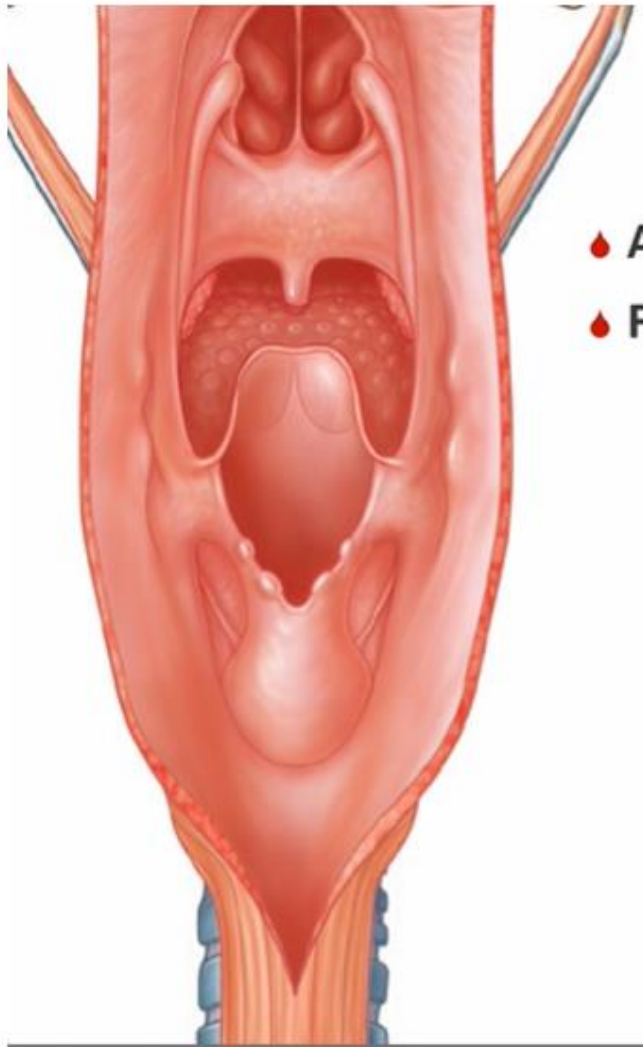
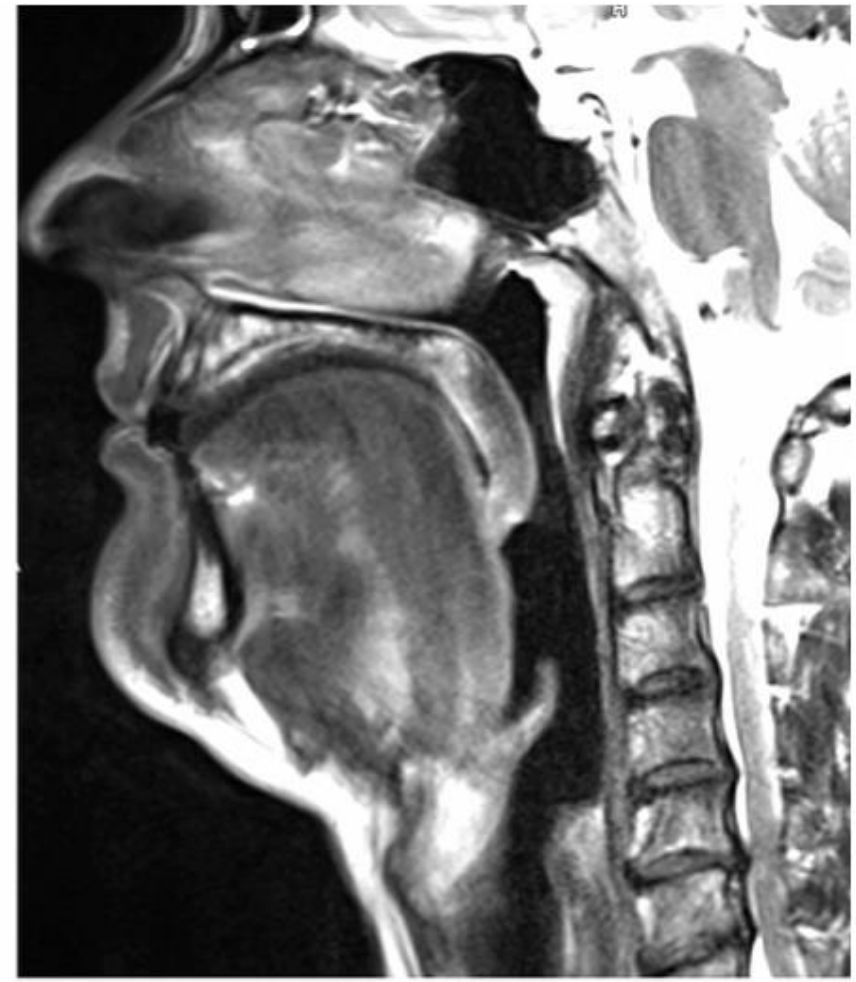
Larynx, thyroid and parathyroid glands, thymus, neck spaces

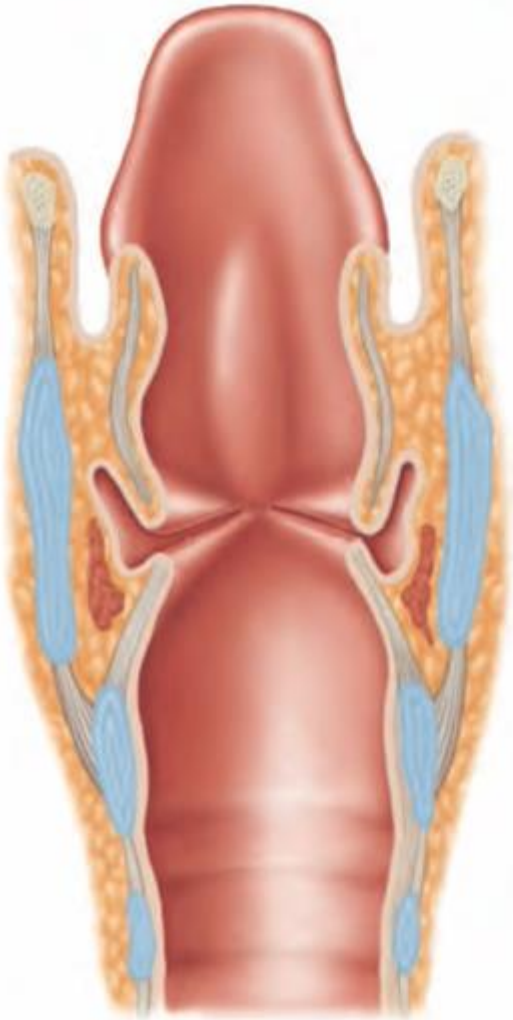
Omid Moztarzadeh



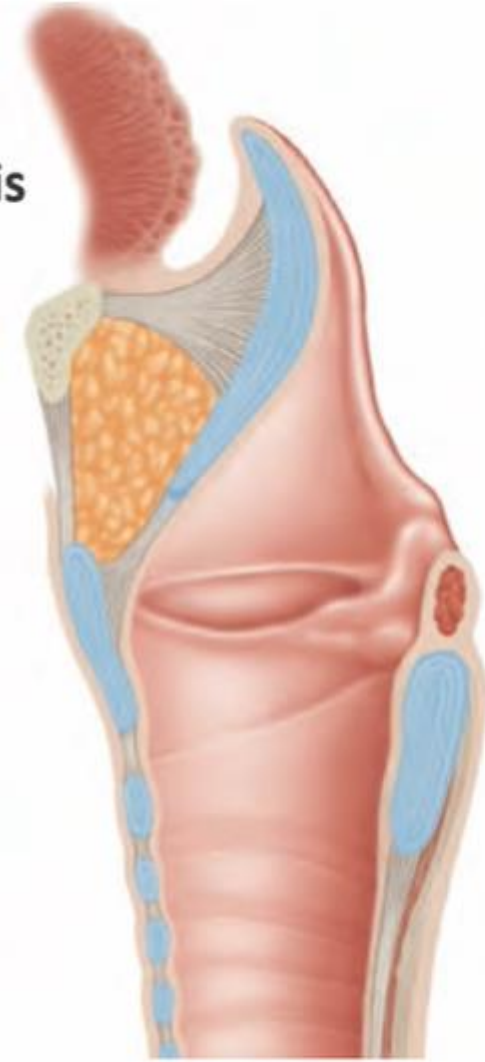
- Aditus laryngis
- Fossae piriformes
  - Recessus piriformis
  - grooves
  - Conduct solid and fluid meal
  - To esophagus



hypofarynx – laryngopharynx and larynx



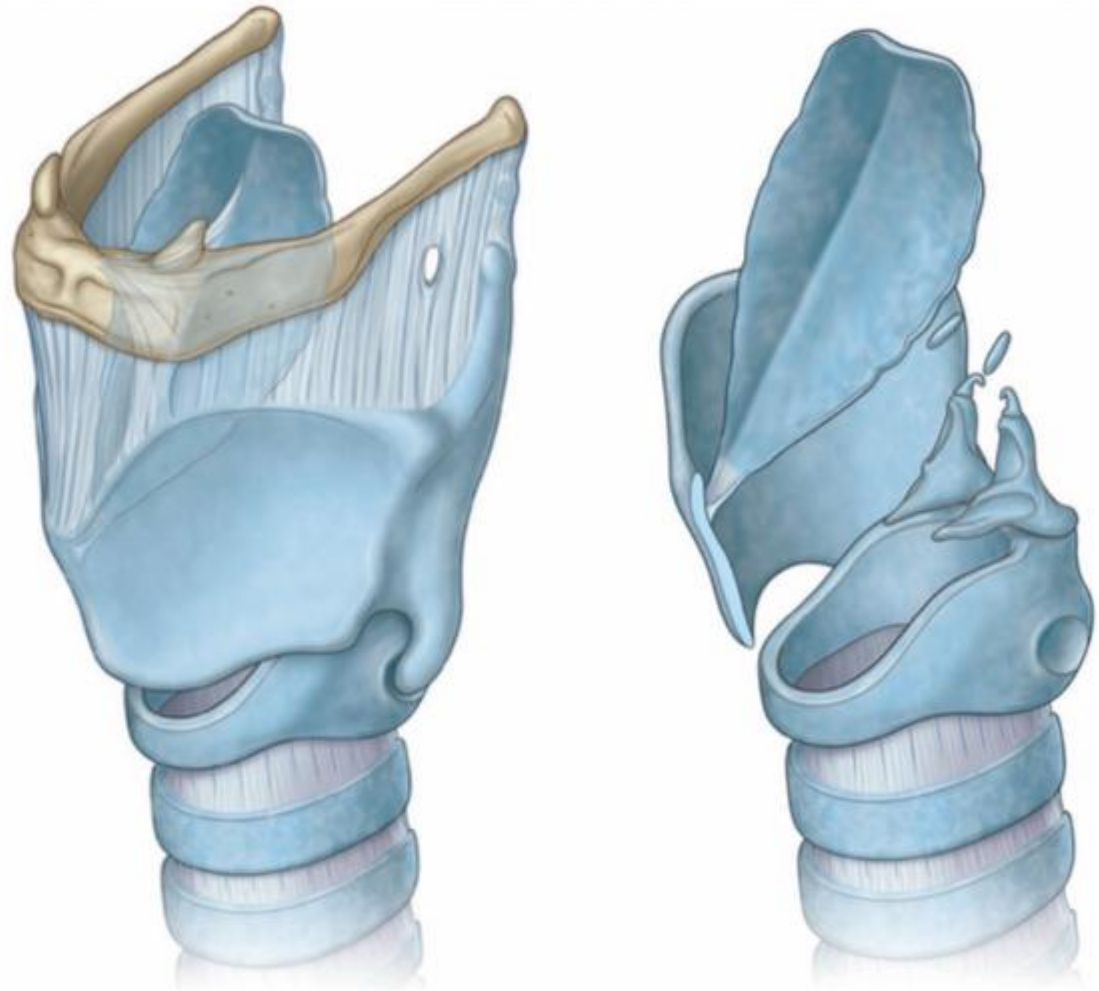
- Aditus laryngis
- Tuberculum epiglottidis
- Vestibulum
- Cavitas supraglottica
- Plica vestibularis
- Ventriculus
- Glottis
- Plica vocalis
  - lig. vocale, m. vocalis
- Cavitas infraglottica



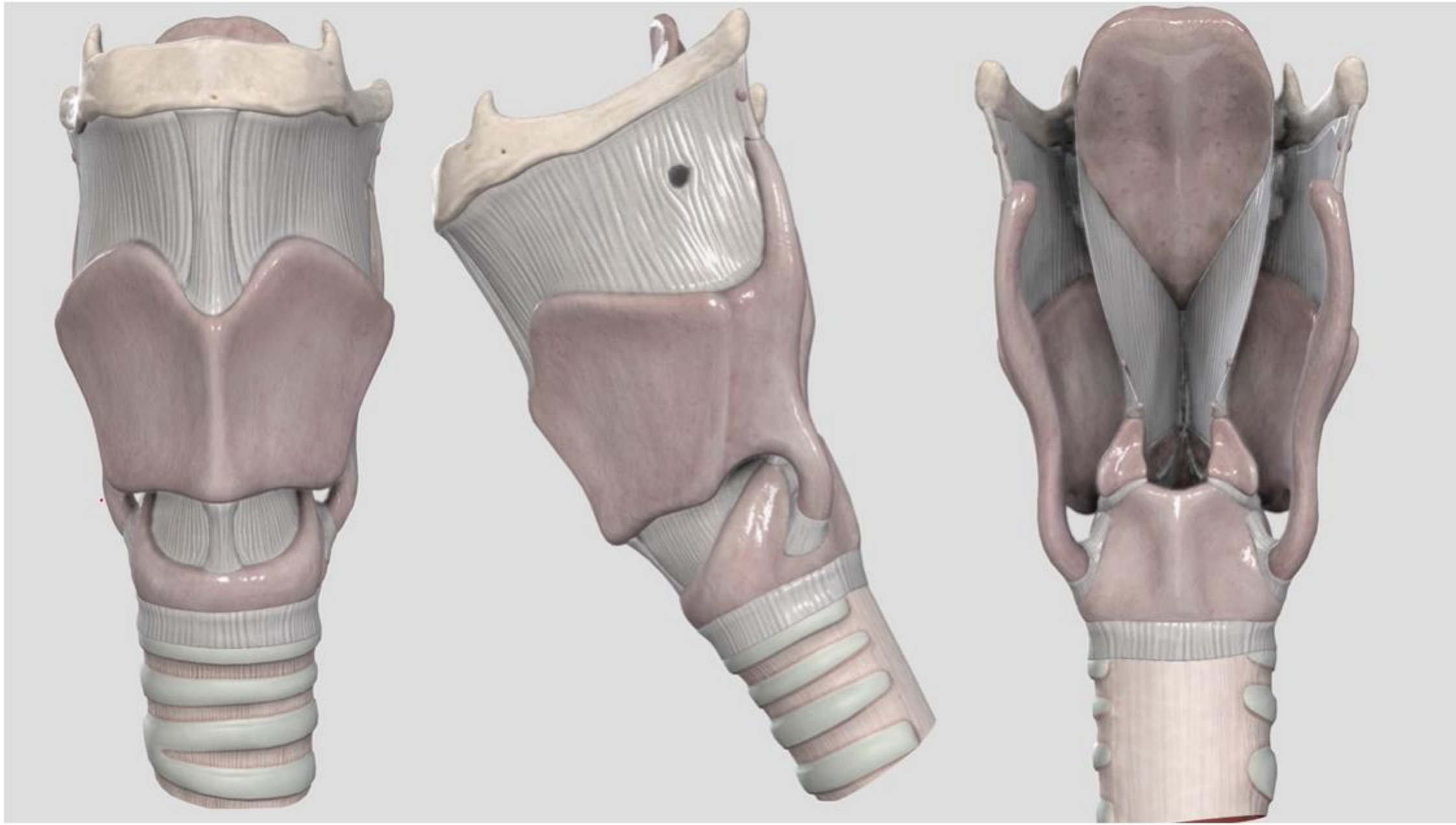
larynx

cartilagines laryngis

- Cartilages – skeleton of larynx
- **paired**
- Cart. arytenoidea
- Cart. corniculata
- Cart. cuneiformis
- Cart. triticea
- **unpaired**
- Cart. thyroidea
- Cart. cricoidea
- Cart epiglotica



Gray's Anatomy 41th ed.



Larynx - cartilagines

- **Cartilago triticea**
- **Cart. thyroidea**
- *Cornu superius*
- *Cornu inferius*
- *Lamina*
- *Incissura thyroidea*
- *Prominentia laryngis*
- *Linea obliqua*
- *Tuberculum superius*
- *Tuberculum inferius*
- **Cart. cricoidea**
- *Arcus anterior*

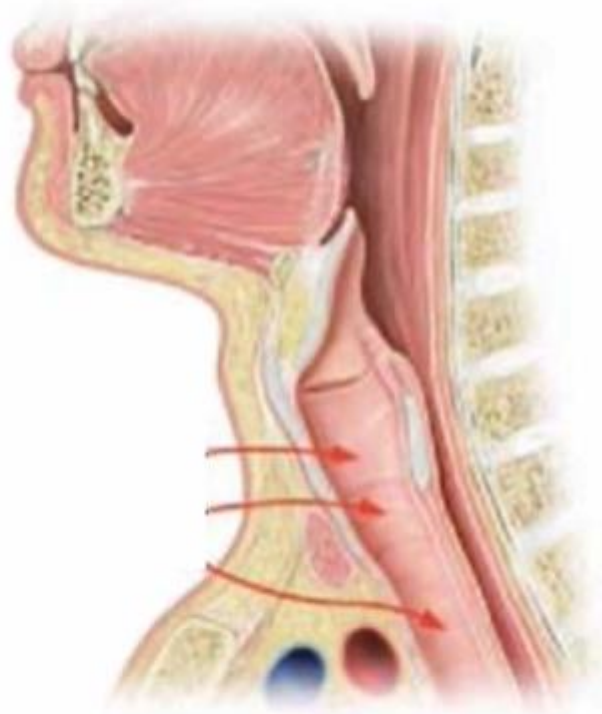
Connection of cartilages

- **Os hyoideum**
- *Corpus, cornu minus, cornu majus*

- **Lig. thyrohyoideum medianum**
- **Membrana thyrohyoidea**
- **Apertura (sup. laryngeal artery and internal br. of sup. laryngeal n.)**
- **Conus elasticus - coniotomy**
- **Lig. cricothyroideum medianum**

- **Capsula articulationis cricothyroidea**

- **Ligamentum cricotracheale - tracheostomy**
- **Trachea**



Laryngela cartilages

- Cartilago triticea
- **Cart. thyroidea**
- *Cornu superius*
- *Cornu inferius*
- *Lamina*
- *Incissura thyroidea*
- **Cart. cuneiformis**
- **Cart. corniculatum**
- **Cart. arytenoidea**
- **Cart. cricoidea**
- *lamina*
- *crista*

connection of cartilages

- Os hyoideum
- Lig. thyrohyoideum laterale
- Membrana thyrohyoidea
- Apertura (n. et. a. laryngea ant.)

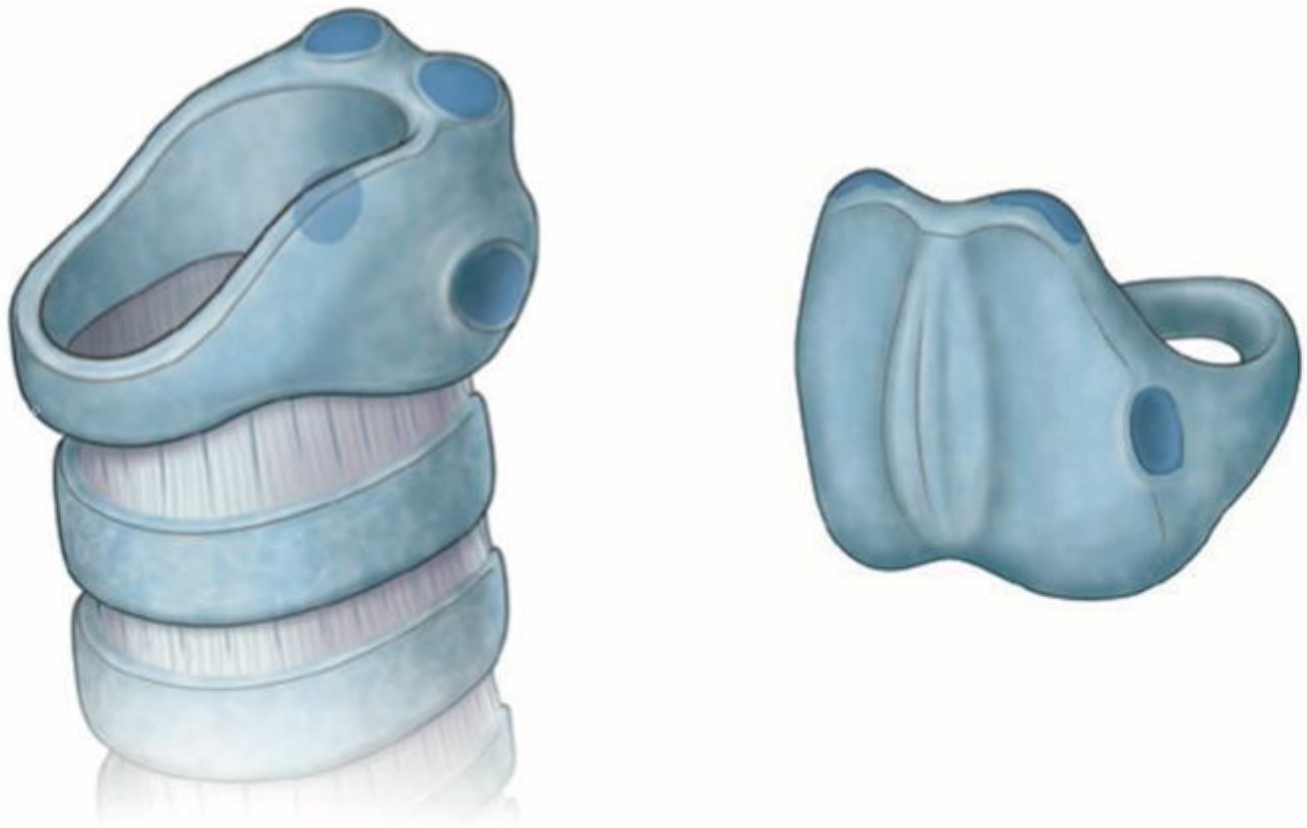
- Epiglottis
- Lig. thyroepigloticum

- Capsula art. cricoarytenoidea
- Lig. cricoarytenoideum post.
- Lig. cricothyroideum medianum

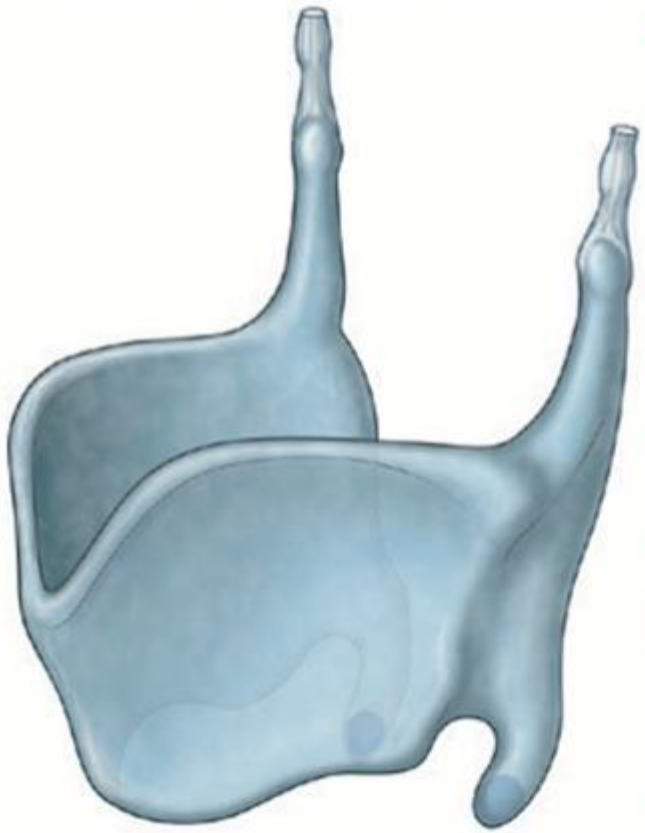
- Capsula art. cricothyroidea

- Ligamentum cricotracheale

Cartilago cricoidea

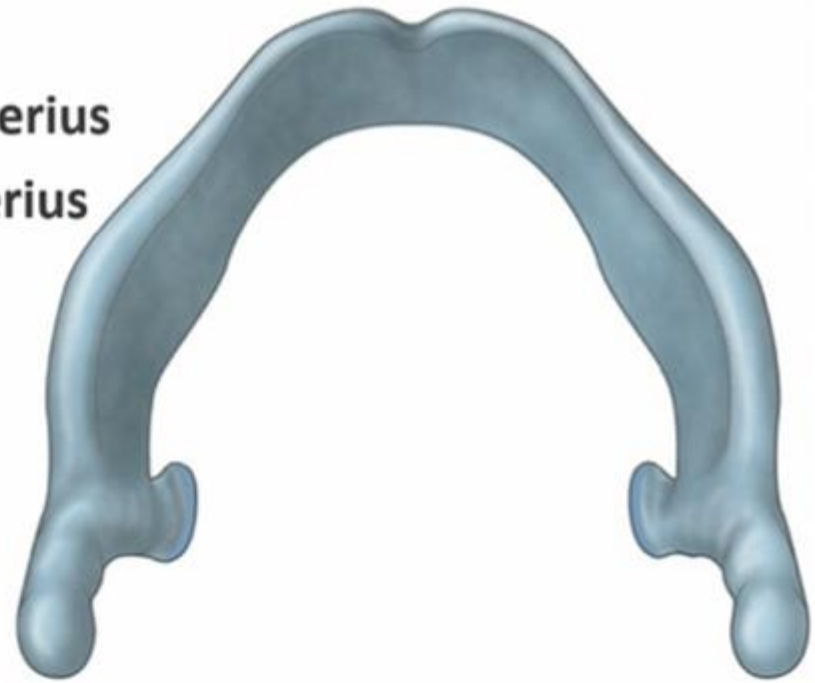


Cartilago thyroidea

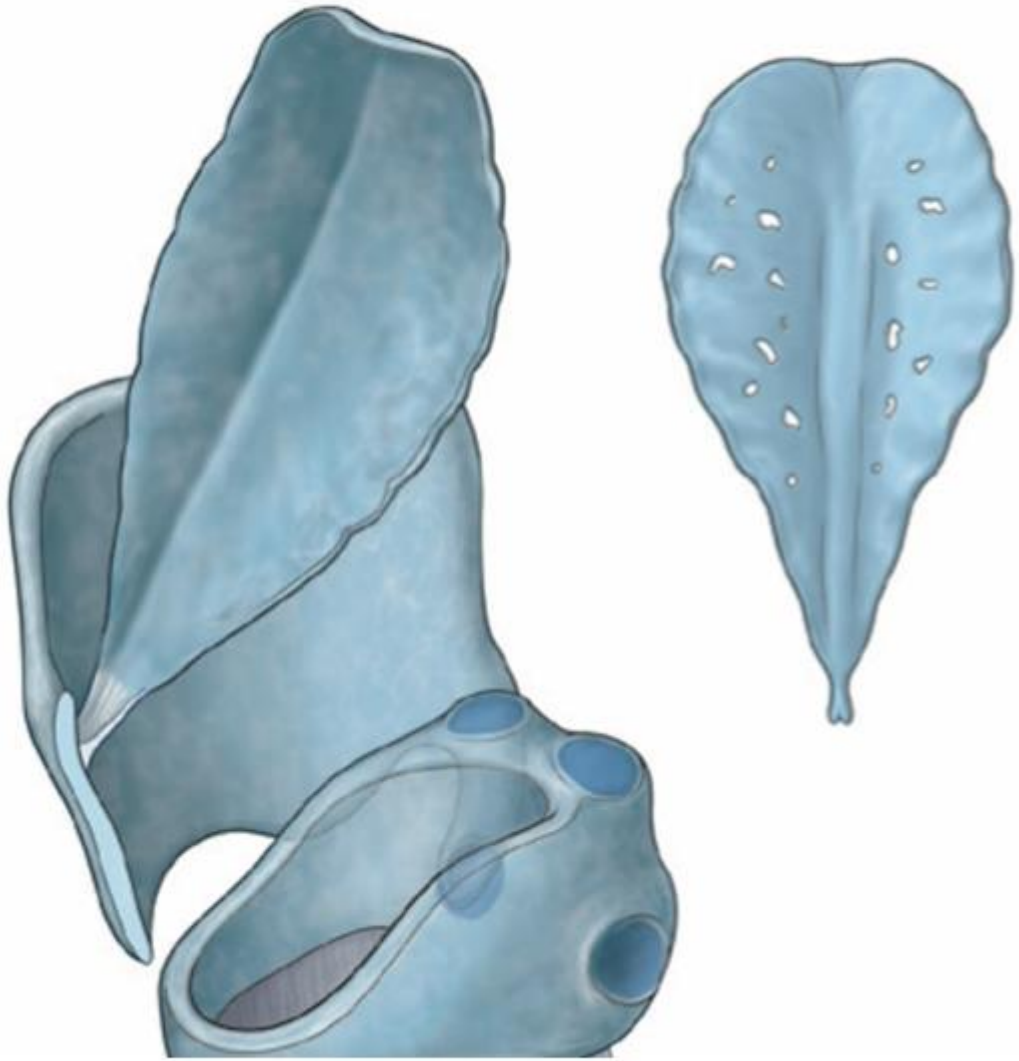


- Lamina
- Incissura superior
- Prominentia laryngis
- Incissura inferior
- Linea obliqua
- Tuberculum thyroideum superius
- Tuberculum thyroideum inferius
- Cornu superius
- Cornu inferius

- *Angulus laminarum*
  - *90-120 st.*



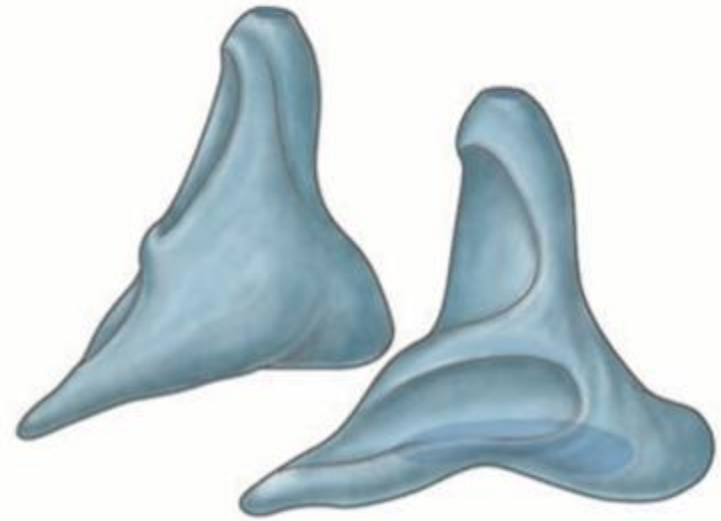
Epiglottis



- Facies anterior
- Facies posterior
- Tuberculum epiglottidis
- *Ligamentum hyo-epiglotticum*

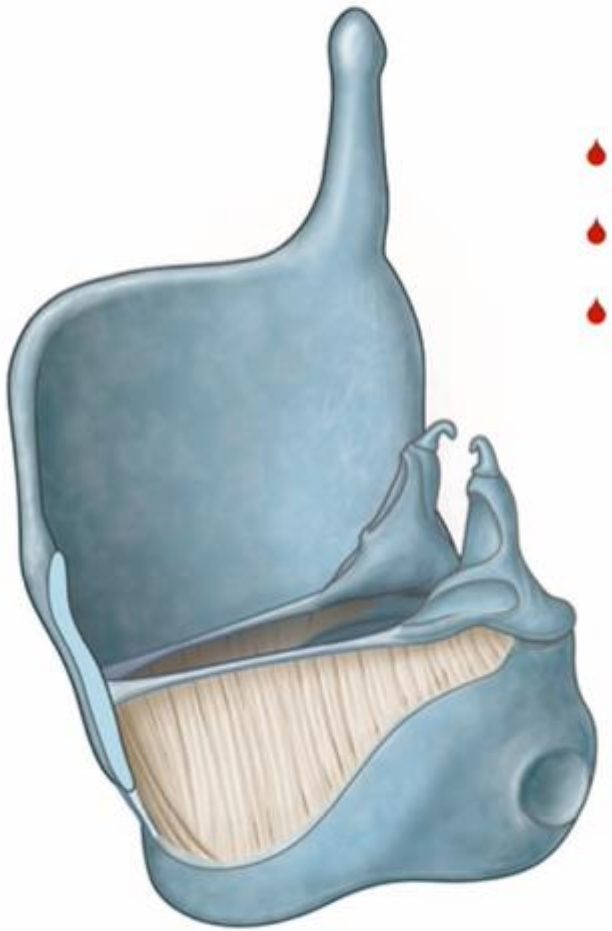
Cartilago arytenoidea

- **Processus vocalis**
- **Processus muscularis**



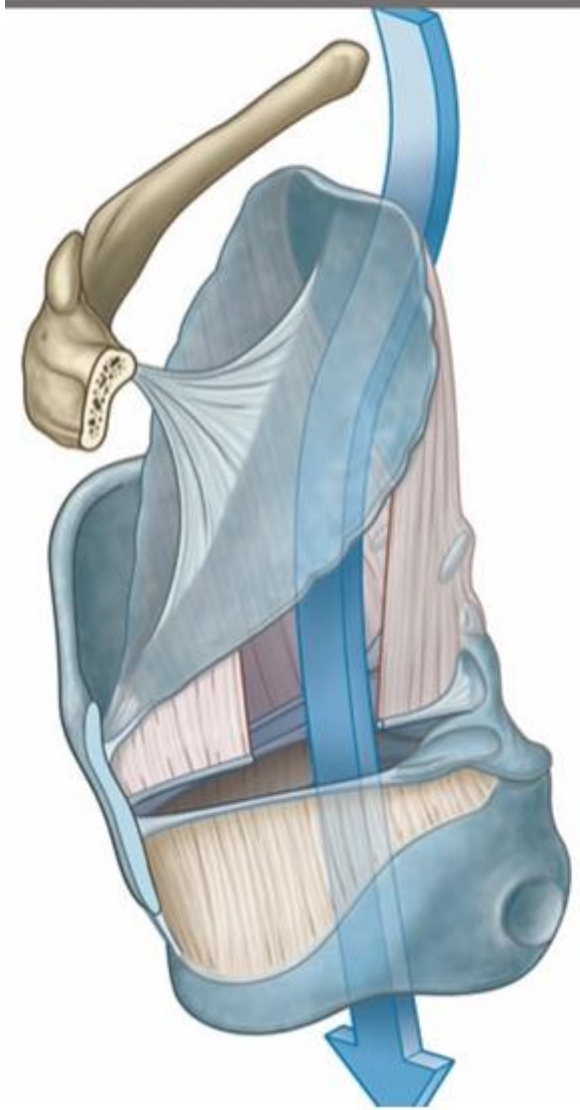
- *Insertio m. vocalis*
- *Insertio lig. vestibulare*

Conus elasticus

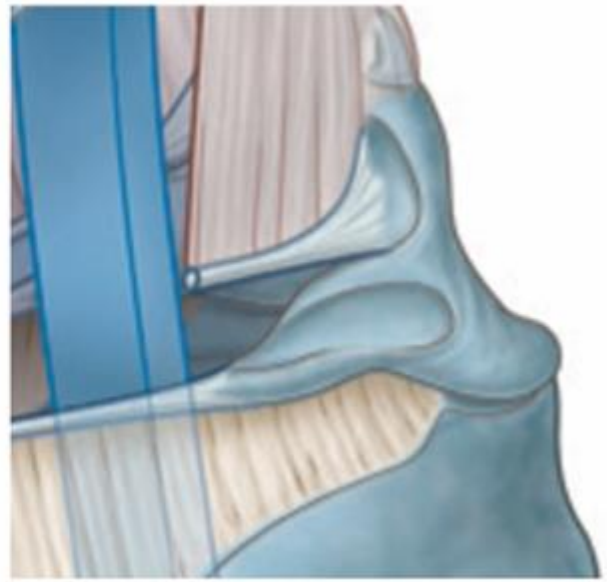


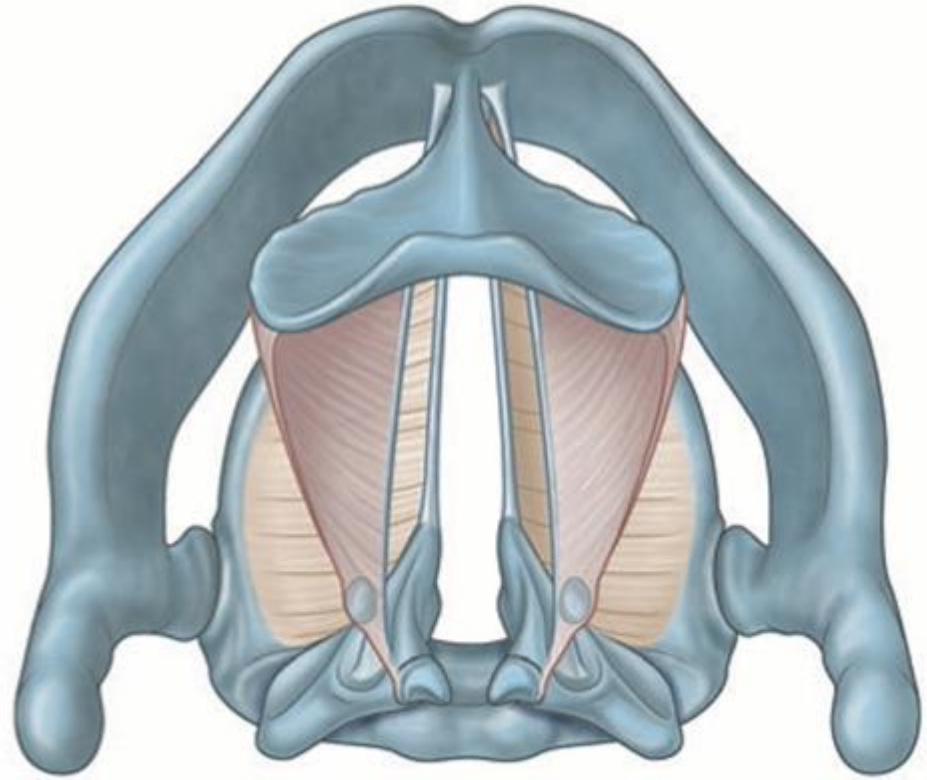
- **Conus elasticus – coniotomie**
- *Lig. cricothyroideum medianum*
- *Ligamentum vocale*

intrinsic ligamenta

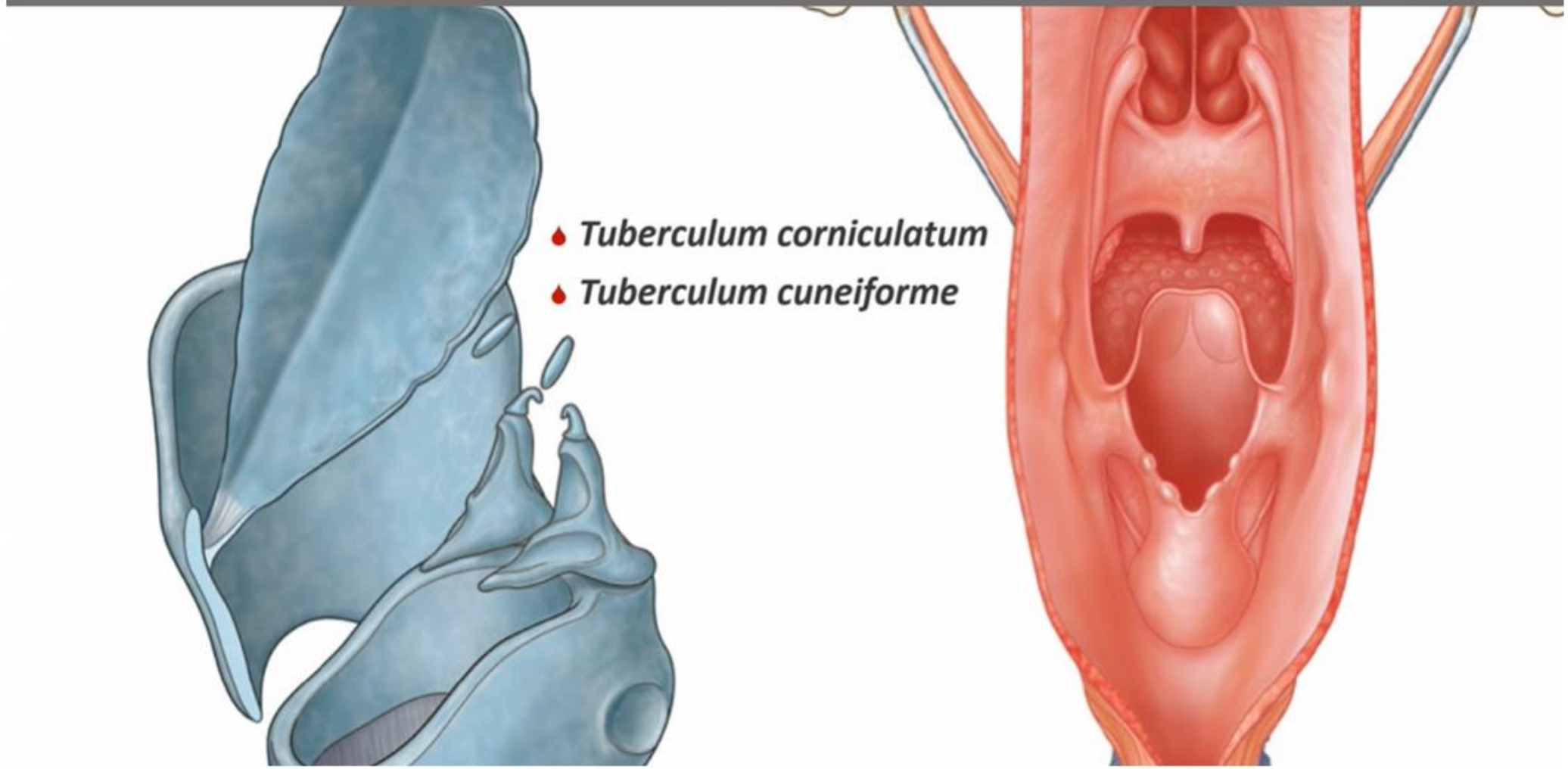


- Ligamentum hyo-epiglotticum
- Lamina quandrangularis
- Ligamentum vestibulare
  - False lvocal ligament
- Ligamentum vocale
  - Vocal ligament

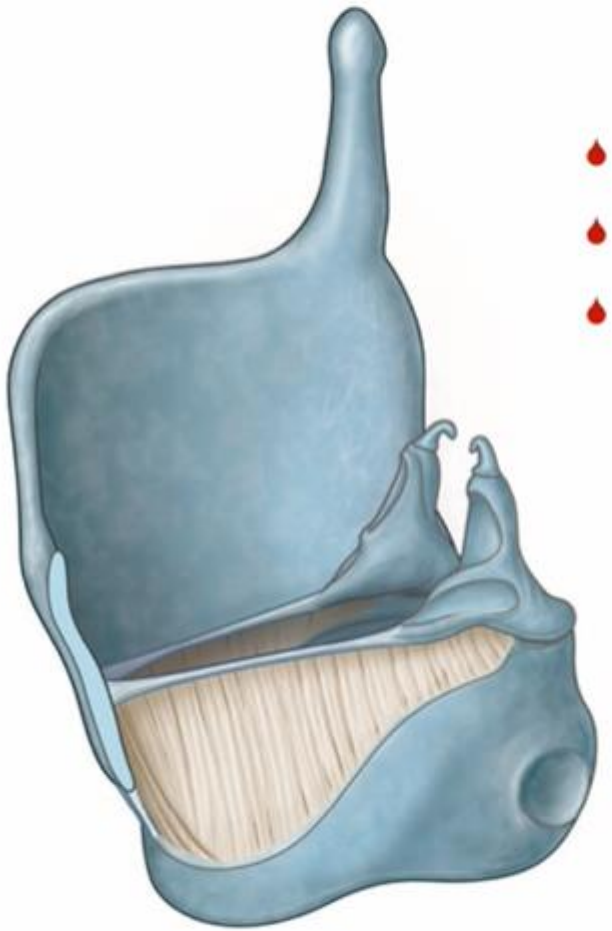




Cartilago corniculata et cuneiformis

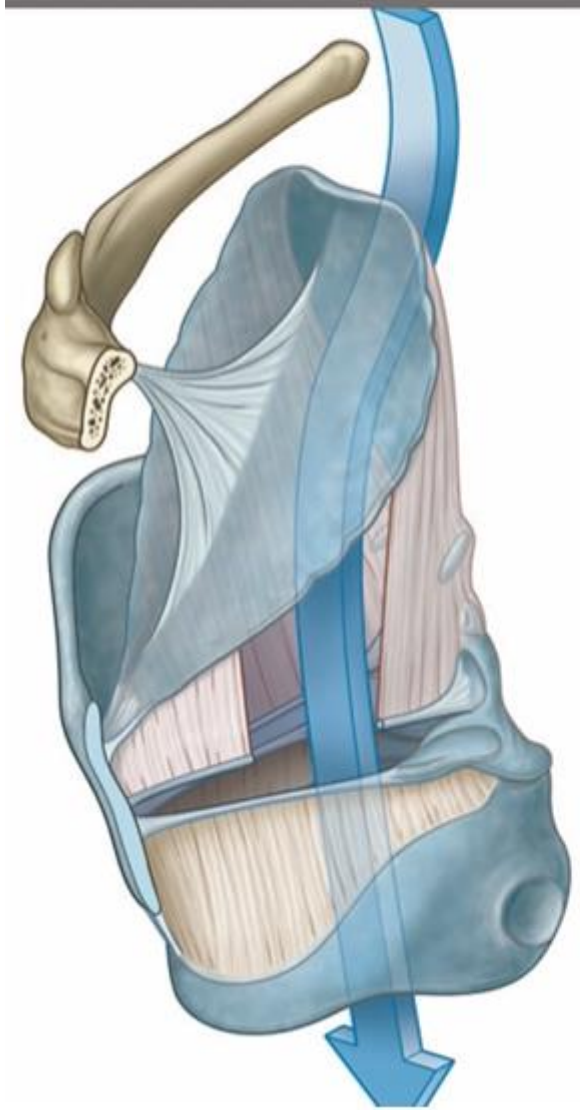


Conus elasticus

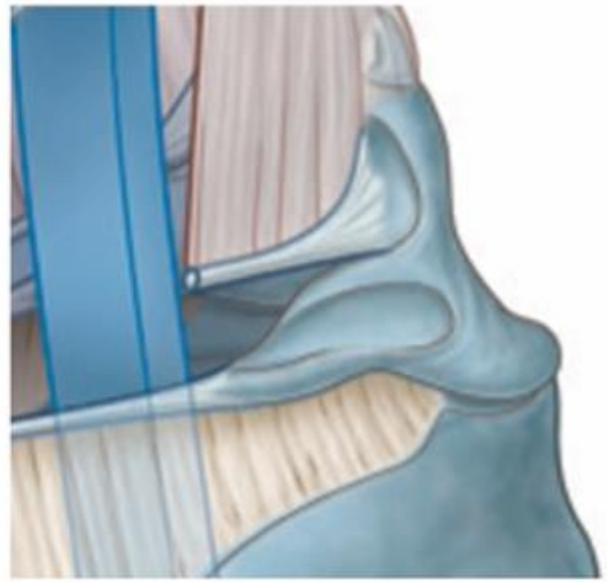


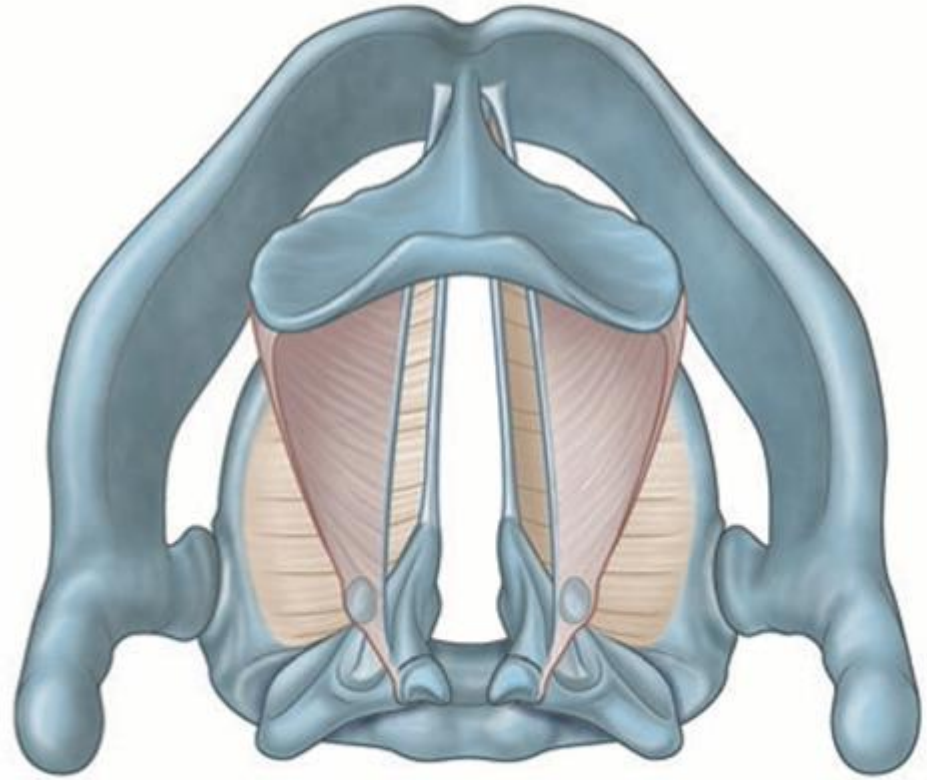
- **Conus elasticus – coniotomie**
- *Lig. cricothyroideum medianum*
- *Ligamentum vocale*

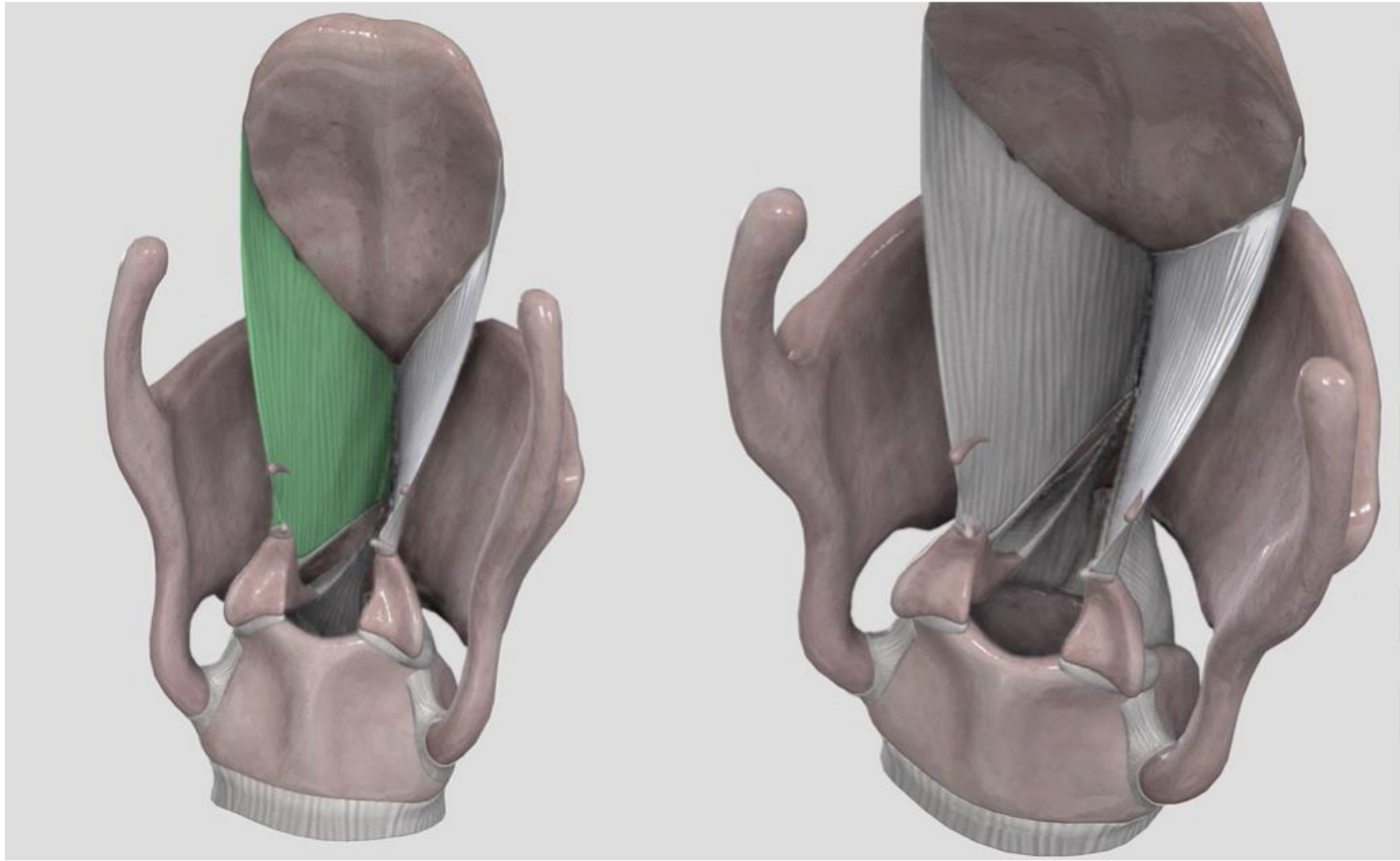
intrinsic ligamenta



- Ligamentum hyo-epiglotticum
- Lamina quandrangularis
- Ligamentum vestibulare
  - False lvocal ligament
- Ligamentum vocale
  - Vocal ligament

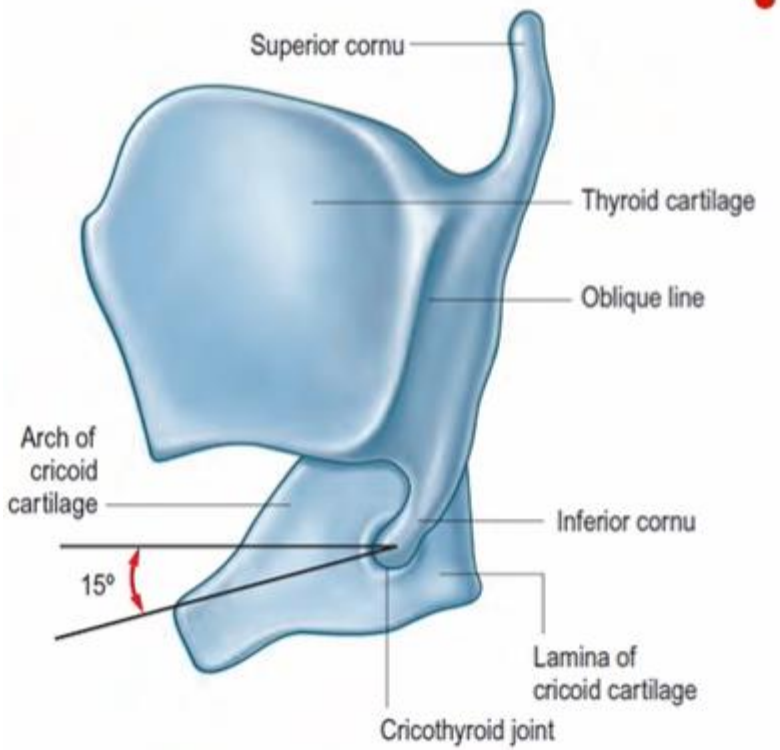


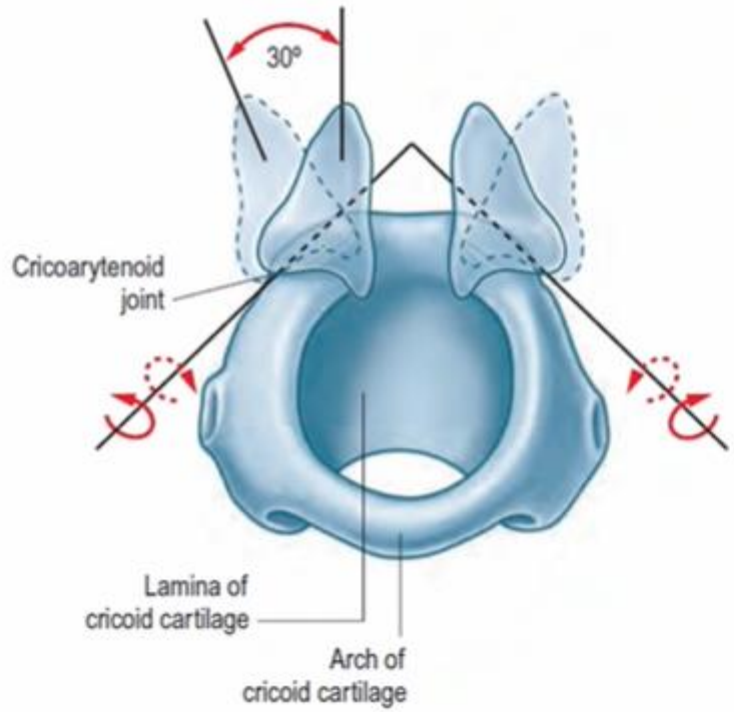


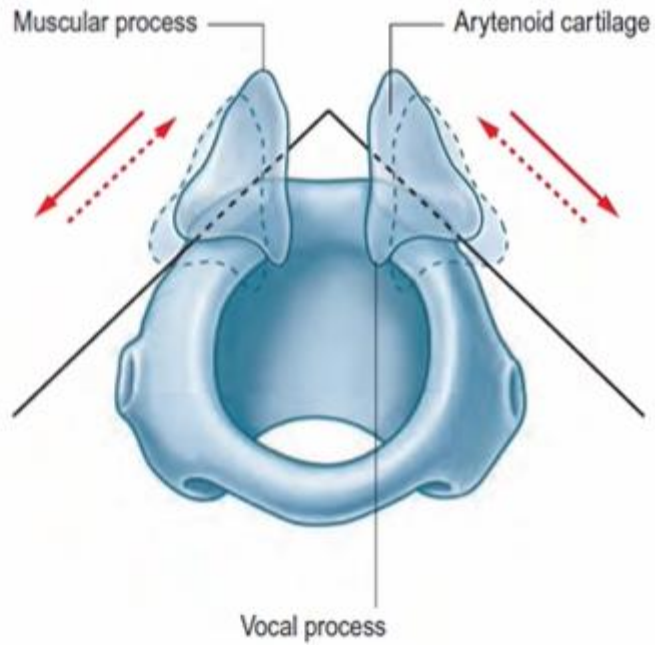


Articulationes laryngis

- **Articulatio cricotyhroidea**
- ***Articulatio cricoarytenoidea***

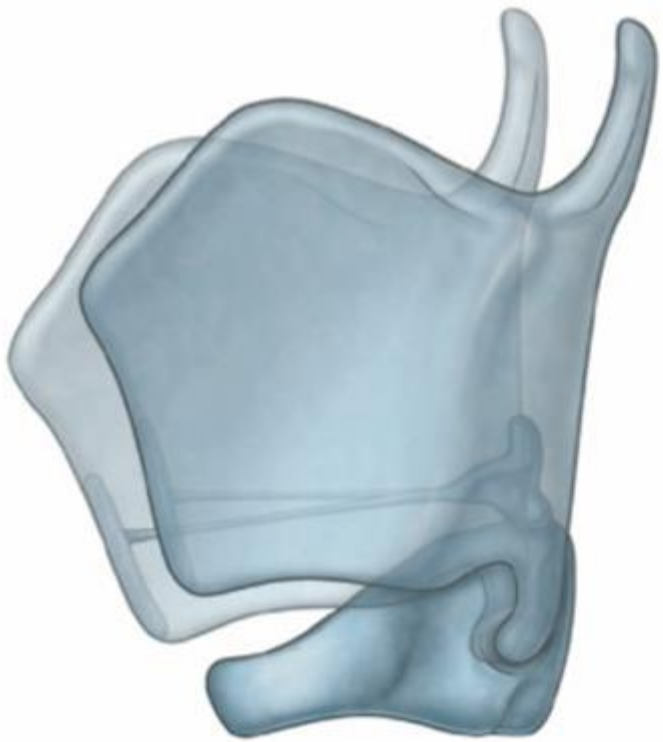


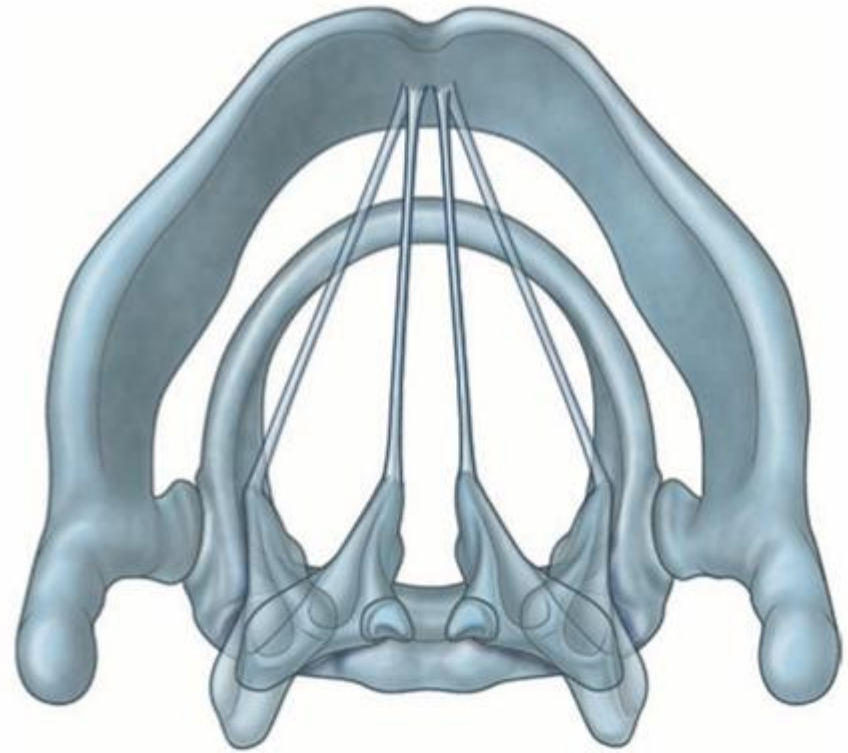




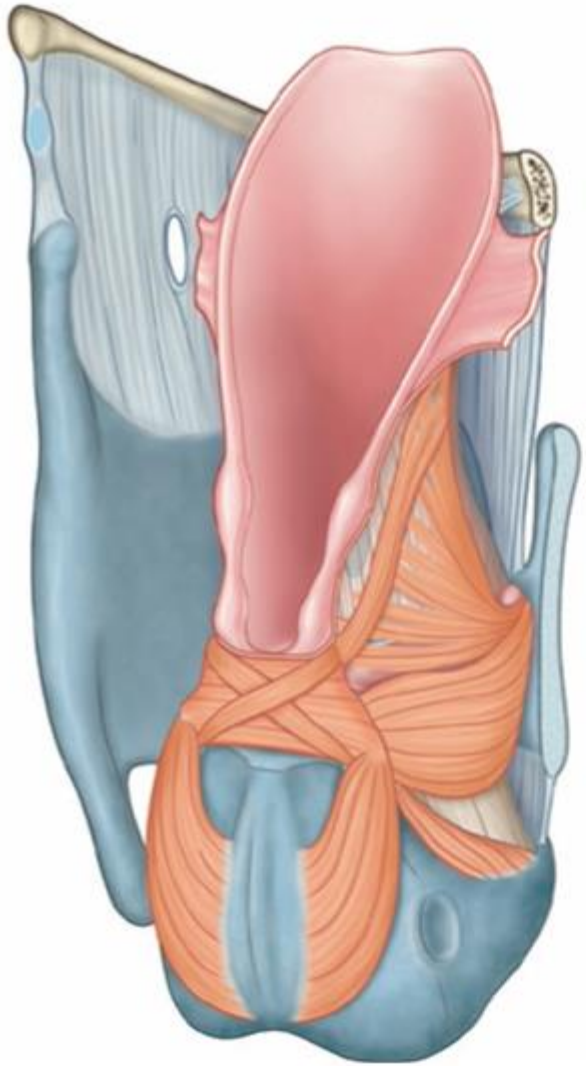
Articulationes laryngis

- Articulatio cricotyhroidea
- *Articulatio cricoarytenoidea*

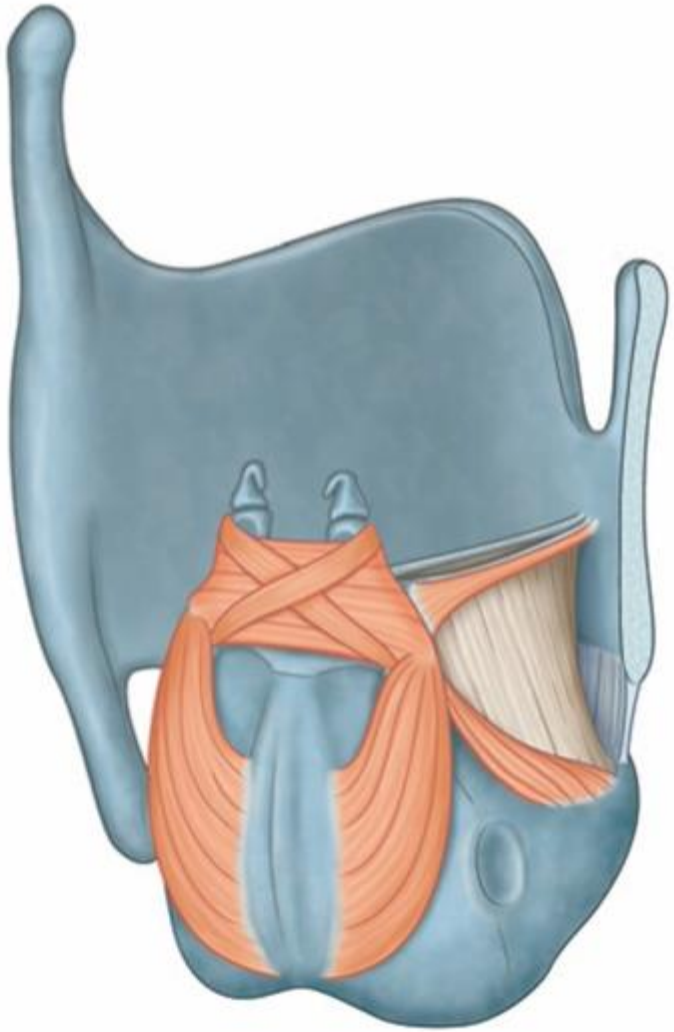




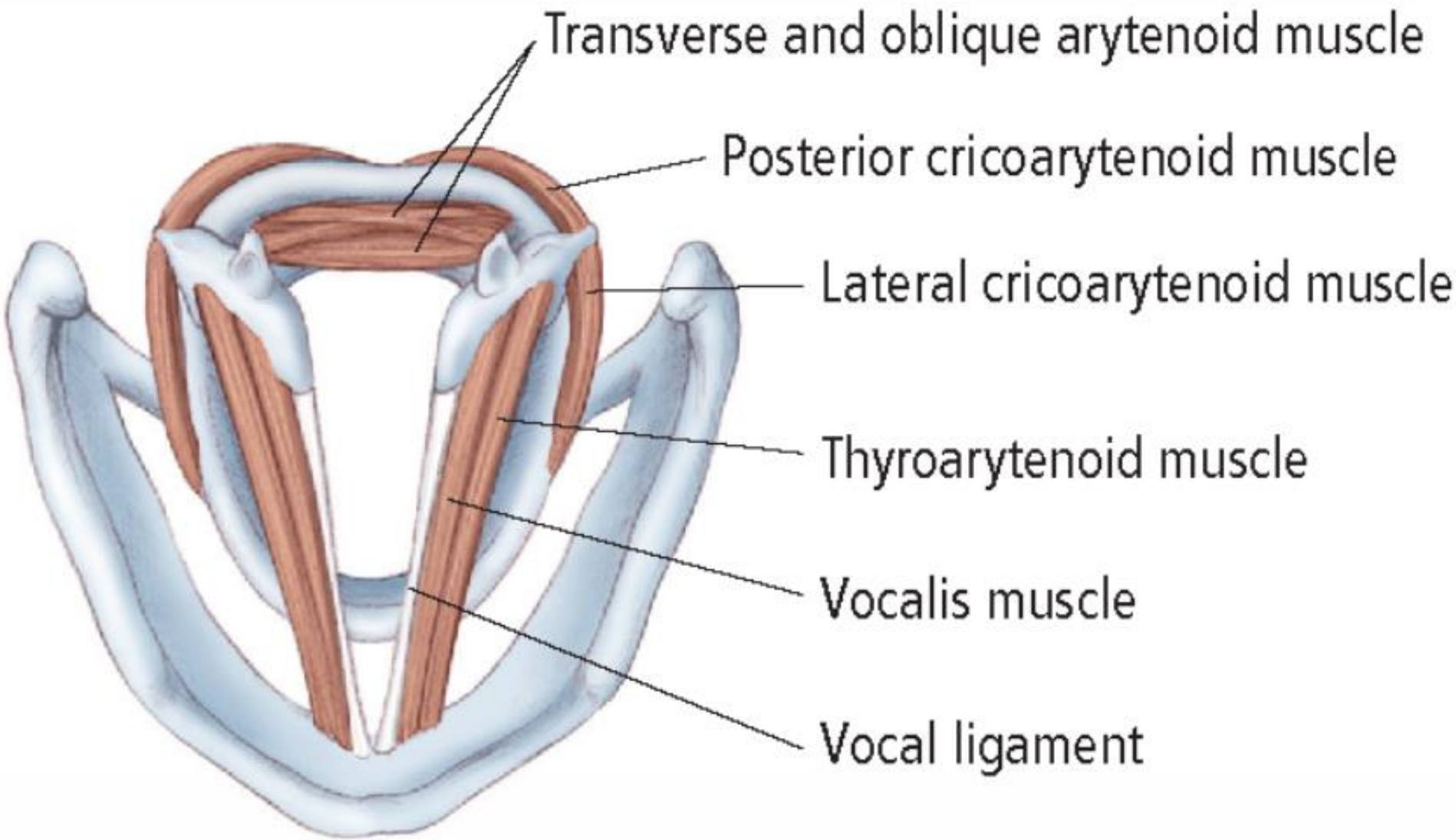
Musculi laryngis



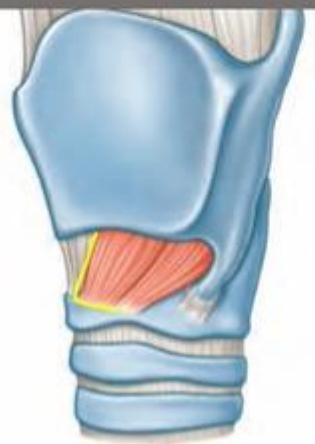
- M. cricothyroideus
  - Bars recta
  - Pars obliqua
  - ! N. laryngeus superior (N. X)
- M. arytenoideus transversus
- M. arytenoideus obliquus
  - Pars ary-epiglottica
- M. vocalis
- M. cricoarytenoideus posterior
- M. cricoarytenoideus lateralis
- M. thyroarytenoideus
  - Pars thyroepiglottica
- *!! N. laryngeus recurrens (N. X)*



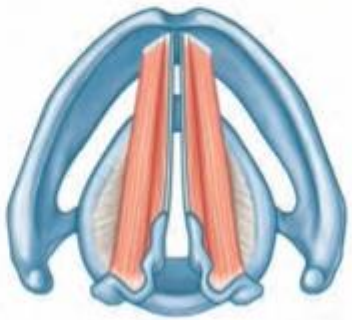
Muscles of the Larynx

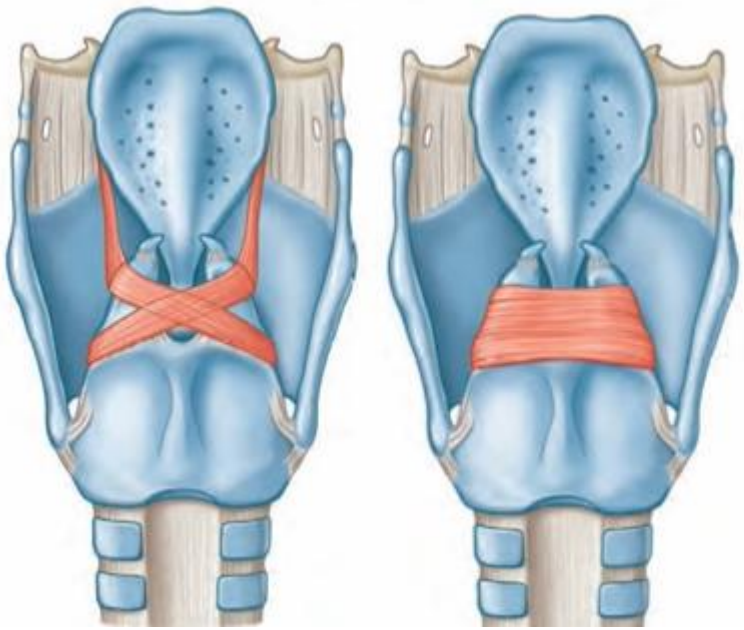


Musculi laryngis

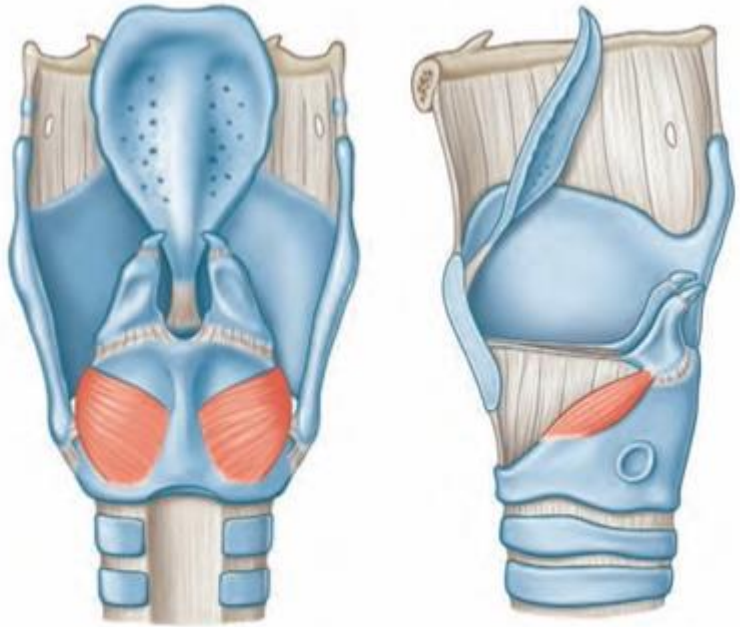


- M. cricothyroideus
  - Bars recta
  - Pars obliqua
  - ! N. laryngeus superior (N. X)

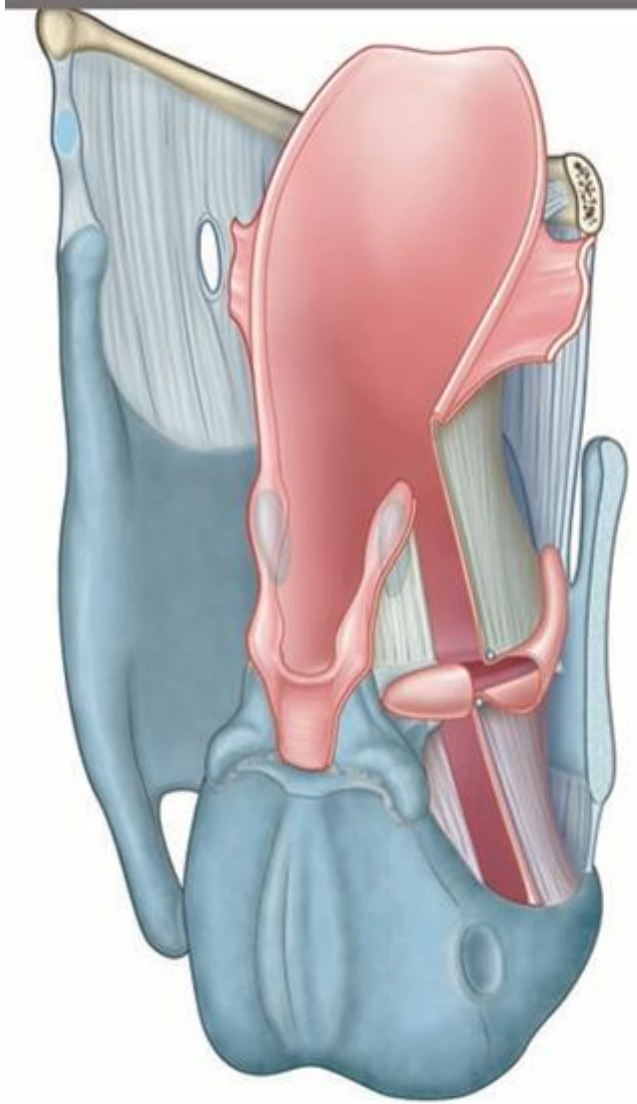




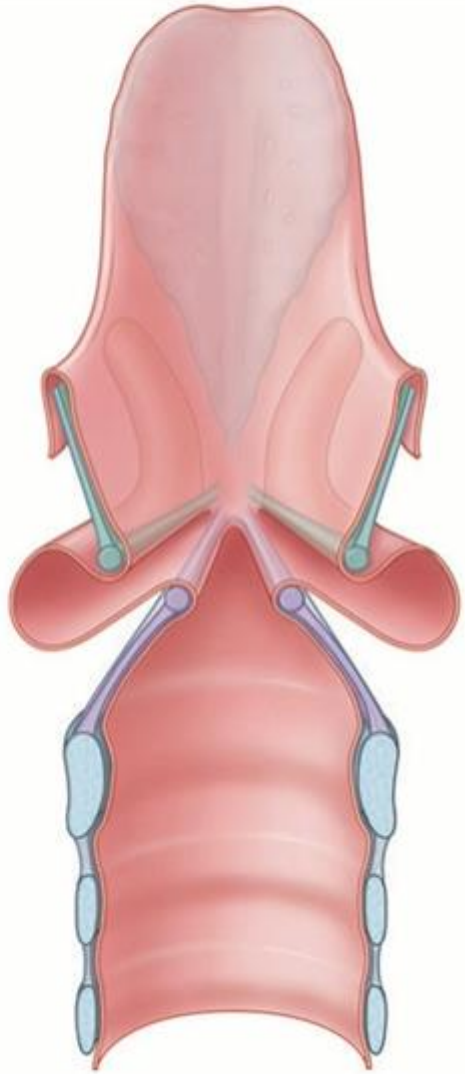
- M. arytenoideus transversus
- M. arytenoideus obliquus
  - Pars ary-epiglottica
- M. vocalis
- M. cricoarytenoideus posterior
- M. cricoarytenoideus lateralis
- M. thyroarytenoideus
  - Pars thyroepiglottica
- *!! N. laryngeus recurrens (N. X)*



Cavitas laryngis



- Plica aryepiglottica
- Vestibulum
- Rima vestibuli
- Ventriculus
  - *Saculus*
- Supraglotic space
- Rima glottidis
  - *Incissura interarytenoidea*
  - *Plica interarytenoidea*
- Infraglotic space



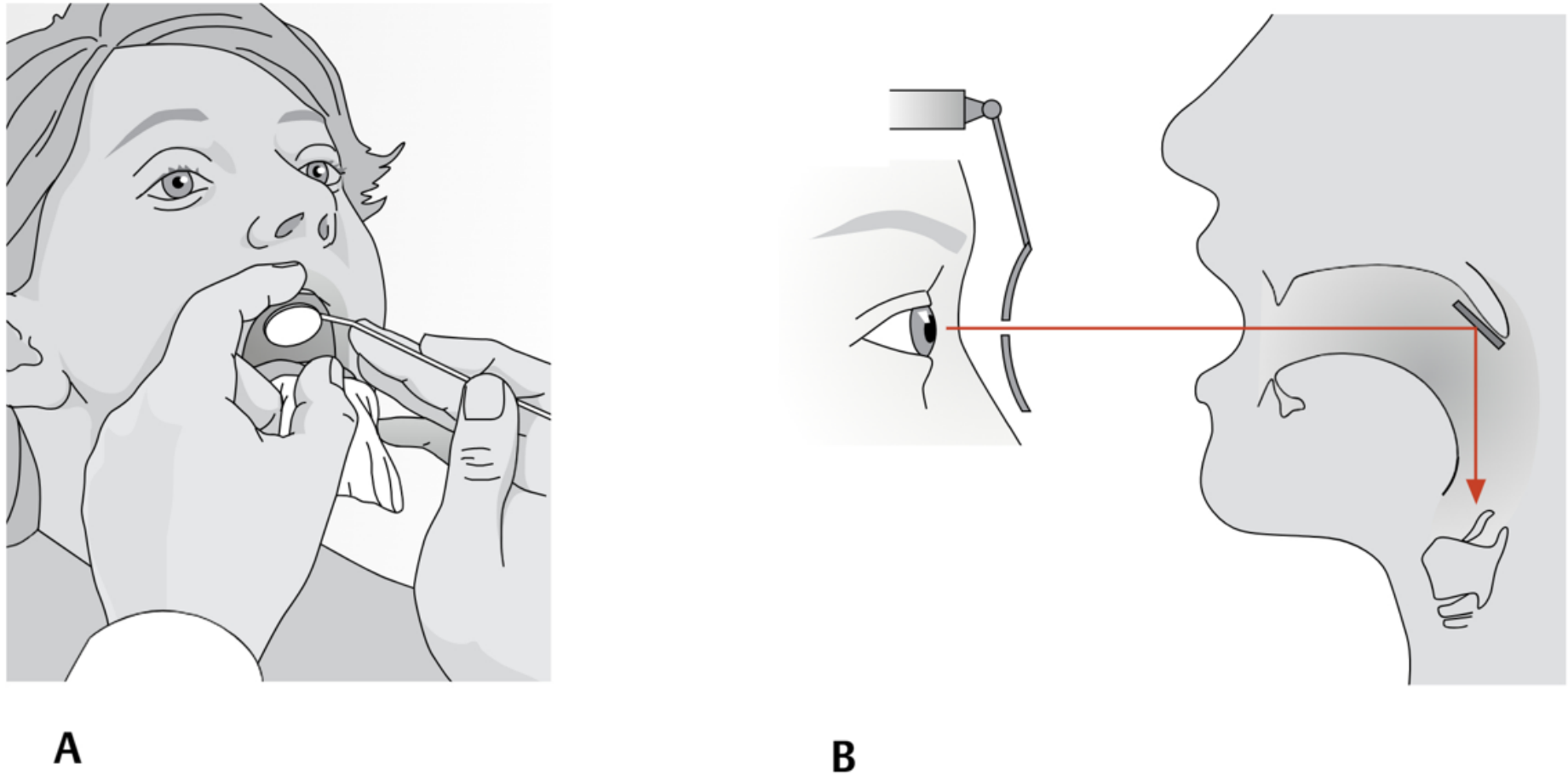


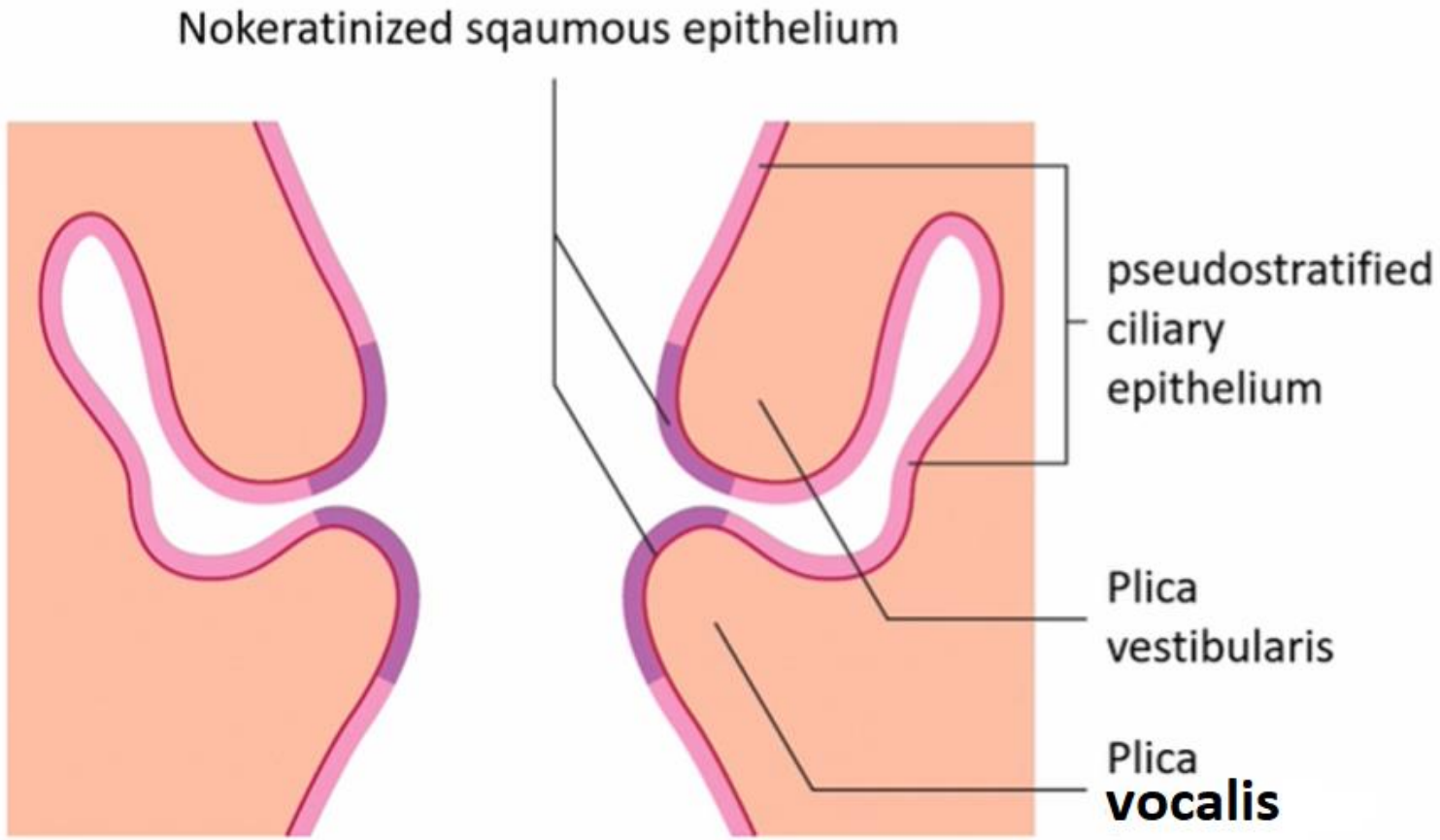
Fig. 13.9 **Indirect laryngoscopy technique**

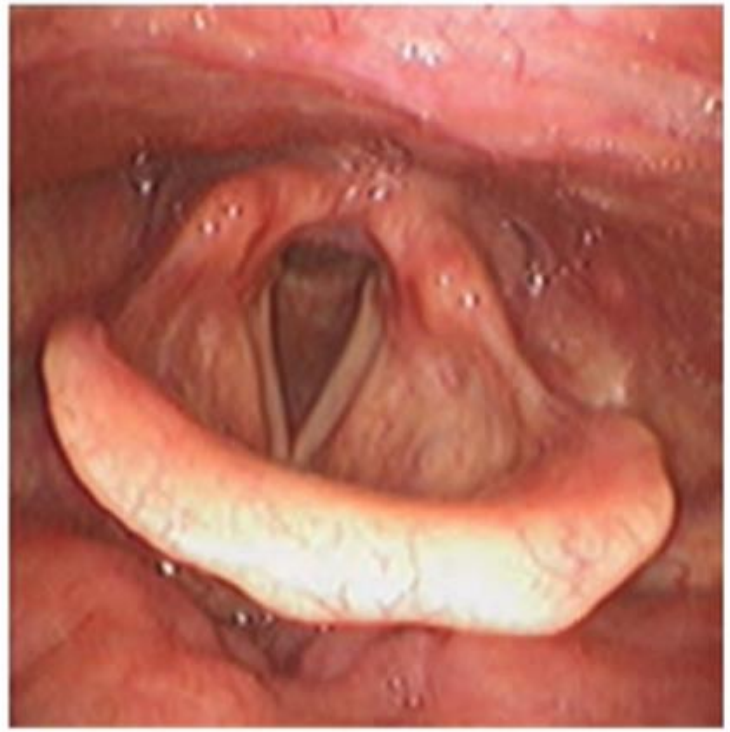
A Mirror examination of the larynx from the perspective of the examiner. The larynx is not accessible to direct inspection but can be viewed with the aid of a small mirror. The examiner depresses the tongue with one hand while introducing the laryngeal mirror (or endoscope) with the other hand.

A Optical path: The laryngeal mirror is held in front of the uvula, directing light from the examiner's head mirror down toward the larynx. The image seen by the examiner is shown in **Fig. 13.10**.

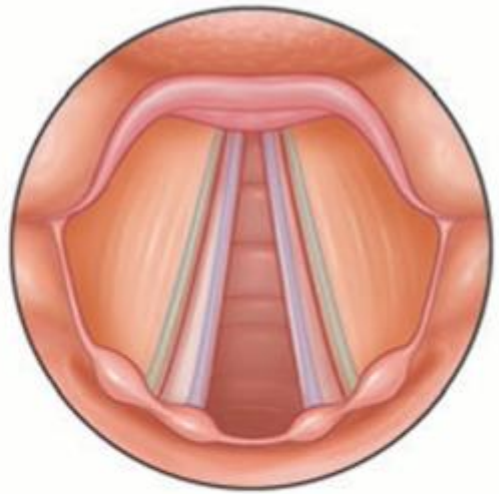
Source: 13. Larynx & Thyroid Gland. In: Baker E, Lopez E, Schünke M, Schulte E, Schumacher U, Voll M, Wesker K, ed. Anatomy for Dental Medicine. 3rd Edition. New York: Thieme; 2020. doi:10.1055/b000000284

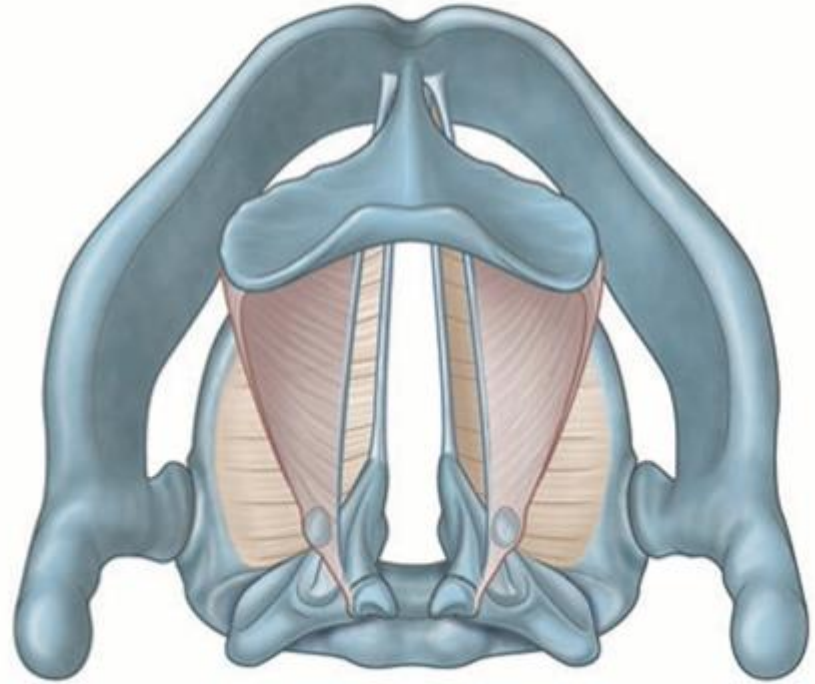
Rima glottidis



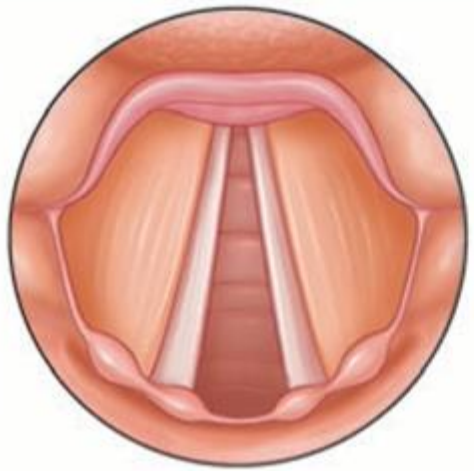
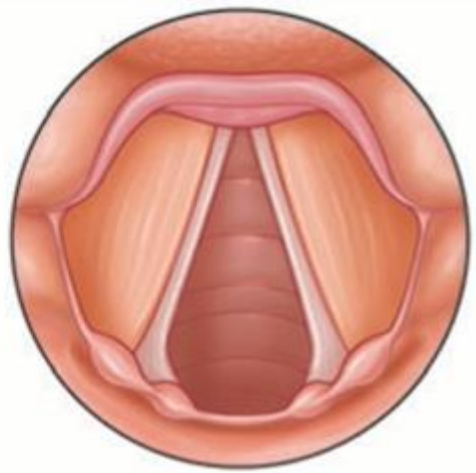
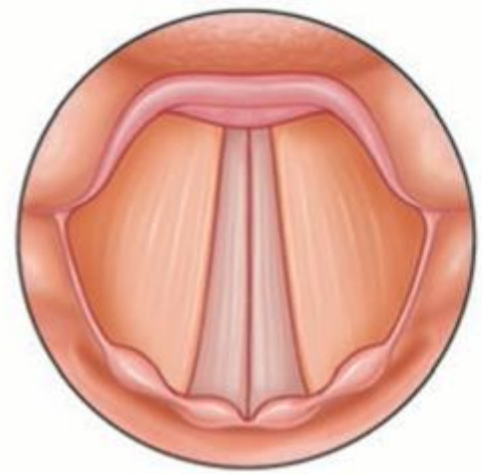
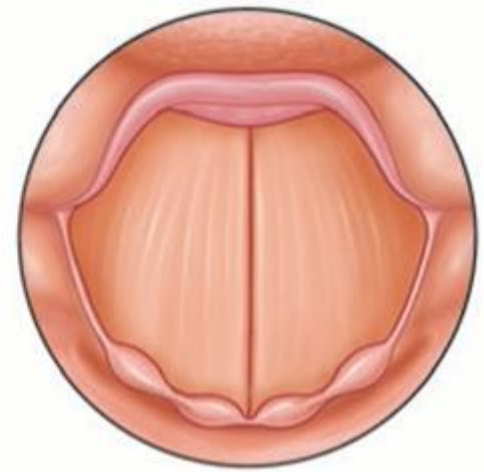


laryngoscopy



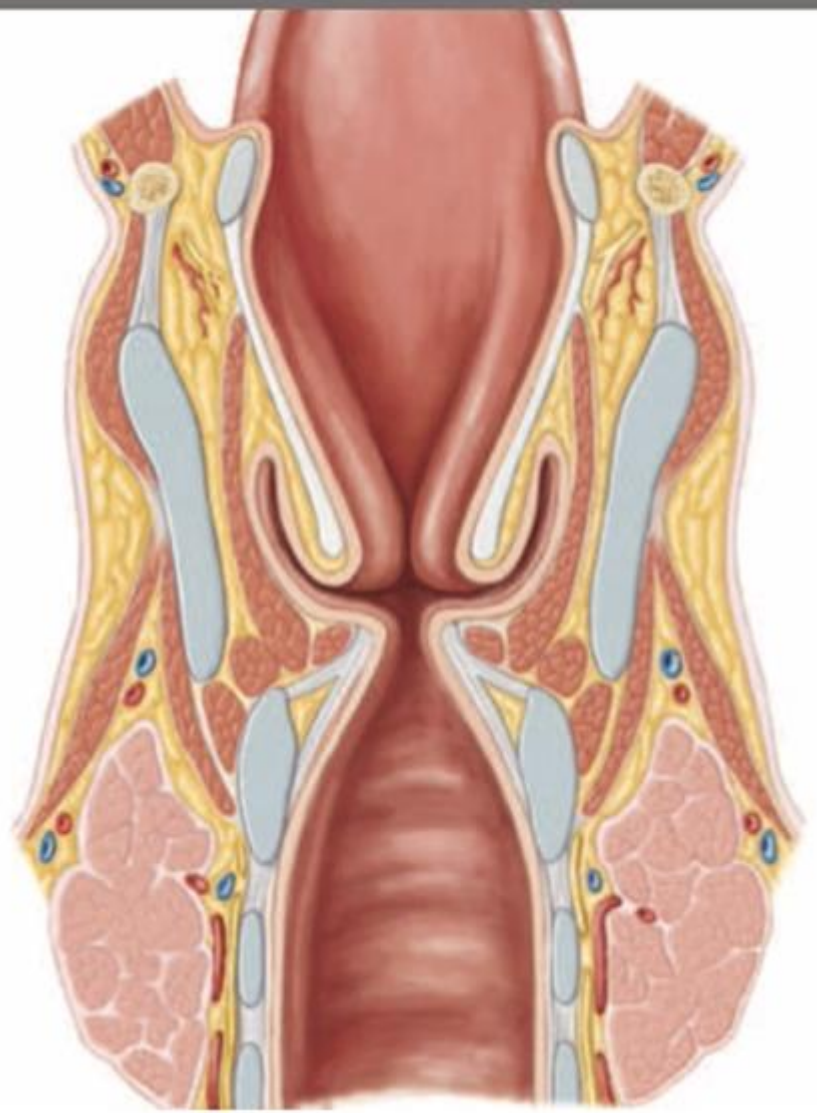


laryngoscopy

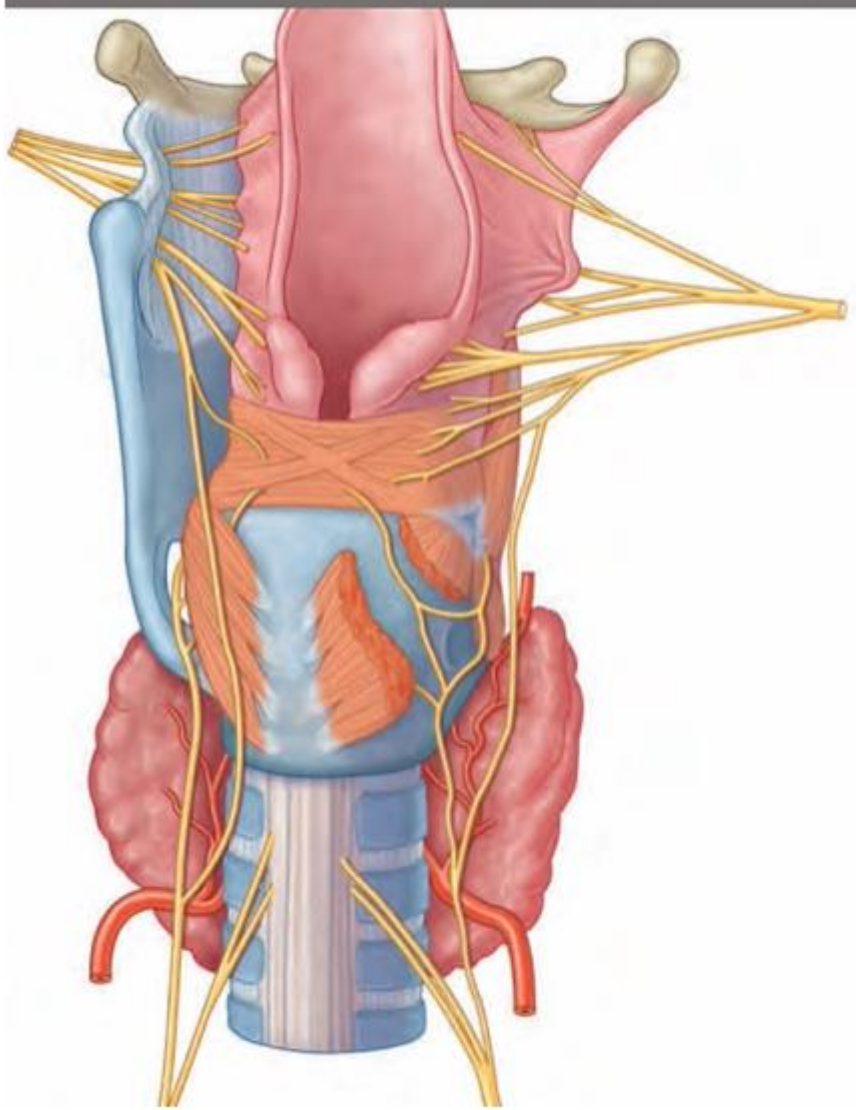
- Normal breathing
- Forced inspiration
- phonation
- Forced occlusion – Valsalva maneuvre
- swallowing

Larynx

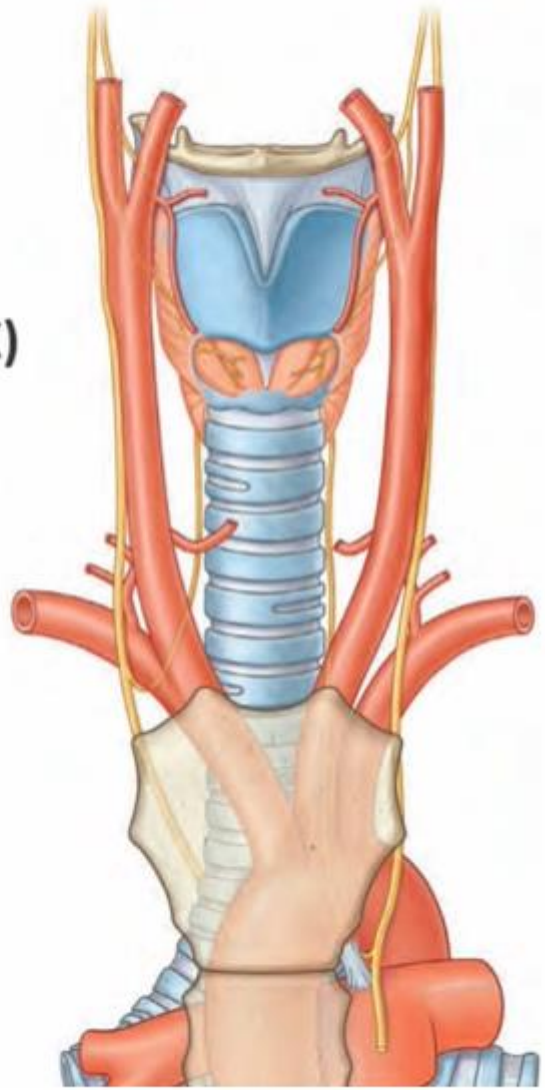


- M. thyrohyoideus
- *M. sterno*thyroideus
- *M. constrictor pharyngis inferior*
- *M. cricothyroideus*
- *M. cricoarytenoideus laterlais*
- *M. arytenoideus obliquus (pars aryepiglottica)*
- *M. vocalis*
- *Plica vocalis*
- *Plica vestibularis*
- *Conus elasticus*
- *Cartilago cricoidea*
- *Cartilago thyroidea*
- *Os hy*oi*deum*

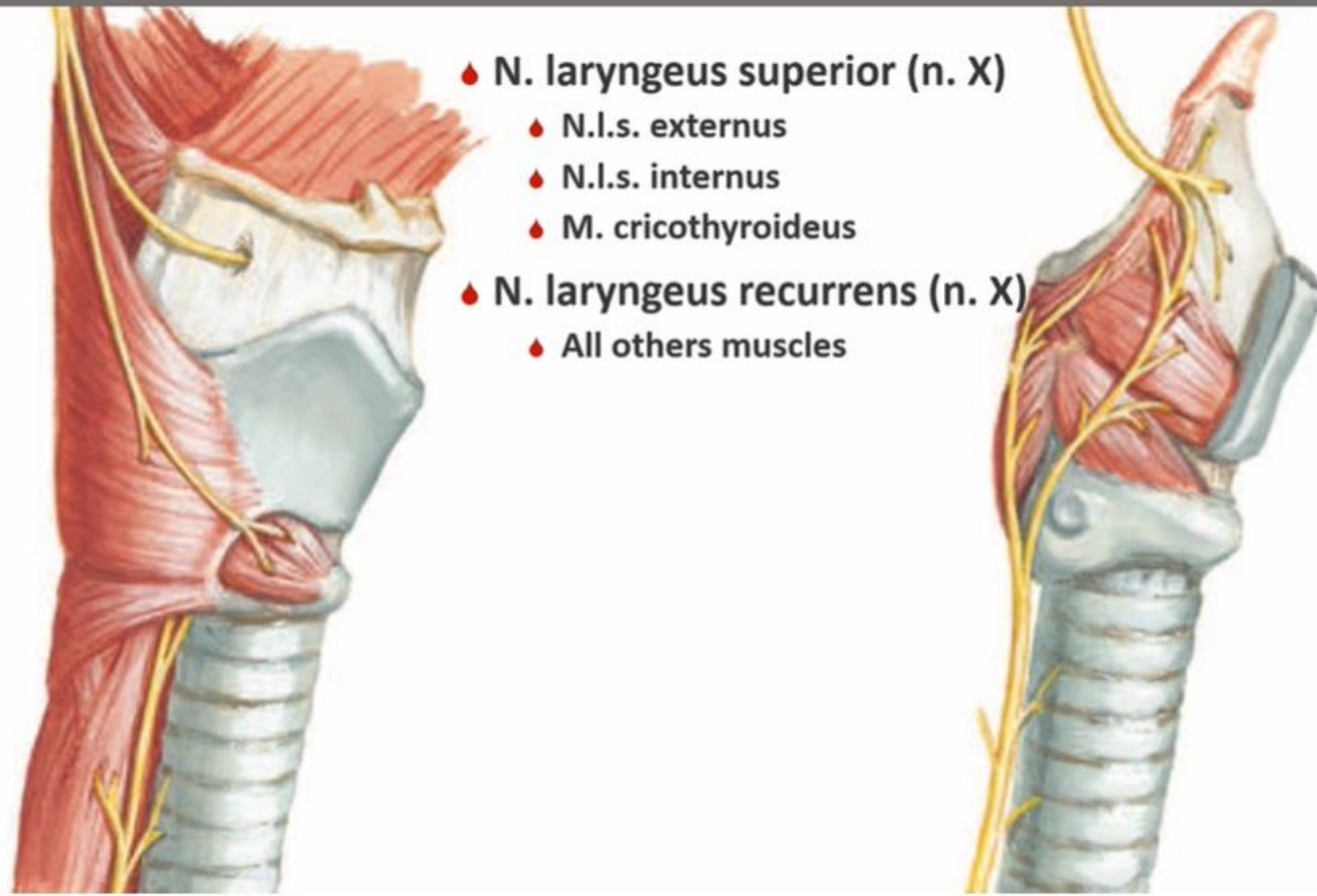
Inervace laryngu



- N. laryngeus superior (n. X)
  - N.l.s. externus
  - N.l.s. internus
  - M. cricothyroideus
- N. laryngeus recurrens (n. X)
  - All others muscles

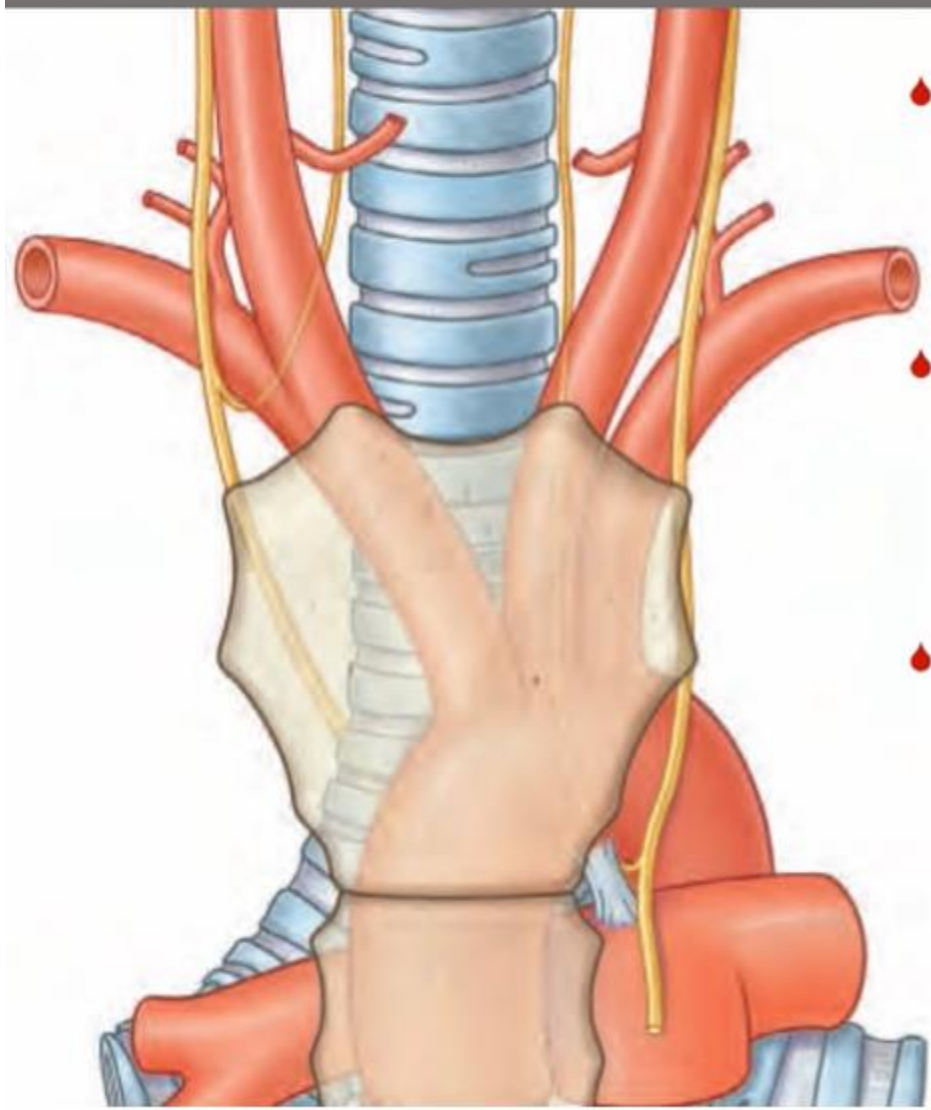


Inervace laryngu

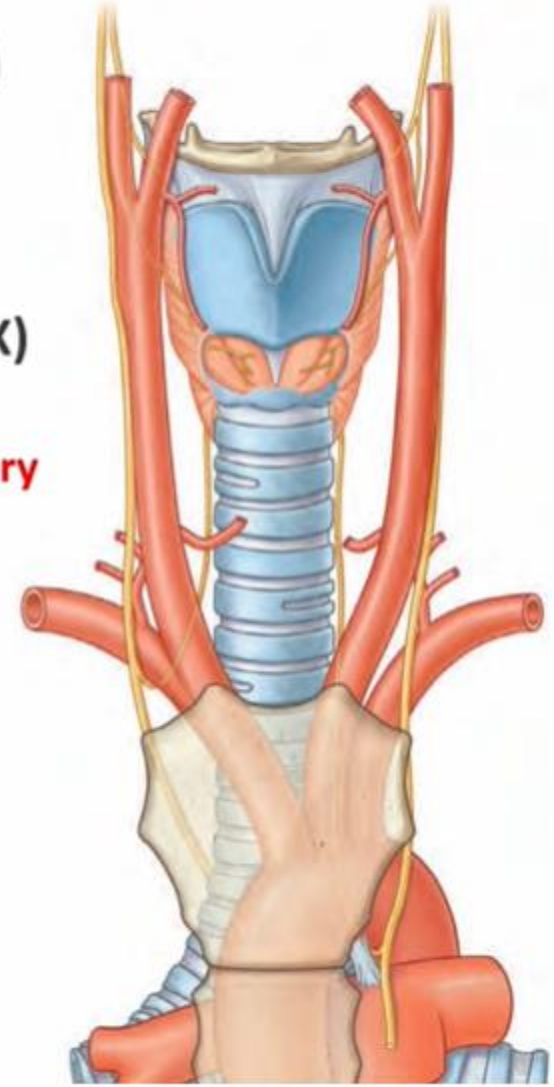


- N. laryngeus superior (n. X)
  - N.l.s. externus
  - N.l.s. internus
  - M. cricothyroideus
- N. laryngeus recurrens (n. X)
  - All others muscles

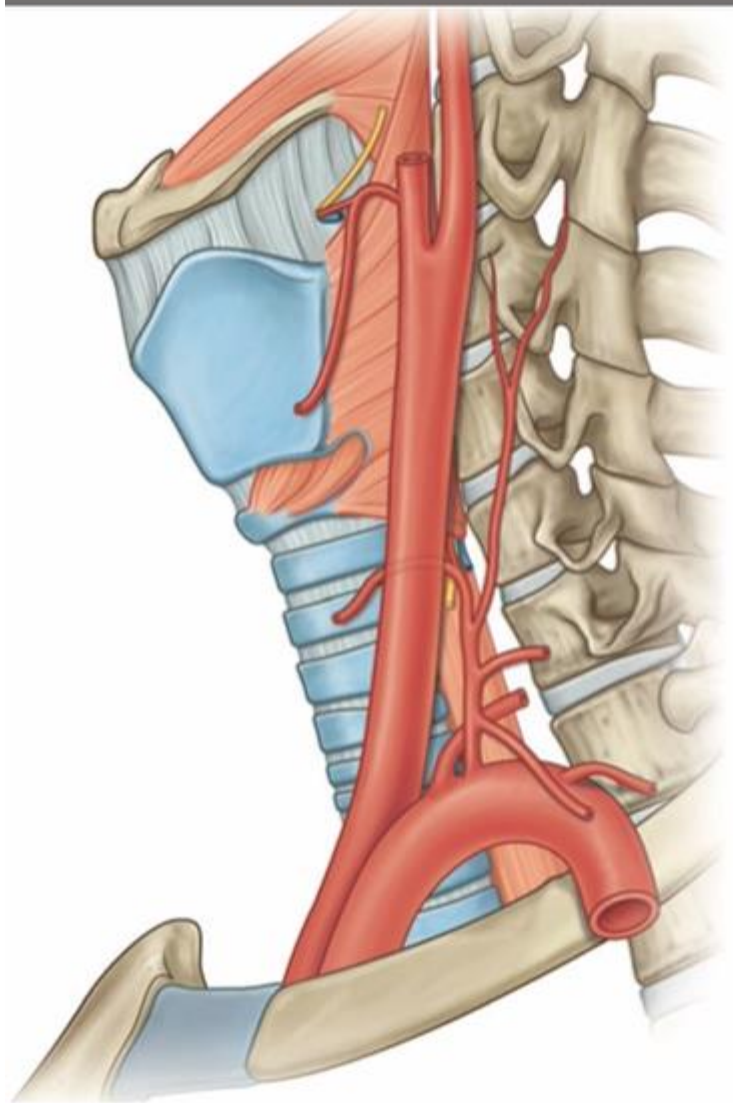
Nervus laryngeus recurrens



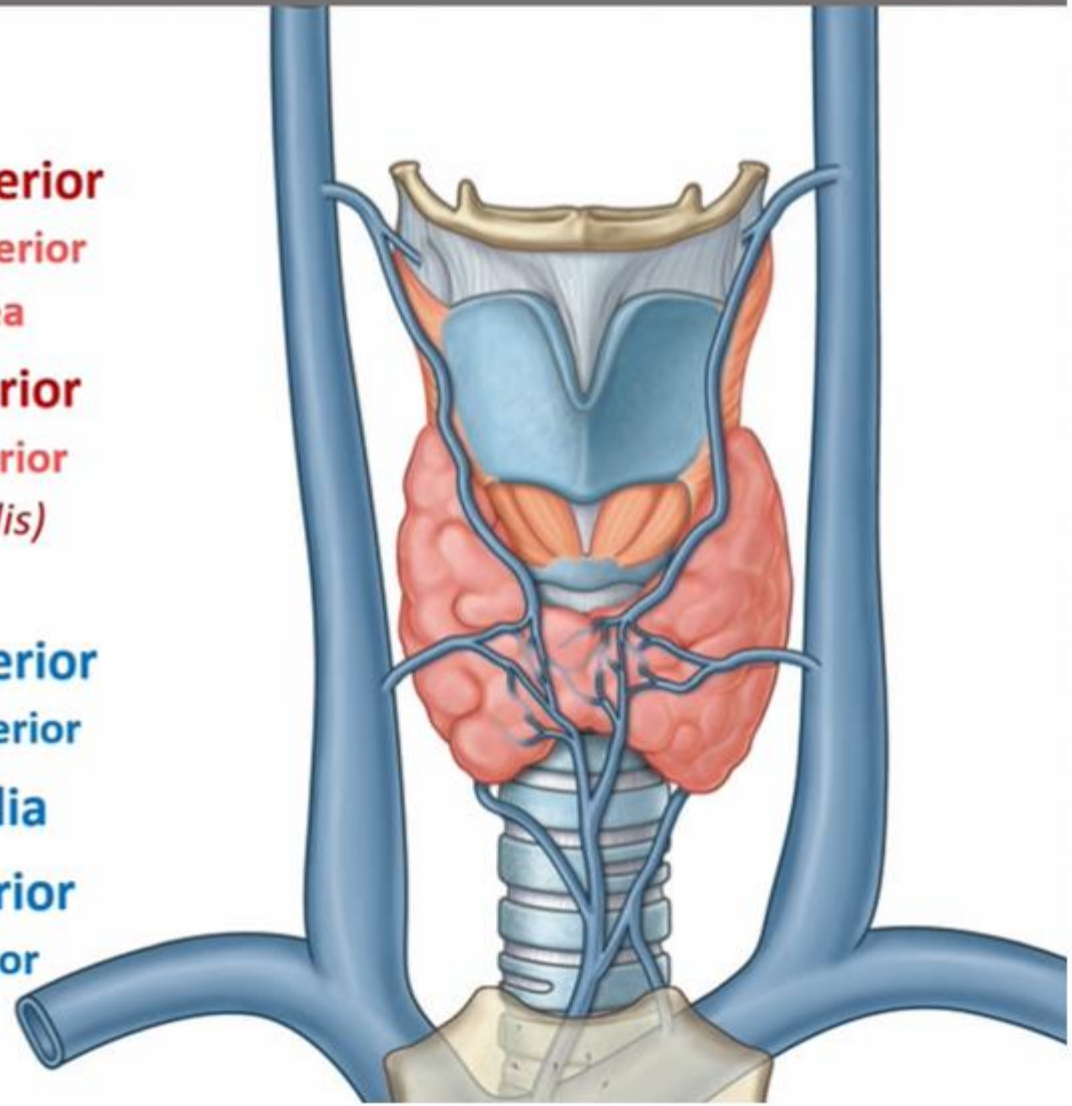
- N. laryngeus superior (n. X)
  - N.l.s. externus
  - N.l.s. internus
  - M. cricothyroideus
- N. laryngeus recurrens (n. X)
  - Left – below aortic arch
  - Right below right sublc. artery
- Motor fibers
  - N. XI PARS CRANIALIS
  - Accompanyied to N. VAGUS
  - VI. branchial arch



Laryngeal vessels



- A. thyroidea superior
  - A. laryngea superior
  - A. cricothyroidea
- A. thyroidea inferior
  - A. laryngea inferior
  - *(tr. thyrocervicalis)*
  - *(A. subclavia)*
- V. thyroidea superior
  - V. laryngea superior
- V. thyroidea media
- V. thyroidea inferior
  - V. lryngea inferior



Laryngeal blood vessels and nerves

- **Arteries:** The larynx derives its blood supply primarily from the superior and inferior laryngeal arteries. The superior laryngeal artery arises from the superior thyroid artery (a branch of the external carotid artery). The inferior laryngeal artery arises from the inferior thyroid artery (a branch of the thyrocervical trunk).
- **Nerves:** The larynx is innervated by the superior laryngeal nerve and the recurrent laryngeal nerve (of the vagus nerve). The superior laryngeal nerve splits into an internal (sensory) and an external (motor) laryngeal nerve. The external laryngeal nerve innervates the cricothyroid. The remaining intrinsic laryngeal muscles receive motor innervation from the recurrent laryngeal nerve, which branches from the vagus nerve below the larynx and ascends. *Note:* The left recurrent laryngeal nerve wraps around the aortic arch, and the right recurrent laryngeal nerve wraps around the subclavian artery. A left-sided aortic aneurysm may cause left recurrent laryngeal nerve palsy, resulting in hoarseness.
- **Veins:** The larynx is drained by a superior and an inferior laryngeal vein. The superior laryngeal vein drains to the internal jugular vein (via the superior thyroid vein); the inferior laryngeal vein drains to the left brachiocephalic vein (via the thyroid venous plexus to the inferior thyroid vein).

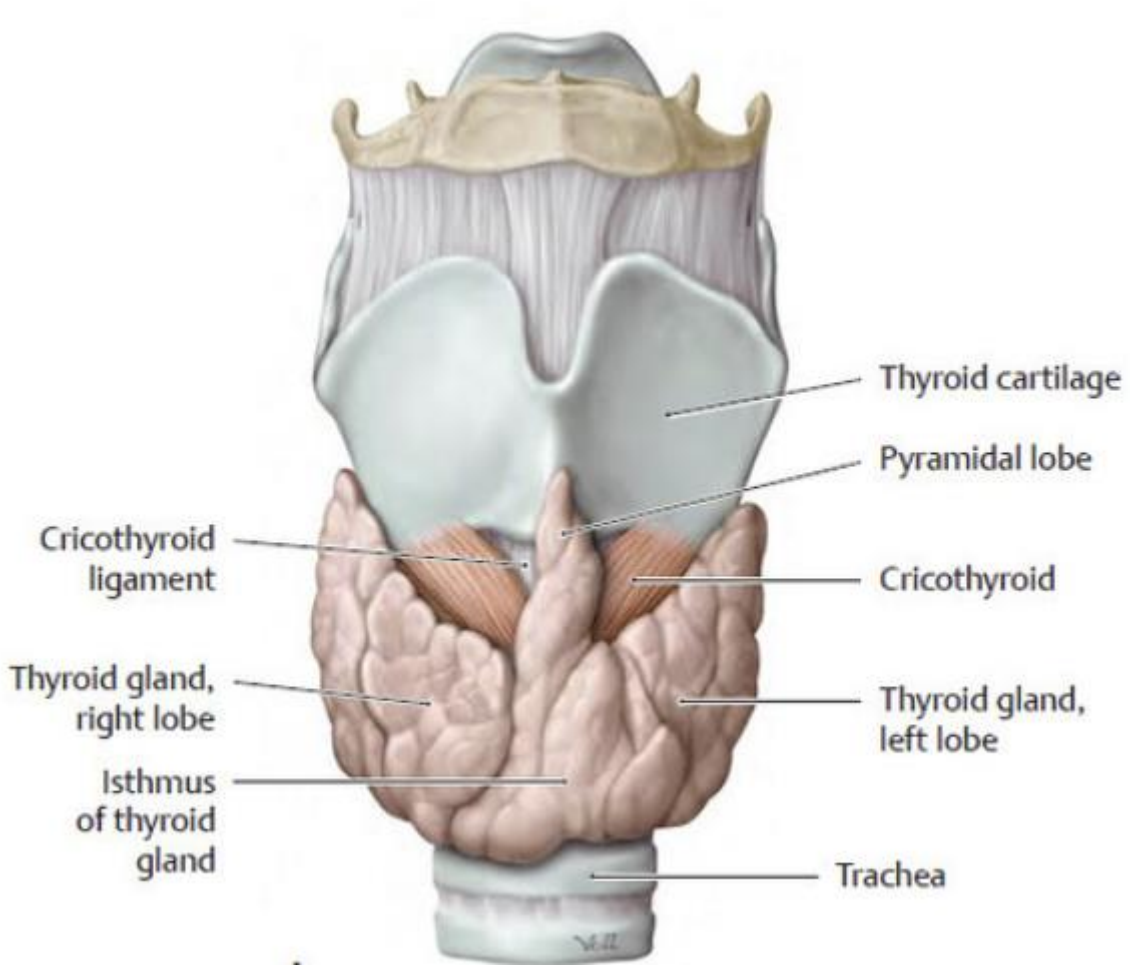
Thyroid gland

It is a ductless endocrine gland present in the anterior median region of the neck .

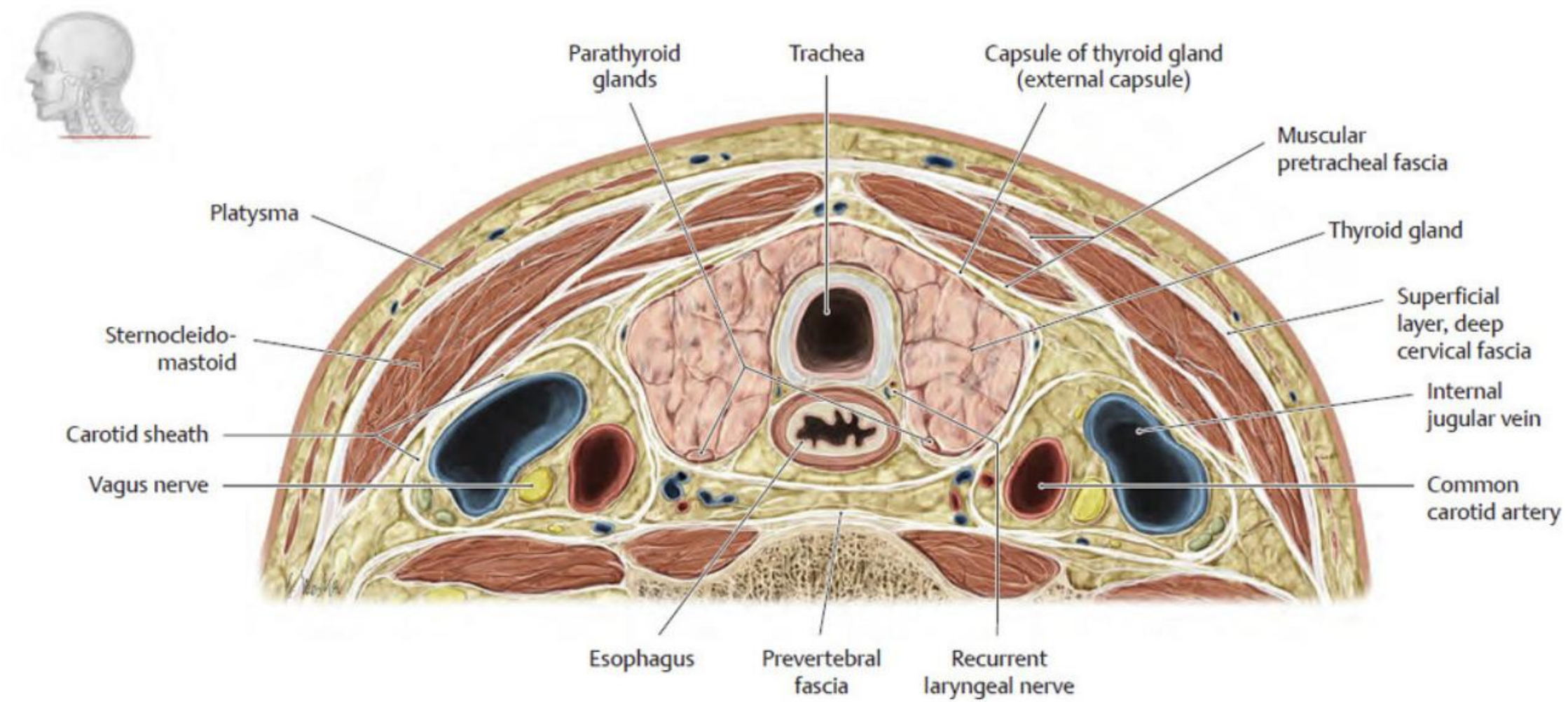
The thyroid gland consists of two laterally situated lobes and a central narrowing (isthmus).

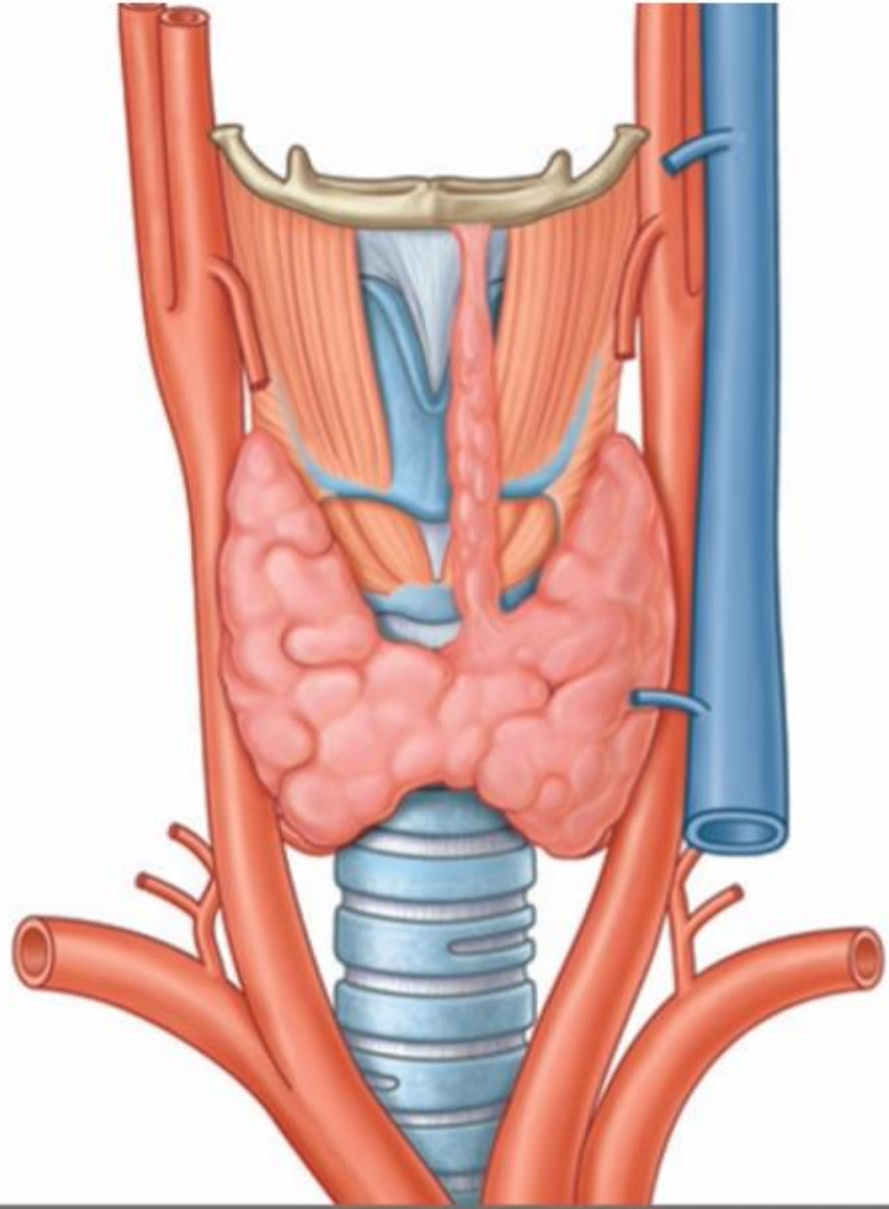
Isthmus lies in front of the 2nd, 3rd & 4th tracheal rings

A pyramidal lobe may be found in place of the isthmus; the apex points to the embryonic origin of the thyroid at the base of the tongue.

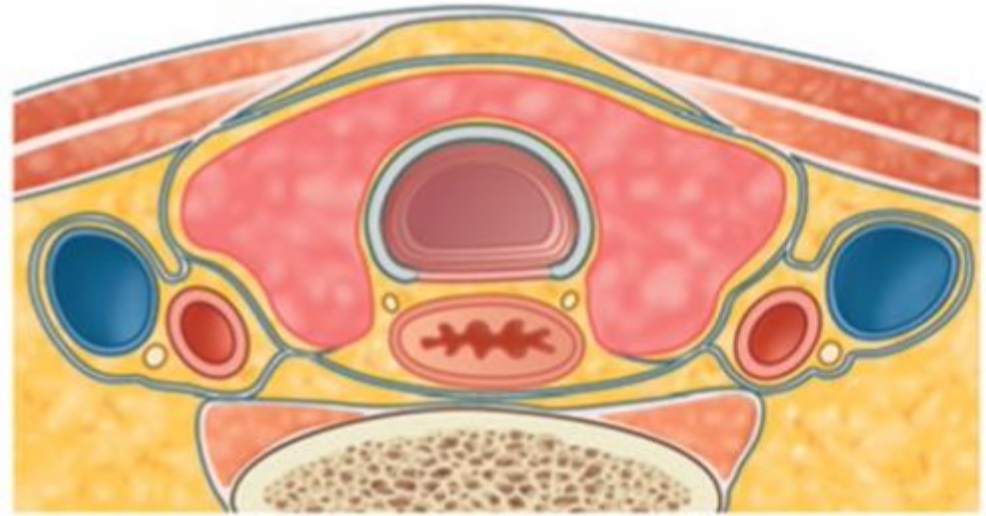


The thyroid gland partially surrounds the trachea and is bordered posterolaterally by the carotid sheath. When the thyroid gland is pathologically enlarged (e. g., due to iodine-deficiency goiter), it may gradually compress and narrow the tracheal lumen, causing respiratory distress. The thyroid gland is surrounded by a fibrous capsule composed of an internal and external layer. The delicate internal layer (*internal capsule*, not shown here) directly invests the thyroid gland and is fused with its glandular parenchyma. Vascularized fibrous slips extend from the internal capsule into the substance of the gland, subdividing it into lobules. The internal capsule is covered by the tough *external capsule*, which is part of the pretracheal layer of the deep cervical fascia. This capsule invests the thyroid gland and parathyroid glands and is also called the "surgical capsule" because it must be opened to gain surgical access to the thyroid gland. Between the external and internal capsules is a potential space that is traversed by vascular branches and is occupied by the parathyroid glands.

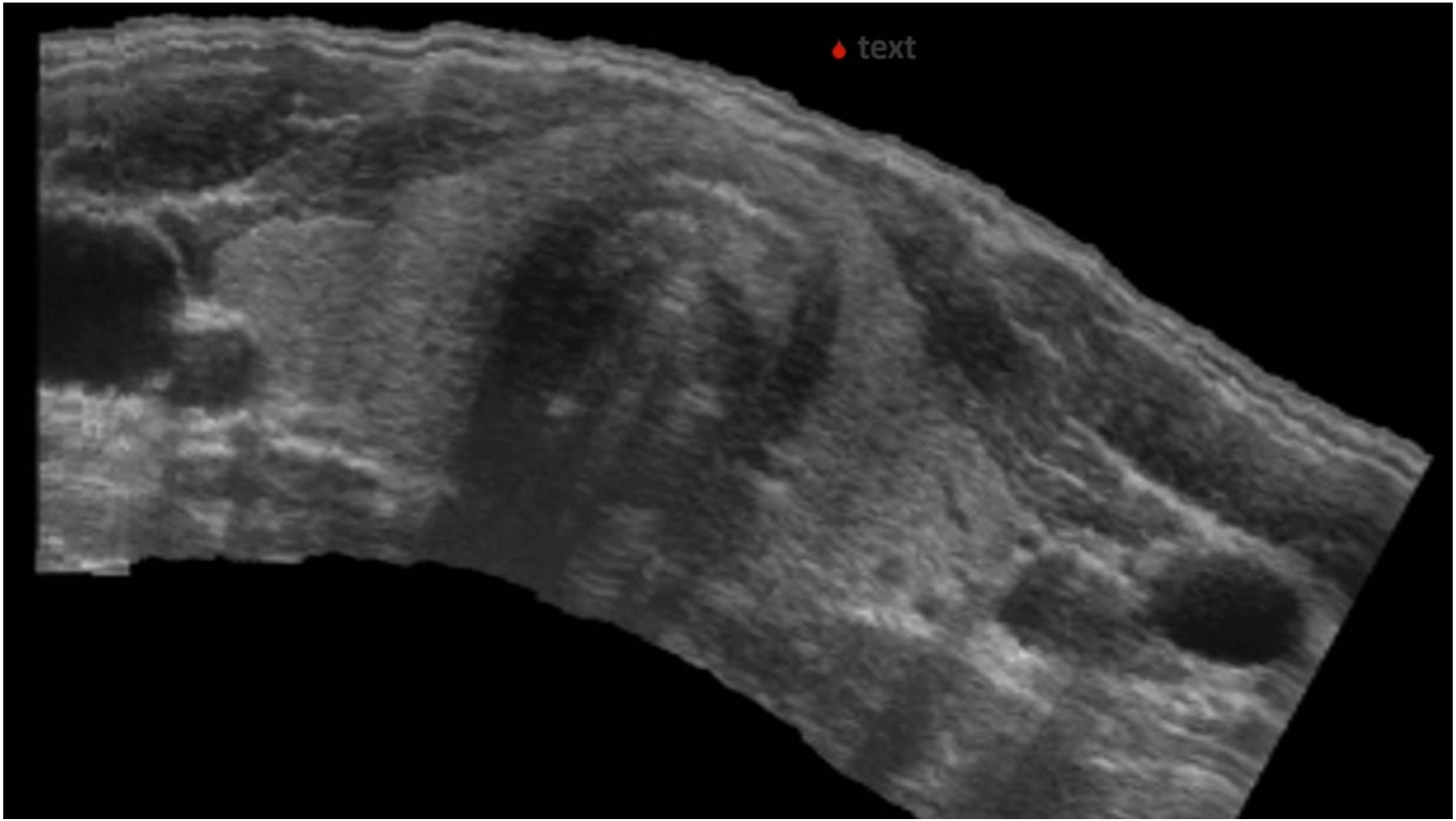




- Lobus dexter
- Lobus sinister
- Isthmus
- Lobus pyramidalis
- T3, T_4, calcitonin - parafolicullar cells

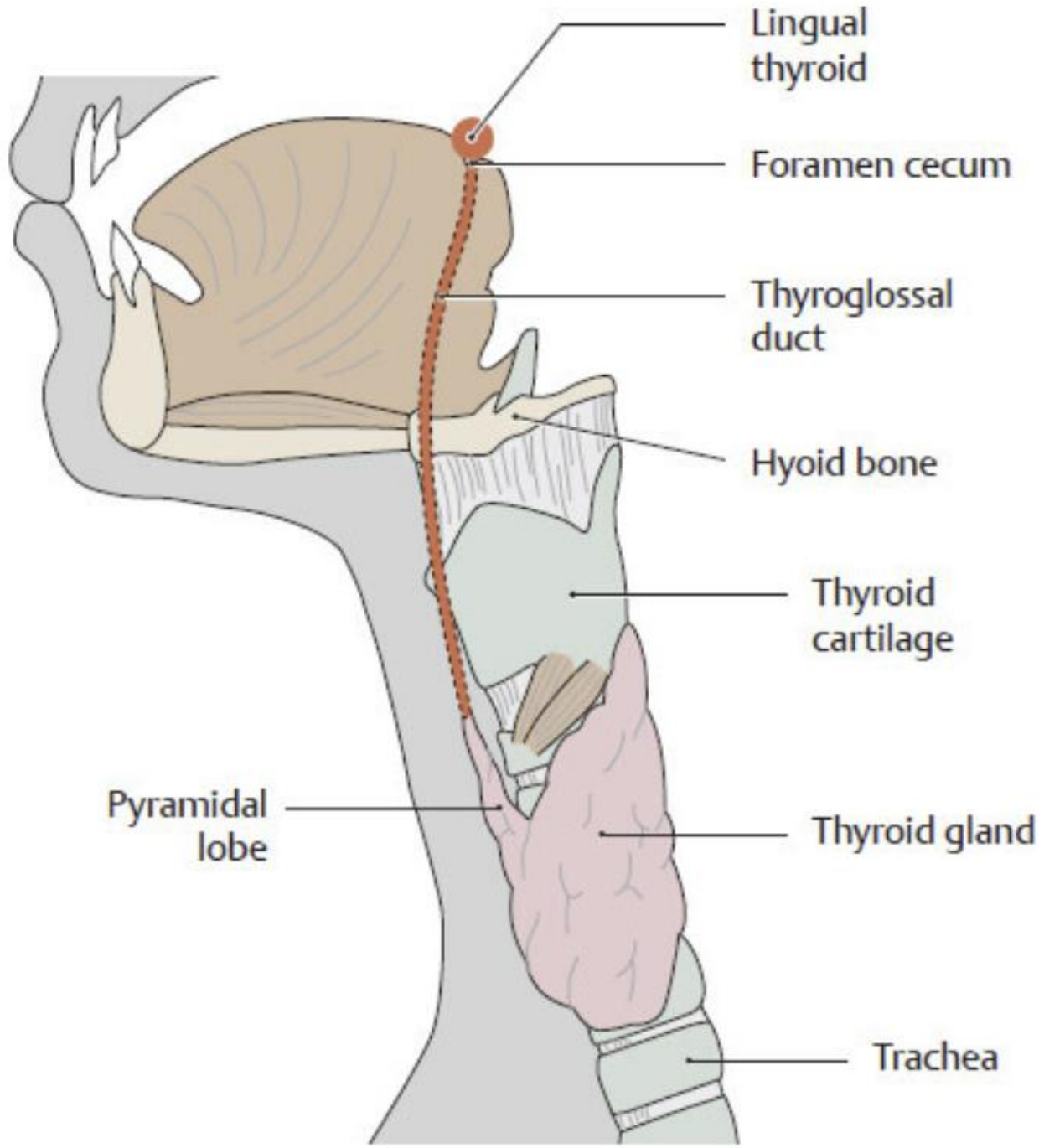


Glandula thyroidea

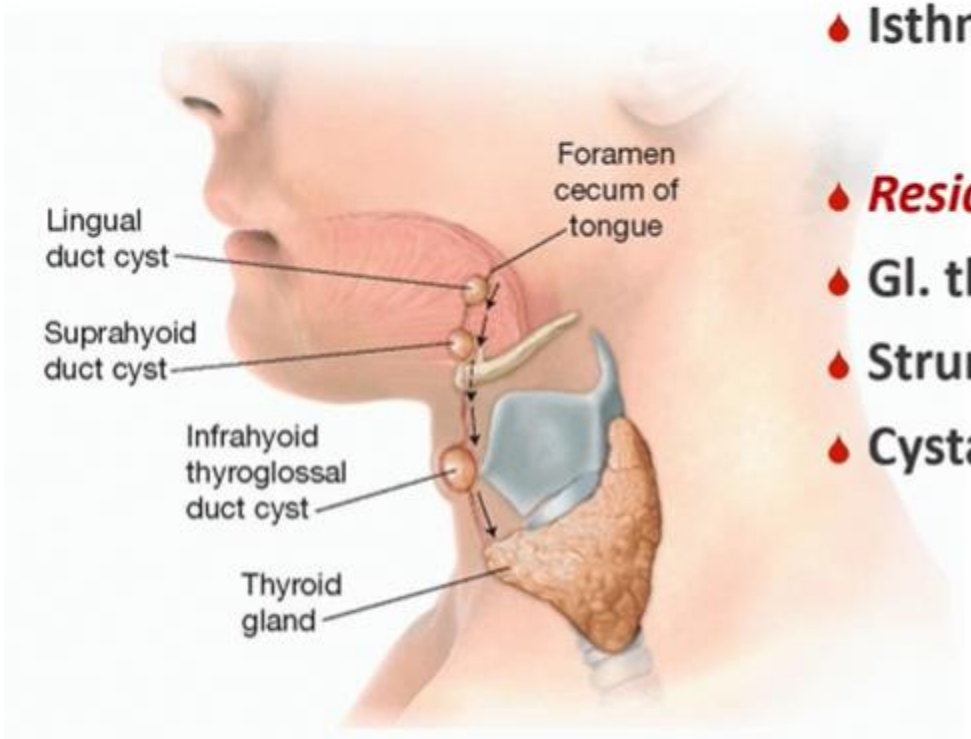

text

on occasion, a persistent thyroglossal duct may be present, connecting the pyramidal lobe with the foramen cecum of the tongue.

Ectopic thyroid is a rare condition in which the entire thyroid gland or thyroid tissues are found outwith their normal position in the neck inferolateral to the thyroid cartilage. Dentists may encounter this as a firm midline mass on the dorsal tongue, just posterior to the foramen cecum (the embryonic origin on the thyroid gland). This mass may appear as light pink to bright red, and may be regular or irregular. This is known as a lingual thyroid and represents approximately 90% of ectopic thyroid cases. Symptoms of lingual thyroid may include cough, pain, dysphagia (difficulty swallowing), dysphonia (difficulty speaking), and dyspnea (shortness of breath). Treatment involves administration of thyroxine to suppress thyroid stimulating hormone (TSH) production and therefore reduce the size of the mass. Surgical excision may be necessary if symptoms are severe, especially if they threaten the airway.



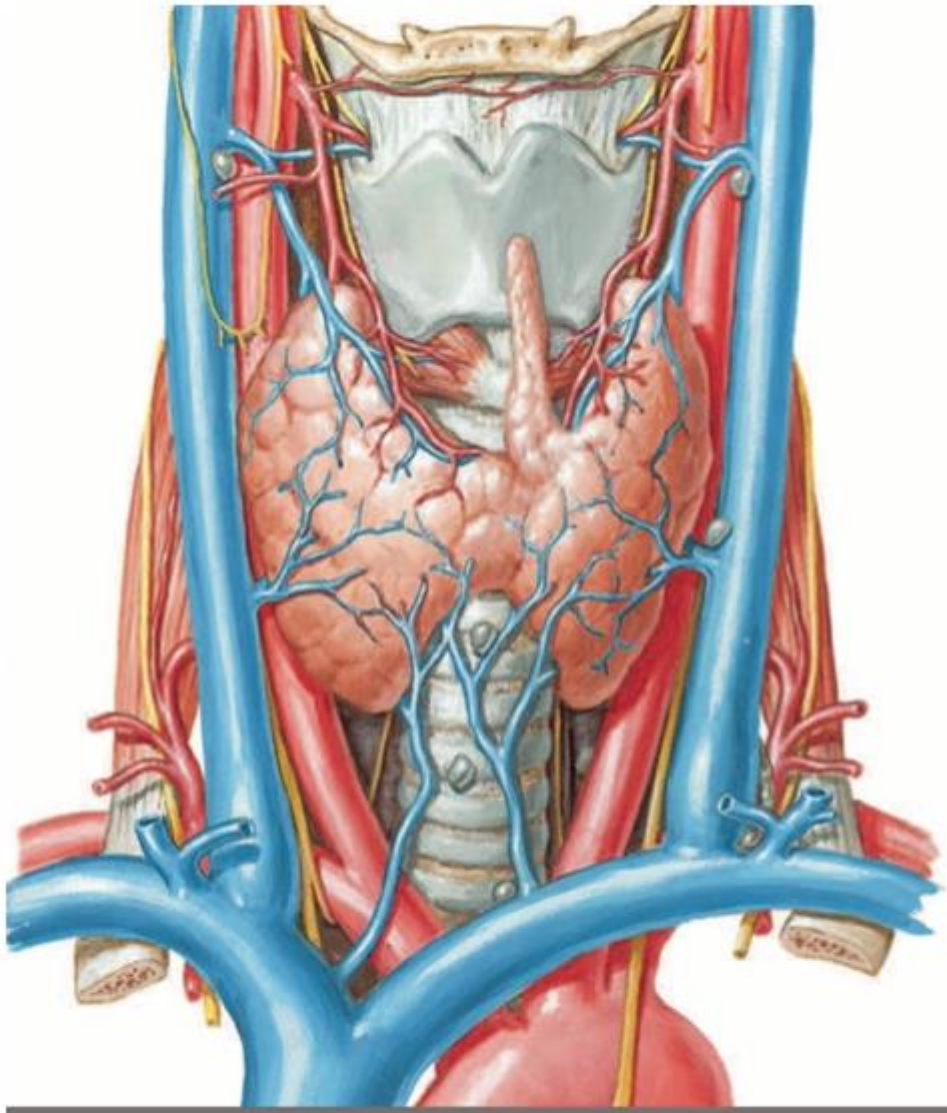
- Foramen caecum linguae
- Isthmus gl. thyreoideae

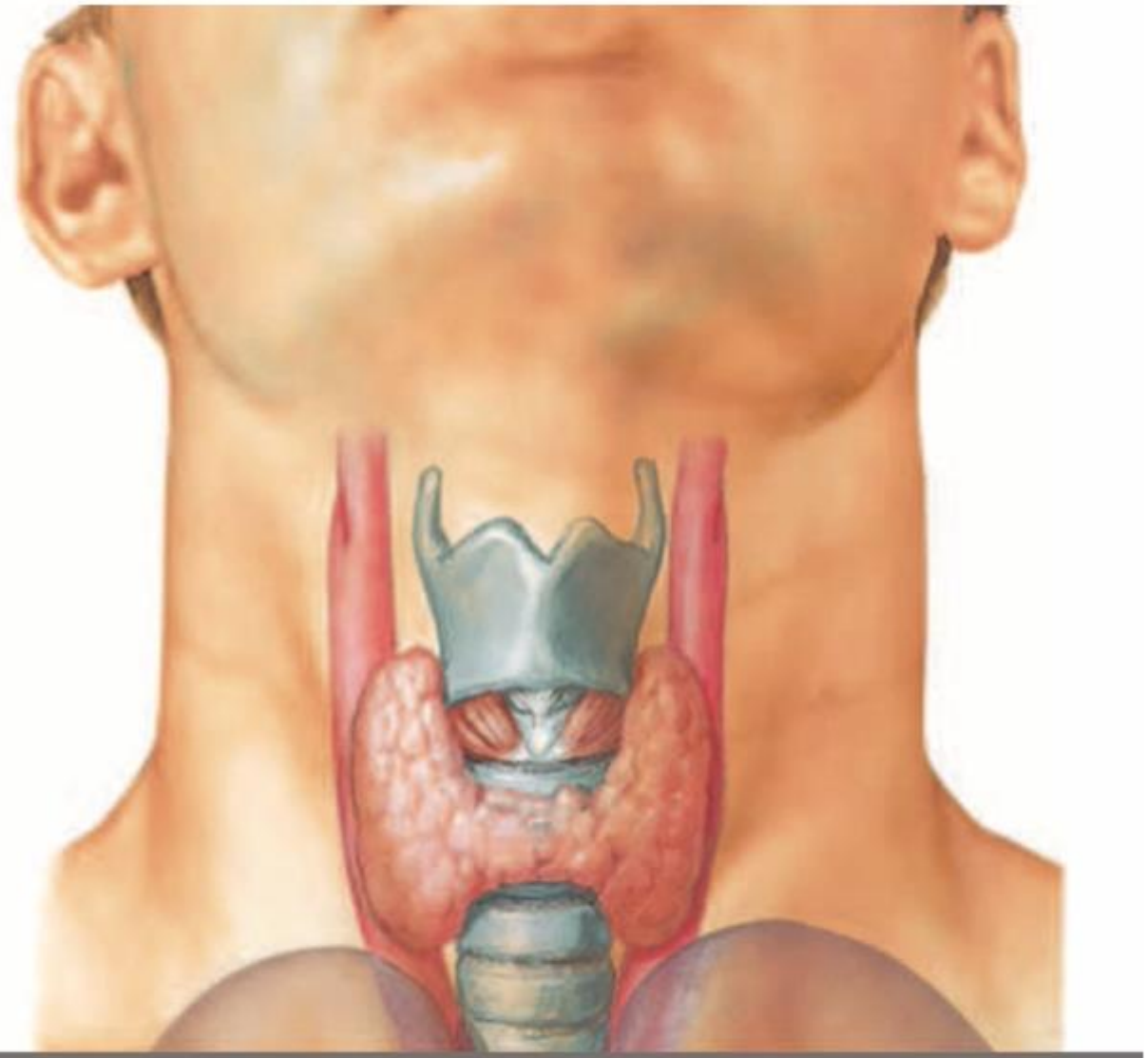


- ***Residua***
- Gl. thyroidea aberrans
- Struma linguae
- Cysta ductus thyreoglossi

https://plasticsurgerykey.com/thyroglossal-duct-cysts/

Ductus thyreoglossus

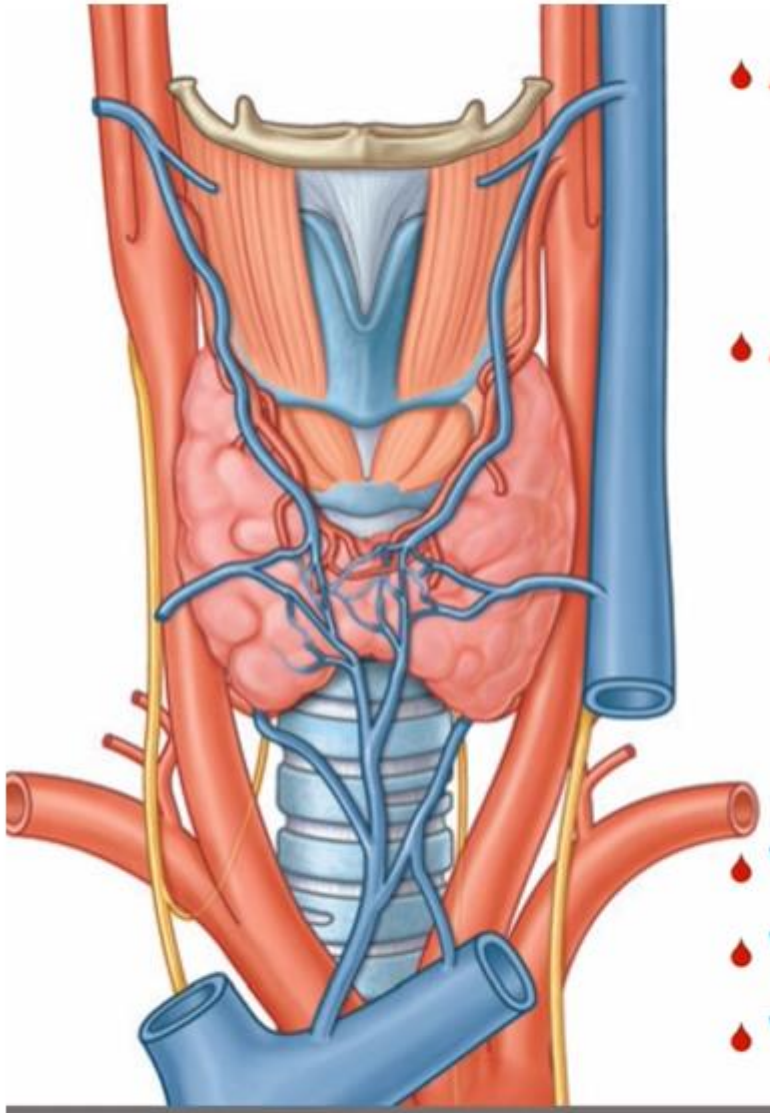




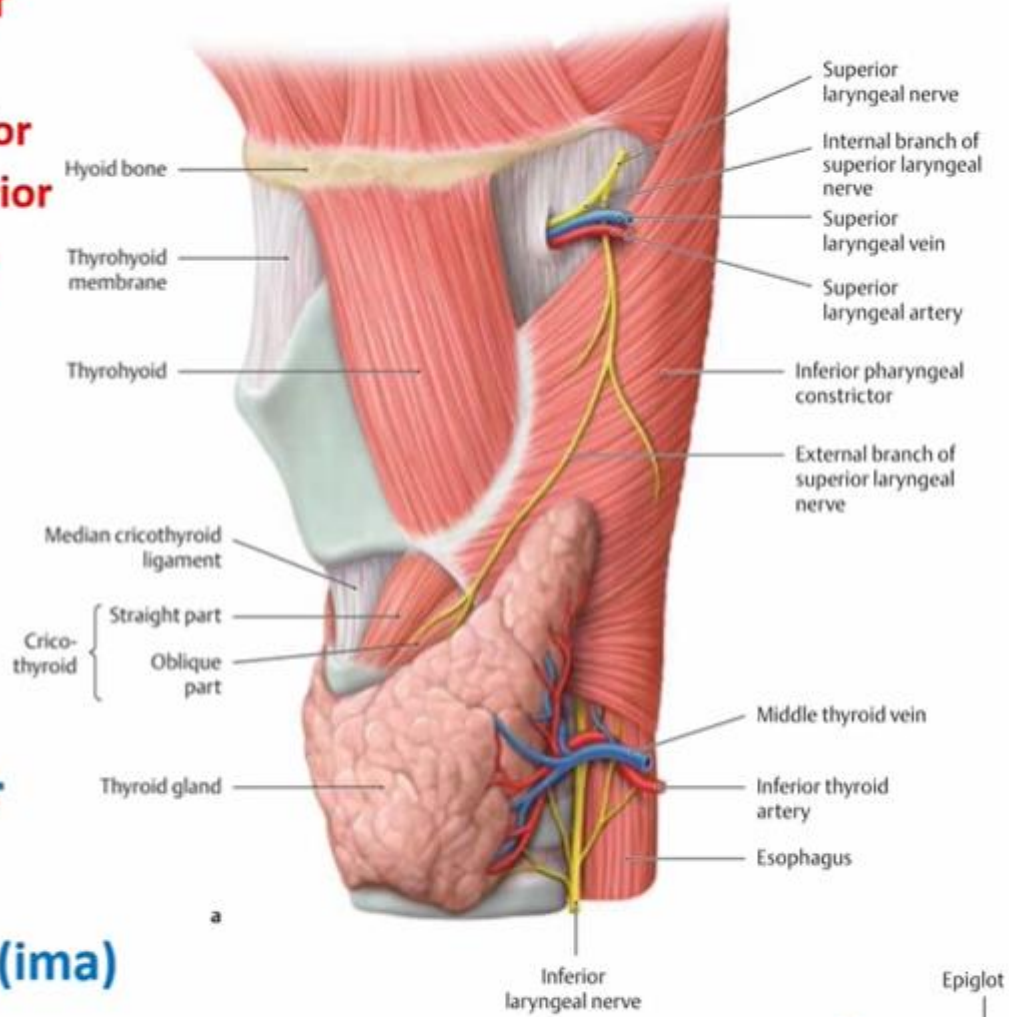
Glandula thyroidea

- **The superior thyroid artery is accompanied by the external br. Of sup. laryngeal nerve** which supplies the cricothyroid muscle. The external laryngeal nerve lies closely related to the artery in the proximal part of its course. As it approaches the gland, it moves more medially and thus gets separated from the superior thyroid artery. ***That is the reason why the superior thyroid artery is ligated as near to the gland as possible to avoid injury to the external laryngeal nerve.***

- **The inferior thyroid artery** is a branch of the thyrocervical trunk (from 1st part of subclavian) and it turns **transversely at the level of 6th cervical vertebra** and goes behind the common carotid artery. As it approaches the posterior aspect of the gland, it is closely related to the corresponding ***recurrent laryngeal nerve***. ***That is the reason why the inferior thyroid artery is ligated as far away as possible from the gland to avoid injury to the recurrent laryngeal nerve.*** (results in the hoarseness of the voice as most of the muscles of the larynx are supplied by the recurrent laryngeal nerve).



- **A. thyroidea superior**
  - *A. carotis externa*
  - **R. glandularis anterior**
  - **R. glandularis posterior**
- **A. thyroidea inferior**
  - *Tr. thyrocervicalis*
  - *A. subclavia*



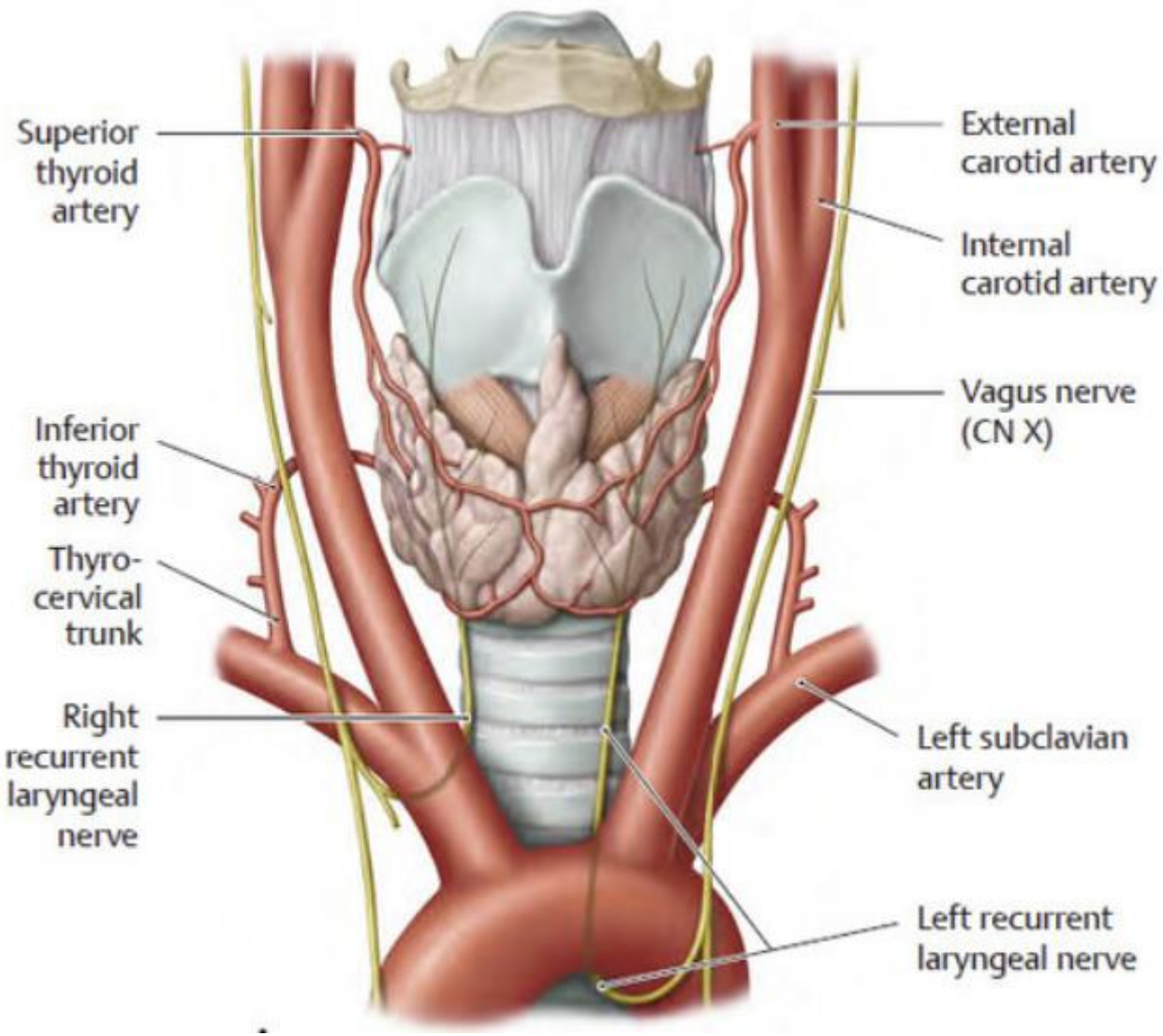
- **V. thyroidea superior**
- **V. thyroidea media**
- **V. tyhroidea inferior (ima)**

Vasa thyroidea

Arterial supply

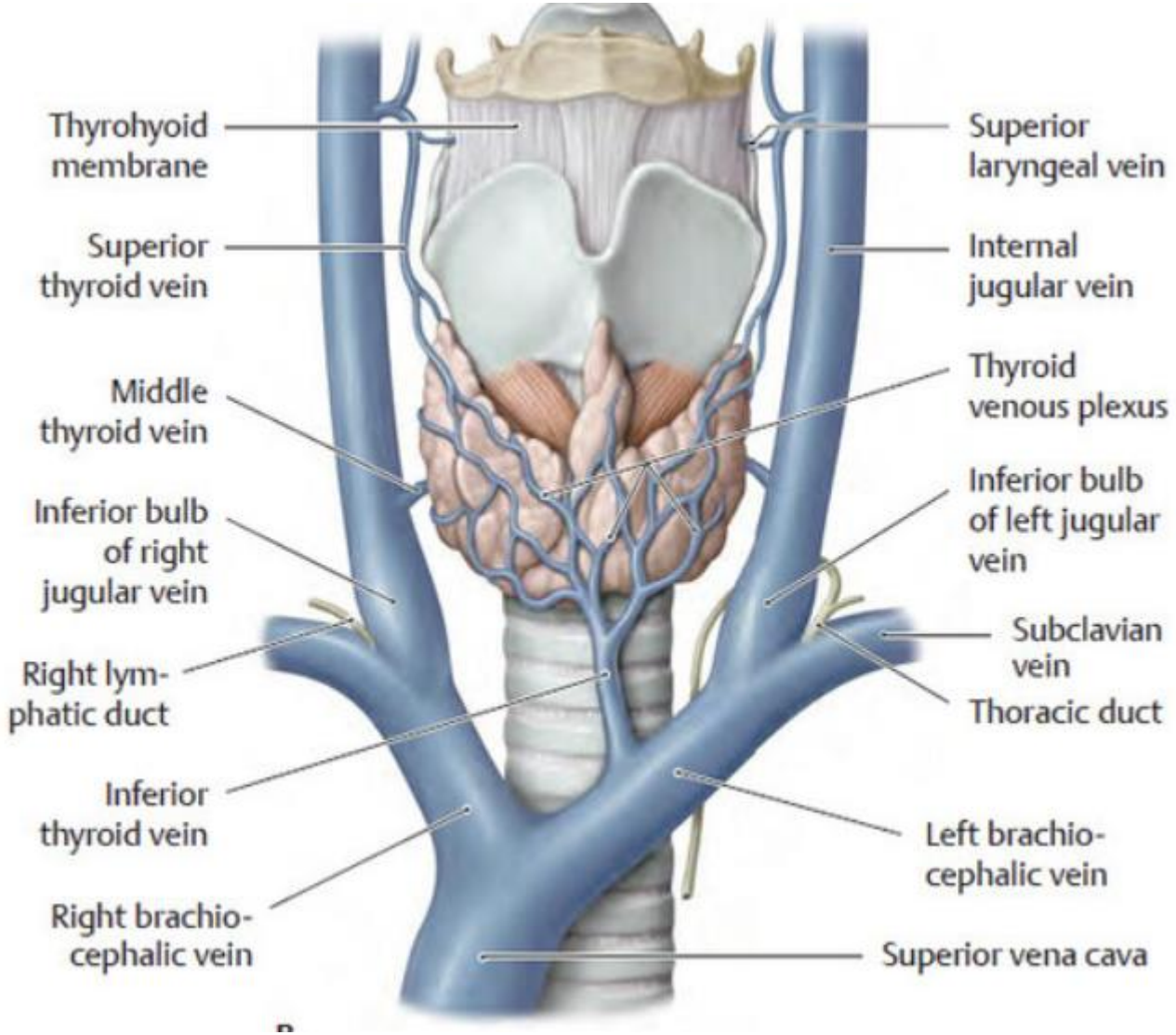
The thyroid gland derives most of its arterial blood supply from the superior and inferior thyroid arteries. The superior thyroid artery, a branch of the external carotid artery, runs forward and downward to supply the gland. It is supplied from below by the inferior thyroid artery, which branches from the thyrocervical trunk. All of these arteries, which course on the right and left sides of the organ, must be ligated during surgical removal of the thyroid gland. In addition, a rare branch, the thyroid ima, may arise from the brachiocephalic trunk or right common carotid artery to supply the gland from below. It is a potential source of bleeding when performing midline procedures on the neck, for example, a tracheostomy.

Note: Operations on the thyroid gland carry a risk of injury to the recurrent laryngeal nerve, which is closely related to the posterior surface of the gland. Because it supplies important laryngeal muscles, unilateral injury to the nerve will cause postoperative hoarseness; bilateral injury may additionally result in dyspnea (difficulty in breathing). Prior to thyroid surgery, therefore, an otolaryngologist should confirm the integrity of the nerve supply to the laryngeal muscles and exclude any preexisting nerve lesion.



Venous drainage

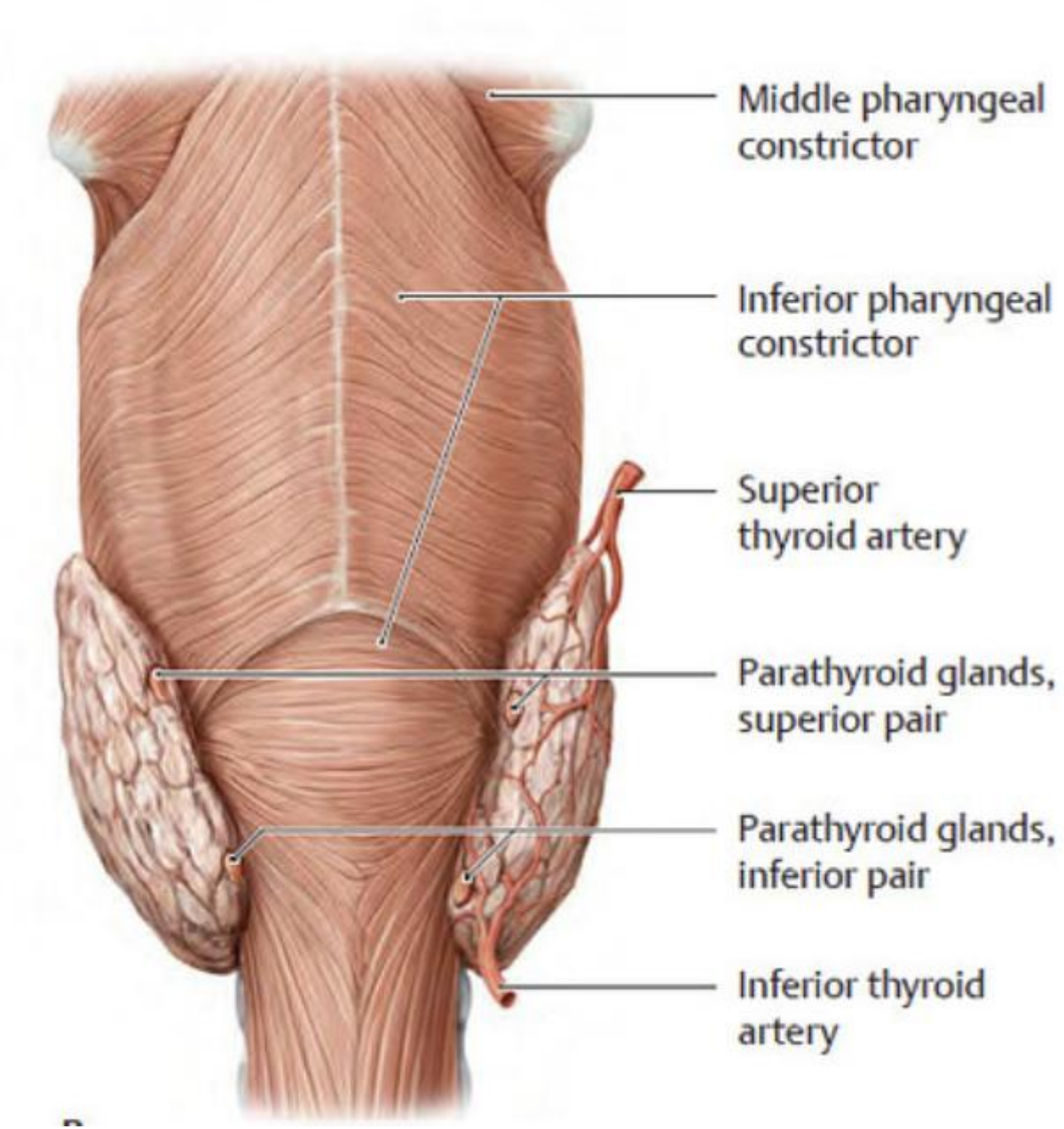
The thyroid gland is drained anteroinferiorly by a well-developed *thyroid venous plexus*, which usually drains through the inferior thyroid vein to the left brachiocephalic vein!. Blood from the thyroid gland also drains to the internal jugular vein via the superior and middle thyroid veins.

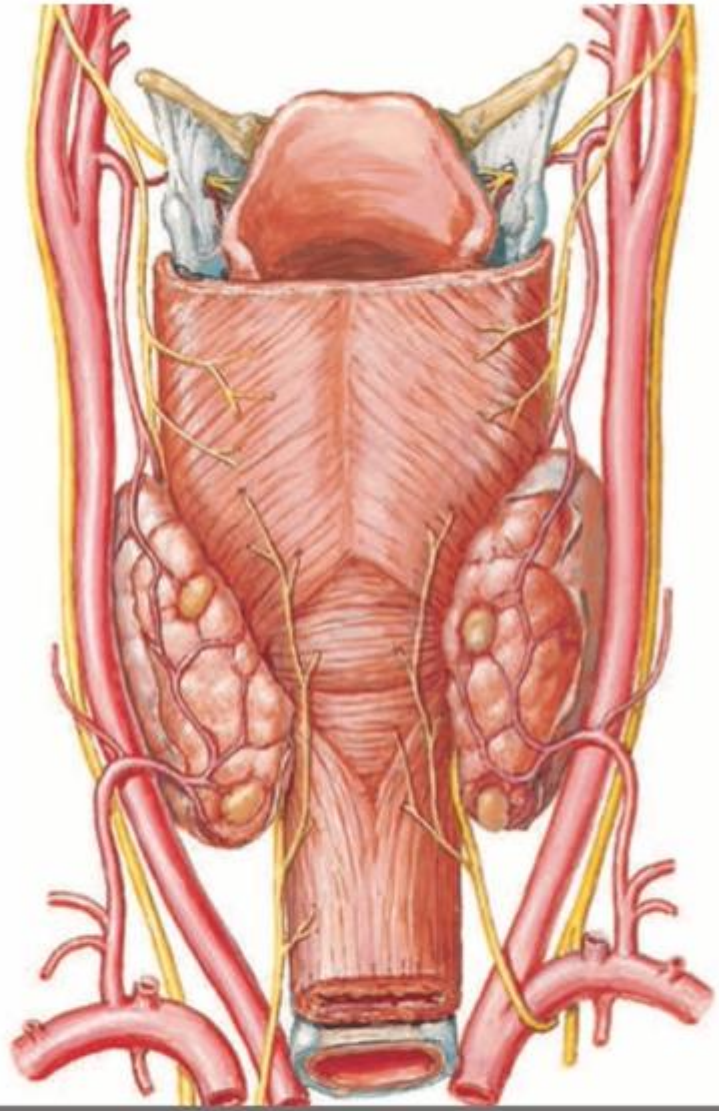


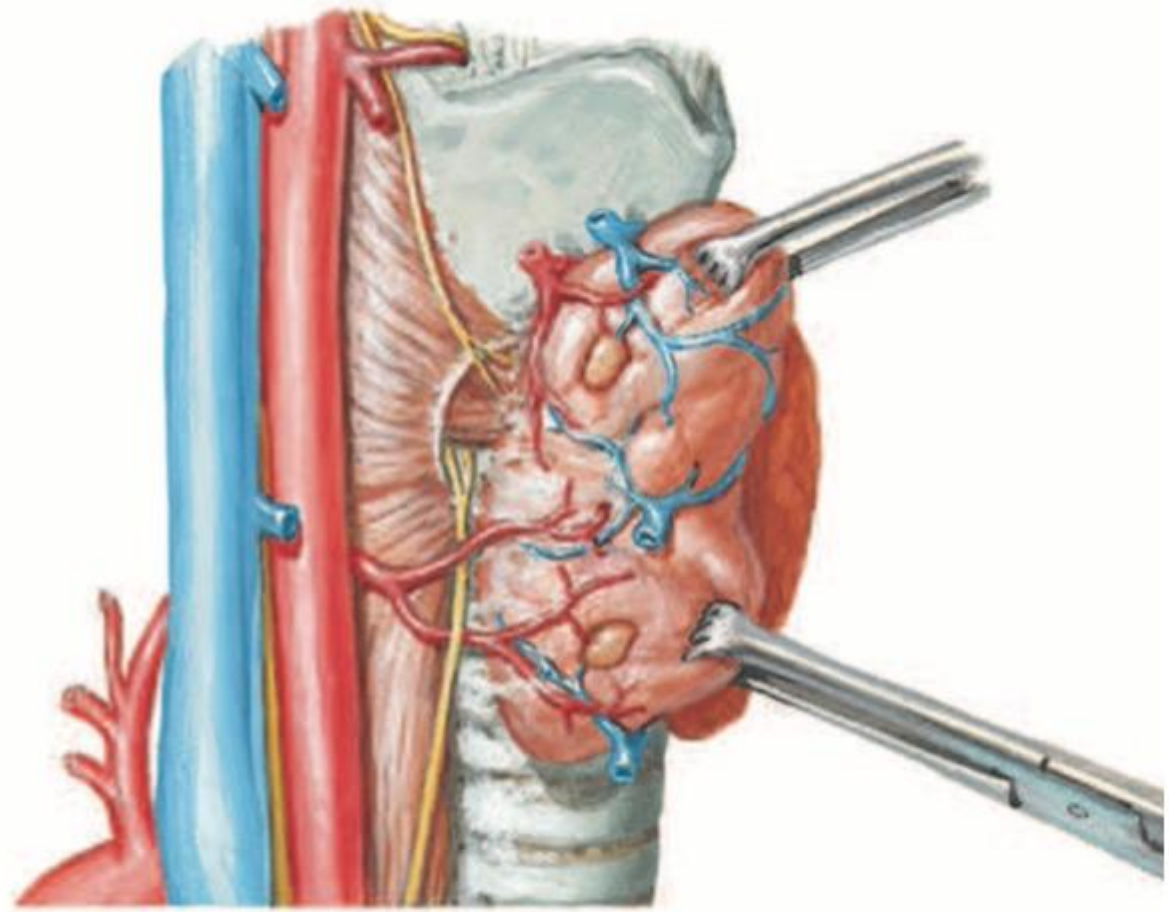
Parathyroid glands

The parathyroid glands (generally four in number) show considerable variation in number and location.

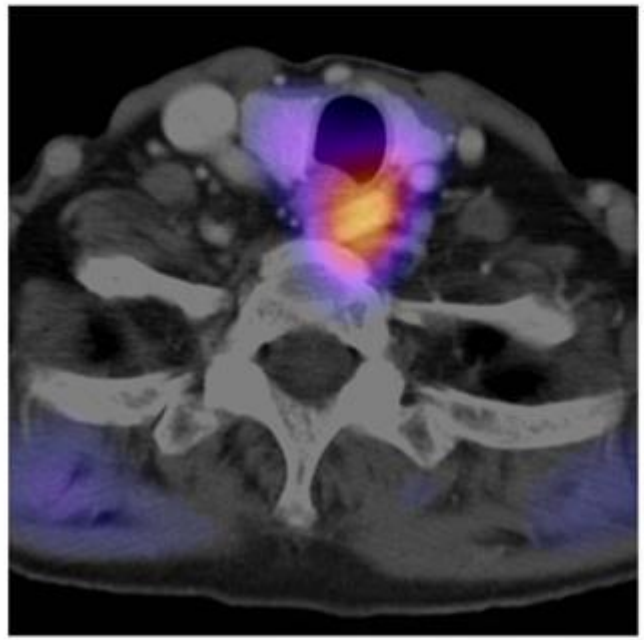
Note: Because the parathyroid glands are usually contained within the thyroid capsule, there is considerable risk of inadvertently removing them during thyroid surgery. This causes decreased plasma calcium (Ca^{2+}) levels, resulting in tetany (muscle twitching and cramps). Tetany involving the laryngeal and respiratory muscles may cause dyspnea (shortness of breath), which could be fatal if untreated.







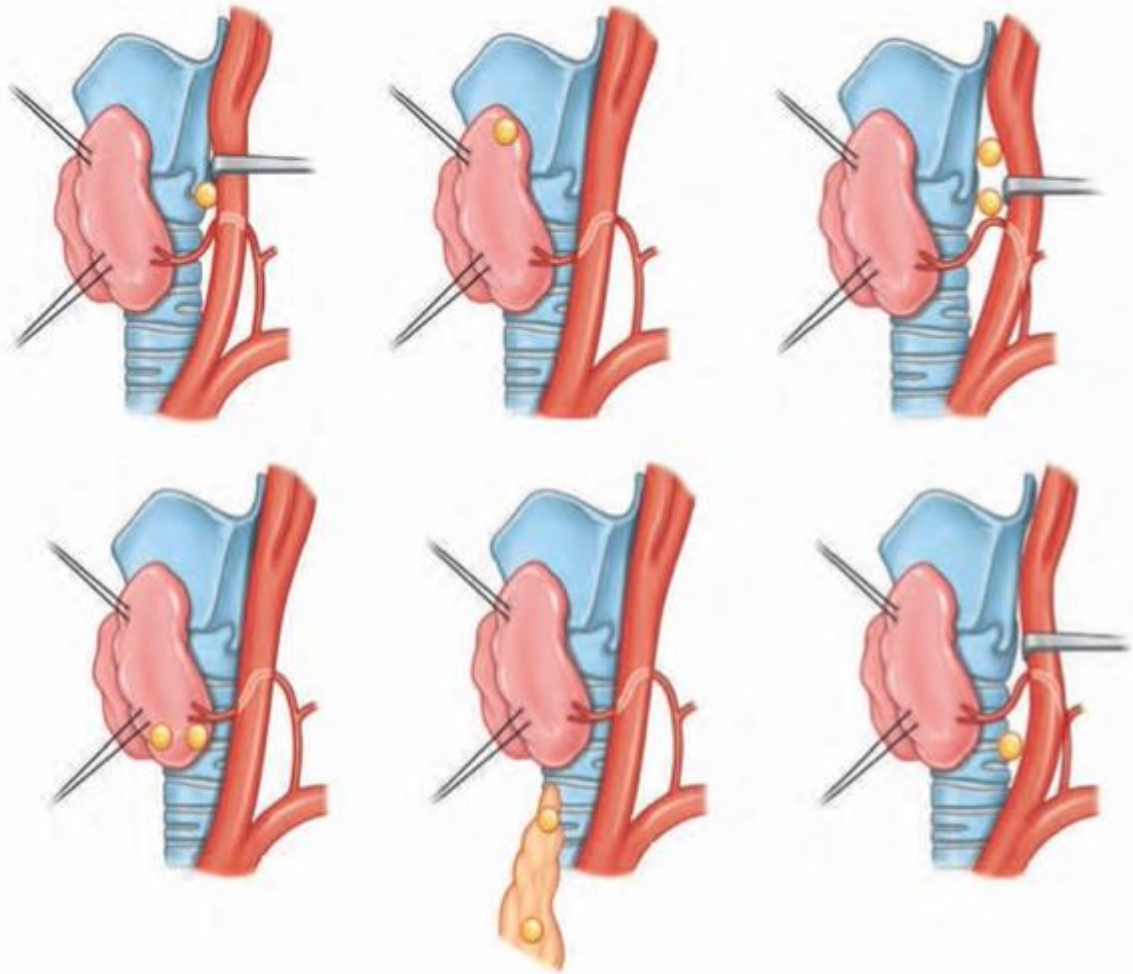
Glandula parathyroidea



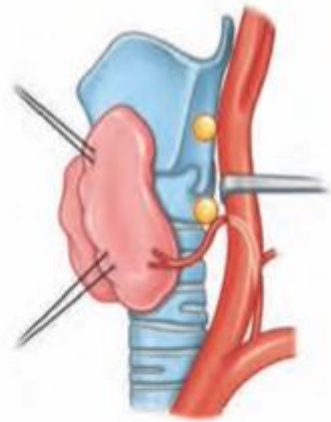
- **upper**
  - *IV. brachial*
  - *Pharyngeal pouch*
- **lower**
  - *III. brachial*
  - *Pharyngeal pouch*
- **migration**
- dystopy
  -
- Adenoma

- hyperparathyroidismus

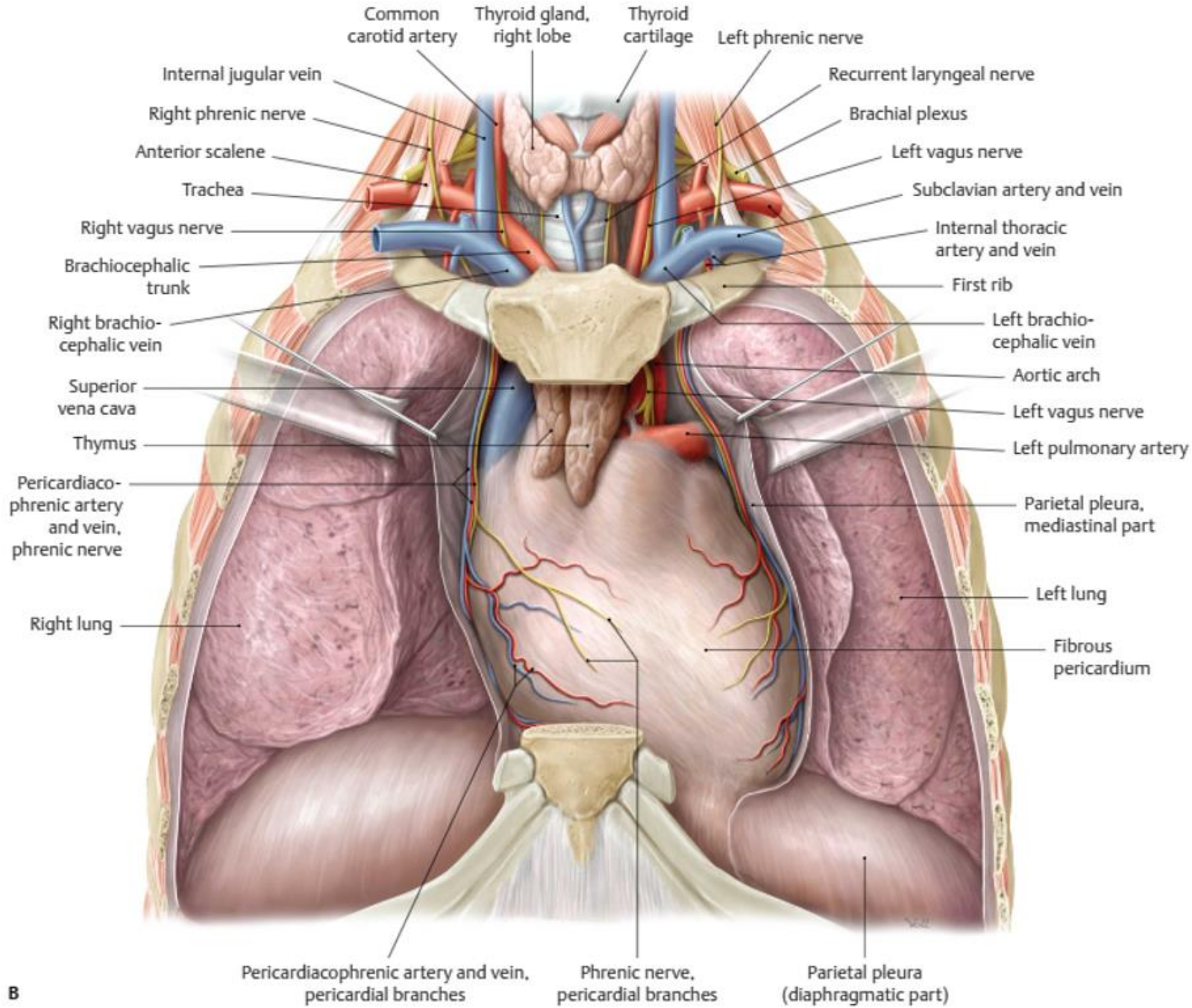
Glandula parathyroidea



- **gll. PTH superiores**
- *Cricothyrodealis juxtacricoidalis (77%)*
- *Retrolobaris superior 22%*
- *Retropharyngealis, retrooesophagealis (1%)*
- **gll. PTH inferiores**
- *Cricothyrodealis juxtacricoidalis (77%)*
- *Thyroidealis inferior (42%)*
- *Linguae thymi (39%)*
- *Intrathymica (2%)*
- *Juxtathyroidalis (15)*
- *Superior ectopia (2%)*

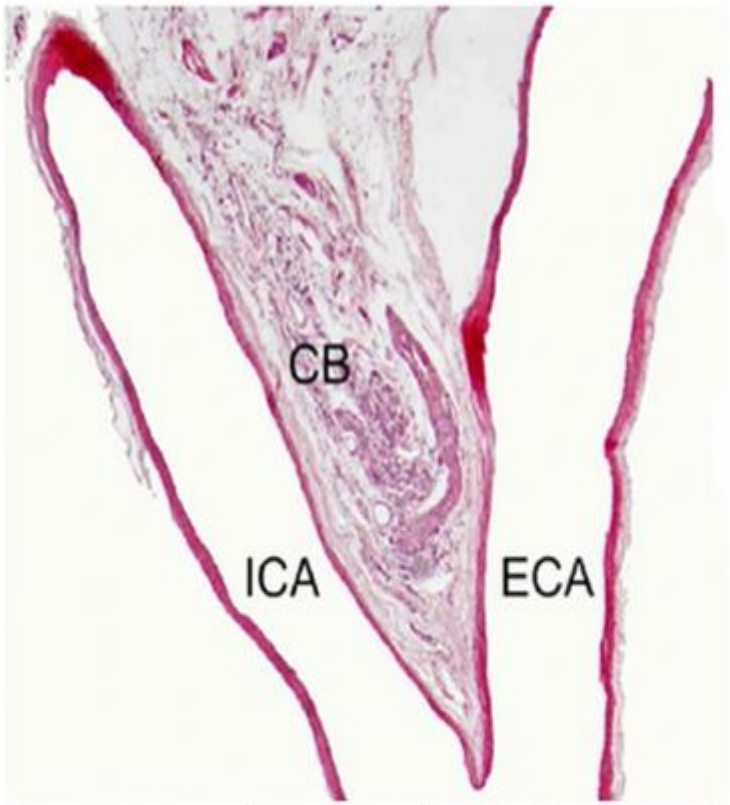


Glandula parathyroidea - dystopia

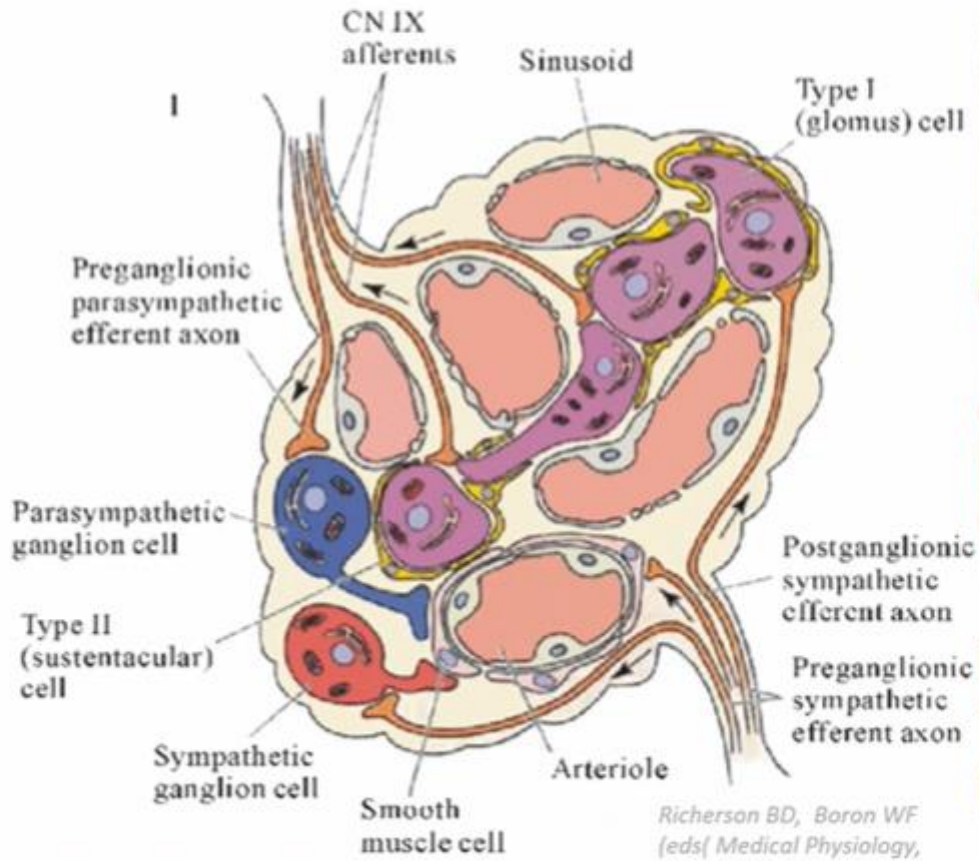

Common carotid artery
Thyroid gland, right lobe
Thyroid cartilage
Left phrenic nerve
Internal jugular vein
Recurrent laryngeal nerve
Right phrenic nerve
Brachial plexus
Anterior scalene
Left vagus nerve
Trachea
Subclavian artery and vein
Right vagus nerve
Internal thoracic artery and vein
Brachiocephalic trunk
First rib
Right brachio-cephalic vein
Left brachio-cephalic vein
Superior vena cava
Aortic arch
Left vagus nerve
Thymus
Left pulmonary artery
Pericardiaco-phrenic artery and vein, phrenic nerve
Parietal pleura, mediastinal part
Left lung
Right lung
Fibrous pericardium
Pericardiacophrenic artery and vein, pericardial branches
Phrenic nerve, pericardial branches
Parietal pleura (diaphragmatic part)

B

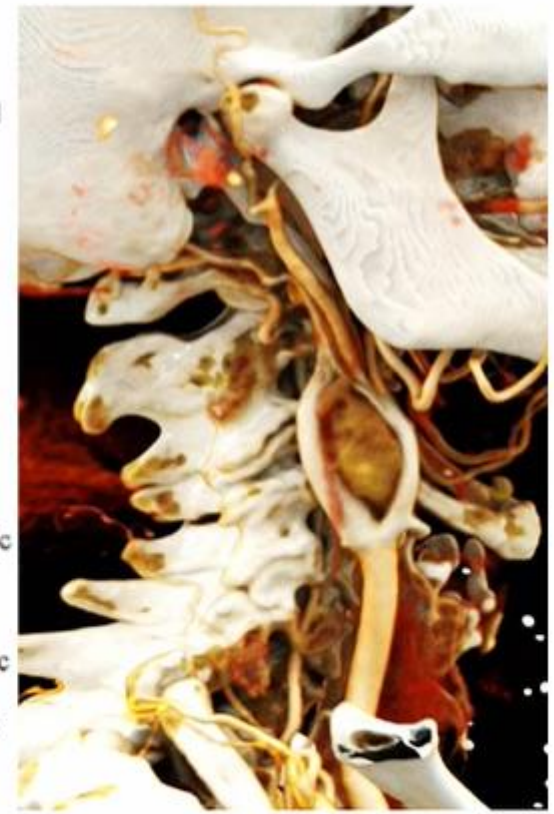
Glomus caroticum



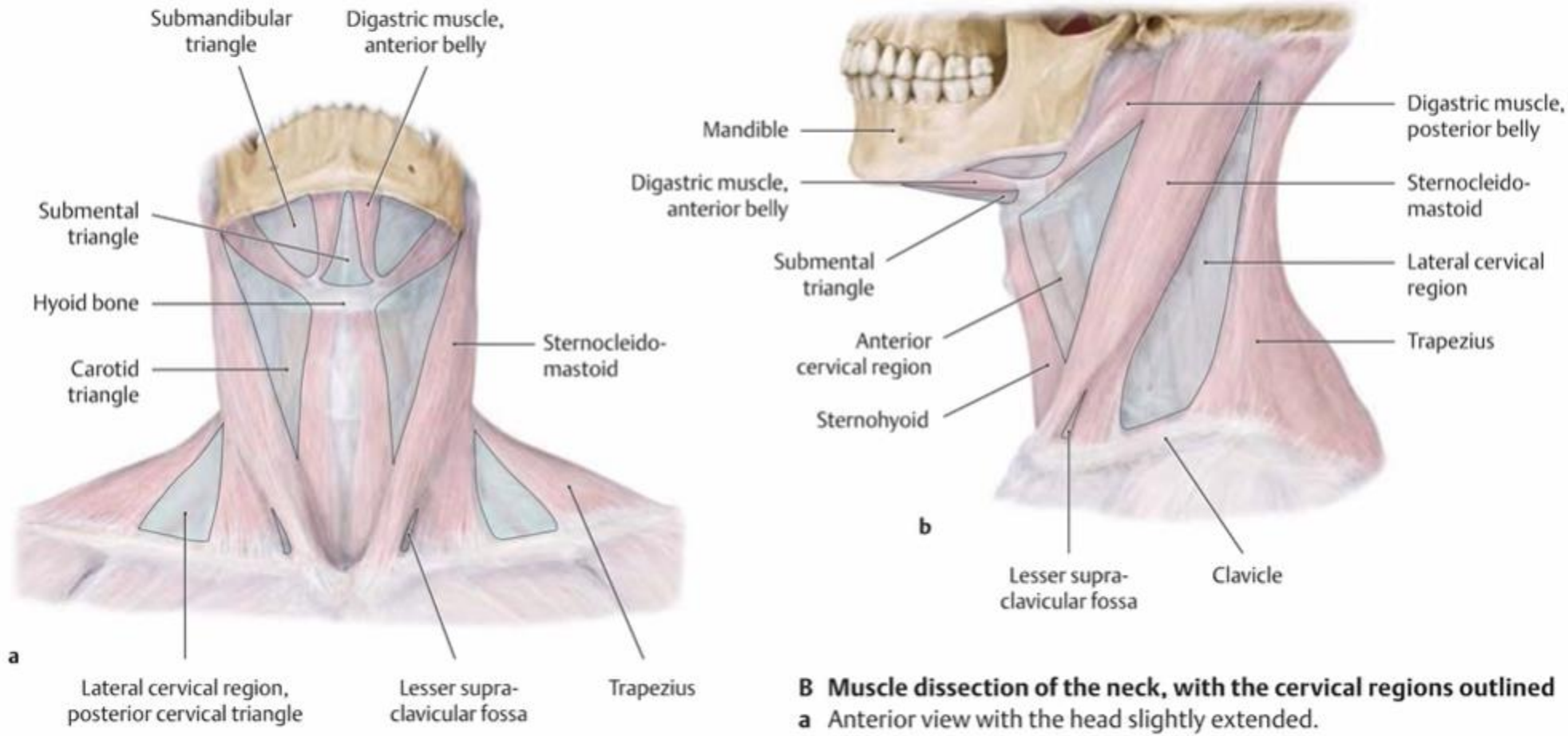
https://www.researchgate.net/figure/Location-of-the-carotid-body-bifurcation_fig1_259761100



Richerson BD, Boron WF (eds(Medical Physiology, Elsevier, 2016



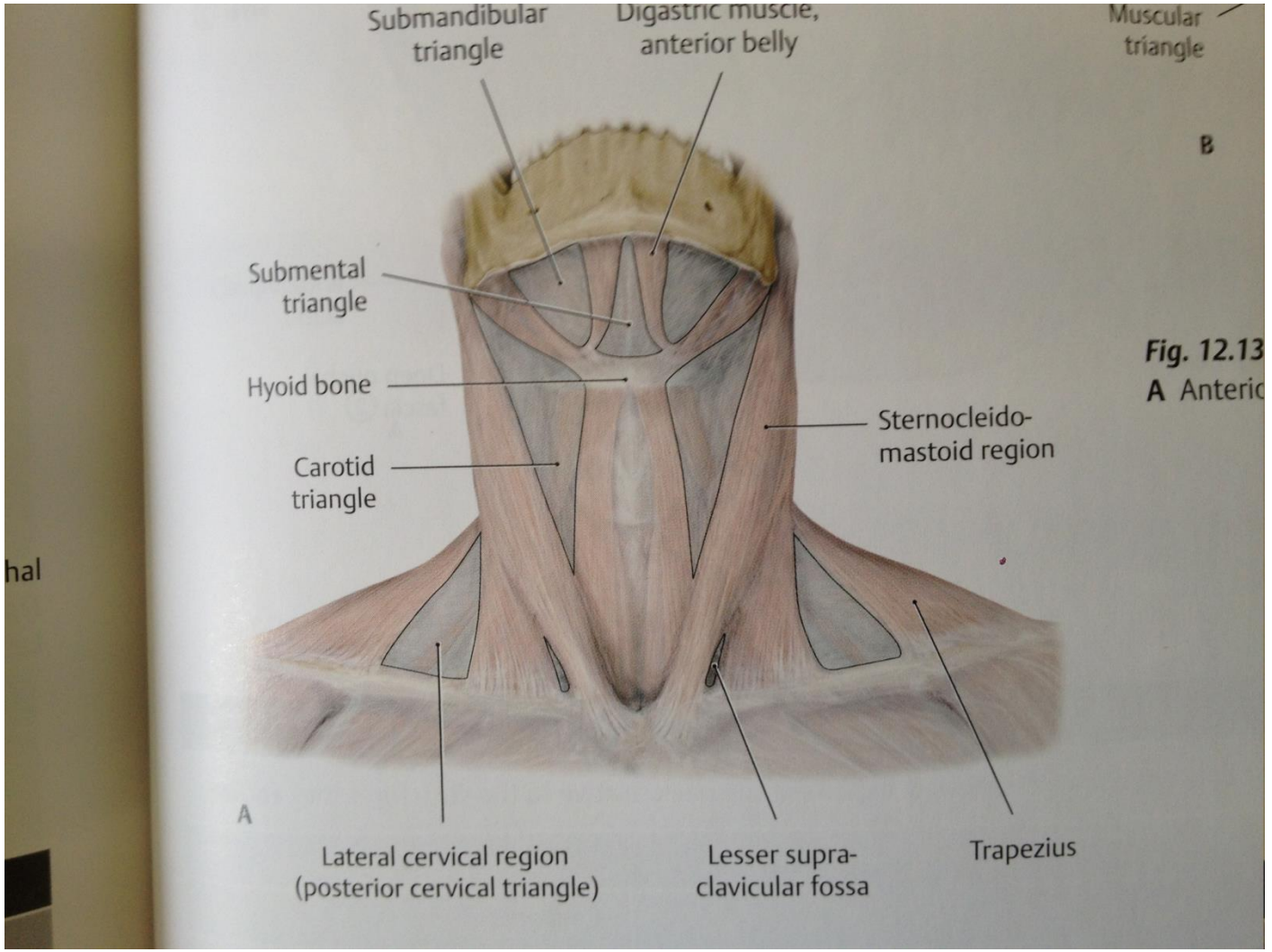
Trigona cervicis



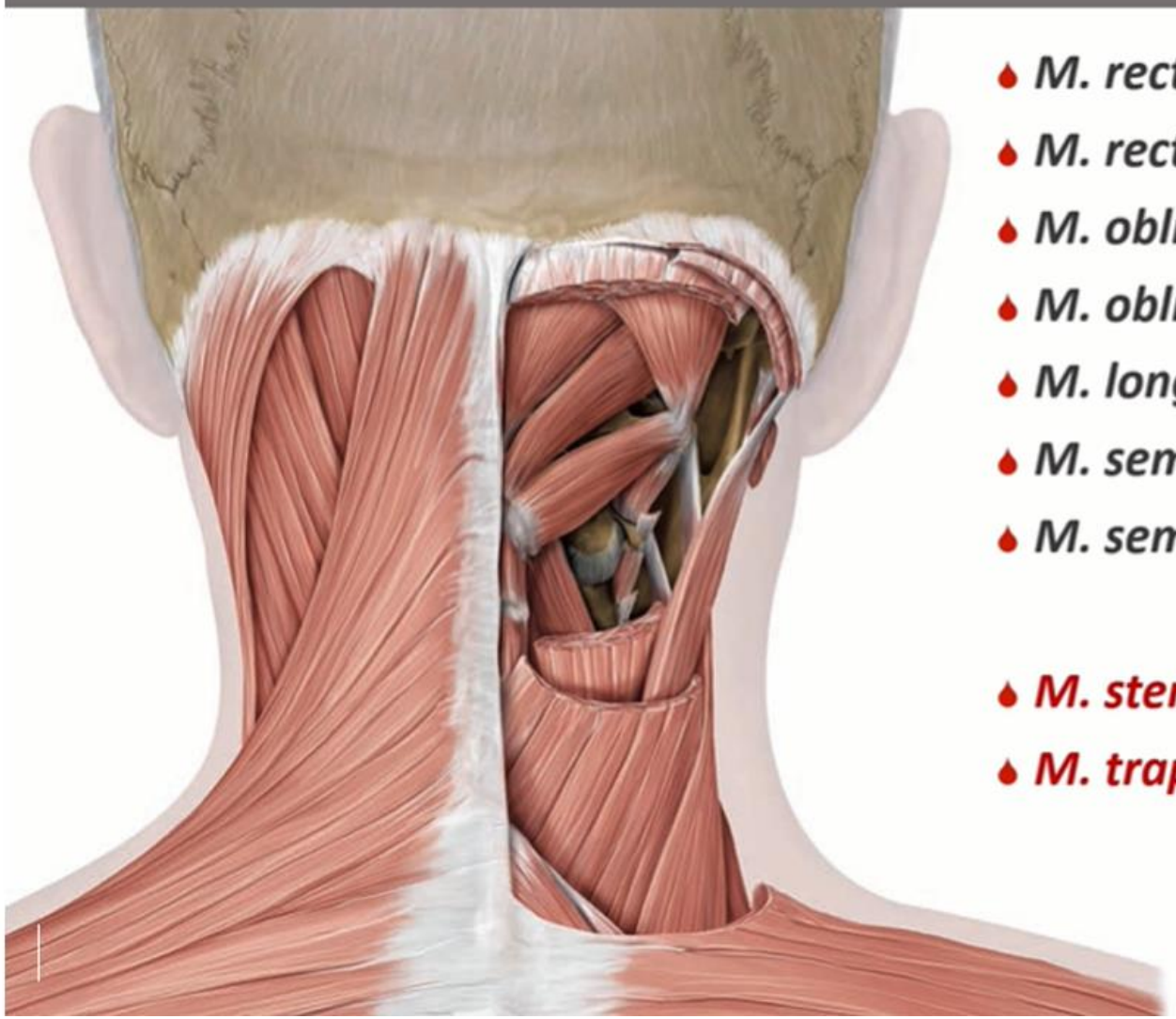
B Muscle dissection of the neck, with the cervical regions outlined
a Anterior view with the head slightly extended.
b Left lateral view.

Anterior cervical region (anterior cervical triangle):

is bordered superiorly by mandible, laterally by SCM m.and inferiorly by jugular notch of sternum



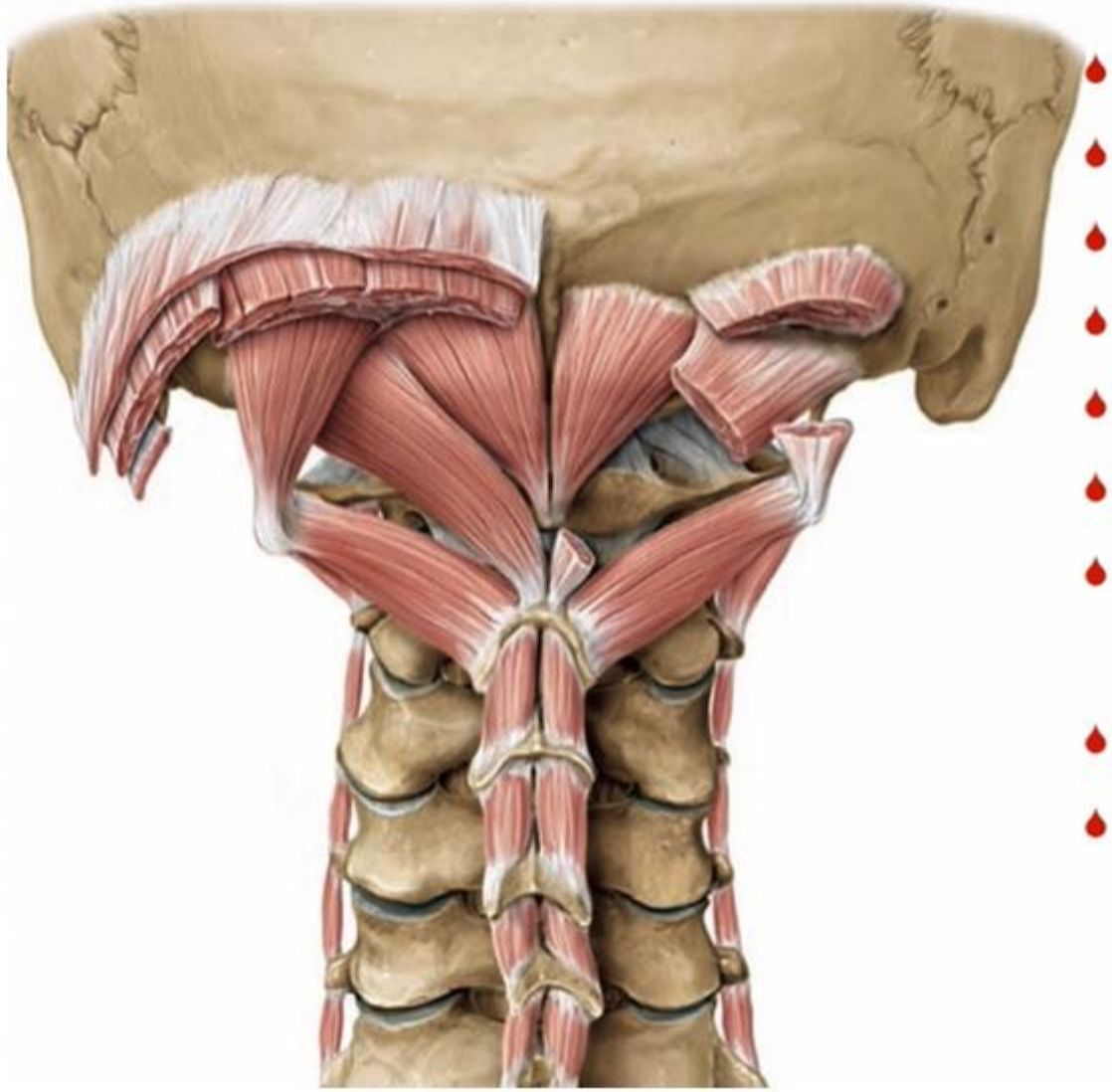
Intrinsic muscles of back - neck



- *M. rectus capitis posterior minor*
- *M. rectus capitis posterior major*
- *M. obliquus capitis superior*
- *M. obliquus capitis* **inferior**
- *M. longissimus capitis*
- *M. semispinalis capitis*
- *M. semispinalis cervicis*

- *M. sternocleidomastoideus*
- *M. trapezius*

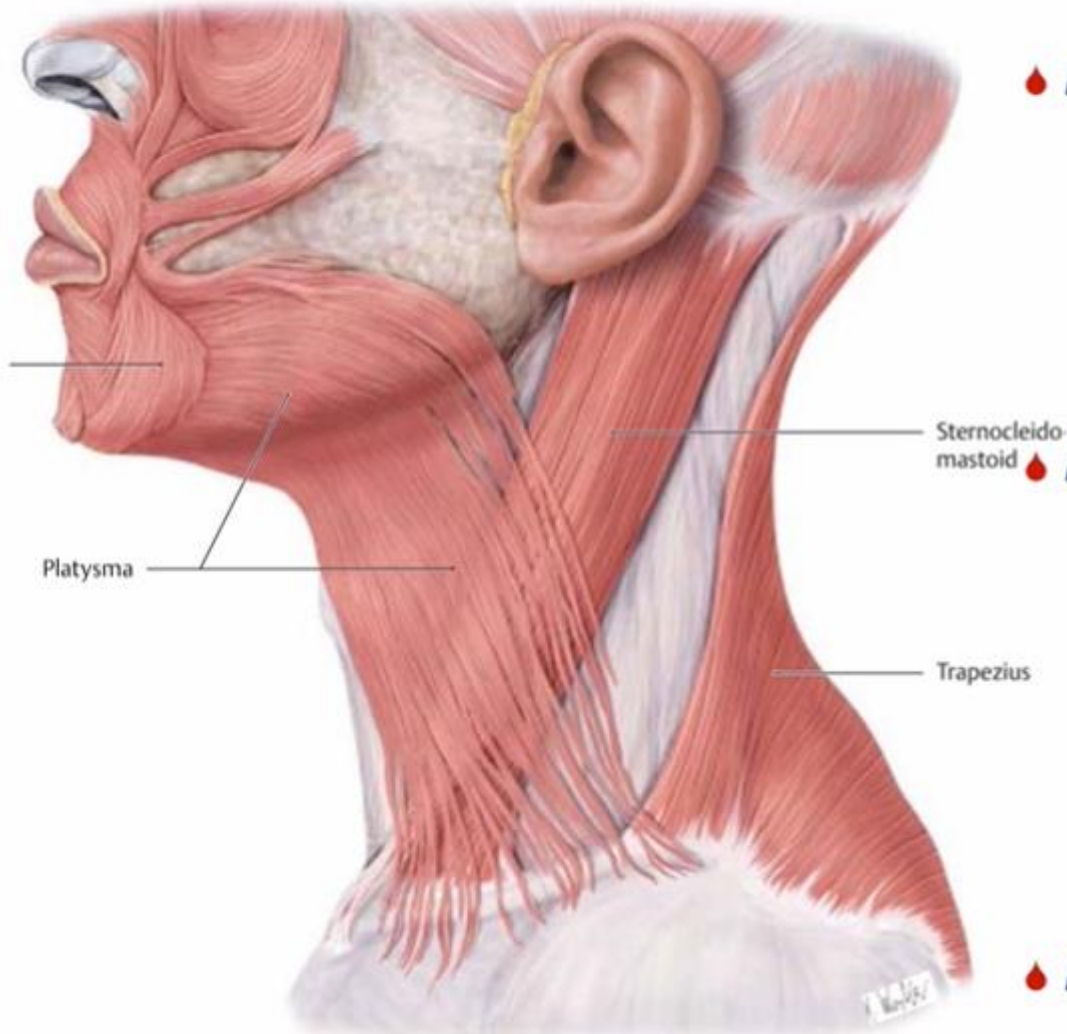
Intrinsic muscles of back - neck



- *M. rectus capiris posterior minor*
- *M. rectus capitis posterior major*
- *M. obliquus capitis ~~superior~~* INF
- *M. obliquus capitis superior*
- *M. longissimus capitis*
- *M. semispinalis capitis*
- *M. semispinalis cervicis*

- *M. sternocleidomastoideus*
- *M. trapezius*

Neck muscles



- *M. sternocleidomastoideus*
  - *Caput sternalis*
  - *Caput clavicularis*
  - *insertion*
    - *proc. mastoideus + linea nuchae superior*
  - *N. accesorius + C1 – C4*
- *M. trapezius*
  - *Protuberantia occipitalis externa*
  - *Linea nuchae superior*
  - *Aponeurosis lata – Th1 – Th4*
  - *Th5-Th12*
  - *insertion – clavilula, acromion, spina scapulae*
  - *N. accesorius + C2 – C4*
- *M. platysma*
  - *N. facialis*

Sternocleideomastoid m.

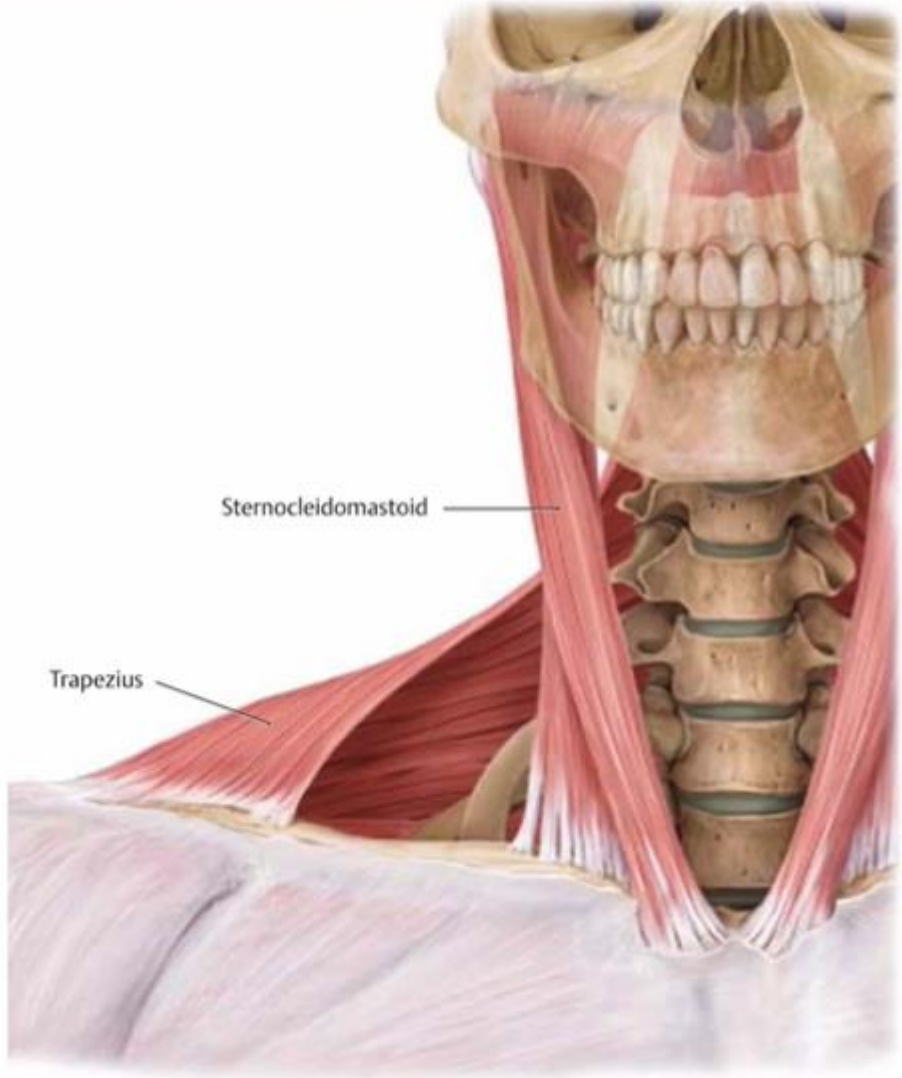
- Acting alone, tilts head to its own side and rotates it so the face is turned towards the opposite side.
- Acting together, flexes the neck, raises the sternum and assists in forced inspiration

Trapezius m.

- **Origin:** The muscle attaches to the medial third of superior nuchal line; external occipital protruberance, nuchal ligament, and spinous processes of C7 - T12 vertebrae.

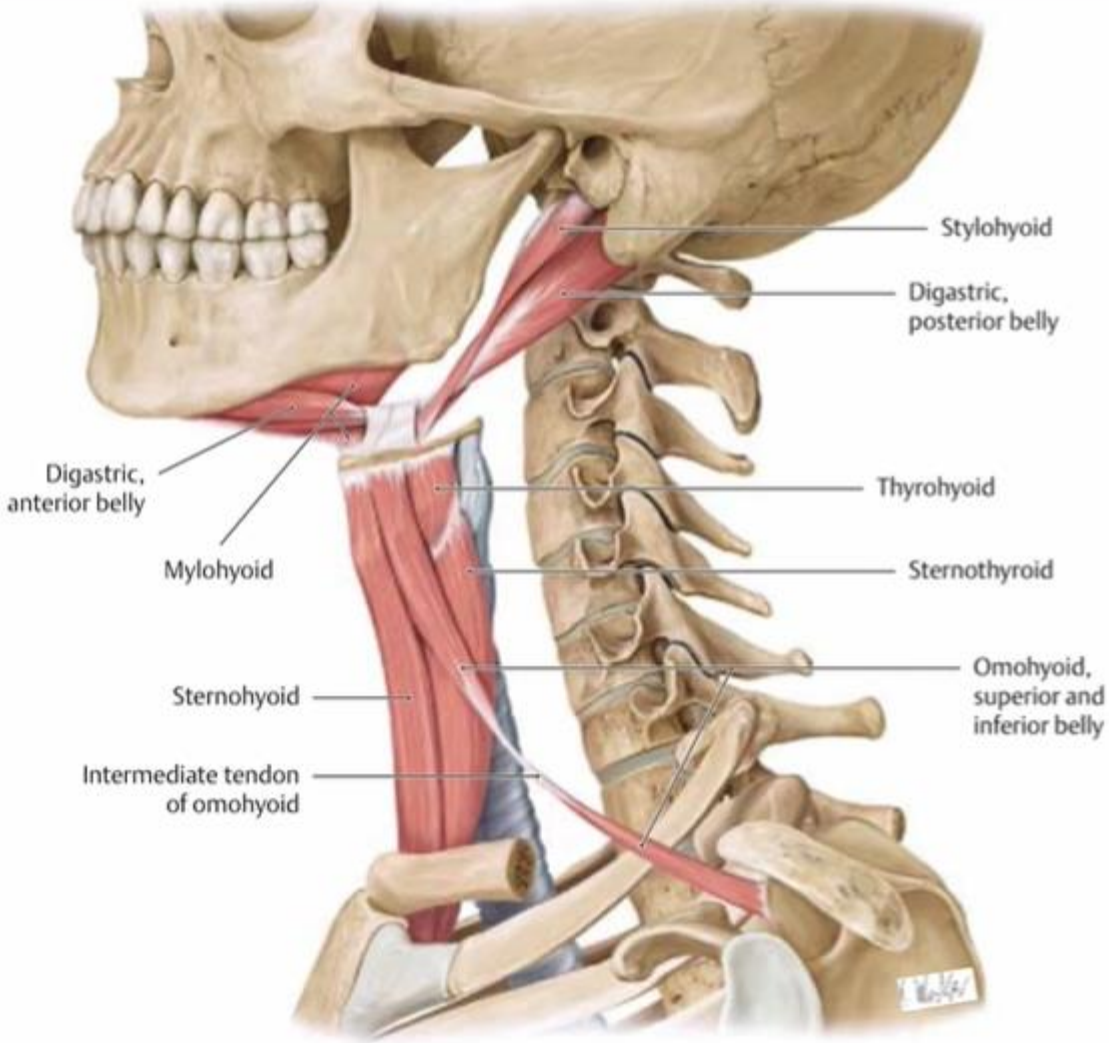
- Contraction of the trapezius muscle can have two effects: movement of the scapulae when the spinal origins are stable, and movement of the spine when the scapulae are stable. Its main function is to stabilize and move the scapula:
- Rotation, retraction, elevation, and depression of scapula

Neck muscles



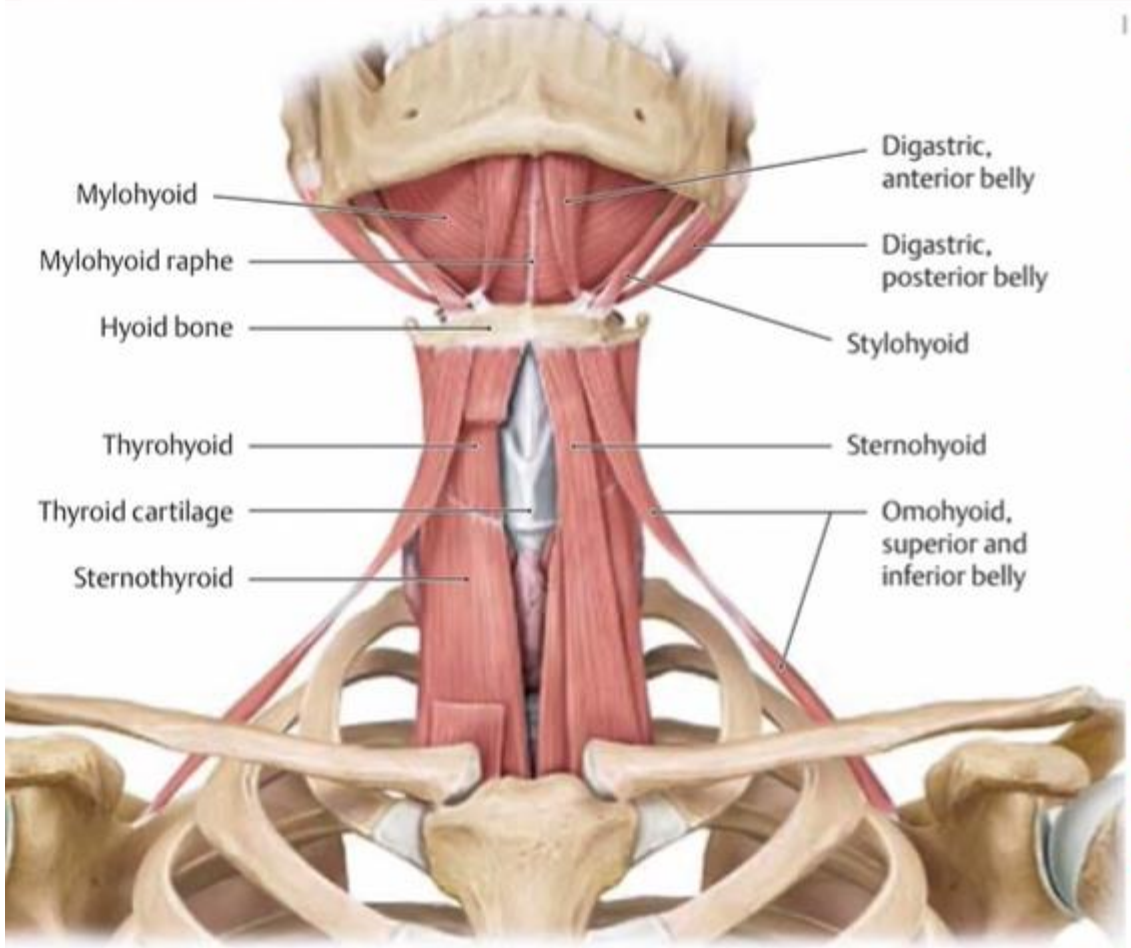
- ***M. sternocleidomastoideus***
  - ***Caput sternalis***
  - ***Caput clavicularis***
  - ***Insertion***
    - ***proc. mastoideus + linea nuchae superior***
  - ***N. accesorius + C1 – C4***
- ***M. trapezius***
  - ***Protuberantia occipitalis externa***
  - ***Linea nuchae superior***
  - ***Aponeurosis lata – Th1 – Th4***
  - ***Th5-Th12***
  - ***insertion – clavilula, acromion, spina scapulae***
  - ***N. accesorius + C2 – C4***
- ***M. platysma***
  - ***N. facialis***

Neck muscles – suprahyoid, infrahyoid



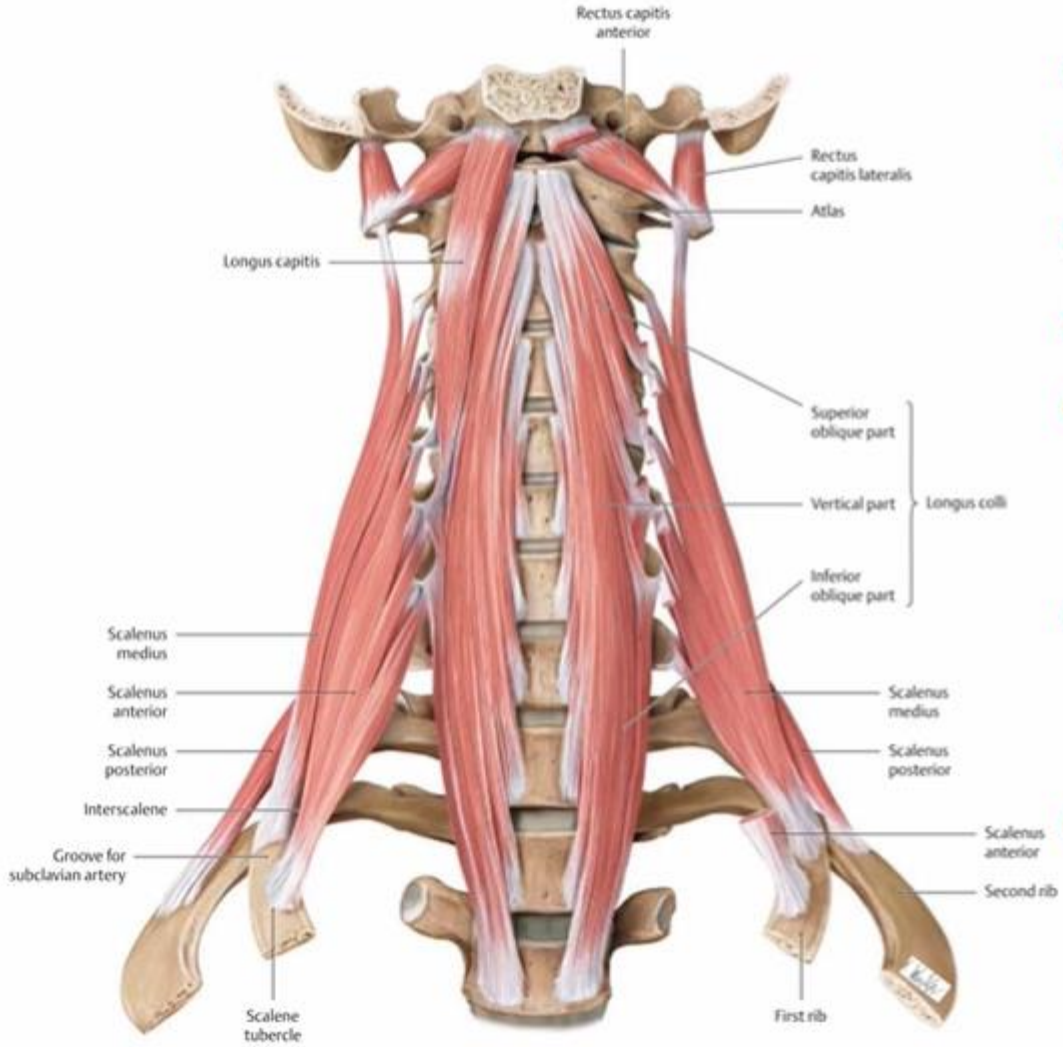
- *M. digastricus*
  - *Venter anterior – n. V3*
  - *Venter posterior – N. VII*
- *M. stylohyoideus. - n. VII*
- *M. mylohyoideus – n. V3*
- *M. geniohyoideus – ramus ventralis C1*
- *M. thyrohyoideus – ramus ventralis C1*
- *M. sternohyoideus – ansa cervicalis C1-3*
- *M. sternothyroideus - ansa cervicalis C1-3*
- *M. omohyoideus - ansa cervicalis C1-3*

Neck muscles – suprahyoid, infrahyoid



- *M. digastricus*
  - *Venter anterior – n. V3*
  - *Venter posterior – N. VII*
- *M. stylohyoideus. - n. VII*
- *M. mylohyoideus – n. V3*
- *M. geniohyoideus – ramus ventralis C1*
- *M. thyrohyoideus – ramus ventralis C1*
- *M. sternohyoideus – ansa cervicalis C1-3*
- *M. sternothyroideus - ansa cervicalis C1-3*
- *M. omohyoideus - ansa cervicalis C1-3*

Neck muscles - prevertebral and deep lateral



- *M. longus capitis – C1-3 – plexus cervicalis*
- *M. longus cervicis – C2-6 – plexus cervicalis*
- *M. rectus capitis anterior – rami ventr. C1-2*
- *M. rectus capitis lateralis – rami ventr. C1-2*
- *M. scalenus anterior – C3-C8 pl. cerv+brach*
  - *Tuberculi anteriores proc. transversi C3 -6*
  - *Costa I., in the front of sulcus a. subcl.*
- *M. scaluenus medius – C3-C8 pl. cerv+brach*
  - *Proc. transversusu C1 – C7*
  - *Costa I., behind sulcus a. subcl.*
- *M. scalenus posterior – C3-C8 pl. cerv+brach*
  - *Tuberculi psoteriores proc. Transversi C5 – C7*
  - *Outer margin costa II.*