

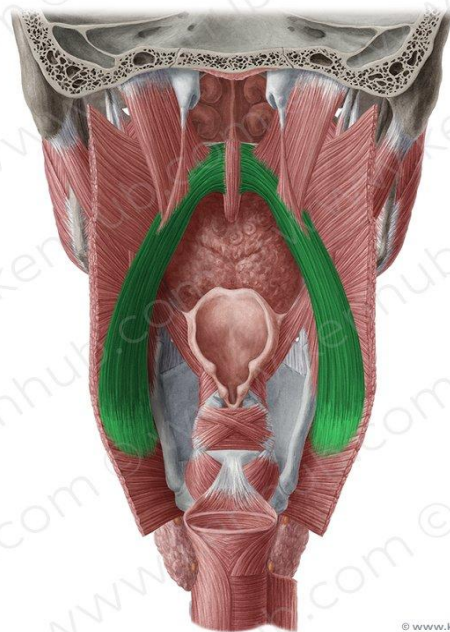


Anatomy of the **Larynx 02** (Muscles)

By:

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THE LARYNX..... THE CARTILAGES³

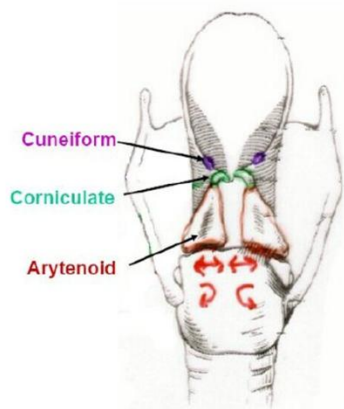
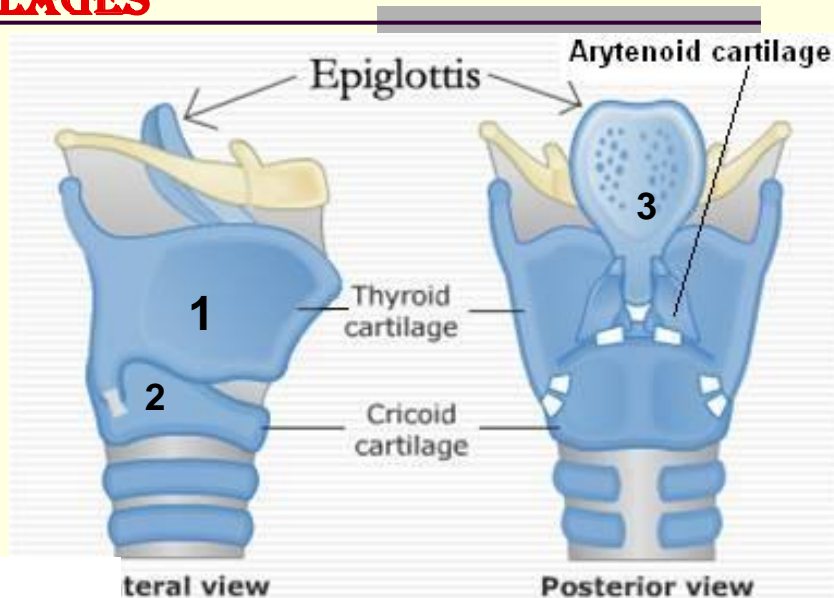
The cartilaginous skeleton is comprised of :

- Single Cartilages:

1. Thyroid
2. Cricoid
3. Epiglottis

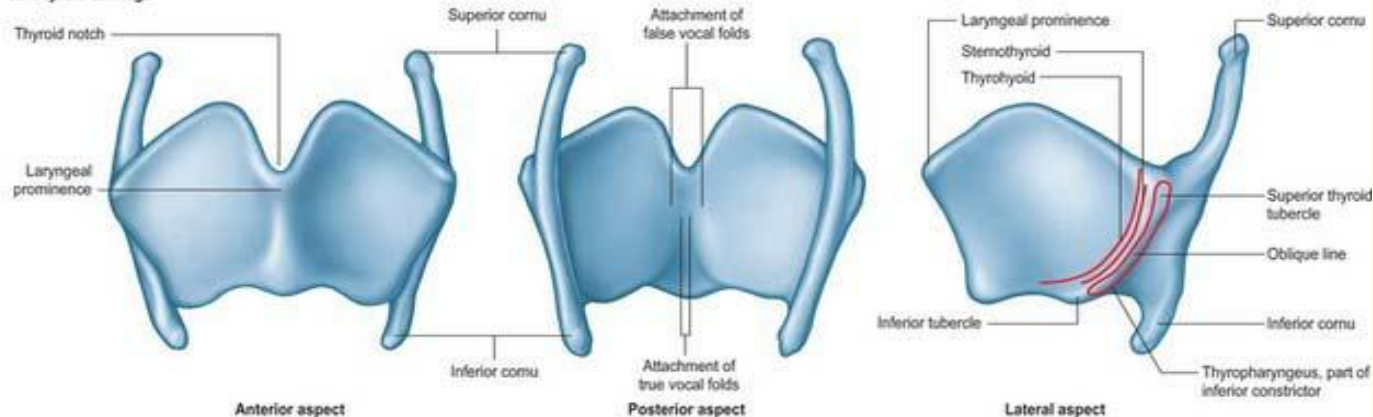
- Paired Cartilages:

4. Arytenoid
5. Corniculate
6. Cuneiform

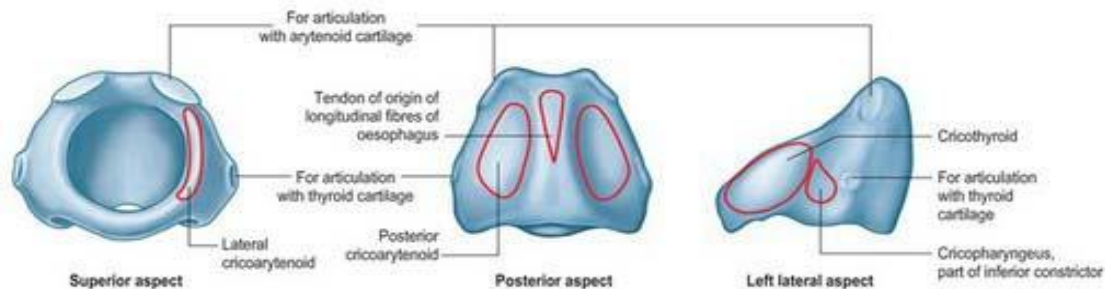




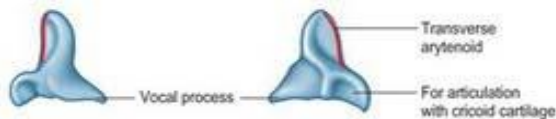
A Thyroid cartilage



B Cricoid cartilage



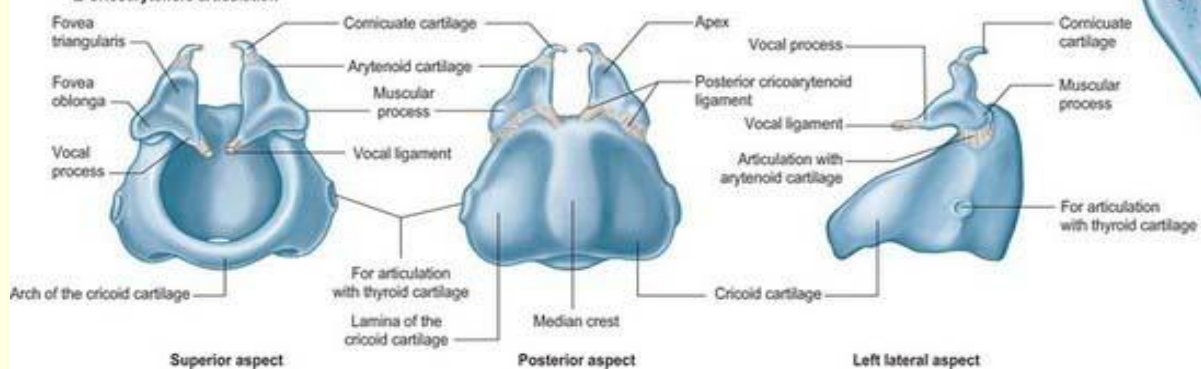
C Arytenoid cartilage: medial aspect



D Epiglottis: posterior aspect



E Cricoarytenoid articulation

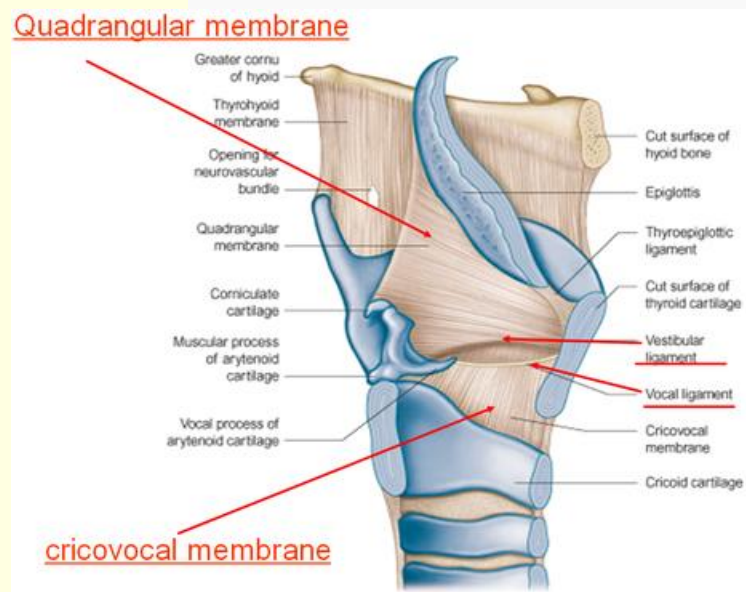
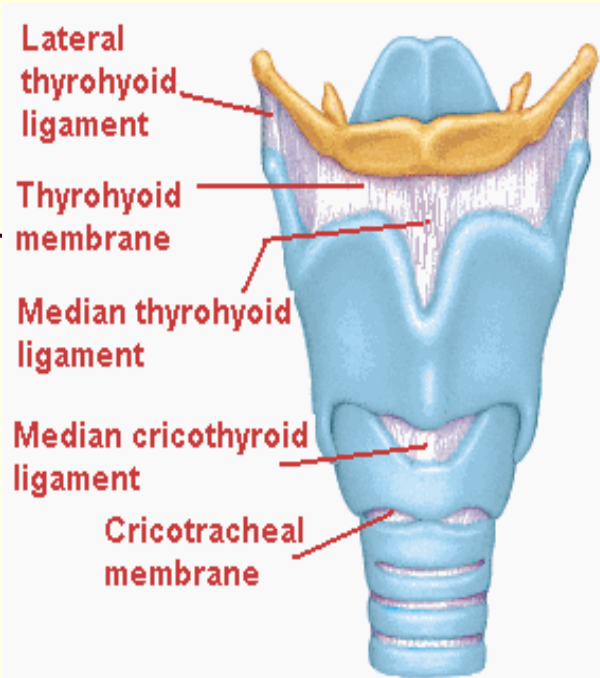




MEMBRANES & LIGAMENTS

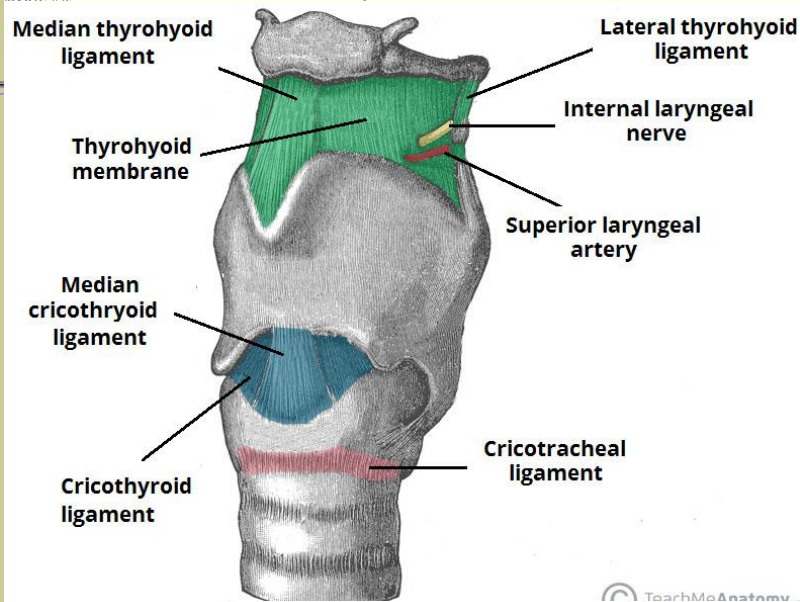
Following are the main membranes and ligaments of the larynx.

1. Thyrohoid membrane.
 - a. Median &
 - b. Lateral thyrohoid ligaments.
2. Median cricothyroid ligament
3. Cricotracheal membrane.
4. Hyoepiglottic ligament
5. Thyroepiglottic ligament

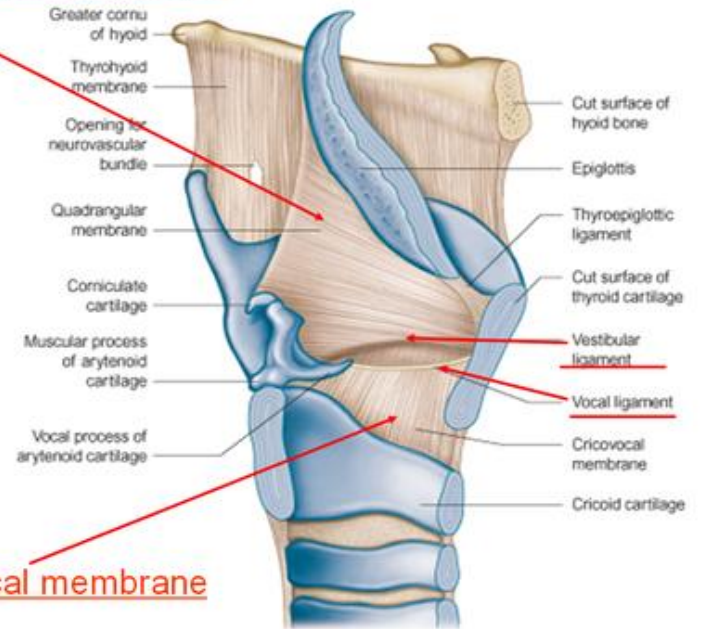




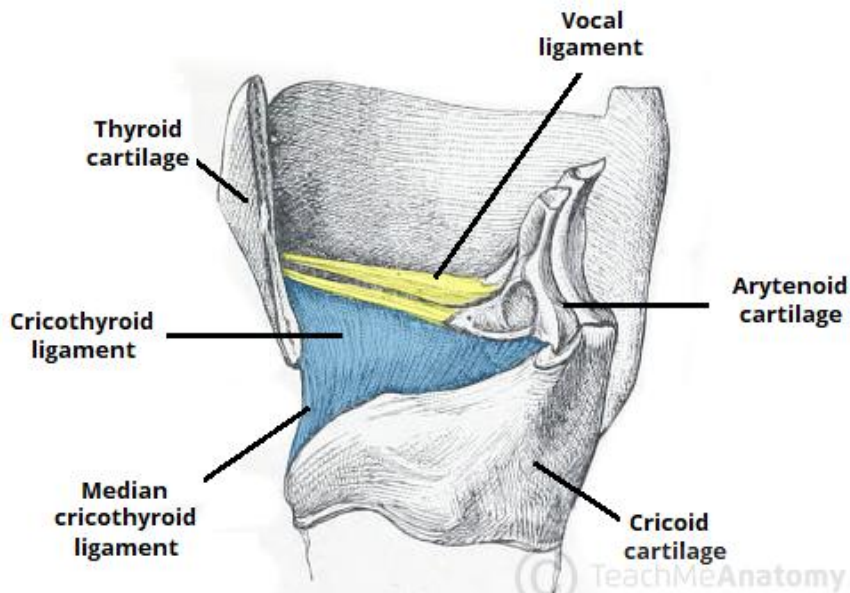
MEMBRANES & LIGAMENTS



Quadrangular membrane



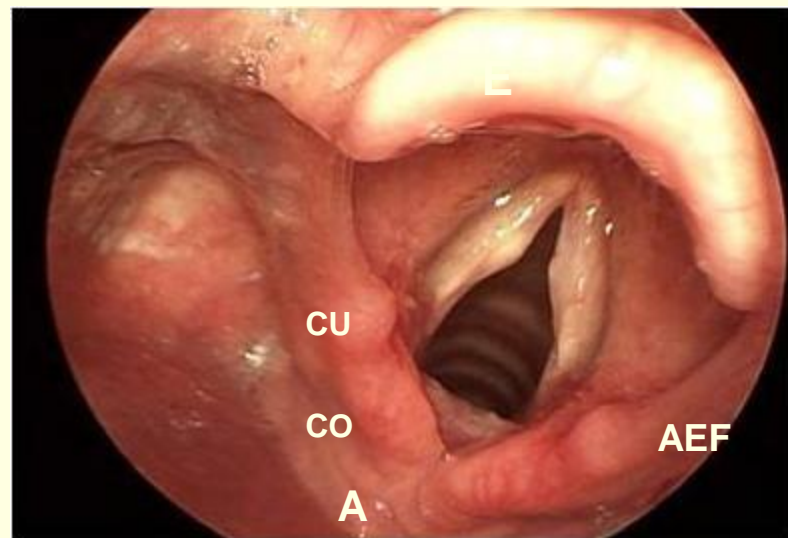
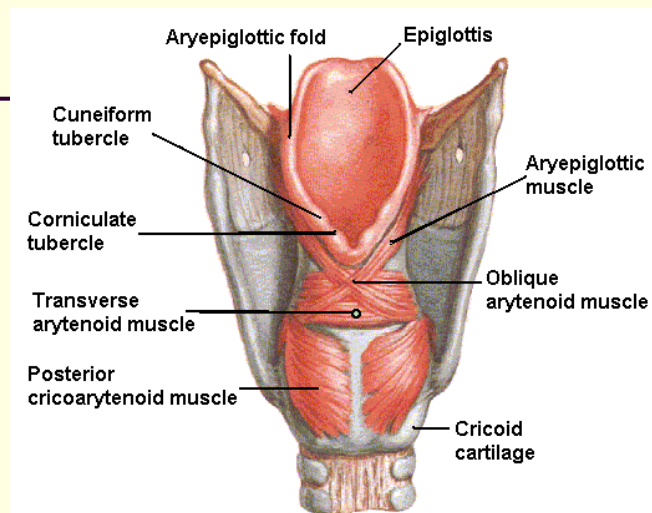
Cricovocal membrane





Laryngeal Inlet

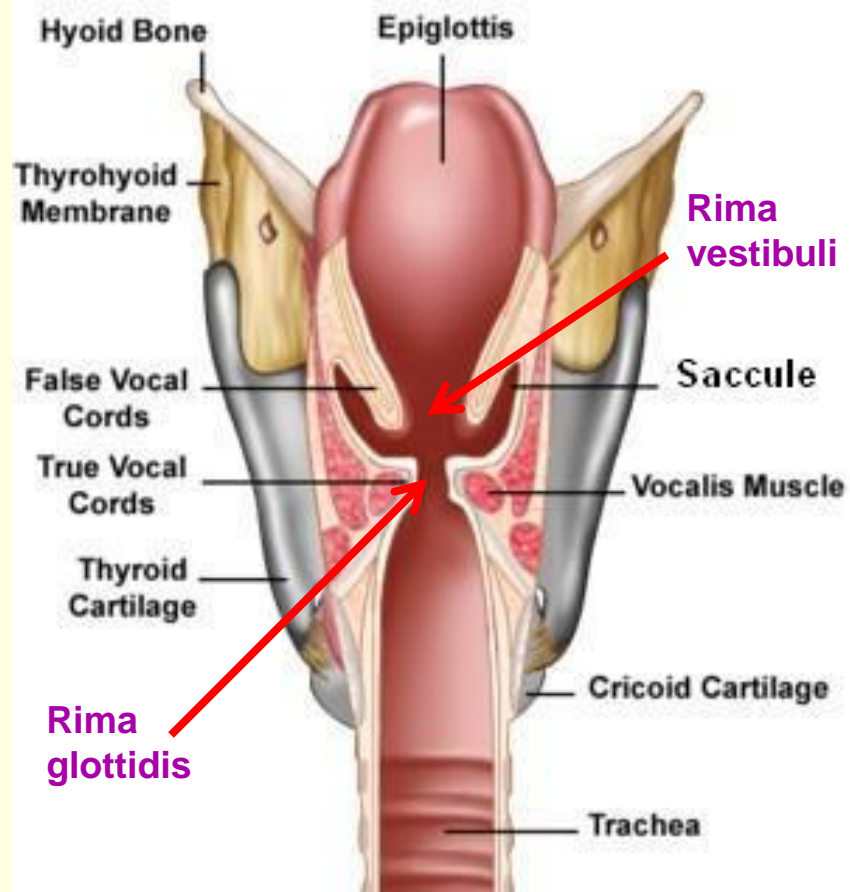
- Faces backward and upward and opens into the laryngeal part of the pharynx
- The opening is bounded:
 - **Anteriorly:**
 - By the upper margin of Epiglottis.
 - **Posteriorly & below:**
 - By Arytenoid cartilages.
 - **Laterally:**
 - By Aryepiglottic folds





Laryngeal Cavity

- Extends from laryngeal inlet to lower border of the cricoid cartilage
- Narrow in the region of the vestibular folds (**rima vestibuli**)
- Narrowest in the region of the vocal folds (**rima glottidis**)





Laryngeal Cavity cont'd

Divided into three parts:

A. Supraglottic part

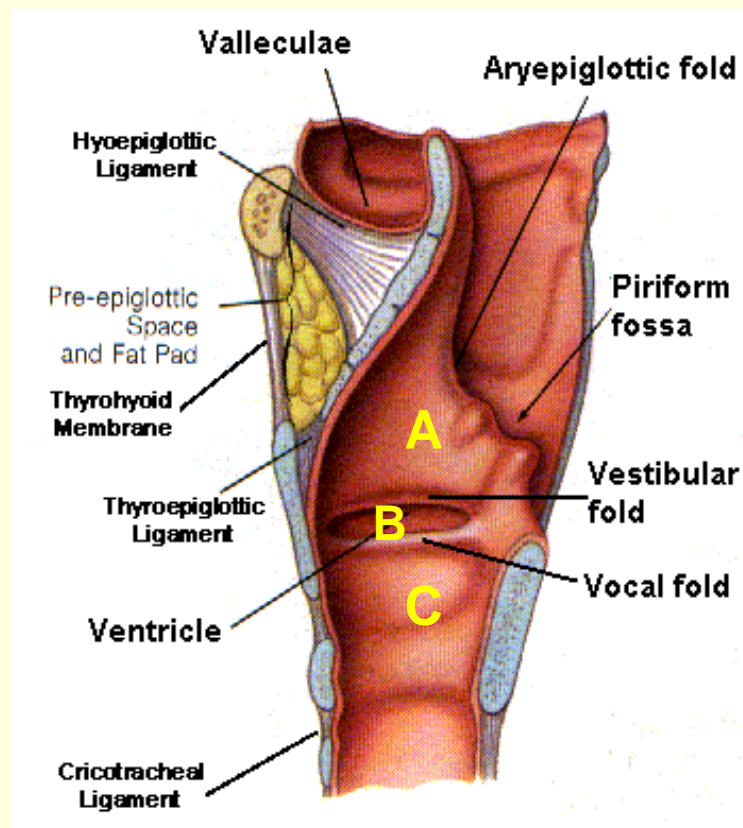
- The part above the vestibular folds, is called the vestibule.

B. Glottic part:

- The part between the vestibular & the vocal folds, is called the ventricle

C. Infraglottic part:

- The part below the vocal folds.



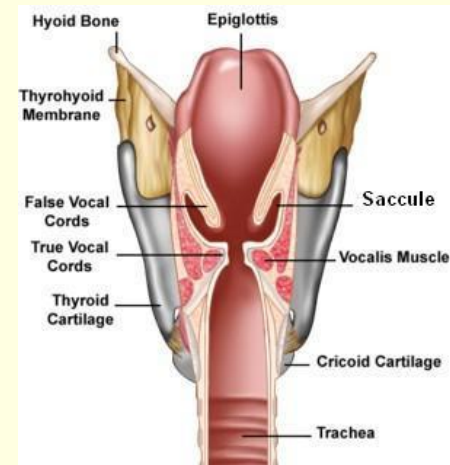
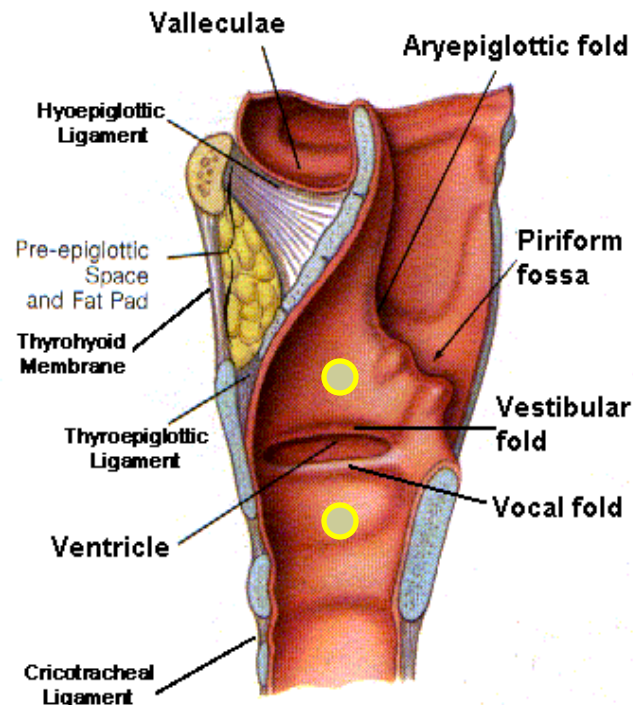


Vestibular Part:

- Extends from the inlet to the vestibular fold
- Below it becomes narrow as the vestibular folds project medially.
- Each vestibular fold contains vestibular ligament, the lower free margin of the quadrangular membrane stretching from thyroid cartilage to the arytenoid cartilage

Lower Part:

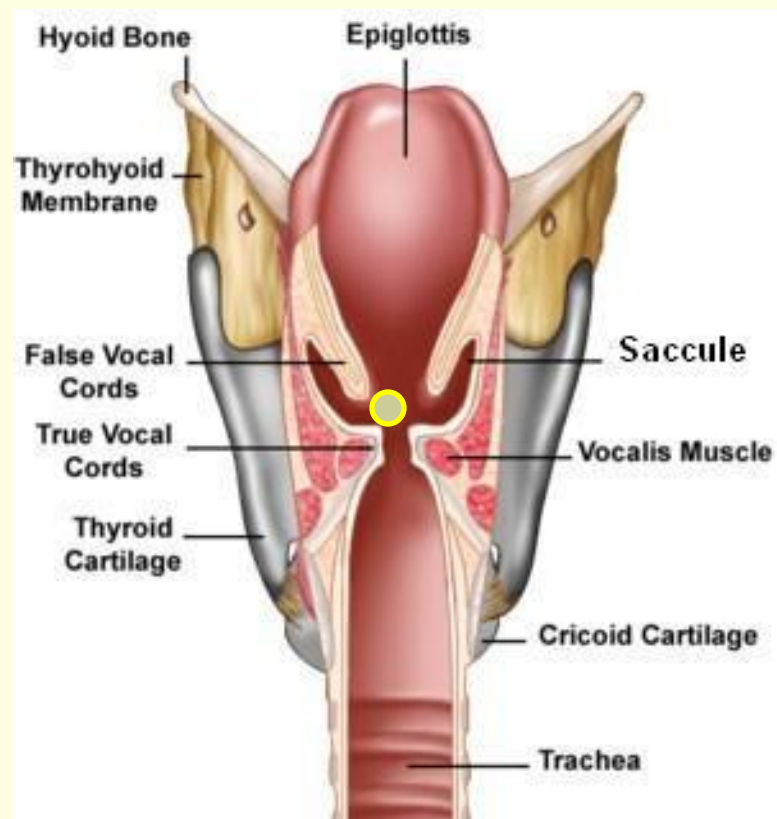
- Extends from vocal folds to lower border of cricoid cartilage
- Walls formed by the inner surface of the cricothyroid ligament and the cricoid cartilage





Middle Part

- Extend from vestibular folds to the vocal folds.
- Laterally a small recess between the vestibular fold & the vocal fold is called the **sinus of the larynx**.
- This may extend upwards between vestibular fold and the thyroid cartilage as **sacculae of the larynx**





Muscles of the larynx

- The muscles moves the larynx as a whole.
- The infrahyoid muscles are depressors of the hyoid and larynx, while
- The suprahyoid muscles and the stylopharyngeus, are elevators of the hyoid and larynx.
- The laryngeal muscles are divided into extrinsic and intrinsic groups:

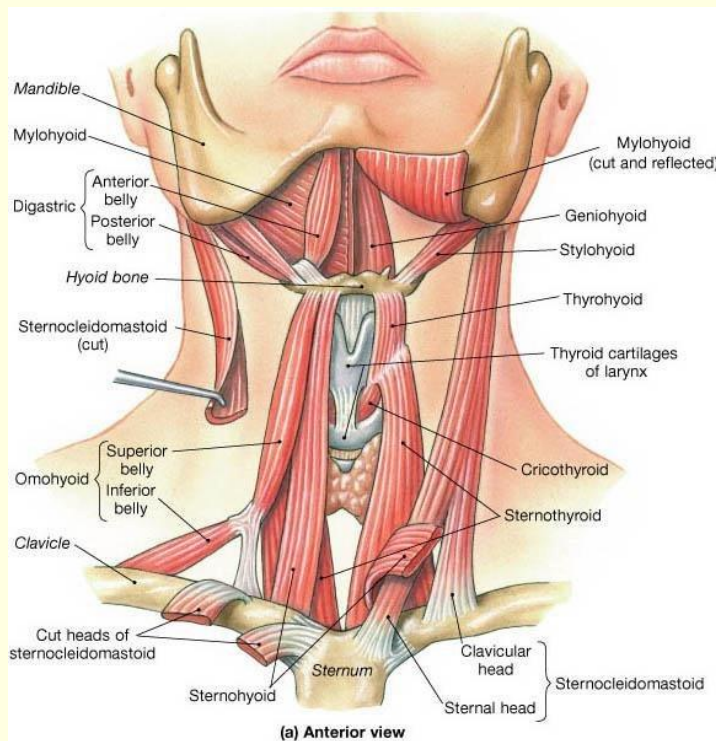
Extrinsic muscle:

Depressors:

- Sternothyroid, Sternohyoid, Omohyoid muscles and the elastic recoil of the trachea.

Elevators:

- Digastric, Stylohyoid, Mylohyoid, Geniohyoid,
- Stylopharyngeus, Salpingopharyngeus and Palatopharyngeus.





INTRINSIC MUSCLES:

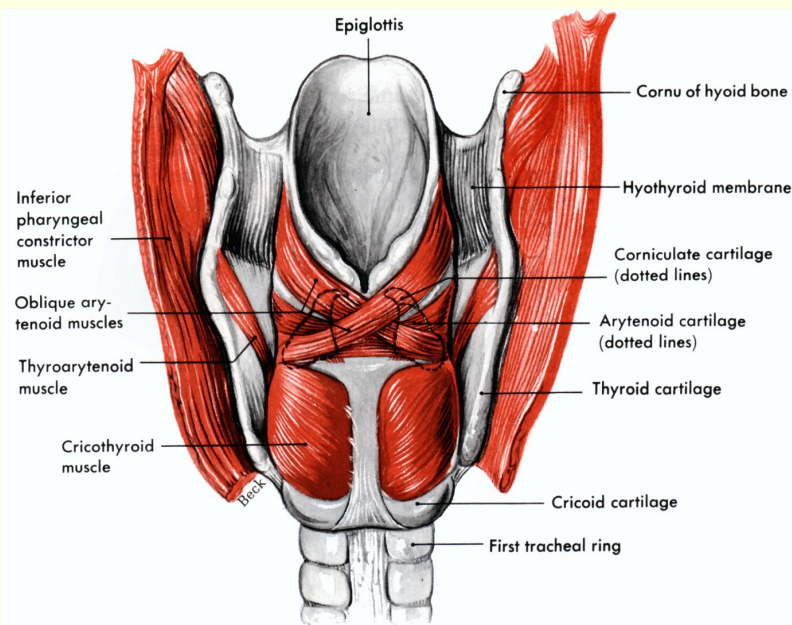
The intrinsic muscles moves the laryngeal components altering the:

- ❖ Length and tension of the vocal folds and
- ❖ The size and shape of the rima glottidis.

All of the intrinsic muscles of the larynx are supplied by the recurrent laryngeal nerve a branch of CN X.

Except....

The **Cricothyroid** is supplied by the external laryngeal nerve one of the terminal branches of the superior laryngeal nerve.



Posterior view of the larynx (voice box) showing many of the muscles that function to alter its shape.



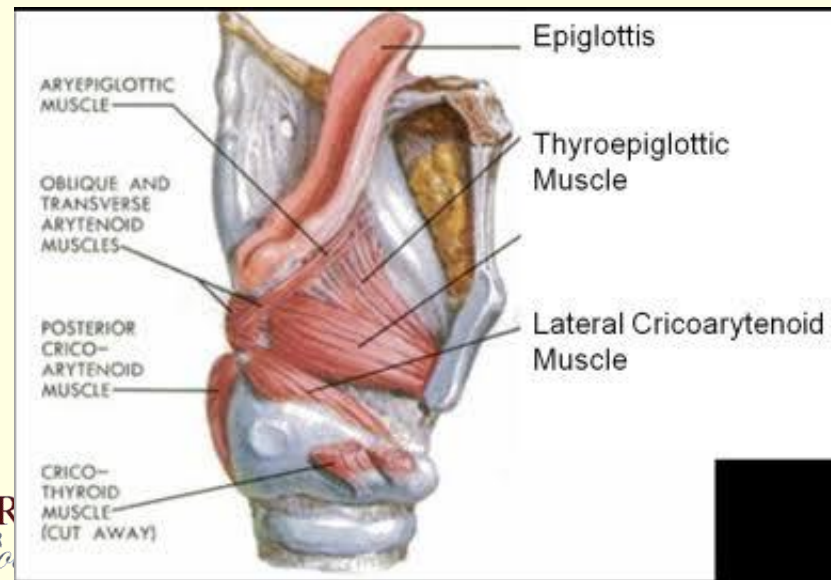
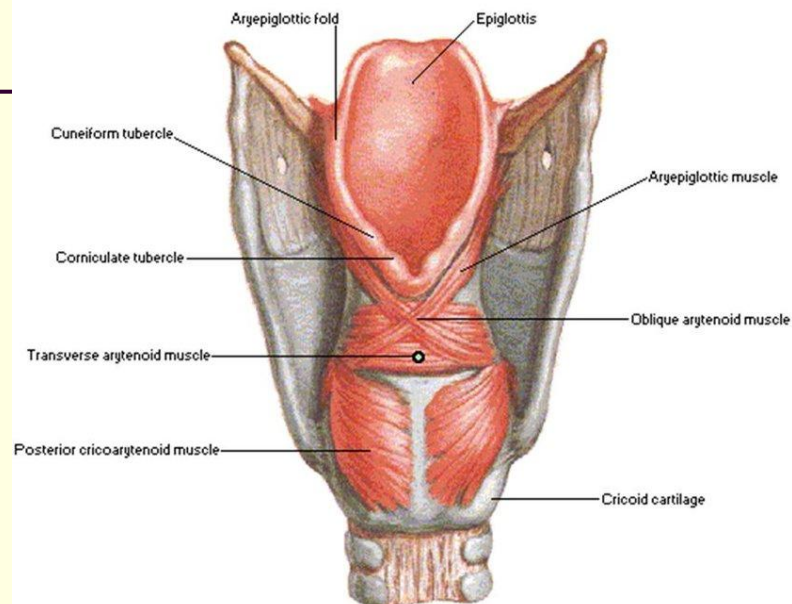
INTRINSIC LARYNGEAL MUSCLES

□ The intrinsic muscles of the larynx can be considered in two groups:

1. Those that **alter the size and shape** of the inlet (Sphincter muscles).

- i. Aryepiglottic
- ii. Arytenoideus
 - a. Oblique Arytenoids
 - b. Transverse Arytenoids
- iii. Thyroepiglottic

Intrinsic Muscles of Larynx
Posterior View

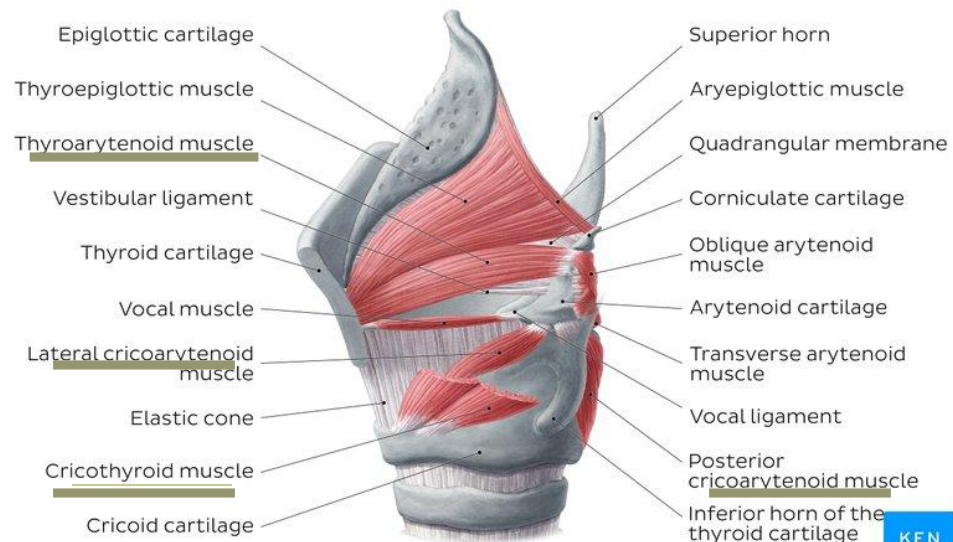
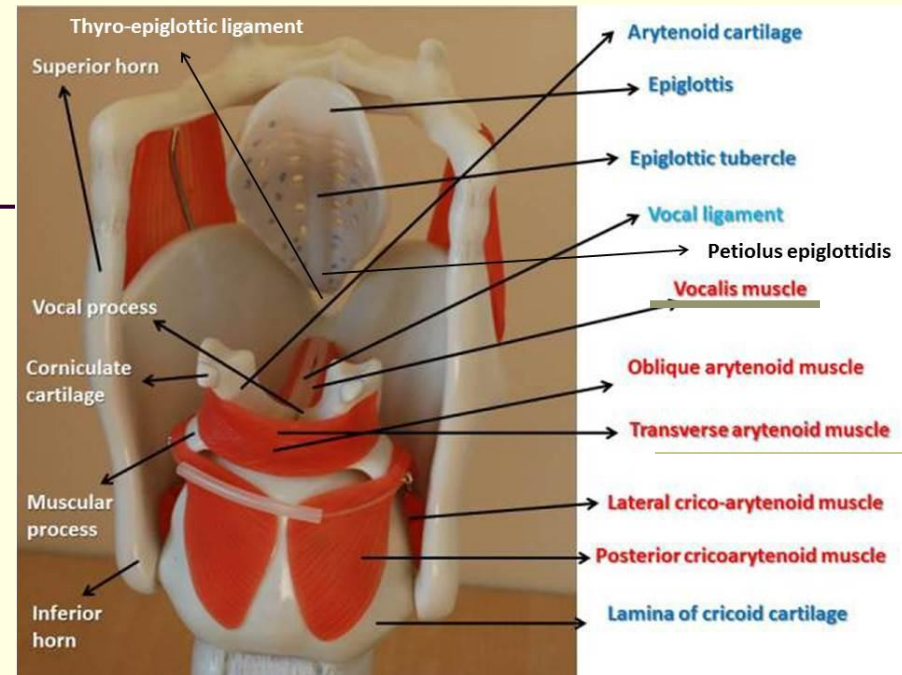


INTRINSIC LARYNGEAL MUSCLES



2. Those that move the **Vocal folds** (Phonation):

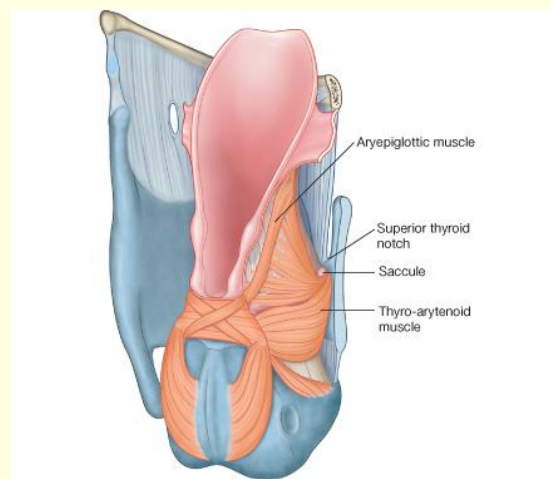
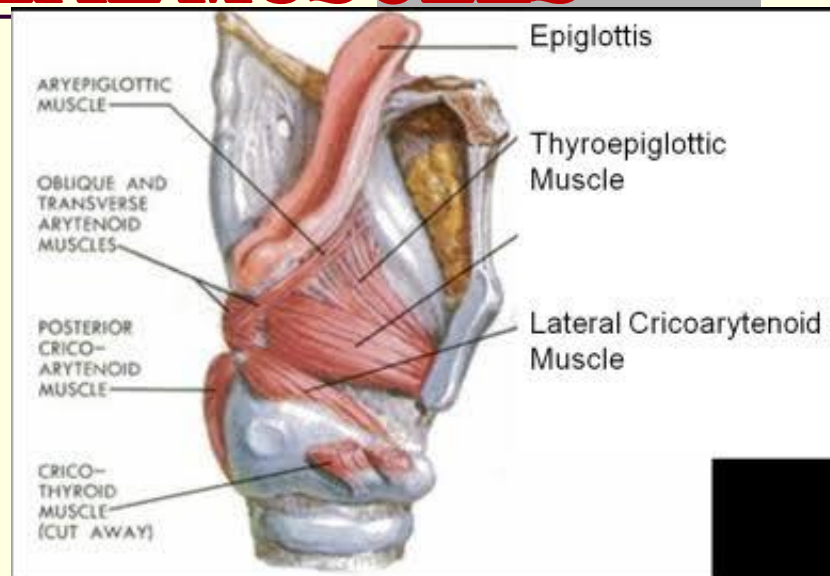
- i. Cricothyroids
- ii. Lateral Cricoarytenoids
- iii. Thyroarytenoids
- iv. Vocalis
- v. Posterior Cricoarytenoids
- vi. **Transverse Arytenoids**





INTRINSIC LARYNGEAL MUSCLES

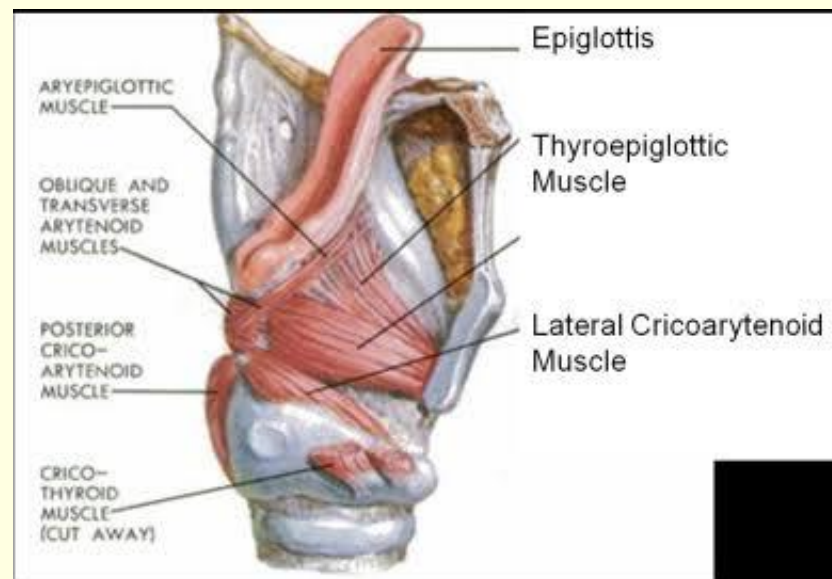
- ❑ Some of the muscle fibers pass alongside the aryepiglottic ligament between the arytenoid and epiglottis.
 - ❑ (Aryepiglottic)
- ❑ Others arise from the Thyroid cartilage adjacent to the attachment of the thyroepiglottic ligament and fan upward and backward on the external surface of the quadrangular membrane.
 - ❑ (Thyroepiglottic)





INTRINSIC LARYNGEAL MUSCLES

- ❑ The **lowermost fibers** of this fan travel alongside the ventricular ligament to reach the arytenoid,
- ❑ The **middle fibers** pass toward the aryepiglottic ligament,
- ❑ The **most anterior fibers** actually insert on the inferolateral margin of the epiglottis.
- ❑ Because different fibers of the sphincter vestibuli have different attachments, bundles of muscle are usually given specific names, but these names are not important.





Muscles of the Inlet

❑ 1. Aryepiglottic Muscle

❑ It lies within the aryepiglottic fold.

■ **Origin:**

■ From the apex of the arytenoid cartilage as a continuation of the oblique arytenoid muscle.

■ **Insertion::**

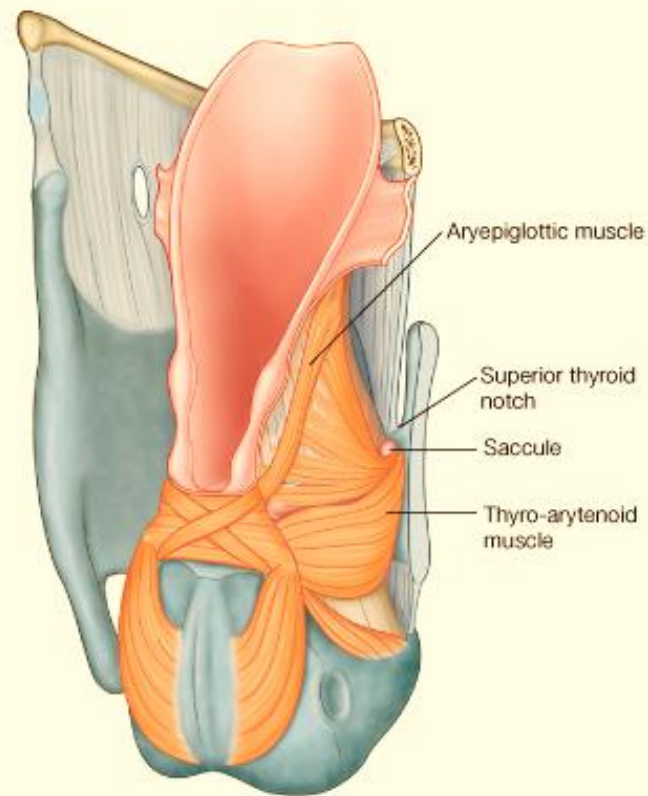
■ Into the side of the epiglottis cartilage.

■ **Nerve supply::**

■ Recurrent laryngeal nerve (branch of vagus nerve).

■ **Action::**

■ Narrowing of the laryngeal inlet by shortening the aryepiglottic fold.

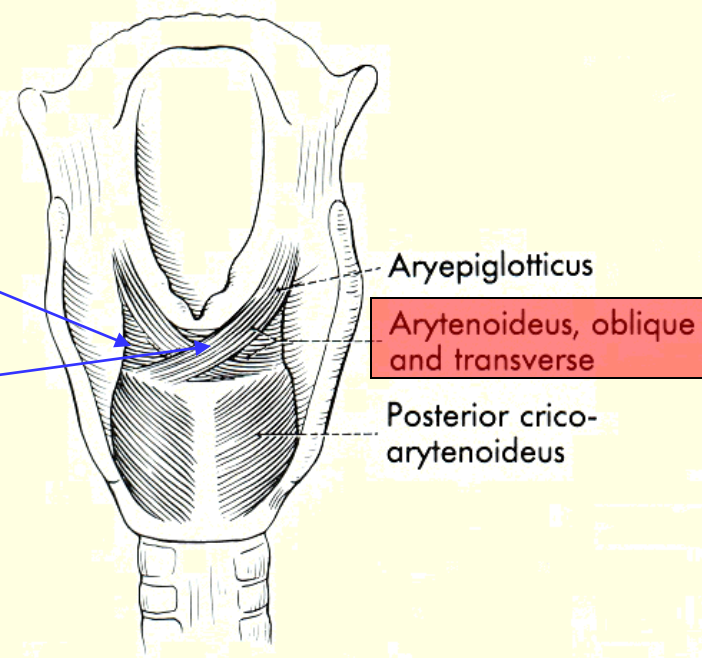




MUSCLES OF THE INLET

2. Arytenoideus, an “unpaired muscle” that has two parts:

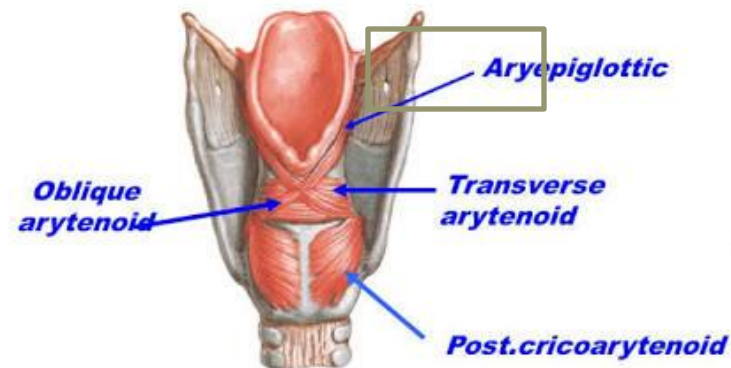
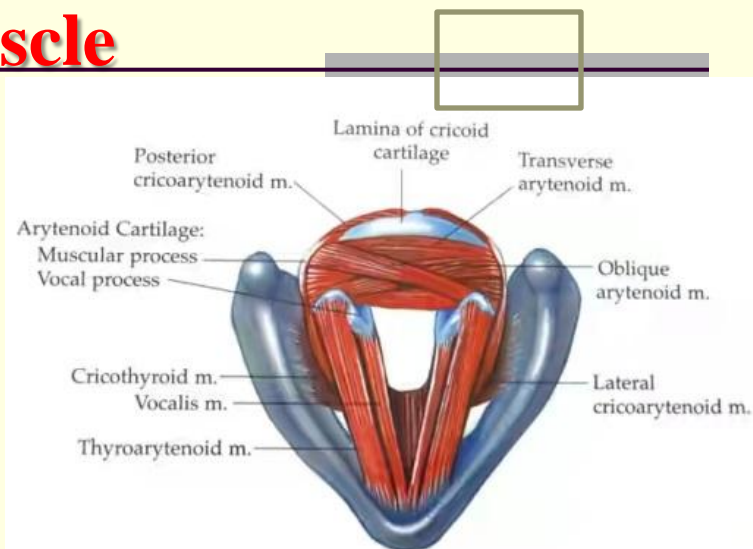
- a) A **transverse** bundle passing horizontally from the back surface of one arytenoid to the back surface of the other, and
- b) An **oblique** bundles passing from the back surface of one arytenoid near its apex to the back surface of the other arytenoid near its base.





a. 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 (branch of vagus nerve).
- Action:**
- Adduction of the vocal cords by approximating the arytenoid cartilages.





MUSCLES OF THE INLET

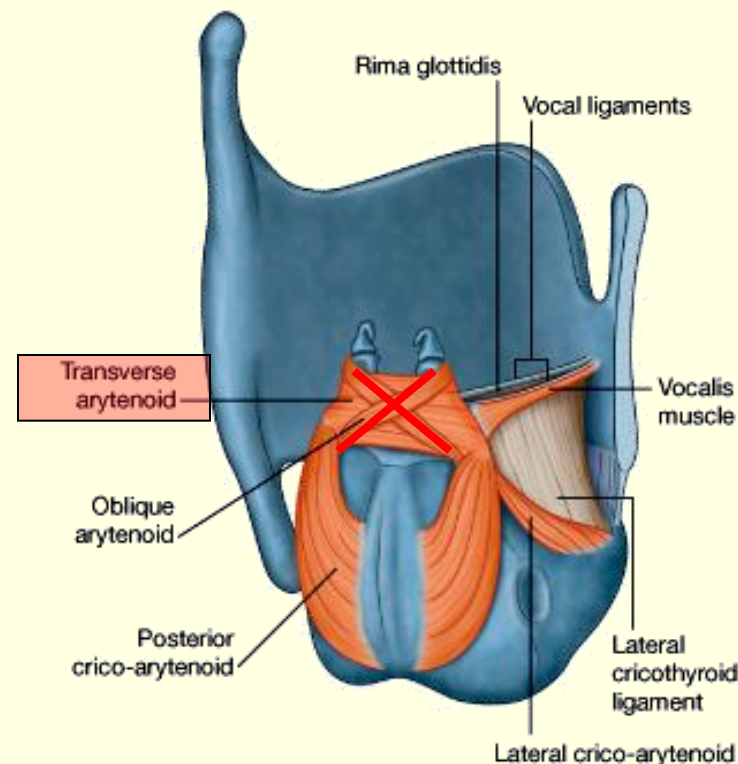
❑ b. OBLIQUE ARYTENOID MUSCLES

❑ **Origin:**

❑ It pass from the muscular process of one arytenoid to the top of the aryepiglottic muscle of the opposite side, where some fibres get attached to the opposite corniculate cartilage.

❑ **Insertion:**

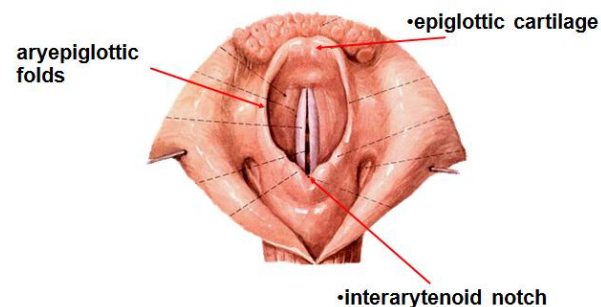
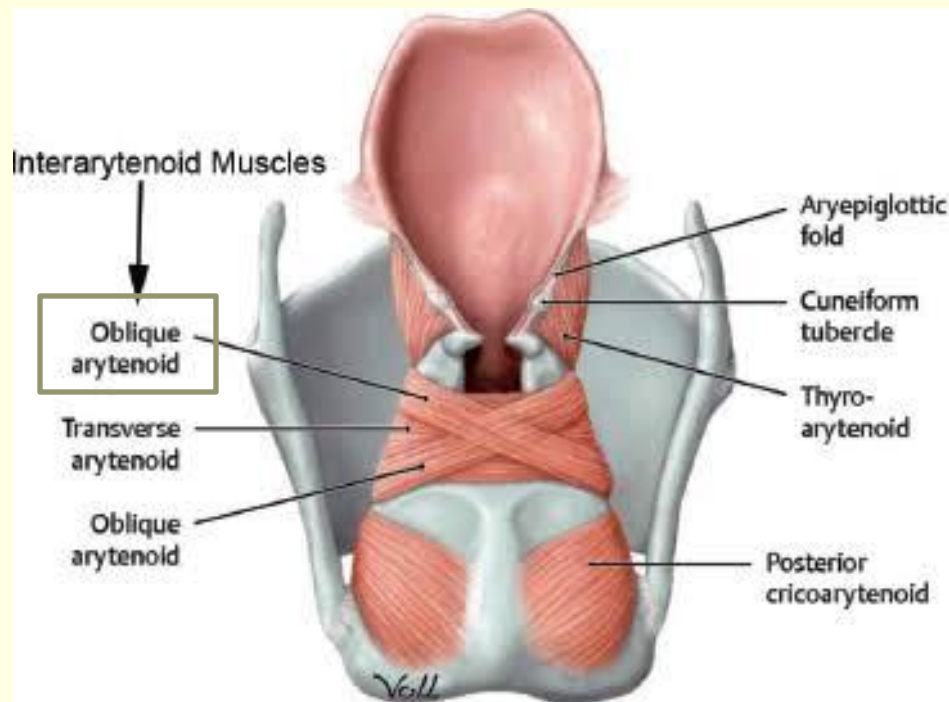
❑ The two oblique arytenoids thus cross each other like an “X” superficial to the Transverse arytenoid muscle.





Oblique arytenoid Muscle

- ❑ **Nerve supply:**
- ❑ Recurrent laryngeal nerve (branch of vagus nerve).
- ❑ **Action:**
- ❑ Narrowing of the laryngeal inlet by bringing the two aryepiglottic folds together.





Muscles of the Inlet

❑ 3. Thyroepiglottic muscle

❑ **ORIGIN:**

- ❑ It arises from the lamina of the Thyroid cartilage in common with the thyroarytenoideus but leaves it to sweep upward into the aryepiglottic fold.

❑ **INSERTION:**

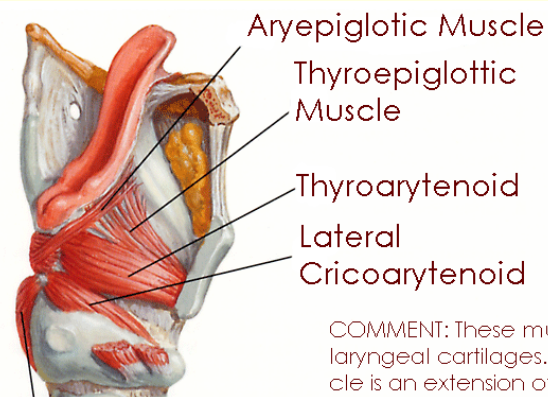
- ❑ Its fibres run outside the quadrangular membrane (lying upon it), and are inserted into the side of the epiglottis.

■ **Nerve supply:**

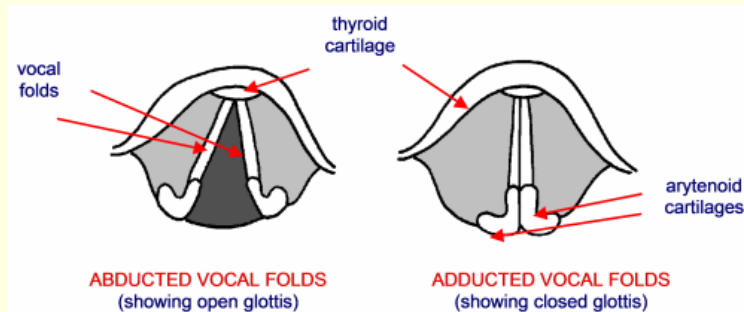
- Recurrent laryngeal nerve (branch of vagus nerve).

■ **Action:**

- Widening of the laryngeal inlet.



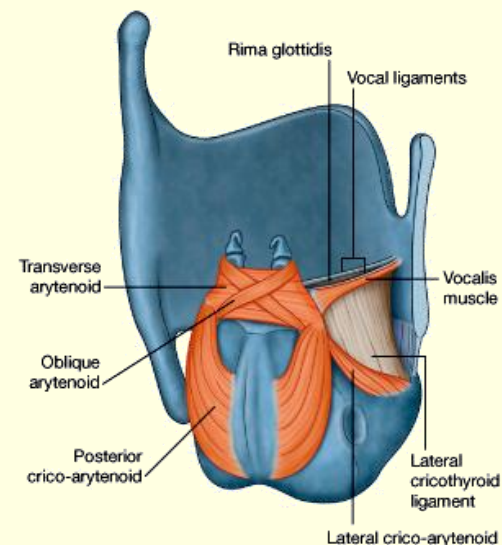
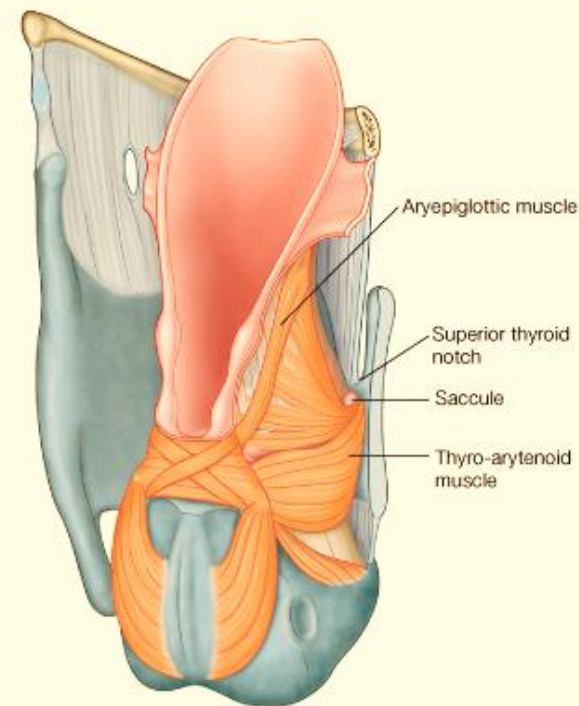
COMMENT: These muscles act on the laryngeal cartilages. The vocalis muscle is an extension of the thyroary-





Muscles of the Inlet

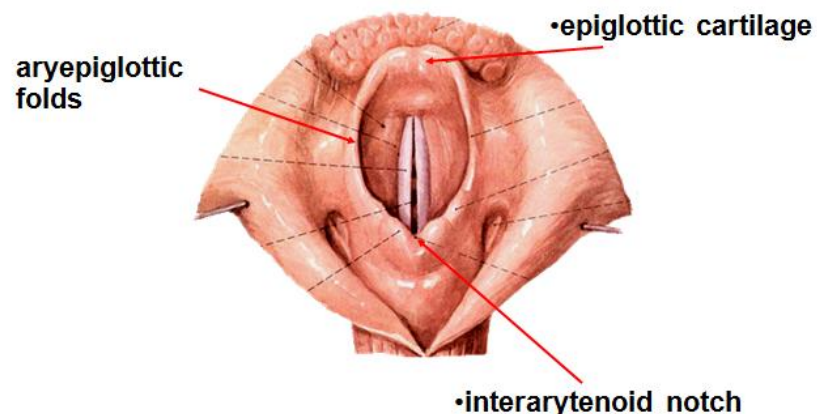
- ❑ The **Aryepiglottic** and **oblique arytenoids** act as a **sphincter for the inlet**.
- ❑ They oppose the arytenoid cartilages on each other and draw the epiglottis down to bring its lower half into contact with the arytenoids.
- ❑ In case, no **Aryepiglottic muscles** are developed in the free edge of the Aryepiglottic fold, the oblique fibres are well developed and the **Thyroepiglottic muscles** assist in approximating the epiglottis to the arytenoid cartilages.





Muscles of the Inlet

- ❑ Thus, the aperture of the inlet is closed and forms an effective valvular protection from above (i.e. against swallowed material) even without the epiglottic lid that normally is an added modification.
- ❑ However, it can be readily opened by air pressure from below, such as an inescapable cough during swallowing.





1. CRICOTHYROID

Origin:

- Anterolateral aspect of arch of cricoid cartilage .

Insertion:

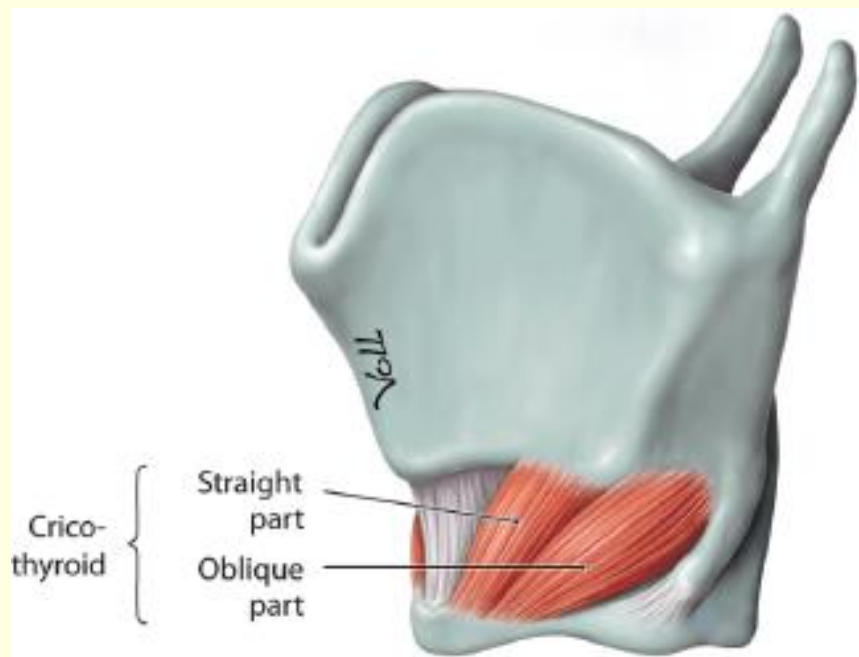
- 1. Oblique part:- inferior horn of thyroid cartilage.
- 2. Straight part:- inferior margin of thyroid cartilage.

Nerve supply:

- Superior laryngeal nerve (branch of vagus nerve).

Action:

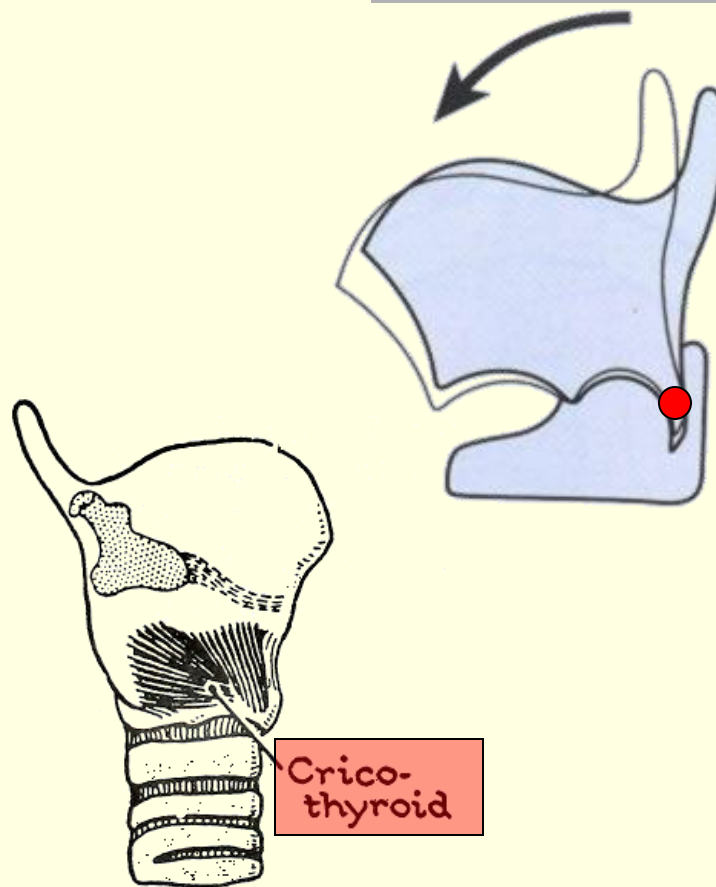
- Forward and downward rotation of the thyroid cartilage at cricothyroid joint.





Cricothyroid Joints and the Cricothyroid Muscle.

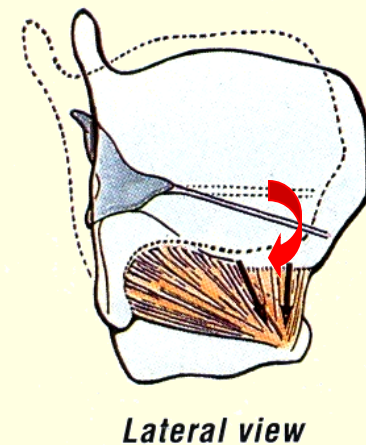
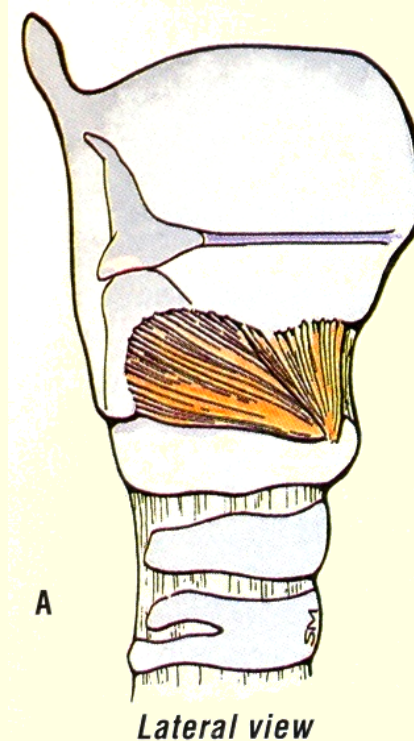
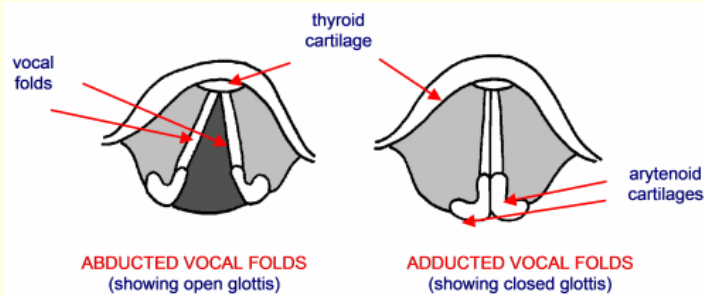
- ❑ The thyroid cartilage can rotate forward around a horizontal axis that passes between the right and left cricothyroid joints.
- ❑ The muscles that produce such rotation are the **cricothyroid muscles**.





CRICOTHYROID JOINTS AND THE CRICOTHYROID MUSCLE.

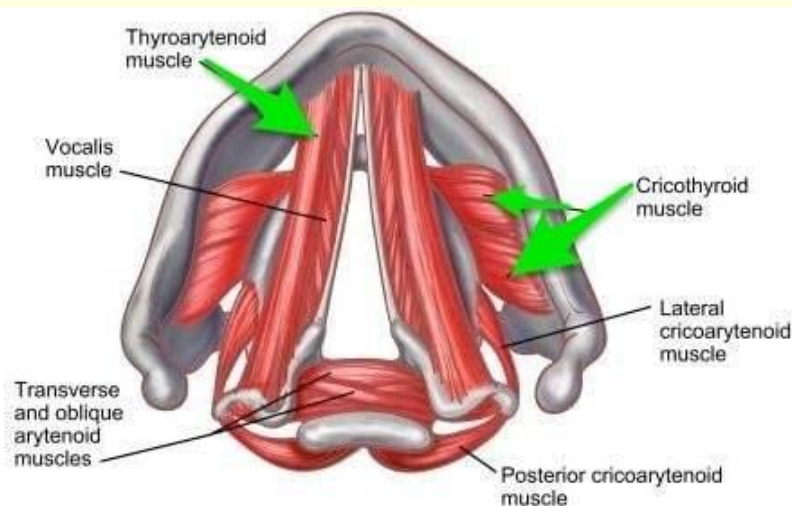
- By rotating the thyroid cartilage downward and forward, the cricothyroid muscles cause the vocal cords to become tighter and to move slightly closer together (i.e. to adduct).





CRICOTHYROID JOINTS AND THE CRICOTHYROID MUSCLE.

- ❑ Upon surgical entrance to the visceral compartment of the neck, the cricothyroid muscle is the only laryngeal muscle that can be visualized without further dissection.
- ❑ Thus it is called an **external laryngeal muscle**.
- ❑ It also has a **nerve supply different** from all the other, so called internal laryngeal muscles.





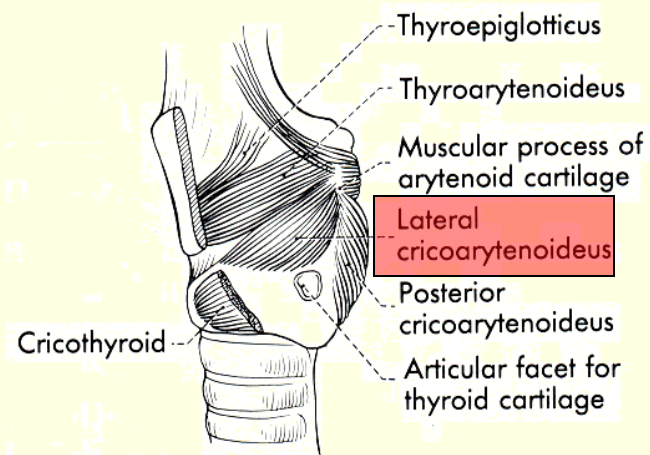
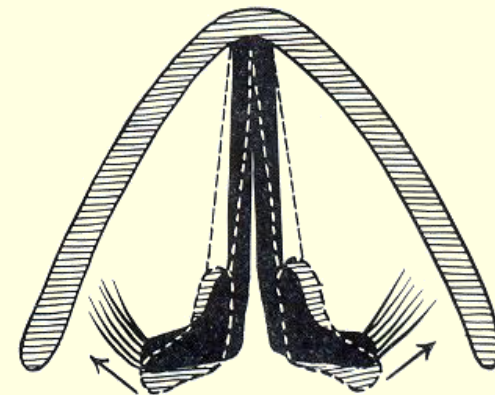
Cricoarytenoid Joints and the Muscles Acting Across Them

- ❑ Almost all the muscles acting across a cricoarytenoid joint cause the vocal cords to adduct.
- ❑ The adductors are:

2. LATERAL CRICOARYTENOIDEUS:

ORIGIN:

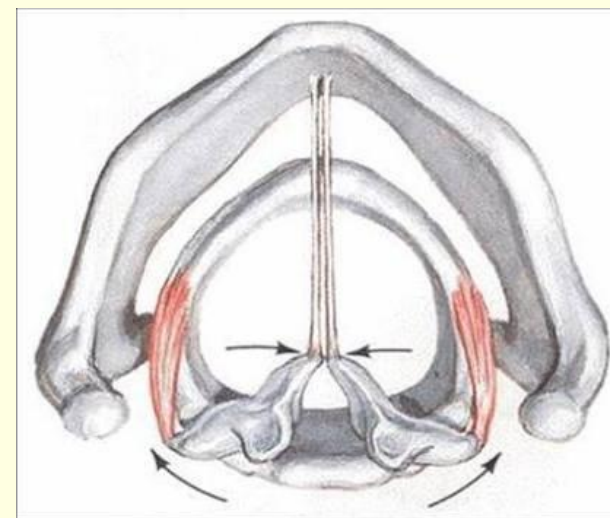
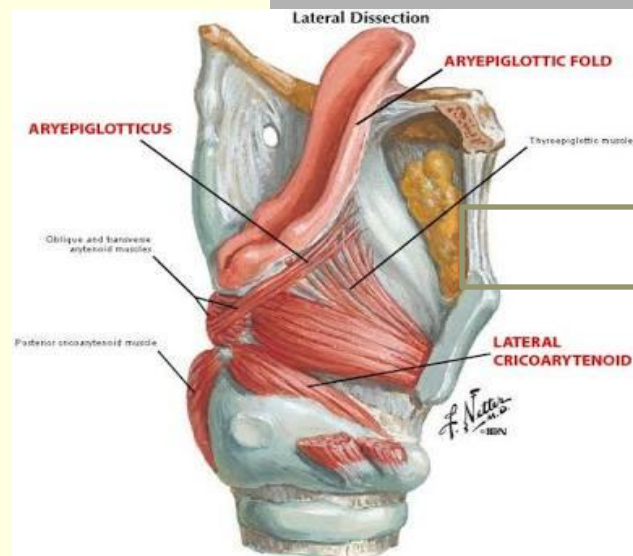
- Arises from the upper rim of the cricoid arch and passes backward and upward.





Lateral Cricoarytenoid Muscle...con't

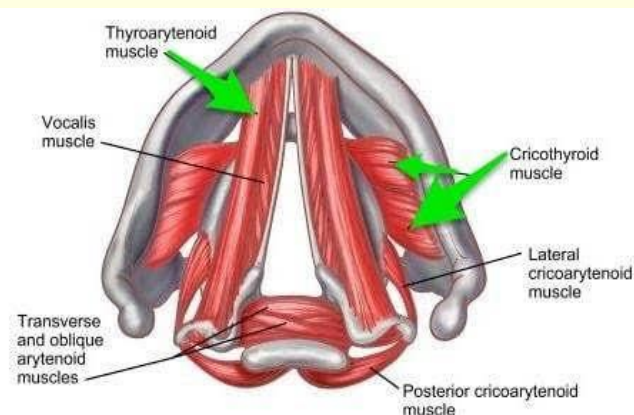
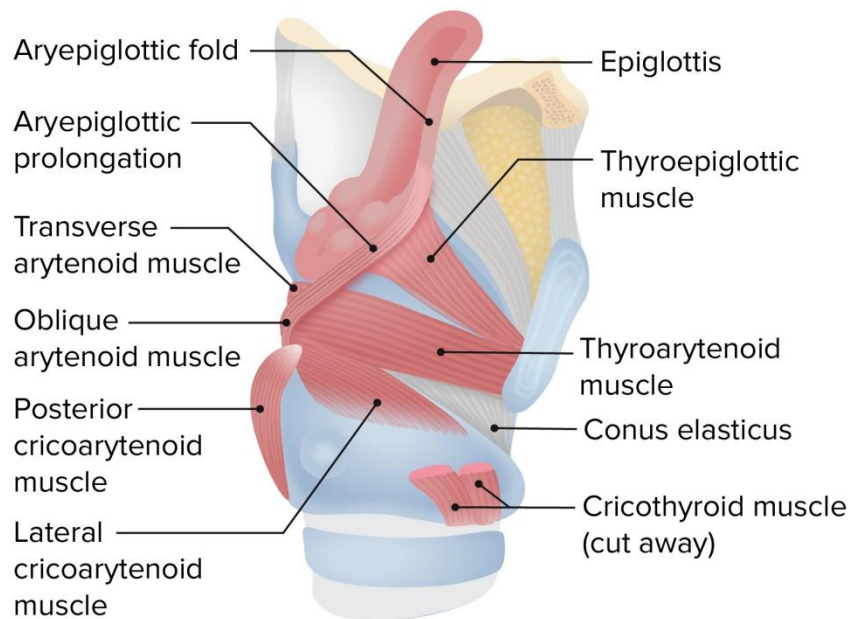
- ❑ **Insertion:**
- ❑ Into the muscular process of the arytenoid cartilage.
- ❑ **Nerve supply:**
- ❑ Recurrent laryngeal nerve (branch of vagus nerve).
- ❑ **Action:**
- ❑ Adduction of the vocal cords by rotation of the arytenoid cartilage.





3. Thyroarytenoid Muscle

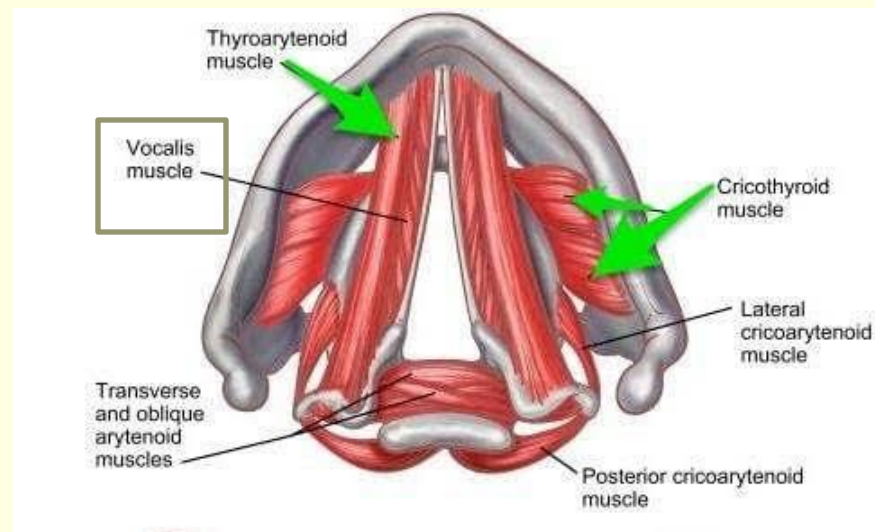
- ❑ **Origin:**
- ❑ From the inner surface of thyroid cartilage lateral to the cricothyroid ligament.
- ❑ **Insertion:**
- ❑ Into the antero-lateral surface of arytenoid cartilage.
- ❑ **Nerve supply:**
- ❑ Recurrent laryngeal nerve (branch of vagus nerve).
- ❑ **Action:**
- ❑ Shortening and relaxation of the vocal fold.





4. VOCALIS MUSCLE

- ❑ **Origin:**
- ❑ Deep fibers of thyroarytenoid.
- ❑ **Insertion:**
- ❑ Into the vocal process of arytenoid cartilage and vocal ligament.
- ❑ **Nerve supply:**
- ❑ Recurrent laryngeal nerve (branch of vagus nerve).
- ❑ **Action:**
- ❑ Shortening and relaxation of the vocal fold.



- ❑ The **thyroarytenoideus** (particularly its vocalis part) causes the cord to slacken; the **arytenoideus** causes it to tighten.

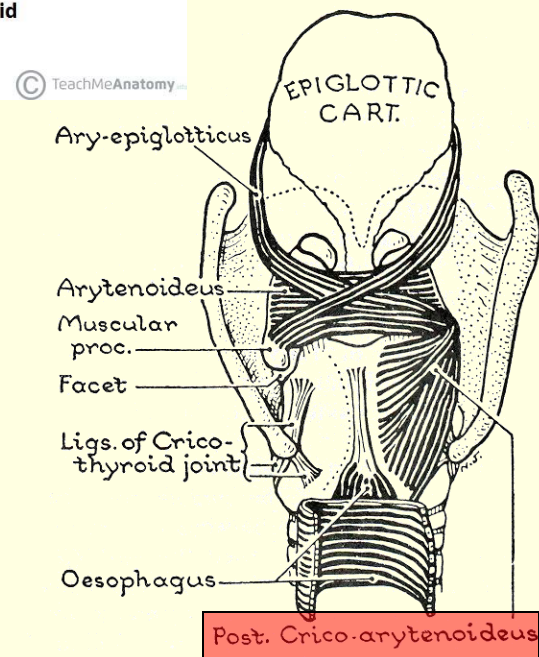
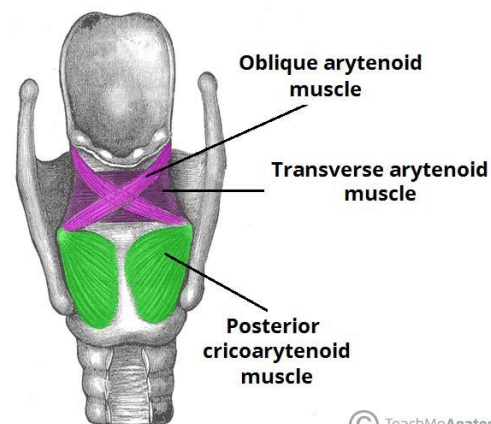


Cricoarytenoid Joints and the Muscles Acting Across Them

- ❑ The only muscles that produce this motion are the paired **5. posterior cricoarytenoideus**.

- ❑ **ORIGIN:**

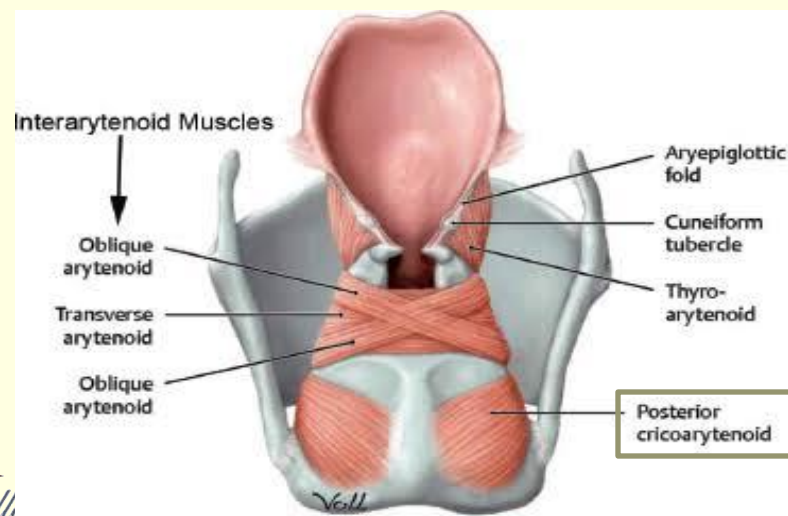
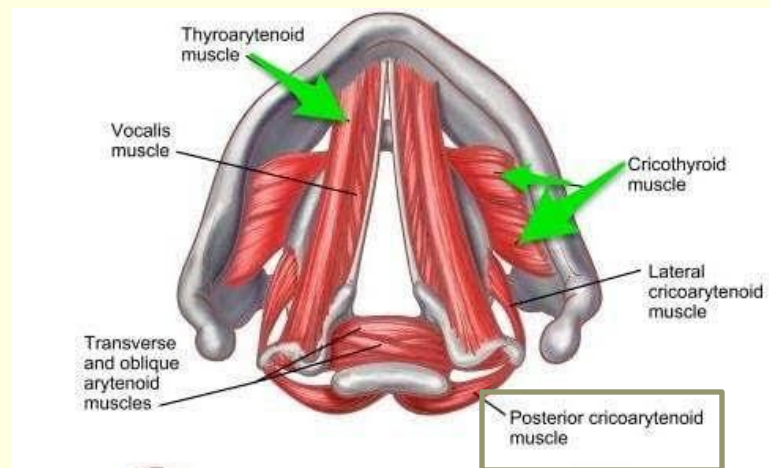
- ❑ On each side the fibers of the posterior cricoarytenoideus arise from the back of the cricoid lamina.





Posterior Cricoarytenoid Muscle....con't

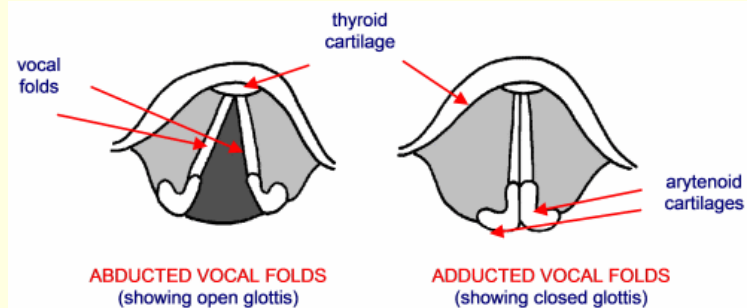
- ❑ **Insertion:**
- ❑ Into the muscular process of the arytenoid cartilage.
- ❑ **Nerve supply:**
- ❑ Recurrent laryngeal nerve (branch of vagus nerve).
- ❑ **Action:**
- ❑ Abduction of the vocal cords by rotating the arytenoid cartilage.





Cricoarytenoid Joints and the Muscles Acting Across Them

- ❑ When both arytenoid cartilages rotate so that their vocal processes move upward and outward, the vocal cords are abducted (brought away from another) and the rima glottidis thus opened.
- ❑ Being the only abductors of the vocal cords, the posterior cricoarytenoids play a vital role in holding the glottis open during breathing.





Summary of vocal fold movements

- ❑ The vocal folds are held open constantly (for breathing), and their length is never altered in this position.
- ❑ They are closed intermittently for:
 - ❑ Phonation
 - ❑ Prior to a cough
 - ❑ Abdominal straining.
- ❑ Change of length occurs *only when they are closed for phonation*. When closed they are bunched up by vocalis to strengthen the seal.



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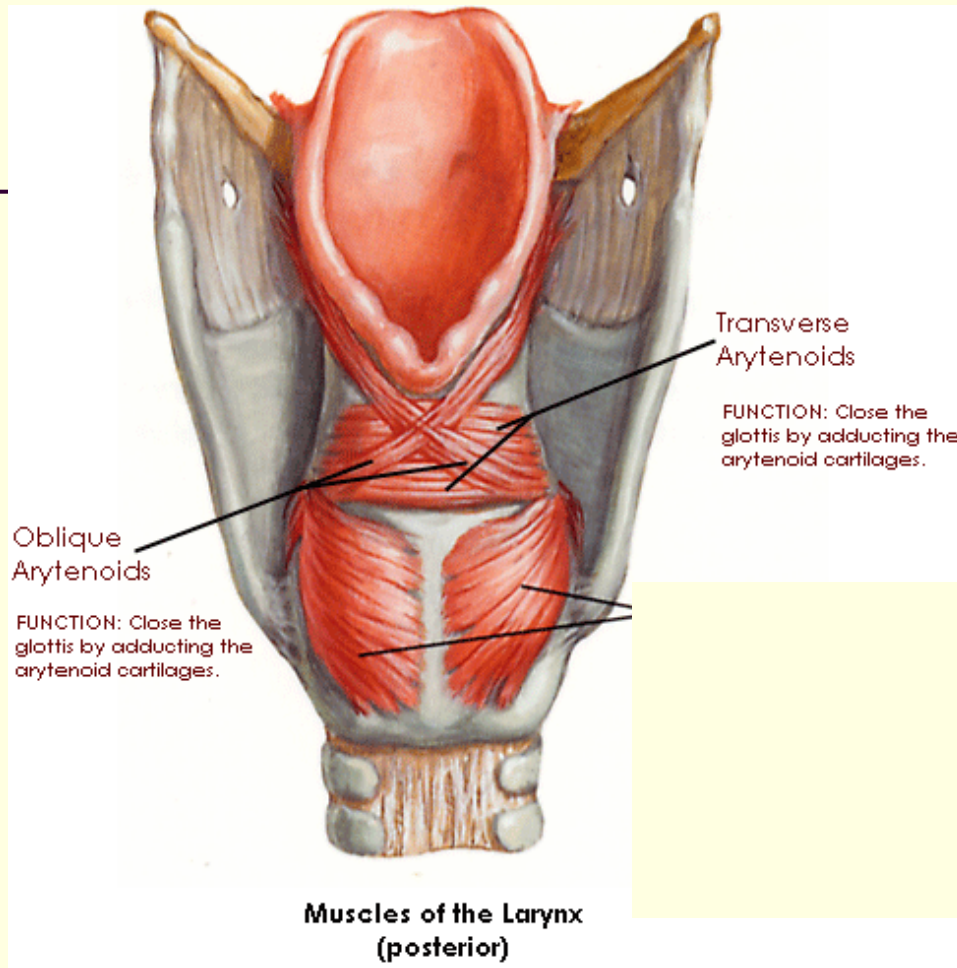
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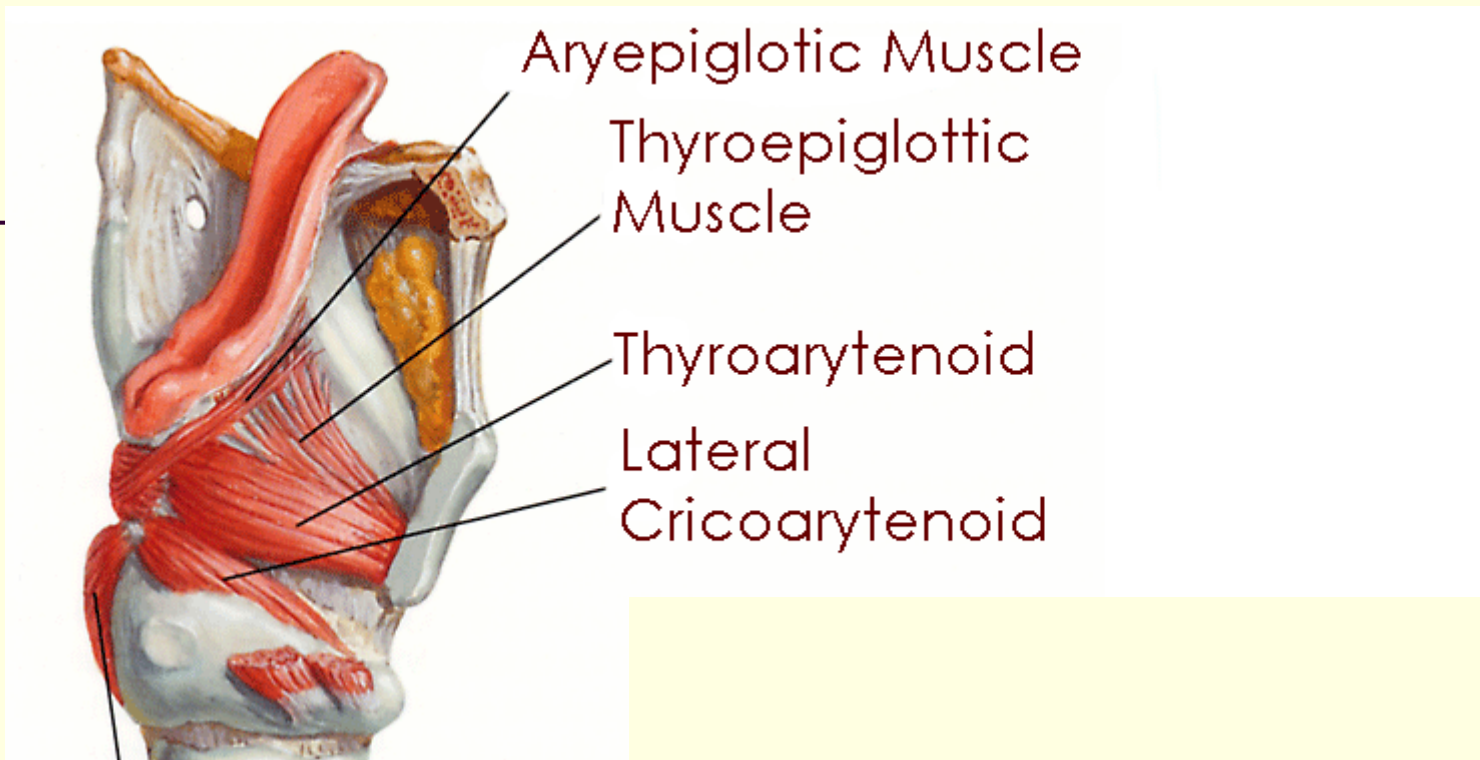
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THANK YOU....

HUMAN
Anatomy



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اللہ تعالیٰ دو جمعوں کے درمیان ایک نور روشن فرمادیتا ہے۔
(اسے حاکم اور بیہقی نے روایت کیا ہے، صحیح الجامع الصغیر للالبانی، جلد 5، حدیث 6346)

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تو ذکر الہی کی طرف لپکو اور خرید و فروخت چھوڑ دو
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(سورۃ الجمعہ، آیت: 9)

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