

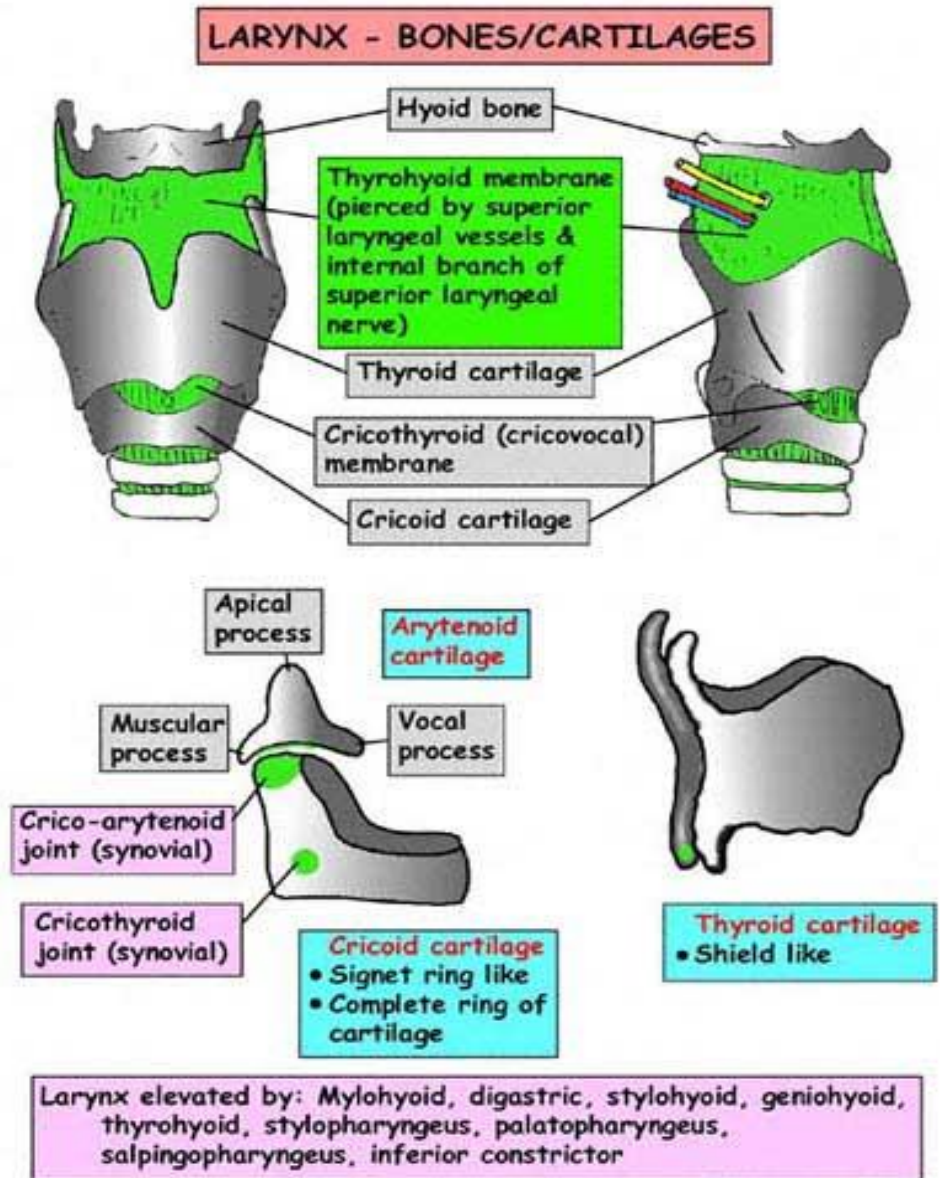
# The Larynx

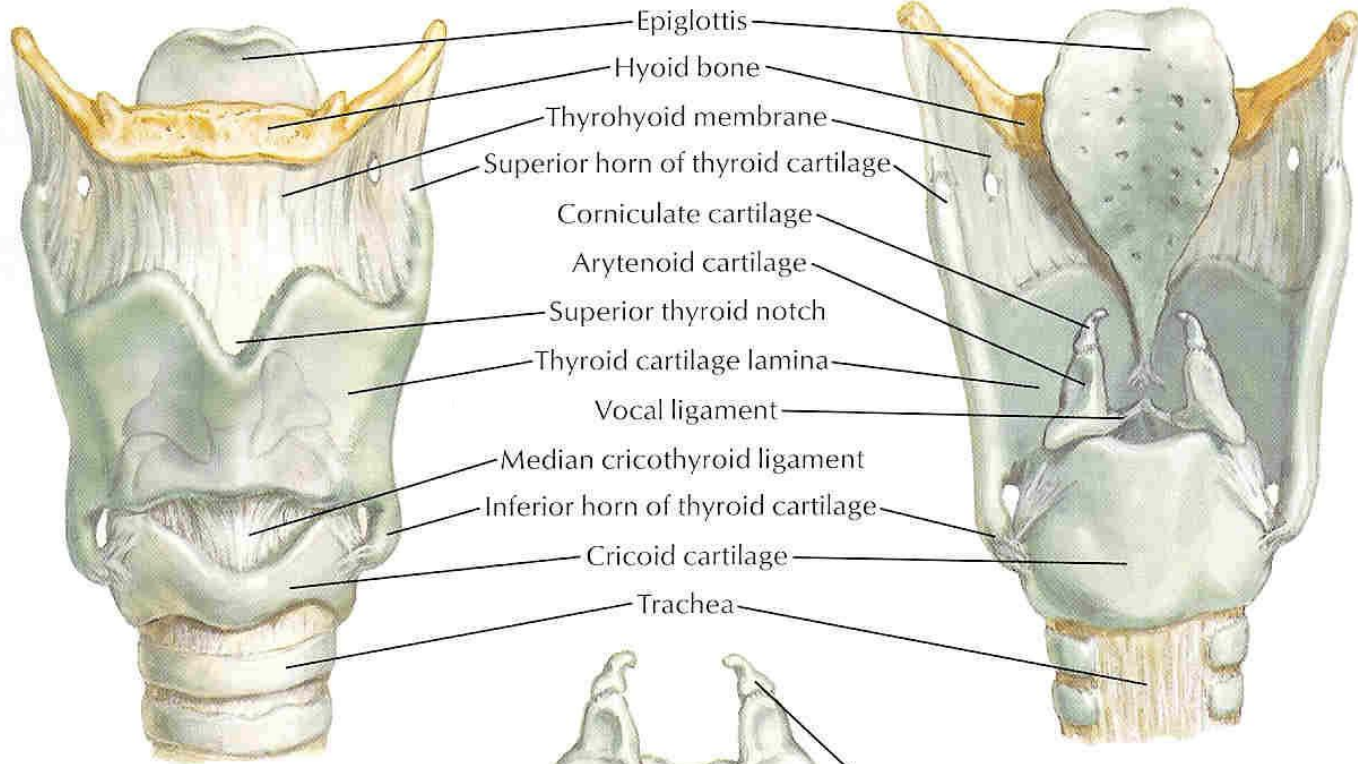
The larynx lies in the anterior part of the neck in the midline opposite to C4-C6 vertebrae forming the laryngeal prominence (Adam's apple), At this level the larynx. Is **triangular** in cross section while lower down at the level of the cricoid cartilage it is **circular** in cross Section

- Part of respiratory passage between pharynx & trachea. **Relations** :
  - - **Anterolaterally** ; **Thyroid gland** & Covered by the **infra hyoid muscles** & investing layer of deep cervical fascia.
  - **Laterally**, Carotid sheath
  - - **Posteriorly** ; Pharynx

# Structure (Skeleton)

- Larynx formed of a number of cartilages:
- 1- Paired: arytenoid, cuneiform & corniculate cartilages.
- 2- Unpaired: thyroid, cricoid & epiglottic.
- These cartilages articulate with each other at the cricothyroid & cricoarytenoid joints.



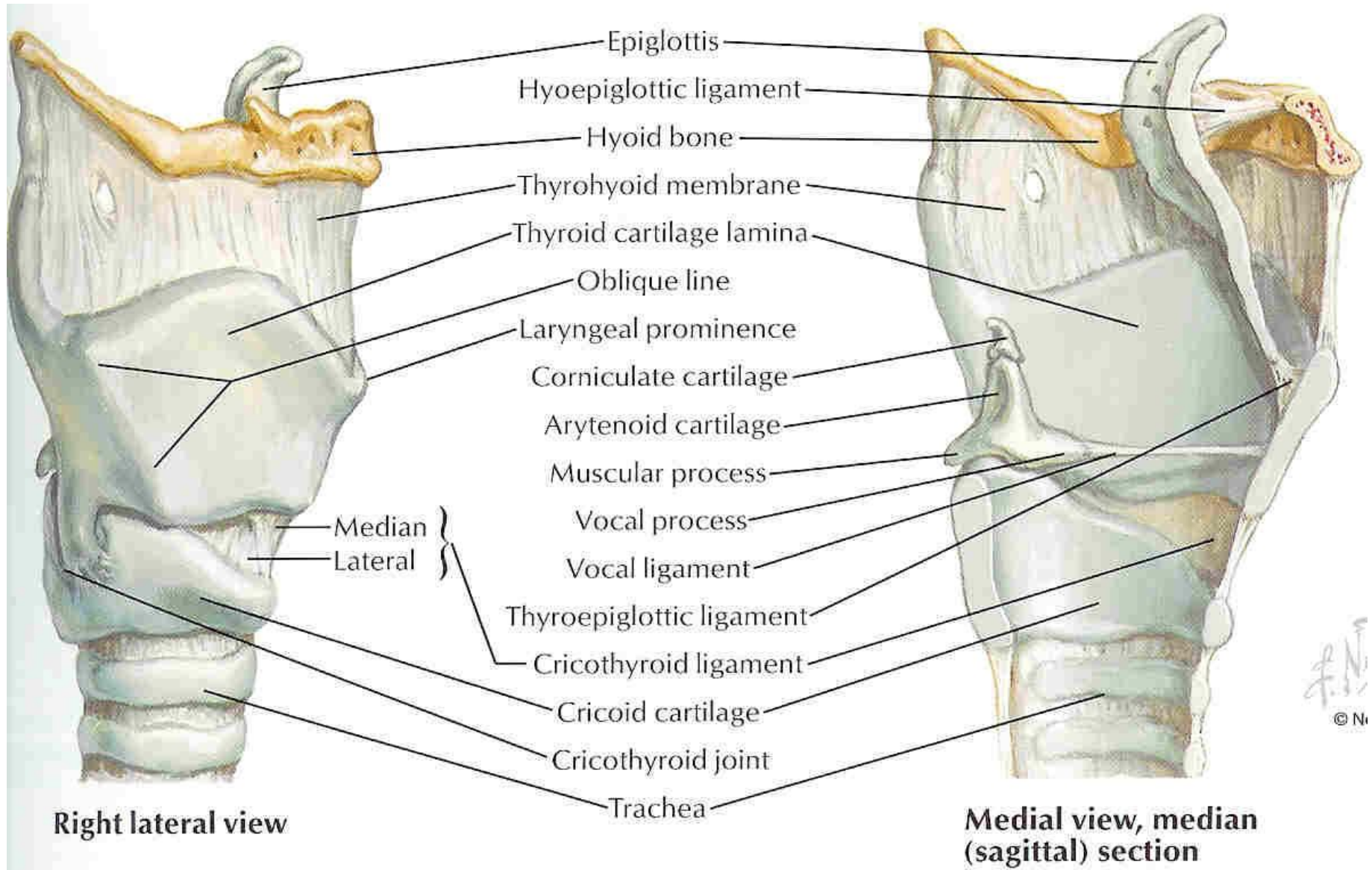


**Anterior view**

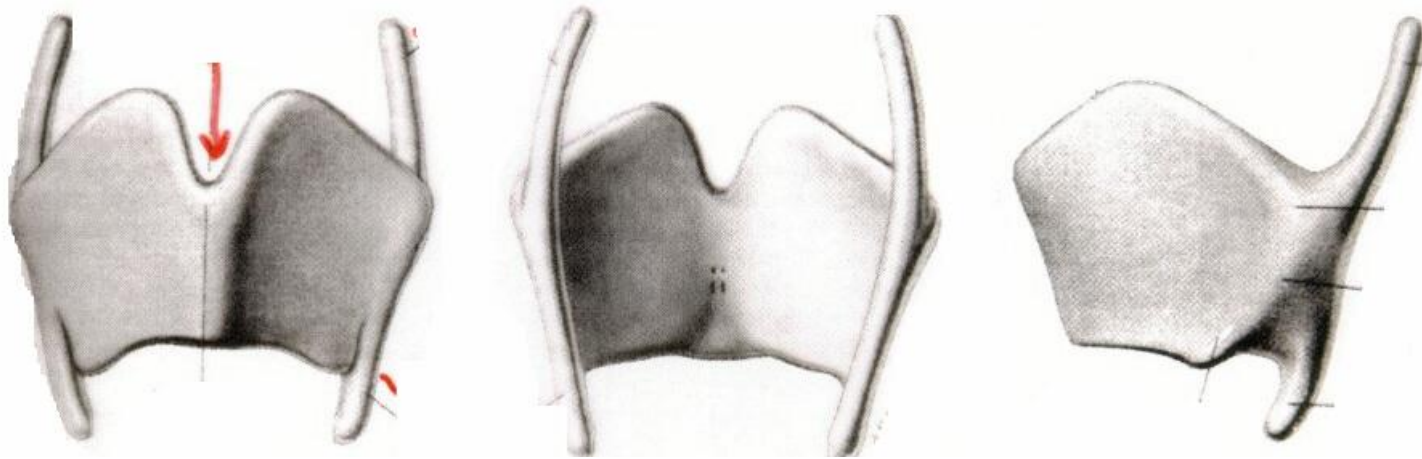
**Posterior view**



**Anterosuperior view**



# Thyroid Cartilage



- Shield shaped, open posteriorly, angulated anteriorly
- Angulation more acute in males
- Its function is to shield larynx from injury and provide an attachment to vocal cords

# Thyroid cartilage

Formed of 2 quadrilateral laminae united anteriorly at an angle of 120

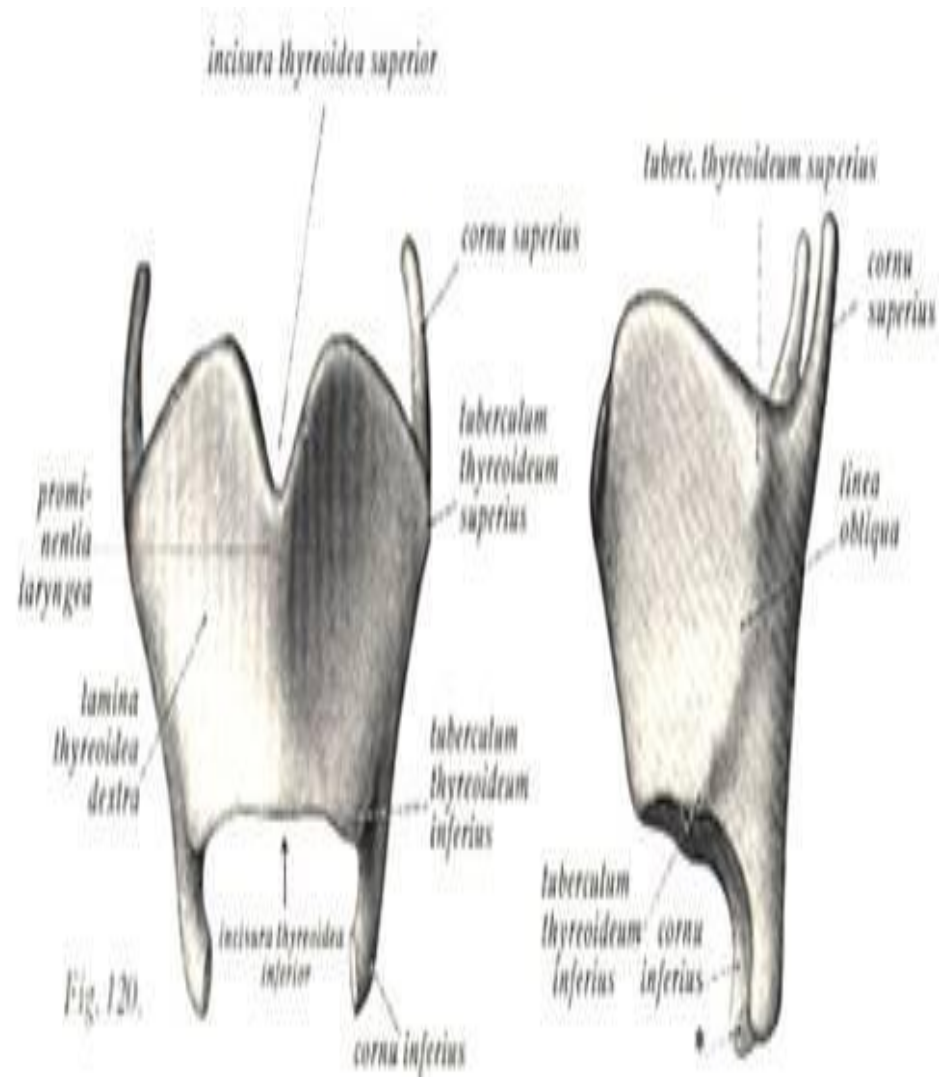
degrees in females & 90 degrees in males.

The angle forms the (laryngeal prominence), with a **V-shape gap** above it called (**thyroid notch**).

The free **posterior border extend** superiorly & inferiorly to form the **superior & inferior horns**.

An **oblique line extends** from the **superior horn** in downwards & forwards direction to the **inferior horn**.

which gives attachment to **thyrohyoid, sternothyroid & thyropharyngeus**



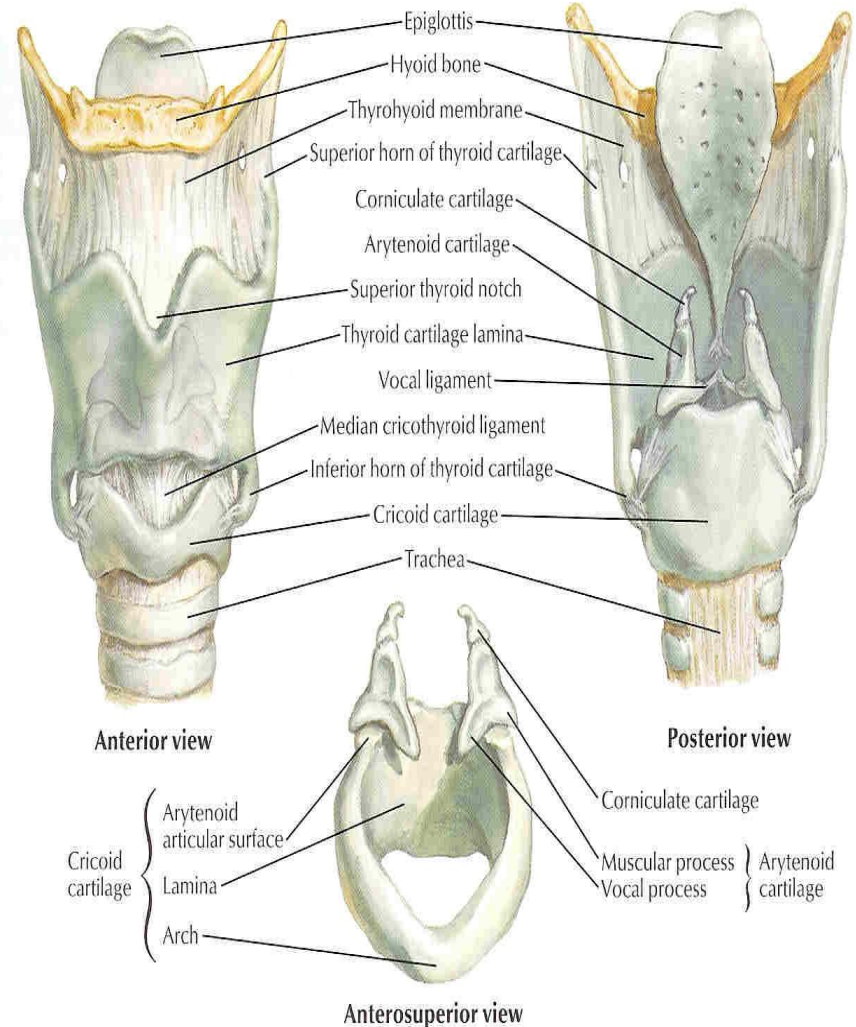
# Thyroid cartilage

The inferior horn articulates with the cricoid cartilage.

The **upper border & superior horn** give attachment to the **thyrohyoid membrane**.

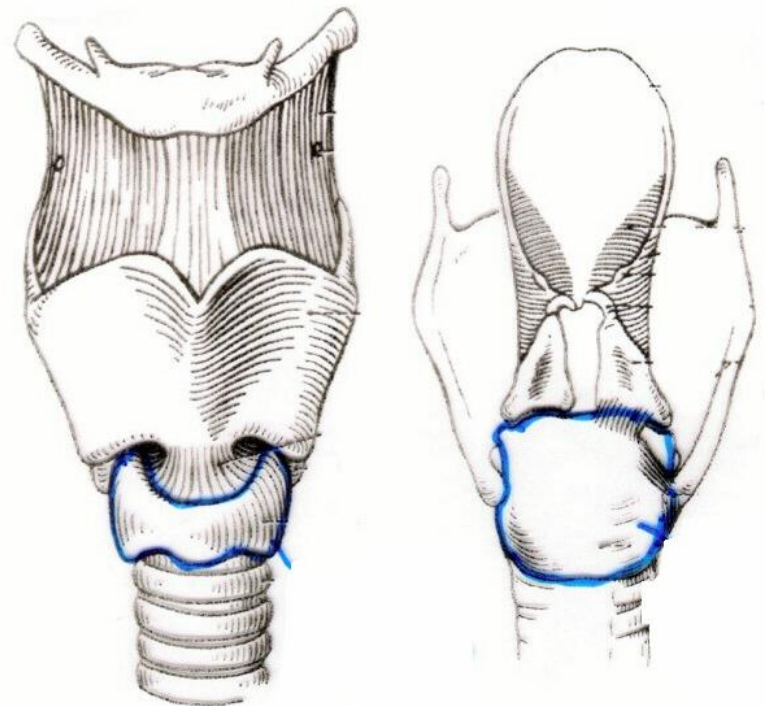
The **lower border & inferior horn** give attachment to the **cricothyroid membrane**.

At the **posterior aspect of laryngeal prominence (inside)**, attached the **epiglottic cartilage above, the vocal ligaments below & thyroarytenoid muscle & cricothyroid ligament**.



# Cricoid Cartilage

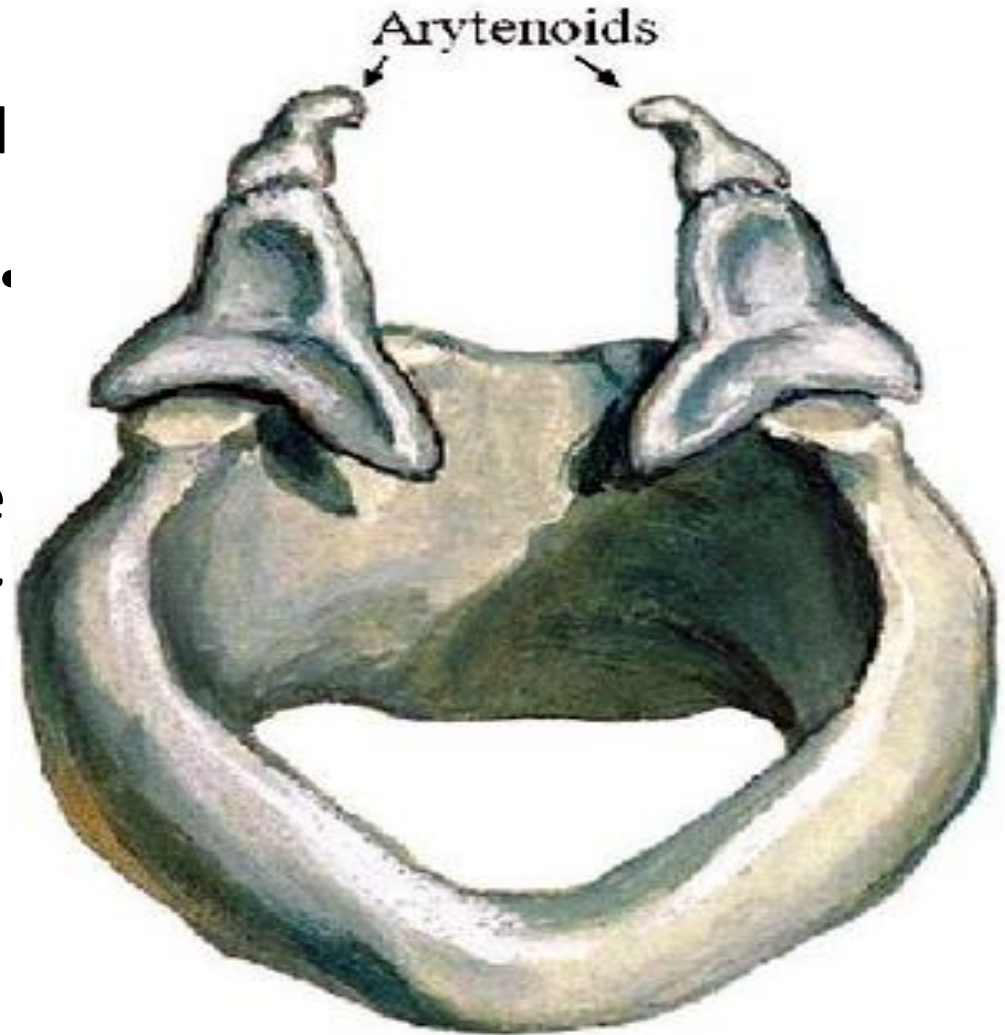
- Signet ring shaped
- Stronger than thyroid cartilage.
- Lamina – 2 to 3 cm from above downwards, considerably broader than anterior arch.





# Cricoid cartilage

- This signet ring-like cartilage is characterized by an **anterior arch** & **posterior broad lamina**.
- It lies at the level of C6 vertebra & forms the foundation on which the rest of the larynx *is built*. The **posterior lamina** is marked in the lies a shallow depression for the **posterior crico-arytenoid muscle**.



# Cricoid cartilage

Articulates with: •

- \* Inferior horn at its lateral surface.

- \* Arytenoid cartilage at the upper border of the lamina.

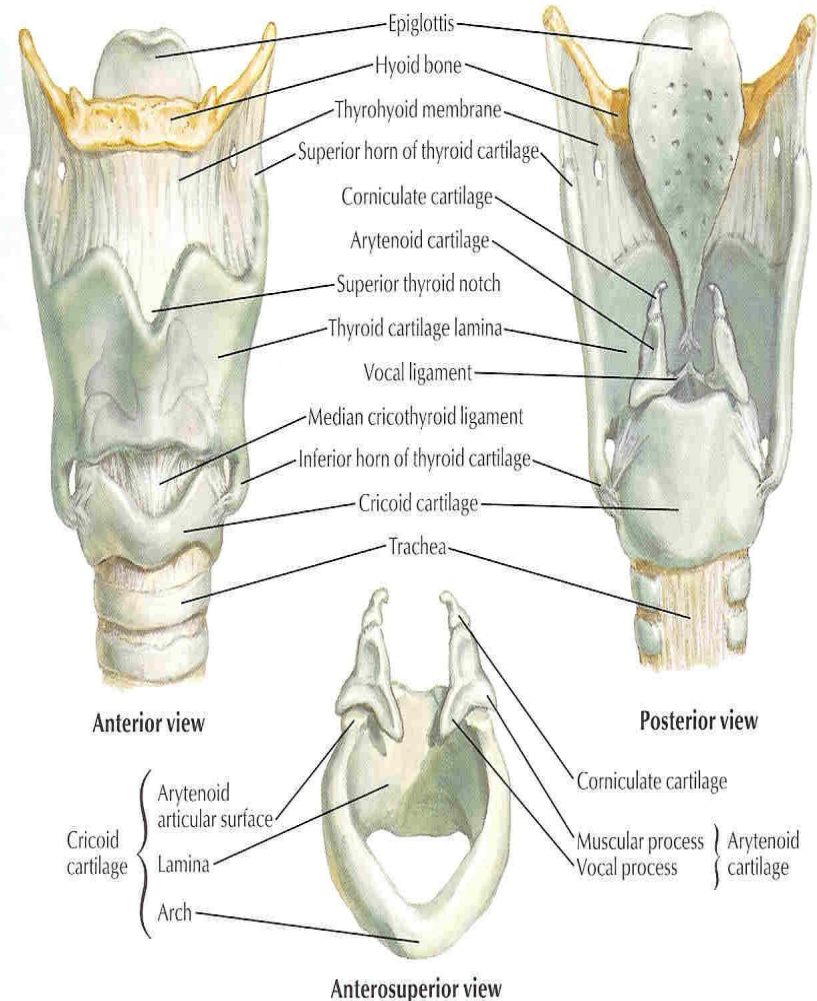
- Conus elasticus & cricothyroid ligament are attached to its upper surface.

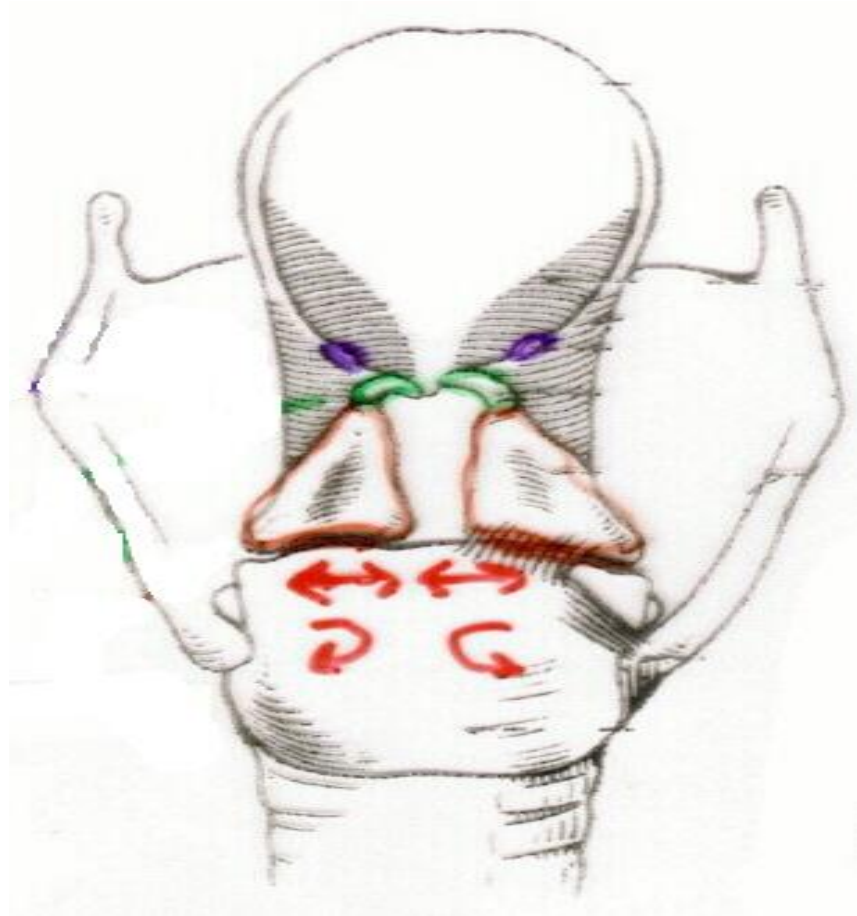
- Cricothyroid & lateral cricoarytenoid muscles are attached to the outer surfaces.



# Arytenoid cartilage

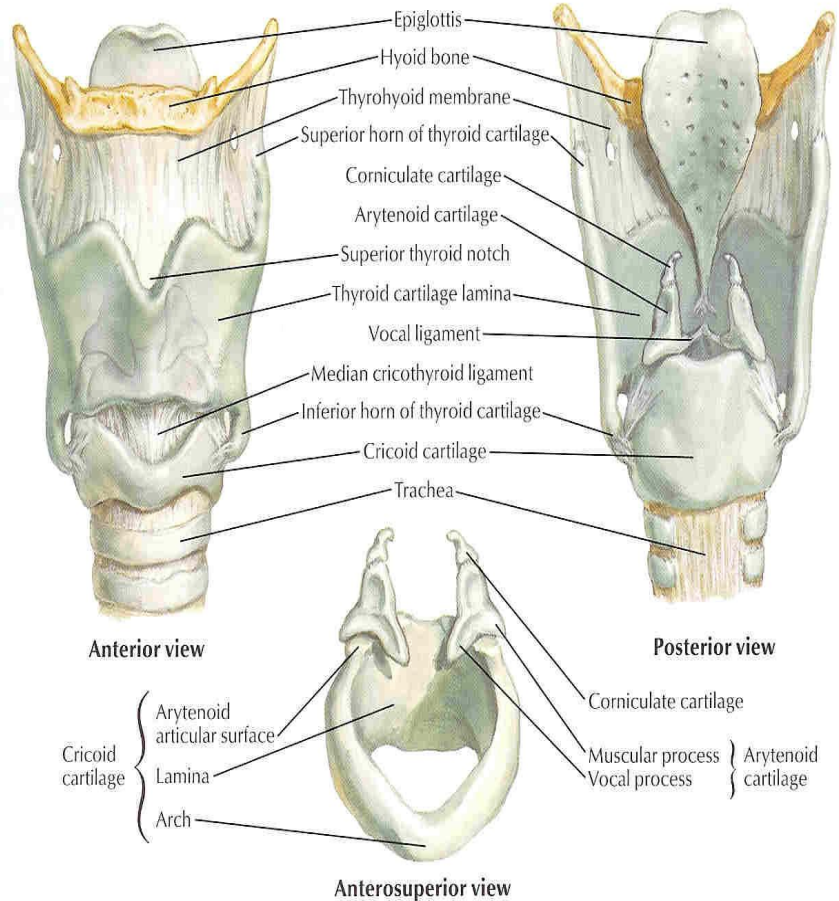
- Paired cartilage. whose **apex** projects posteromedially & carries the **corniculate cartilages**.
- They have the shape of **3-sided pyramid** with medial, posterior, antero-lateral **surfaces** and a base which articulates with the **lamina** of the **cricoid**





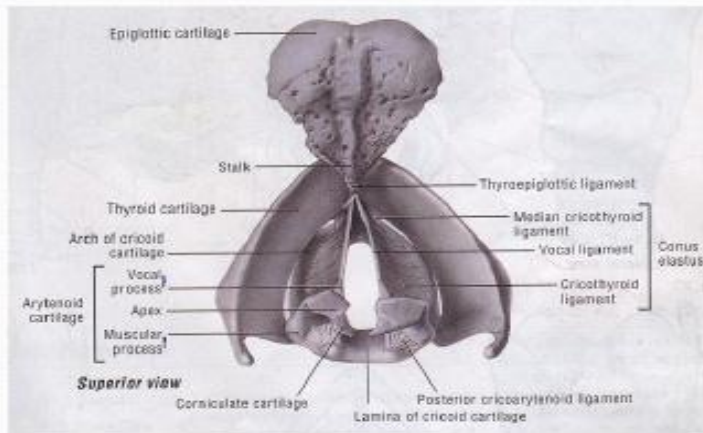
# Arytenoid cartilage

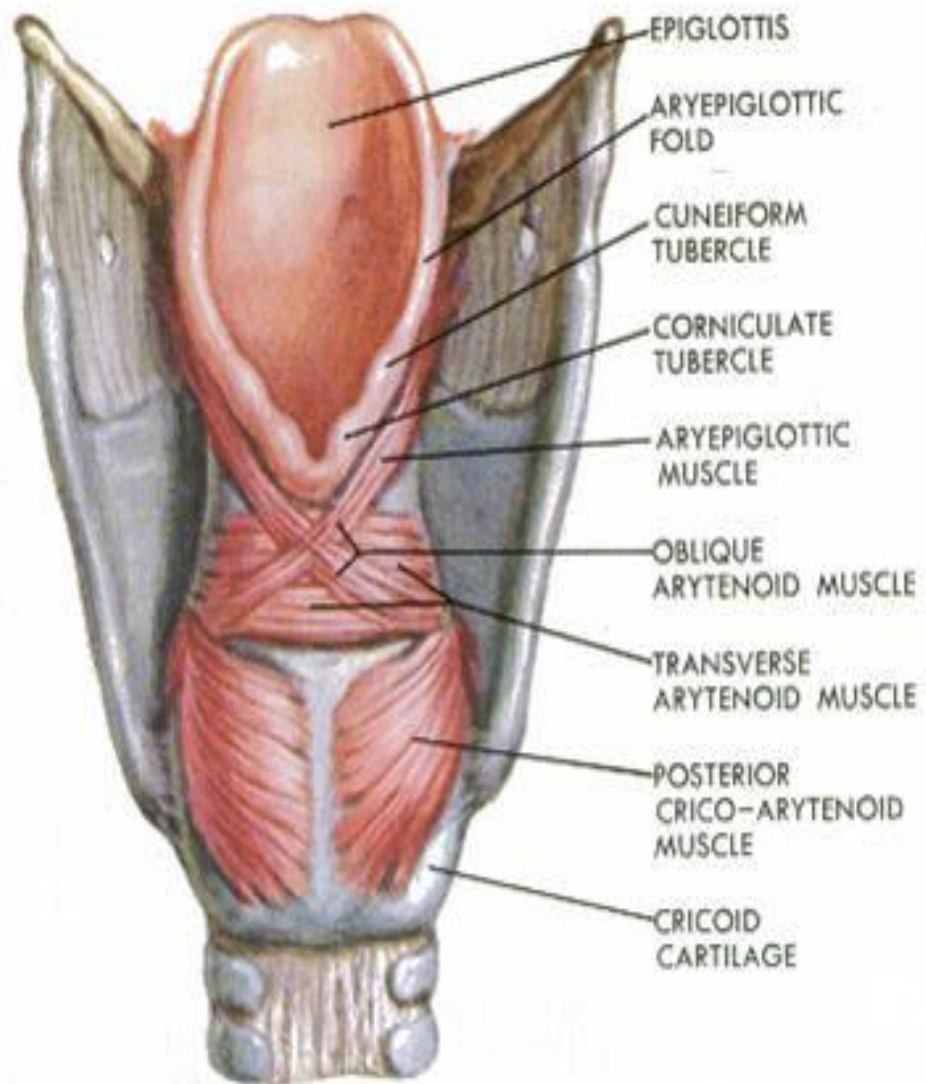
- The **base** of the pyramid carries three processes
- The **anterior sharp process** is the **vocal process** & to which the upper **free end of the cones elasticus** is attached as the **vocal fold**. The **lateral process** is the **muscular process** to which the **lateral & posterior crico-arytenoids** are attached.



# Conus elasticus

- The vocal ligament is the free upper edge of the conus between these points of attachments.





# Arytenoid cartilage

The **medial surface** of the pyramid is flat & faces the opposite one

The anterolateral surface is curved & gives attachment for the thyro-arytenoid muscle.

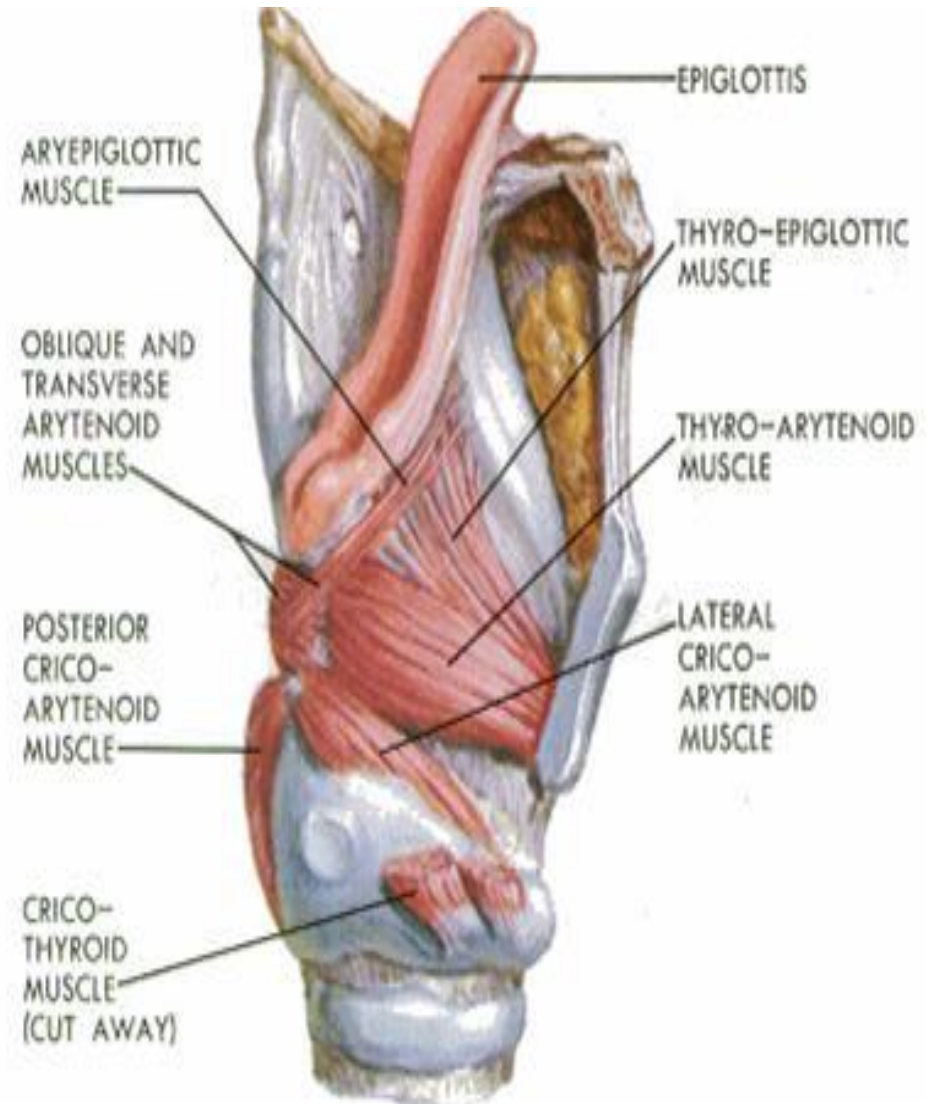
The **posterior surface** is smooth & gives attachment for the **transverse arytenoid muscle**

The arytenoid cartilage sits on the elongated facet on the sloping shoulder of the cricoid lamina forming the **crico-arytenoid synovial joint**

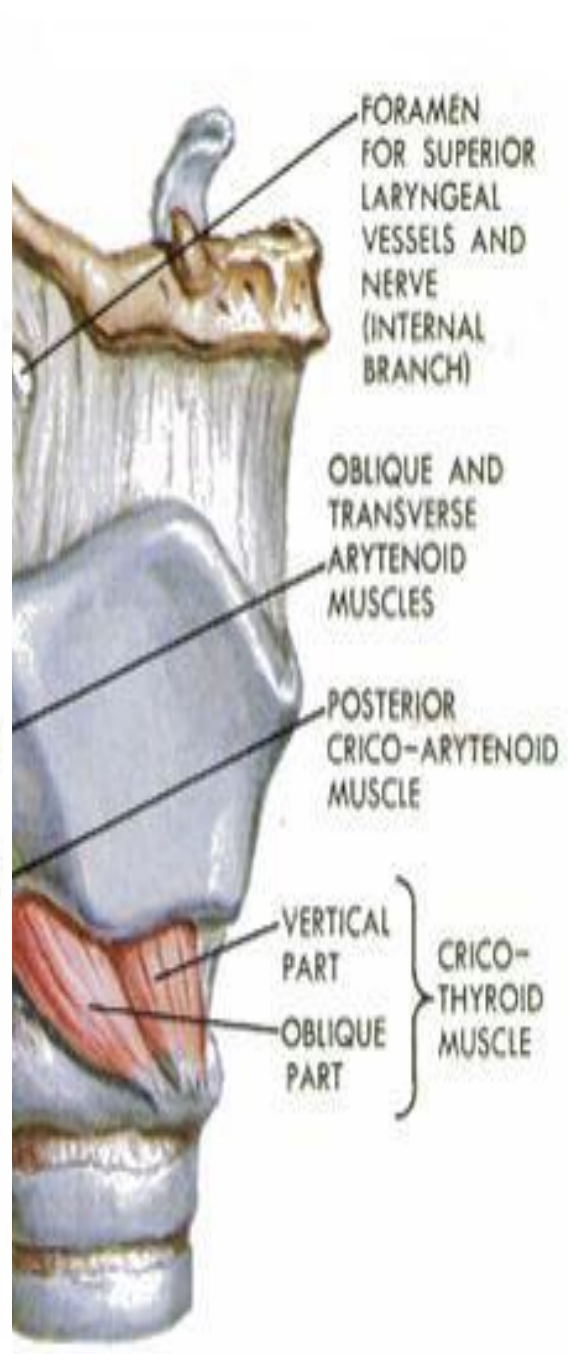
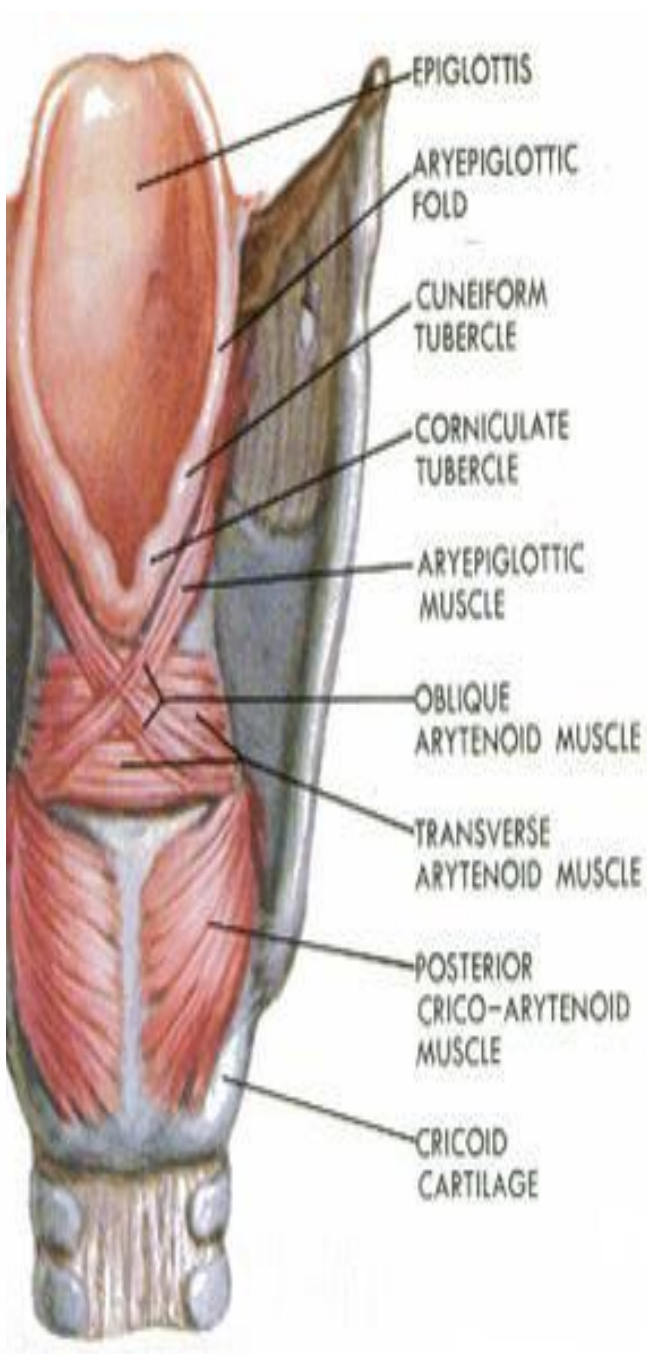
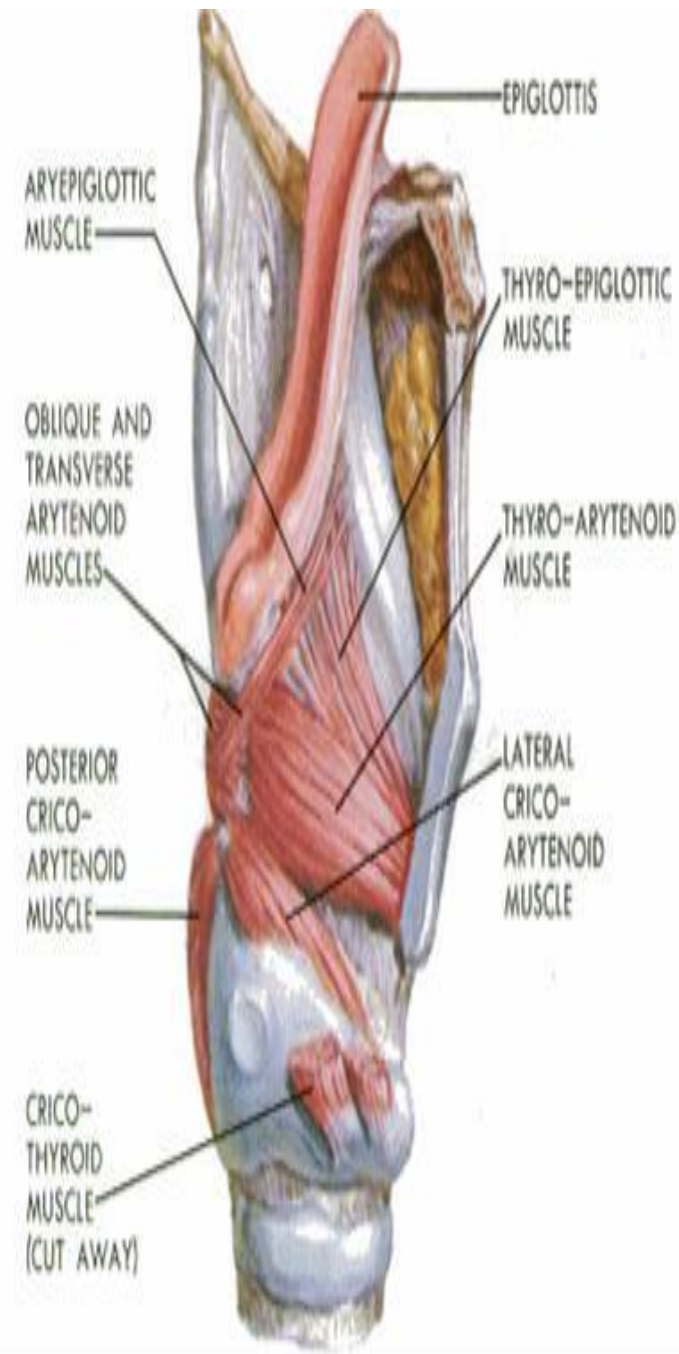
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# *The corniculate cartilage:*

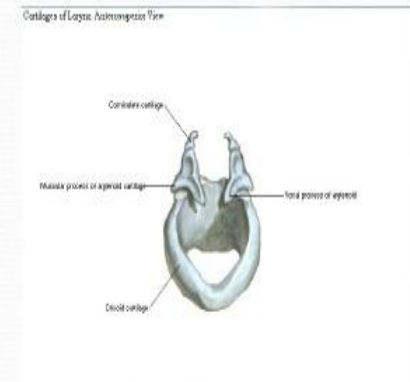
This small nodular • elastic cartilage **lies on the apex** of the **arytenoid** to prolong it backward & medial ward.

**They are enclosed by • the ary-epiglottic folds**

- **Are rod like elastic cartilages lies on the previous ones in the aryepiglottic folds.**

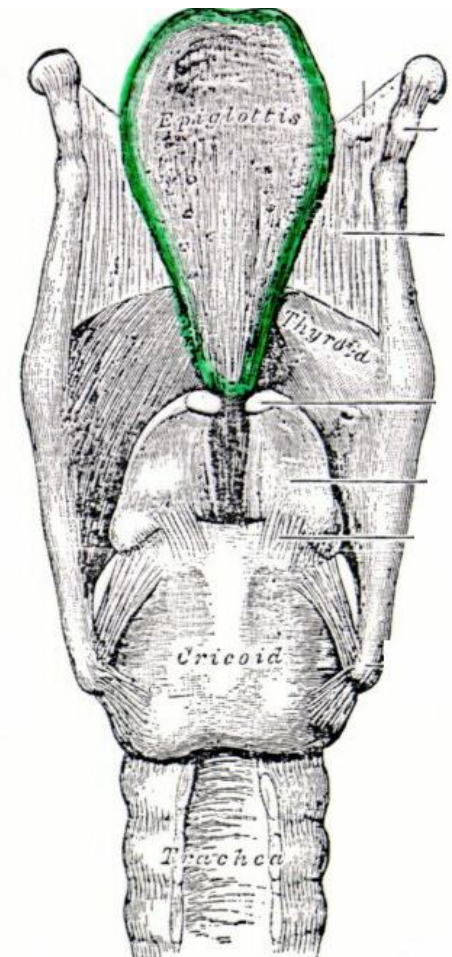
## Corniculate cartilages (The cartilages of Santorini)

- They articulate with the apices of the arytenoid cartilages and prolong them backwards and medially.
- They give attachments to the upper fibers of the oesophagus.



# Epiglottis

- Thin **leaf shaped** fibro-cartilage, situated in **midline**
- Upper free end **broad & rounded**, projects up behind base of tongue
- Narrow base called **pitiole**
- This **attachment** forms lower limit of **pre-epiglottis space**



# Epiglottic cartilage (Epiglottis):

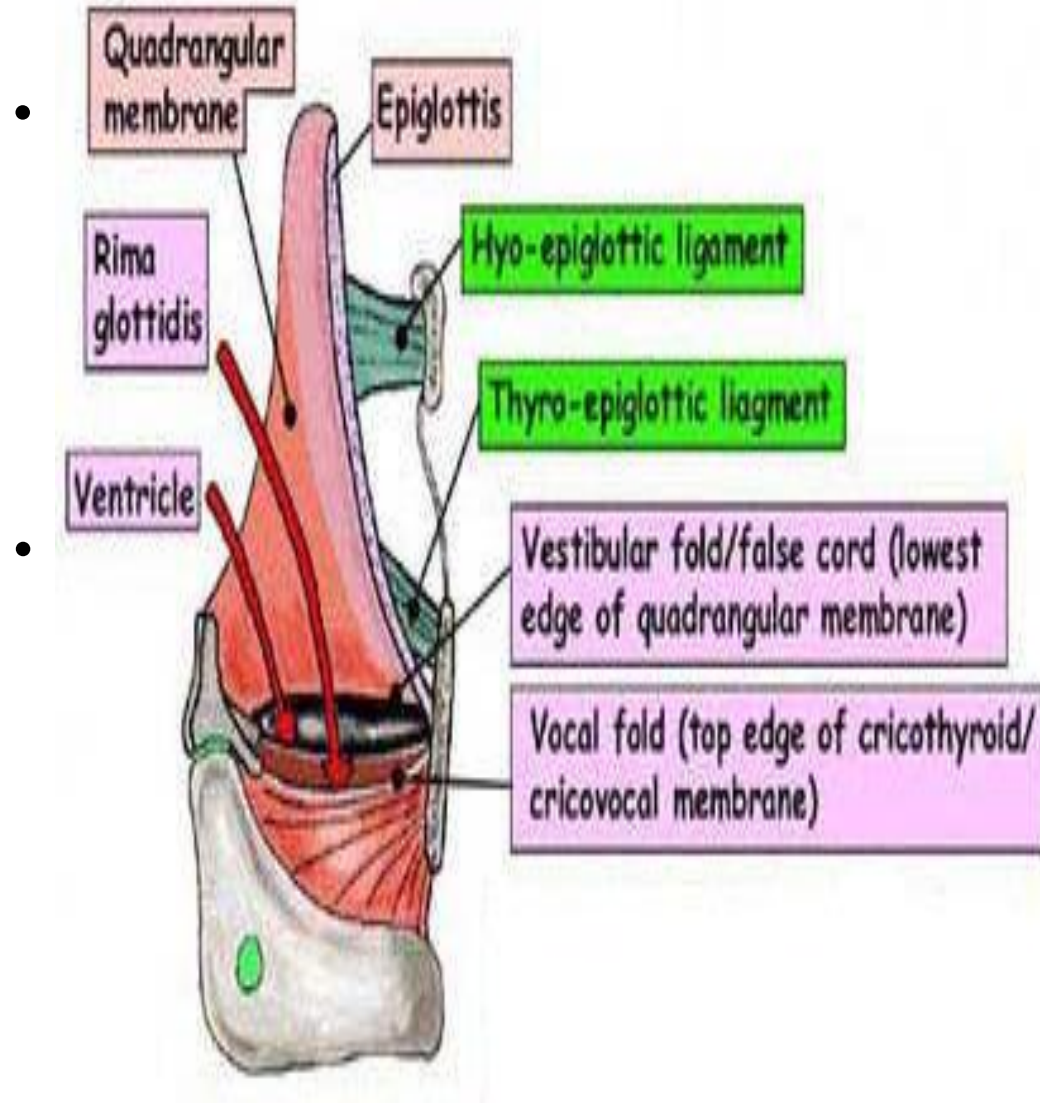
Leaf shape cartilage, attached inferiorly to the back of the laryngeal

prominence and its free upper end projects upward behind the tongue.

**Anterior & posterior surfaces** are covered by **mucous membrane**.

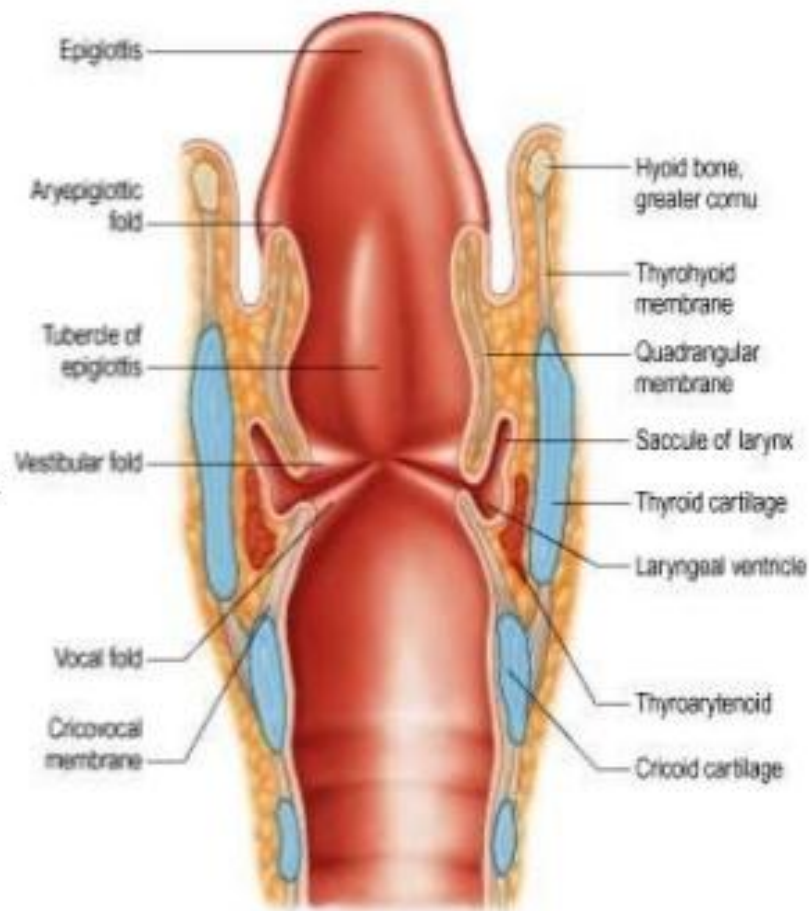
Its two **sides** give attachment to the **ary-epiglottic membrane & the**

**thyroepiglottic & aryepiglottic muscles.**



# Cavity of Larynx (cont.)

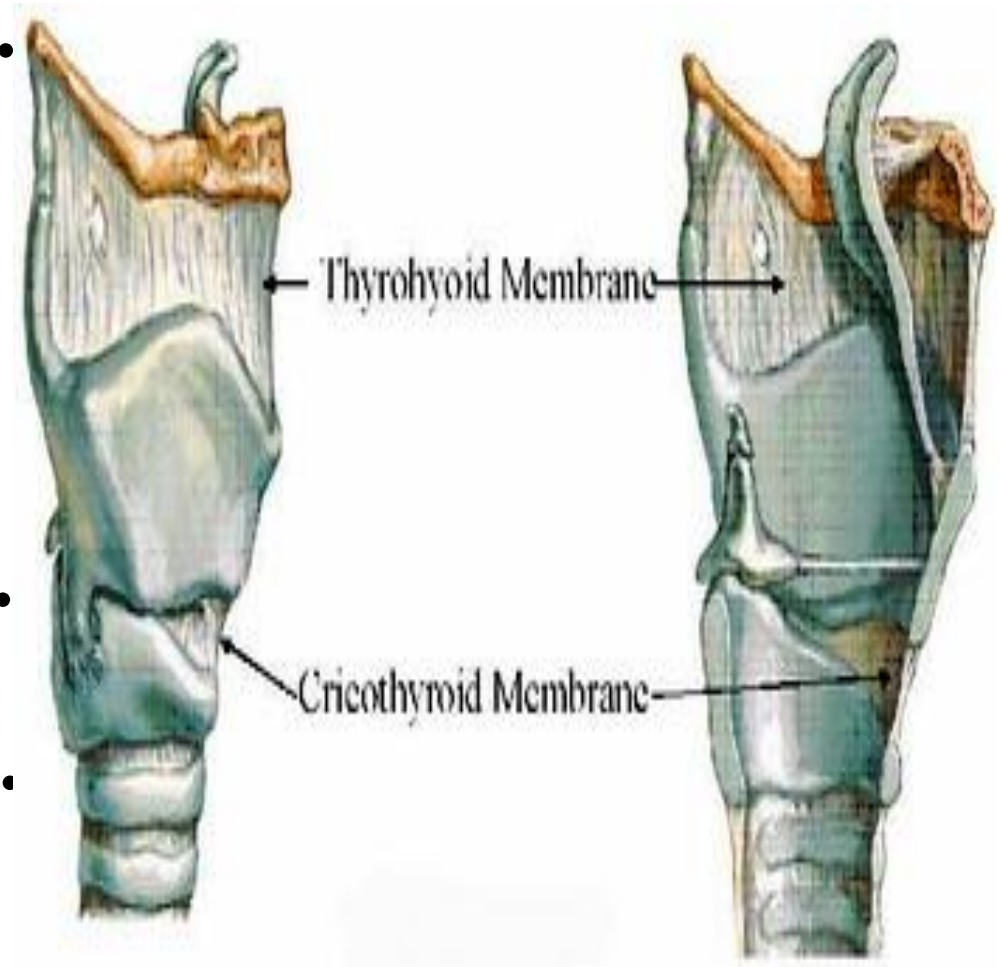
- **Vestibule** – Extends from laryngeal inlet to vestibular folds  
Antr. wall - Postr. surface of Epiglottis  
Latr. Wall – Aryepiglottic folds  
Postr. Wall – Arytenoids
- **Ventricles** – Space between vestibular & vocal folds
  - Extends above to form Saccule
  - Mucous glands in saccule lubricates vocal cords
- **Subglottis** – Extends from vocal cords to lower border of cricoid.



# Laryngeal membranes

## 1- Thyro – hyoid membrane:

- - **Suspends** the thyroid cartilage to the **hyoid bone**
- - It passes from the upper border of the thyroid cartilage to the upper border of the hyoid bone passing behind the bone separated from it by a bursa
- - It shows one median & two lateral ligaments of the same name
- - It is **pierced** by the **superior laryngeal artery & internal laryngeal nerve**.
- - It forms the **lateral** boundary of the **piriform rescess**



# Laryngeal membranes

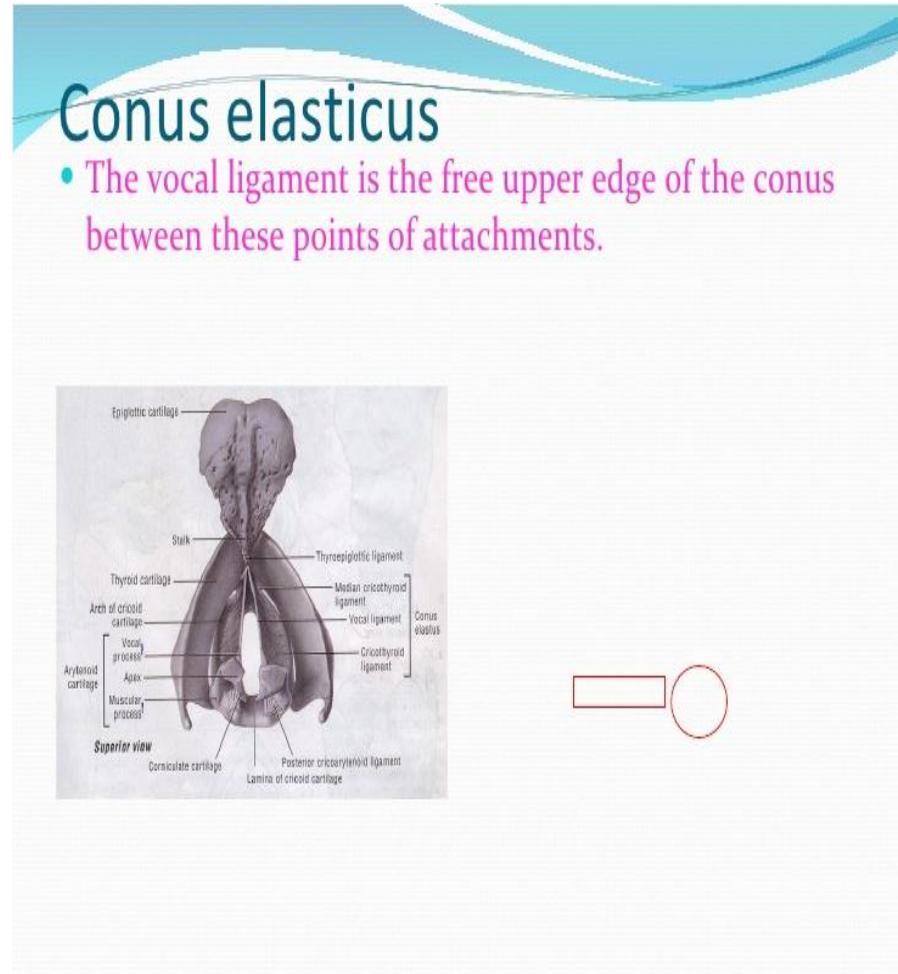
## 2- Conus elasticus :

Is a **half – circle** ligament whose lower **attachment** is to the whole length of the upper border of the **cricoid arch**.

Its free upper border is attached on either side to the **vocal process** of the arytenoids cartilage forming the vocal fold ( true vocal cord) which contains in its free border muscle fibers (**vocalis**).

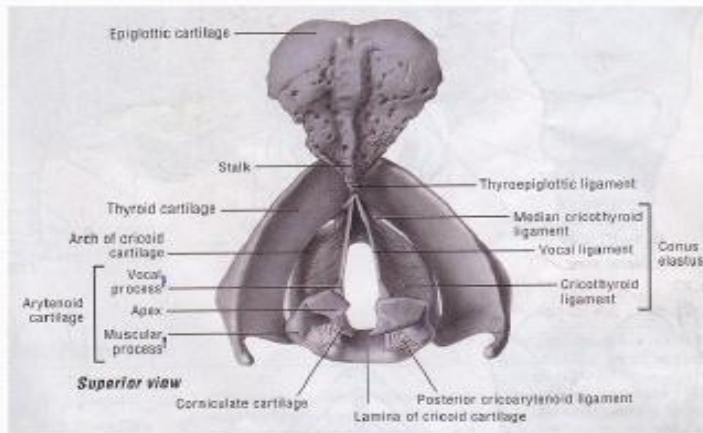
Anteriorly the membrane is attached to the back of the thyroid cartilage in the angle between the two lamina in the midline midway between the **superior & inferior notches** converting the curved membrane to **V-shape membrane** .

Its **thickening in the midline** anteriorly produces the **median crico-thyroid ligament**.



# Conus elasticus

- The vocal ligament is the free upper edge of the conus between these points of attachments.





# Laryngeal membranes

## 3- Quadrate membrane :

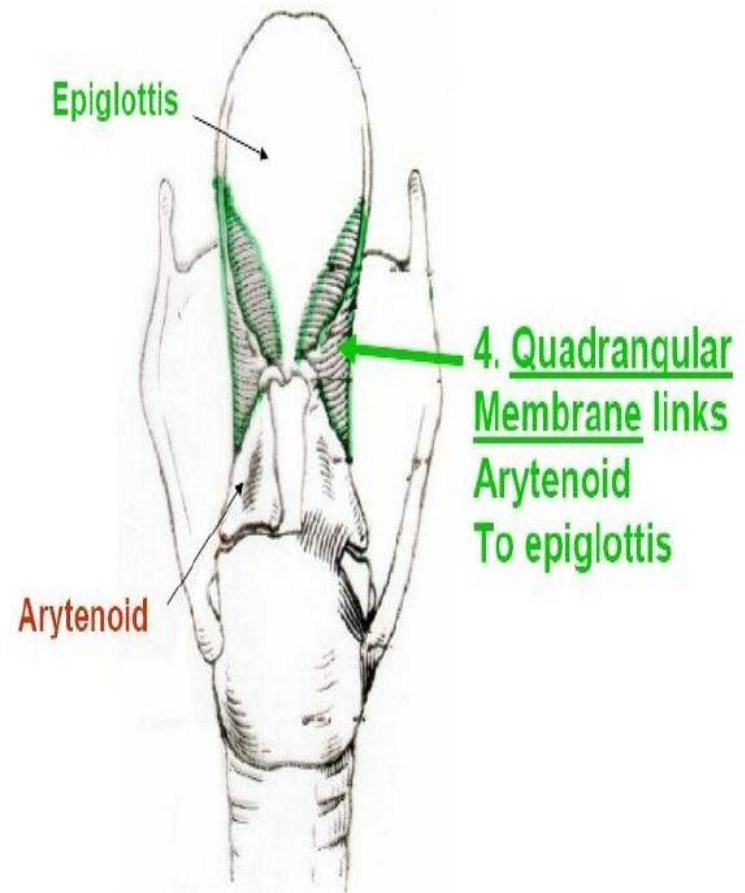
- Is a weak membrane whose **posterior border** is attached to the anterior surface of the **arytenoid cartilage** & its **anterior border** is attached to the sides of **the lower half of the epiglottis**.

- Its **upper free border** will extend between the epiglottis & the arytenoid cartilage forming **the ary-epiglottis fold** which involves in its substance the **corniculate & cuneiform cartilage**.

- Its **lower free border** will be parallel to the upper free border of the conus (true vocal cords) forming the vestibular fold (false cords)

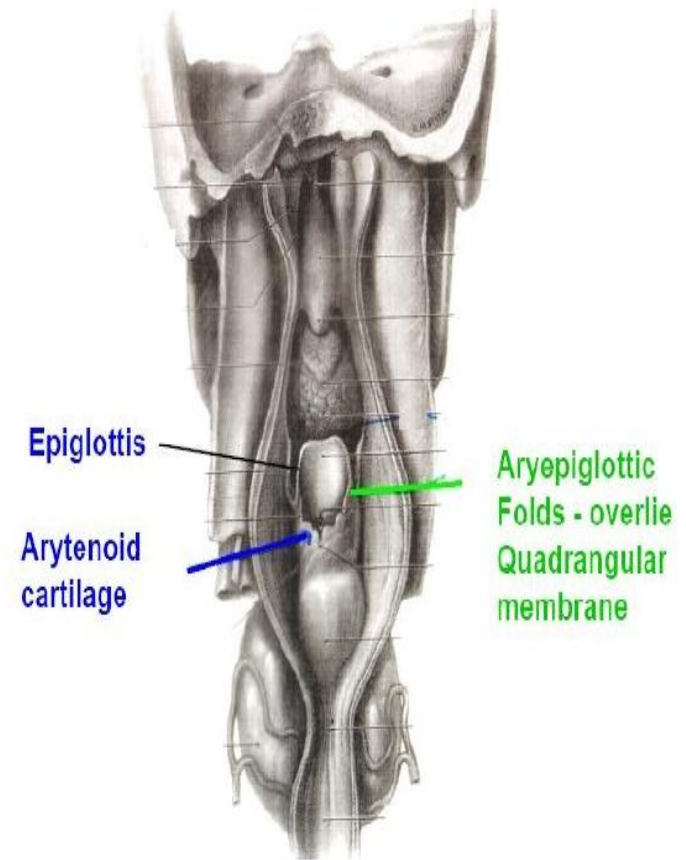
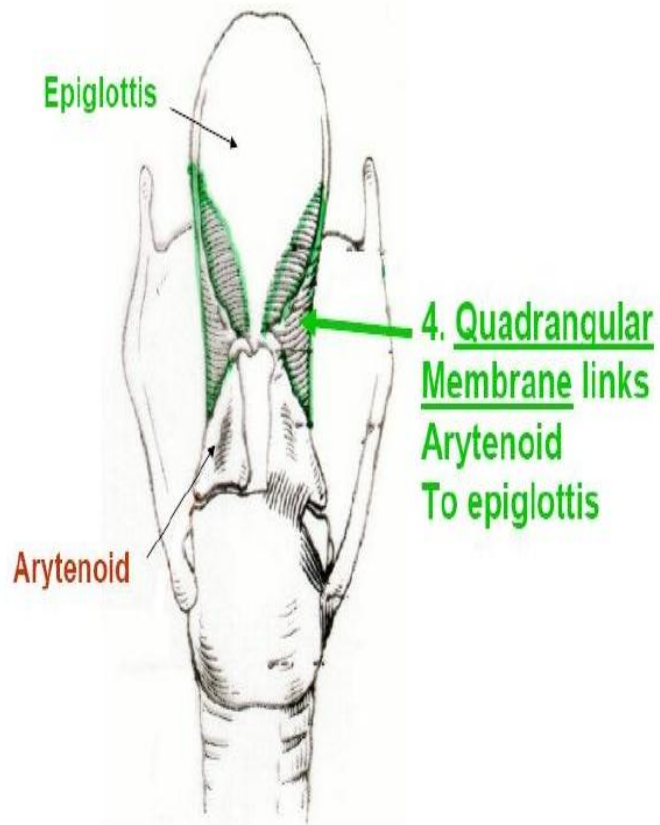
- - it forms the **medial** boundary of the piriform recess

## STRUCTURAL LIGAMENTS



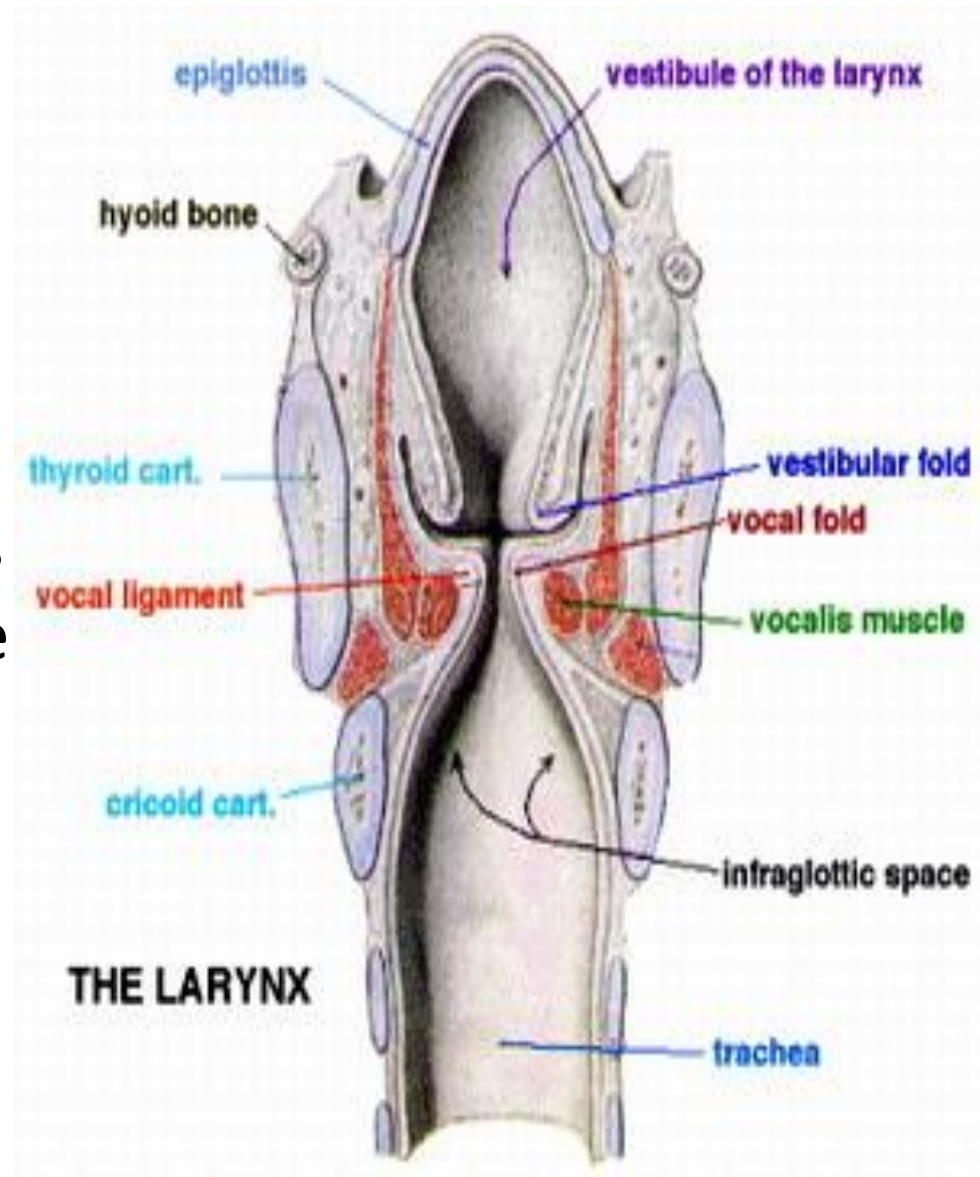
# 3- Quadrate membrane :

## STRUCTURAL LIGAMENTS



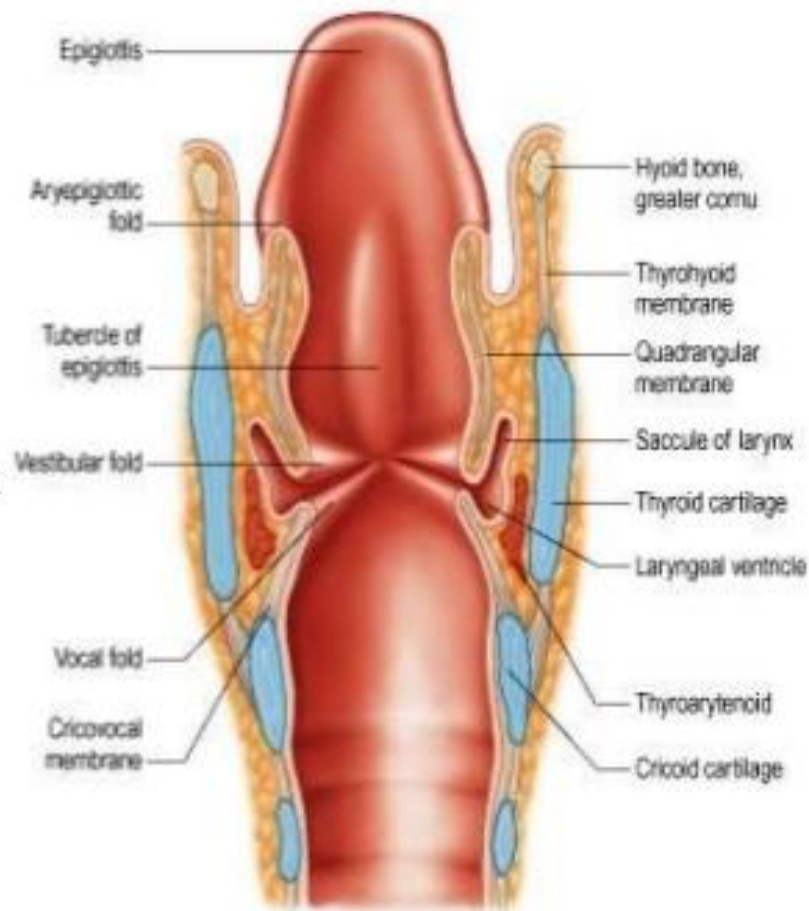
# Interior of the larynx

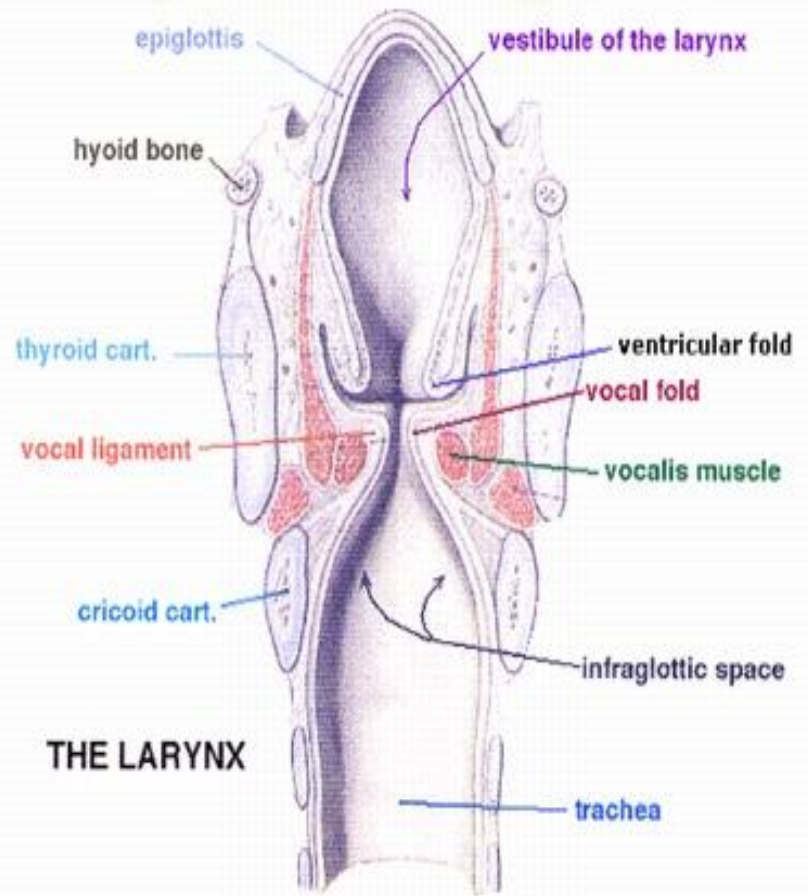
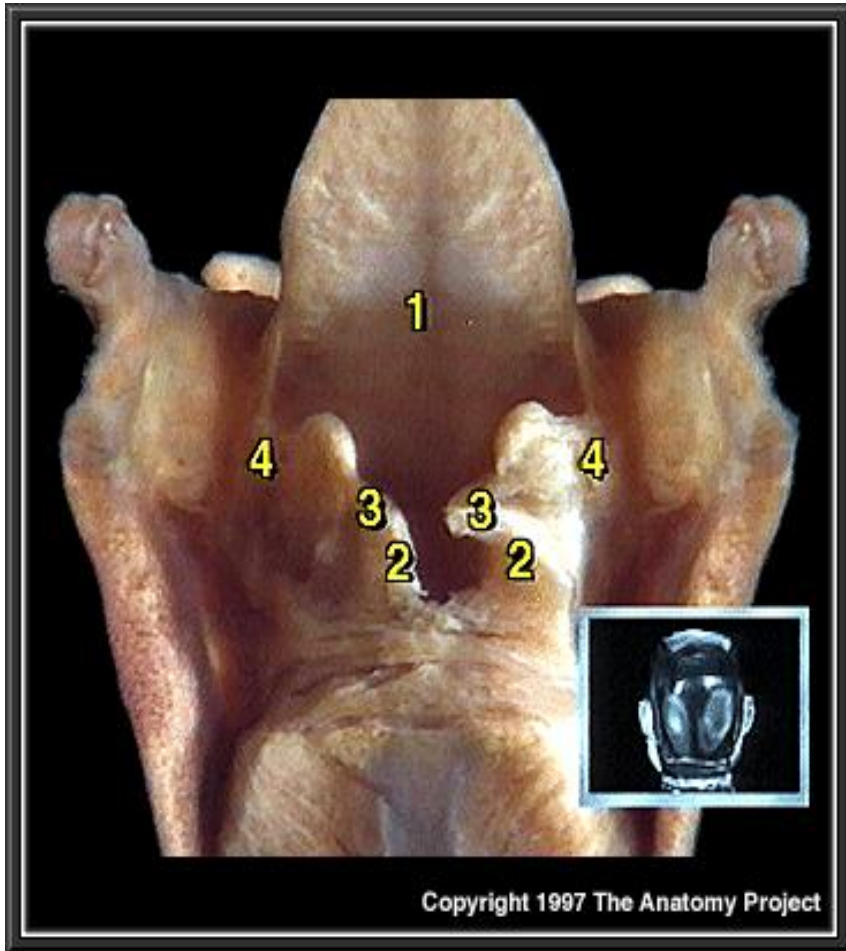
- Superior opening of the larynx: bounded
- Anteriorly: by the epiglottic & aryepiglottic folds.
- Posteriorly: by the apices of the arytenoid cartilage & transverse arytenoid muscle.



# Cavity of Larynx (cont.)

- **Vestibule** – Extends from laryngeal inlet to vestibular folds  
Antr. wall - Postr. surface of Epiglottis  
Latr. Wall – Aryepiglottic folds  
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- **Ventricles** – Space between vestibular & vocal folds
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- **Subglottis** – Extends from vocal cords to lower border of cricoid.



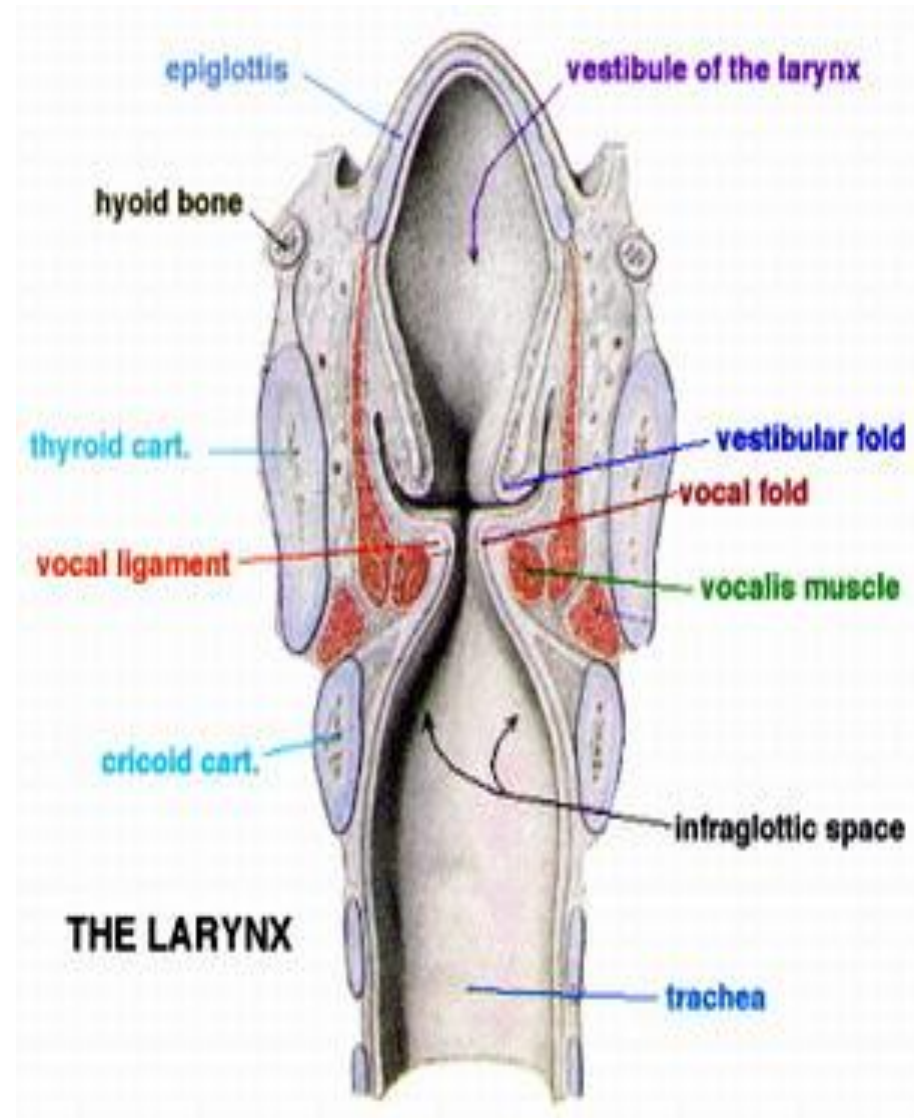


# Interior of the larynx

- Within the larynx there are 2 pairs of parallel horizontal folds in the lateral wall.
- Upper pair: vestibular fold (false vocal cords).
- Lower pair: vocal fold (true vocal cords).

The gap between vocal folds is called “Rima glottidis”.

The recess of mucous membrane between vestibular & vocal folds is called “sinus of the larynx”.



# *The vocal folds :*

Are formed by the free upper border of the conus stretched between the thyroid cartilage anteriorly and the arytenoids posteriorly. —

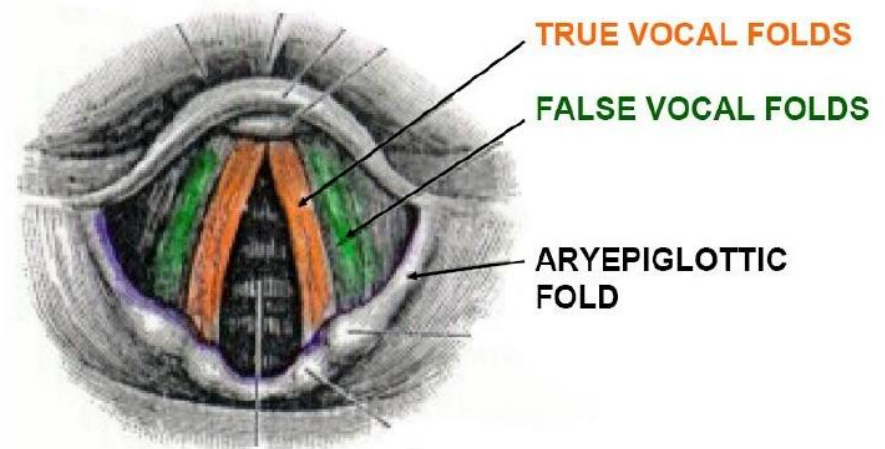
The anterior 3/5 are true components of the conus while the posterior 2/5 are formed by the vocal process of the arytenoids —

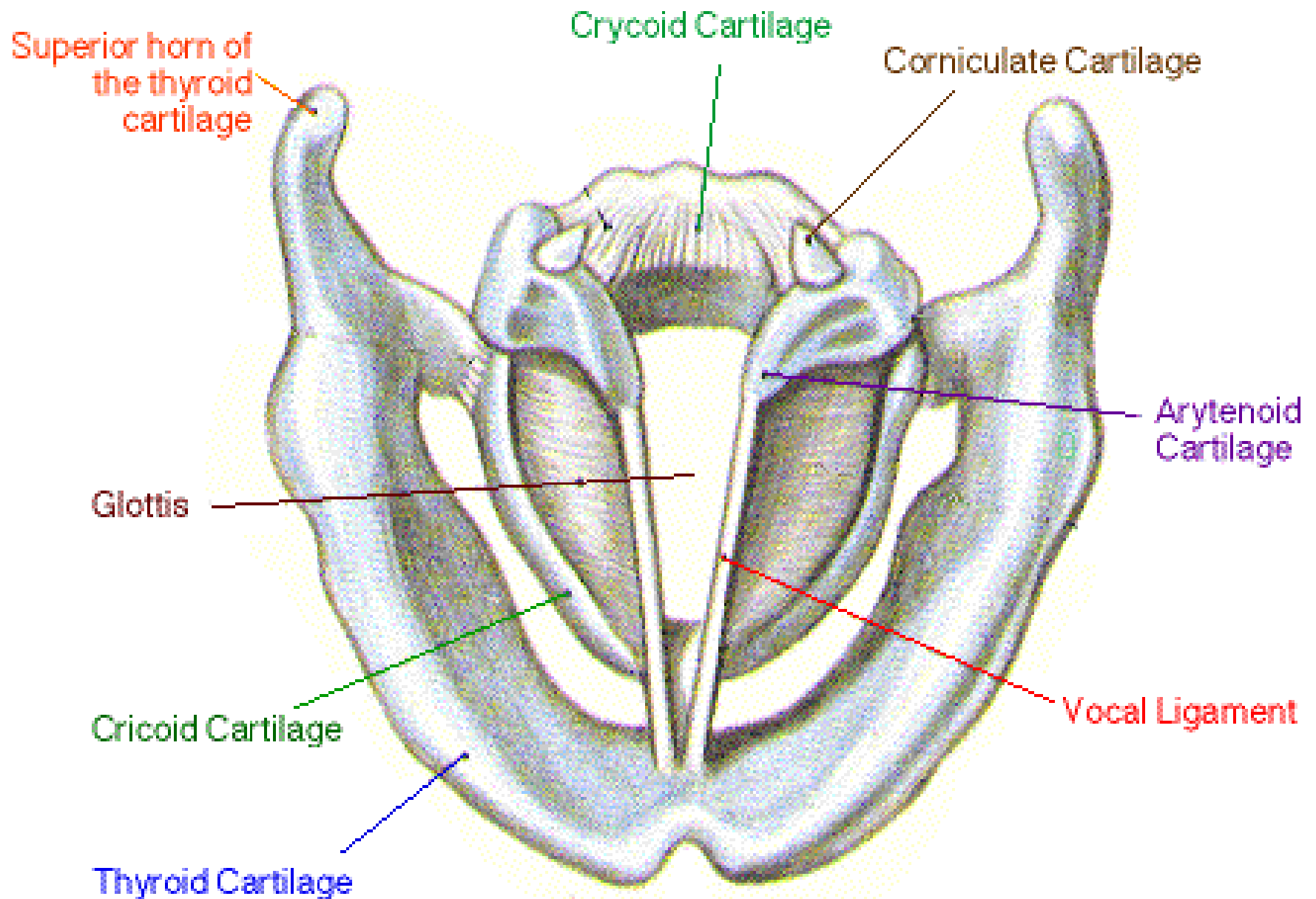
They contain in their free edge the vocalis muscle which increases the apposed surface area of the cords during phonation. —

The opening between them is called the rima glottides —

Glottis, is a term applied to the two vocal cords & the rima glottides as they are the main structure involved in phonation. —

**LARYNGOSCOPE VIEW OF LARYNX**

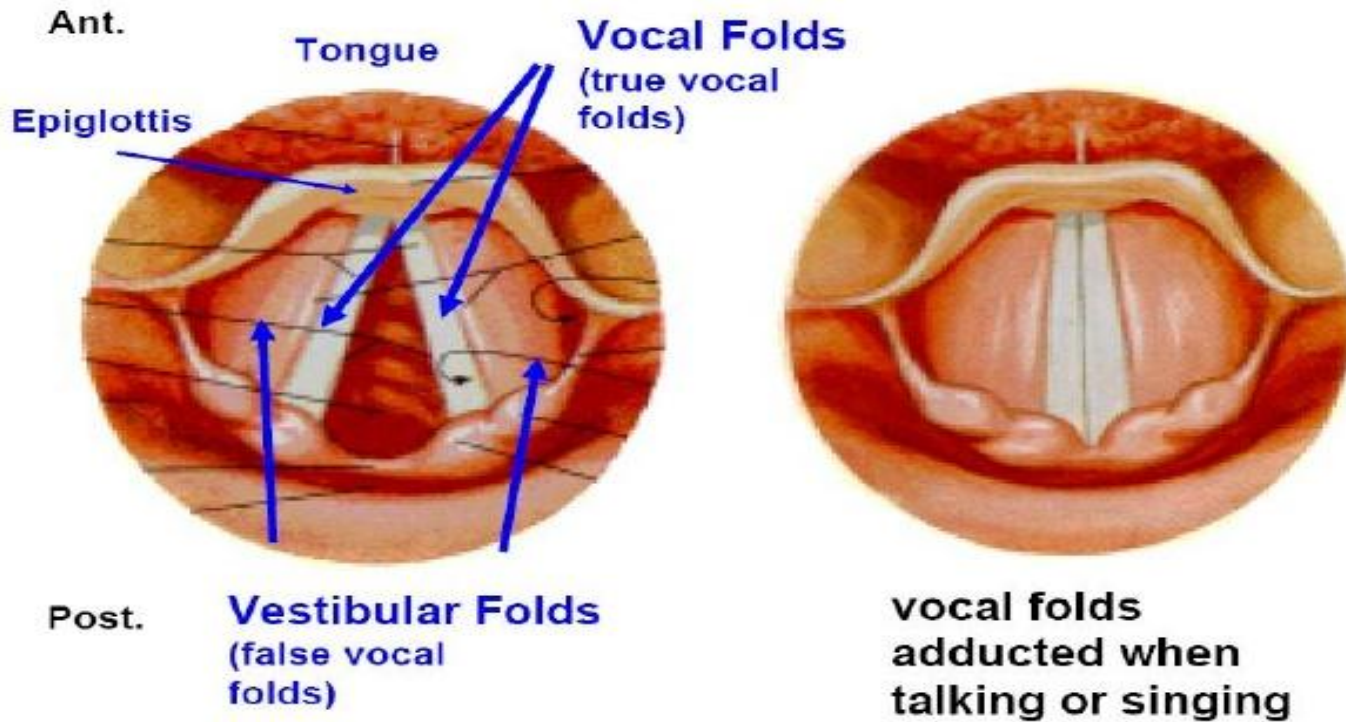




**The Larynx: viewed from above**



## LARYNGOSCOPE VIEW OF LARYNX

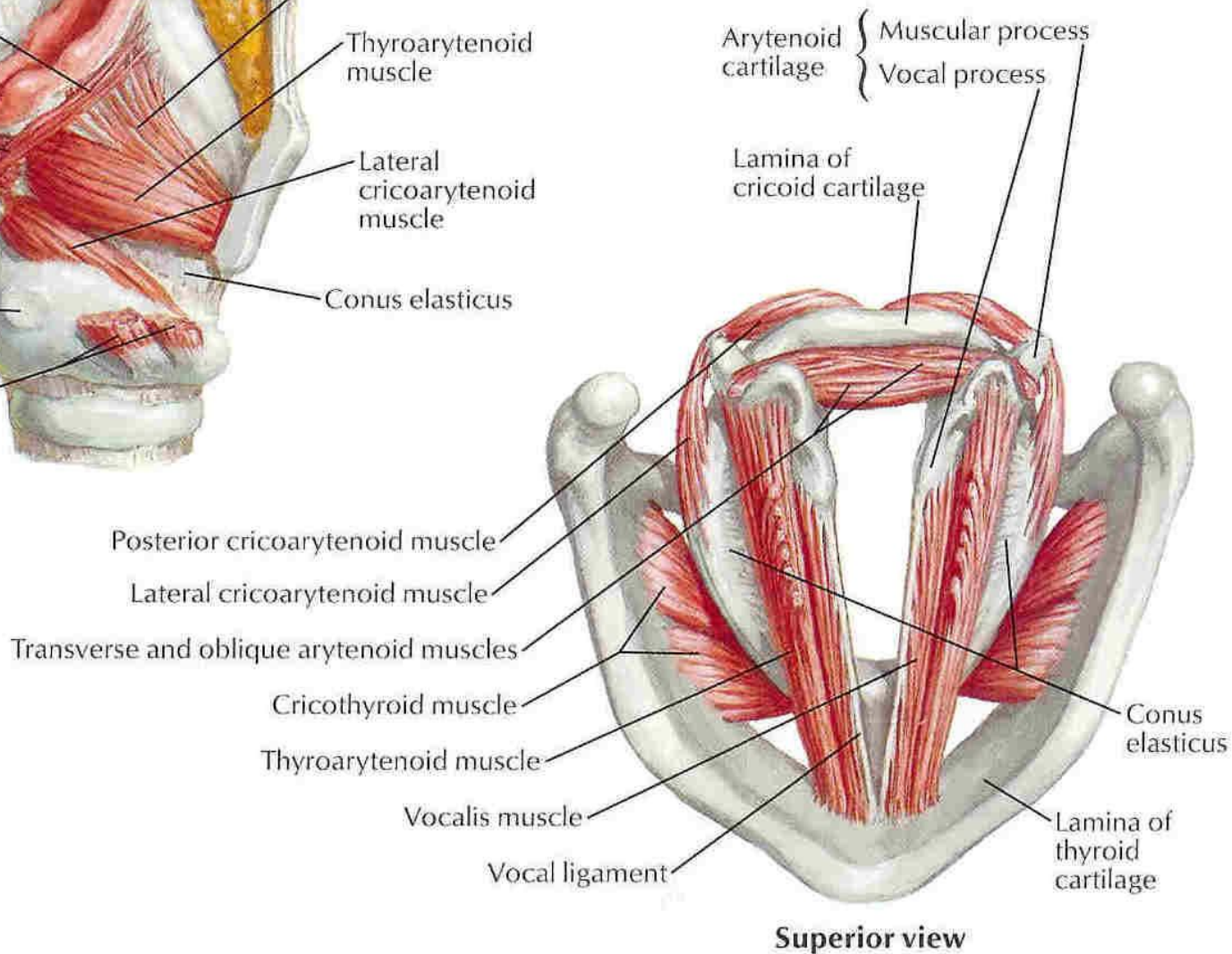
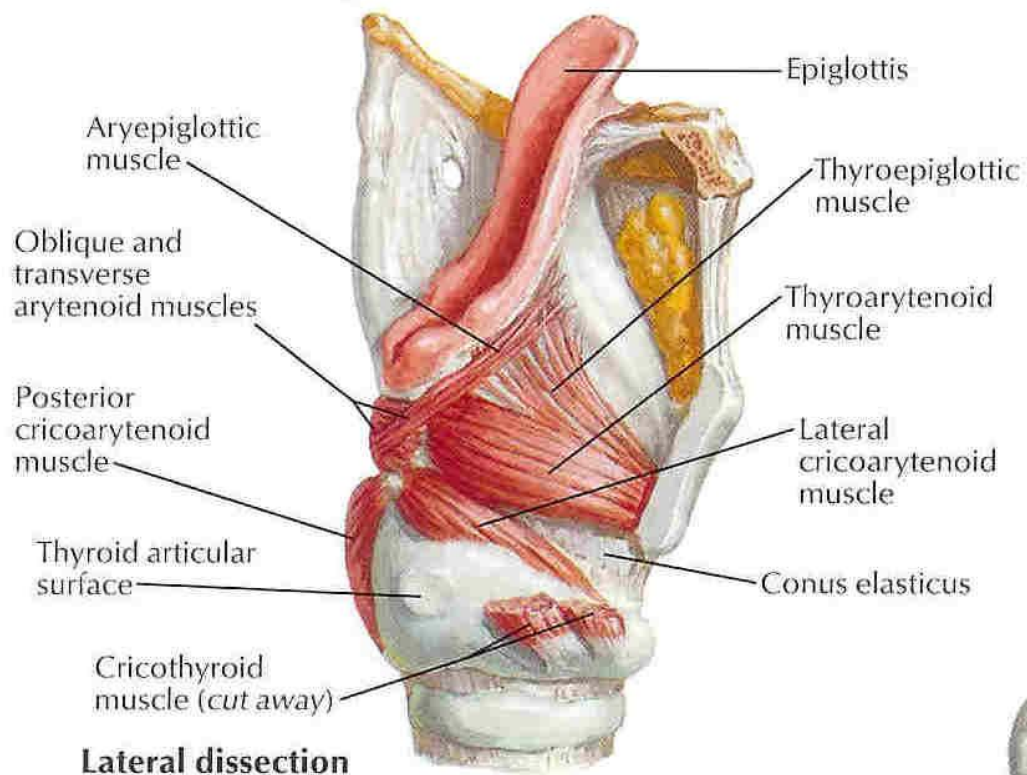


# The Laryngeal Musculature

- The larynx is associated with two different groups of muscles,
  - the **intrinsic** laryngeal muscles.
  - the **extrinsic** laryngeal muscles.
  - **The intrinsic laryngeal muscles have two major functions:**
    - One group **regulates** tension in the vocal folds,
    - **while a second set opens and closes the glottis.**
    - Those involved with the vocal folds insert upon the thyroid, arytenoid, and corniculate cartilages.
    - *Opening or closing the glottis involves rotational movements of the arytenoids that move the vocal folds apart or together.*

# Intrinsic muscles

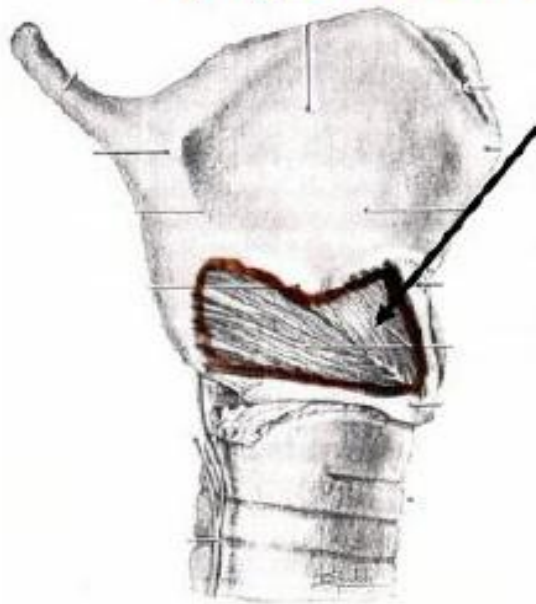
- 1-The ary- epiglottic muscle. •
- 2-The posterior crico-arytenoid muscle.
- 3-*The transverse arytenoid.*
- 4-The lateral crico-arytenoid .
- 5-The crico-thyroid .
- 6-The thyro – arytenoid.



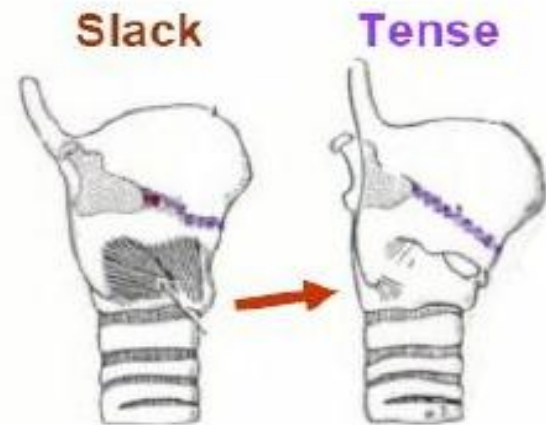
# MUSCLES OF LARYNX - well named

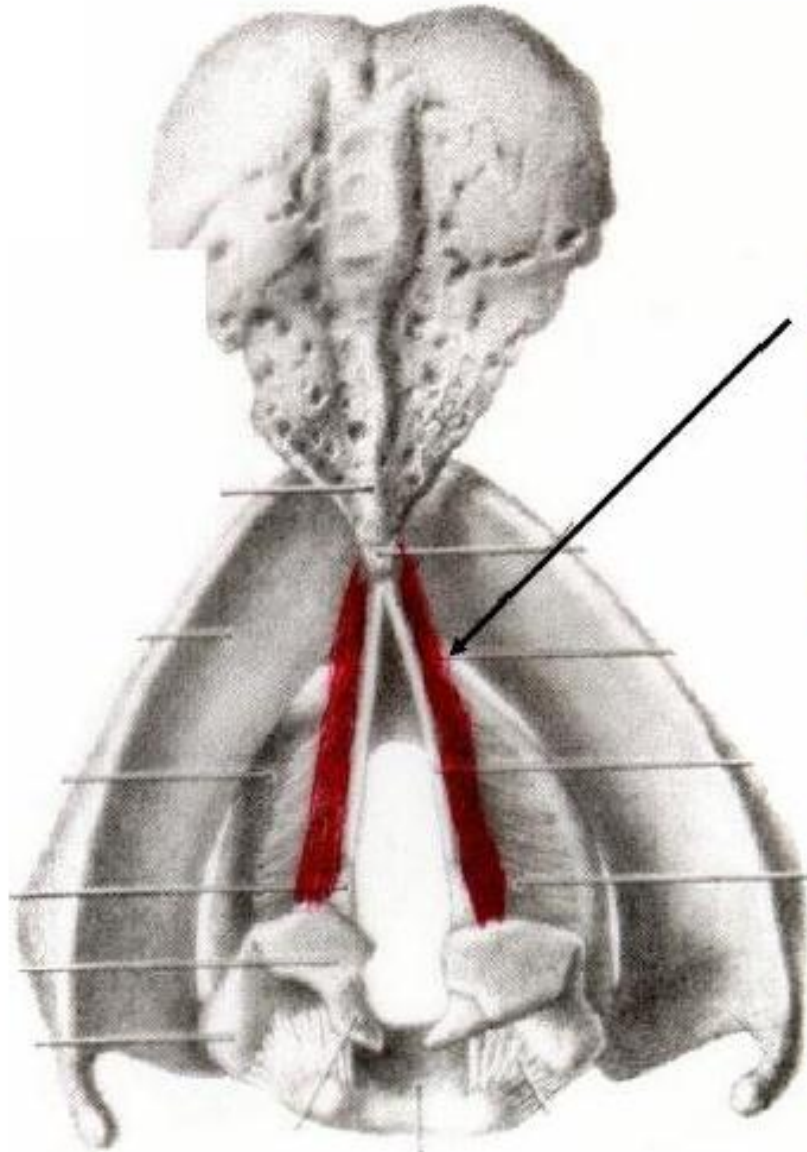
A. Extrinsic muscles (ex. hyoid muscles) - Move whole larynx as in swallowing

B. Intrinsic Muscles 1) change tension in vocal lig  
--- changes pitch: increase tension raises pitch,  
decreased tension lowers pitch  
2) open & close Rima Glottidis

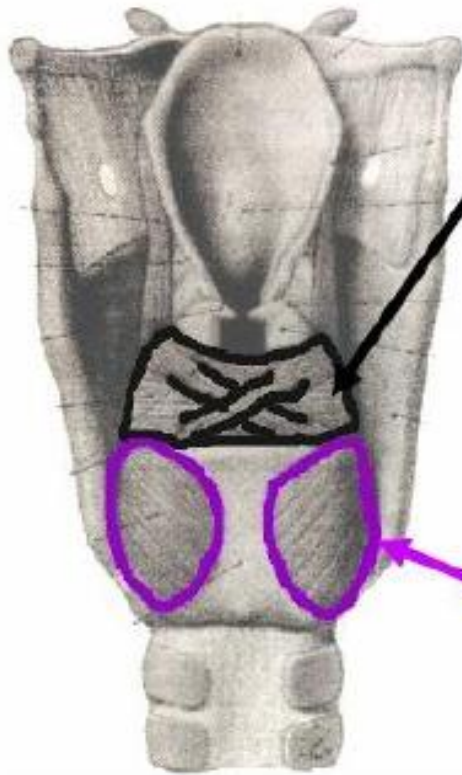


1) CRICOTHYROID M. -  
Tenses  
Vocal Ligament  
Increasing Pitch





**2) THYROARYTENOID**  
**MUSCLE -**  
**Relaxes**  
**Vocal Ligaments**  
**Decreases pitch**



5) ARYTENOID  
(Transverse and oblique arytenoid) -  
Adduct vocal folds

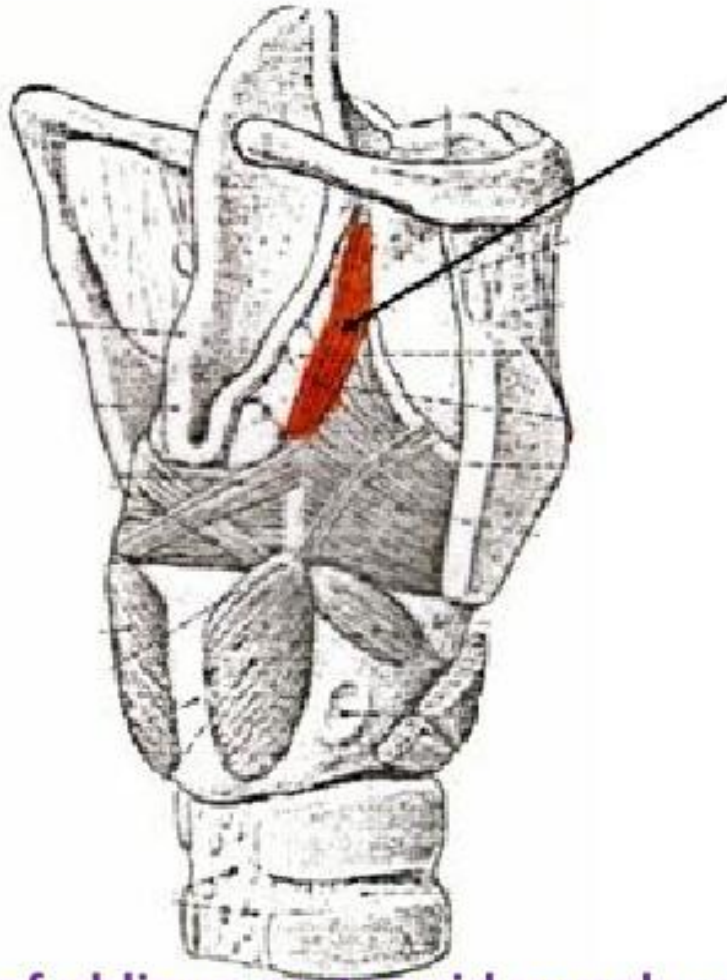
4) LATERAL CRICO-ARYTENOID - Adduct  
vocal folds

3) POSTERIOR CRICO-ARYTENOID - Abducts  
vocal fold

Arytenoids  
Can rotate/slide



Adduct closes rima glottidis  
Abduct opens rima glottidis



## ARYEPIGLOTTIC MUSCLE

Pulls epiglottis down  
during  
swallowing

- Covers inlet to larynx
- Not necessary in  
adult humans

Part of oblique arytenoid muscle: an inconstant fascicle of the oblique arytenoid muscle, originating from the apex of the arytenoid cartilage and inserting to the lateral margin of the epiglottis.



# Extrinsic Laryngeal muscles

- The extrinsic laryngeal musculature positions and stabilizes the larynx.
- **Three of the four strap muscles** of the neck, the **omohyoid**, **sternohyoid** and **thyrohyoid**, find attachment to it, **only the sternothyroid failing to gain it.**

# Blood supply:

- Superior & inferior thyroid artery & veins.
- Arteries of the larynx :**
  - 1-Superior laryngeal artery
    - - A branch of the superior thyroid a.
    - - Pierces the thyrohyoid membrane together with the internal laryngeal nerve to lie underneath the floor of piriform recess.
    - - supplies the larynx to supply mucosa down to the level of the vocal cords.
  - 2- inferior laryngeal artery :
    - - A branch of the inferior thyroid artery
    - Enters the lower part of the larynx deep to the inferior pharyngeal constrictor.
    - Supplies it up to the vocal cords(vocal cord are supplied by the inferior one).

# Nerve supply

## Mucous membranes: •

- - **Above vocal fold:** internal laryngeal nerve branch of the superior laryngeal nerve(X)(accompanies the superior laryngeal artery), enters by piercing the thyrohyoid membrane. •

- - **Below vocal fold:** recurrent laryngeal nerve(inferior laryngeal artery) , enters by ascending posterior to the cricothyroid joint and deep to inferior constrictor muscle. •

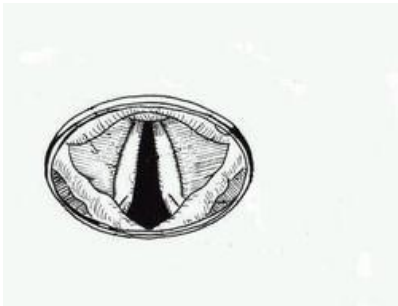
- Muscles: all supplied by the recurrent laryngeal nerve except the cricothyroid, which is supplied by the external laryngeal nerve branch of the superior laryngeal nerve(X).

## Lymphatics: •

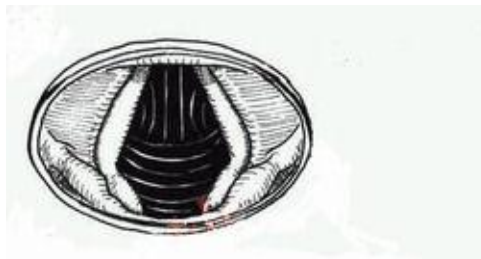
- Efferent pass to the deep cervical & pretracheal lymph nodes.

# Movements of the larynx

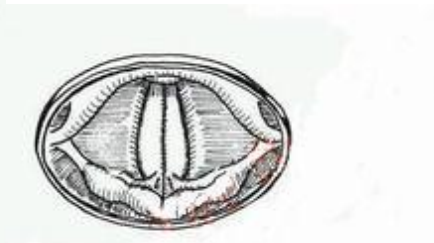
- A) Vocalization: movements of thyroid & arytenoid cartilages will
- alter the length, tension & position of the vocal folds.
- B) Swallowing: the whole larynx is raised & then lowered, the epiglottis is
- approximated to the arytenoid cartilage.
- The food is prevented from
- entering the trachea



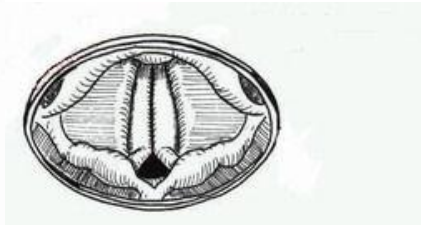
Resting position



Deep inspiration



During phonation



During whispering

# Function of the larynx

Sphincter action: •

1) prevents food from entering the trachea. •

2) Increase intrathoracic pressure: coughing. •

3) Increase intra-abdominal pressure: •  
micturition

B) Sound production: by air passing through •  
the larynx in expiration.

•