Anatomy of the Neck

The Skeleton

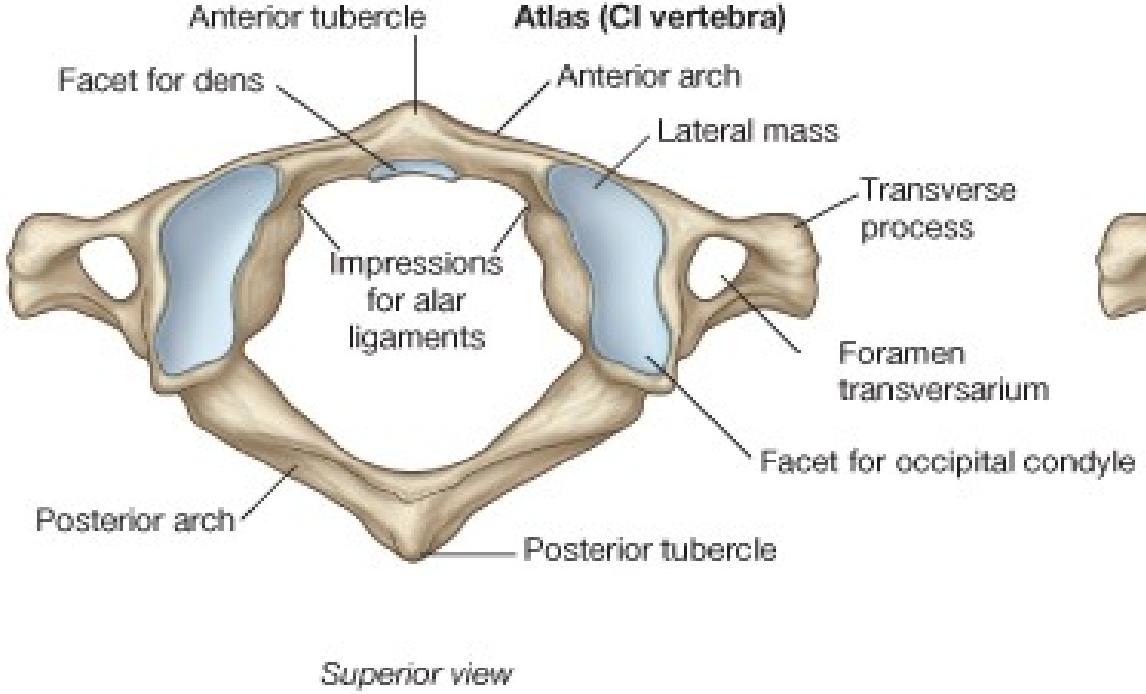
- The skeletal framework of the neck is mainly formed from the **cervical vertebra**. But the **hyoid bone** also contributes to it anteriorly.

Cervical vertebra

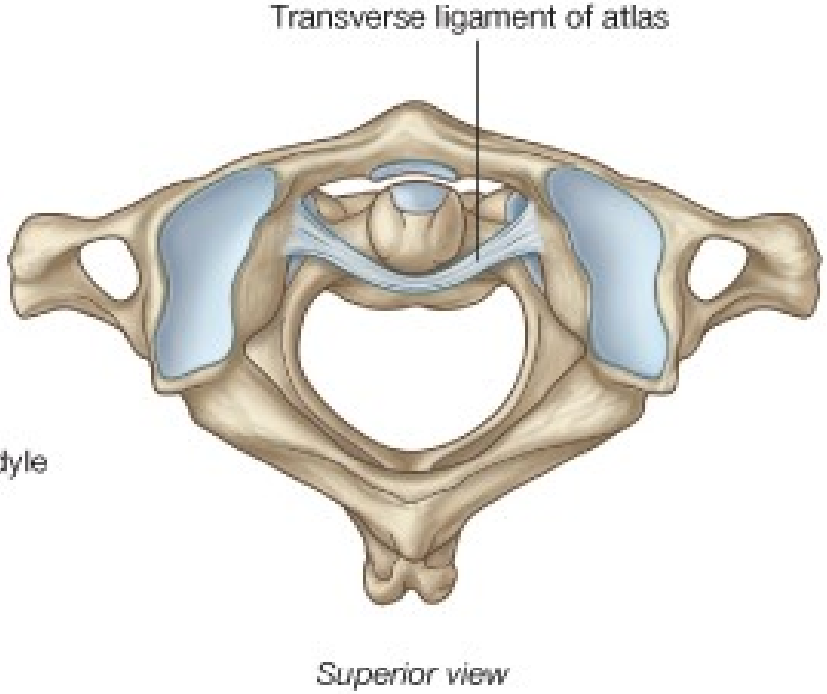
- The seven cervical vertebrae form the bony framework of the neck.
- They are characterized by:
  - small bodies
  - short and bifid spinous processes
  - transverse processes that contain a foramen (**foramen transversarium**).
  - has a triangular shaped vertebral foramen
- The upper two cervical vertebrae, the **atlas** (CI) and **axis** (CII) are modified for moving the head.

Atlas and axis

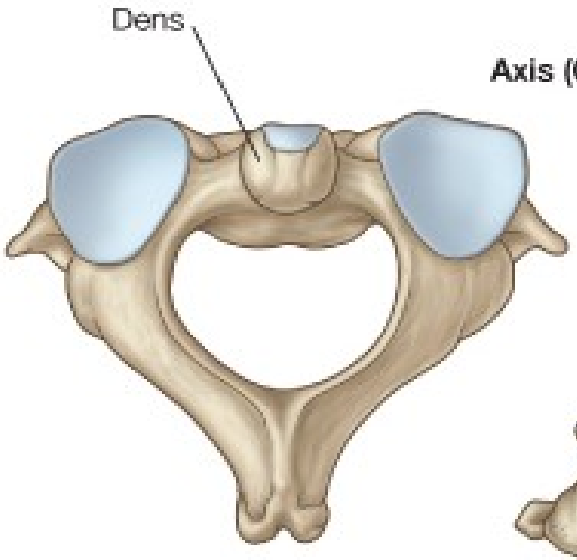
- Vertebra CI (the **atlas**) articulates with the head.
- Its major distinguishing feature is that it lacks a vertebral body .
- It articulates above with an **occipital condyle** of the skull at **atlanto-occipital joint,** which allows the head to nod up and down on the vertebral column. and below with the superior articular process of Vertebra CII



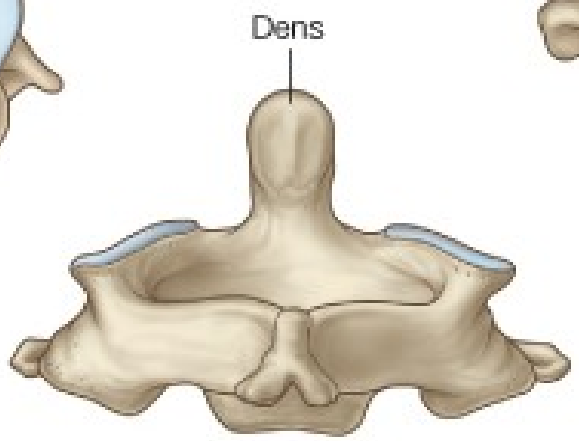
Superior view



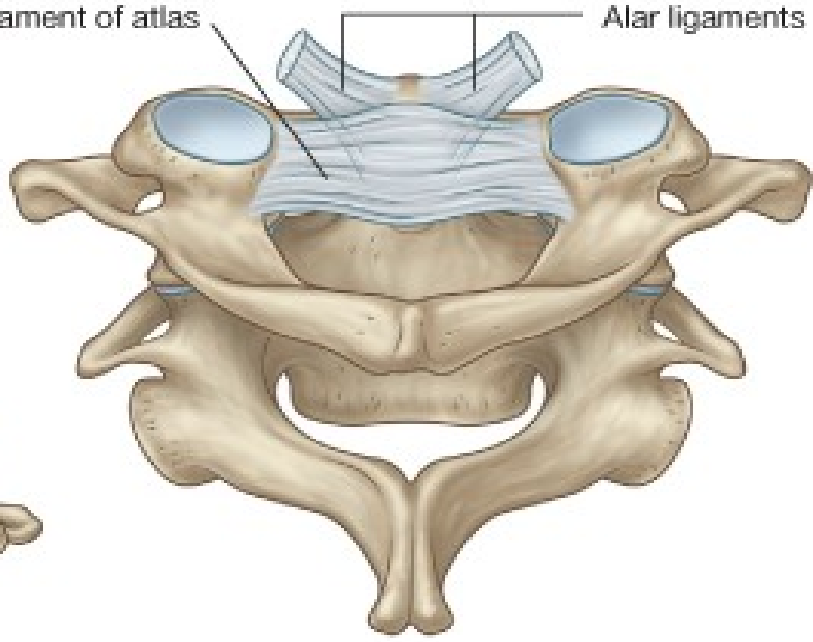
Superior view



Superior view



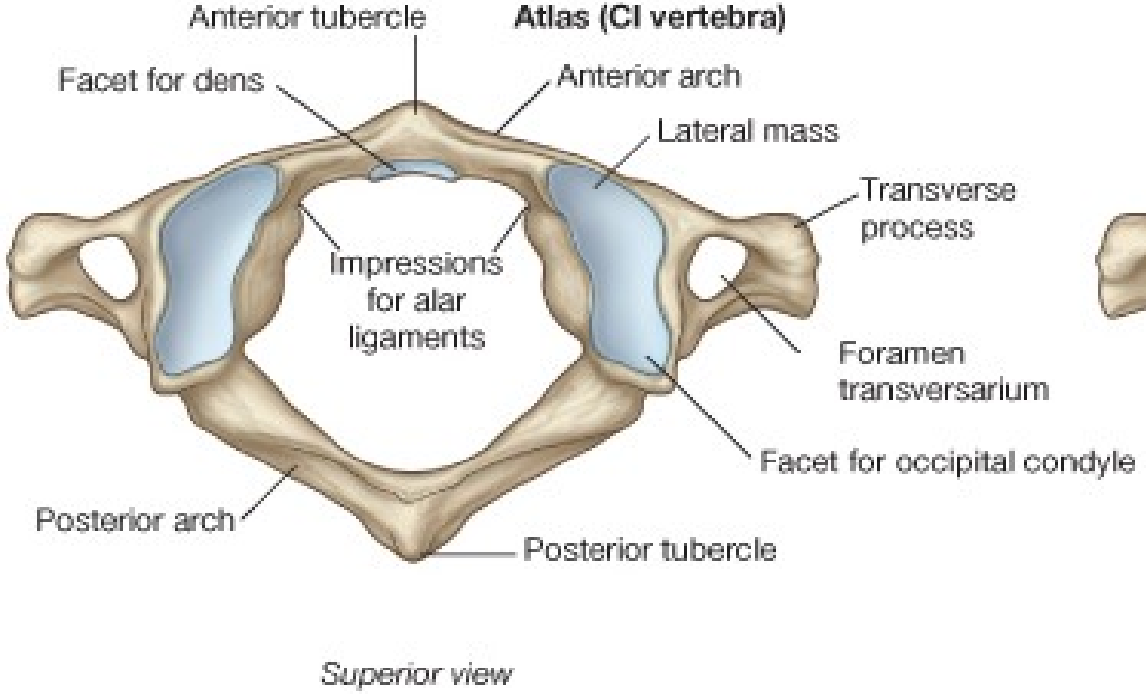
Posterior view



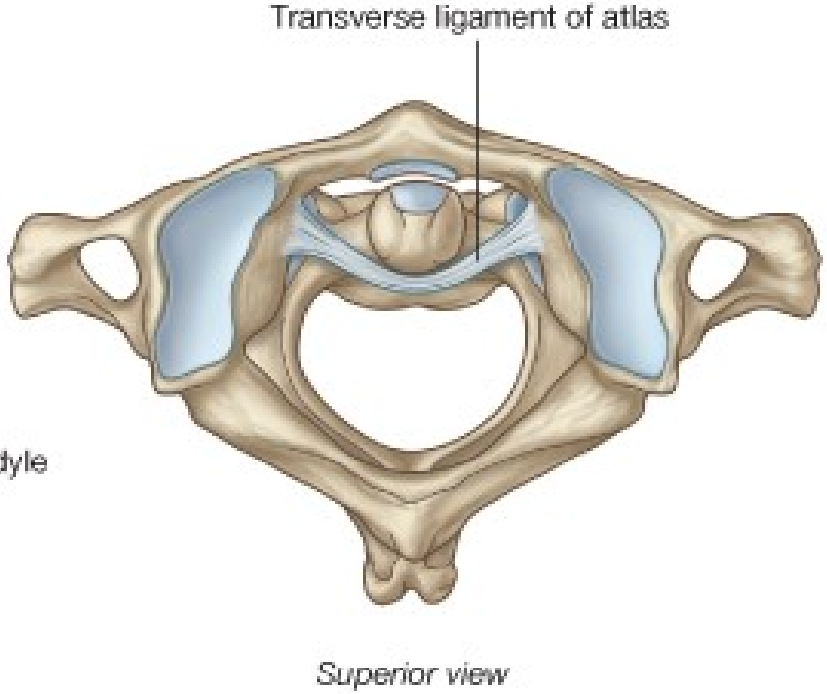
Posterosuperior view

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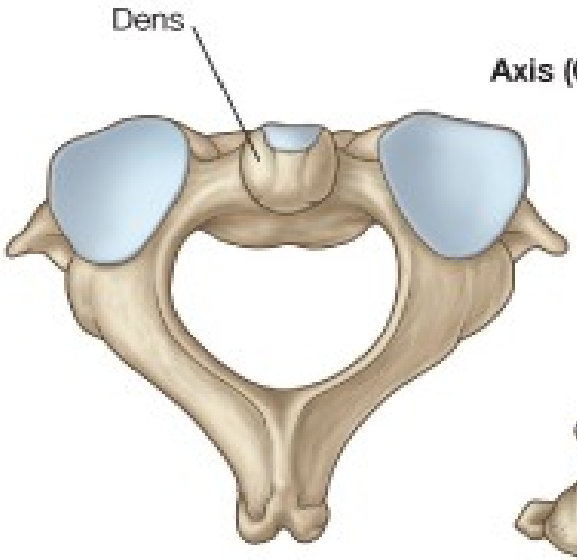
- Vertebra CII (the **axis**) articulates with atlas superiorly at **atlanto-axial joints,** which allows the side to side movement .
- The axis is characterized by the large tooth-like dens, which extends superiorly from the vertebral body.
- The dens is held in position by a strong **transverse ligament of atlas** posterior to it and acts as a pivot that allows the atlas and attached head to rotate on the axis, side to side.
- The dens also attached to the occipital condyles by a strong **alar ligaments**, one on each. These alar ligaments check excessive rotation of the head and atlas relative to the axis.



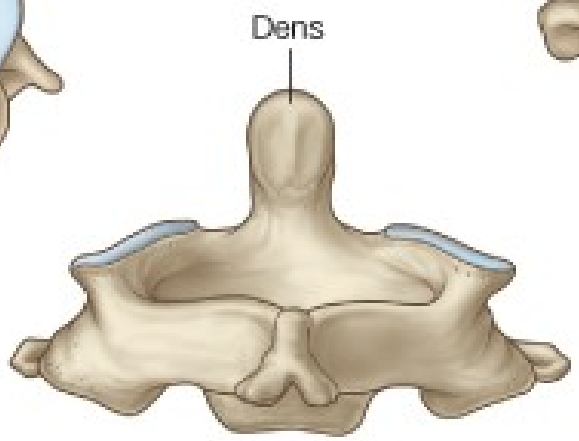
Superior view



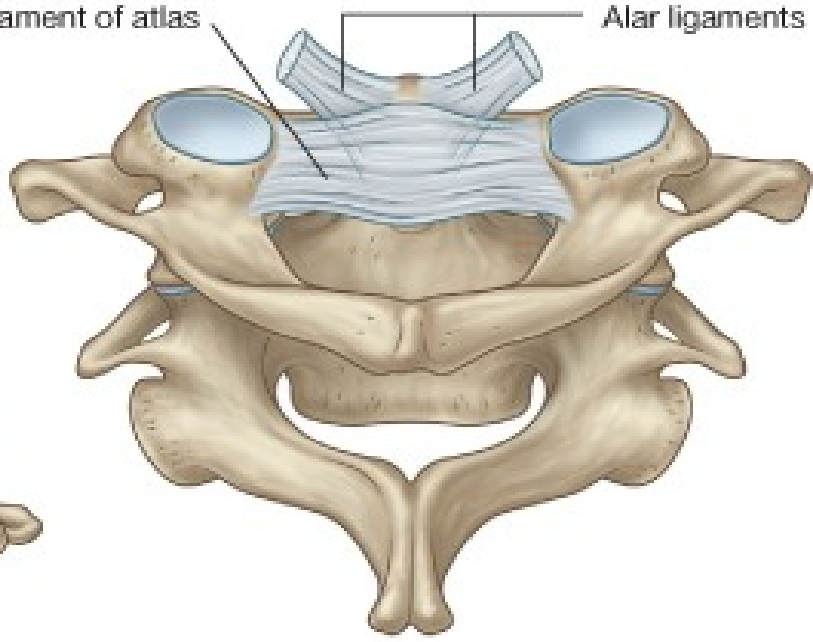
Superior view



Superior view

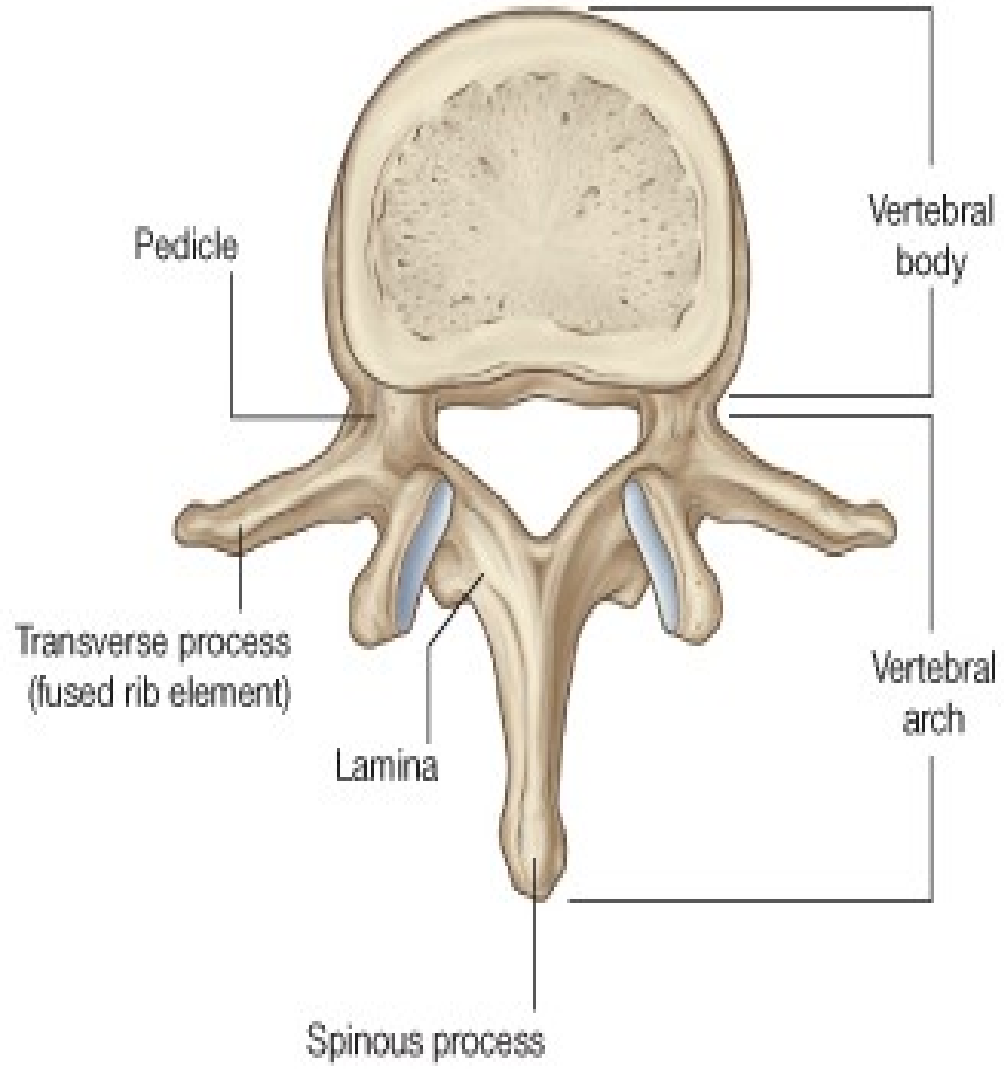


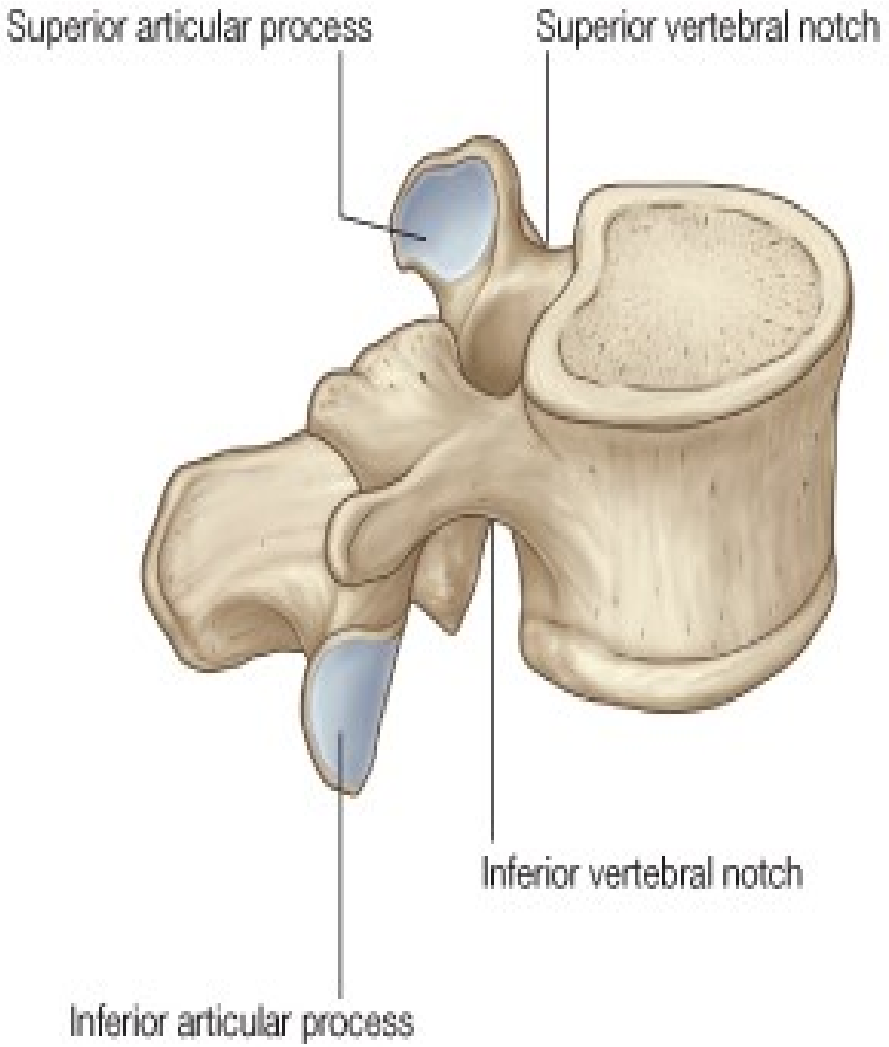
Posterior view



Posterosuperior view

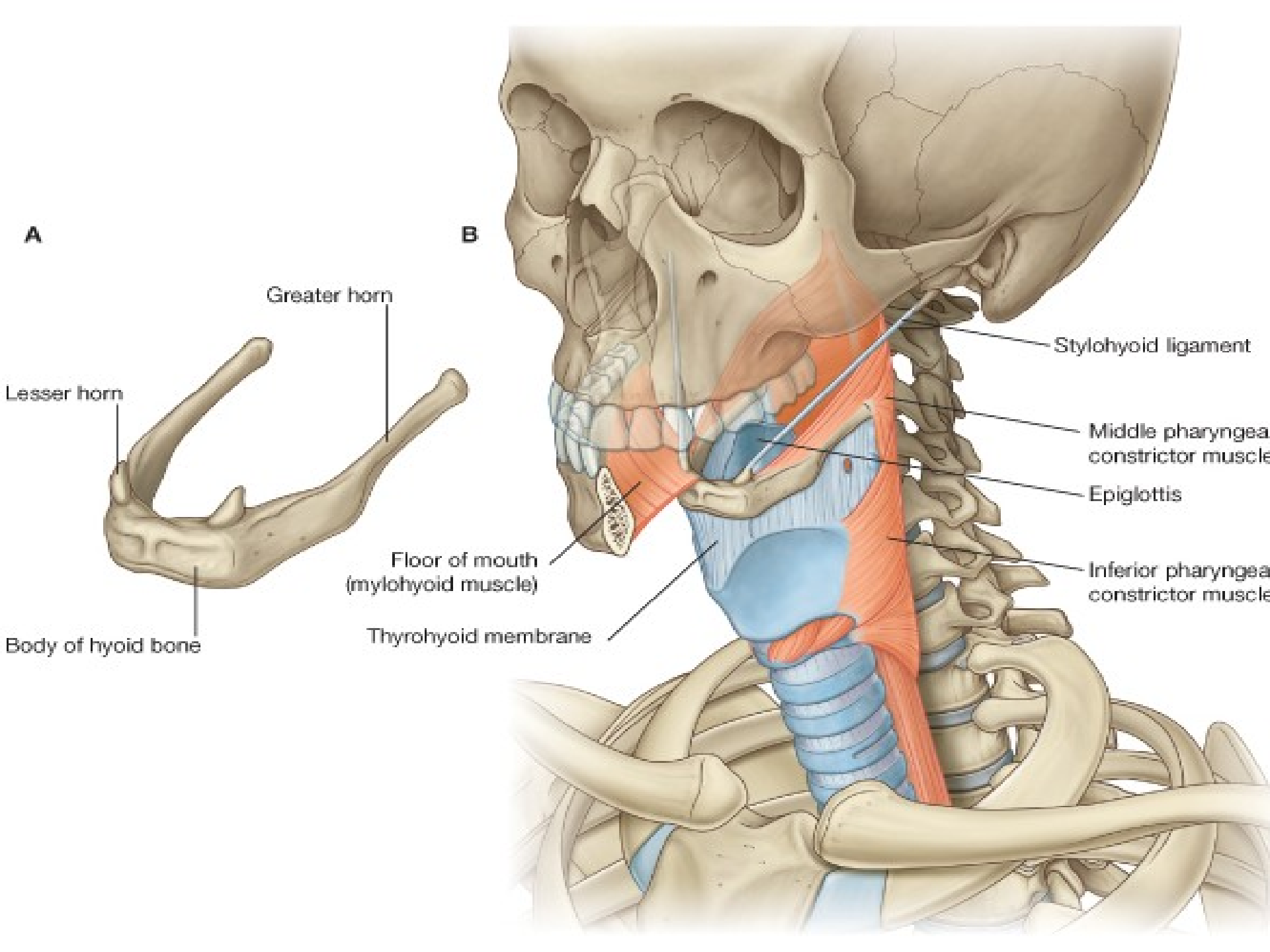
Typical vertebra





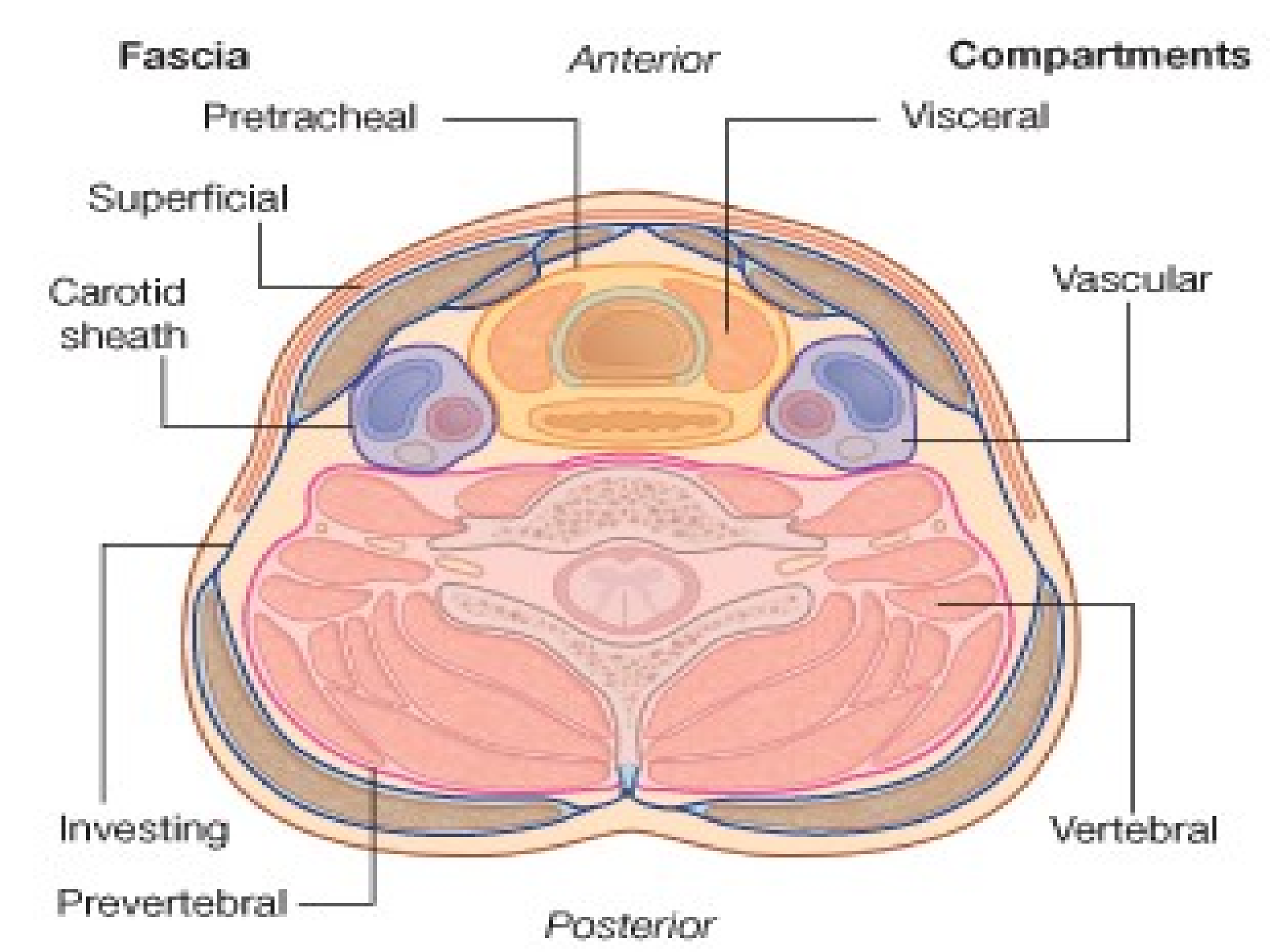
Hyoid bone

- It is a small 'U-shaped' bone oriented in the horizontal plane just superior to the larynx, where it can be palpated and moved from side to side.
- It has three parts:
  - **body of hyoid bone-** anterior and forms the base of the U
  - **greater horns-** project posteriorly from the lateral ends of the body
  - **Lesser horns-** projects superiorly from the body
- It does not articulate directly with any other skeletal elements in the head and neck.
- It is a highly movable and strong bony anchor for a number of muscles and soft tissue structures in the head and neck. And at the interface between three dynamic compartments and attached to them:
  - superiorly- floor of the oral cavity
  - Inferiorly- larynx
  - posteriorly- pharynx


A
Greater horn
Lesser horn
Body of hyoid bone
B
Stylohyoid ligament
Middle pharyngeal
constrictor muscle
Epiglottis
Floor of mouth
(mylohyoid muscle)
Inferior pharyngeal
constrictor muscle
Thyrohyoid membrane

Fascia of the Neck

- The neck has two types of fascia:
  - **superficial fascia** and**Deep fascia**
- The **superficial fascia** in the neck contains a thin sheet of muscle (**platysma**), which begins in the superficial fascia of the thorax, runs upwards to attach to the mandible and blend with the muscles on the face.
- Deep to the superficial fascia, the deep cervical fascia is organized into several distinct layers :
  - **investing layer-** surrounds all structures in the neck
  - **prevertebral layer**- surrounds the vertebral column and the deep muscles associated with the back
  - **pretracheal layer-** encloses the viscera of the neck
  - **carotid sheaths-** receive a contribution from the other three fascial layers and surround the two major neurovascular bundles on either side of the neck.


Fascia
Anterior
Compartments
Pretracheal
Visceral
Superficial
Carotid sheath
Vascular
Investing
Vertebral
Prevertebral
Posterior

Investing layer

- It completely surrounds the neck
- Anteriorly it surrounds the infrahyoid muscles.
- It attached:
  - Superiorly- to the external occipital protuberance and the superior nuchal line
  - Posteriorly- to the **ligamentum nuchae** and the **spinous process** of the CVII vertebra
  - laterally to the mastoid process and zygomatic arch
  - inferiorly to the spine of the scapula, the acromion, the clavicle, and the manubrium of sternum

Prevertebral layer

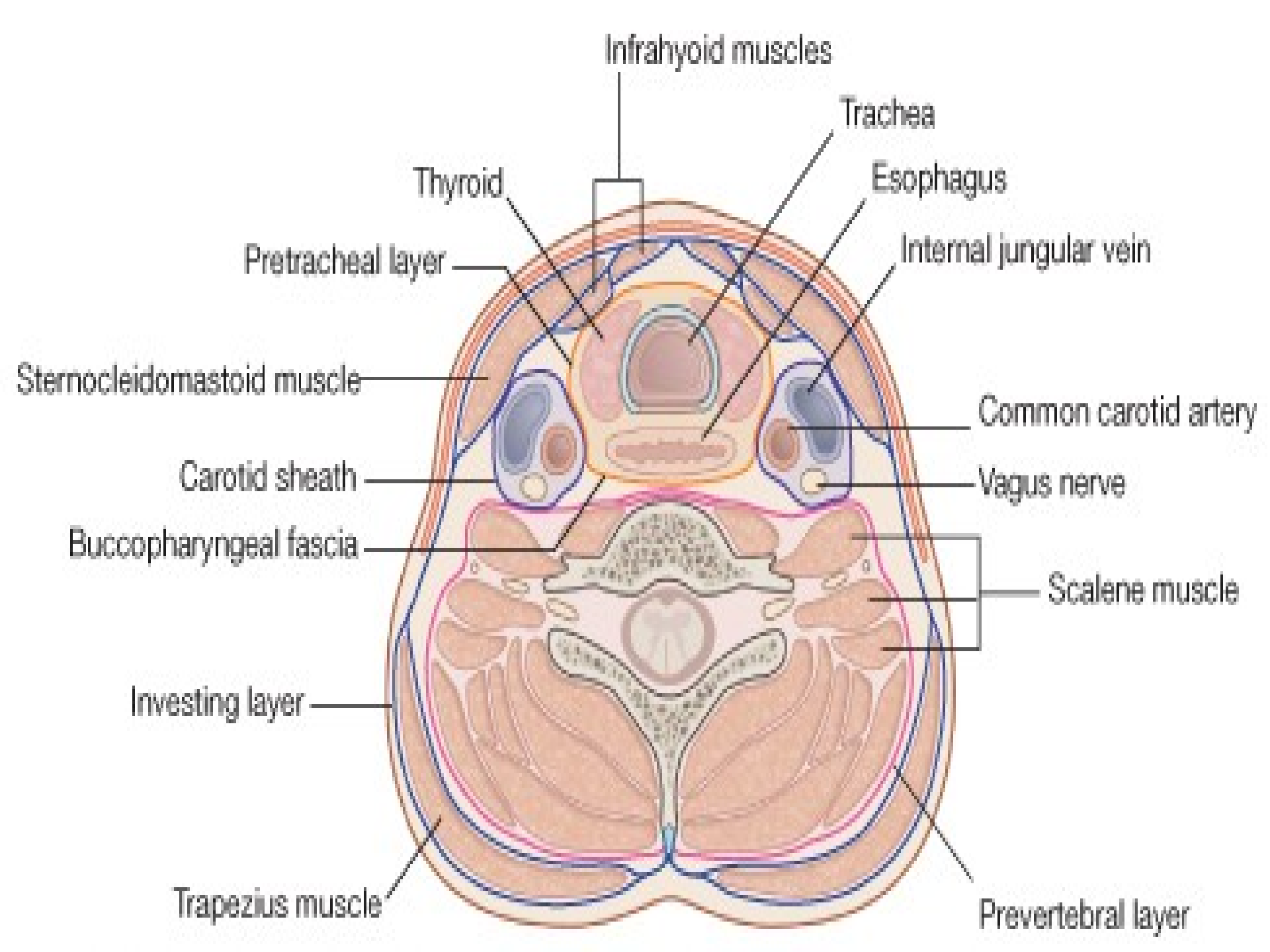
- It is a cylindrical layer of fascia that surrounds the vertebral column and the muscles associated with it.
- Muscles in this group include the prevertebral muscles, the anterior, middle, and posterior scalene muscles, and the deep muscles of the back.
- It is attached:
  - posteriorly along the length of the ligamentum nuchae
  - superiorly forms a continuous circular line attaching to the base of the skull
  - Anteriorly to the anterior surfaces of the transverse processes and bodies of vertebrae

Pretracheal layer

- It consists of a collection of fascias that surround the trachea, esophagus, and thyroid gland.
- Anteriorly, it consists of a pretracheal fascia that crosses the neck, just posterior to the infrahyoid muscles, and covers the trachea and the thyroid gland.
- It begins:
  - superiorly at the hyoid bone and ends inferiorly in the upper thoracic cavity
  - Laterally- covers the thyroid gland and the esophagus
  - Posteriorly- the buccopharyngeal fascia forms the pretracheal layer and separates the pharynx and the esophagus from the prevertebral layer

Carotid sheath

- Each **carotid sheath** is a column of fascia that surrounds the common carotid artery, the internal carotid artery, the internal jugular vein, and the vagus nerve as these structures pass through the neck.
- It receives contributions from the investing, prevertebral, and pretracheal layers, though the extent of each component's contribution varies.


Infrahyoid muscles
Trachea
Thyroid
Esophagus
Pretracheal layer
Internal jungular vein
Sternocleidomastoid muscle
Common carotid artery
Carotid sheath
Vagus nerve
Buccopharyngeal fascia
Scalene muscle
Investing layer
Trapezius muscle
Prevertebral layer

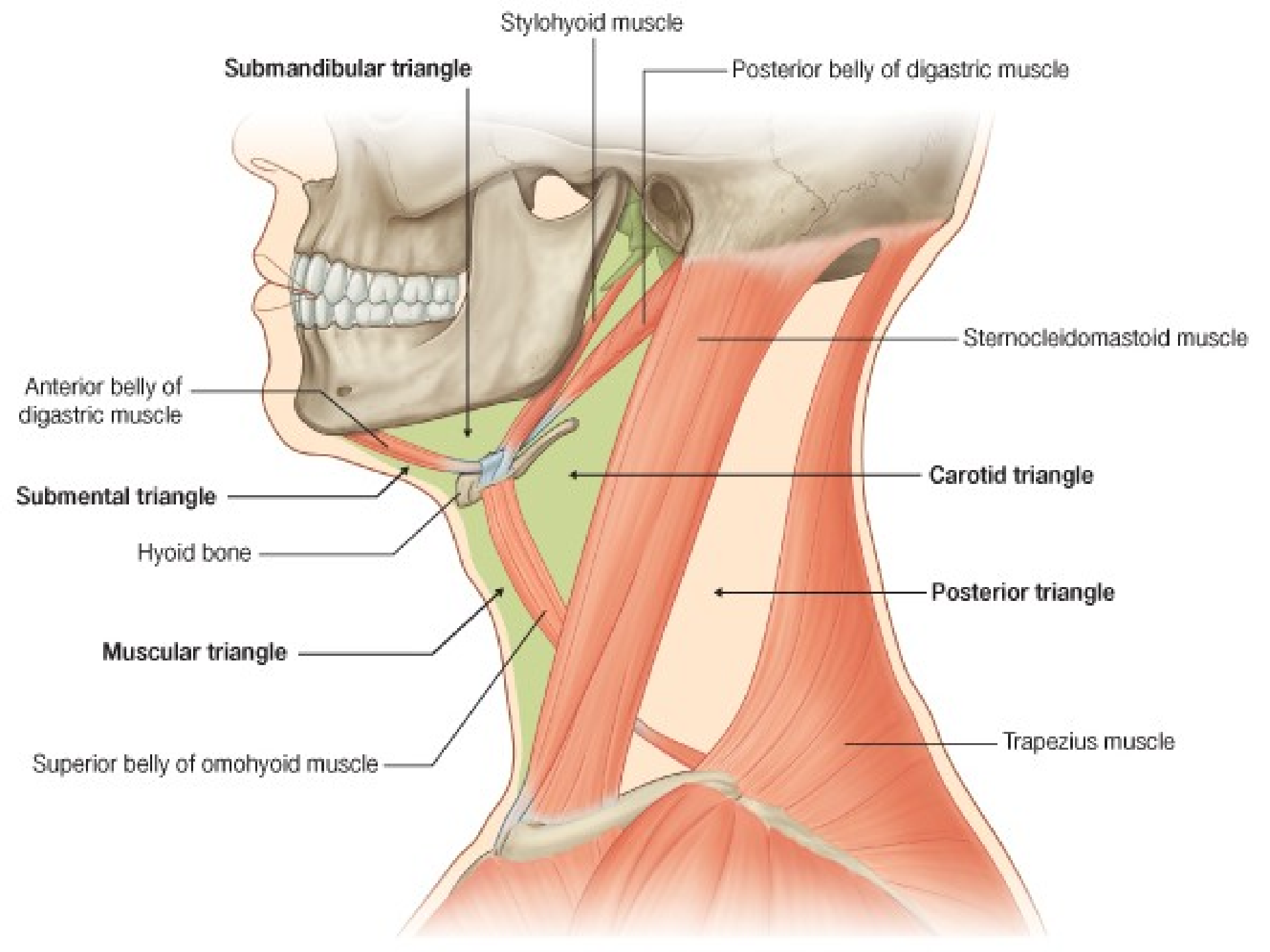
Triangles of the Neck

- There are two major triangles on the neck, these are:
- The **anterior** and **posterior** triangles

Anterior triangle of the neck

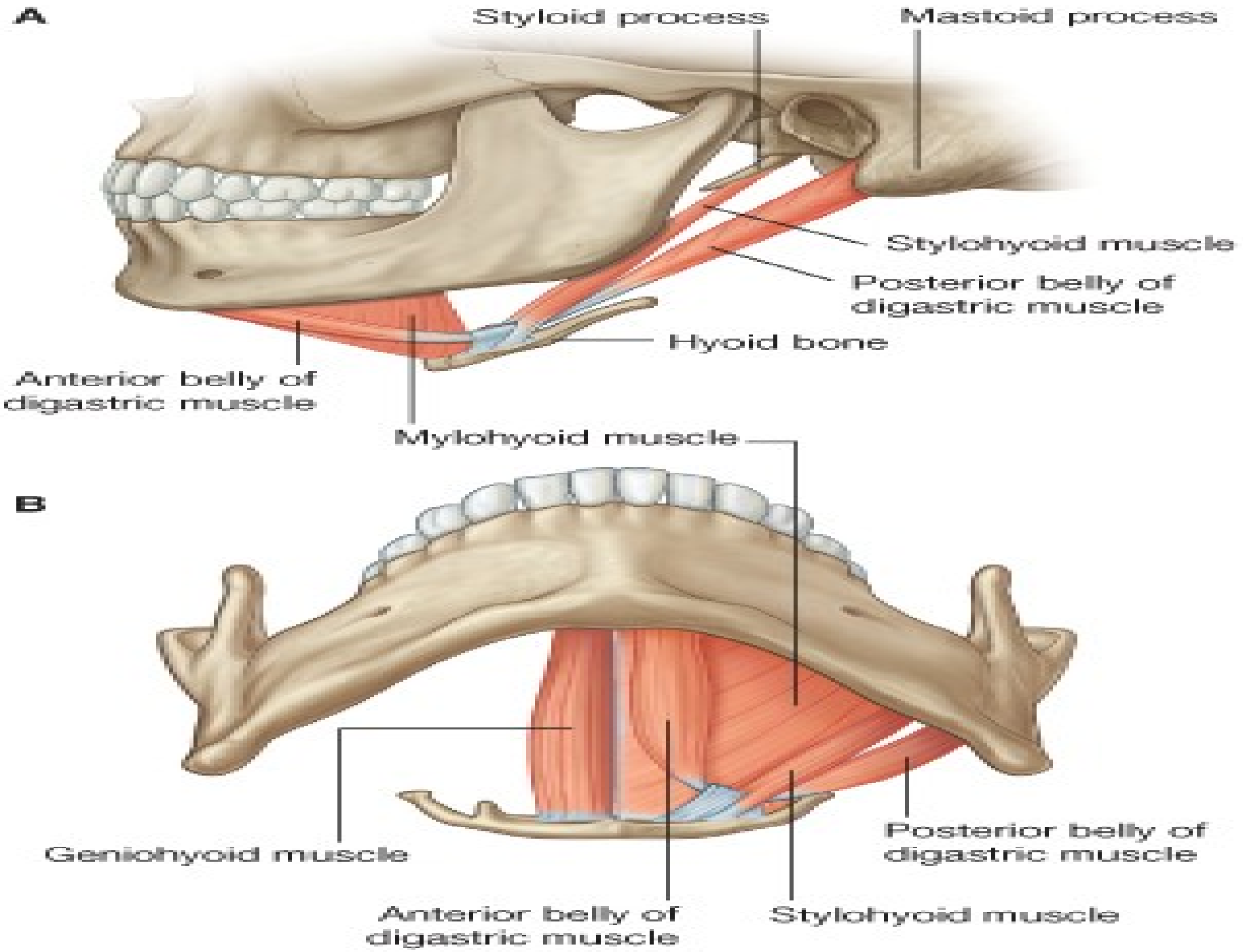
- It is outlined by:
  - sternocleidomastoid muscle- laterally
  - inferior border of the mandible- superiorly
  - midline of the neck- medially
- It is further subdivided into several smaller triangles:
  - **submandibular triangle-** outlined:
    - superiorly by the inferior border of the mandible
    - inferiorly by the anterior and posterior bellies of the digastric muscle

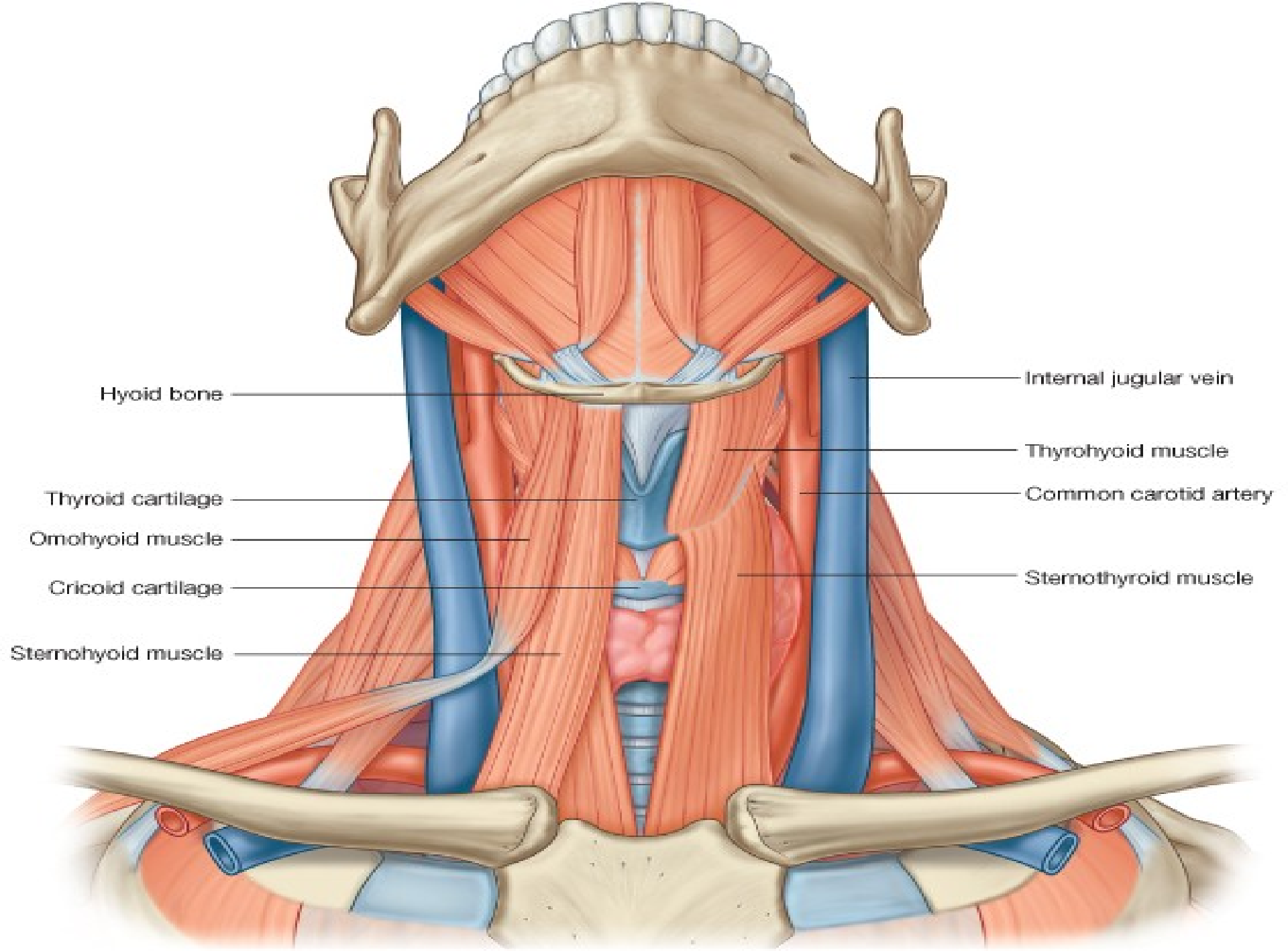
- **submental triangle-** outlined:
  - inferiorly by the hyoid bone
  - laterally by the anterior belly of the digastric muscle and
  - medially by the midline
- **muscular triangle-** outlined:
  - superiorly by the hyoid bone,
  - laterally by the superior belly of the omohyoid muscle and the anterior border of the sternocleidomastoid muscle
  - medially by the midline
- **carotid triangle-** outlined:
  - anteroinferiorly by the superior belly of the omohyoid muscle
  - superiorly by the stylohyoid muscle and posterior belly of the digastric


Stylohyoid muscle
Submandibular triangle
Posterior belly of digastric muscle
Sternocleidomastoid muscle
Anterior belly of digastric muscle
Carotid triangle
Submental triangle
Hyoid bone
Posterior triangle
Muscular triangle
Trapezius muscle
Superior belly of omohyoid muscle

Muscles

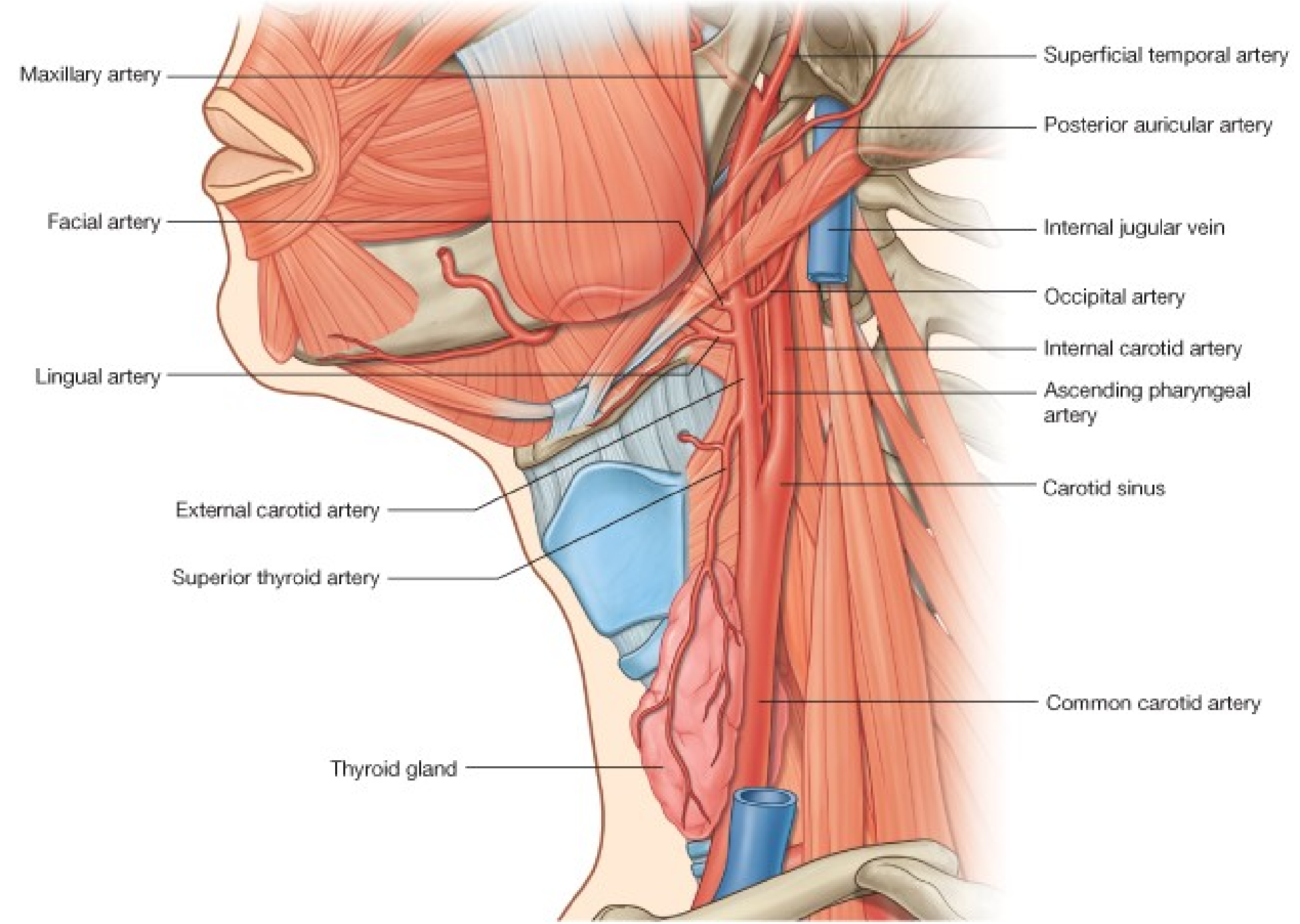
- The muscles in the anterior triangle of the neck can be grouped according to their location relative to the hyoid bone:
- **suprahyoid muscles-** superior to the hyoid and include the stylohyoid, digastric, mylohyoid, and geniohyoid
  - They are in the submental and submandibular triangles.
  - They pass in a superior direction from the hyoid bone to the skull or mandible and raise the hyoid, as occurs during swallowing.
- **infrahyoid muscles-** inferior to the hyoid and include the omohyoid, sternohyoid, thyrohyoid, and sternothyroid.
  - They are in the muscular triangle and attach the hyoid bone to inferior structures and depress the hyoid bone.
  - They also provide a stable point of attachment for the suprahyoid muscles. Because of their appearance, they are sometimes referred to as the '**strap muscles**'.


A
Styloid process
Mastoid process
Stylohyoid muscle
Posterior belly of digastric muscle
Hyoid bone
Anterior belly of digastric muscle
Mylohyoid muscle
B
Geniohyoid muscle
Posterior belly of digastric muscle
Anterior belly of digastric muscle
Stylohyoid muscle


Hyoid bone
Thyroid cartilage
Omohyoid muscle
Cricoid cartilage
Sternohyoid muscle
Internal jugular vein
Thyrohyoid muscle
Common carotid artery
Sternothyroid muscle

Vessels

- Passing through the anterior triangle of the neck are the **common carotid arteries** and their branches, the **external** and **internal carotid arteries**. These vessels supply all structures of the head and neck.
- Associated with this arterial system are the **internal jugular vein** and its tributaries. These vessels receive blood from all structures of the head and neck.

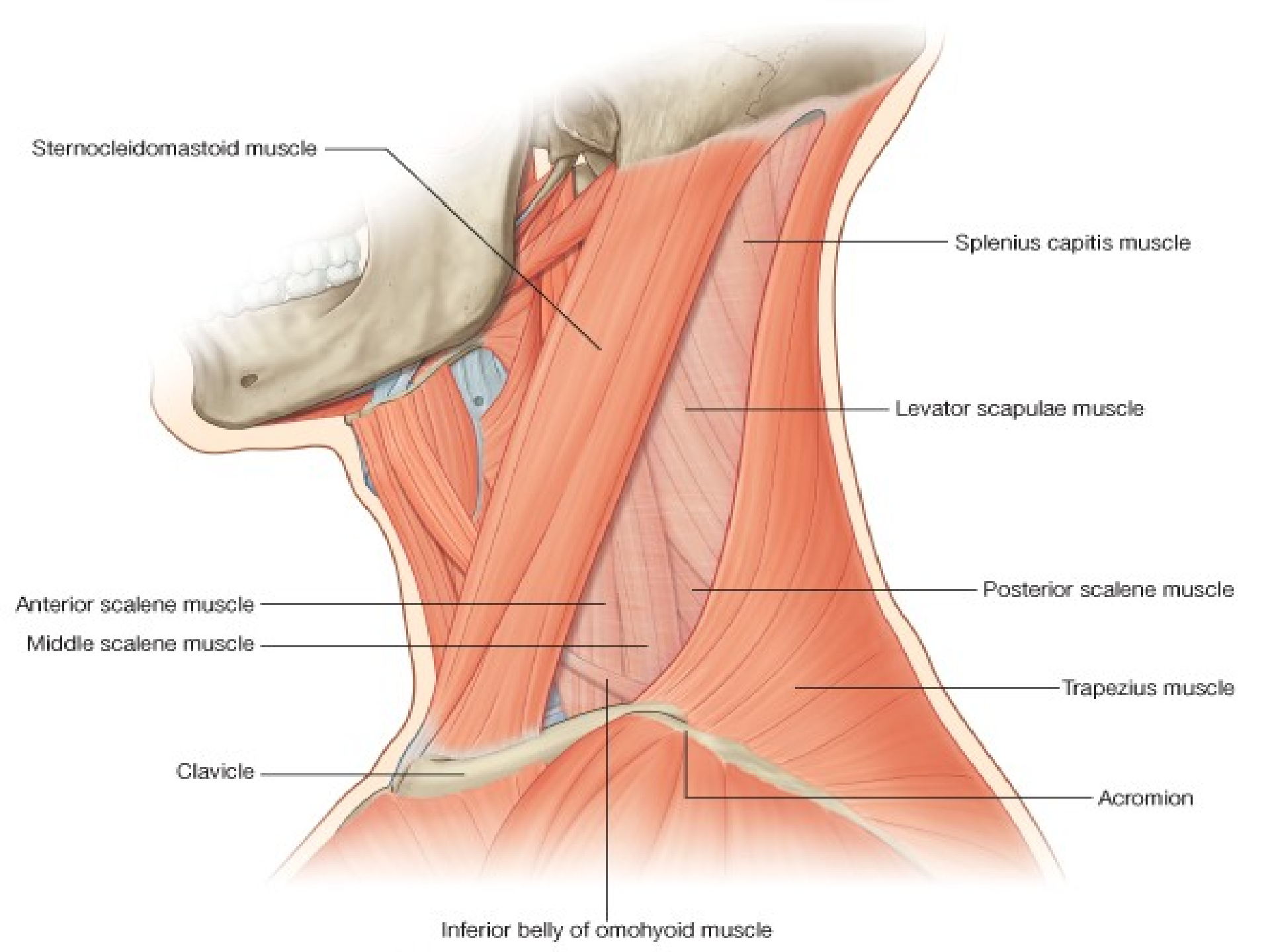

Maxillary artery
Facial artery
Lingual artery
External carotid artery
Superior thyroid artery
Thyroid gland
Superficial temporal artery
Posterior auricular artery
Internal jugular vein
Occipital artery
Internal carotid artery
Ascending pharyngeal artery
Carotid sinus
Common carotid artery

Posterior triangle of the neck

- It is on the lateral aspect of the neck in direct continuity with the upper limb.
- It is bordered:
  - anteriorly by the posterior edge of the sternocleidomastoid muscle;
  - posteriorly by the anterior edge of the trapezius muscle;
  - its base is the middle one-third of the clavicle;
  - its apex is the occipital bone just posterior to the mastoid process where the attachments of the trapezius and sternocleidomastoid come together.
- The roof of it consists of an investing layer of cervical fascia that surrounds the sternocleidomastoid and trapezius muscles as it passes through the region.

Muscles

- The muscular floor of the posterior triangle is covered by the prevertebral layer of cervical fascia; and from superior to inferior consists of the **splenius capitis**, **levator scapulae**, and the **posterior, middle**, and **anterior scalene muscles**.

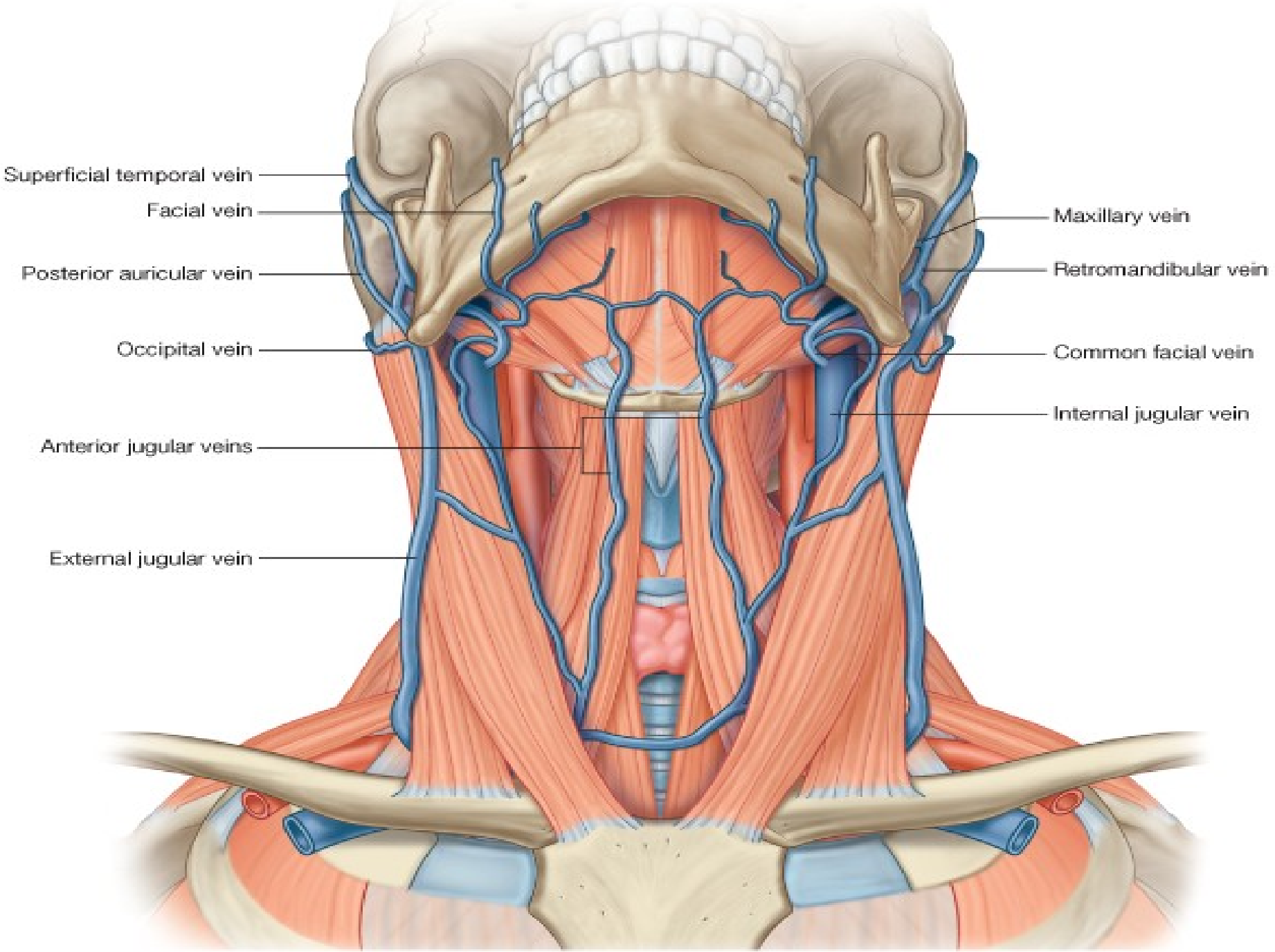

Sternocleidomastoid muscle
Splenius capitis muscle
Levator scapulae muscle
Posterior scalene muscle
Anterior scalene muscle
Middle scalene muscle
Trapezius muscle
Clavicle
Acromion
Inferior belly of omohyoid muscle

Vessels

- **External jugular vein** is one of the most superficial structures passing through the posterior triangle of the neck is the external jugular vein. This large vein forms near the angle of mandible, when the retromandibular and posterior auricular veins join, and descends through the neck in the superficial fascia. After crossing the sternocleidomastoid muscle the external jugular vein enters the posterior triangle and continues its vertical descent.
- **Subclavian artery** and its branches are found within the boundaries of the posterior triangle of the neck. The largest is the third part of the subclavian artery as it crosses the base of the posterior triangle.

Vasculature of the neck

- Common carotid artery
  - Internal carotid- has no branches in the neck
  - External carotid- branches into
    - Superior thyroid artery
    - Ascending pharyngeal artery
- The main veins of the neck that lie superficial to deep fascia of the neck are
  - External jagular vein
  - Anterior jagular vein
  - Internal jagular vein


Superficial temporal vein
Facial vein
Posterior auricular vein
Occipital vein
Anterior jugular veins
External jugular vein
Maxillary vein
Retromandibular vein
Common facial vein
Internal jugular vein

Cervical viscera

- The cervical viscera are disposed in three layers
- Superficial to deep they are:
  - Endocrine layer: thyroid & parathyroid gland
  - Respiratory layer: larynx & trachea
  - Alimentary layer: pharynx & esophagus

❖ **Endocrine layer**

Thyroid gland

- Is the body's largest endocrine gland and positioned anteriorly in the neck
- It produces **thyroid hormone**
- Situated at the front & sides of the neck at the level of (C5-T1)
- It consists primarily the **right** & **left lobes** with relatively thin **isthmus** unites the lobes over the trachea
- Pathological enlargement of the thyroid gland is called **goiter**.

- The thyroid gland is anterior in the neck below and lateral to the thyroid cartilage.
- The thyroid gland is in the visceral compartment of the neck. This compartment also includes the pharynx, trachea, and esophagus and is surrounded by the pretracheal layers of fascia.
- The thyroid gland arises as a median outgrowth from the floor of the pharynx near the base of the tongue.

Arterial supply:

- Two major arteries supply the thyroid gland.

1)**Superior thyroid artery**:

The superior thyroid artery is the first branch of the external carotid artery.

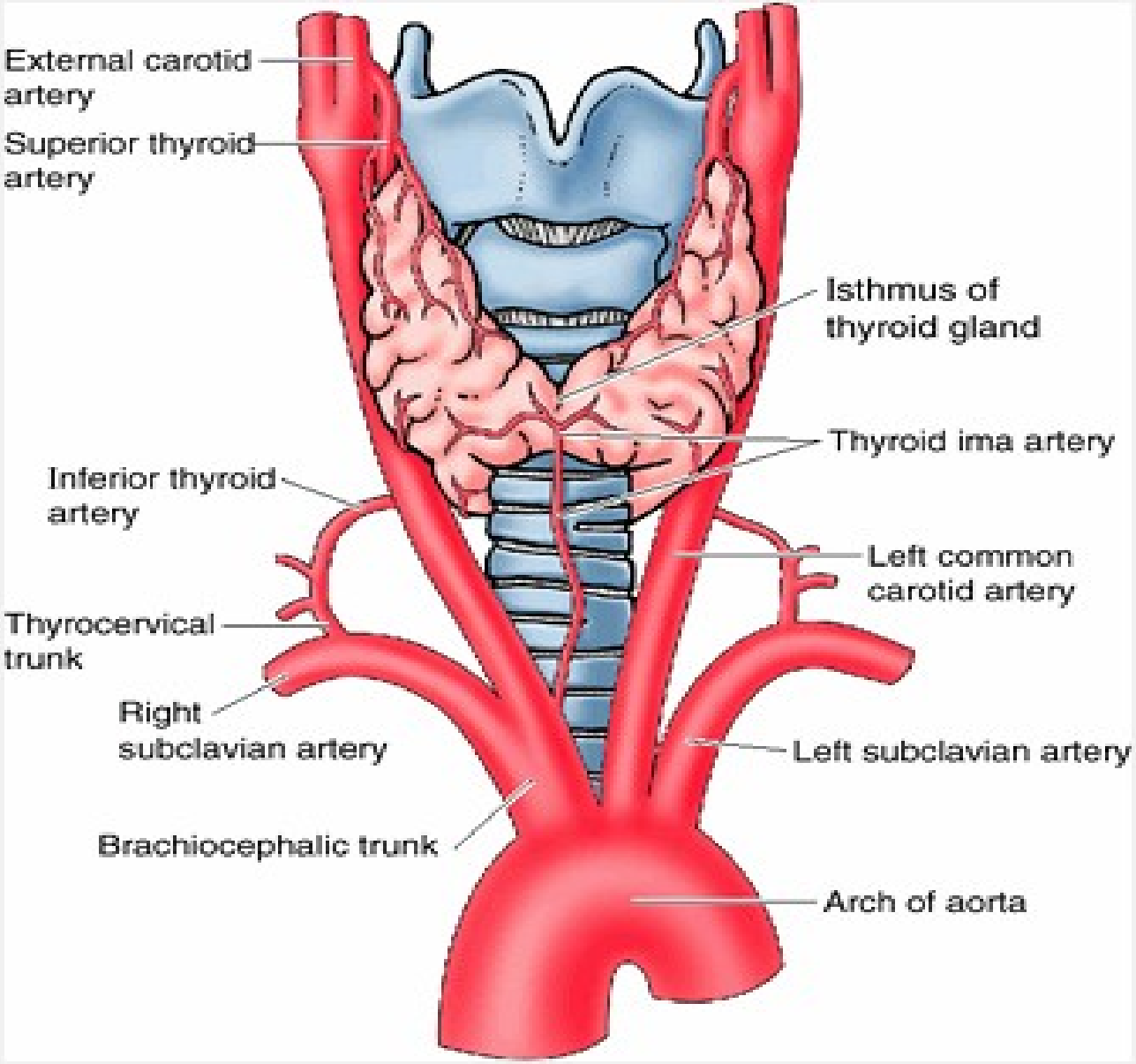
2)Inferior thyroid artery:

The **inferior thyroid artery** is a branch of the **thyrocervical trunk**, which arises from the first part of the subclavian artery.

3)**Thyroid ima artery**:

Occasionally, a small **thyroid ima artery** arises from the brachiocephalic trunk or the arch of the aorta and ascends on the anterior surface of the trachea to supply the thyroid gland.

Cont..


External carotid artery
Superior thyroid artery
Isthmus of thyroid gland
Thyroid ima artery
Inferior thyroid artery
Left common carotid artery
Thyrocervical trunk
Right subclavian artery
Left subclavian artery
Brachiocephalic trunk
Arch of aorta

Venous drainage:

- Three veins drain the thyroid gland:

1)the **superior thyroid vein** primarily drains the area supplied by the superior thyroid artery.

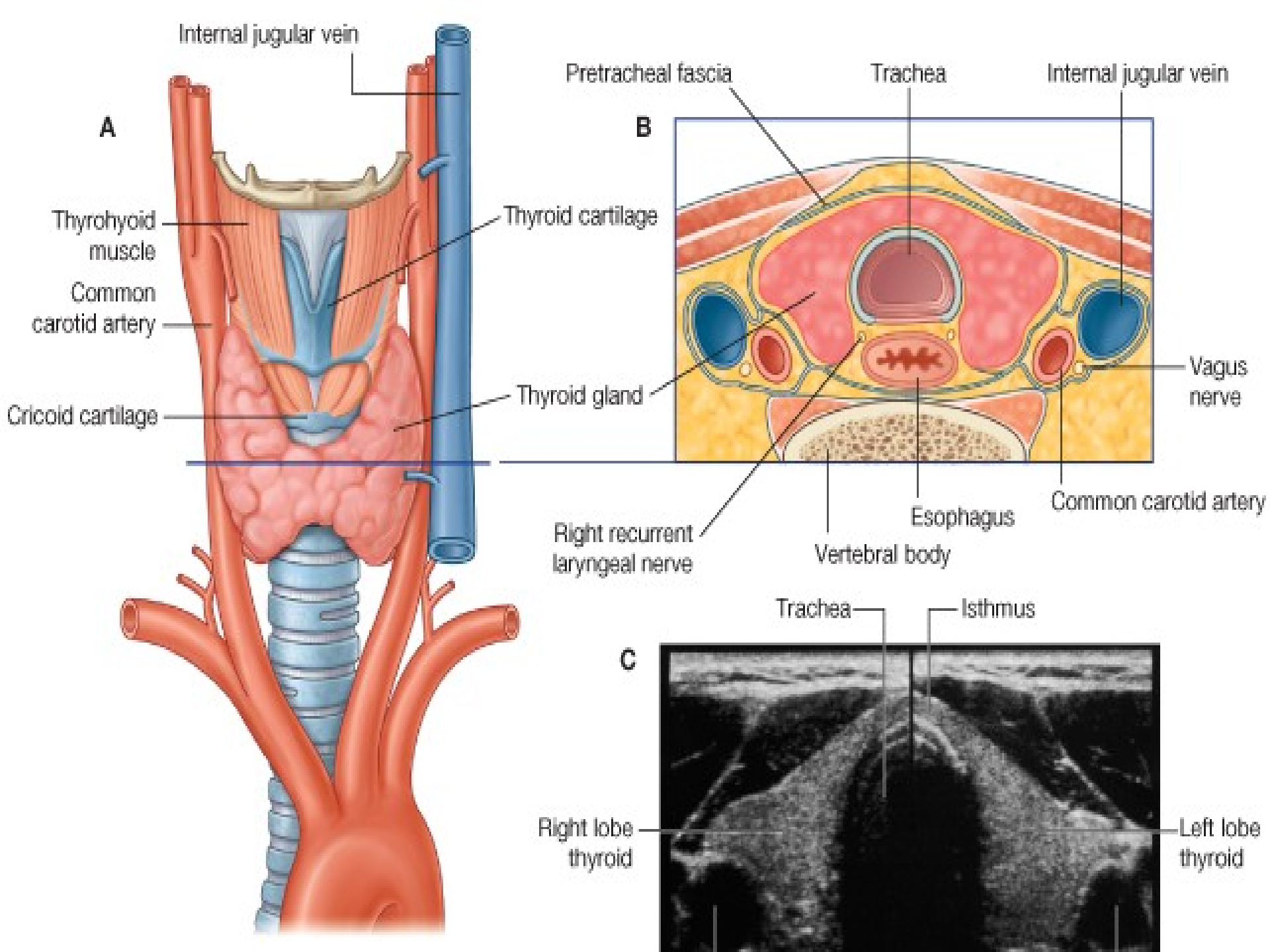
2)the **middle** and **inferior thyroid veins** drain the rest of the thyroid gland.

Innervation:

- by **recurrent laryngeal nerves** are branches from the vagus nerve.

Parathyroid glands

- Usually lie external to the thyroid capsule on the medial half of the posterior surface of each of the thyroid gland, inside its sheath.
- Divided according to their position, into **two superior** & **two inferior**
- They produce parathyroid hormone (PTH), controls the metabolism of **phosphorus** & **calcium** in the blood.
- The parathyroid insufficiency is the main factor in the production of ***epilepsy***.
- ***Arteries***: branch from inferior thyroid artery


A
Internal jugular vein
Thyrohyoid muscle
Thyroid cartilage
Common carotid artery
Cricoid cartilage
Thyroid gland
B
Pretracheal fascia
Trachea
Internal jugular vein
Vagus nerve
Right recurrent laryngeal nerve
Vertebral body
Esophagus
Common carotid artery
C
Trachea
Isthmus
Right lobe thyroid
Left lobe thyroid

❖ **Respiratory layer**

Larynx

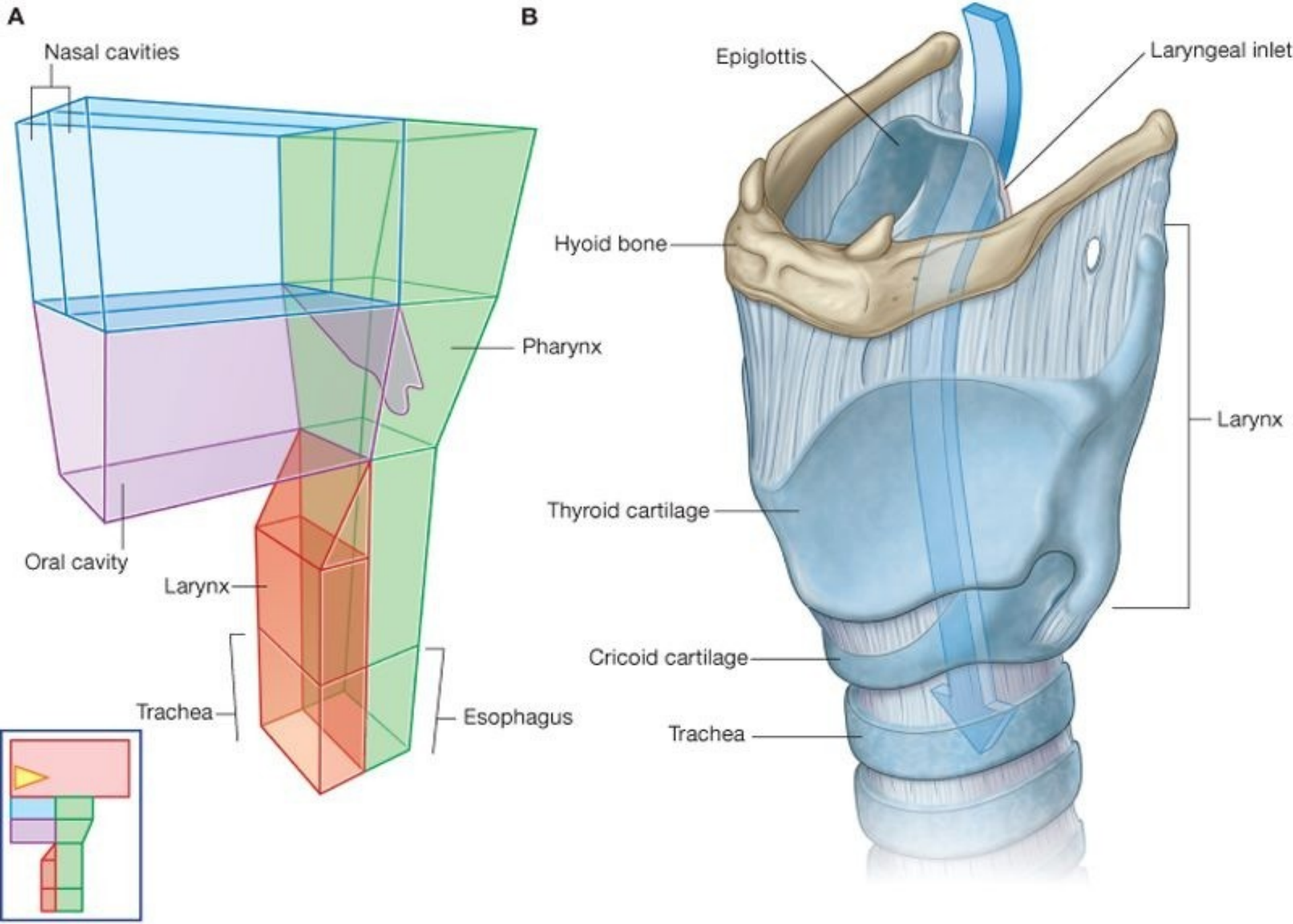
- The larynx is a hollow musculoligamentous structure with a cartilaginous framework that caps the lower respiratory tract.
- The cavity of the larynx is continuous below with the trachea, and above opens into the pharynx.
- The larynx is both a **valve** (or sphincter) to close the lower respiratory tract, and an **instrument** to produce sound.
- It is composed of:

-three large unpaired cartilages (**cricoid, thyroid**, and **epiglottis**);

-three pairs of smaller cartilages (**arytenoid, corniculate**, and **cuneiform**);

-a fibroelastic membrane and numerous intrinsic muscles.

- The thyroid, cricoid & arytenoid cartilages are composed of **hyaline cartilage**
- Epiglottis, corniculate & cuneiform cartilages are formed of **elastic cartilage**.
- The larynx is suspended from the hyoid bone above and attached to the trachea below by membranes and ligaments.
- It is highly mobile in the neck and can be moved up and down and forward and backward by the action of extrinsic muscles that attach either to the larynx itself or to the hyoid bone.
- During swallowing, the dramatic upward and forward movements of the larynx facilitate closing the laryngeal inlet and opening the esophagus.

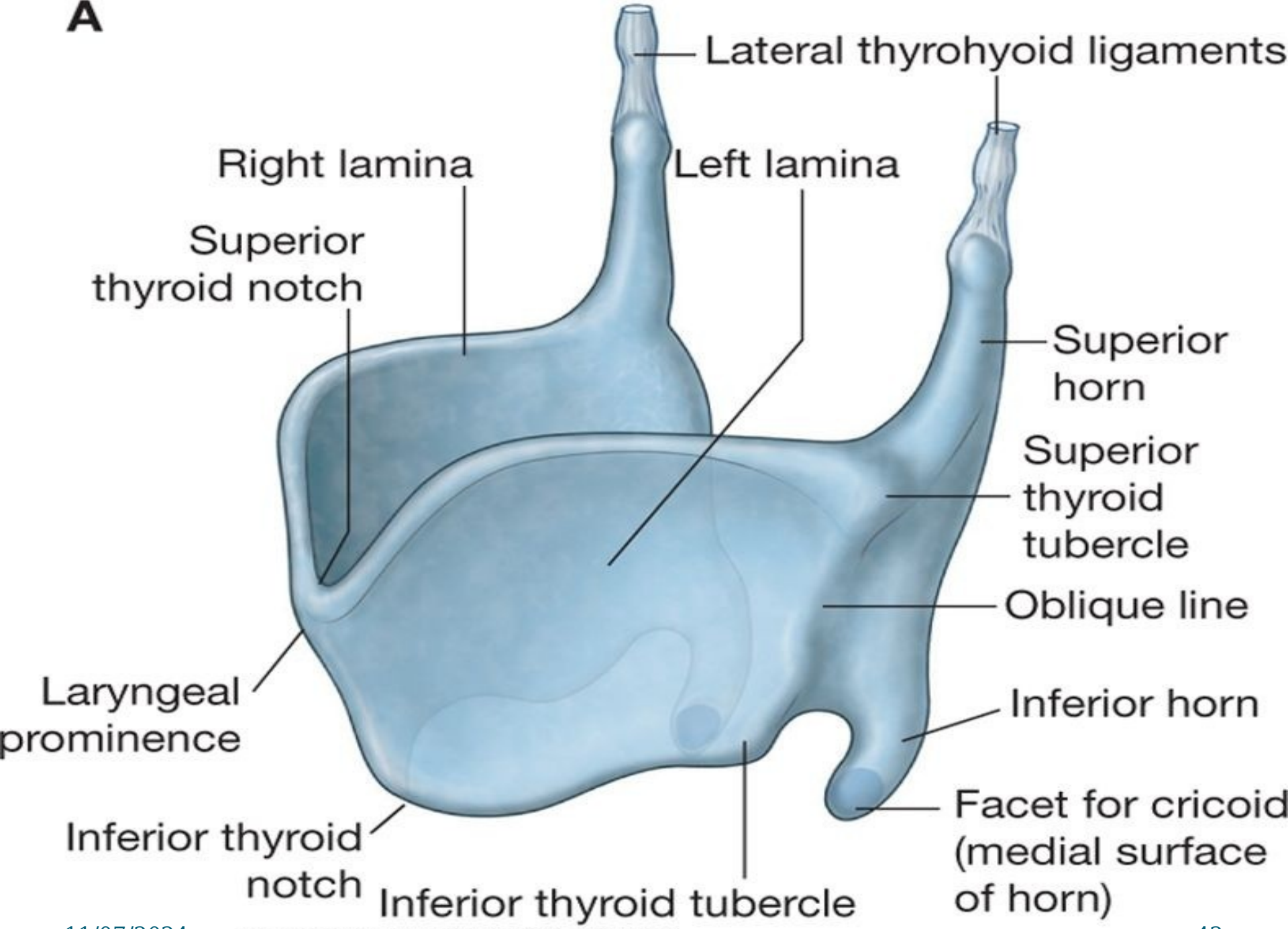


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- Motor and sensory innervations of the larynx is provided by the vagus nerve [X].

Thyroid cartilage:

- It is the largest of the laryngeal cartilages.
- The most superior point projects forward as the **laryngeal prominence** (**'Adam's apple**')and it is more apparent in men than women.
- Just superior to the laryngeal prominence, there is **superior thyroid notch**.
- *Both the superior thyroid notch and the laryngeal prominence are palpable landmarks in the neck.*
- There is a less distinct **inferior thyroid notch** in the midline along the base of the thyroid cartilage.



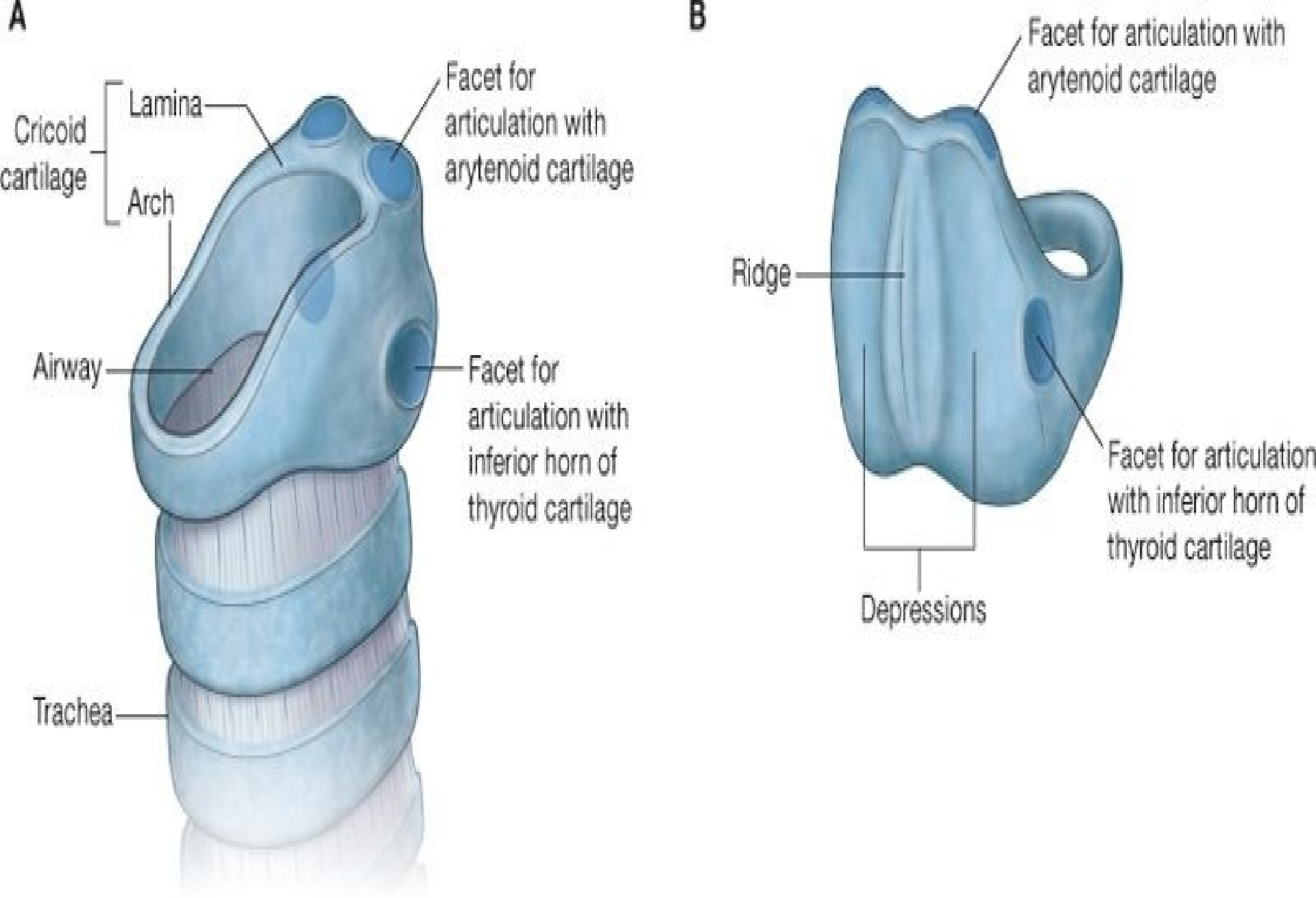
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Cricoid cartilage:

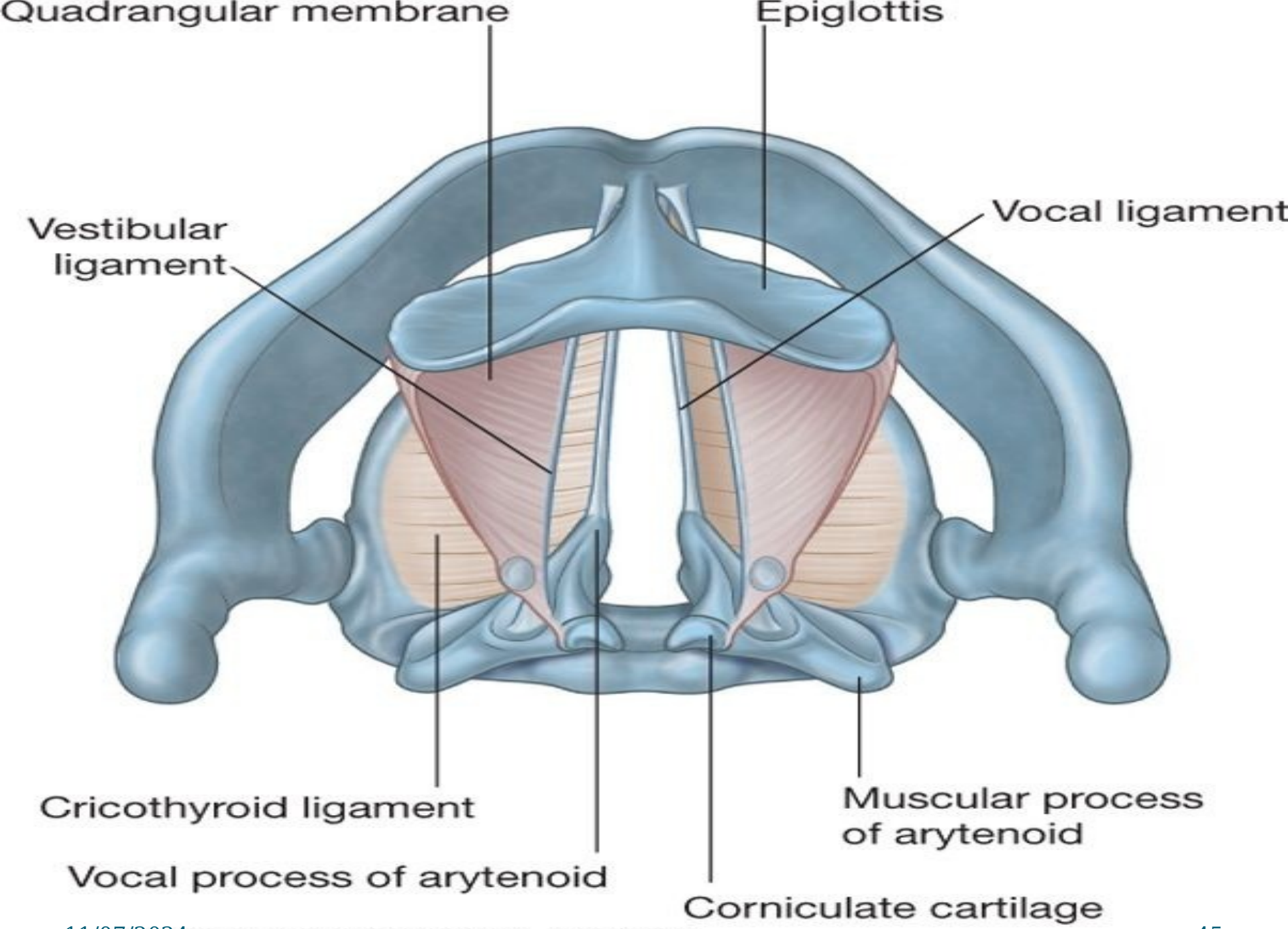
- The cricoid cartilage is the most inferior of the laryngeal cartilages and completely encircles the airway
- Its anterior part is called the arch while its posterior flattened part is known as the lamina.

Artenoid cartilage:

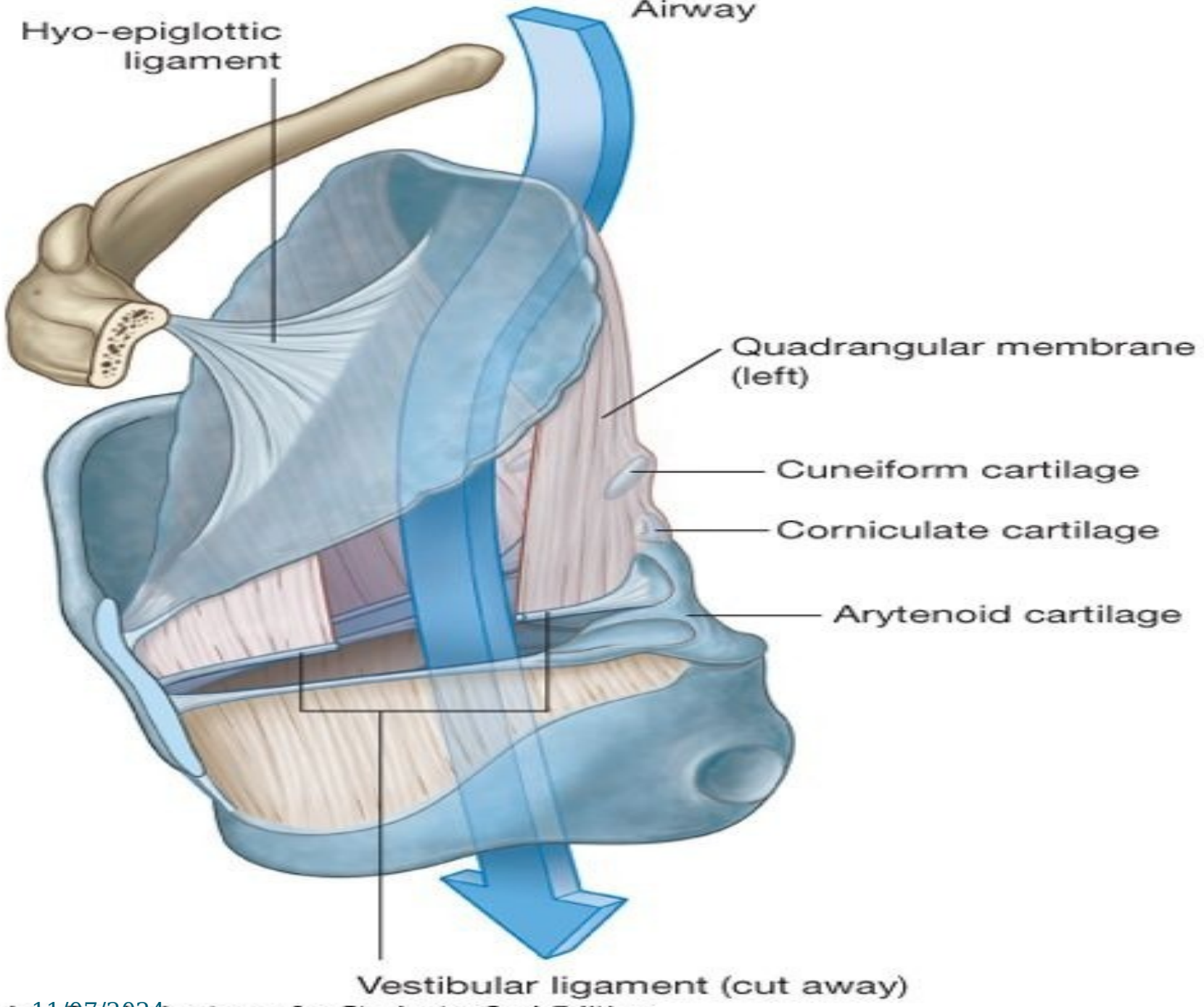
- They are pyramidal in shape & have two process
  - **Vocal** & **muscular process**



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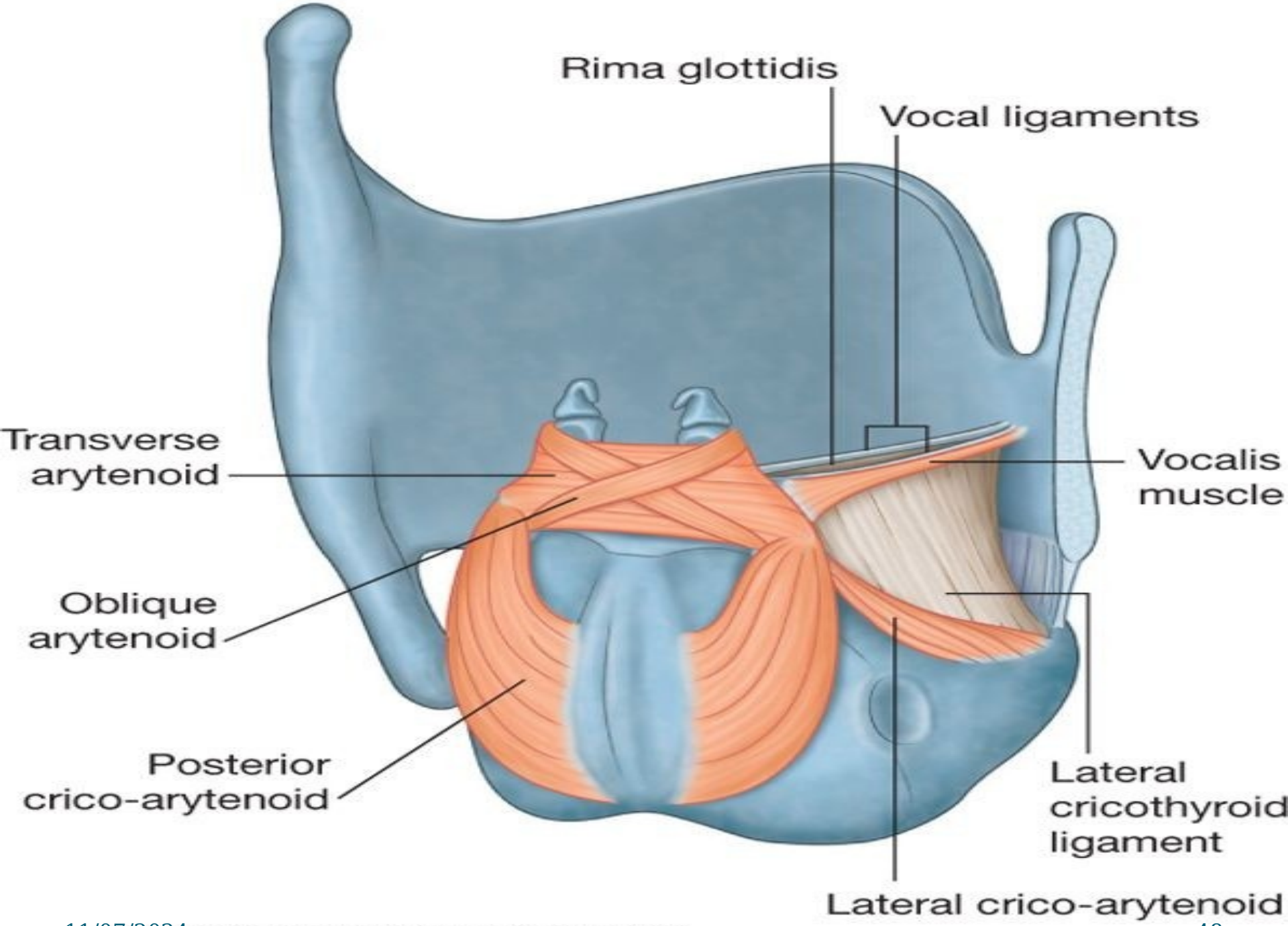
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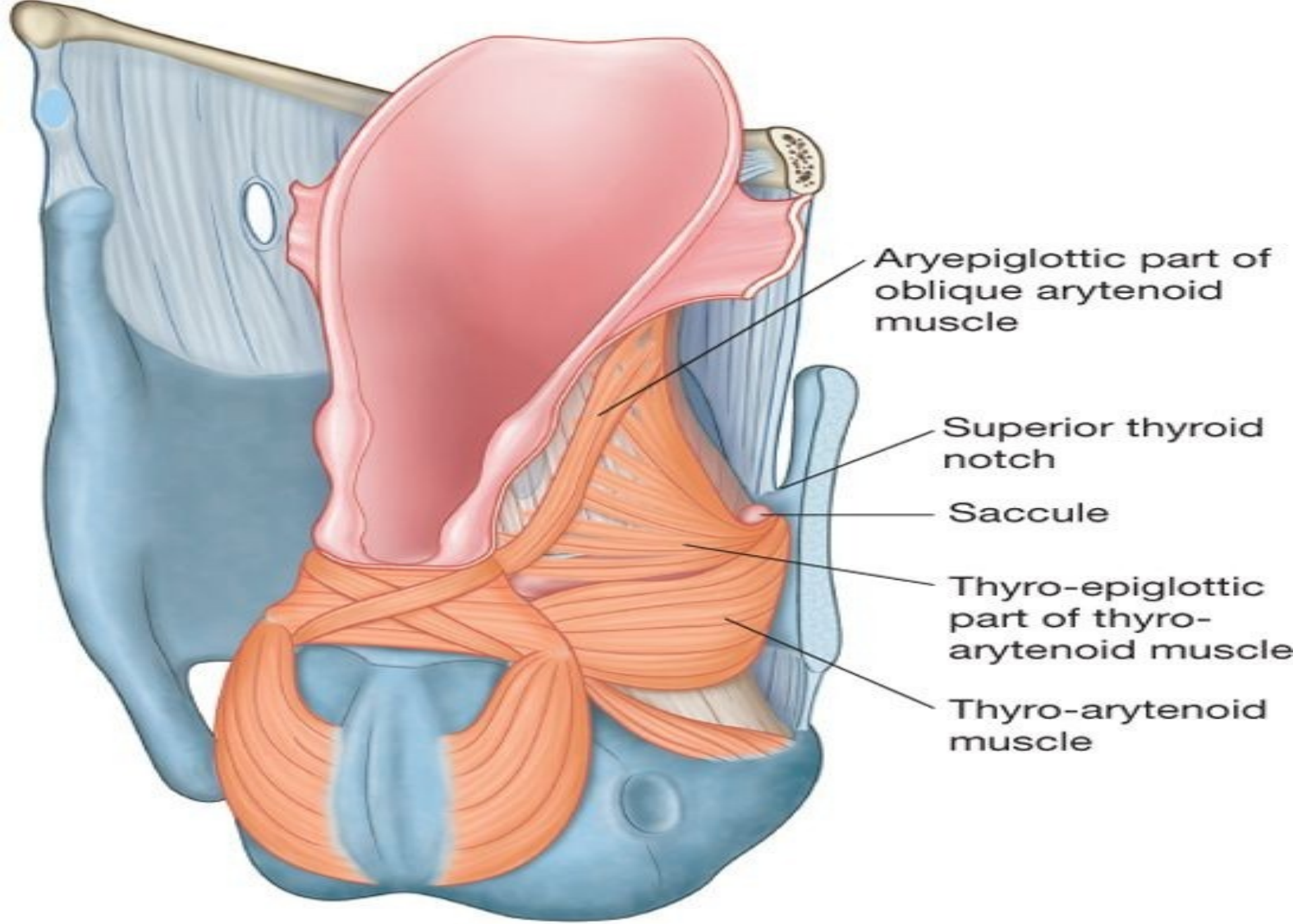
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Muscles of the larynx

- **Intrinsic muscles**
  - These muscles alter the size & shape of the inlet of the larynx
- **Extrinsic muscles**
  - These muscles have direct attachment to the larynx & elevate it like the thyrohyoid muscle.
  - Muscle that depresses the larynx is the sternothyroid muscle.



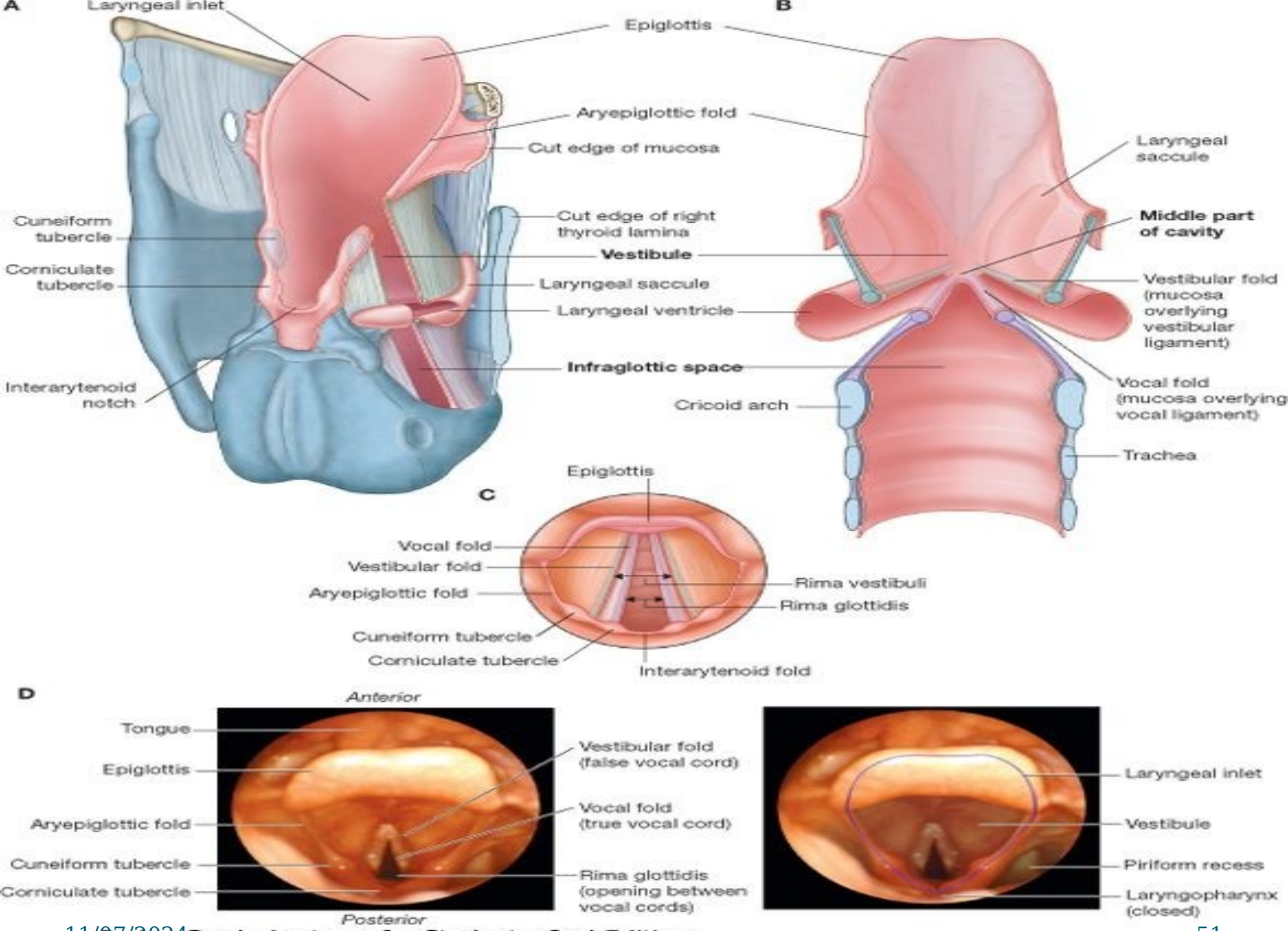
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Laryngeal cavity

- The cavity extend from the inlet to the lower border of cricoid cartilage.
- Has three parts:
  - Upper(vestibule)
  - Middle (ventricle)
  - Lower (infraglottis)



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- **Alimentary layer**

Pharynx

- It is part of the digestive tube
- 12.5cm long conical musculomebranous tube
- Its narrowest is at its termination in the esophagus
- Pharynx communicates with the following cavities:
  - Two nasal cavities
  - Two tympanic cavities
  - Mouth
  - Larynx
  - Esophagus

Parts of the pharynx

- Nasal part (nasopharynx or epipharynx)
- Oral part (oropharynx or mesopharynx)
- Laryngeal part (laryngophaynx or hypopharynx)

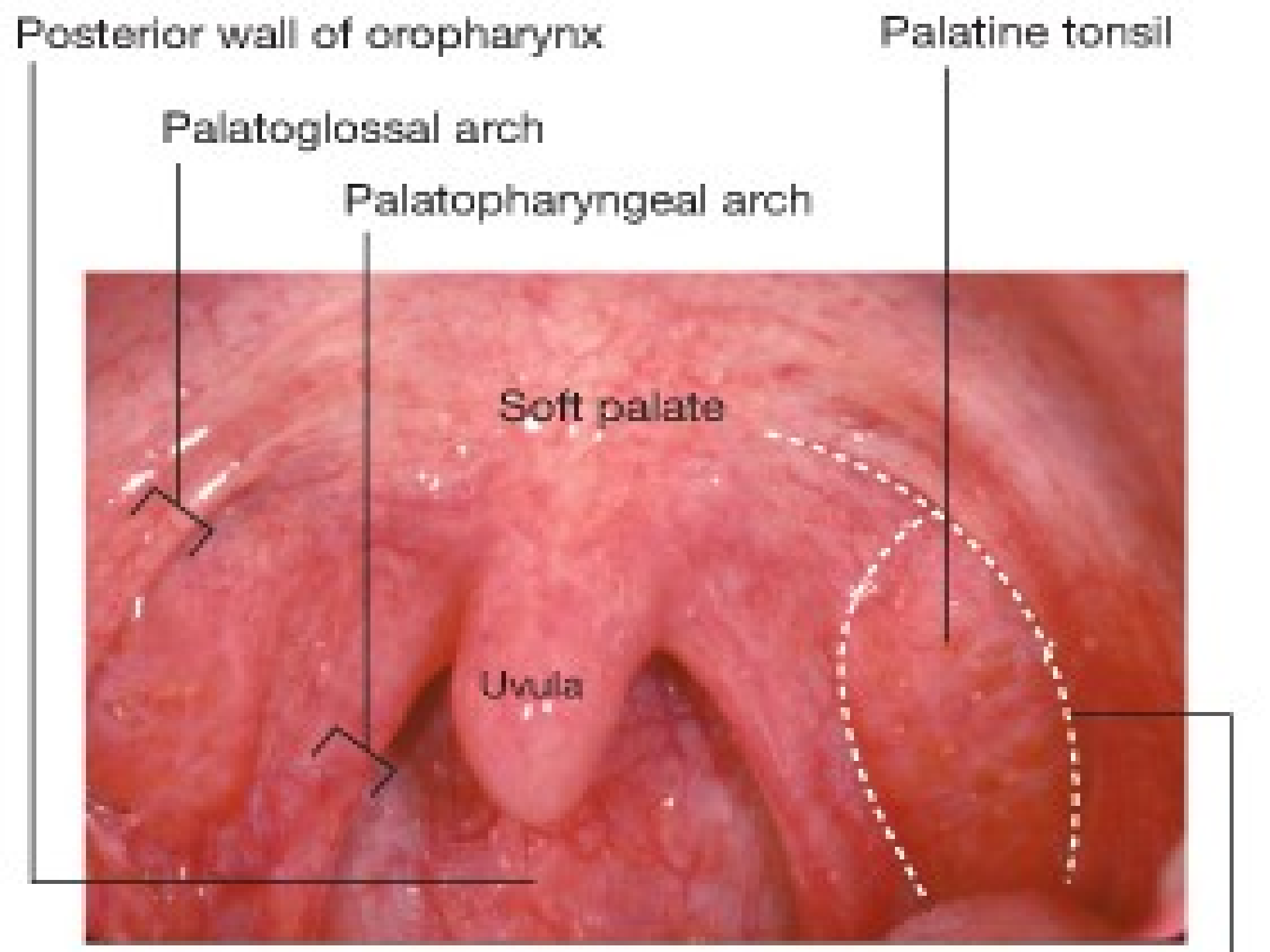
Muscle of the pharynx

- The superior, middle & inferior constrictors
- Their action is constriction of the pharyngeal cavity
- Blood supply- superior & middle constrictors is by ascending pharyngeal artery, while the inferior constrictor gets its supply from superior & inferior thyroid arteries
- The pharyngeal constrictors are innervated by the superior laryngeal & recurrent laryngeal nerves

- **Palatopharyngeus**
  - Elevates the pharynx, innervated by vagus via pharyngeal plexus
  - Its blood supply by ascending is by ascending pharyngeal artery
- **Stylopharyngeus**
  - Elevates the pharynx, innervated glossopharyngeal nerve & supplied by ascending pharygeal artery
- **Salpingopharyngeus**
  - elevates the pharynx, innervated by the vagus via pharyngeal plexus & is supplied by ascending pharyngeal artery

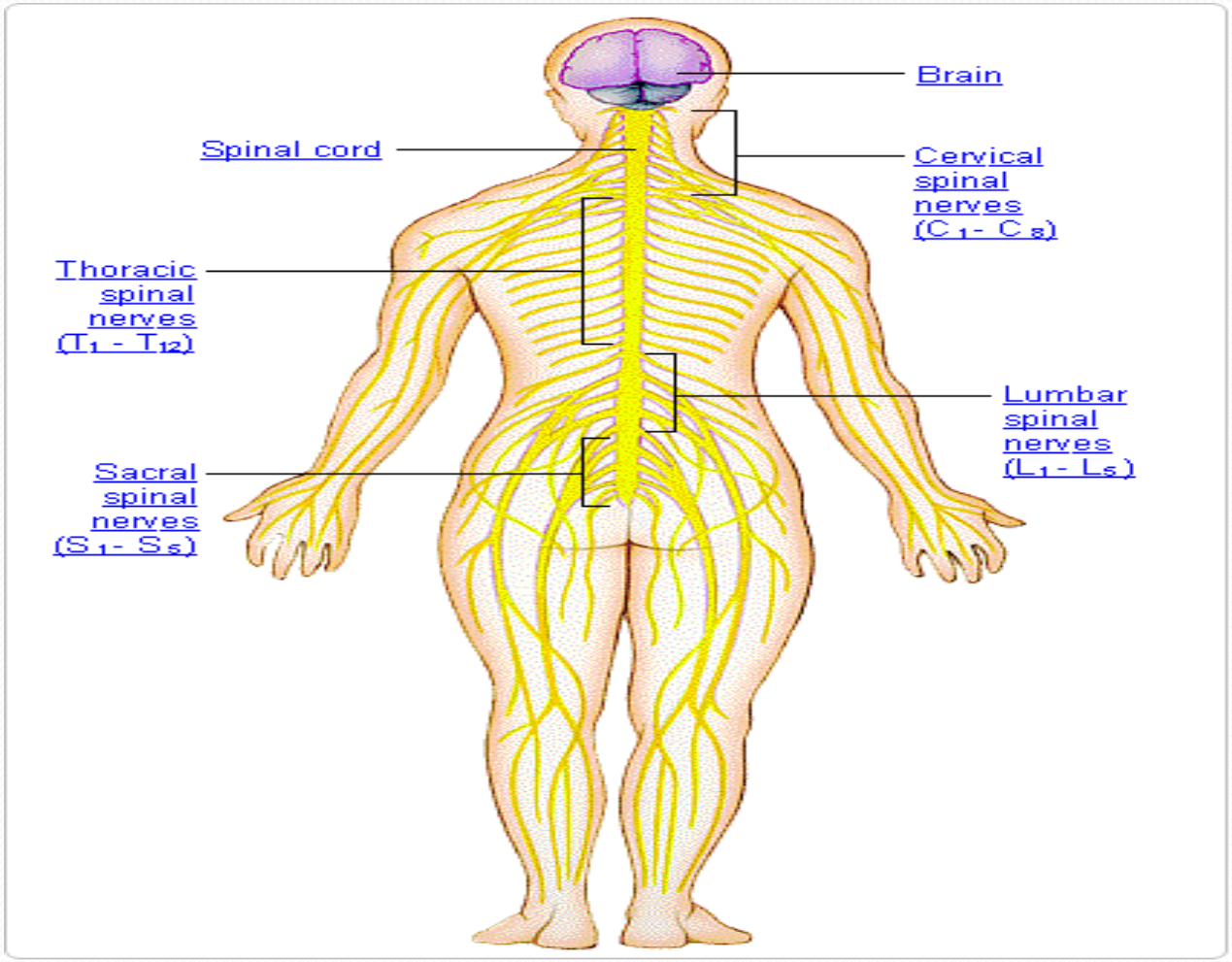
Tonsils

- Collections of lymphoid tissue in the mucosa of the pharynx surrounding the openings of the nasal and oral cavities are part of the body's defense system.
- The largest of these collections form distinct masses (**tonsils**).
- Tonsils occur mainly in three areas:
- The **pharyngeal tonsil**, known as **adenoids** when enlarged, is in the midline on the roof of the nasopharynx.
- The **palatine tonsils** are on each side of the oropharynx just posterior to the oropharyngeal isthmus.
- (*The palatine tonsils are visible through the open mouth of a patient when the tongue is depressed.*)
- The **lingual tonsils** refers collectively to numerous lymphoid nodules on the posterior one-third of the tongue.


Posterior wall of oropharynx
Palatine tonsil
Palatoglossal arch
Palatopharyngeal arch
Soft palate
Uvula


Thanks
much!!!
Encarta Encyclopedia, Peter Arnold, Inc./S. J. Krasemann

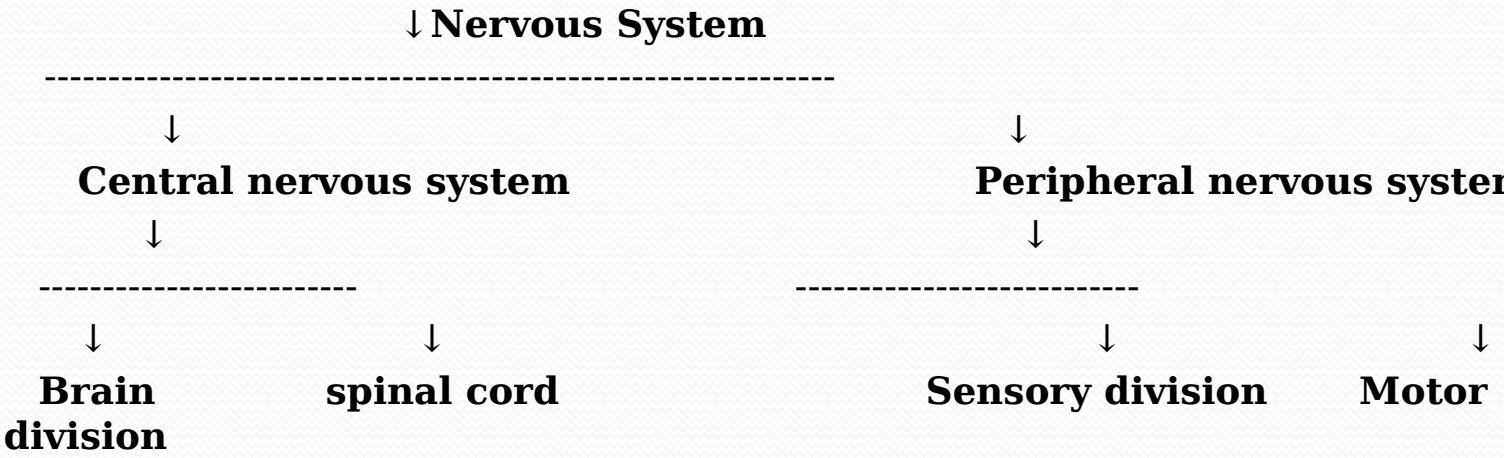
CNS


Brain
Spinal cord
Cervical spinal nerves (C1 - C8)
Thoracic spinal nerves (T1 - T12)
Lumbar spinal nerves (L1 - L5)
Sacral spinal nerves (S1 - S5)

INTRODUCTION

- Control of the body's billions of cells is accomplished mainly by **two communication systems**: the **nervous system** and the **endocrine system**. Both systems transmit information from one part of the body to another, but they do it in **different ways**.
- The nervous system transmits information **very rapidly** by **nerve impulses.**

division



Subdivisions of the Nervous system

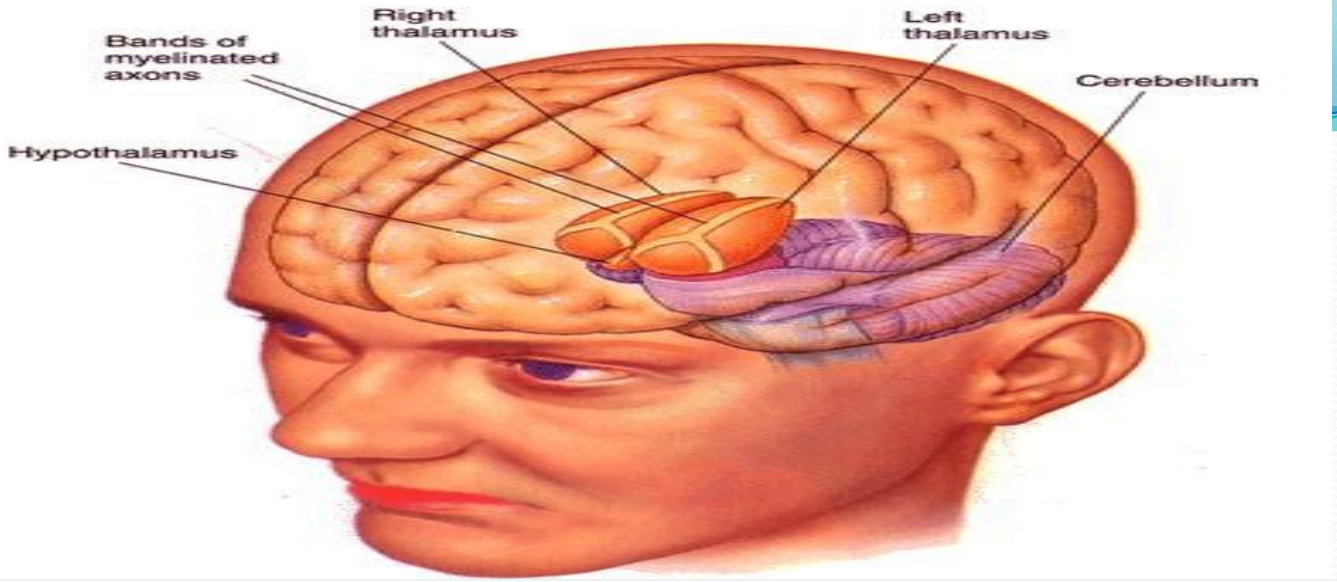
Regions of brain

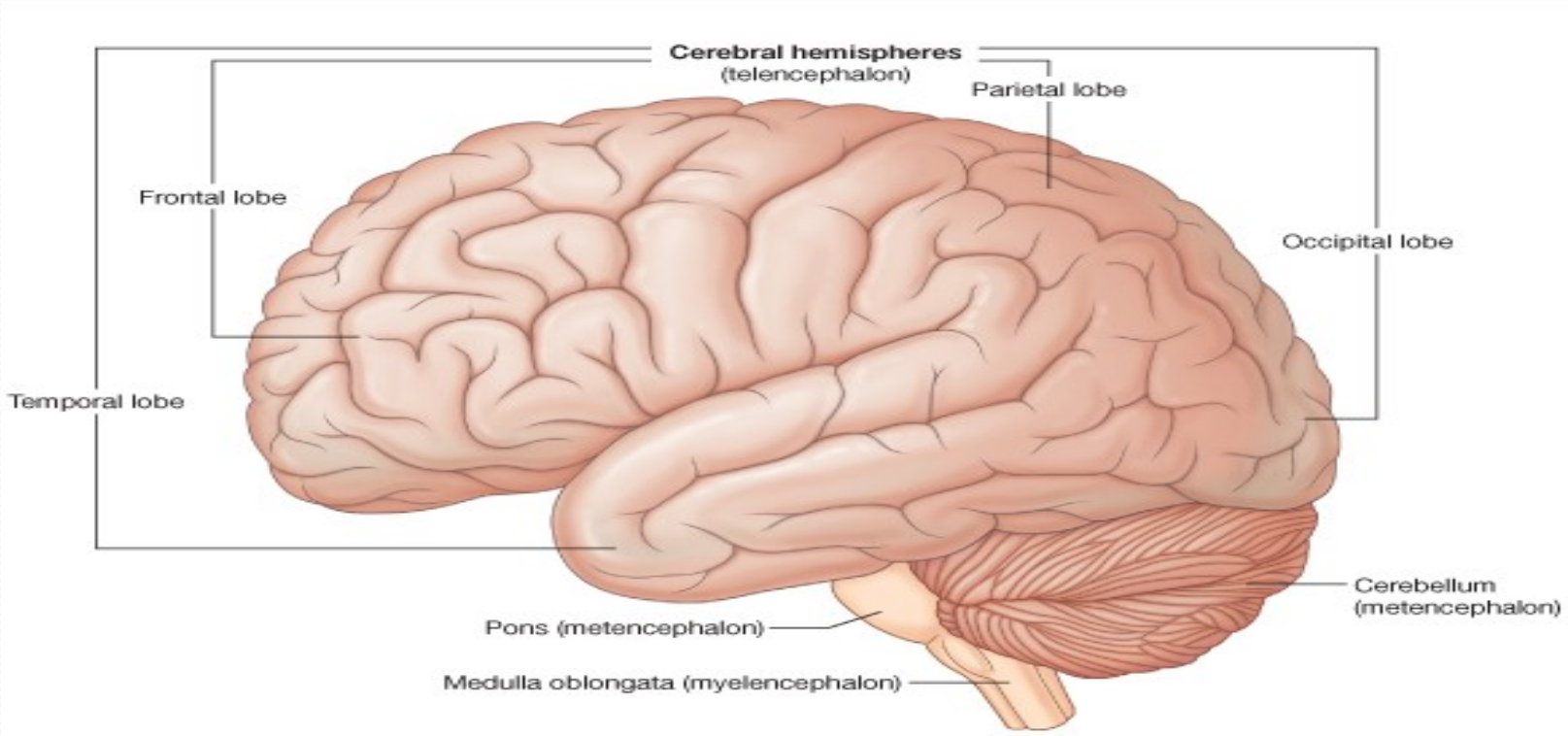
1. FOREBRAIN

- The forebrain consists of the **cerebrum** and **diencephalon**

THE CEREBRUM

- The **largest** and most **conspicuous** part of the human brain (accounts for about **83%** of the brain volume).
- It is the **seat** of sensory perception, voluntary motor actions, memory and mental processes such as thought, judgment, and imagination, which most **distinguish** human from other animals.
- The cerebrum consists of a pair of half-globes called the **central hemispheres**. Each hemisphere is marked by thick folds called **gyri** (singu: gyrus) separated by shallow grooves called **Sulci** (plu: Sulcus).
- This extensive folding is one of the greatest **differences** between the human brain and other mammals


Right thalamus
Left thalamus
Bands of myelinated axons
Cerebellum
Hypothalamus


Cerebral hemispheres
(telencephalon)
Parietal lobe
Frontal lobe
Occipital lobe
Temporal lobe
Cerebellum
(metencephalon)
Pons (metencephalon)
Medulla oblongata (myelencephalon)

cont..

- Each hemisphere is divided in to **five** anatomically & functionally **distinct lobes**. The first four of these are **visible** superficially and are named for the cranial bones overlying them; the **fifth** lobe is **not visible** from the surface.
- **The Frontal Lobe**

  Lies immediately **behind** the frontal bone, **superior** to the orbits. It is concerned with the **cognition** (thought) and other "**higher**" mental processes, **speech** and **motor control**.
- **The Parietal Lobe**

  Forms the **uppermost** part of the brain and underlies the parietal bone. It is the primary site for **receiving** & **interpreting** signals of the **general senses** as well as signals for **taste**, one of the special senses.
- **The occipital Lobe**

  Found underlying the occipital bone. It is the principal **visual center** of the brain.

Cont..

- **The Temporal Lobe**

  Is a lateral, horizontal lobe **deep** to the temporal bone. Among its functions are **hearing**, **smell**, **learning**, **memory**, and some aspects of **vision** & **emotion.**

- **The Insula**

  Is a **small mass** of cortex deep to the **lateral sulcus**, made visible only by **retracting** or **cutting** away some of the underlying Cerebrum. It is **less** understood than the other lobes but apparently plays role in **taste**, **hearing**, and **visual** sensation

cont

Gray and White matter

- **Gray matter**-A zone or layer of tissue in the CNS where the neuron cell bodies, Dendrites, and synapses are found; forms the core of the spinal cord, nuclei of the brainstem, basal nuclei of the cerebrum, cerebral cortex, and celebral cortex.
- **White matter**

  White myelinated nervous tissue deep to the cortex of cerebrum & cerebellum and superficial to the gray matter of the spinal cord.

Cont..

THE DIENCEPHALON

- The embryonic **diencephalon** has three major derivatives: 1-**THE THALAMUS**,

2- **HYPOTHALAMUS**

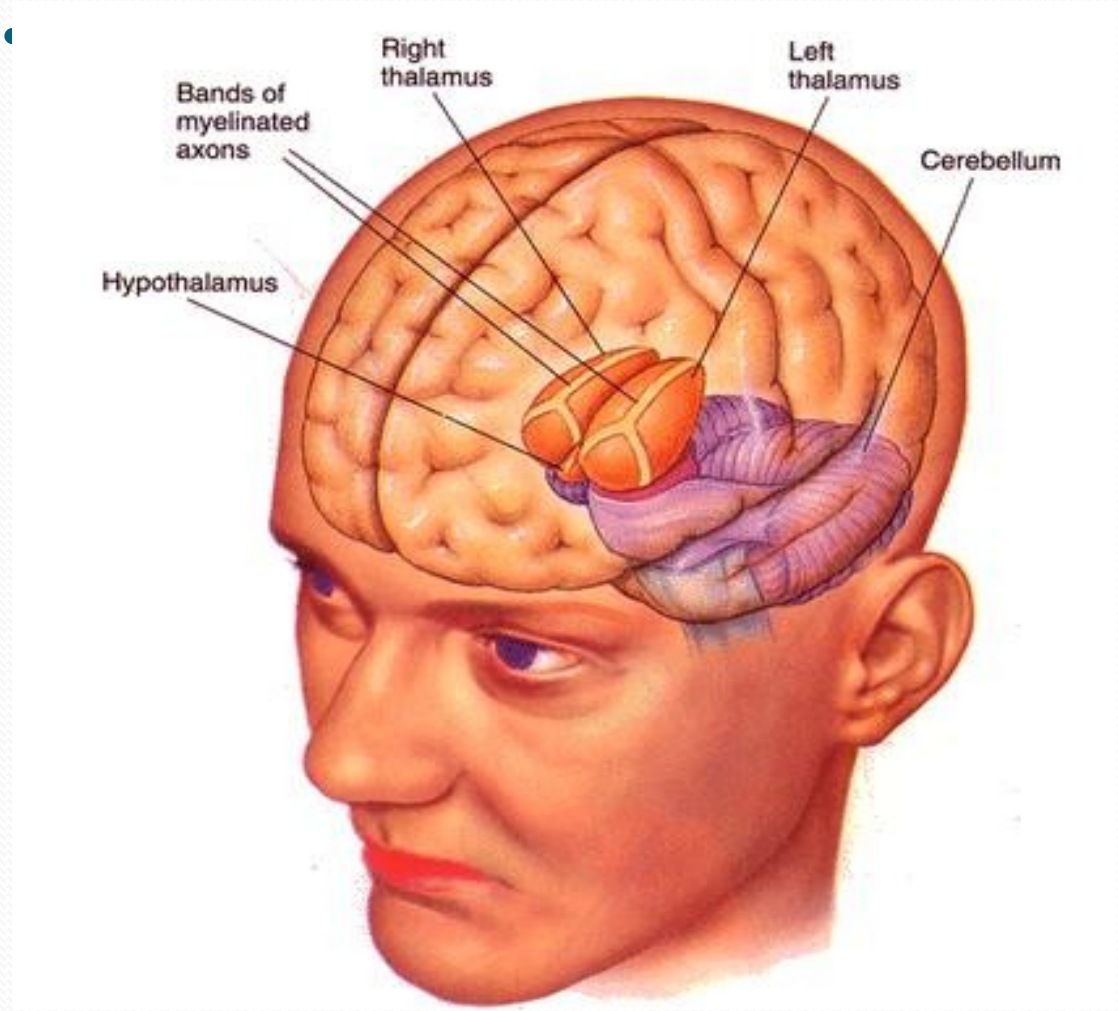
3- **EPITHALAMUS.**

Cont..

Thalamus

- About 2/3rd of the diencephalon is thalamus,
- an oval mass of gray matter underlying each cerebral hemisphere.
- It is the “gateway to the cerebral cortex.” Nearly all ***sensory signals*** & other input to the cerebrum pass by way of nuclei in the thalamus & the thalamus process these signal and relays coded information to areas of the cerebral cortex specialized to interpret it.

Cont.


Right thalamus
Left thalamus
Bands of myelinated axons
Cerebellum
Hypothalamus

Cont..

Hypothalamus

- The hypothalamus forms part of the walls and floor of the ***third ventricle.*** It extends anteriorly to the ***optic chiasm***, an X-shaped crossing of the ***optic nerves,*** and posteriorly to the mammillary bodies. The mammillary bodies are composed of nuclei belonging to the hypothalamus & limbic system; they are the primary route of sensory input to the hypothalamus and their output goes also to the thalamus & the lower brainstem. **The pituitary gland** is attached to the hypothalamus by a stalk between the optic chiasm and mammillary bodies.
- The hypothalamus is the major control center of the ***autonomic nervous system*** and ***endocrine system*** & plays an essential role in the homeostasis nearly all organs of the body.

Cont..

2. MIDBRAIN

- The embryonic ***mesencephalon*** develops in to just one mature brain structure,
- the midbrain-a short segment of the brainstem that connects the hindbrain & forebrain.
- It contains the cerebral aqueduct and gives rise to two cranial nerves that control eye movements ***(CN III & CN IV)***

Cont..

3. HINDBRAIN

Medulla Oblongata

- The embryonic ***myelencephalon*** develops in to just one structure, the medulla oblongata.
- The most caudal part of the brainstem, immediately superior to the foramen magnum of the skull,
- The medulla oblongata is the origin or termination of ***CNs IX, X,*** part of ***XI,*** and ***XII.***

Cont..

Pons

- The ***metencephalon*** develops in to two structures, the pons & cerebellum.
- Cranial nerves ***V, VI, VII*** & ***VIII*** arise from the pons, with last three emerging from the groove between the pons & medulla.

Cont..

Cerebellum

- The cerebellum is the largest part of hindbrain.
- The cerebellum consists of right & left cerebellar hemispheres. Each hemisphere has four deep nuclei, masses of gray matter embedded in the white matter.
- The cerebellum contains about 100 billion neurons.
- The cerebellum receives input from four principal sources: the *cerebral cortex, the ear & eye, the reticular formation of the brainstem, and the spinocerebellar tracts of the spinal cord.*

Blood supply

- **Vertebral arteries:**

  Each vertebral artery arises from the first part of each **subclavian artery.**

  On enter ,the vertebral artery gives off a small meningeal branch.

- **Internal carotid arteries:**

The two internal carotid arteries arise as one of the two terminal branches of the common carotid arteries.

internal carotid artery gives off :-the **ophthalmic artery**

:-the **posterior communicating artery**,

:-the **middle cerebral artery**, and

:-the **anterior cerebral artery.**

Cranial nerves

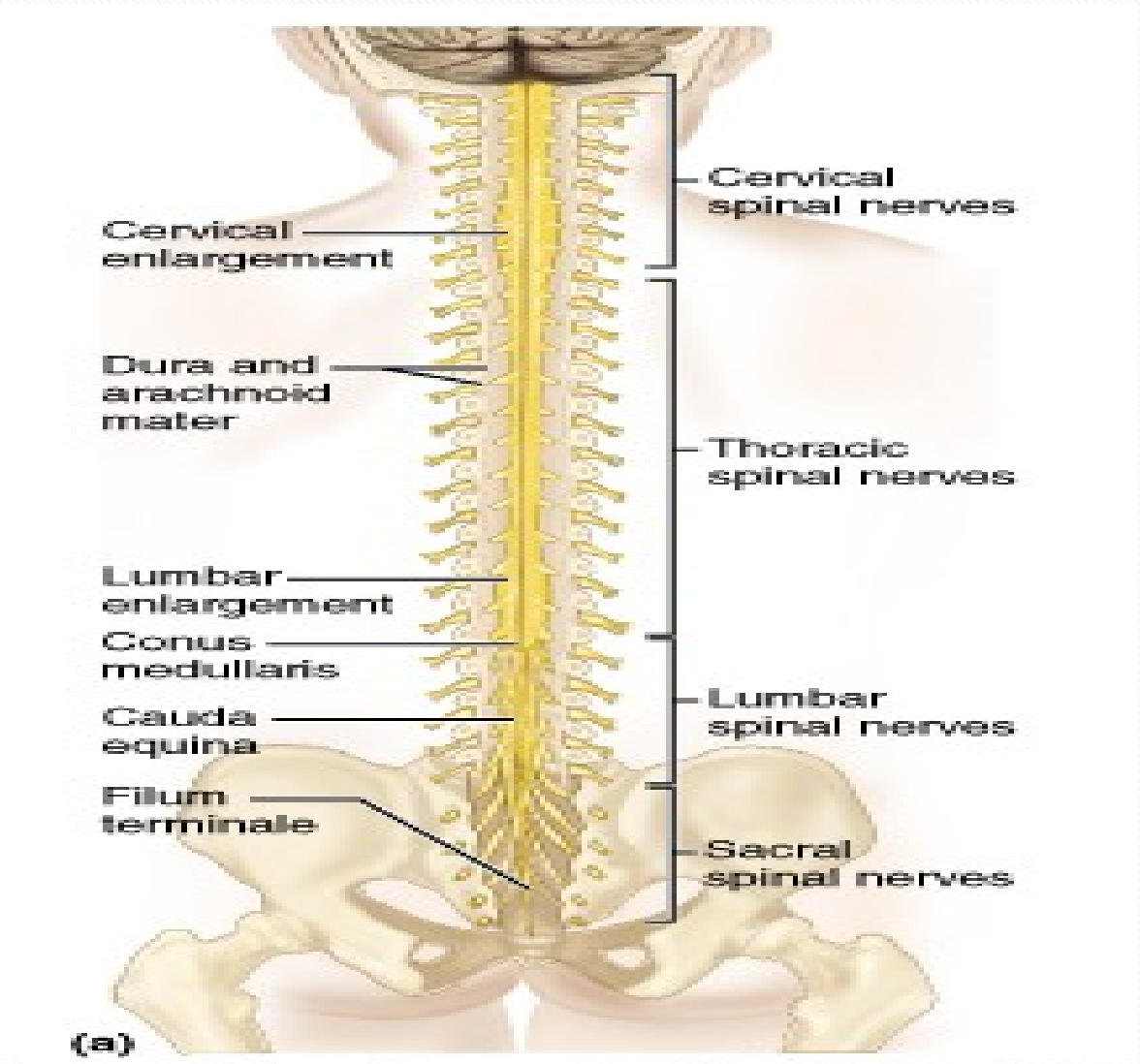
assignment??????????

Spinal cord

Function of spinal cord

- Conduction
  - bundles of fibers passing information up & down spinal cord
- Locomotion
  - repetitive, coordinated actions of several muscle groups
  - central pattern generators are pools of neurons providing control of flexors and extensors (walking)
- Reflexes
  - involuntary, stereotyped responses to stimuli
    - remove hand from hot stove

Cont..


Cervical spinal nerves
Cervical enlargement
Dura and arachnoid mater
Thoracic spinal nerves
Lumbar enlargement
Conus medullaris
Lumbar spinal nerves
Cauda equina
Filum terminale
Sacral spinal nerves
(a)

Anatomy of spinal cord

- Ropelike bundle of nerve tissue within the vertebral canal (thick as a finger)
  - vertebral column grows faster so in an adult the spinal cord only extends to L1
- 31 pairs of spinal nerves coming from cervical, thoracic, lumbar or sacral regions of the cord
  - named for level of vertebral column where nerves exit
- Cervical & lumbar enlargements in cord

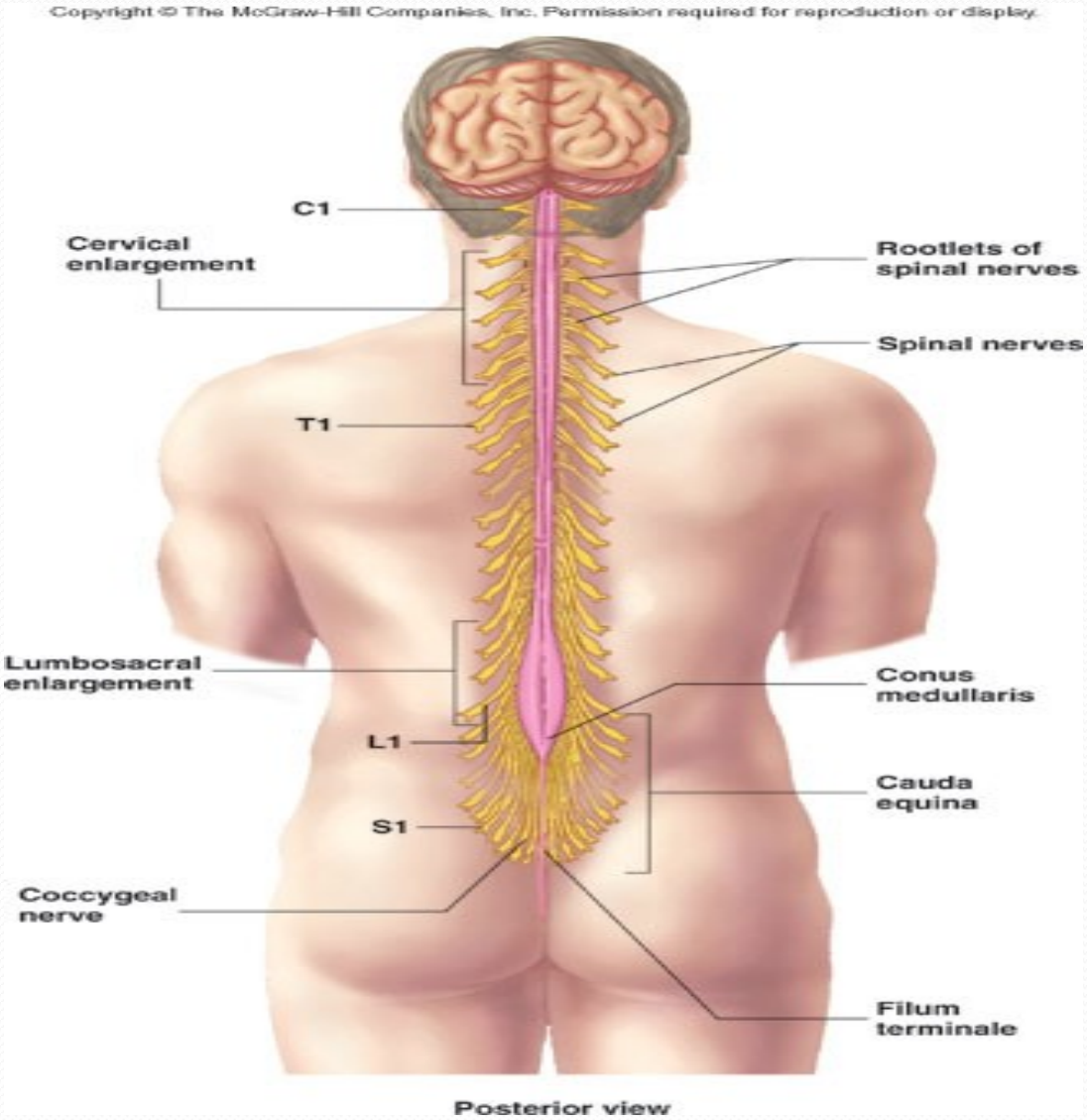
General structure of sc

Principal Parts

- 45 cm in length; 2.5 cm wide
- cervical enlargement - C4-T1 supply upper limbs
- lumbar enlargement - T9-T12 supply lower limbs
- **conus medullaris - is tapered tip of spinal cord to end at L1-L2**
- cauda equina - (like horse tail) is L2 to S5 nerve roots resemble horse's tail, hang down in the cauda equina

- filum terminale - **pia mater** anchors **cord** to **coccyx**

Cont..


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C1
Cervical enlargement
Rootlets of spinal nerves
Spinal nerves
T1
Lumbosacral enlargement
Conus medullaris
L1
Cauda equina
S1
Coccygeal nerve
Filum terminale
Posterior view

The end