

The Larynx



The larynx

Larynx Is the upper expanded part of trachea

It is the organ of

Respiration.

Phonation.

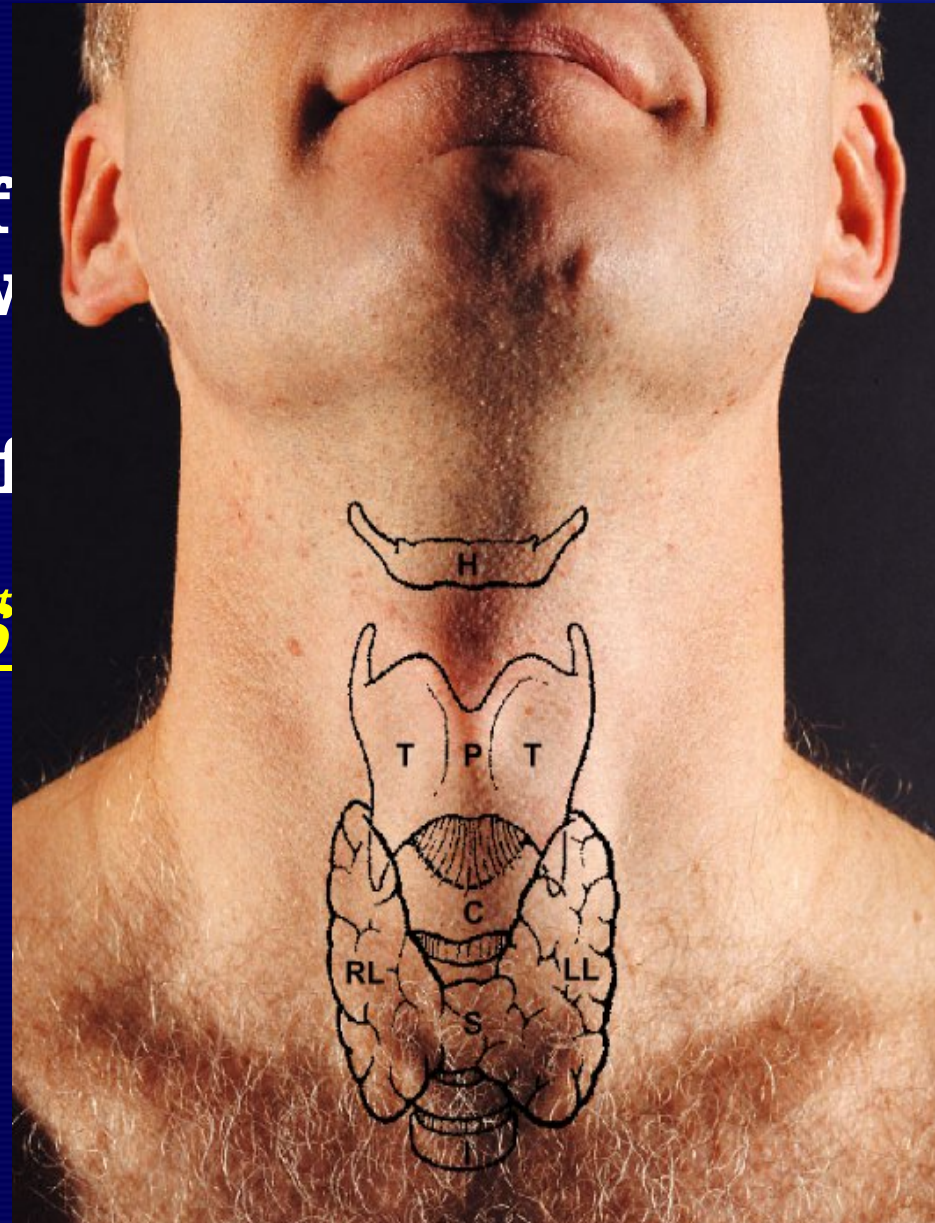
Protection.

Coughing.



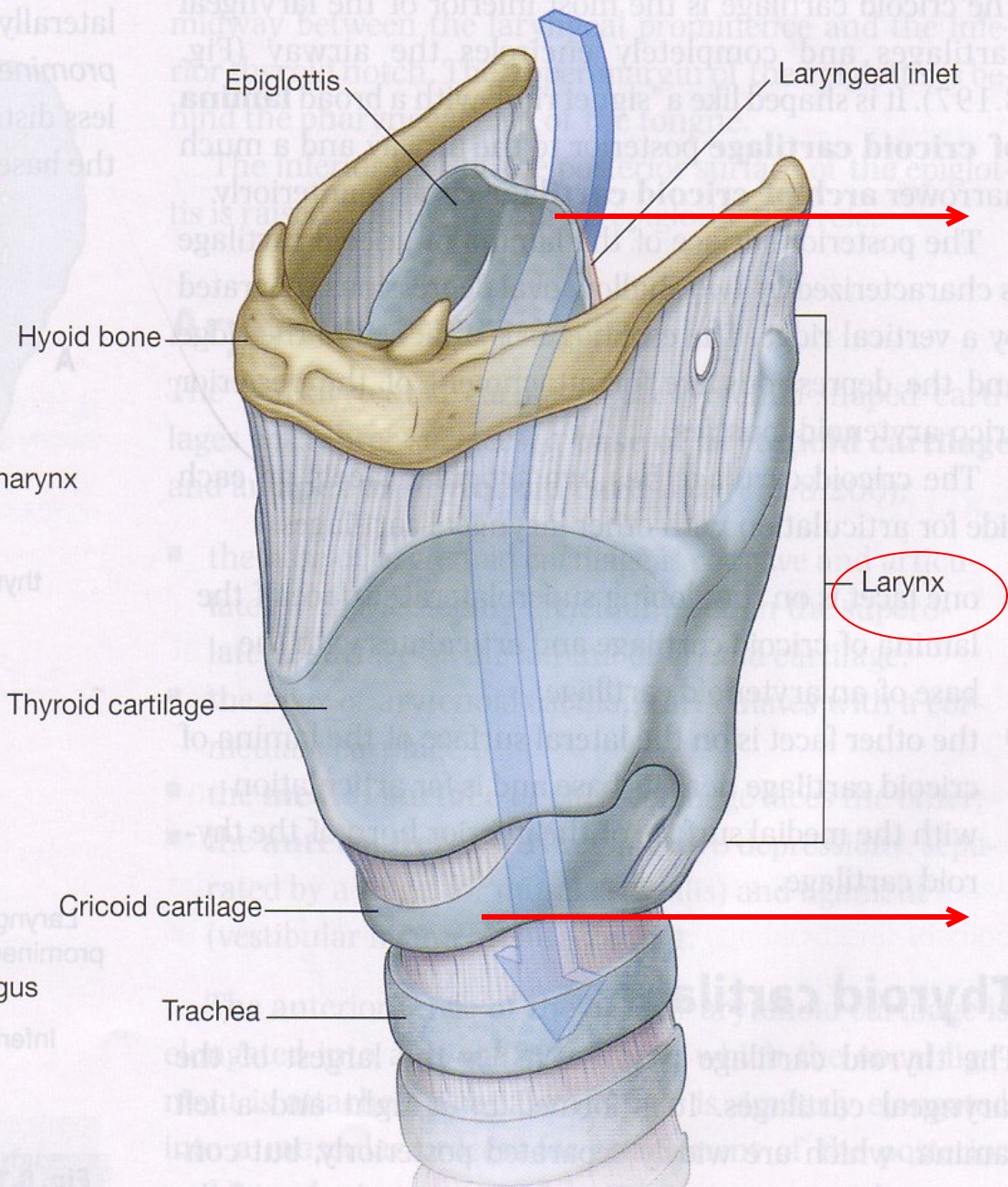
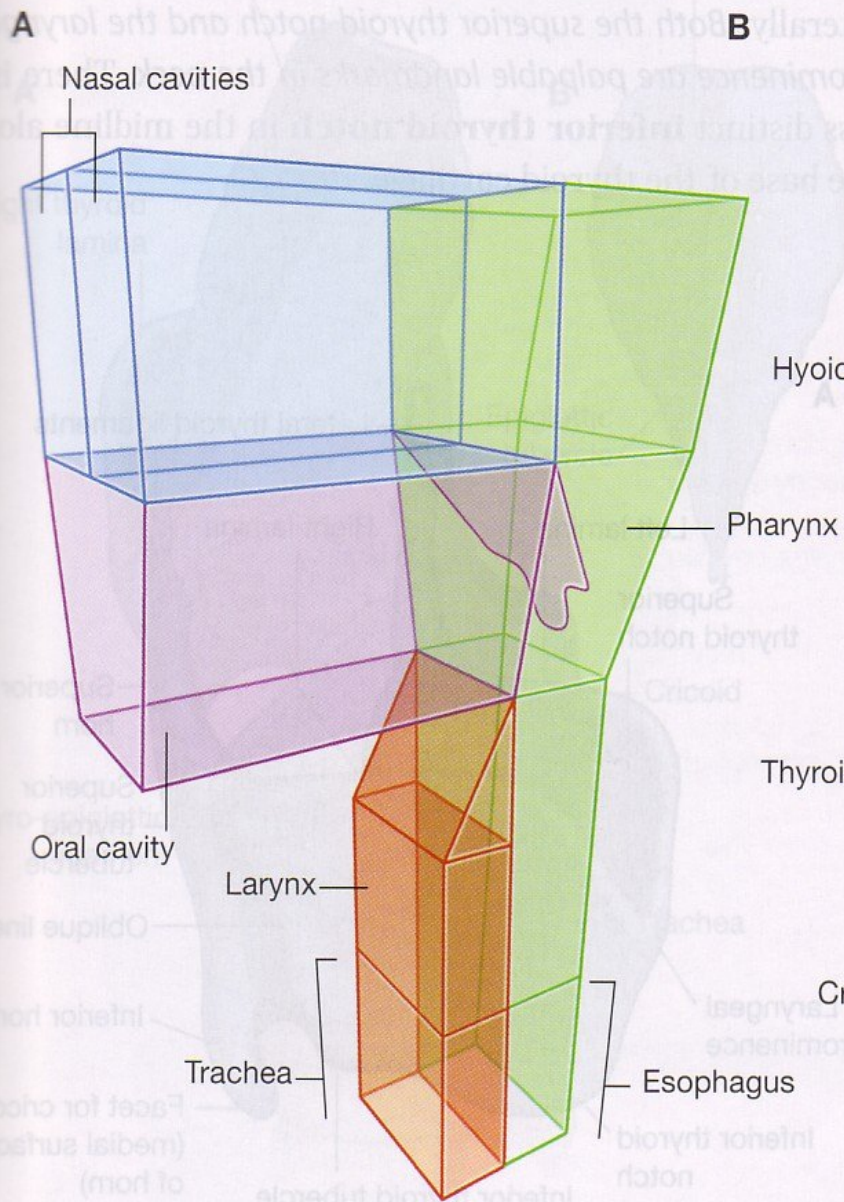
The Larynx

- ★ It lies in the median part of the front of the neck, below the hyoid bone.
- ★ In front of the lower part of Pharynx and Tongue . opposite the 3rd, 4th, 5th and 6th cervical vertebrae.
- ★ It extends from the Upper border of Epiglottis to the lower border of Cricoid cartilage.



Its upper end opens into the Laryngopharynx
by the Laryngeal Inlet

Its lower end is Continuous with the Trachea
at the level of the Lower Border Sixth
Cervical Vertebra.



The larynx consists of

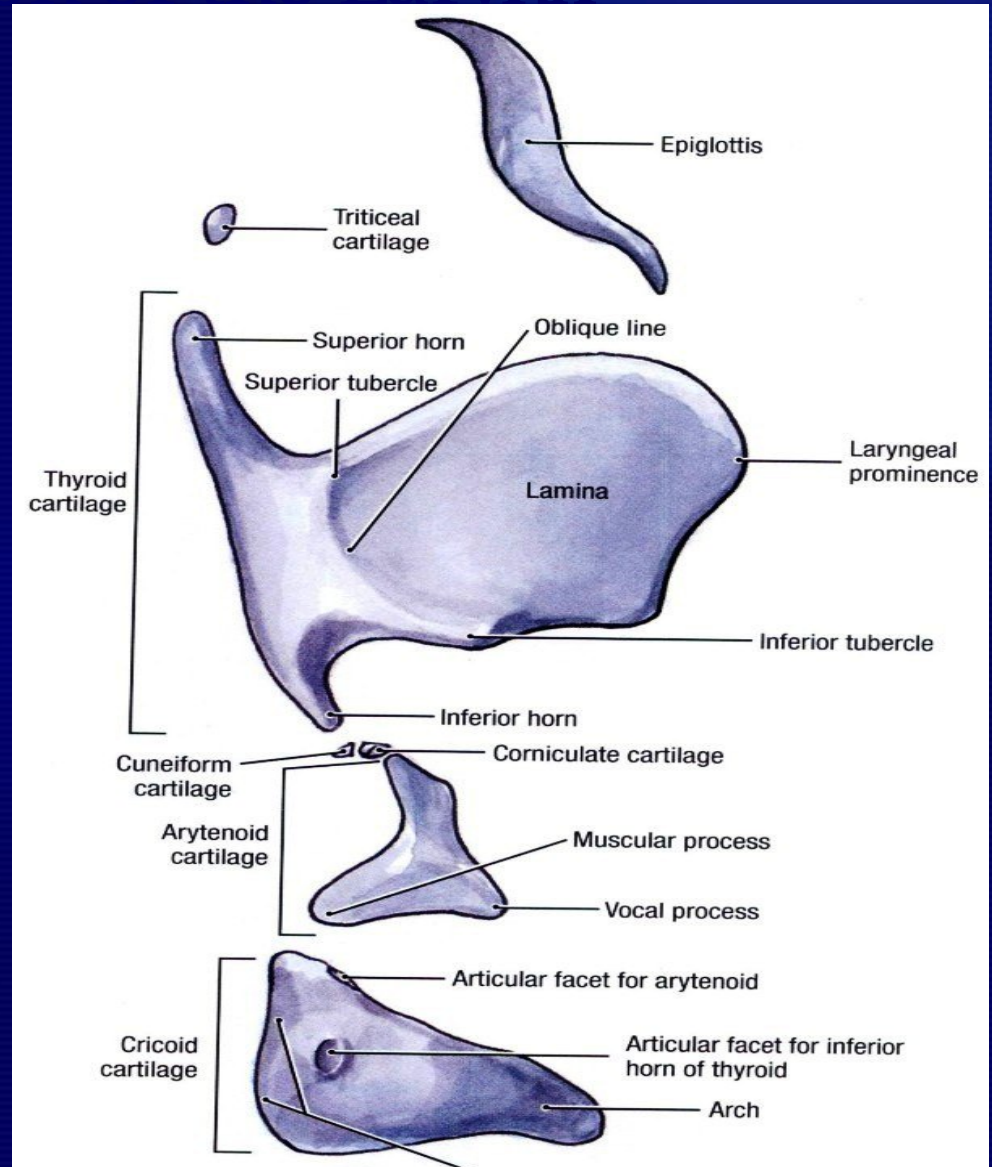
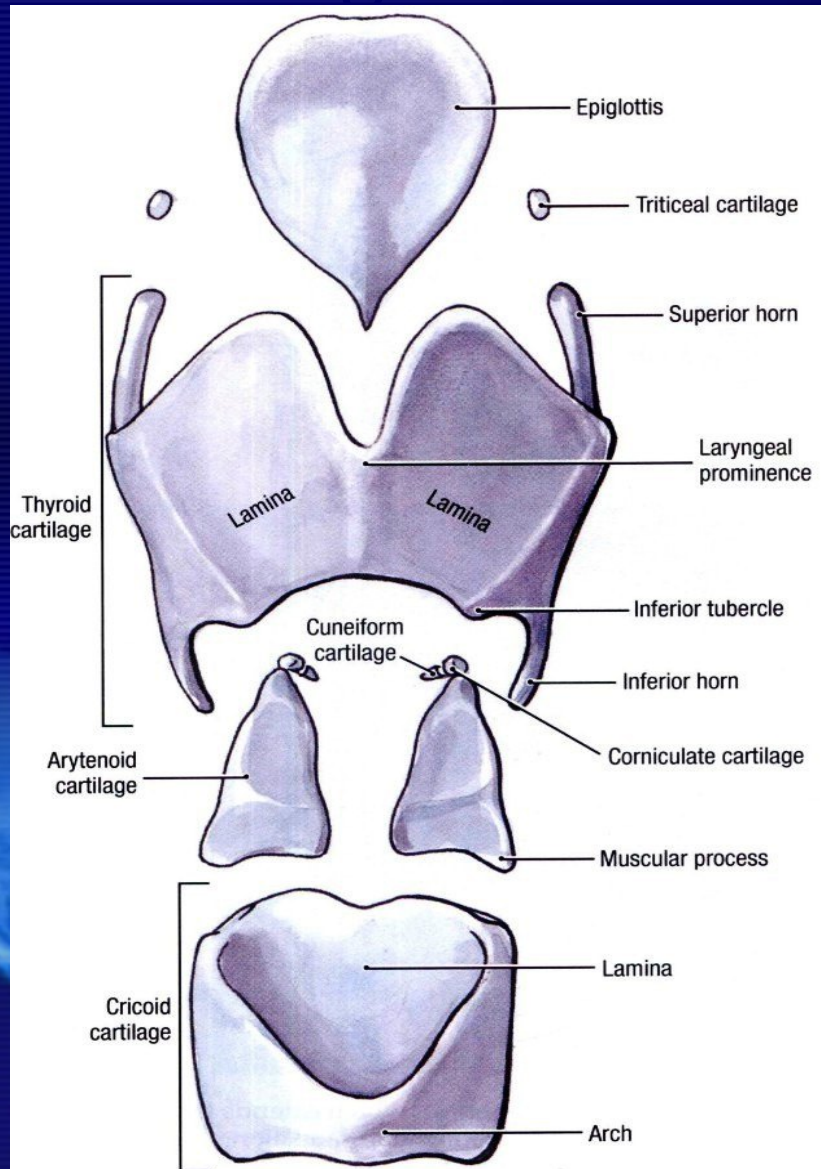
Cartilages.

Muscles.

Ligaments and mucus membranes.

Joints.

Cartilaginous Framework of the Larynx



The Larynx

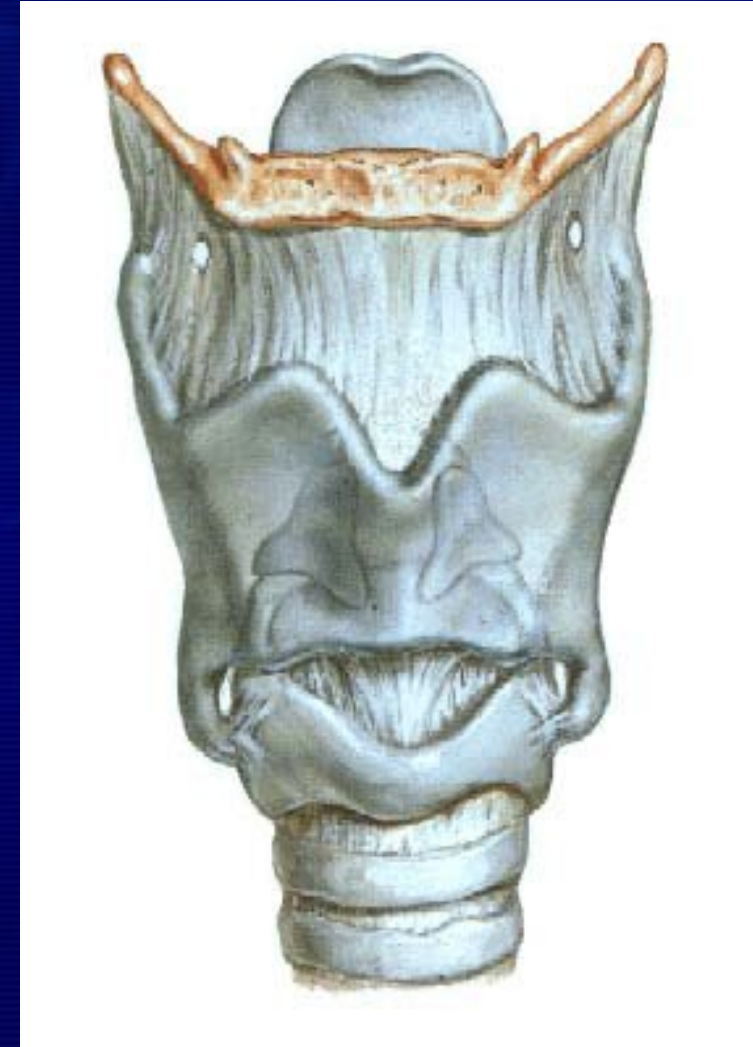
★ Laryngeal cartilages:

A. Single:

- A. Thyroid cartilage.
- B. Cricoid cartilage.
- C. Epiglottis cartilage.

B. Paired:

- D. Arytenoid cartilages.
- E. Corniculate cartilages.
- F. Cuneiform cartilages.



The Hyoid bone

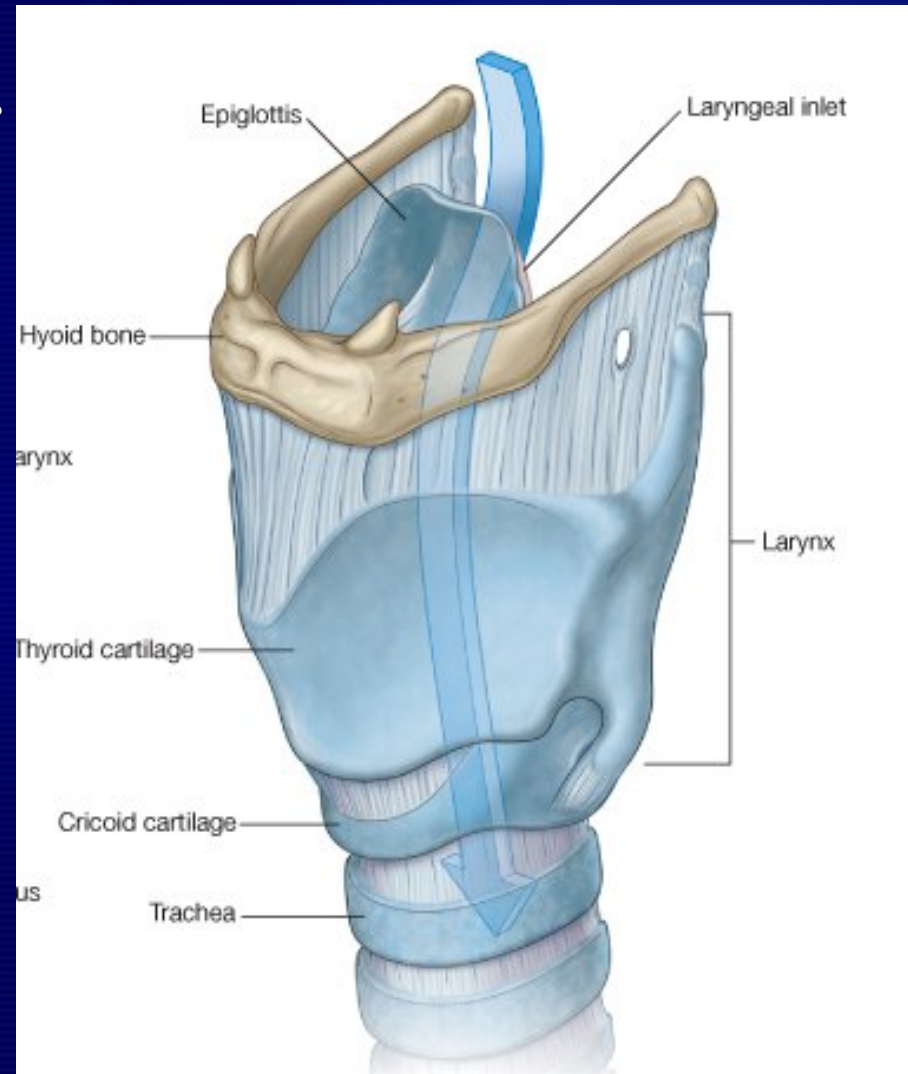
A supportive structure for the Larynx and the Root of the Tongue.

The larynx is suspended to the Hyoid bone.

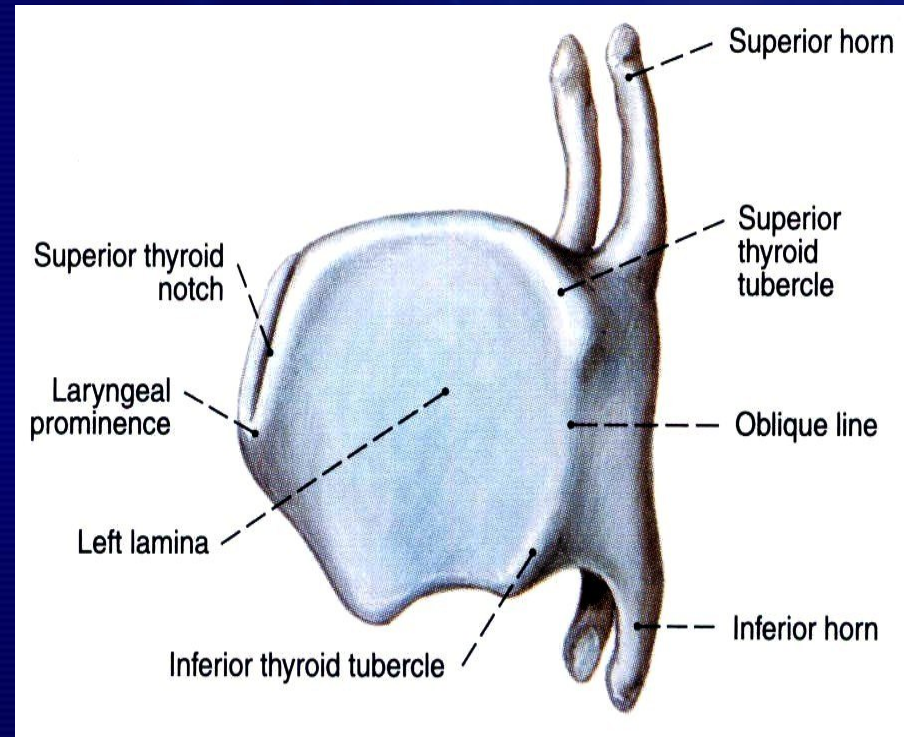
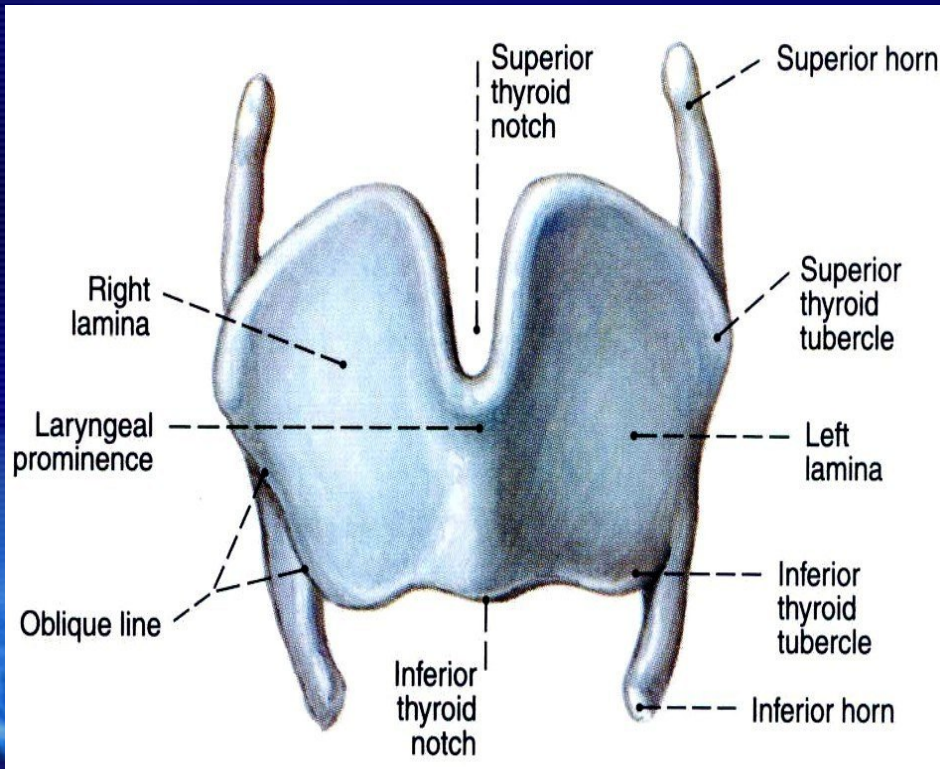
An attachment point to some Extrinsic Muscles of the larynx.

U-shaped and located in the anterior part of the neck.

Consists of : Body- Lesser Cornua Greater Cornua



Thyroid Cartilage



Thyroid cartilage

The largest cartilage of the larynx, related to the thyroid G.

Look like a hard cover of an open book.

Two laminae, widely separated behind, unite ant, inferiorly.

Superior long horn, and inferior short horn

The superior horn is attached by ligaments to the hyoid bone.

The inferior horn articulates with cricoid cartilage (Cricothyroid joint).

Lateral outer surface of lamina has oblique line in pos. part.

Sternothyroid m is Inserted

Thyrohyoid take Origin

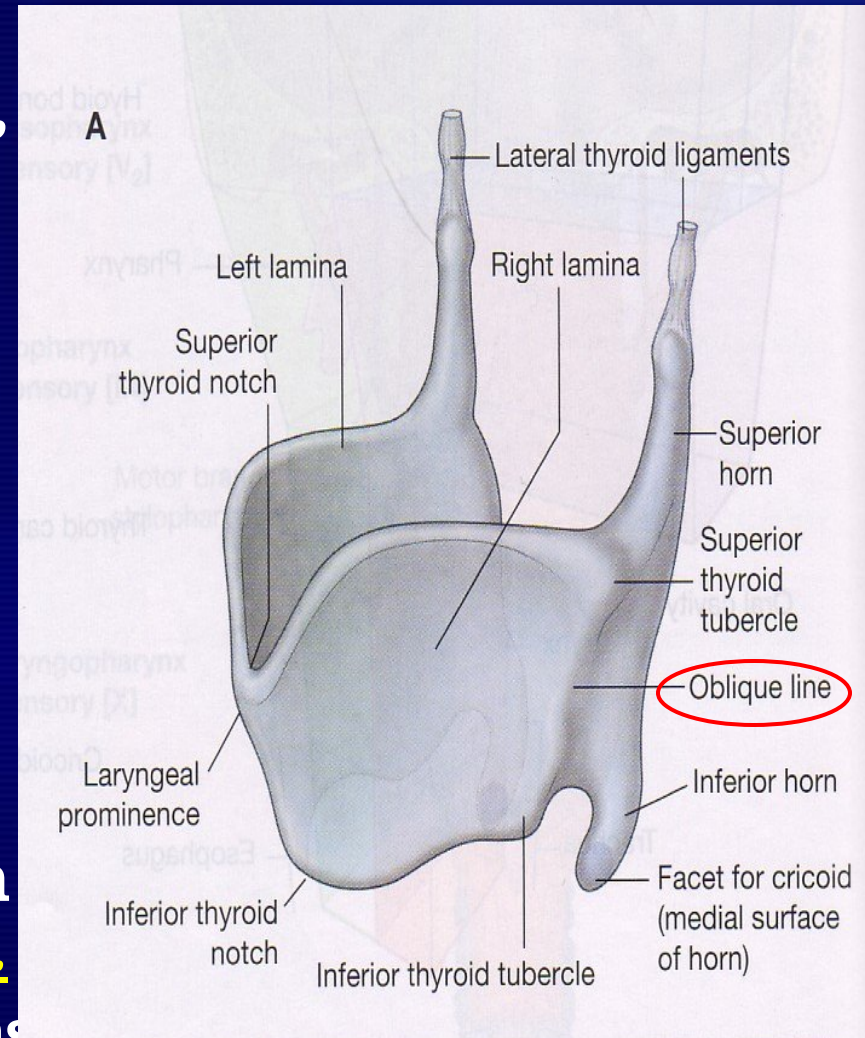


Fig. 8.198 Thyroid cartilage. A. Anterolateral view.

Continued

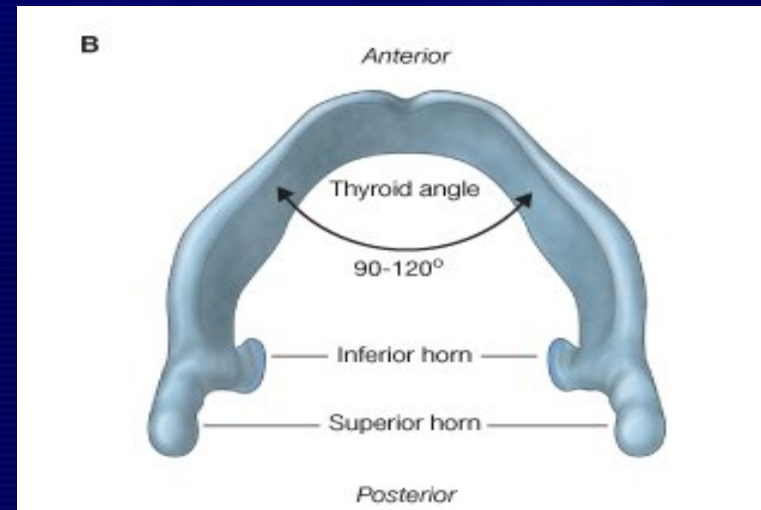
Thyroid cartilage

Thyroid notch superiorly

The angle between the two laminae is called the thyroid angle and is 90 degree in males and 120 degree in females (ADAM'S APPLE).

This means that VC are longer 2.5 cm in male 1.6 in female.

The medial surface of lamina are smooth and concave and give origin to vocal ligament.



Cricoid cartilage

A signet ring, with the wide part of the ring behind.

Anterior: Arch

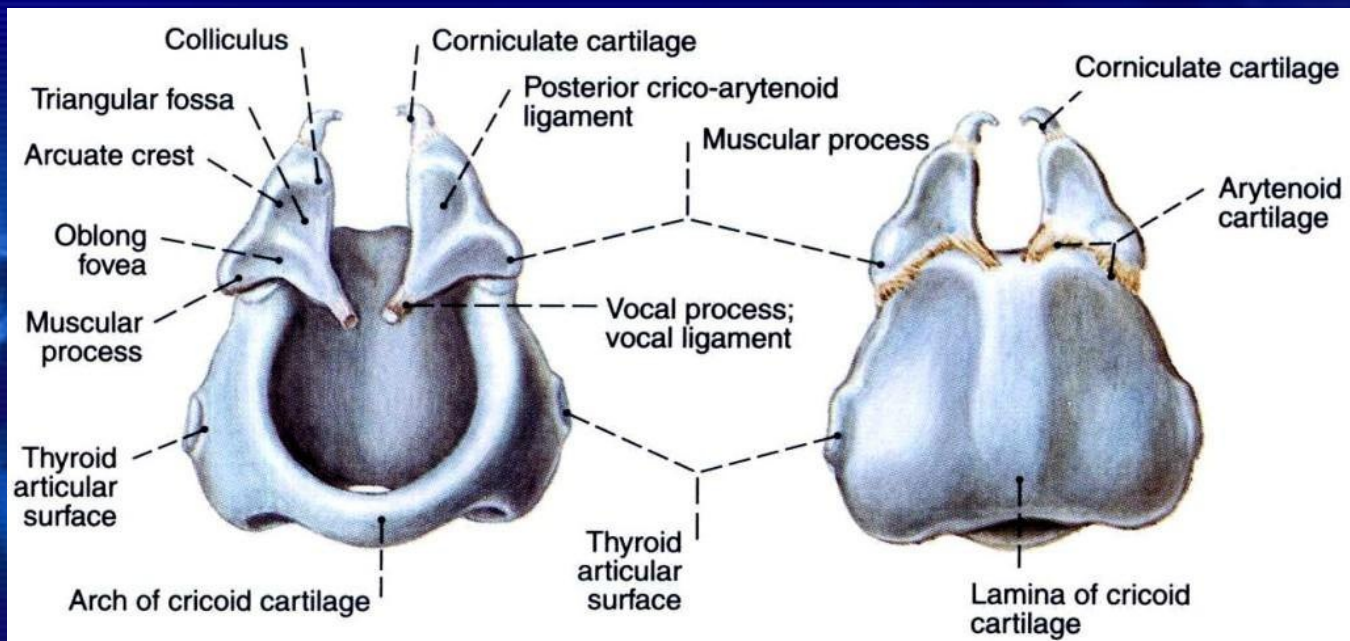
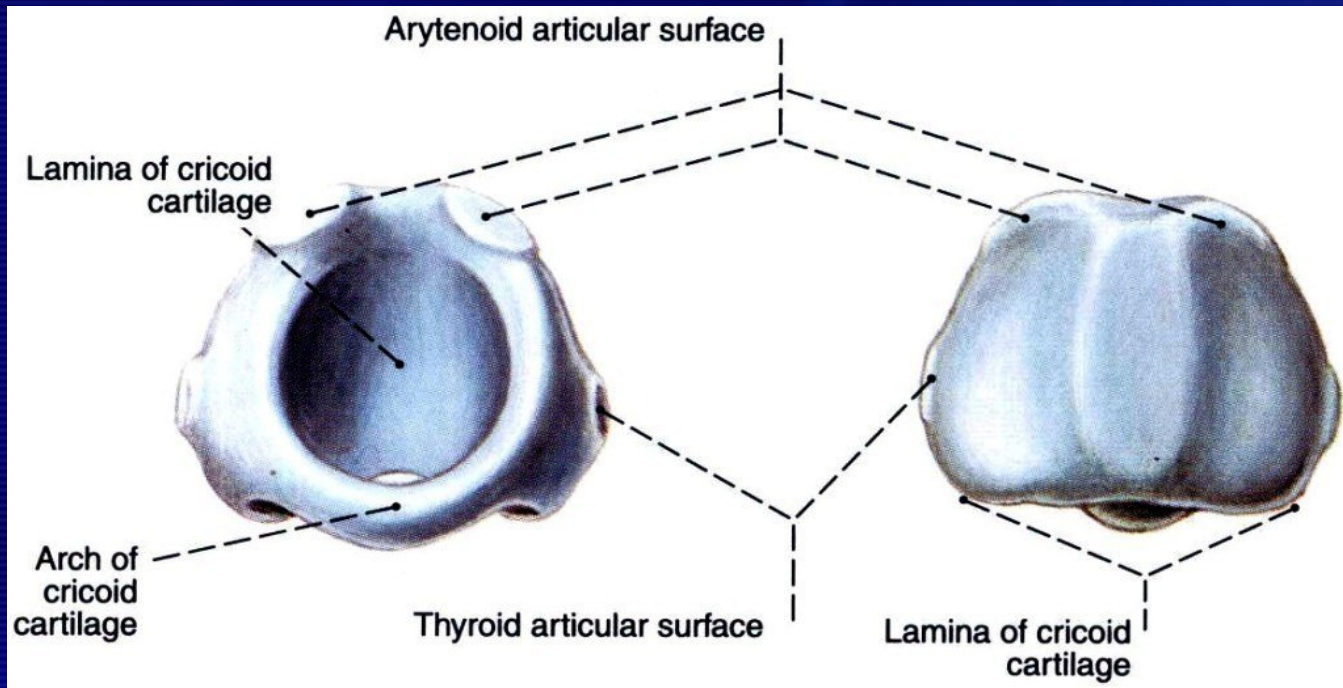
Posterior: Lamina

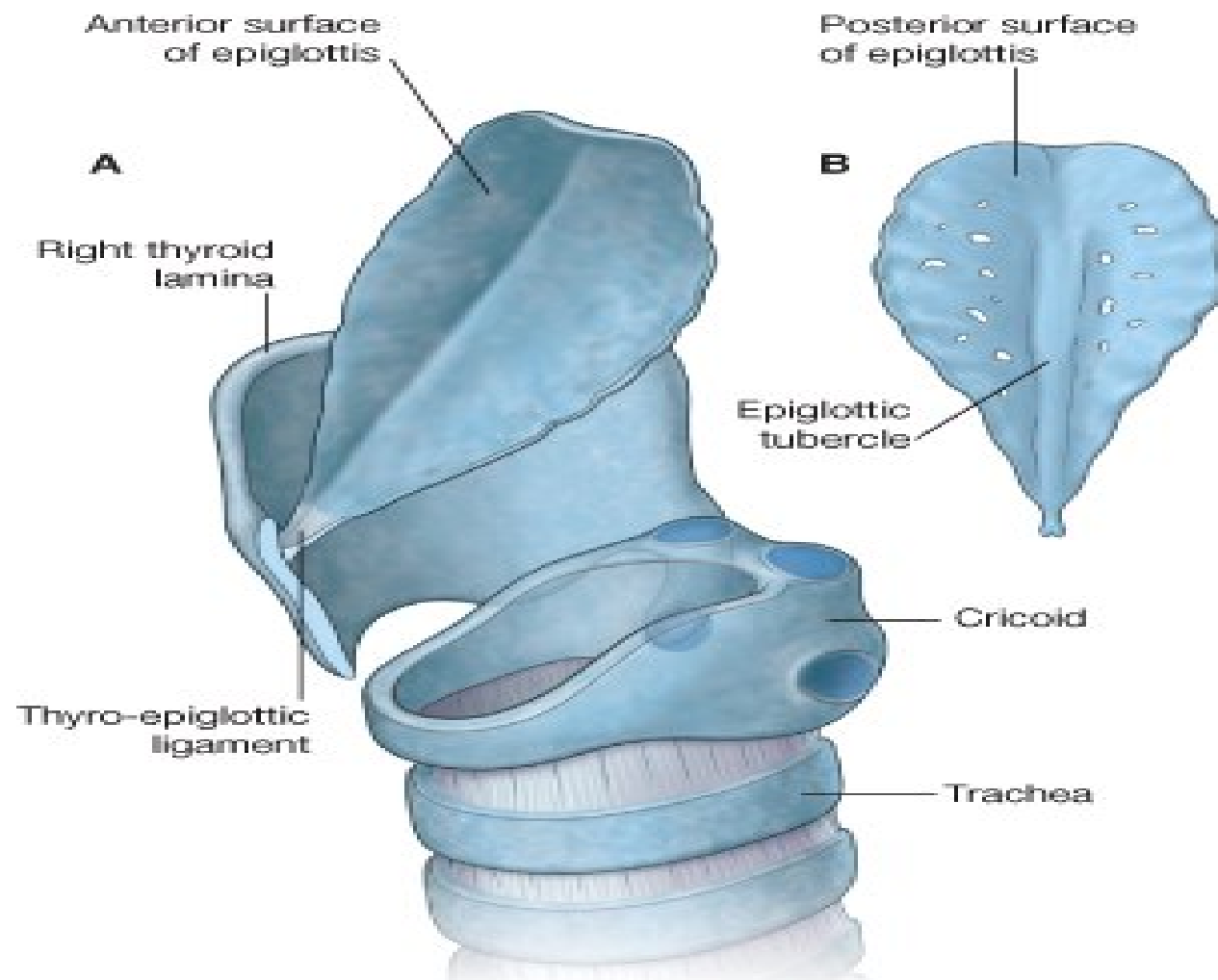
It encircles the larynx below thyroid cartilage and connects to first ring of trachea.

Laterally the arch of the cricoid articulates with the inferior horns of the thyroid cartilage

(Cricothyroid joint).







Arytenoid Cartilage

A pyramidal-shaped cartilage, with an apex, base and 3 surfaces

The Apex is directed upward and articulates with the Corniculate cartilage.

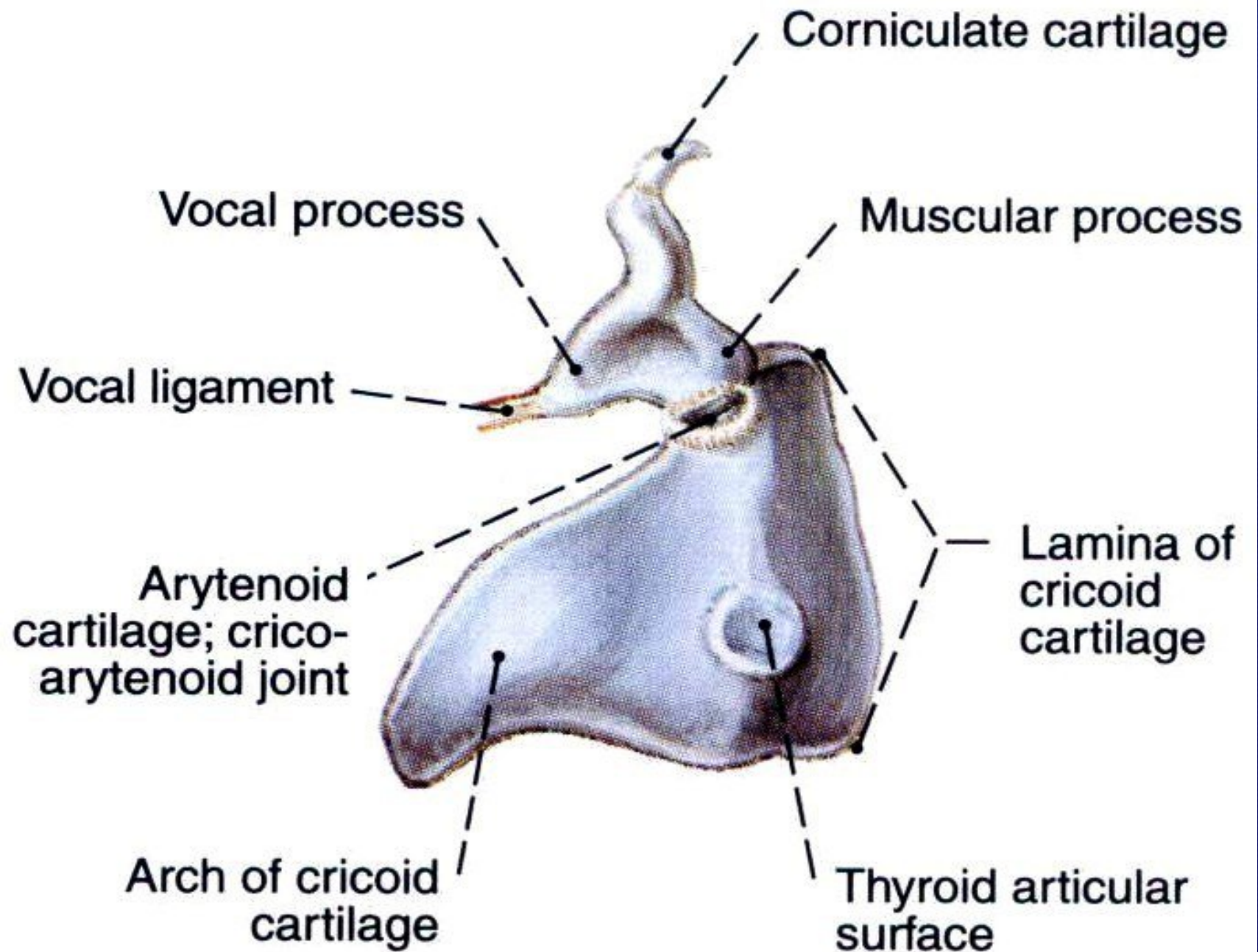
The Base is directed downwards and articulates with the upper border of the lamina of Cricoid Cartilage.



The *Lateral Angle* of the base projects and forms the **Muscular Process**

The *Anterior Angle* of the base projects to form the **Vocal Process**.

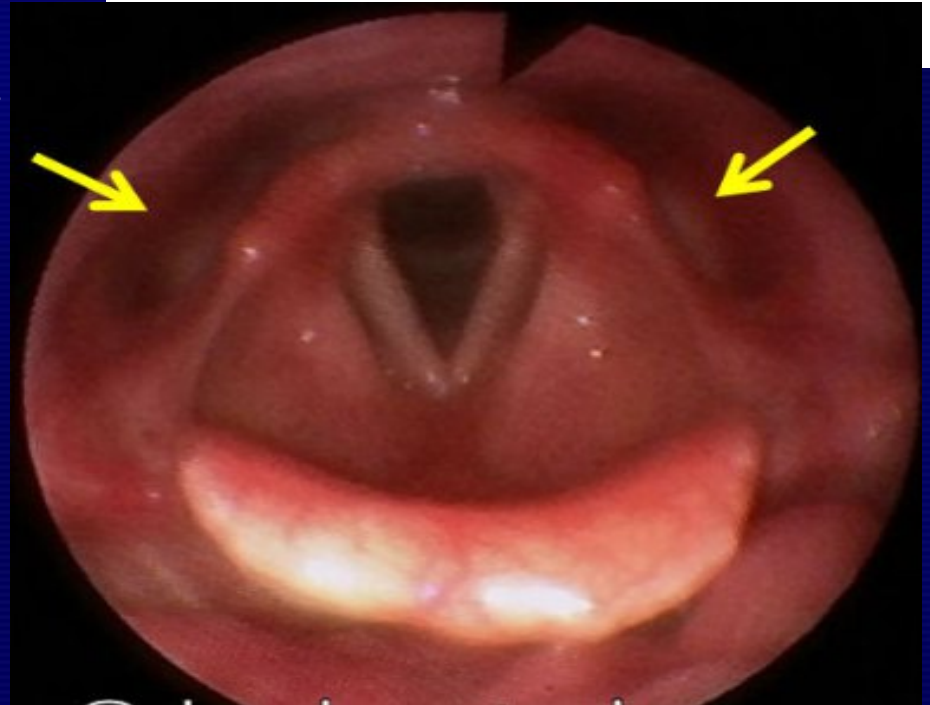




Corniculate Cartilage

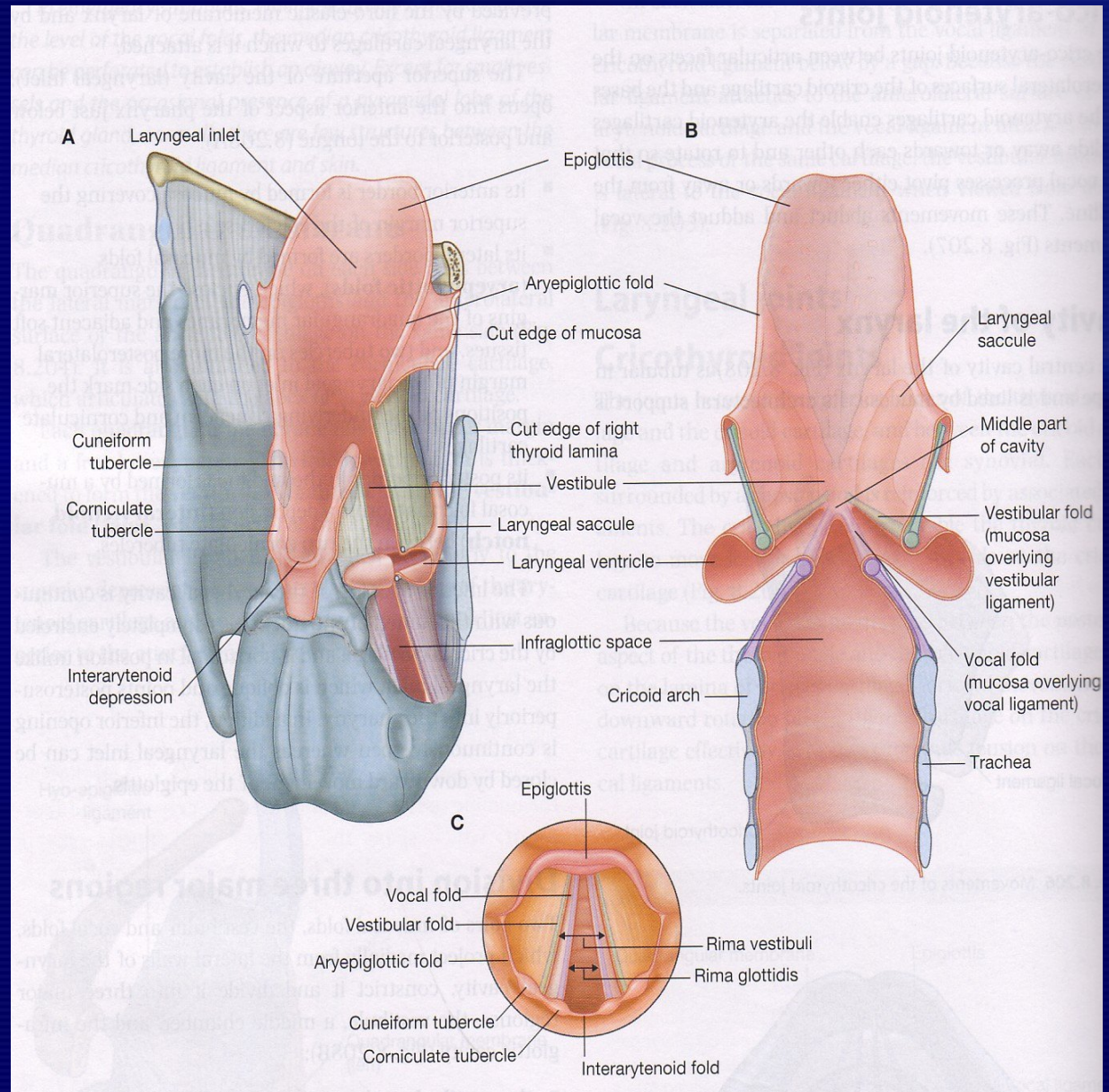
A small cartilage on the apex of the arytenoids cartilage.

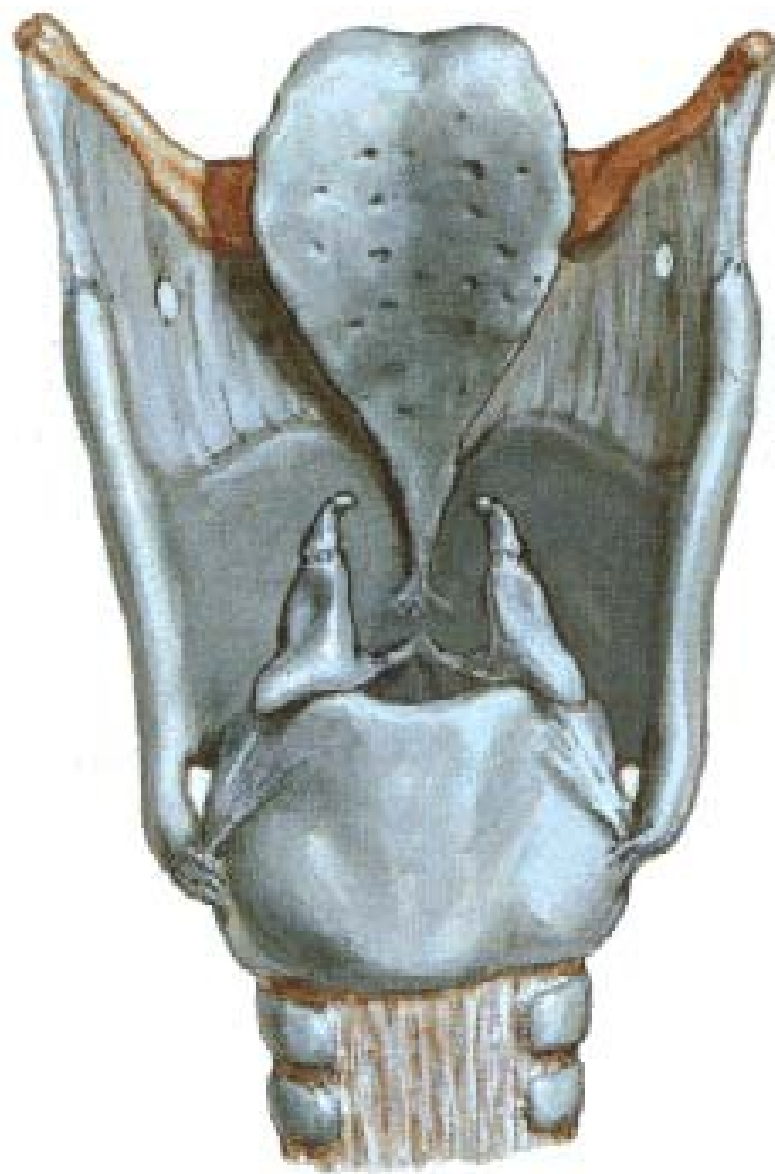
Enclosed in the Aryepiglottic fold forming the Corniculate Tubercle.



Cuneiform Cartilage

A small nodule enclosed in the aryepiglottic fold forming the **Cuneiform Tubercle**.





Epiglottis Cartilage

A **Leaf-Shaped** elastic cartilage.

It **Projects** upwards behind the tongue and hyoid bone.

Has an **Upper Broad** free end and a **Lower Tapering** end.

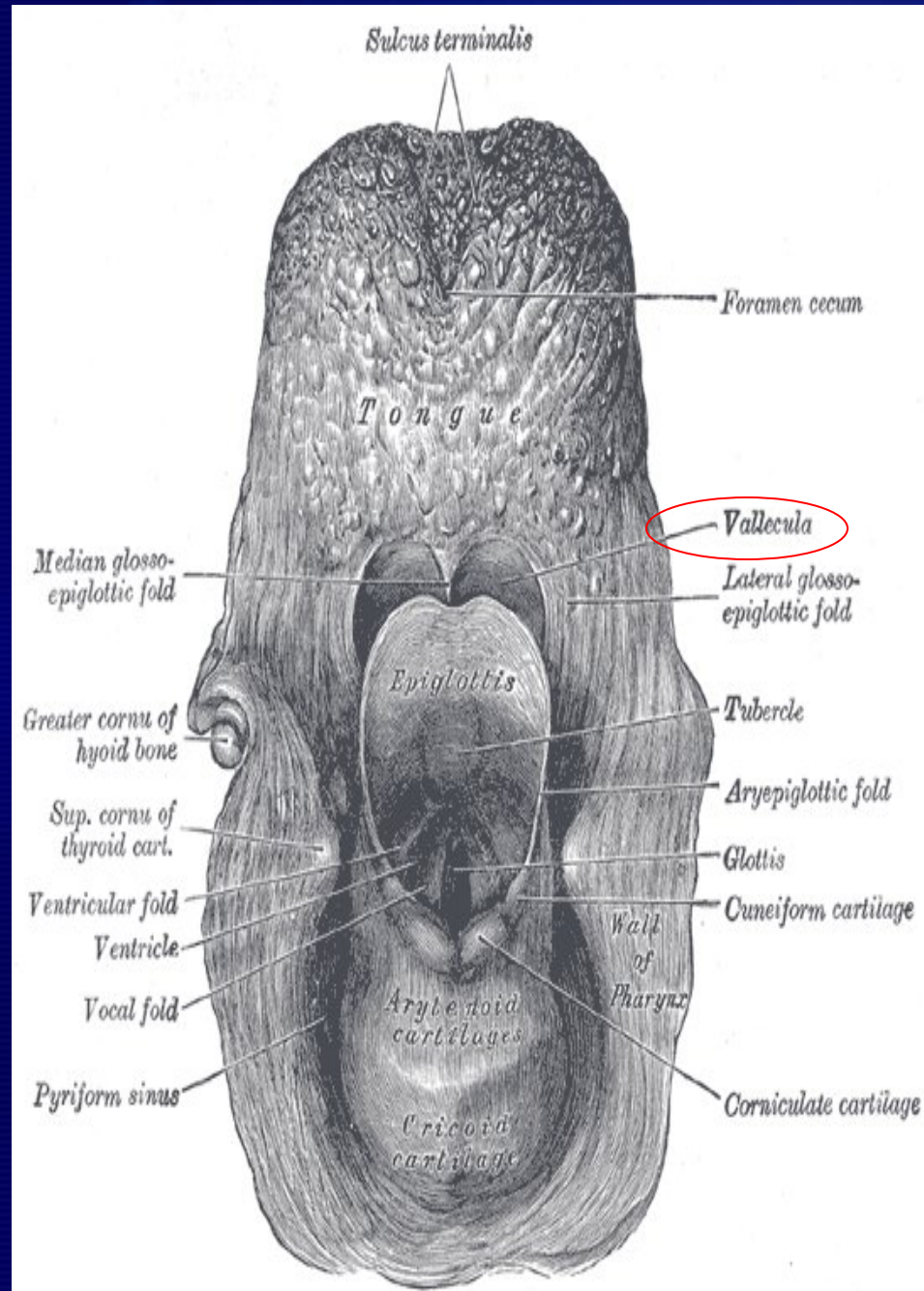


Anteriorly, it is connected to:

- The root of the tongue, by the Median and Lateral glosso-epiglottic folds.

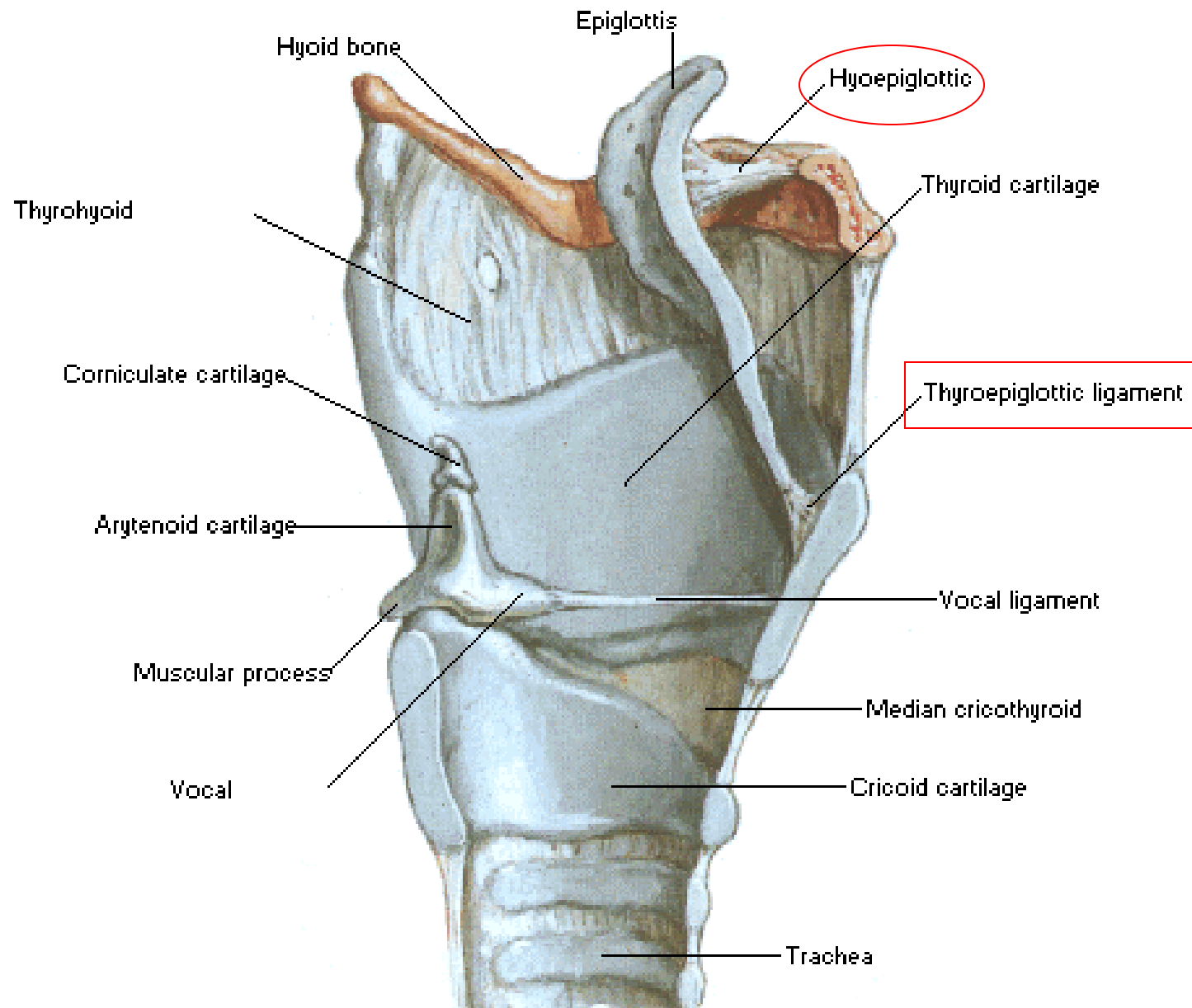
- The hyoid bone, by the Hyo epiglottic ligament.

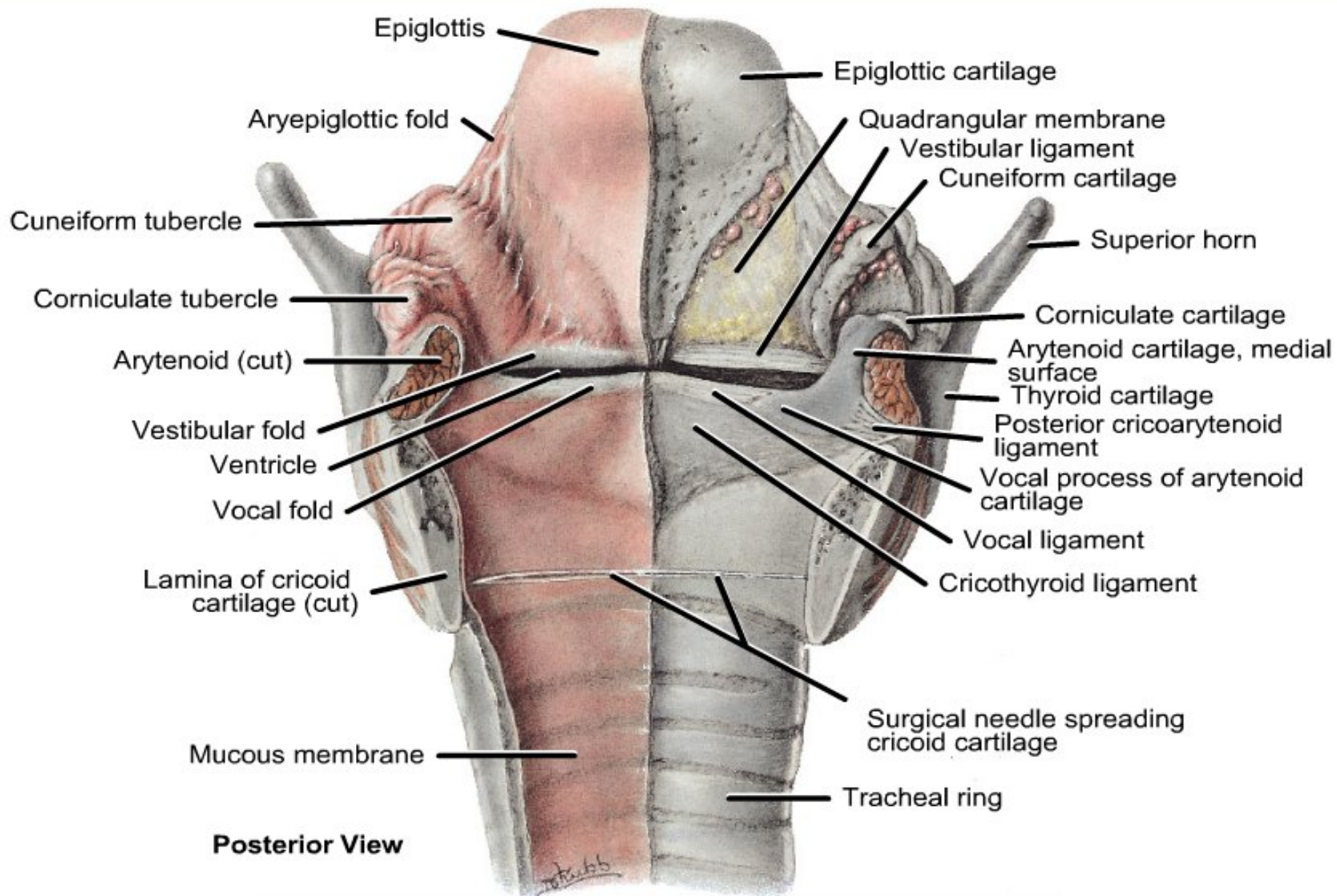
- The inner surface of the thyroid cartilage by the Thyro epiglottic ligament.



Cartilages of Larynx

Sagittal Section





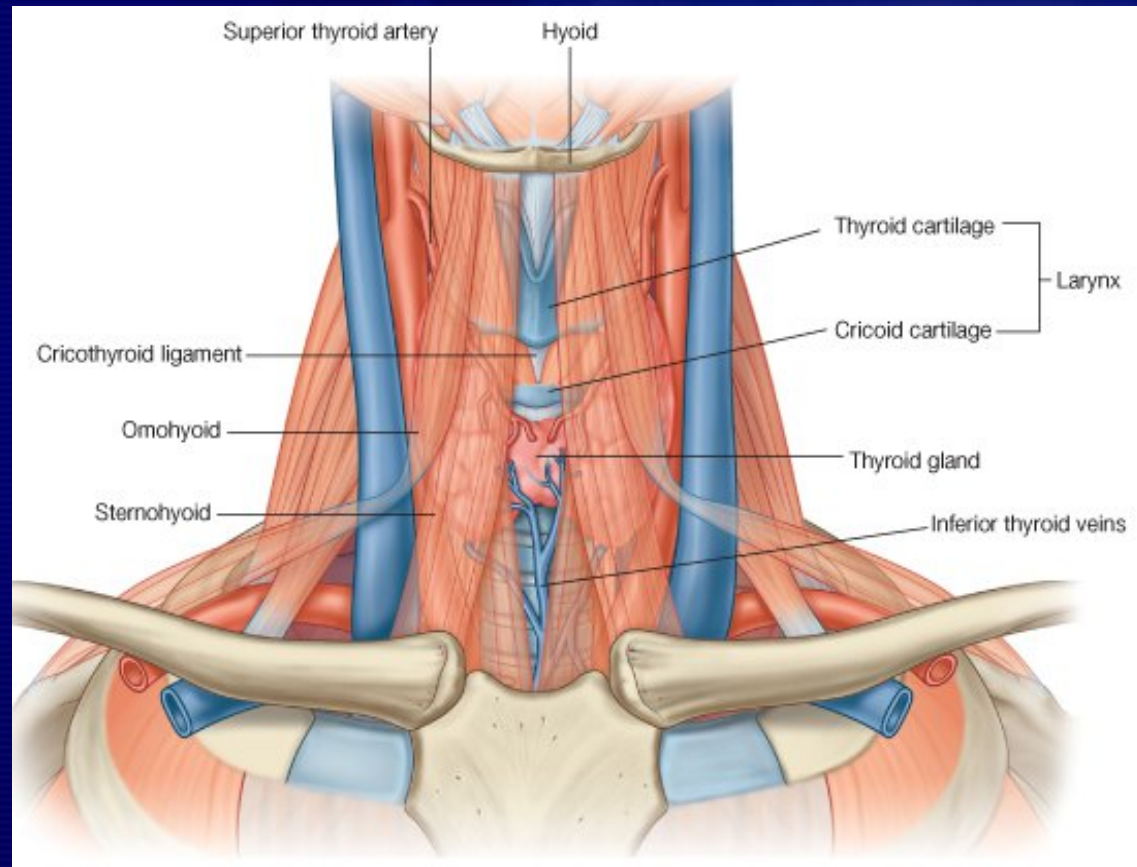
After incision and retraction (spreading)
of sides of incision into posterior
wall of larynx and trachea

Relations of larynx

Anterolateral Skin, fascia ,
2 layers of strap M.

On each side:
Great vessels of neck
Lobe of thyroid gland.

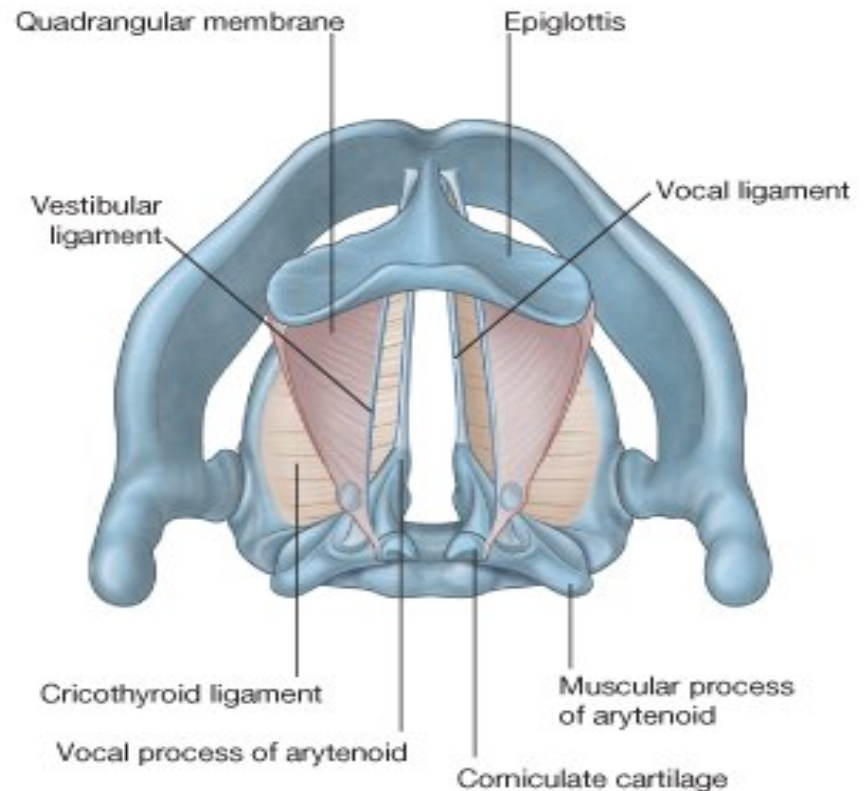
Behind:
Pharynx.



Joints of the larynx

**The Cricothyroid
joints**

**Cricoarytenoid
joints**



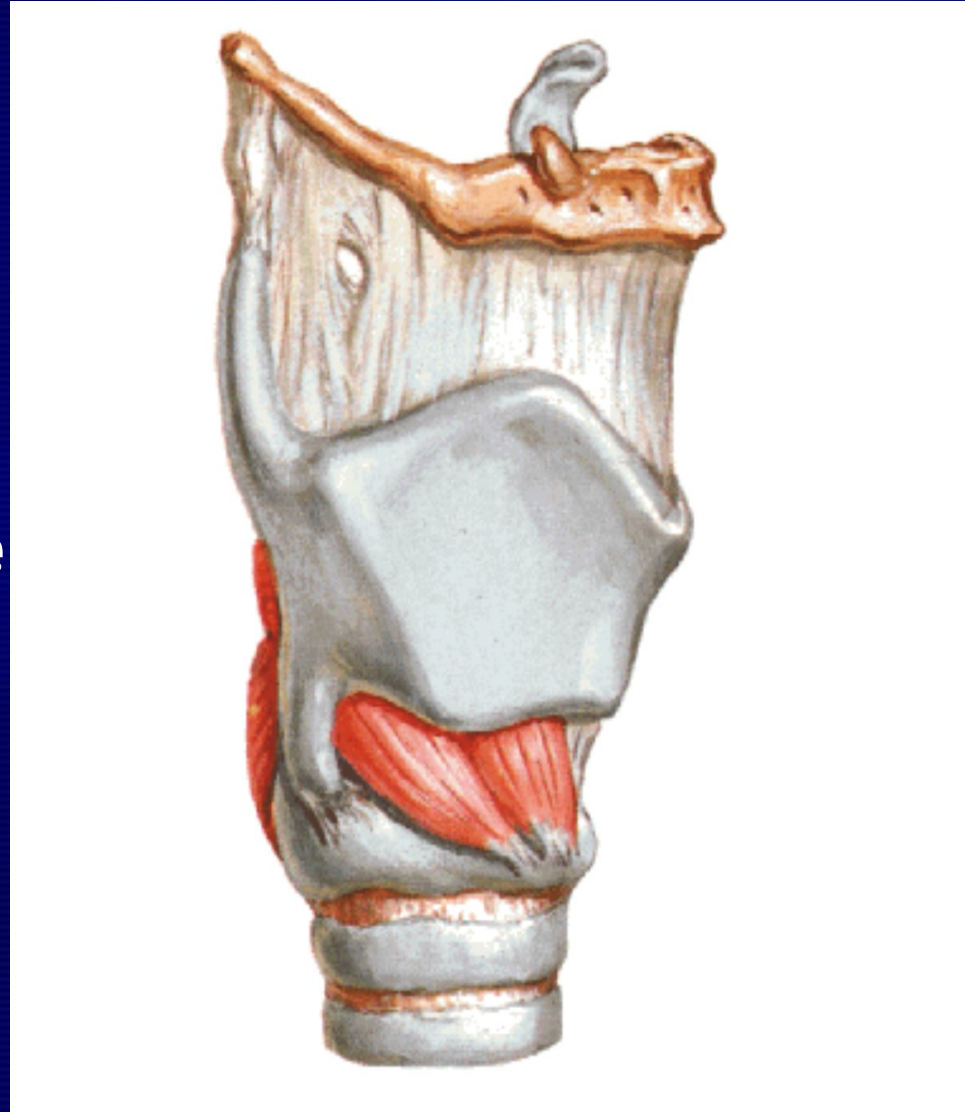
The Cricothyroid joints

The inferior horn of the thyroid cartilage articulates with the lateral side of the lamina of the cricoid cartilage.

Permits the cricoid and the thyroid cartilages to become closer together or farther apart.

This movement is produced by the action of the

Cricothyroid muscle and thyro-arytenoids
Tense or Relax the Vocal Cords.



Cricoarytenoid joints

Between the base of the arytenoids and the cricoid lamina.

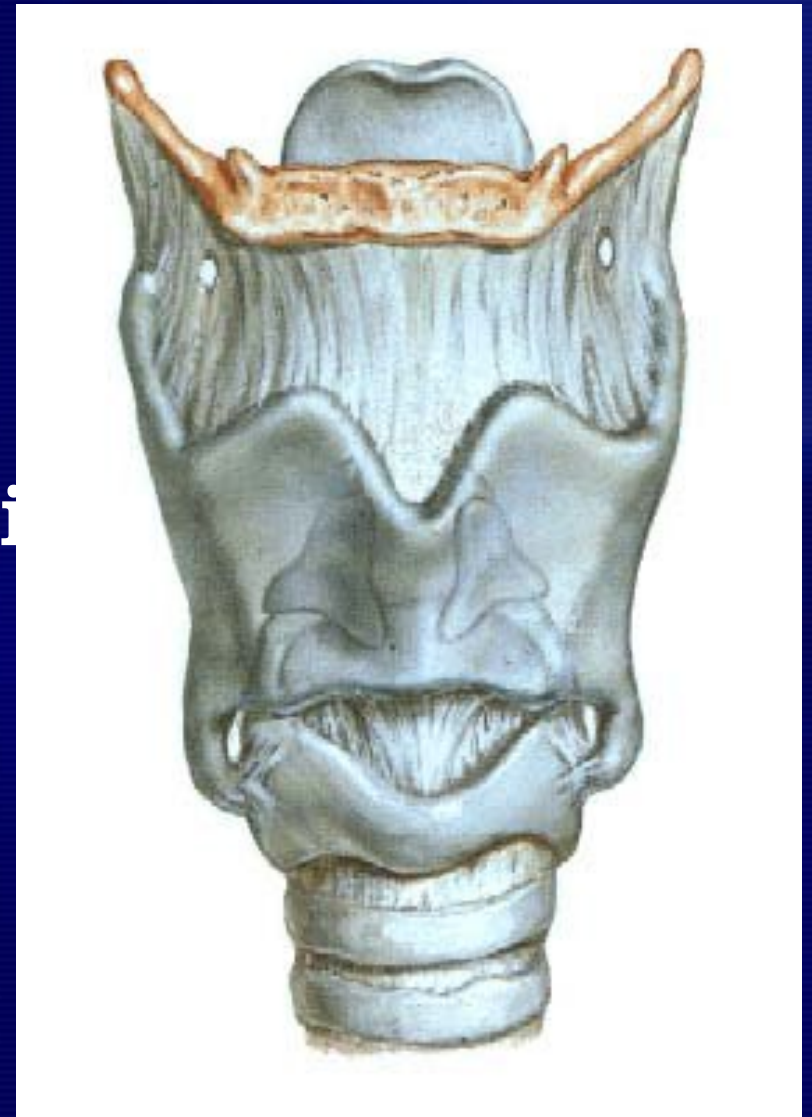


Membranes and ligaments of the larynx



Thyrohyoid membrane

In the space between the Hyoid bone and the Thyroid cartilage.

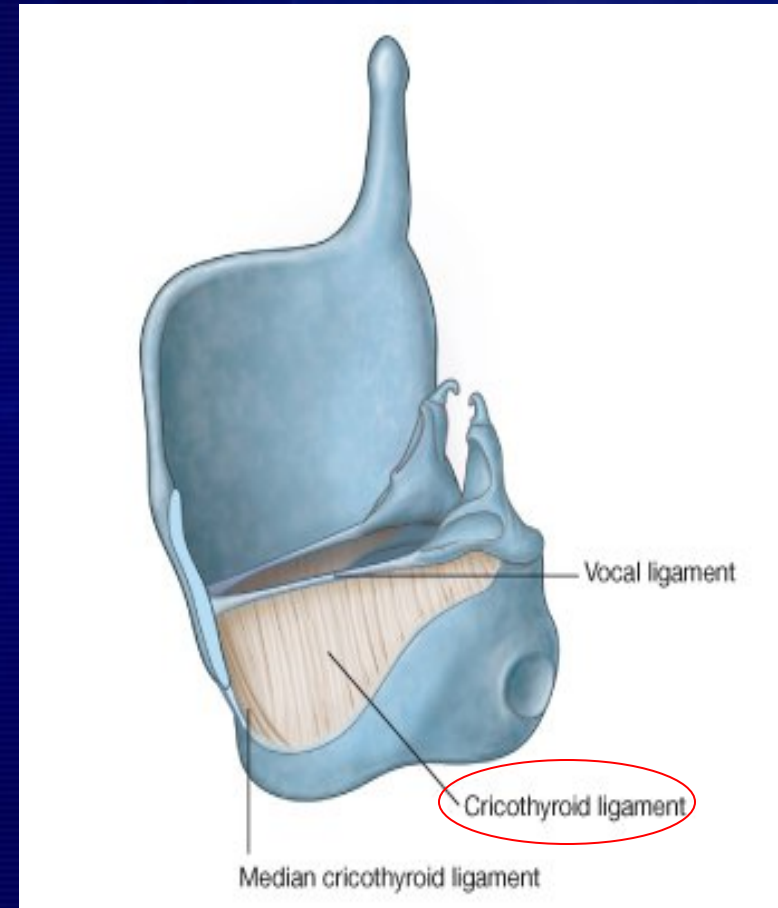


The Cricothyroid Ligament

An elastic band which lies below and on the inner aspect of the thyroid cartilage.

It is connected to thyroid cartilage, cricoid cartilage and arytenoids cartilage.

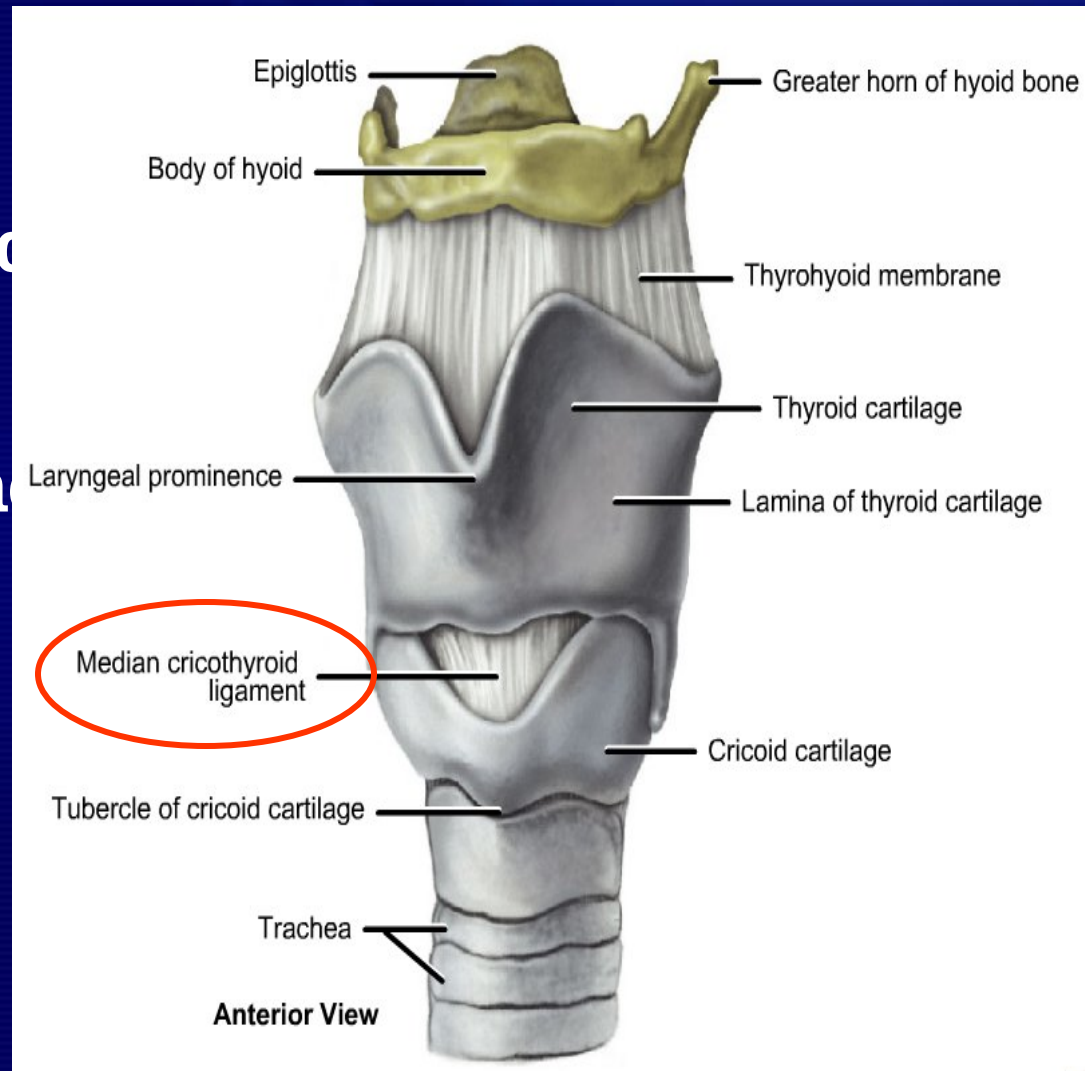
Two parts of the ligament can be recognized:



Median Cricothyroid ligament:

The anterior thickened part of the ligament which connects the adjacent borders of the cricoid and thyroid cartilages.

The ligament is overlapped by the cricothyroid muscle.

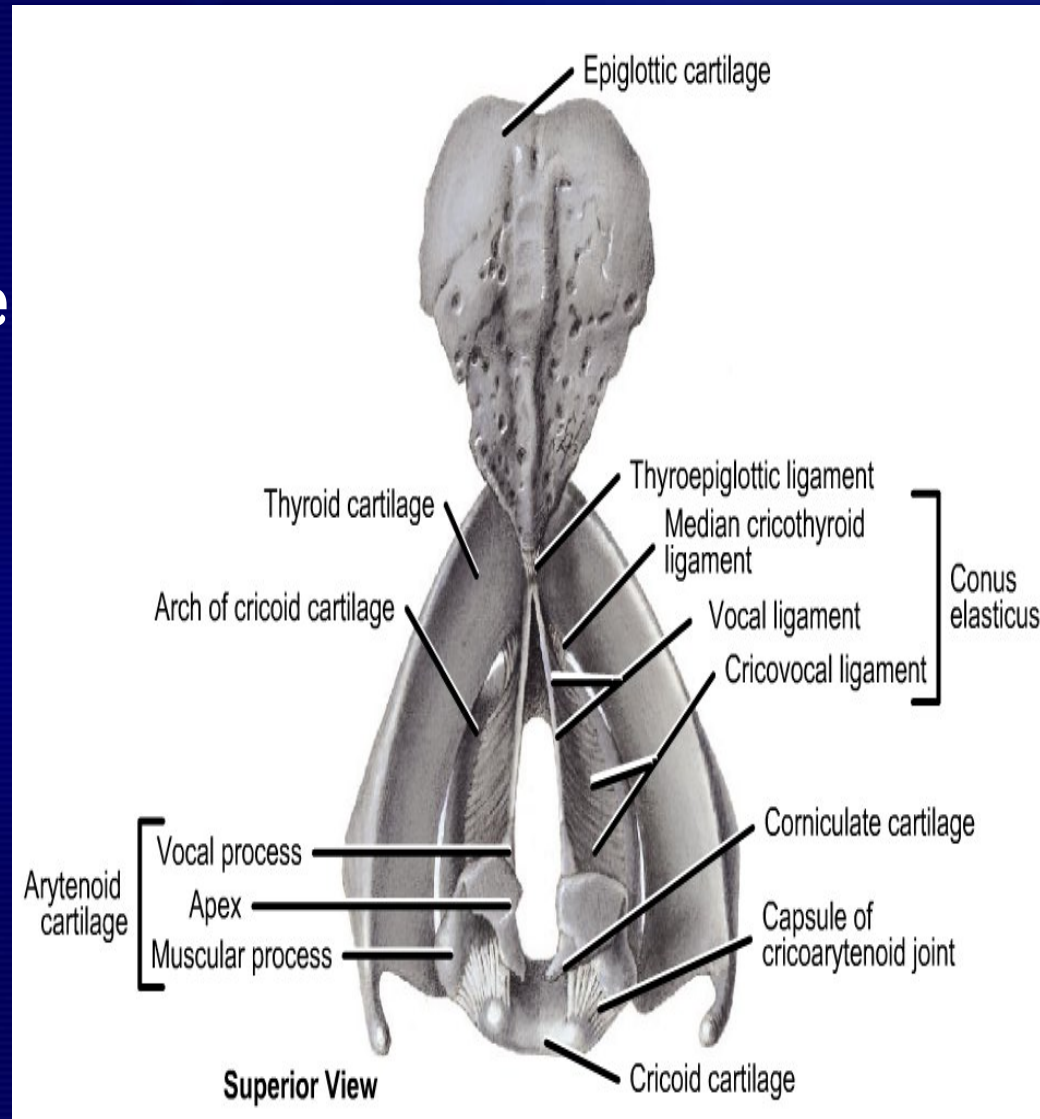


Lateral cricothyroid ligament (crico-vocal membrane)

This ligament is attached inferiorly to the upper border of cricoid cartilage superiorly, it has 2 attachments:

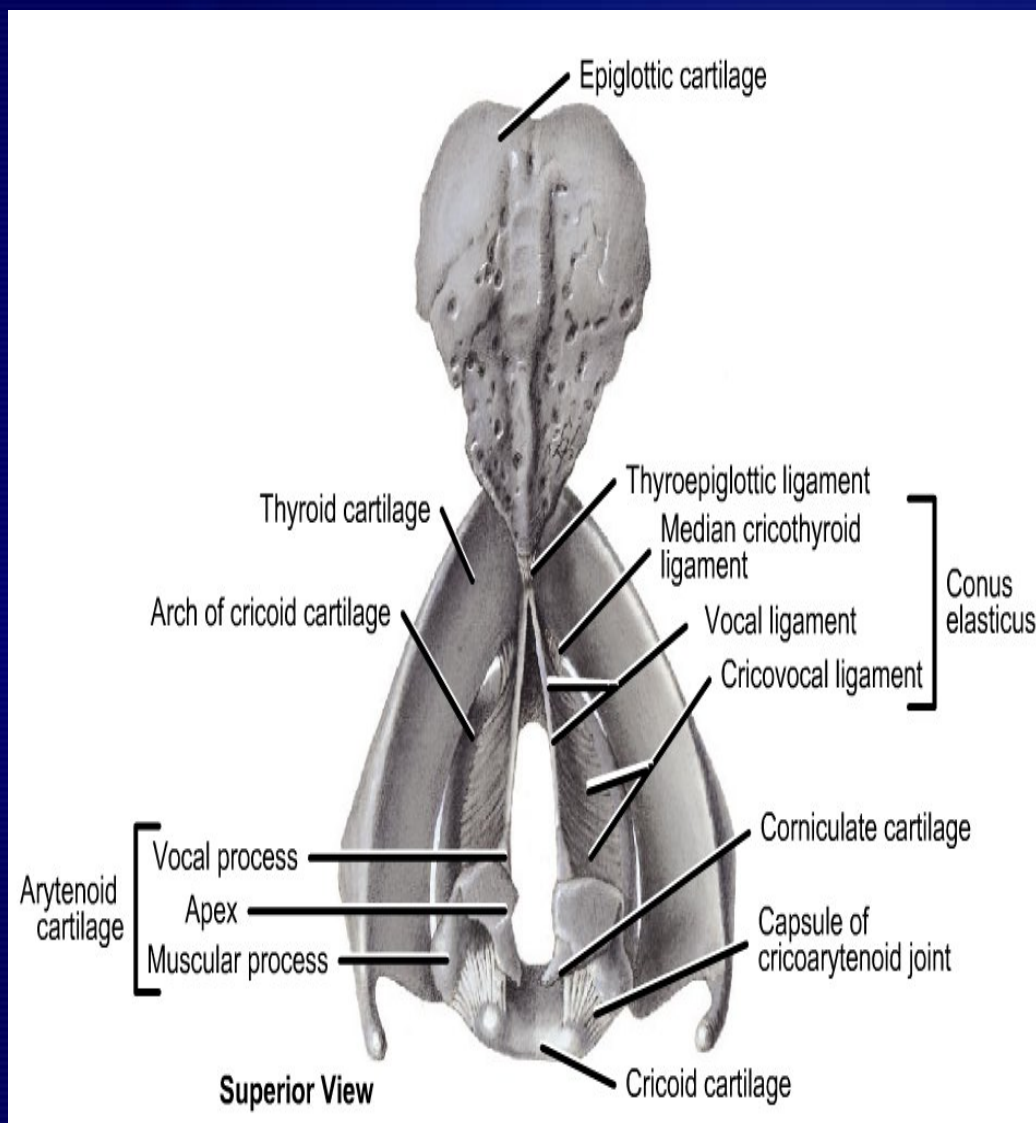
to the inner surface of Thyroid cartilage anteriorly.

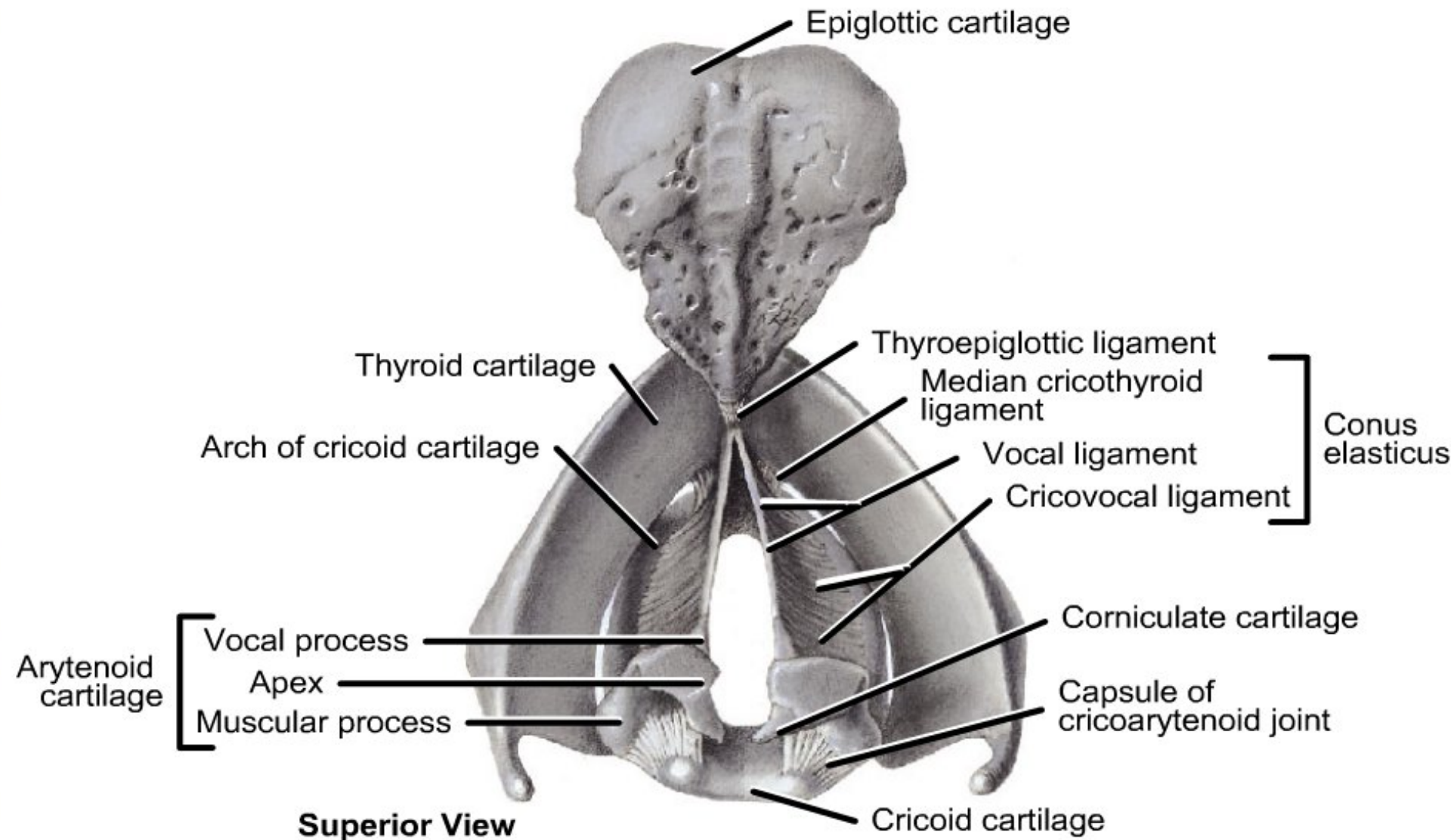
to the Vocal process of Arytenoid cartilage posteriorly.

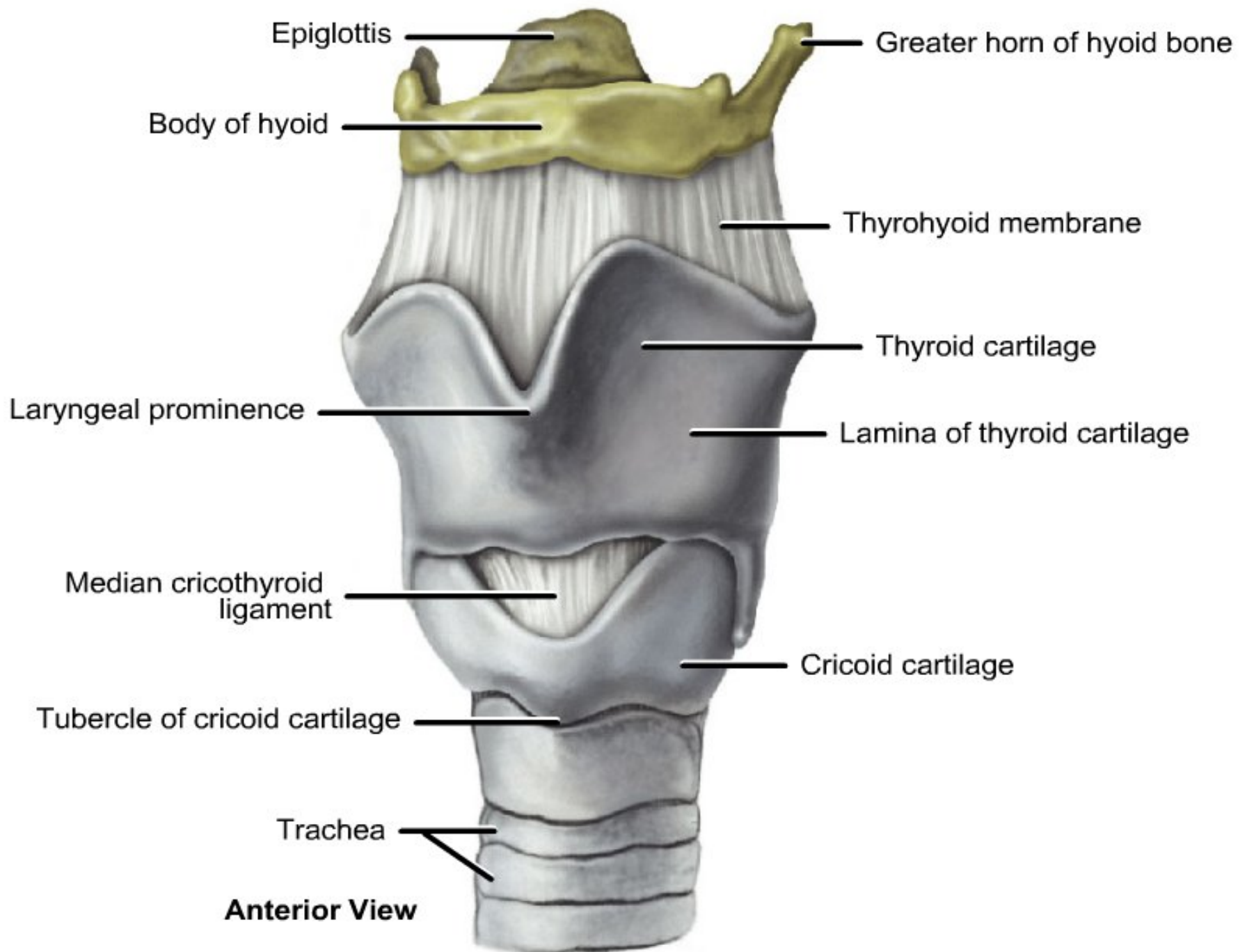


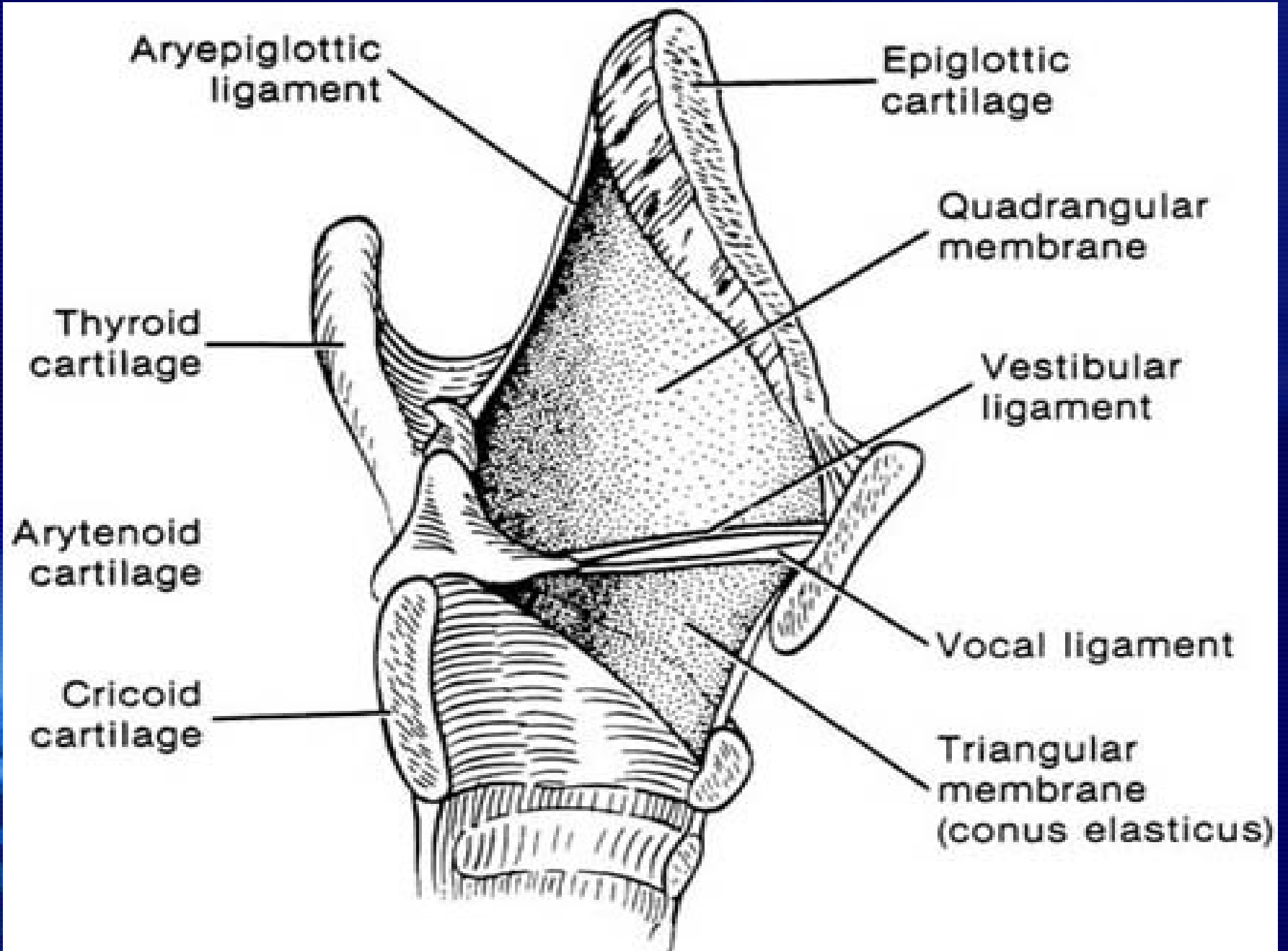
The free upper border of the crico-vocal membrane is called the **Vocal Ligament**

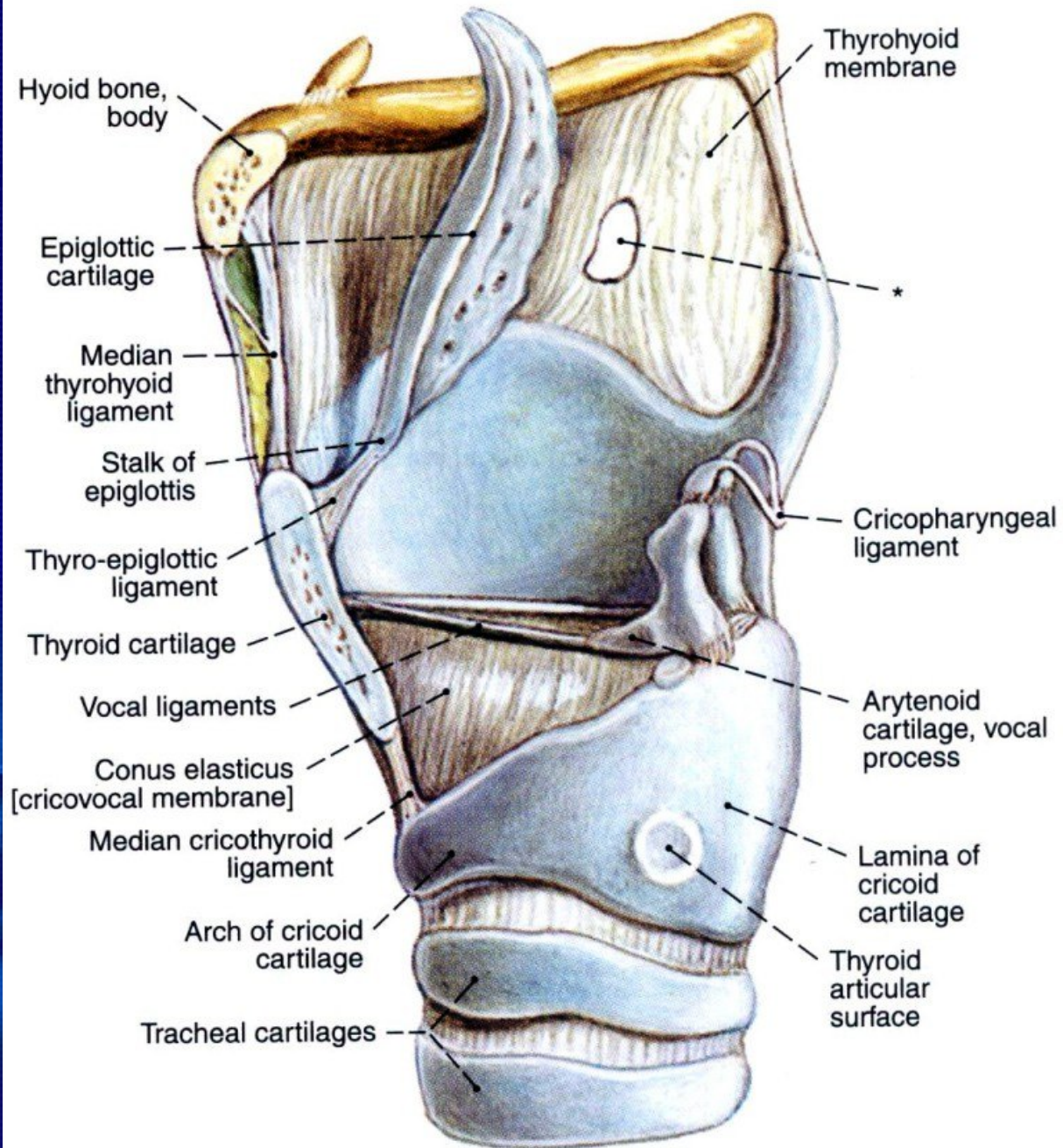
So, the **Vocal ligament** is attached to the inner surface of thyroid cartilage (anteriorly) and to the vocal process of the arytenoid cartilage (posteriorly).



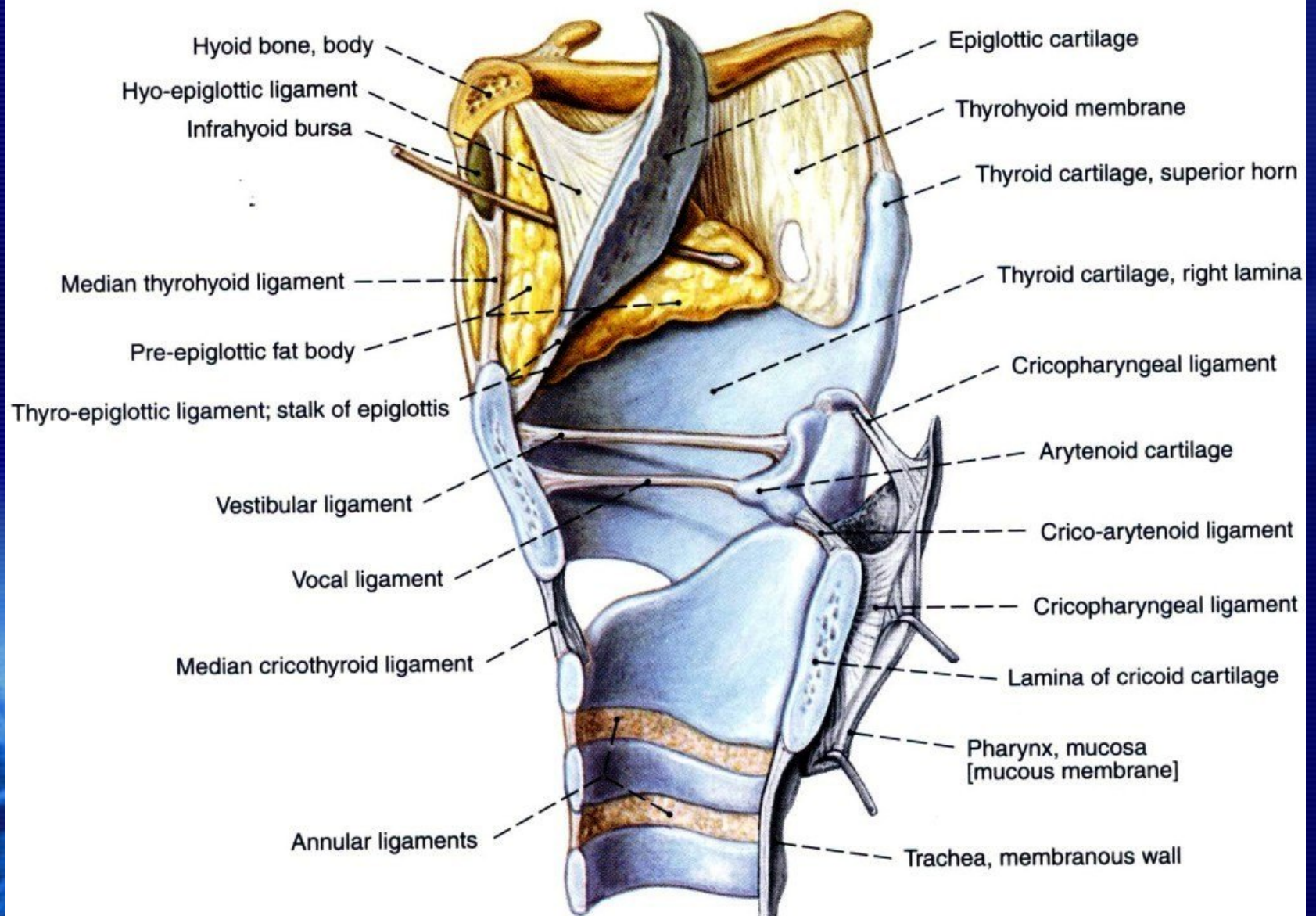








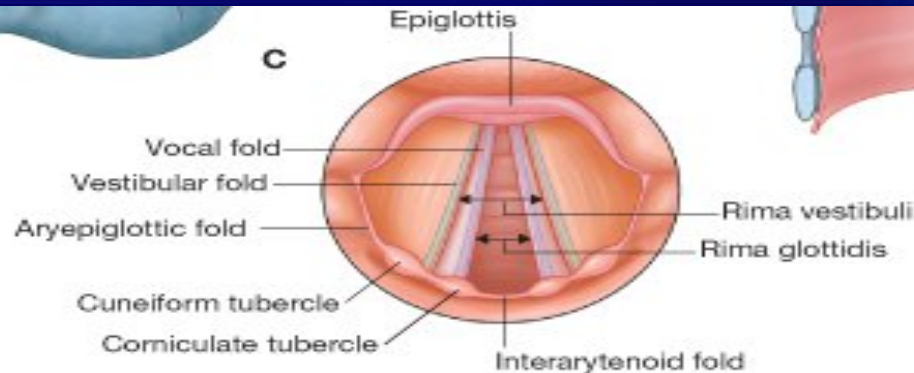
Larynx Ligaments and Membranes



Laryngeal Inlet

The opening of communication between the pharynx and larynx.

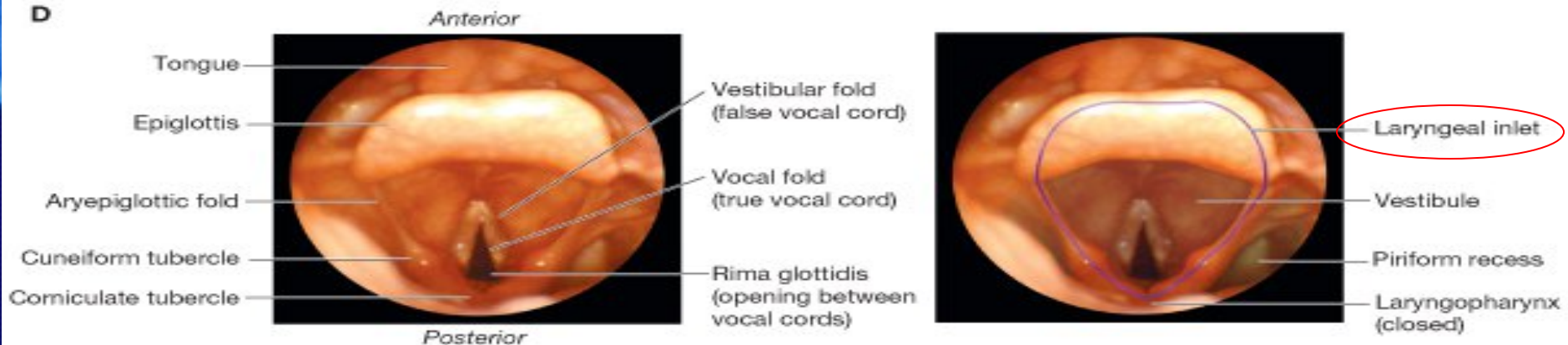
It is Directed Upwards and Backwards.



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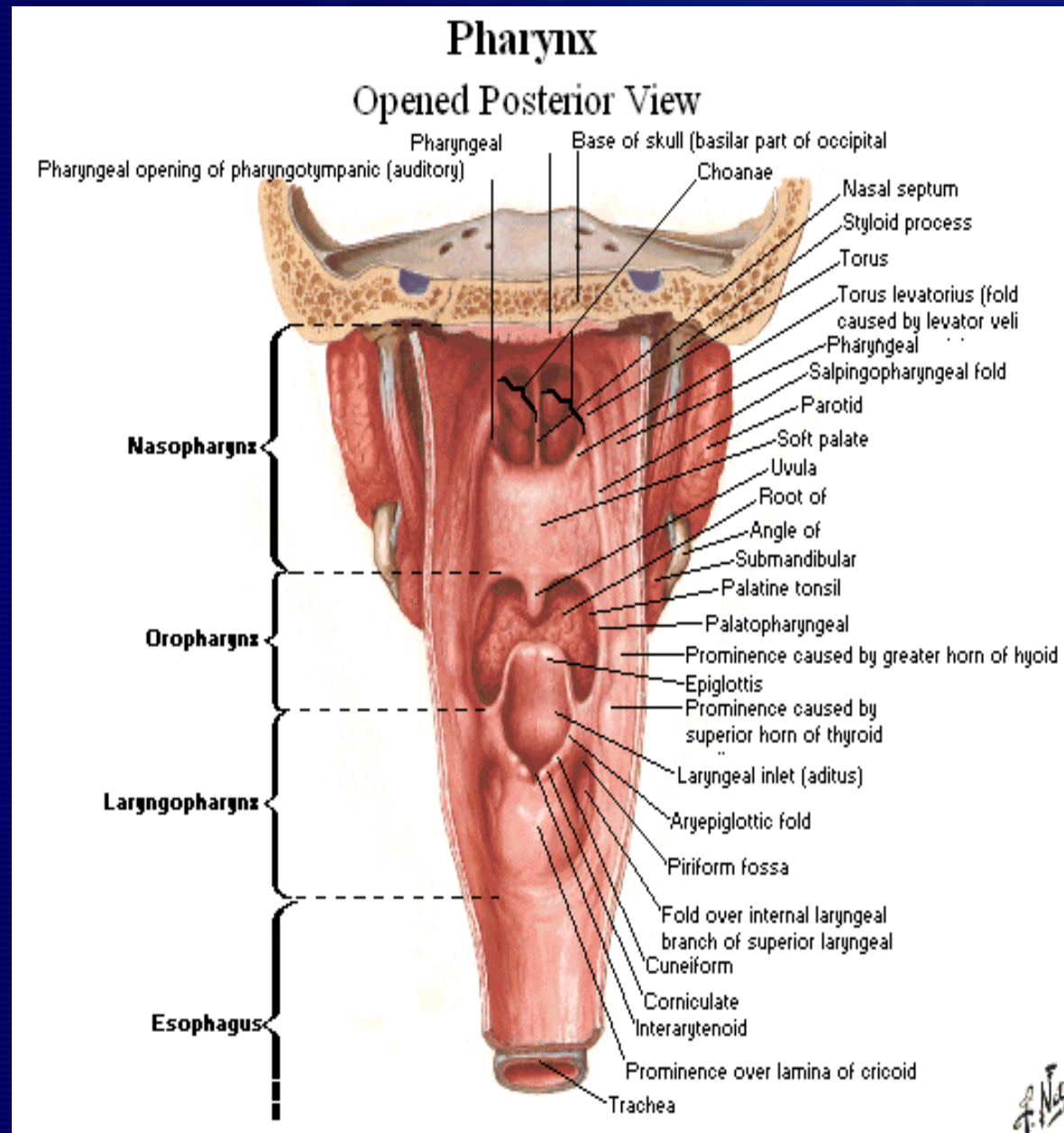


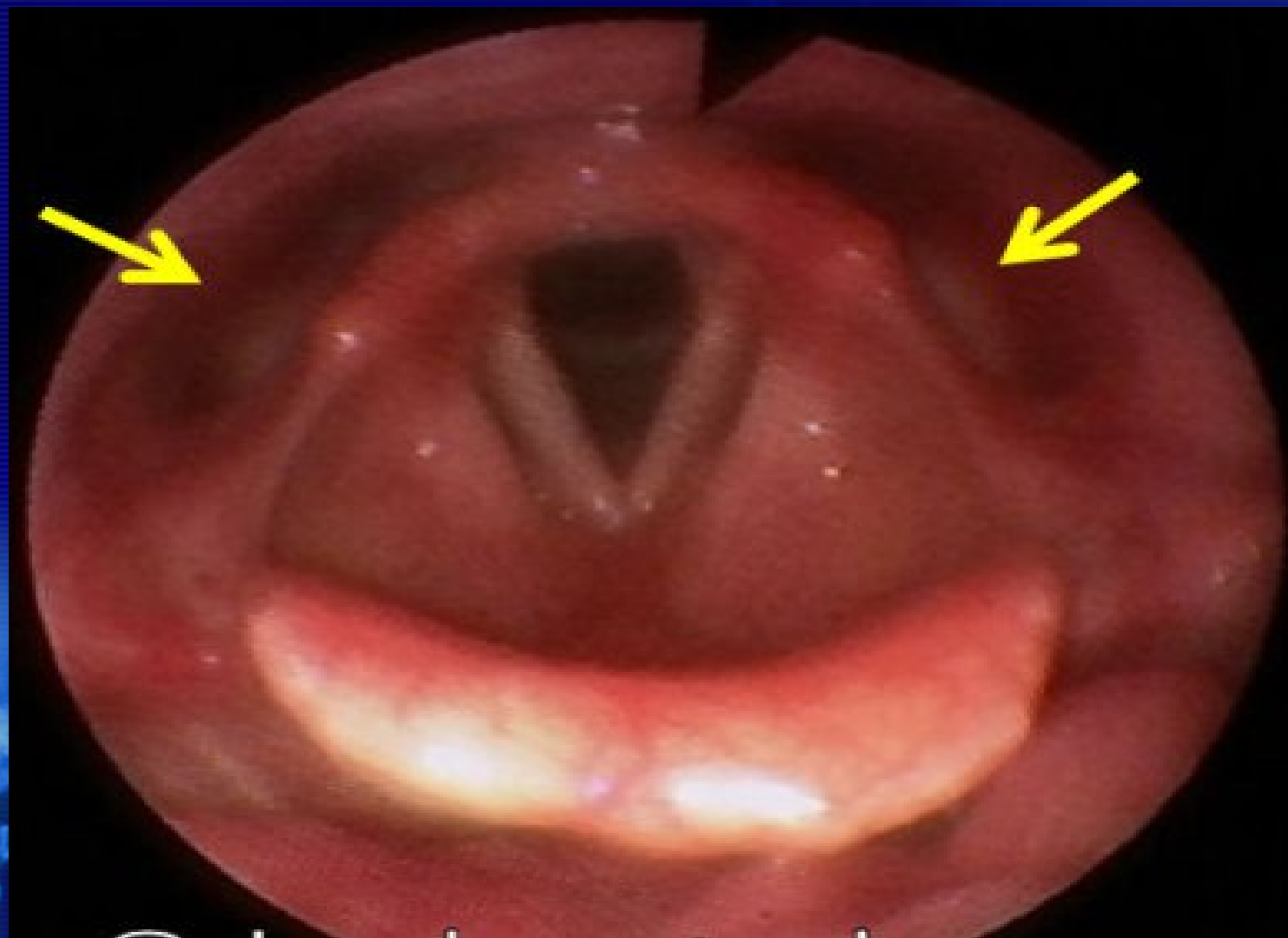
Boundaries:

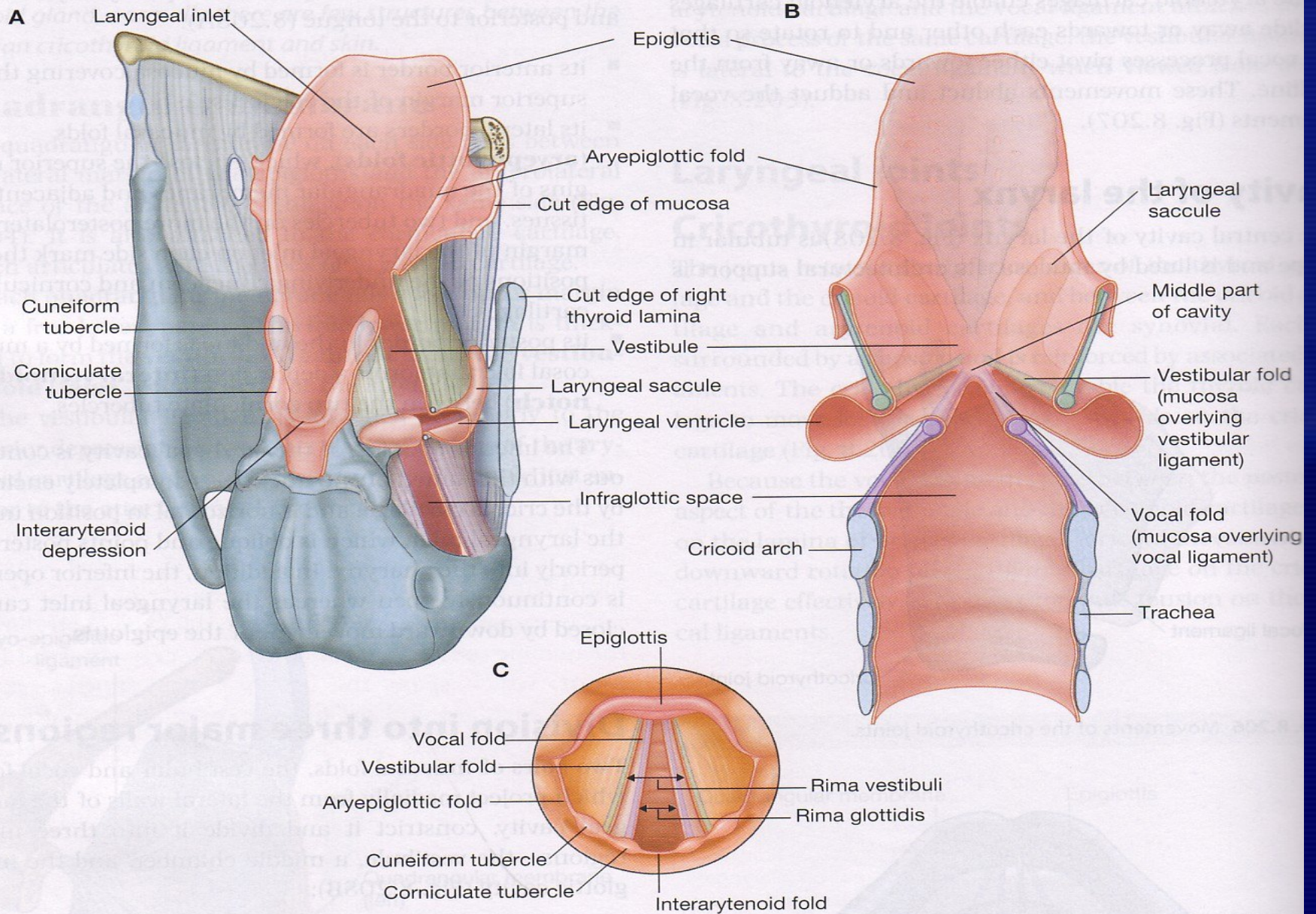
Upper border of
Epiglottis anteriorly.

Aryepiglottic folds
on both sides.

MM between the
arytenoids
cartilages
posteriorly.





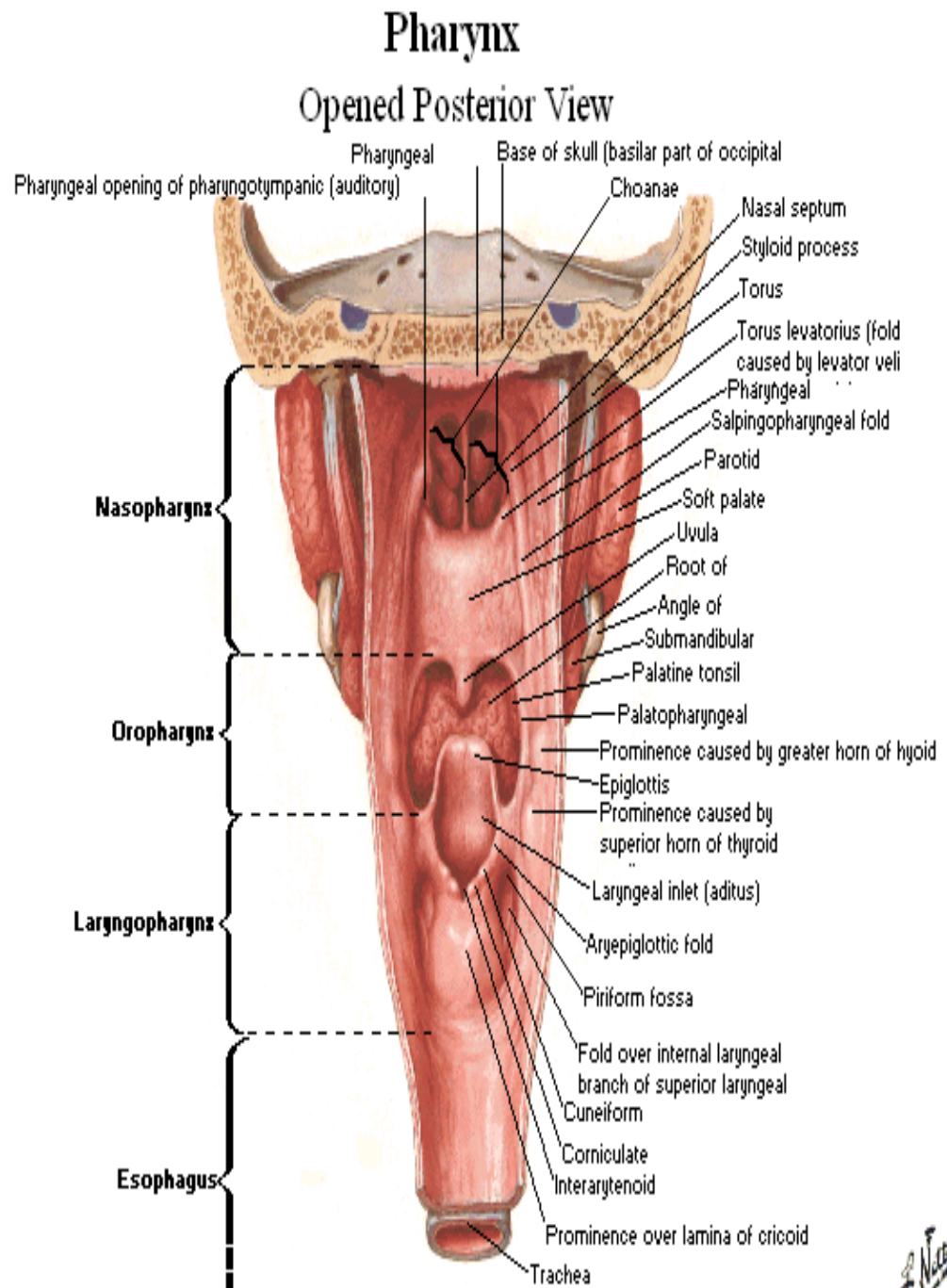


Aryepiglottic fold:

Is a fold of mucosa extending between the apex of arytenoids cartilage and the side of epiglottis.

It encloses the

Aryepiglottic Muscle,
Cuneiform and Corniculate
Cartilages.



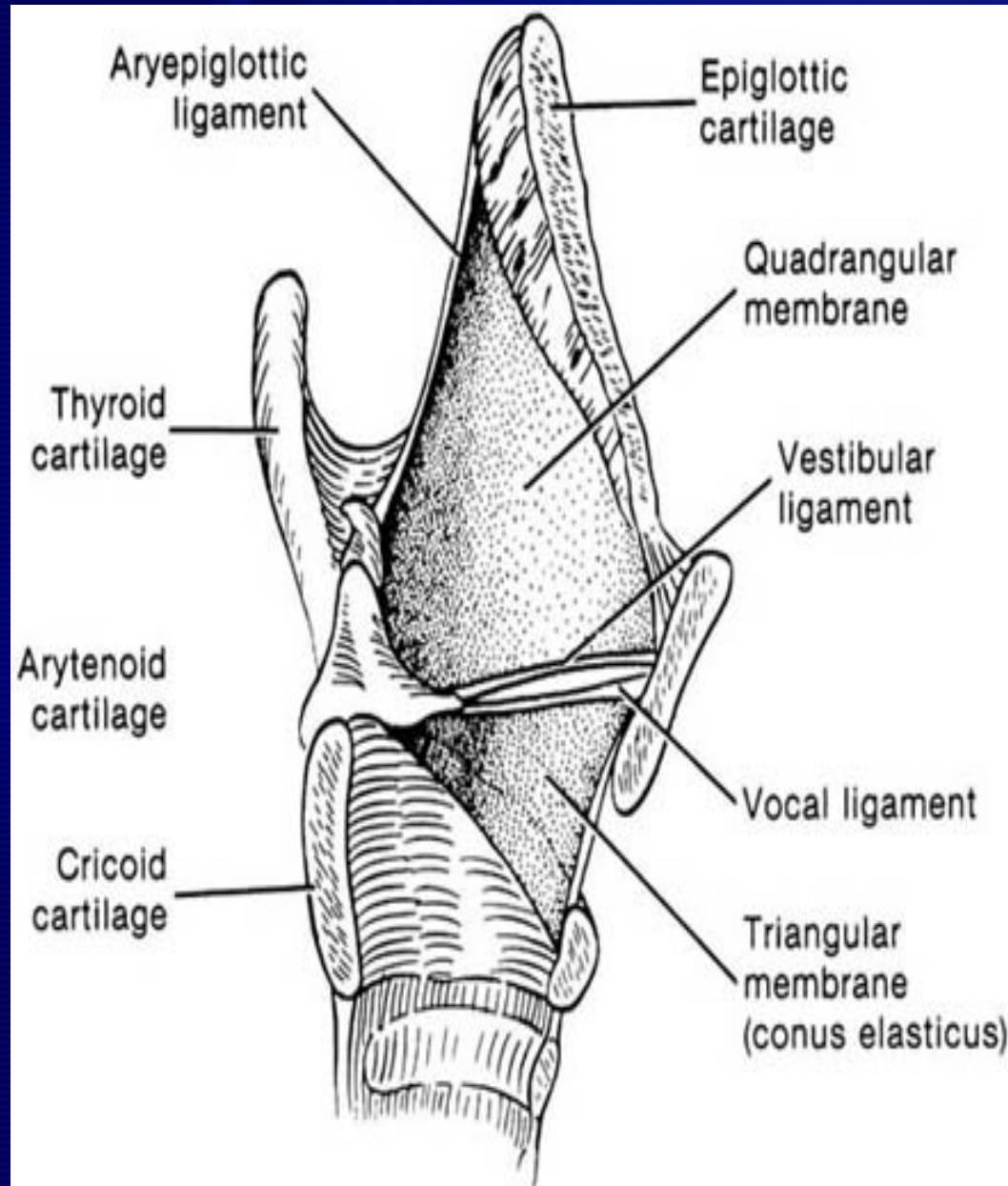
Vestibular folds (False vocal cords):

vestibular ligaments
+ mucosa

Thickening of the
quadrangular
membrane.

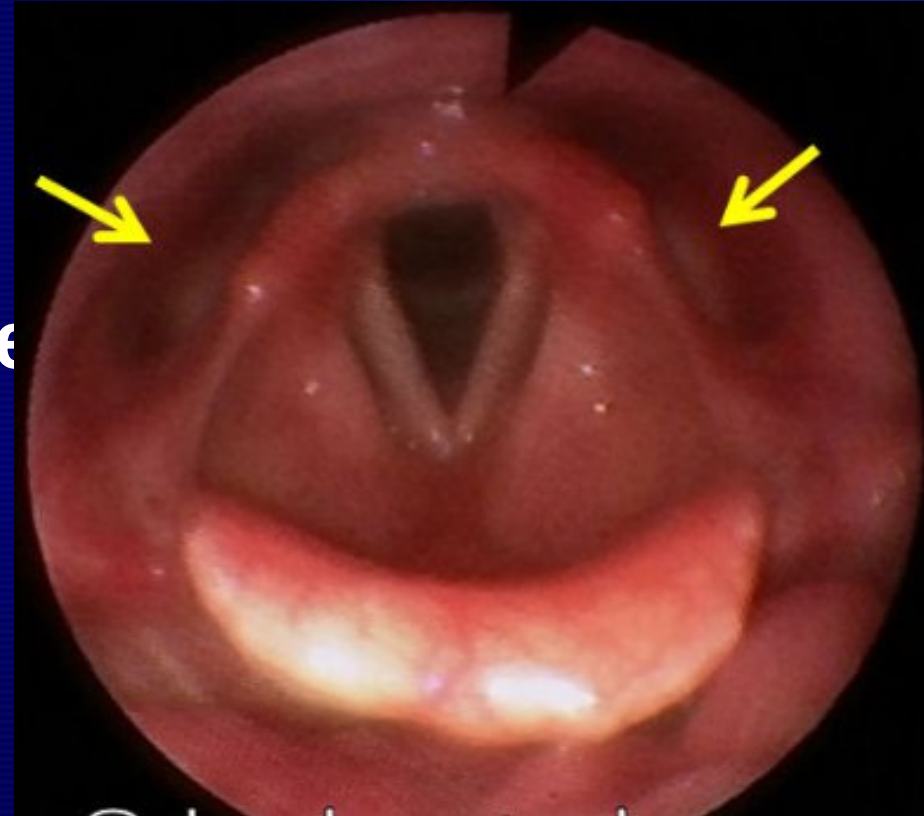
Between the thyroid
cartilage and the
arytenoids.

Rima vestibuli



Vestibule of the larynx

- The part of the cavity between the inlet and the vestibular folds



Vocal fold:

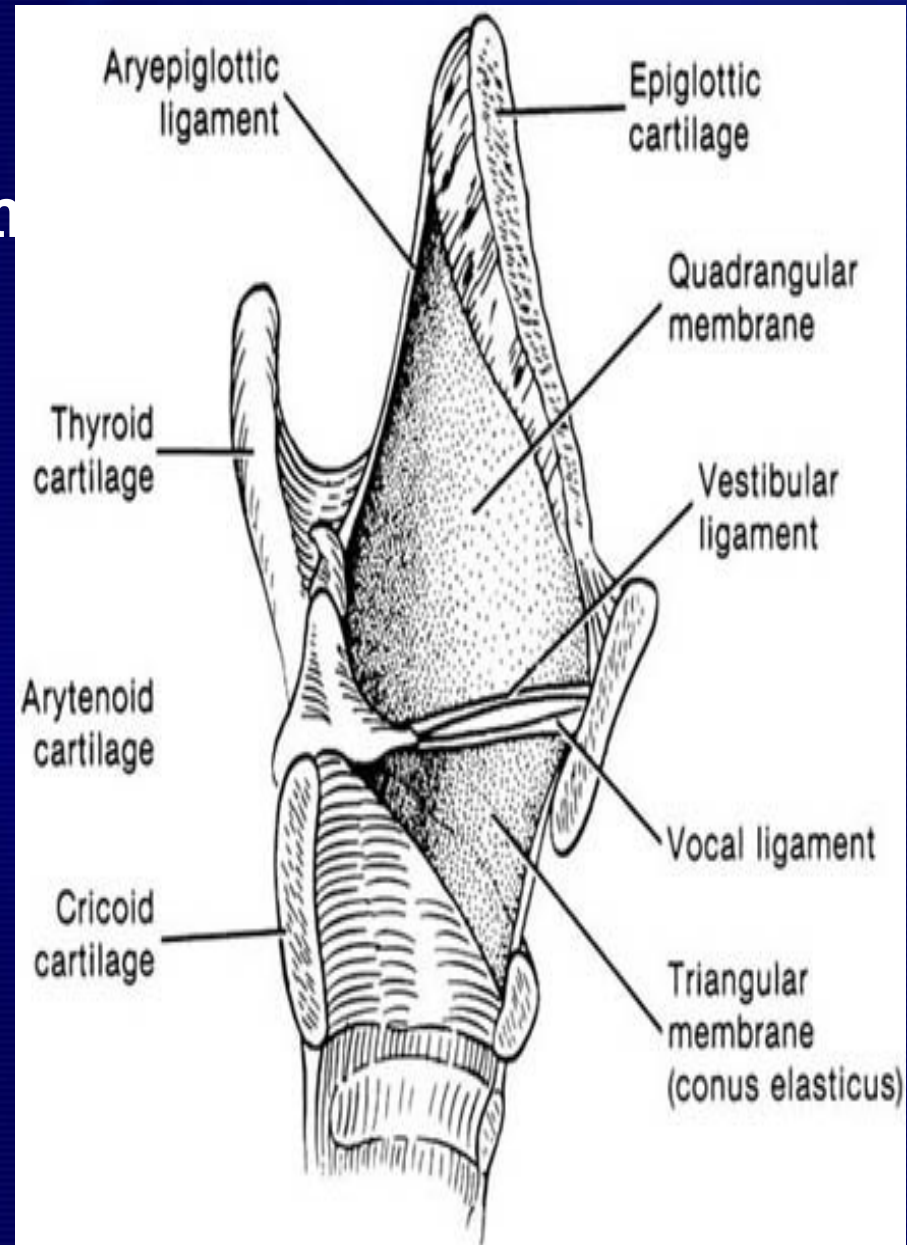
A fold ligamentous structure covered by mm extending from the inner surface of **Thyroid cartilage** to the **Vocal process of Arytenoid cartilage**.

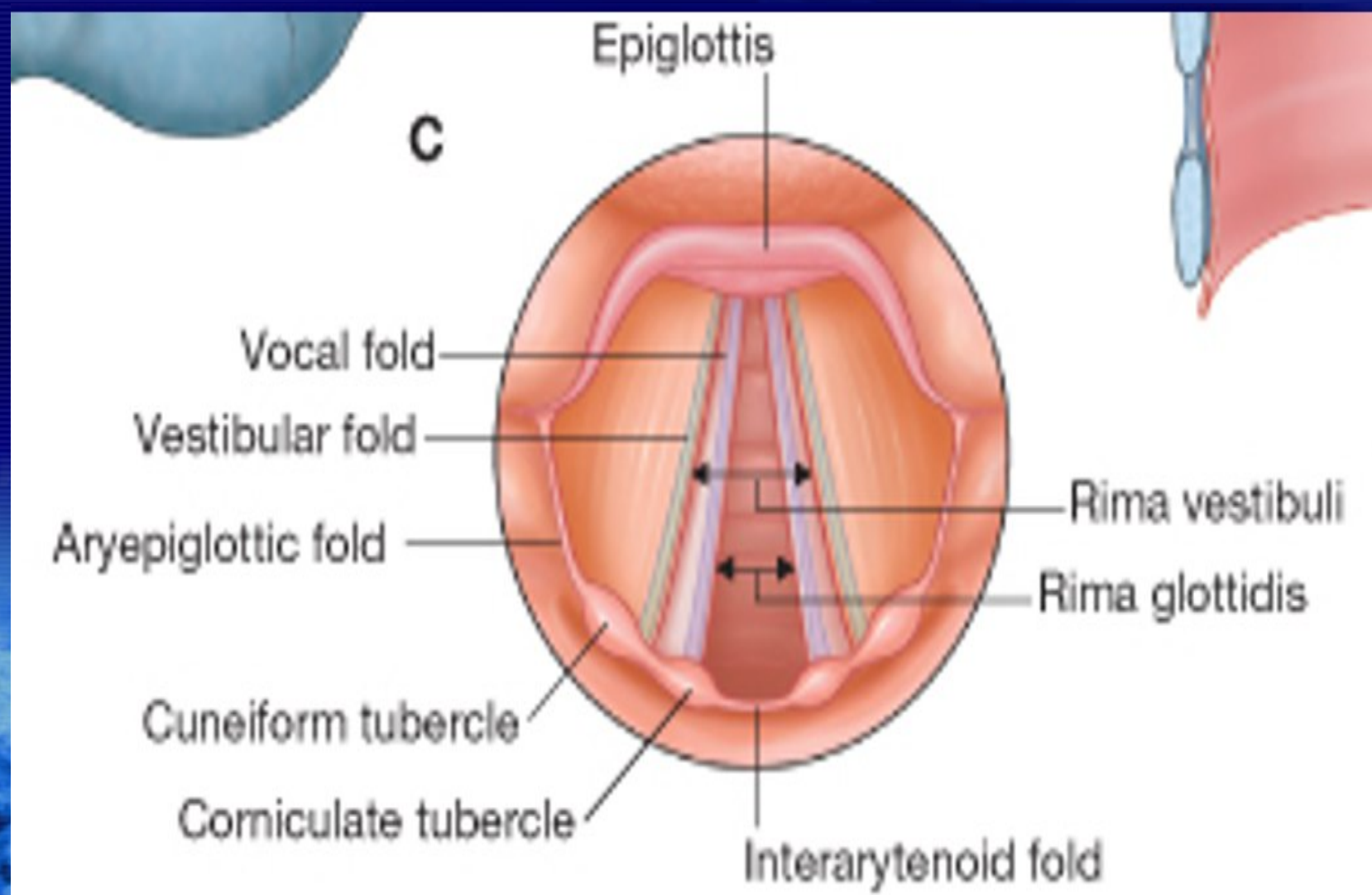
VF are chief agents by which voice is produced.

The folds enclose the **Vocal ligaments** (upper border of lateral cricothyroid ligaments).

The fissure between the 2 vocal folds is called

Rima glottidis.





The Subglottic region

Extends from below the vocal folds till the lower margin of the Cricoid Cartilage.

Between Rima Glottidis (narrowest part of larynx) to trachea.



Muscles of the larynx

Extrinsic Muscles

Intrinsic Muscles



The extrinsic muscles of the larynx

The muscles that have only one attachment or origin in the larynx.

They divided into Elevators and Depressors of the larynx.

They have functions supporting the position and movements of the larynx and in deglutition.

The larynx moves up during swallowing and down after swallowing.

The hyoid moves with the larynx.

Elevators of the larynx

Digastric

Stylohyoid

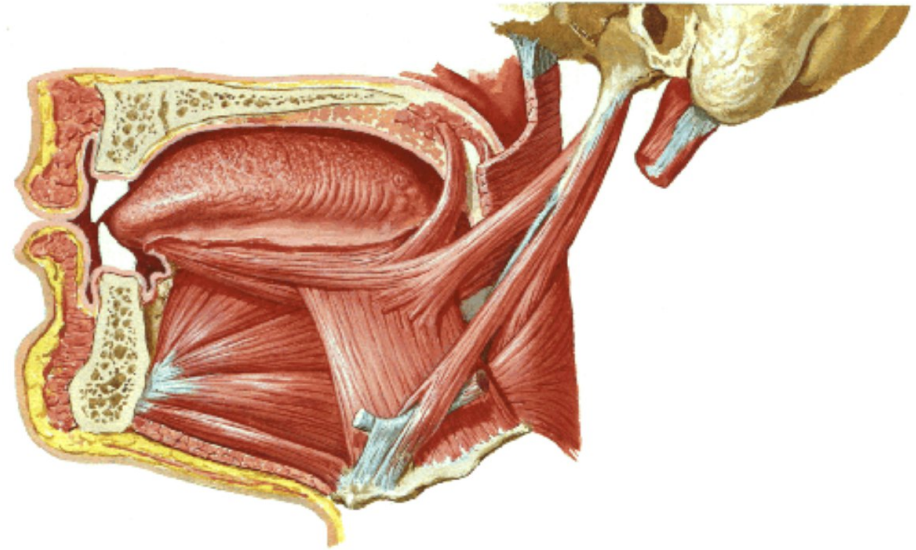
Mylohyoid

Genohyoid

Stylopharyngeus

Salpingopharyngeus

Palatopharyngeus

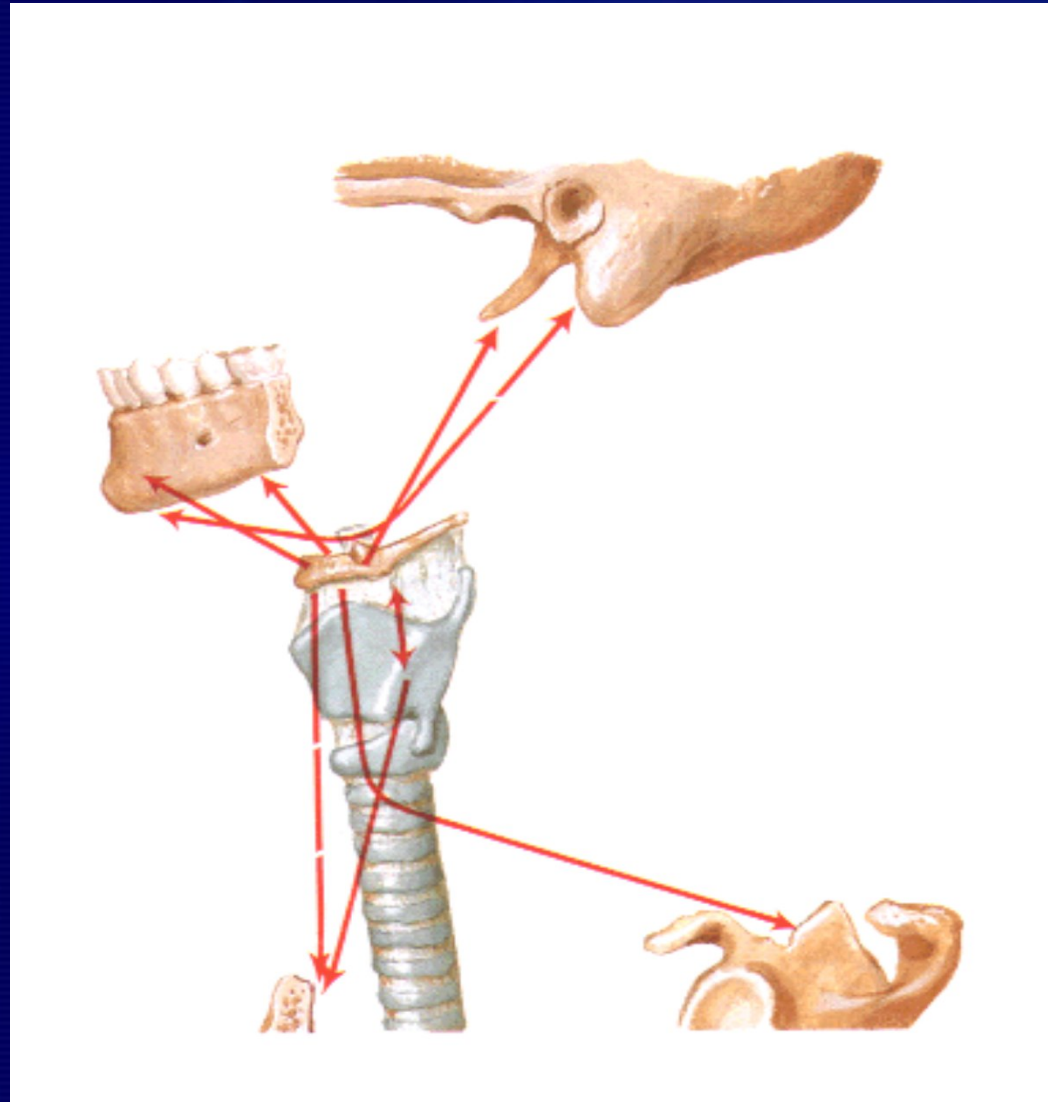


Depressors of the larynx

Sternohyoid

Sternothyroid

Omohyoid



The Intrinsic Muscles of the Larynx

Muscles Controlling the Movements of the Vocal Cords:

Tensors

Crico-Thyroid

Relaxors

Thyro-Arytenoid

Abductors (Open)

Posterior Cricoarytenoid

Adductors (Close)

Lateral Cricoarytenoid , Transverse arytenoids

The intrinsic muscles of the larynx

2. *Muscles controlling the laryngeal inlet:*

Narrowers

Oblique Arytenoids

Wideners

Thyro-Epiglottic

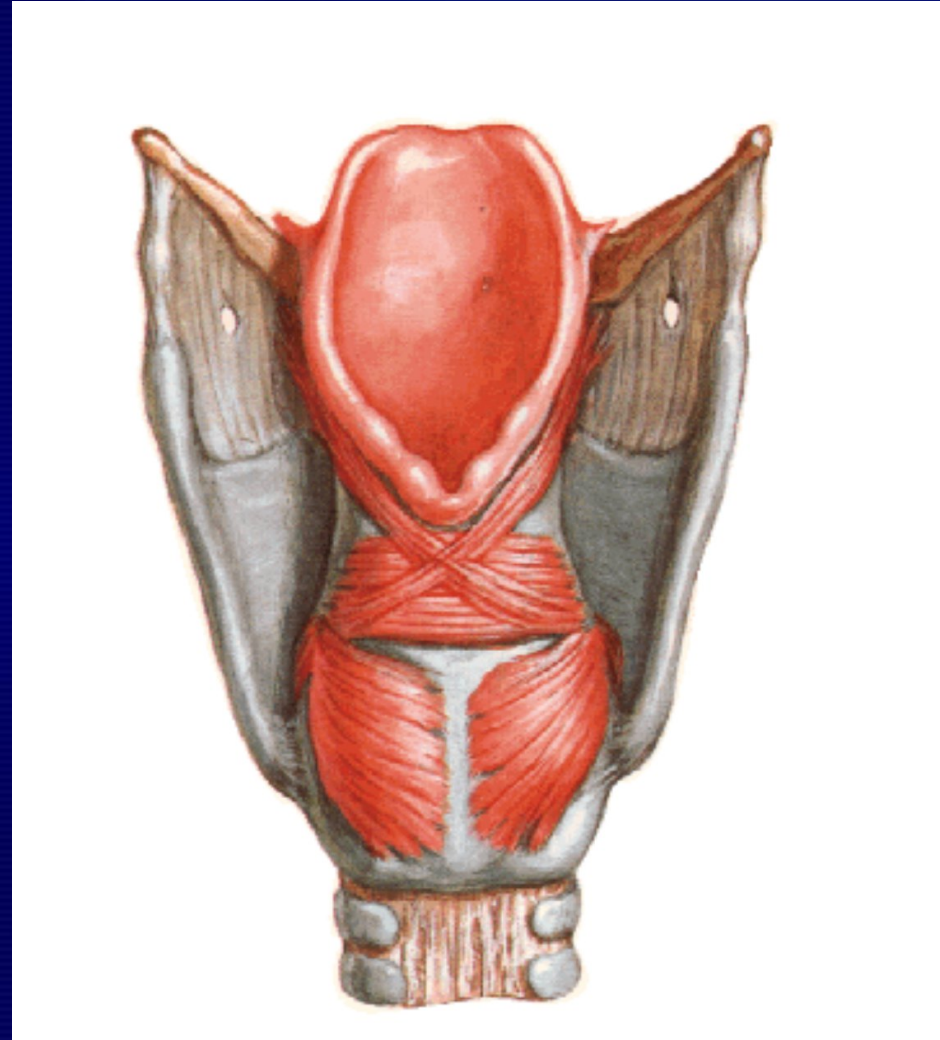
Posterior Cricoarytenoid Muscle

Origin: from the posterior surface of the lamina of the cricoid cartilage.

Insertion into the muscular process of the arytenoid cartilage.

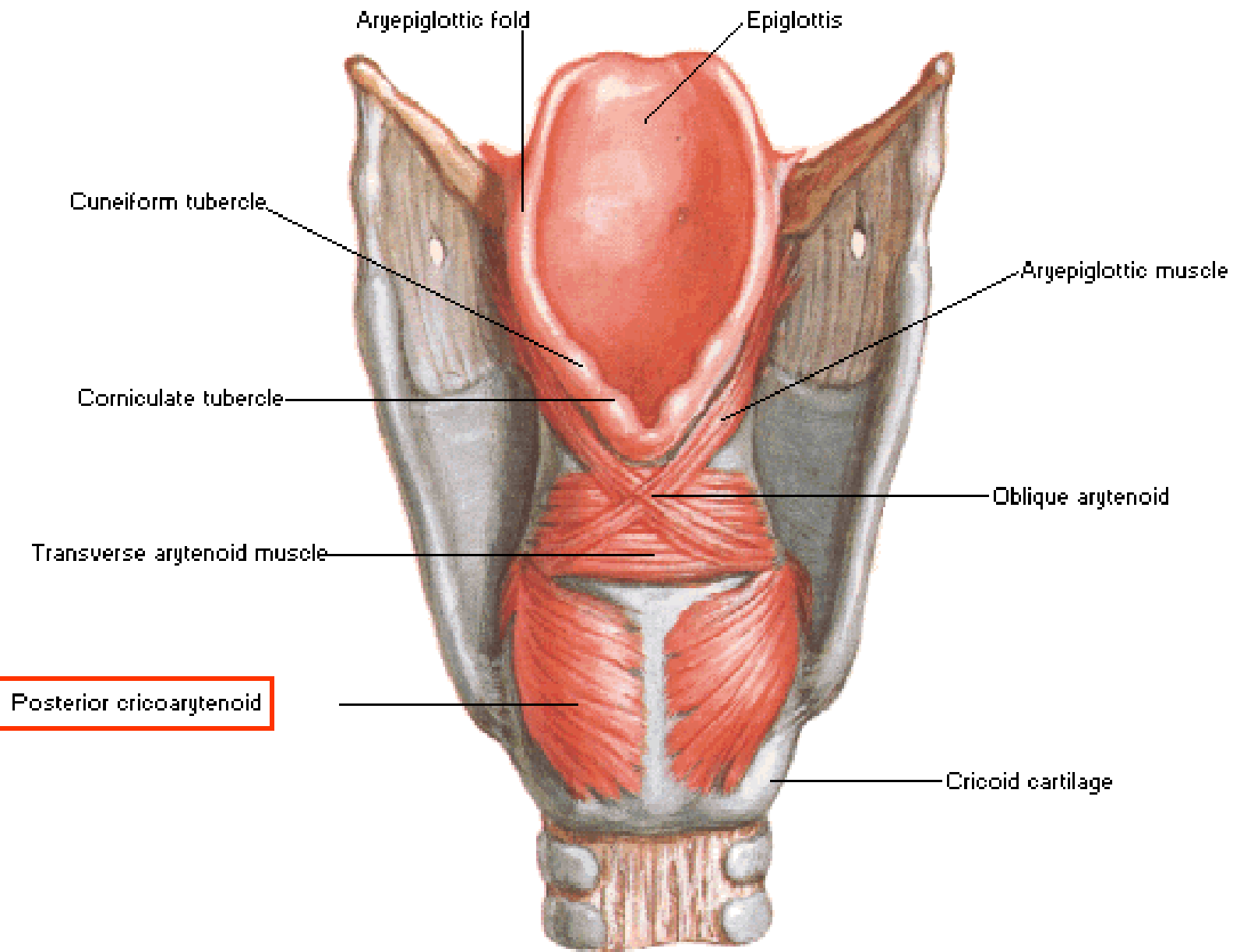
Nerve supply recurrent laryngeal nerve

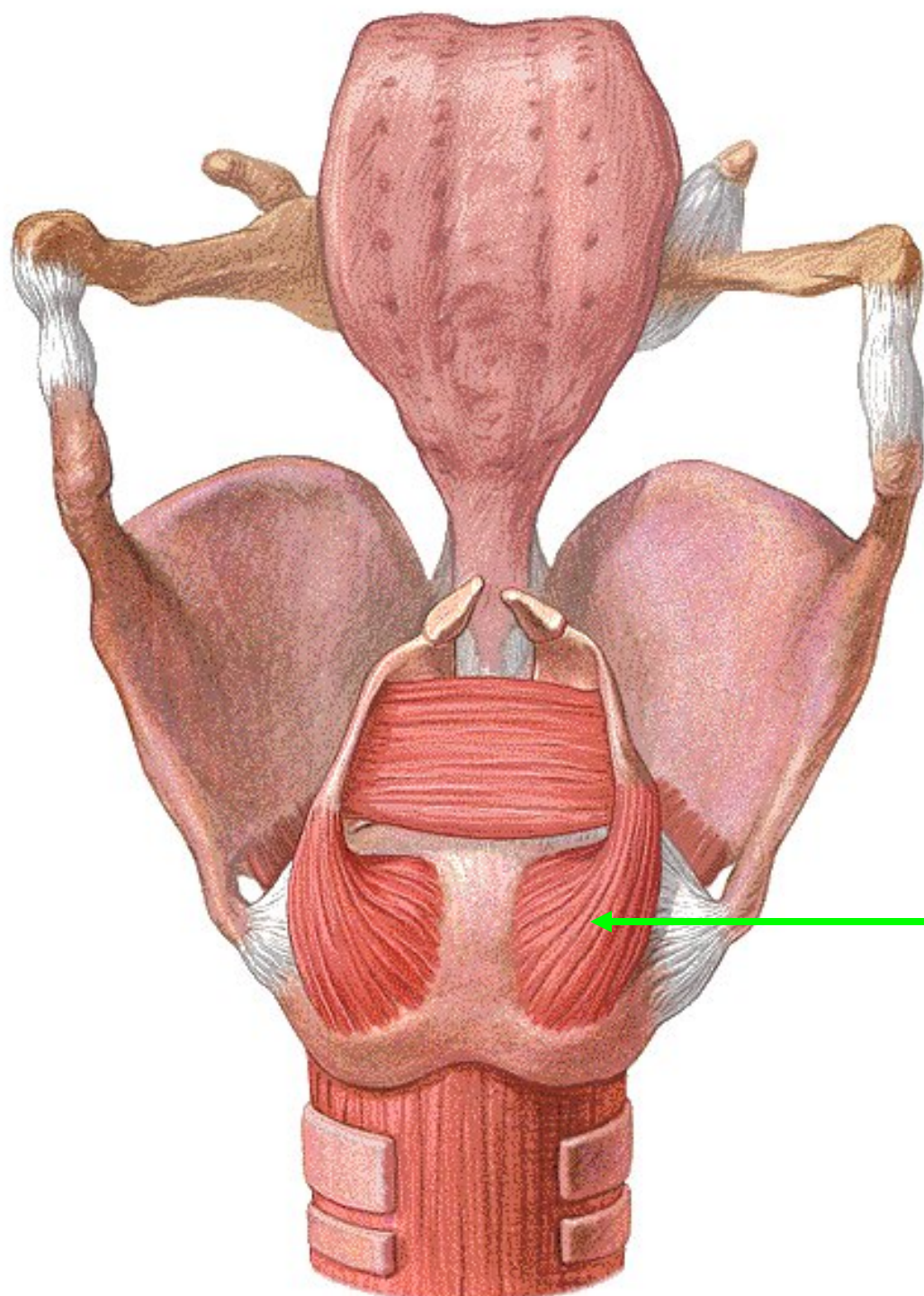
Action: **Abduction** of the vocal cords by rotating the arytenoid cartilage.



Intrinsic Muscles of Larynx

Posterior View

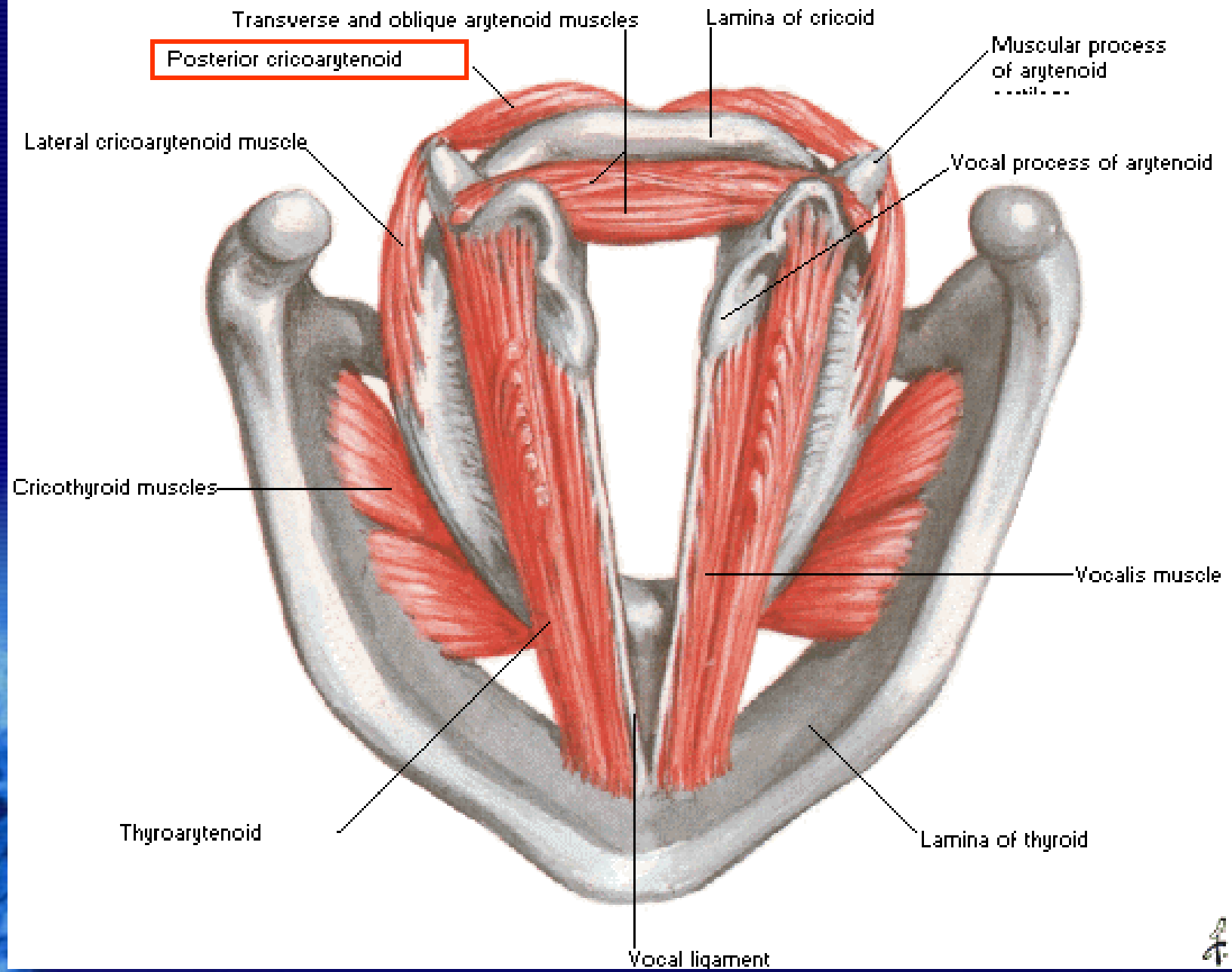


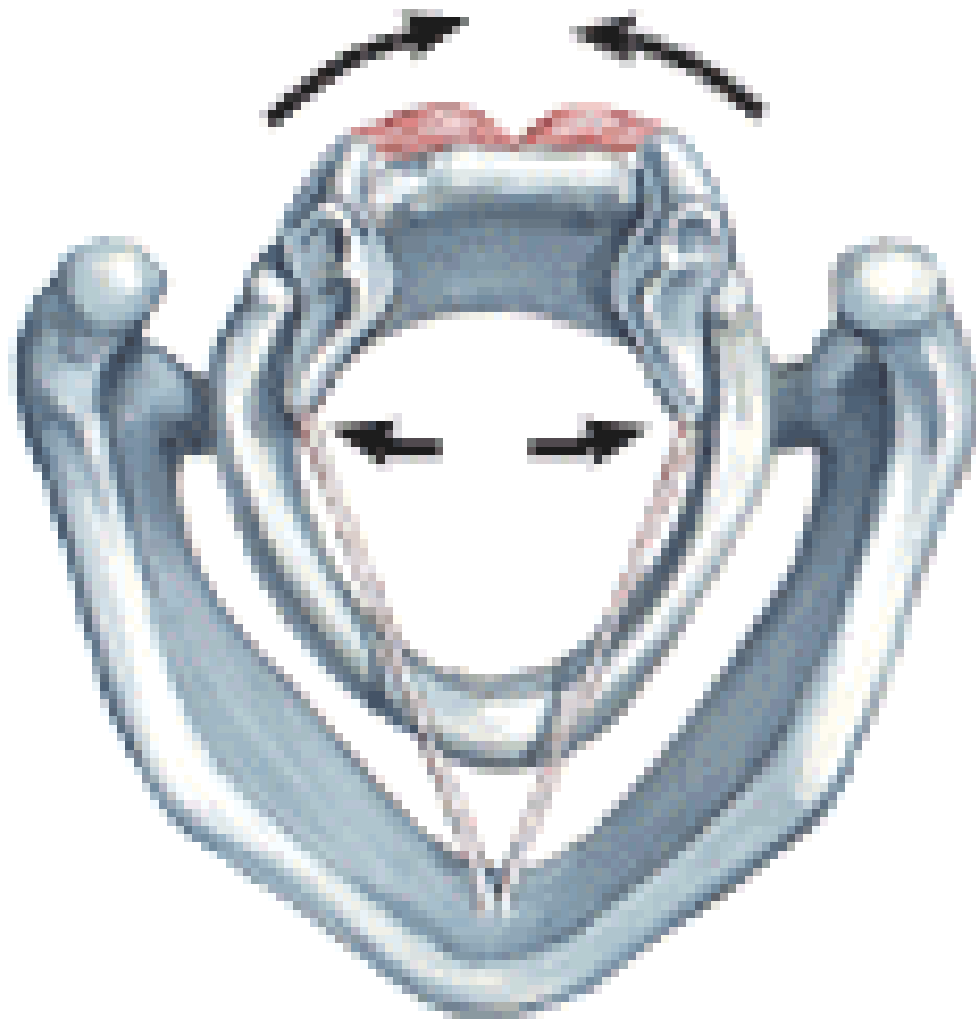


**Posterior
cricoarytenoid muscle**

Intrinsic Muscles of Larynx

Superior View





Action of posterior cricoarytenoid muscles: Abduction of vocal ligaments

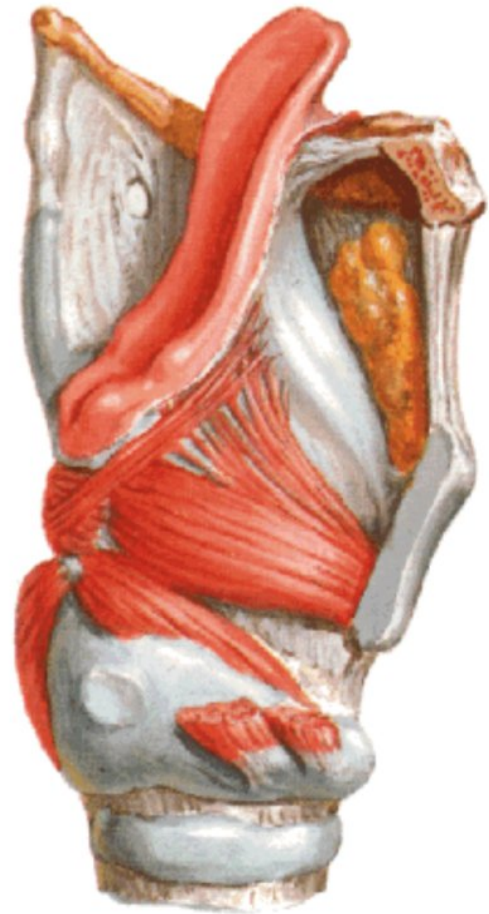
Lateral Cricoarytenoid Muscle

Origin: from the upper border of the arch of cricoid cartilage.

Insertion: into the muscular process of the arytenoid cartilage.

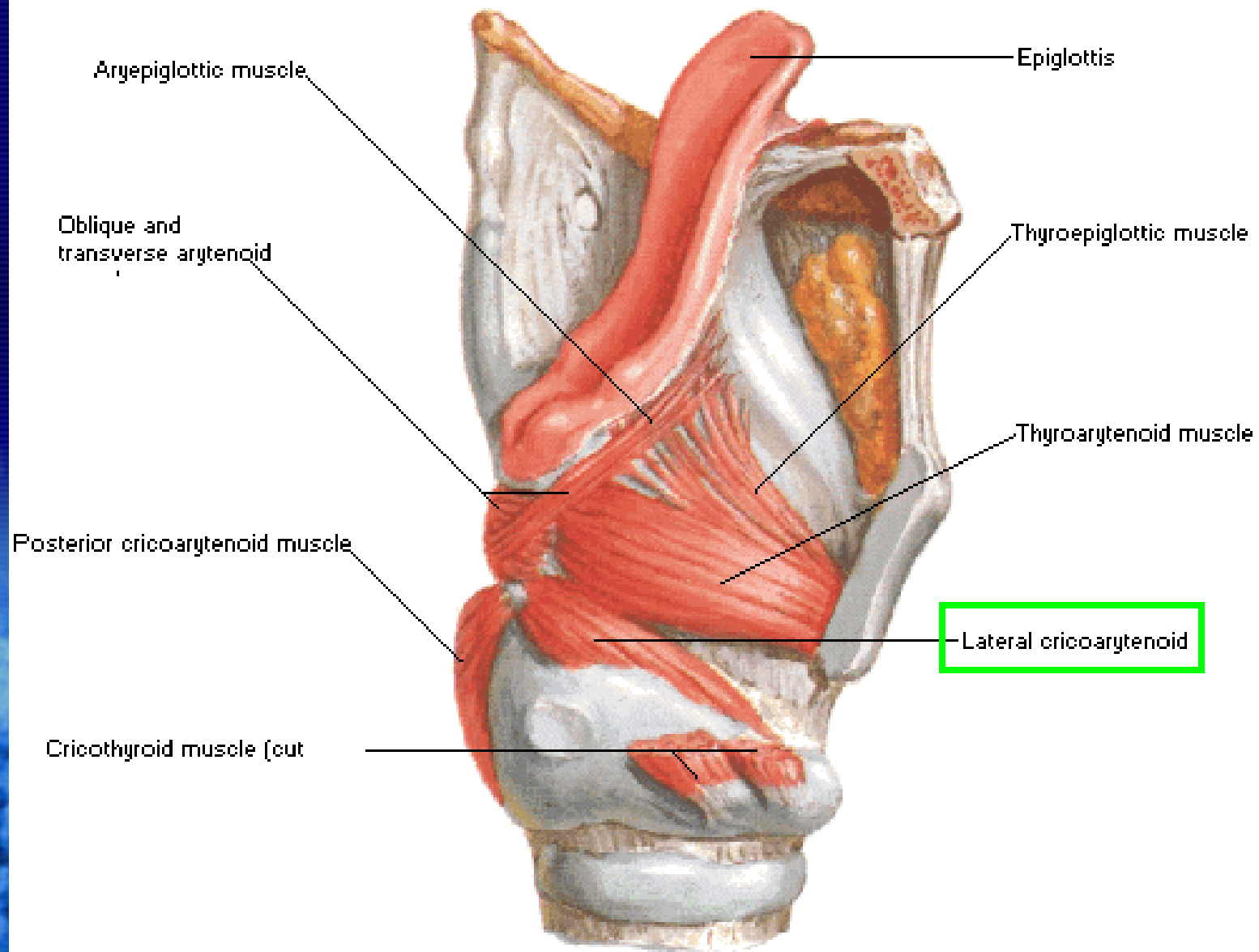
Nerve supply: recurrent laryngeal nerve

Action: Adduction of the vocal cords by rotation of the arytenoid cartilage



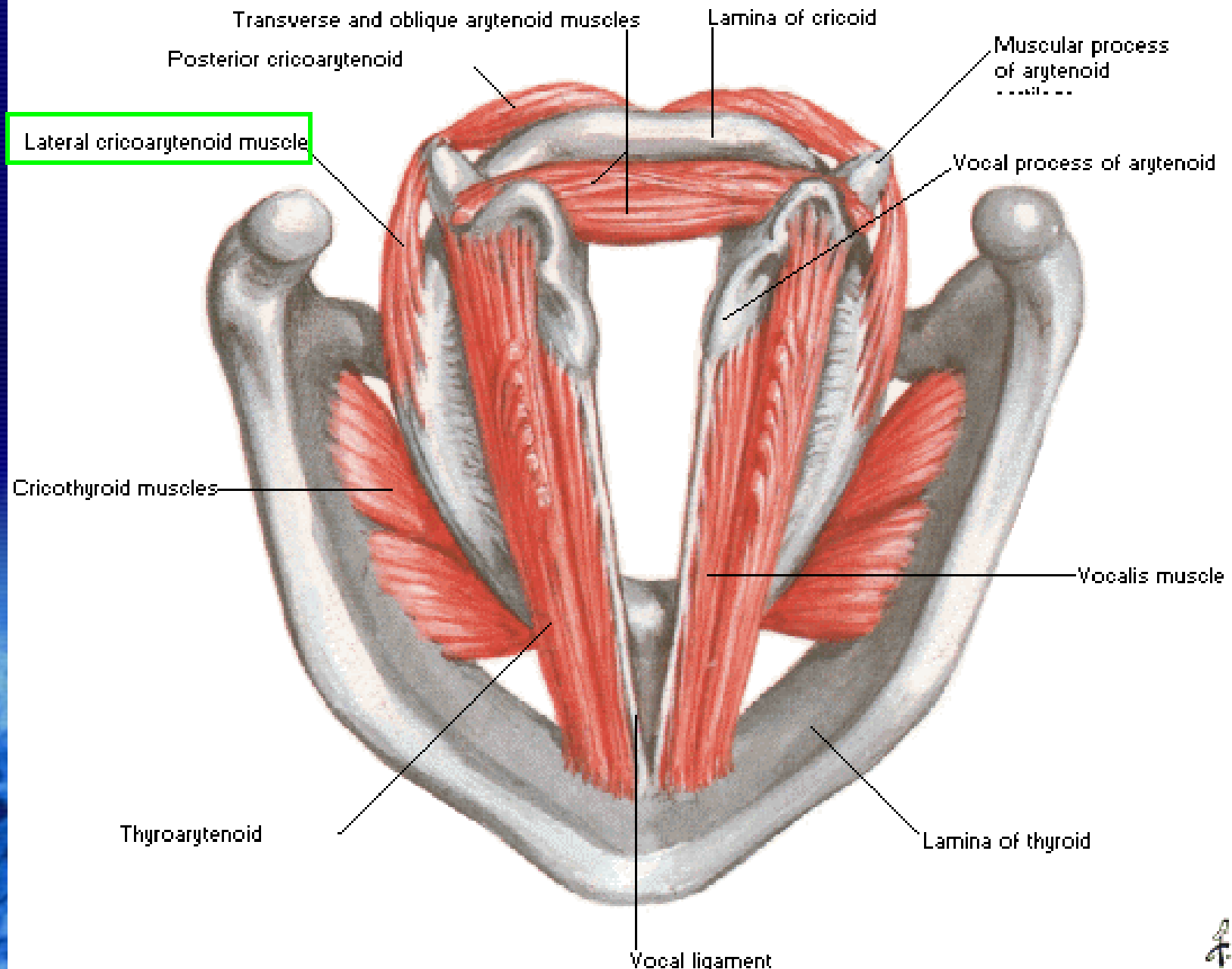
Intrinsic Muscles of Larynx

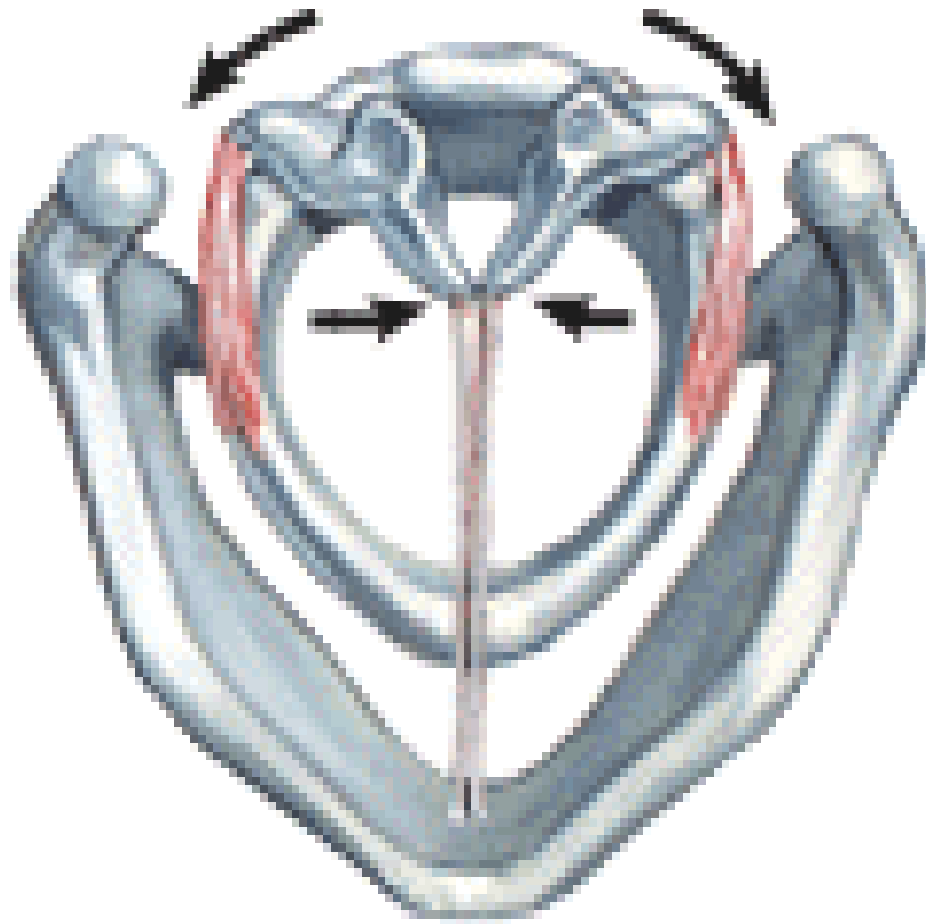
Lateral Dissection



Intrinsic Muscles of Larynx

Superior View





Action of lateral cricoarytenoid muscles:
Adduction of vocal ligaments

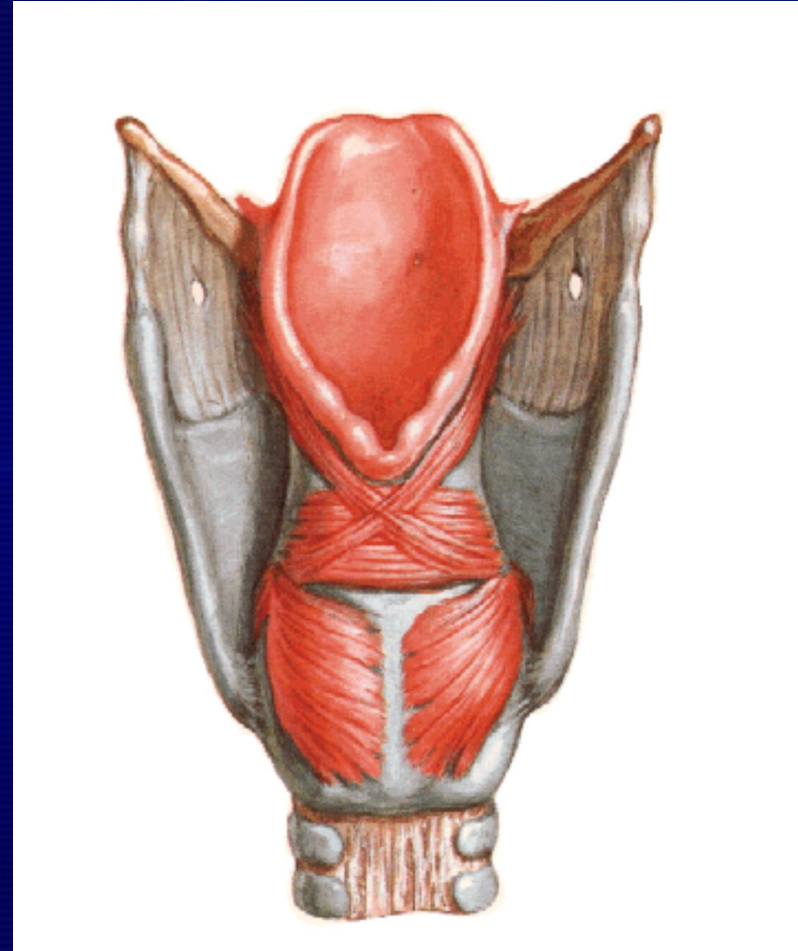
Transverse Arytenoid Muscle

Origin: from the back and medial surface of the arytenoid cartilage.

Insertion: into the back and medial surface of the opposite arytenoid cartilage.

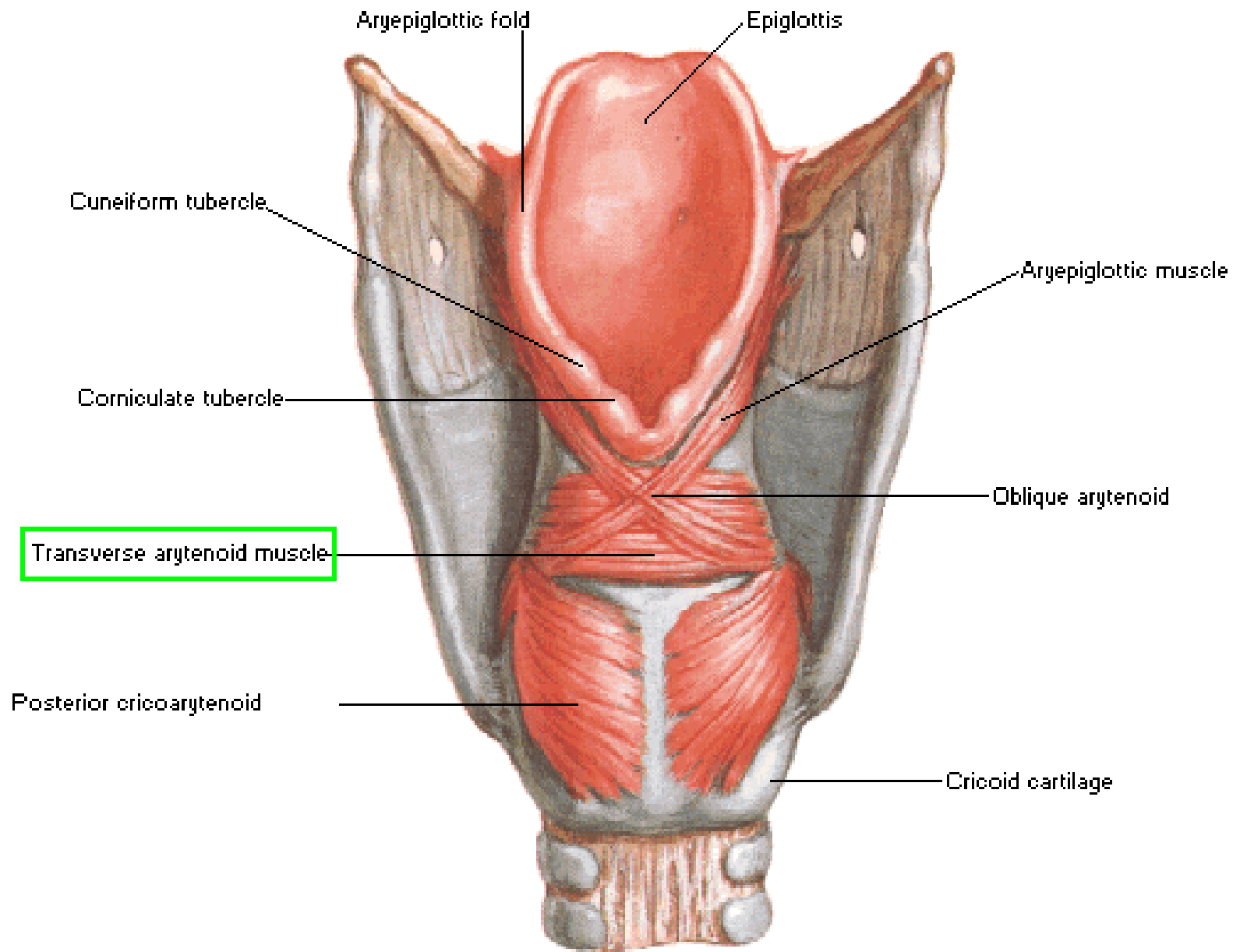
Nerve supply: recurrent laryngeal nerve

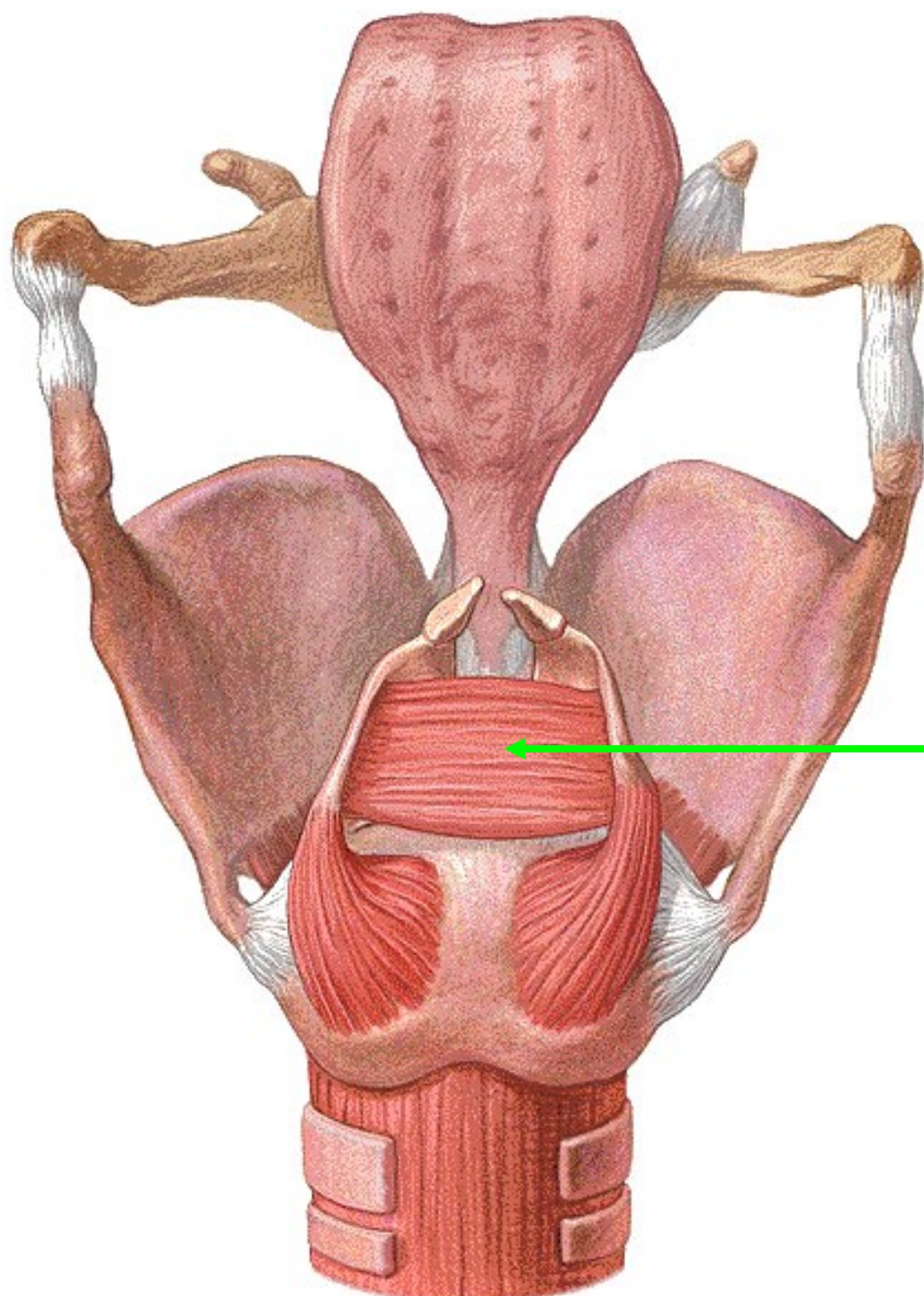
Action: Adduction of the vocal cords by approximating the arytenoid cartilages



Intrinsic Muscles of Larynx

Posterior View

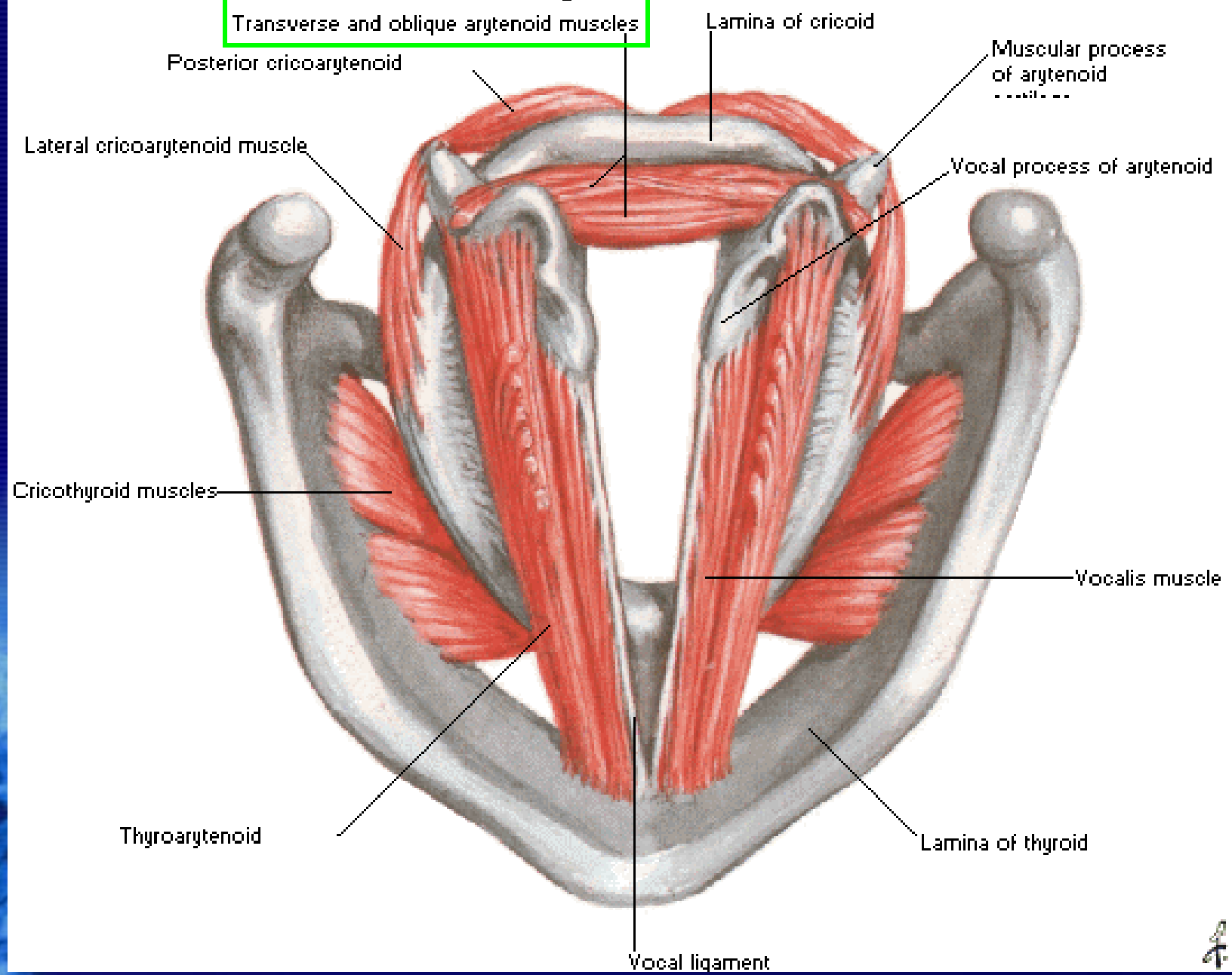


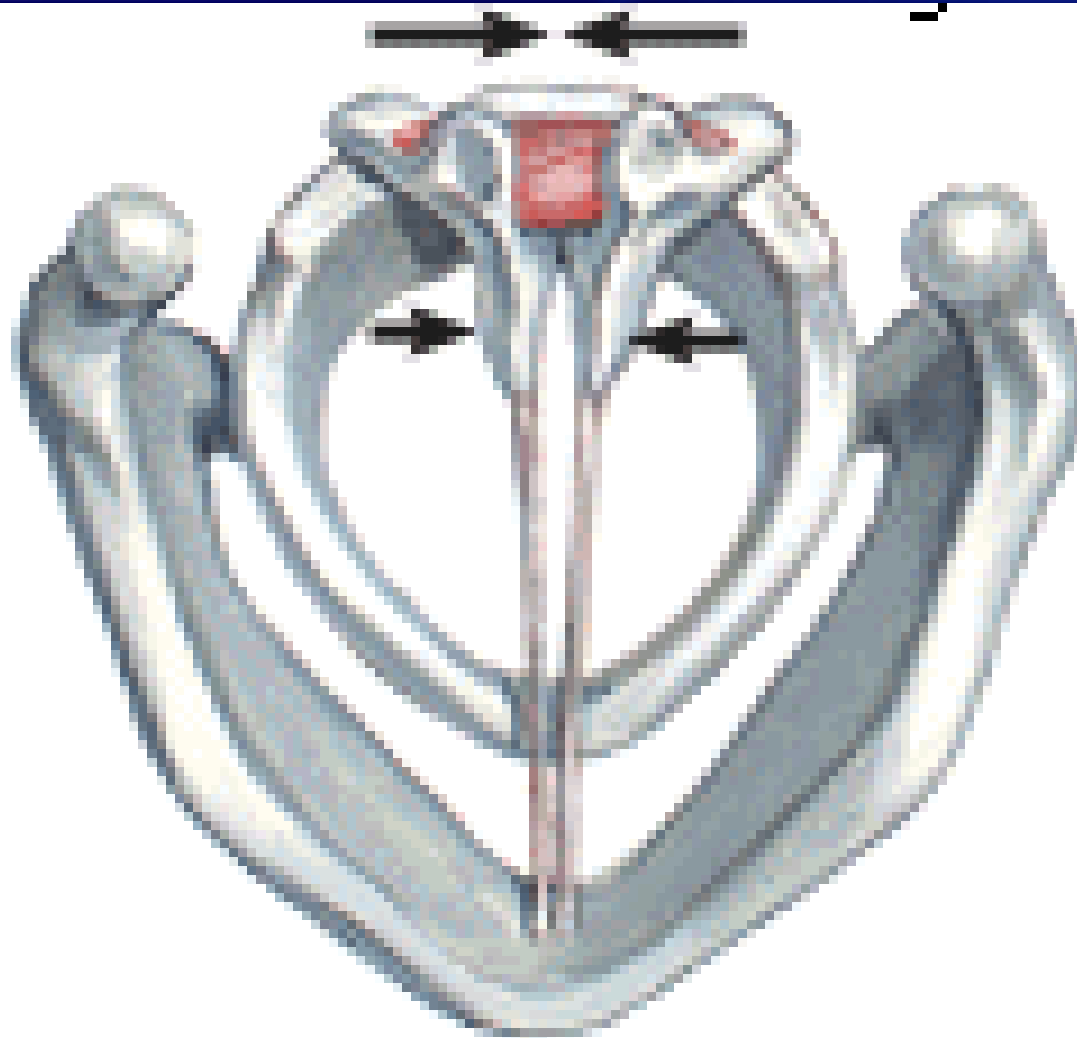


Transverse arytenoid muscle

Intrinsic Muscles of Larynx

Superior View





Action of arytenoid muscle:
Adduction of vocal ligaments

Cricothyroid Muscle

The *Only Intrinsic Muscle* seen on the outside of the larynx.

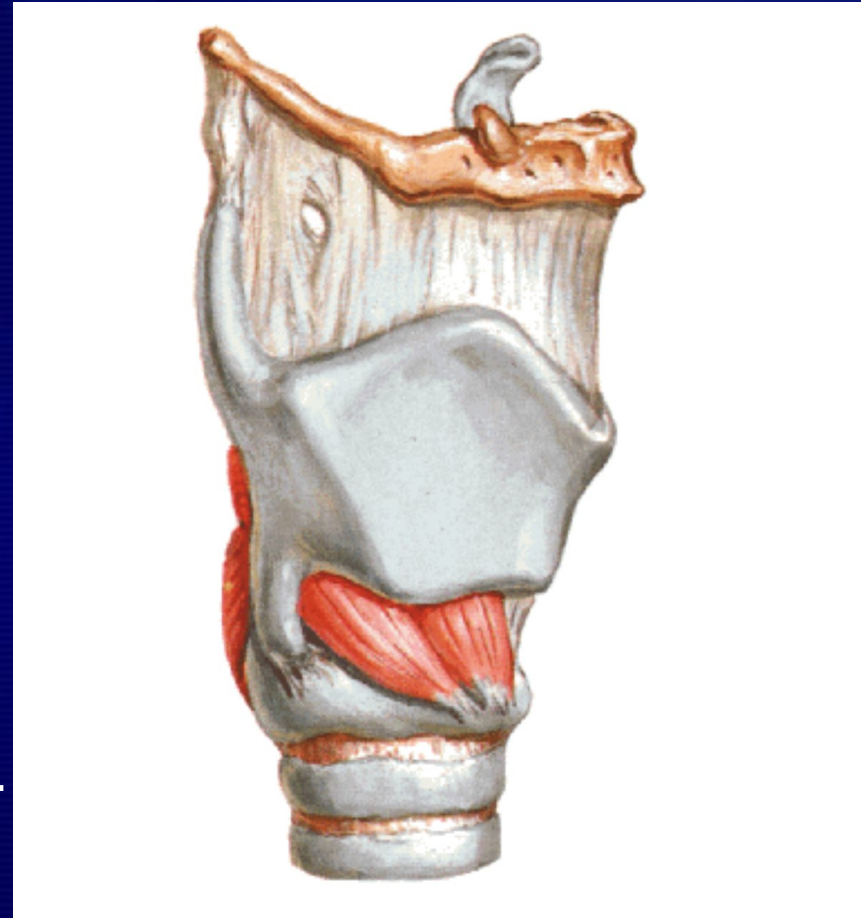
The *Only Muscle* of the larynx supplied by the External Laryngeal Nerve.

Origin: from the outer aspect of the arch of cricoid cartilage.

Insertion: into the inferior horn and lower border of the thyroid cartilage.

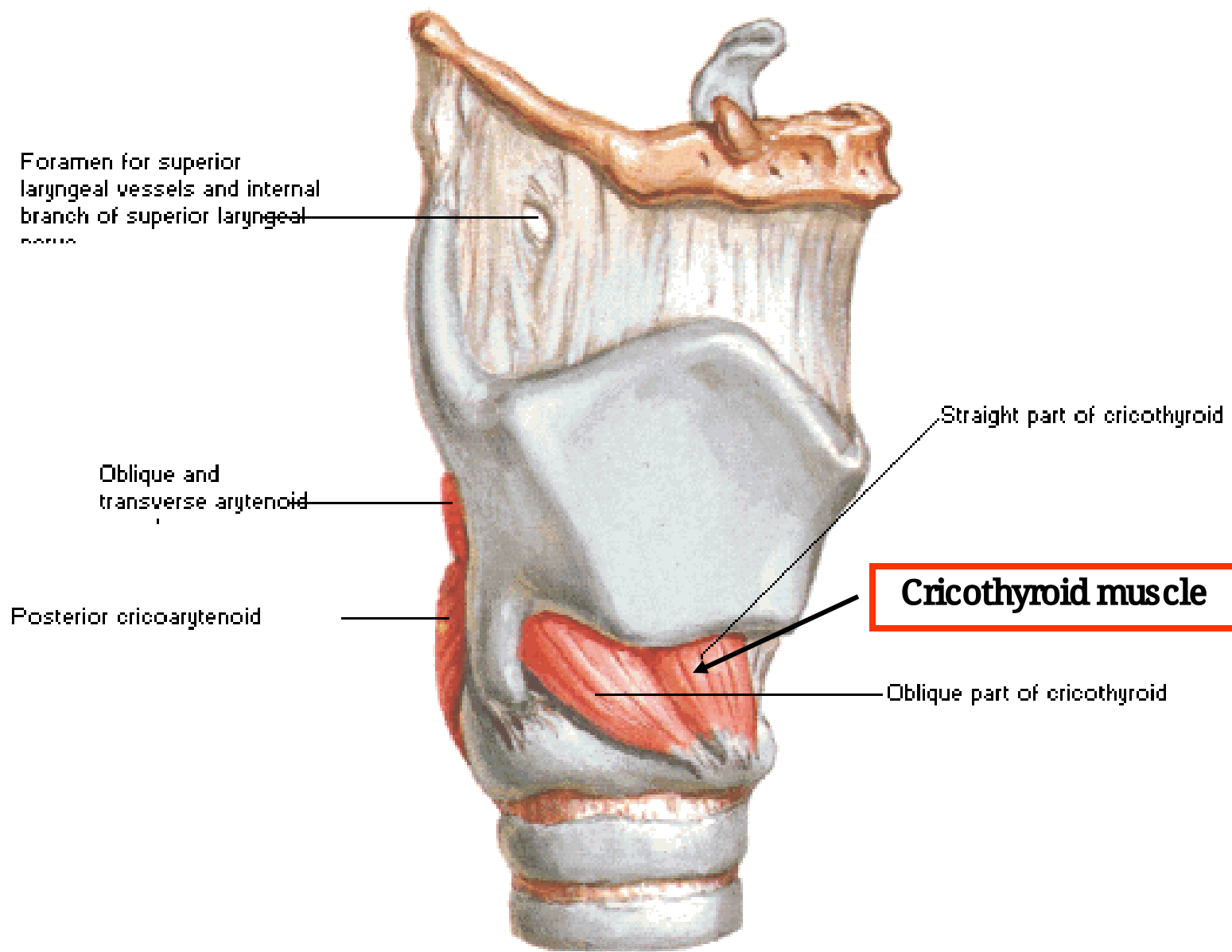
Nerve supply: external laryngeal nerve

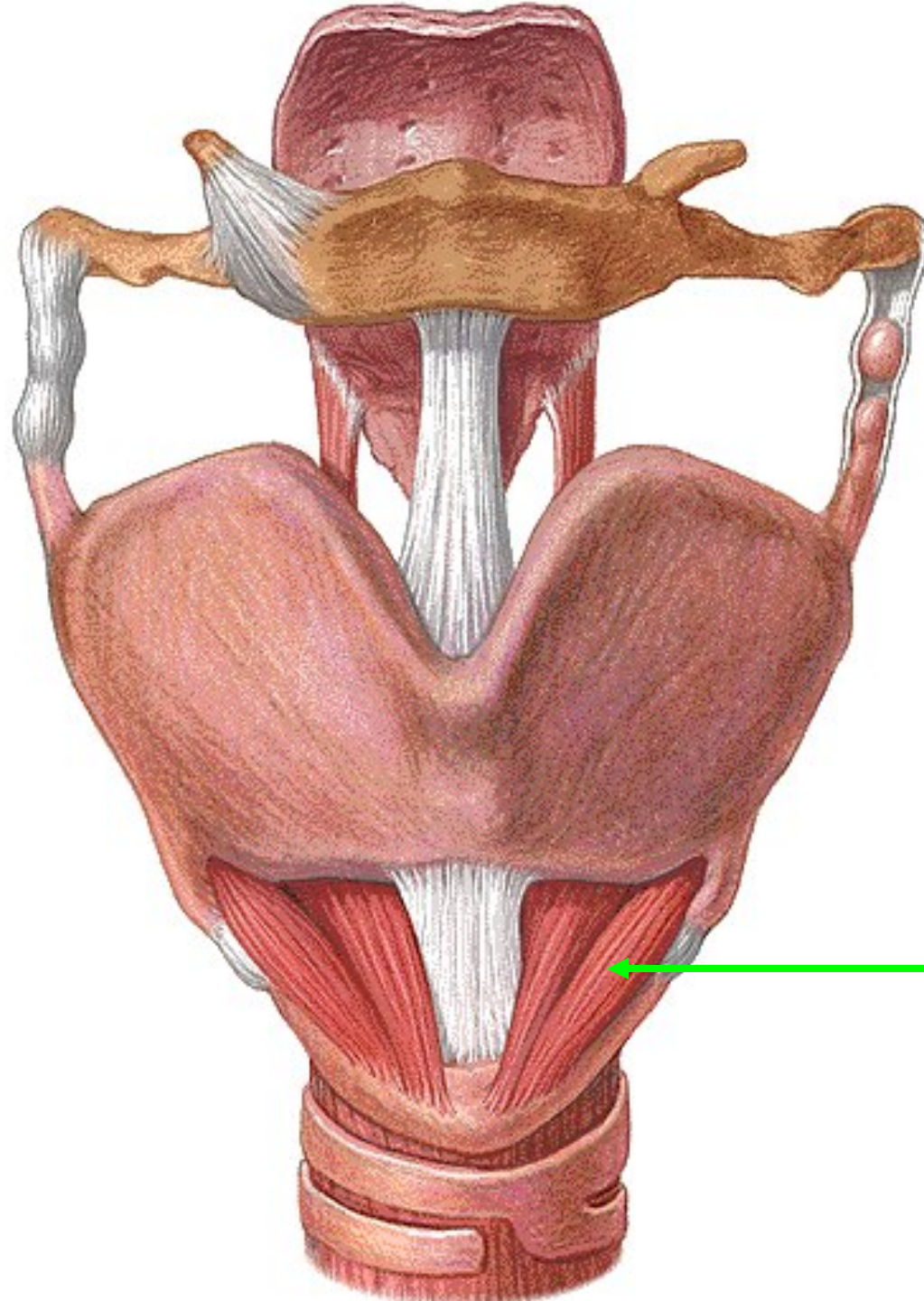
Action: Elongation and Tension of the vocal cords.



Intrinsic Muscles of Larynx

Right Lateral View

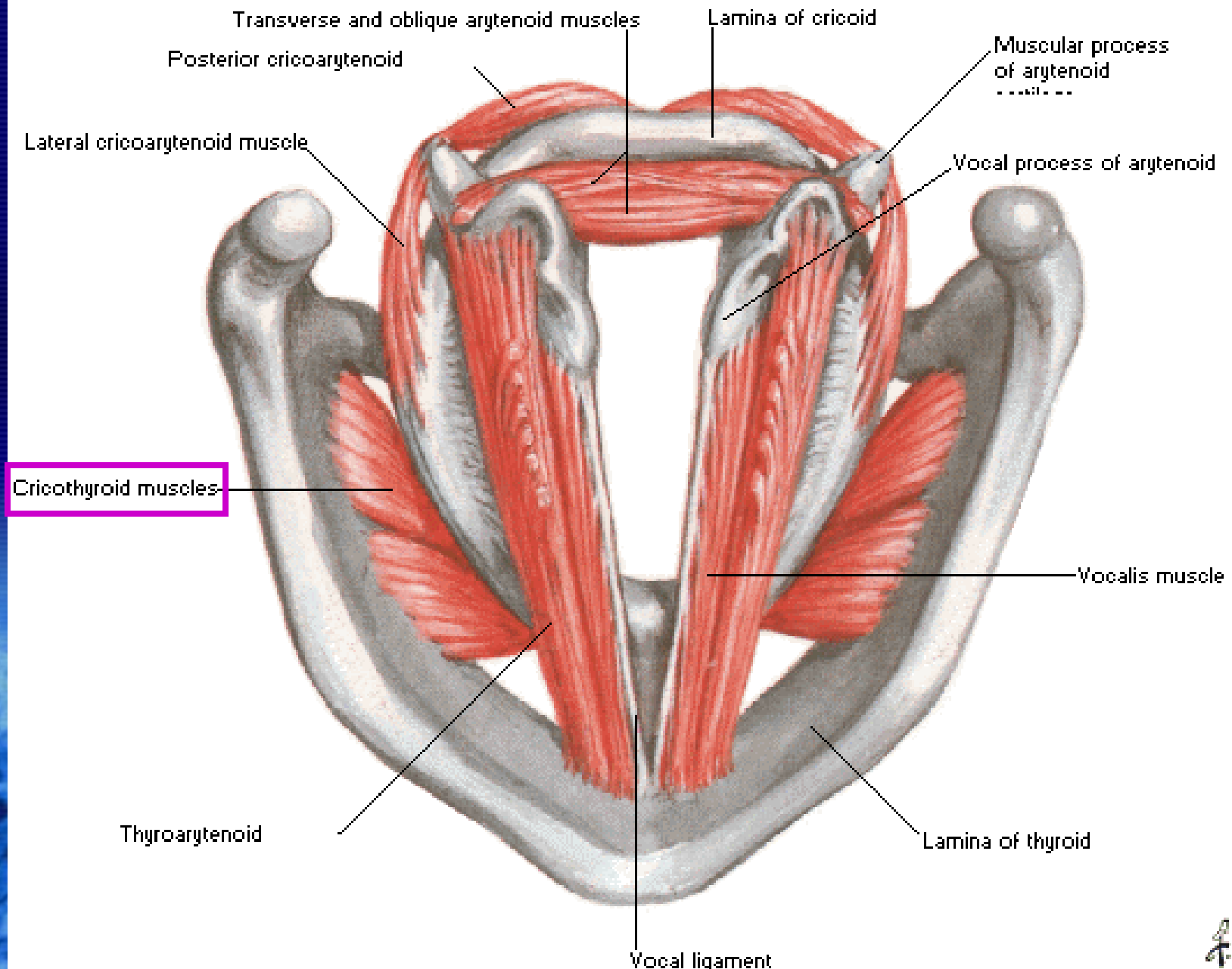




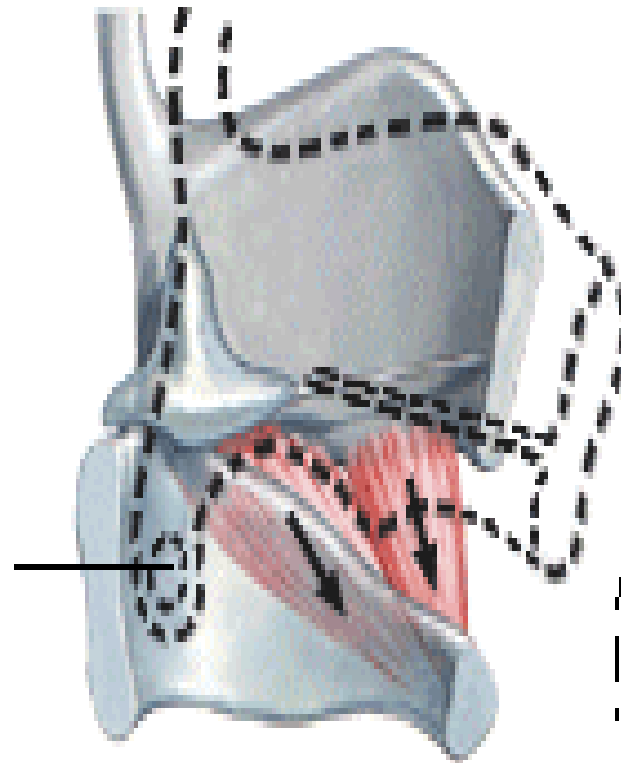
Cricothyroid muscle

Intrinsic Muscles of Larynx

Superior View



Cricothyroid joint
(pivot point for



Action of cricothyroid muscle:
Increasing length (tension) of vocal

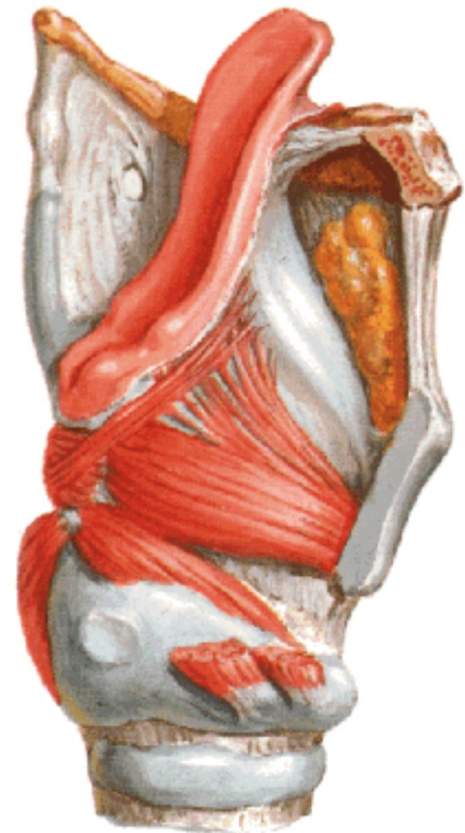
Thyroarytenoid Muscle

Origin: from the inner surface of thyroid cartilage

Insertion: into the anterolateral surface of arytenoid cartilage.

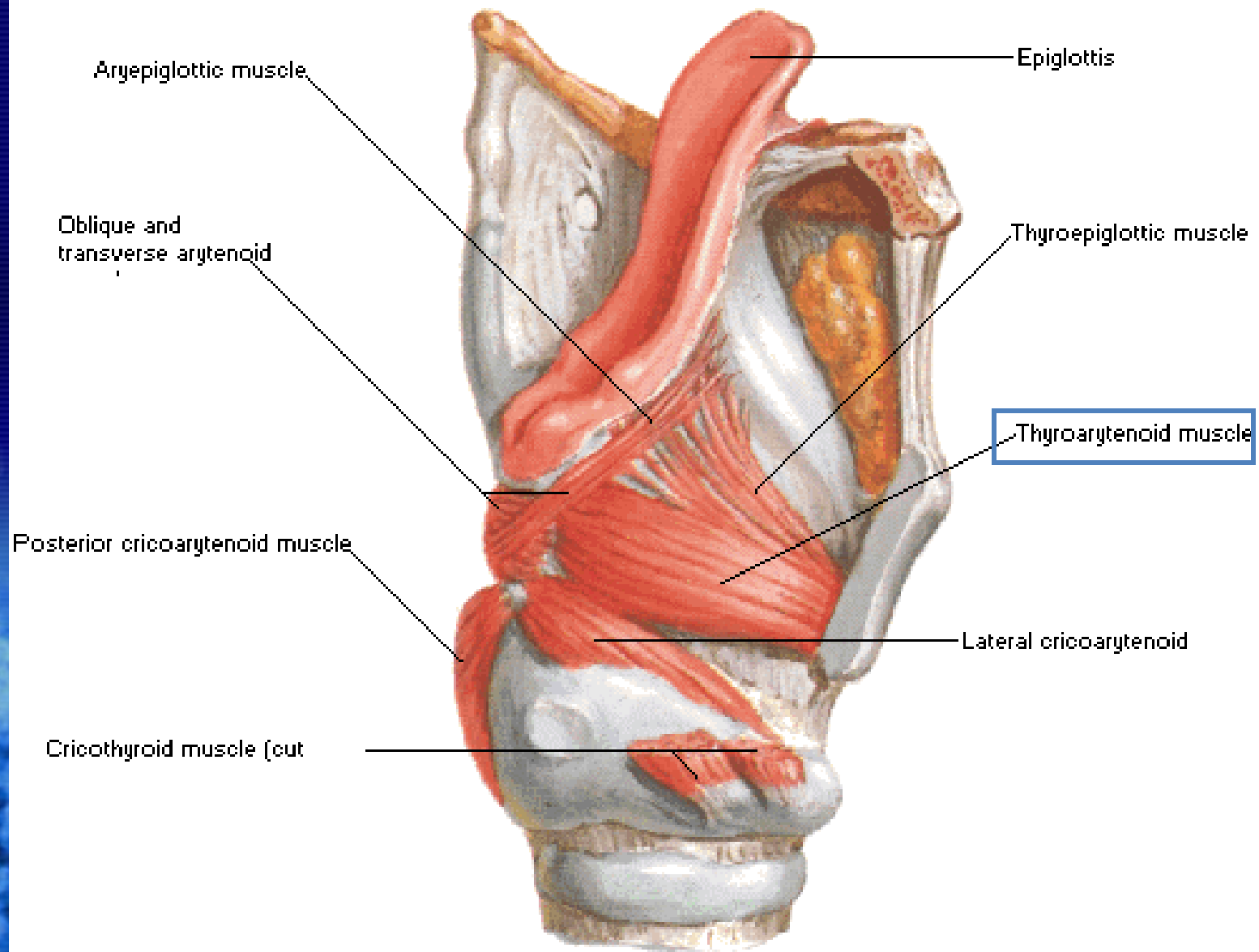
Nerve supply: recurrent laryngeal nerve

Action: shortening and relaxation of the vocal fold.



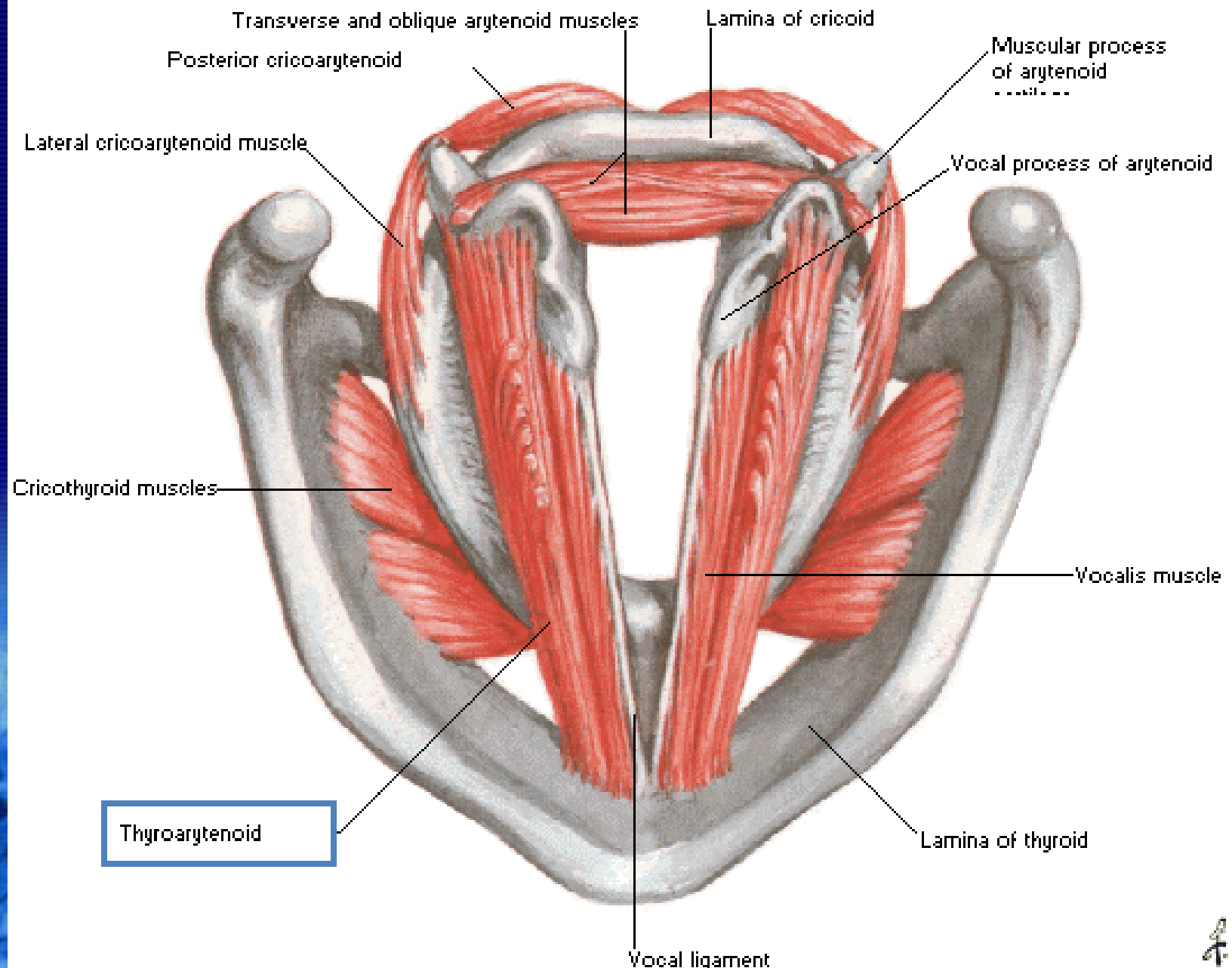
Intrinsic Muscles of Larynx

Lateral Dissection



Intrinsic Muscles of Larynx

Superior View

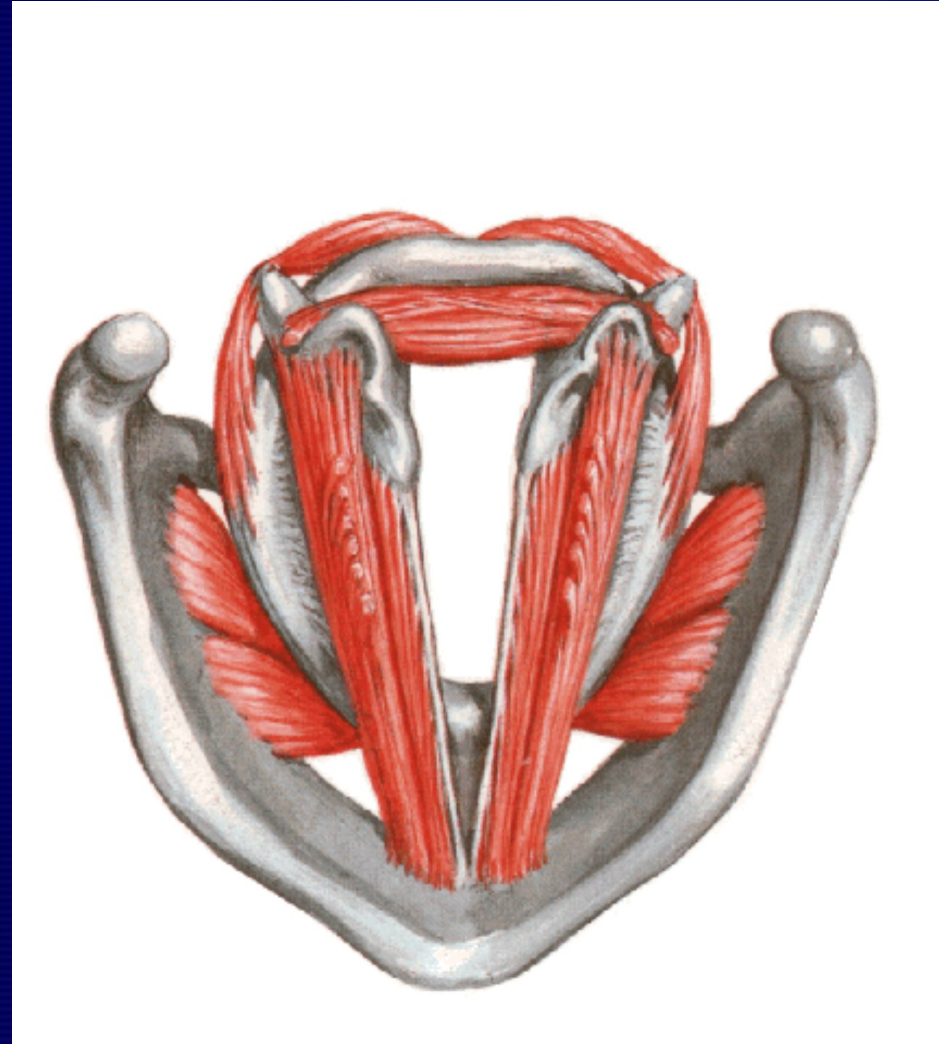




Action of vocalis and thyroarytenoid muscles: Shortening (relaxation) of vocal

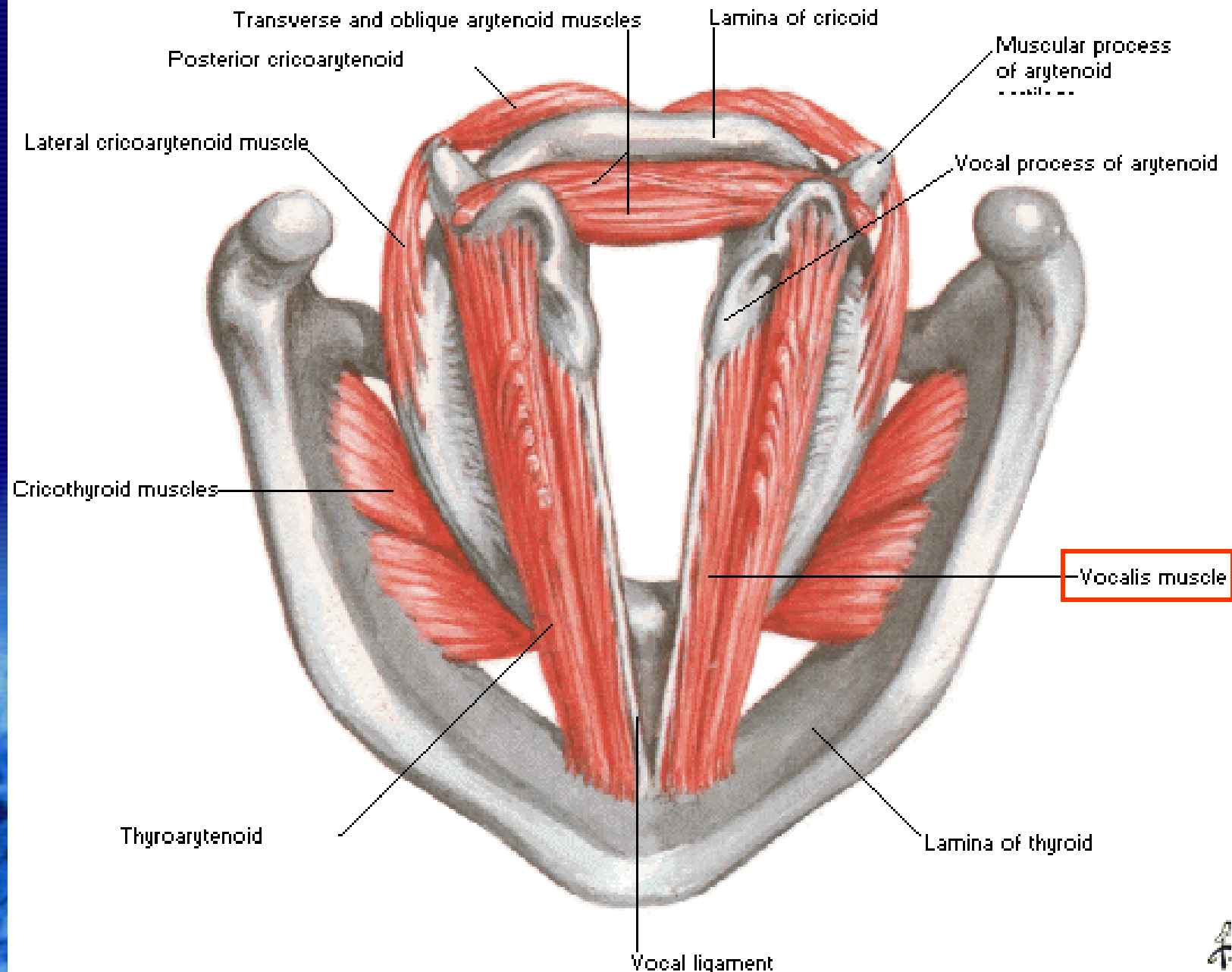
Vocalis Muscle

- **Origin** deep fibers of thyroarytenoid
- **Insertion** into the vocal process of arytenoid cartilage and vocal ligament.
- **Nerve supply** recurrent laryngeal nerve
- **Action:** shortening and relaxation of the vocal fold.



Intrinsic Muscles of Larynx

Superior View

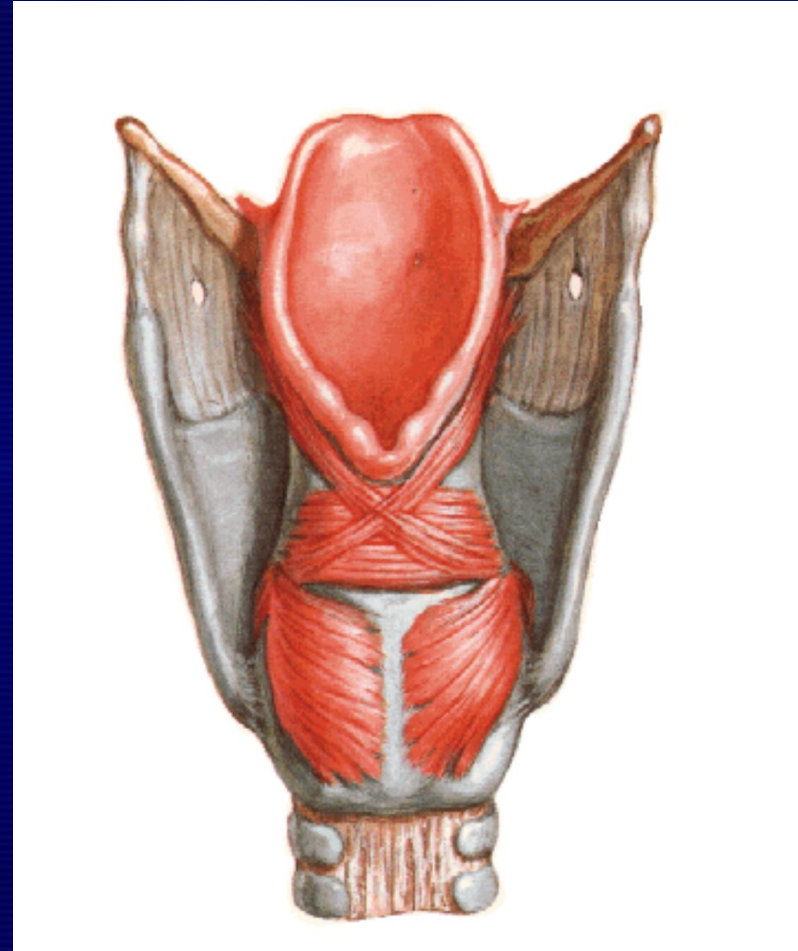




Action of vocalis and thyroarytenoid muscles: Shortening (relaxation) of vocal

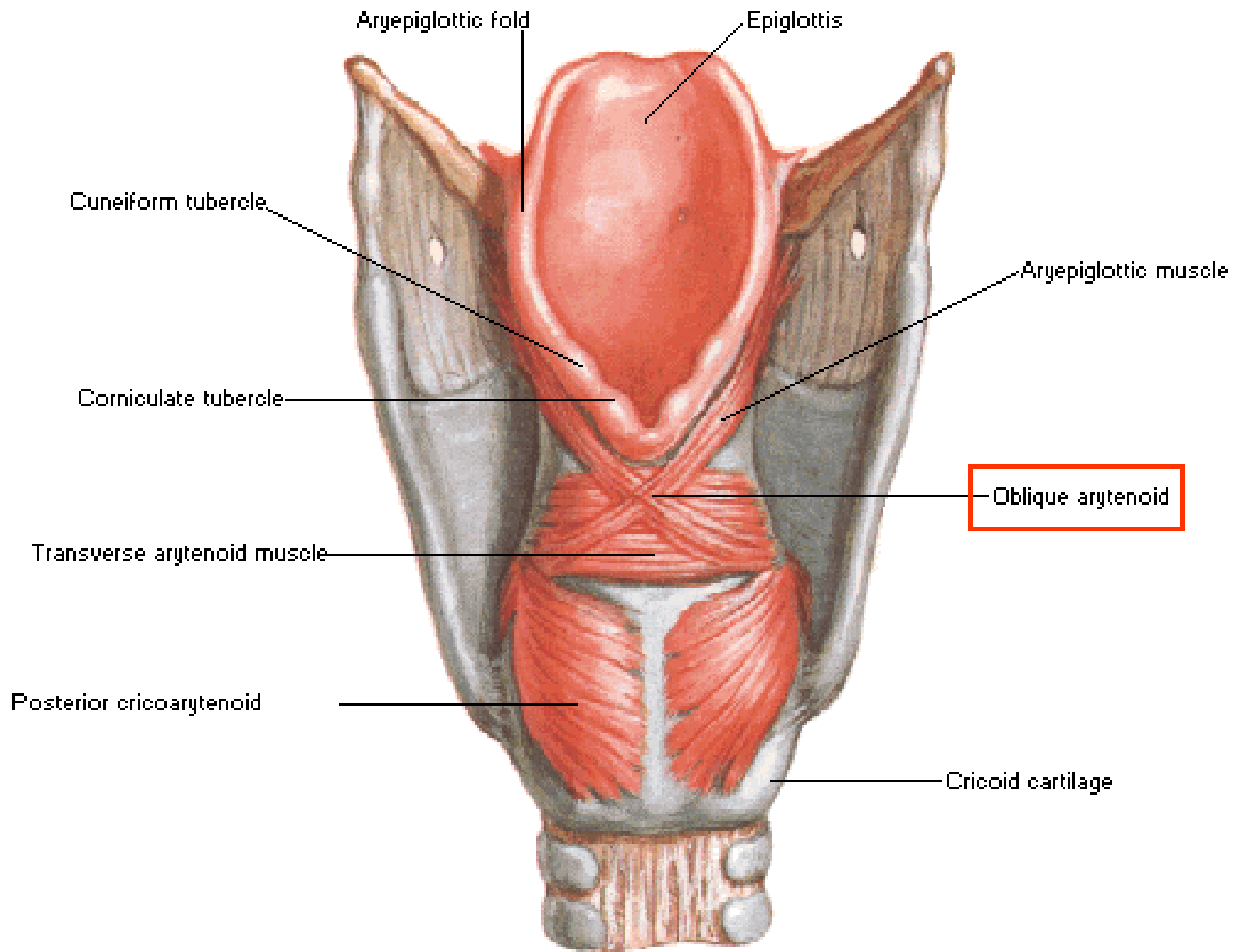
Oblique arytenoid Muscle

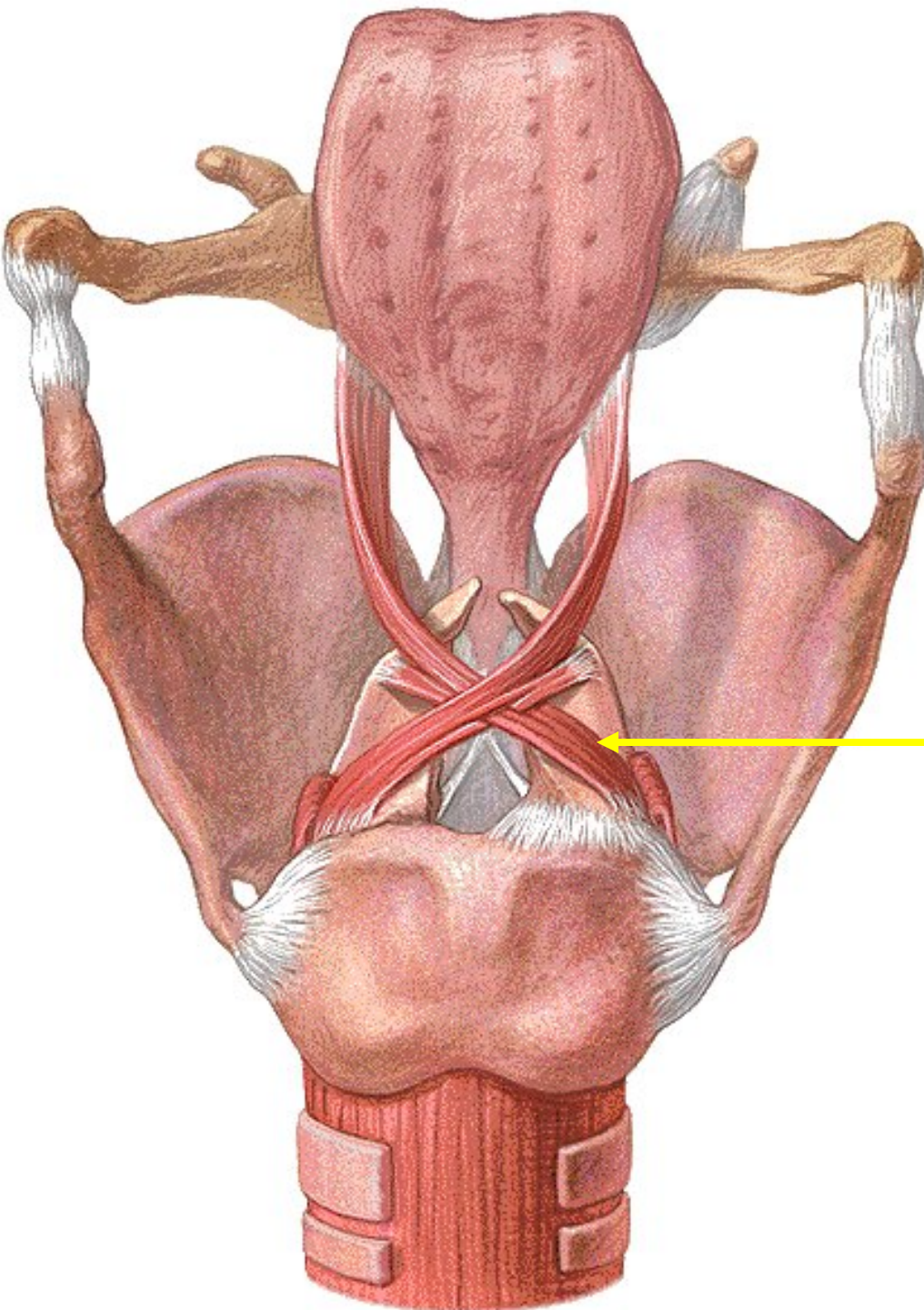
- **Origin:** from the back of the muscular process of the arytenoid cartilage.
- **Insertion:** into the apex of the opposite arytenoid cartilage.
- **Nerve supply:** recurrent laryngeal nerve
- **Action:** narrowing of the laryngeal inlet by bringing the two aryepiglottic folds together.



Intrinsic Muscles of Larynx

Posterior View

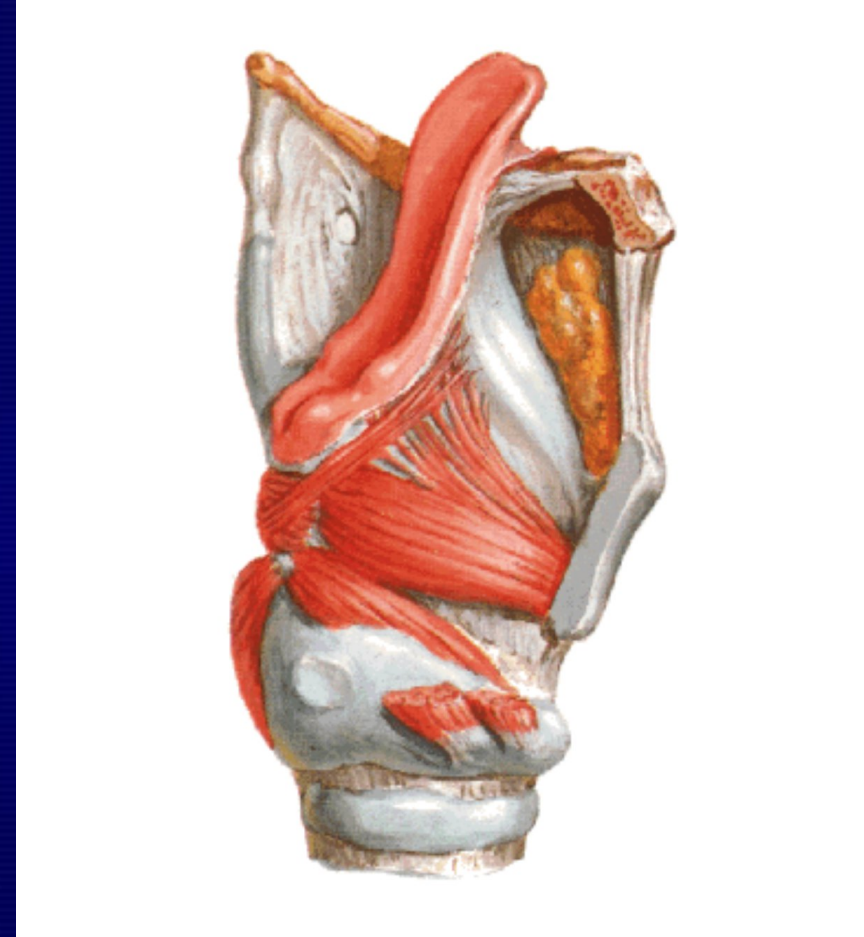




Oblique arytenoid muscle

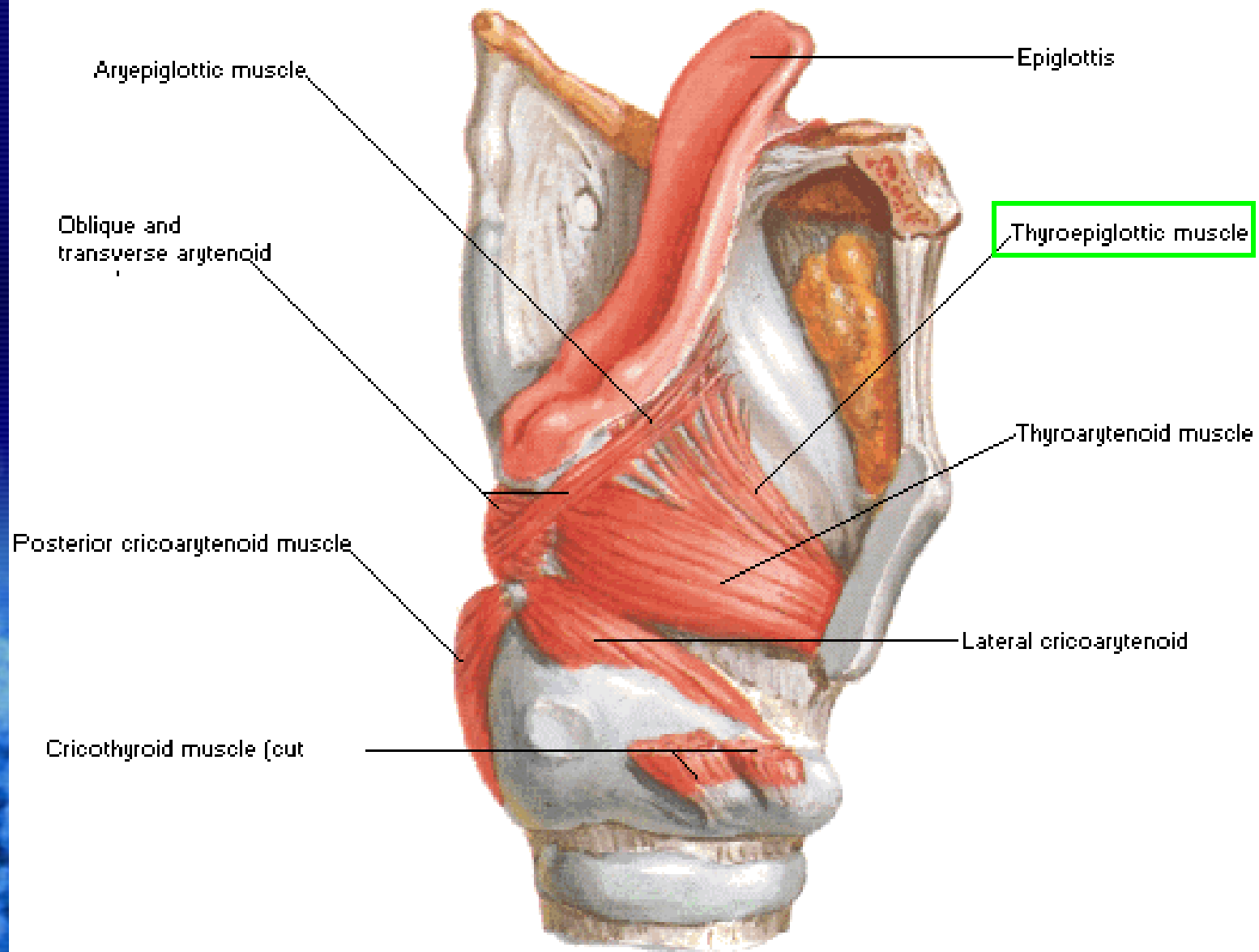
Thyroepiglottic Muscle

- **Origin:** from the inner surface of the thyroid cartilage.
- **Insertion:** into the side of the epiglottis cartilage.
- **Nerve supply:** recurrent laryngeal nerve
- **Action:** widening of the laryngeal inlet.



Intrinsic Muscles of Larynx

Lateral Dissection



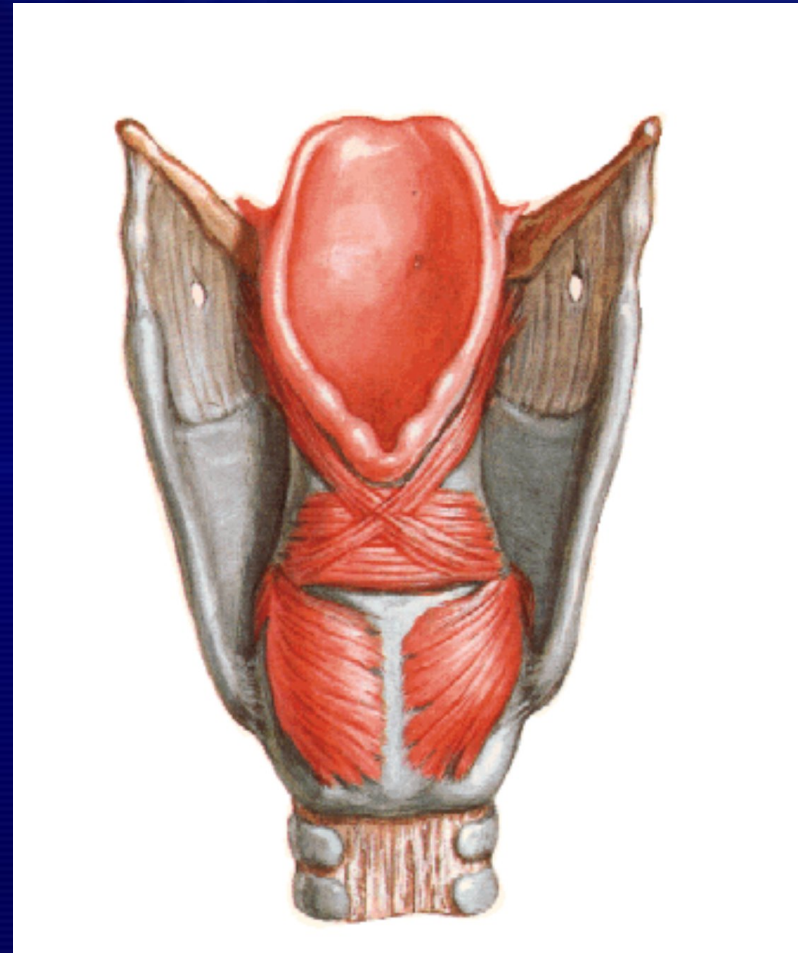
Aryepiglottic Muscle

Origin from the apex of the arytenoid cartilage as a continuation of the oblique arytenoid muscle.

Insertion: into the side of the epiglottis cartilage.

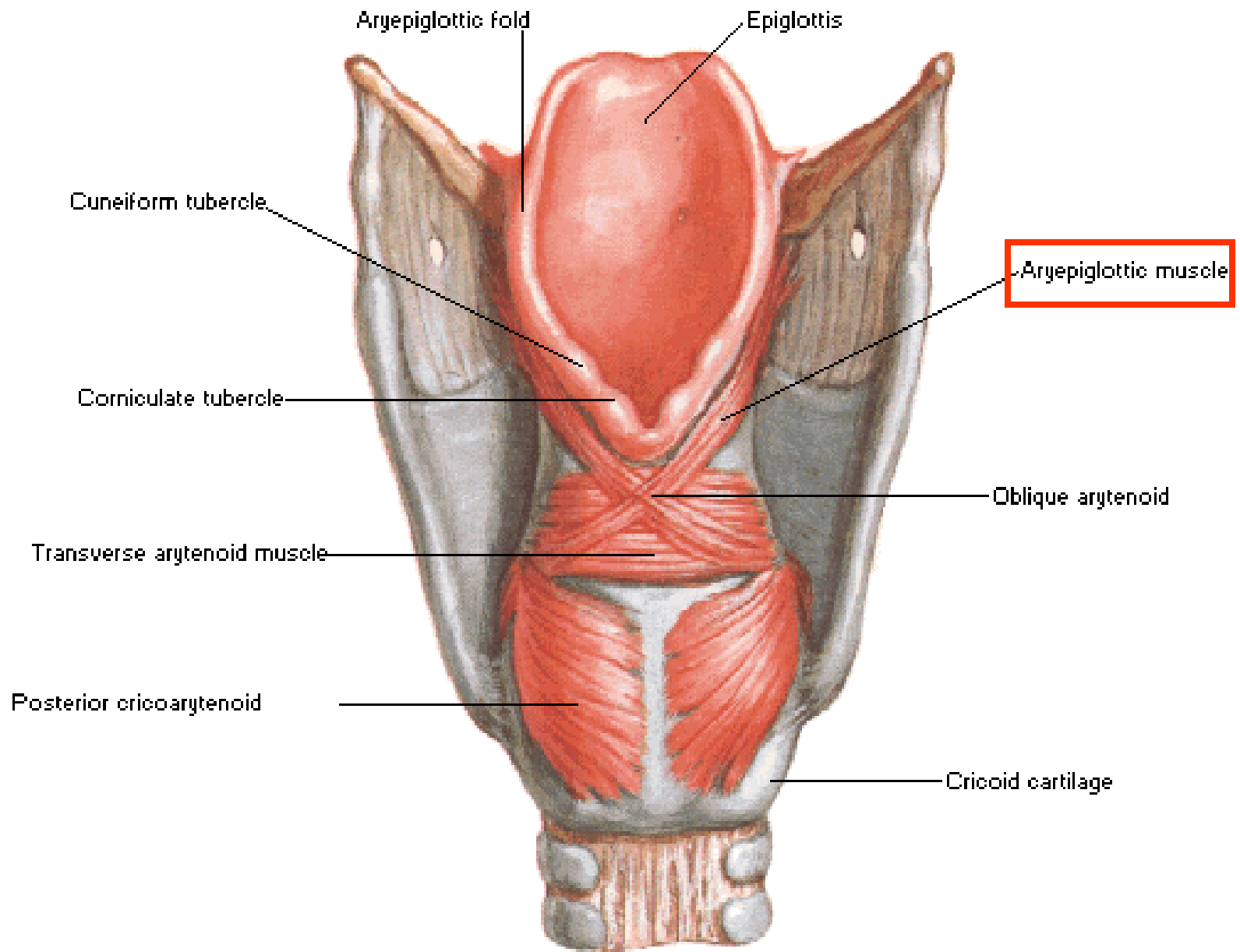
Nerve supply recurrent laryngeal nerve

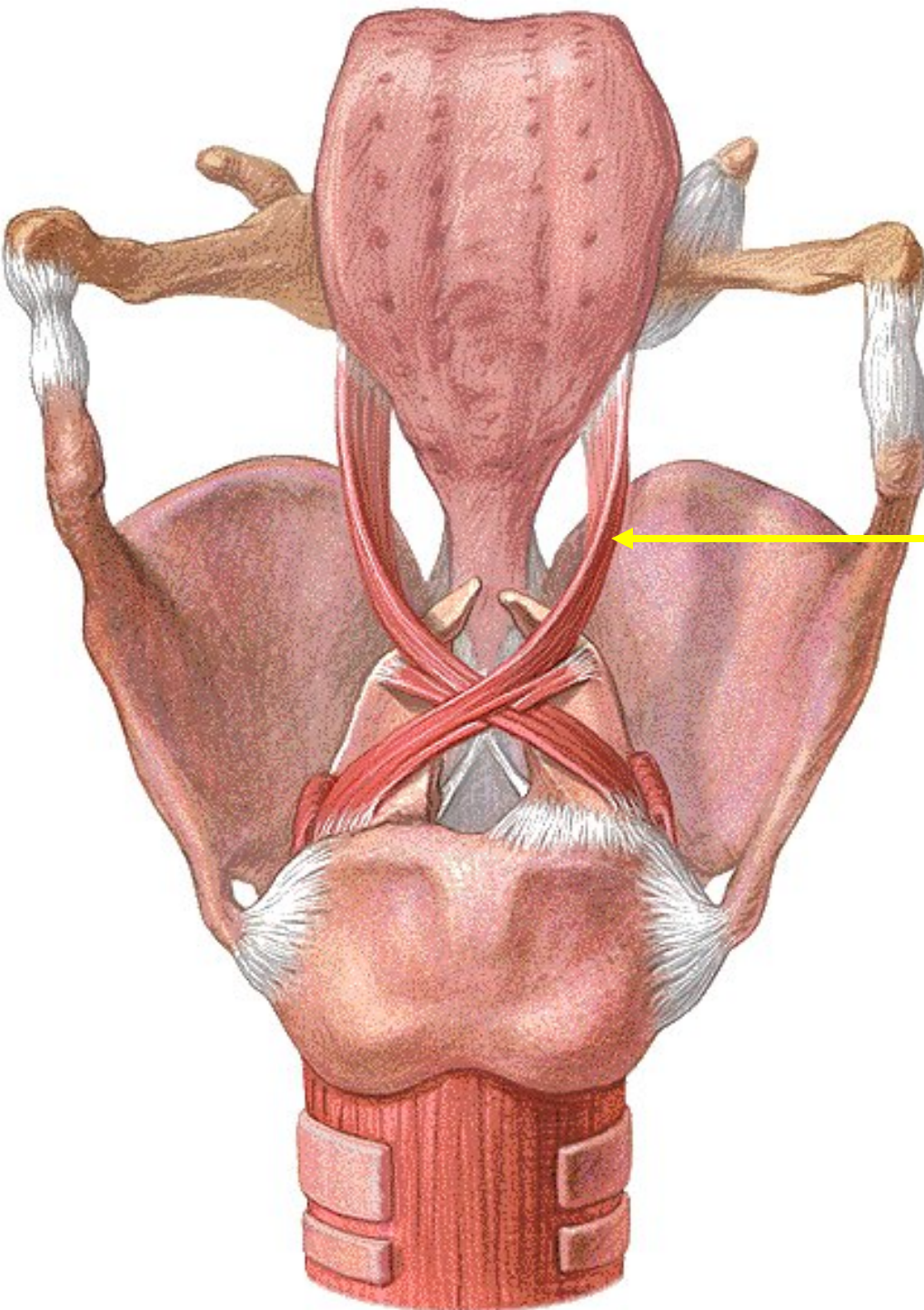
Action: narrowing of the laryngeal inlet by shortening the aryepiglottic fold



Intrinsic Muscles of Larynx

Posterior View





Aryepiglottic muscle

Nerve Supply of the Larynx

1. Superior laryngeal nerve (from Vagus nerve) divides into:
 - A. External laryngeal nerve (motor): supplies the cricothyroid muscle.
 - B. Internal laryngeal nerve (sensory): supplies the mucous membrane Above the level of the vocal folds.



Nerve Supply of the Larynx

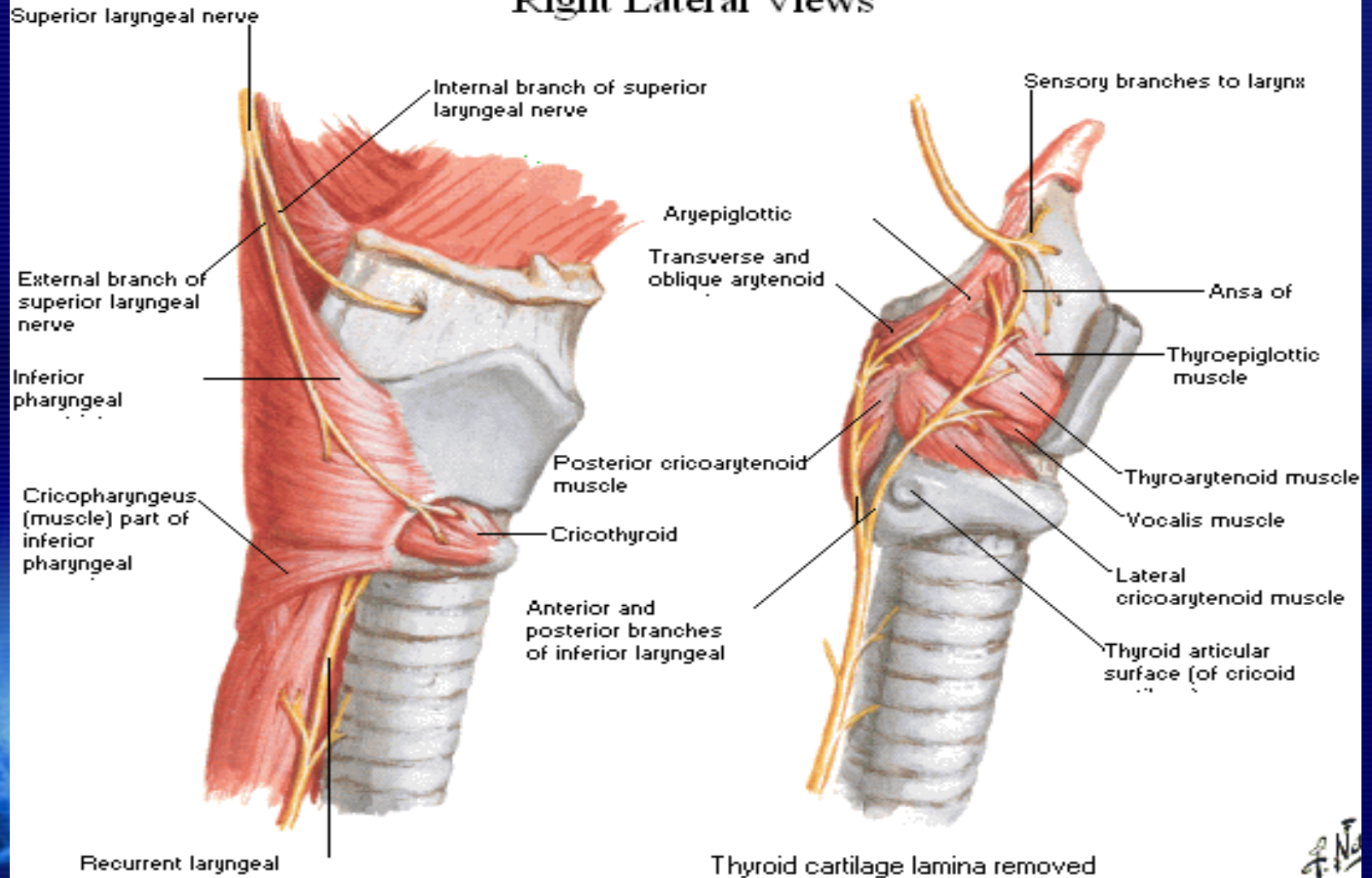
Recurrent laryngeal Nerve (from Vagus nerve)
divides into motor and sensory branches:

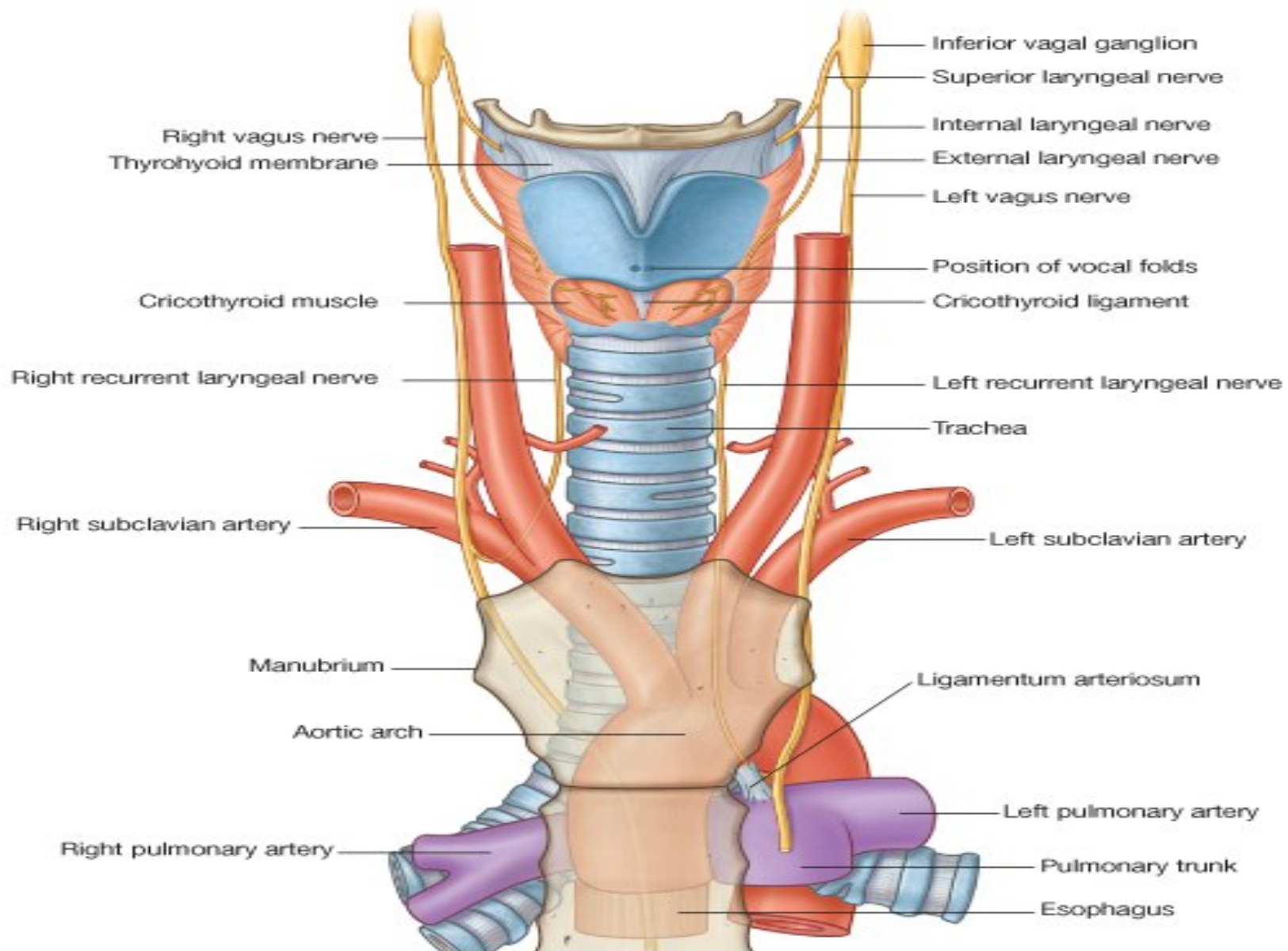
The motor branch supplies ALL intrinsic muscles of the larynx (**Except Cricothyroid Muscle**).

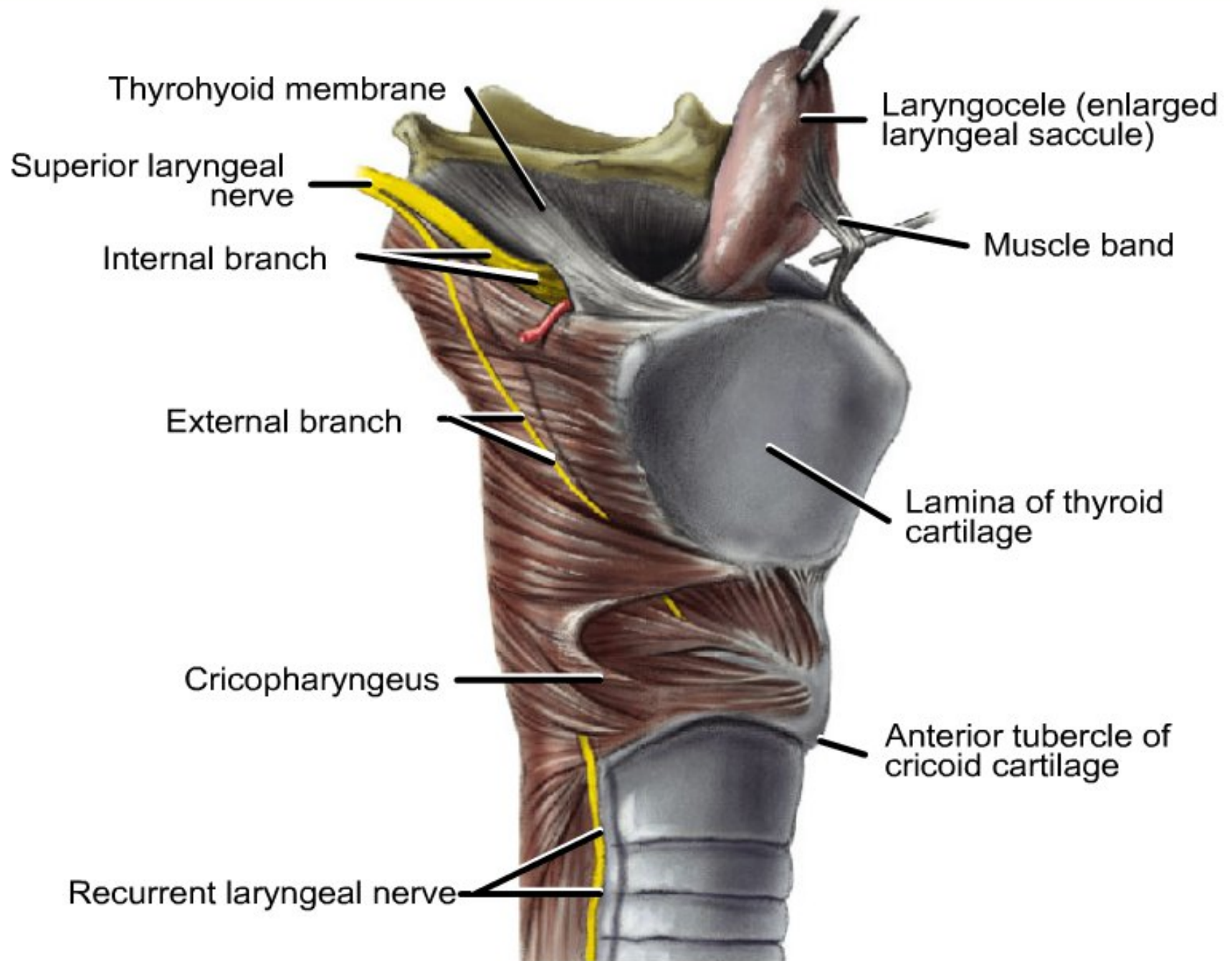
The sensory branch supplies the mucous membrane Below the level of the vocal folds.

Nerves of Larynx

Right Lateral Views







Lateral Views Before Removal of the Right Thyroid Cartilage

Blood supply of the larynx

Arterial supply of the larynx

Superior laryngeal artery (from superior thyroid artery from external carotid artery).

Inferior laryngeal artery (from inferior thyroid artery from thyrocervical trunk from 1st part of subclavian artery).

Lymphatic drainage of the larynx

1. *Supra-glottic larynx* → infra hyoid nodes (thru the thyro hyoid membrane)
→ *Upper Deep Cervical Nodes*
2. *Infraglottic larynx* → Pre laryngeal
→ *Lower Deep Cervical Nodes*

Clinical Points of the Larynx

Injury of the External Laryngeal Nerve:

Paralysis of the Cricothyroid muscle which affects the voice (weakness) with no effect on air pathway.

Loss of high pitched voice

Injury of the Recurrent Laryngeal Nerve:

Unilateral Complete Section: the affected vocal cord will be between adduction and abduction. The other cord will compensate and crosses to the other side.

Hoarseness of voice early, late voice may improve

Bilateral complete section

Both vocal cords will be between adduction and abduction. The *Voice will be lost (Aphonia)* and the respiration is affected may lead to *Stridor*