

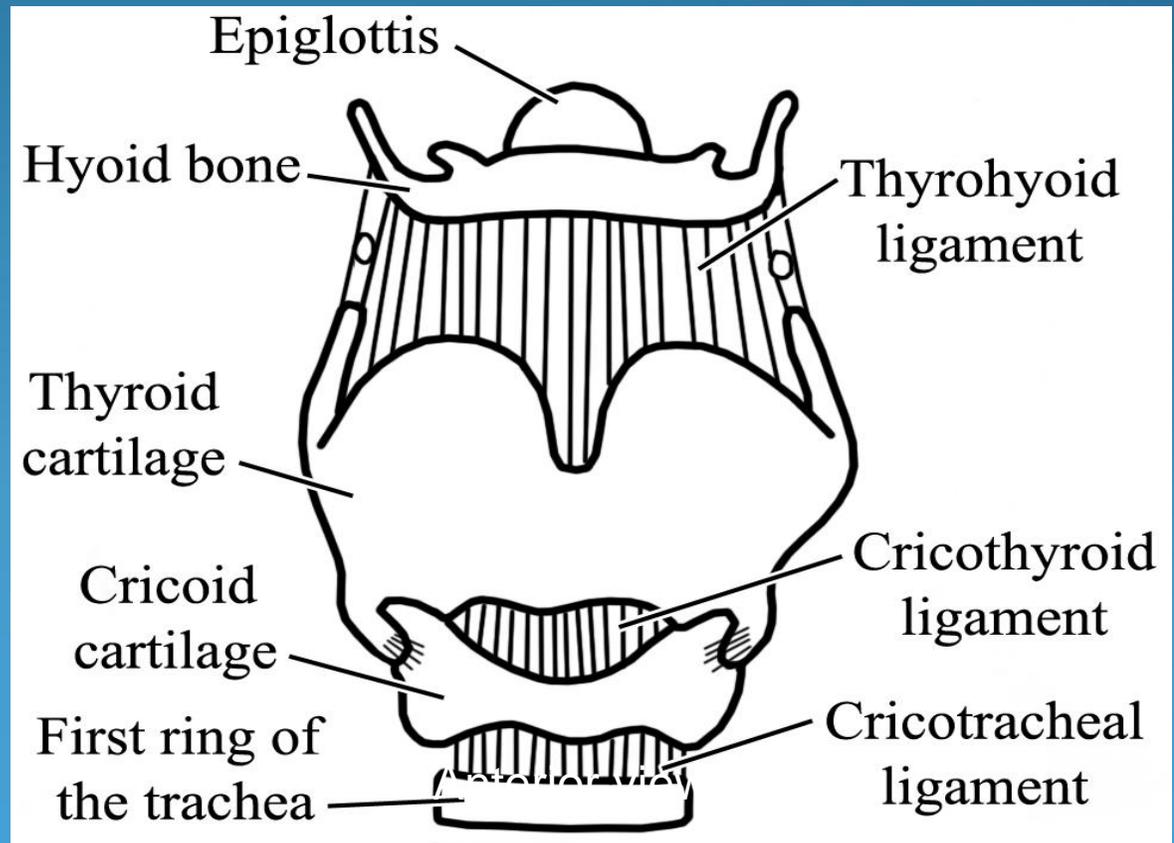
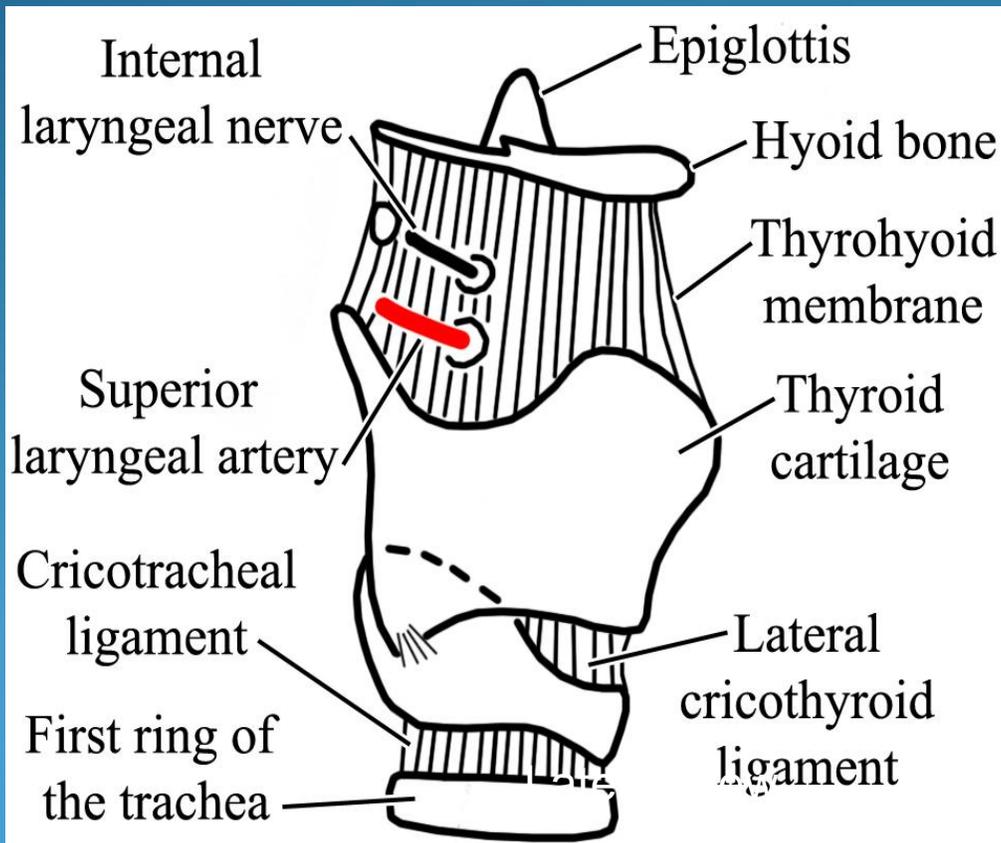
ANATOMY OF THE Larynx

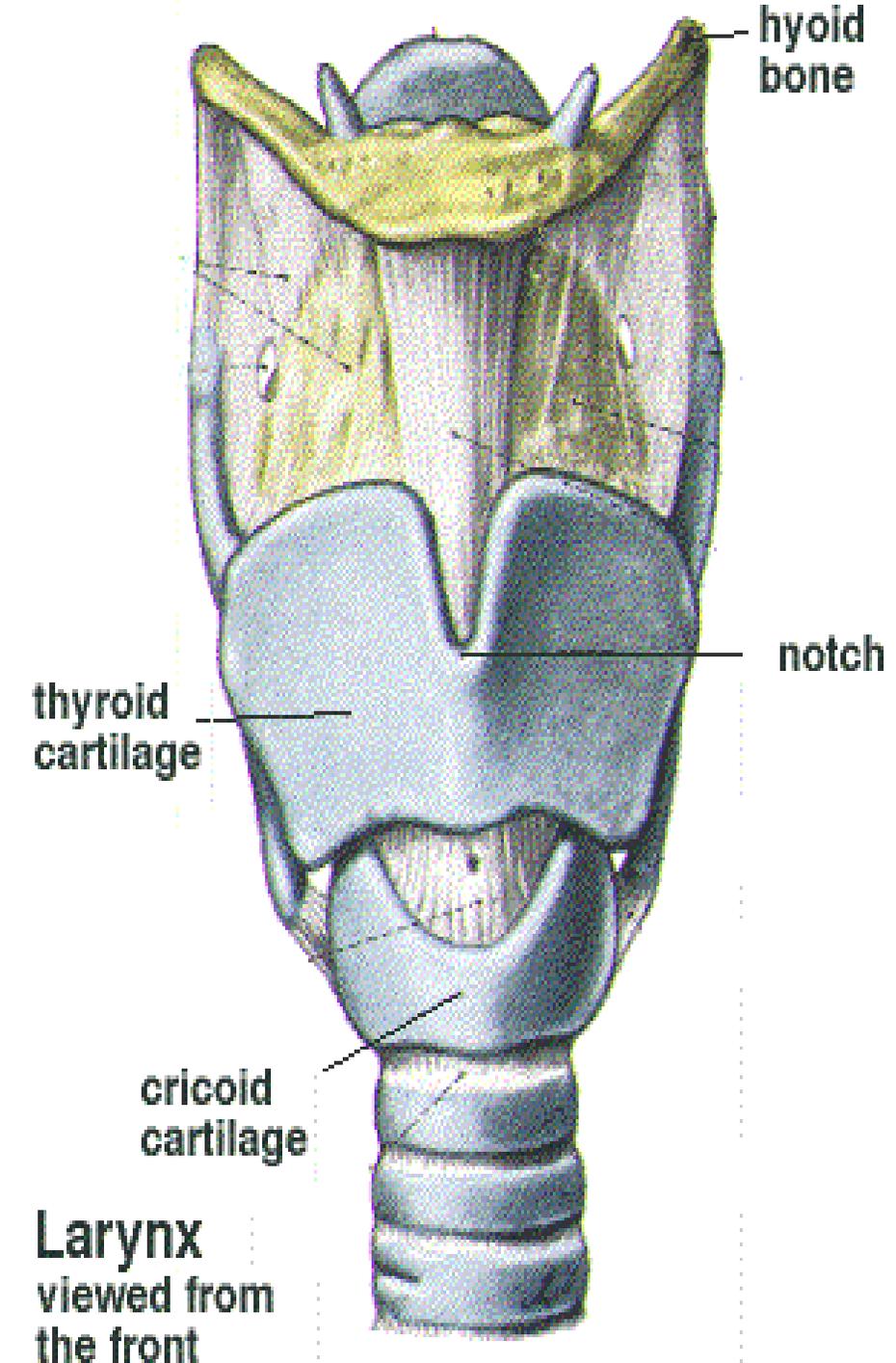
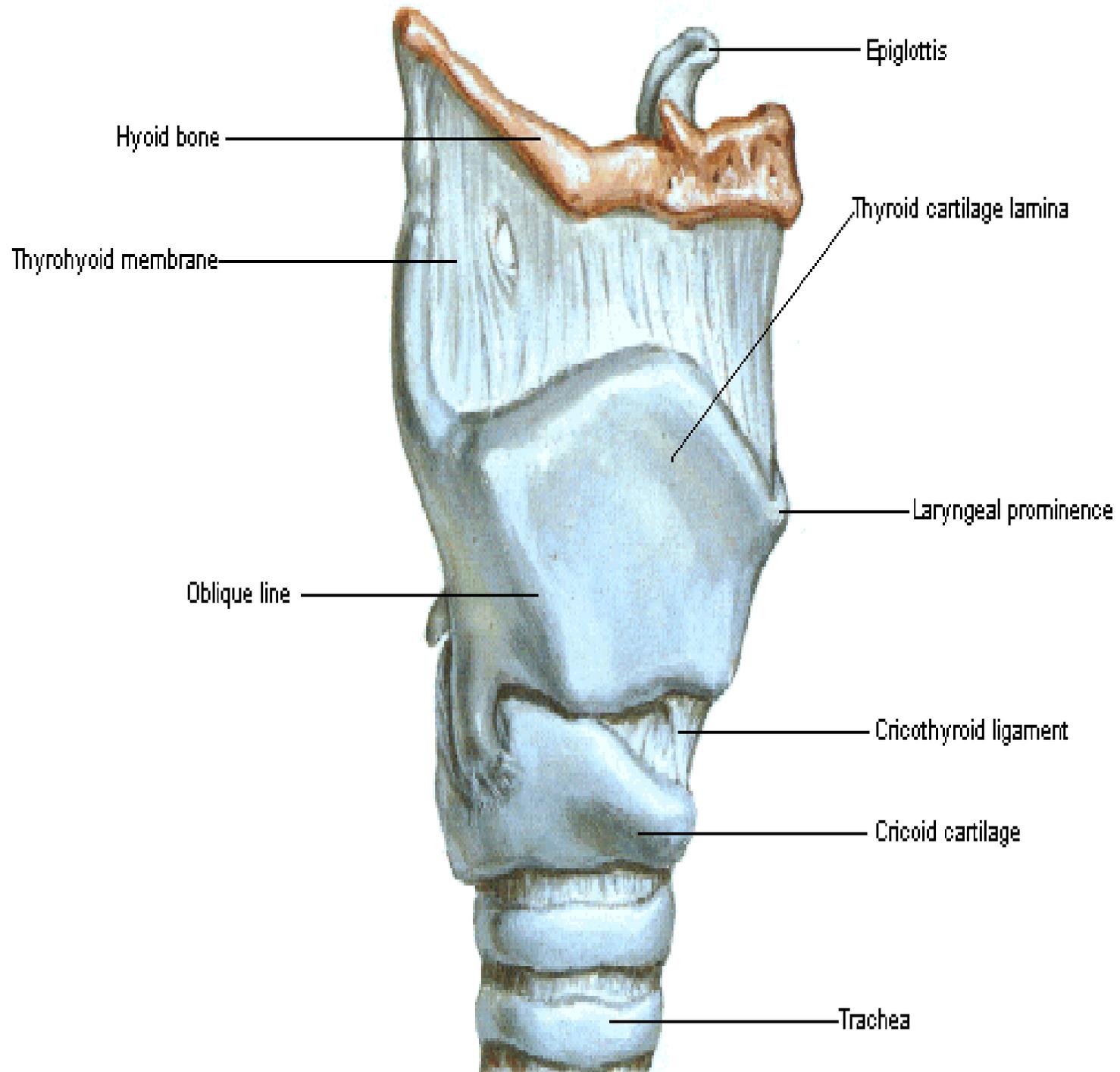
DR.DALIA M. BIRAM

Larynx

- The larynx is the organ of phonation (voice production) in addition to its respiratory function (air way). It is formed of a group of cartilages connected by Muscles, Ligaments and joints).

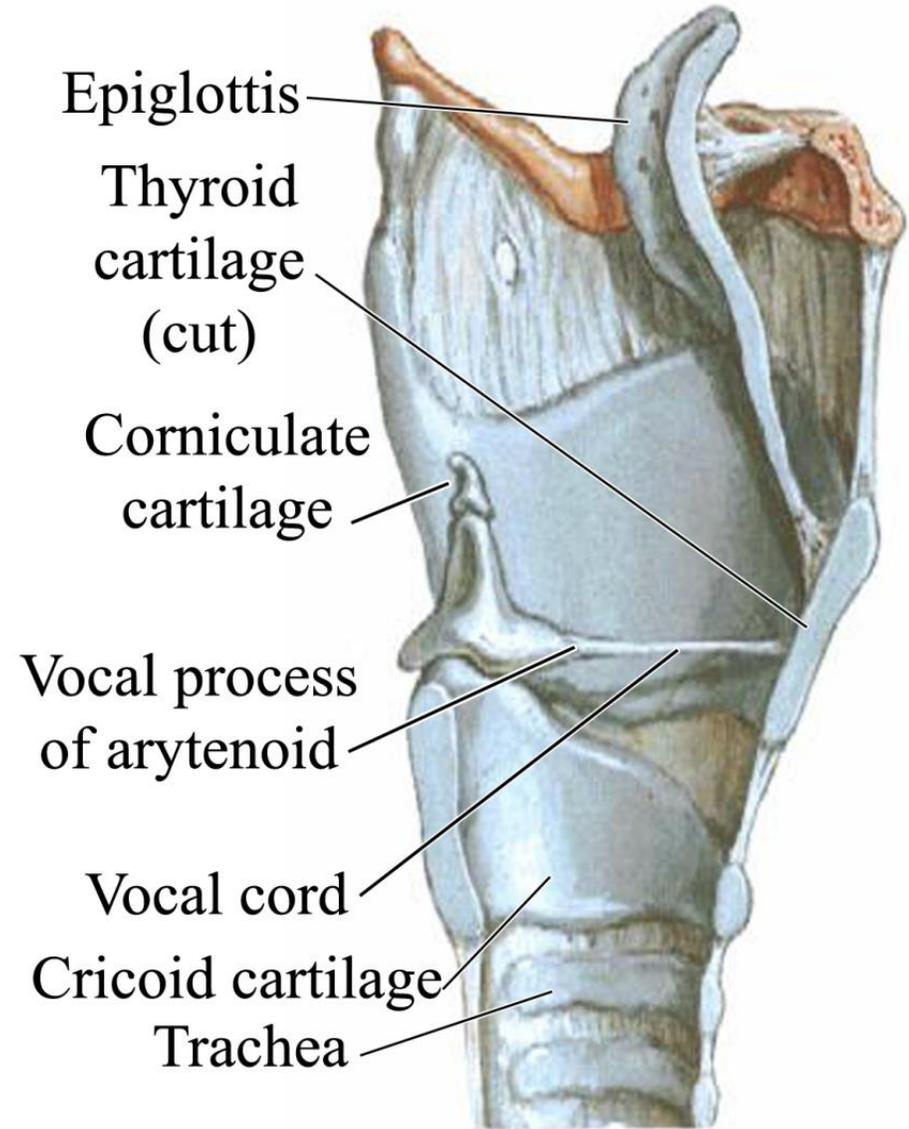
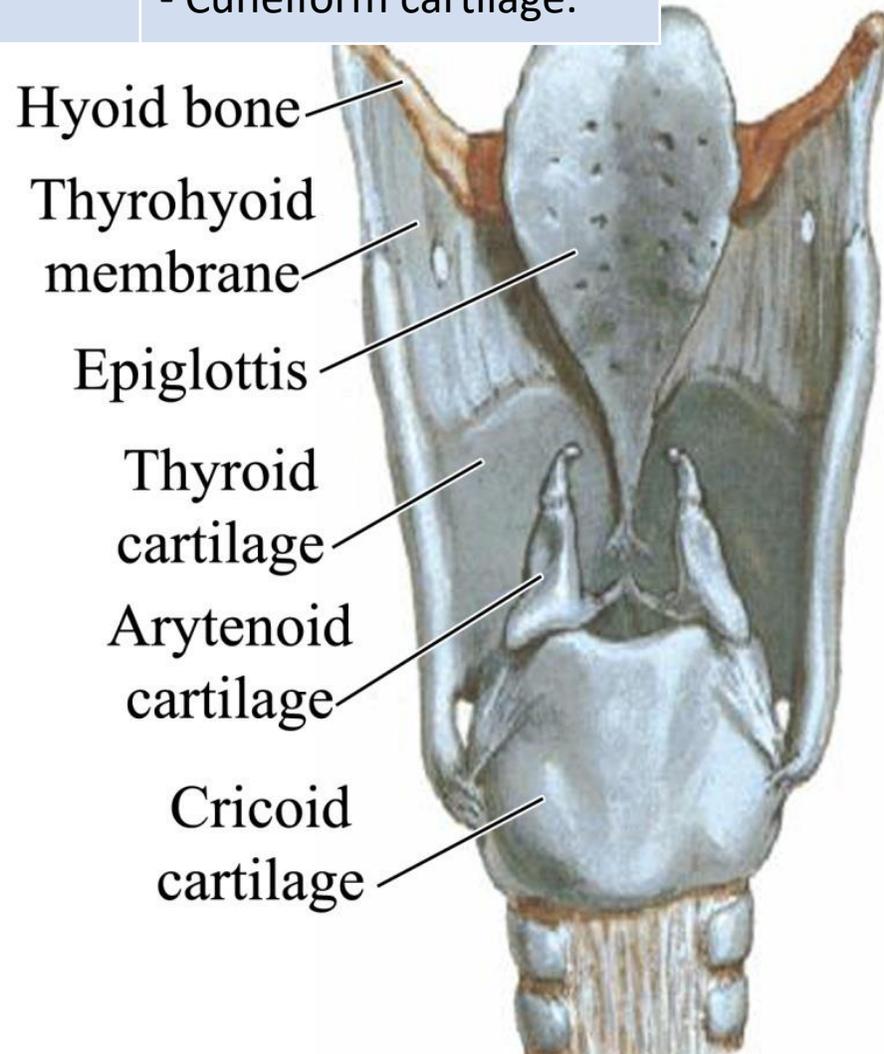
Site: It lies below the hyoid bone in the midline of the neck at the level of C. 4 - 6 vertebrae.





Single cartilages	Paired cartilages
- Thyroid cartilage.	- Arytenoid cartilage.
- Cricoid cartilage.	- Corniculate cartilage.
- Epiglottis.	- Cuneiform cartilage.

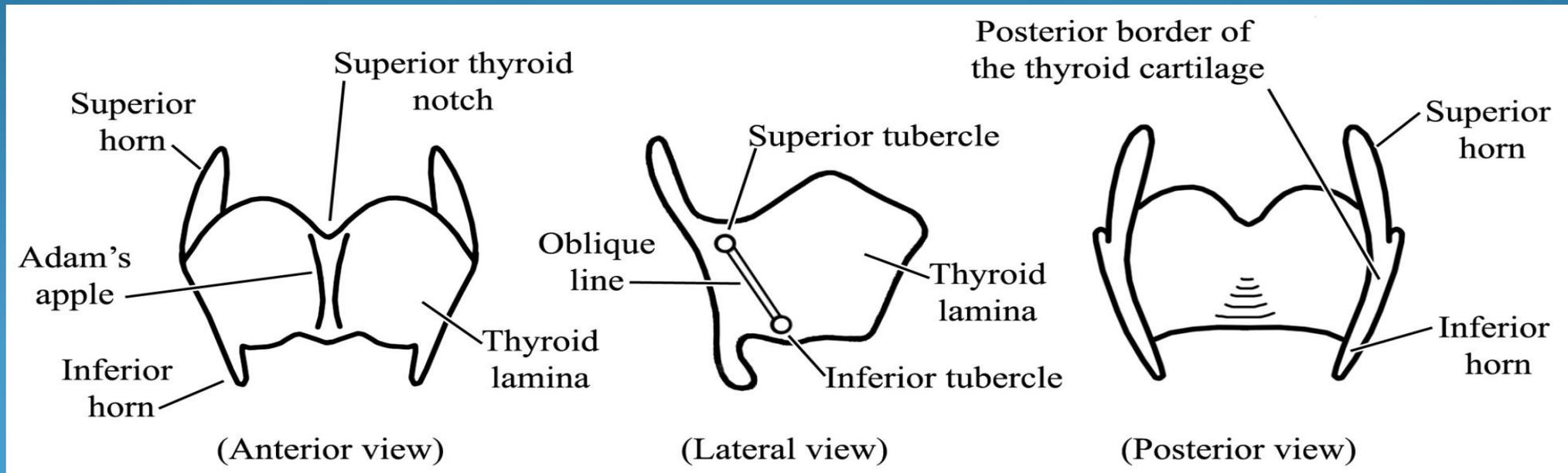
Cartilages of the Larynx



1. Thyroid cartilage

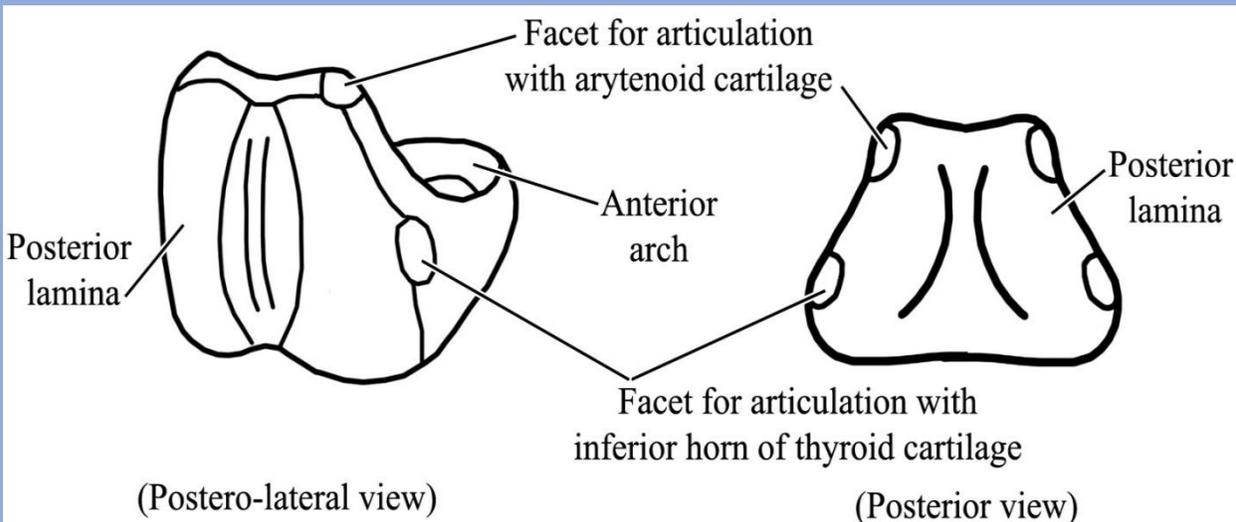
It consists of **two laminae** which are fused anteriorly to form the laryngeal prominence (Adam's apple) but they are separated posteriorly.

- Superiorly the area between the **two laminae** is called the **superior thyroid notch**.
- Each lamina has **two horns** (superior and inferior), and **two tubercles** on its lateral surface (superior and inferior).
- The two tubercles are connected to each other by the **oblique line**.



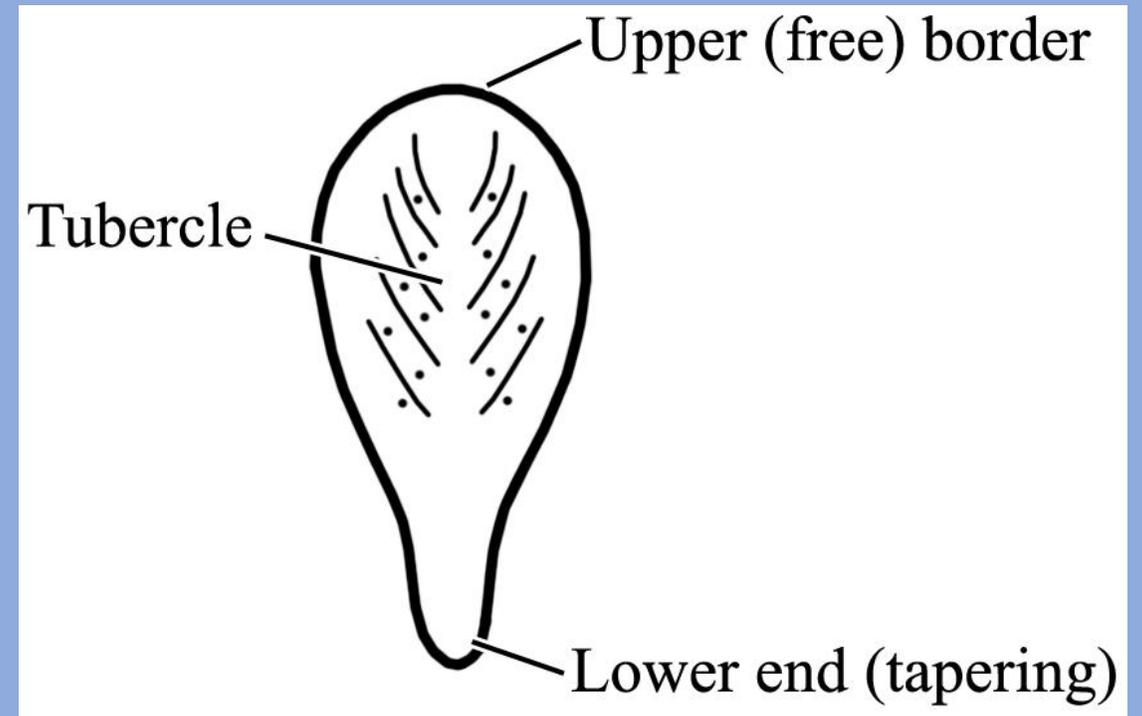
2. Cricoid cartilage

- It is signet-ring in shape (it is the only complete cartilaginous ring in the upper respiratory airway).
- It lies at the level of C. 6.
- It is formed of quadrate lamina (posterior) and a narrow arch (anterior).
- The quadrate lamina contains two facets which are:
 - a. Superior facet: Articulates with the base of the arytenoid cartilage (one on each side).
 - b. Inferior facet: Articulates with the inferior horn of the thyroid cartilage (one on each side).



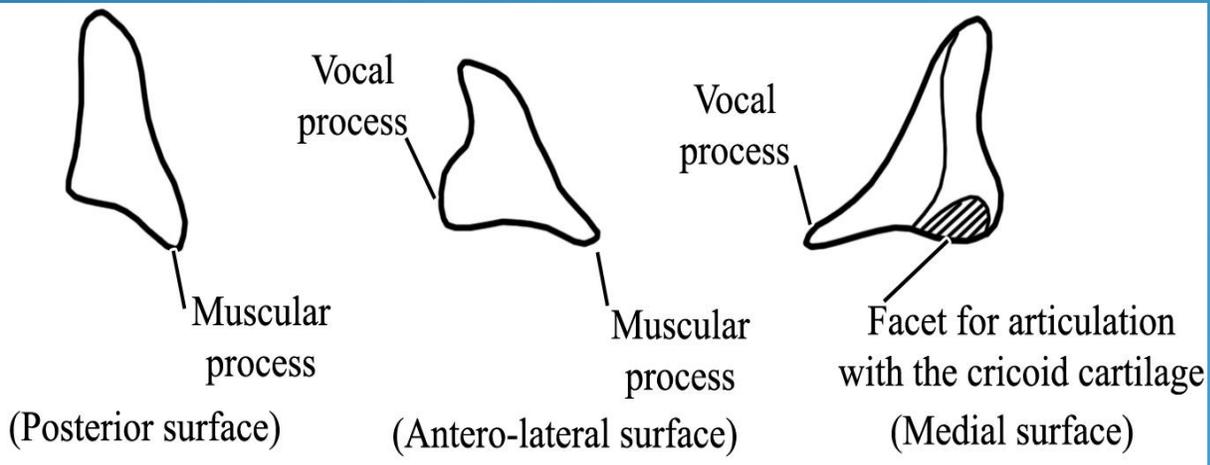
3. Epiglottis

- It is leaf-shaped **elastic** cartilage which lies behind the tongue.
- It has superior rounded free border and an inferior tapering end which is attached to the upper part of the thyroid notch.



4. Arytenoid cartilage

- It is **pyramidal** in shape with antero-lateral, medial and posterior surfaces.
- Its base has a forward projection (vocal process) and a lateral projection (muscular process).
- The base articulates with the upper facet of the quadrate lamina of the cricoid cartilage.



5. Corniculate cartilage

- It is a small cartilaginous nodule.
- It articulates with the apex of each arytenoid and lies in **the aryepiglottic fold**.

6. Cuneiform cartilage

- It is another small cartilaginous nodule which articulates with the upper surface of the corniculate cartilage and lies in the aryepiglottic fold

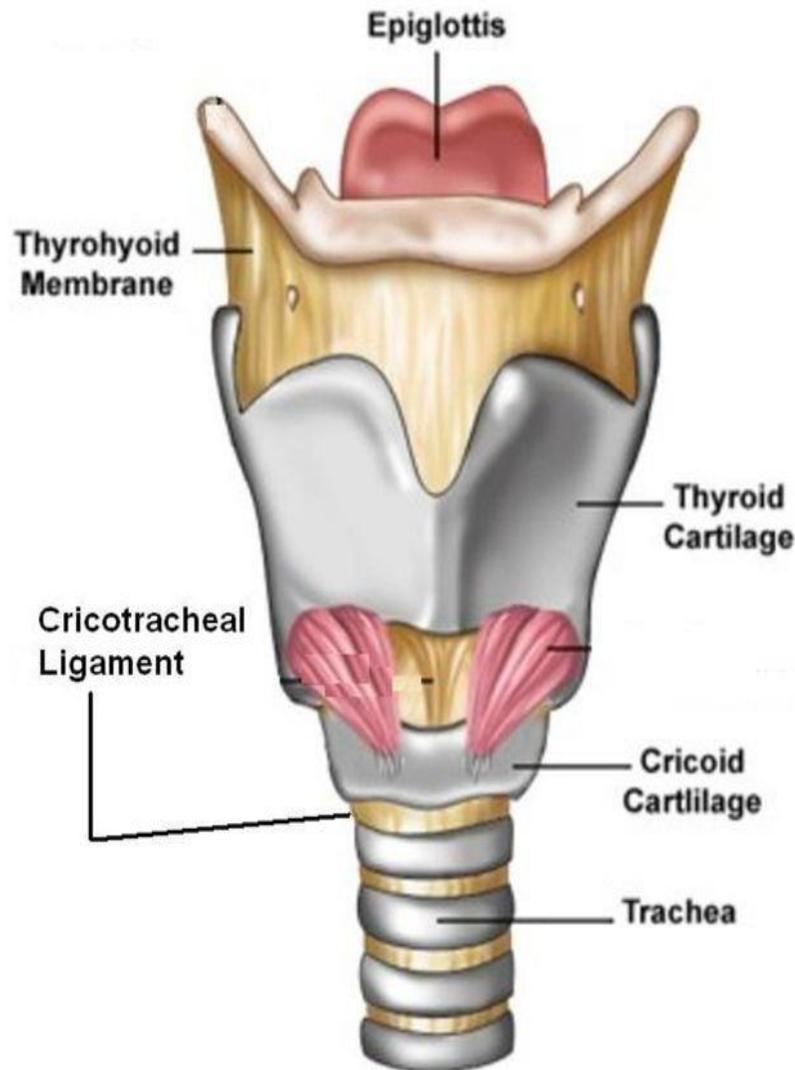
Ligaments and Membranes of the larynx

Extrinsic

Thyrohyoid membrane

Hyoepiglottic ligament

Cricotracheal ligament



A. EXTRINSIC LIGAMENTS

1. Thyrohyoid membrane:

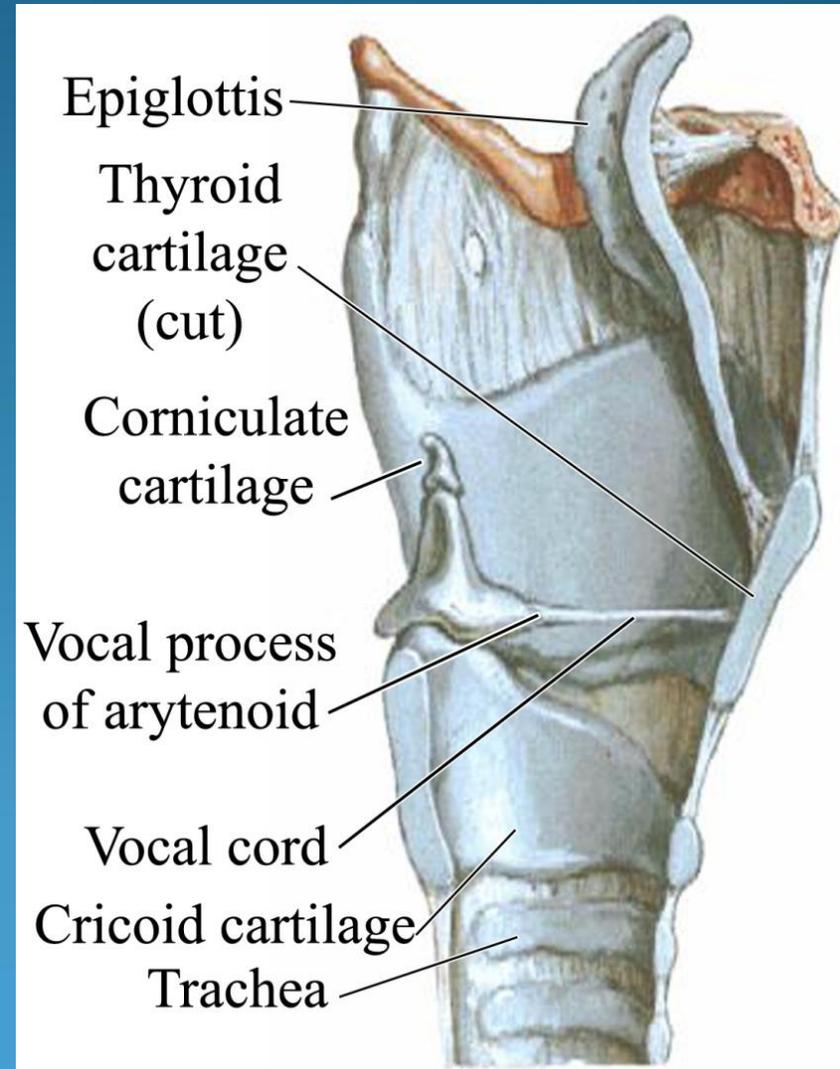
- It connects the upper border of the thyroid lamina to the body and the greater horns of the hyoid bone.

2. Hyoepiglottic ligament

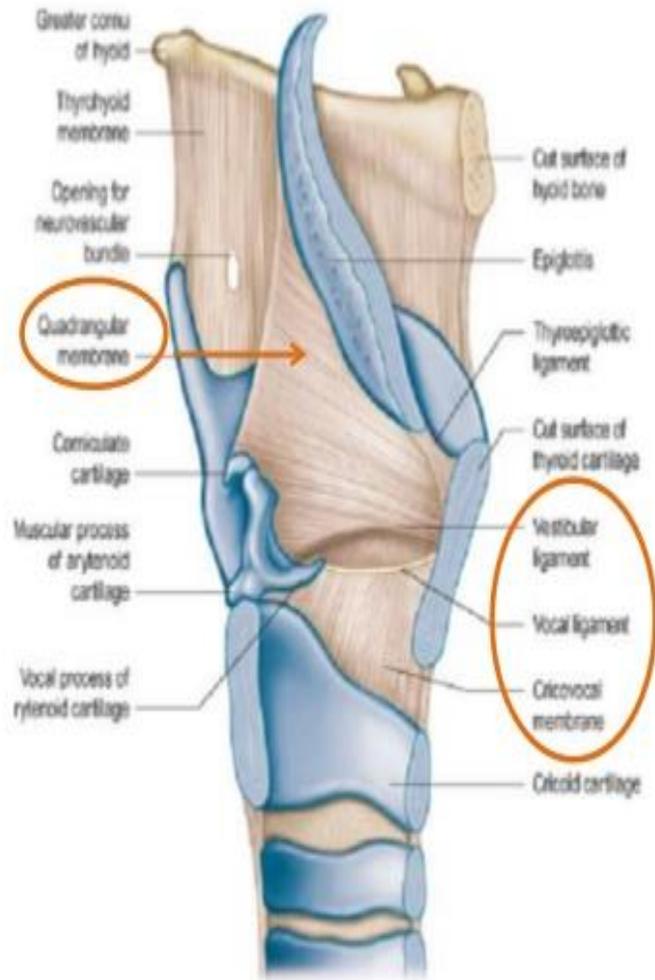
- It is a small elastic ligament which connects the upper part of the anterior surface of the epiglottis to the hyoid bone.

3. Cricotracheal ligament

- It is an elastic ligament which connects the lower border of the cricoid cartilage to the first ring of the trachea.



INTRINSIC



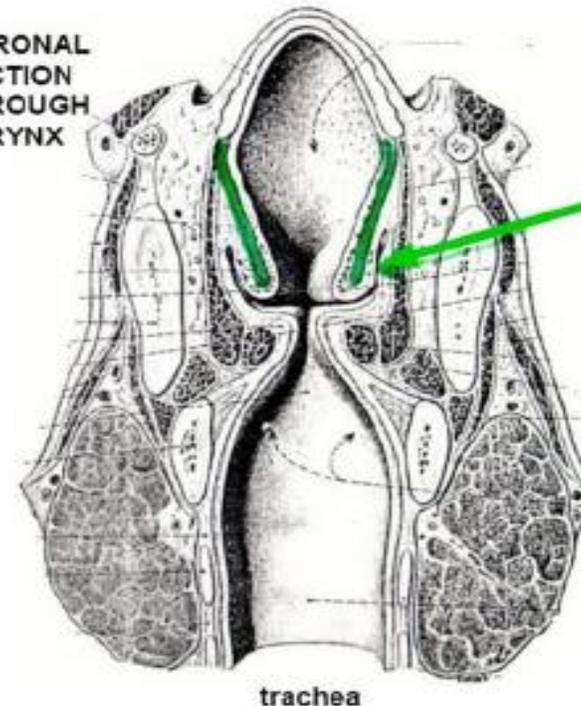
Sagittal section of left side of larynx showing laryngeal membranes

B. INTRINSIC LIGAMENTS

1. Thyroepiglottic ligament

- It is a small elastic ligament which connects the tapering lower end of the epiglottis to the inner surface of the thyroid cartilage.

CORONAL SECTION THROUGH LARYNX



Lower free edge of Quadrangular membrane is called Vestibular Ligament; deep to Vestibular (False Vocal) Folds

3. Cricothyroid membrane (conus elastics) (cricovocal)

- It is formed of two parts: ✌️

a. Median part

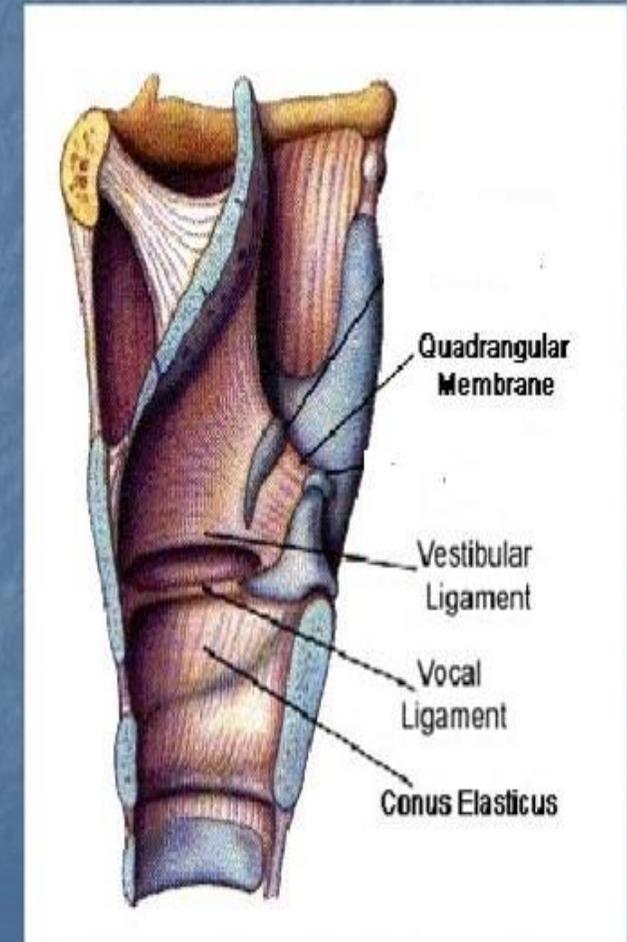
- Between the *upper border of the cricoid cartilage* and the *lower border of the thyroid cartilage*.

b. Lateral part

- Inferiorly, it is attached to the upper border of the arch of the cricoid cartilage.

2 Quadrangular Membrane

- It extends from the lateral margins of the epiglottis within the aryepiglottic fold and attaches to the arytenoid and corniculate cartilages. The inferior free edge is thickened to form the **vestibular ligament** (false vocal cord). The superior edge is also free and it is covered with aryepiglottic fold of mucosa.



Joints

1. Cricothyroid joint (one on each side)

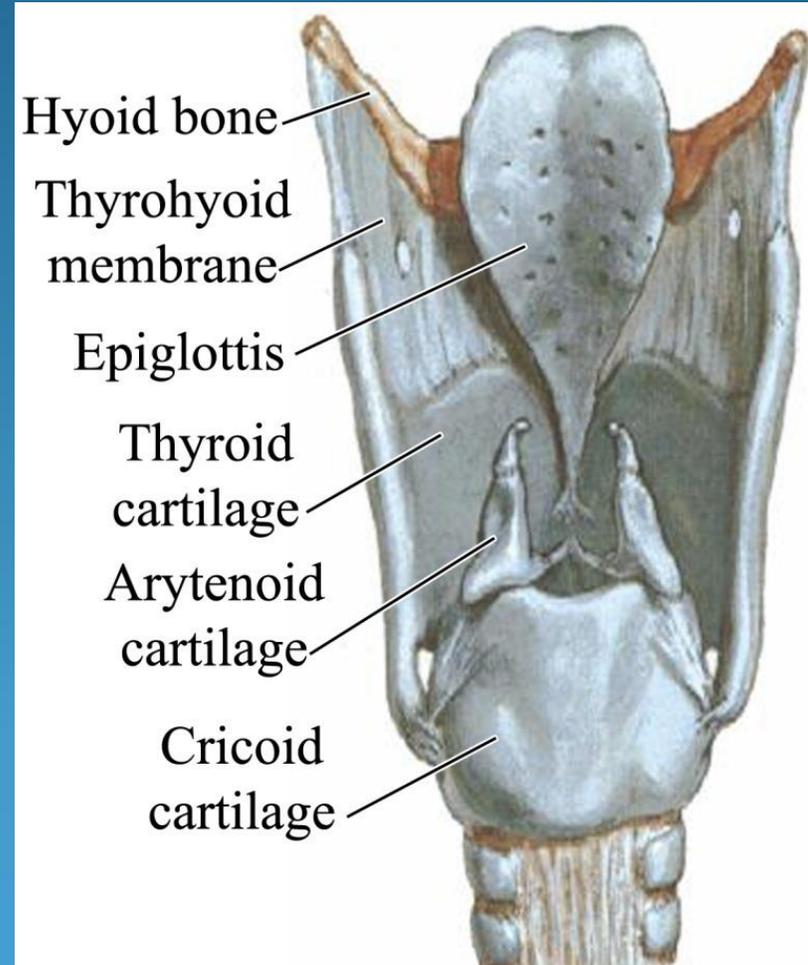
Type: Plane synovial joint.

Articulation: Between the *inferior horn of the thyroid cartilage* and the *lower facet on the arch of cricoid cartilage*.

2. Cricoarytenoid joint (one on each side)

Type: Plane synovial joint.

Articulation: Between the *base of the arytenoid cartilage* and the *superior facet of the quadrangle lamina of the cricoid cartilage*.



Inlet of the larynx

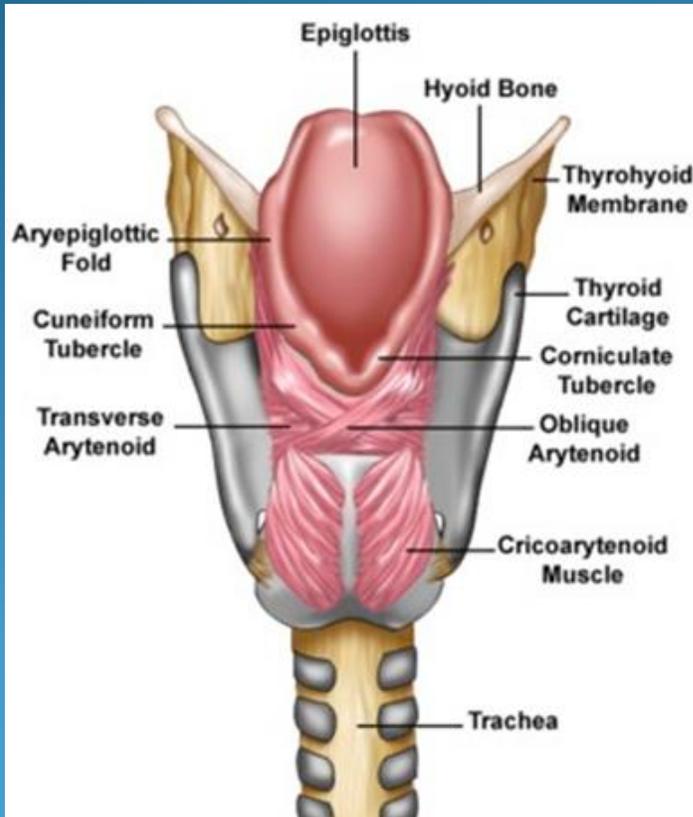
Boundaries:

a. Anterior:

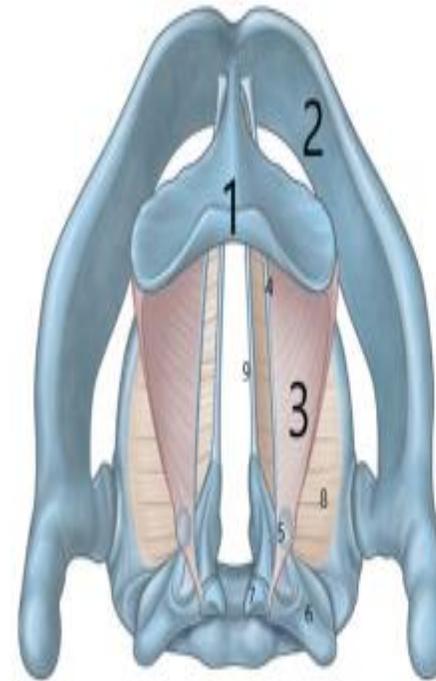
Upper edge of the epiglottis.

b. On each side: Aryepiglottic folds.

c. Posterior: Mucous fold between the arytenoids.



SUPERIOR VIEW OF VOCAL LIGAMENTS



- 1. Epiglottis
- 2. Thyroid cartilage
- 3. Quadrangular membrane
- 4. Vestibular ligament
- 5. Cuneiform cartilage
- 6. Arytenoid cartilage
- 7. Corniculate cartilage
- 8. Cricothyroid (cricovocal) ligament
- 9. Vocal ligament

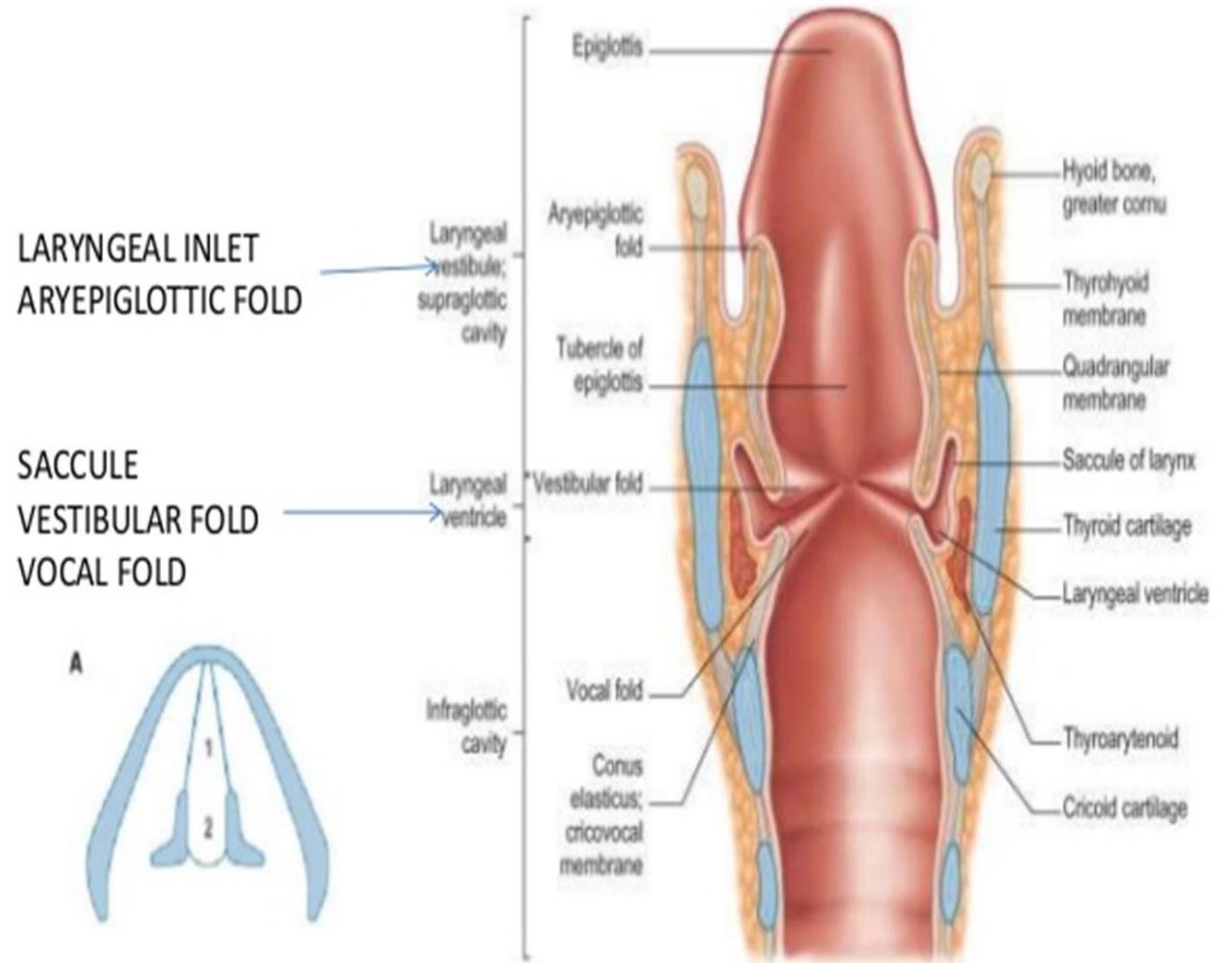
- **The vocal ligament** is the upper, free, thickened margin of the cricothyroid (cricovocal) membrane, and the **vestibular ligament** is the lower, free, thickened margin of the quadrangular membrane.

When viewed from above, the vocal ligaments are more medial in position than are the vestibular ligaments.

The cavity of the larynx is divided into

- 1-vestibule
- 2- middle part(the narrowest)
- 3- Infraglottic part

SUBDIVISIONS OF LARYNGEAL CAVITY



Coronal section through the larynx and cranial end of trachea
Posterior aspect

Side wall of the larynx

1. Vestibular fold

- It is the lower free margin of the quadrangular membrane on each side.

2. Vestibule of the larynx

- It is the area between the *inlet* and the *vestibular folds*.

3. Vocal folds

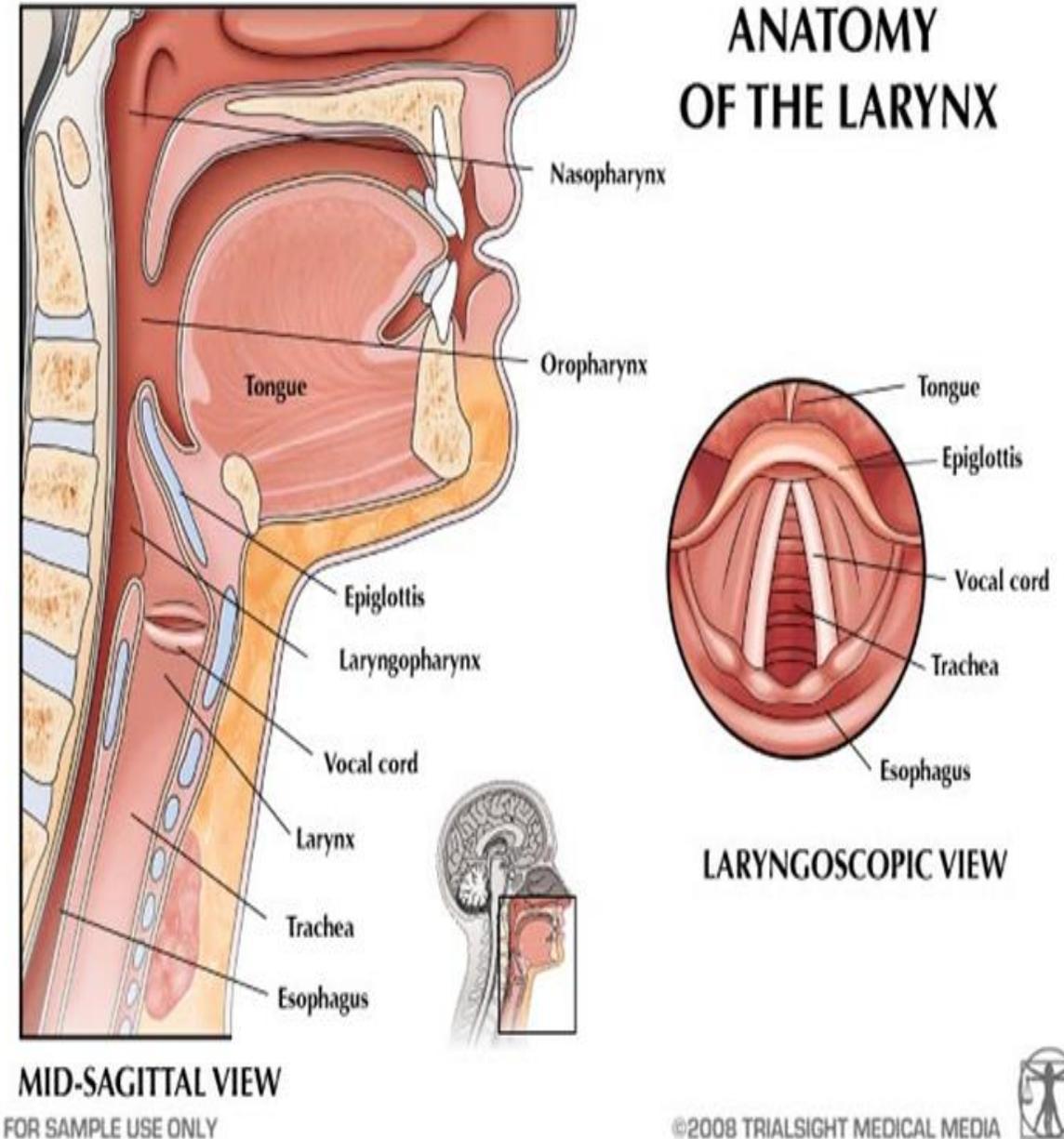
- It is the upper free margin of the cricovocal ligament.
- It extends between the *angle of the thyroid cartilage* and the *vocal process of the arytenoid cartilage*.

4. Sinus (ventricle) of the larynx

- It is the area between the vocal fold and the vestibular fold on each side.

5. Sacculle of the larynx

- It is an upward recess deep to the vestibular folds.
- **Rima vestibuli:** is the space between the two vestibular folds.



MID-SAGITTAL VIEW

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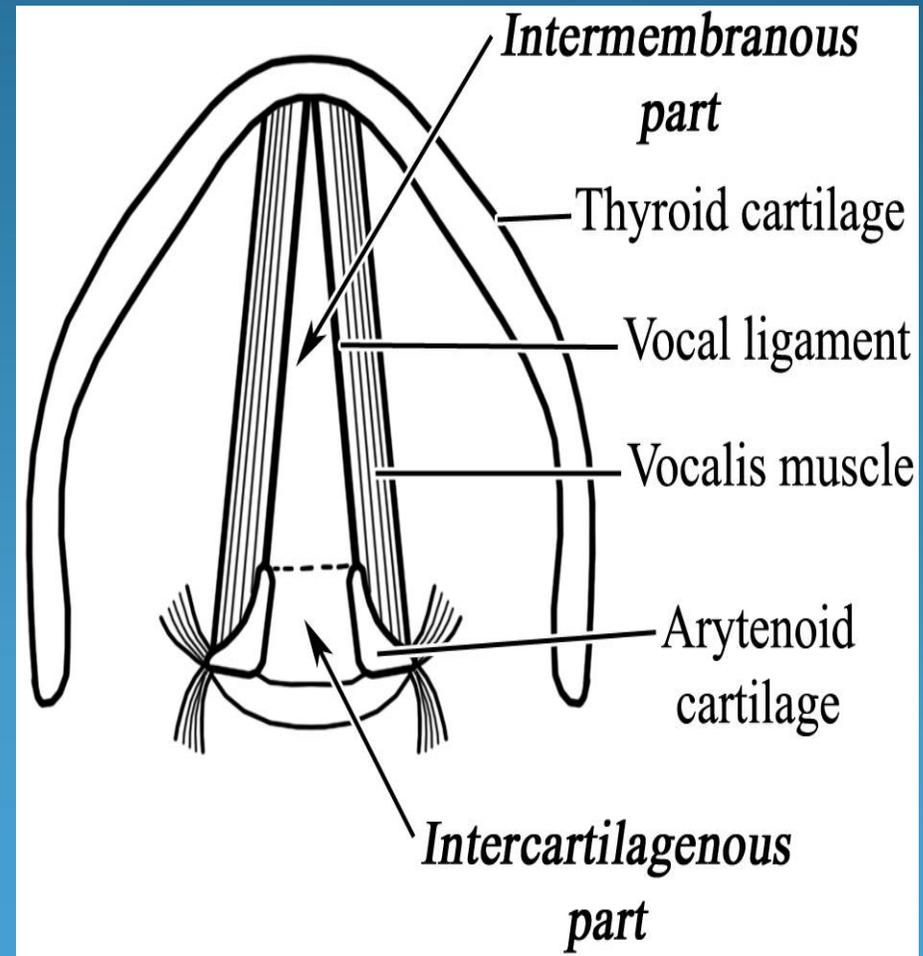
Rima glottidis

It is the narrowest part of the laryngeal cavity between the two vocal cords.

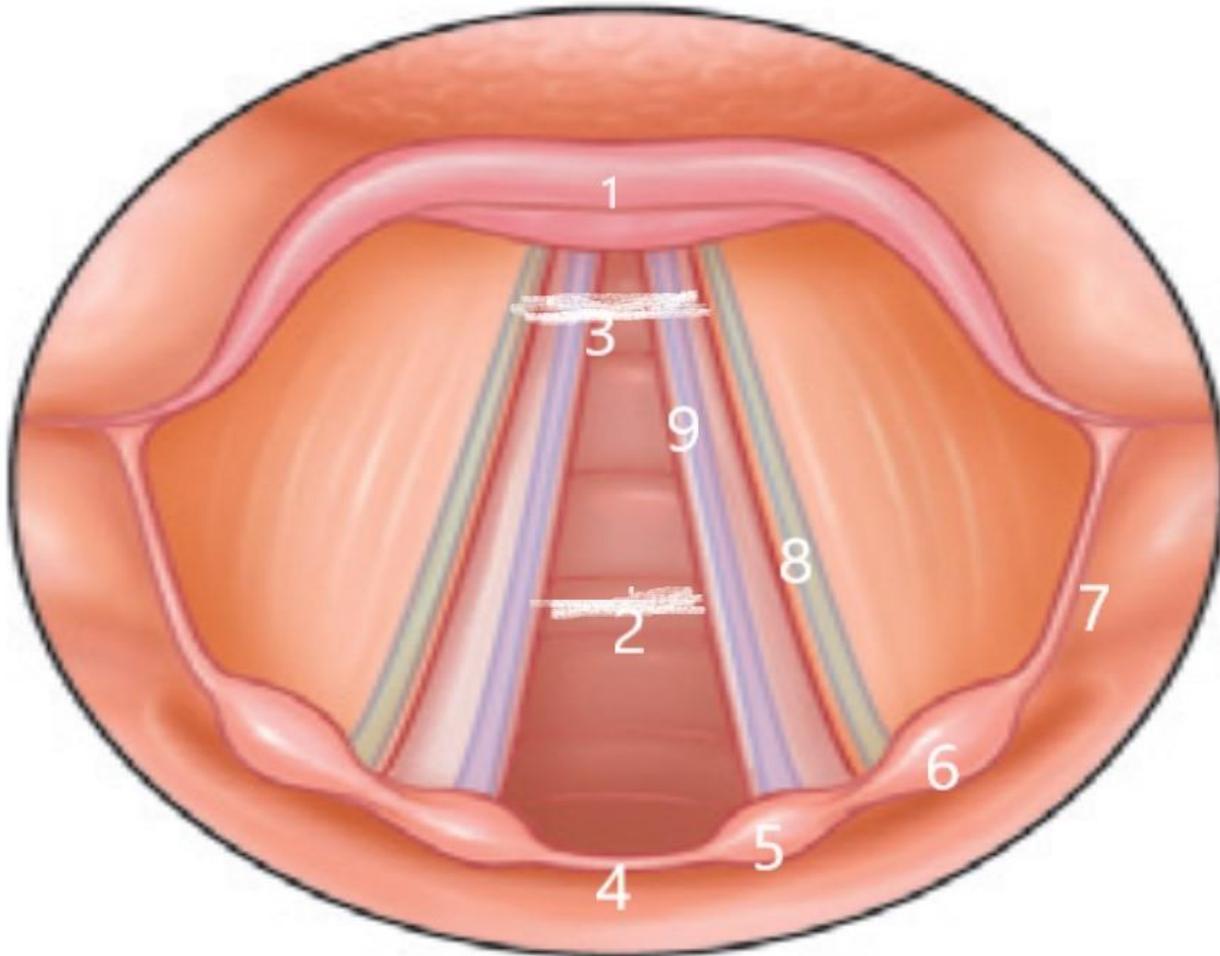
Subdivisions:

a. **Inter-membranous part:** Between the two vocal cords.

b. **Inter-cartilagenous part:** Between the two arytenoid cartilages.

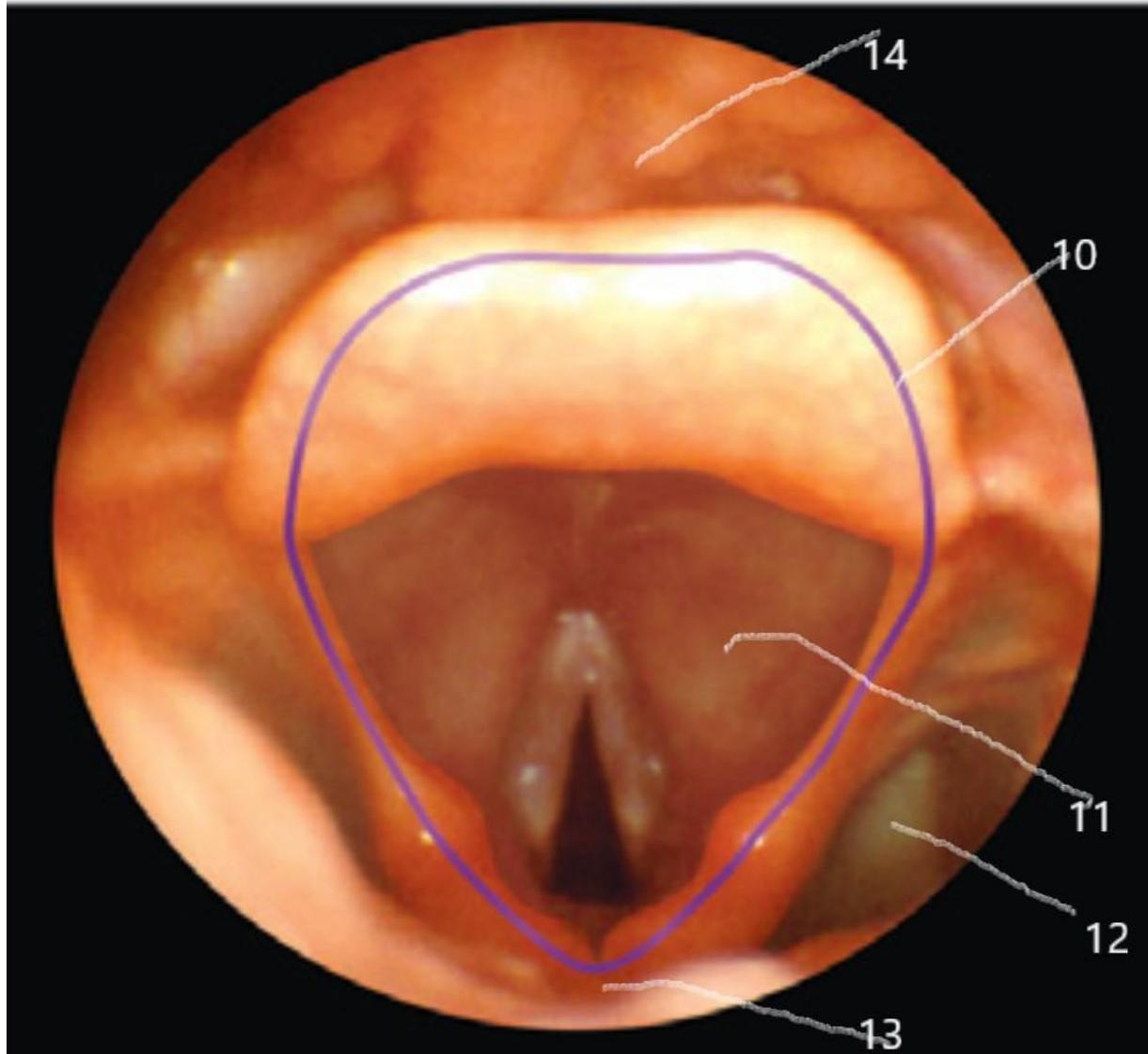


features in this laryngoscopic view of the larynx.



- 1. Epiglottis**
- 2. Rima glottidis**
- 3. Rima vestibuli**
- 4. Interarytenoid fold**
- 5. Corniculate tubercle**
- 6. Cuneiform tubercle**
- 7. Ary-epiglottic fold**
- 8. Vestibular fold**
- 9. Vocal fold**

features in this laryngoscopic view of the larynx.



- **10. Laryngeal inlet**
- **11. Vestibule**
- **12. Piriform recess**
- **13. Laryngopharynx (closed)**
- **14. Tongue**

I. Muscles acting on the laryngeal inlet

A: Muscles closing the laryngeal inlet:

1. Aryepiglottic muscles :

They extend from the arytenoid cartilages to the lateral edges of the epiglottis.

Action: Closure of the laryngeal inlet.

2. Thyro-epiglottic:

They extend from the upper border of the thyroid lamina to the lateral border of the epiglottis.

Action: Closure of the laryngeal inlet.

3. Transverse arytenoid :

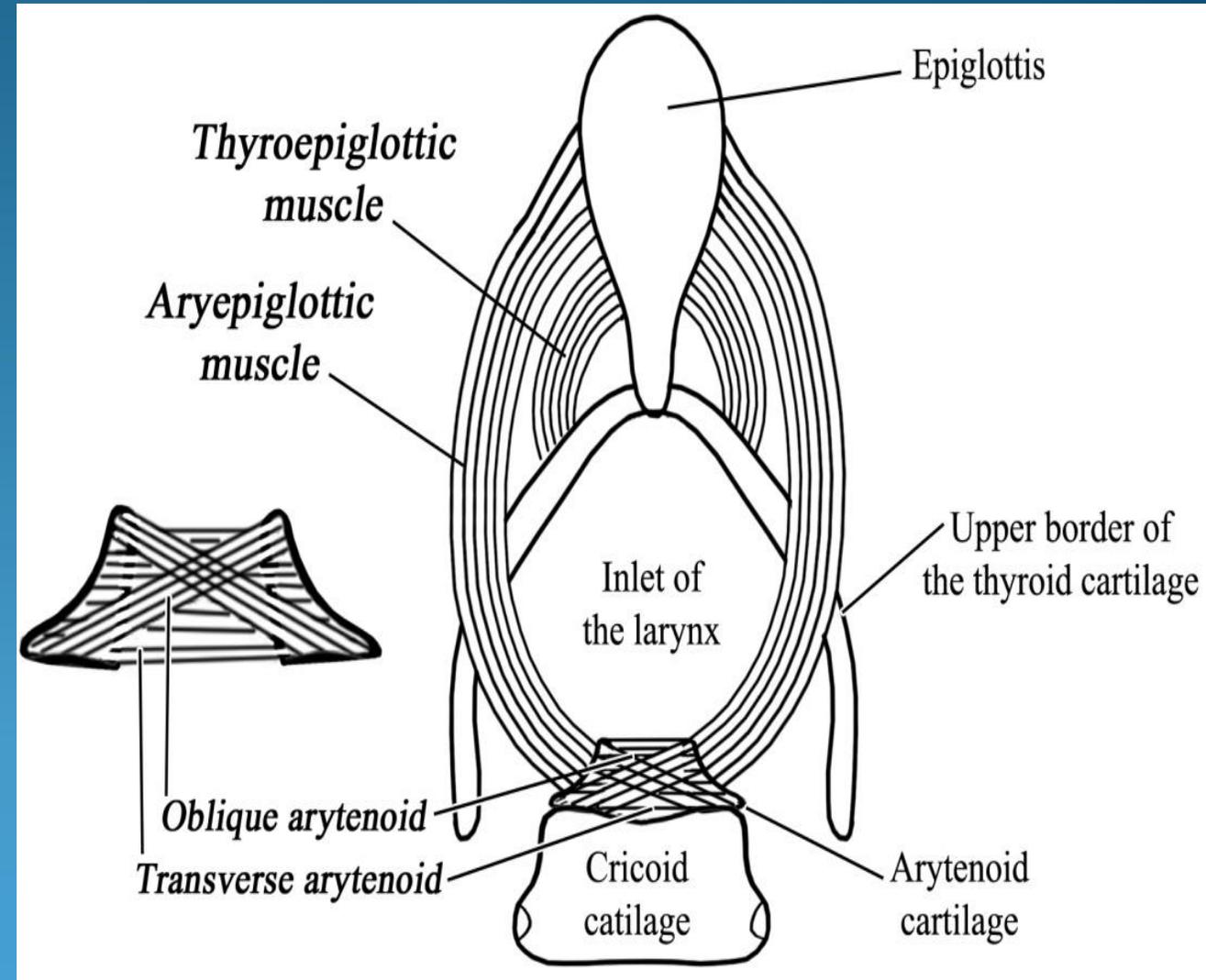
- It connects the posterior and lateral surfaces of both arytenoid cartilages.

Actions: (narrowing the laryngeal inlet) and adducts the vocal cords.

4. Oblique arytenoids :

They extend from the back of the muscular process of one arytenoid cartilage to the apex of the opposite arytenoid cartilage. (crossing each others).

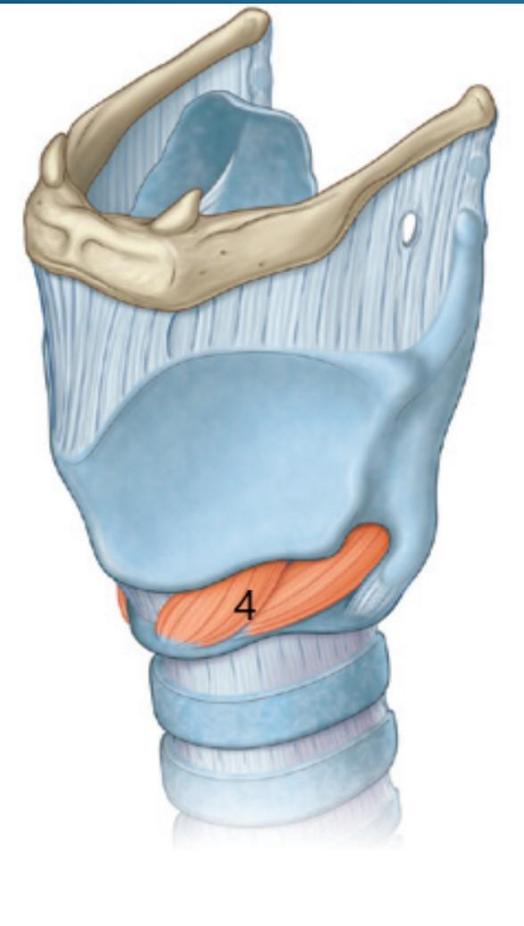
Actions: They narrow the laryngeal inlet) and adducts the vocal cords.



II-Intrinsic Muscles acting on the vocal cords

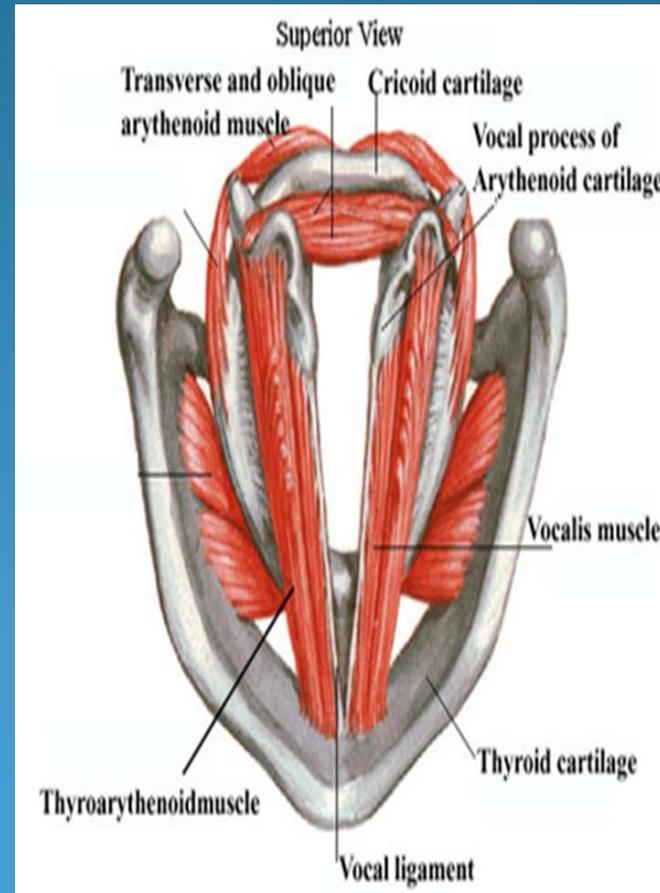
1- Muscles stretching (tensing) the vocal cord

2- Muscles relaxing the vocal cords



Cricothyroid muscle

Actions: It draws the thyroid cartilage downwards and forwards, so it lengthens and tenses the vocal cords (responsible for the sharp loud voice).



1. Thyroarytenoid muscle

Origin: Thyroid angle (lower part).

Insertion: Into the anterolateral surface of the arytenoid.

Actions: It shortens and relaxes the vocal cords, so it changes the pitch of the voice.

2. Vocalis muscle (it is the lower fibers of the thyro-arytenoid muscle)

Origin: Thyroid angle.

Insertion: Vocal process of the arytenoid cartilage.

Action: Relaxation of the vocal cords.

III. Muscles acting on the vocal cords

A: Muscles producing abduction of the vocal cords:

* Posterior crico-arytenoid:

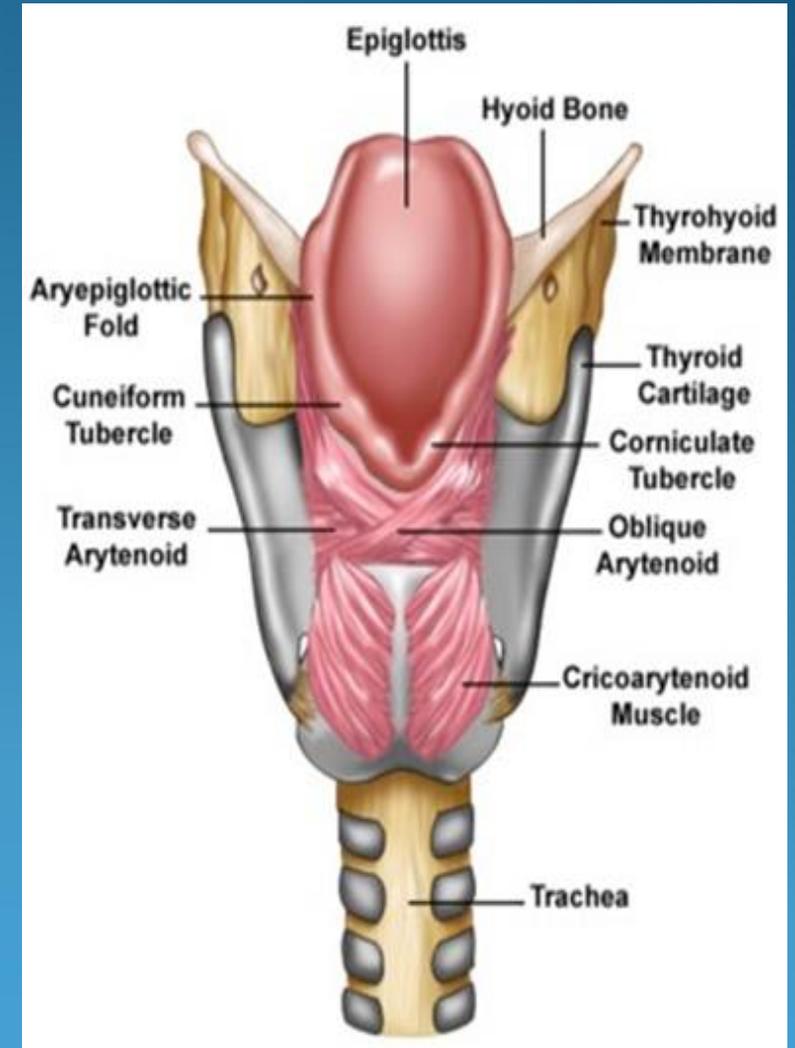
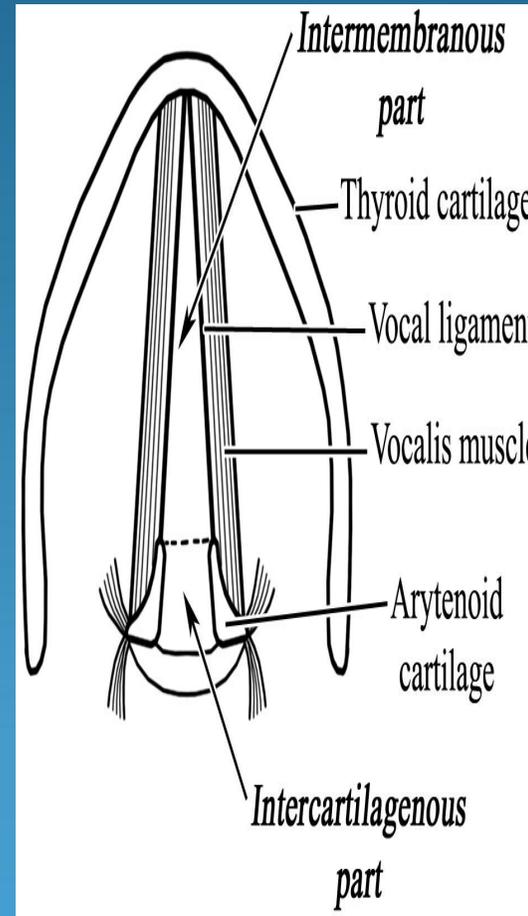
- It is the only abductor to the vocal cords

Origin: Posterior surface of the lamina of the cricoid cartilage.

Insertion: Muscular process of the arytenoid.

Actions:

- Abduction of the vocal cords.



B. Muscles producing adduction of the vocal cords

1. Lateral crico-arytenoid :

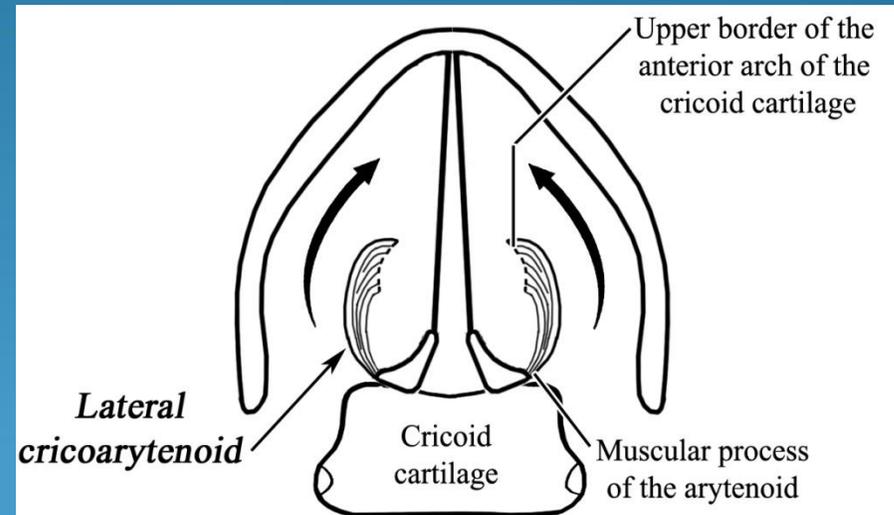
Origin: Upper border of the cricoid arch.

Insertion: Into the front of the muscular process of the arytenoid.

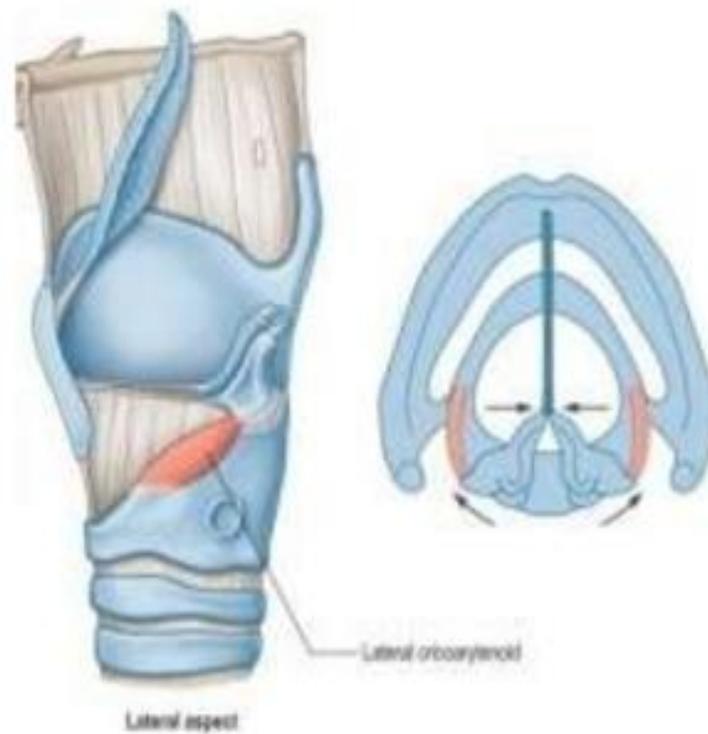
Action: It draws the muscular process forwards so it rotates the vocal process inwards and adducts (closes) the vocal cords.

2. Transverse arytenoid

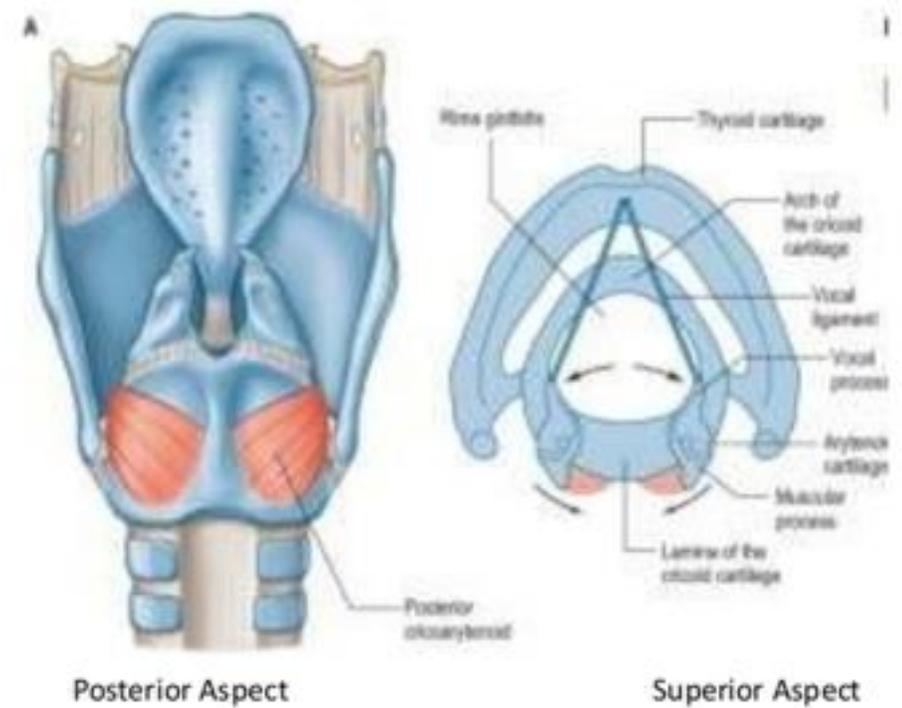
3. Oblique arytenoid

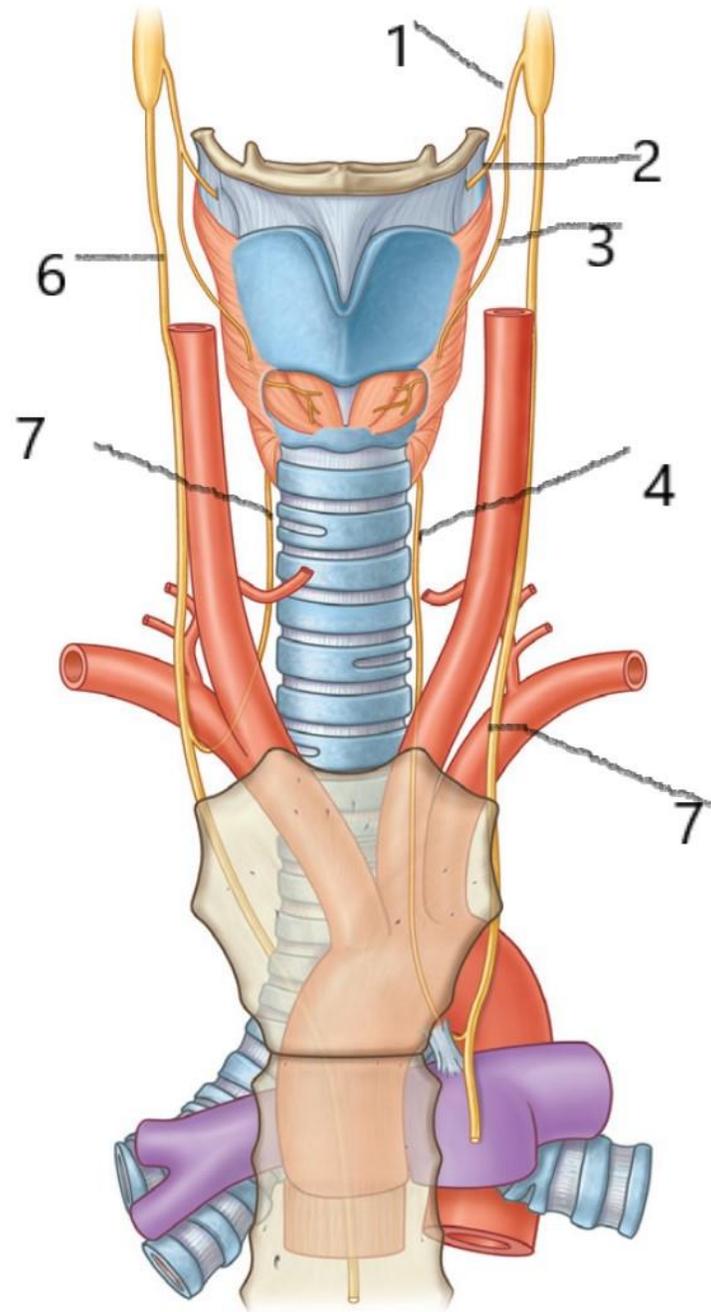


LATERAL CRICOARYTENOID MUSCLE



POSTERIOR CRICOARYTENOID MUSCLE





NERVES OF THE LARYNX

- 1. Superior laryngeal nerve
- 2. Internal laryngeal nerve
- 3. External laryngeal nerve
- 4. Left recurrent laryngeal nerve
- 5. Left vagus nerve
- 6. Right vagus nerve
- 7. Right recurrent laryngeal nerve

Innervation of the larynx is by two major branches of the vagus nerve: **the superior laryngeal nerve** and **the recurrent laryngeal nerve**.

- The superior laryngeal nerve carries general sensation (internal laryngeal nerve) from the lining of the laryngeal cavity above the level of the vocal folds and is motor (**external laryngeal nerve**) to the cricothyroid muscle.

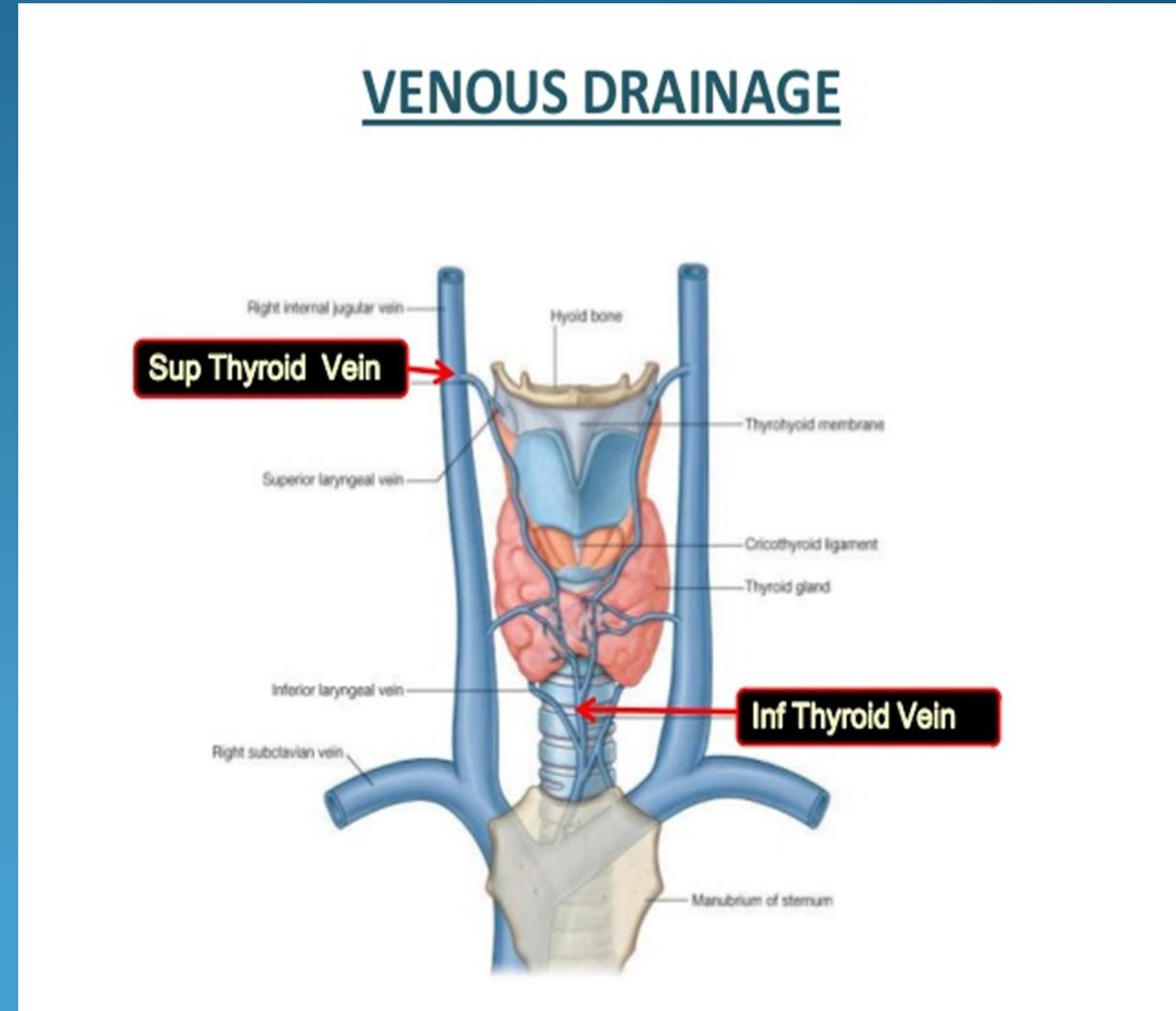
- **The recurrent laryngeal nerve** is motor to all intrinsic muscles of the larynx, except for the cricothyroid muscle, and carries general sensation from the lining of the laryngeal cavity below the level of the vocal fold.

Blood supply

Blood supply:

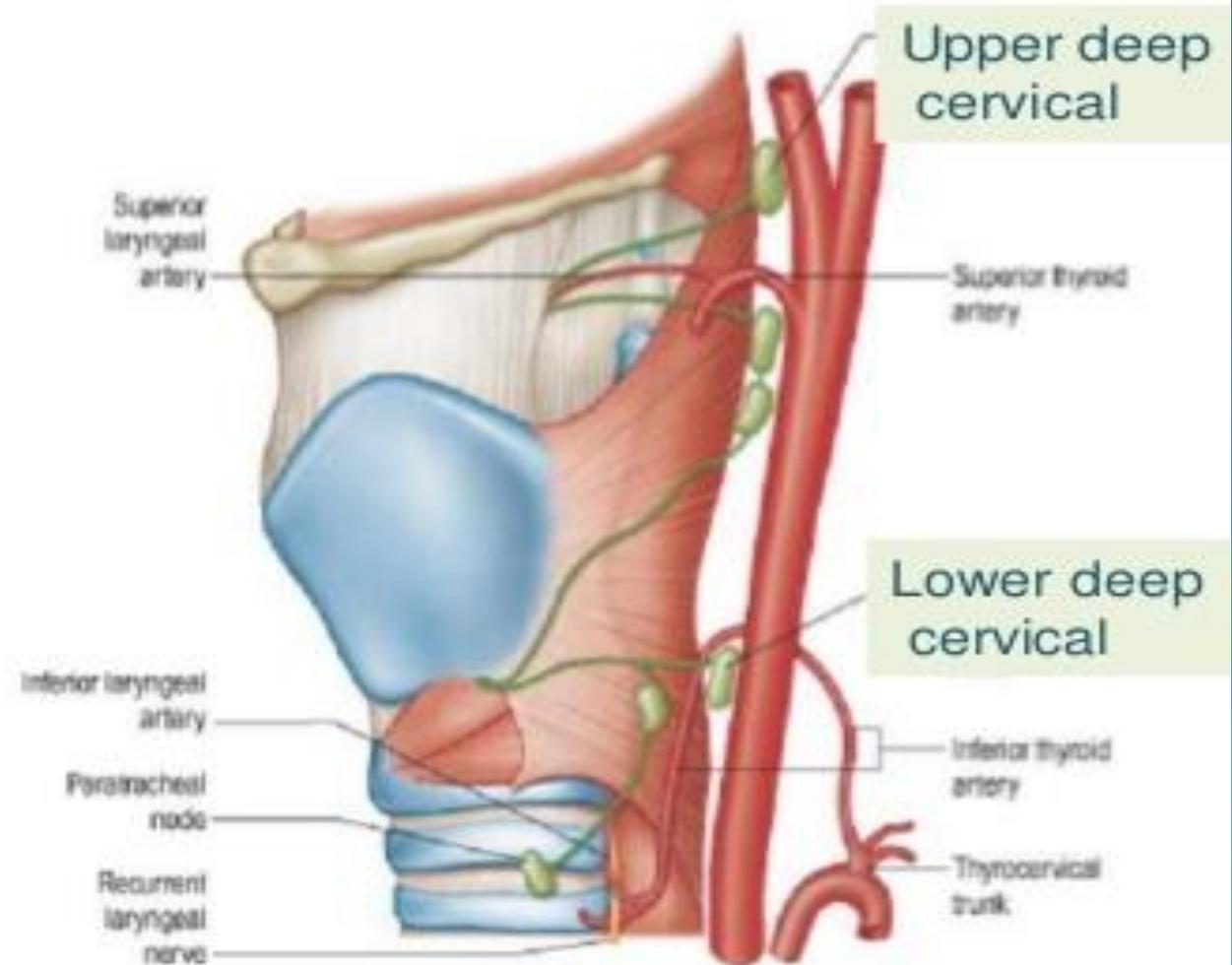
. Arterial supply:

1. Above the vocal cords: Superior laryngeal artery (from the superior thyroid artery).
2. Below the vocal cords: Inferior laryngeal artery (from the inferior thyroid artery).



LYMPHATIC DRAINAGE

- Above **VC** upper deep cervical {anterosuperior group}
- Below **VC** lower deep cervical {posteroinferior group}



Applied anatomy

1. Injury of the external laryngeal nerve (in thyroidectomy):

- This leads to paralysis of the cricothyroid muscle which results in low pitched voice.

2. Injury of the recurrent laryngeal nerve (in thyroidectomy):

a. If partial injury

- It leads to adduction of the vocal cord.
- If this occurs bilaterally, it leads to suffocation (obstruction of the air way)

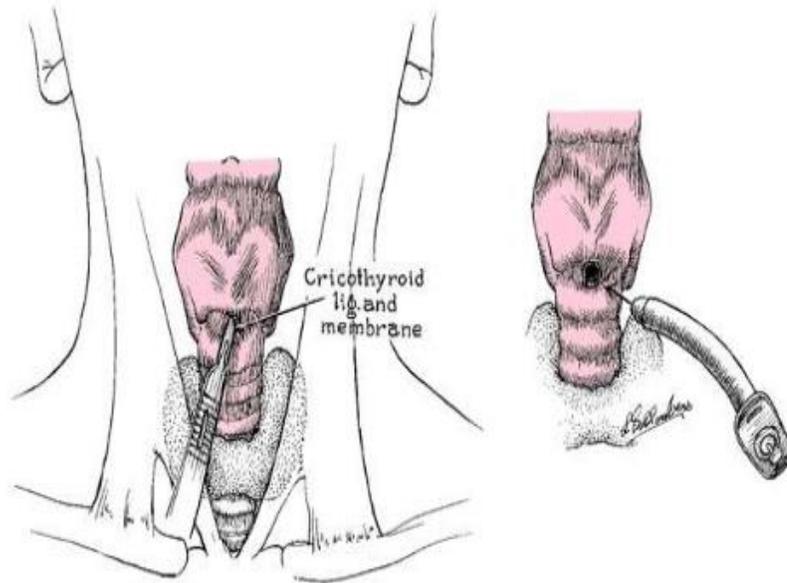
b. If complete injury

- It leads to cadaveric position of the vocal cords (midway between abduction and adduction).

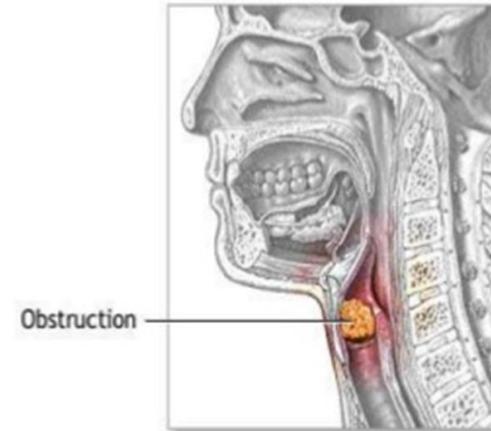
Explanation:

- The fibers which produce abduction lies in the outer part of the nerve (affected by partial injury),
- while the fibers which produce adduction lies in the central part of the nerve (affected by complete injury).

LARYNGOTOMY



LARYNGEAL OBSTRUCTION



*Thank
You*

