

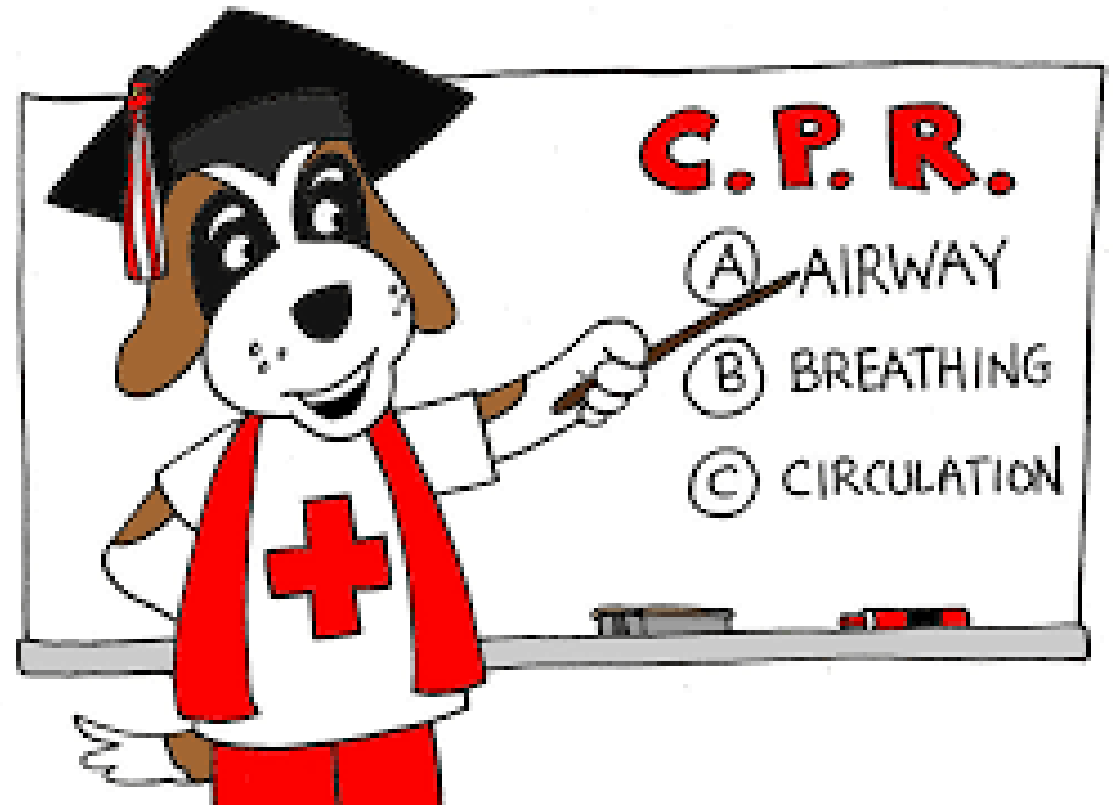
LARYNGEAL ANATOMY & PHYSIOLOGY

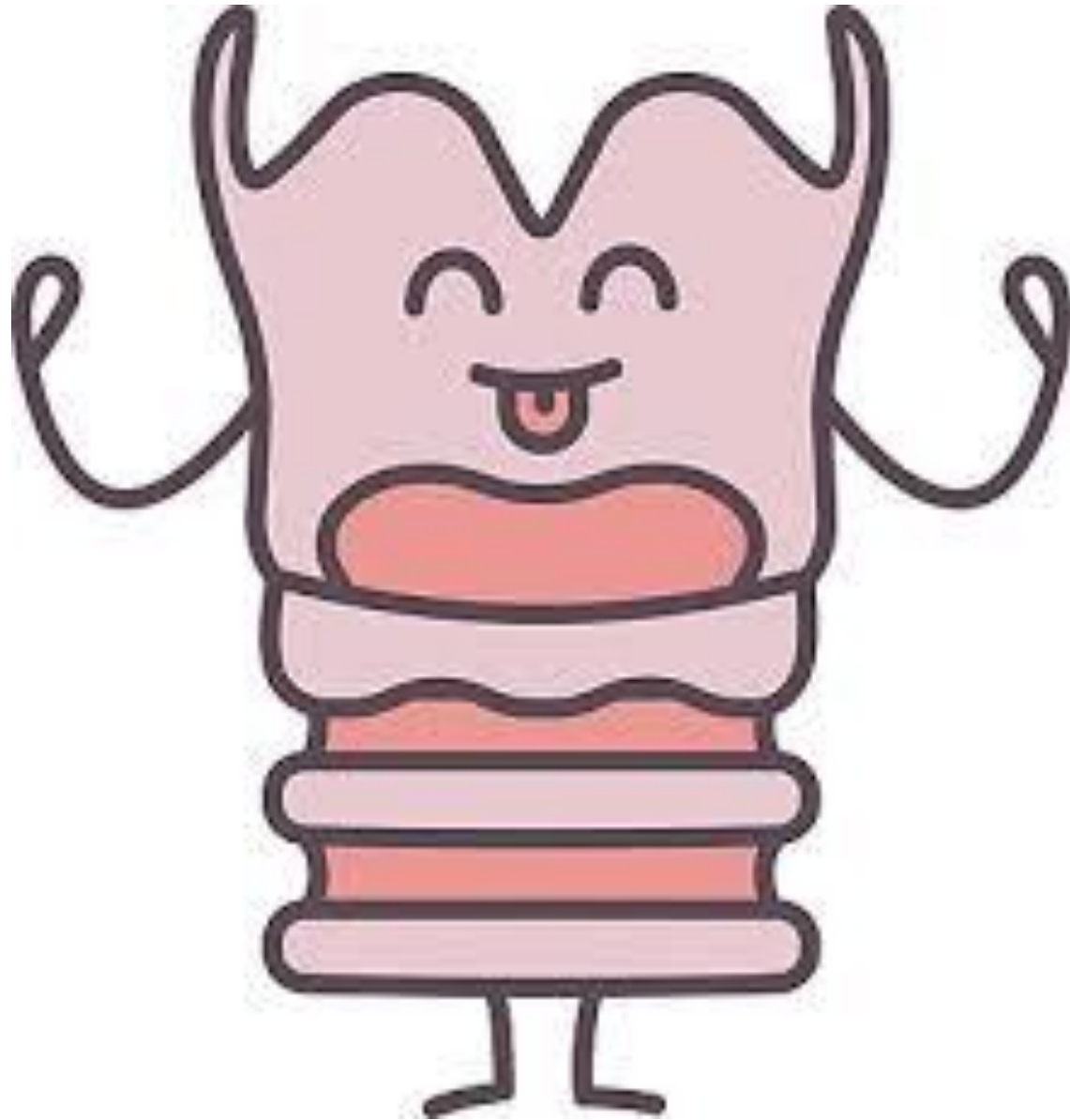
JULIE WINSTON, MD

JOHNS HOPKINS VOICE CENTER

@ GREATER BALTIMORE MEDICAL CENTER

*AIRWAY,
BREATHING
AND
CIRCULATION*





OUTLINE

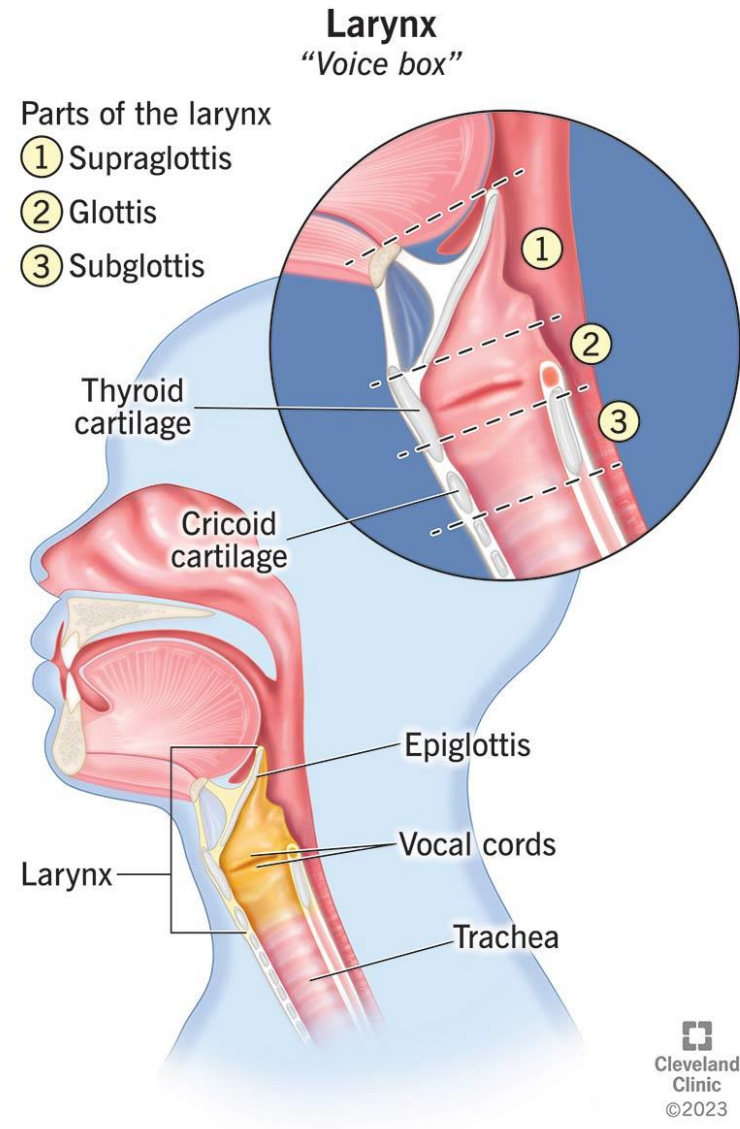
- Laryngeal Function
- Laryngeal Anatomy
- Laryngeal Neurophysiology
- Voice Production

Laryngeal Function:

Respiration

Airway protection

Voice



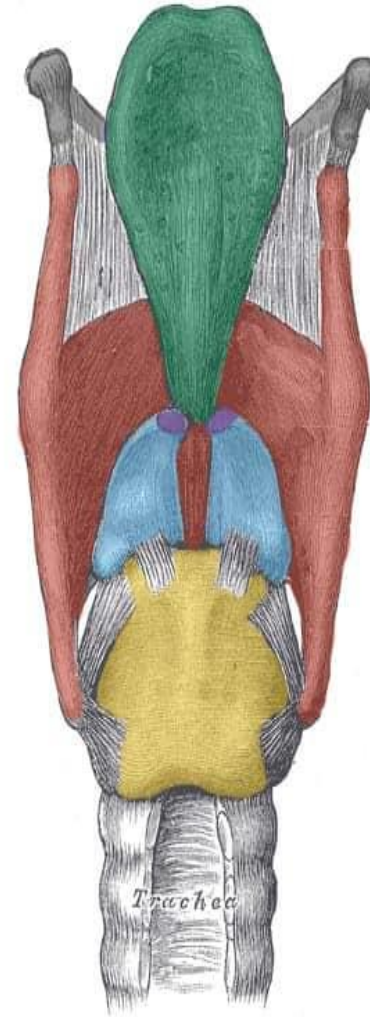
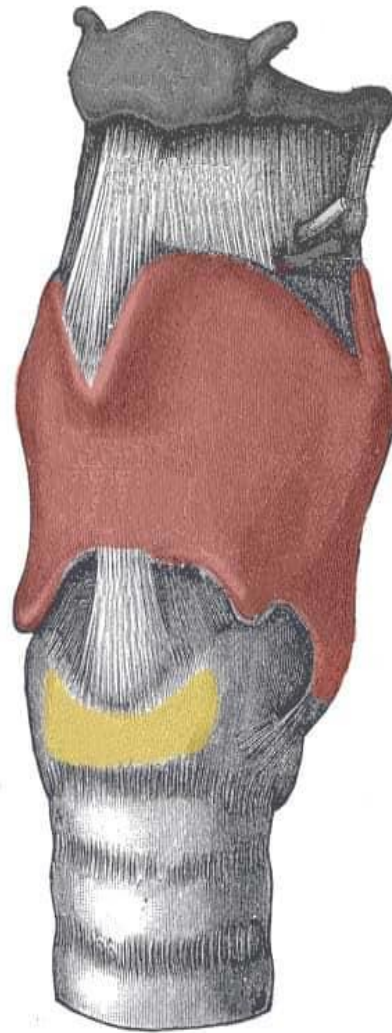
Separation of Respiration and Swallowing

- Shield-like shape of epiglottis, height of aryepiglottic folds
- Lateral diversion of food into piriform fossae
- Elevation of larynx during swallowing

Laryngeal Anatomy

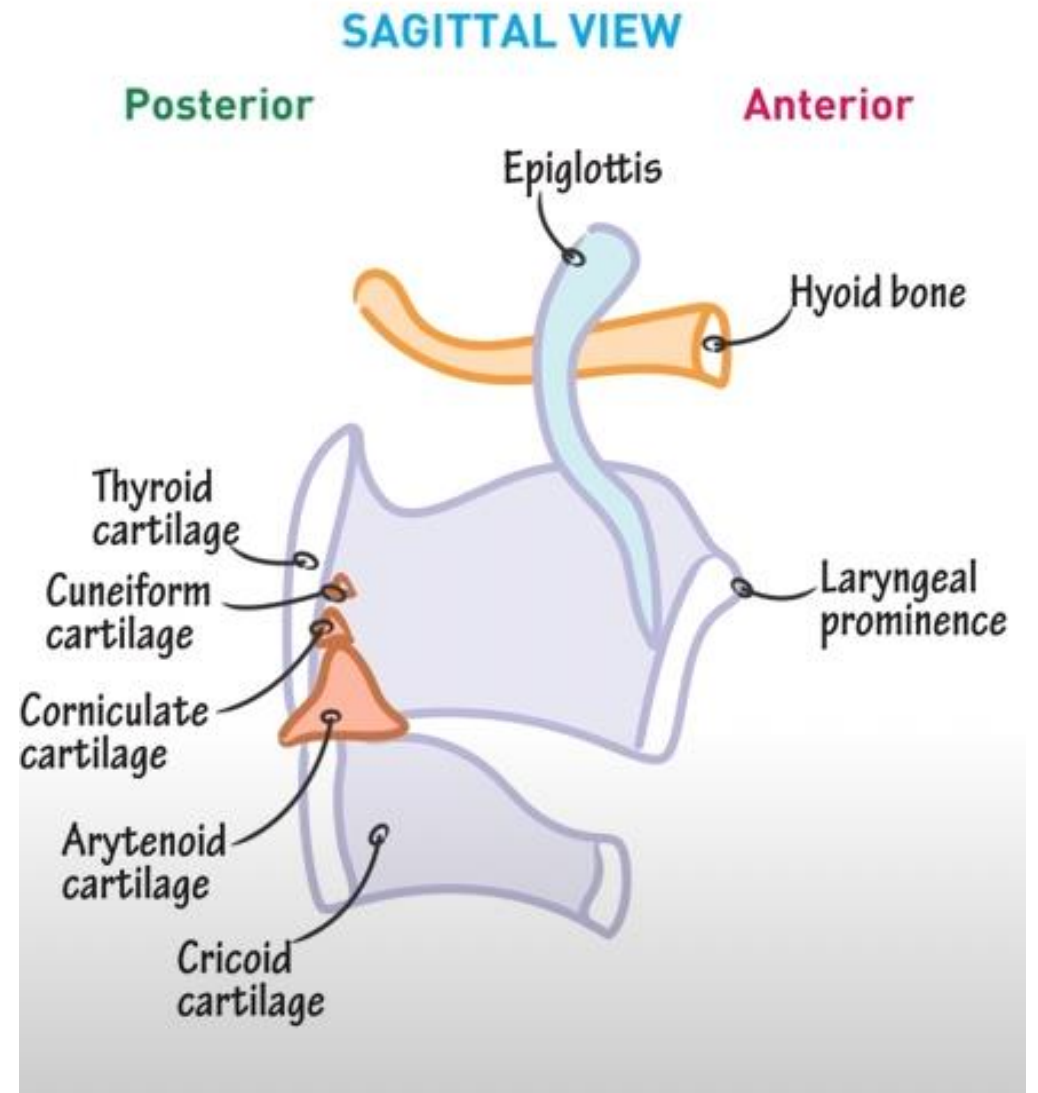
- Cartilaginous
- Ligaments/Fibroelastic Membrane
- Muscular
- Neurologic
- Vasculature

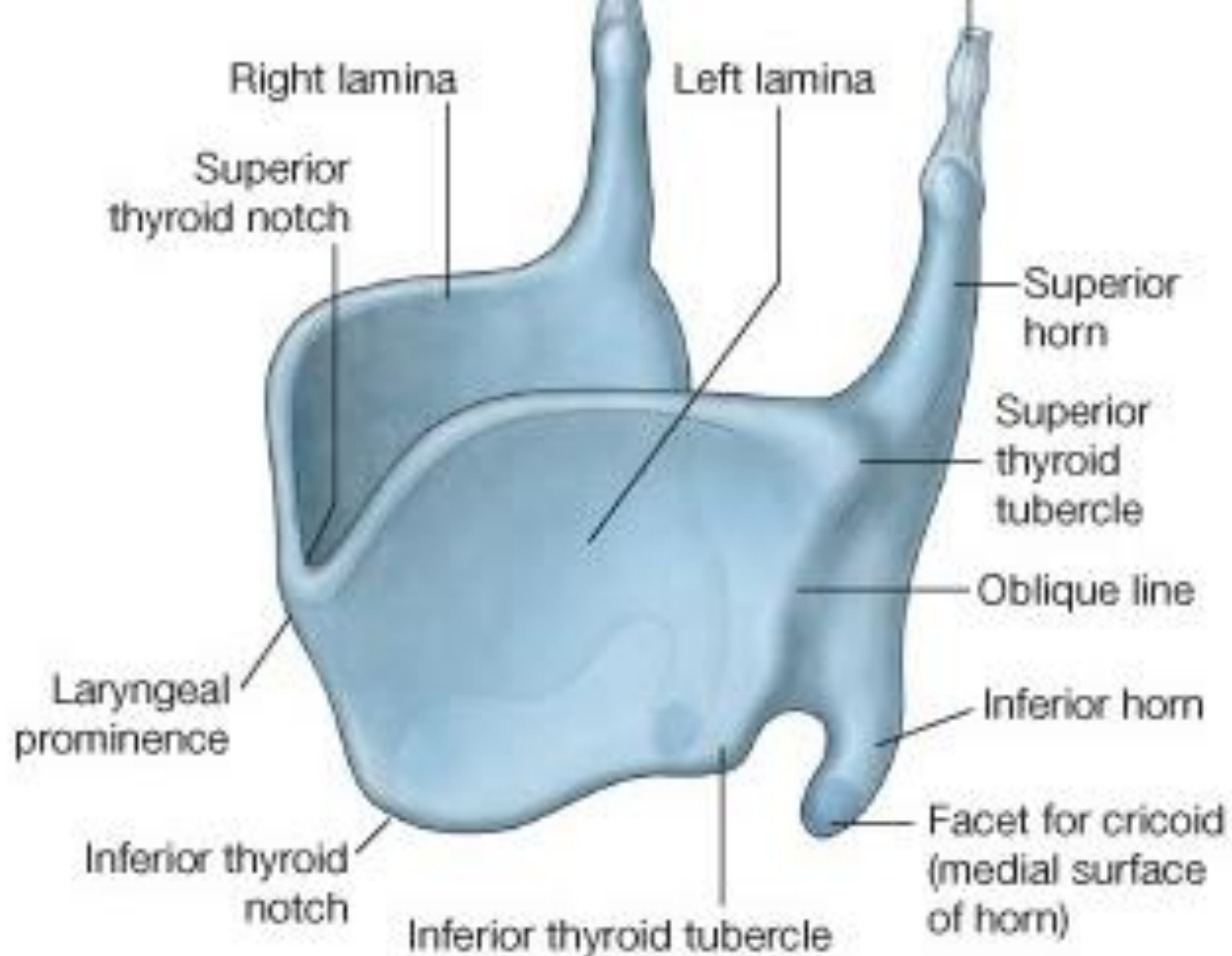
LARYNGEAL SKELETON

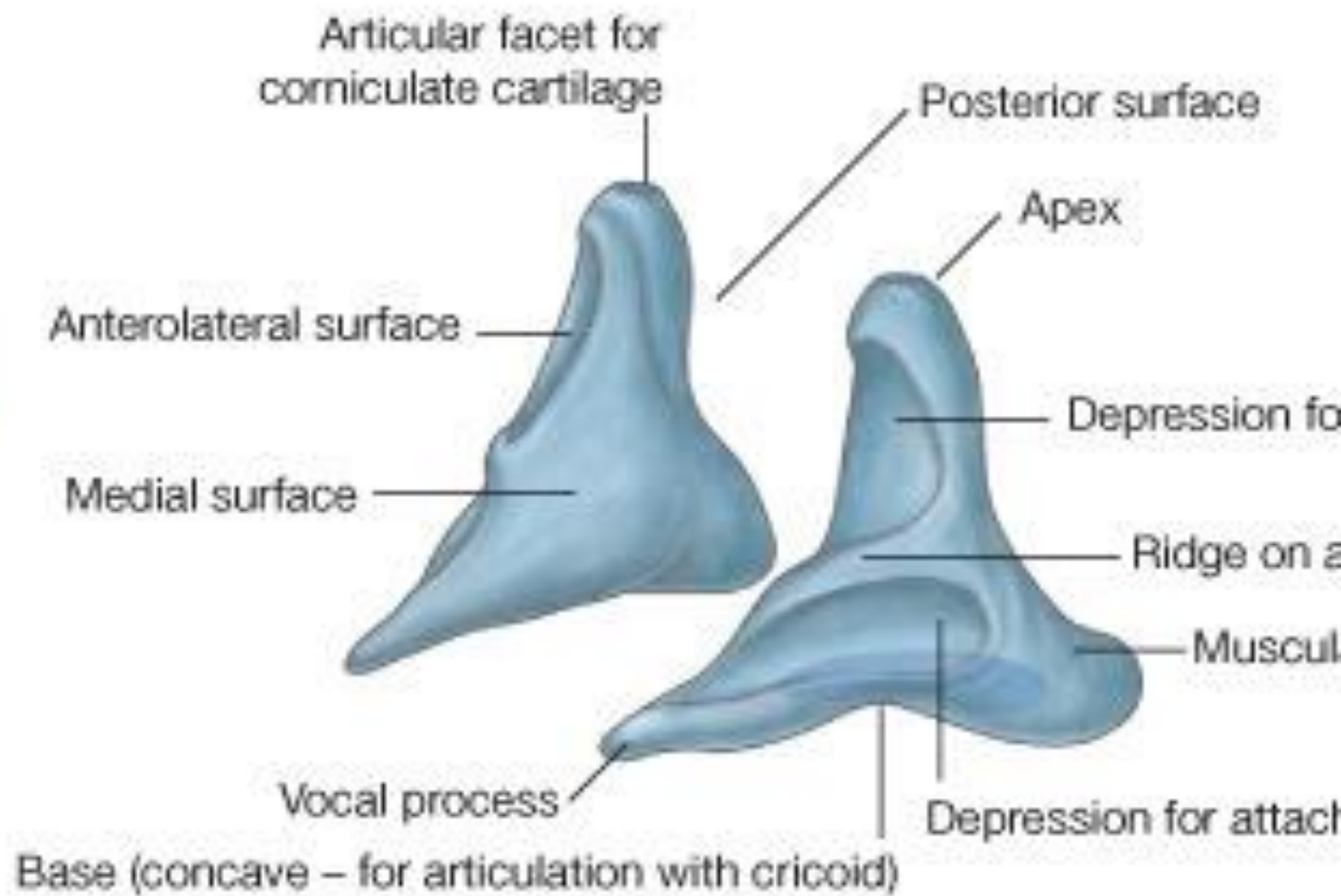


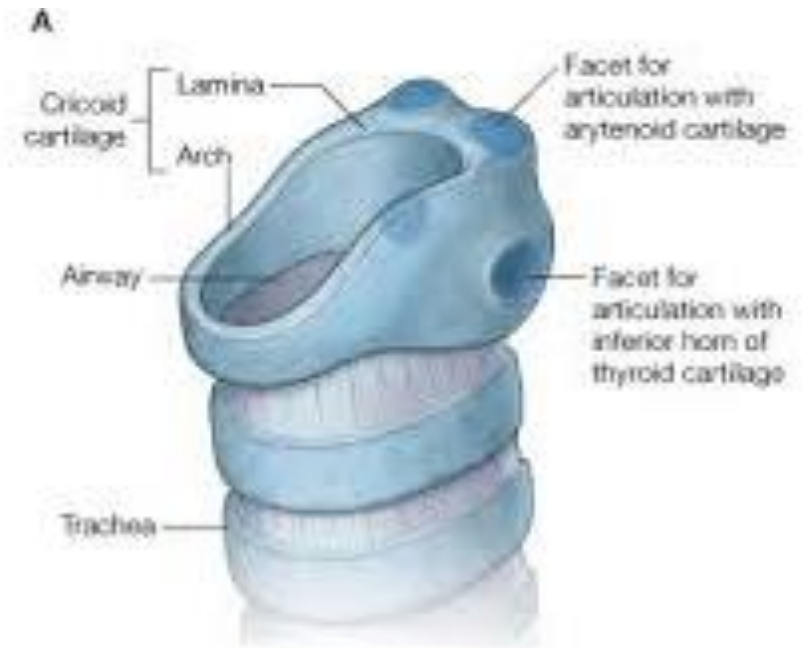
- Epiglottis
- Thyroid cartilage
- Arytenoid cartilages
- Cricoid cartilage
- Corniculate cartilage

SAGITTAL VIEW OF LARYNGEAL CARTILAGE







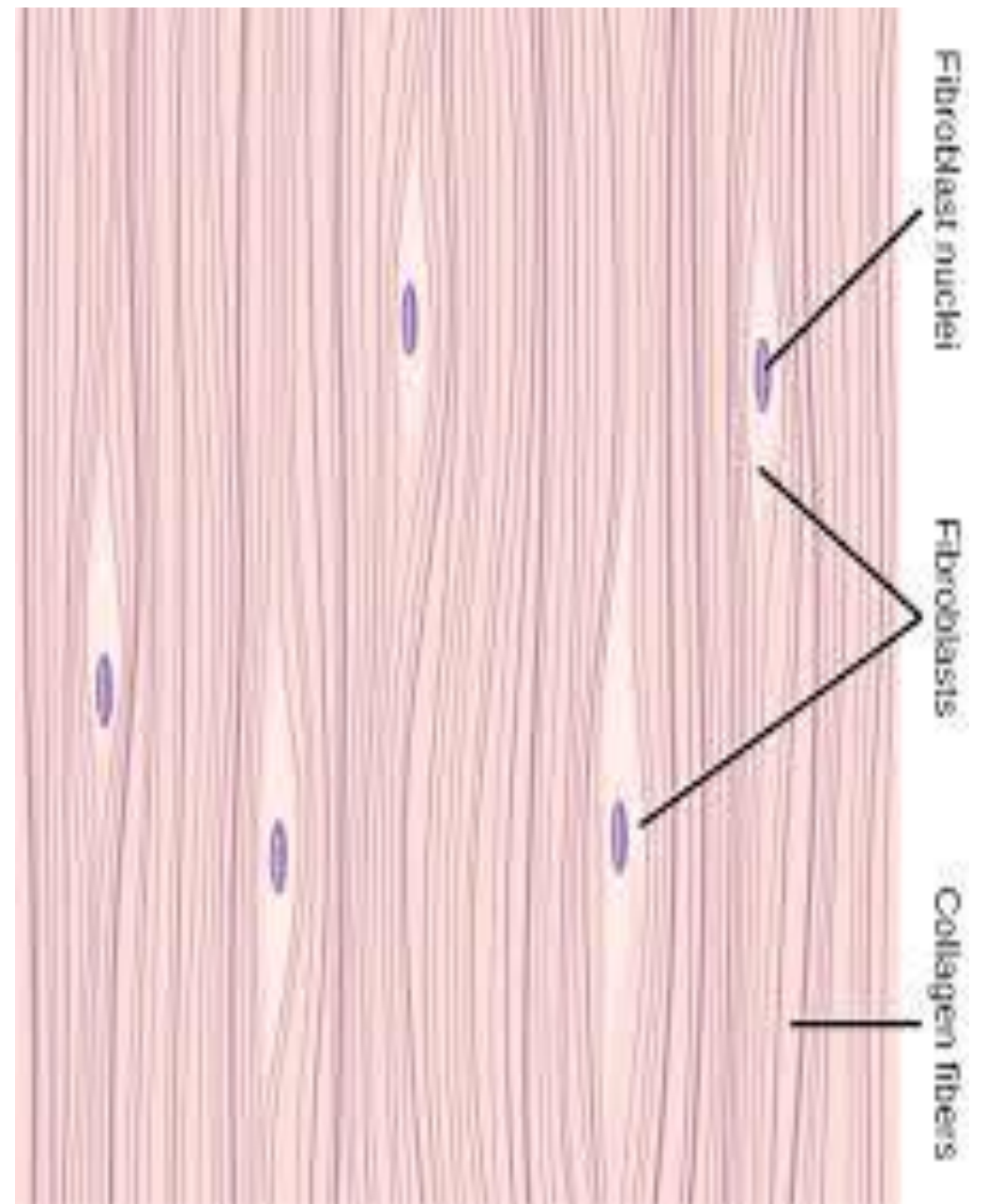


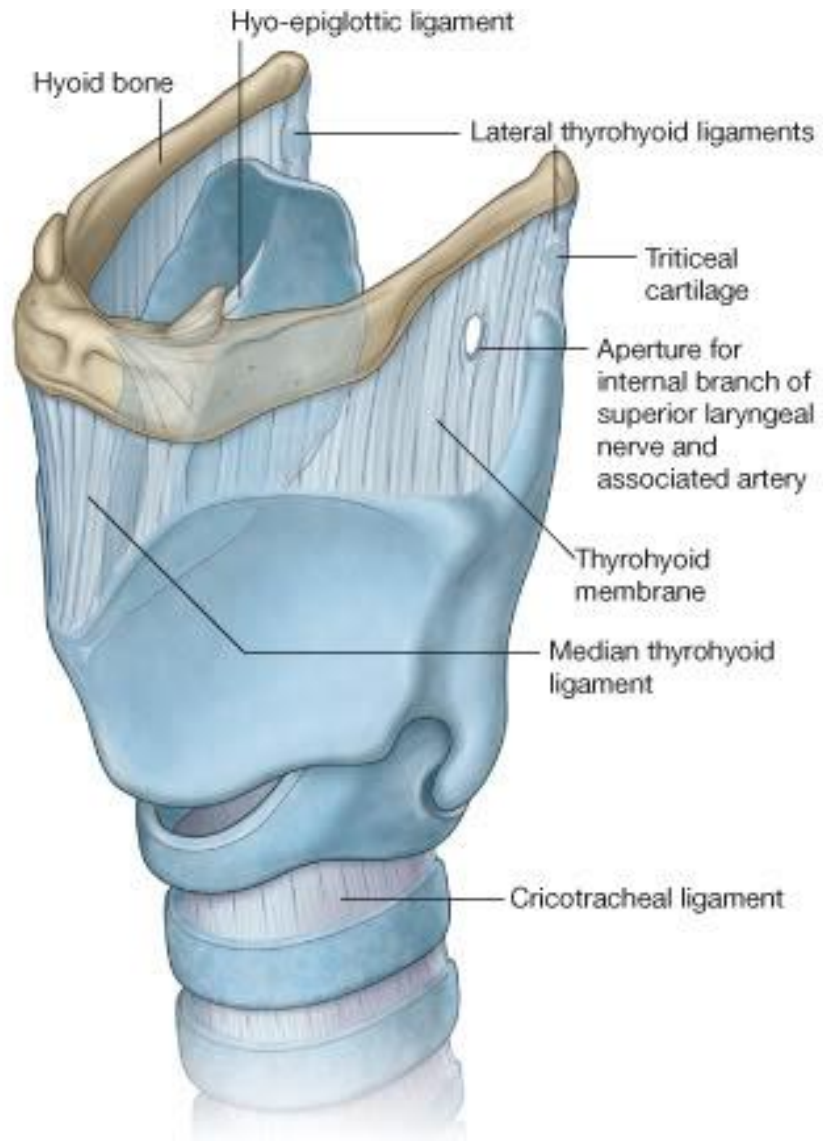
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Cricoid cartilage – Signet ring

LIGAMENTS

- Extrinsic:
 - Thyrohyoid membrane
 - Cricotracheal
 - Hyoepiglottic





Thyrohyoid Membrane

Cough and SLN Injections

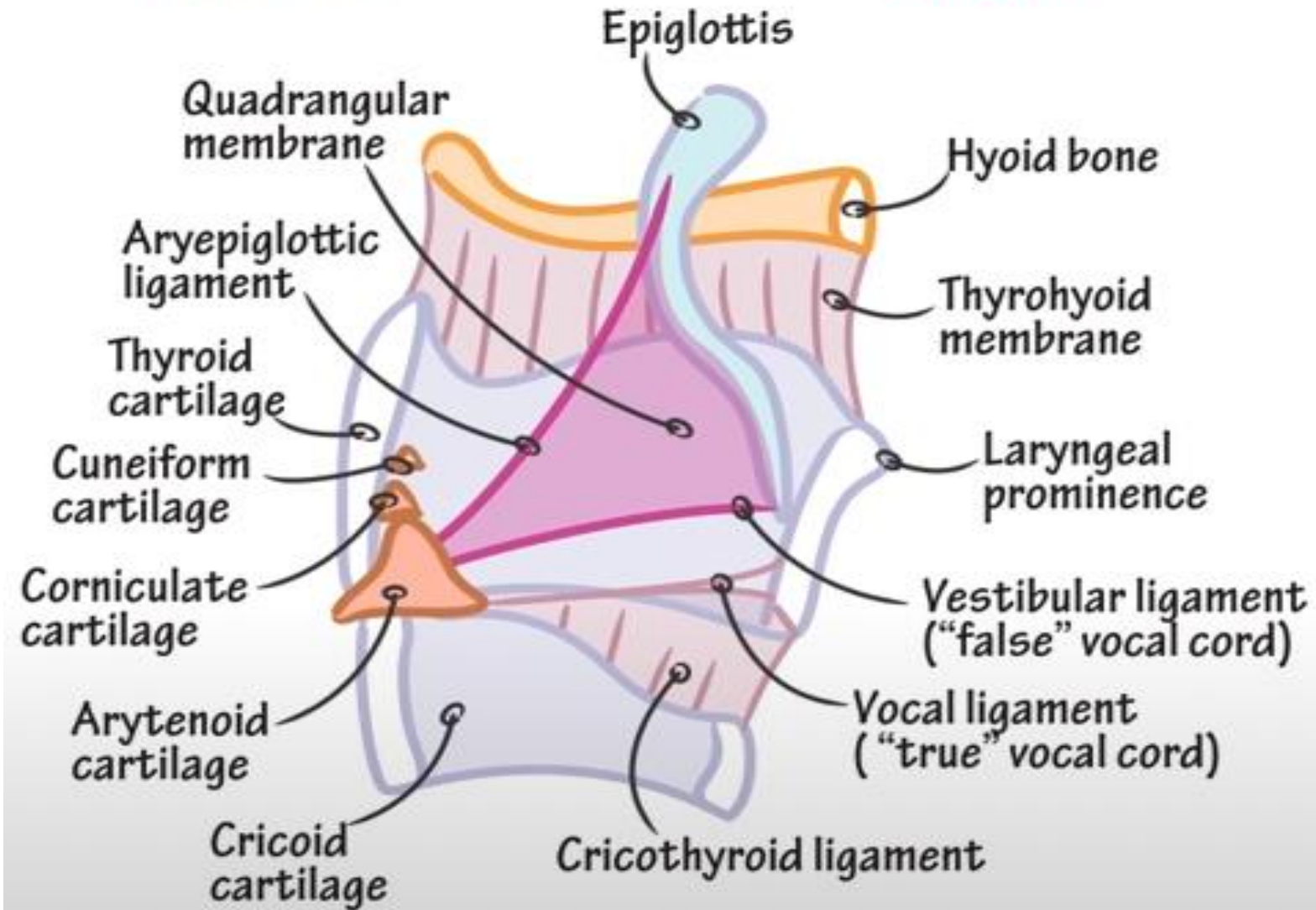
LIGAMENTS AND FIBROELASTIC MEMBRANE

- Intrinsic Ligaments
 - Quadrilateral Membrane: Aryepiglottic fold to the False Vocal Fold
 - Cricothyroid Ligament or Conus Elasticus: Vocal ligament to Cricoid cartilage

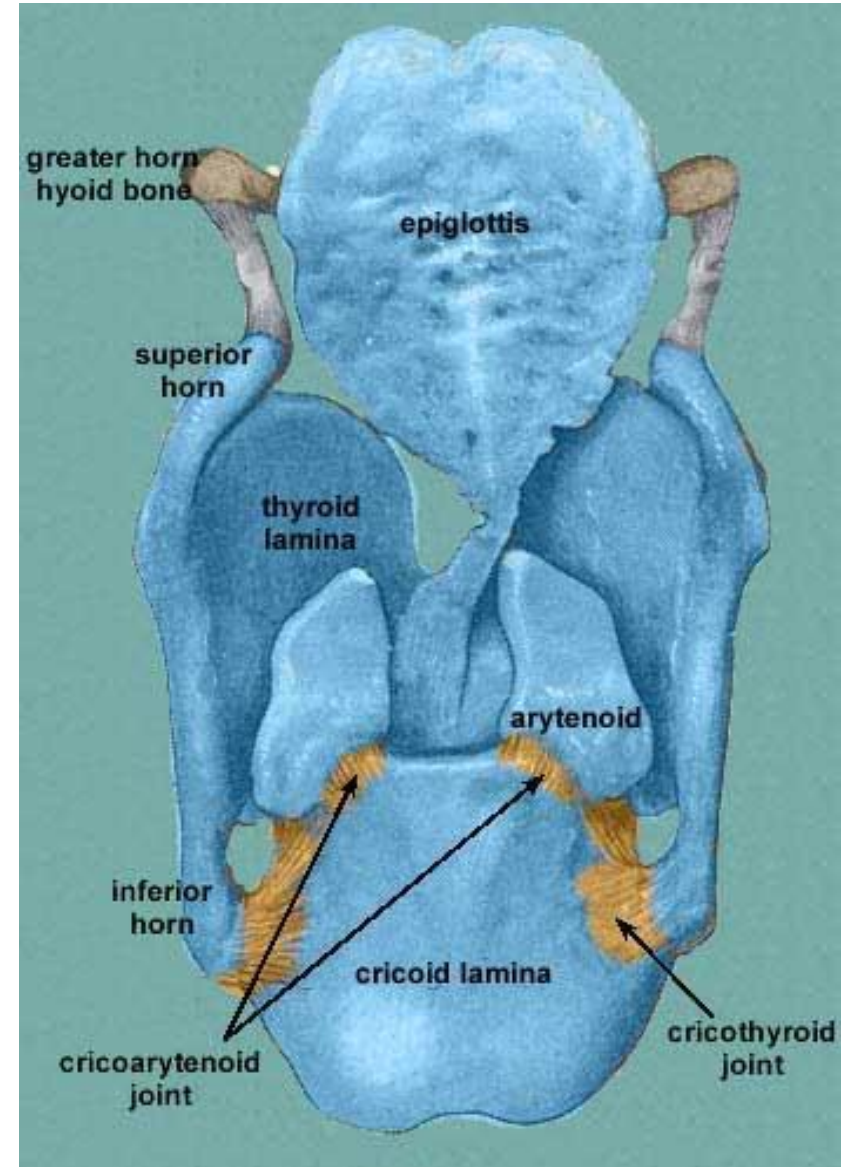
SAGITTAL VIEW

Posterior

Anterior



LARYNGEAL JOINTS

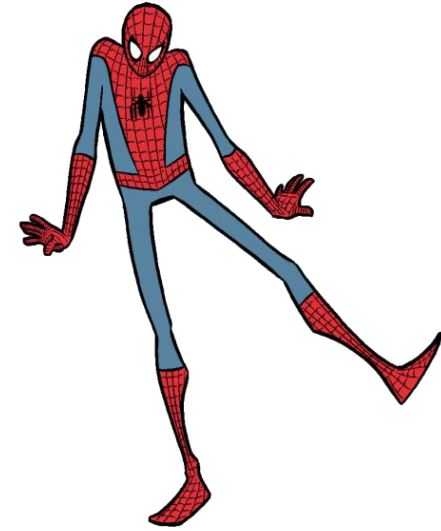


LARYNGEAL ANATOMY

- CARTILAGENOUS FRAMEWORK
- LIGAMENTS AND FIBROELASTIC MEMBRANE
- MUSCLES
- NERVE SUPPLY
- VASCULATURE

Musculature

INTRINSIC AND EXTRINSIC



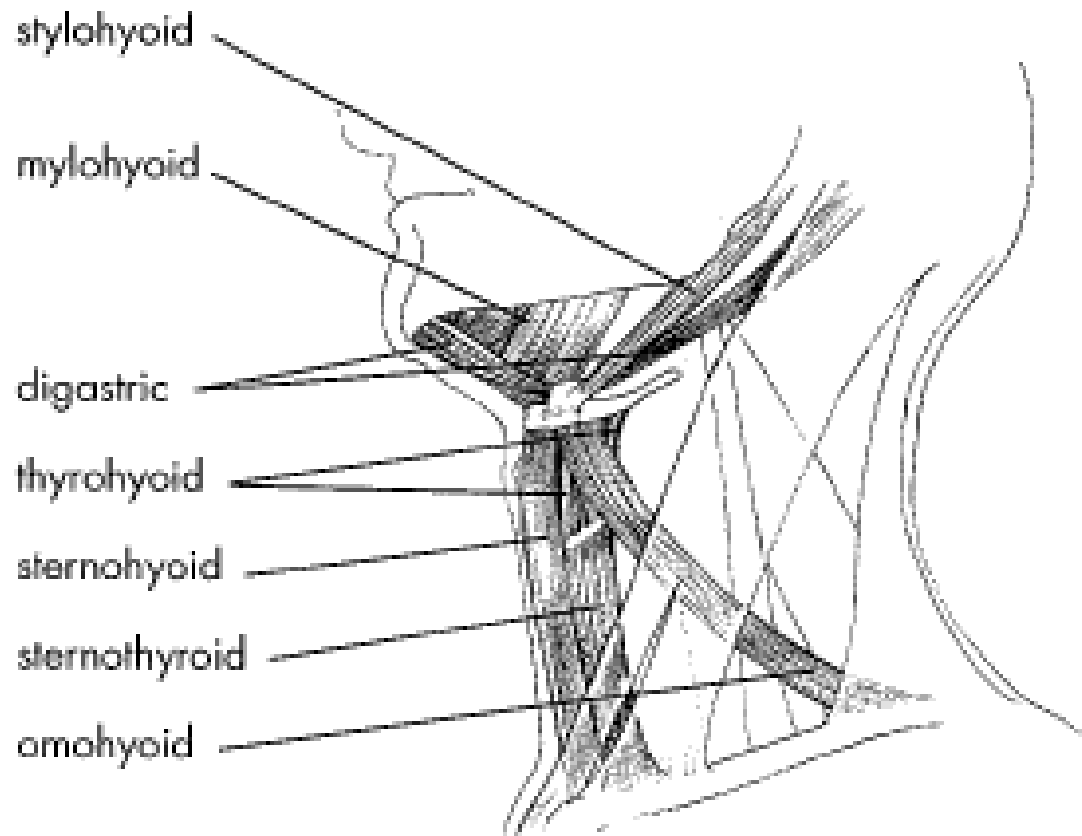
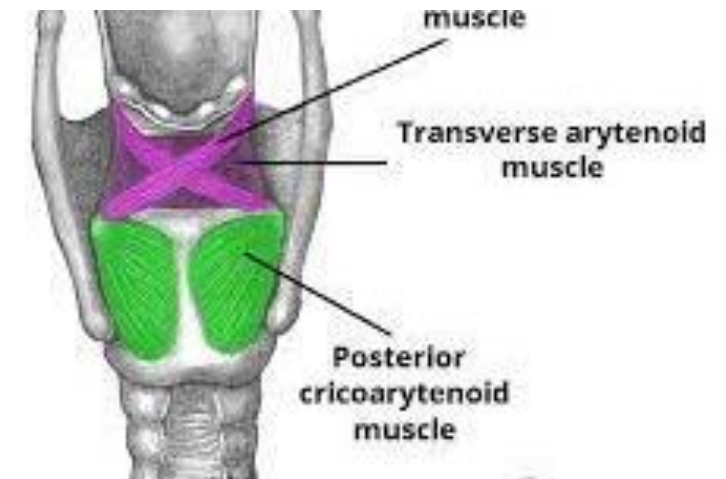
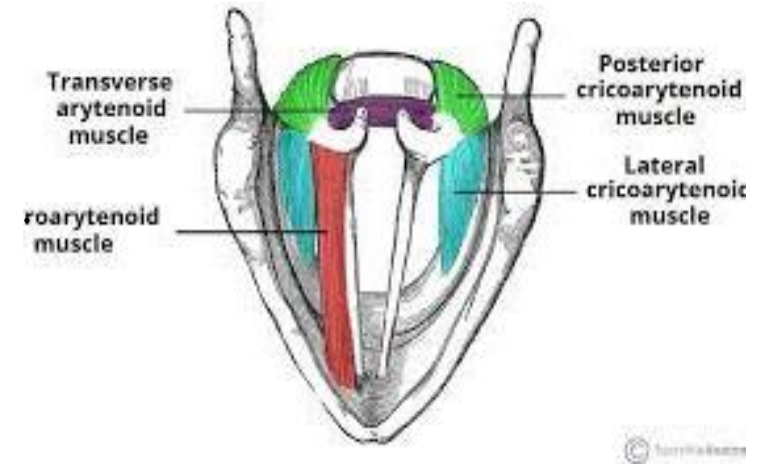


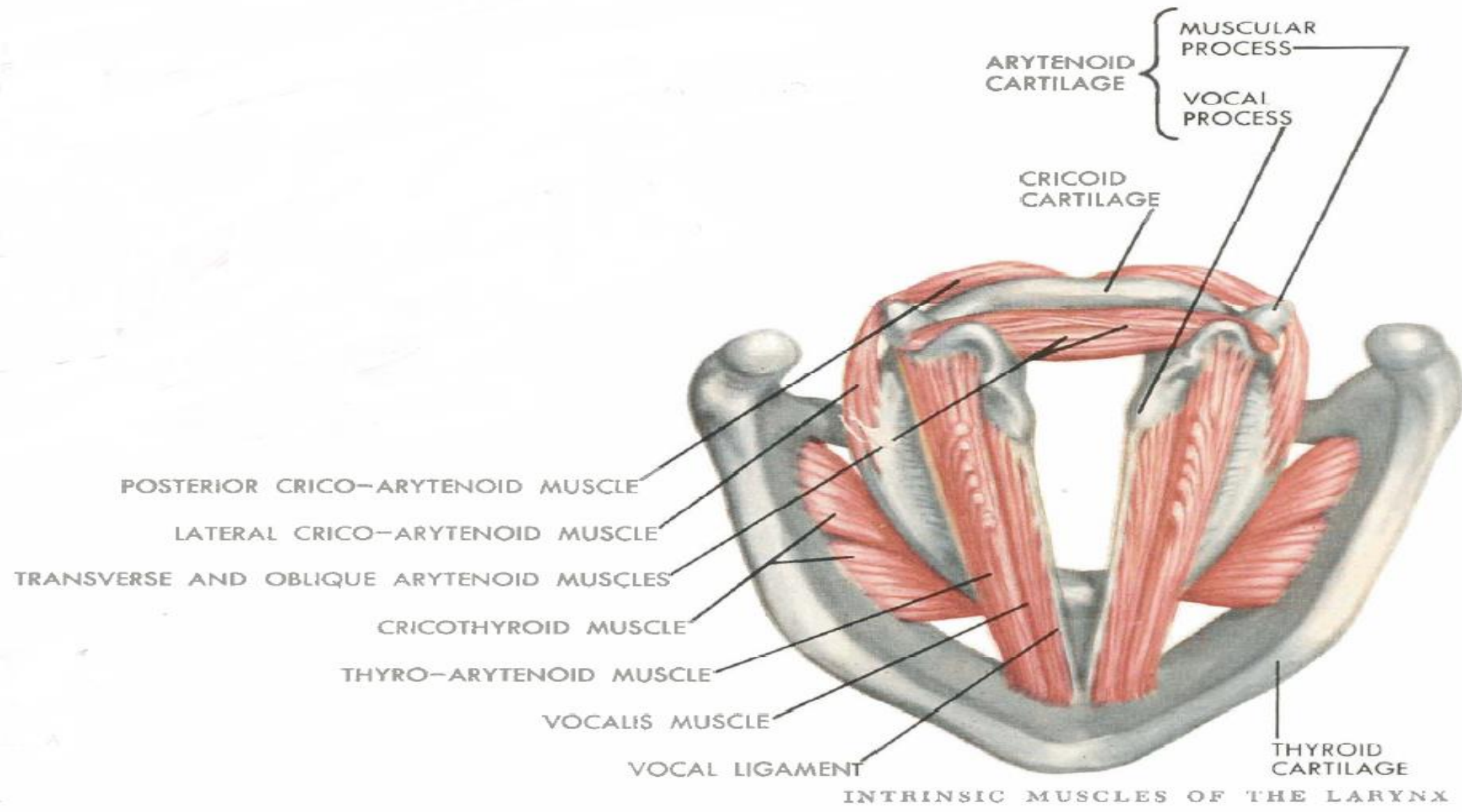
Figure 18 *Extrinsic laryngeal muscles, lateral*

EXTRINSIC MUSCLES

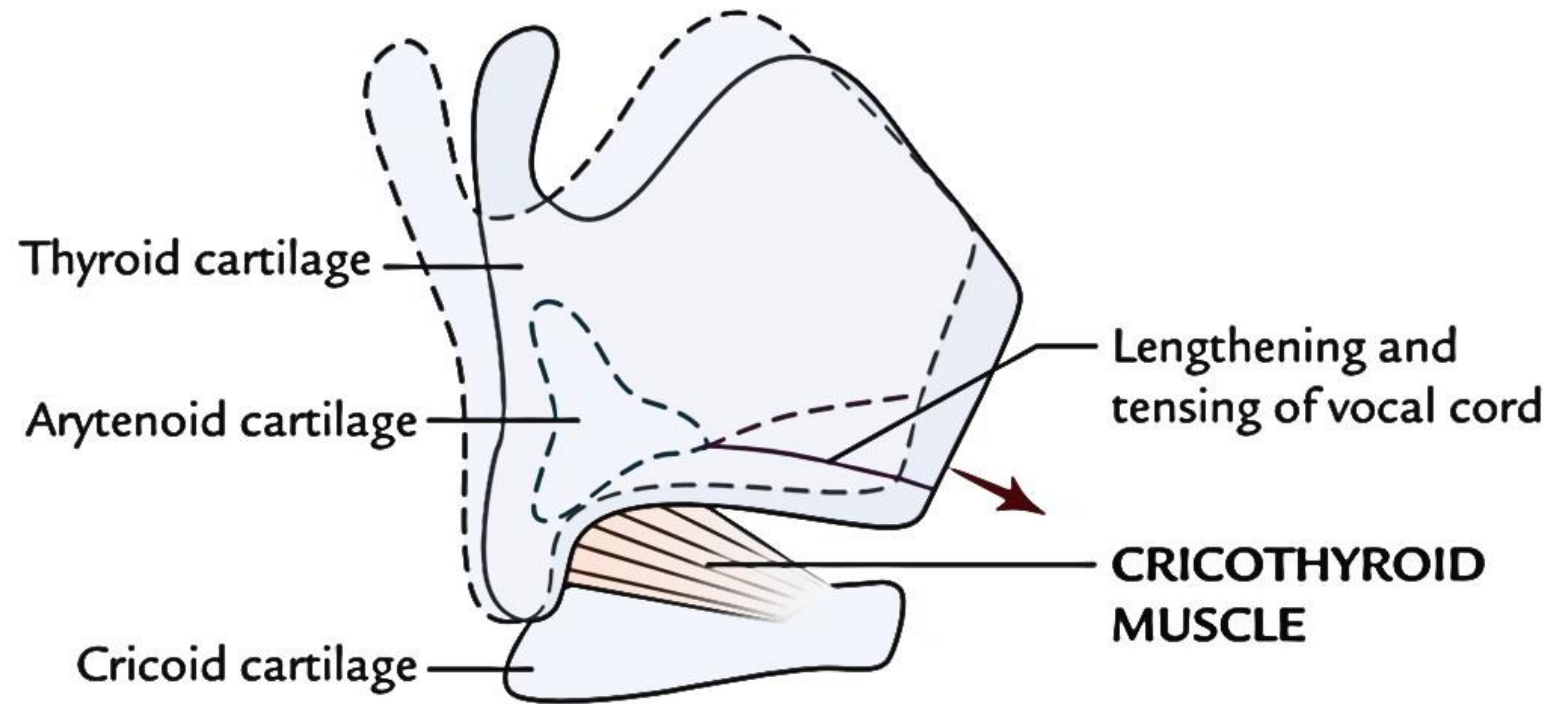
- Responsible for supporting and positioning the larynx for speech, swallowing, and airway protection.
- Can move the entire vocal complex up or down the distance of one vertebra.

INTRINSIC LARYNGEAL MUSCULATURE





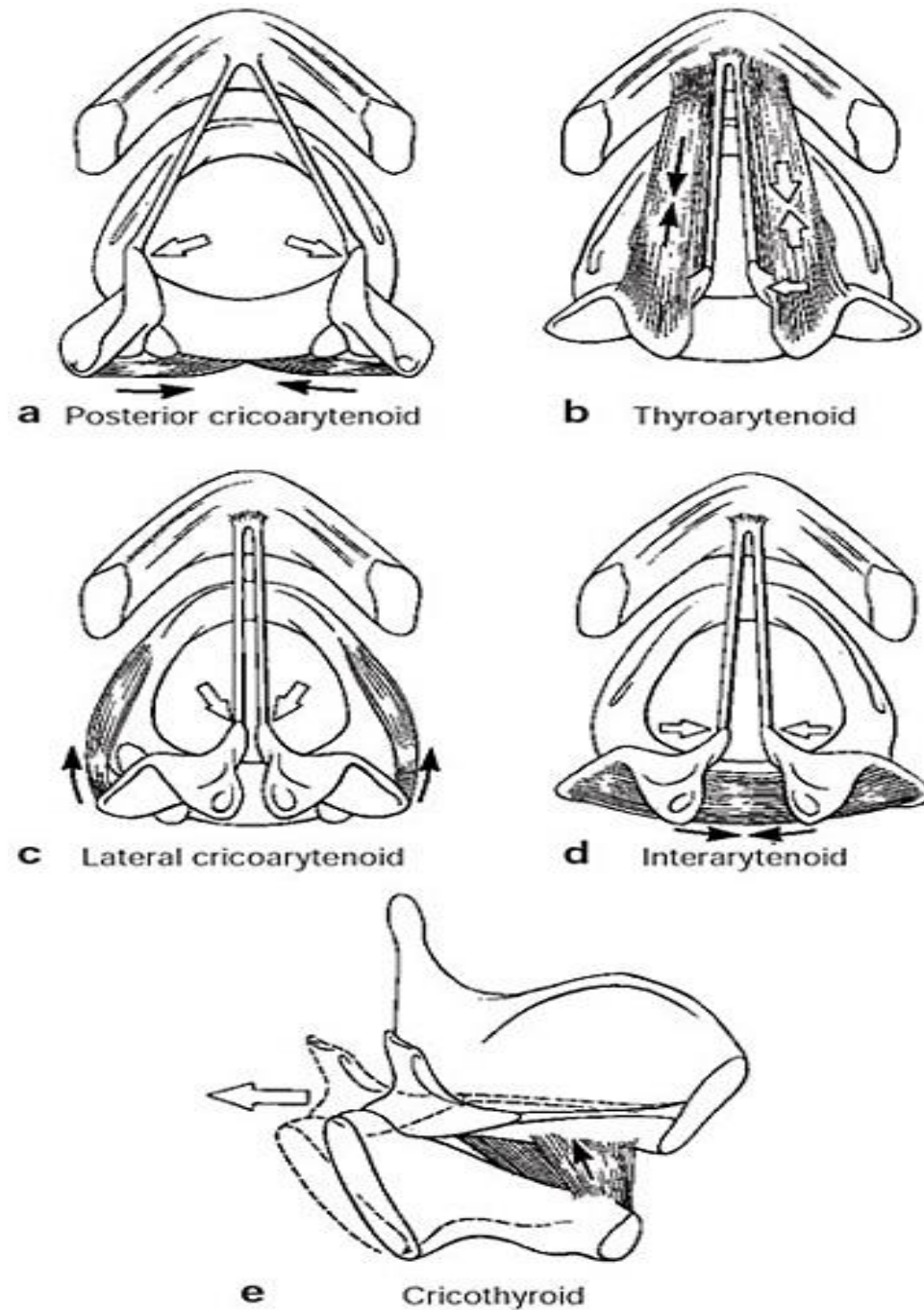
Movement of cricothyroid muscle



Neurophysiology of Muscular Larynx

Nerve	Muscle	Action
Superior laryngeal (external division)	Cricothyroid muscle	Adductor, lengthen
Recurrent laryngeal	Thyroarytenoid muscle	Adductor, shortens
	Lateral cricoarytenoid muscle	Adductor
	Interarytenoid muscle	Adductor
	Posterior cricoarytenoid muscle	ABductor

Neurophysiology of Muscular Larynx

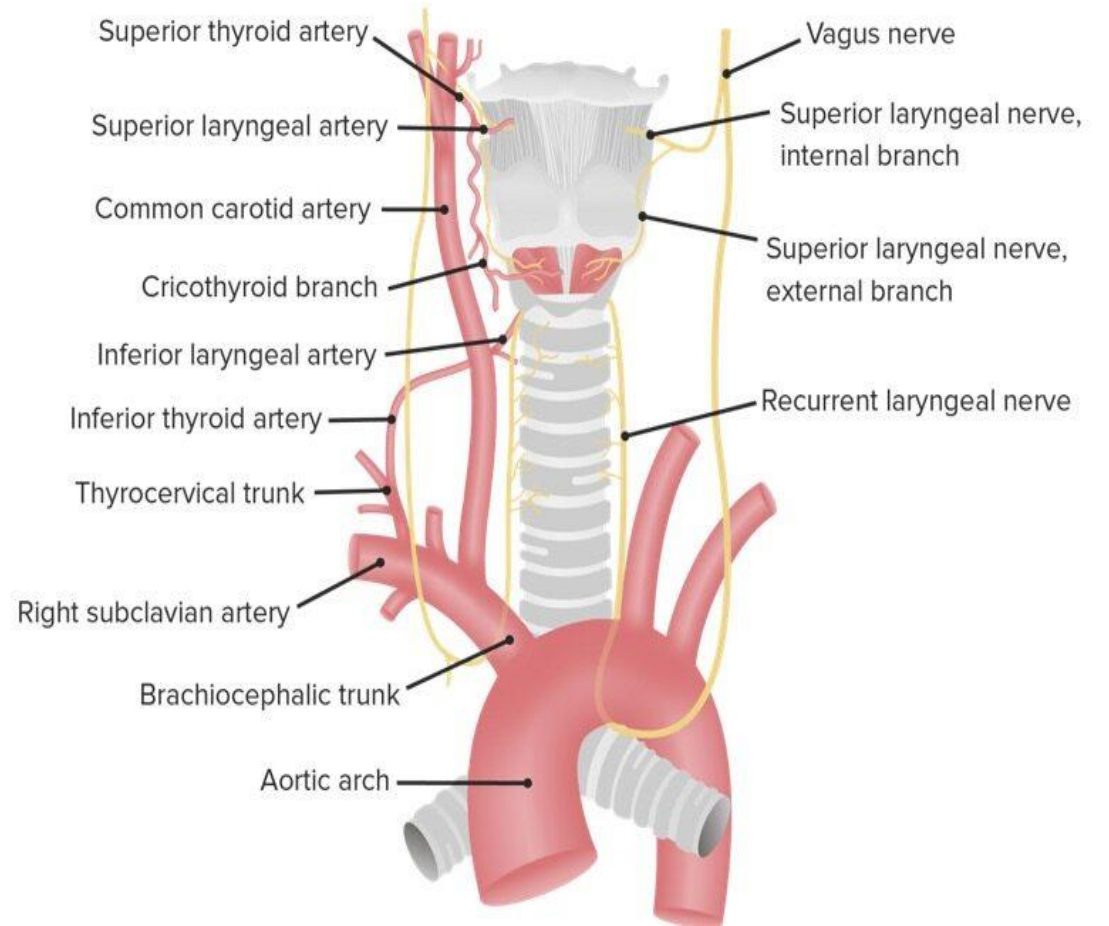


Sensation of Larynx

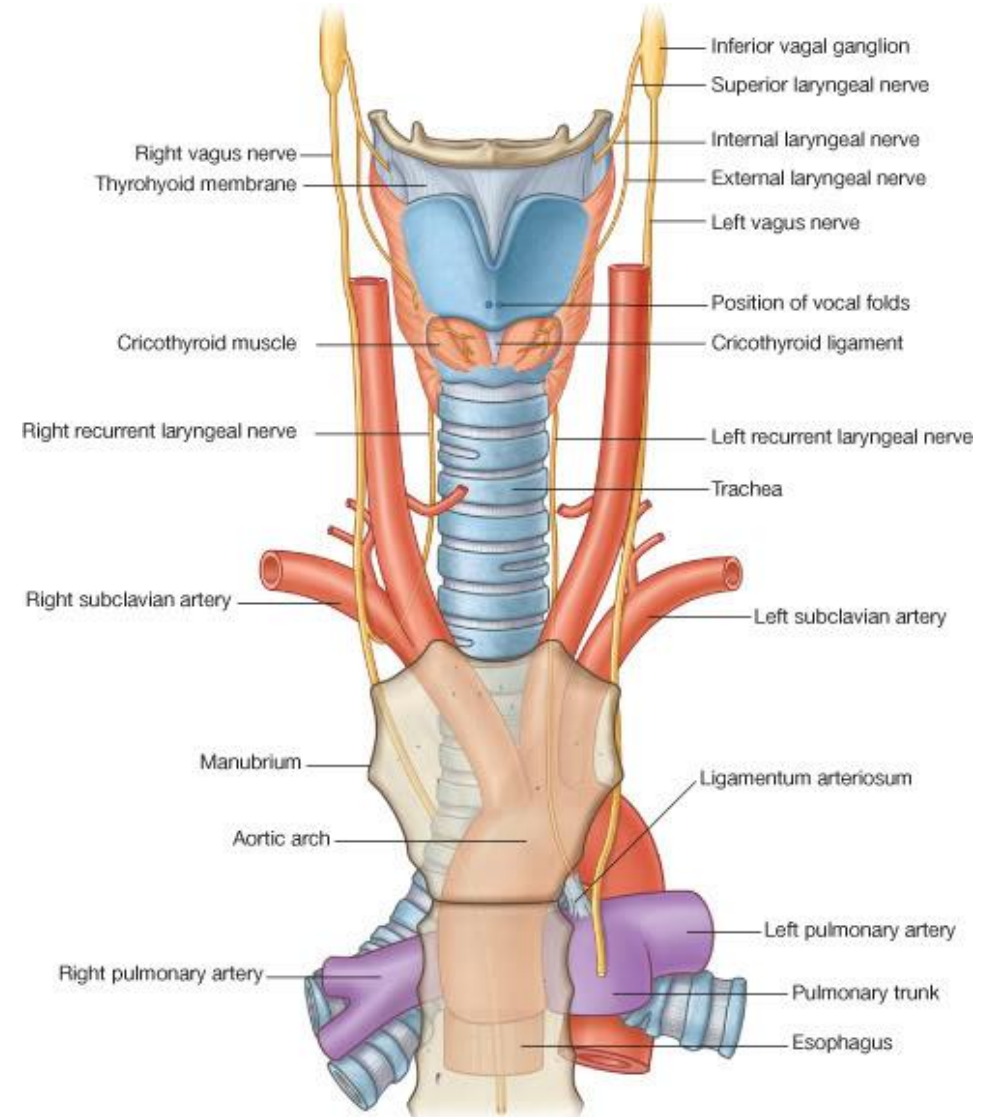
- Superior Laryngeal nerve (internal branch)
 - Superior border of larynx to true vocal folds
- Recurrent Laryngeal nerve
 - Below true vocal folds



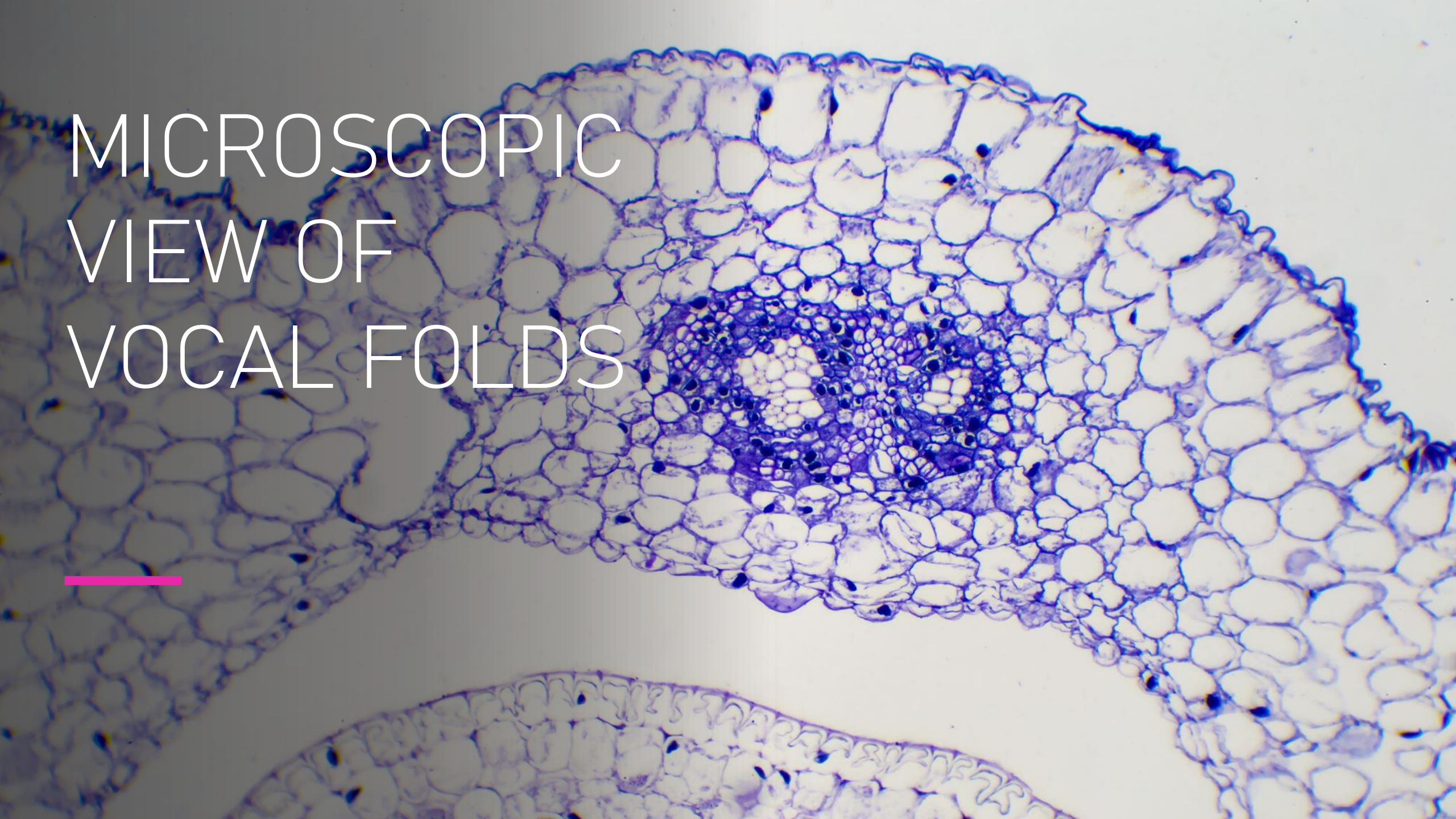
LARYNGEAL INNERVATION & VASCULATURE



Laryngeal Innervation & Vasculature

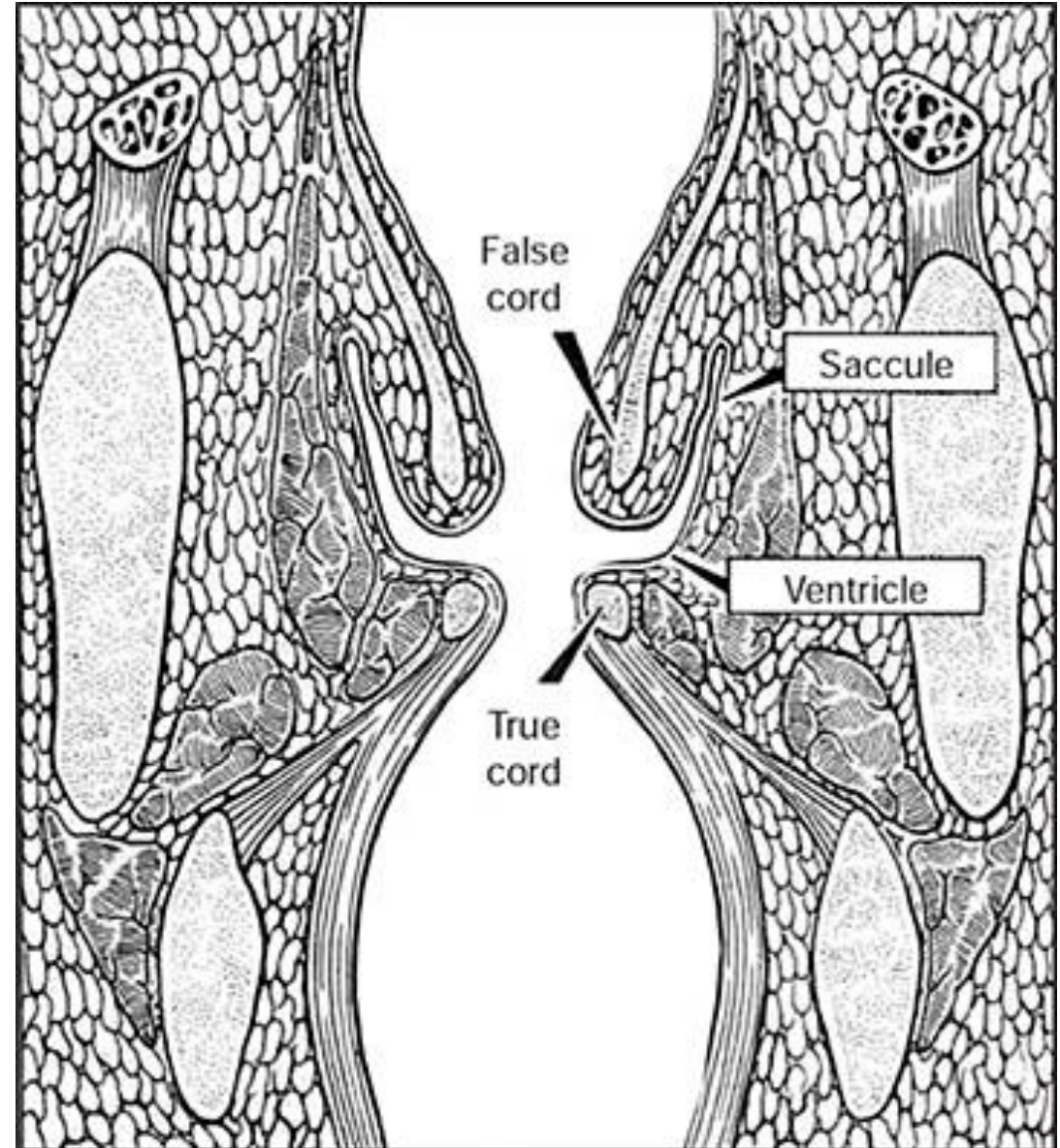


MICROSCOPIC
VIEW OF
VOCAL FOLDS

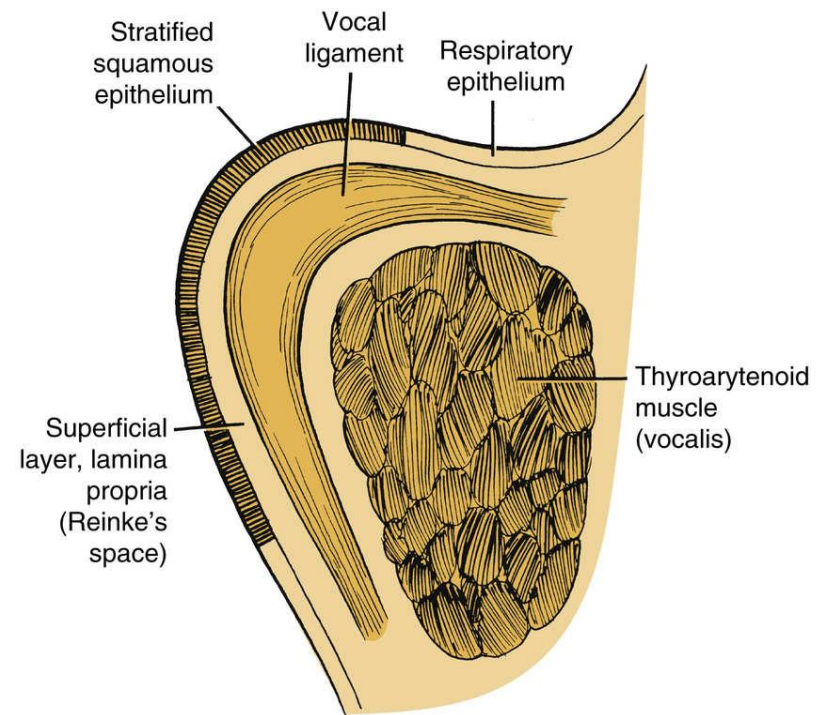


Ventricular Folds (False Vocal Folds)

- Superior and lateral to TVFs
- Space between the TVFs and FVFs is called the Ventricle
- Ideally, the FVFs retract as far away from mid-line as possible during phonation to allow maximum vibratory freedom of the TVFs.

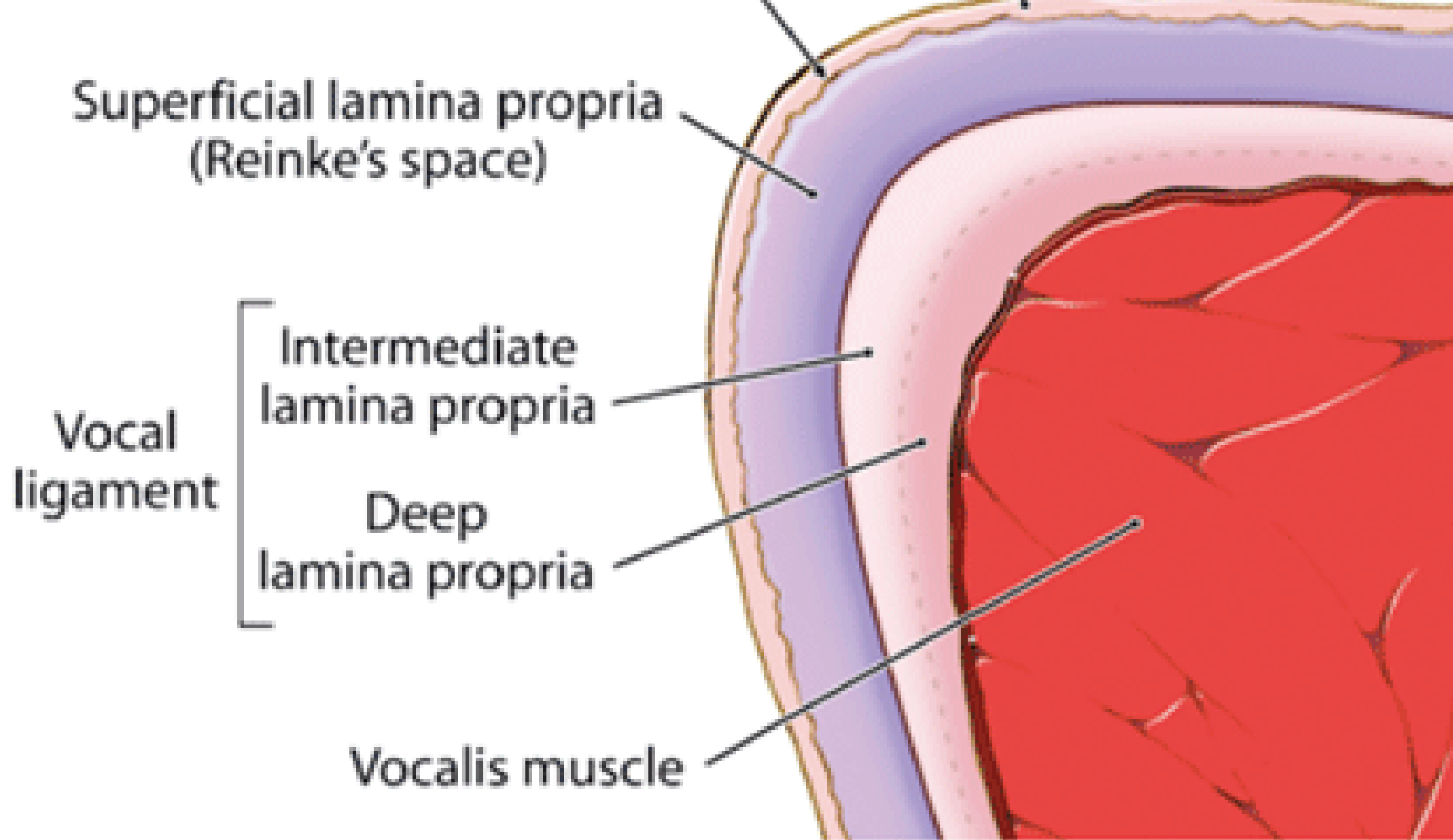


MICROANATOMY OF THE VOCAL FOLD

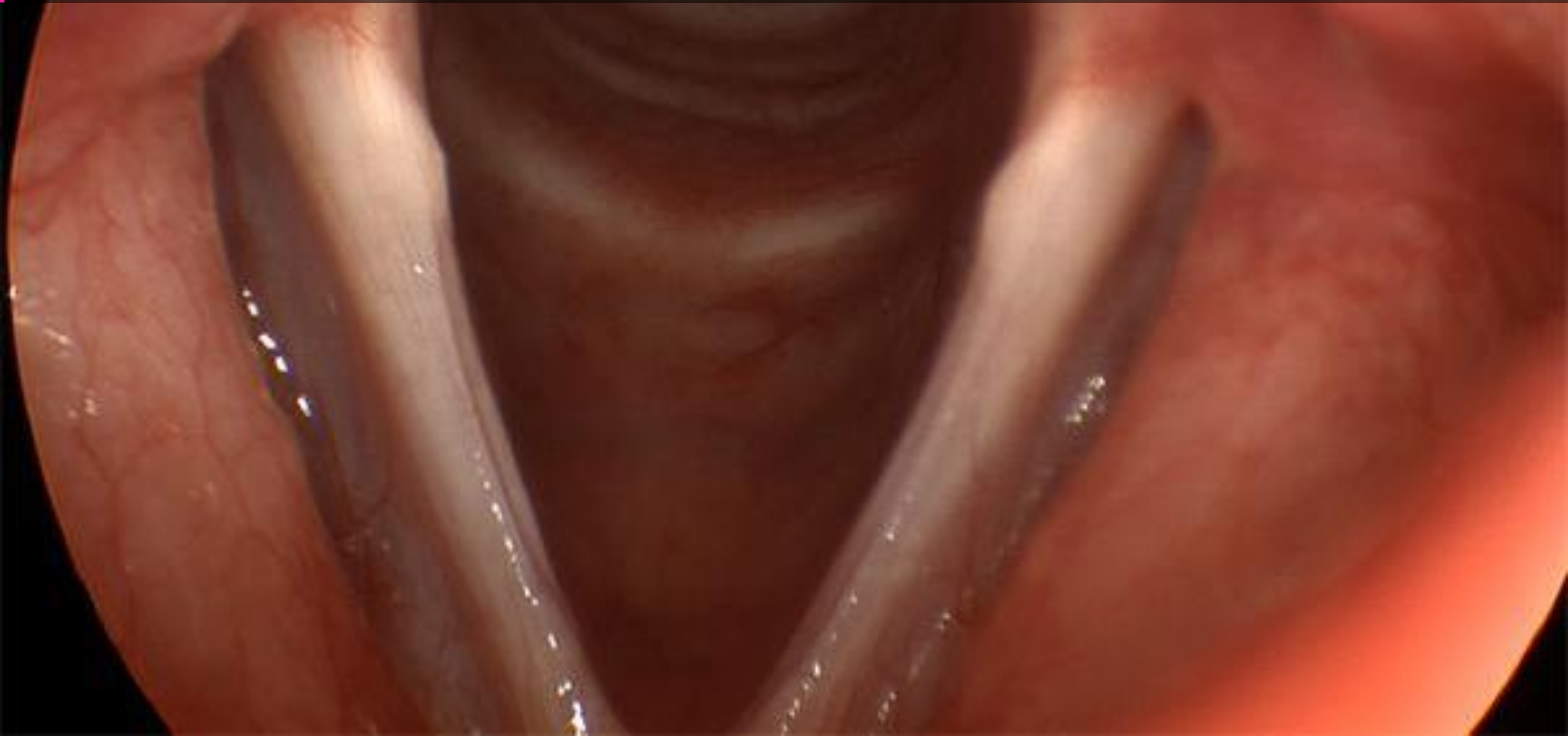


Layered Microstructure

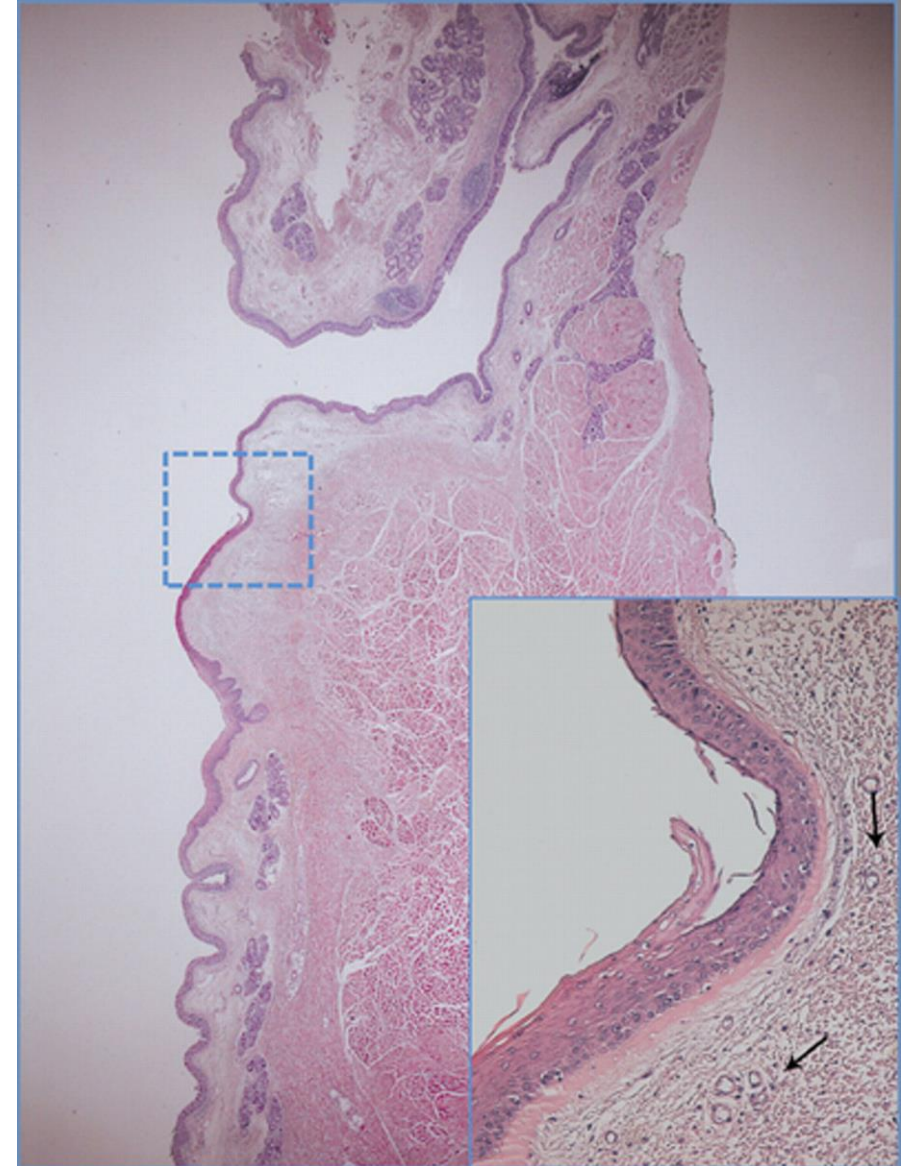
- Epithelium: Non-keratinizing squamous
- SLP: loose fibrous and extracellular matrix; glycoproteins, elastin
- Vocal Ligament: dense collagen



VOCAL FOLD SULCUS

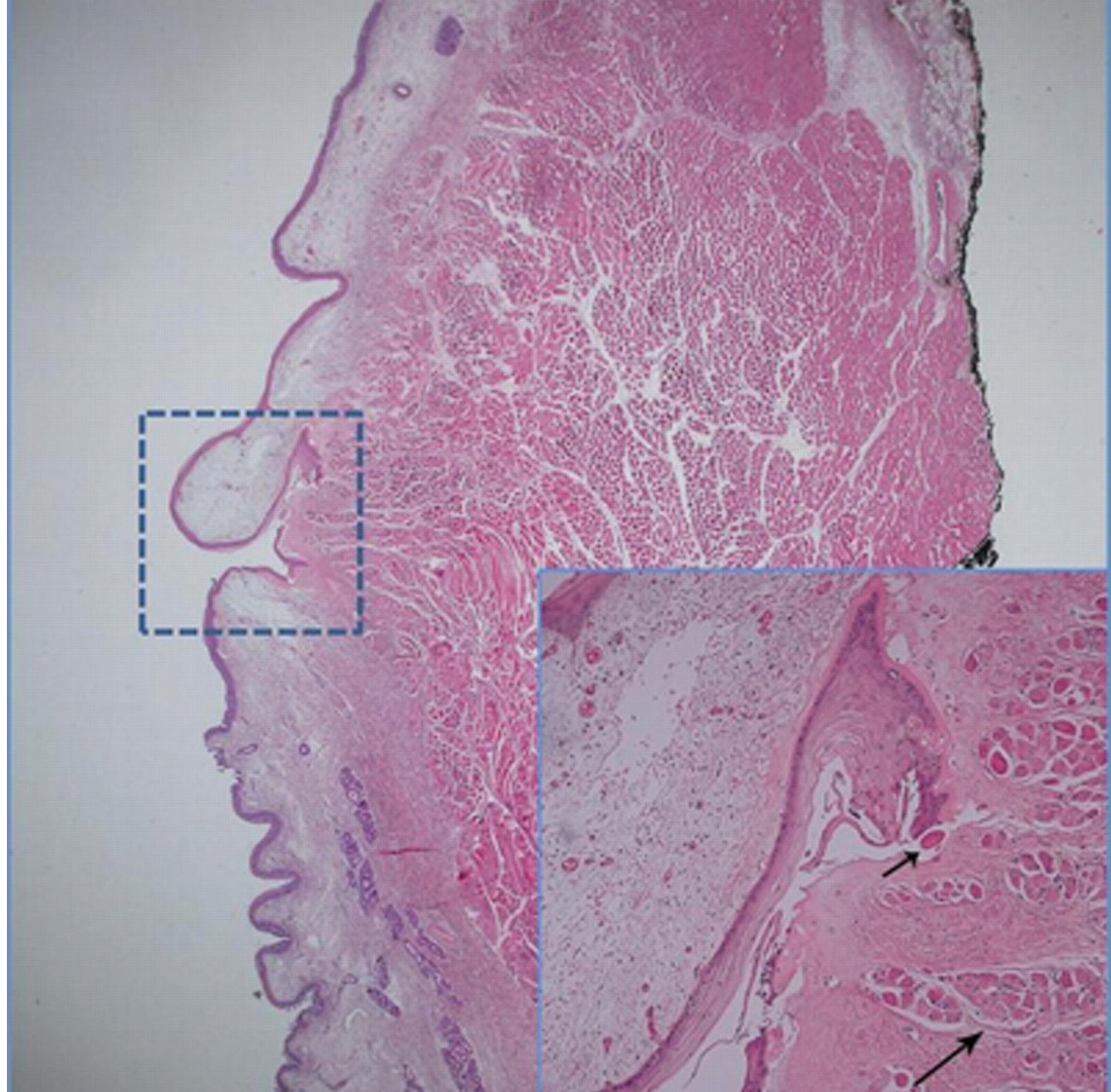


VOCAL
FOLD
SULCUS



—

VOCAL FOLD SULCUS



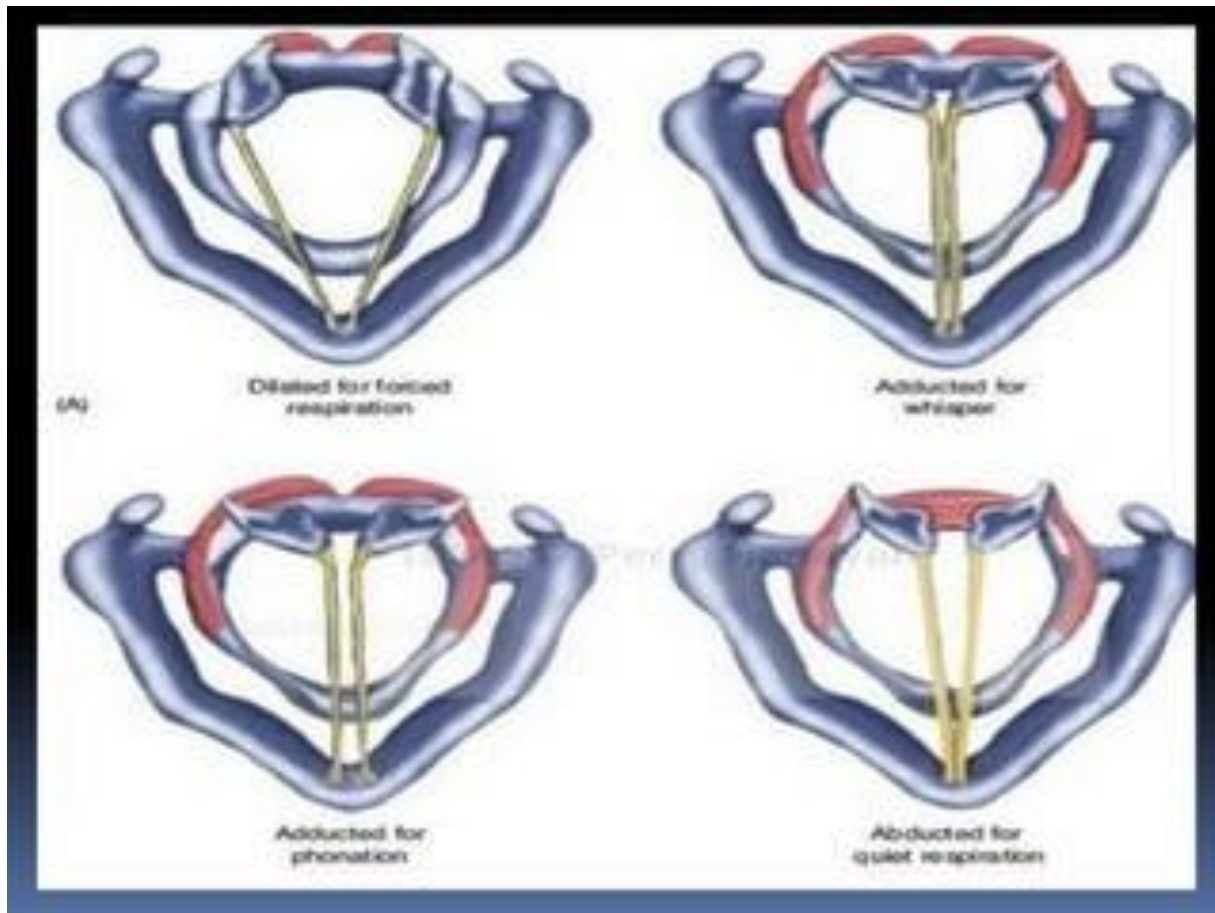


Laryngeal Anatomy

- FROM FORM ONTO FUNCTION
- ANATOMY TO THE PHYSIOLOGY AND FUNCTIONING OF THE LARYNX

BIOMECHANICS OF PHONATION

- FORCED EXPIRATION
- WHISPER
- PHONATION
- QUIET RESPIRATION



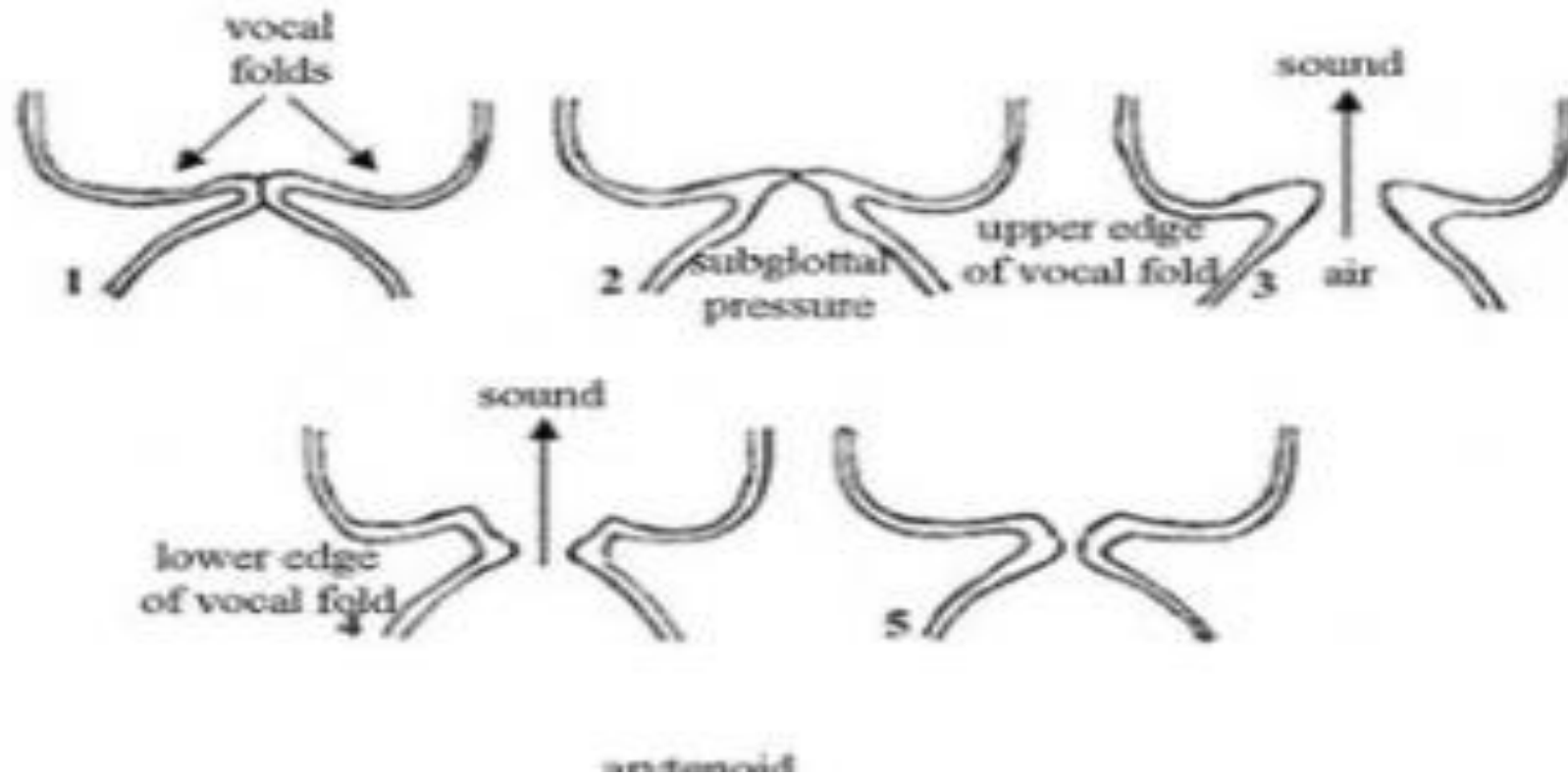
The Biomechanics of phonation

- On quiet respiration vocal cords abduct on inspiration and adduct on expiration.
- The larynx descends on inspiration and ascends on expiration.

Biomechanics of phonation can be divided into –

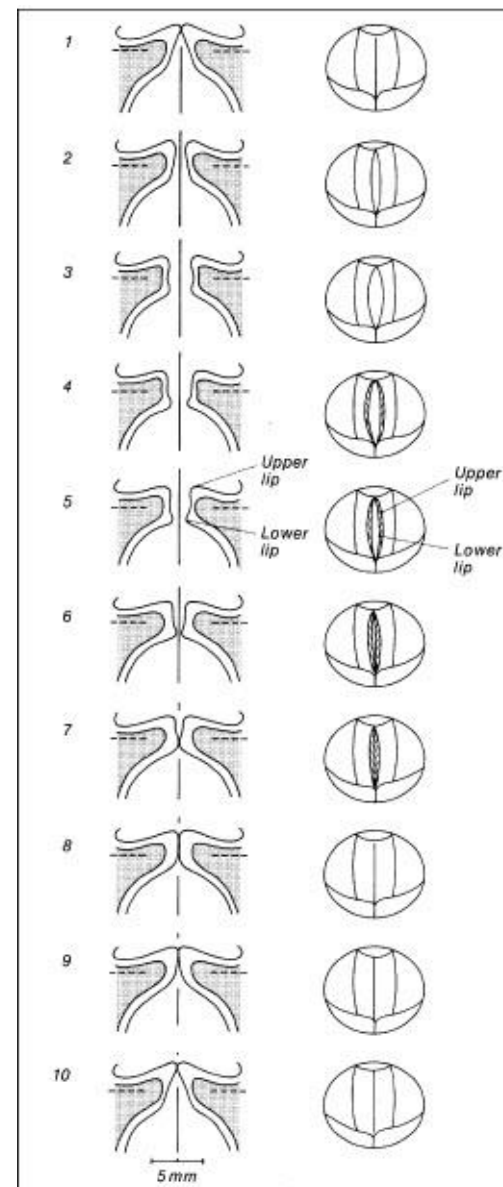
- ❖ Initiation of voice
 - ❖ The vibratory cycle
 - ❖ Vocal registers: characteristics of vocal fold adduction and vibration
-

Aerodynamic Myoelastic Theory



Aerodynamic-Myoelastic Theory

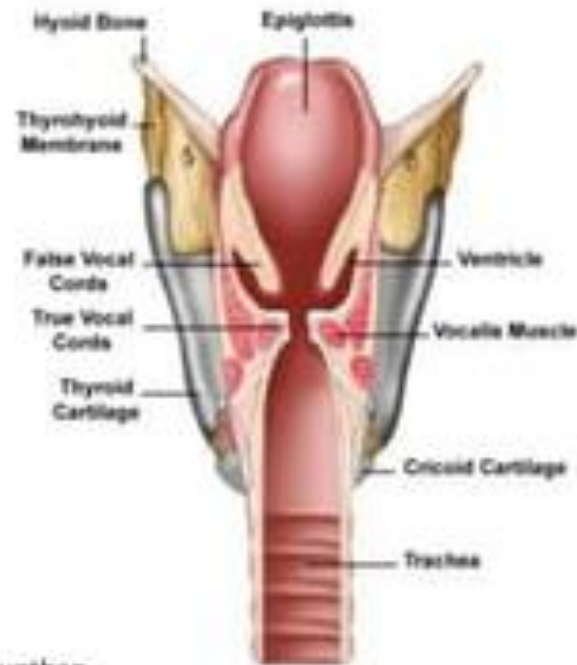
- Vertical Phase Difference:
 - Lower lip (elastic in nature) tends to spring back into place as upper margins are still moving away from one another.
 - Lower lip always leads
 - Essential to normal voice production



Cover Body Theory of Fold Motion

- Proposed by Hirano 1974
- The “cover” / epithelium and Superficial lamina propria moves over the stiffer “body /vocal ligament and vocalis muscle
- Cover – pliable and elastic
- Body – Contractile properties of the muscle to adjust stiffness of vocal fold
- Vocal fold tension – dependent on the coupling of cover and muscular body

- Space between aryepiglottic fold – **inlet of larynx**
- Space between vestibular fold – **rima vestibuli**
- Space between vocal fold – **rima glottidis**

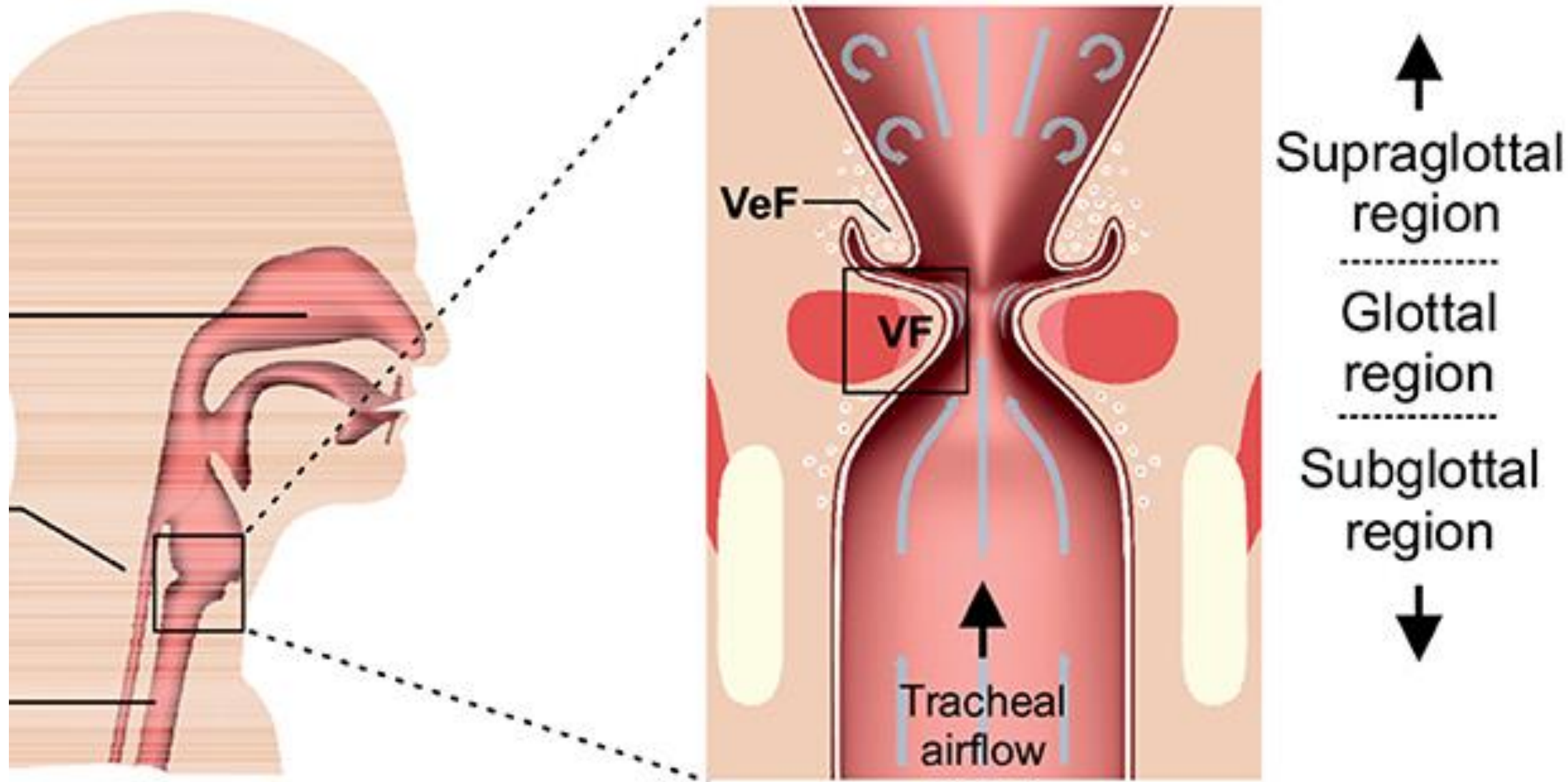


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Ventricle or
Supraglottis

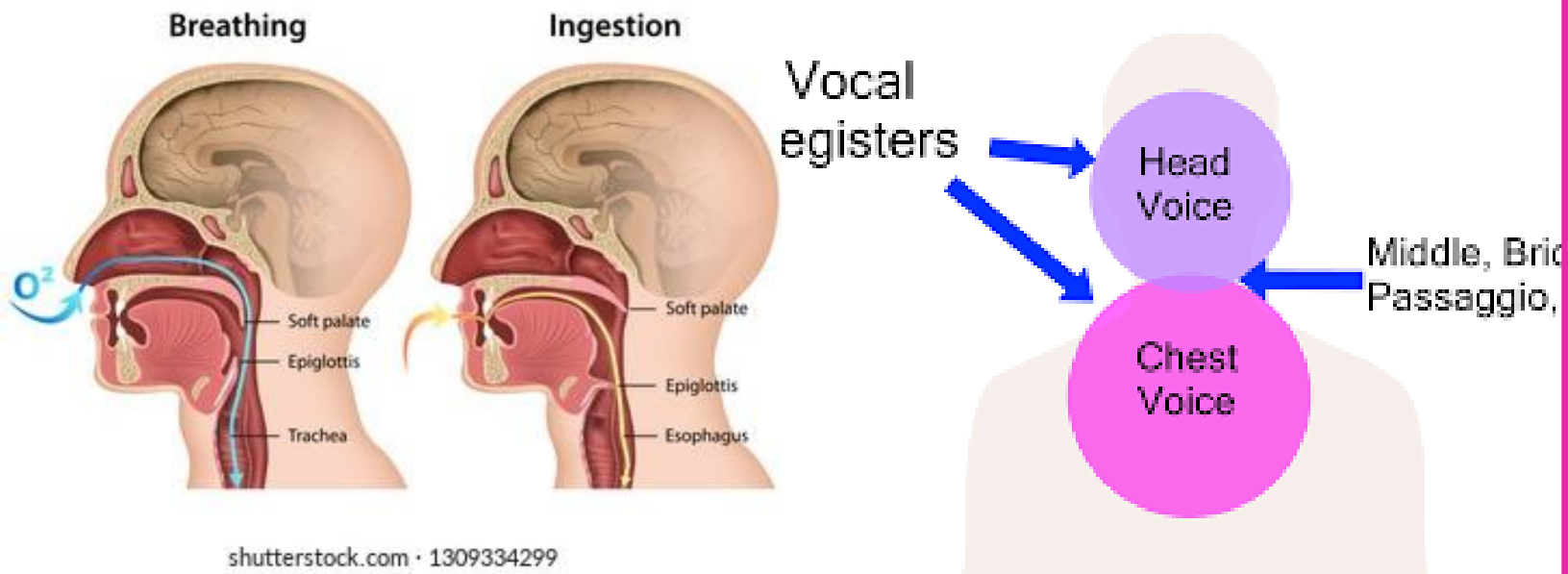
Rhima Glottidis

Subglottis or
infraglottis



CONCLUSIONS

LARYNGEAL ANATOMY,
PHYSIOLOGY AND
FUNCTION:



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- AIRWAY PROTECTION
- RESPIRATION
- PHONATION

THE LARYNX IS A VERY
COMPLEX
NEUROMUSCULAR
ORGAN

THANK YOU

