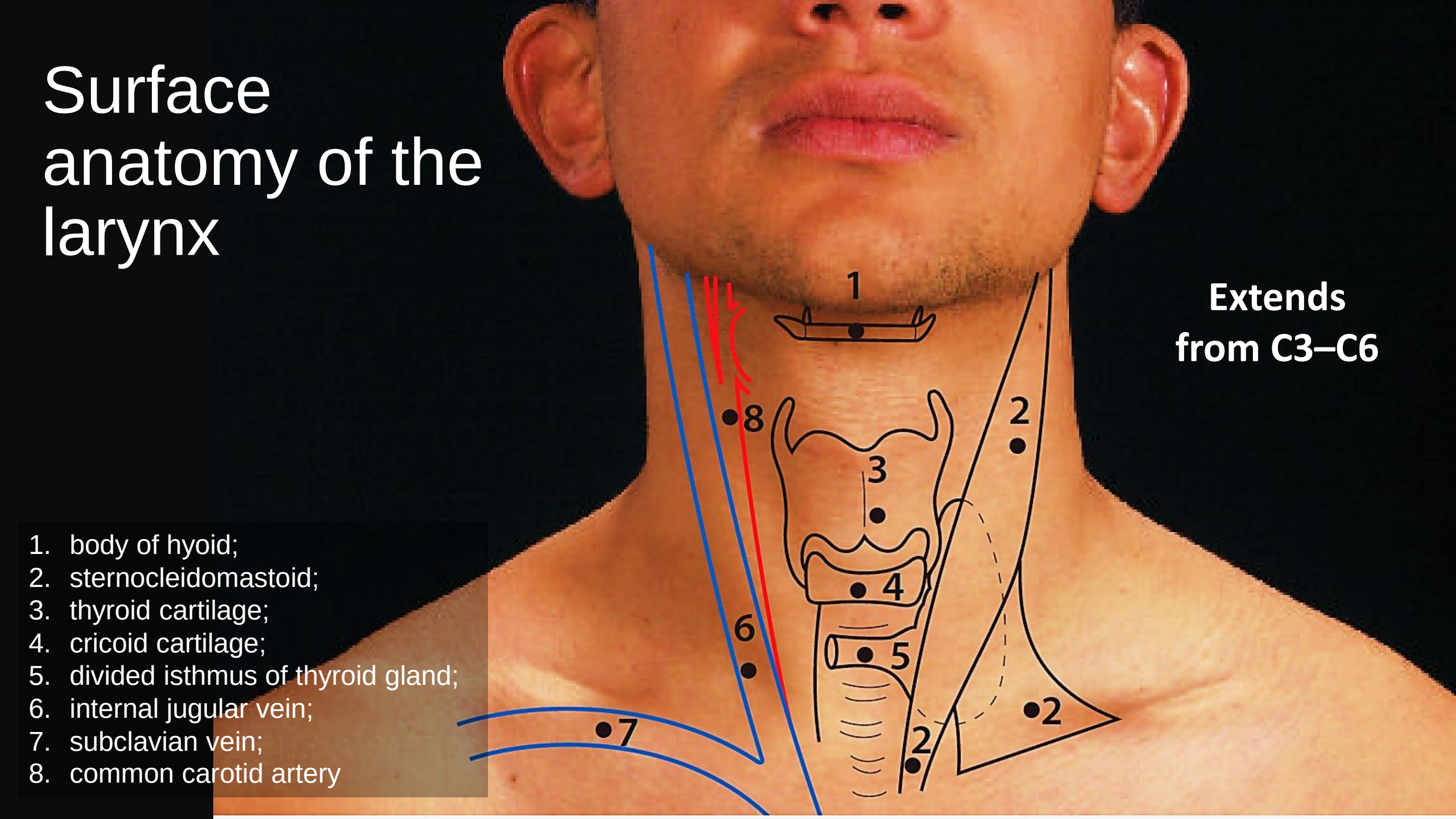
Anatomy of the Hyoid Bone and Laryngeal Cartilages

Dr Maan AlAbbasi MBChB MSc PhD

Surface anatomy of the larynx



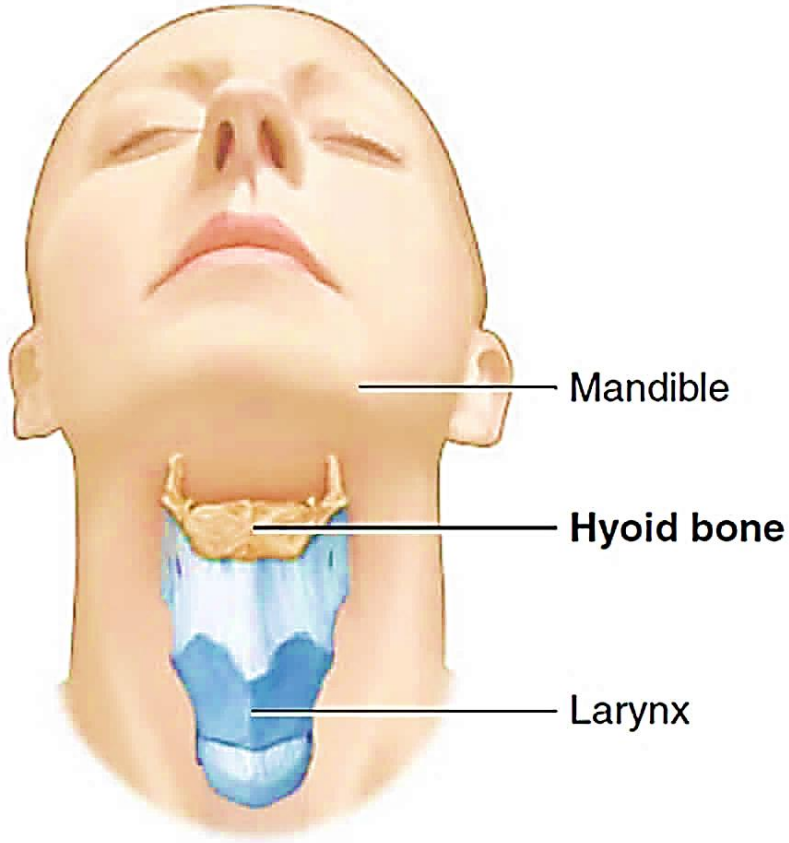
Extends from C3–C6

1. body of hyoid;
2. sternocleidomastoid;
3. thyroid cartilage;
4. cricoid cartilage;
5. divided isthmus of thyroid gland;
6. internal jugular vein;
7. subclavian vein;
8. common carotid artery

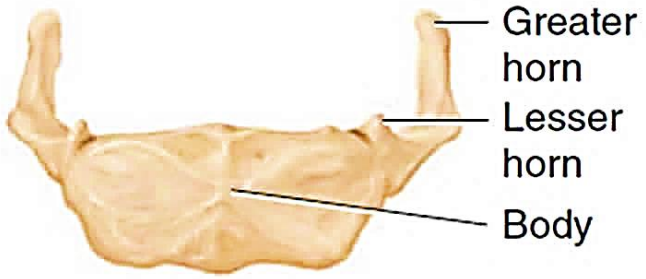
The Hyoid Bone

Hyoid Bone

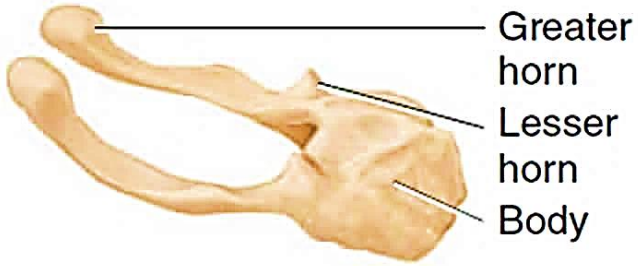
Movable
Ossified with age
Embryologically Divided



(a) Position of hyoid bone

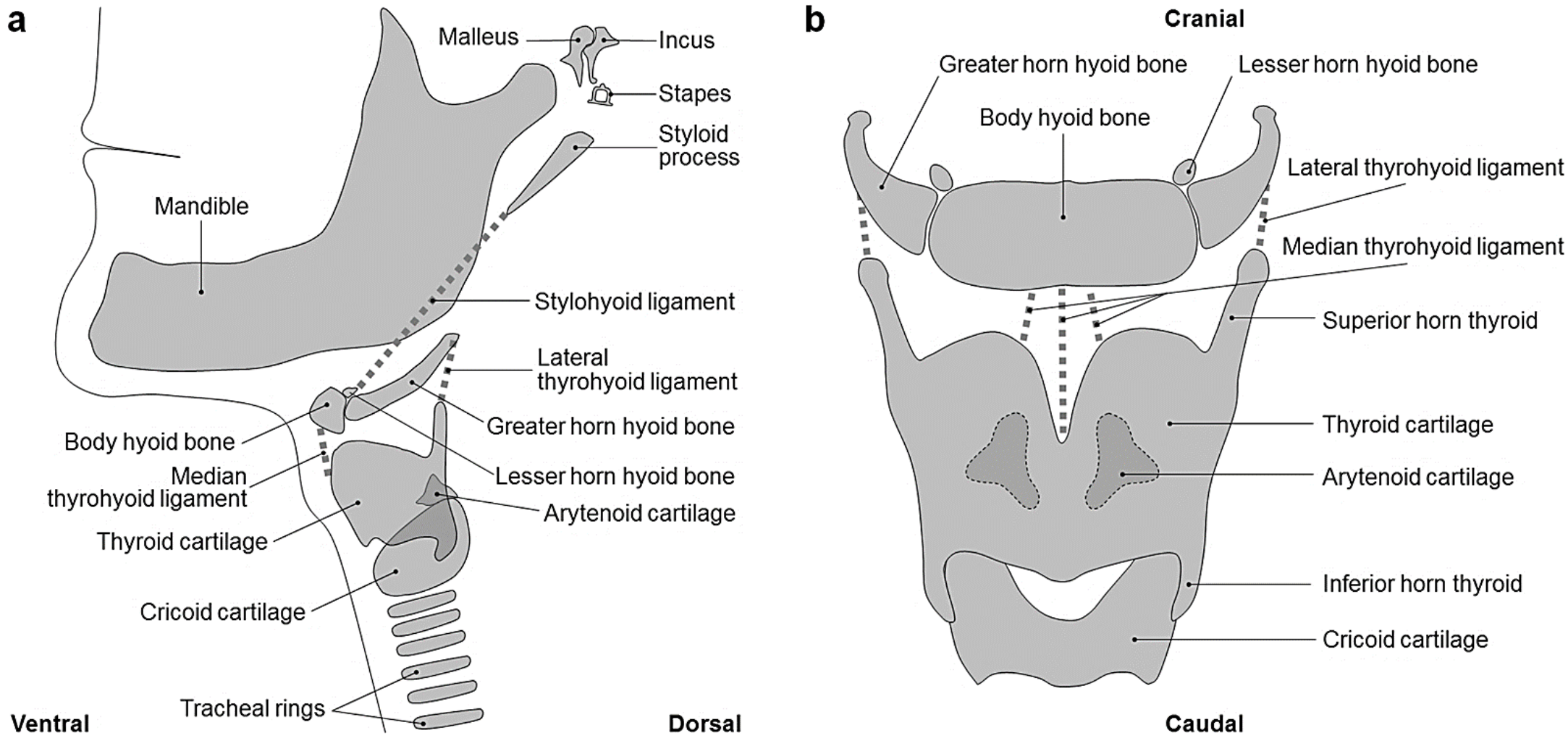


(b) Anterior view



(c) Right lateral view

Overview of the normal adult human anatomy of the neck

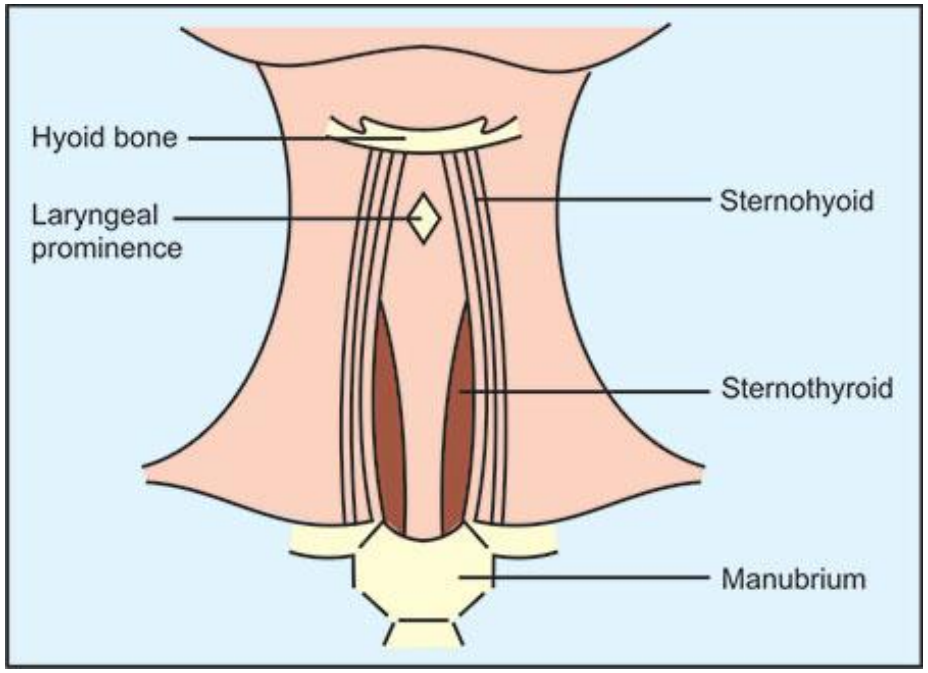


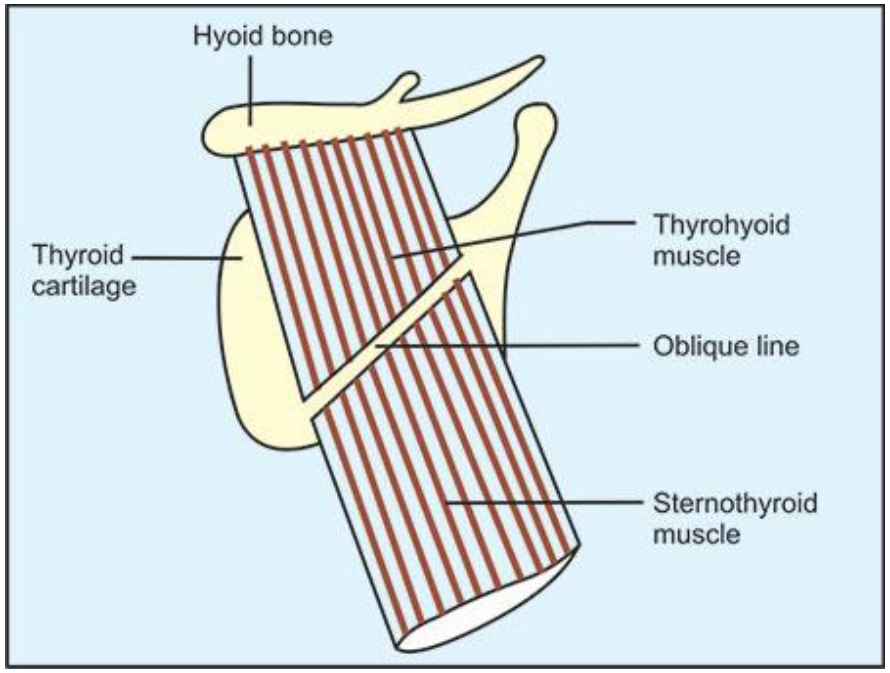
The Extrinsic Muscles of the Larynx

Infrahyoid muscles that depress the hyolaryngeal complex

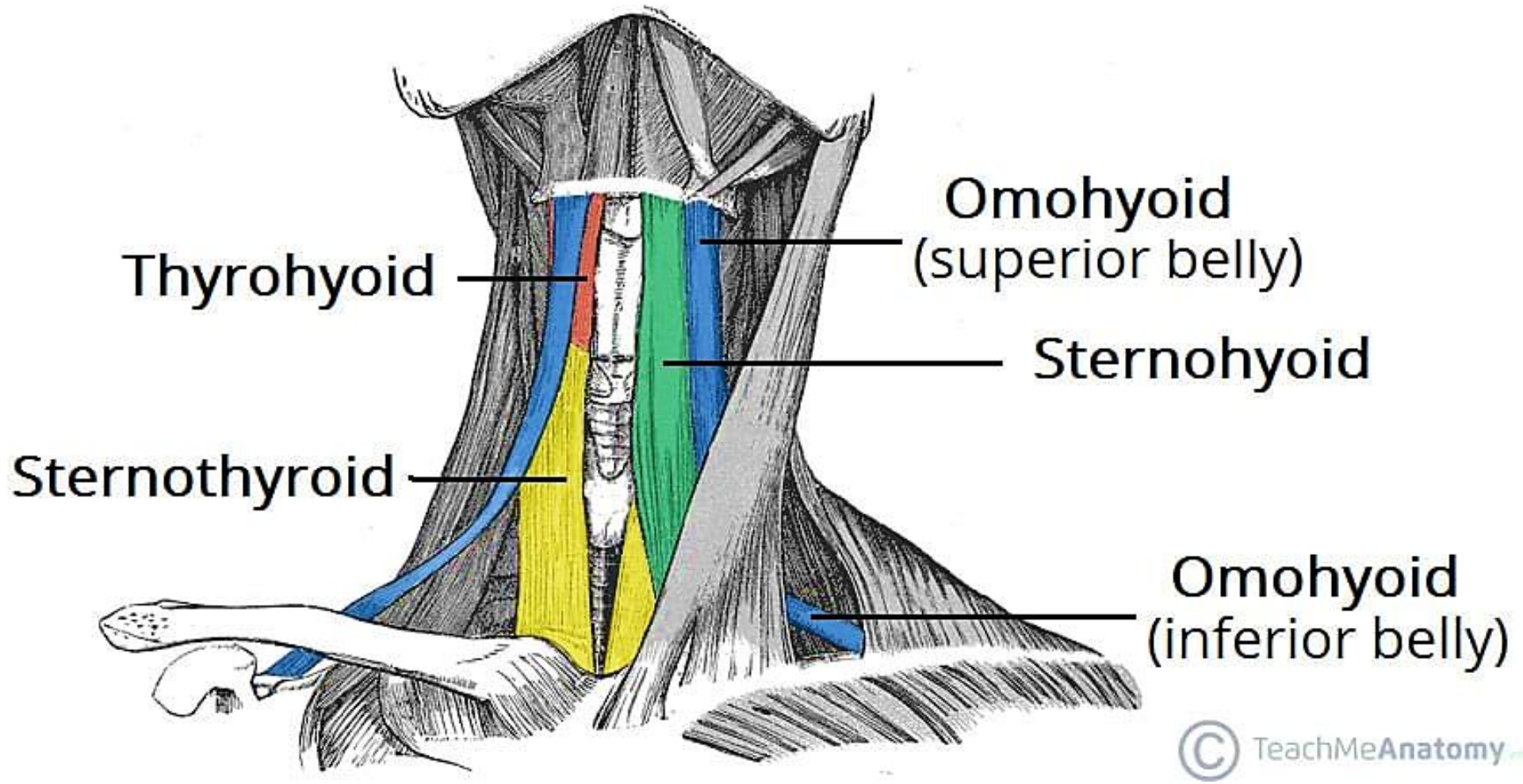
1. Sternohyoid
2. Omohyoid
3. Sternothyroid
4. Thyrohyoid

These muscles fix or depress the hyoid bone during swallowing and speech





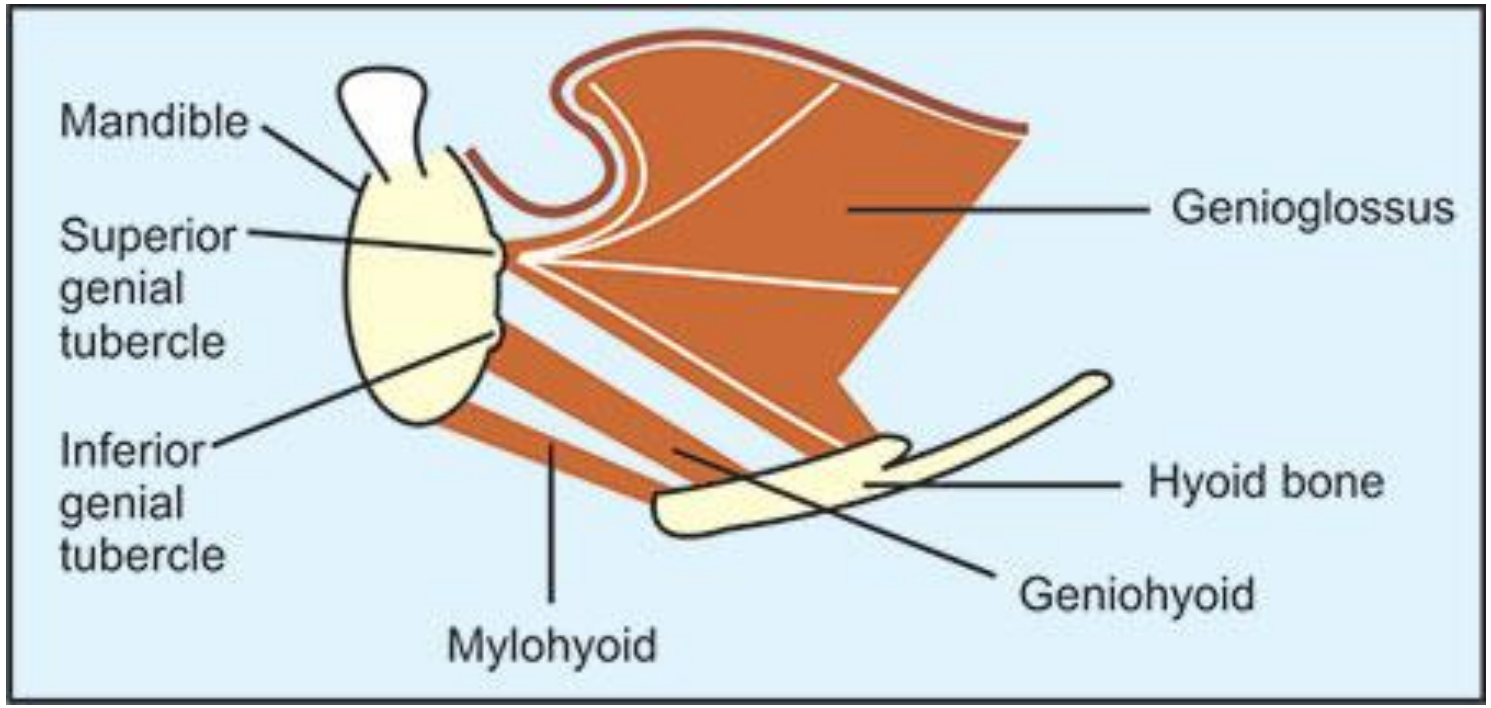
The Extrinsic Muscles of the Larynx



The Extrinsic Muscles of the Larynx

Suprahyoid muscles that elevate the hyolaryngeal complex.

1. Mylohyoid
2. Geniohyoid
3. Stylohyoid
4. Digastric muscles



The Hyolaryngeal Complex

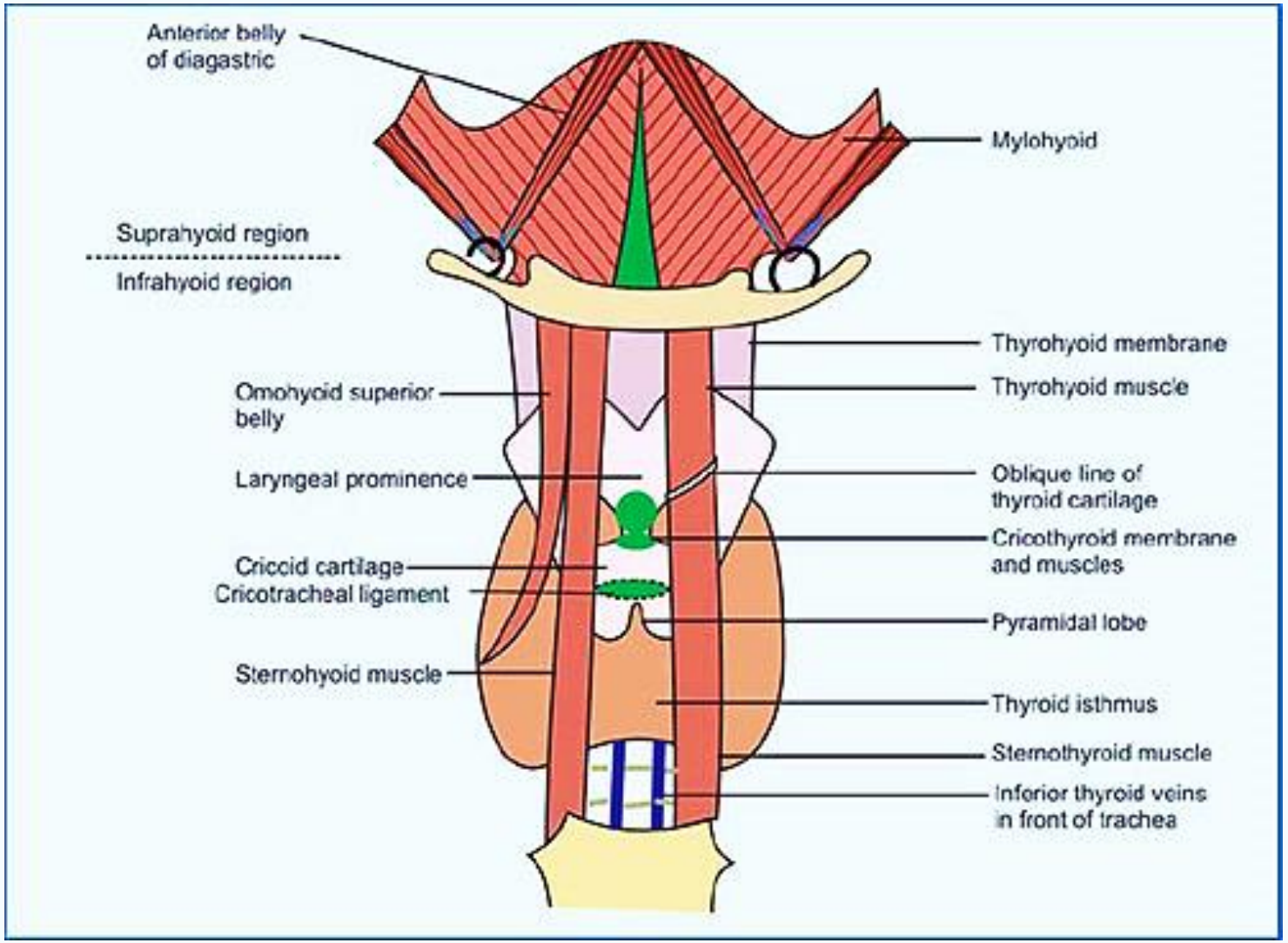
The size and shape of the upper airways can be altered by movements of the hyoid bone.

Suprahyoid muscles

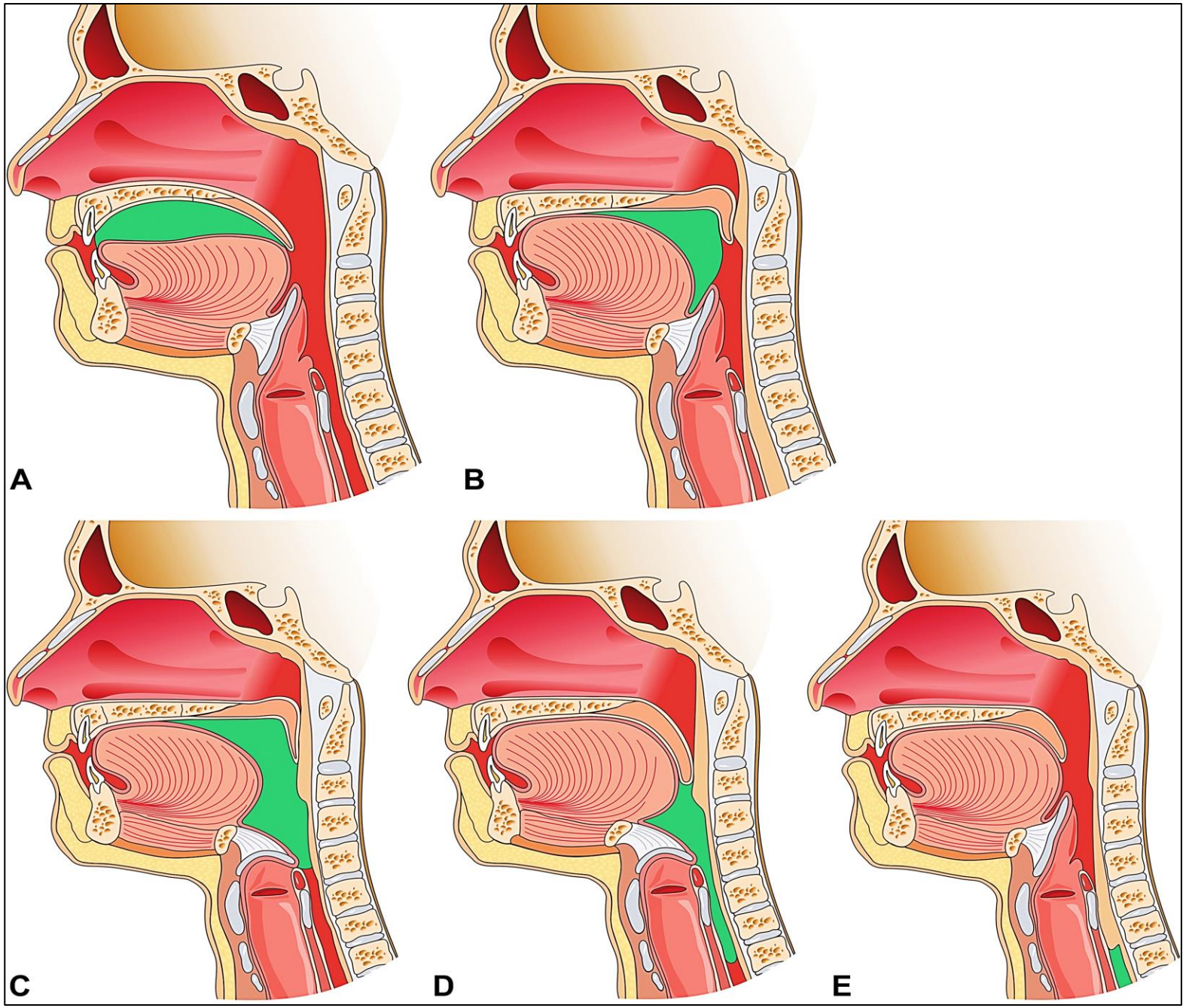
- Digastric (CN V3 & CN VII)
- Stylohyoid (CN VII)
- Geniohyoid (CN XII)
- Mylohyoid (mylohyoid n.-branch of CN V3)

Infrahyoid muscles

- Sternohyoid and sternothyroid (ansa cervicalis)
- Thyrohyoid (CN XII)
- Omohyoid (ansa cervicalis)



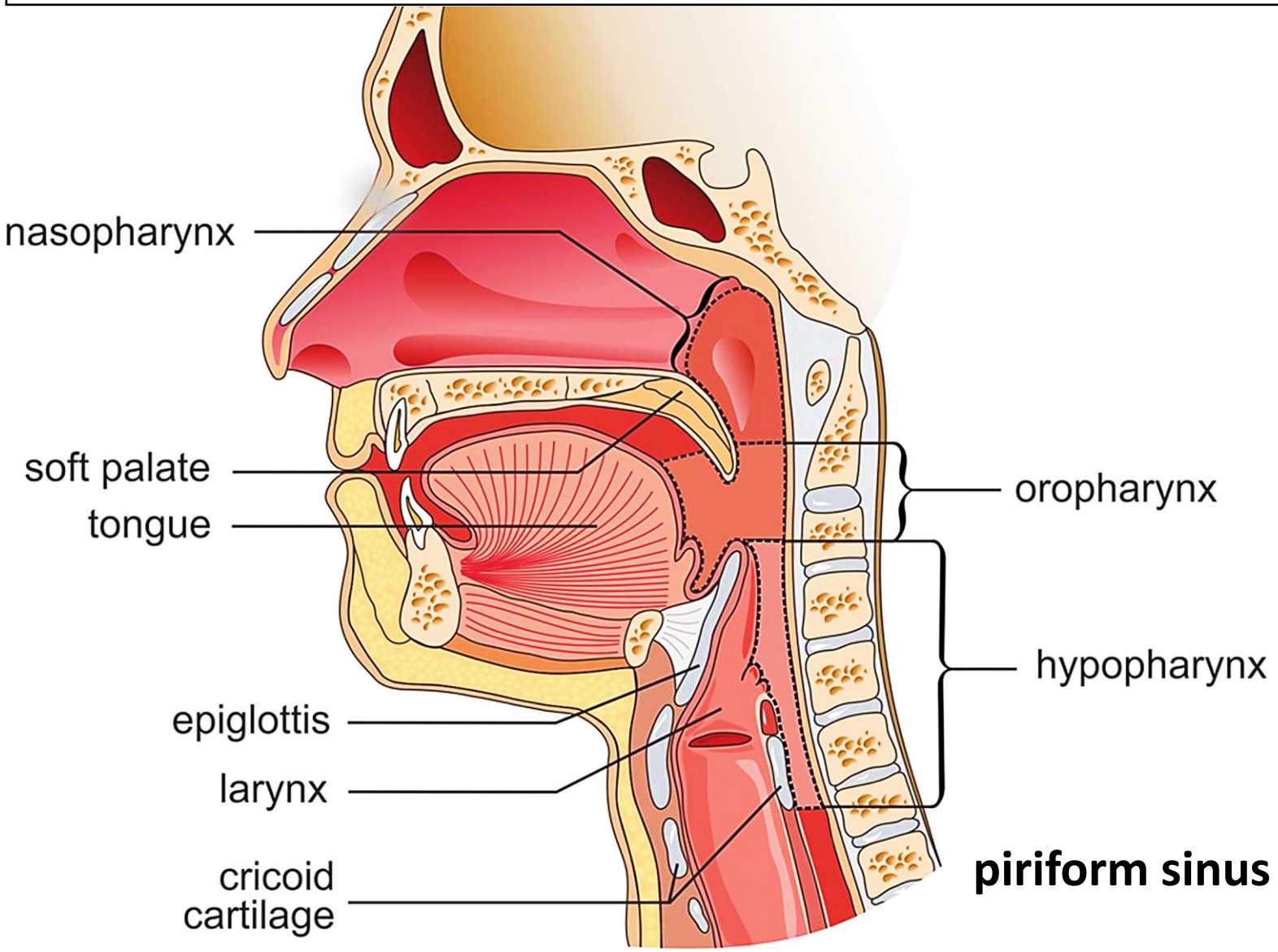
Phases of swallowing



(A) oral preparatory phase
(B) the oral propulsory phase
(C) the pharyngeal phase
(D) the PES phase
(E) the esophageal phase

Carbo AI. Published Online: October 01, 2021
https://doi.org/10.1148/rg.2021210051

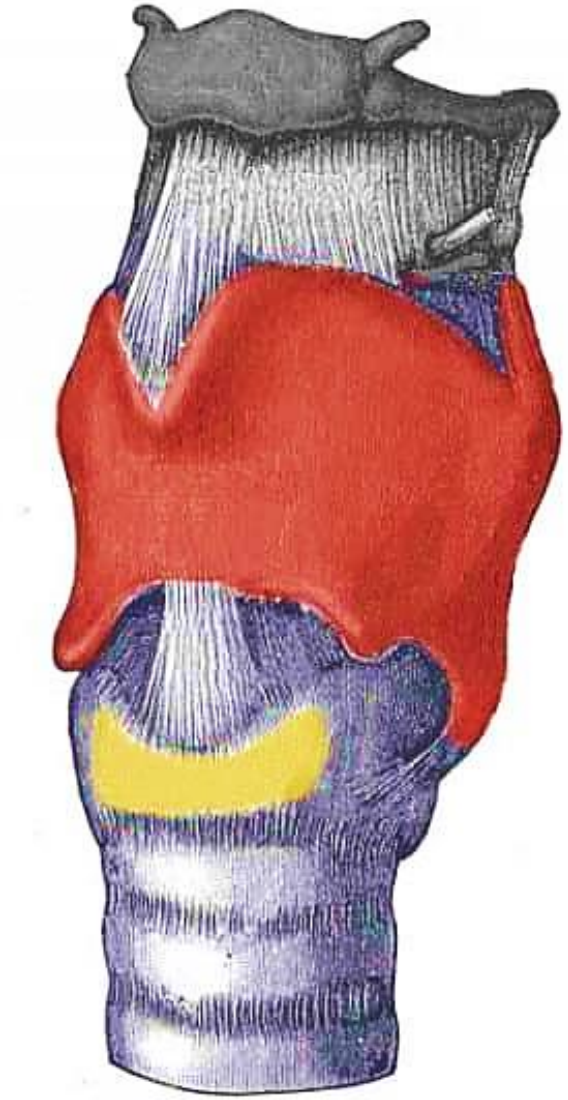
Illustration shows the anatomy of the pharynx

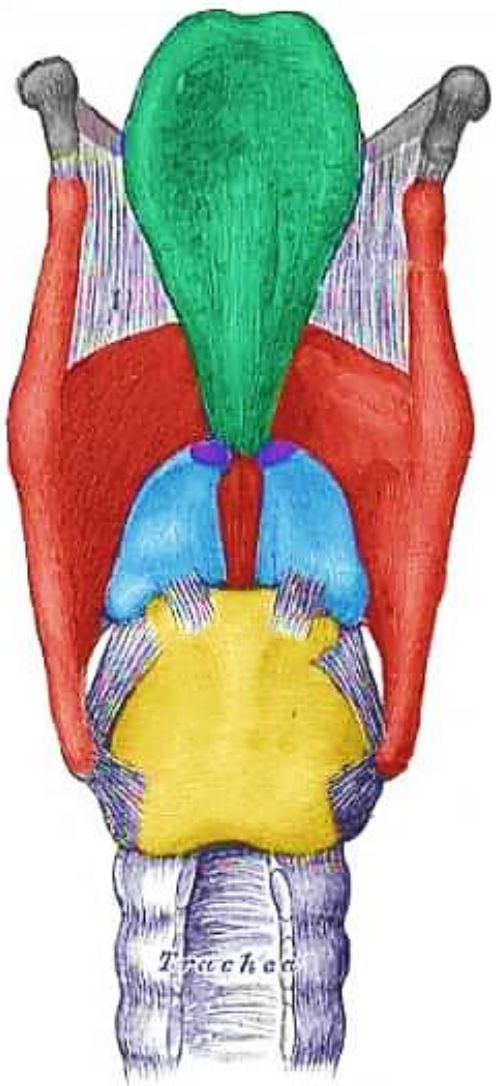


Action of the extrinsic muscles moves the entire larynx as a unit, and failure of these muscles may result in dysphagia from insufficient hyolaryngeal elevation

Laryngeal Cartilages

9 cartilages in the larynx



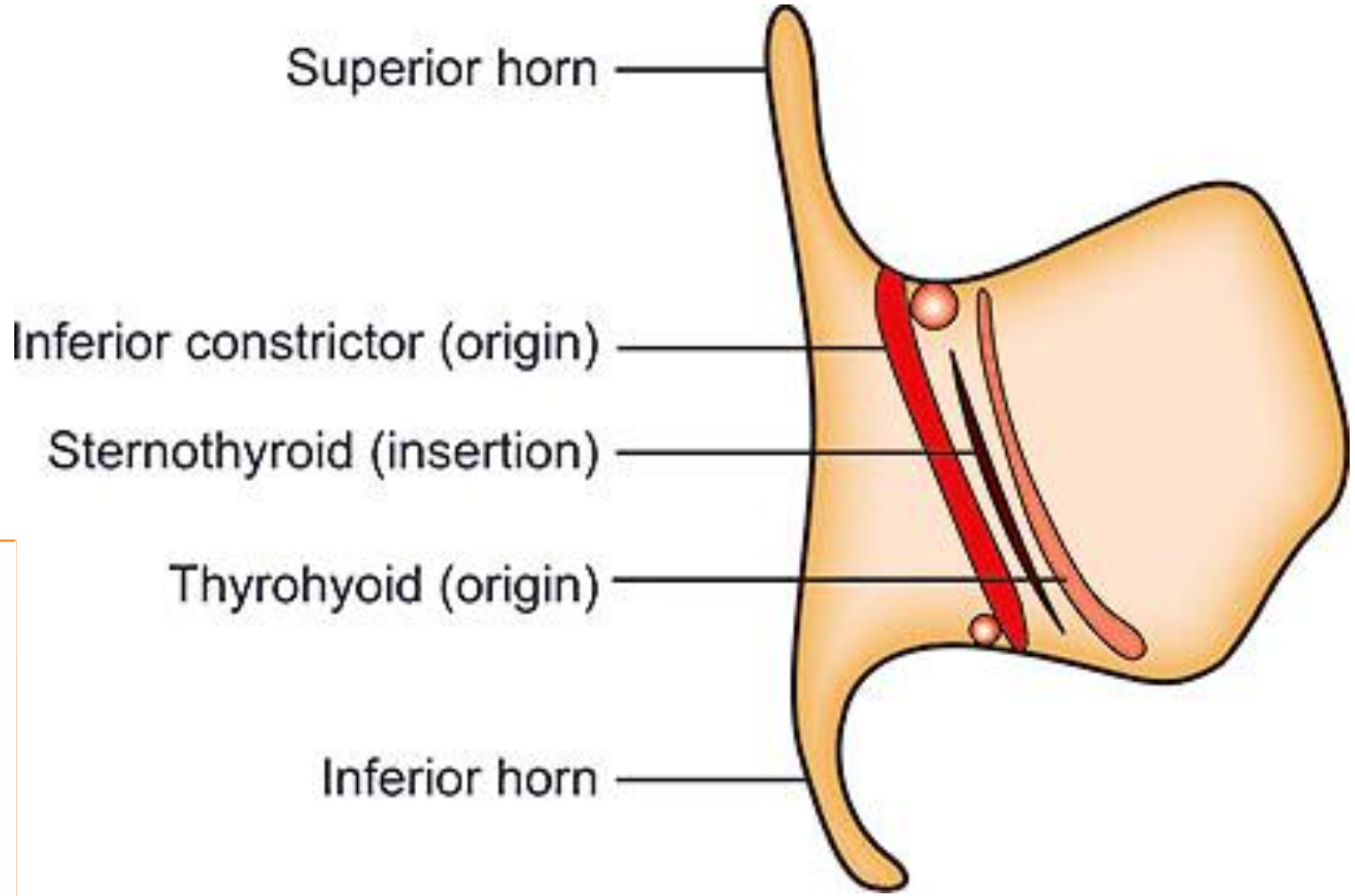


- Epiglottis
- Thyroid cartilage
- Arytenoid cartilages
- Cricoid cartilage
- Corniculate cartilages

&

Cuneiform cartilages

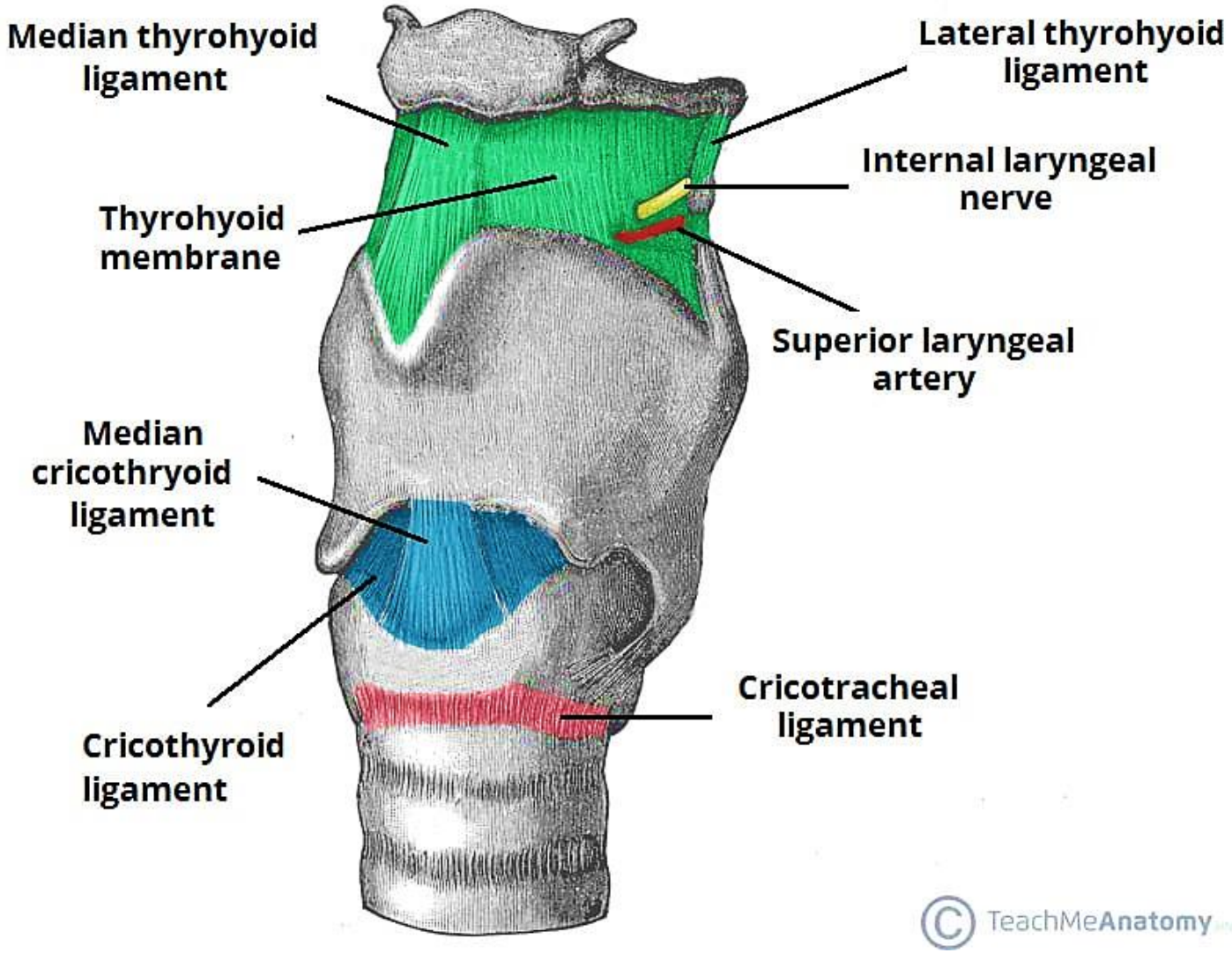
3 muscles attach to the outer thyroid cartilage at its oblique line



Laryngeal framework or reinnervation surgery may disrupt these muscles or their motor innervation, and surgeons should be aware of the potential effects on swallowing.

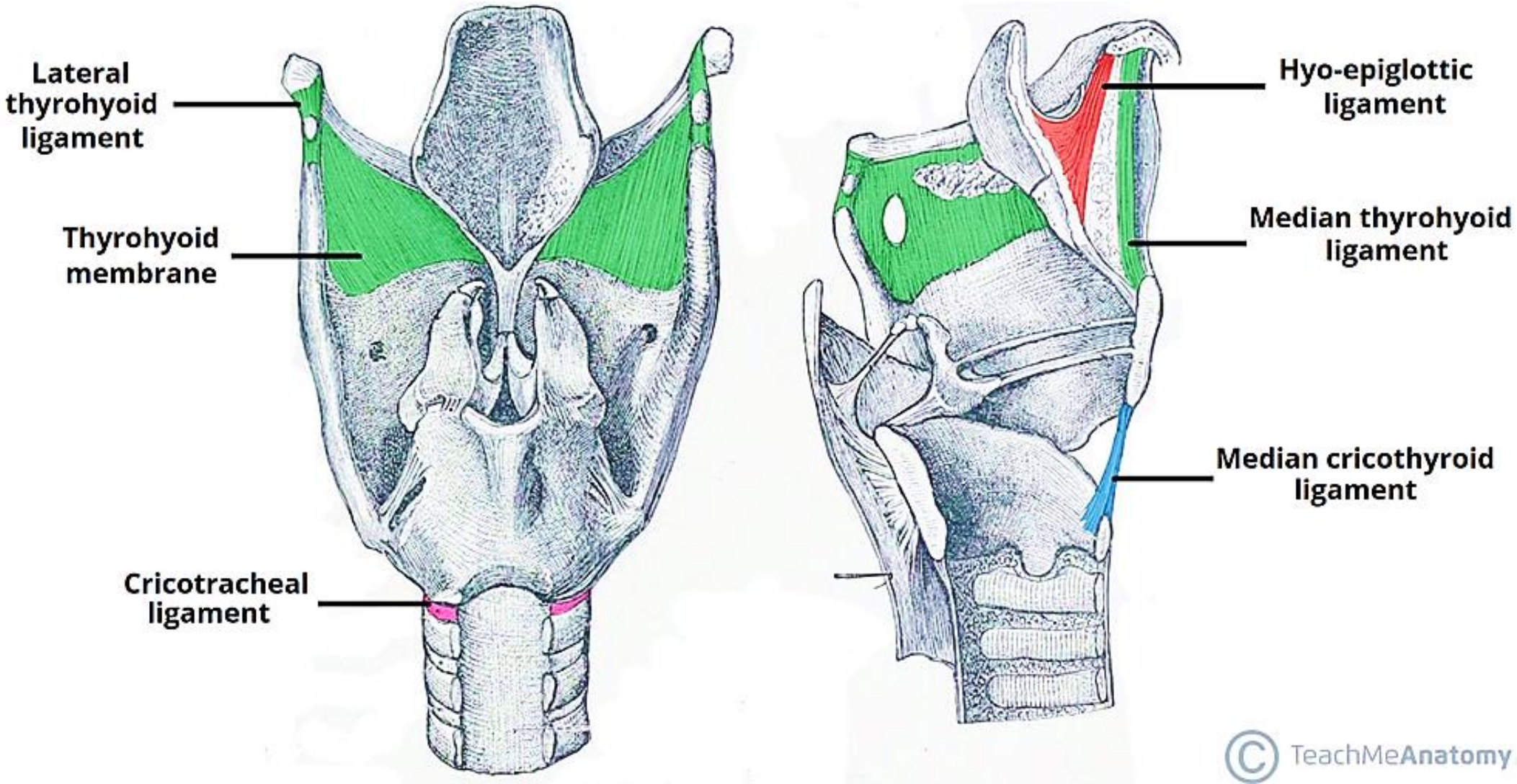
Membranes Connecting Structures

The Extrinsic Ligaments



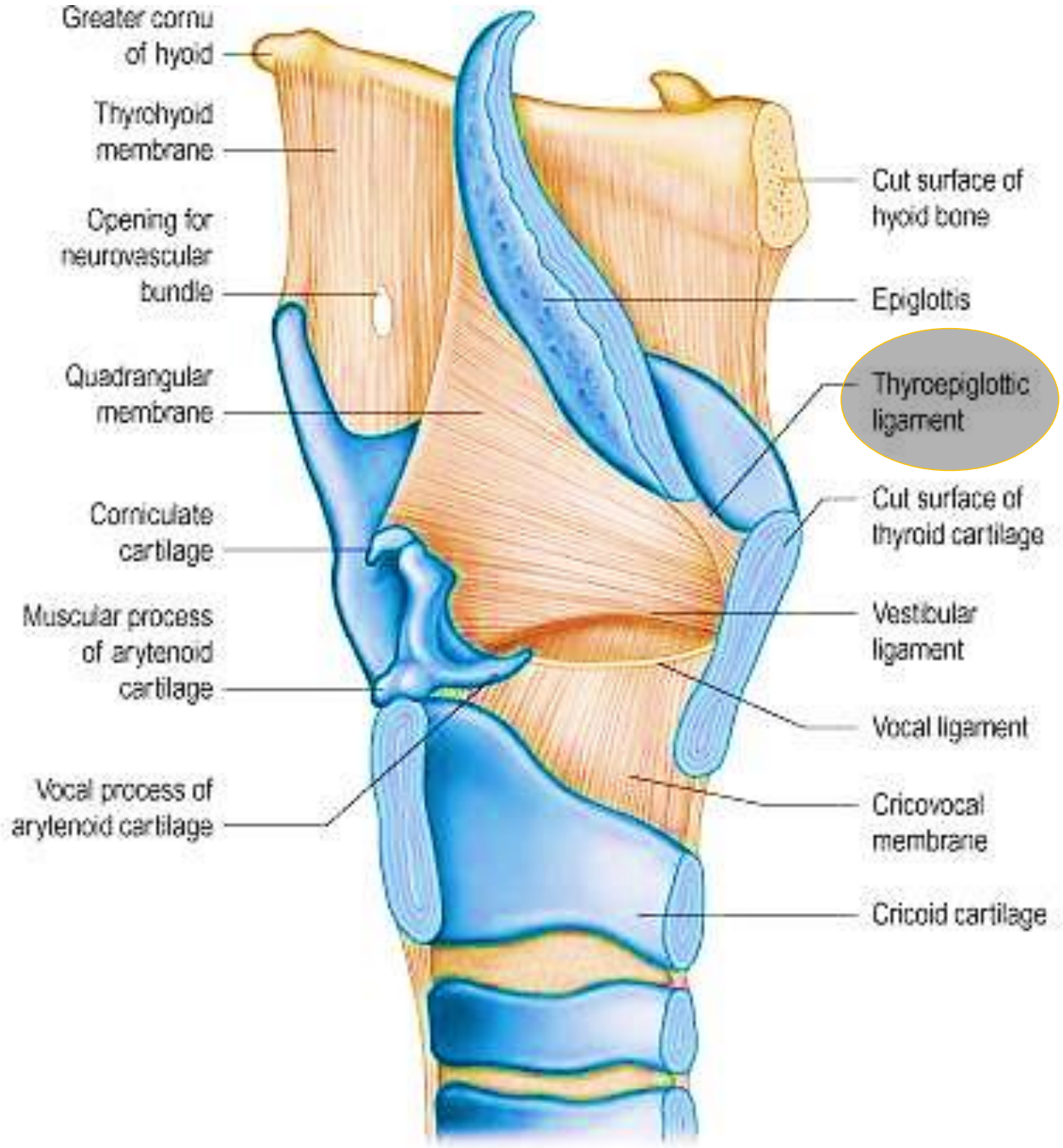
- Thyrohyoid
- Hyoepiglottic
- Cricotracheal

The Extrinsic Ligaments

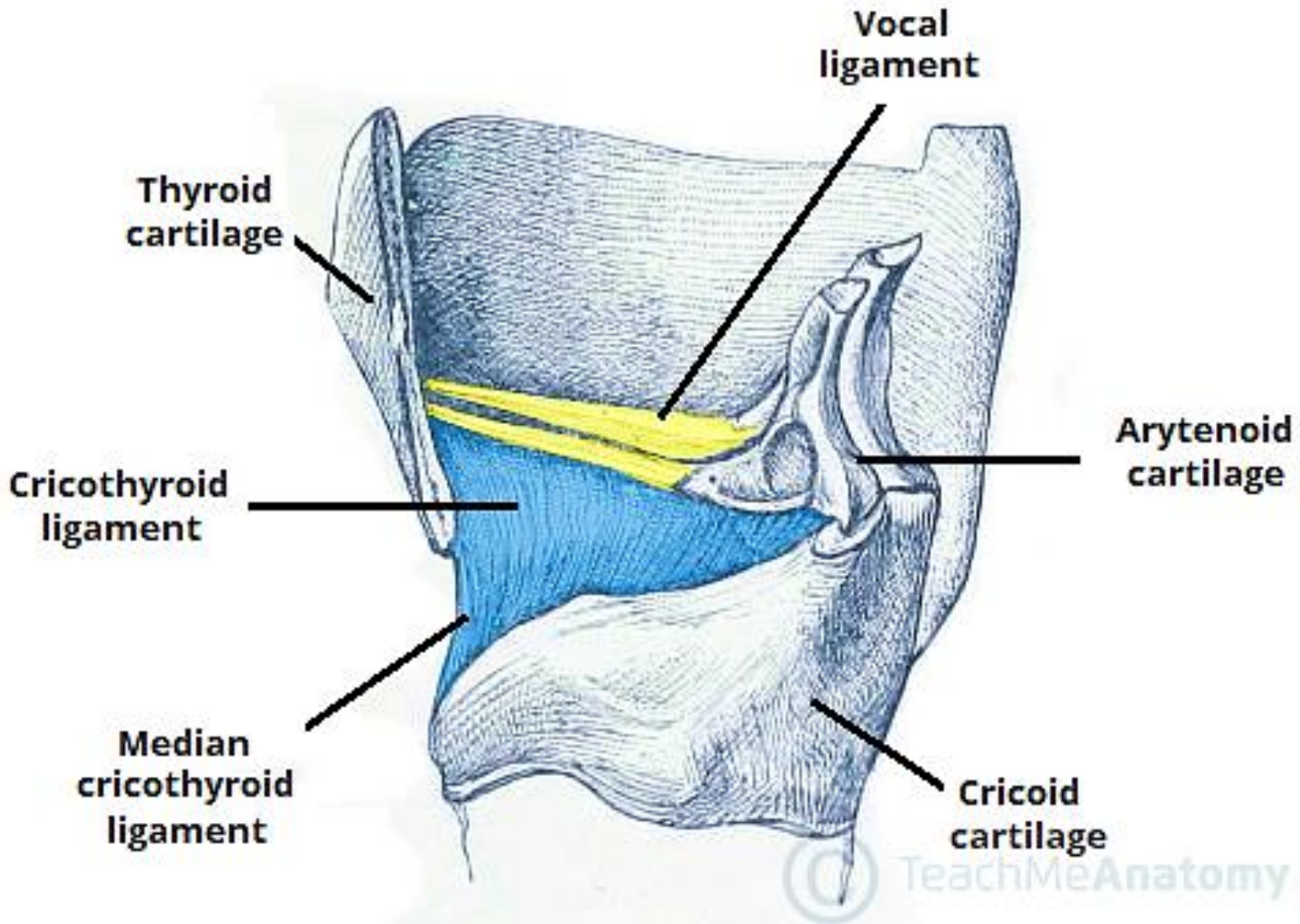


The Intrinsic Ligaments

- Cricocorniculate
- Arytenoidepiglottic

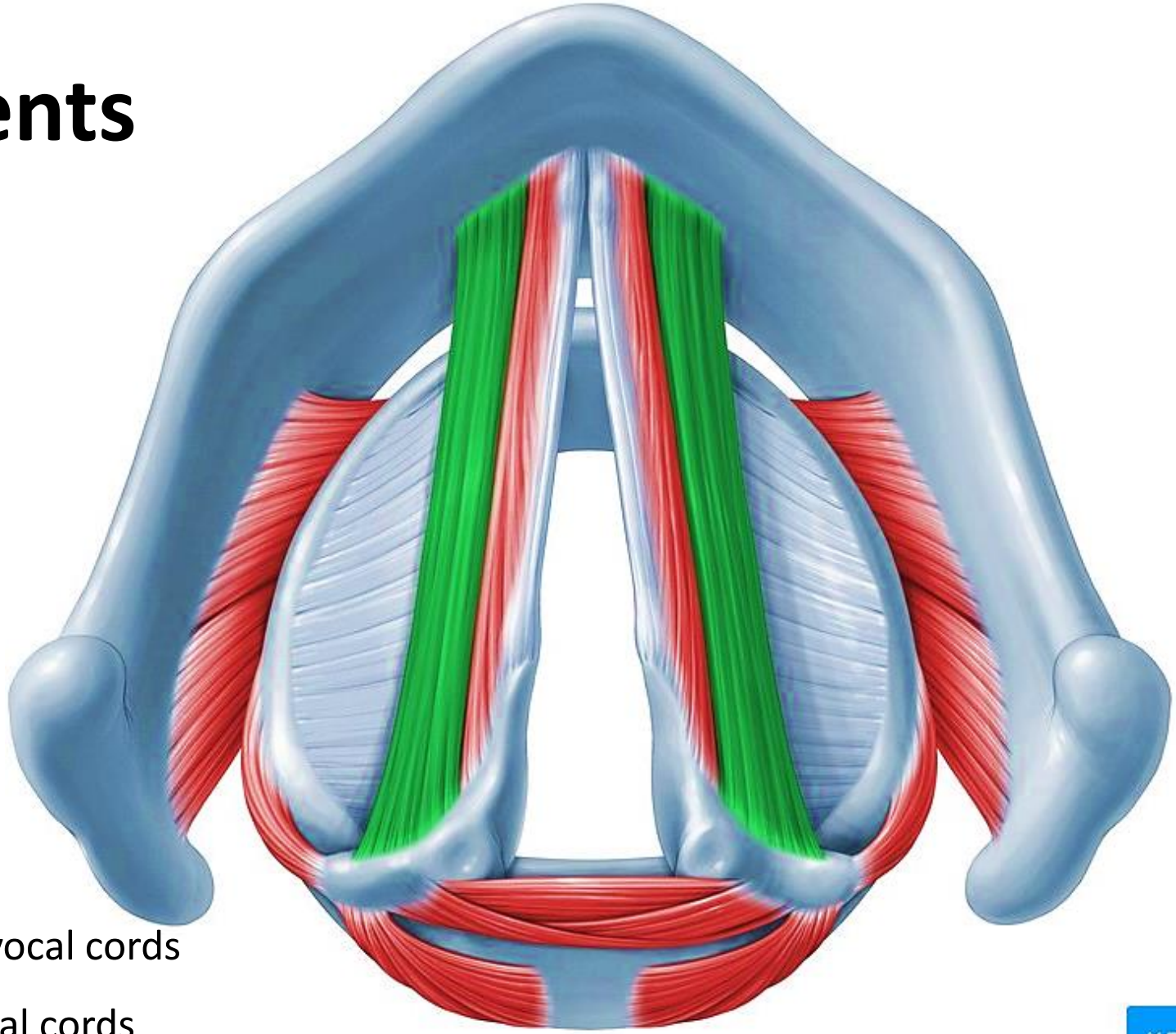


The Intrinsic Ligaments



The Intrinsic Ligaments

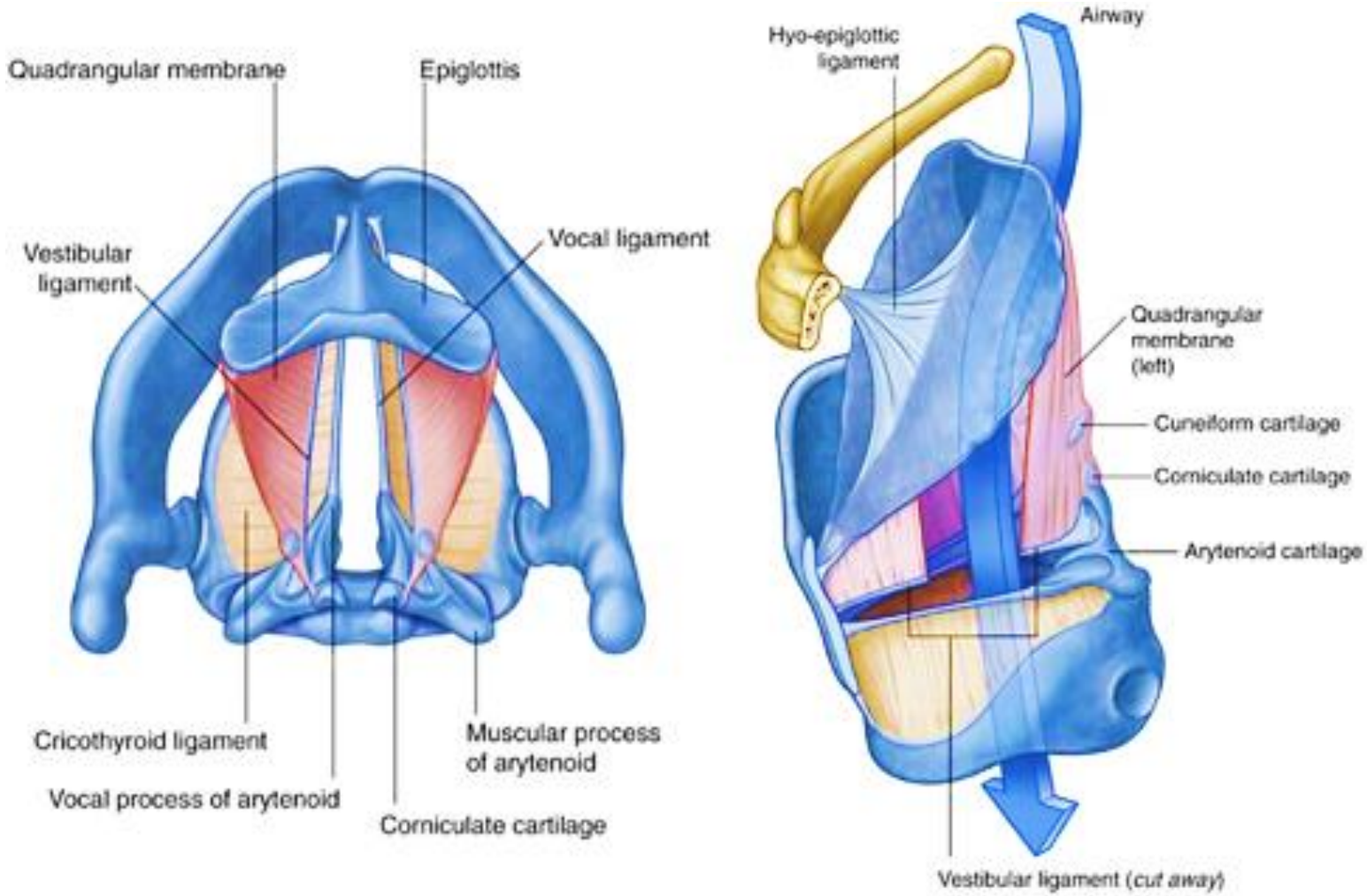
- **Thyroarytenoid ligament**



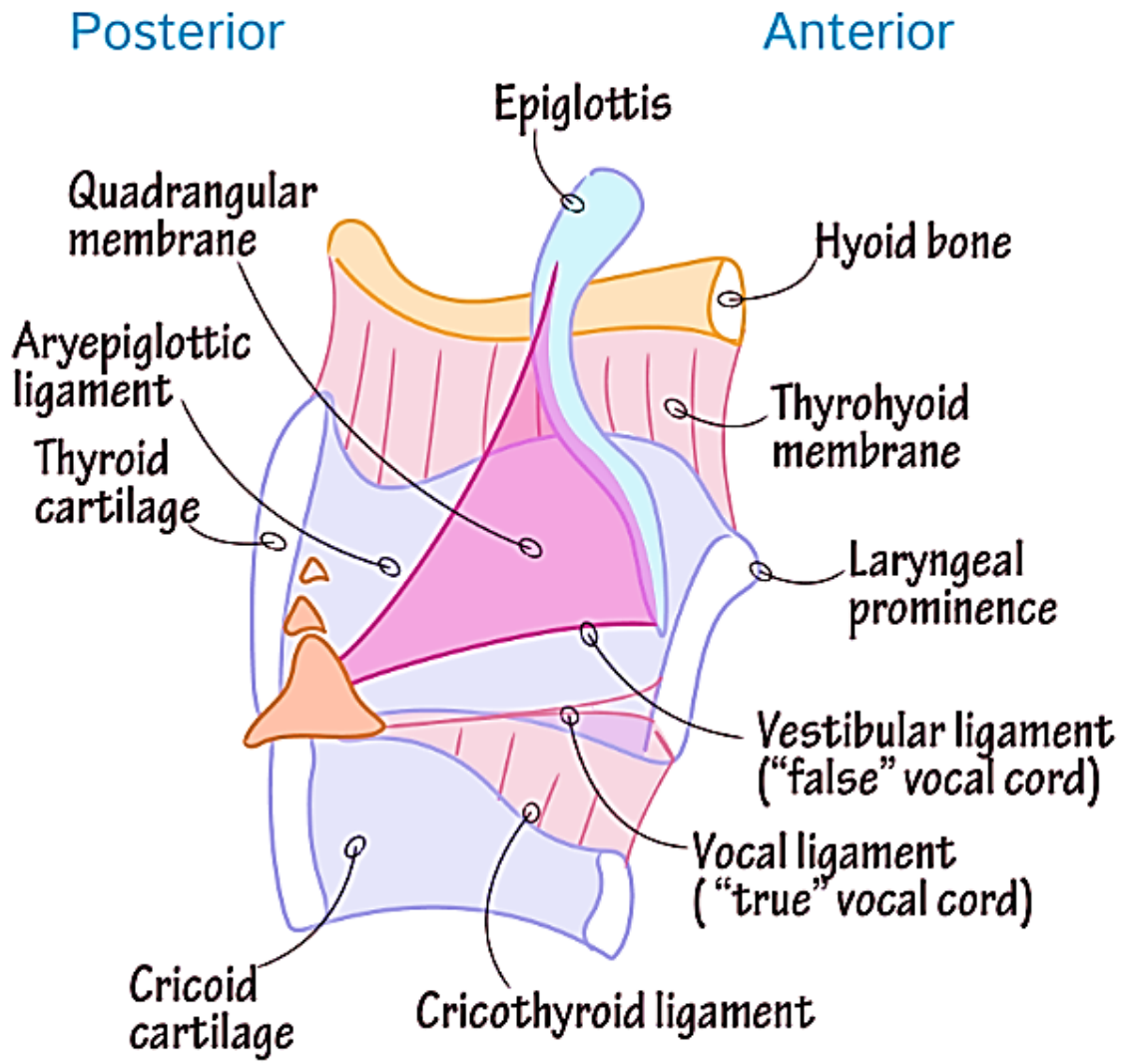
<u>Subdivide into:</u>

- superior ligament that sits next to superior vocal cords
- inferior ligament that sits on the inferior vocal cords

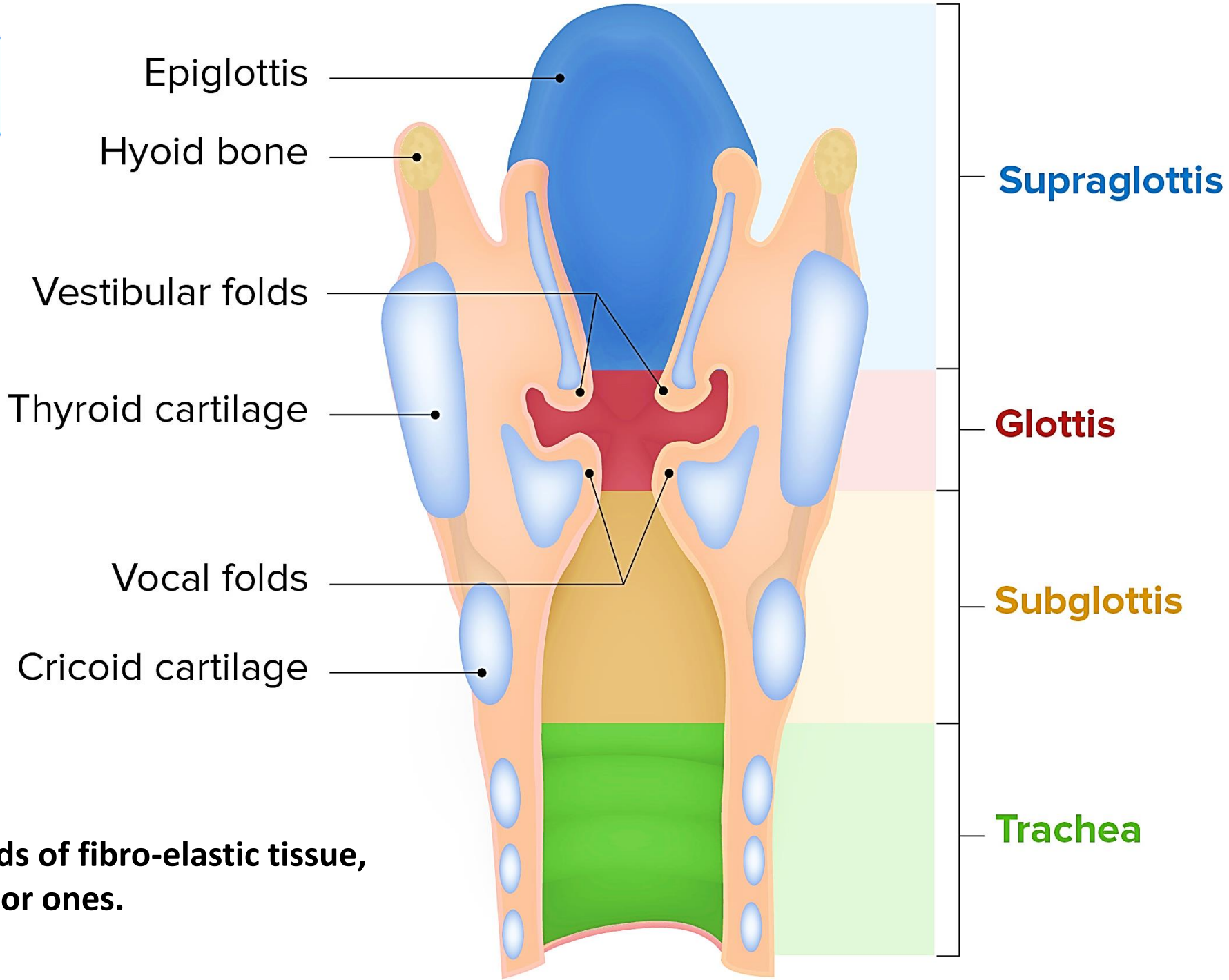
Conus elasticus & Quadrangular membranes



The Intrinsic Ligaments (Sagittal View)



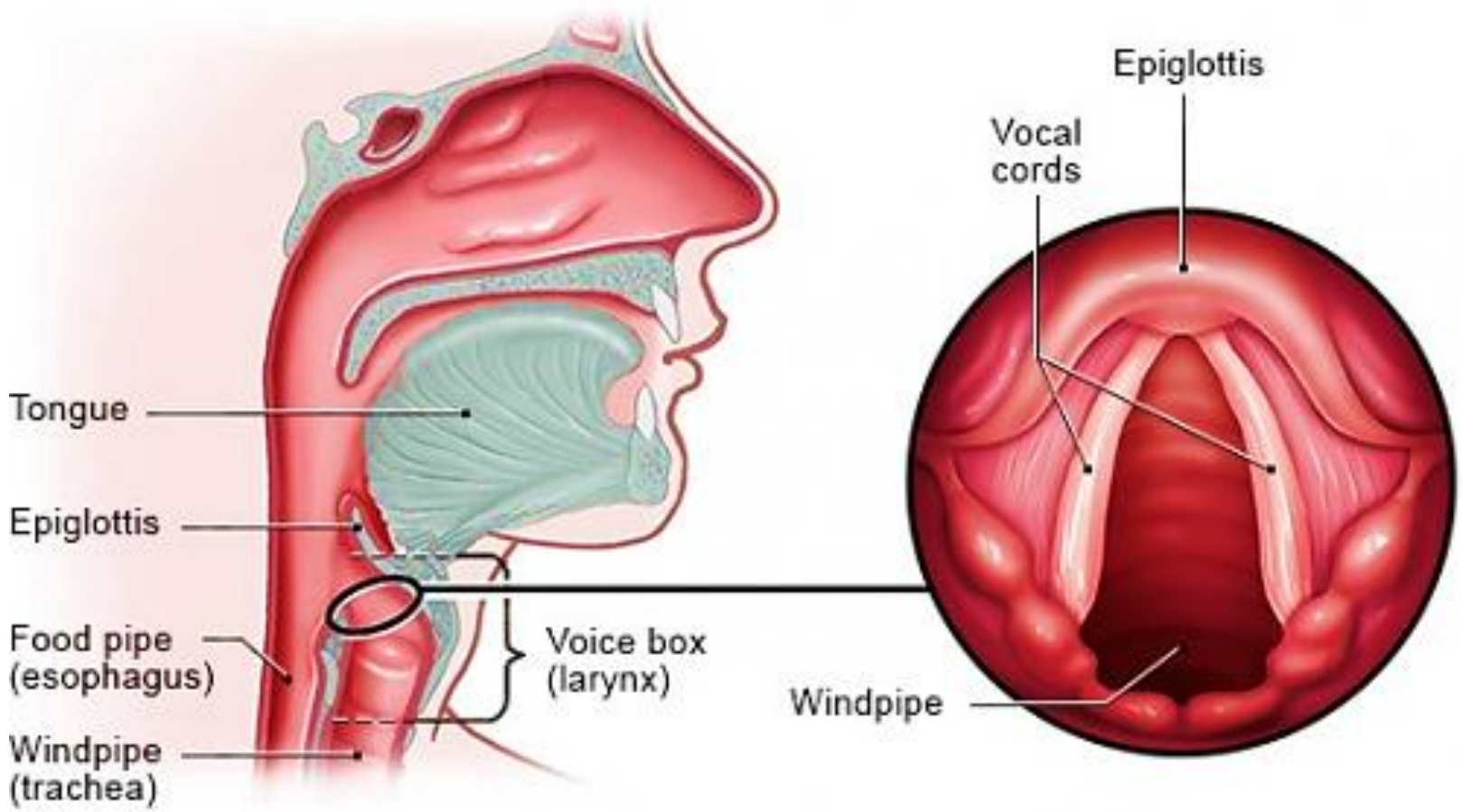
Inside the Larynx



- **The vocal cords are four folds of fibro-elastic tissue, two superior and two inferior ones.**

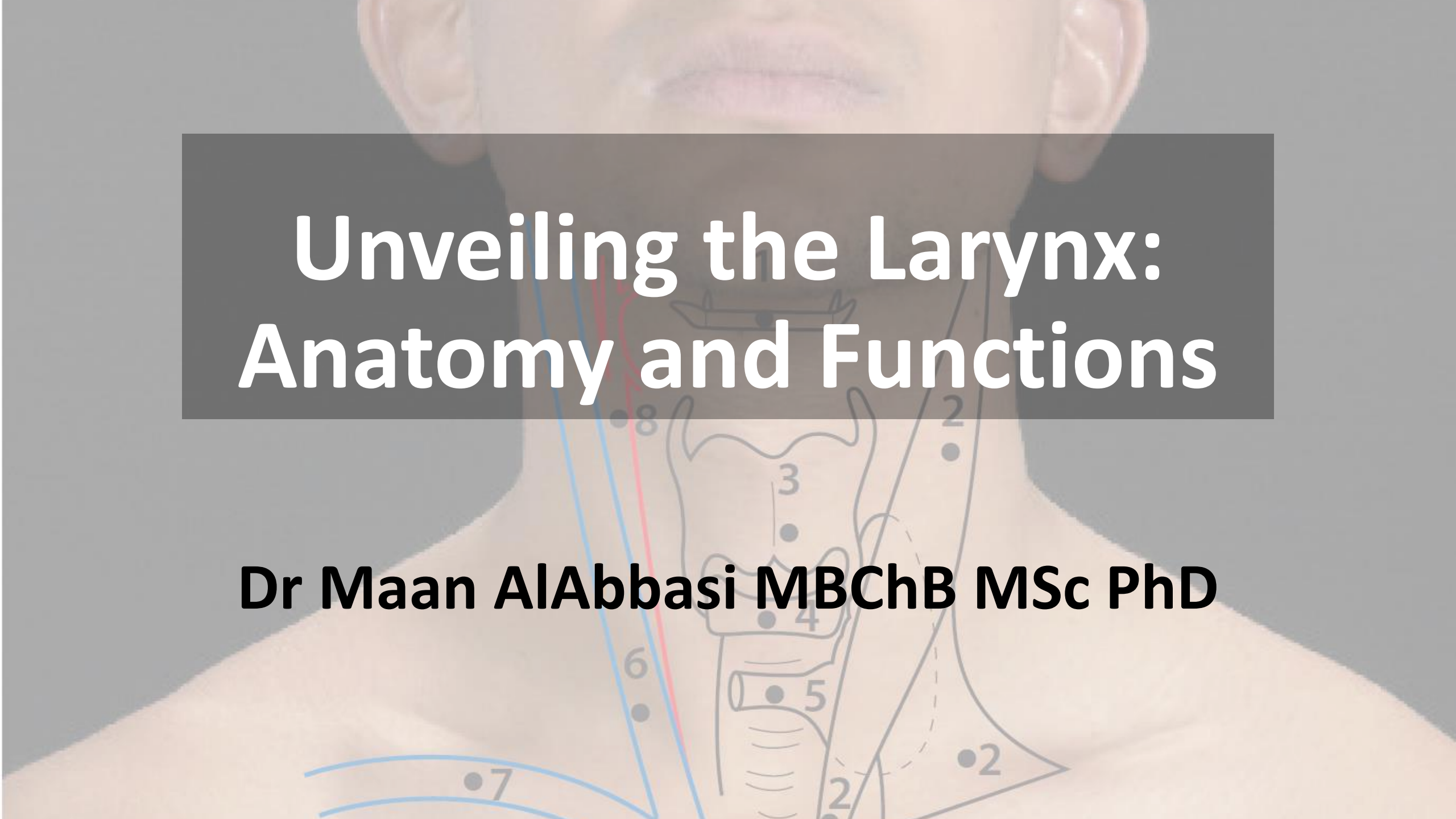
Larynx and vocal cords

In childhood, the vocal cords of boys and girls are equally long. The larynx grows during puberty. This makes the vocal cords longer, lowering the voice – there is a noticeable "breaking" of the voice, especially in boys.



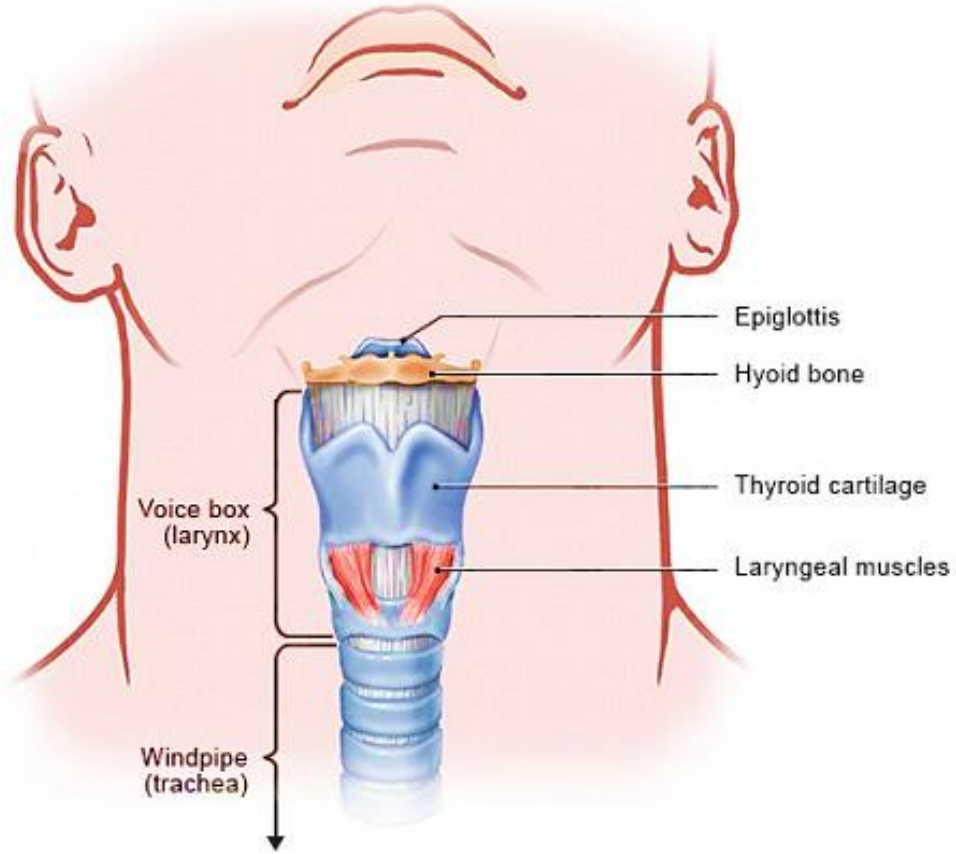
Unveiling the Larynx: Anatomy and Functions

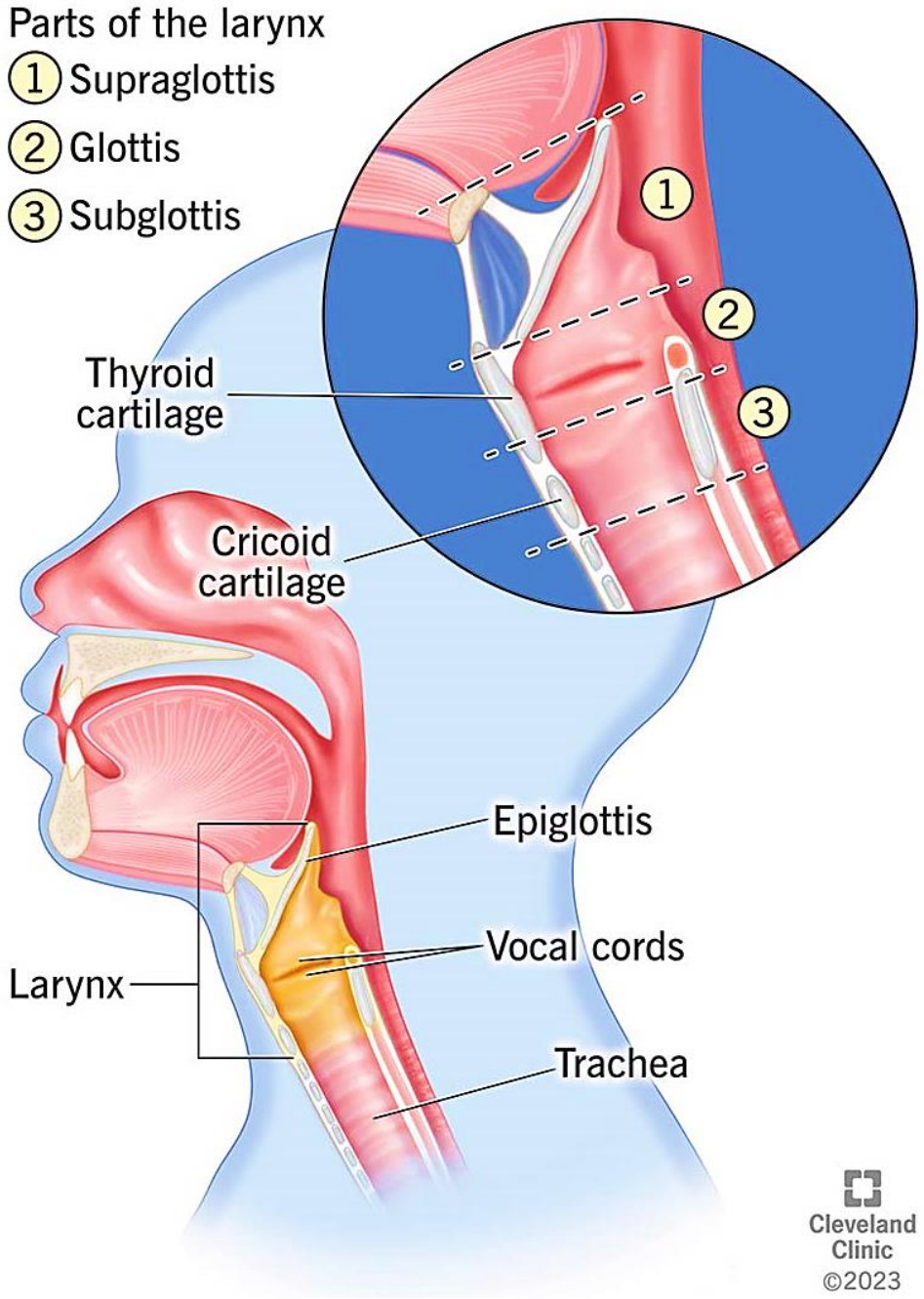
Dr Maan AlAbbasi MBChB MSc PhD



Larynx “Voice Box”

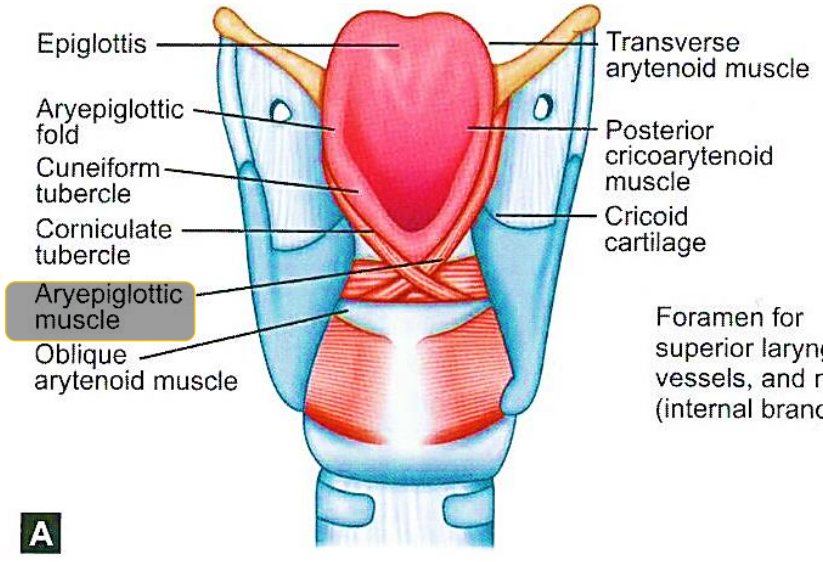
Adam’s apple

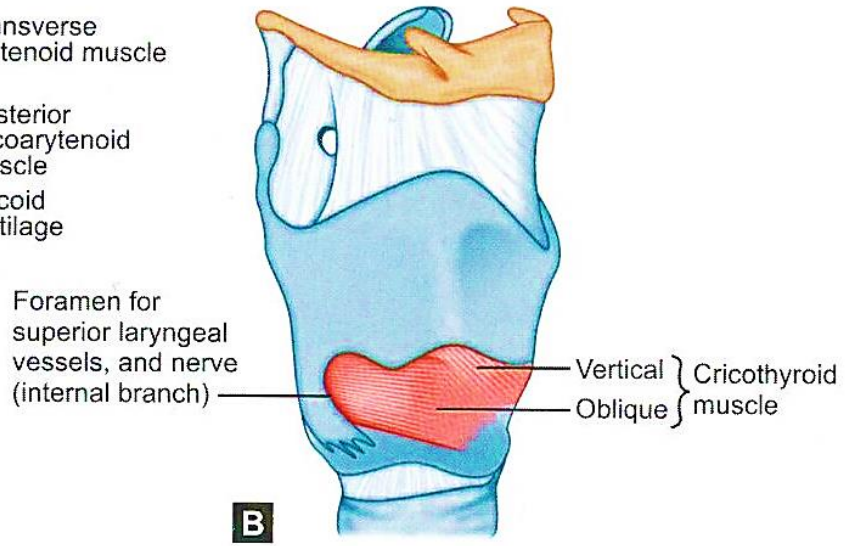


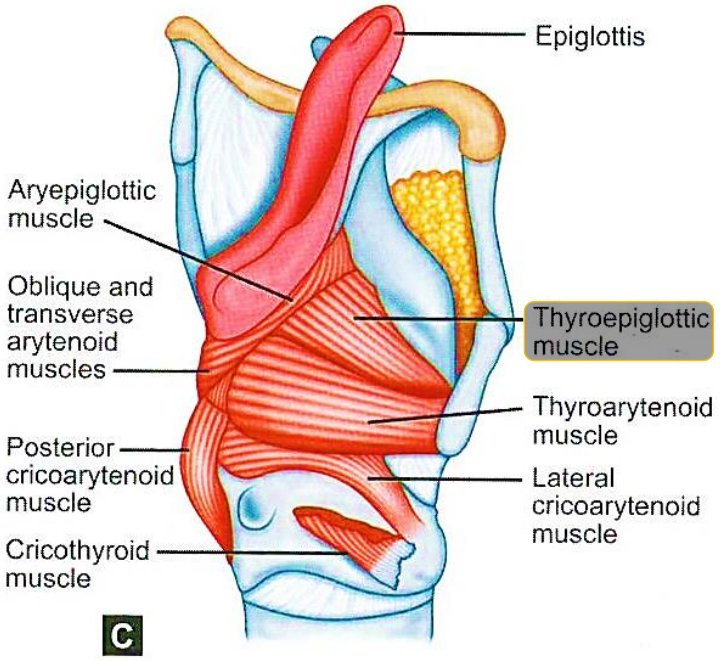


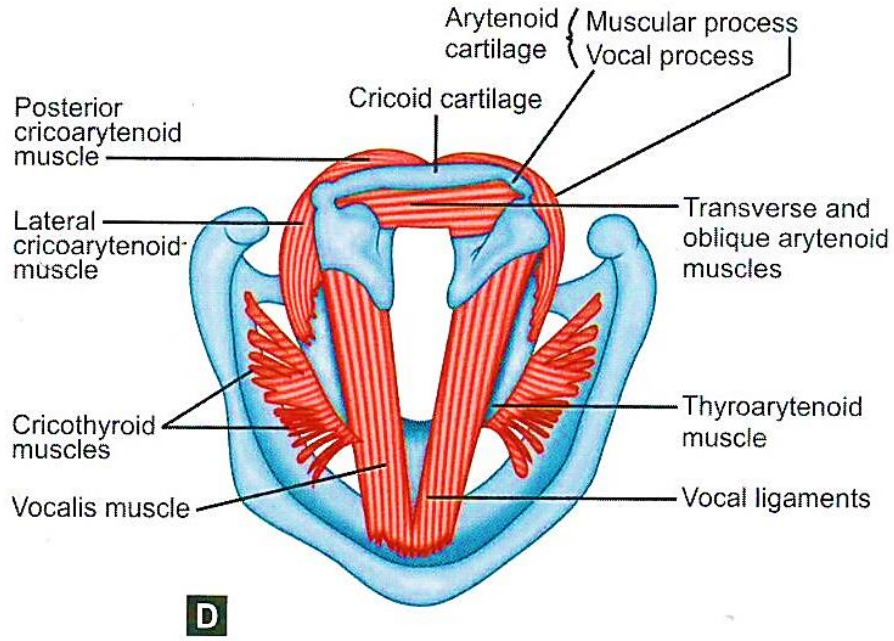
Muscle Functions

- Phonation
- Laryngeal closure
- Cough reflex
- Regulation of intrathoracic pressure



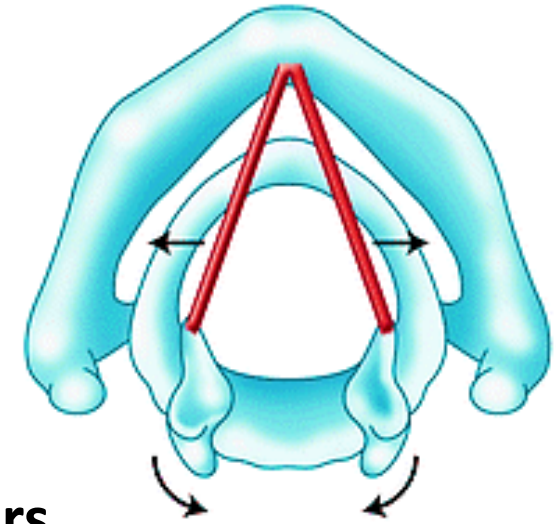




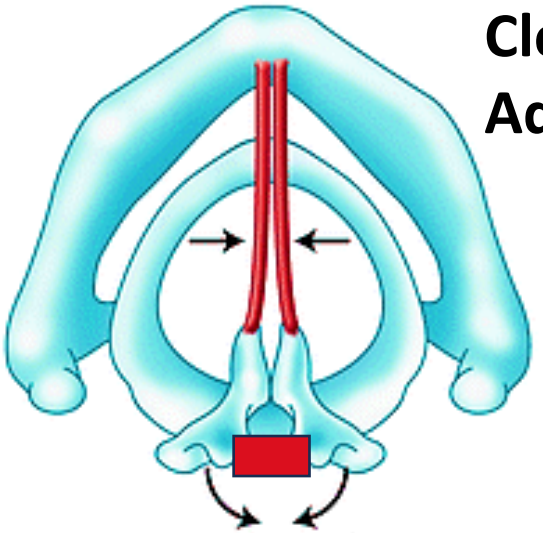


Intrinsic Laryngeal Muscles + Actions

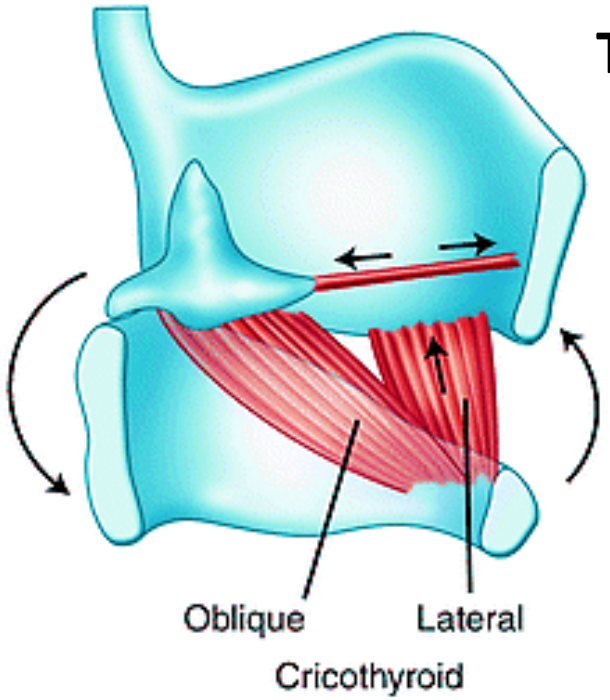
Open Abductors



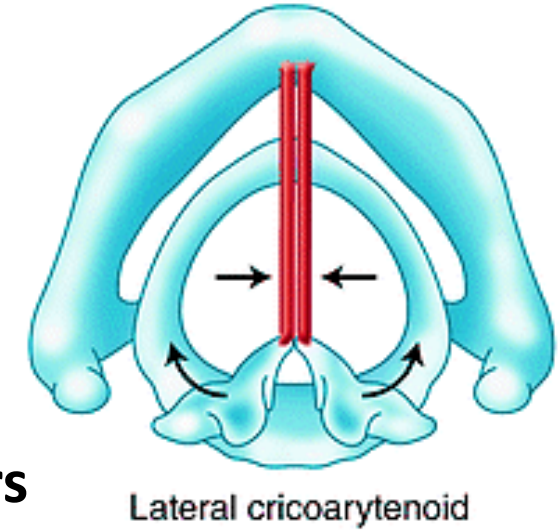
Close Adductors



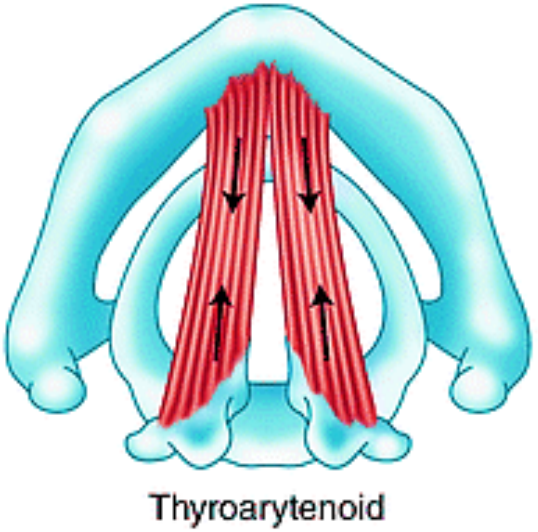
Tense



Close Adductors



Relax



Action of the intrinsic laryngeal muscles (ILMs) control abduction, adduction, and tensing of the vocal fold.

The PCA muscles are the sole vocal fold abductors. As the PCA contracts, it moves the muscular process of the arytenoid posteriorly and inferiorly, which rotates the vocal process laterally and superiorly and thus opens the glottis.

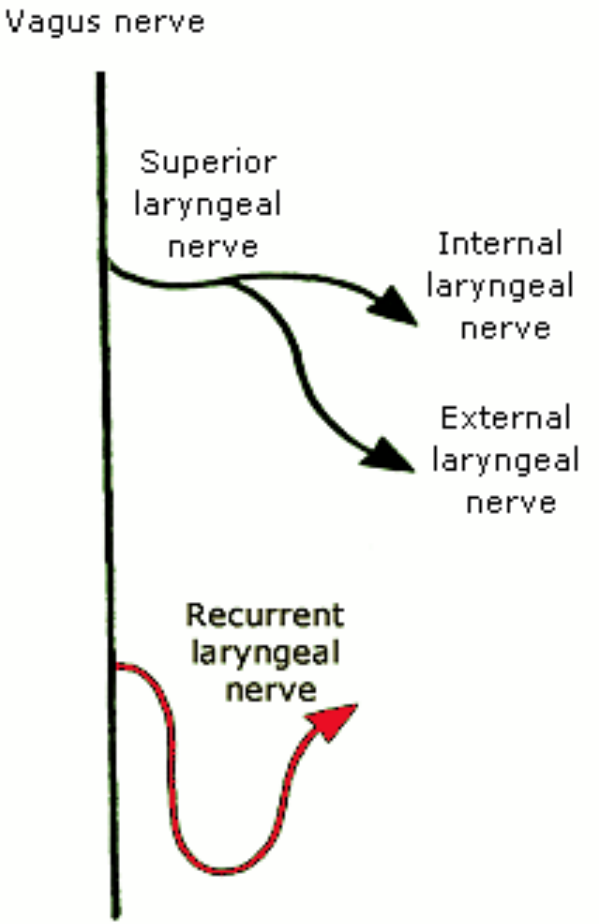
The LCA muscles have an opposite effect: as the LCA moves the muscular process of the arytenoid anteriorly, the vocal process rotates medially and inferiorly to narrow the glottis.

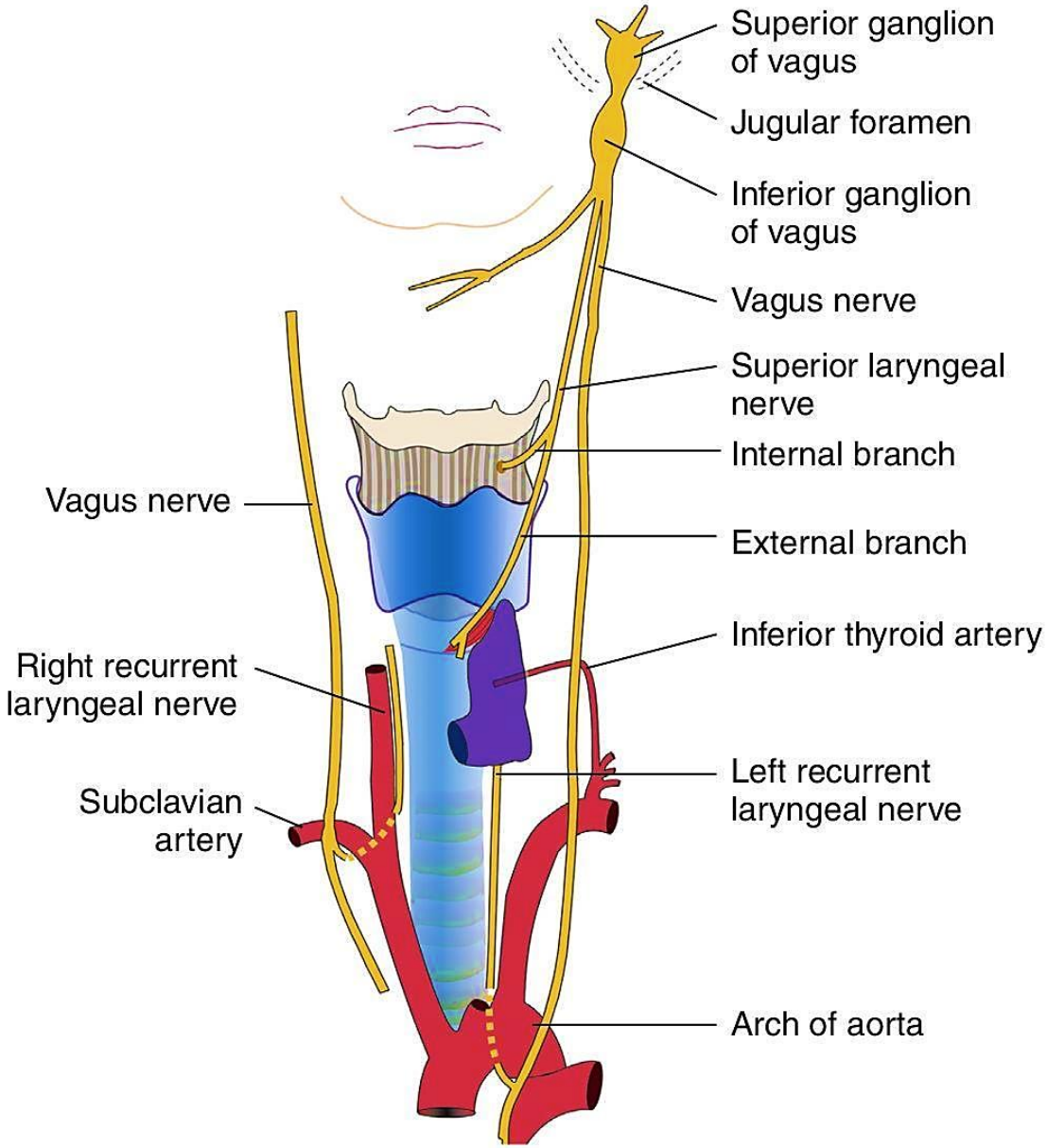
The interarytenoid muscle (IA) connects each arytenoid medial body to the other and assists in adducting the arytenoid cartilages at the posterior commissure.

The thyroarytenoid muscle (TA) acts to adduct the vocal folds, in concert with the action of the LCA and IA muscles. The TA has a primary adductor effect on the mid-membranous vocal fold, as compared to the role of the LCA and IA on adducting the posterior cartilaginous region.

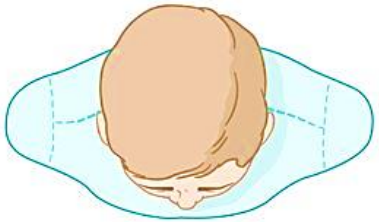
The cricothyroid muscle (CT) brings the anterior aspect of the cricoid and thyroid cartilages closer together, tilting the arytenoid posteriorly, and thus increasing tension on the vocal folds. The CT also acts synergistically with the PCA muscle to widen the anteroposterior dimension of the glottis during vigorous inspiration.

Nerve Supply





Vocal cord paresis



Dysfunction of the recurrent laryngeal nerve
(Inferior laryngeal nerve)

Dysfunction of the vagus nerve
(inferior and superior laryngeal nerve)

	Normal	Unilateral	Bilateral	Unilateral	Bilateral
Respiration					
Phonation					

■ Paramedian position ■ Intermediate position

Blood Supply