

# LARYNX



## OUTLINE

- I. CARTILAGES
- II. LIGAMENTS
- III. MUSCLES
- IV. TERMS/AREAS
- V. INNERVATION
- VI. BLOOD SUPPLY
- VII. LYMPHATICS
- VIII. OBSTRUCTION OF LARYNX

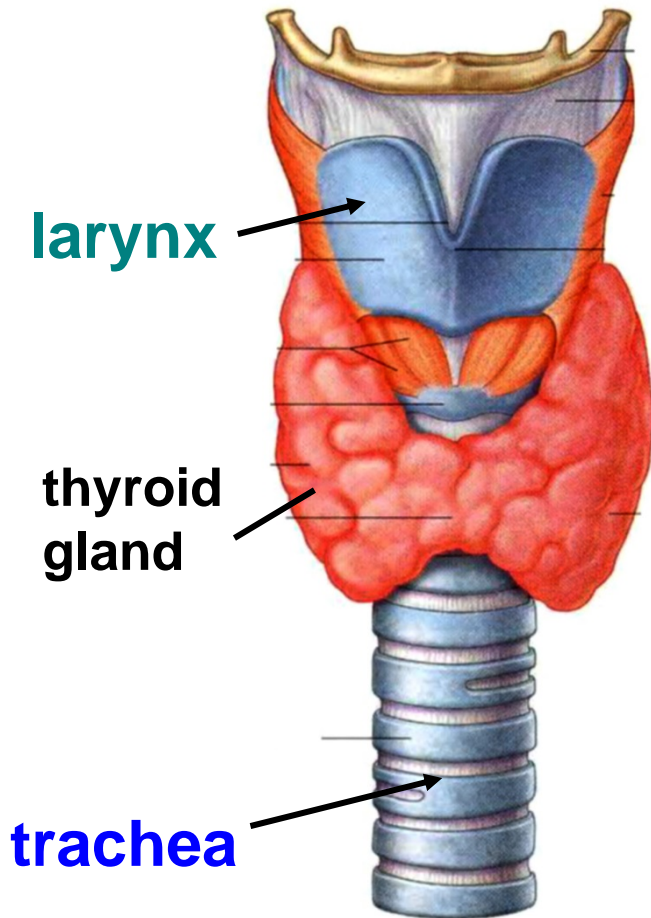
**LARYNX IS SOUND GENERATOR; HOWEVER, SOUNDS ARE EXTENSIVELY MODIFIED IN SPEECH AND SINGING BY RESONANCE OF PHARYNX, NASAL CAVITY, ORAL CAVITY**

# LARYNX

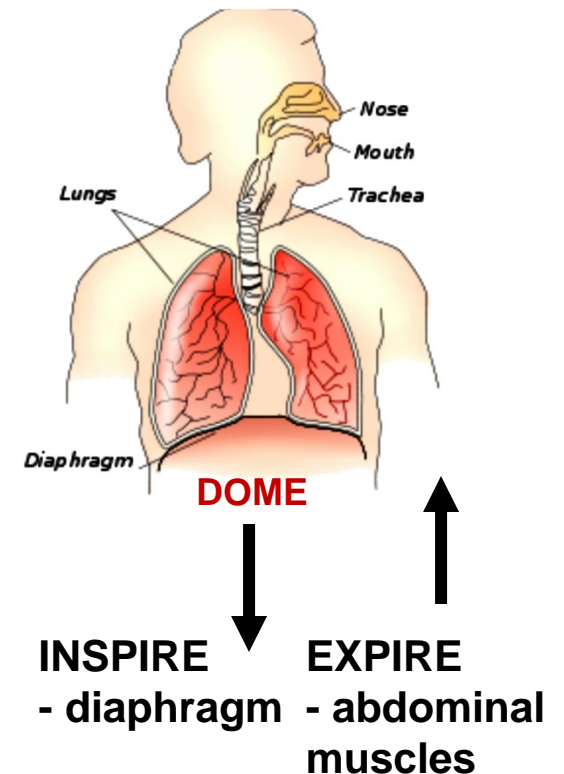
Cartilages connected by membranes and ligaments, moved by muscles

2 Functions: 1) Sound production

2) Closes of Respiratory System - allows increase in Abdominal Pressure



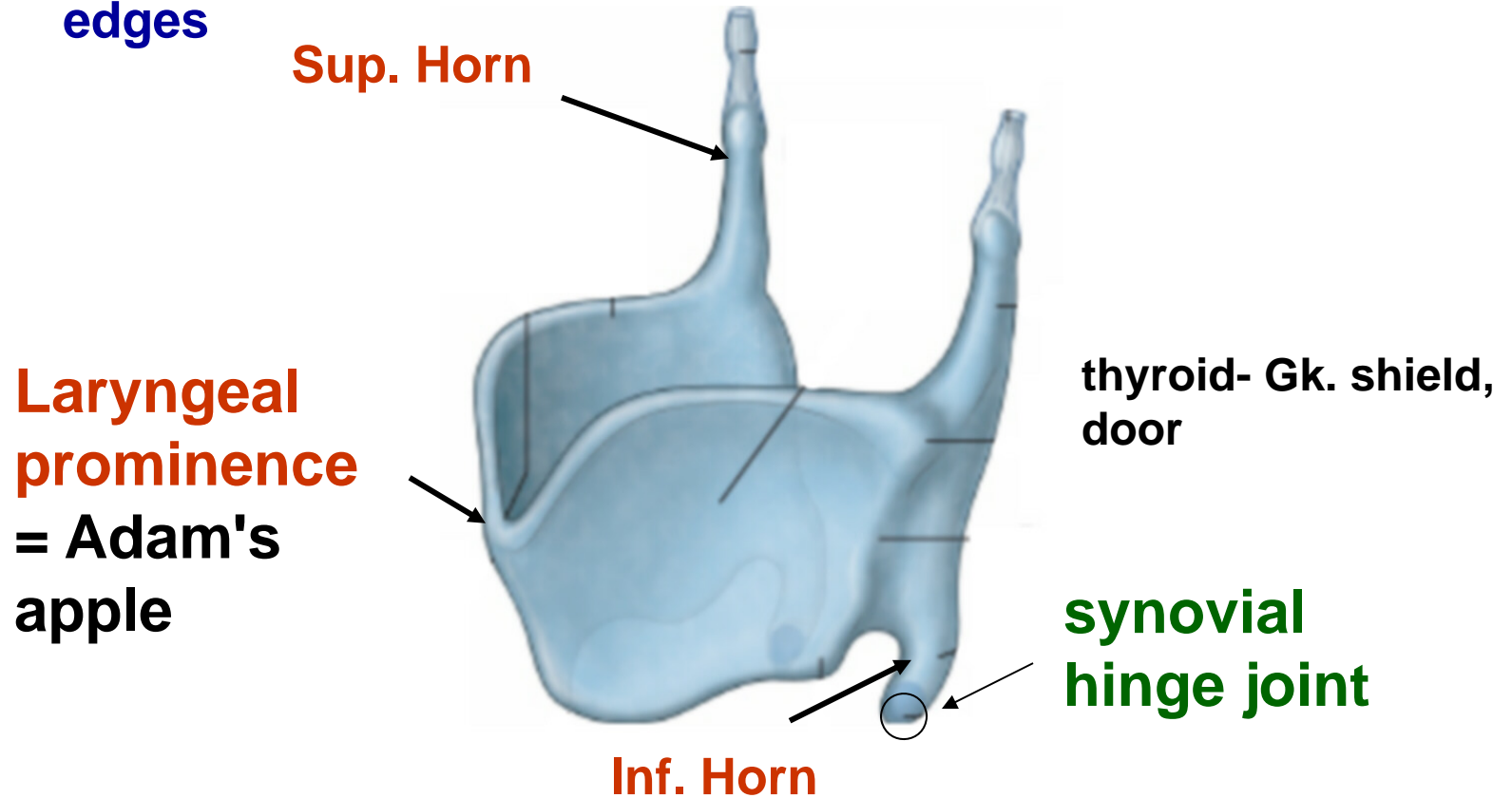
Note: In Respiration -  
Inspire - Diaphragm;  
Expire - Some muscles but largely passive;  
Forced Expire -  
Abdominal Muscles



When larynx closes off trachea, forced expiration produces increased abdominal pressure: push-childbirth; defecation etc.

# I. LARYNX: CARTILAGES

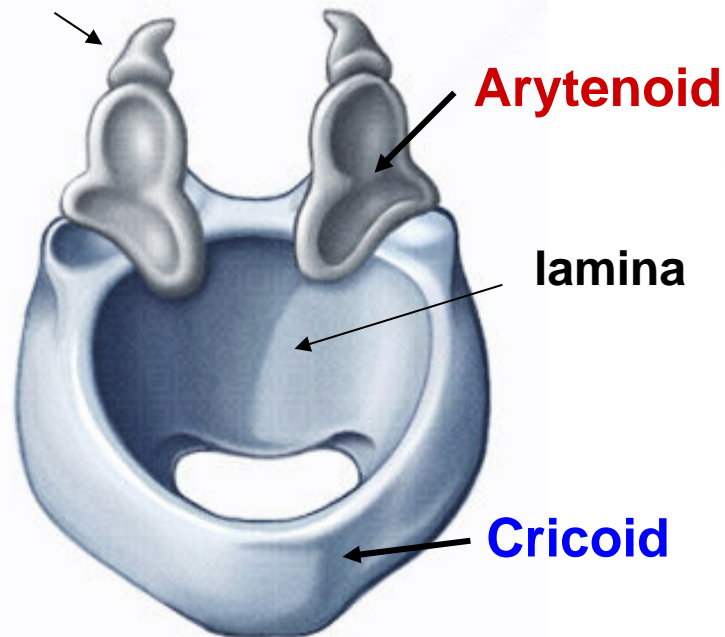
A. THYROID CARTILAGE – Shield shaped  
- has Sup. and Inf. Horns from upper and lower edges



- Inferior horns make synovial hinge joints with Cricoid Cartilage; - Laryngeal Prominence = Adam's Apple, more prominent in males

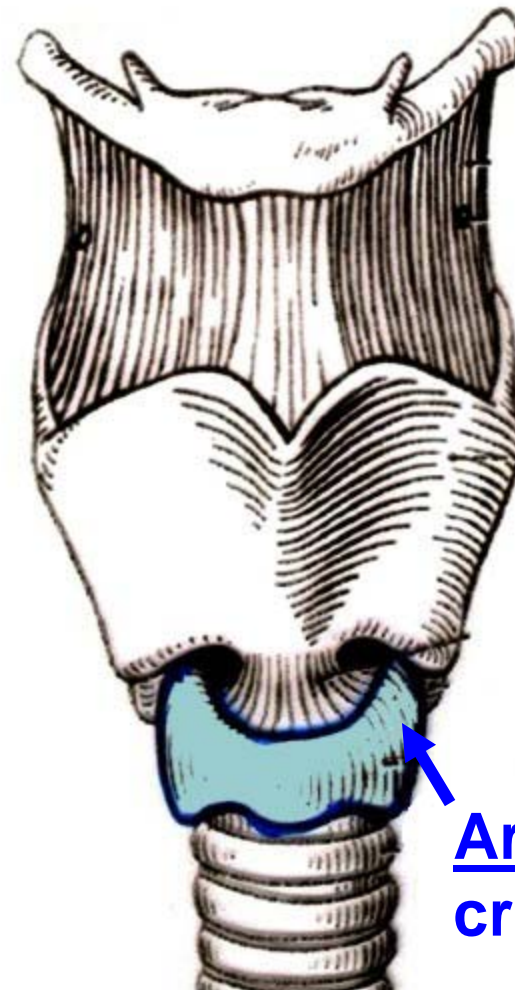
**B. CRICOID-**  
complete ring of  
cartilage has  
narrow Arch ant.,  
broad Lamina post.

Corniculate  
Cartilages



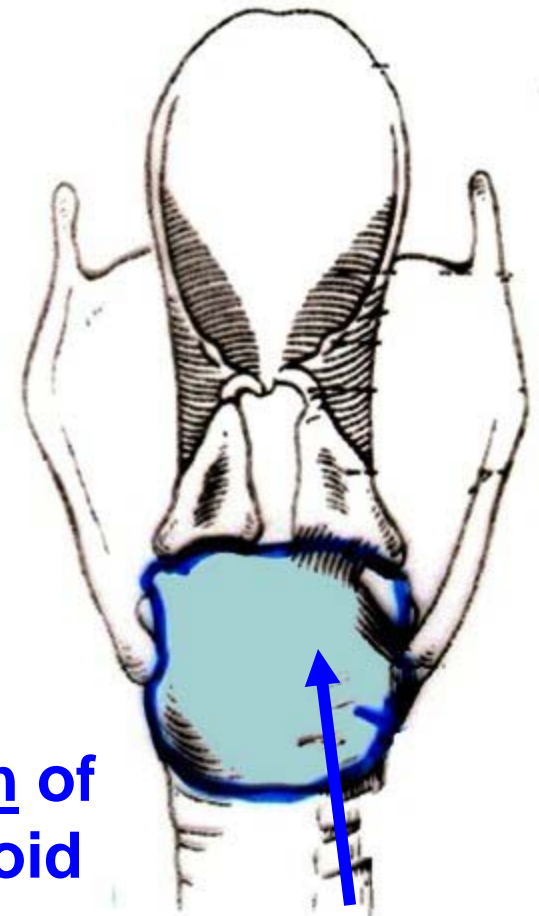
## LARYNX: CARTILAGES

ANT VIEW



Cricoid means  
Signet Ring

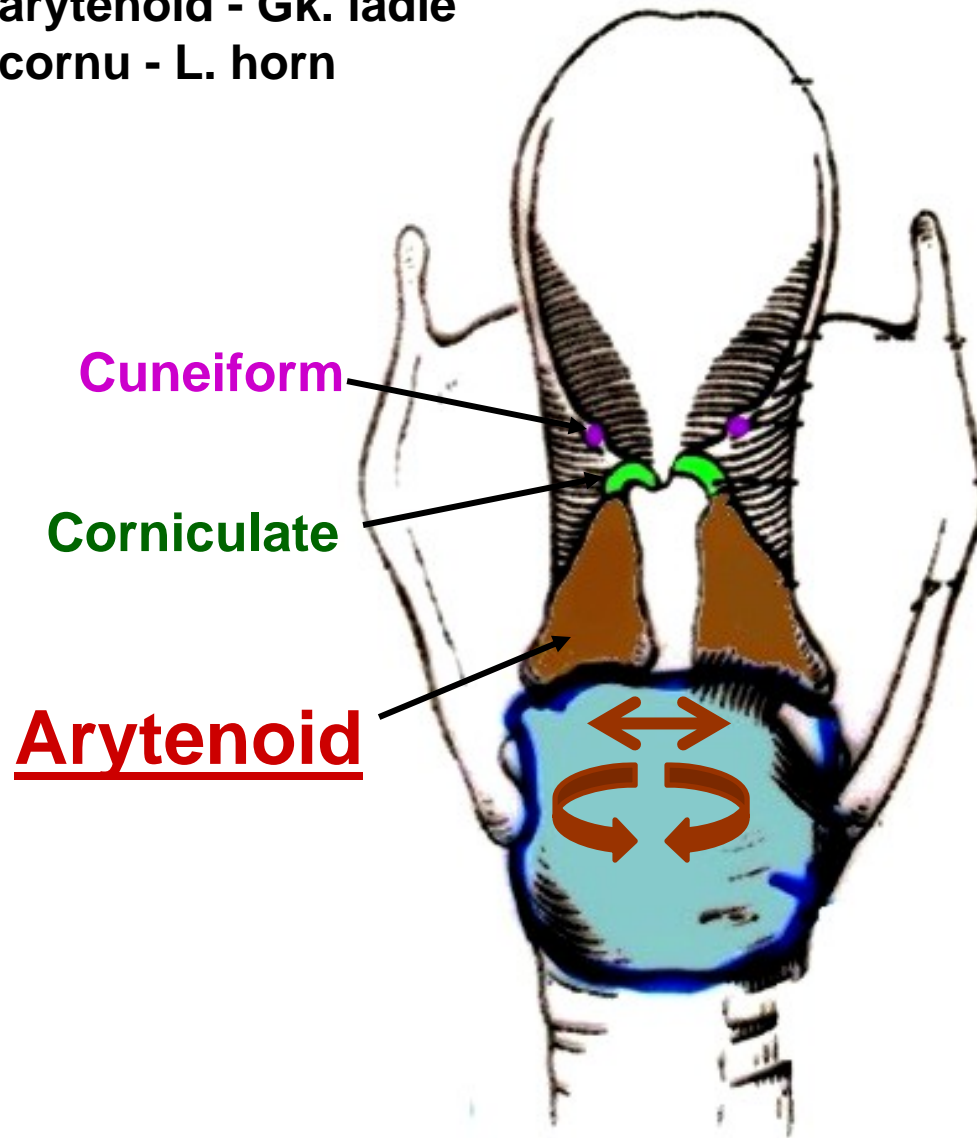
POST VIEW



Lamina of  
cricoid

## LARYNX: CARTILAGES

arytenoid - Gk. ladle  
cornu - L. horn



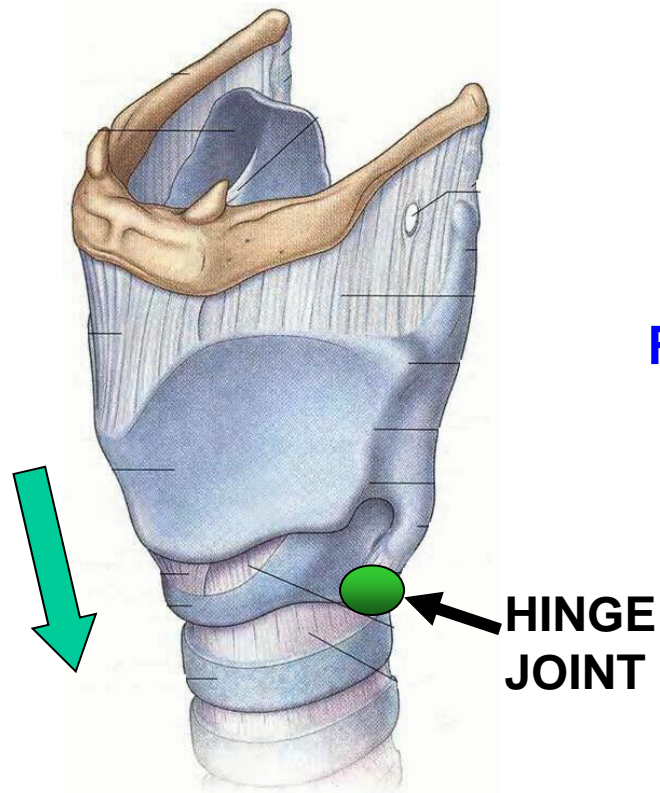
C. Arytenoid - 2  
pyramidal shaped  
cartilages above  
lamina – have  
synovial joints with  
Cricoid permit  
Swivel = Rotate  
Sliding = Ab/Adduct

D. Corniculate -  
nodules above  
arytenoids in  
aryepiglottic folds

E. Cuneiform - rod  
shaped, above  
corniculate cartilages

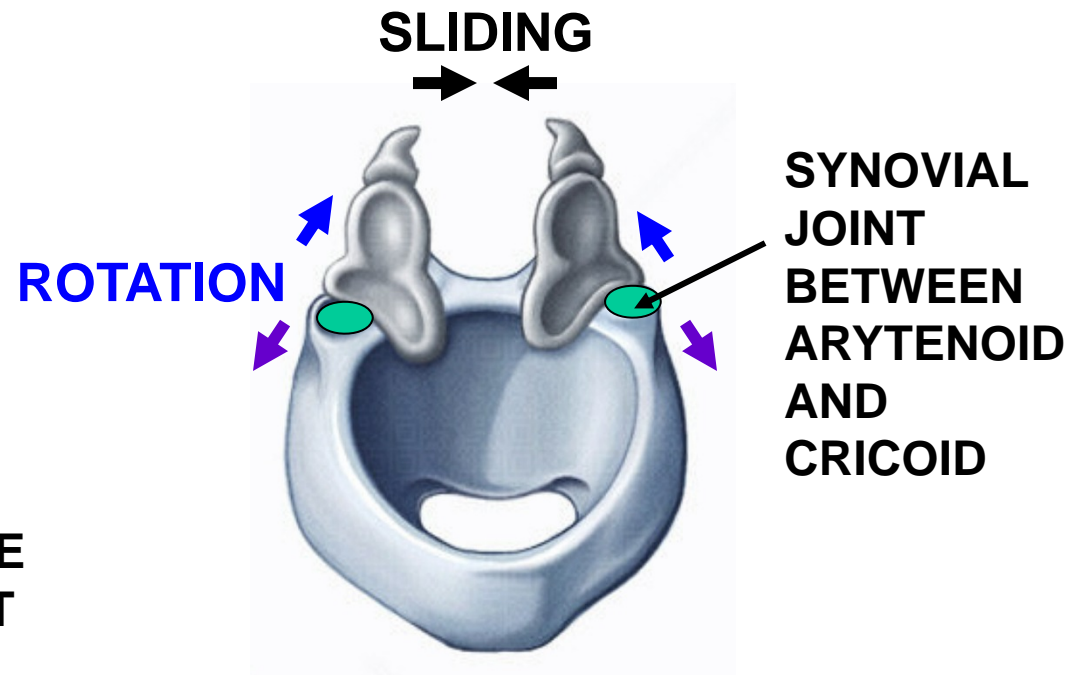
# LARYNX: SYNOVIAL JOINTS

## THYROID and CRICOID



**JOINTS PERMIT TILTING OF THYROID-CRICOID:**  
- CHANGE PITCH OF SOUND (TENSE OR RELAX VOCAL LIGAMENTS)

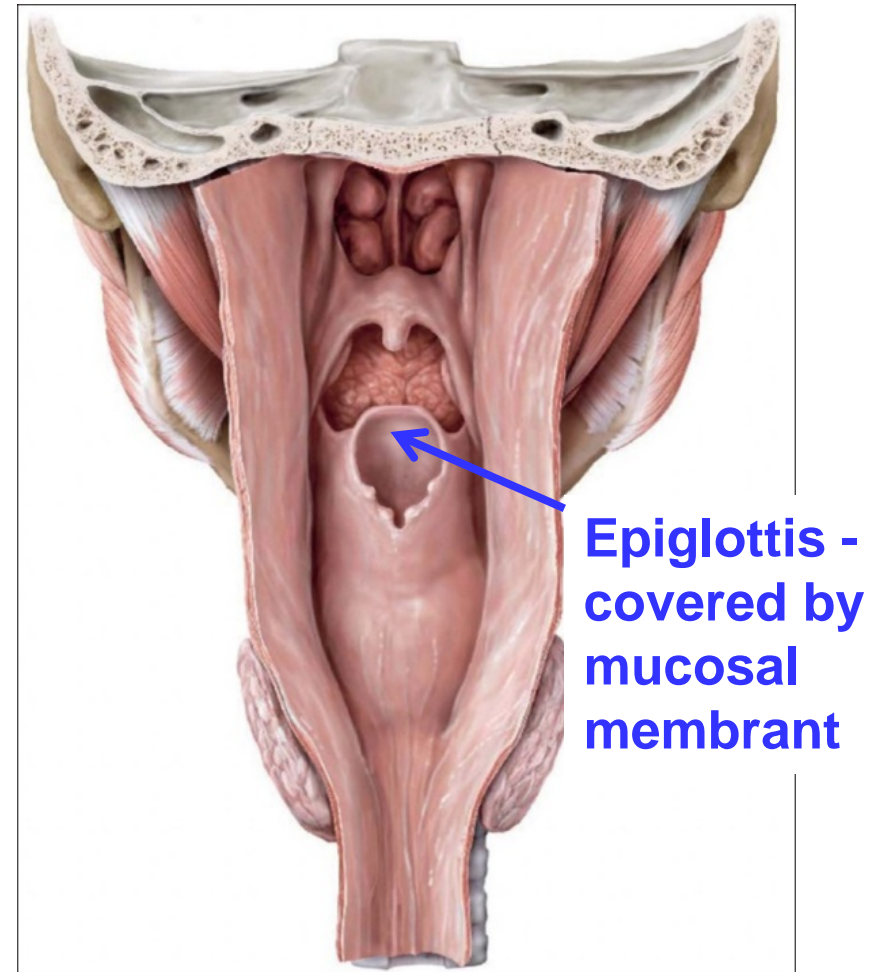
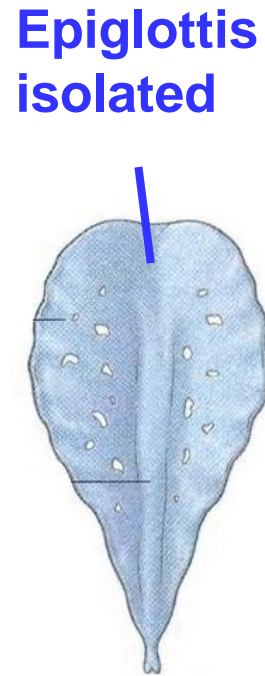
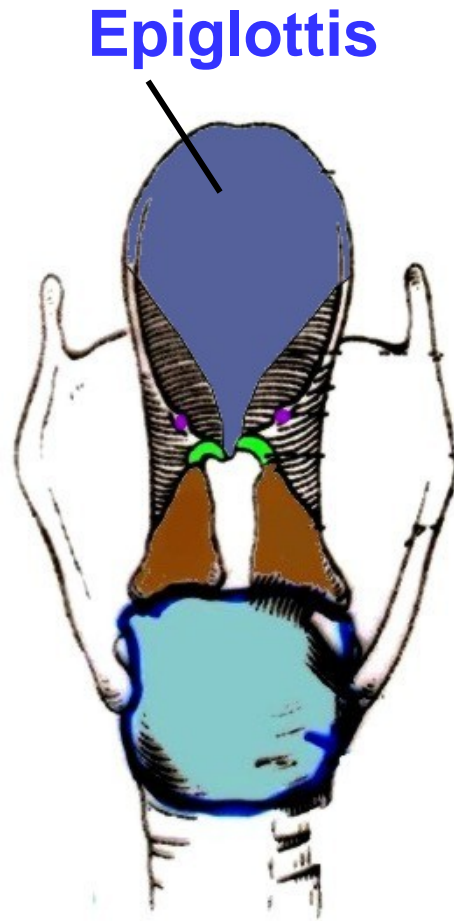
## ARYTENOID and CRICOID



**JOINTS PERMIT ROTATION AND SLIDING:**  
- OPEN OR CLOSE LARYNX (ABDUCT OR ADDUCT VOCAL LIGAMENTS)

# LARYNX CARTILAGES: EPIGLOTTIS

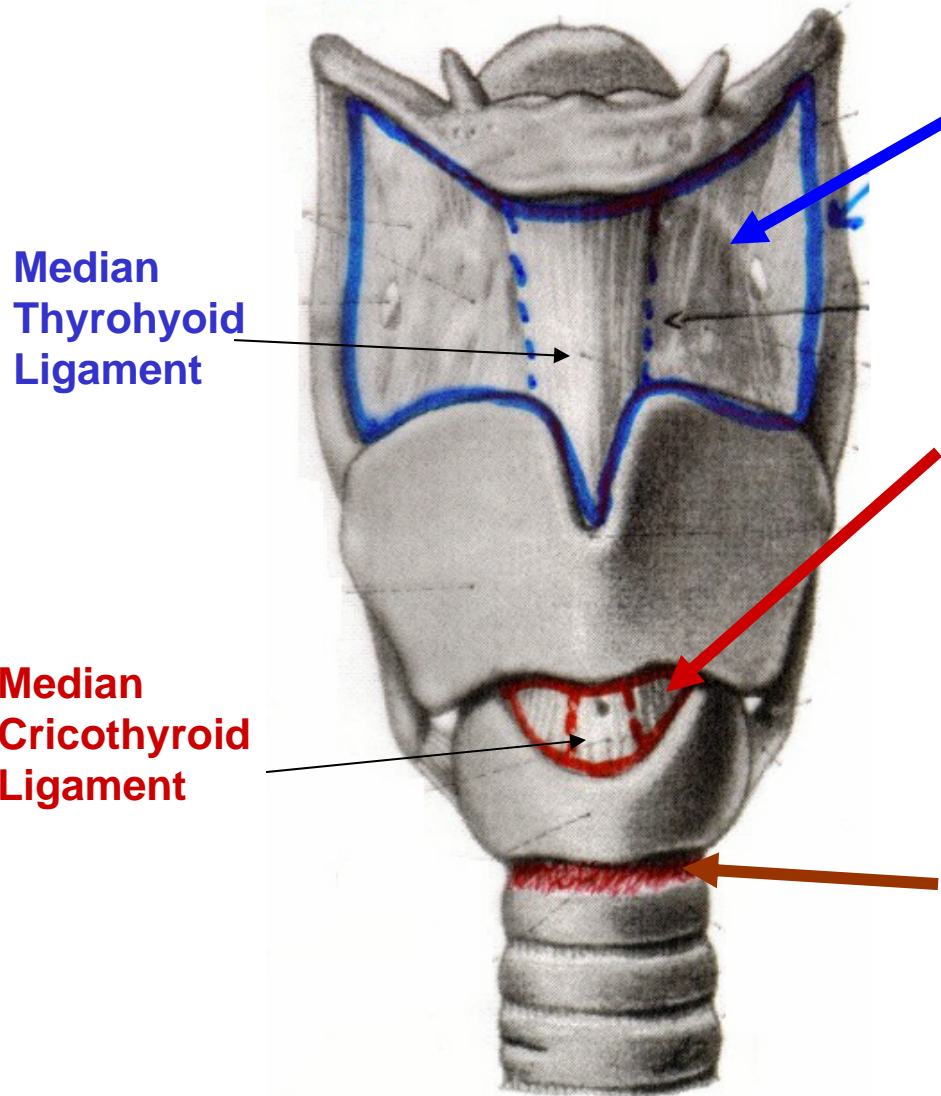
POST. VIEW



**F. EPIGLOTTIS - leaf shaped cartilage posterior to root of tongue; connected to body of hyoid and post side of thyroid cartilage**

## II. LIGAMENTS OF LARYNX

### A. Structural ligaments - hold larynx, hyoid, trachea together



Median  
Thyrohyoid  
Ligament

Median  
Cricothyroid  
Ligament

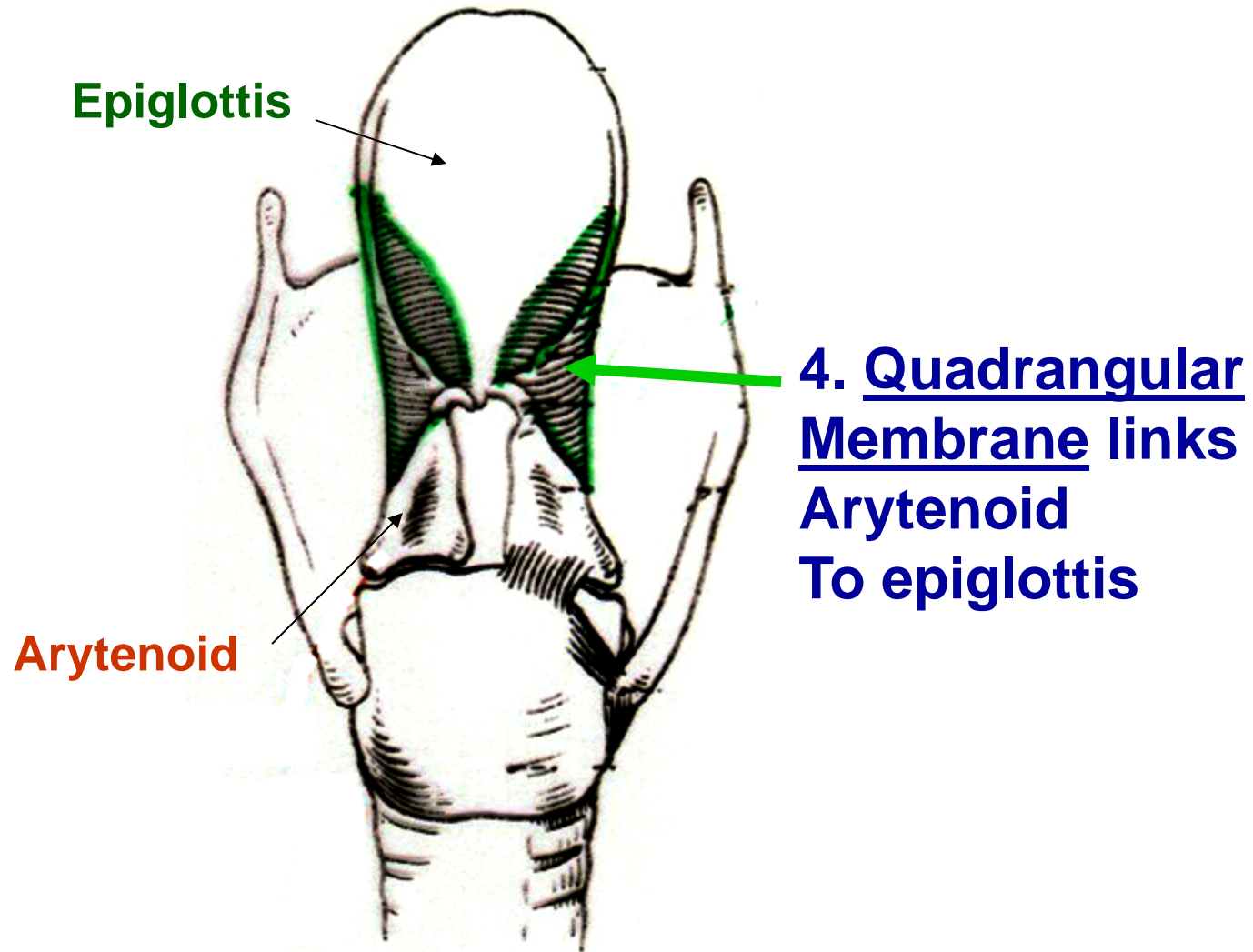
1. Thyrohyoid Membrane  
links larynx to hyoid;  
Median Thyrohyoid  
Ligament - thickened  
midline part

2. Cricothyroid Membrane  
links thyroid to cricoid;  
Median Cricothyroid  
Ligament - thickened  
midline part

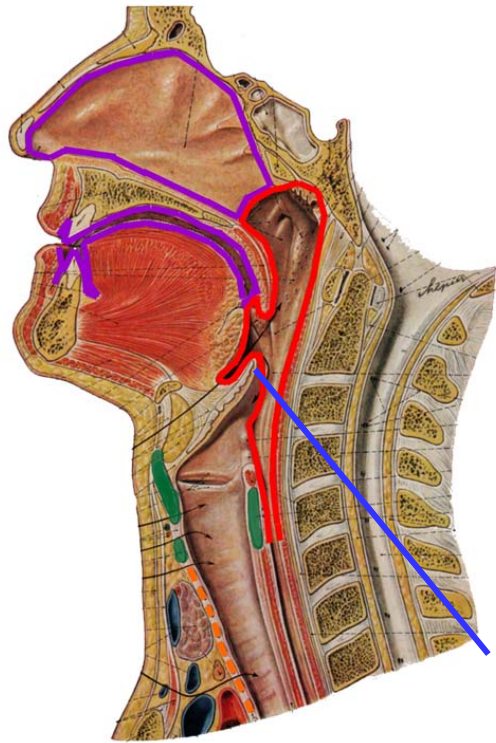
3. Cricotracheal ligament  
links Cricoid to first  
tracheal cartilage



# STRUCTURAL LIGAMENTS

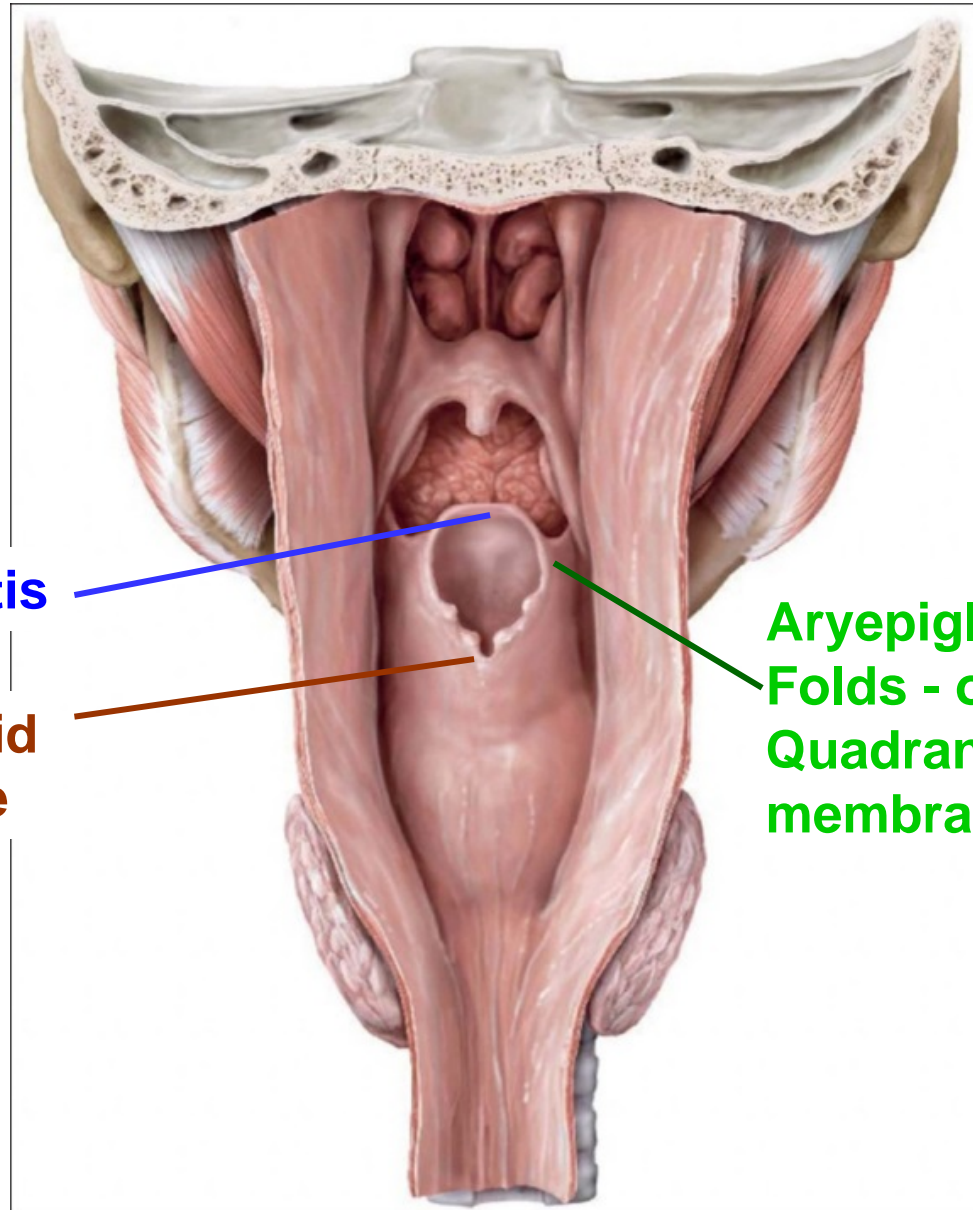


# STRUCTURAL LIGAMENTS



**Epiglottis**

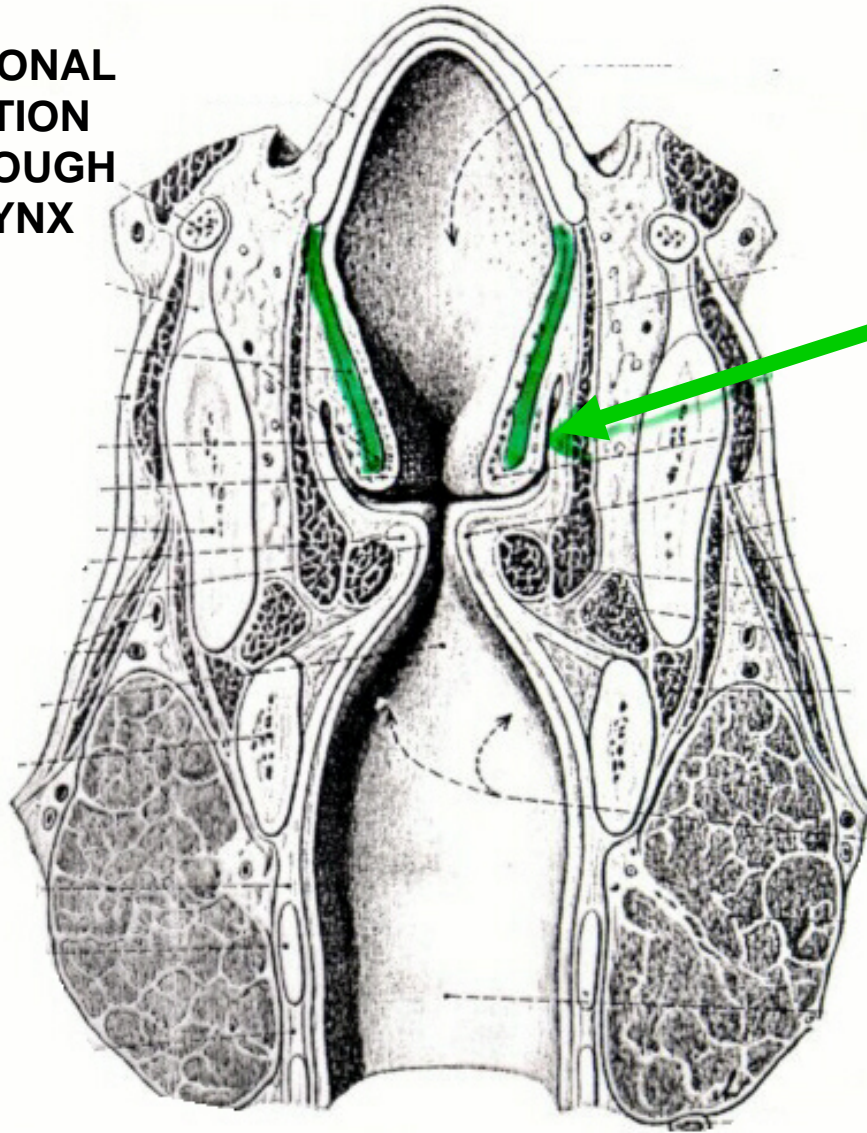
**Arytenoid  
cartilage**



**Aryepiglottic  
Folds - overlie  
Quadrangular  
membrane**

# STRUCTURAL LIGAMENTS

CORONAL  
SECTION  
THROUGH  
LARYNX



trachea

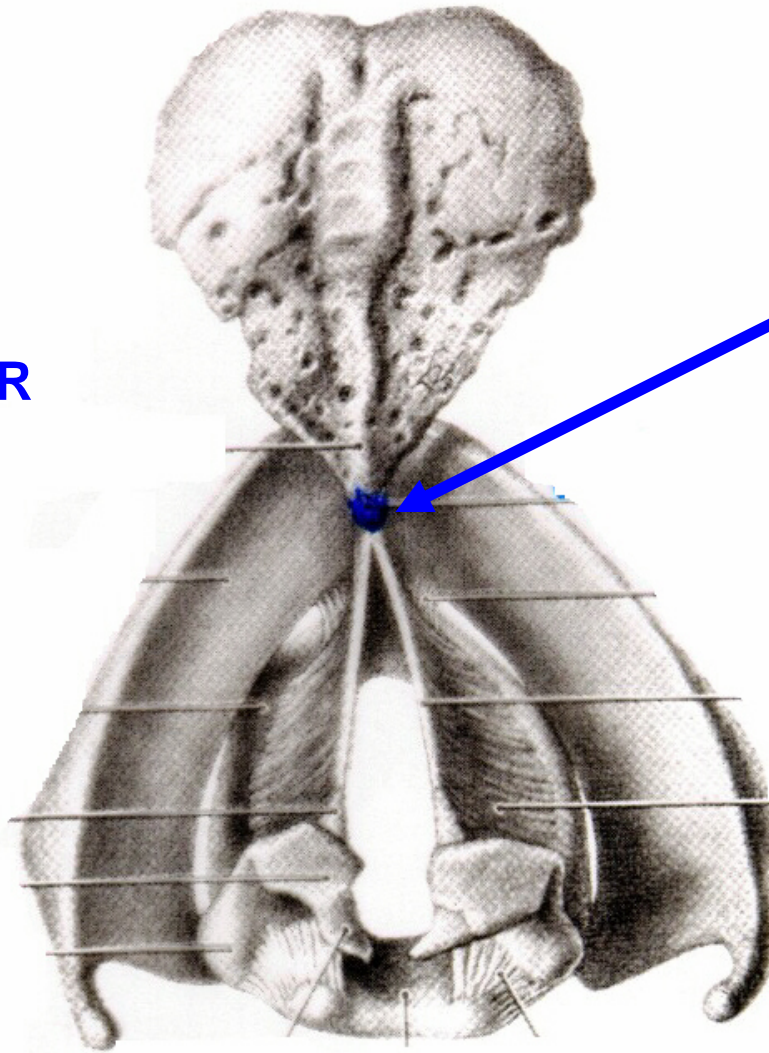
Lower free  
edge of  
Quadrangular  
membrane is  
Called  
Vestibular  
Ligament; deep  
to Vestibular  
(False Vocal)  
Folds

# STRUCTURAL LIGAMENTS



NOSE

SUPERIOR  
VIEW  
ABOVE  
LARYNX



5. Thyroepiglottic Ligament  
links epiglottis to  
thyroid cartilage



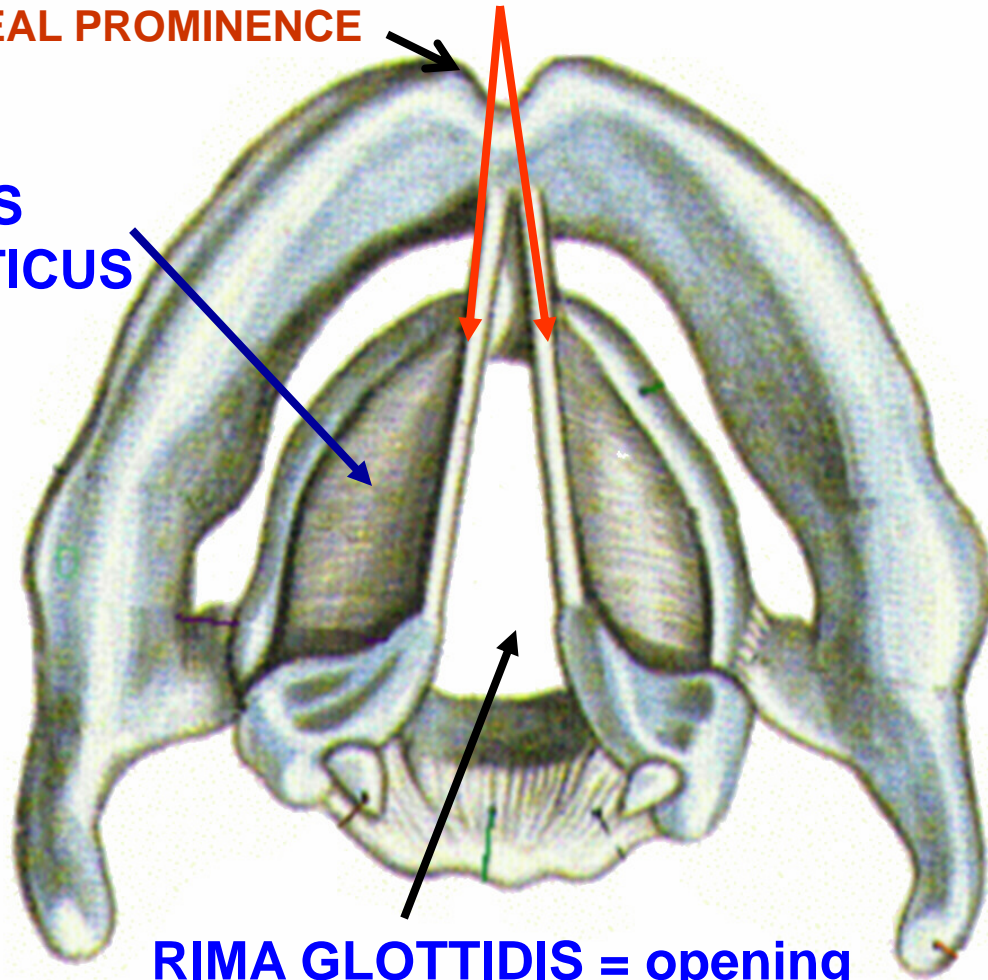
NOSE  
top view

## B. FUNCTIONAL LIGAMENTS

**VOCAL LIGAMENTS =  
UPPER FREE EDGE OF  
CONUS**

LARYNGEAL PROMINENCE

CONUS  
ELASTICUS



RIMA GLOTTIDIS = opening  
between Vocal ligaments

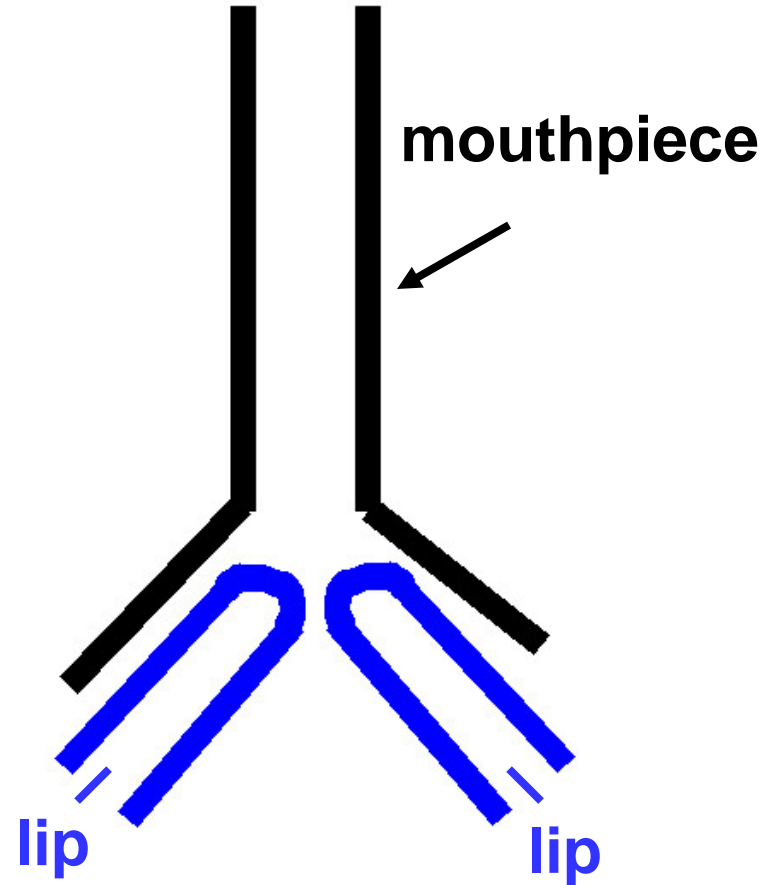
Functional  
ligaments: Conus  
Elasticus -  
Vibrating lips that  
arise from entire  
upper edge of arch  
of cricoid  
Attach: ant. to  
Thyroid, post. to  
Arytenoid

**VOCAL LIGAMENTS -  
longer in males than  
females  
- Laryngeal  
Prominence is Adam's  
apple not Eve's apple**

# LARYNX PRODUCES SOUND LIKE LIPS OF TRUMPET PLAYER



Trumpet player –  
Clifford Brown



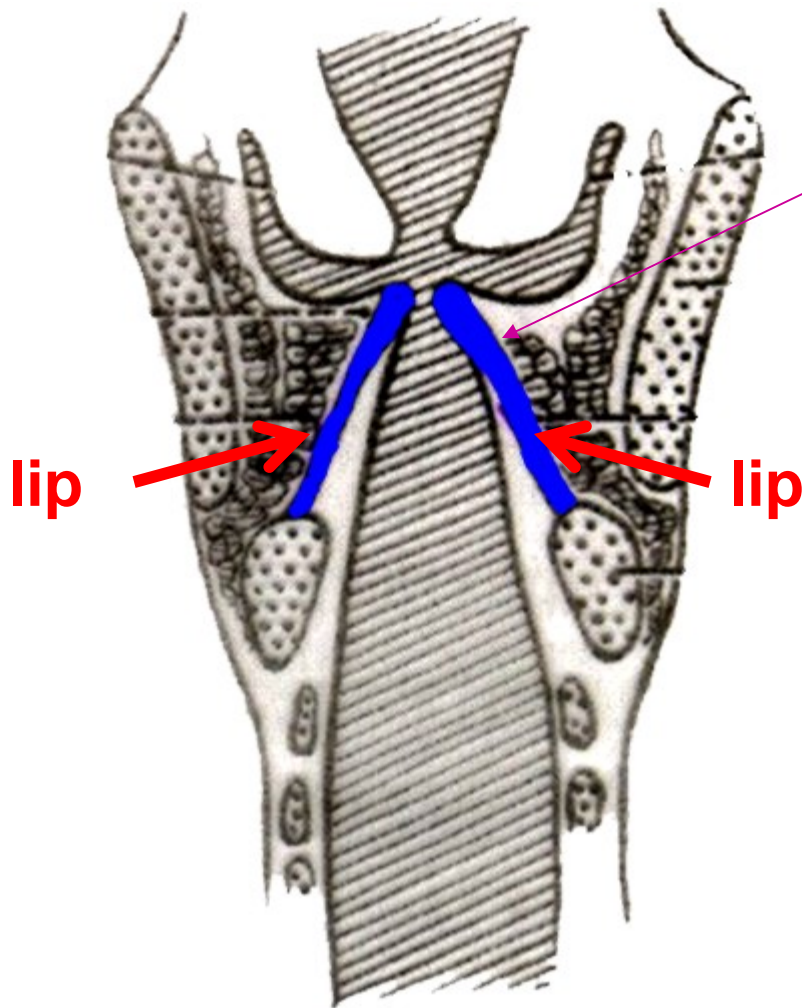
Tense lips - raise pitch  
Relax lips - lower pitch

# FUNCTIONAL LIGAMENTS

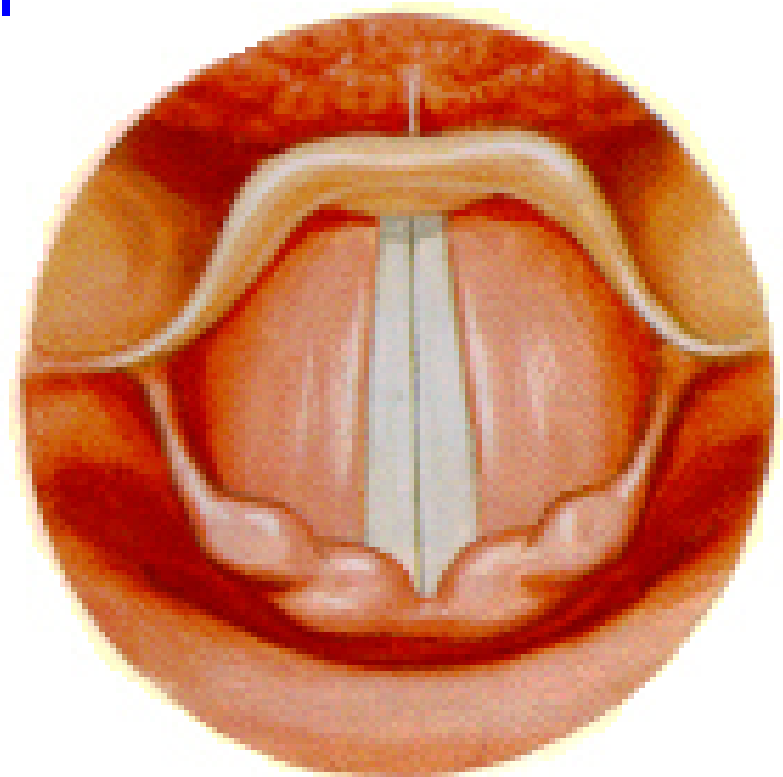
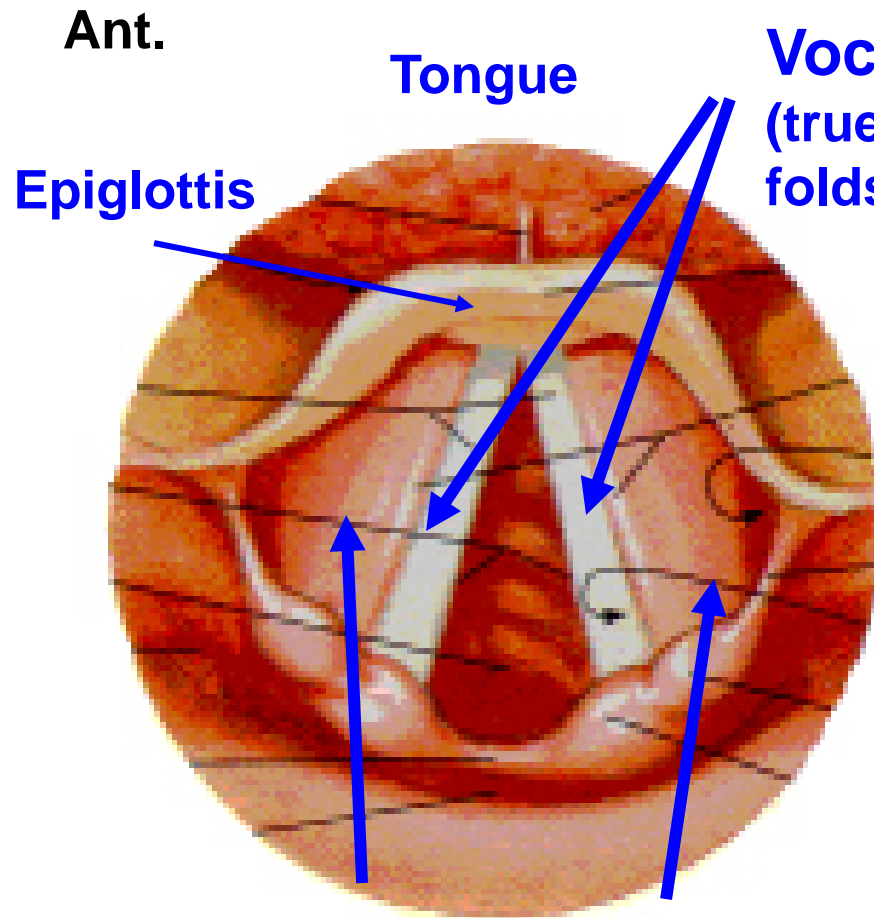
(In Coronal Section)

## Conus Elasticus Functions

- 1) Sound Production – Vibrate like lips of trumpet player;
- 2) Close Rima Glottidis stops outflow air, upward movement of diaphragm - when contract abdominal muscle pressure increases in abdominal cavity; occurs in childbirth, defecation



# LARYNGOSCOPE VIEW OF LARYNX



Post.

**Vestibular Folds**  
(false vocal folds)

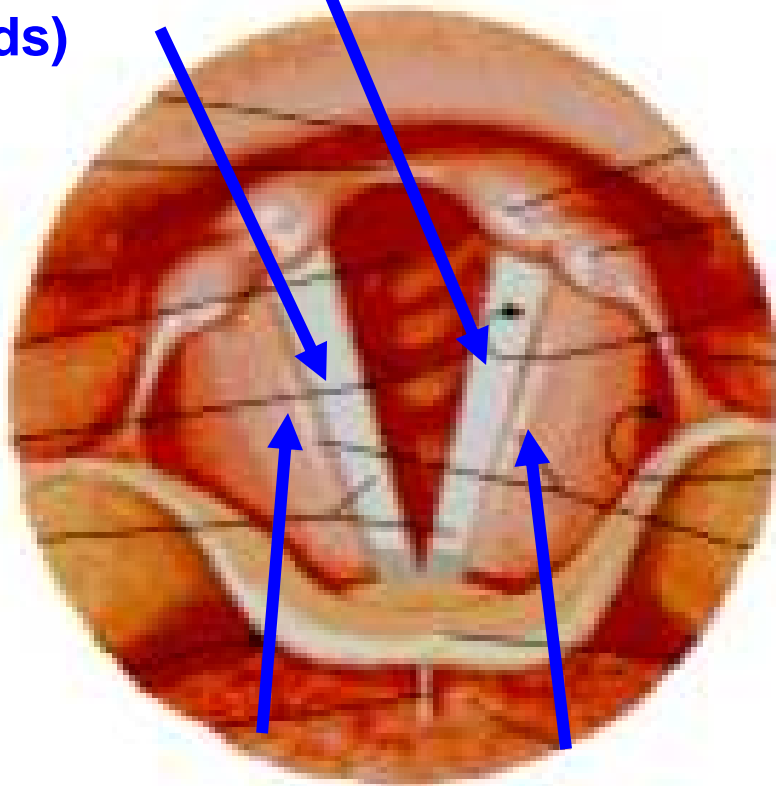
**vocal folds  
adducted when  
talking or singing**



# LARYNGOSCOPE VIEW OF LARYNX

Post.

**Vocal Folds**  
(true vocal folds)



**Vestibular Folds**  
(false vocal folds)

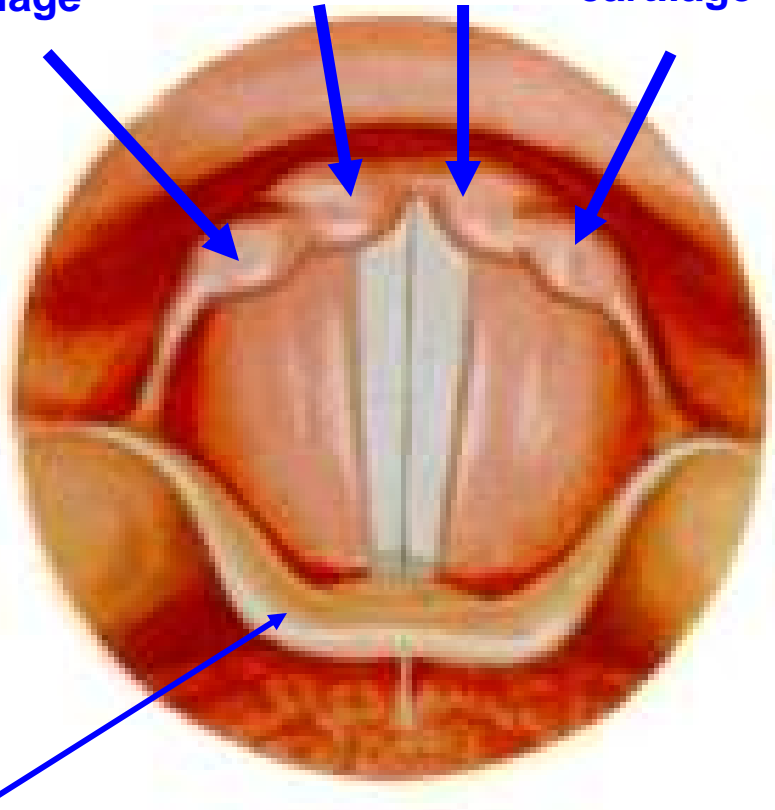
Ant.

Tongue

Cuneiform cartilage

Corniculate cartilages

Cuneiform cartilage



Epiglottis

**vocal folds adducted when talking or singing**



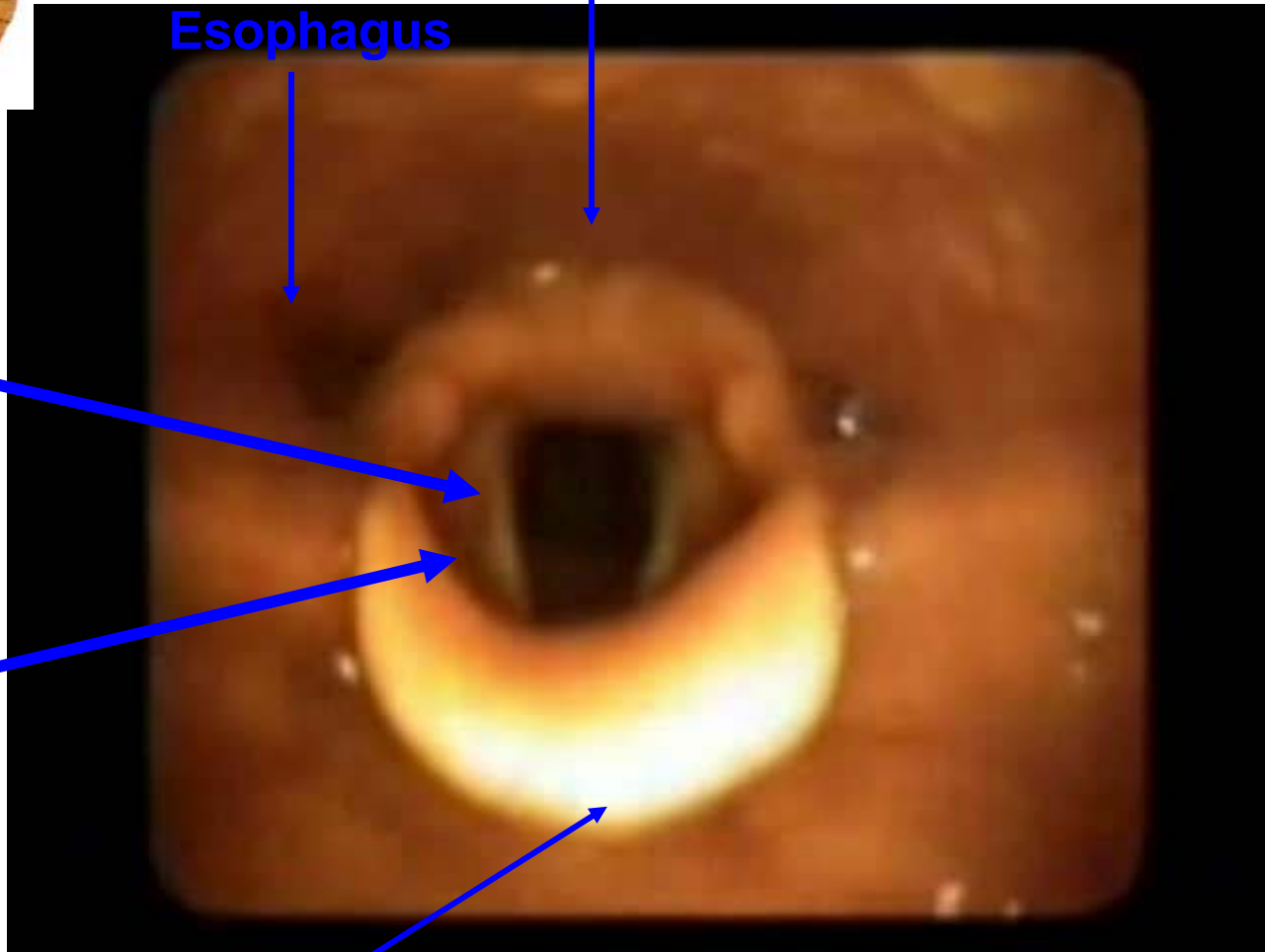
# BREATHING (INHALATION)

Leads to  
Esophagus

Leads to  
Esophagus

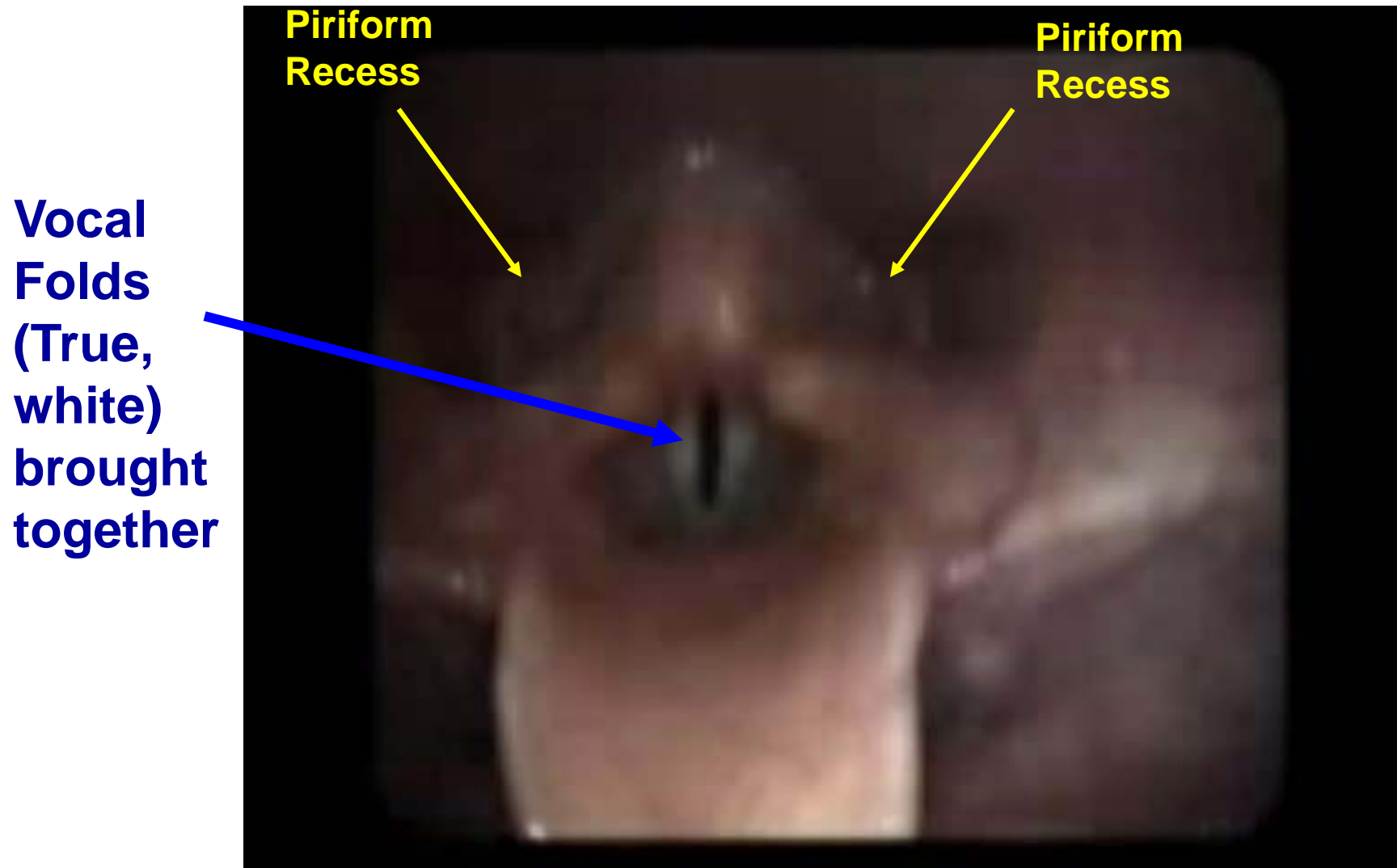
Vocal  
Folds  
(True,  
white)

Vestib-  
ular  
Folds  
(False,  
Reddish)



Epiglottis

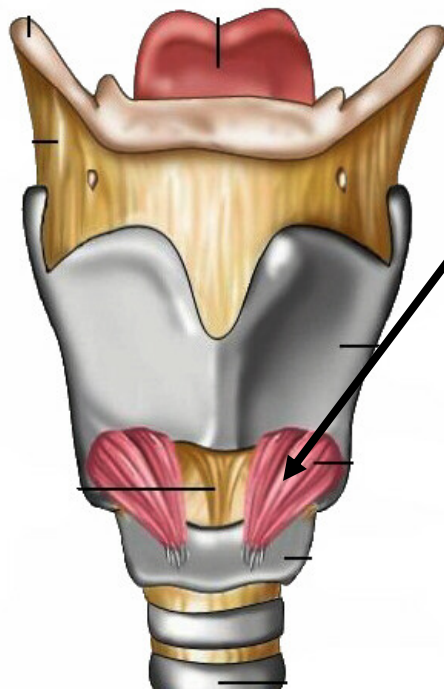
## LARYNX PRODUCING SOUND



### III. MUSCLES OF LARYNX - well named

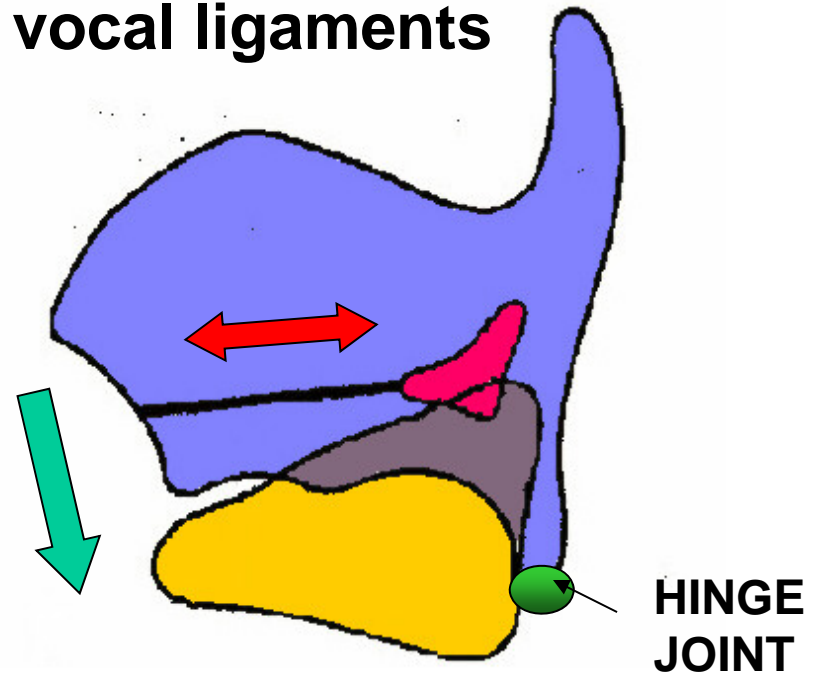
A. Extrinsic muscles (ex. hyoid muscles) - Move whole larynx as in swallowing

B. Intrinsic Muscles 1) change pitch by changing tension in vocal lig; increase tension raises pitch, decreased tension lowers pitch; 2) open and close Rima Glottidis



1) CRICOTHYROID-  
Tenses  
Vocal Ligament  
Increasing Pitch

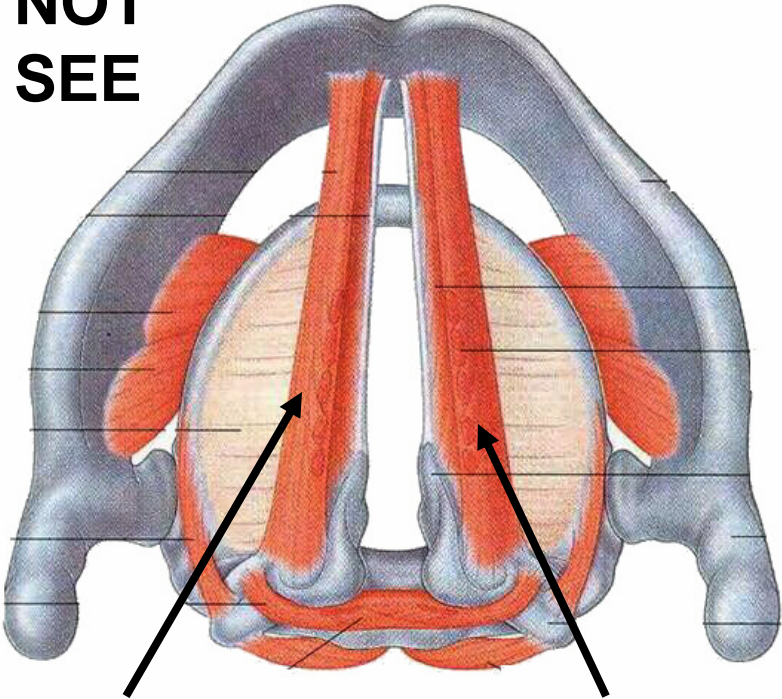
Tilting - **STRETCHES** vocal ligaments



**STRETCH** vocal ligament  
**INCREASE PITCH -**  
**CRICOTHYROID**

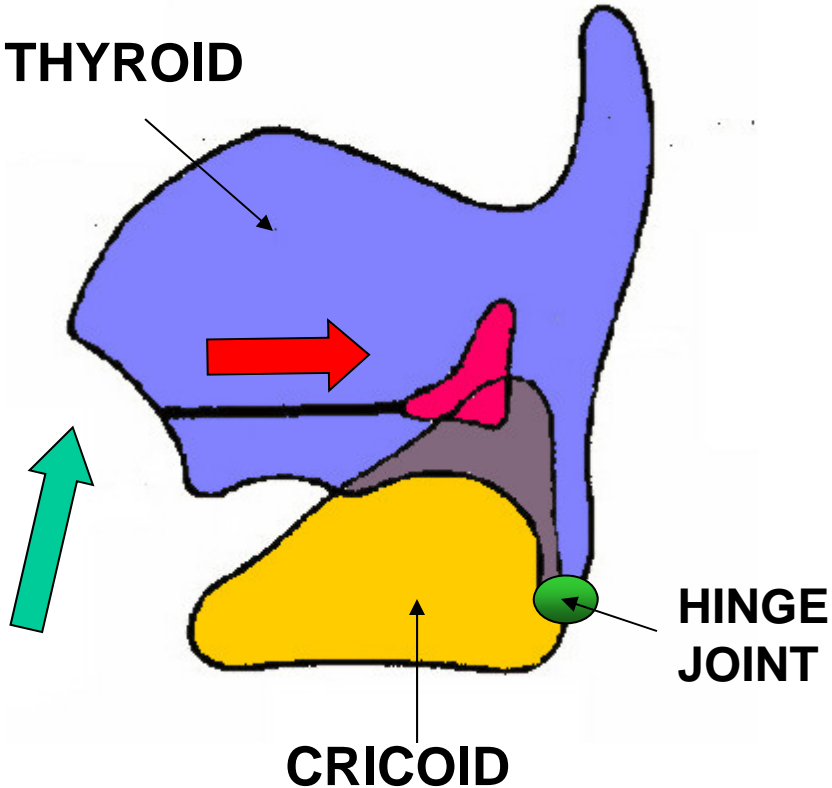
# MUSCLES OF LARYNX

**NOT  
SEE**



**THYROARYTENOID  
MUSCLES - adjacent to  
vocal ligament -  
Relaxes  
Vocal Ligaments  
Decreases pitch**

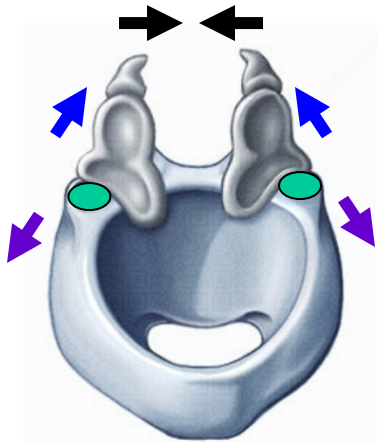
**THYROID**



**RELAX vocal ligament  
DECREASE PITCH -  
THYROARYTENOID**

# OPEN AND CLOSE RIMA GLOTTIDIS BY ROTATING/SLIDING ARYTENOIDS -

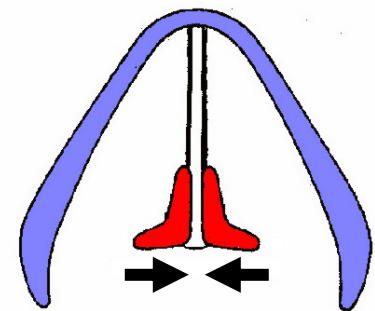
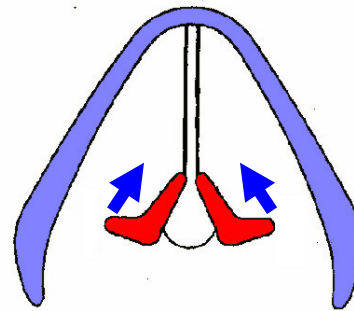
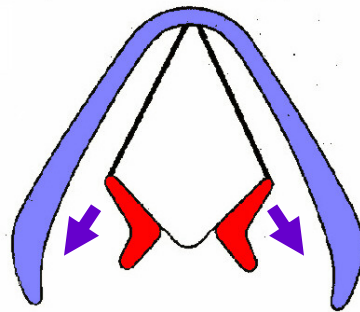
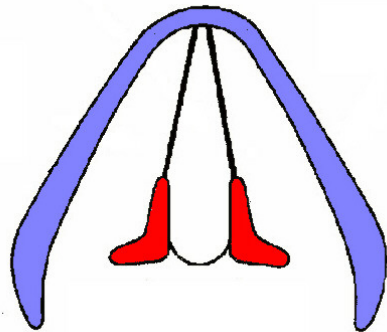
Rotate laterally opens; Rotate medially or slide closes  
 more close than open



**OPEN**  
 ROTATE  
 Laterally

**CLOSE**  
 ROTATE  
 Medially

**CLOSE**  
 SLIDE



POSTERIOR  
 CRICO-  
 ARYTENOID

LATERAL  
 CRICO-  
 ARYTENOID

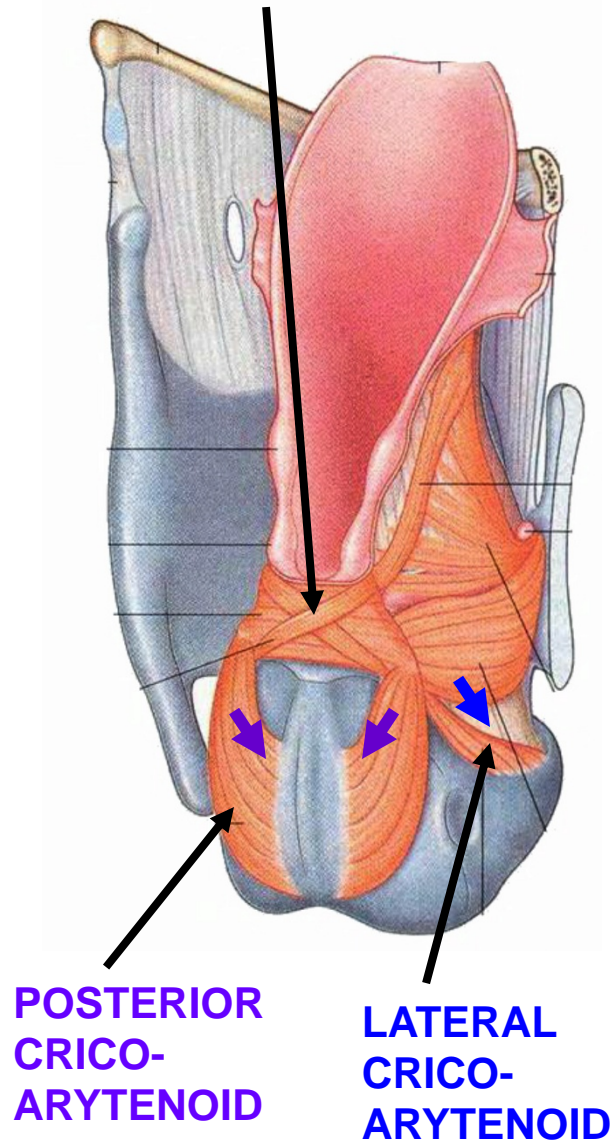
ARYTENOIDEUS

**REST  
 POSITION**

Larynx open for deep breathing; close for speech; completely close to raise abdominal pressure (Valsalva maneuver)

# MUSCLES OF LARYNX

ARYTENOIDEUS



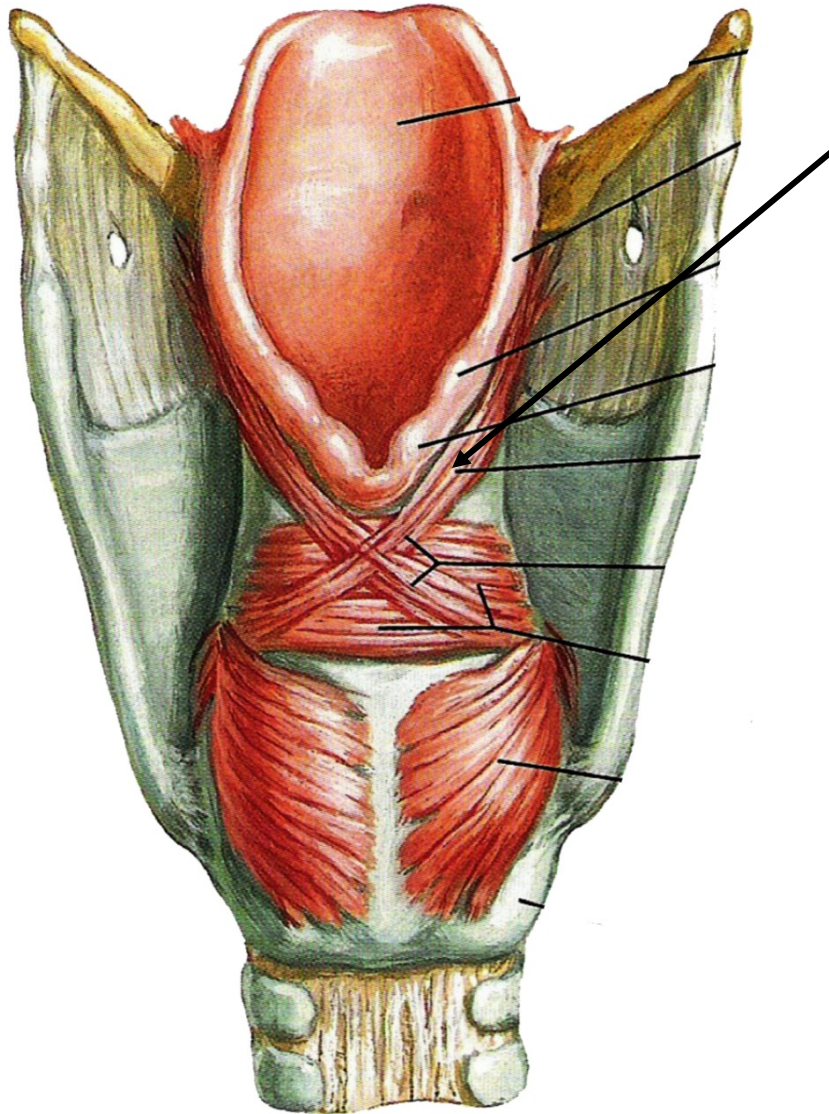
5) ARYTENOID (Transverse and oblique arytenoid) - Adduct vocal folds

4) LATERAL CRICO-ARYTENOID - Adduct vocal folds

3) POSTERIOR CRICO-ARYTENOID – Abducts vocal fold

Adduct closes rima glottidis  
Abduct opens rima glottidis

# MUSCLES OF LARYNX



## 5) ARYEPIGLOTTIC MUSCLE

Pulls epiglottis down during swallowing

- Covers inlet to larynx
- Not necessary in adult humans



## LARYNX MUSCLES - KNOW MUSCLE, ACTION, INNERVATION



MUSCLE	ACTION	NERVE
Cricothyroid	Tenses vocal fold, raises pitch of sound	External Laryngeal n. (X)
Thyroarytenoid	Relaxes vocal fold, decreases pitch of sound	Recurrent Laryngeal n. (X)
Posterior cricoarytenoid	Abducts vocal folds, opens rima glottidis	Recurrent Laryngeal n. (X)
Lateral cricoarytenoid	Adducts vocal folds, closes rima glottidis	Recurrent Laryngeal n. (X)
Arytenoid (Transverse arytenoid)	Adducts vocal folds, closes rima glottidis	Recurrent Laryngeal n. (X)
Aryepiglottic muscle	Pulls down epiglottis during swallowing	Recurrent Laryngeal n. (X)

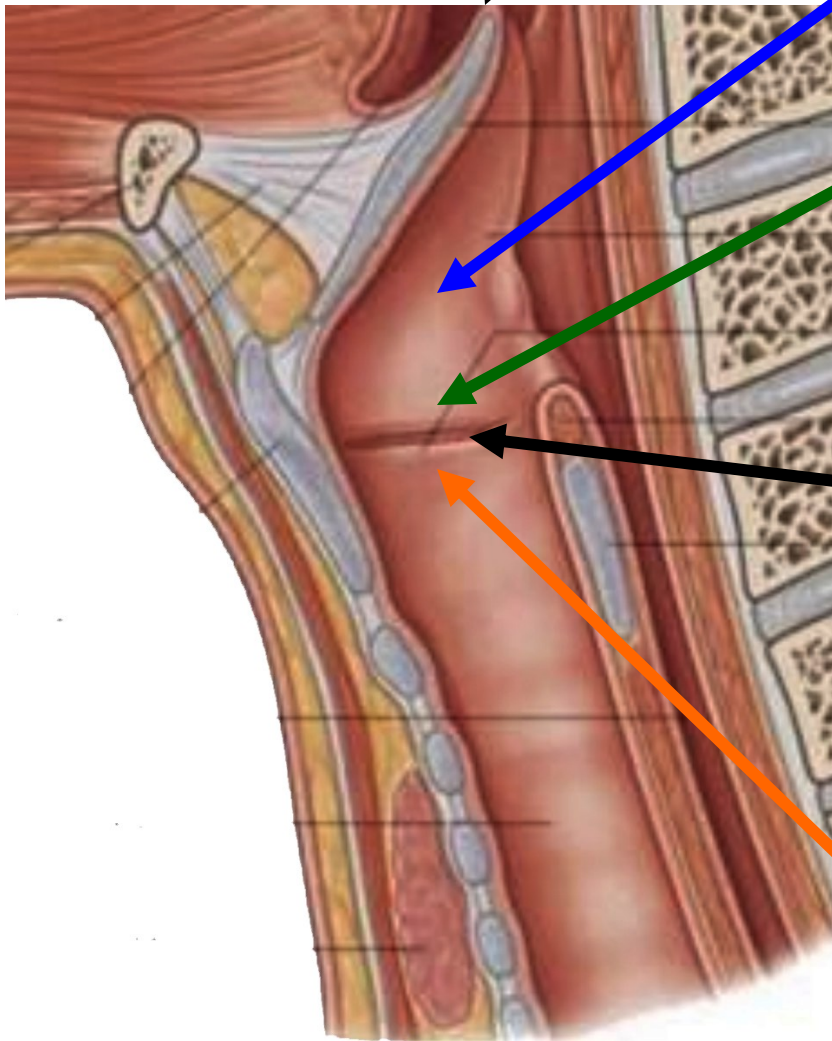


# TERMS ASSOCIATED WITH LARYNX

NOSE



epiglottis



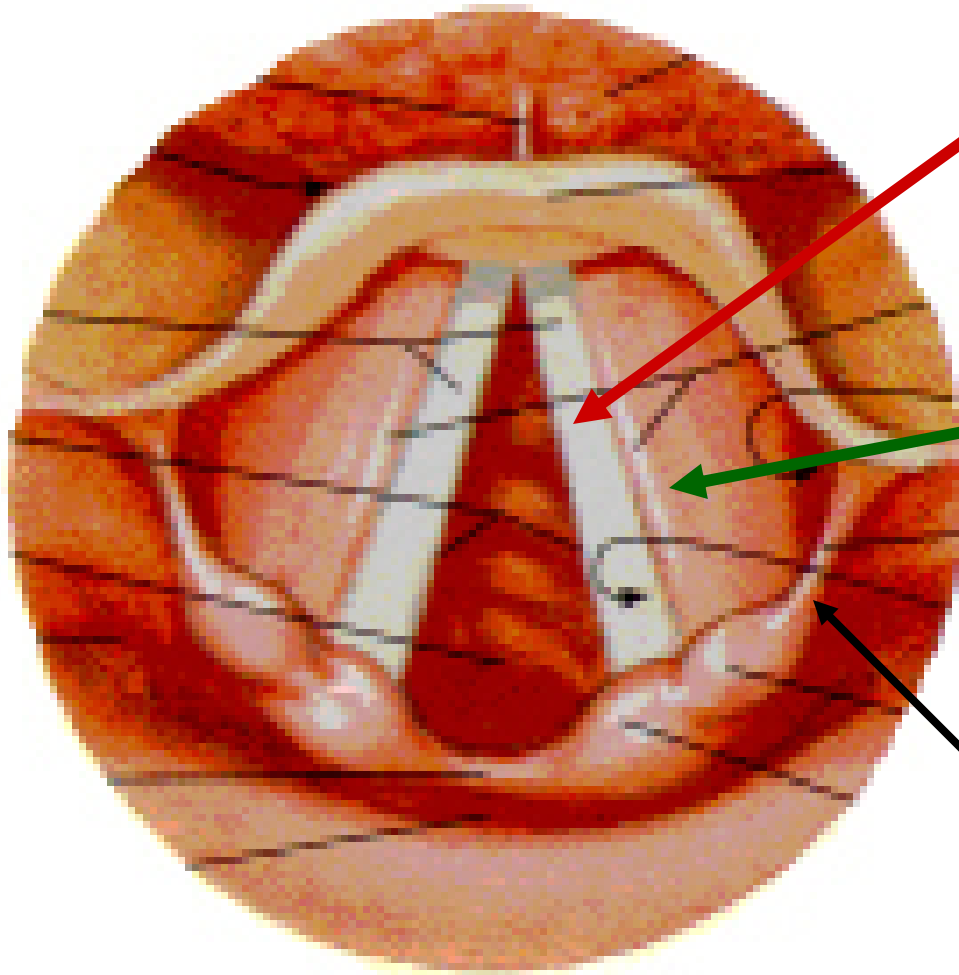
VESTIBULE - inlet above false vocal folds

VESTIBULAR (FALSE VOCAL) FOLDS - overlie vestibular ligaments

VENTRICLE - area between true and false vocal folds; lateral extension is Laryngeal Sinus

VOCAL (TRUE VOCAL) FOLDS - overlie vocal ligaments

# LARYNGOSCOPE VIEW OF LARYNX



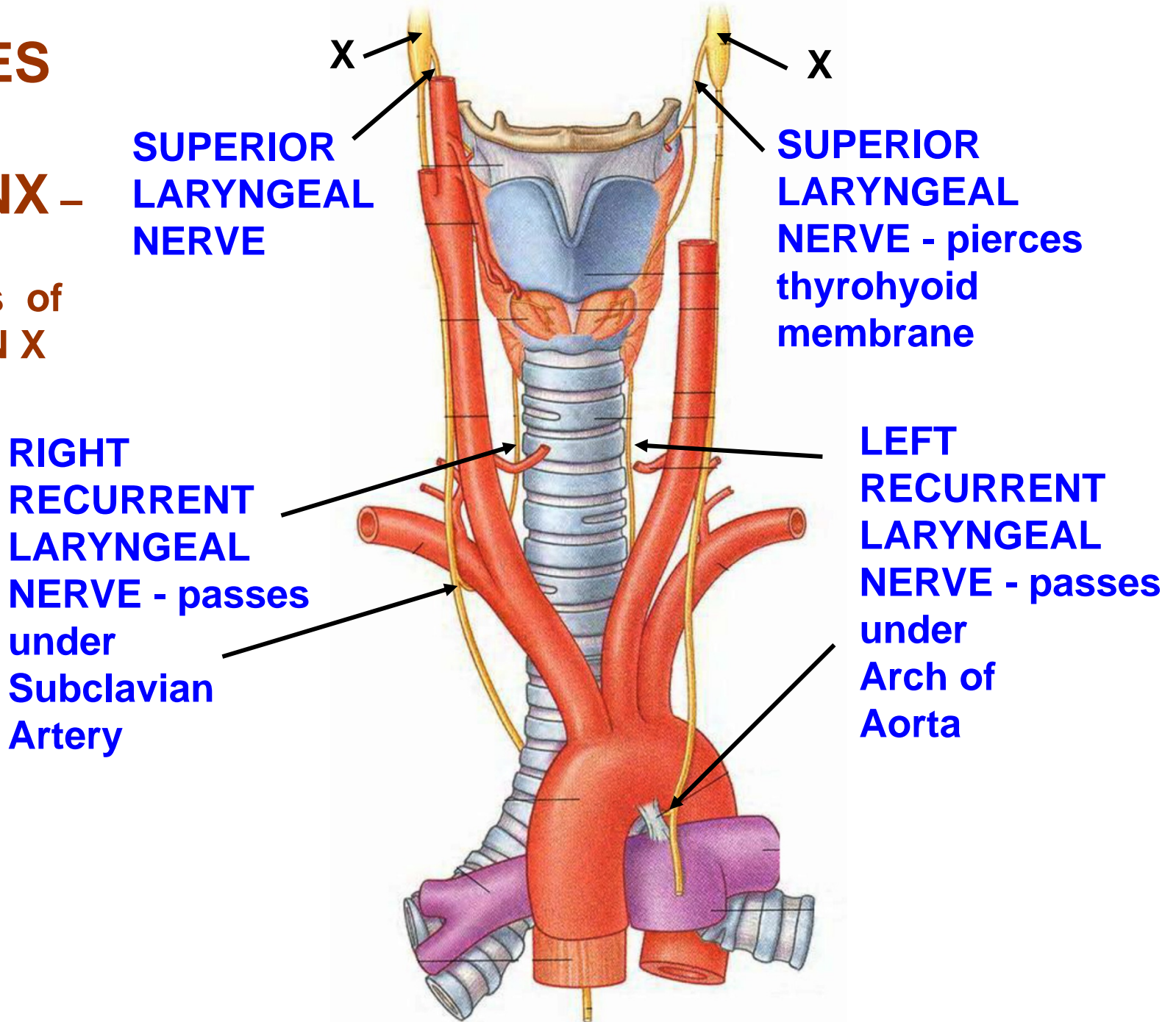
**TRUE VOCAL FOLDS**  
-overlie vocal  
ligaments

**FALSE VOCAL  
FOLDS - overlie  
vestibular ligaments**

**ARYEPIGLOTTIC  
FOLD - overlie  
Quadrangular  
membrane**

# NERVES OF LARYNX –

All are  
Branches of  
Vagus CN X



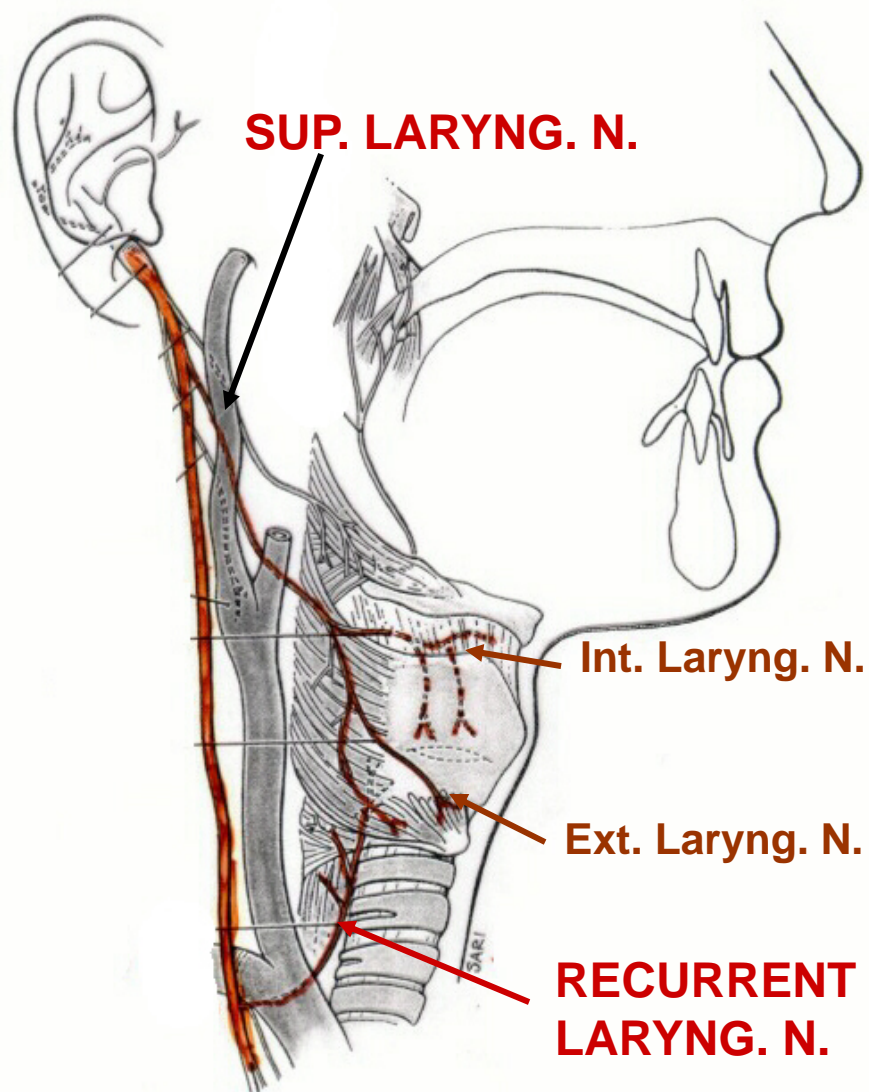
**SUPERIOR  
LARYNGEAL  
NERVE**

**SUPERIOR  
LARYNGEAL  
NERVE - pierces  
thyrohyoid  
membrane**

**RIGHT  
RECURRENT  
LARYNGEAL  
NERVE - passes  
under  
Subclavian  
Artery**

**LEFT  
RECURRENT  
LARYNGEAL  
NERVE - passes  
under  
Arch of  
Aorta**

## V. NERVES OF LARYNX – Branches of Vagus



**A. Superior Laryngeal N.**  
divides to -

1. Internal Laryngeal N.  
**Visceral Sensory to Larynx**  
**Above True Vocal Folds**

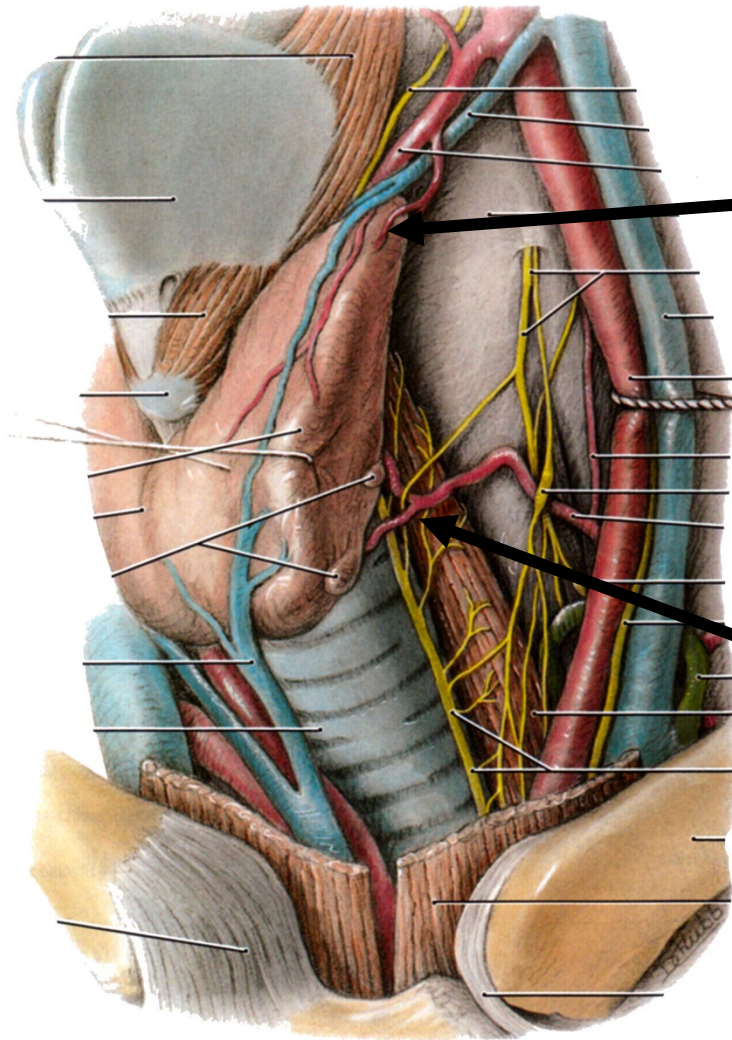
2. External Laryngeal N.  
Branchiomotor to Cricothyroid

**B. Recurrent Laryngeal N.**

- Visceral Sensory to Larynx  
**Below True Vocal Folds**

- Branchiomotor to all other  
Muscles of Larynx

## VI. LARYNX - ARTERIAL SUPPLY



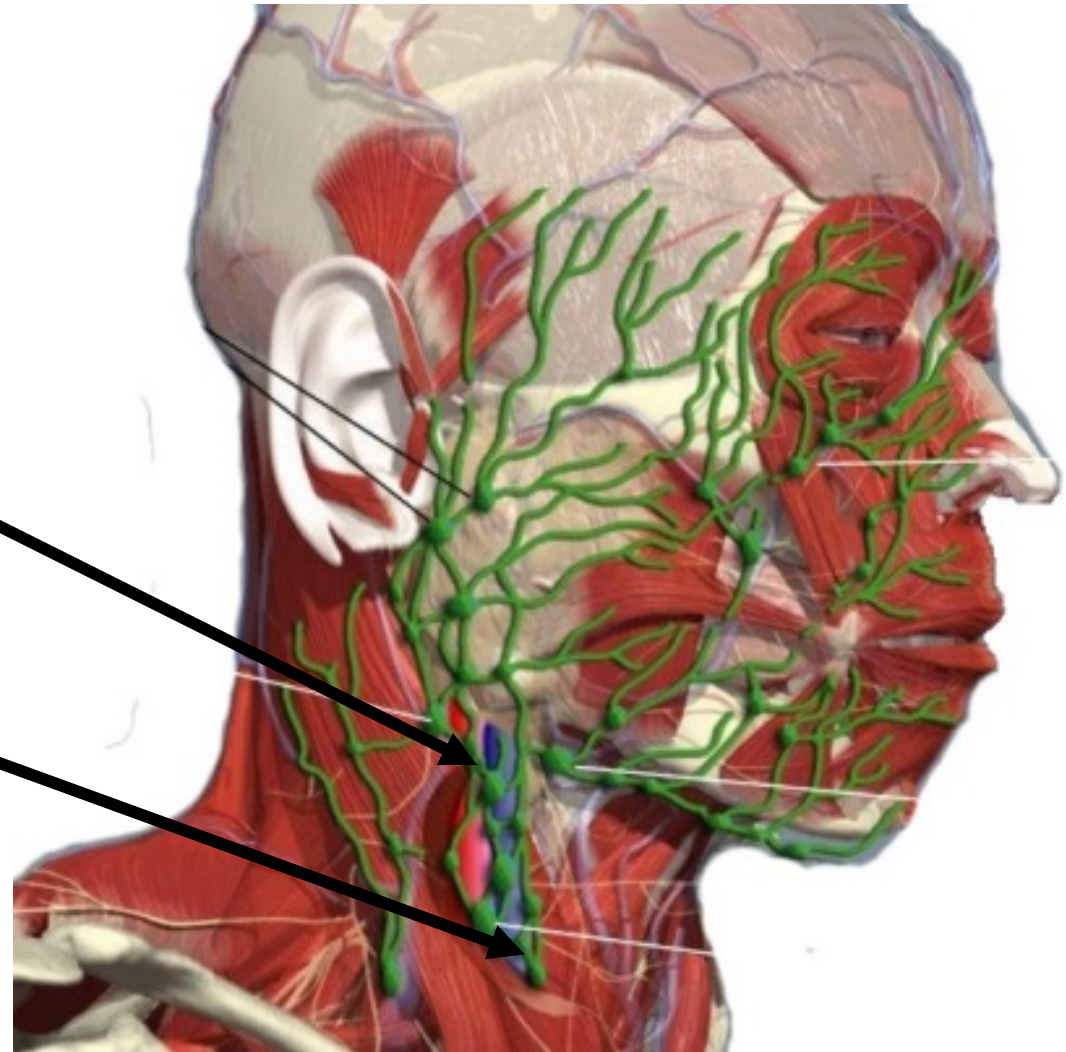
**Superior  
Laryngeal Artery  
from Superior  
Thyroid artery**

**Inferior Laryngeal  
Artery from  
Inferior Thyroid  
artery**

## VII. LARYNX - LYMPHATICS

Superior Deep Cervical Nodes - drain Larynx above true vocal folds

Inferior Deep Cervical Nodes - drain Larynx below true vocal folds

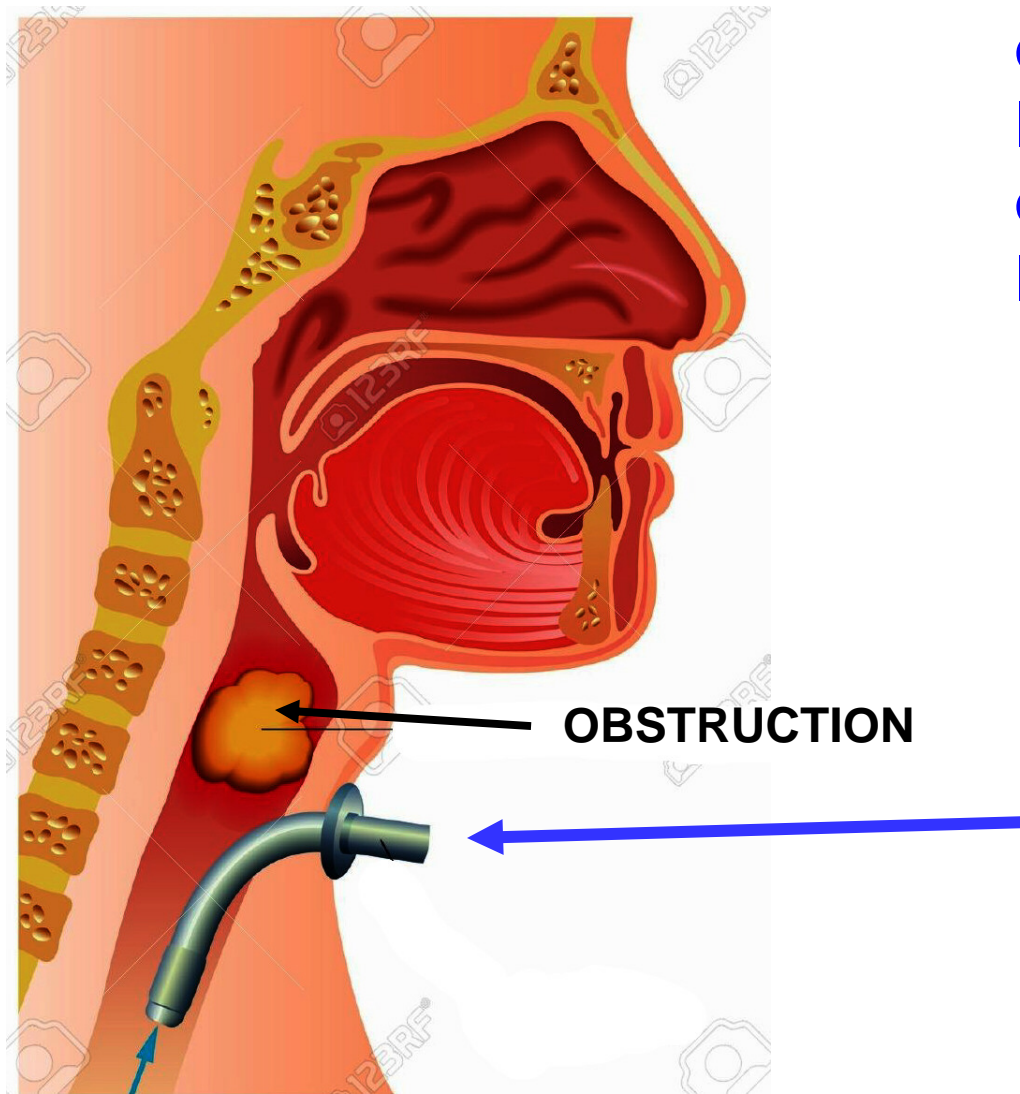


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**CLINICAL Note:** Mucosa is tightly attached to vocal folds; in **Anaphylactic Shock** (acute allergic reaction) swelling of **Vestibular** folds can constrict airway and lead to Suffocation)



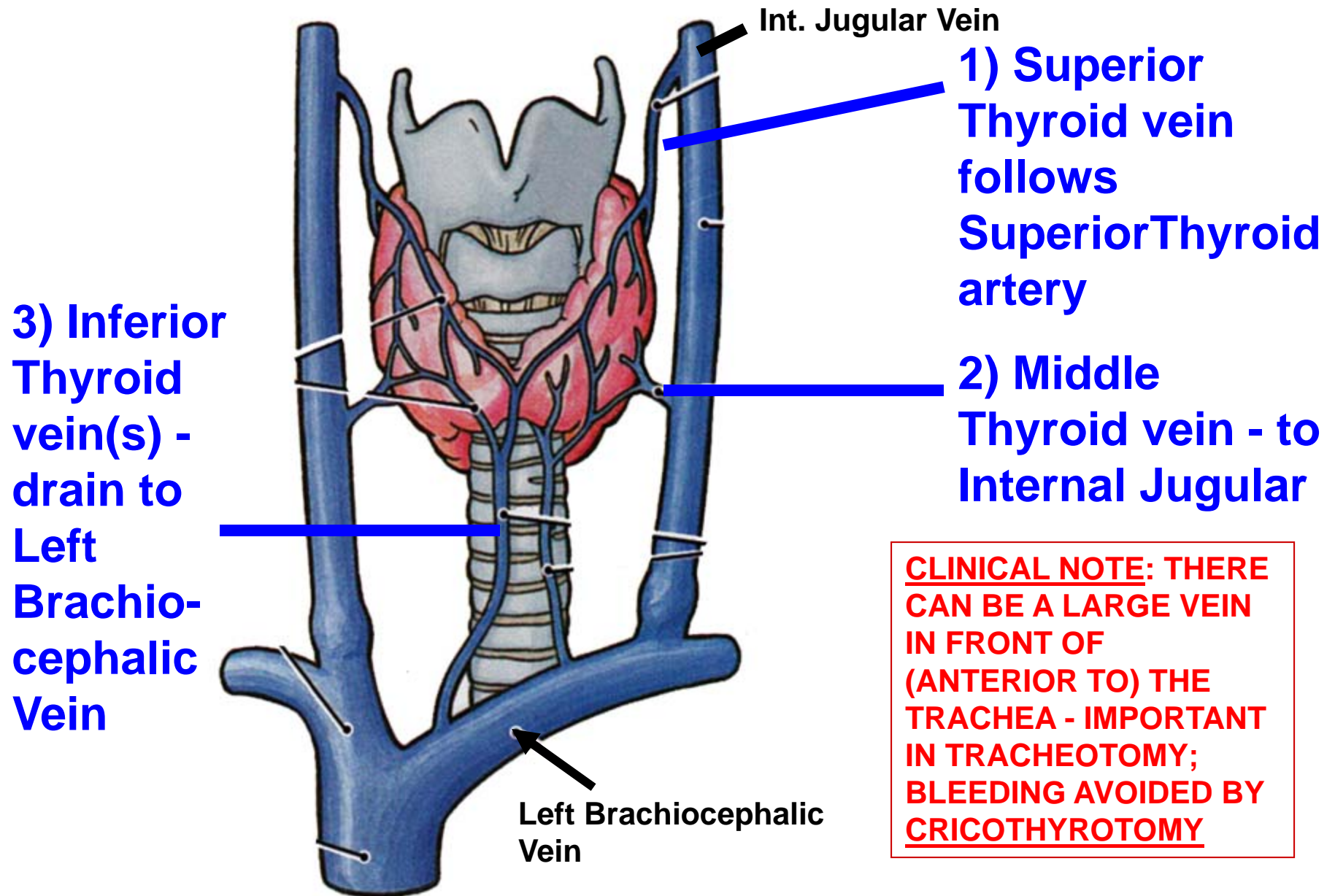
## VIII. OBSTRUCTION OF LARYNX: TRACHEOTOMY



open airway to  
lungs below  
obstructed  
larynx

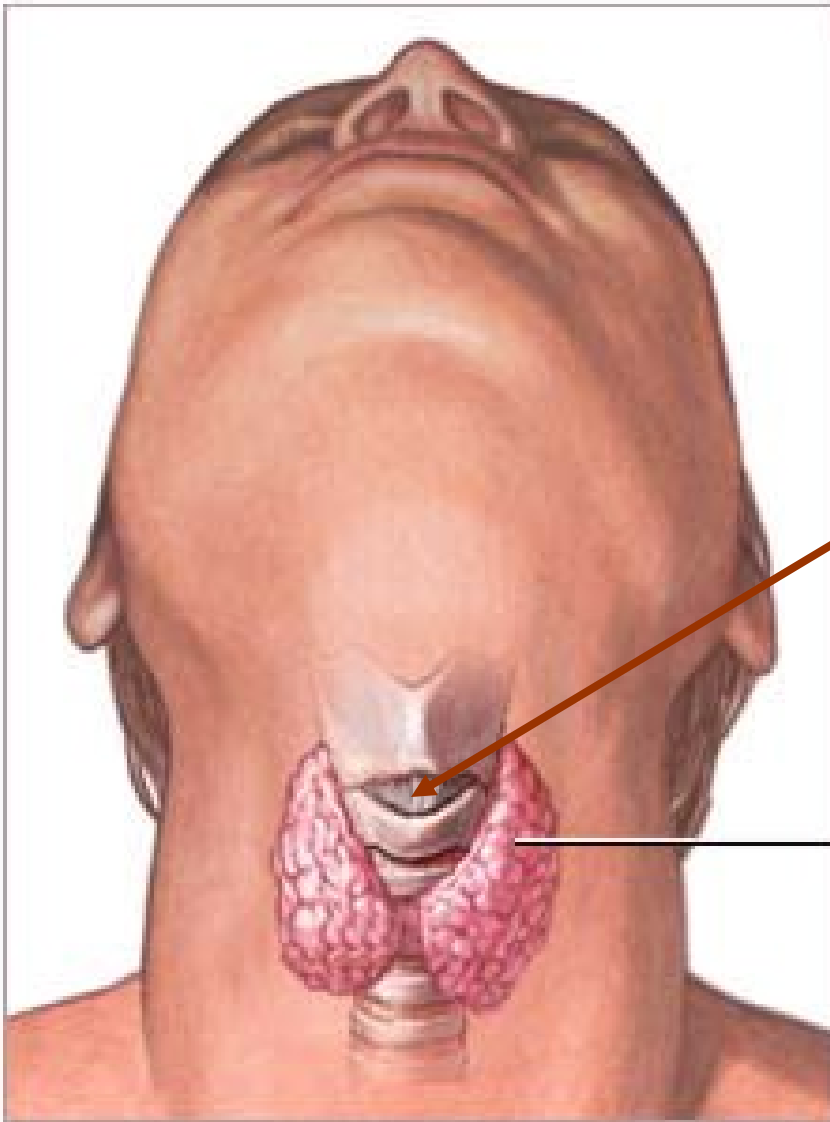
Tracheotomy  
- cut between  
1<sup>st</sup> and 2<sup>nd</sup> or  
2<sup>nd</sup> and 3<sup>rd</sup>  
Tracheal  
cartilages

# THYROID GLAND - LOTS OF VEINS

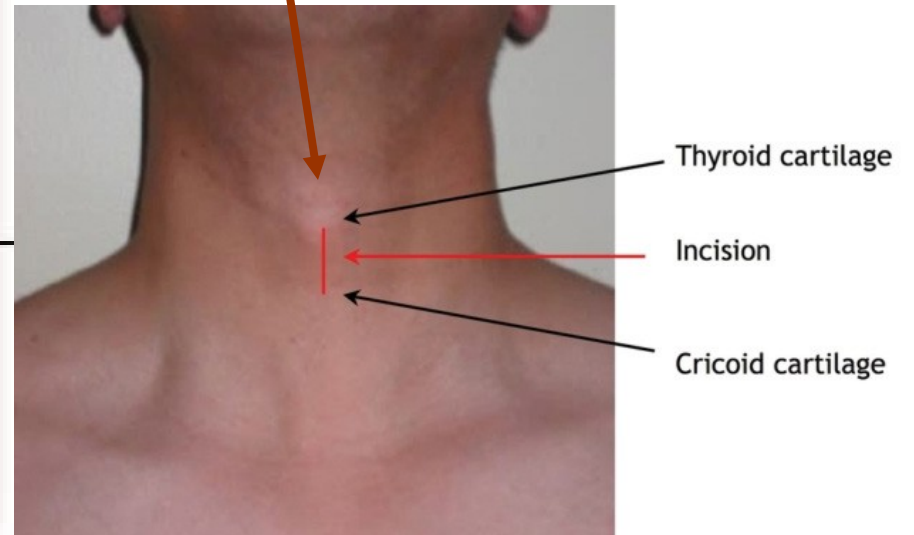


# OBSTRUCTION OF LARYNX: CRICOTHYROTOMY

**CLINICALLY IMPORTANT:  
IN ANAPHYLACTIC SHOCK,  
INSERT TUBE TO  
CRICOTHYROID  
MEMBRANE (LESS BLEEDING)**



**Cricothyroid  
Membrane**



Thyroid cartilage

Incision

Cricoid cartilage

