HEAD AND NECK

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SURFACE ANATOMY

SURFACE MARKINGS

1. **Hyoid bone**

On the **C3 level**, lying in the angle berween the floor of the mouth and the anterior nekj. Its greater horn is palpable only when the opposite side is steadied.

2. **Notch of thyroid cartilage**

Forms the laryngeal prominence, on the C4/5 level.

3. **Cricoid carilage**

On the C6 level, connected to the thyroid cartilage by the **cricothyroid membrane** [**cricothyreotomy** site in case of laryngeal obstruction].

4. **Tracheal rings**

Palpable below the cricoid cartilage, on the sides. The 3rd and 4th are overlapped by the thyroid isthmus.

5. **Suprasternal notch**

On the **T2-T3 level**

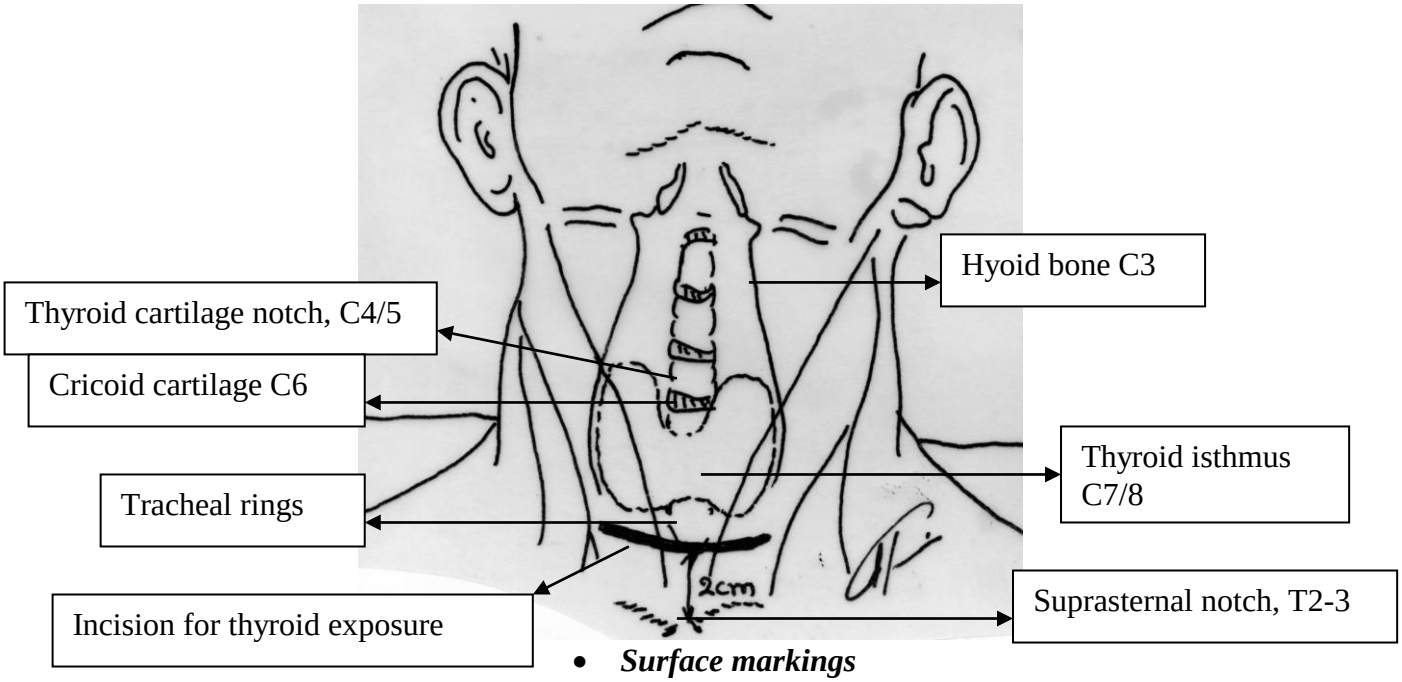
6. **C6 LEVEL**
    - lower border of cricoid cartilage
    - junction of larynx to trachea
    - transition of phatynx to oesophagus
    - entry point of middle thyroid vein and inferior thyroid artery into the thyroid gland
    - the vertebral artery enters the transverse foramen
    - the superior border of the homohyoid crosses the carotid sheath
    - level of the middle cervical sympathetic ganglion
    - carotid tubercle of C6 vertebra

7. **Carotid artery**

The course of the carotid artery is marked by a **line joining the tip of the mastoid and angle of the jaw to the sternoclavicular joint**. It **bifurcates at the upper level of the thyroid cartilage**.

BONY LANDMAKS

1. **External occipital protuberance** [trapezius insertion point]
2. **Mastoid process** [inserts the sternomastoid]
3. **Styloid process**
4. **Angle of mandible**
5. **Hyoid bone** [body and lateral horns]
6. **Thyroid cartilage** [C4 level]
7. **Cricoid cartilage** [C6 level]



- ***Surface markings***

8. **Sternoclavicular loint**
9. **Sternal notch** [T2/3]
10. **Head and shaft of clavicle**
11. **Coracoid process**
12. **Acromial end of clavicle**
13. **Acromion**

PLATYSMA

A **thin sheet of muscle** enclosed in the **superficial fascia**, which spreads from the **mandible to the clavicle, 1st and 2nd ribs and the acromion**. Its fibers decussate only anterior to the chin, leaving the **anterior midline of the neck unprotected**. Posteriorly they cover only the anteroinferior part of the posterior triangle.
The **external jugular vein** lies just below the platysma, crosses the sternomasroid and pierces the deep fascia just above the clavicle to empty into the internal jugular vein.

FASCIAL COMPARTMENTS

- **SUPERFICIAL FASCIA**

A thin fatty membrane enclosing the platysma.

- **DEEP FASCIA**
    1. **Enveloping [investing] fascia**
        Invests the muscles of the neck [trapezius, sternomastoid & strap muscles], as well as the **parotid and submandibular glands**.
    2. **Prevertebral fascia.**
        Passes **in front of the cervical vertebrae and prevertebral muscles, behind the larynx and oesophagus**. Covers the scalene muscles, the brachial plexus and the 1st part of the subclavian artery. It is a tough membrane and in case of tuberculous spondylitis with development, a midline bulge on the posterior pharyngeal wall will be formed
    3. **Pretracheal fascia**
        Encloses the **visceral compartment of the neck**, extending from the hyoid bone to the fibrous pericardium. A tube arises from it, forming the **carotid sheath**.

THE TRIANGLES OF THE NECK

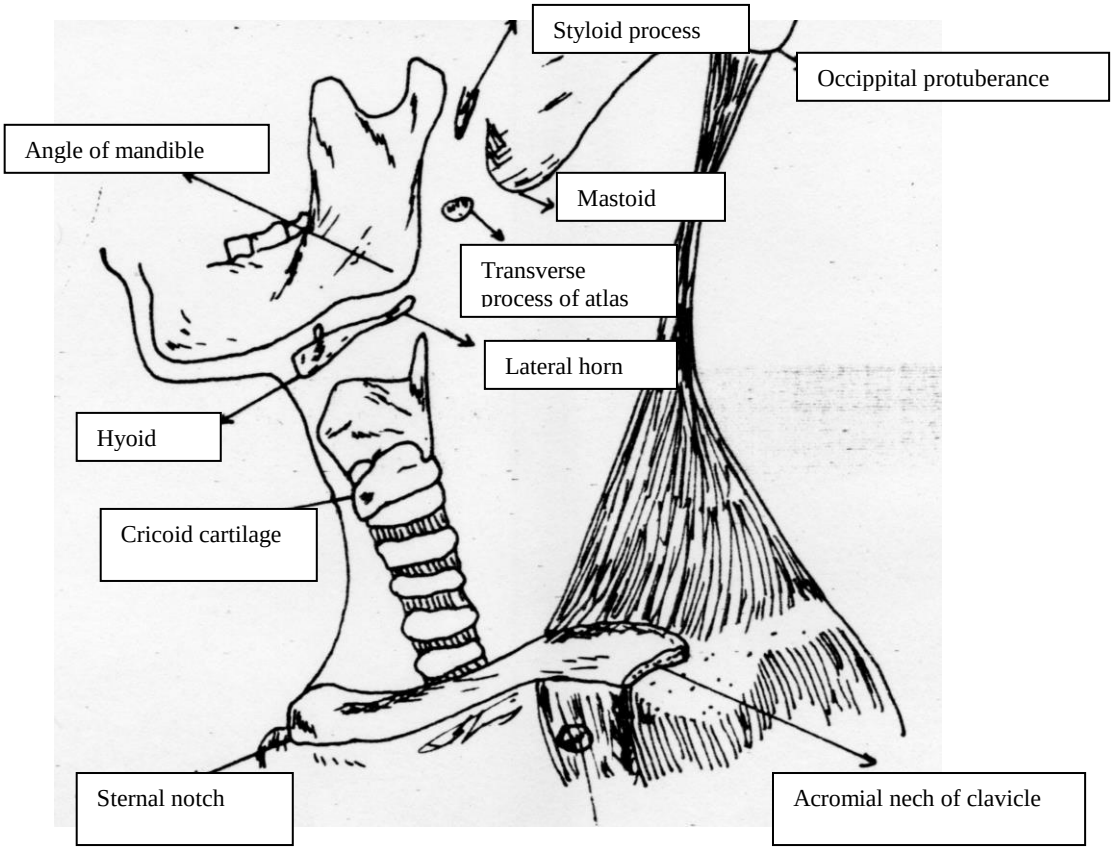
- **POSTERIOR TRIANGLE**

[**sternomastoid - trapezius - clavicle**]

a. **Supraclavicular** [**posterior belly of omohyoid** - clavicle - sternomastoid]
b. **Occipital** [omohyoid, - sternomastoid - trapezius]
    The **accessory nerve [XI]** crosses it. The area above it is of little importance

- **ANTERIOR TRIANGLE**

[sternomastoid - midline - mandible]



Bony cervical landmarks

1. **Submandibular** [anterior belly of **digastor muscle** - mandible - posterior belly of digastor]
2. **Muscular** [anterior **omohyoid** - sternomastoid - **midlin**e]
3. **Carotid** [s**ternomastoid** - omohyoid - **posterior belly of digastor**]

- **SUBMENTAL TRIANGLE**

[anterior belly of left digastor - chin - posterior belly of right digastor - hyoid bone]

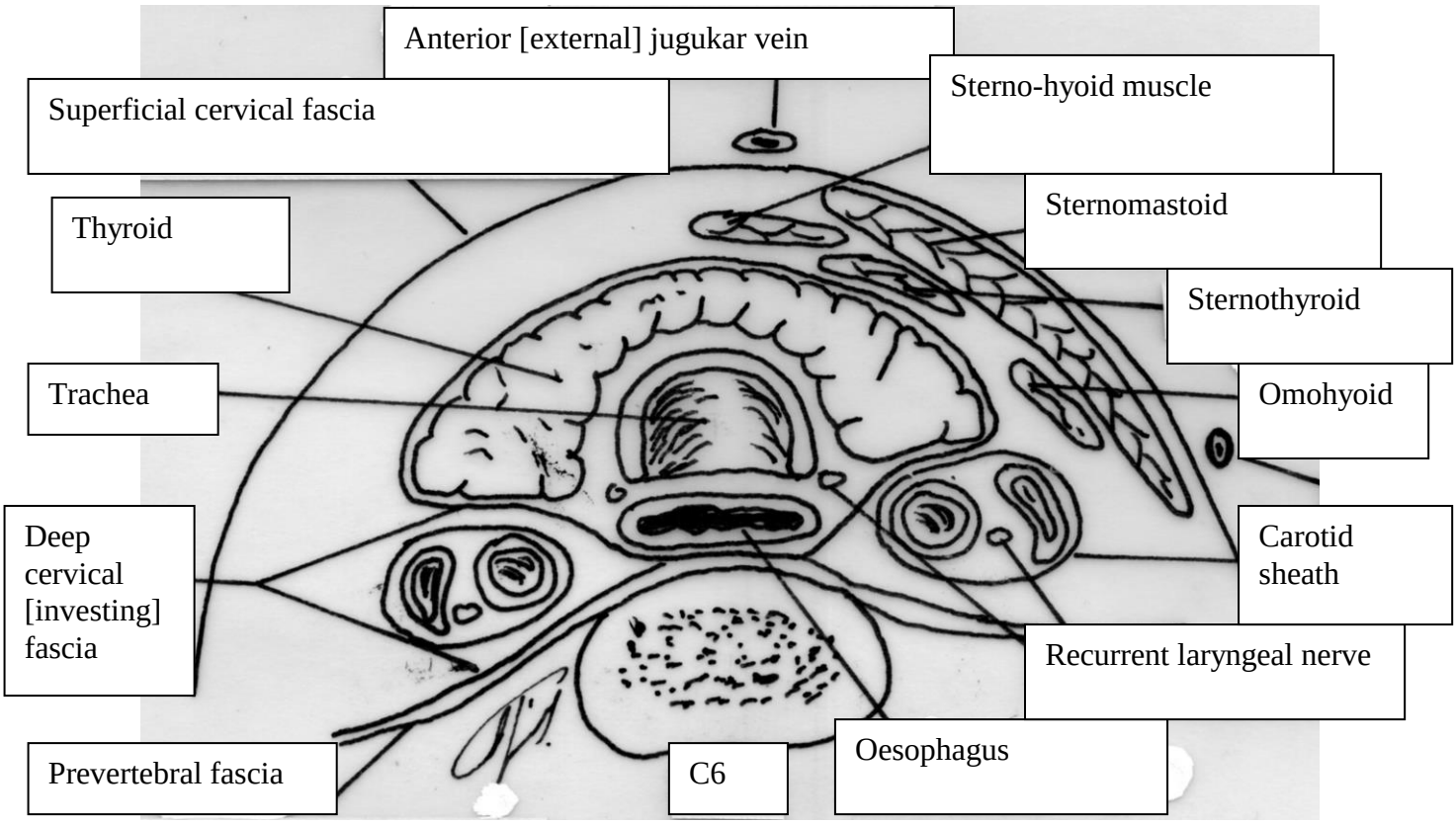
- **POSTERIOR TRIANGLE**
- **SUPERFICIAL STRUCTURES**
  - **Platysma**
    Covers only the anteroinferior part of the triangle
  - **External jugular vein**
    Descends vertically from the posterior angle of mandible, accompanied by the great auricular nerve. It crosses the sternomastoid and 2cm above the clavicle it pierces the investing fascia.
  - **Investing fascia** [superficial fascial carpet]
  - **Accessory nerve**
    Is the only motor nerve superficial to the investing fascia. Appears in the mid-upper third of sternomastoid and disappears below the trapezius, 2 fingers above the clavicle.
  - **Cutaneous nerves [C2, C3, C4]**
    They radiate anteriorly from the posterior border of mid- sternomastoid.
- **STRUCTURES DEEPER TO THE INVESTING FASCIA**
  - **Motor nerves** [to levator scapulae, rhomboids and serratus anterior]
    They lie in a plane between the fascia and the muscle floor of the triangle, between the accessory nerve and the brachial plexus.
  - **Phrenic nerve** & **Internal jugular vein**
    They lie behind the sternomastoid, parallel and just beyond the medial confines of the triangle.
- **MUSCLE FLOOR**

From above downwards:

1. Semispinalis capitis
2. Splenius capitis
3. Levator scapulae
4. Scalenus medius
5. Scalenus anterior
6. Omohyoid

- **INFERIOR PART OF THE TRIANGLE**

The inferior border of omohyoid is connected to the **omohyoid fascia** which covers the **supraclavicular triangle**. The **transverse cervical artery** appears behind the belly of the muscle, **crossing the scalenus anterior, brachial plexus and scalenus medius**. It then passes to the lateral border of the triangle, which **is floored by the scalenus posterior and serratus anterior superior**. At the medial border of the triangle lie the **internal jugular vein**, the **phrenic nerve** and the **thoracic duct** [on the left side].

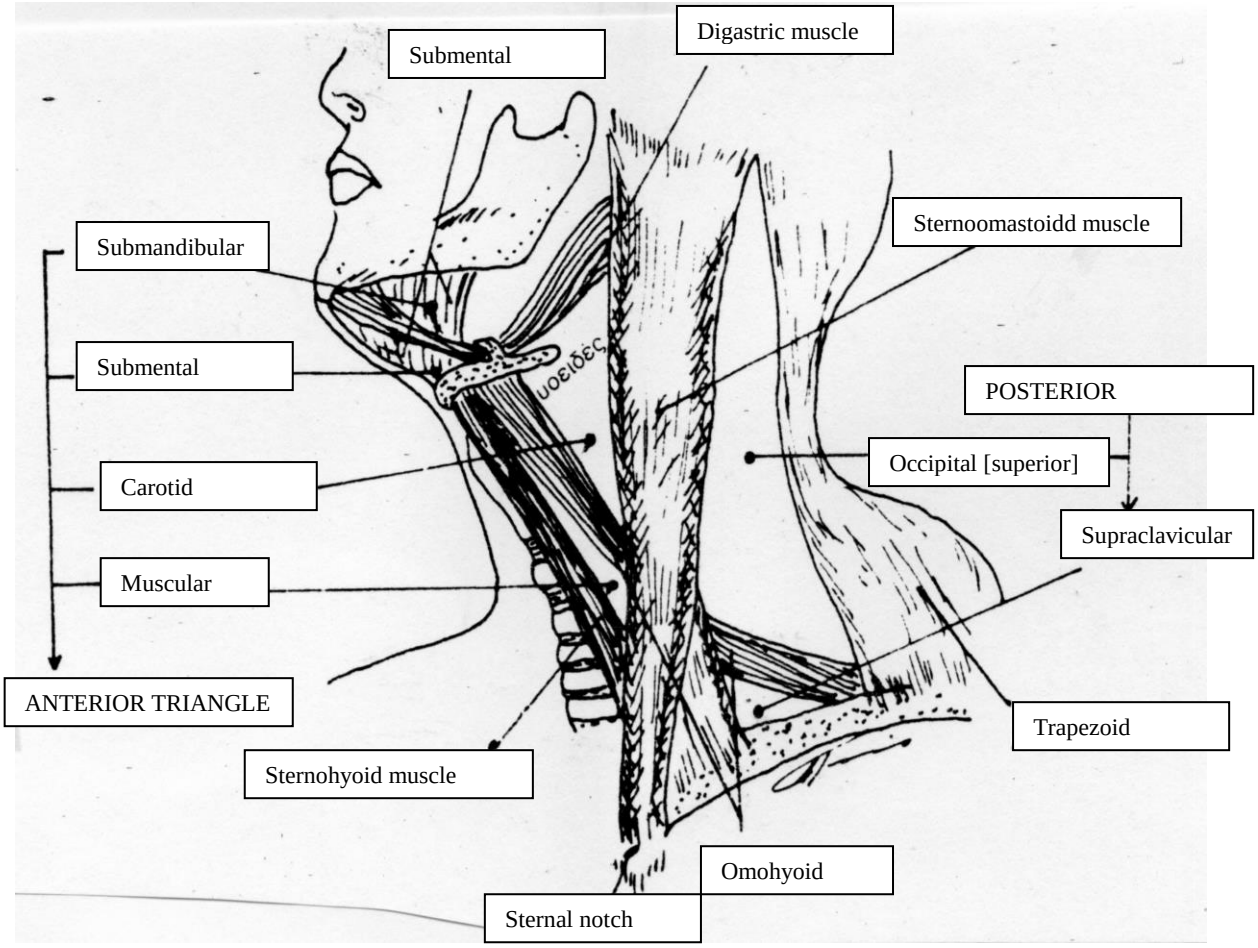


- ***Transverse topographic anatomy of neck***

Behind the omohyoid lie the **3rd part of the subclavian** vein and the **suprascapular artery**, in front of **scalenus anterior**, which separates the vein from the **subclavian artery and the brachial plexus**, which lies further posteriorly, **in front of scalenus medius**.
The posterior border of scalenus anterior is almost parallel to the sternomastoid. The **subclavius muscle** separates the clavicle from the subclavian vessels [although unimportant muscle, acts as a buffer in fractures of the clavicle]

- **ANTERIOR TRIANGLE**

The **accessory nerve [XI]** emerges behind the parotid, **crosses the internal jugular vein** and disappears below the **sternomastoid, 5cm distal to the mastoid process**, accompanied by the **sternomastoid branch of the occipital artery** [external carotid branch].
The internal jugular vein receives the **common facial vein** at the mid-level of the steronmastoid [the site of carotid bifurcation]. In front of and parallel to the jugular vein passes the **ansa cervicalis** [superior root of hypoglossal ansa], supplying the strap muscles.
Along the mandible are the **inferior border of the parotid**, the **submandibular lymph nodes** and the **submandibular salivary gland**. Above the latter, the **facial artery** [from external jugular] crosses the mandible.
In front and behind the internal jugular vein lies the **common carotid artery**, bifurcating at the level of the **upper border of the thyroid cartilage [C4**, place of jugular-facial junction]. The main branches of the external carotid [**facial and lingual**] course anterosuperiorly and pass deep to the digastor muscle. The **1st branch of the external carotid is the superior thyroid artery**, which curves downwards and runs medially and forwards to reach the thyroid lobe. Deep behind and medially to the external carotid appears the **superior laryngeal nerve**, running forwards and downwards.
The **hypoglossal nerve [XII]** emerges in front of the styloid process, courses parallel to the **posterior belly of the digastor**, **crosses the internal jugular vein and the internal carotid** artery [giving off the **ansa hypoglossi** which descends on the carotid sheath]] and passes deep behind the digastric muscle to enter the floor of mouth.
The medial border of the triangle is formed by the **thyroid** and the **inferior constrictors of the pharunx**.



- ***Neck triangles***

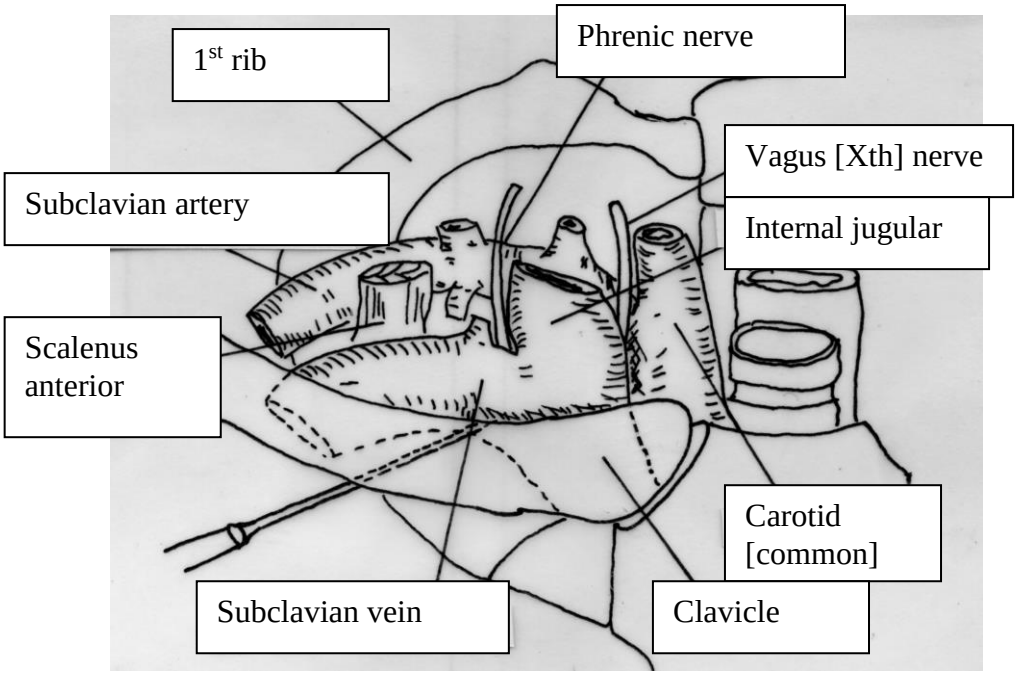
THE ANTERIOR NECK

SURFACE ANATOMY

- **Anterior jugular veins**, communicating at the bottom of the midline
- **Superficial strap muscles** [infrahyoid depressors of larynx]
    - **Omohyoid**
    - **Sternohyoid**
    - **Sternothyroid** [medially and posteriorly]
        - Thyrohyoid
        - Cricothyroid muscle
- **Inferior thyroid vein** [midline]
- **Vein on anterior border of sternomastoid**, connecting the facial and anterior jugular vein
- **The two lobes of the thyroid**, united above the 3rd and 4th tracheal rings by the isthmus. The two lobes overlie the common carotid artery. On the gland surface there is a venous network, draining into the **superior** [along superior thyroid artery], **middle** [along inferior thyroid artery] and **inferior thyroid veins**.
- Parallel to the superior thyroid artery descends the **external branch of the superior laryngeal nerve**, passing deep to the upper part of sternothyroid muscle. **The internal branch** lies more medially, running on the superior border of the inferior constrictor pharyngeal muscle. The **recurrent laryngeal nerve** ascends in the tracheoesophageal groove, on the lateral aspect of the trachea, passes between the twigs of the inferior thryroid artery and enters the larynx.

THE ROOT OF THE NECK

On a transverse section, in front of the prevertebral fascia, lie the **trachea** and the **oesophagus**, behind the **3 structures of the carotid sheath** [**internal jugular vein**, common carotid artery, **vagus, X, nerve**]. The oesophagus is buldging slightly to the left of the trachea. The **recurrent laryngeal nerve** is located on the lateral aspect of the trachea, anterior to the oesophagus, giving off twigs to it and the trachea. The **thoracic duct** is ascending on the left side of the osephagus and immediately arches forwards and downwards, behind the carotid sheath, to empty into the jugular - subclavian junction.



- ***The root of the neck and subclavian catheterisation***

THYROID GLAND

- **ANATOMY**
- **Lateral lobes**

Usually asymetrical, reaching down to the 6th tracheal ring

- **Isthmus**

Unites the two lobes, covering the 2nd-4th tracheal rings on the midline.

- **Pyramidal lobe**

Is inconstant [≈ 50%], extending from the isthmus up to or towards the hyoid bone.

- **RELATIONS**

The gland is enclosed in the **pretracheal fascia**, which is more dense in front then behind the gland; thus, in case of gland enlargement, the thyroid tends to grow backwards. As the fascia is also attached to the larynx, the the thyroid moves up and down during swallowing.
The gland is covered by the **strap muscles** [become quite thin when the gland enlarges] and is overlapped by the **sternomastoids**. Behind the gland lie the **larynx and the trachea** and further posteriorly the **pharynx and oesophagus**. In the **tracheo-oesophageal groove** ascends the **recurrent laryngeal nerve** which is crossing the **inferior thyroid artery** [usually through its branches or behind it, but may cross above it].
At the upper pole, the **external branch of the superior laryngeal nerve** descends along and medially to the **superior thyroid artery** to innervate the **cricothyroid muscle** [loss of phonation if injured; the safest dissection is to stick to the thyroid surface].
On either side of the lateral lobes and posteriorly to them lie the **carotid sheaths**.
Posterior to the lobes and at their upper and lower ends lie the **parathyroid glands**.

- **DEVELOPMENT**

The thyroid develops from a **bud arising from the floor of the pharynx**, which descends vertically downwards, leaving at its original site the **foramen cecum**.
ANOMALIES:

- **Lingual thyroid**, at the foramen cecum site, on the middle / posterior third of the tongue
- **Thyroglossal duct, thyroglossal cyst**, fistula or thyroid remnants along the line of descend. They lie in the midline of the neck, in intimate contact with the hyoid bone.
- **Pyramidal lobe**
- **Retrosternal thyroid**

- **BLOOD SUPPLY**
- **ARTERIES**

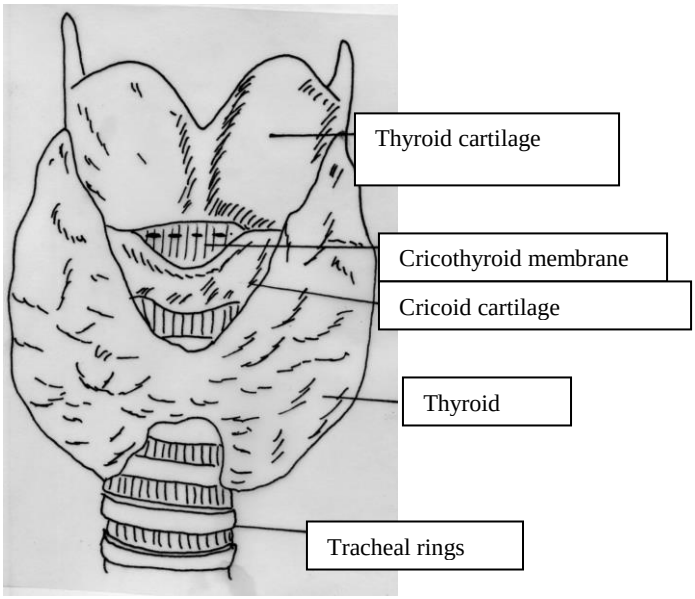
1. **Superior thyroid artery**

Is the first branch of the **external carotid**, passing anteroinferiorly, accompanied by the **external laryngeal nerve**, to enter the **upper pole of the lateral lobe**.

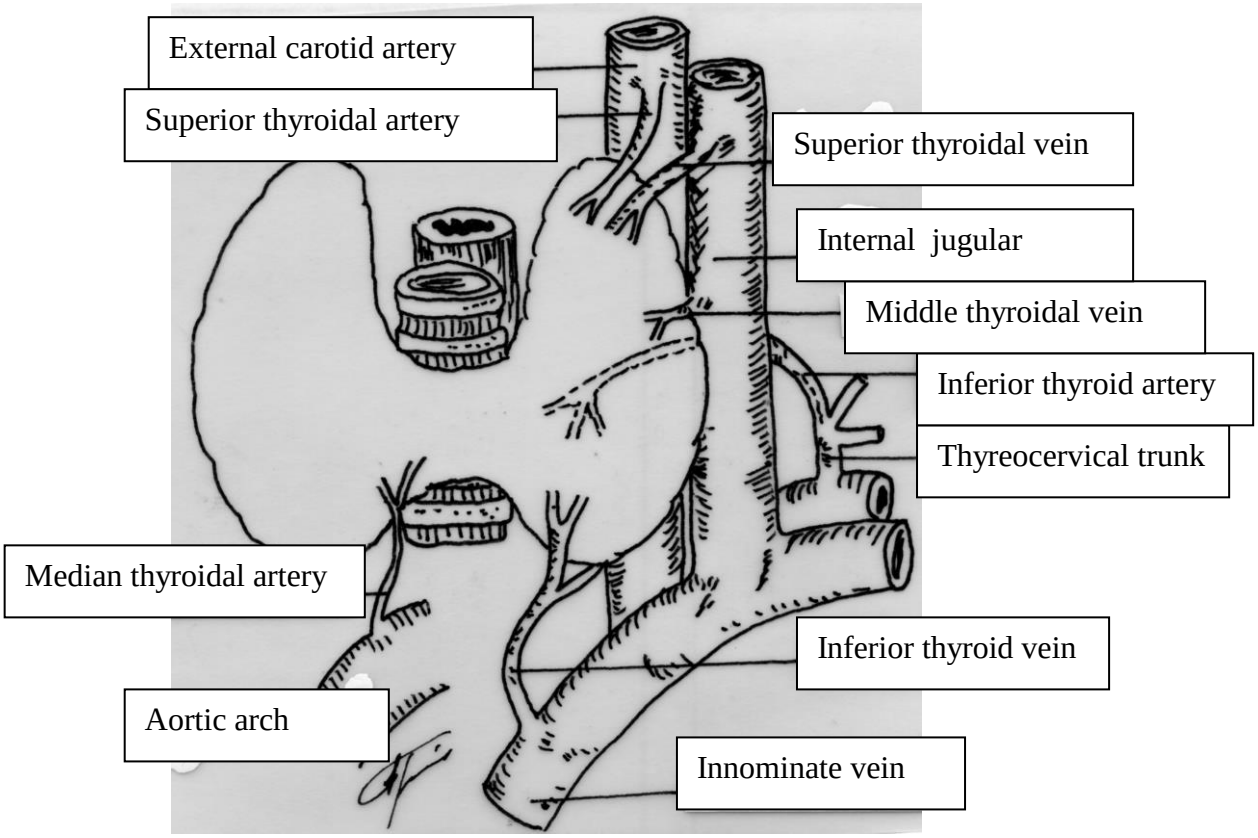
2. **Inferior thyroid artery**

Branch of the **thyreocervical trunk** [from the **subclavian artery**]. The **recurrent laryngeal nerve** comes in close contact with the artery.

3. **Thyroidea ima artery**



- ***Thyroid & cricoid cartilages***



- ***Vasculature of thyroid gland***

An incostant branch arising from either the aortic arch or the innominate artery, supplying the isthmus.

4. **Small twigs from larynx and trachea**

- **VEINS**

1. **Superior thyroid vein** [drains into the internal jugular]
2. **Middle thyroid vein** [drains into the internal jugular]
3. **Inferior thyroid vein**, draining into the **innominate vein**
4. **Numerous small vessels from larynx and trachea**

PARATHYROID GLANDS

They are usually four [varying from 2-6], **2 superior and 2 inferior**. In 90% they are in close relationship with the thyroid, while in 10% of cases they may be located on aberrant positions [usually the inferior glands].

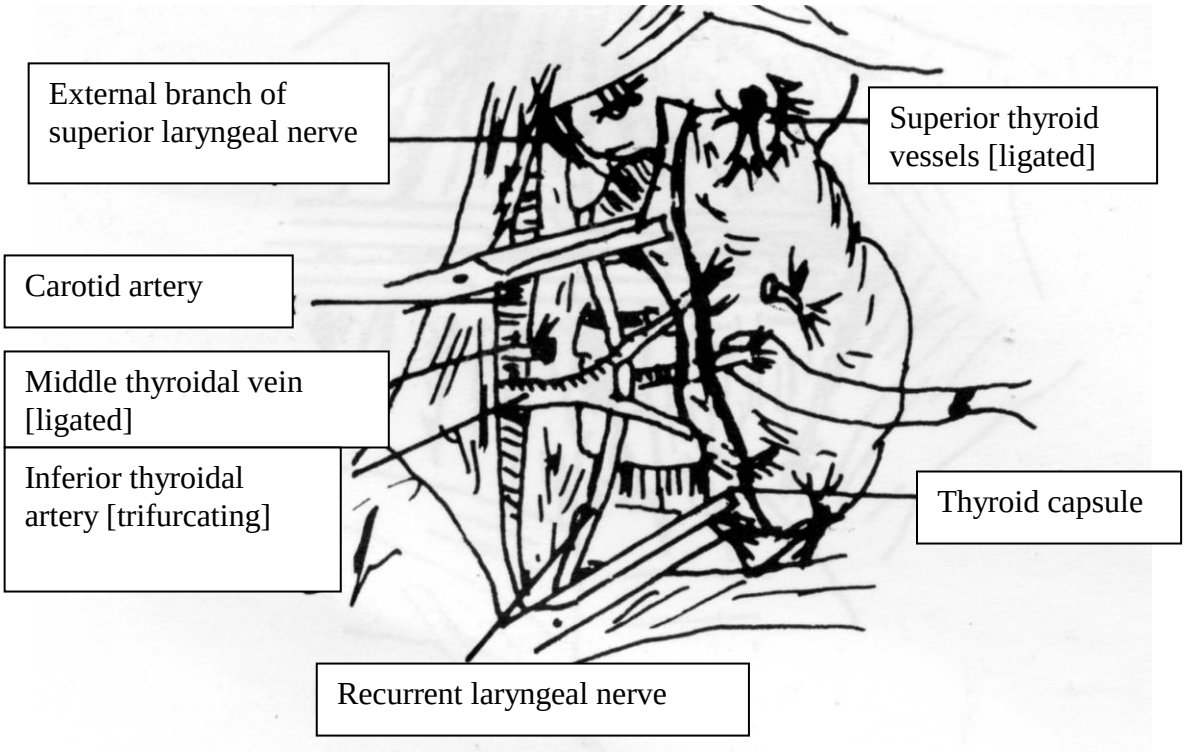
The **most constant position is that of the superior glands**, lying in the **middle of the posterior border of the lateral thyroid lobe**, right above the level where the inferior thyroid artery is crossed by the recurrant laryngeal nerve.

The **inferior glands** are usually situated close to **inferior thyroid poles**, but may lie{

- 1cm caudally
- in front of the trachea, in the superior mediastinum, within the thymus, outside the faacial sheath of the hyoid bone, behind the oesophagus
- very rarely they may beburried in the thyroid tissue

Each gland has the size of a split pea and a **brown-yellowish color**.

The **superior glands** develop from the **4th pharyngeal pouch** while **the inferior ones develop from the 3rd**, as the thymus, and descend downwards dragged by the thymus.



- ***The course of the recurrent laryngeal nerve between the branches of the inferior thyroid artery [during lobectomy]***

MAJOR VESSELS OF THE NECK

ARTERIES

- **COMMON CAROTIDS**
- **LEFT CAROTID**

Arises from the **aortic arch**, in front of the subclavian artery. Ascends towards the root of the neck lying first **in front and then lateral to the trachea**, having as lateral relations the lung, the pleura, the **phrenic and the vagus nerve**. It passes behind the left sternoclavicular joint to enter the neck.

- **RIGHT CAROTID**

Arises from the **innominate artery** [brachiocephalic trunk] **behind the right sternoclavicular loint**.

- **COMMON NECK ROUTE**

In the neck they ascend enclosed in the **carotid sheath**, having **the internal jugular vein laterally** and the **vagus nerve posterolaterally**. The **cervical sympathetic chain lies posterior** to the sheath.

The common carotid lies on the **transverse vertebral processes**, having medially the trachea, the thyroid, the larynx and pharynx. Is covered by the sternomastoid and, in the muscular triangle, by the omohyoid.

At the **C4 level** [**upper border of thyroid cartilage**] it bifurcates into the **internal** and **external carotid arteries**.

- **EXTERNAL CAROTID**

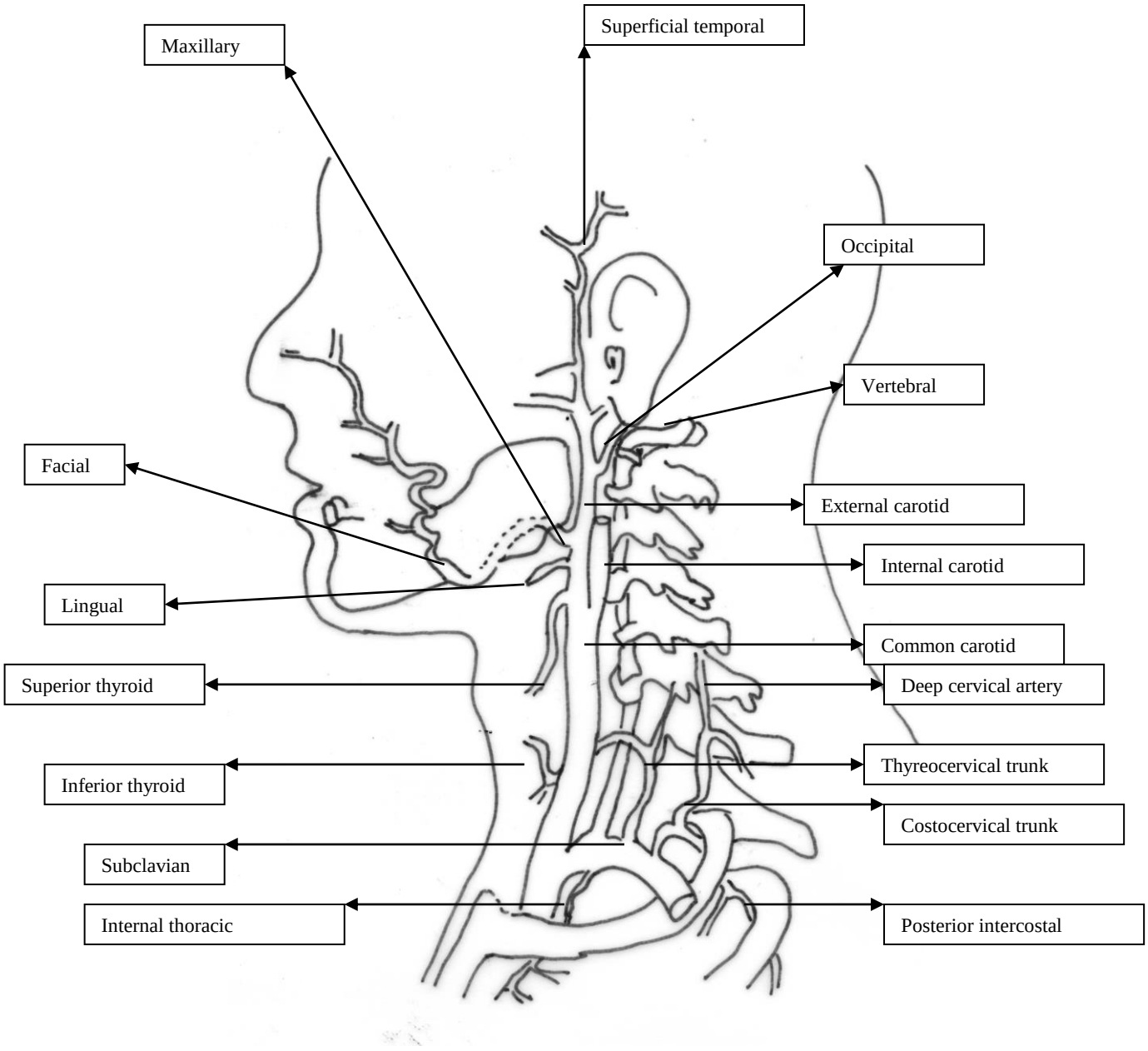
At first it lies **deep and medial to the internal carotid artery**; it then passes **anteriorly and laterally** to it. The internal jugular vein is initially lateral but more superiorly it becomes posterior to the external carotid.

The artery passes **posterior to the hypoglossal nerve and digastric muscle**, lying on the **posterior parotid surface**, and bifurcates at the **temporo-mandibular junction** into the **superficial temporal artery** [exterior to the junction] and **maxillary artery**, passing behind the mandible.

- **ANTERIOR BRANCHES**
    1. **Superior thyroid**

    Gives off the superior laryngeal artery
    2. **Lingual artery**
    3. **Facial artery**

    It gives off an **artery for the submandibular** gland, a **tonsilar branch** and then winds around the mandible to supply the **masseter**.
    4. **Maxillary artery**
        a. **middle meningeal artery**
        b. **inferior alveolar artery**
        c. **masseter artery**
- **POSTERIOR BRANCHES**
    1. **Ascending pharyngeal**



- ***The major vessels of neck and face***

2. **Occipital artery**
3. **Posterior auricular artery**
4. **Superficial temporal artery**

- **INTERNAL CAROTID**

Arises at the **carotid bifurcation, [C4 level, usually under the facial vein**] and is usually slightly dilated, forming the **carotid bulb**, which receives the **carotid sinus nerve** [branch of **X, a presso-receptor**]. At the bifurcation lies the **carotid body**, a small yellowish structure acting as **chemoreceptor**, innervated by the **glossopharyngeal nerve [IX]**.

The internal carotid lies first lateral to the external carotid, but then passes medially and posteriorly, to **cross the posterior belly of digastor muscle and hypoglossal nerve**, having on its outer side the internal jugular vein. Ascends on the **side of the pharyngeal wall**. Is separated from the external carotid by the parotid, the styloid process and muscles.

At the base of the skull it enters the **carotid canal** in the **petrous part of temporal bone**. At this point the **4 last cranial nerves** lie just lateral to the artery; further posterolaterally lies the **internal jugular vein**, exiting the skull through the **jugular foramen.**

Entering the skull it has a twisted course with **6 bends** [**petrous sinus** and **cavernous sinus** leading to the **carotid siphon**] and exits just **medial to the anterior clinoid process**, in contact with the **occulomotor nerve [III**]. It passes lateral to the **optic chiasma** and bifurcates into the **middle and anterior cerebral arteries**.

- **BRANCHES**

1. **Ophthalmic artery** [arising immediately after the internal carotid exirs the carotid siphon]
    - **Supratrochlear artery**
    - **Supraorbital artery**
    - **Central artery of the retina**
2. **Anterior cerebral artery** [passes around the genu of corpus callosum and supplies the superolateral aspect of the brain hemisphere]
    - **Anterior communicating artery**
3. **Middle cerebral artery** [ascends in the lateral cerebral sulcus to supply the internal capsule and the lateral cerebral cortex]
    - **Posterior communicating artery**

- **SUBCLAVIAN ARTERY**

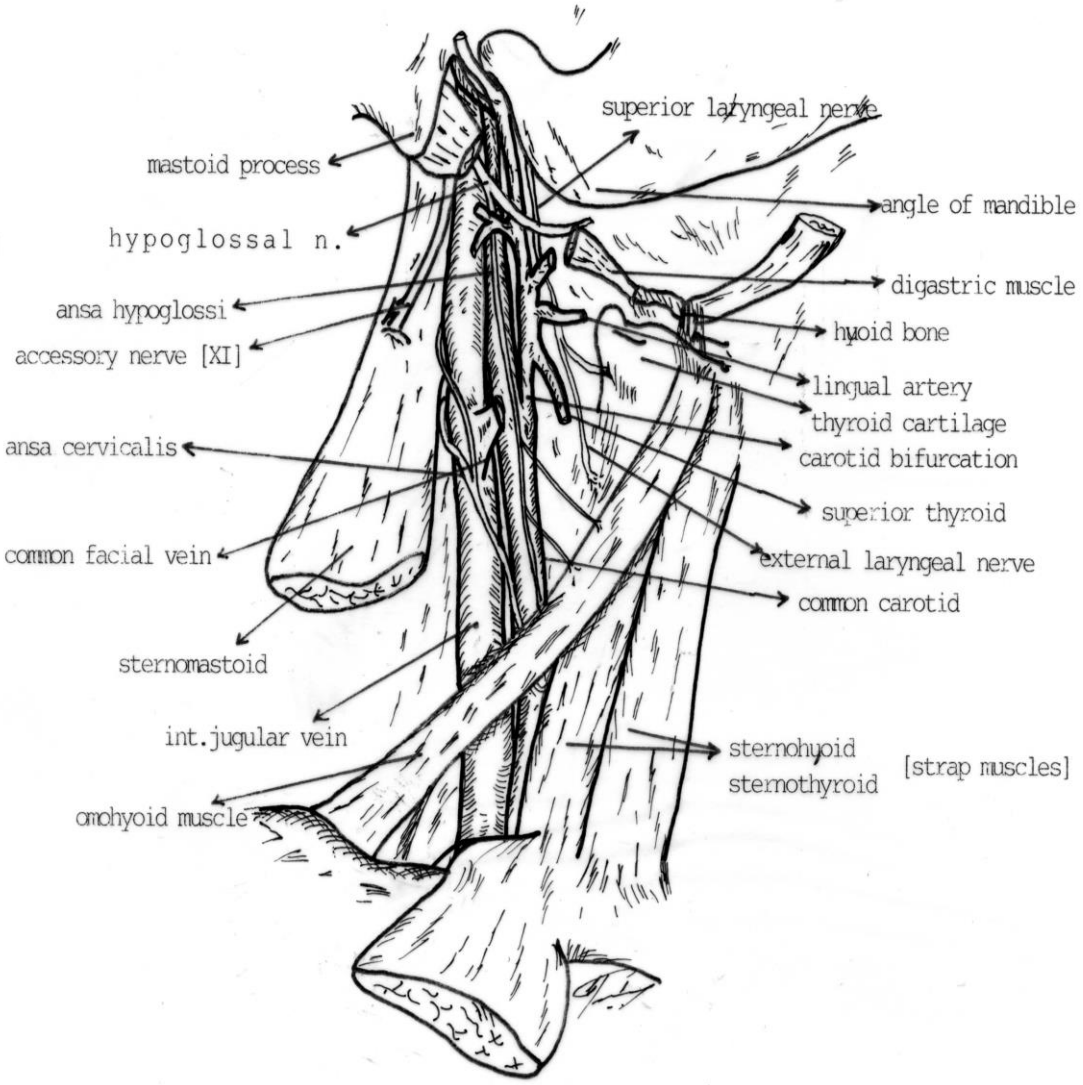
The **right subclavian arises from the innominate** artery while the **left is a direct branch of the aortic arch**.

It ascends on the **mediastinal surface of the lung and pleura**, having on its medial side the **trachea, the oesophagus and the common carotid artery**. Domes above the pleura, covered by the sternomastoid and strap muscles, crossed by the carotid sheath and the **vagus and phrenic nerves** [more laterally and anteriorly].

On the left, the **thoracic duct** curves around the artery from behind to empty into the jugulo-subclavian venous junction.

It courses **behind the anterior scalenus muscle** [separating it from the subclavian vein] and above the 1st rib to exit behind the clavicle.

- **BRANCHES**
    - **1st part**



- ***Topographic anatomy of carotid teritory***

1. **vertebral artery**
2. **internal mammary**
3. **thyreocervical trunk**
    a. **inferior thyroid artery**
    b. **suprascapular artery**
    c. **transverse cervical artery**

- **2nd part**
    1. **costocervical trunk**
        a. **cervical branches**
        b. **1st intercostal artery**
        c. **2nd intercostal artery**
- **3rd part: no branches**

- **VERTEBRAL ARTERY**

Arises from the **1st part of the subclavian artery**, crosses the dome of the pleura and disappears between scalenus anterior and longus coli muscle to enter the **transverse foramen of C6 vertebra**.

Over the **arch of atlas** it turns posteriorly and medially to enter the **foramen magnum**. Runs on the **anterolateral aspect of the medulla** to join at the **pons** with the opposite artery, forming the **basilar artery**.

- **BRANCHES**
    1. **anterior apinal arteries**
    2. **posterior spinal arteries**
    3. **posterior inferior cerebellar arteries**

- **THE CIRCLE OF WILLIS**

Is an **arterial hexagon** at the base of the brain, around the foramen magnum, formed by the **basilar artery** and the **internal carotids**.

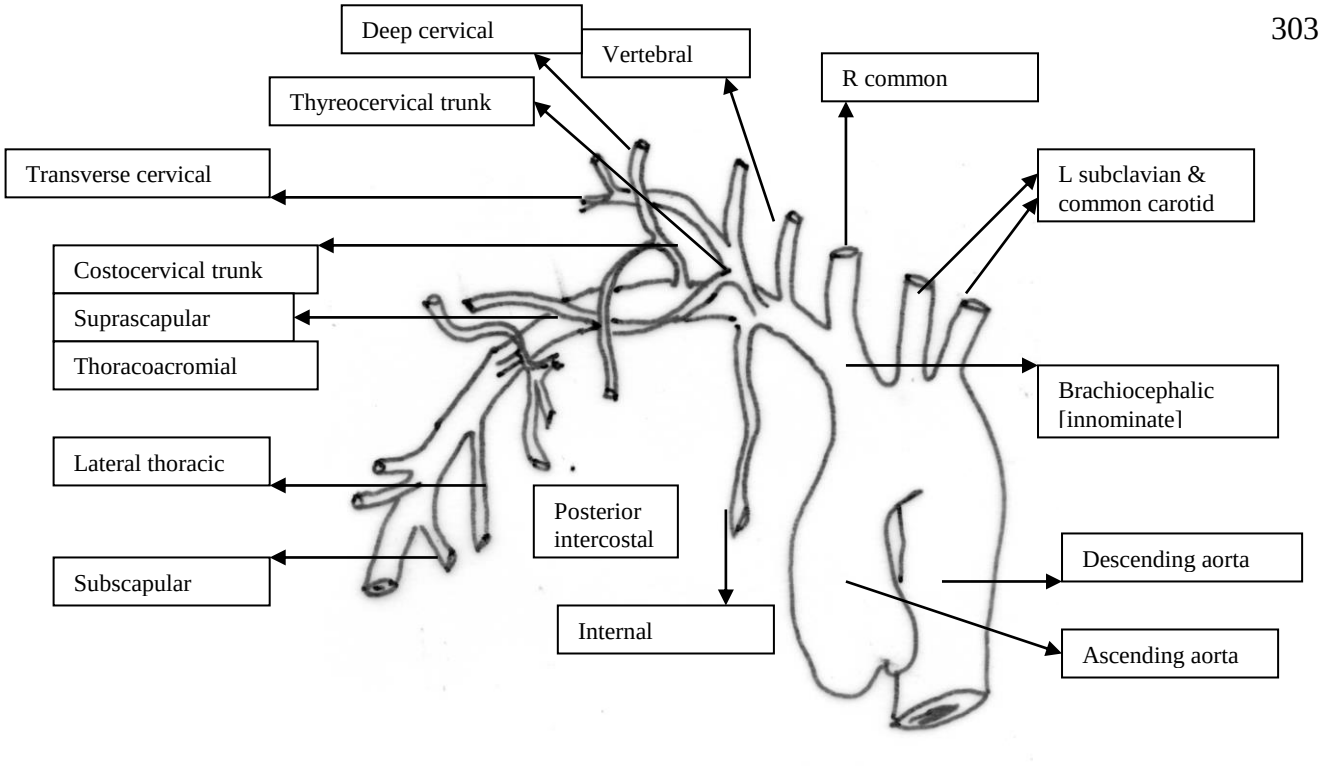
The **vertebral arteries** give off the **posterior spinal arteries** [posteromedially] and the **anterior spinal arteries** [anterolaterally]; the last branch they give off before joining to form the basilar artery is the **posterior inferior cerebellar artery**.

From the **basilar trunk** arise the **anterior inferior carebelar** arteries, the **superior cerebellar** and the **posterior cerebral arteries**. As the basilar artery reaches the circle of Willis it gives off the **two posterior communicating arteries**, which anastomose with the middle cerebral arteries [internal carotid branches]

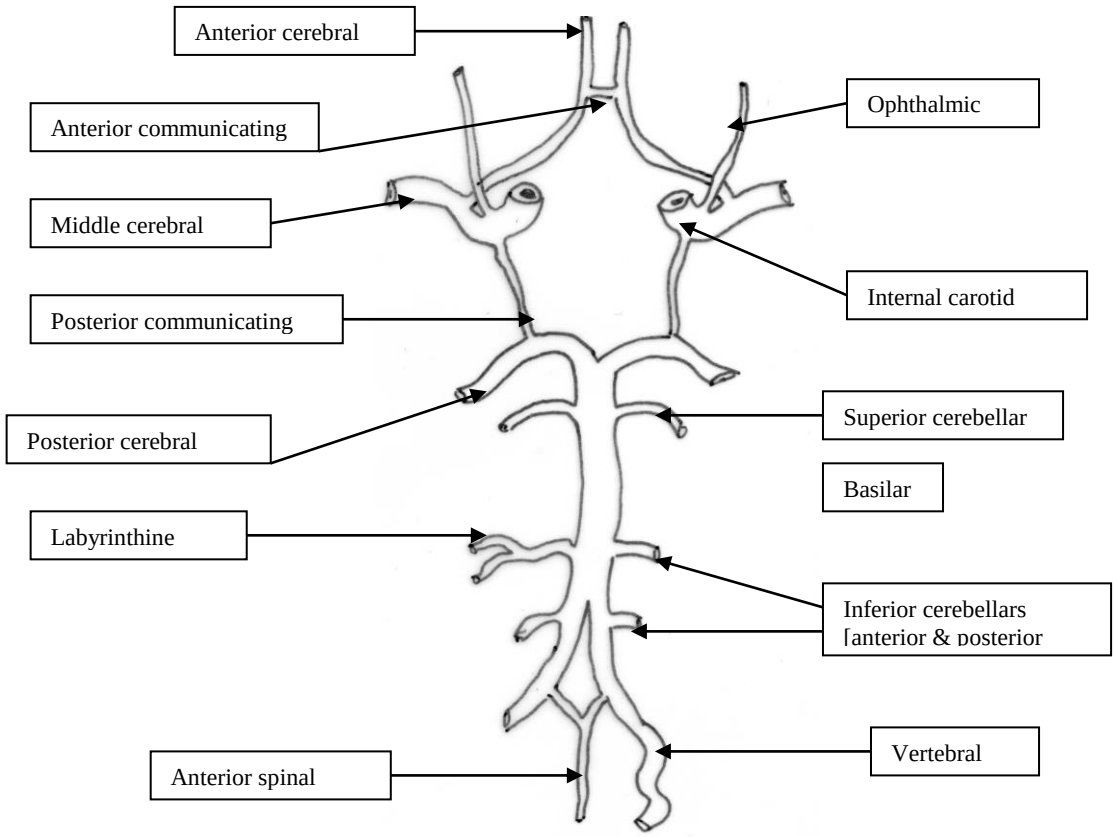
The **internal carotid ascends** in the carotid siphon within the lithous part of temporal bone; exiting from it, it gives off the **ophthalmic artery** and then bifurcates to the **middle cerebral** artery [anastomosing with the posterior communicating from the basilar artery] and the **anterior cerebral artery**. The two anterior cerebral arteries communicate via the **anterior communicating artery** which joins them in front of the chiasma and the clinoid process.

VEINS

- **SKULL AND FACE VENOUS NETWORK**
- **DRAINAGE OF DEEP STRUCTURES**



- ***The subclavian artery***



- ***The circle of Willis***

The **lateral choroid plexus** fuses into the **choroid vein**. The latter joins the **thalamostriate vein** which drains the basal ganglia to form the **internal cerebral vein** which passes through the **interventricular foramen** to empty into the **great cerebral vein of Galen** which courses under the splenium. The great cerebral vein empties into the **straight sinus** lying on top of the tentorium cerebelli.

- **DRAINAGE OF CORTICES [superficial structures]**

  They drain into the nearest venous branches and then to the nearest dural sinus.

- **DURAL VENOUS SINUSES**

1. **Superior sagittal sinus**

   Lies along the attached border of falx cerebri. Receives the **diploic veins** and some **emissary veins** from the scalp and face. It drains into the **right transverse sinus**

2. **Inferior sagittal sinus**

   Lies on the free border of falx cerebri. Receives the **great cerebral vein** and drains into the **straight and left transverse sinus**.

3. **Straight sinus**.

   Lies on top of tentorium cerebelli. It receives the **inferior sagittal sinus** and drains into the **left transverse sinus**

4. **Lateral sinuses**

   They are the **right and left transverse sinuses** which extend from the occipital protuberance to the sides of tentorium cerebri. The right receives the **superior sagittal sinus**, while the left receives the **straight** and the **inferior sagittal sinuses**. They drain into the **sigmoid sinus**.

5. **Cavernous sinuses**.

   They lie on either side of the sphenoid bone. They receive the **ophthalmic vein**, the **pterygoid veins**, the **anterior facial vein** and the **superficial middle cerebral vein**. They drain into the **petrosal basilar sinus**.

6. **Intercavernous sinus**

   Intercommunicates **between the two cavernous sinuses**.

7. **Petrosal [basilar] sinus**.

   Receives the **cavernus sinuses** and drains into the **sigmoid sinus**

8. **Sigmoid sinus**

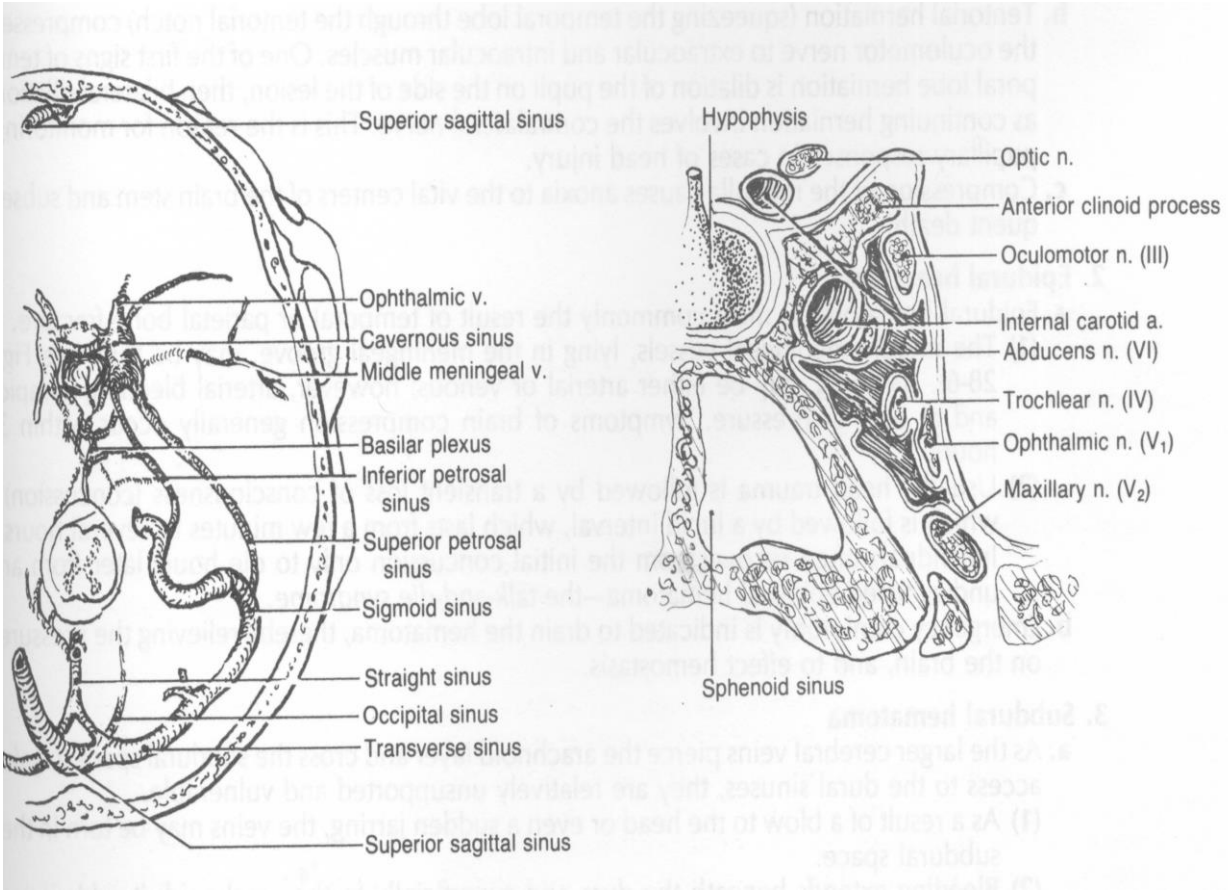
   Lies on the mastoid part of the temporal bone. It receives the **lateral sinuses** and **the petrosal sinus**. Drains into the **internal jugular vein** which exits the skull through the **jugular foramen**.

   The internal carotid artery and the occulomotor [II], trochlear [IV], the ophthalmic and maxillary branhes of the trigeminal nerve [V] and the abducent nerve **transverse the sigmoid sinus**. Above it lie the distal internal carotid, the optic tract and the uncus.

- **SEPSIS-THROMBOSIS**
  - **Cavernous sinus**

  May thrombose after **superficial infection of the lip and face** [through the facial or ophthalmic vein], after **deep infections of the face** [pterygoid veins] or **after orbit and nasal infections** [ophthalmic vein].

  Symptoms include: edema of the conjuctiva and eyelids
  transmitted pulsations at the forehead
  ophthalmoplegia



- ***Venous sinuses of cranium and contents of cavernous sinus***

papilledema, retinal haemorrhage, venous engorgement
exophthalmos

- **Sigmoid & transverse sinus**

May thrombose after **otitis media**, which may lead to a condition called **otitis hydrocephalus**.

- **Sagittal sinuses**

May thrombose after **skull infections**, transmitted through **the diploic and emissary veins**.

- **INTERNAL JUGULAR VEINS**

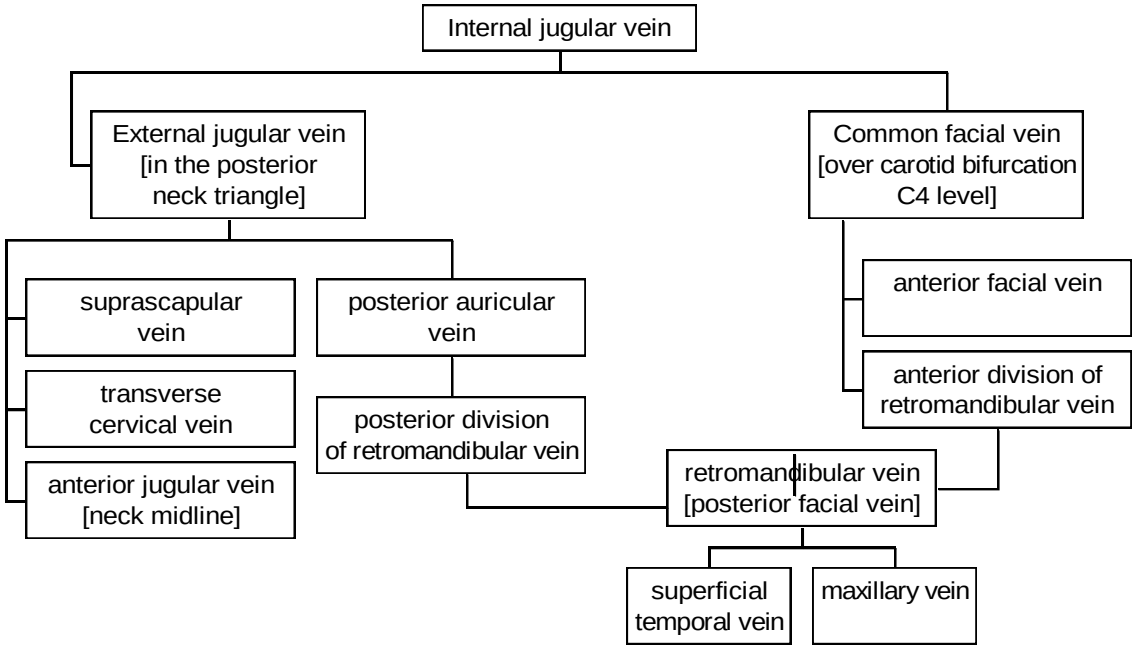
Is the continuation of the **sigmoid sinus**. It exits the skull through the **jugular foramen**, being initially **lateral to the internal carotid artery**. It enters the **carotid sheath**, being **anterolateral to the common carotid artery**. The **deep chain of cervical lymph nodes** [deep jugular chain] lie posterolateral to the vein.

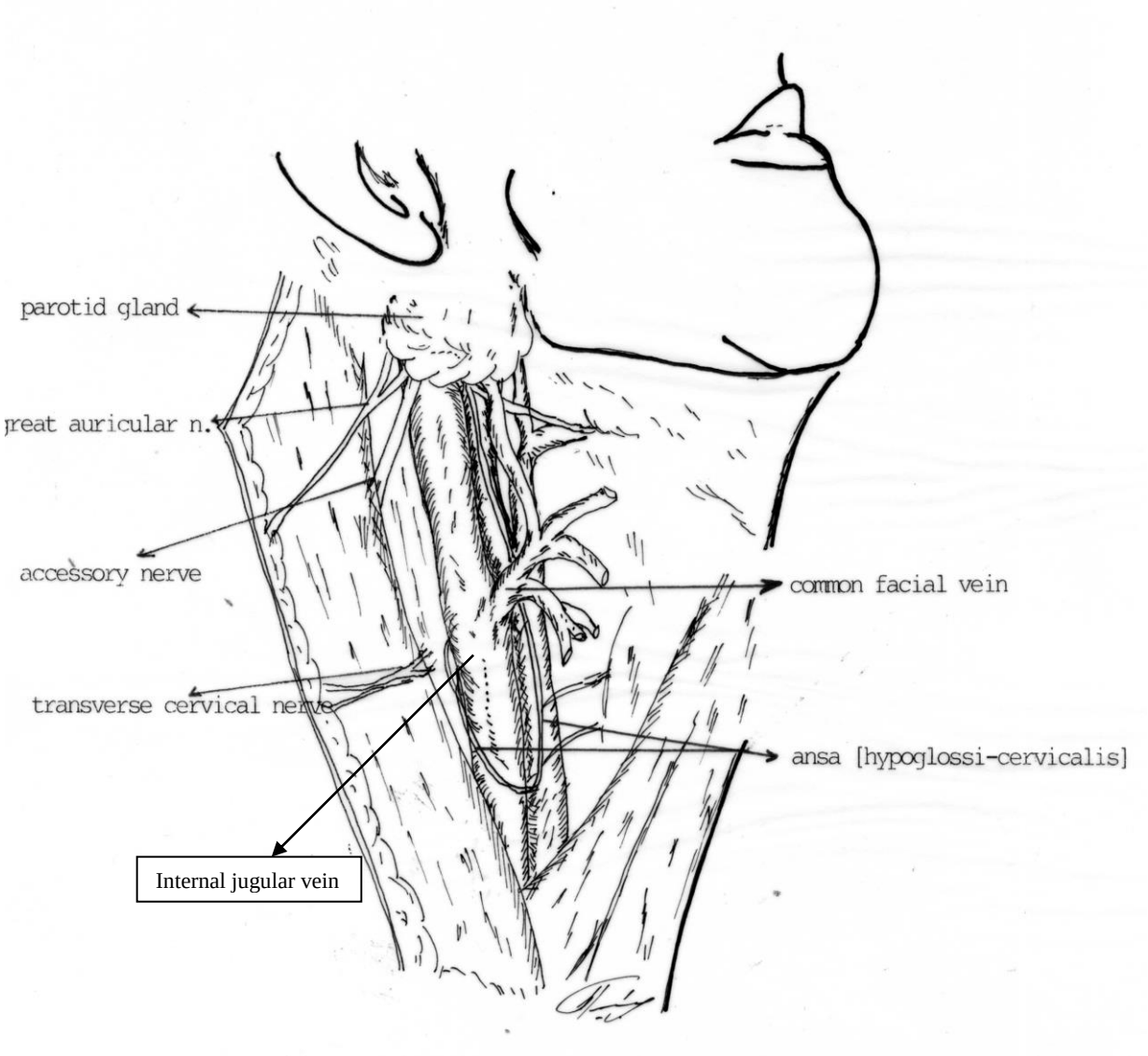
It receives the external jugular and joins the **subclavian** at the medial border of scalenus anterior, behind and lateral to the costocervical junction.

- **TRIBUTARIES**

1. **Pharyngeal venous plexus**
2. **Common facial vein**
3. **Superior and middle thyroid veins**
4. **Lingual vein**
5. **External jugular vein**

- **SUPERFICIAL NECK VEINS**





- ***The internal jugular vein***

LYMPH NODES OF THE NECK

- **HORIZONTAL CHAIN**

At the base of the skull. Drain the superficial tissues of the head and face.

- **Occipital nodes**
- **Retroauricular [mastoid**] nodes
- **Preauricular [parotid]** nodes]
- **Submandibular** nodes
- **Submental** nodes

The horizontal chain drains at the **deep cervical [jugular] nodes**

- **VERTICAL CHAINS**

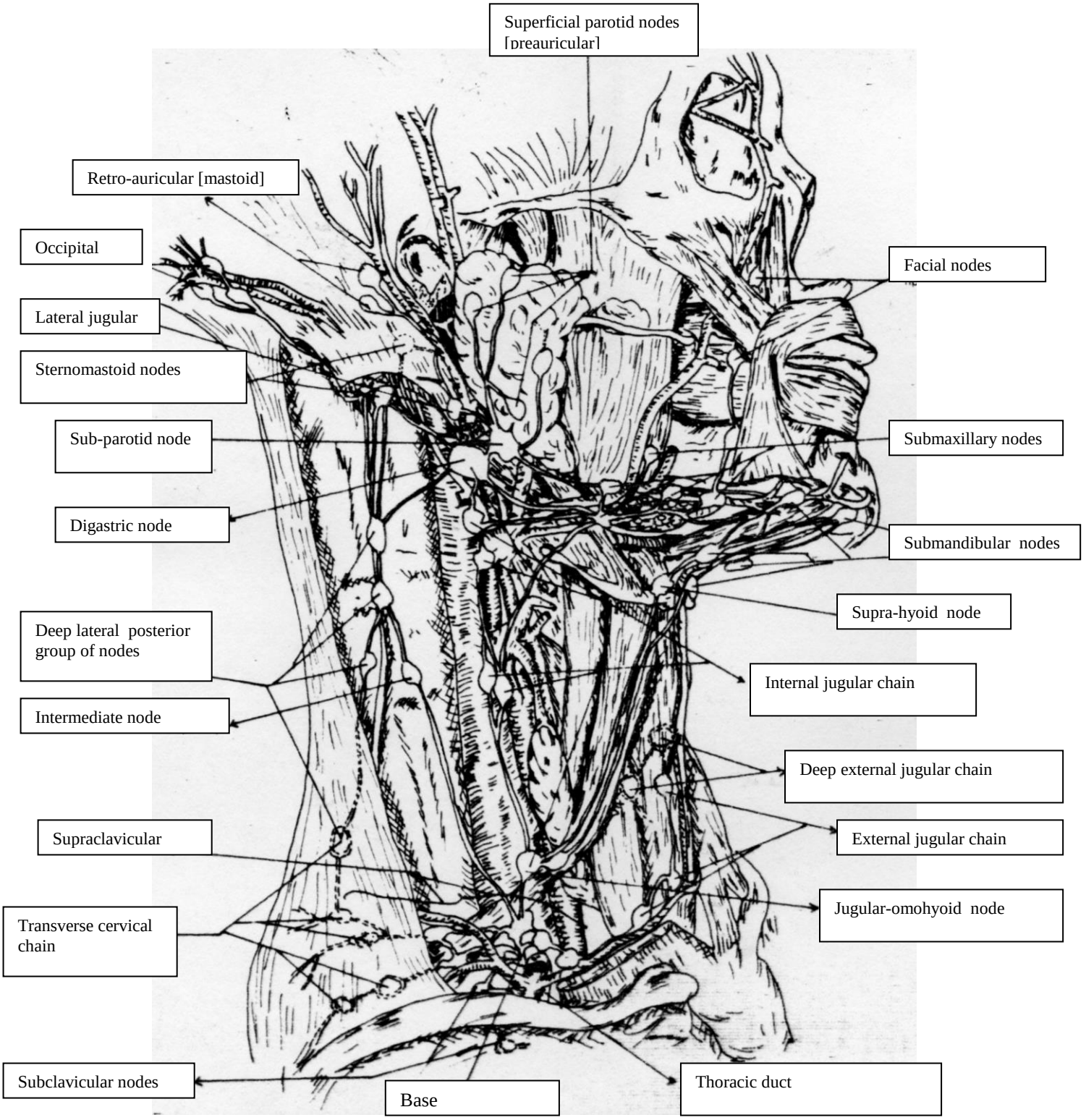
1. **Superficial cervical [external jugular] nodes**, draining the parotid, ear and superficial structures
2. **Retropharyngeal nodes**
3. **Midline chain**
    - **Infrahyoid nodes**
    - **Prelaryngeal nodes**
    - **Paratracheal nodes**
    - **Pretracheal nodes**

All the above drain into the **DEEP CERVICAL CHAIN OF NODES** [**internal jugular chain**], subdivided into upper and lower nodes, lying on the posterolateral aspect of the external jugular vein.

The deep chain empties into the **thoracic duct** [on the left] or the **right lymphatic duct**.

- **BLOCK NODE DISSECTION OF THE NECK**

Everything in the investing fascia of the neck is removed, preserving only the carotid artyeries, vagus, sympathetic trunks, hypoglossal and lingual nerves [**radical dissection**]. In the **modified radical dissection** the internal jugular vein and the accessory nerve are also preserved.



- ***Cervical and facial lymphatic drainage***

THE CERVICAL SYMPATHETIC TRUNK

Continues upwards from the thorax, crossing the neck of the first rib. It ascends deep to the carotid sheath reaching the base of the skull. Contains 3 ganglia.

- **SUPERIOR GANGLION**

The largest, formed by fusion of C2 C3 ganglia

- **MIDDLE [C6]**
- **INFERIOR [C7]**

Lies behind the vertebral artery. It may fuse with the T1, forming the **stellate ganglion** at the **neck of the first rib** [not visible during thoracoscopy].

The cervical ganglia **do not receive white rami communicantes**. They give off :

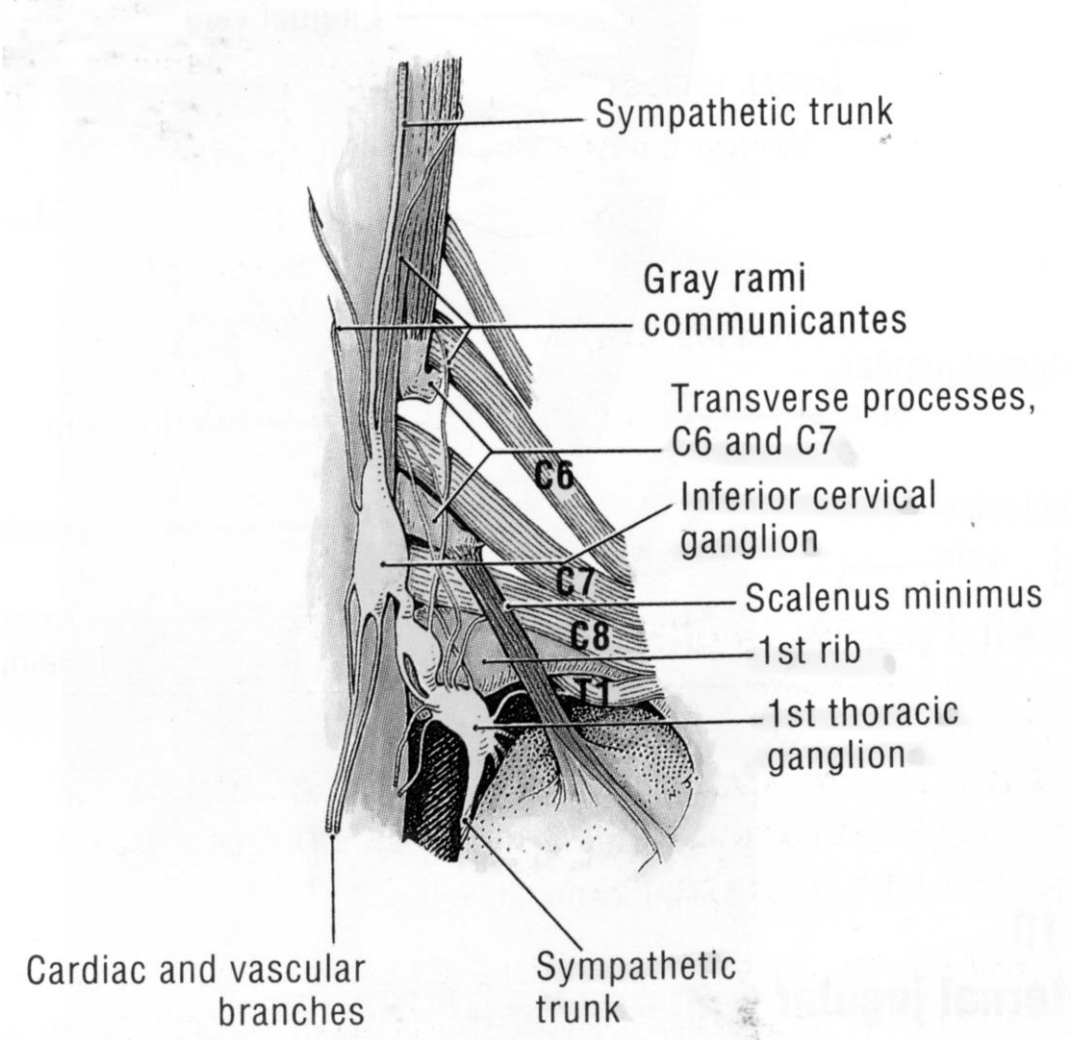
- **somatic branches [cervical nerves]**
- **cardiac branches**
- **branches for the vascular plexuses** [carotid, subclavian, vertebral]

- **THORACIC / CERVICAL SYMPATHECTOMY**

Can be performed through a **cervical incision**, through an **axillary incision** at the 2nd intercostal space or through **thoracoscopy** [endoscopic sympathectomy].

The trunk should be divided below the T1 [usually at the T3 ganglion] in order to interrupt the sudomotorm and vasoconstrictor pathways to the upper limb. If the T1 ganglion is injured, then **Horner's syndrome** may develop:

- **Myosis** [constriction of pupils due to unopposed parasympathetic innervation to the pupil constrictor by the occulomotor [III] nerve]
- **Ptosis** [paralusis of levator palpebrae]
- **Dry and flushed ipsilateral side of the face**
- **Enophthalmos**



- ***The cervical sympathetic trunk & brachial plexus***

SALIVARY GLANDS

PAROTID

The largest of the salivary glands. It lies between the **mandible and the mastoid process**, overlapping both. It consists of **two lobes** [**superficial** and **deep**] which fuse intimately around the facial nerve [VII].

- **RELATIONS**

Above: **external auditory meatus**
temporo-mandibular joint
superficial temporal vessels
superficial temporal branches of facial nerve

Below: **posterior belly of digastric muscle** [deep to it lie the internal jugular vein, the two carotid arteries and the last 3 cranial nerves]
submandibular gland

Anteriorly: **mandible**
masseter
superficial temporal artery

Posteriorly **sternomastoid muscle**

Medially: **styloid process and its muscles** [**stylohyoid & styloglossus**] separating the gland from the **internal jugular vein**, **internal carotid artery** [the external carotid winds around these muscles and ascends in front of the gland], the **last 4 cranial nerves** and the **superior pharyngeal constrictor**. The glossopharyngeal nerve passes between the two carotids while the hypoglossal crosses them anteriorly.

- **THE GLAND**

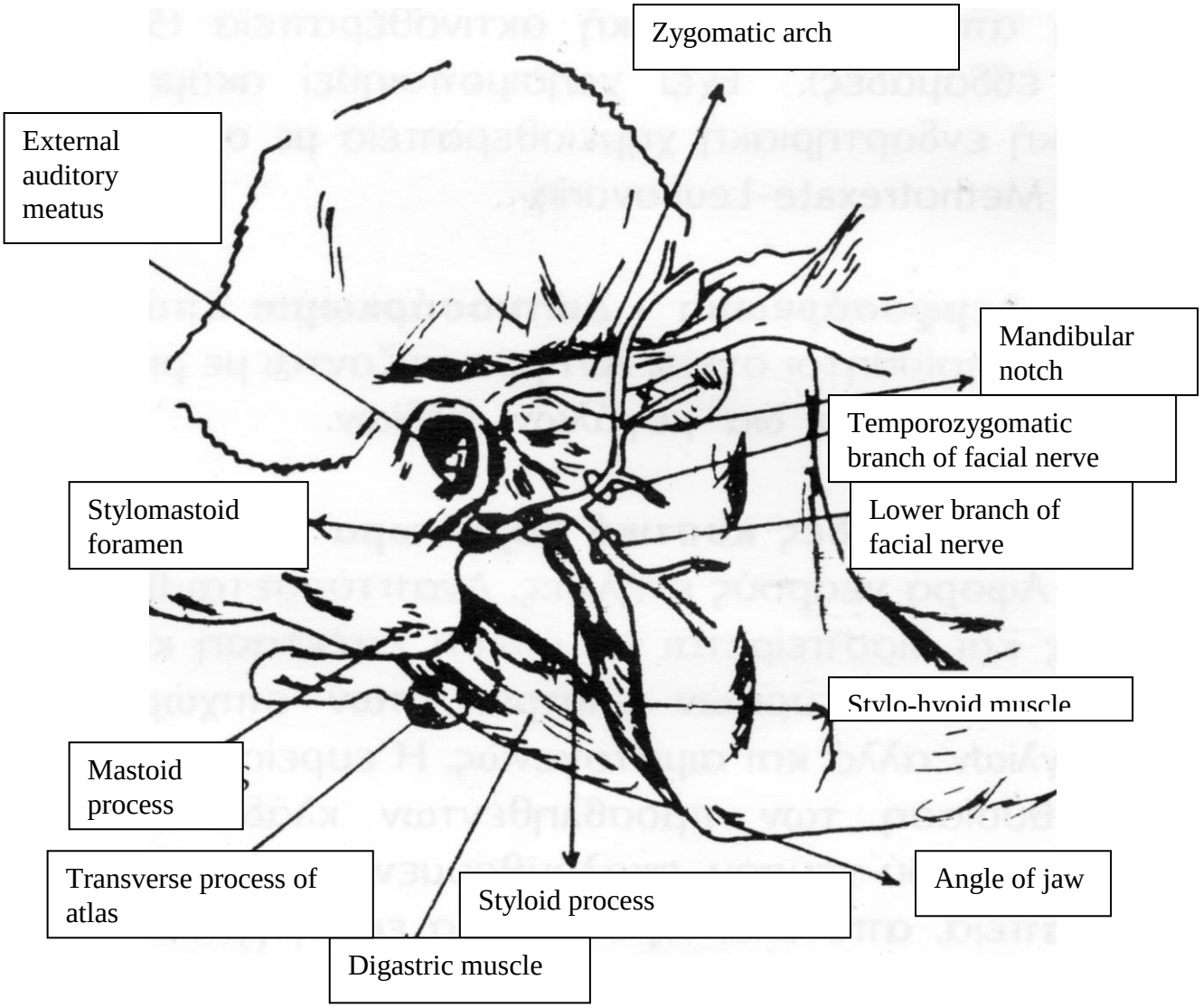
The parotid gland is enclosed in a split of the investing fascia [**parotid fascia**] which condenses anteroposteriorly [**stylomandibular ligament**], separating it from the submandibular gland. The gland drains through a 5cm duct, the **parotid duct of Stensen**; it arises from the anterior part of the gland and lies on the massester [may be felt as the fingers roll over it], a finger's breadth below the zygoma, **pierces the buccinator muscle** and opens **opposite to the second mollar tooth**.

The gland is **traversed** by:

- **facial nerve** [between the two lobes]
- **posterior fascial vein [retromandibular]**
- **Branches of the external carotid** [superficial temporal and traverse cervical artery]

- **THE FACIAL NERVE**

The VIIth nerve emerges from the **stylomastoid foramen**, in the inverted V berween the mastoid process and the bony external auditory meatus [can be exposed there]. It courses downwards for



- ***Bony landmarks in parotid surgery***

1cm and then curves anteriorly to enter the gland. The **intertragic notch** of the ear is situated just above the point of emergence of the nerve. It bifurcates into **two major branches**:

- **Upper**
    - **temporal**
    - **zygomatic**
- **Lower**
    - **mandibular**
    - **cervical**
    - **buccal**

Therre are **many cross communications** between the branches. The **mandibular branch** passes 1cm behind the angle of the jaw, before arching upwards, over the body of the mandible to supply the **depressor of the lip**.

SUBMANDIBULAR GLAND

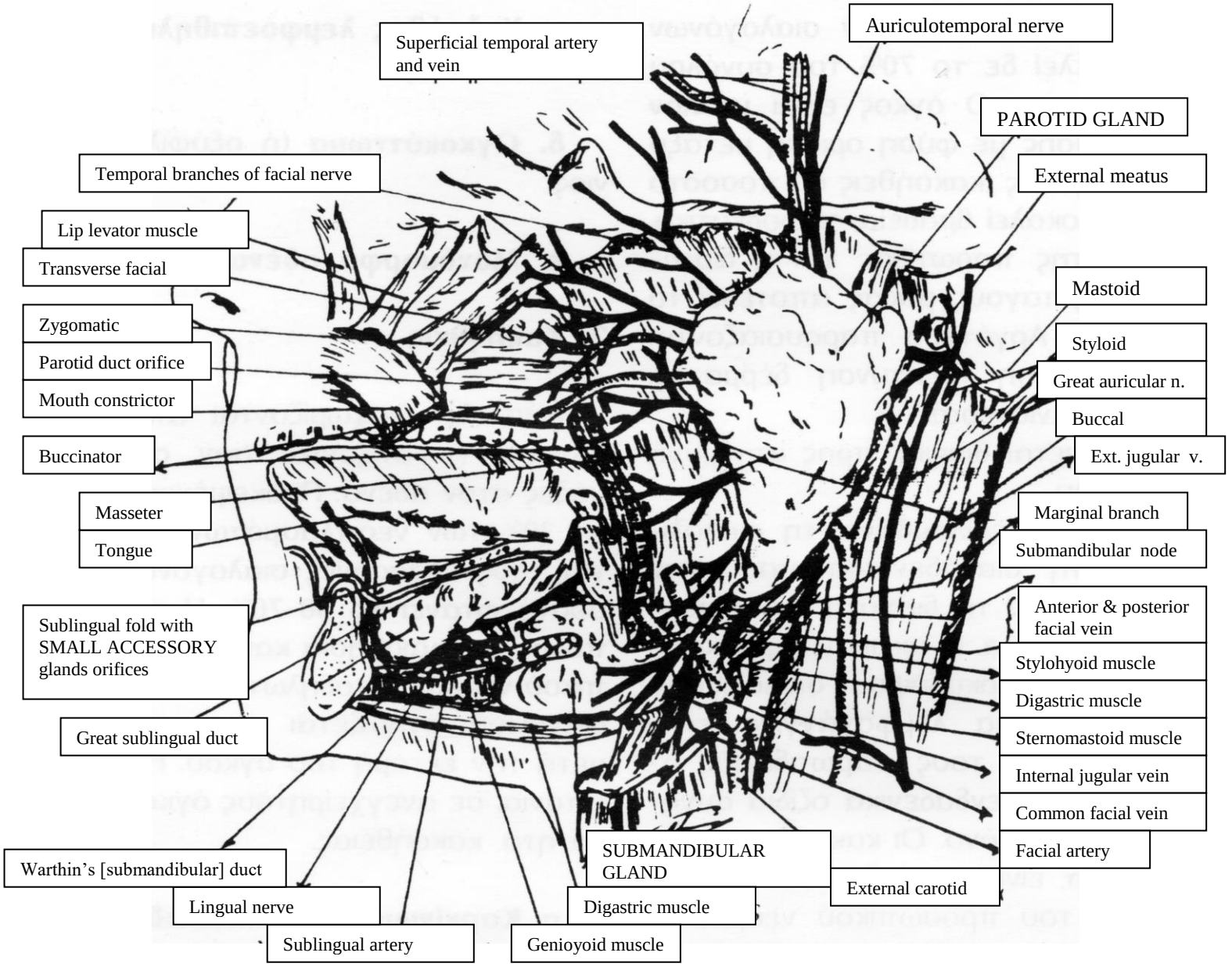
- Comprises a large superficial and a small deep lobe, which are connected around the posterior free border of mylohyoid muscle. The superficial lobe lies at the angle of the jaw, overlapping the digastor muscle. Posteriorly, it comes in contact with the parotid gland. Is covered by a capsule derived by the deep investing fascia and is crossed by the cervical branch of facial nerve [VII] and the anterior facial vein.
- The gland rests on the mylohyoid muscle, but its posterior part rests on the hyoglossus, coming thus in contact with the hypoglossal and lingual nerves [which course on the hyoglossus surface] as well as the facial and lingual arteries. The facial artery approaches it posteriorly and then arches over its superior aspect, crosses the inferior border of the mandible and ascends in front of the masseter. The lingual artery is crossed twice by the hypoglossal nerve before passing behind the hyoglossus muscle.
- The submandibular duct of Warthon's arises from the deep lobe and passes anteriorly, lying on the hyoglossus. It is crossed twice by the lingual nerve before opening at the frenulum lingua [a sublingual fold], just medially to the sublingual gland.
- The presence of a lymph node within the substance of the gland makes the removal of the gland during neck dissection necessary

SUBLINGUAL GLAND

An almond shaped gland which lies immediately below the mucosa of the floor of the mouth. It is attached to the mandible and the mylohyoid muscle [laterally], while medial to it lie the submandibular duct and the lingual nerve, the latter coursing on the hyoglossus surface.
Its opens into the floor of the mouth by a series of small ducts.

SMALL ACCESSORY GLANDS

They are scattered over the palate, lips, cheeks, tonsils and tongue.



- ***The salivary glands***

THE MOUTH AND PHARYNX

THE PALATE

Separates the buccal and nasal cavities. It closes off the nasopharynx during swallowing, speaking or blowing; if paralysed, there will be a change in voice and regurgitation through the nose in swallowing.

- **HARD PALATE.**

Vault-shaped, made up from the **horizontal palatine bone** and the **palatine plate of the maxilla**. Anteriorly is the alveolar margin of the maxilla. Is covered by a **serosal mambrane** and **mucosa**, into which the **accessory salivary glands** are embeded.

- **SOFT PALATE.**

Is made from the **aponeurosis of the tensor palatini muscle**, attached to the hard palate. Upon the aponeurosis lie the rest of the **palatine muscles**, covered by **squamus epithelium caudally** and **ciliated columnar epithelium cranially**. At the posterior border hangs the uvula. The soft palate acts like a curtain between the oropharynx and nasopharynx.

- **Sensory supply**

Mainly from the **trigeminal nerve [V]**

- **Motor innervation**
    - tensor palati muscle → **trigeminal [V]**
    - palatine muscle → **glossopharyngeal [IX]**

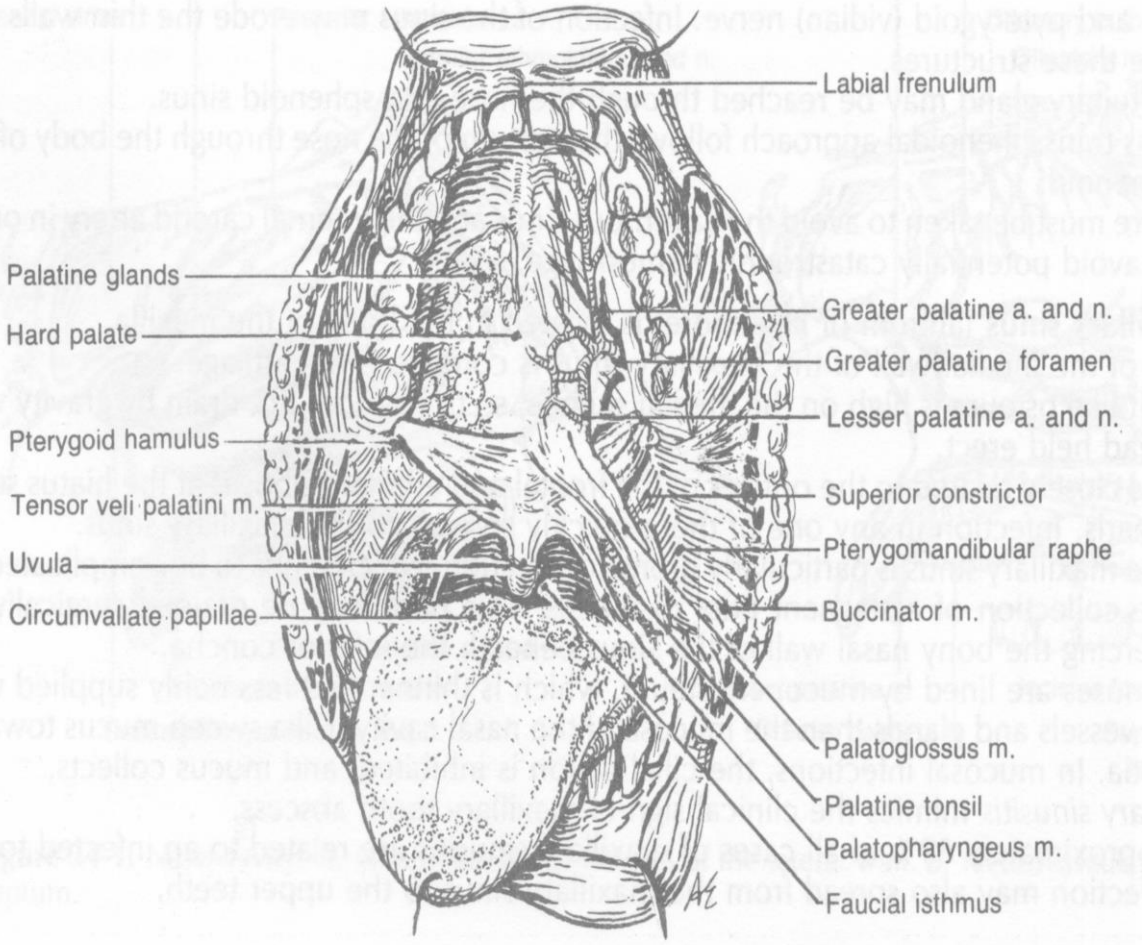
- **DEVELOPMENT**

Develops from a **complex fusion process** and this is the reason why represents one of the **commonest sites with congenital anomalies**.

From the **primitive mouth** [**stomodaeum**] develops the **fronto-nasal process** [development of nose, septum, nostril, philtrum of upper lip and pre-maxilla → 4 incisors]. Two **olfactory pits** develop as well. The frontonasal process fuses with **maxillary process** [cheek, upper lip, upper jaw, palate] and the latter fuses with the **mandibular process** [lower jaw].

- **ANOMALIES**

1. **Microstoma**
2. **Macrostoma**
3. **Cleft upper lip** [is usually unilateral; the split may extend up to the orbit]
4. **Cleft lower lip** [rare]
5. **Cleft palate**
    - bifid uvula
    - partial cleft
    - complete cleft
6. **Inclusion dermoids**
    - external angular dermoid at the lateral extremity of the upper eyebrow



- ***The mouth and palate***

THE TONGUE AND FLOOR OF THE MOUTH

- **THE TONGUE**

The tongue is subdivided in **buccal and pharyngeal portions**. These are separated by a V-shaped distal groove, the **sulcus terminalis**, bearing at its apex the **foramen cecum** and in front of it a raw of taste buds, the **vallate papillae**.

At the caudal aspect of the tongue a frenulum with thin mucosa is seen in the midline, the **frenulum linguae**. Laterally, on each side, is a **fimbriated fold**, overlying the deep lingual artery and nerve.

- **STRUCTURE**

1. **Median vertical fibrous septum**
2. **Intrinsic muscles**
    - vertical
    - longitudinal
    - transverse fibres
3. **Extrinsic muscles**
    - **Genioglossus**

    The submandibular duct, the lingual nerve and artery and the sublingual artery lie on its anterolateral surface.
    - **Hyoglossus**

    Lies more postero-laterally. The hypoglossal nerve lies on its anterior surface while the lingual artery is located posterior to the muscle.
    - **Styloglossus**

    Lies postero-superiorly, interdigitating with hyoglossus. On its anterior aspect descends the lingual nerve [branch of trigeminal [V] nerve].
    - **Palatoglossus**

    Reaches the tongue from the sides of the soft palate.
4. **Thick stratified squamus mucosa**

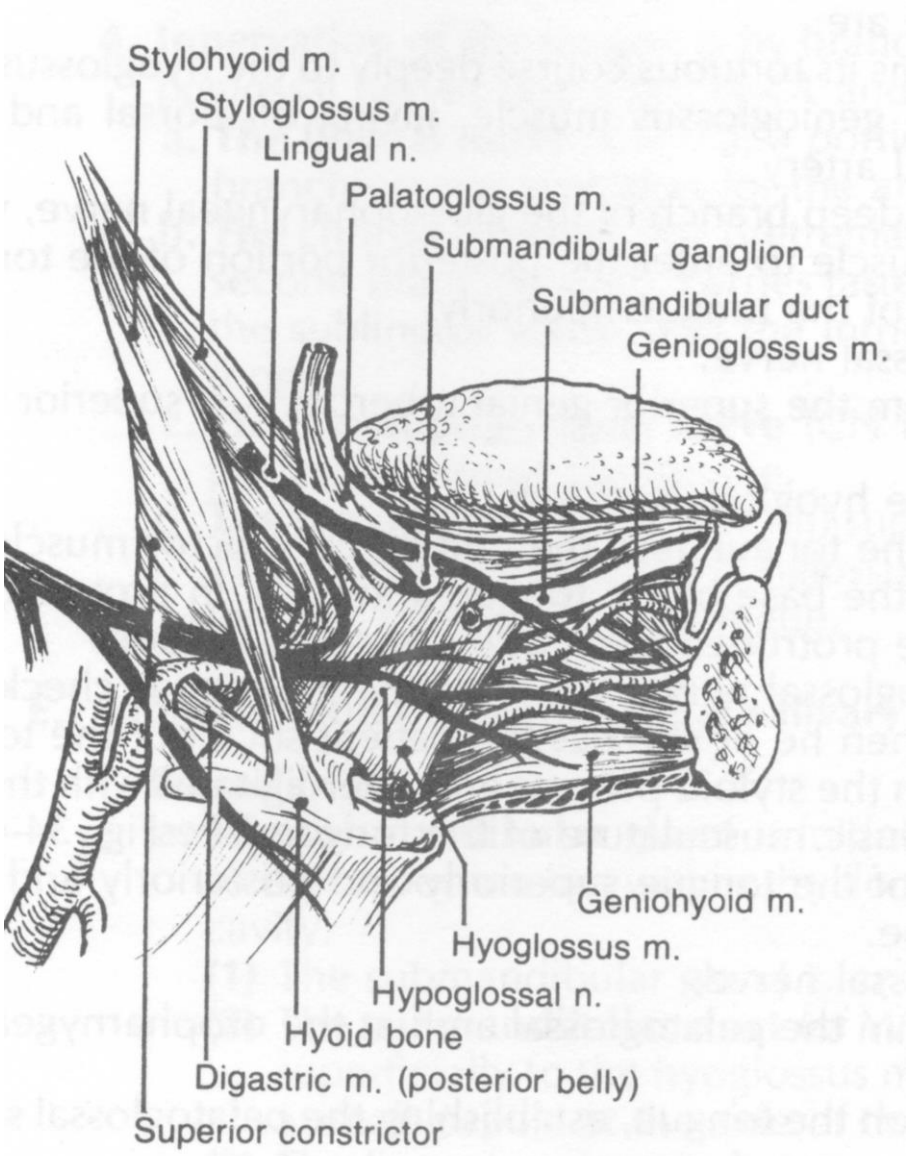
Bears the **taste papillae** on in the anterior two thirds and **lymphoid nodules** in the posterior third which form [with the tonsils and adenoids] **part of the lymphoid ring of Waldayer**.

- **BLOOD SUPPLY**

The tongue is supplied by the **lingual artery**, a branch of the **external carotid**. It passes behind the hyoglossus muscle and is **crosses twice by the hypoglossal nerve** near its origin. Gives off the **deep lingual**, the **dorsal lingual** and the **sublingual arteries**.

- **INNERVATION**
    - **Motor**

    All the **extrinsic and intrinsic muscles are supplied by the hypoglossal nerve [XII**], except **palatoglossus [pharyngeal plexus of vagus,X].** The hypoglossal crosses the internal carotid artery at the lower border of the posterior belly of digastric muscle, crosses twice the lingual artery and passes anteriorly to hyoglossus. Is then crossed by the anterior belly of digastric and stylohyoid muscle, giving off its branches after the second digastric crossing.
    - **Sensory**



- ***The tongue, lingual muscles and lingual nerve***

The sensory supply of the **anterior two thirds** is by the **lingual nerve** [branch of **trigeminal**], which descends on the styloglossus, in contact with the mandible [posteriorly], making a spiral around the submandibular duct. It also transmits the **gustatory fibres** derived from **chorda tympani** [**a branch of facial nerve**].

The sensory supply to the **posterior third**, including the vallate papillae, is derived from the **glossopharyngeal nerve [IX].**

- **LYMPH DRAINAGE**
  - **Tip of tongue → submental nodes**
  - **Anterior two thirds → unilateral** submental and submandibular nodes → **lower deep cervical chain** of nodes
  - **Posterior third → upper deep cervical chain, bilaterally**.
- **DEVELOPMENT**

The diamond shaped **tuberculum impar** develops from the **floor of pharynx**. **Two lateral swellings** develop from which the anterior two thirds of the tongue are formed and one posterior swelling, the **copula**. At the junction point develops the **foramen cecum**.

The tongue muscles develop from the **occipital myutomes** and come to their position by forward migration.

- **THE FLOOR OF MOUTH**
- **MACROSCOPIC ANATOMY**

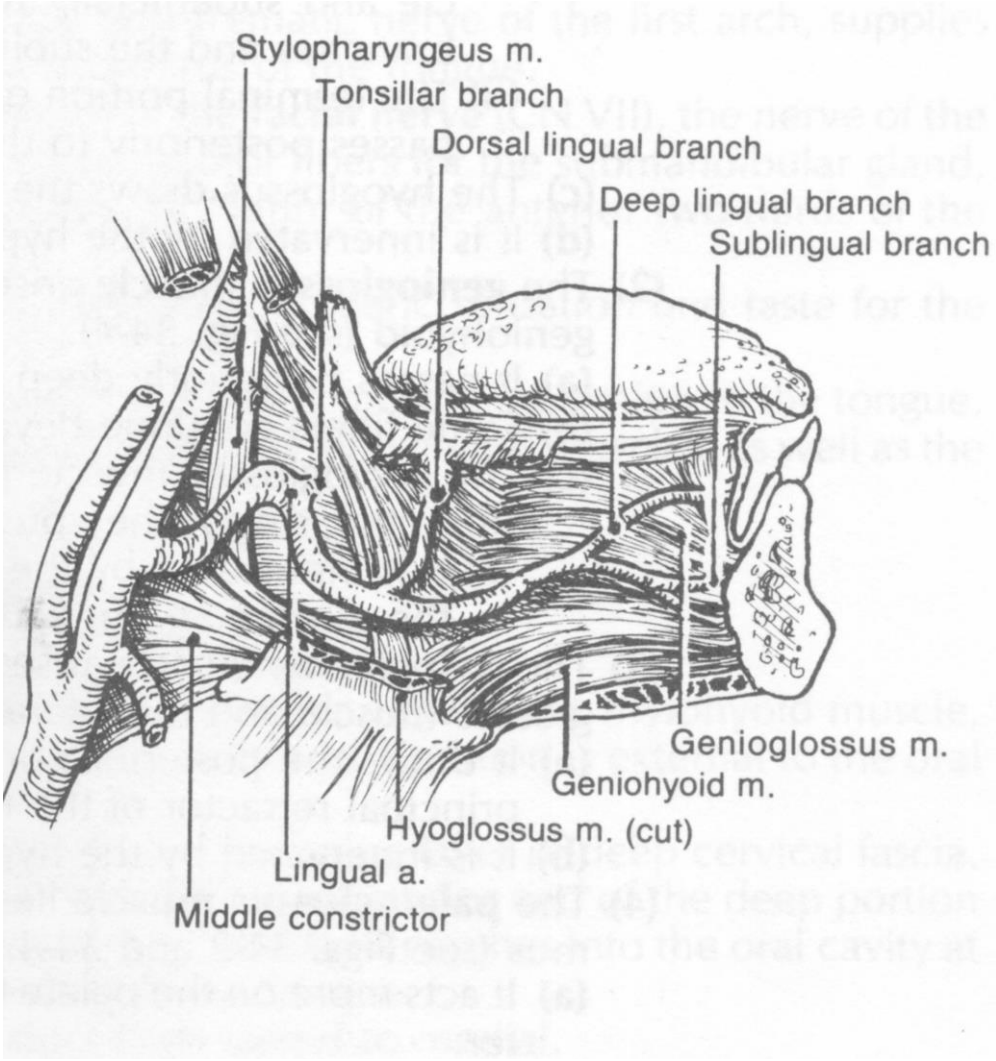
The **mylohyoid muscle** forms a septum, the **oral diaphragm**, extending from the **myloid line** of the medial aspect of the mandible to the median angle of the hyoid bone. Exterior to this muscle and to the lateral sides of the submental triangle are **the anterior bellies of the digastric muscles**, the **superficial lobe of the submandibular gland** [behind the belly] and the **submandibular lymph nodes**, all covered by **deep investing fascia** and, more superficially, the **platysma**.

Above and behind the mylohyoid , on each side, are the **sublingual glands**, close to the mandible, in close contact with the **lingual nerve** and the **submandibular duct**. The tongue **muscles form a central mass**; first the **hyoglossus** ,as a vertical sheet, covering the lingual artery, and more centrally the **geniohyoid**, covering the **genioglossus**, which lies in a deeper plane.

In **Ludwig's angina** [cellulitis of the floor of the mouth] which spreads above the mylohyoid, there is a swelling both below the chin and within the mouth.

- **SUBMANDIBULAR TRIANGLE [SUPRAHYOID]**
- **Boundaries**
  - Posterior side → **stylohyoid, posterior belly of digastric**
  - Anterior side → **anterior belly of digastric**
  - Superior side → **mandible**
  - **Floor → mylohyoid muscle and submandibular gland**

The **facial artery**, after giving off the **submental branch**, ascends behind the submandibular gland and **winds around the mandible**. The **hypoglossal nerve** and the **submandibular duct** pass anteriorly, deep to the mylohyoid muscle. The deep plobe of the submandibular glend also lies deep to the muscle.



- ***The floor of mouth and course of lingual artery***

THE PHARYNX

The pharynx is a **musculofascial tube**, incomplete anteriorly, extending from the base of the skull to the oesophagus. It represents the common entrance to both respiratory and alimentary tracts.

- **STRUCTURE**

1. **MUCOSA**

Ciliated columnar epithelium in the nasopharynx, **stratified squamus** elsewhere.

2. **SUBMUCOSA**

Thick and fibrous, connected to the **pharyngobasilar fascia**, which extends from the pharynx to the basilar part of occipital bone. This fascia forms the capsule of the tonsil.

3. **THREE PHARYNGEAL CONSTRICTOR MUSCLES**

- 3 pharyngeal constrictors [**superior, middle, inferior**], nesting one into the other posteriorly, like a series of flower pots. Anteriorly they are attached to the **side walls of the three pharyngeal cavities** [nasopharynx, oropharynx, laryngopharynx], while posteriorly they are attached in a **median raphe**. They are covered by the **buccopharyngeal fascia**, a thin areolar layer continuous with that covering the buccinator. There are 4 potential gaps in these circular muscles, as they are open in front at the entries of the 3 pharyngeal cavities.

The **inferior constrictor** is formed by an upper oblique [**thyropharyngeus**] and a lower transverse part [**cricopharyngeus**]. Between these there is apotential gap, the **Killian's dehiscence**, through which the **pharyngeal pouch** [**Zenker's diverticulum**] may arise. Three other muscles come in contact with the constrictors:

a. superiorly to superior constrictor

- **levator velli palatini**
- **tensor veli palatini**
  - ***auditory tube***

b. between superior and middle constrictor

- **stylopharyngeus**
  - ***glossopharyngeal nerve [IX]***

c. middle and inferior constrictor

- ***superior laryngeal artery***
- ***superior laryngeal nerve***
- ***internal laryngeal nerve***

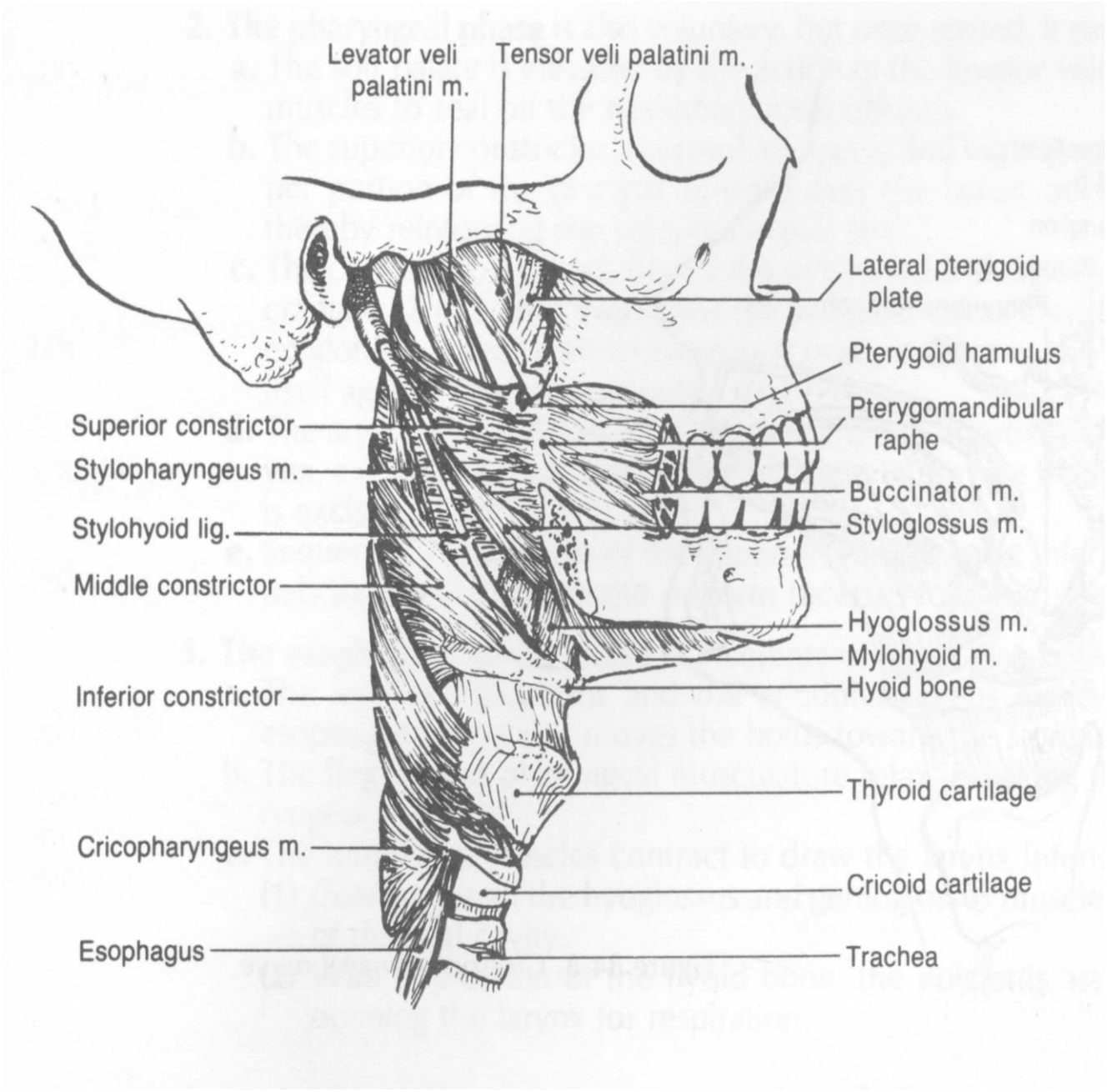
4. **PALATOPHARYNGEUS AND STYLOPHARYNGEUS**

They form, in a way, an incomplete longitudinal muscle layer.

- **BLOOD SUPPLY**

1. **Superior thyroid artery**
2. **Ascending pharyngeal artery** [from external carotid]

The veins drain into the **pharyngeal venous plexus**, which lies in the areolar sheath [bucco-pharyngeal fascia] that covers the pharyngeal muscles. The plexus drains into the **internal jugular vein**.



- ***The external pharyngeal muscles***

- **NERVE SUPPLY**
- **SENSORY**
    - **glossopharyngeal nerve [IX] [principal sensory innervation]**
    - **maxillary branch of trigeminal to the nasopharynx.**
- **MOTOR**
    - **vagus nerve [X]**

- **THE PHARYNGEAL CAVITIES**
- **NASOPHARYNX**

Lies above the soft palate, which cuts it off during degluttition.

- **Nasopharyngeal tonsil [adenoids]**

A collection of lymphoid tissue beneath the epithelium of the roof and posterior wall of the cavity. Atrophies with age. It may become prominent after chronic infections, leading ro mouth breath, blocking of the auditory tube, middle ear infection and conduction deafness.

- **Orifice of pharyngotympanic [auditory, eustachian] tube**

Opens **1cm inferiorly to the inferior nasal concha**, on the side of the pharyngeal wall. The posterior lip is prominent [**torus, eustachian cushion**], as it contains the **salpingopharyngeus muscle**. Posterior to it is the **pharyngeal recess**. The **levator palatini** muscle produces a **lateral ridge**, which seems to be emerging through the tube.

- **OROPHARYNX**

Is the cavity behind the mouth and the tongue. The anterior boundary are the **anterior tonsil pillars**, while inferiorly it extends till the **tip of epiglottis**.

Contains the **tonsils**, which lie in the **tonsilar fossa**, between the **anterior pillar** [**palatoglossal fold**, formed by the contained **palatoglossus muscle**] and **the posterior palatopharyngeal fold**, containing the **palatopharyngeus muscle**. The floor of the fossa is made by the **superior constrictor**, which submucosa [pharyngobasilar fascia] condenses to form the **tonsilar capsule**. The latter is separated from the muscle by a thin areolar tissue, which may disappear after repeated infections.

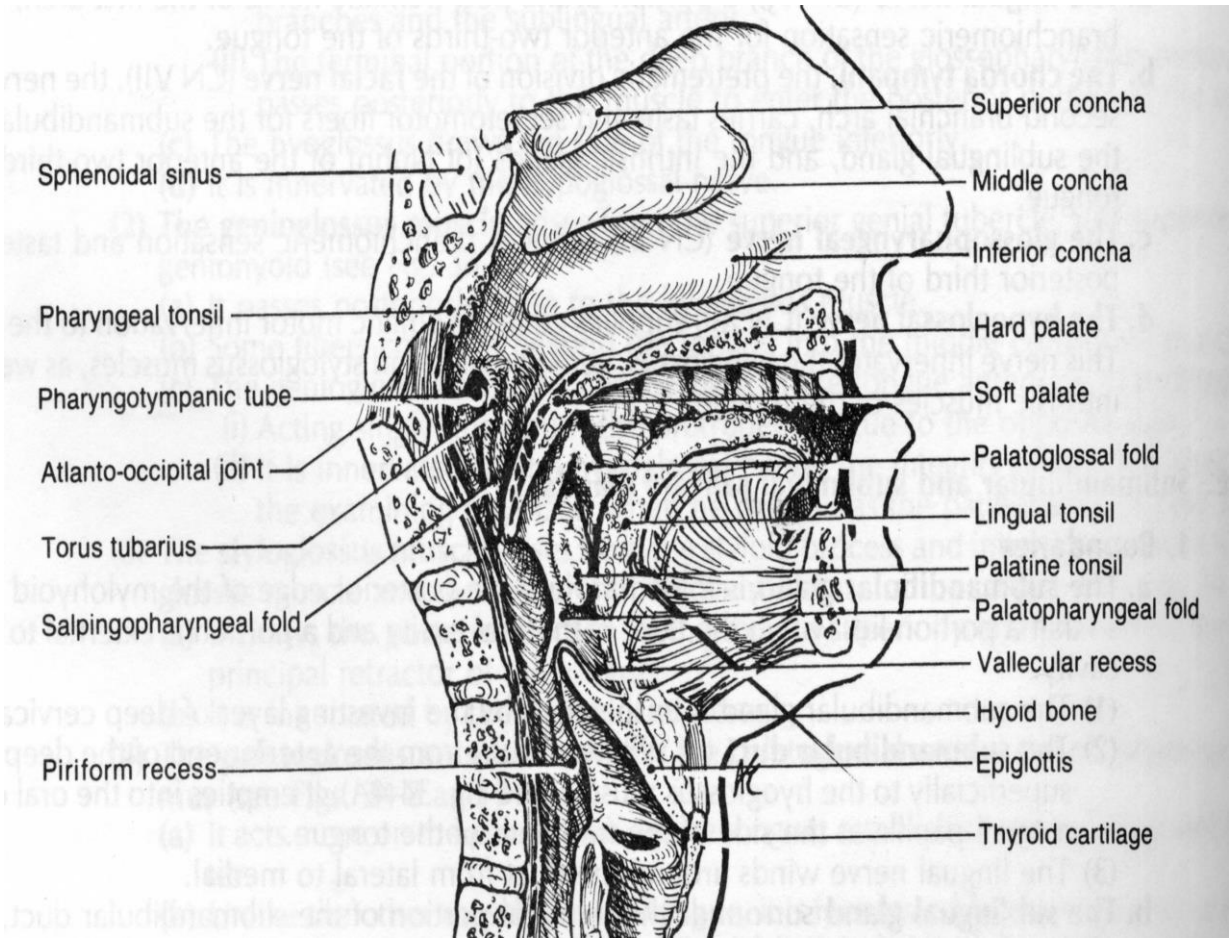
The blood supply to the tonsils comes from the **tonsilar branch of the facial artery** [entering through the inferior pole of the tonsil] and from the **ascending pharyngeal** and **palatine arteries**, entering through the upper pole. The tonsils drain into the **paratonsilar vein**, which descends on the posterolateral aspect of the tonsil bed to reach the **pharyngeal plexus** [risl of bleeding during tonsilectomy].

The tonsils consist of **lymphoid tissue**, lined by **squamus epothelium** bearing **crypts**. The lymphatics pierce the superior constrictor to empty into the **jugular nodes**, especially the **jugulo-digastric [tonsilar] node at the angle of the jaw**, which is the commonest node in the body to enlarge.

- **LARYBGOPHARYNX**

Extends from the **tip of epiglottis** to the **C6 level**, where is the **pharyngo-oesophageal junction**, the narrowest and least distensible part of the alimentary tract.

Contains the **inlet of the larynx** [**auditus to the larynx**], formed by the **epiglottis** [anteriorly], the **pharyngoepiglottic fold** [on either side of epiglottis] and the **arytenoids** [bearing the arytenoid notch] inferolaterally. Anteriorly, on each side of the larynx, a deep recess is formed, the **piriform fossa**, into which foreighn bodies frequently lodge.



- ***Nasopharynx & oropharunx***

THE LARYNX

ANATOMY

- **THE SKELETON [FRAMEWORK] OF LARYNX**

1. **HYOID BONE [C3 level]**

The larynx actually slungs down from the hyoid bone

- **U-shaped**, connected to the **larynx [thyroid cartilage & epiglottis]** by the **thyrohyoid membrane and muscle.**
- The **hyoglossus, mylohyoid, geniohyoid and digastric muscles** connect it to the **mandible and tongue**
- Is connected to the **styloid process** by the **stylohyoid muscle and ligament**
- The **3 strap muscles** [omohyoid, sternohyoid, thyrohypid] are attached yo it
- The **middle pharyngeal constrictor** is also attached to it.

2. **EPIGLOTTIS**

A leaf shaped elastic cartilage attached to the **floor of the tongue** and the **upper posterior border of the hyoid bone**. Inferiorly, it is connected to the **thyroid cartilage**, just above the vocal cords, having the **quadrangular fascia** on its lateral sides. Anteriorly lies the **median glossoepiglottic fold**, having on its sides the **vallecula** [a depression], followed by the **pharyngoepiglottic fold**. The **aryepiglottic folds** run backwards, towards the **laryngeal inlet [auditus]**

3. **THYROID CARTILAGE**

Looks like a **shield**, with its **two lateral plates** meeting anteriorly, forming the **laryngeal prominence** [V of Addam's apple] at the C4 level, and the two **horns** lying laterally.

4. **CRICOID CARTILAGE**

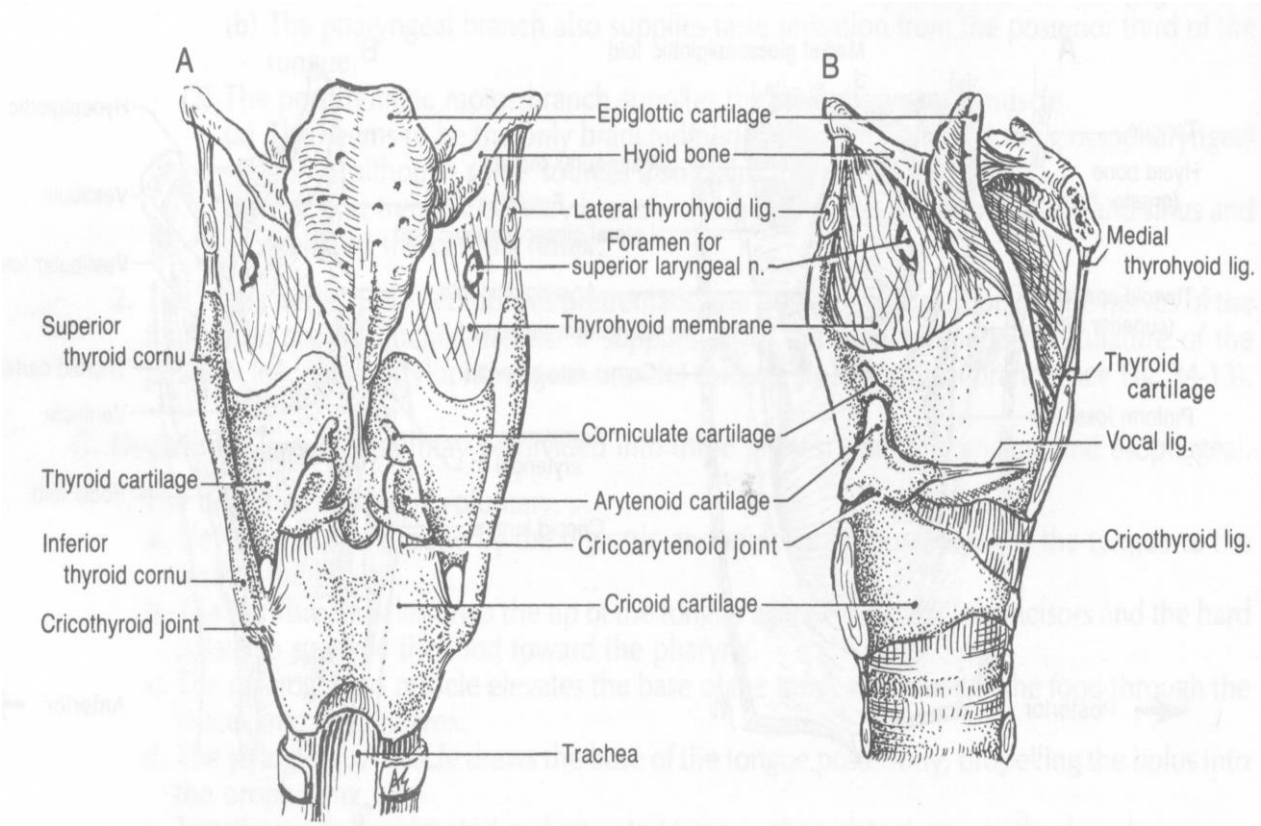
A signet-ring shape cartilage, attached to the thyroid cartilage [**cricothyroid membrane**] and the 1st tracheal ring [**cricotracheal membrane**]. The cartilage is triangular and at its upper free border forms the **vocal ligament** within the true vocal cord.

5. **ARYTENOID CARTILAGES**

Triangular in shape, they sit on each posterior side of the laryngeal inlet, held in place by the **cricoarytenoid ligament** which prevents them from falling into the larynx. From the arytenoids to the back of the thyroid cartilage there are two mucosal folds on each side. The upper, the **vestibular fold** [red and widely apart] forms the **false vocal cords**. The lower fold, containing the **vocal ligament**, is the **true vocal cord**; it looks **pearly white and avascular**, because it **has no submucosa**. Between the two pairs of vocal cords and on the sides lie a recess called the **laryngeal ventricle**.

- **COMPARTMENTS**

1. **Vestibul**e, or **supraglottic compartment**, above the false vocal cords
2. **Glottis**, or **glottic compartment**, including the true cords, false cords and the laryngeal ventricle.
3. **Infraglottic compartment**



- ***The laryngeal small bones [ossicles]***

- **MUSCLES**

4. **EXTRINSIC**
    - **Cricothyroid**

      tenses the vocal cords; is innervated by the **external branch of the superior laryngeal nerve**

2. **INTRINSIC**

   Constitute a single encircling sheath. They all have a **sphincter action**, apart from the posterior **cricoarytenoids** [on each side] which are **abductors** [separate the cords]. They are all innervated by the **recurrent laryngeal nerve**.
    - **thyro-arytenoid**
    - **crico-arytenoid**
    - **ary-epiglottic**
    - **thyro-epiglottic**
    - **inter-arytenoid**

- **BLOOD SUPPLY**
- **Superior laryngeal artery**

  Branch of the **superior thyroid**, decends to the larynx accompanied by the superior laryngeal nerve.
- **Inferior laryngeal artery**

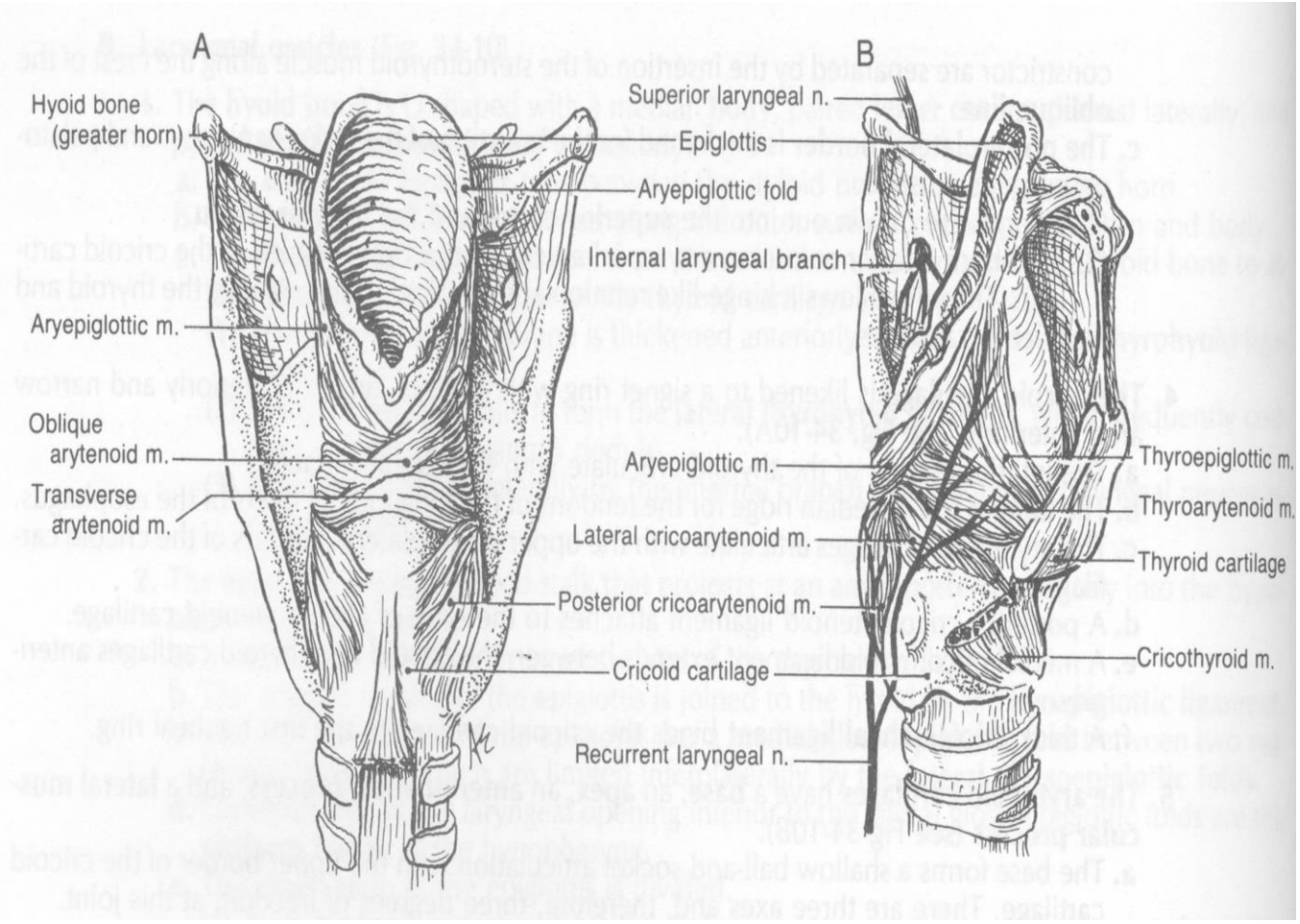
  Branch of the **inferior thyroid**, enters the gland accompanying the recurrent laryngeal nerve.

- **LYMPHATIC DRAINAGE**
- Above the cords → **upper deep cervical nodes**
- Below the cords → **lower deep cervical nodes**
- Cords → act as a lymphtics barrier, but there is cross communication posteriorly

- **NERVES**
- **SUPERIOR LARYNGEAL NERVE**

  Is a branch of the **vagus.** It passes deep to the internal and external carotids and then divides in two branches.
    - The **internal branch** pierces the thyrohyoid membrane [with the superior laryngeal vessels] an reaches the **mucosa** which it supplies till the vocal cords
    - The **external branch** descends on the side of the inferior pharyngeal constrictor, deep to the superior thyroid artery, and supplies the **cricothyroid muscle**.
- **RECURRENT LARYNGEAL NERVE**

  Supplies all the **intrinsic muscles** and the **mucosa below the vocal cords**.
    - **The left** arises from the vagus as the latter crosses the subclavian artery. Winds around the arch and deep to the ligamentum arteriosum and ascends to the side of the trachea.
    - **The right** arises as the Xth nerve crosses the subclavian. Winds around it and ascends behind the common carotid to lie in the tracheo-oesophageal groove. Crosses the

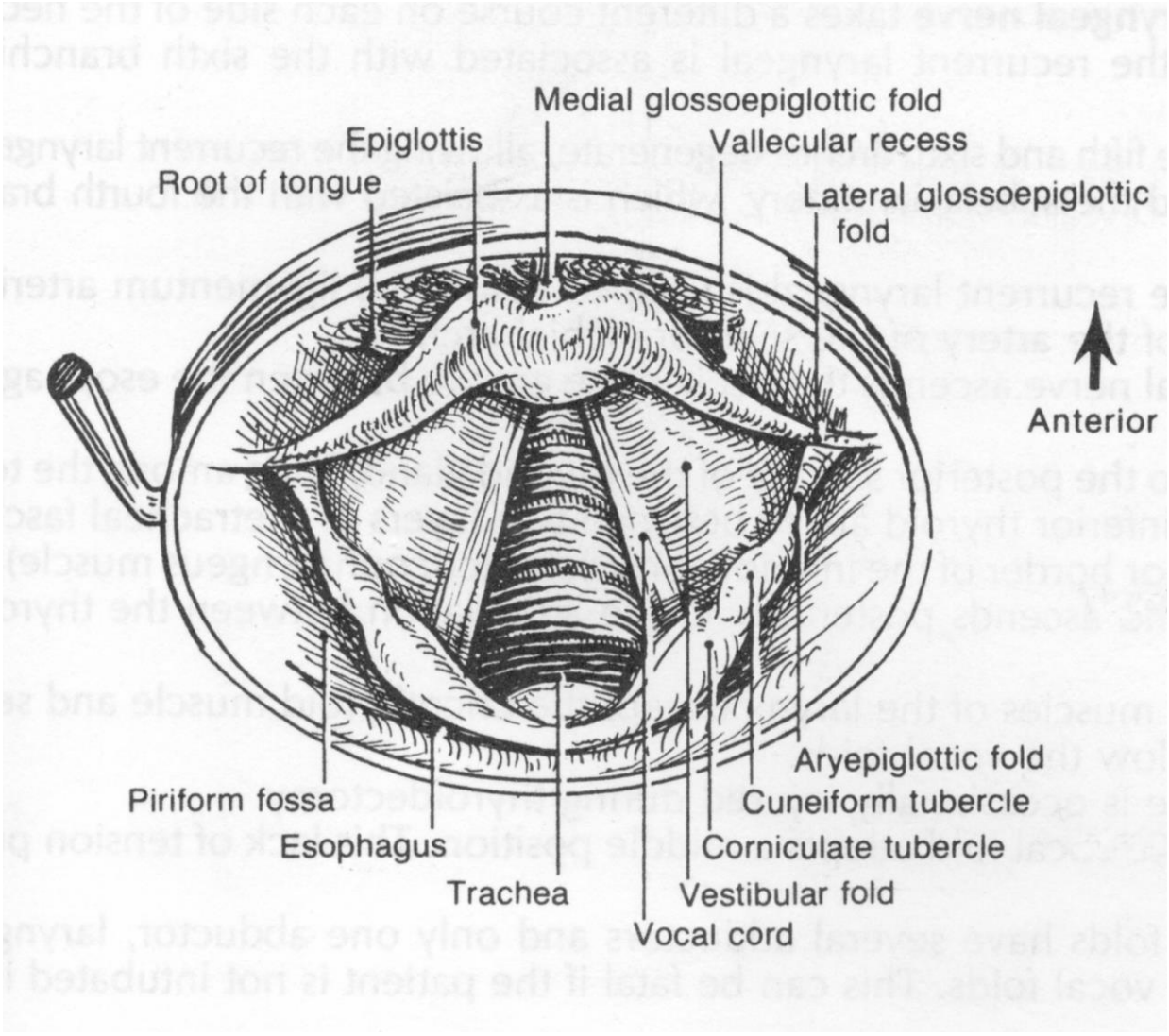


- ***The laryngeal muscles***

branches of the inferior thyroid artery and passes deep to the inferior constrictor to enter the lung, accompanied by the inferior laryngeal verssels.

CLINICAL FEATURES

- **FUNCTIONS OF THE LARYNX**
    a. open valve in respiration
    b. partially closed and modulated valve during phonation
    c. closed valve during degluttition
- **Coughing** is possible only when the larynx is closed effectively
- **Foreign bodies** are usually lodged in the vallecula or the pisiform fossa
- **The true cords are pearly white** because of the lack of submucosa and the direct adherence of the mucosa to the vocal ligamenr
- **Damage to the superior laryngeal nerve** will be followed by **weakness in phonation**, due to loss of tightness from paralysis of the cricothyroid
- **DAMAGE TO THE RECURRENT LARYNGEAL NERVE**:
- **Division → paramedian position** of the cord of the affected side
- **Bruise → Semons' law**: the abductors are mostly affected, so the cord adopts a **midline position**
- **Causes of injury / involvement**:
    - Left: Bronchial carcinoma
      Oesophageal carcinoma
      Mediastinal lymphadenopathy
      Left atrium enlargement [i.e. mitral stenosis]
    - Both:
      Laryngeal carcinoma
      Thyroid carcinoma
      Malignant neck nodes



- ***The vocal cords***

THE SKULL

BONES

The skull forms the head skeleton and is subdivide in neurocranium and facial cranium.

- **NEUROCRANIUM**

8 BONES

- **frontal bone**
- **2 parietal bones**
- **occipital bone**
- **2 temporal bones**

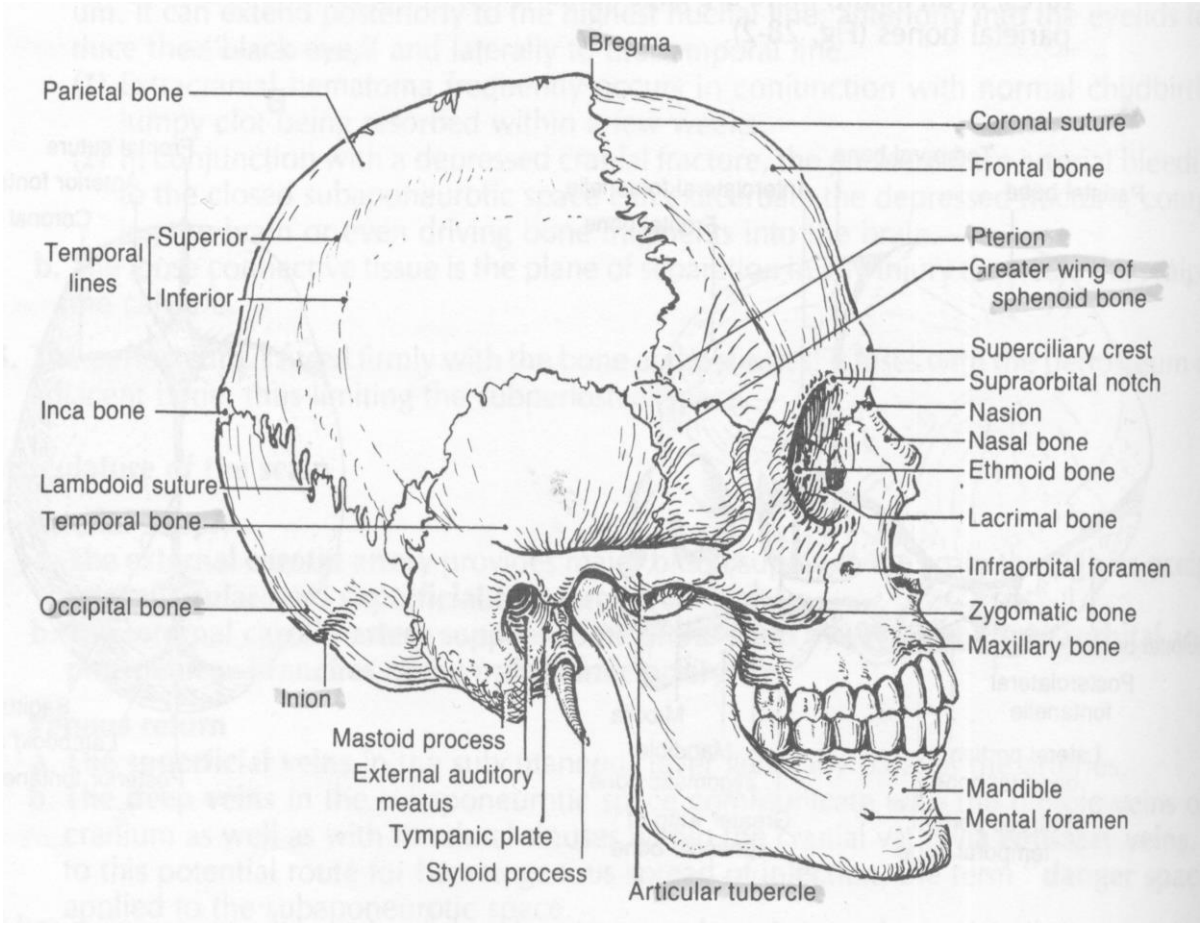
- **FACIAL CRANIUM**

14 BONES

- **orbital plates of the frontal bones**
- **2 zygomatic bones**
- **ethmoid bone**
- **2 nasal bones**
- **2 lacrimal bones**
- **2 maxillae**
- **inferior nasal concha**
- **vomer** [posterior nasal septum]
- **palatine bone**
- **sphenoid bone**

SURFACE MARKINGS

- **External occipital protuberance** [**inion**]
- **Nasion** : a depression between the supraorbital margins of the frontal bone
- **Glabella**: the ridge above the nasion
- **Frontal process of zygoma**, at the lateral orbital margin
- **Zygomatic arch** of the temporal bone
- **Jugal point**: the junction between the zygomatic arch and the zygoma → point of middle meningeal artery
- **Pterion [anterolaterla fontanelle]**: two fingers breadth above the jugal point and one finger breadth poaterior to the frontal process of the zygoma; is the point of the anterior branch of the middle meningeal artery.
- **Mandible**
- **Condyloid process** of the mandible [the coronoid process cannot be felt]
- **Masseter**
- **Temporalis muscle**
- **Parotid duct**: canbe rolled over the masseter when the teeth are clenched



- ***The skull bones***

- **Mental foramen** → a vertical line between the 1st and 2nd premolars; the **inferior dental nerve** from the **mental branch of the trigeminal nerve** passes through the foramen. The **infraorbital nerve** [V2 branch] passes through the **infraorbital foramen** while the **supraorbital nerve** [V1] passes through the **supraorbital notch / foramen**.

THE SCALP

- **S → Skin**

Rich blood supply, many sebaceous glands

- **C → Connective tissue**

Dense encapsulation of fat through fibrous septa. The blood vessels lie in it. The **emissary veins** of the scalp drain into the **diploic veins** and from there to the sinuses or the facial vein.

- **A → Aponeurosis**

The aponeurotic layer of the **occipito-frontalis muscle**, extending from the **nuchal line** to the subcutaneous tissue of eyebrow and nose.

- **L → Loose areolar [connective] tissue**

Lies beneath the aponeurosis and accounts for the mobility of the whole scalp. Blood or air collections may pass into the orbis [resulting in black eye] but not on the occipito-temporal attachments of the muscle.

- **P → Periosteum**

Adheres to the suture lines of the skull; so sub-periosteal collections outline the bone segment involved.

THE CRANIUM

- **VAULT OF THE SKULL [SKULL CAP, CALVARIA]**

Its bones develop in membrane, forming **two plates** [inner & outer], containing the **diploe**, which is the persistent red marrow site in adukts. Where the cranium is covered by muscle it is thin; elsewhere it is thick.

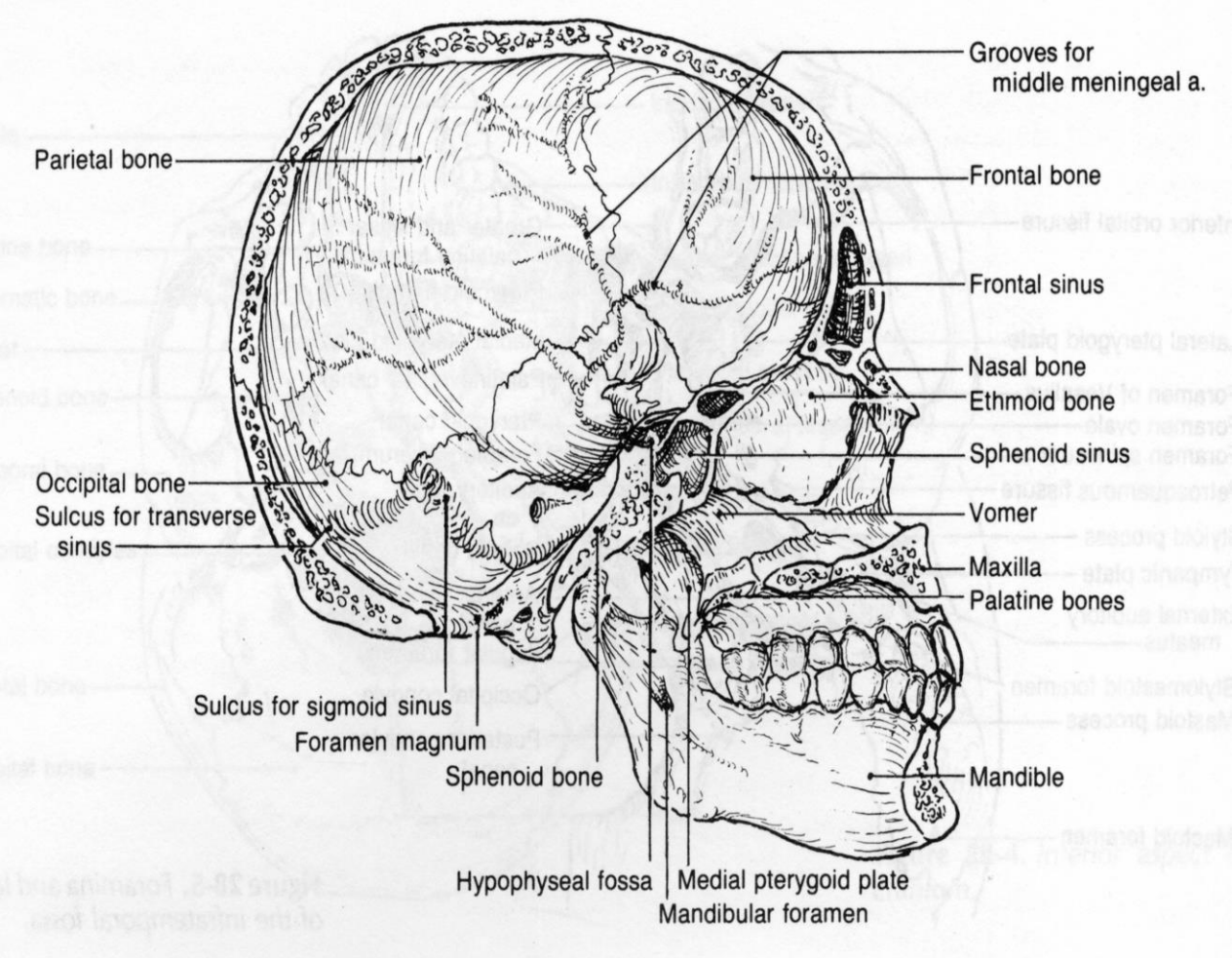
The fusion points between two bones represent the suture lines, while at the junction of two sutures [3 bones] develop the fontanelles.

- **Coronal suture**: between the frontal and the parietal bones
- **Sagittal suture**: between the two parietals
    - **Anterior fontanelle**, between coronal and sagittal sutures, [**bregma**]
- **Lambdoid suture**: between occipital bone, parietal and temporal bones
    - **Posterior fontanelle**, between sagittal and lamboid suture [**lamda**]
- **Squamosal suture**: between squamus part of temporal bone and sphenoid bone
    - **Anterolateral fontanelle**: between squamosal and sagittal suture
- **Metopic suture**: in the midline, between the frontal bones, present in only 8% of people
- **BASE OF NEUROCRANIUM**

The bones of the base develop in cartilage.

The floor of the base of the cranium declines in a **continuous convex curve**, interrupted only by the **tubercullum sellae** and the **dorsum sellae** [formed by the sphenoid bone]. Anterior and laterally to the dorsum sellae lie the **cranial fossae**.

1. **ANTERIOR CRANIAL FOSSA**



- ***The interior of skull***

- **Frontal bone**: forms the anterior and lateral boundaries; the **orbital plates** form the **floor** of the anterior fossa.
- **Ethmoid bone**:
    - **crista galli,** for the attachment of falx cerebri
    - **cribriform plate of the ethmoid**, which bears **15-20 foramina** for the passage of the **olfactory nerves**
- **Lesser wing of sphenoid bone**
    - **Tuberculum sellae** with the **optic grooves** in front of it, leading to the
    - **Optic foramina**
    - **Hypopheseal fossa**, formed by the body of the sphenoid
    - **Dorsum sellae**, with the **posterior clinoid processes** slopping down on each side

2. **MIDDLE CRANIAL FOSSAE**

Is formed by the sphenoid and temporal bones. Contain the pituitary gland and the temporal lobes of the brain.

- **Floor**: **greater wing of sphenoid**
- **Anteriorly**: **lesser wing** of sphenoid, forming the **anterior clinoid process**
- **Medially**: **body of the sphenoid** forming the **dorsum sellae [sella turcica]**
- **Foraminae**

a. **Superior orbital fissure**: at the medial end of the middle fossa, between the two wings of sphenoid.

- **Occulomotor nerve [III]**
- **Trochlear [IV]**
- **Ophthalmic division of trigeminal nerve [V1]**
- **Abducens nerve**
- **Ophthalmic veins**

b. **Foramen rotundum**

Within the great wing of sphenoid, below the anterior clinoid process and inferior to the superior orbital fissure.

- **Maxillary division of trigeminal nerve [V2**], entering then the **pterygopallatine fossa** [anterior to the wings of sphenoid]

c. **Foramen ovale**

Posteriorly and inferiorly to the sides of the dorsum sellae

- **Mandibular division of trigeminal [V3]**

d. **Foramen spinosum** [lateral sides]

- **Middle meningeal artery**

e. **Foramen lacerum**

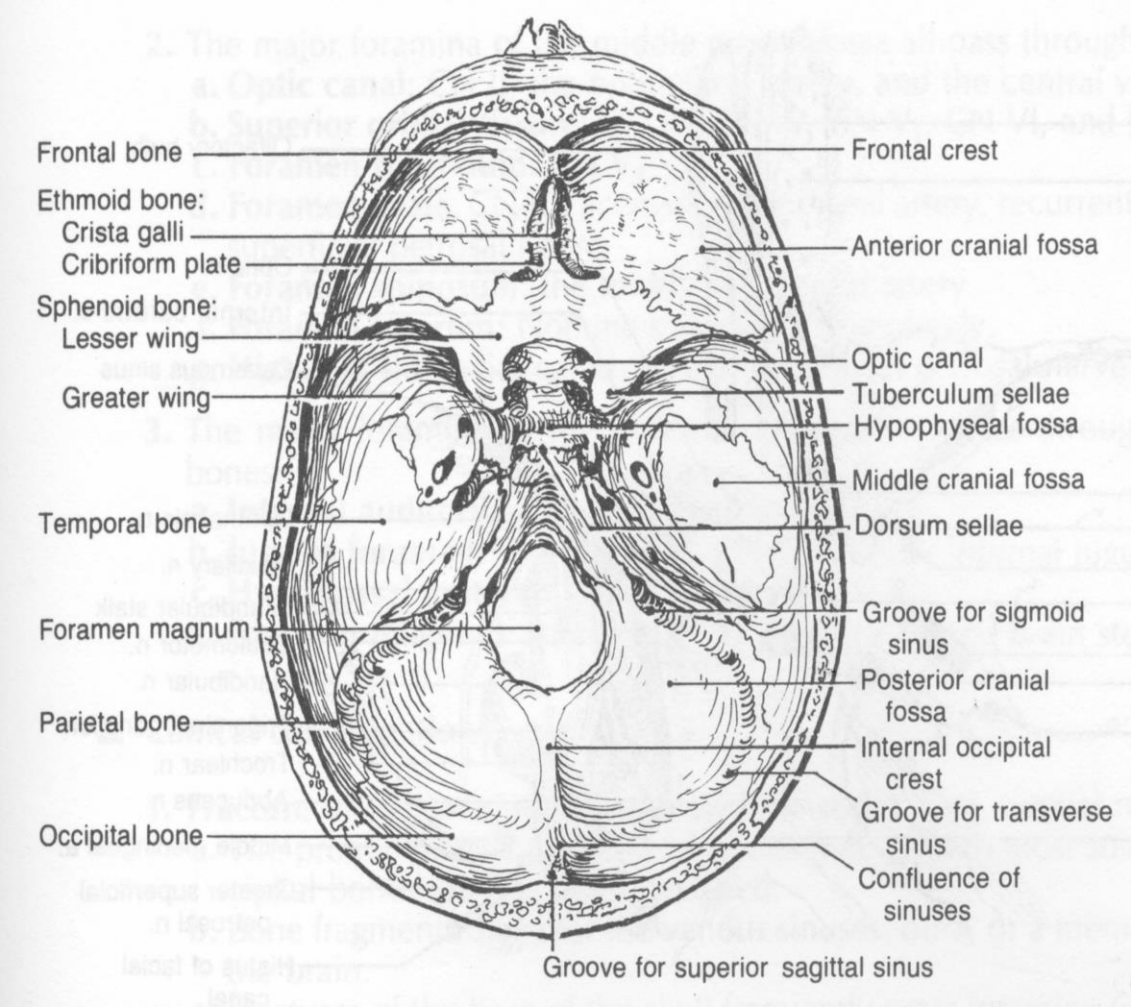
Laterally to dorsum sellae, between the petrous part of the temporal bone and the sphenoid

- **Carotid canal**
- **Fibrocartilage**

3. **POSTERIOR CRANIAL FOSSA**

Is formed by the temporal and occipital bones. Contains the cerebellum and the brain stem.

- **Clivus**, a descending plate formed by the occipital bone, which descends from the dorsum sellae to the foramen magnum, on which lie the basilar artery.



- ***The crania fossae***

- **Grooves for the transverse and sigmoid sinuses**

a. **Internal auditory meatus**

On the posteromedial surface of the petrous part of temporal bone.

- **Facial nerve [VII]**
- **Vestibulicochlear nerve [VIII]**

b. **Jugular foramen**

- **Internal jugular vein**
- **Glossopharyngeal nerve [IX]**
- **Vagus [X]**
- **Accessory nerve [XI]**

c. **Anterior condylar [hypoglossal] canal**

- **Hypoglossal nerve [XII]**

d. **Foramen magnum**

- **Vertebral arteries**
- **Spinal roots of accessory nerve**
- **Brain stem**

- **FRACTURES OF THE BASE OF THE SKULL**

The base of neurocranium is more fragile than the vault. The symptoms consist of:

- **ANTERIOR FOSSA**
  - Bleeding into the nose or mouth [involvement of frontal, ethmoidal and sphenoidal sinuses]
  - CSF leakage through the nose due to meningeal tear
  - Subconjuctival haemorrhage in frctures of the roof of the orbit
  - Anosmia [fracture of the cribriform plate of ethmoid]
  - Blindness, when the optic foramen is involved
- **MIDDLE FOSSA**
  - Bleeding into the mouth [fracture of the sphenoid]
  - CSF leakage from the ear
  - Facial nerve injury
  - Tinnitus, deafness, due to vestibulocochlear nerve injury
- **POSTERIOR FOSSA**
  - Bruising over the mastoid
  - Involvement of the last 6 cranial nerves

ACCESSORY NASAL SINUSES

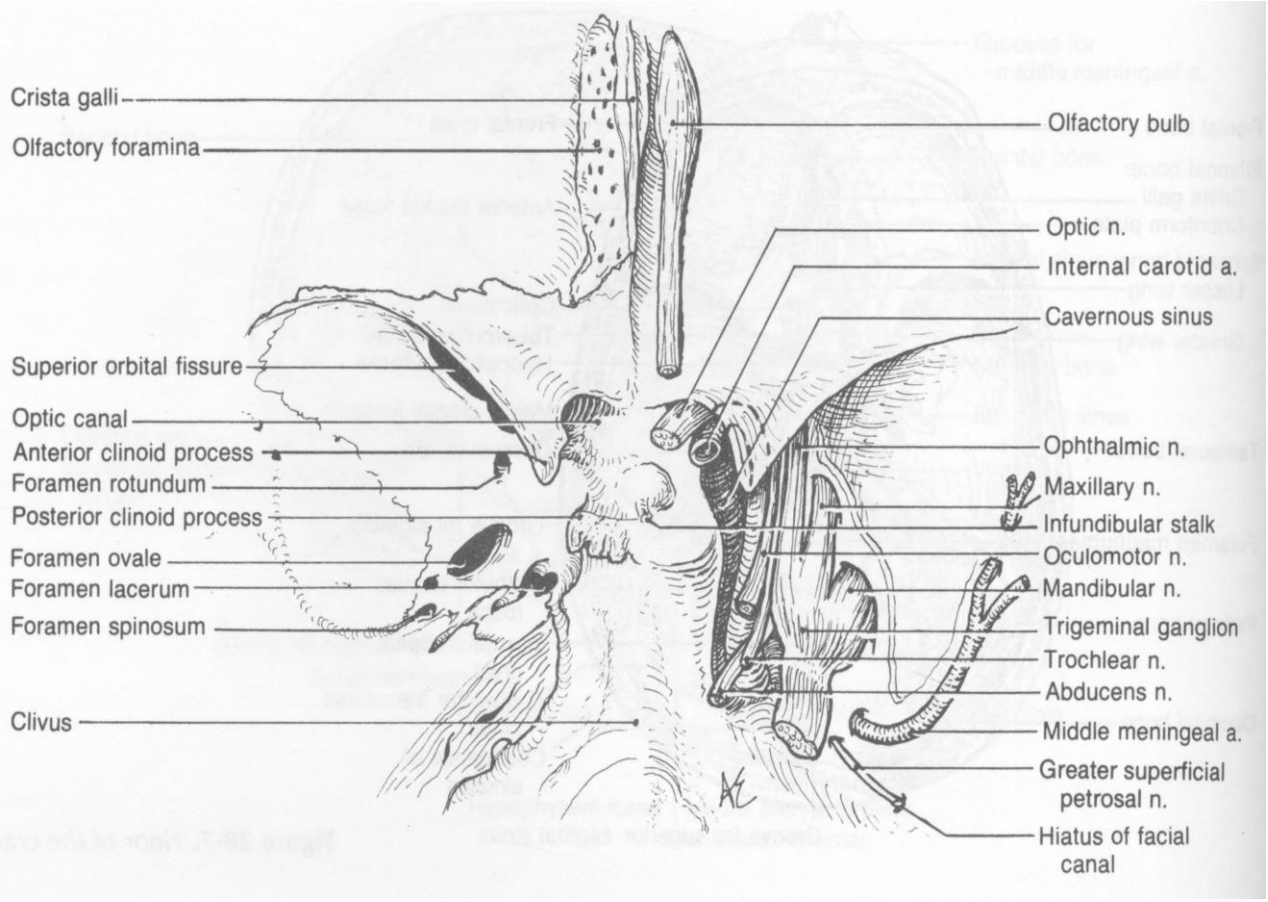
They represent air contained sacs within the facial and anterior bones of the neurocranium, which communicate with the nasal cavity through narrow channels and are lined by **ciliated columnar epithelium** [respiratory mucosa].

1. **Frontal sinuses**

Two cavities separated by a median bony septum, lying underneath the prominence of the forehead. They drain into the middle nasal meatus

2. **Maxillary sinus**

Pyramidal shaped, within the body of the maxilla, forming the lateral wall of the nasal cavity. Opens in the middle meatus, between the middle and inferior conchae. On the roof of the sinus



- ***The middle fossa foramina***

lies the infraorbital nerve, while its floor bears the impressions of the upper premolar and mollar teeth.

3. **Ethmoid sinuses**

8-10 air cells in the lateral mass of ethmoid, between the nasal cavity and the orbits, on the lateral sides of the cribriform plate. Drain into the superior and middle meatus.

4. **Sphenoid sinuses.**

On either side of the midline, within the body of the sphenoid. They drain above the superior conchae.

THE MANDIBLE

- **HORIZONTAL BODY**

They join in the midline, forming the **symphysis menti**. On its medial side is the **alveolar border** with multiple alveoli.

- **VERTICAL BODY**
- **Mandibular foramen** on the inner aspect of the bone, where the **mandibular branch of trigeminal** enters the **mandibular canal** to exit through the **mental foramen**.
- **Coronoid process** [anteriorly]
- **Mandibular notch**
- **Condyloid process**, the head of which articulates with the temporal bone to form the **temporomandinular joint**. The joint has an articular disk and is held in place by the **temporomandibular** and **sphenomandibular ligaments**. Dislocation of the joint can happen almost always in the forward direction.
- **BLOOD SUPPLY**

The lower jaw [mandible] is supplied only by the **inferior dental artery**, running in the **mandibular canal**. Thrombosis may thus lead to bone necrosis. In contrast to this, the upper jaw [maxilla] has segmental blood supply by multiple vertical branches, so there is no chnace of ischaemic bone necrosis

- **THE TEETH**

20 DECIDUOUS

On each upper and lower half there are:

- **2 incisors**
- **1 canine**
- **2 molars**

The 1st lower deciduous incisor appears at 6 months

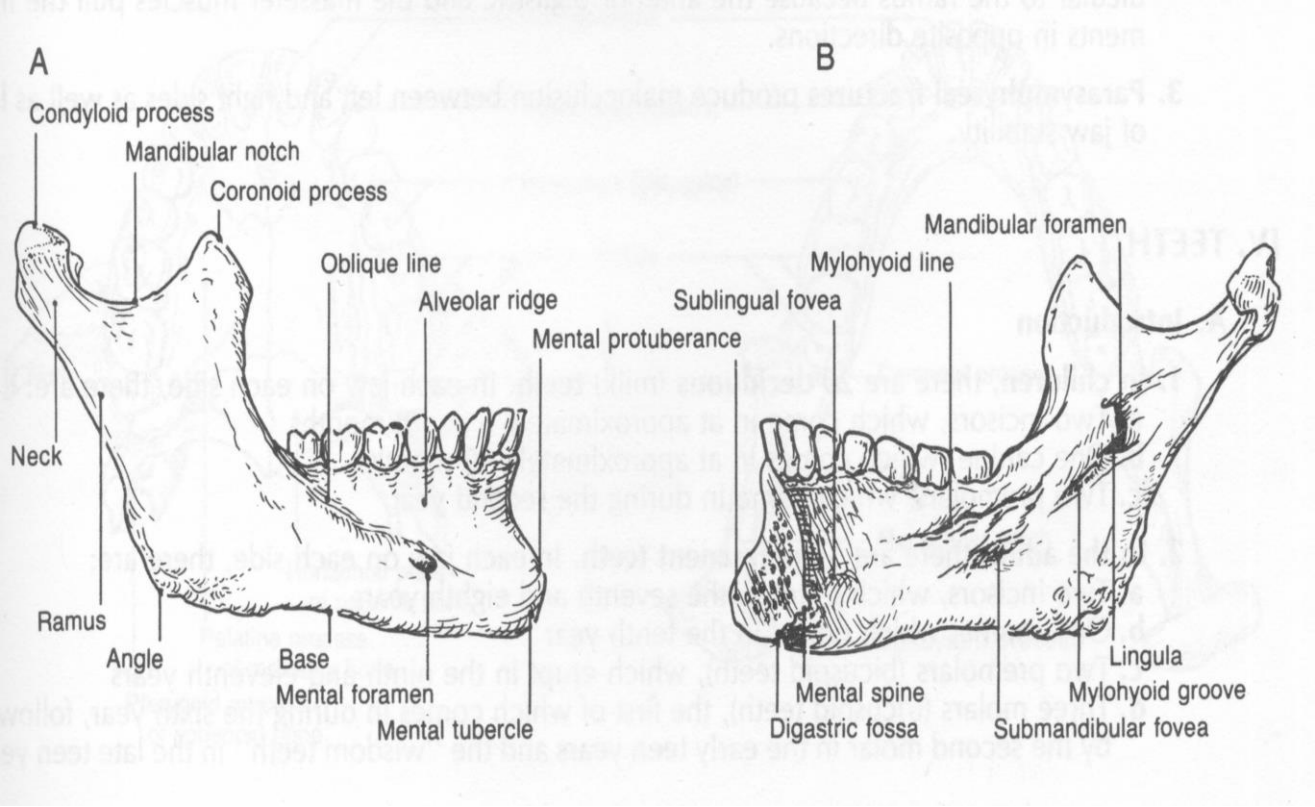
All deciduous teeth appear by the 24th month

32 PERMANENT:

- **2 incisors**
- **1 canine**
- **2 premolars**
- **3 molars**

The permanent 1st molar and 1st incisor appear at 6 years

The 2nd permanent molar appears at 12 years
The 3rd permanet molar appears at 24 years



- ***The mandible***