

وسهلا

أهلا



الأستاذ الدكتور / يوسف حسين

أستاذ التشريح وعلم الأجنة - كلية الطب - جامعة الزقازيق - مصر

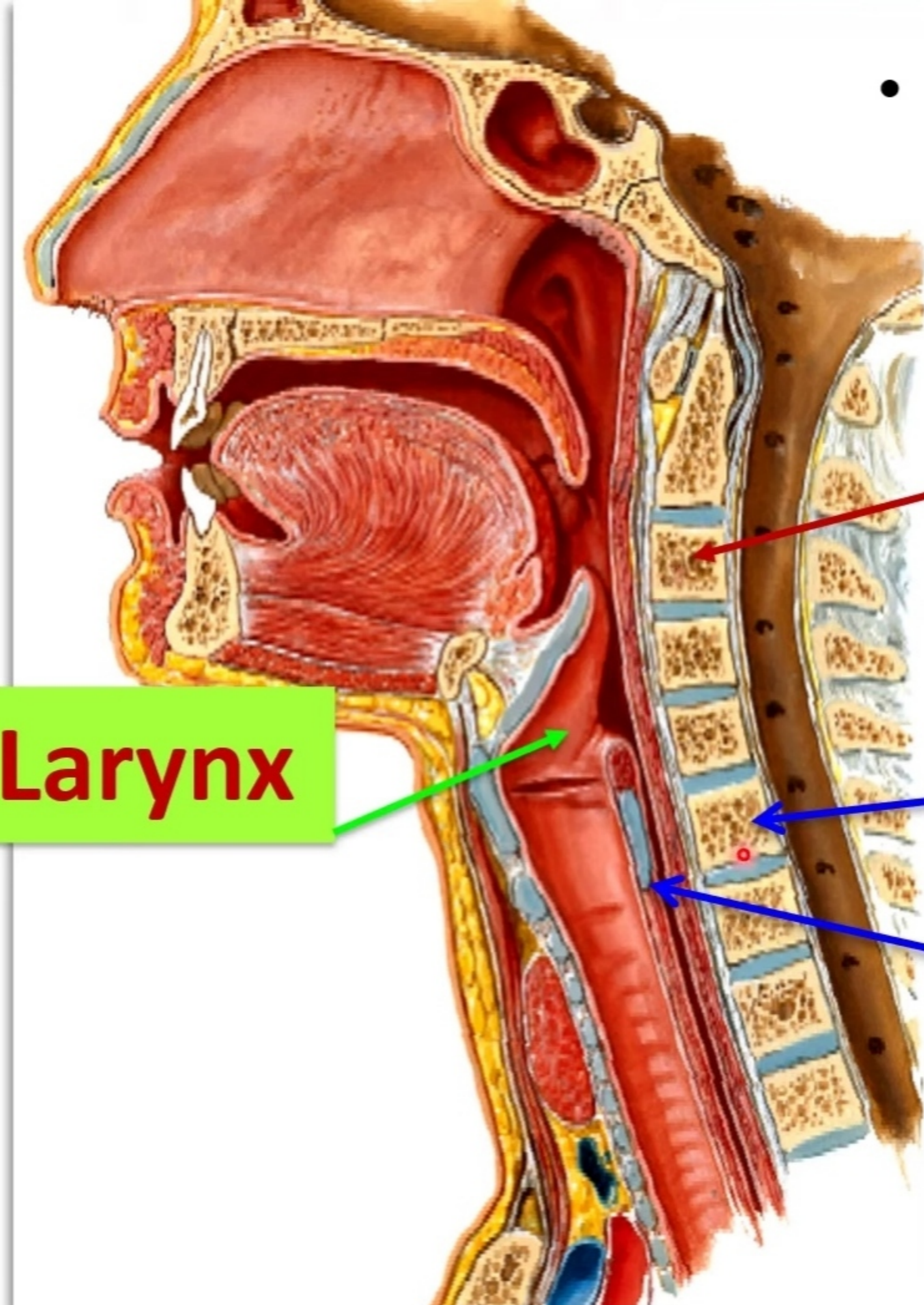
رئيس قسم التشريح و الأنسجة و الأجنة - كلية الطب - جامعة مؤتة

مساعد العميد لشؤون الطلاب والامتحانات - كلية الطب - جامعة مؤتة

دكتورة من جامعة كولونيا المانيا

STRUCTURE OF LARYNX

- The larynx is organ of voice and forms an important part of the respiratory tract
- It is formed a number of **cartilages** which are articulated by **synovial joints** and connected together by **ligaments** and **membranes** and moved by number of **muscles**.



- extending from the root of the tongue to the trachea (from **C3** to **C6** vertebra)

Larynx

C3 vertebra
extension

C6 vertebra

Lower border of Cricoid cartilage

Cartilages

3 single

Epiglottis

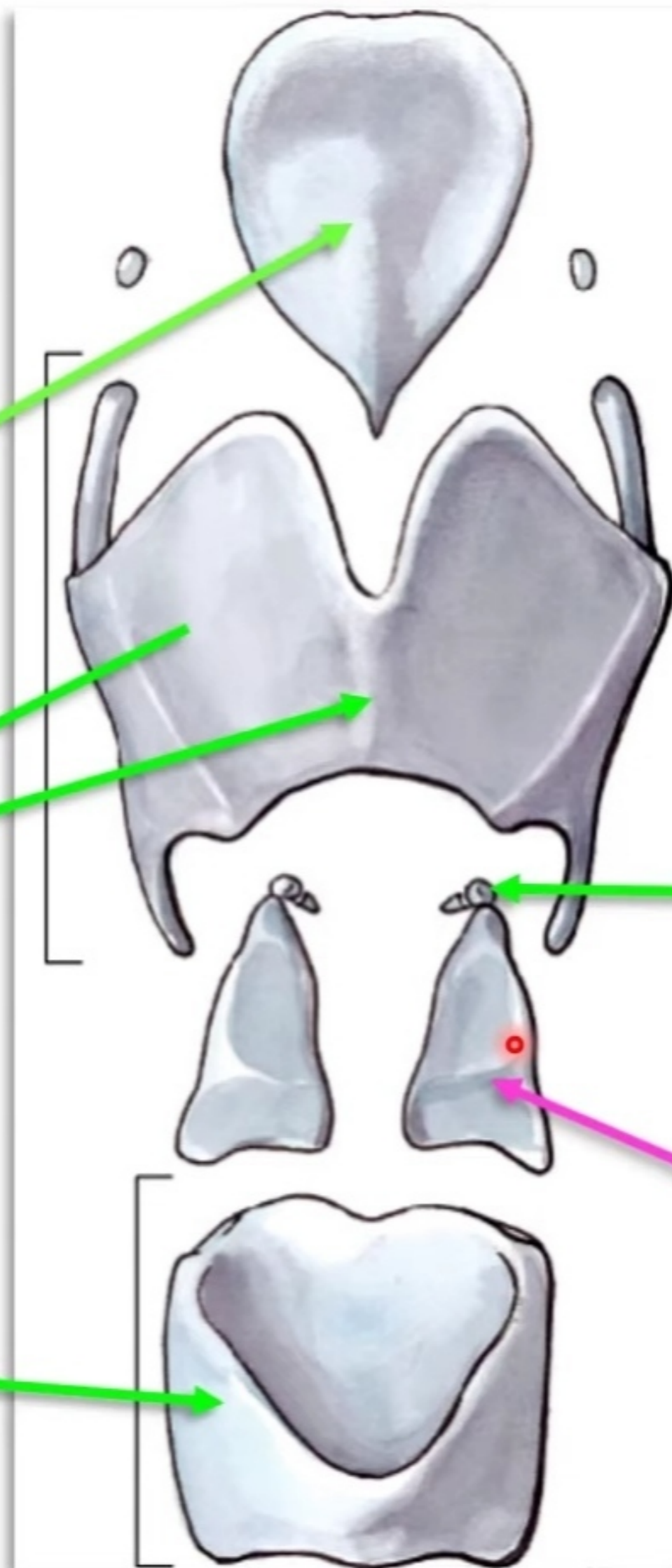
Thyroid cartilage
(Adam's apple).

Cricoid cartilage

3 paired

Corniculate cartilage

Arytenoid cartilage



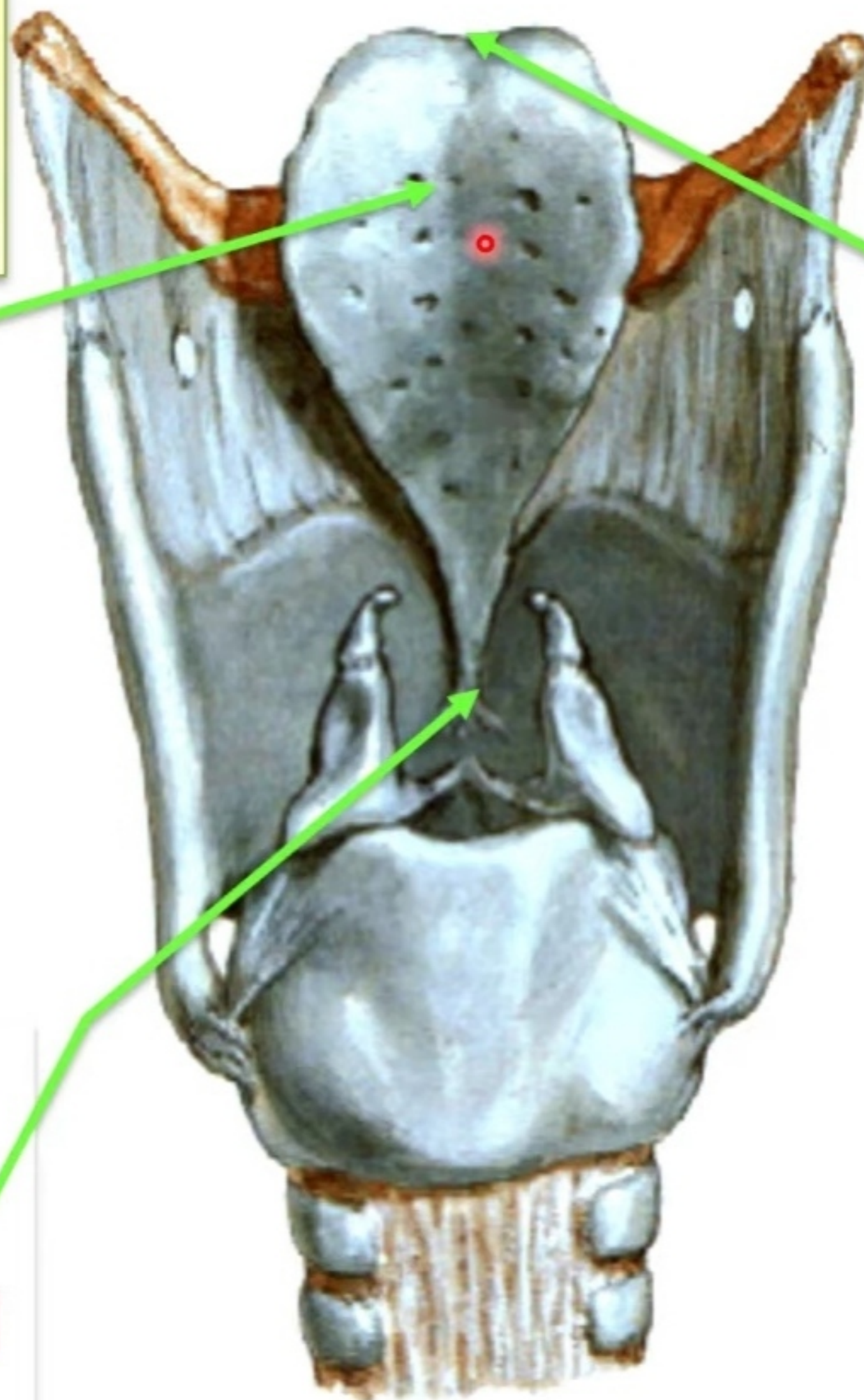
Epiglottis is a leaf-shaped plate

Epiglottis

Upper margin free & wide

Narrow Inferior end to the inner aspect of thyroid cartilage

Post. Surface of epiglottis



Epiglottis

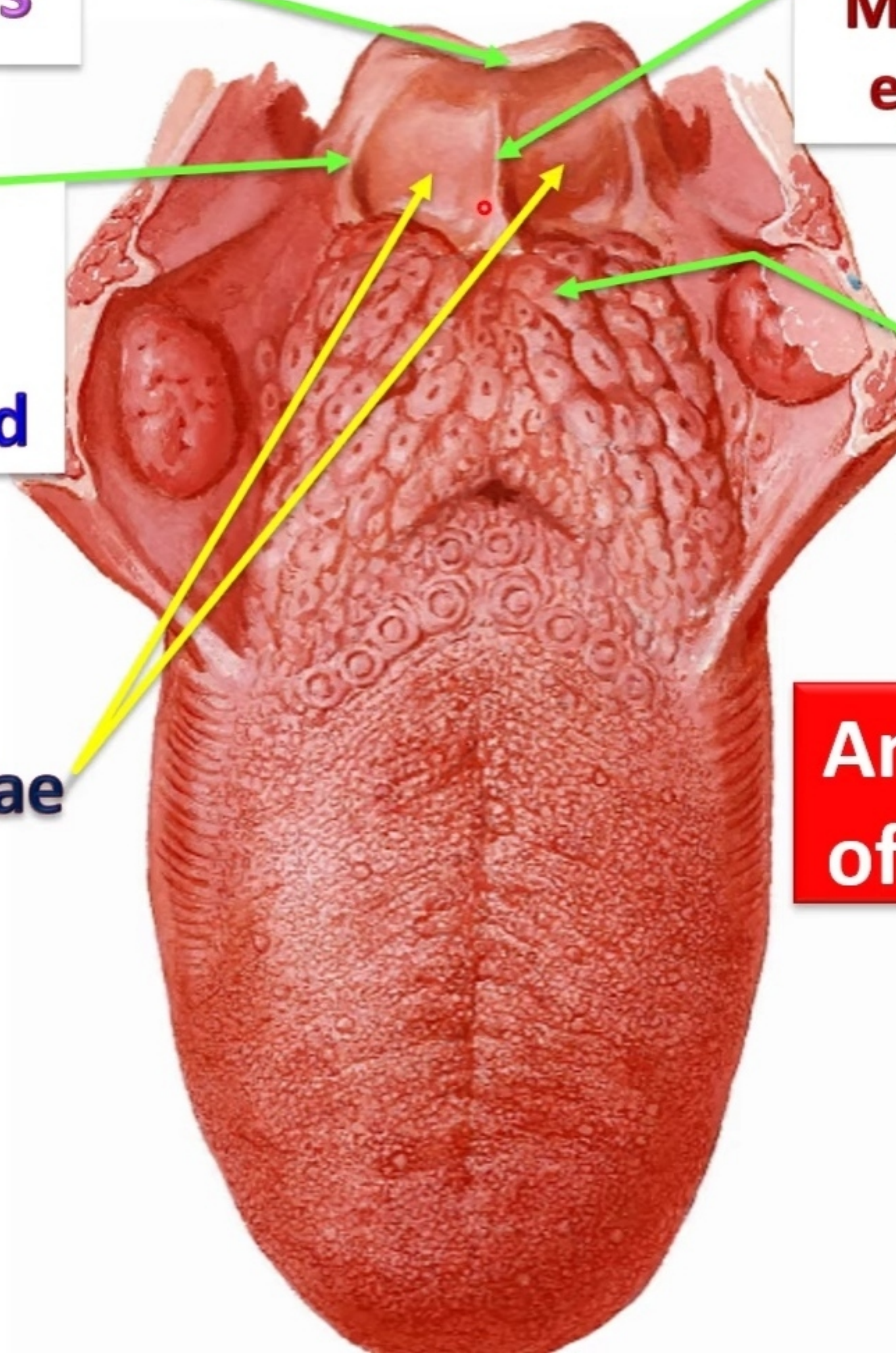
Median Glosso-epiglottic fold

Lateral Glosso-epiglottic fold

Root of tongue

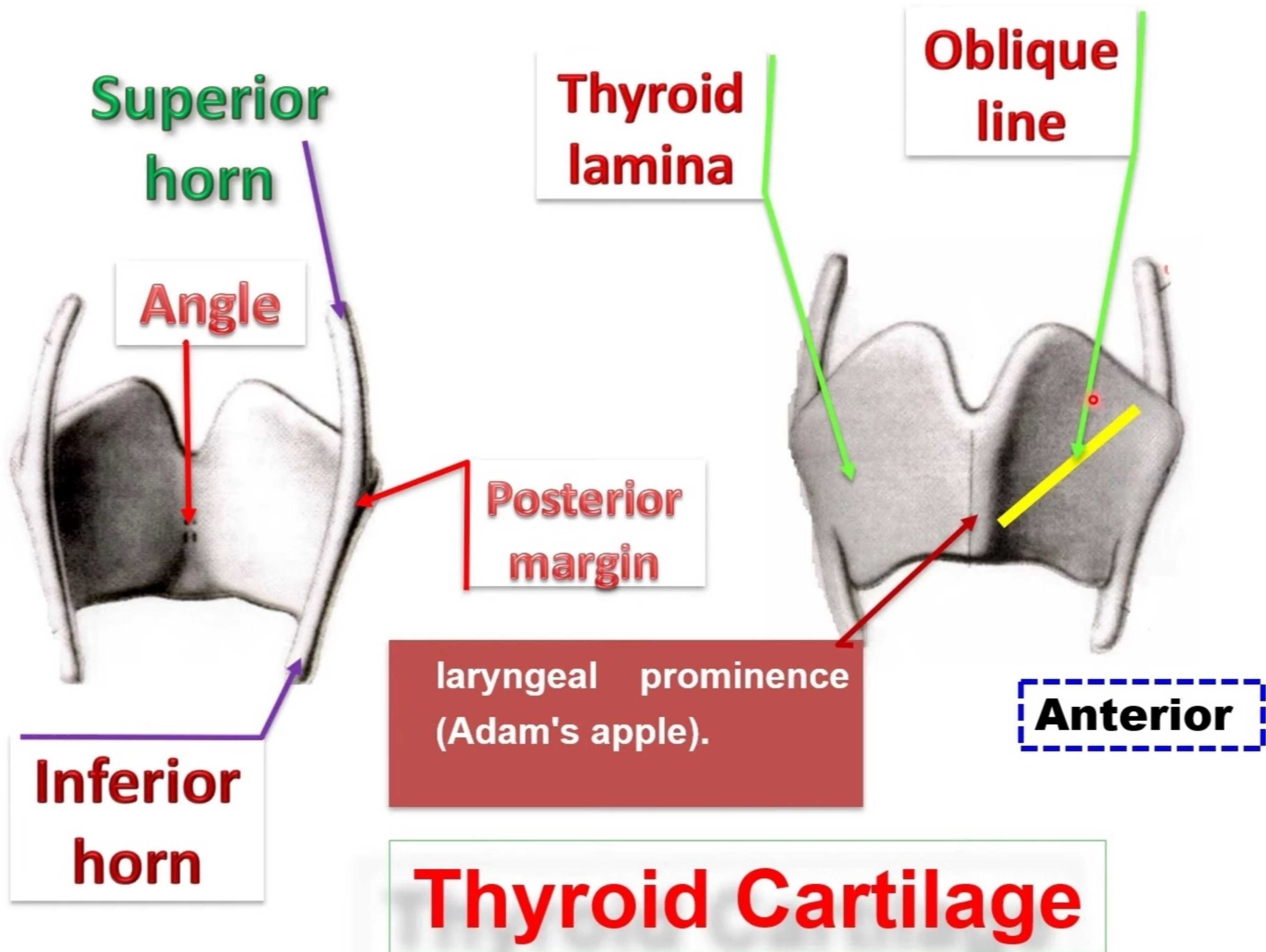
Valleculae

Ant. Surface of epiglottis



• Epiglottis اللهاة

- It is a **leaf-like** lamella of elastic cartilage.
- It projects upwards behind the tongue and hyoid bones.
- Its **upper** end is wide and free.
- Its **lower** end is narrow and fixed to the inner aspect of the thyroid prominence.
- **Posterior surface** of the epiglottis is smooth.
- **Anterior surface,**
 - **Upper level**, is connected to the root of the tongue by:
 - **A median fold** called median **glosso-epiglottic fold**.
 - **On each side** by a lateral **glosso-epiglottic folds**.
 - The depression between median and lateral folds is called **vallecula** أخدود. **It is an important landmark during intubation of the trachea**



Superior horn

Thyroid lamina

Oblique line

Angle

Posterior margin

laryngeal prominence (Adam's apple).

Anterior

Inferior horn

Thyroid Cartilage

- **Thyroid cartilage** (the largest one) **الدرقي**

- It is formed of 2 quadrilateral laminae which are separated posteriorly but united anteriorly to form the laryngeal prominence (**Adam's apple**).
- **It is more prominent in in male (90 degree) than females (120 degree).**
- The posterior border of each lamina has 2 horns:
 - a) Superior Horn:** attached to the hyoid bone by the lateral **thyrohyoid ligament**.
 - b) Inferior horn:** articulates with **cricoid cartilage**.
- The lateral surface of the lamina shows an **oblique line** that gives attachment to the muscles (sternothyroid, thyrohyoid and inferior constrictor muscle of the pharynx).

signet-ring shaped

Cricoid cartilage



Broad posterior lamina

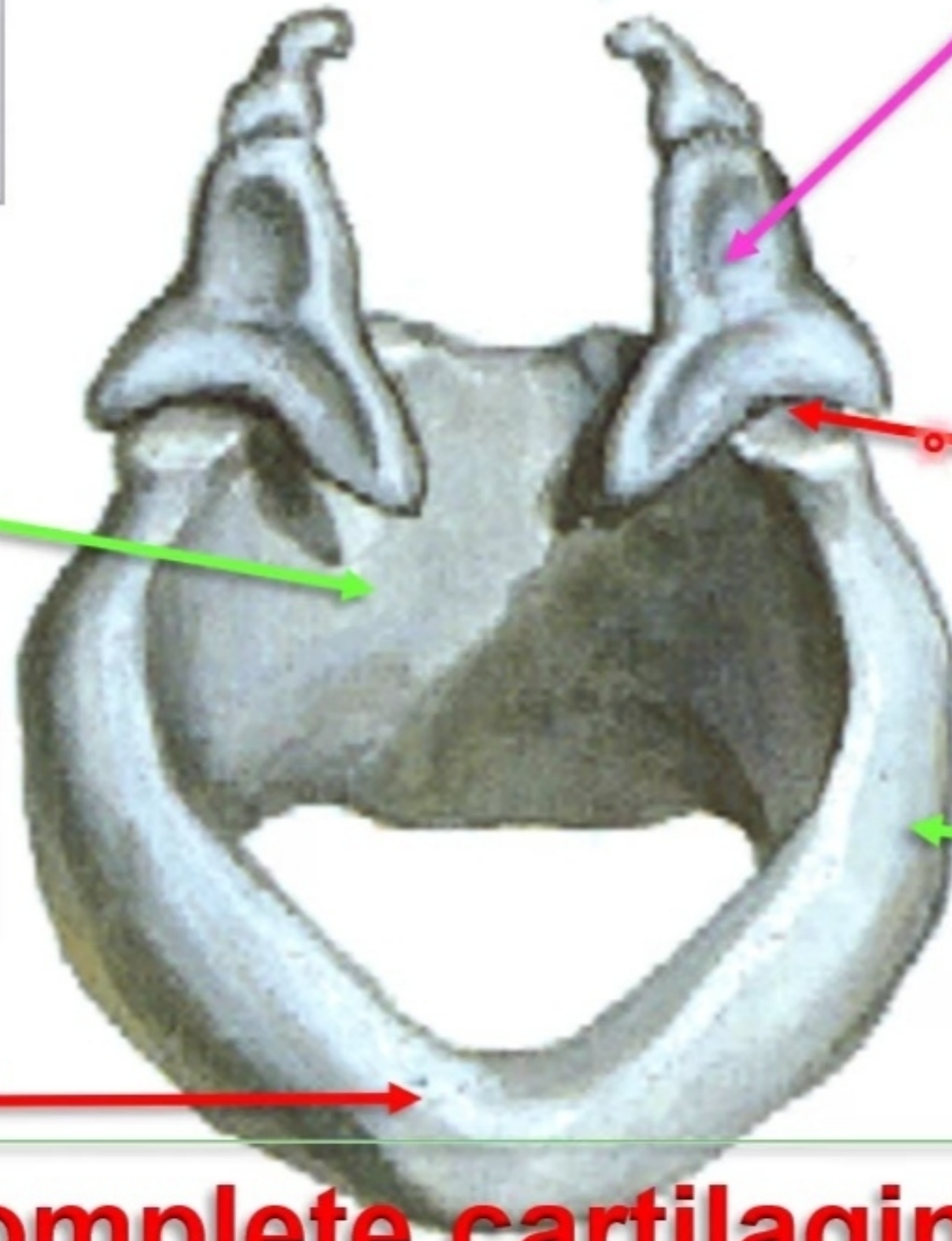
Narrow anterior arch

Arytenoid cartilage

Articular facet for Arytenoid cartilage

Cricoid cartilage

Is the only complete cartilaginous ring in the whole of air passage



- **Cricoid cartilage** حلقى

- It is **ring-shaped** having a broad **lamina posteriorly** and a narrow **arch anteriorly**.

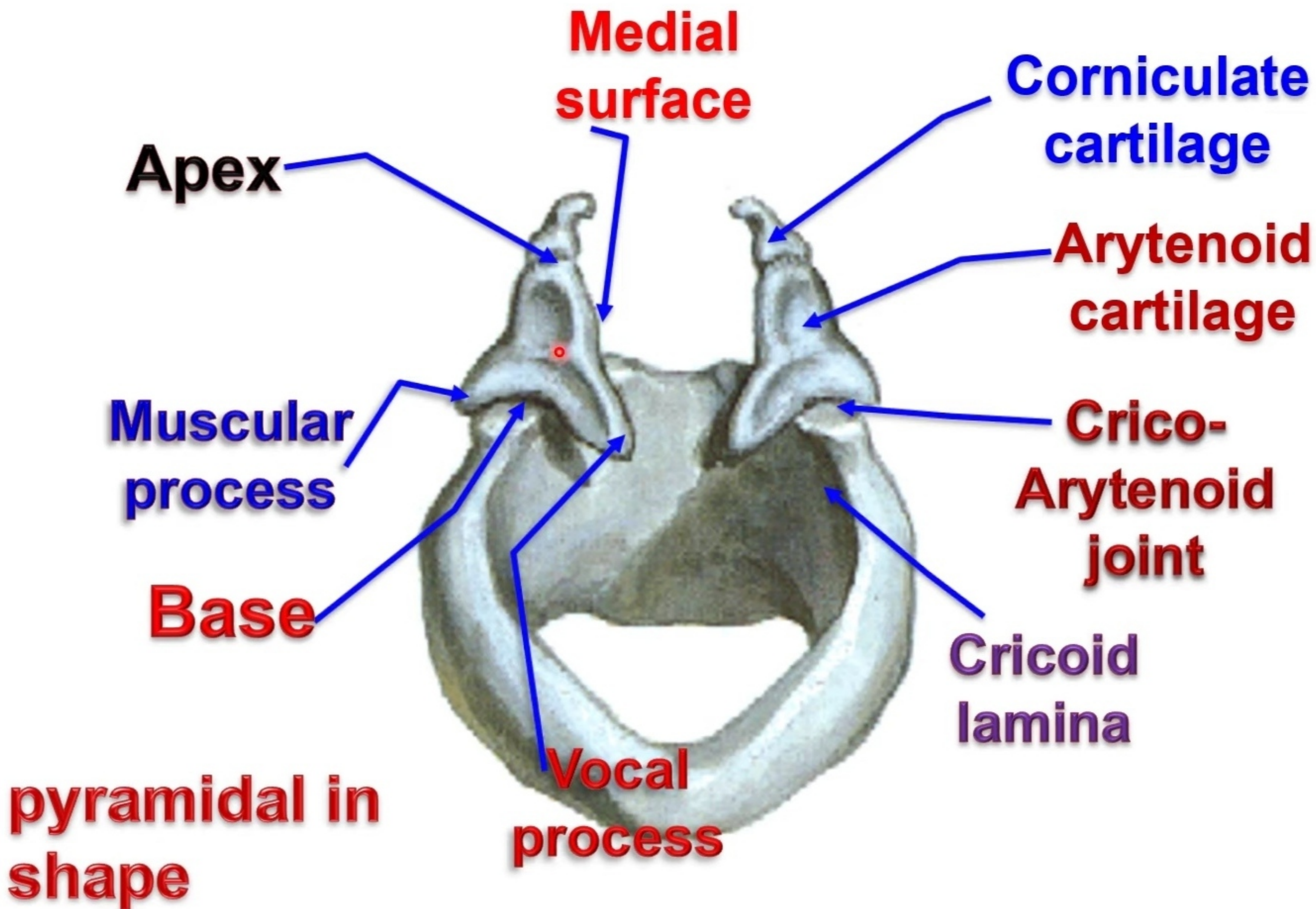
- It lies opposite the **6th** cervical vertebrae.

- **It articulates with**

- a- Posteriorly:** upper border of the lamina articulates with **2 arytenoids** cartilages (**cricoarytenoid joint**).

- b- The anterolateral aspect** of the arch articulates with the inferior horn of the **thyroid cartilage** (**cricothyroid joint**).

Arytenoid cartilages (Key cartilage)



- **Arytenoid cartilages**
(**Key cartilage of the larynx**)

- Each one is **pyramidal** in shape having:

1) Apex (above): related to **corniculate cartilage**.

2) Base (below): articulates with **cricoid cartilage**

* Two processes project from the base;

a- Vocal process direct gives attachment to the **vocal ligament**.

b- Muscular process gives attachment for the muscles.

- **Corniculate cartilages**

- Each one lying at the apex of the arytenoid cartilage.

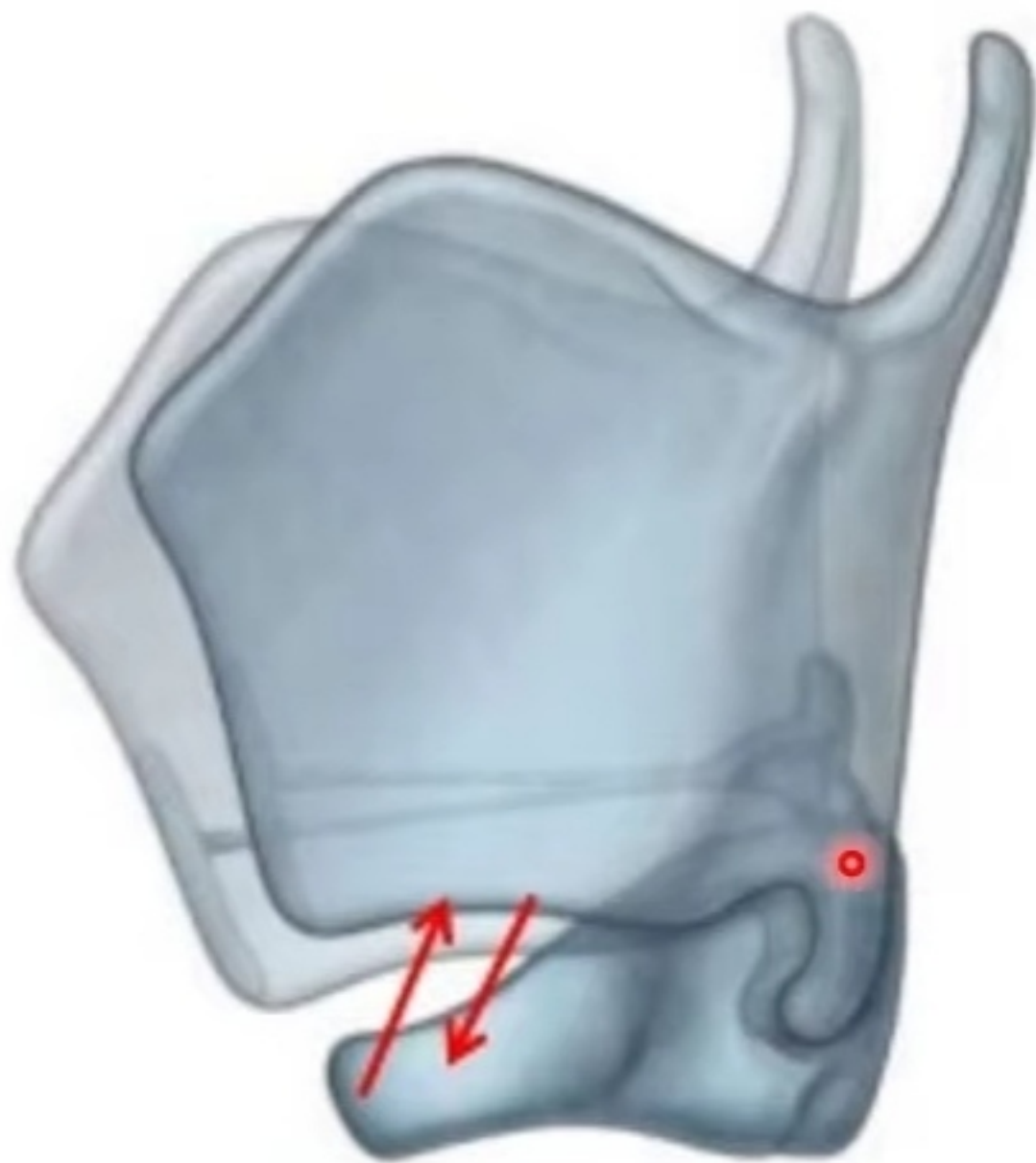
- **Cuniform cartilages**

- Small cartilage nodule lying in aryepiglottic fold.

Joints of larynx (Synovial)

Anterior

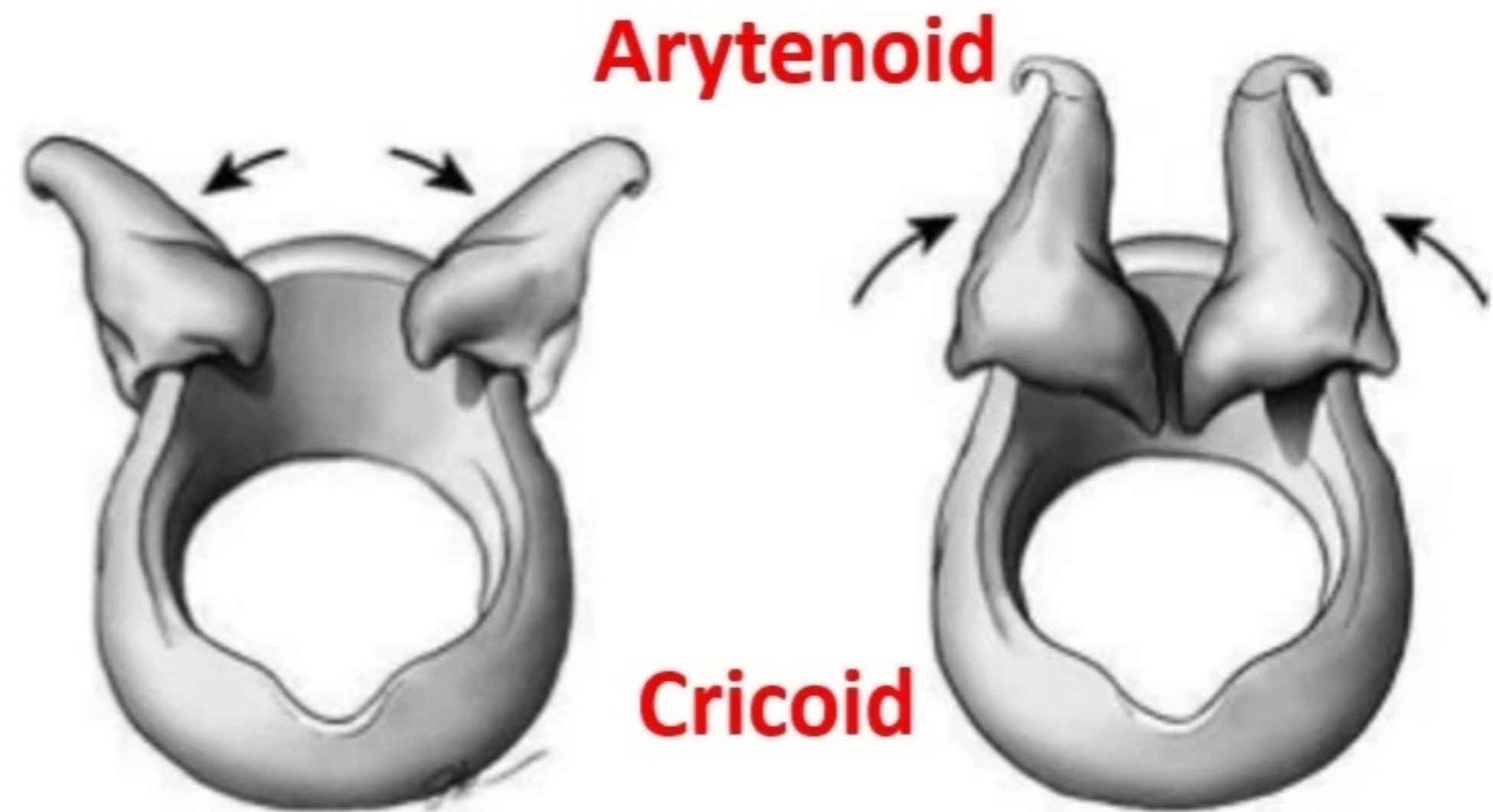
Crico-thyroid Joint



**Forward and
Backward of
thyroid cartilage**

Posterior

Crico-arytenoid Joint



**Abduction and
Adduction of vocal
cord**

Membranes and ligaments of the larynx

Hyoid

Thyrohyoid membrane

Internal laryngeal nerve

Superior laryngeal artery

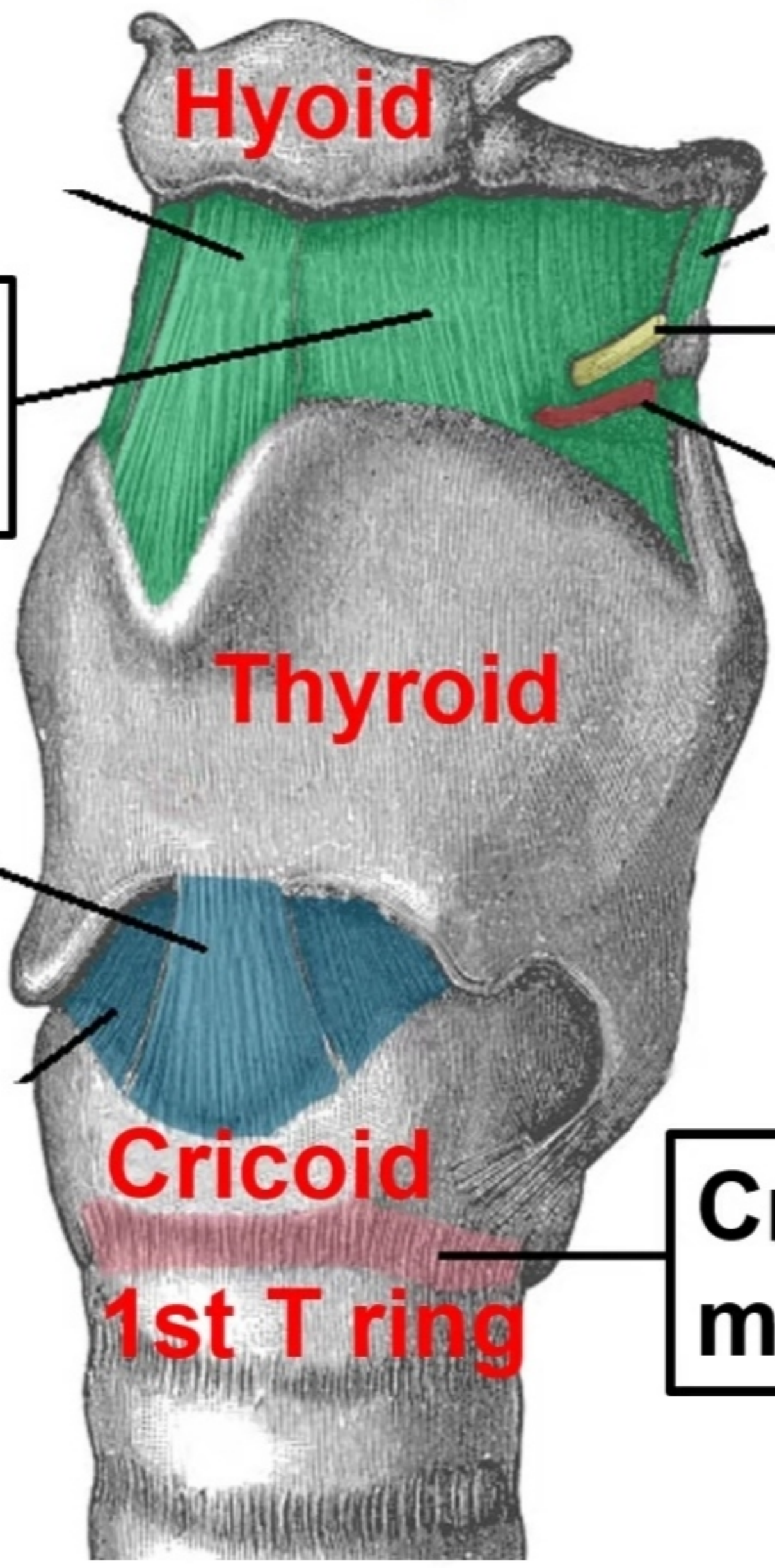
Thyroid

Cricothyroid membrane

Cricoid

1st T ring

Cricotracheal membrane



- **Membranes and ligaments of the larynx**

- ❖ **Thyrohyoid membrane:**

- **Attachment;**

- a- From the upper border of the thyroid cartilage.

- b- To the hyoid bone.

- The membrane **pierced by**: internal laryngeal nerve and superior laryngeal artery.

- ❖ **Cricotracheal membrane** from the cricoid cartilage **to the** first ring of the trachea.

**Conus
elasticus**

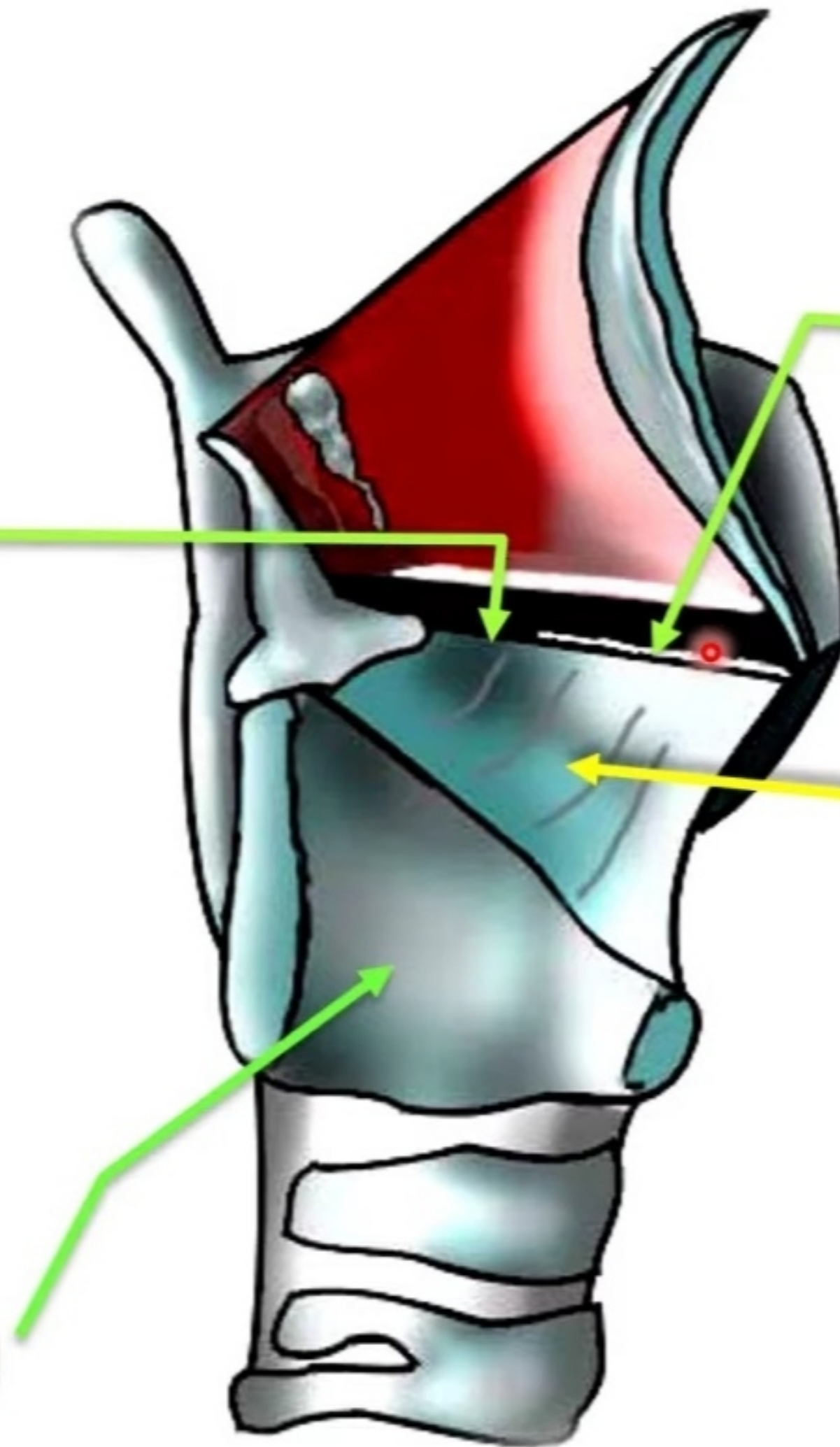
Cricothyroid membrane

Vocal ligament

**Upper free
margin**

**Cricothyroid
membrane**

Cricoid arch



**Upper Free margin
aryepiglottic fold**

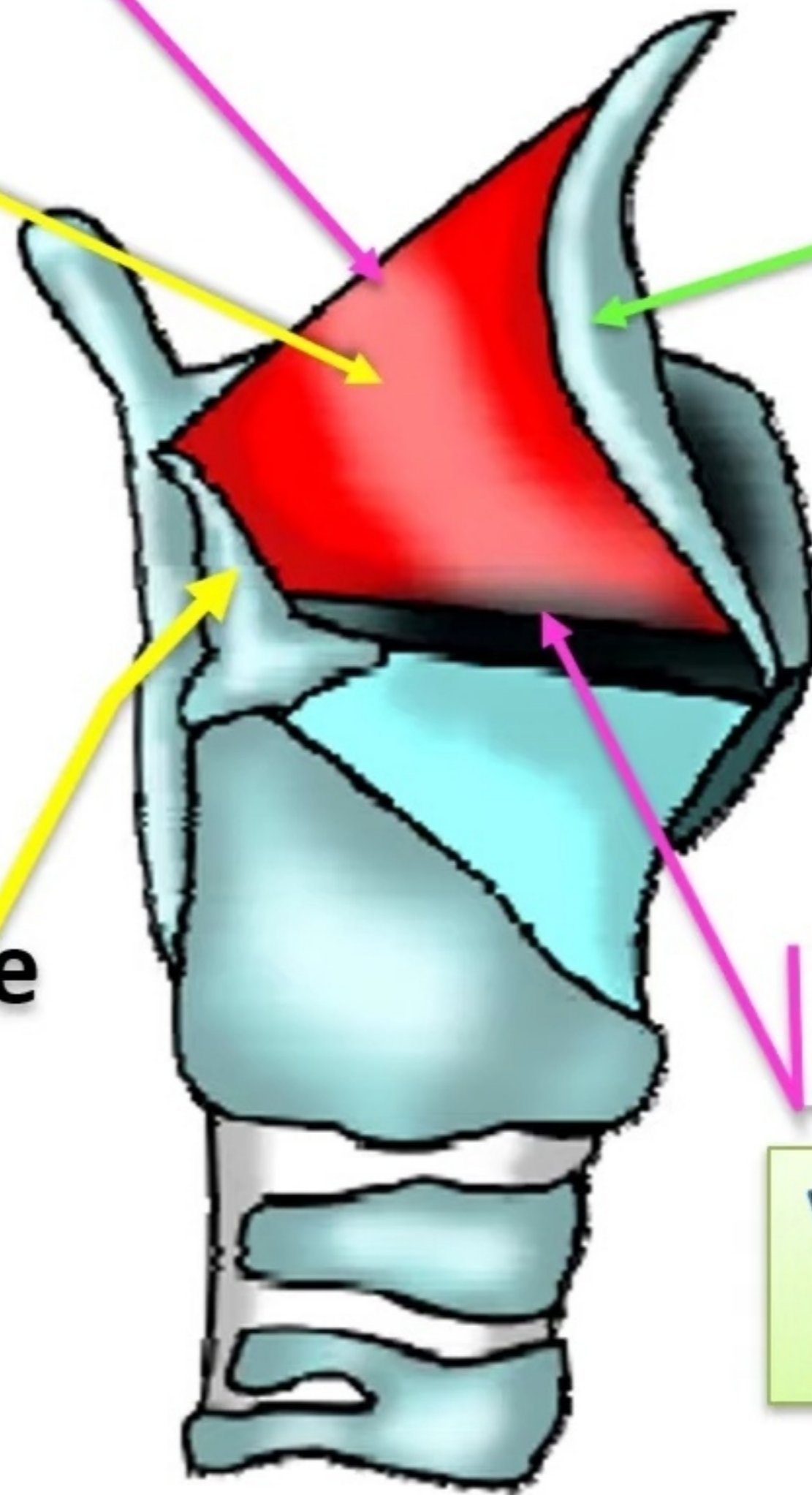
**Quadrangular
Membrane**

Epiglottis

Arytenoid cartilage

lower Free margin

**Vestibular ligament
False vocal cord**



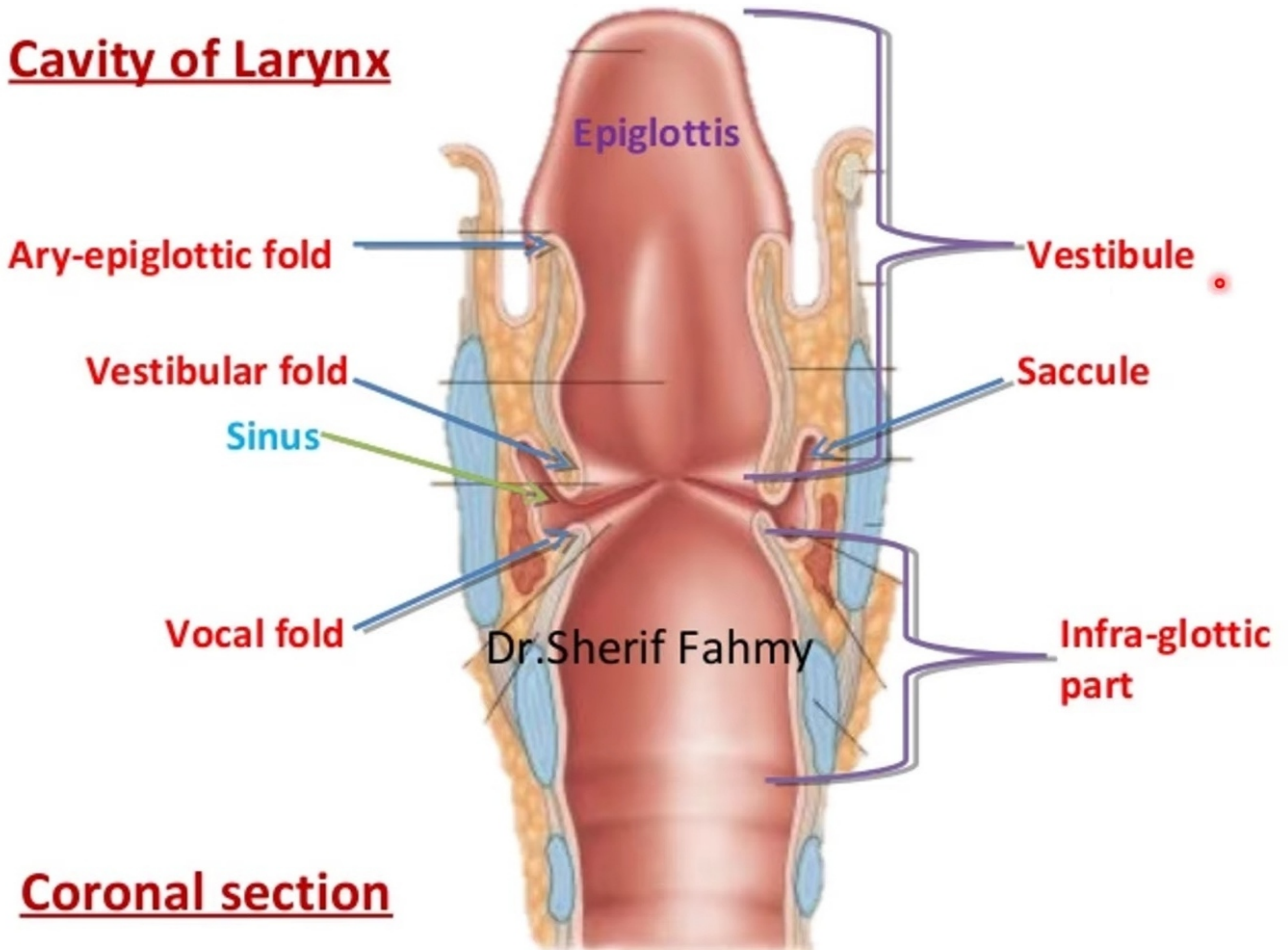
- **Membranes and ligaments of the larynx**

- **Cricothyroid membrane and ligaments (*conus elasticus*):**
 - From upper border of cricoid cartilage to lower border of thyroid cartilage.
- **The upper free border of the lateral cricothyroid membrane (Vocal ligament or true vocal cord)** extends between inner surface of angle of **thyroid cartilage** (anterior) and vocal process of **arytenoid cartilage** (posterior).
- **Quadrangular membrane:**
 - **Extends from epiglottis** (anterior) & **arytenoid cartilages** (posterior).
 - a- **Upper free border** (**aryepiglottic fold**) and forms the laryngeal inlet.
 - b- **Lower free border** forms the vestibular fold (**false vocal cord**).



**Cavity of
larynx**

Cavity of Larynx



Coronal section

- **CAVITY OF THE LARYNX**

- Each side wall presents a pair of folds of mucous membrane.

A- Upper folds called **vestibular folds** (false vocal cords)

B- Lower folds called **vocal folds** (true vocal cords)

- **It is divided into 3 Compartments:**

1. Vestibule (upper): above the vestibular folds.

2. Sinus or Ventricle (middle): between them.

- **Saccules**, one on each side, a **pouch** extends up from the anterior part of the sinus, **between vestibular fold and thyroid cartilage**

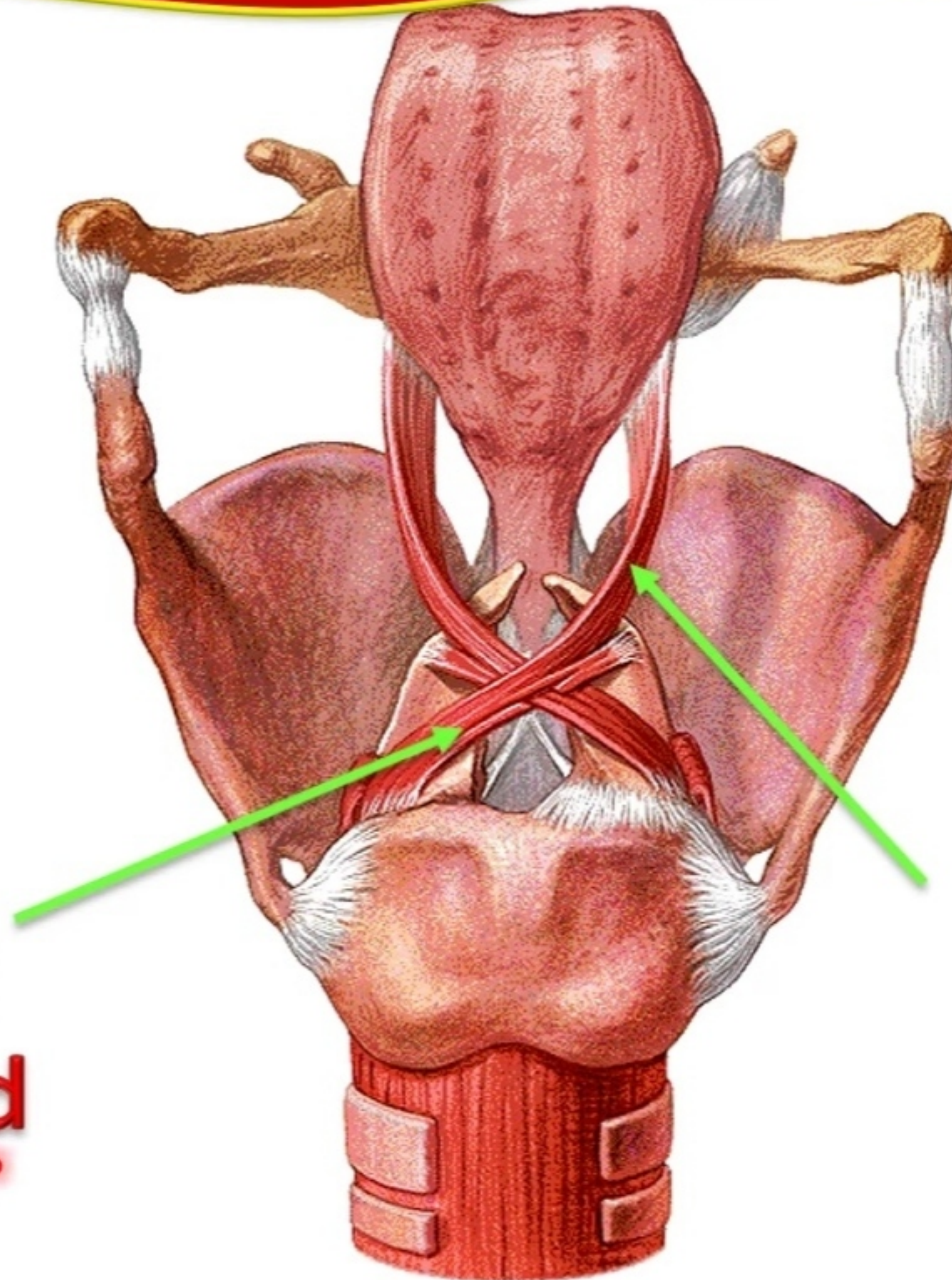
3. Infraglottic part: (lower) below the vocal folds.

(1) Rima vestibuli: is the space between the 2 vestibular folds.

(2) Rima glottidis: is the space between the 2 vocal folds.

- It is the **narrowest part** of the laryngeal cavity. It is more wide in **male** (about 23 mm) than **female** (17 mm).

**Muscles Controls the inlet of larynx
(act as sphincter of the inlet)**

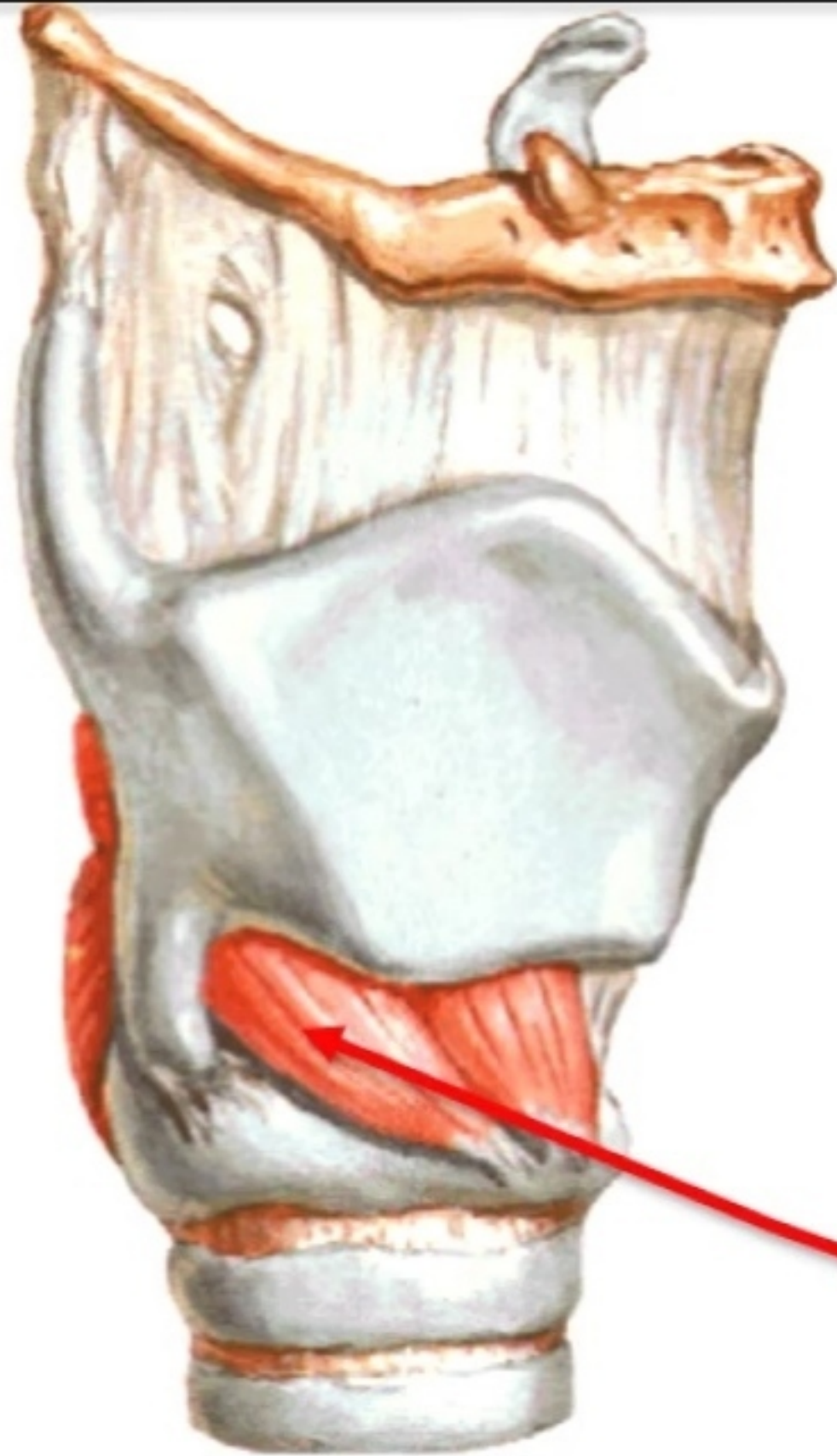


**Oblique
Arytenoid
muscle**

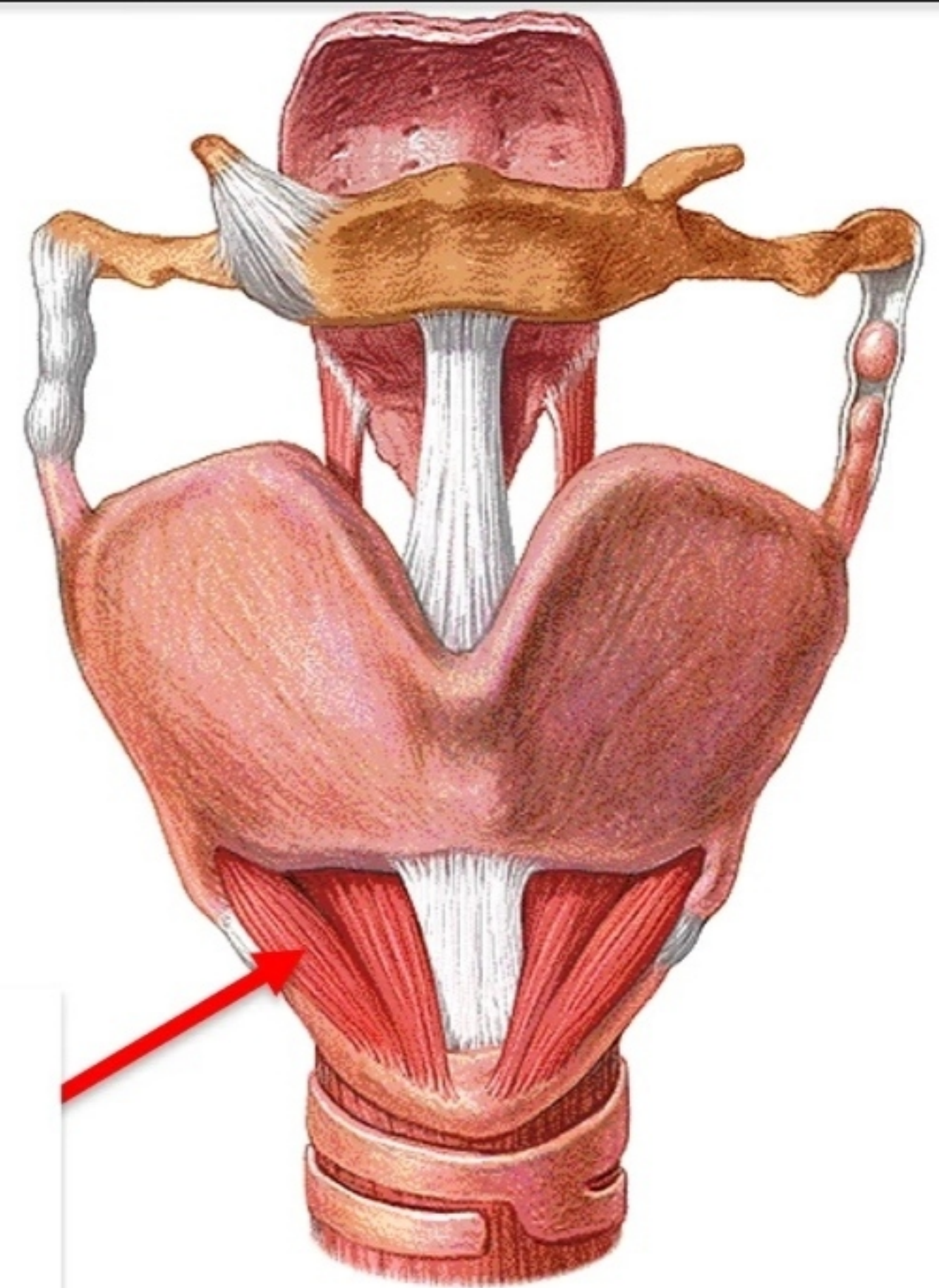
**Aryepiglottic
muscle**

Muscles which stretch the vocal cords

Cricothyroid muscle: From the arch of cricoid cartilage to the inferior horn and lamina of the thyroid cartilage



Lateral view



Front view

Cricothyroid stretch

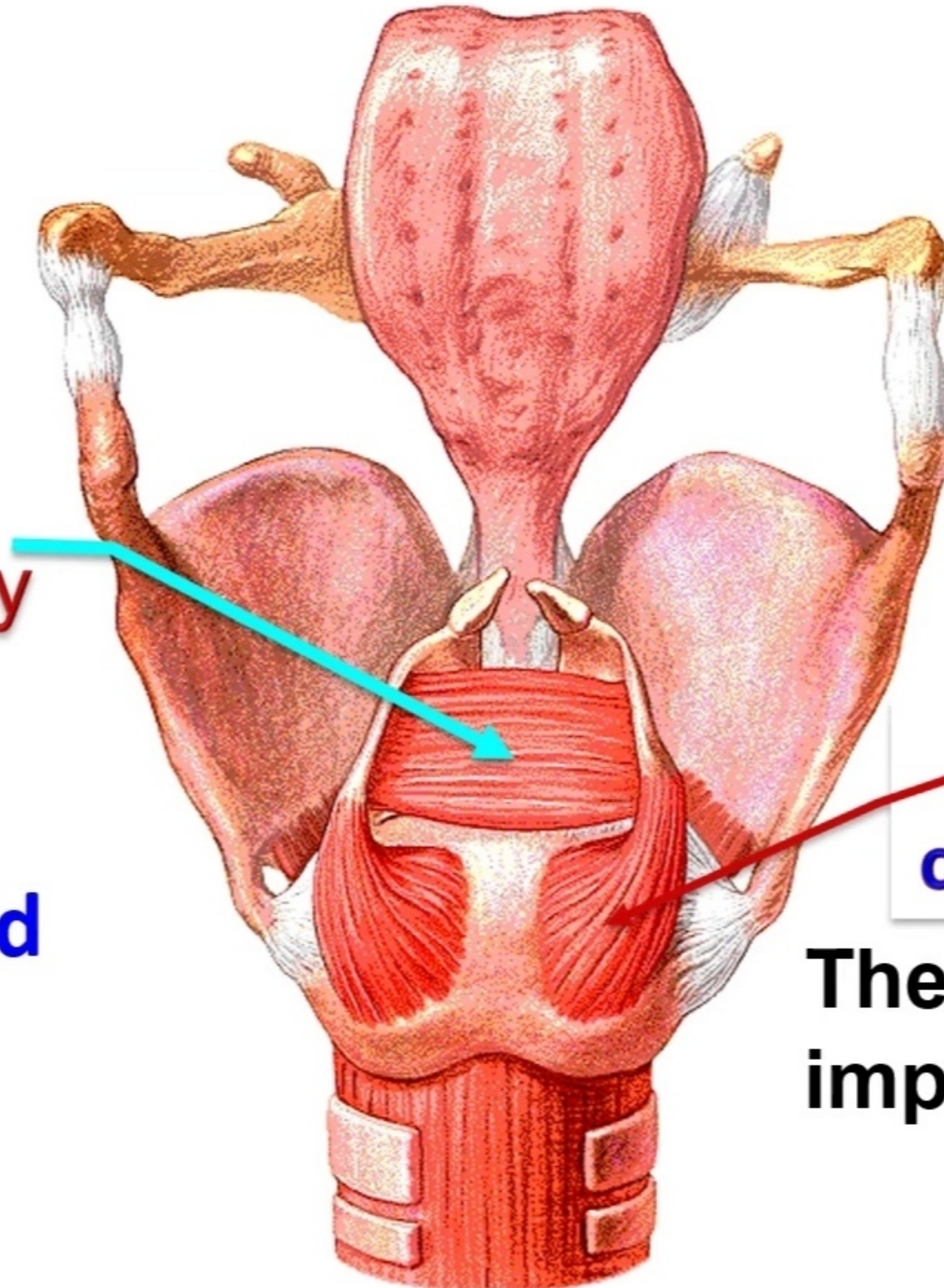
only muscle lies outside

Muscles abduct and adduct the vocal cord

Adduction

Abduction

- Transverse Arytenoid (Only single)
- Lateral cricoarytenoid



Posterior cricoarytenoid

The most important muscle

- **Muscles which abduct the vocal cords**

- * **The posterior crico-arytenoid**

- **Origin** from the posterior surface of the cricoid cartilage.
- **Insertion** into the muscular process of the arytenoid cartilage.
- **Action**; It is the **most important muscle in the larynx** and perhaps in the whole body, since it is the **only abductor** of the vocal fold (open the rima glottidis).

- **Muscles which adduct vocal cords**

- (1) **The lateral crico-arytenoids muscles:**

- **Origin** from the upper border of the arch of cricoid cartilage.
- **Insertion** into the muscular process of the arytenoid cartilage.

- (2) **The transverse arytenoid muscle (only single).**

- **Origin** from the posterior surface of arytenoids cartilage.
- **Insertion** into the posterior surface of arytenoids cartilage of the opposite side.

Epiglottis

Aryepiglottic fold

Cuneiform cartilage

Corniculate cartilage

Aryepiglottic muscle

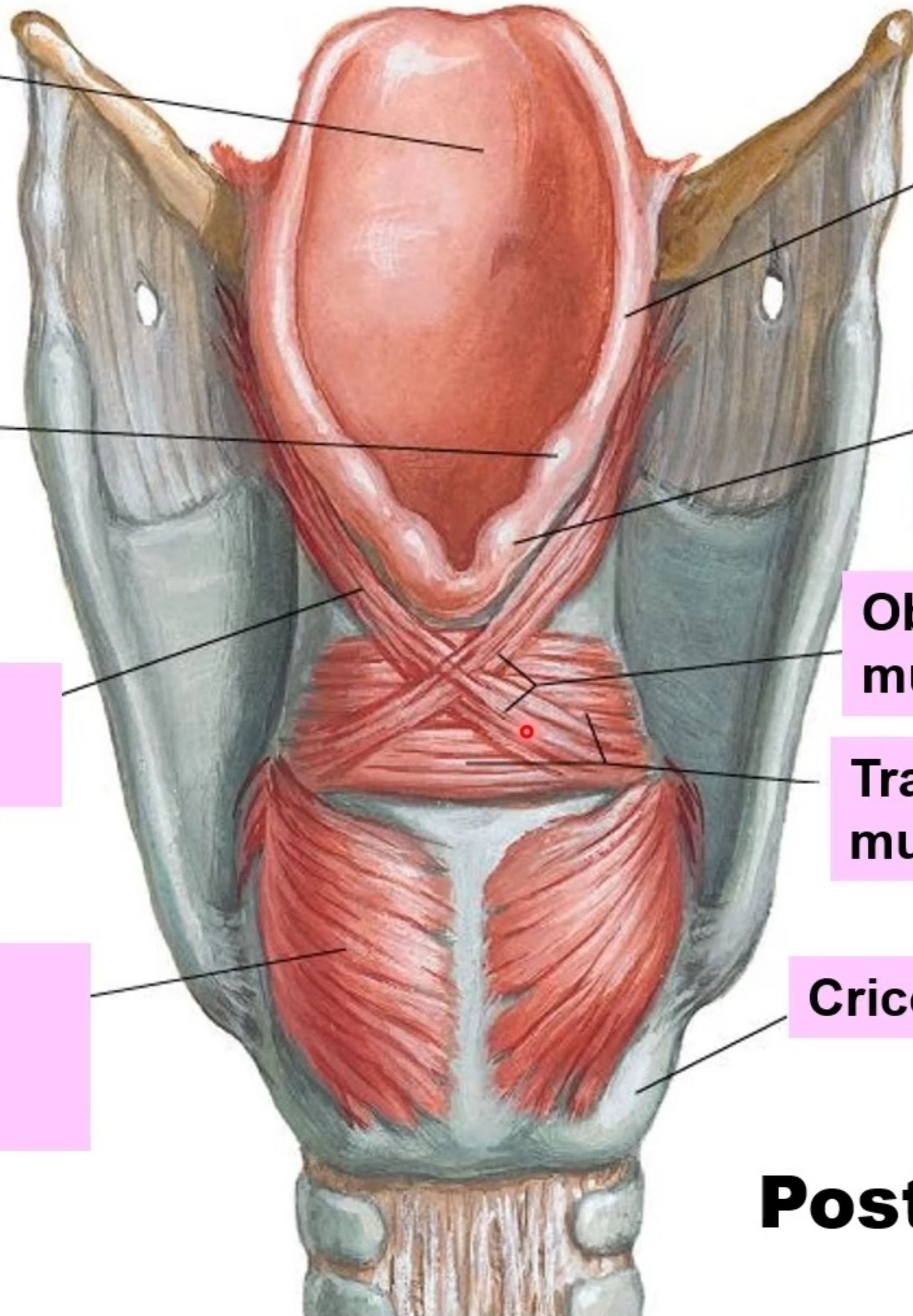
Oblique arytenoid muscle

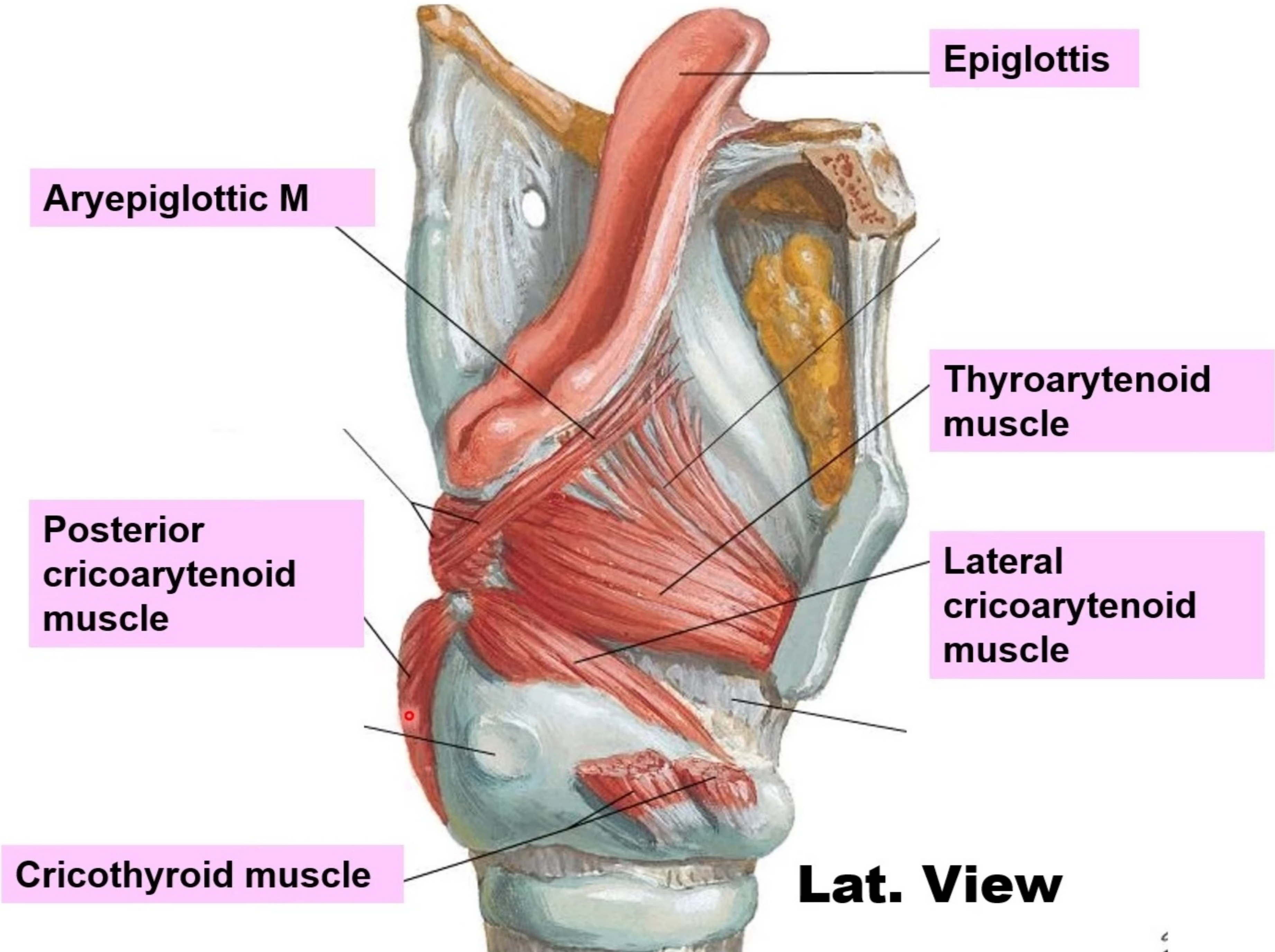
Transverse arytenoid muscle

Posterior cricoarytenoid muscle

Cricoid cartilage

Post. View





Epiglottis

Aryepiglottic M

Thyroarytenoid muscle

Posterior cricoarytenoid muscle

Lateral cricoarytenoid muscle

Cricothyroid muscle

Lat. View

Nerve supply of larynx

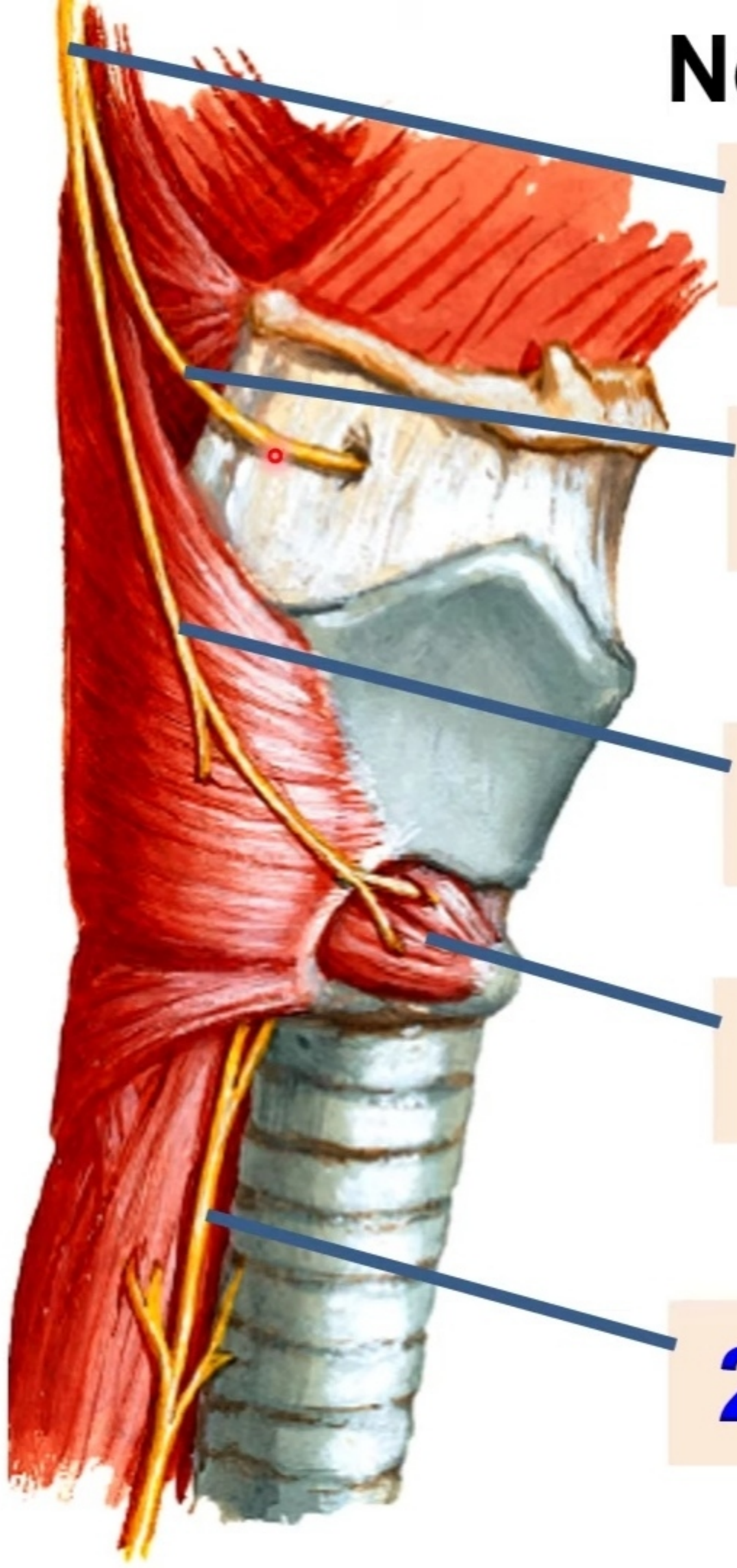
1- Superior Laryngeal N

Internal Laryngeal N

External Laryngeal N

Cricothyroid M

2- Recurrent Laryngeal N



- **NERVE SUPPLY OF THE LARYNX**

(1) Motor supply

- **All the intrinsic laryngeal muscles** are supplied by recurrent laryngeal nerves **except cricothyroid muscle** is supplied by **external** laryngeal nerve.

(2) Sensory supply to the mucous membrane :

a- Internal laryngeal nerve above the vocal cords.

b- Recurrent laryngeal nerve below the vocal cords.

- **Left recurrent laryngeal** nerve hooks around ligamentum arteriosum (longer than right)
- **Right** hooks around the 1st part of subclavian artery

- **Blood supply**

1- Superior laryngeal A from superior thyroid A (ECA)

2- Inferior laryngeal A from inferior thyroid A (subclavian A)

Paralysis of the laryngeal nerves

1- Paralysis of the external laryngeal nerve

- The nerve is closely related to superior thyroid artery, So it is liable to injury during thyroidectomy leading to paralysis of cricothyroid muscle.

a- Unilateral injury leading to hoarsens of voice and voice fatigue

b- Bilateral injury; leading to loss of voice (aphonia)

2- Paralysis of the recurrent laryngeal nerve

- The nerve is closely related to inferior thyroid artery, So it is liable to injury during thyroidectomy.

a- Unilateral Injury leading to hoarsens of voice caused by reduced mobility of one vocal fold.

b- Bilateral Injury leading to dyspnea (suffocation), stridor and snoring (paralysis of posterior cricoarytenoid muscles but adduction caused by cricothyroid muscles)

3- Paralysis of bilateral internal laryngeal nerve leading to loss of laryngeal reflex cough result in aspiration pneumonia