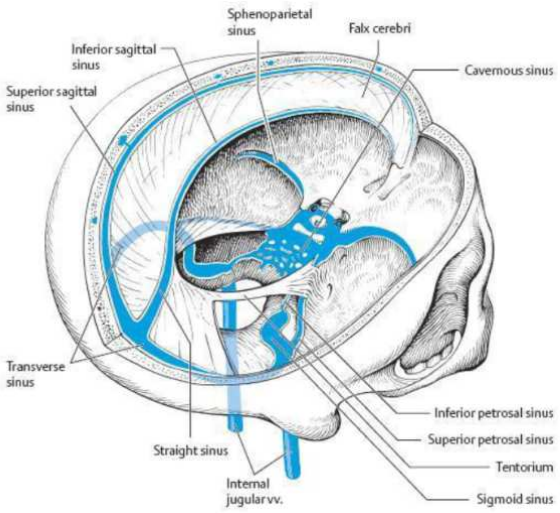
- **Diploic veins** lying in **diploë** of cranial bones
  - **Diploë**: spongy bone separating two layers of cortical bone in calvaria
- **Emissary veins**: small veins passing through foramen in cranial bones
  - Connects **dural venous sinuses** inside skull (intracranial) with extracranial veins
  - Note that they are <u>valveless</u> → extracranial infections in scalp and face can pass into cranial cavity via emissary veins → osteomyelitis, meningitis, encephalitis



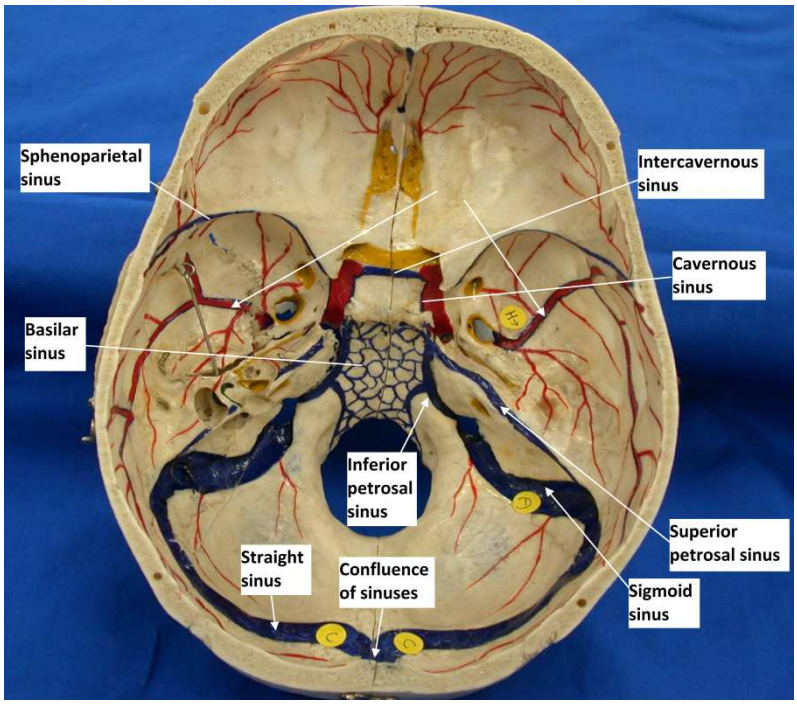


i. Dural Venous Sinuses

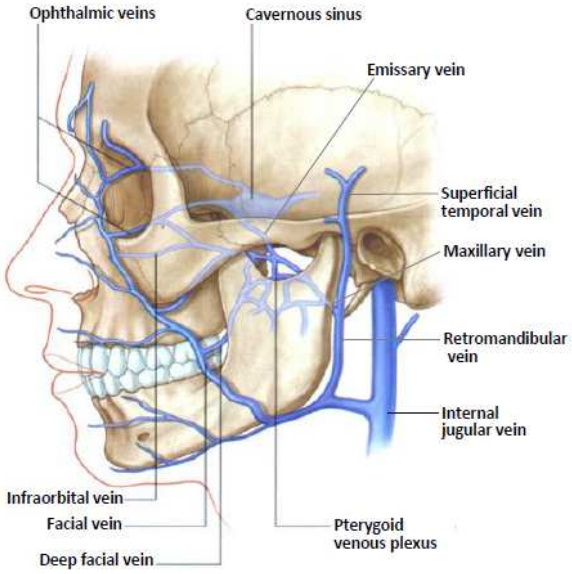




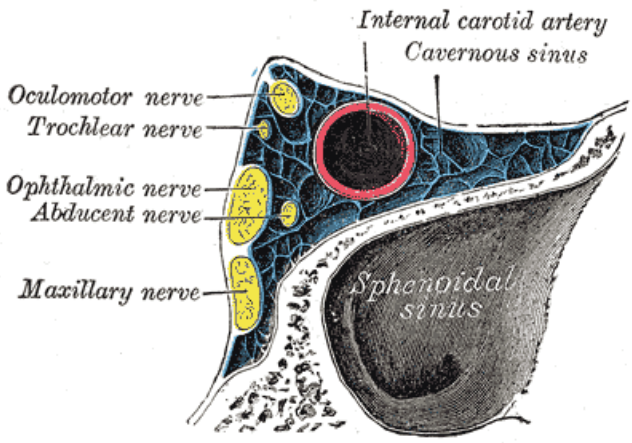
- **Dural venous sinuses**: venous sinuses formed between <u>two layers of dura mater</u>
- Receives blood from the brain
- Drain into <u>internal jugular veins</u>
- Includes:
  - **Superior** and **inferior sagittal sinuses** running along the margins of falx cerebri
  - **Straight sinus** running posteriorly along midline to drain inferior sagittal sinus and great cerebral veins
  - **Confluence of sinuses** formed by joining of superior sagittal and straight sinuses
  - **Transverse sinus** running anteriorly along attachment of tentorium cerebelli to base of petrous temporal
  - **Sigmoid sinus** running inferomedially into jugular foramen
  - **Cavernous sinus** located on either side of sella turcica
  - **Superior petrosal sinus** running posteriorly along petrous temporal bone from cavernous sinus into transverse sinus
  - **Inferior petrosal sinus** running posteriorly from cavernous sinus into internal jugular vein at jugular foramen
  - **Sphenoparietal sinus** running medially on the underside of lesser wing
  - **Basillar sinus** connecting bilateral inferior petrosal sinuses and vertebral venous plexus



(1) Cavernous Sinus

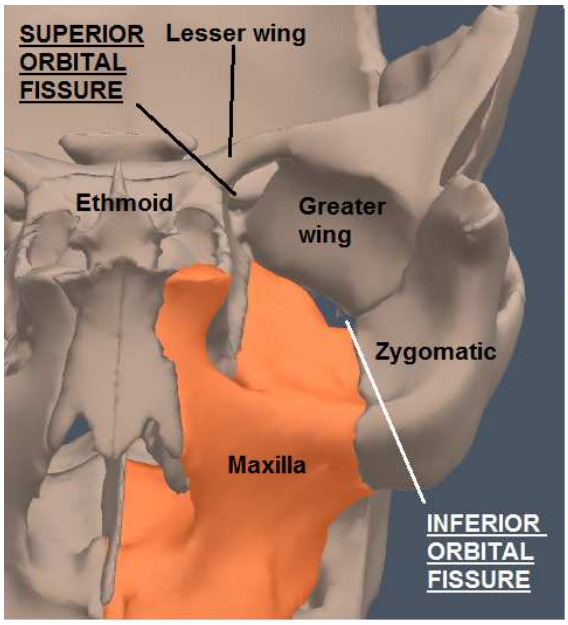


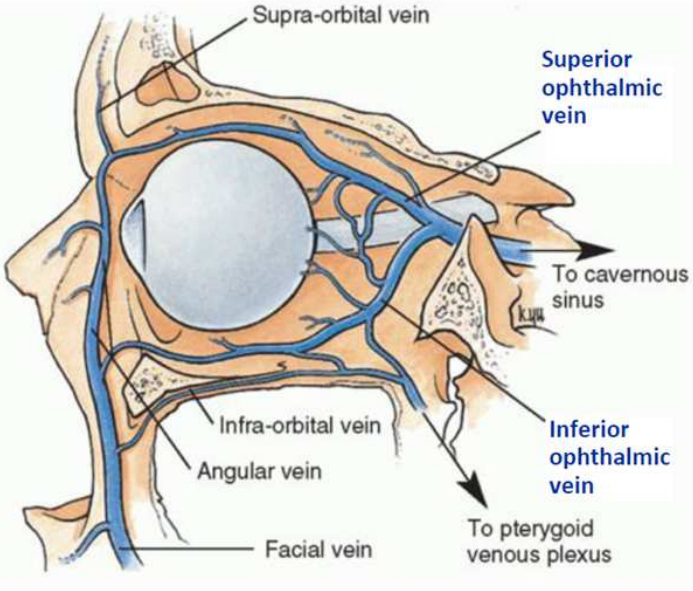
- ‘Cave-like’ with multiple trabeculae
  → liable to thrombus formation
- Locates on each side of **pituitary fossa** and body of sphenoid
- Receives blood from:
  - **Superior** and **inferior ophthalmic vv.**
  - **Cerebral vv.**
  - **Spheno-parietal sinuses**
  - **Pterygoid plexus** and its associated **deep facial veins**
- Valveless → susceptible to infection from multiple sites
- Contents:
  - Traverses the sinus:
    → **Internal carotid artery**
    → **Abducens nerve (CN VI)**
  - In lateral wall:
    → **Oculomotor nerve (CN III)**
    → **Trochlear nerve (CN IV)**
    → **Ophthalmic nerve (CN V_1)**
    → **Maxillary nerve (CN V_2)**



- Pathologies that can affect drainage:
  - **Aneurysm of internal carotid artery**
  - **Pituitary adenoma**
  - **Cavernous sinus thrombosis (CST)**

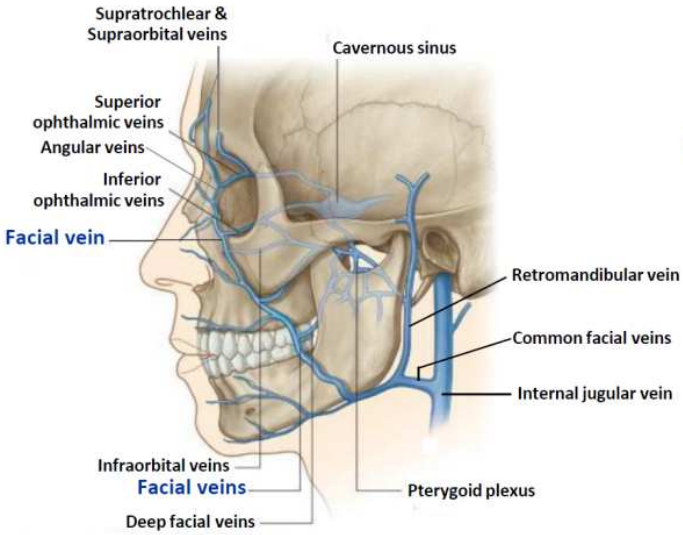
c. Venous Drainage of Orbit

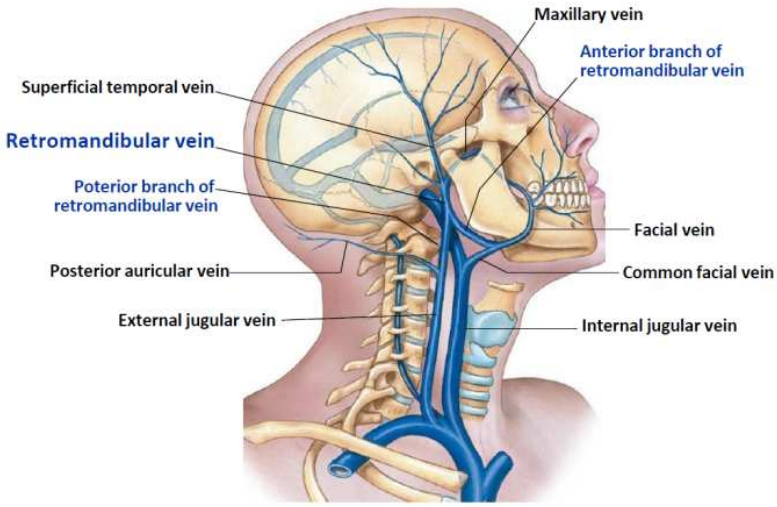




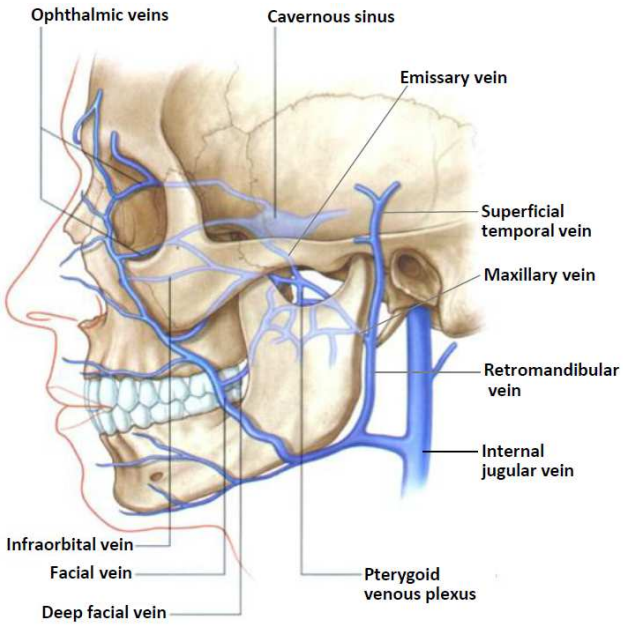
- Two veins present in orbit
- **Superior ophthalmic vein**:
  - Connects with supraorbital and angular veins
  - Passes across superior part of orbit
  - Leaves orbit through **superior orbital fissure** between greater and lesser wings of sphenoid to drain into **cavernous sinus** in the cranial cavity
- **Inferior ophthalmic vein**:
  - Smaller and passes inferiorly in the orbit
  - Receives blood from muscles and posterior part of eye
  - Leaves orbit posteriorly by:
    - → Joining with **superior orbital vein** and leaves via sup. orbital fissure
    - → Passes through **inferior orbital fissure** to join **pterygoid venous plexus** via **pterygopalatine fossa**

d. Veins of the Face

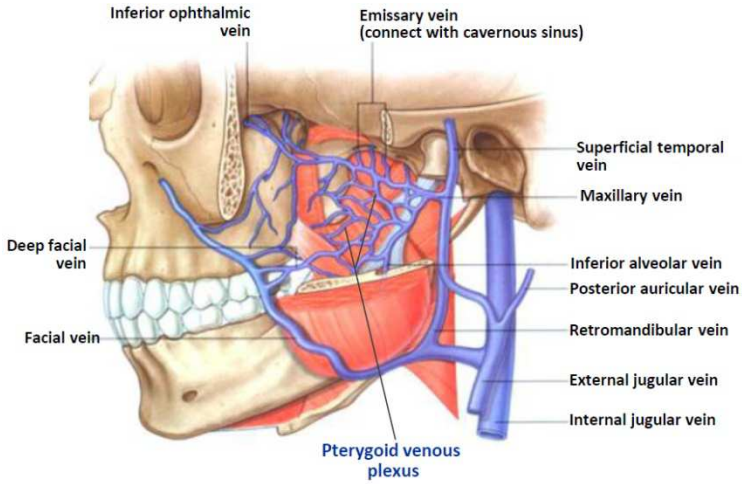




- **Retromandibular vein**:
  - Begins as **superficial temporal** and **maxillary vv.** join (~ECA)
  - Gives two branches:
    - → **Anterior branch** to join **facial v.** to form **common facial v.**
    - → **Posterior branch** to join **posterior auricular v.** to form **external jugular vein**
- **Facial vein**:
  - Begins as **angular vein** as **supratrochlear** and **supraorbital vv.** join
  - Communicates with **ophthalmic**, **infraorbital** and **deep facial vv.**
  - Drains either directly into **int. jugular vein** or through **common facial vein**
- Note that **facial vein** has numerous connections with venous channels passing into deeper regions of the head
- Facial vein communicates with:
  - **Ophthalmic vv.** near medial corner of orbit
  - **Infraorbital v.** passing into infra-orbital foramen
  - **Deep facial v.** then to pterygoid venous plexus
- Clinical significance:
  - All of these channels have interconnections with **cavernous sinus** (intracranial) via emissary veins
  - Absence of valves in any vein in the head
    - → infections of the face can be spread intracranially



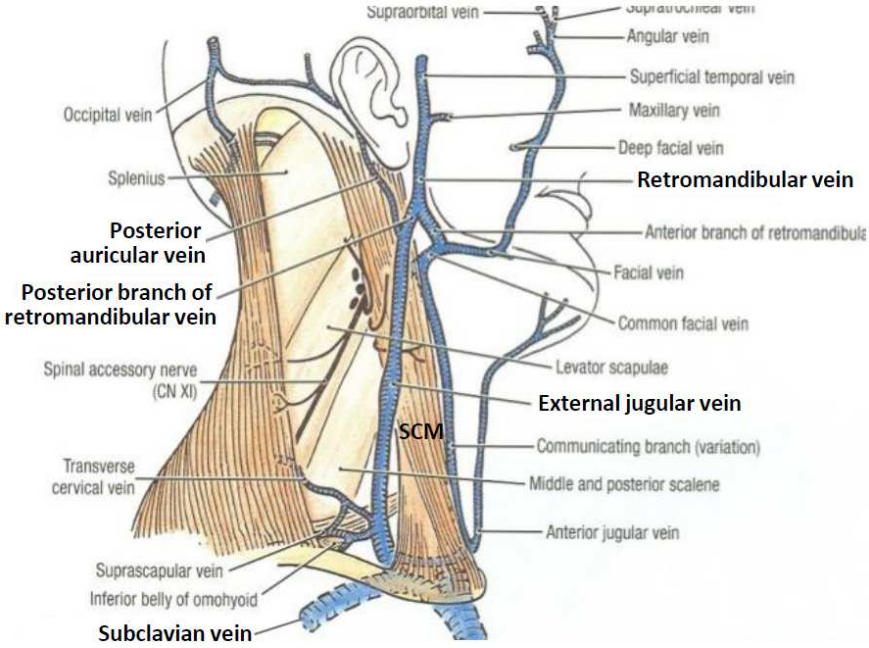
e. Pterygoid Venous Plexus



- **Pterygoid venous plexus**: a network of veins lying in infratemporal fossa between medial and lateral pterygoid muscles
- Drains regions supplied by maxillary artery, incl. nasal cavity and PN sinuses, nasopharynx, oral cavity, teeth and muscles of mastication
- Receives **inferior ophthalmic v.** through inferior orbital fissure
- Anteriorly connected to **deep facial vein** (to facial vein)
- Posteriorly connected to **maxillary vein** (to retromandibular vein)

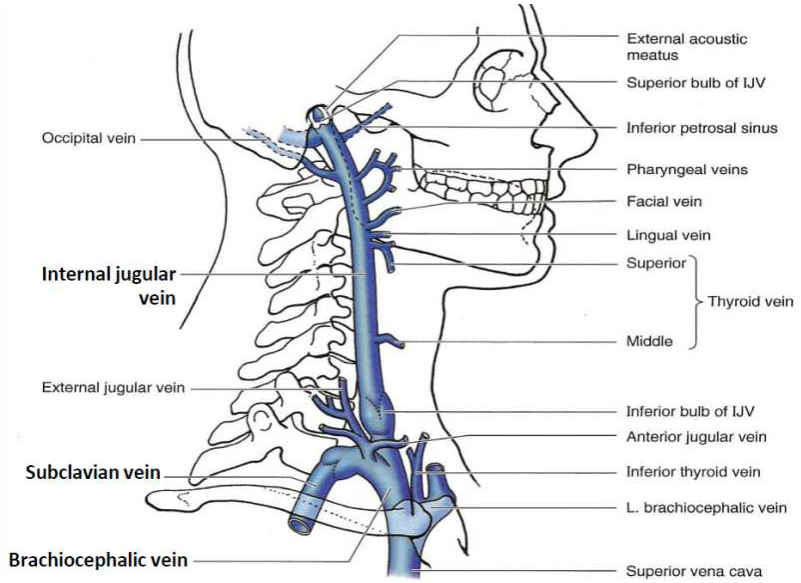
3. Veins of the Neck

a. External Jugular Vein



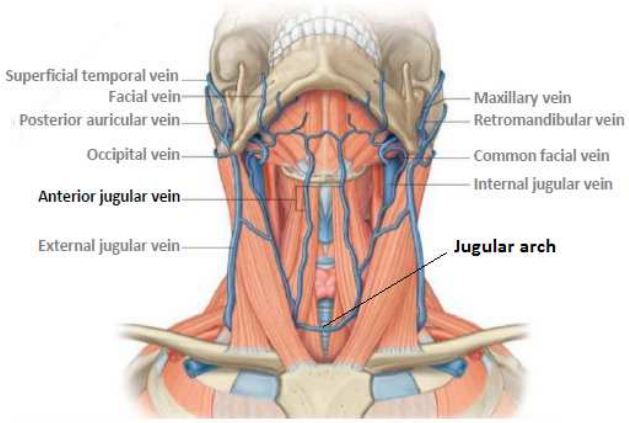
- Arises from joining of **posterior auricular vein** and **posterior branch of retromandibular vein**
- Crosses **sternocleidomastoid** muscle
- Receives blood from tissues outside cranium, deep face and neck
- Empties into subclavian vein

b. Internal Jugular Vein



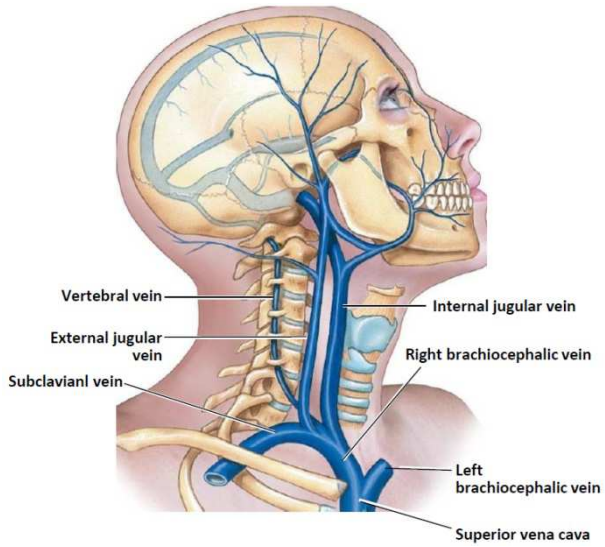
- Begins in **jugular foramen** (just behind carotid canal) as a continuation of **sigmoid sinus**
- Dilated at the two ends to form **superior** and **inferior bulbs**
- Drains blood from brain, face and neck
- Descends in **carotid sheath**
- Joins subclavian vein to form brachiocephalic vein

c. Anterior Jugular Vein



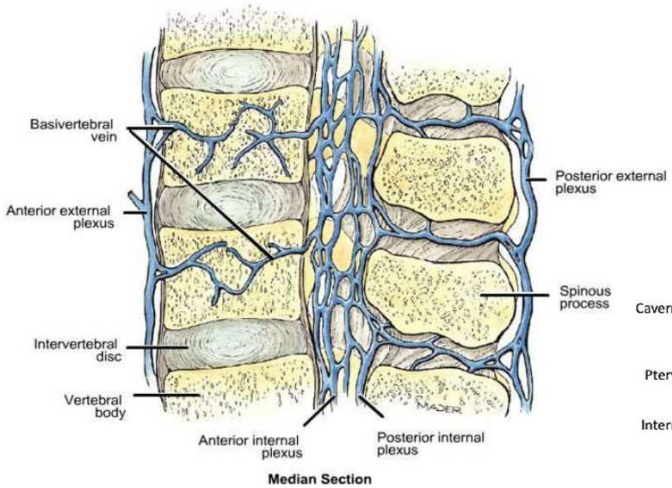
- Located on either side of midline of the neck
- Receives blood from larynx and other tissues below the lower jaw
- Bilaterally connected via **jugular arch** at suprasternal notch
- Drains into either **external jugular** or **subclavian veins**

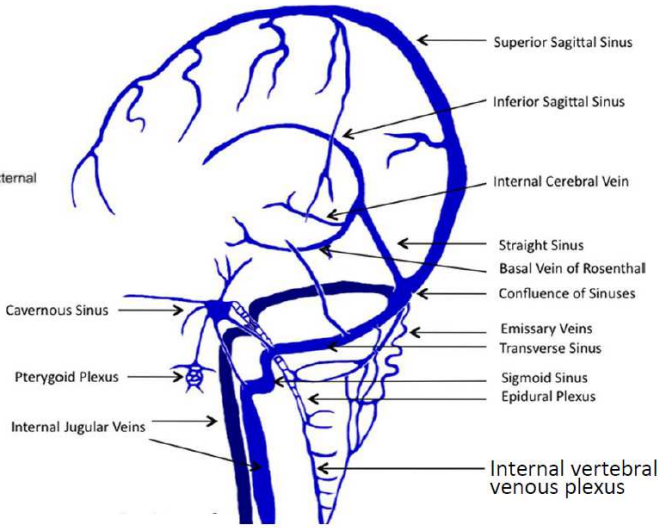
d. Vertebral Vein



- Does <u>NOT</u> traverse foramen magnum *a lá* vertebral artery
- Formed by many small veins around the <u>base of skull</u> (outside neurocranium)
- Enter **foramen transversarium** of C1 and descends with vertebral artery
- Ends in brachiocephalic or subclavian veins

e. Vertebral Venous Plexuses

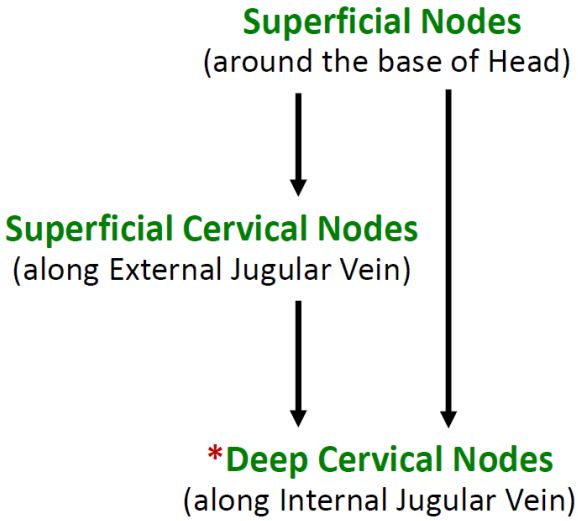




- **Internal** and **external venous plexuses** located in vertebral canal and on external surface of vertebral column respectively
  - Collect blood from vertebral column and drain into thoracic, abdominal and pelvic veins
  - **Internal vertebral plexus** also communicates with intracranial venous sinuses, eg. occipital and **basilar sinuses** (posteroinferior to cavernous sinus)
  - Clinical importance: allow metastasis from the body to CNS and spine

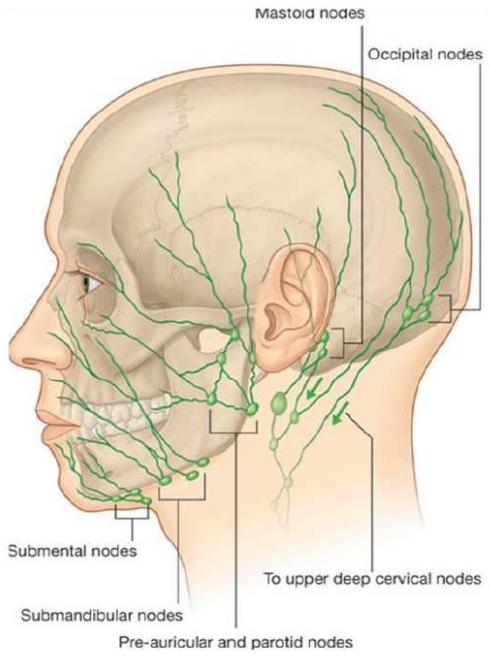
C. Lymphatic Drainage in Head and Neck

- Can be divided into three groups:
  - **Superficial nodes** around base of head drains into superficial or deep cervical nodes
  - **Superficial cervical nodes** along external jugular vein drains into deep cervical nodes
  - **Deep cervical nodes** along internal jugular vein drains into thoracic duct or right lymphatic duct
- Clinical importance:
  - Obstruction → lymphedema
  - Conduit for spread of malignant diseases and infections (of head and neck)
  - May be site of primary tumour (lymphangioma)



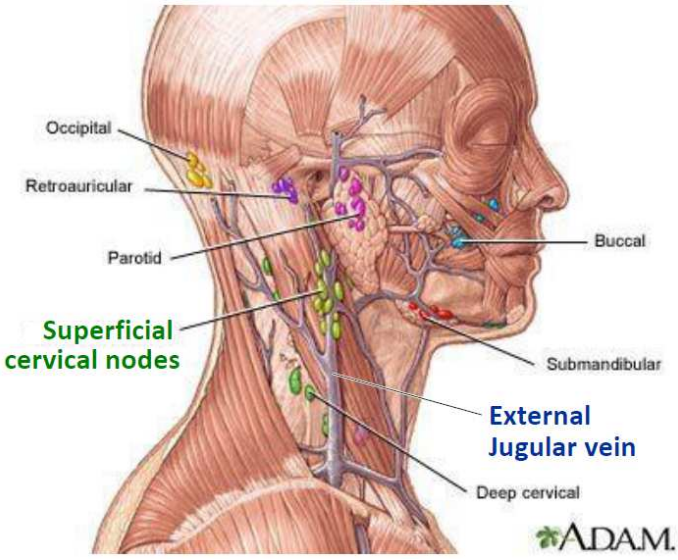
1. Superficial Lymph Nodes

- Five main groups forming a ring around base of head for drainage of face and scalp:
  - **Occipital nodes**
  - **Mastoid (retroauricular or posterior auricular) nodes**
  - **Pre-auricular** and **parotid nodes**
  - **Submandibular nodes**
  - **Submental nodes**
- Drains into superficial cervical nodes or directly into deep cervical nodes

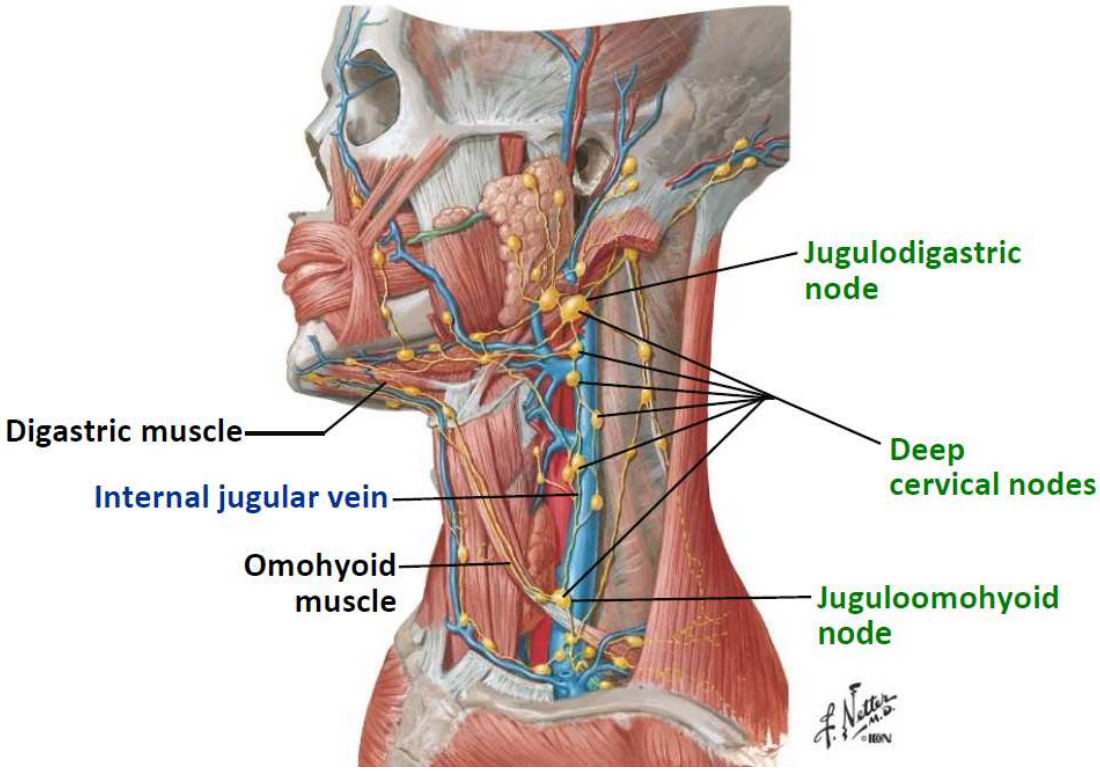


2. Superficial Cervical Lymph Nodes

- Located along external jugular vein
- Receives lymphatic drainage from <u>posterior</u> and <u>posterolateral scalp</u>
- Drains to deep cervical nodes



3. Deep Cervical Lymph Nodes



- Located along internal jugular vein
- Ultimately drain all lymph from head and neck
- Divided into two groups:
  - **Upper group** between angle of mandible and anterior border of SCM
    → **Jugulodigastric node** (enlarged in tonsillitis)
  - **Lower group** at intersection of IJV and omohyoid muscle
    → **Jugulo-omohyoid (lingual) node**

**Note that lymphatics are shown to be present in brains of mice and human autopsy specimens to carry fluid and immune cells from cerebrospinal fluid. This may be related to neurological diseases (eg. Alzheimer's) due to immune mechanisms in these diseases.*