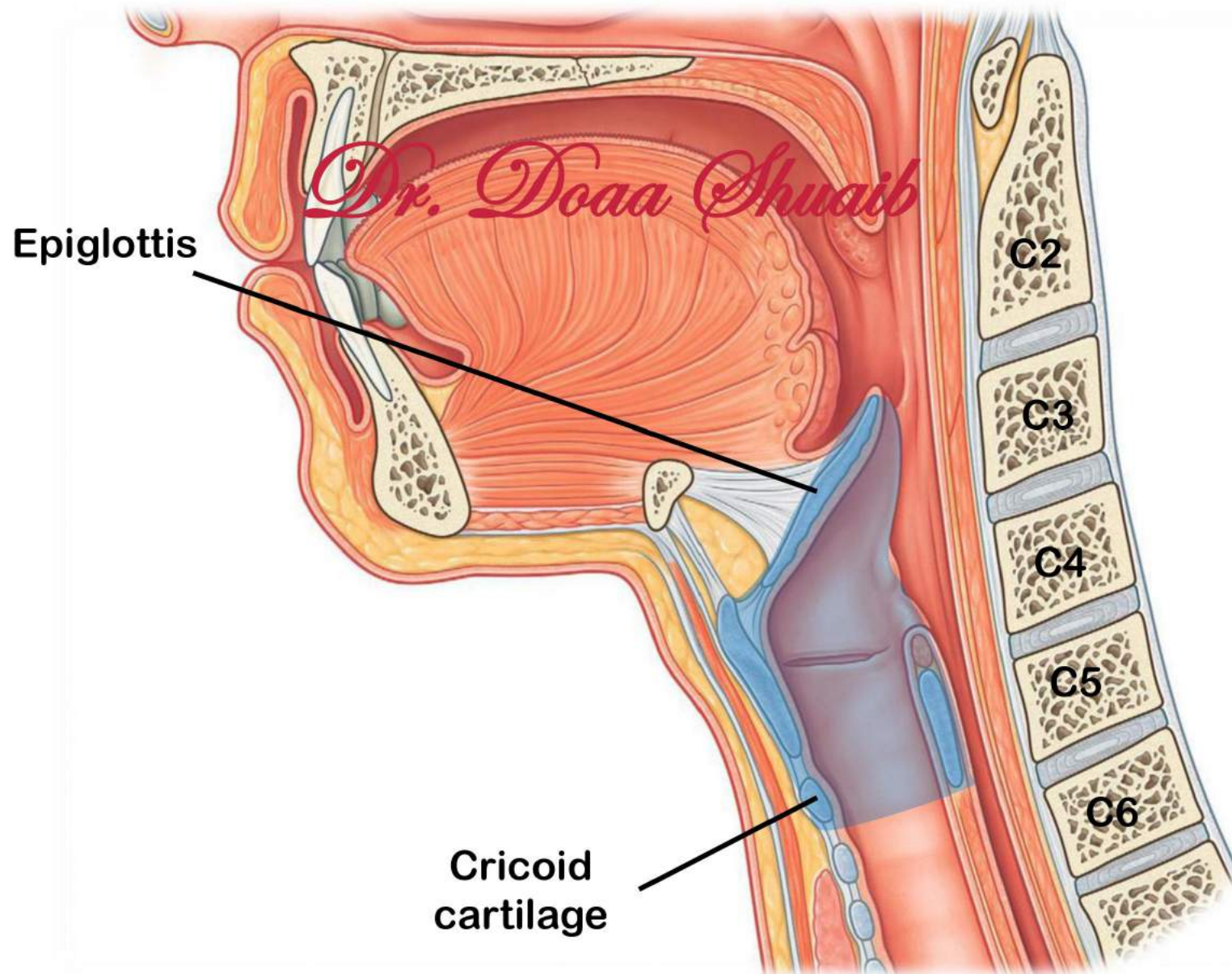


Anatomy of the larynx



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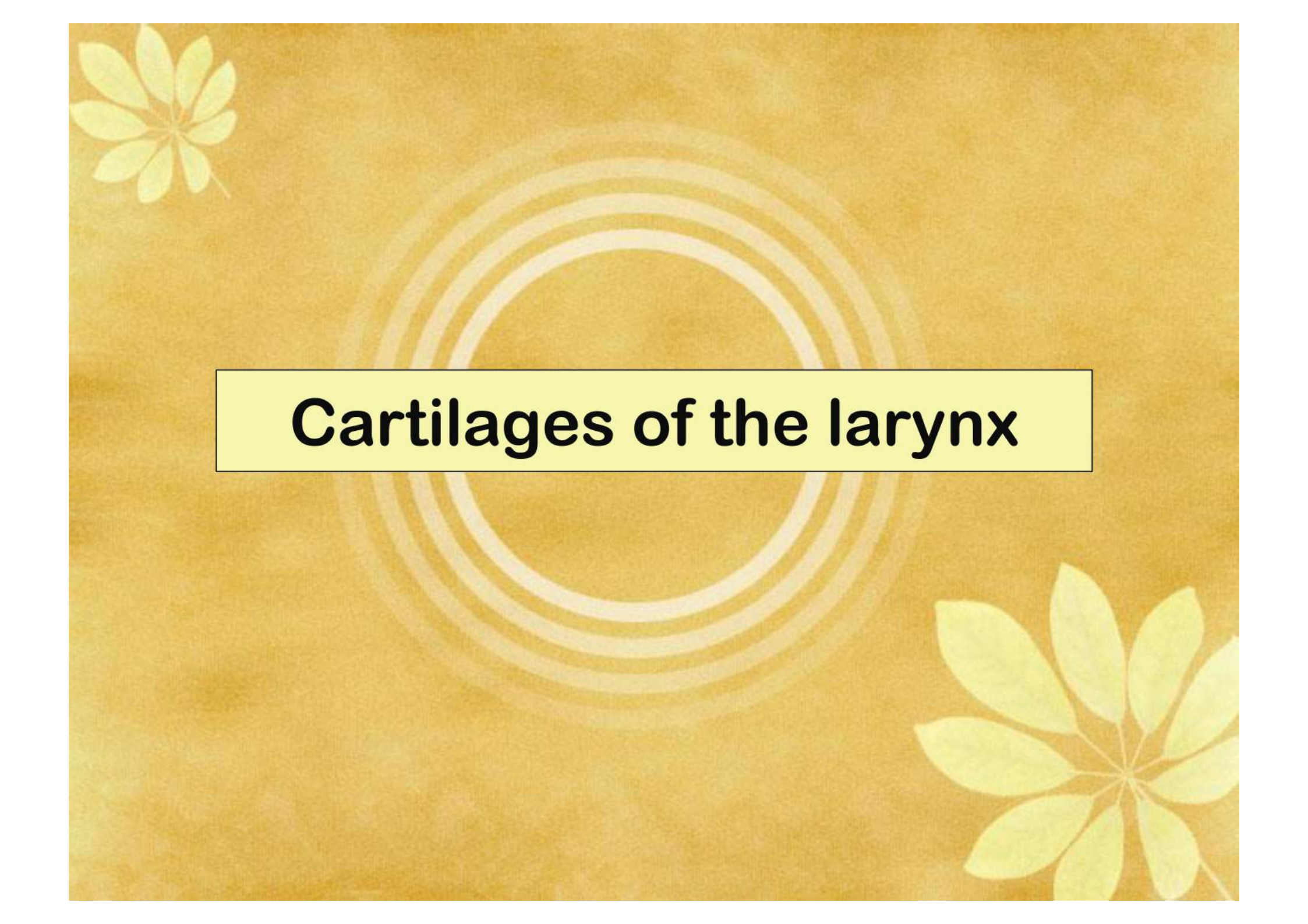
**Assistant Professor of Anatomy & Embryology
Faculty of Medicine – Cairo University
Email: doaa.shuaib@kasralainy.edu.eg**



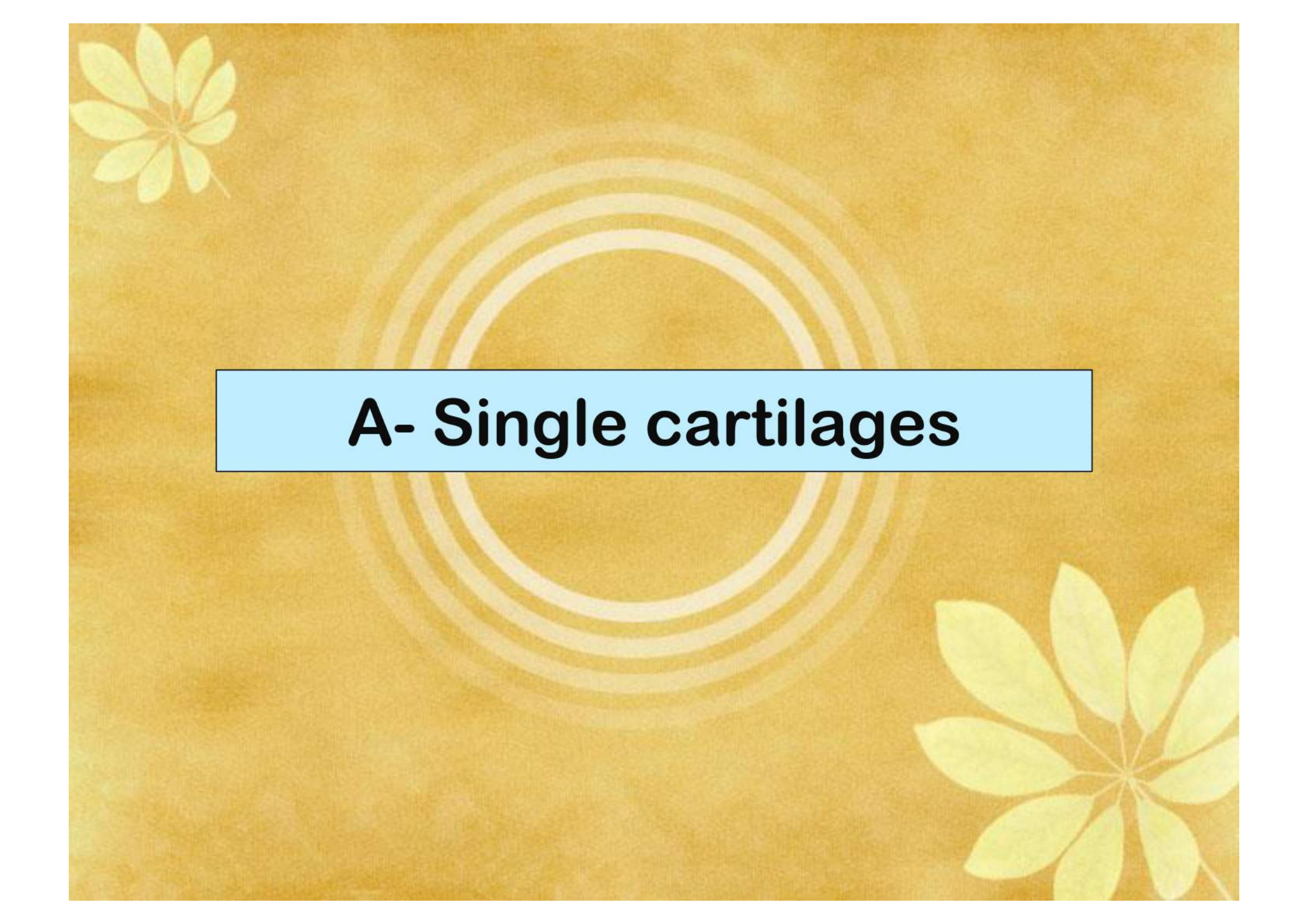
Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

Position

It extends from the root of the tongue and upper border of the epiglottis (C3 vertebra) to the lower border of cricoid cartilage (C6 vertebra).

The background is a solid mustard yellow color. In the center, there are several concentric circles in a lighter, cream-colored shade. In the top-left and bottom-right corners, there are stylized floral motifs with multiple pointed petals in a light yellow-green color.

Cartilages of the larynx

The background is a textured, golden-yellow surface. In the center, there are several concentric, light-colored circles that create a ripple effect. In the top-left and bottom-right corners, there are stylized, light-green floral motifs with multiple pointed petals.

A- Single cartilages

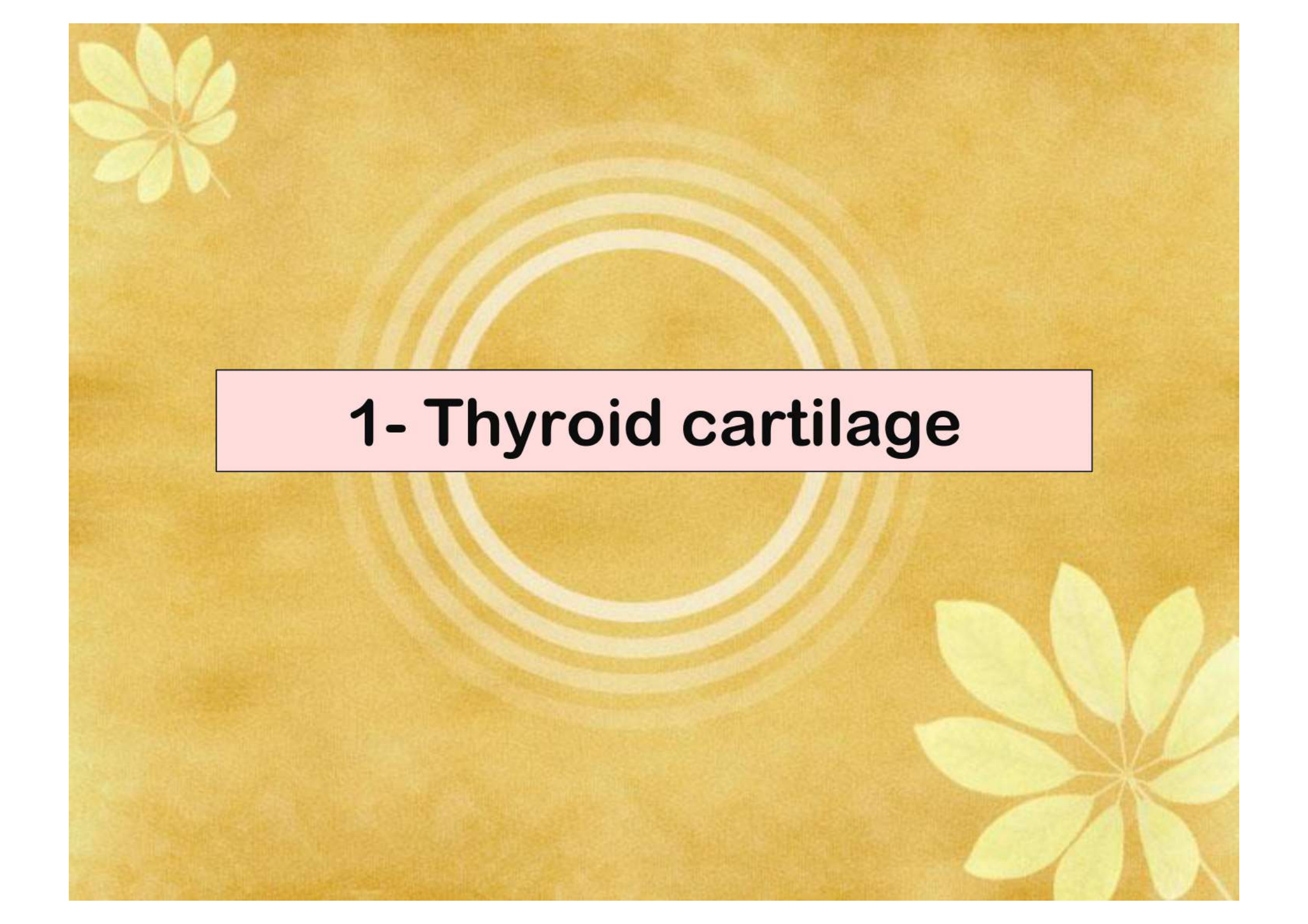
**Single
cartilages**

Epiglottis

Dr. Doaa Shuaib

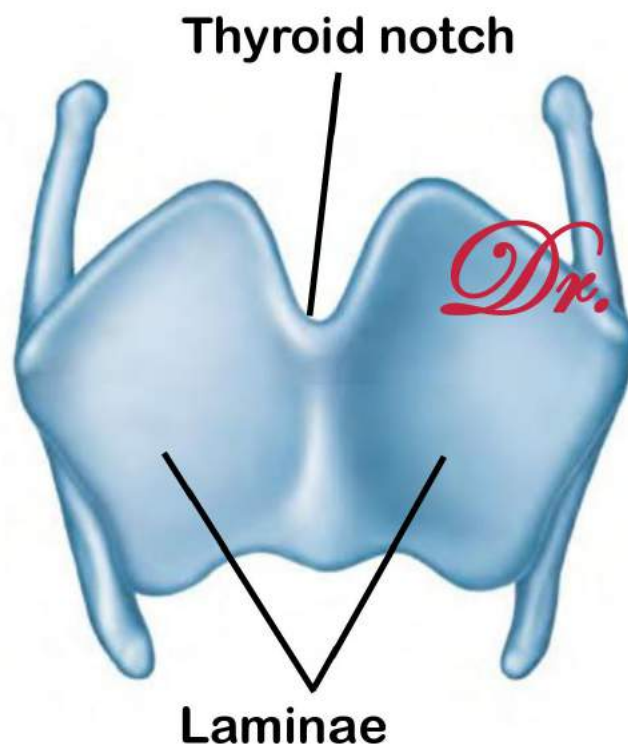
Thyroid
cartilage

Cricoid
cartilage

The background is a textured, golden-yellow surface. In the center, there are several concentric, light-colored circles that create a ripple effect. In the top-left and bottom-right corners, there are stylized, light-green floral motifs with multiple pointed petals.

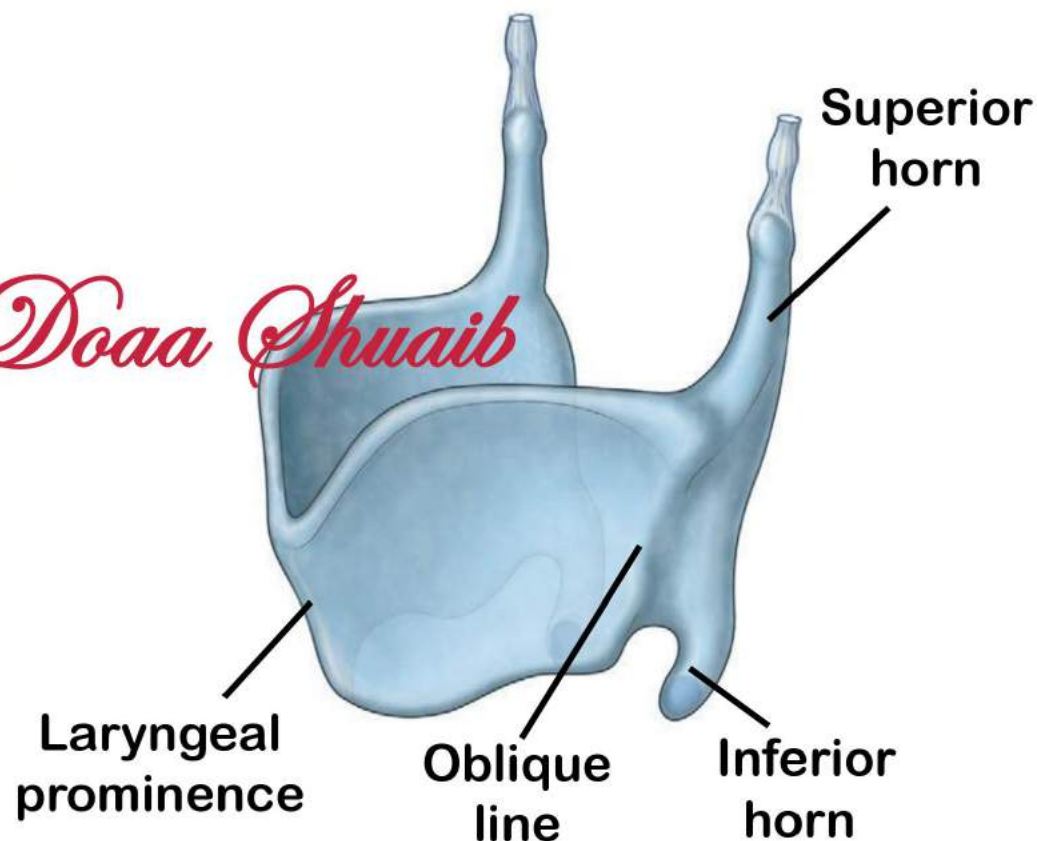
1- Thyroid cartilage

A- Single cartilages



Source: Gray's Anatomy - 40th edition

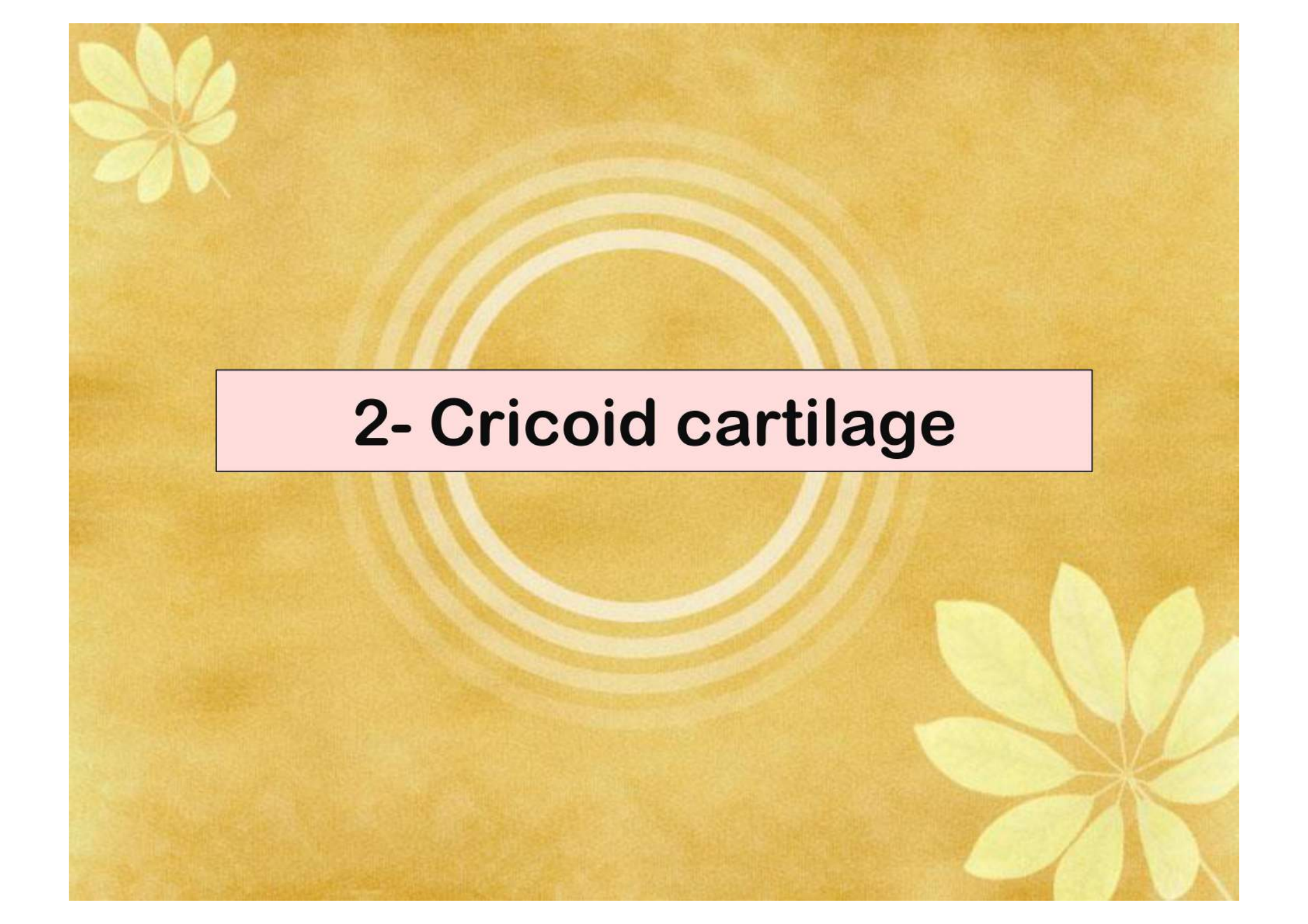
Dr. Doaa Shuaib



Source: Source: Gray's Basic Anatomy - Richard L. Drake, Wayne Vogl, Adam W.M. Mitchell

1- Thyroid cartilage

- It consists of two quadrilateral laminae which are fused anteriorly forming an angle about 90° in males and 120° in females. The fused anterior borders form the laryngeal prominence or **Adam's apple**.
- The upper border of the cartilage shows a V-shaped depression in the median plane above the laryngeal prominence called **thyroid notch**.
- The posterior border of each lamina is free and extends upwards and downwards as **superior and inferior horns**.
- The outer surface of each lamina shows an **oblique line**.

The background is a textured, golden-yellow surface. In the center, there are several concentric, light-colored circles that create a ripple effect. In the top-left and bottom-right corners, there are stylized, light-green floral motifs with multiple pointed petals.

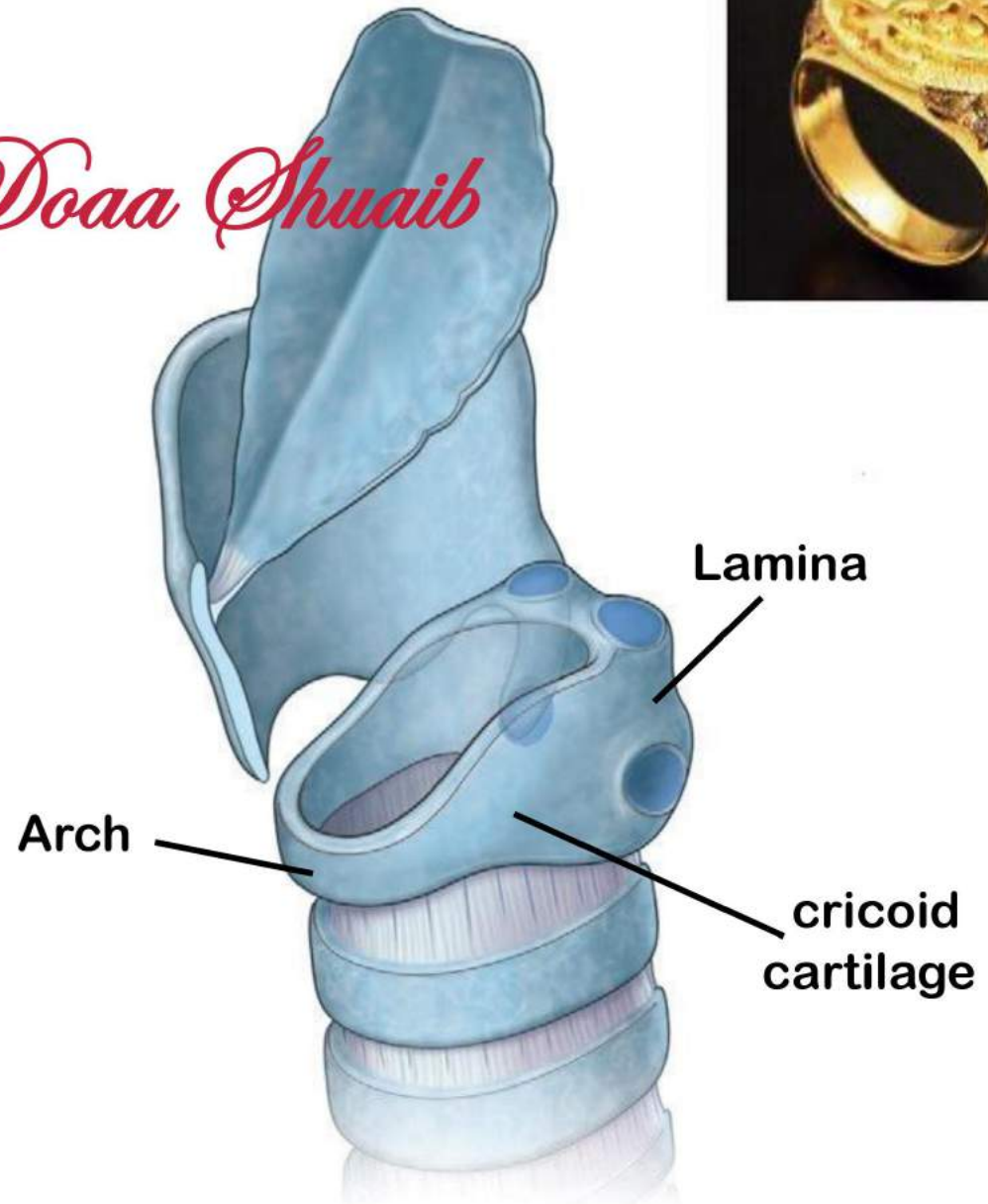
2- Cricoid cartilage

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A- Single cartilages

2- Cricoid cartilage

- It is signet-ring in shape
- It consists of narrow arch anteriorly and broad quadrate lamina posteriorly.

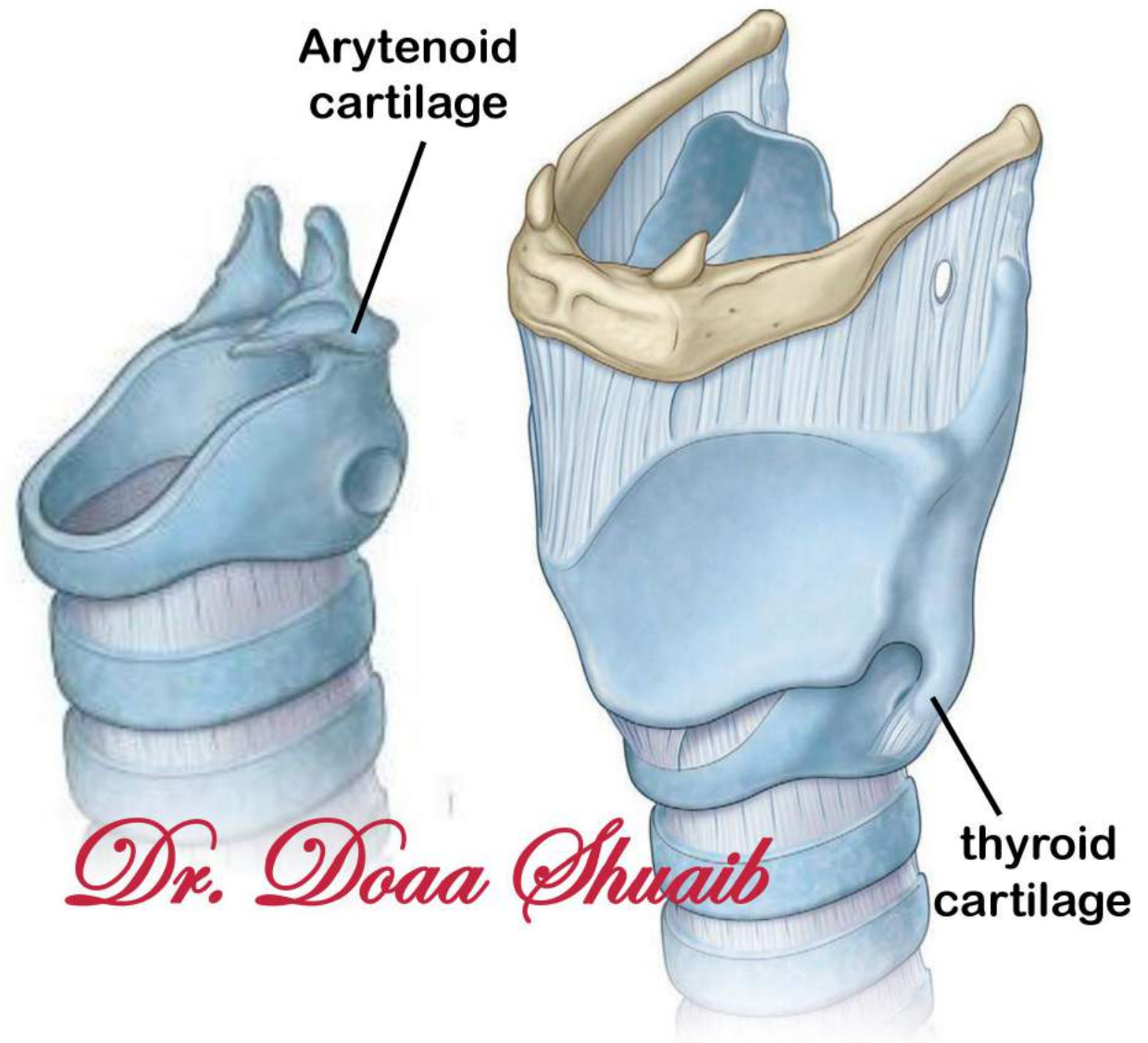


Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

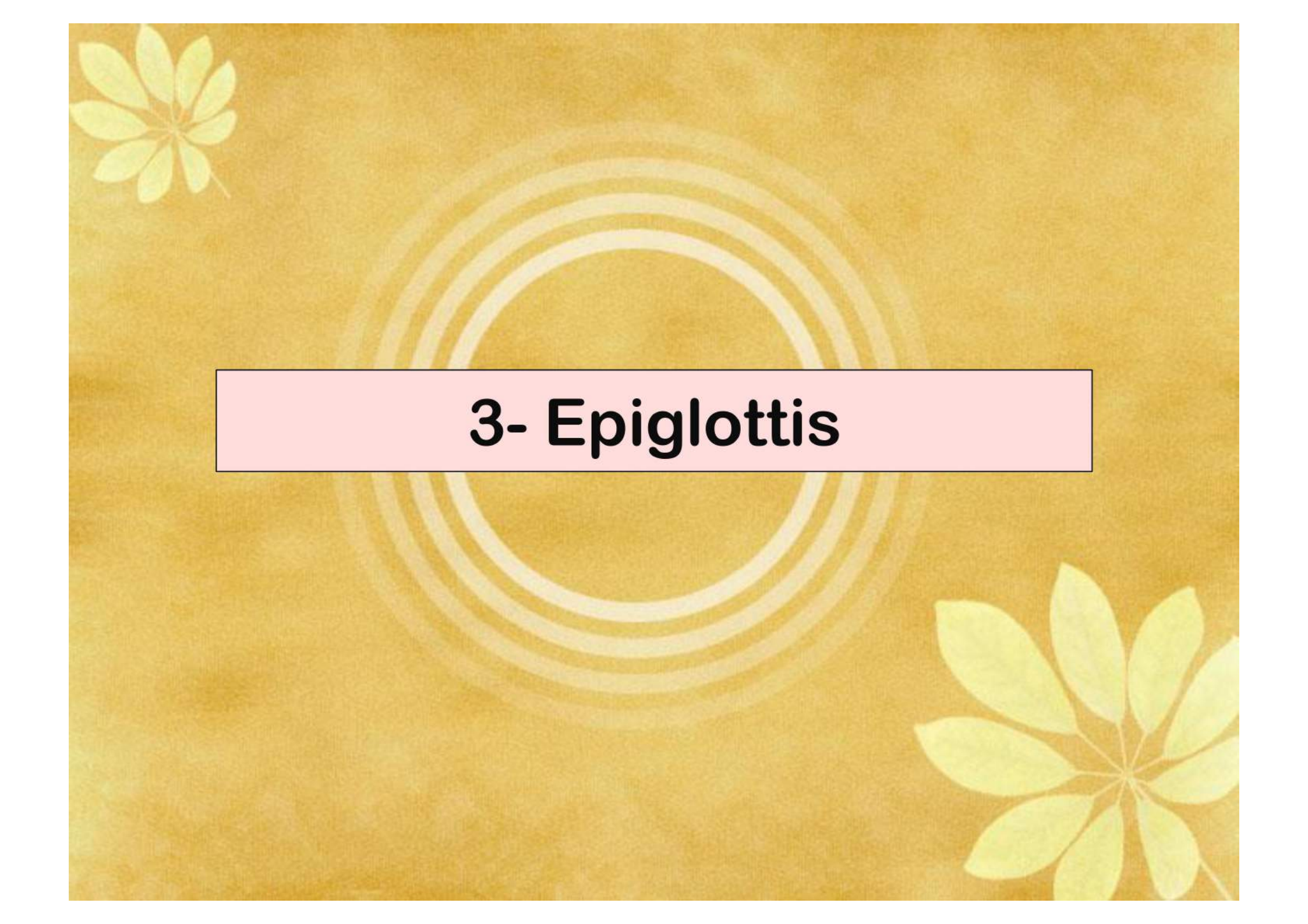
A- Single cartilages

2- Cricoid cartilage

- It forms 4 (or two on each side) synovial joints with the inferior horns of thyroid and arytenoid cartilages.



Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell



3- Epiglottitis

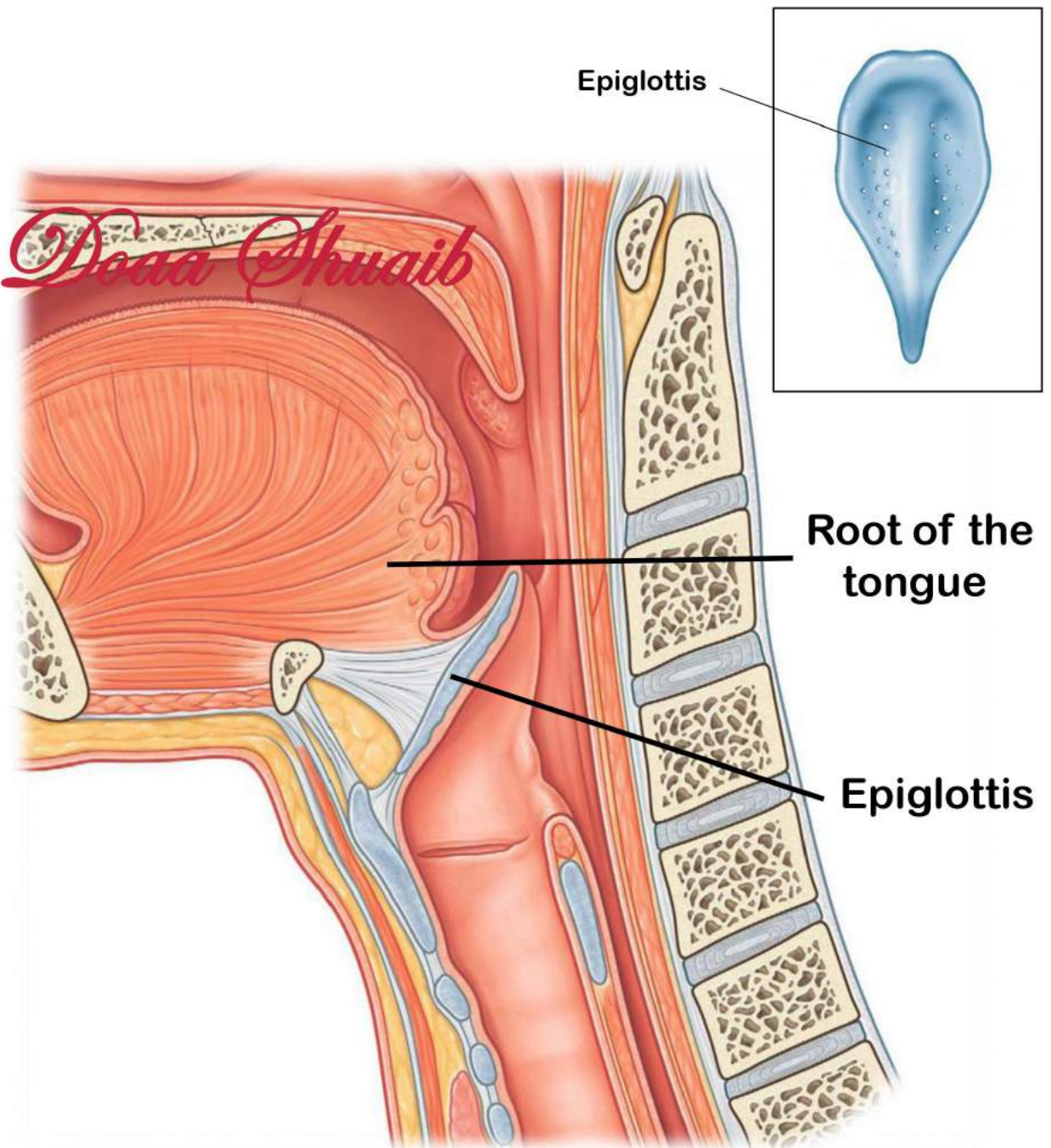
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A- Single cartilages

3- Epiglottis

Shape & site:

It is a leaf-like plate of elastic fibrocartilage which lies behind the root of the tongue.



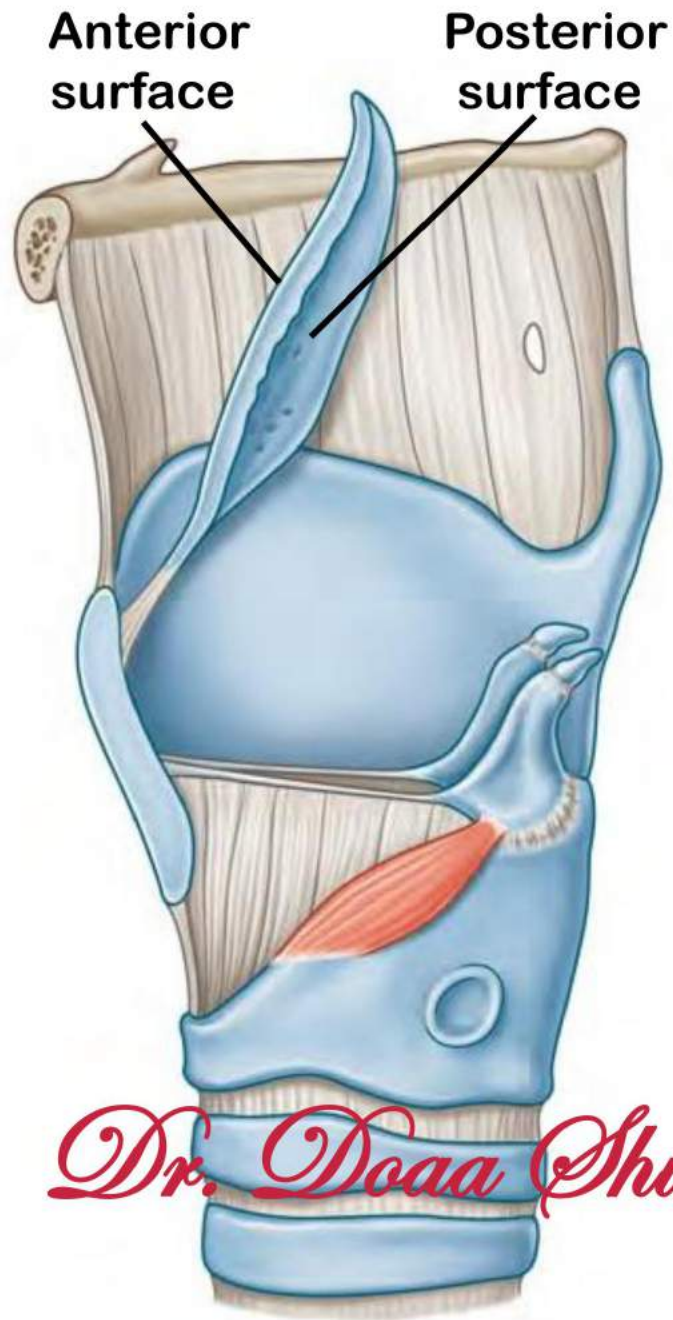
Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

A- Single cartilages

3- Epiglottis

Parts:

- Two ends (Upper and lower)
- Two sides
- Two surfaces (Anterior & Posterior)



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A- Single cartilages

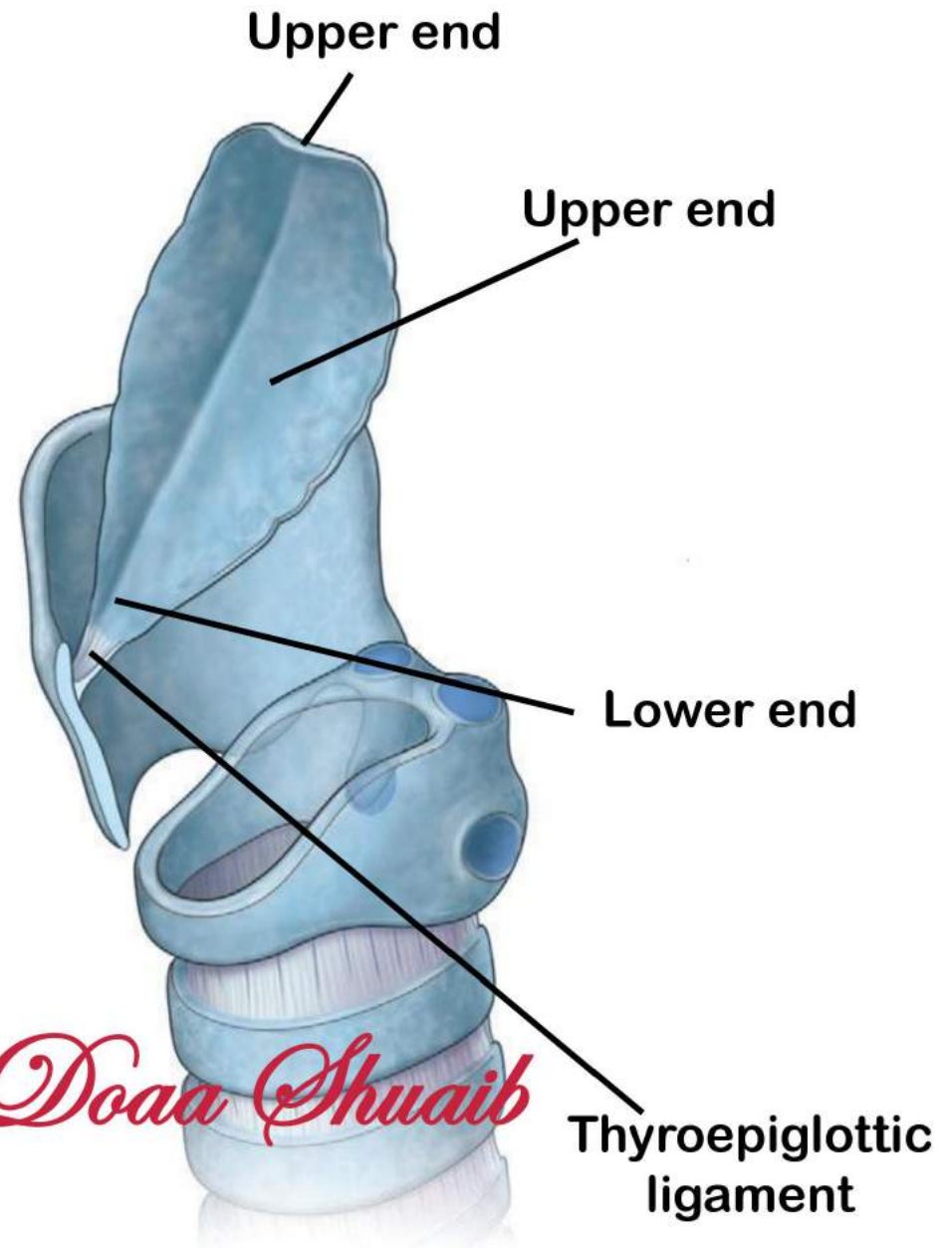
3- Epiglottis

Upper end:

- Broad
- Free

Lower end:

- Narrow (stalk)
- Attached to the inner surface of thyroid angle by thyroepiglottic ligament



Source: Source: Gray's Basic Anatomy - Richard L. Drake, Wayne Vogl, Adam W.M. Mitchell

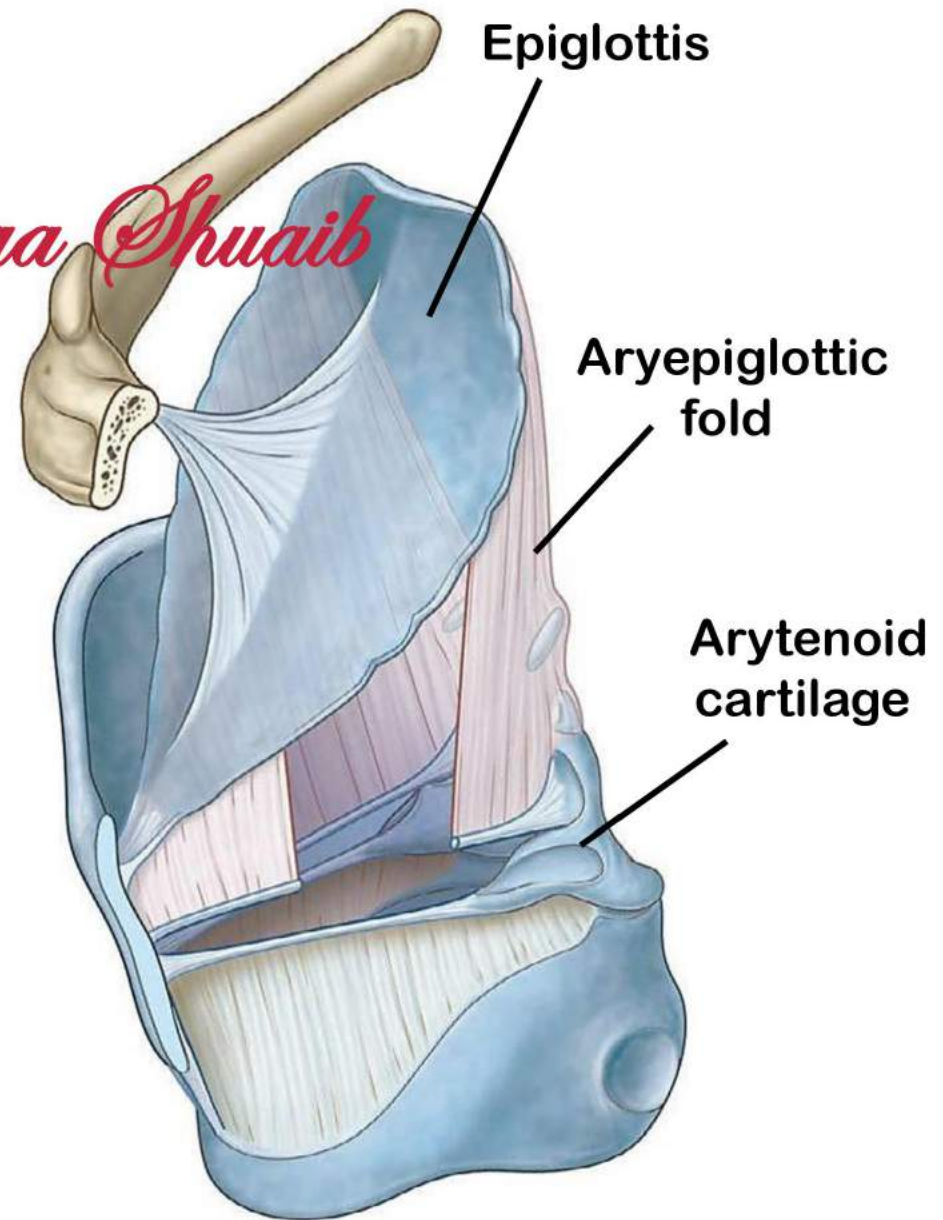
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**A- Single
cartilages**

3- Epiglottis

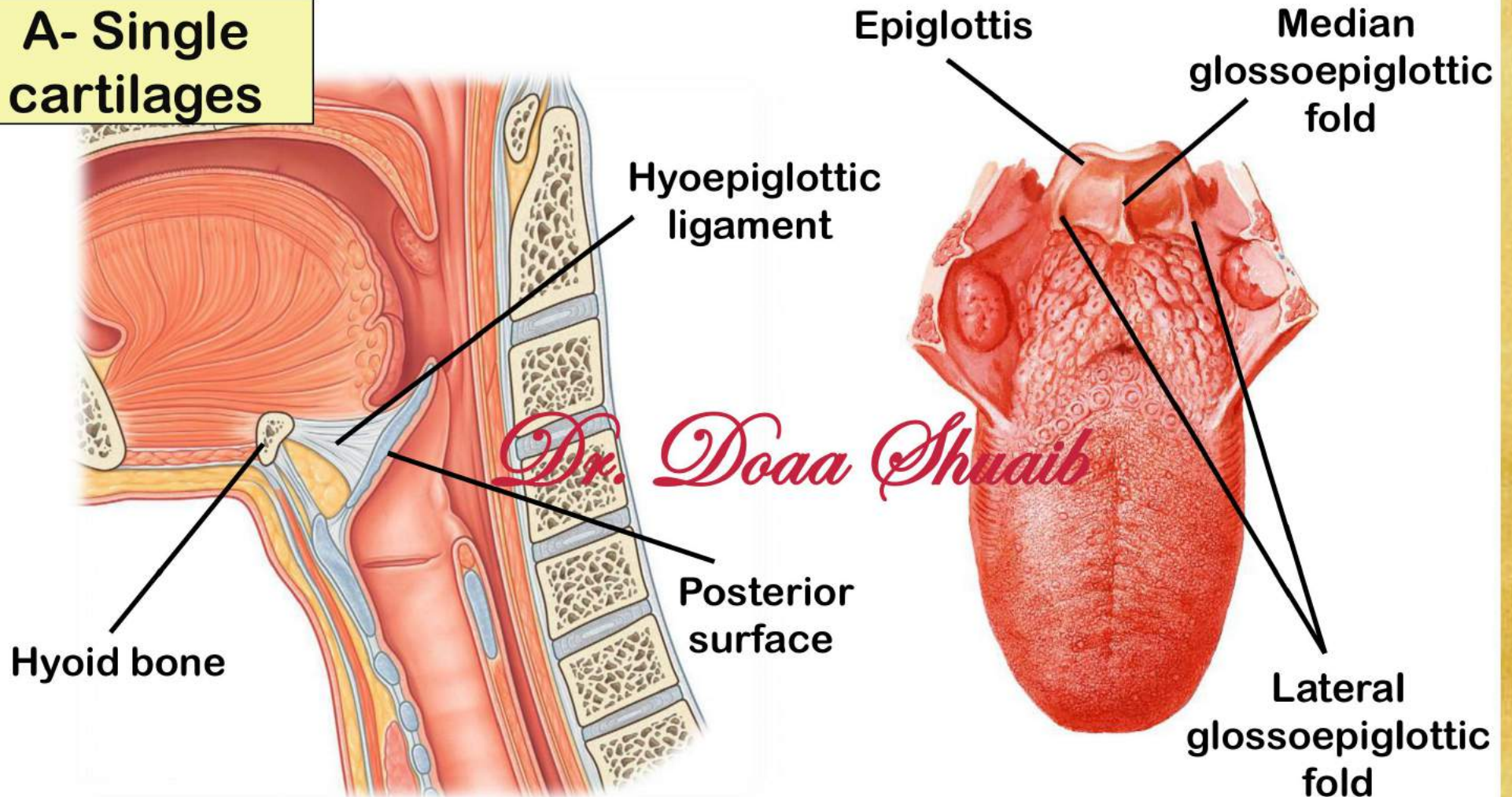
Sides :

They are attached to the
arytenoid cartilages by two
aryepiglottic folds



Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

A- Single cartilages



Source: Source: Gray's Basic Anatomy - Richard L. Drake, Wayne Vogl, Adam W.M. Mitchell

Source: Atlas of Human Anatomy, Sixth Edition- Frank H. Netter, M.D

3- Epiglottis

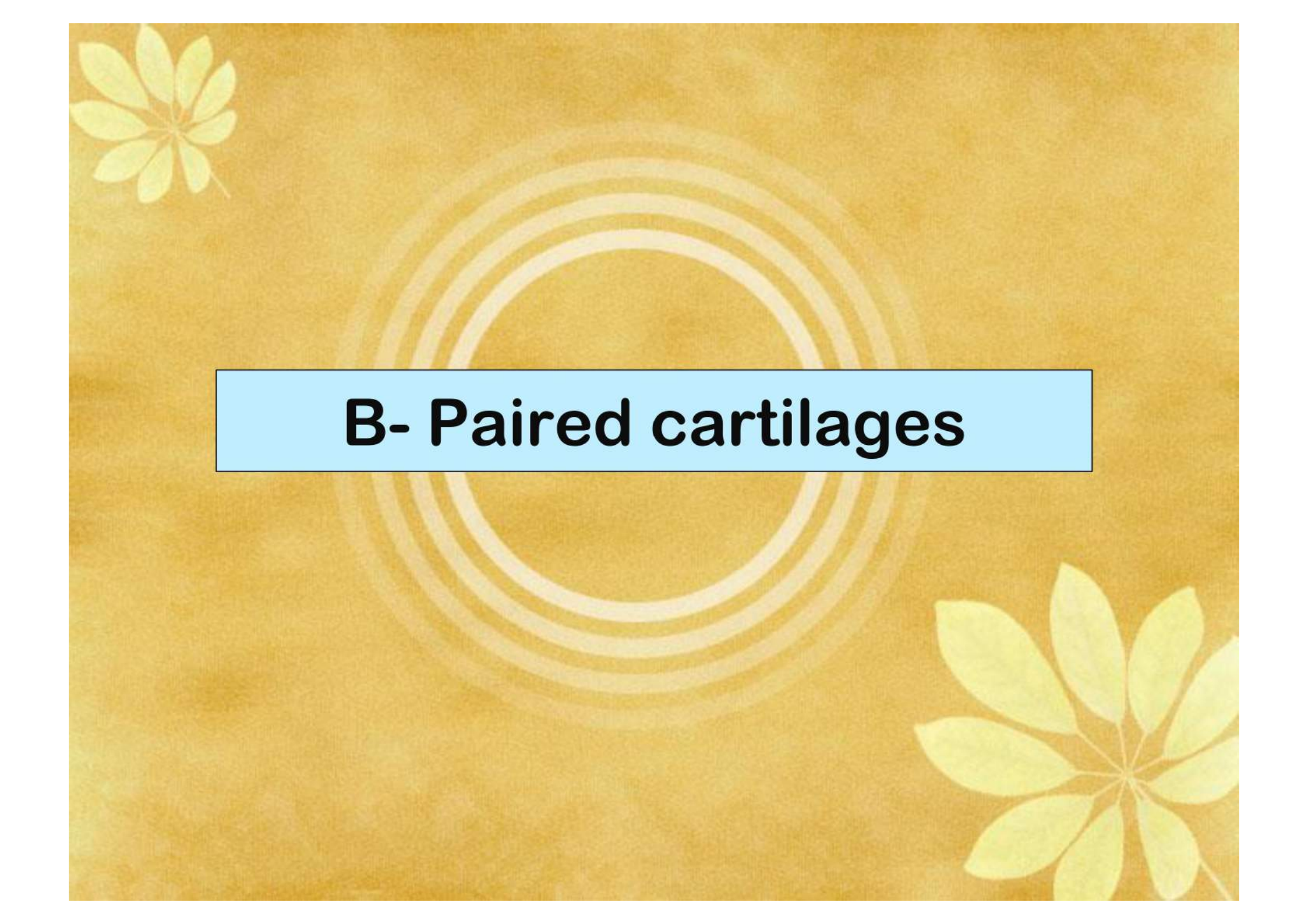
Surfaces:

- **Anterior surface:**

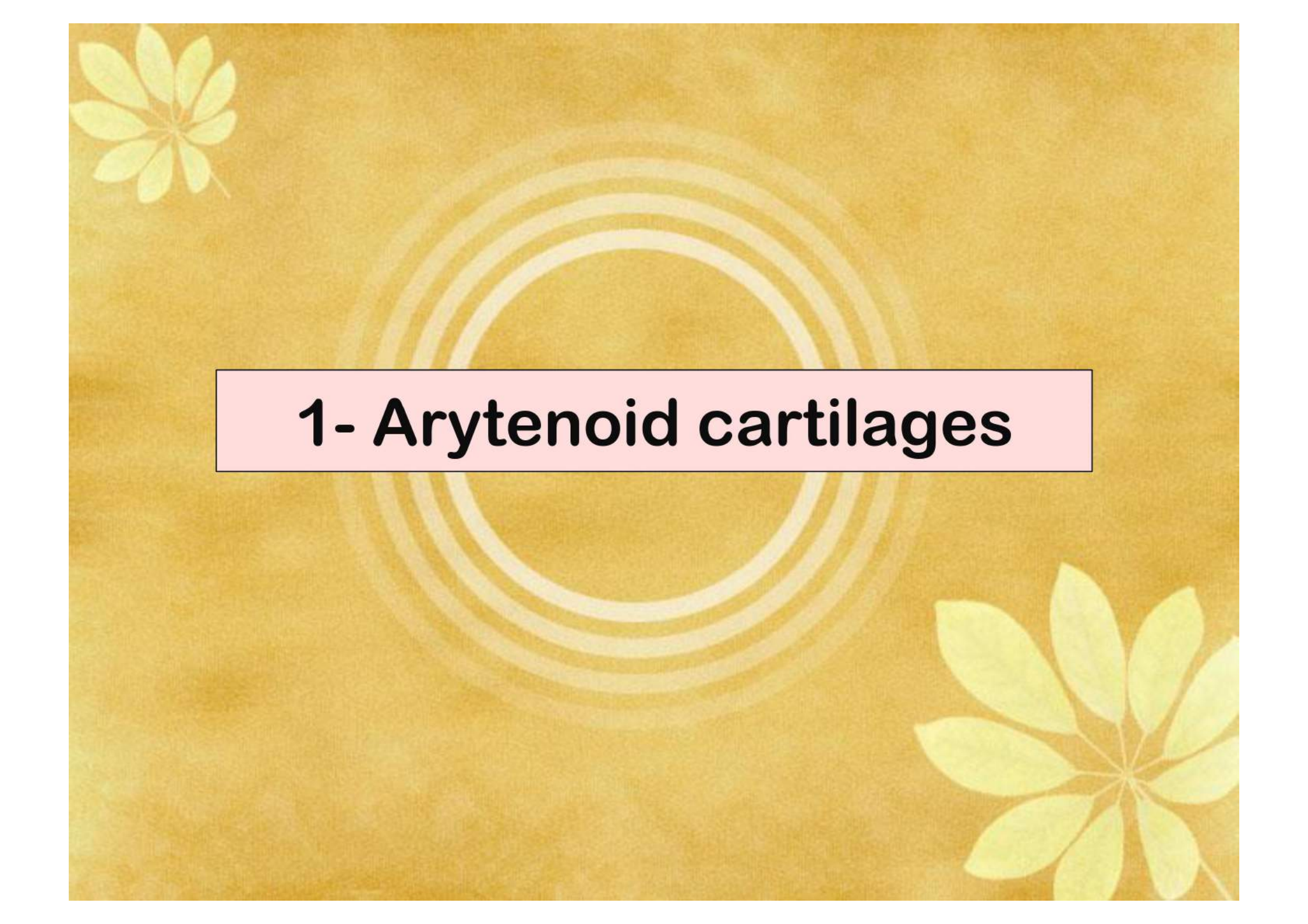
- Its upper part is connected to the posterior part of tongue by a median and 2 lateral glossoepiglottic folds.

- Its lower part is connected to the body of hyoid bone by the hyoepiglottic ligament.

- **Posterior surface:** Is smooth, concave and covered with mucosa.

The background is a textured, golden-yellow surface. In the center, there are several concentric, light-colored circles that create a ripple effect. In the top-left and bottom-right corners, there are stylized, light-green floral motifs with multiple pointed petals.

B- Paired cartilages

The background is a solid mustard yellow color. In the center, there are several concentric circles in a lighter, cream-colored shade. In the top-left and bottom-right corners, there are stylized floral motifs with multiple pointed petals in a pale yellow-green color.

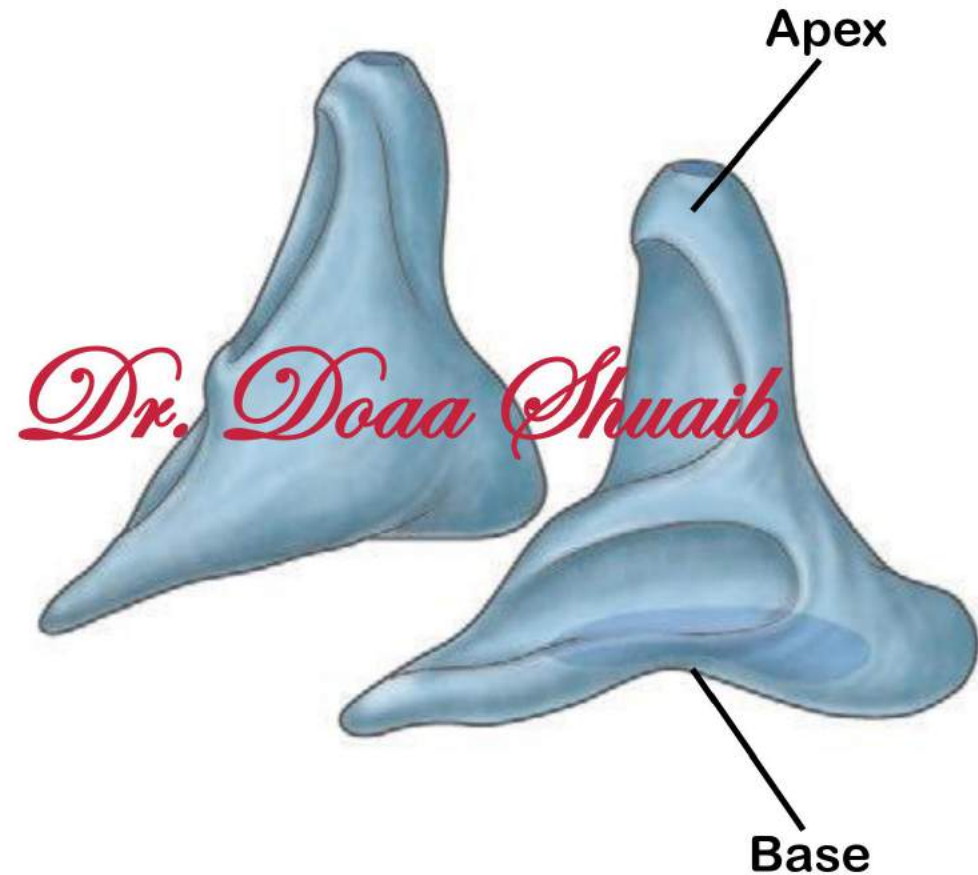
1- Arytenoid cartilages

B- Paired cartilages

1- Arytenoid cartilages

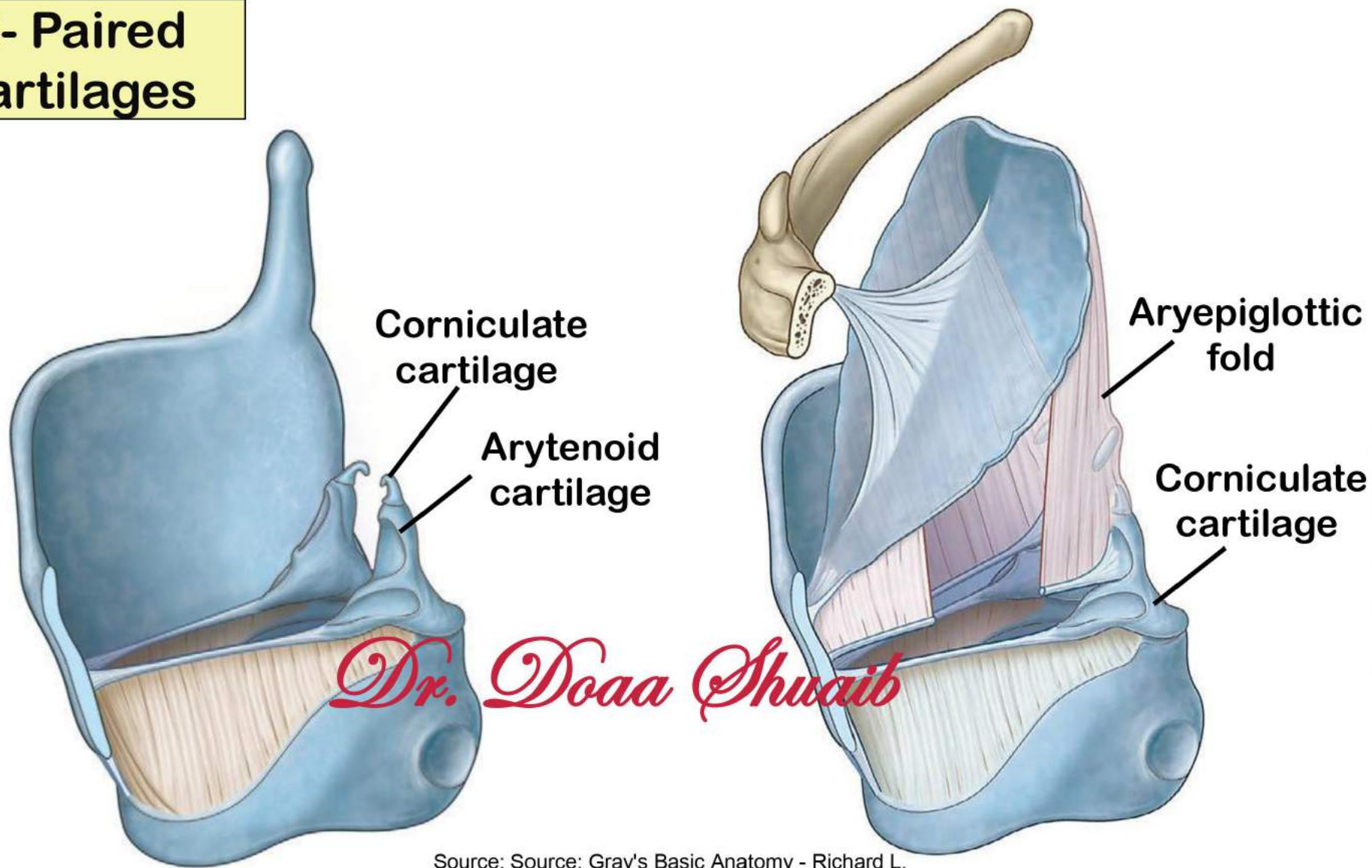
Shape:

- They are pyramidal-shaped hyaline cartilages which lie on the upper part of the lamina of the cricoid cartilage.
- Each cartilage has:
 - Apex
 - Base
 - 3 surfaces



Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

B- Paired cartilages



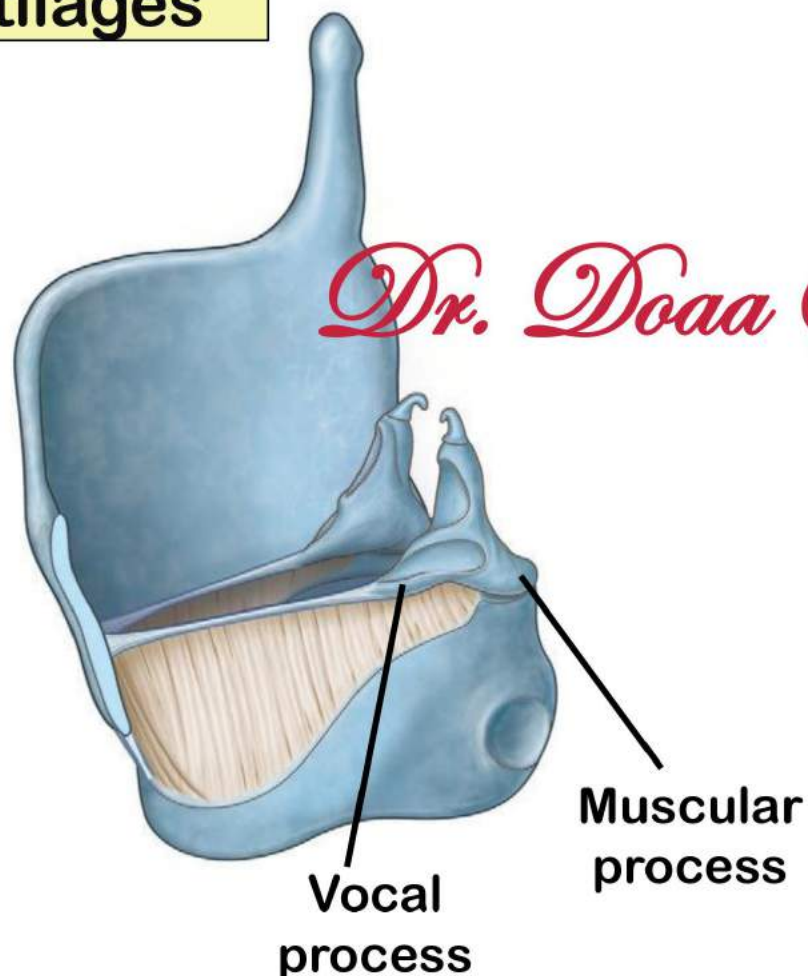
Source: Source: Gray's Basic Anatomy - Richard L. Drake, Wayne Vogl, Adam W.M. Mitchell

1- Arytenoid cartilages

Apex:

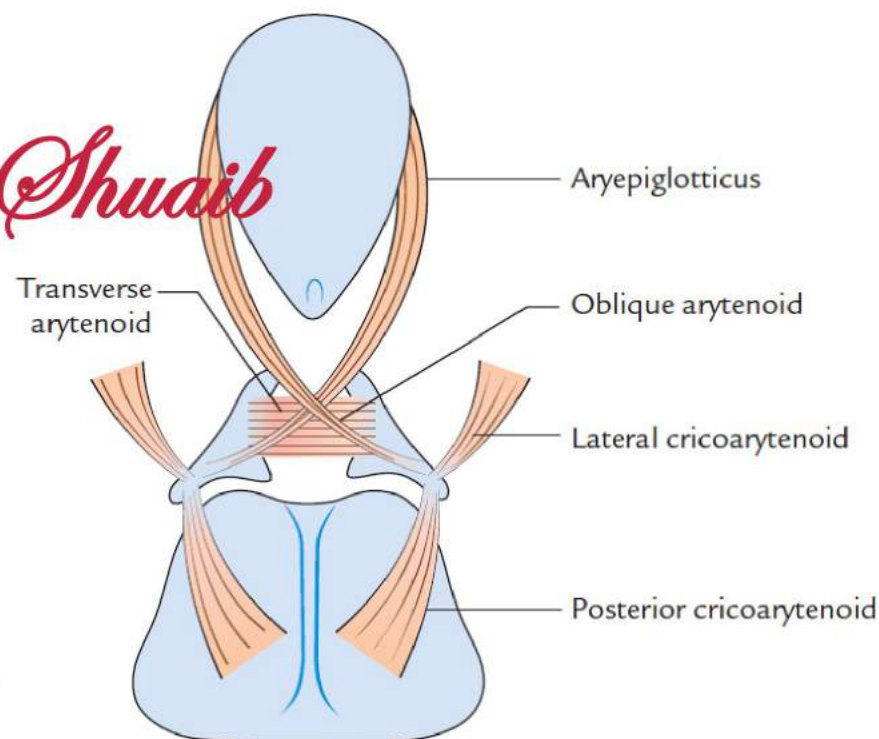
- It is directed upwards backwards and medially
- It articulates with the corniculate cartilage
- It gives attachment to the aryepiglottic fold

B- Paired cartilages



Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

Dr. Doaa Shuaib



Source: Textbook of Anatomy, Head, Neck & Brain,
Vishram Singh, 2nd edition

1- Arytenoid cartilages

Base: Triangular in shape articulating with the upper border of the lamina of the cricoid cartilage by a synovial joint. It has 2 important processes:

a- Vocal process: Is the anterior angle of the base and gives attachment to the vocal ligament.

b- Muscular process: Is the lateral angle of the base and gives attachment to three muscles.

B- Paired cartilages

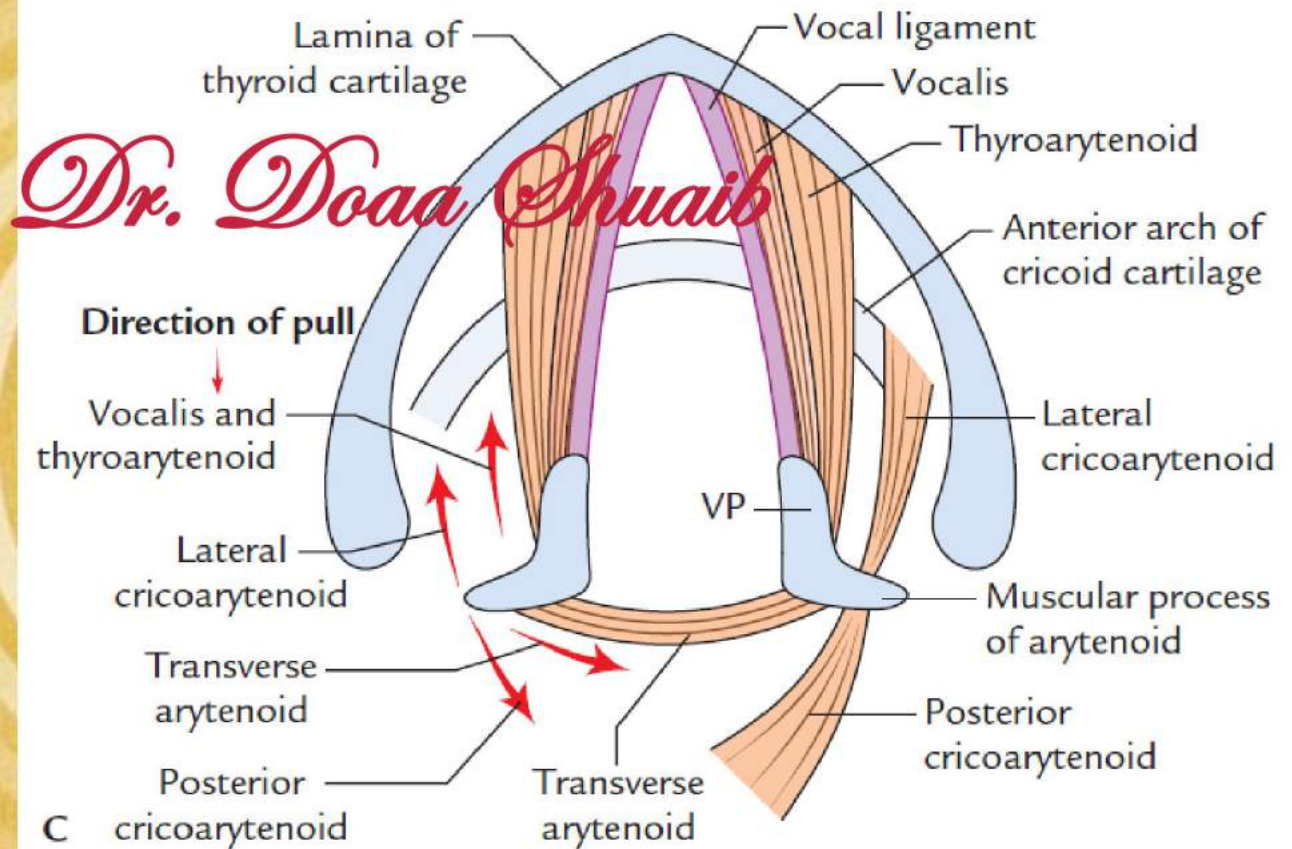
1- Arytenoid cartilages

Surfaces:

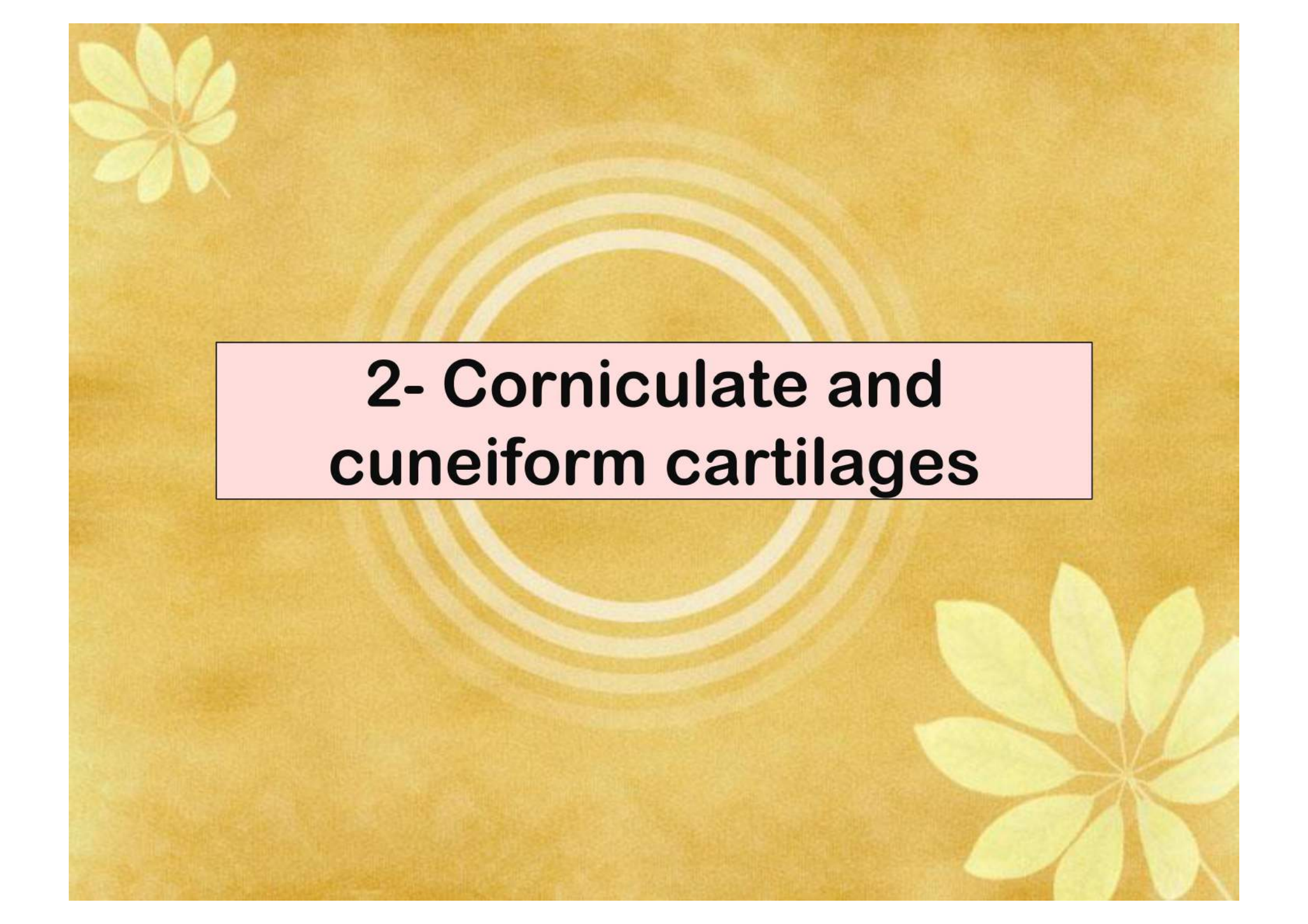
Anterolateral surface: concave

Medial surface: flat and covered with mucous membrane

Posterior surface: concave and smooth.

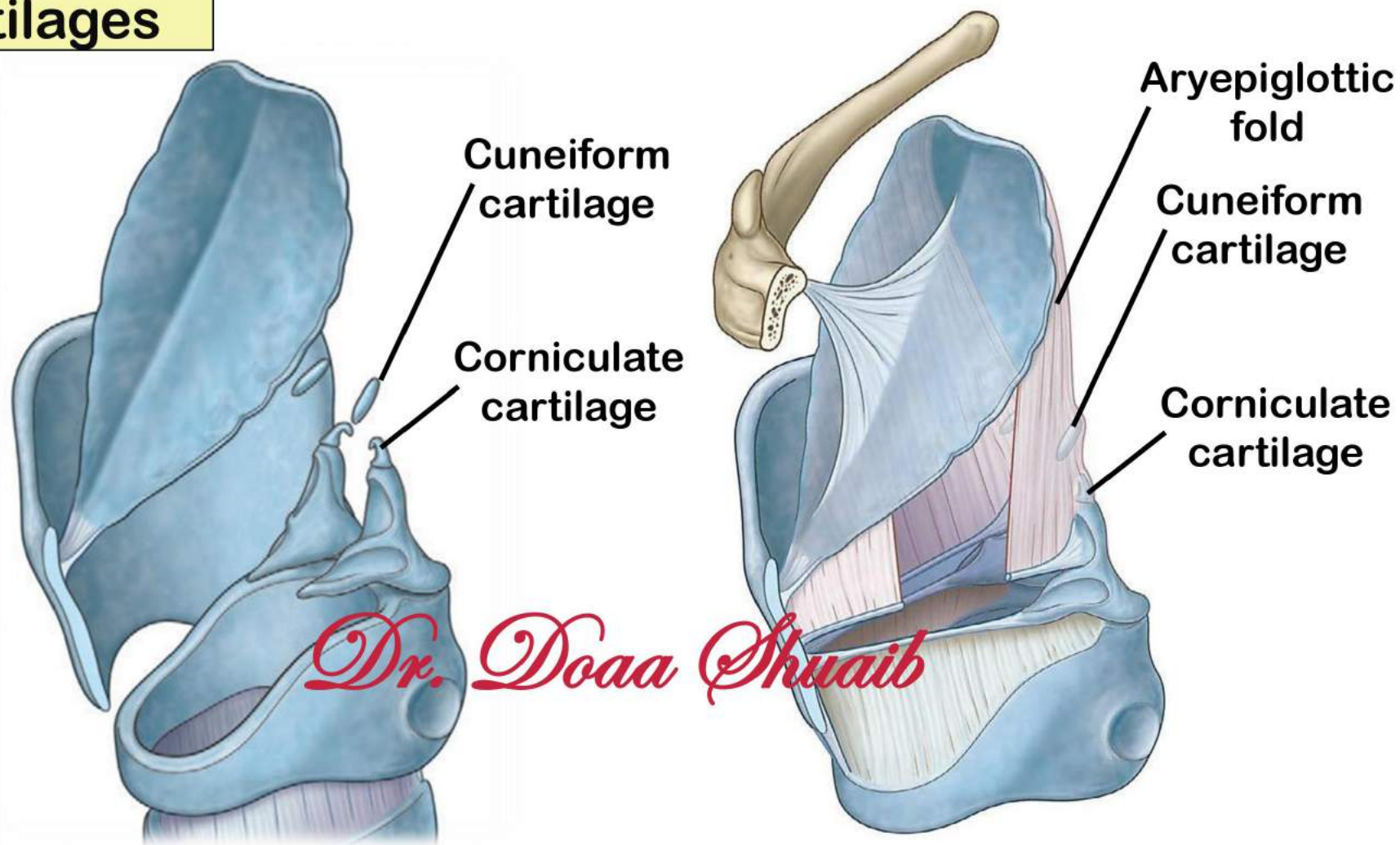


Source: Textbook of Anatomy, Head, Neck & Brain,
Vishram Singh, 2nd edition



2- Corniculate and cuneiform cartilages

B- Paired cartilages

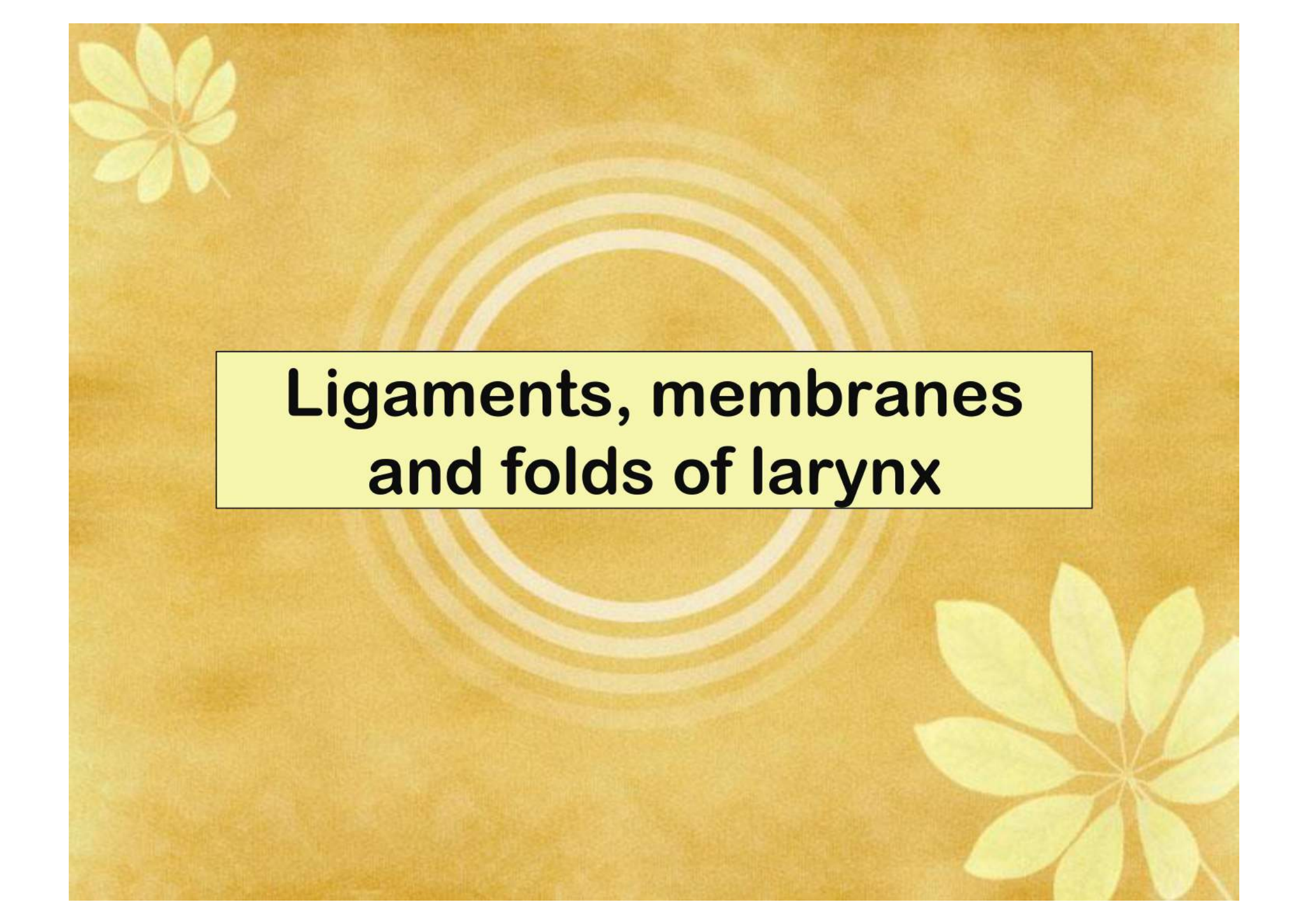


Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

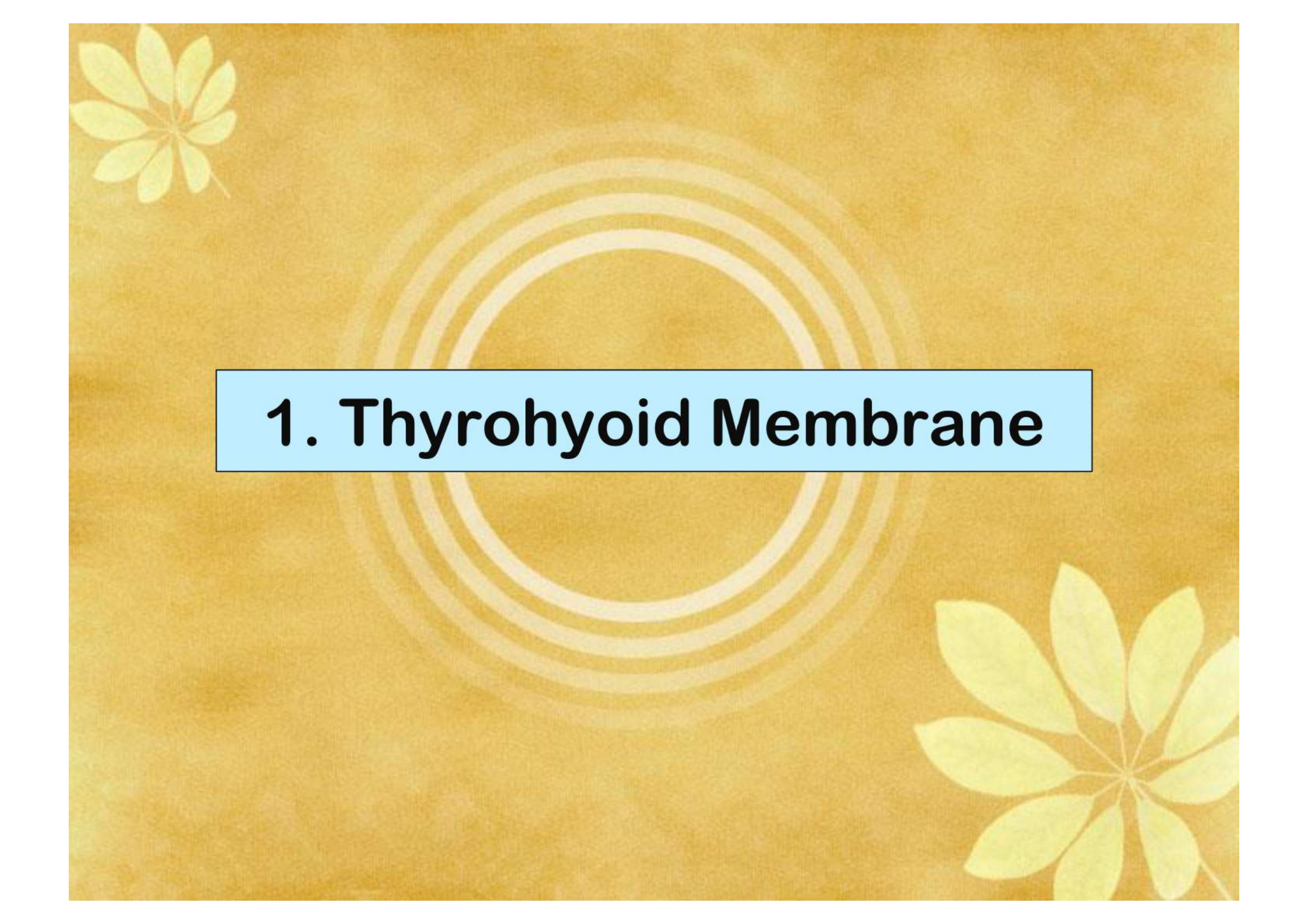
Source: Gray s Atlas of Anatomy – 2nd edition

2- Corniculate and cuneiform cartilages

- These are small nodules of elastic fibrocartilage which lie in the posterior part of the aryepiglottic fold.
- Cuneiform cartilages lie in front of the corniculate cartilages which articulate with the apices of the arytenoid cartilages.

The background is a textured, golden-yellow color. In the center, there are several concentric, light-colored circles that create a ripple effect. In the top-left and bottom-right corners, there are stylized, light-yellow floral or leaf-like motifs.

Ligaments, membranes and folds of larynx

The background is a textured, golden-yellow surface. In the center, there are several concentric, light-colored circles that create a ripple effect. In the top-left and bottom-right corners, there are stylized, light-green floral motifs with multiple pointed petals.

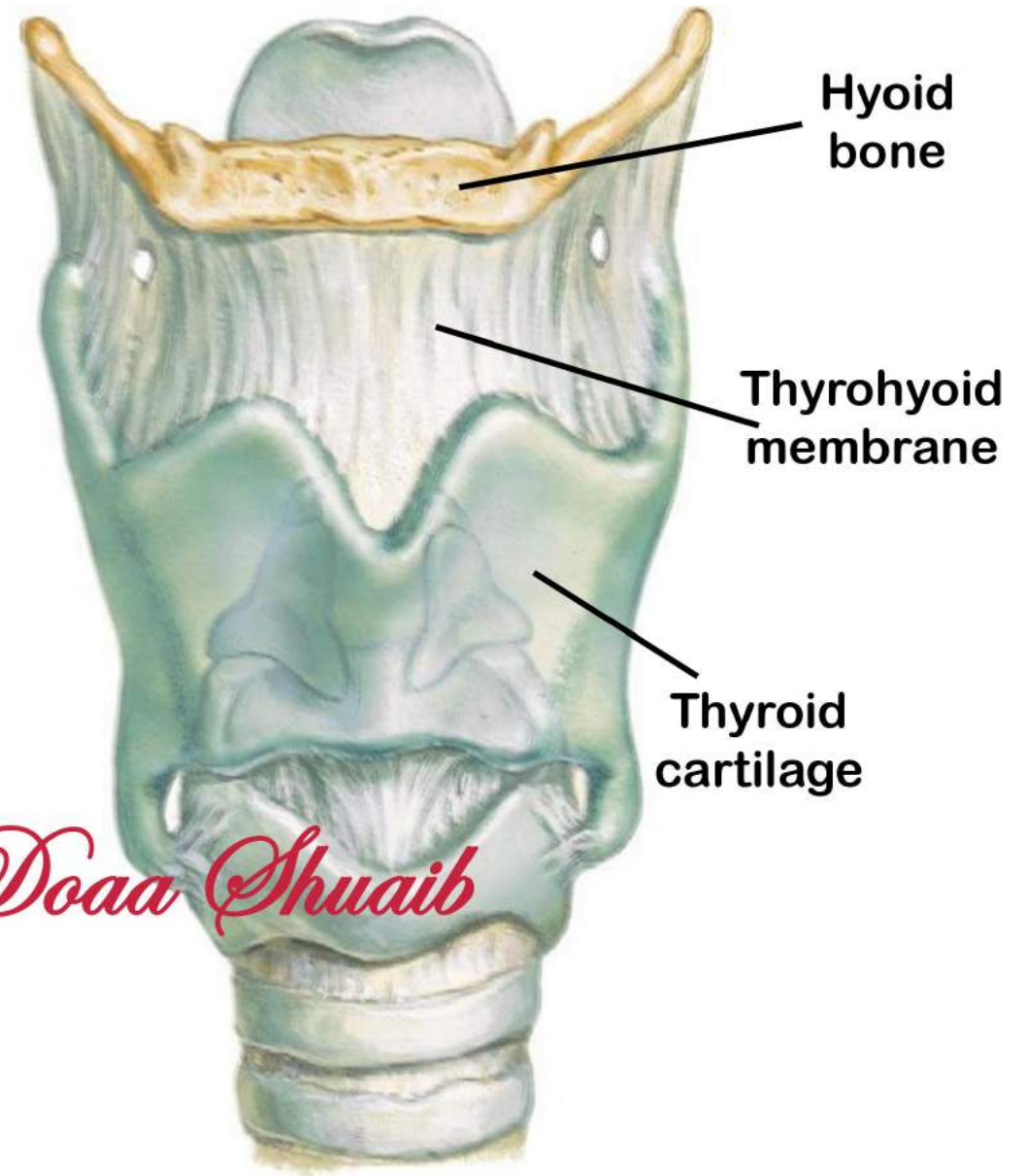
1. Thyrohyoid Membrane

Ligaments, membranes & folds

1. Thyrohyoid Membrane

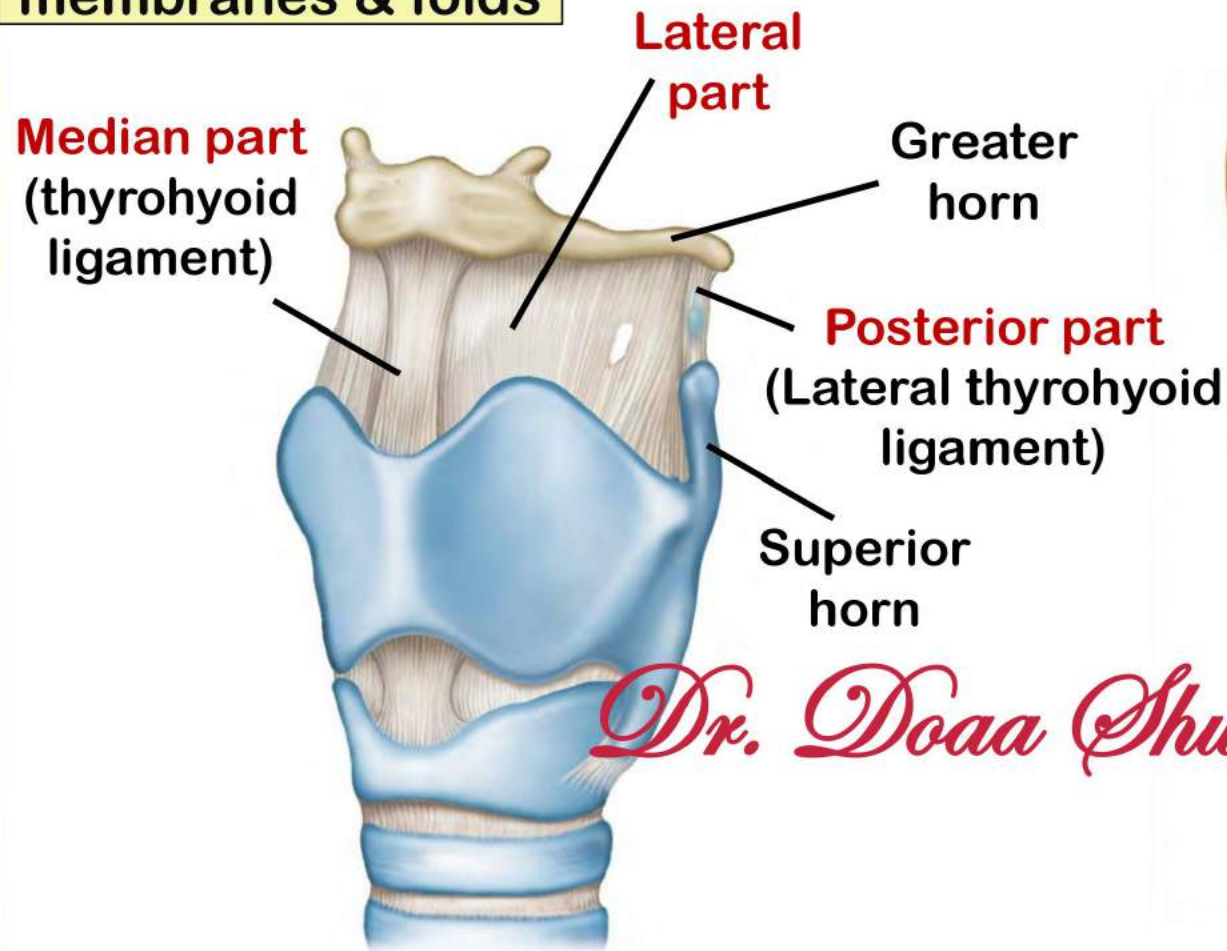
Attachment :

It extends from upper border and superior horns of thyroid cartilage to upper part of posterior surface of body of hyoid bone and its greater horns.

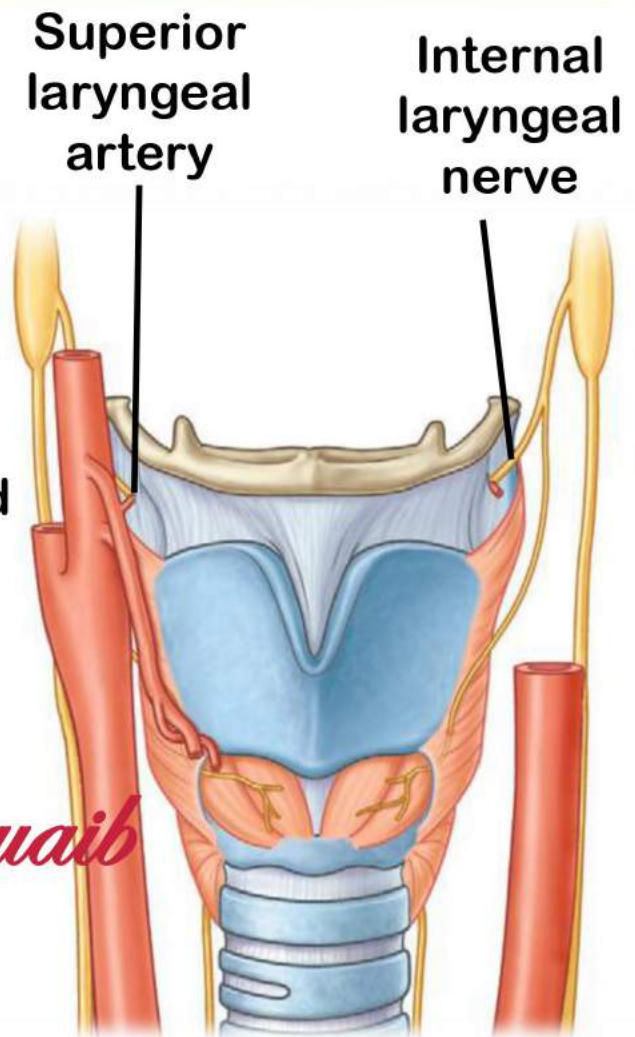


Dr. Doaa Shuaib

Ligaments, membranes & folds



Source: Gray's Anatomy - 40th edition

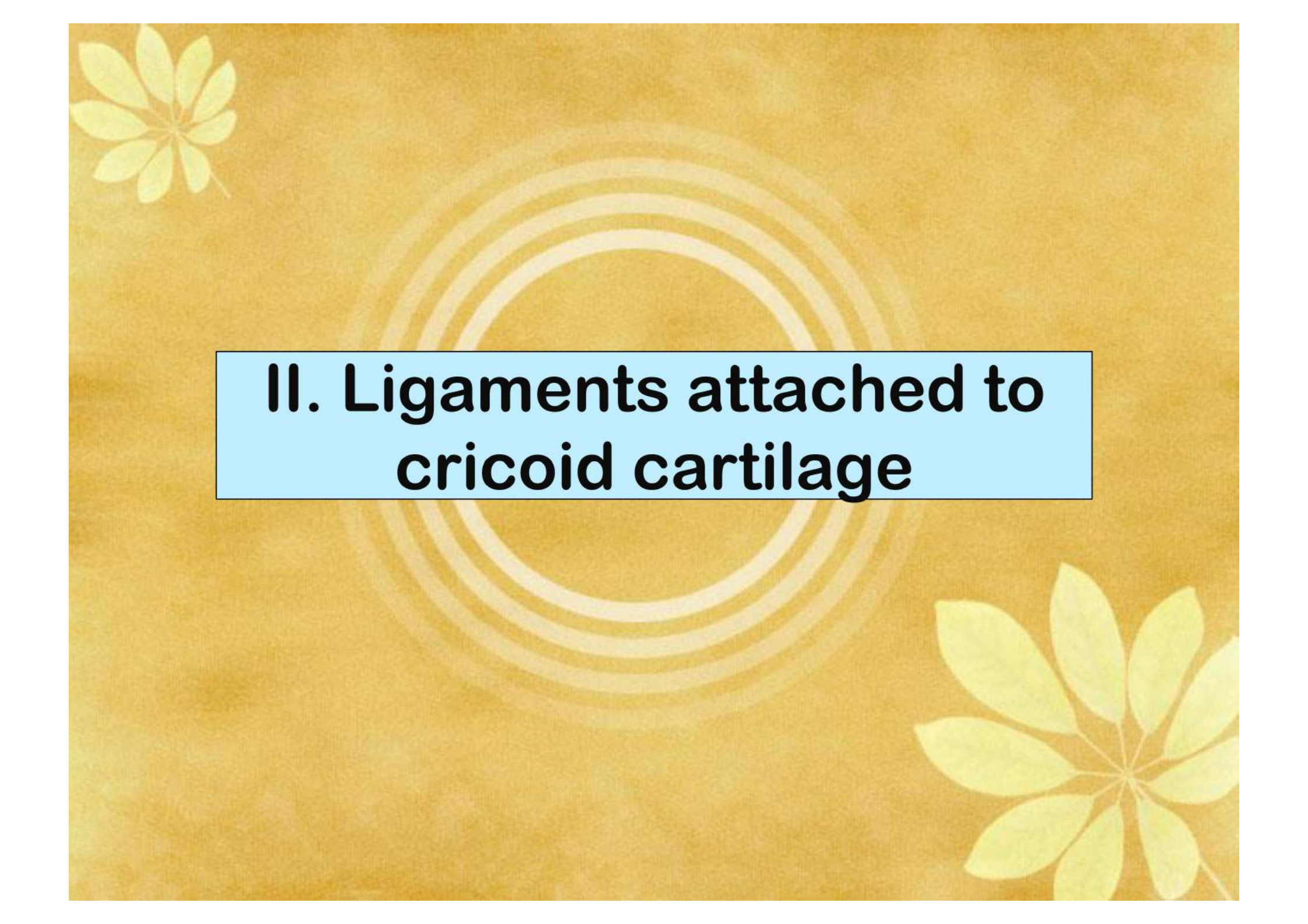


Source: Gray's Atlas of Anatomy – 2nd edition

1. Thyrohyoid Membrane

Parts :

- a- Median thick part:** Called thyrohyoid ligament.
- b- Lateral thin part:** Pierced by superior laryngeal BV and internal laryngeal nerve.
- c- Posterior cord-like part:** Called lateral thyrohyoid ligament. It connects the superior horn of thyroid cartilage and greater horn of hyoid bone.



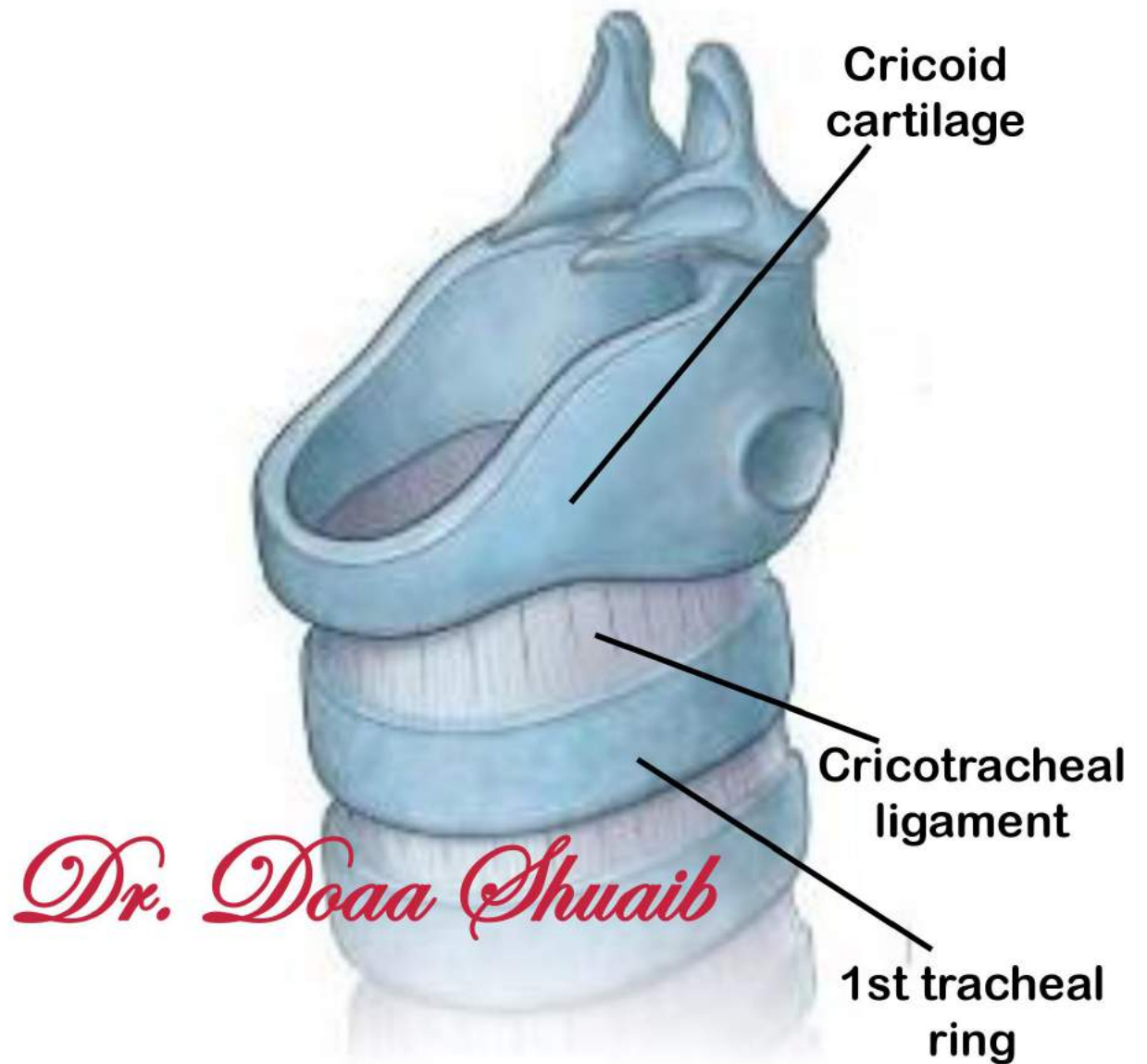
II. Ligaments attached to cricoid cartilage



II. Ligaments attached to cricoid cartilage

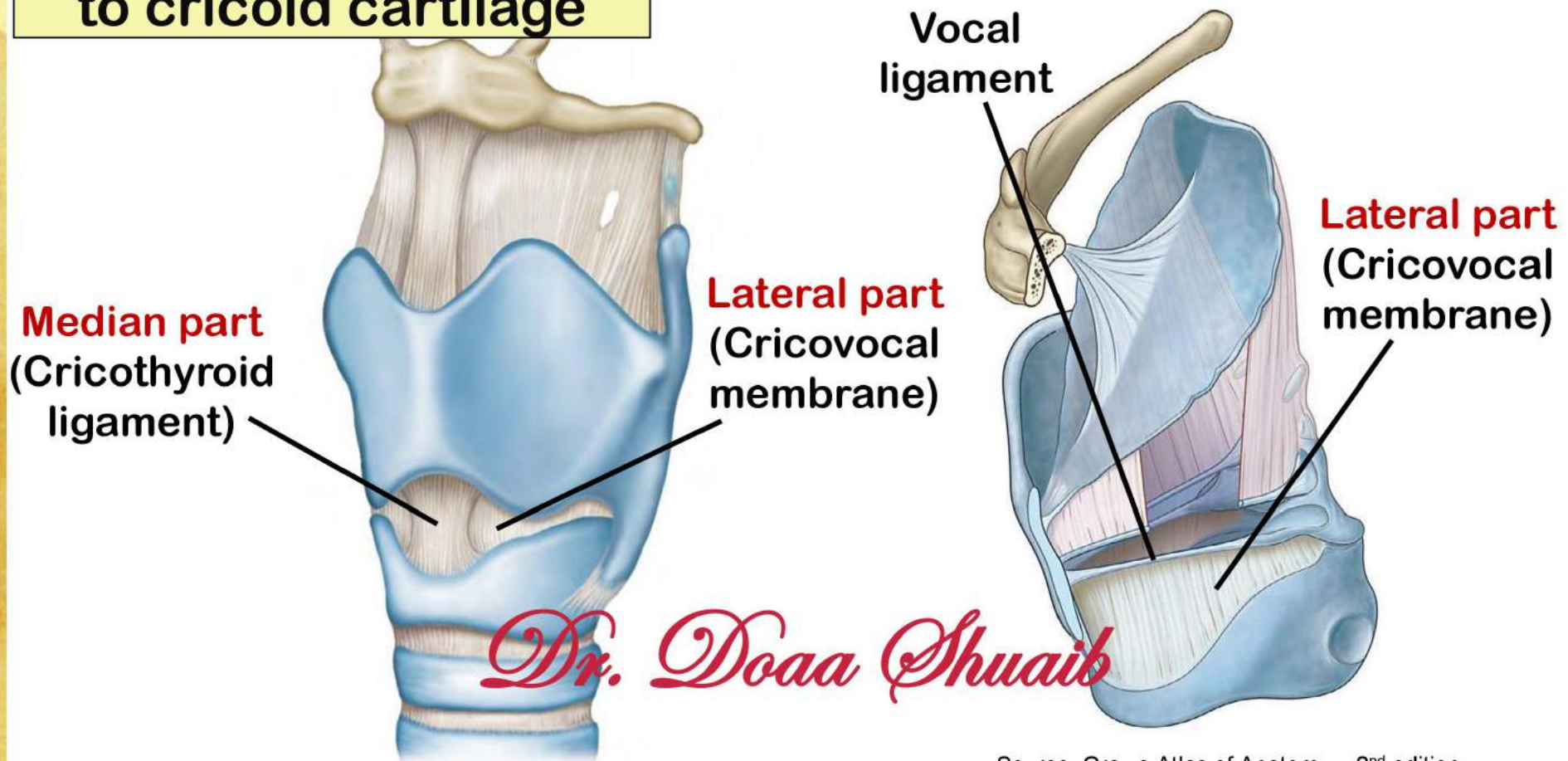
1- Cricotracheal ligament

- Connects the lower border of cricoid cartilage to the 1st tracheal ring.



Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

II. Ligaments attached to cricoid cartilage



Source: Gray s Anatomy - 40th edition

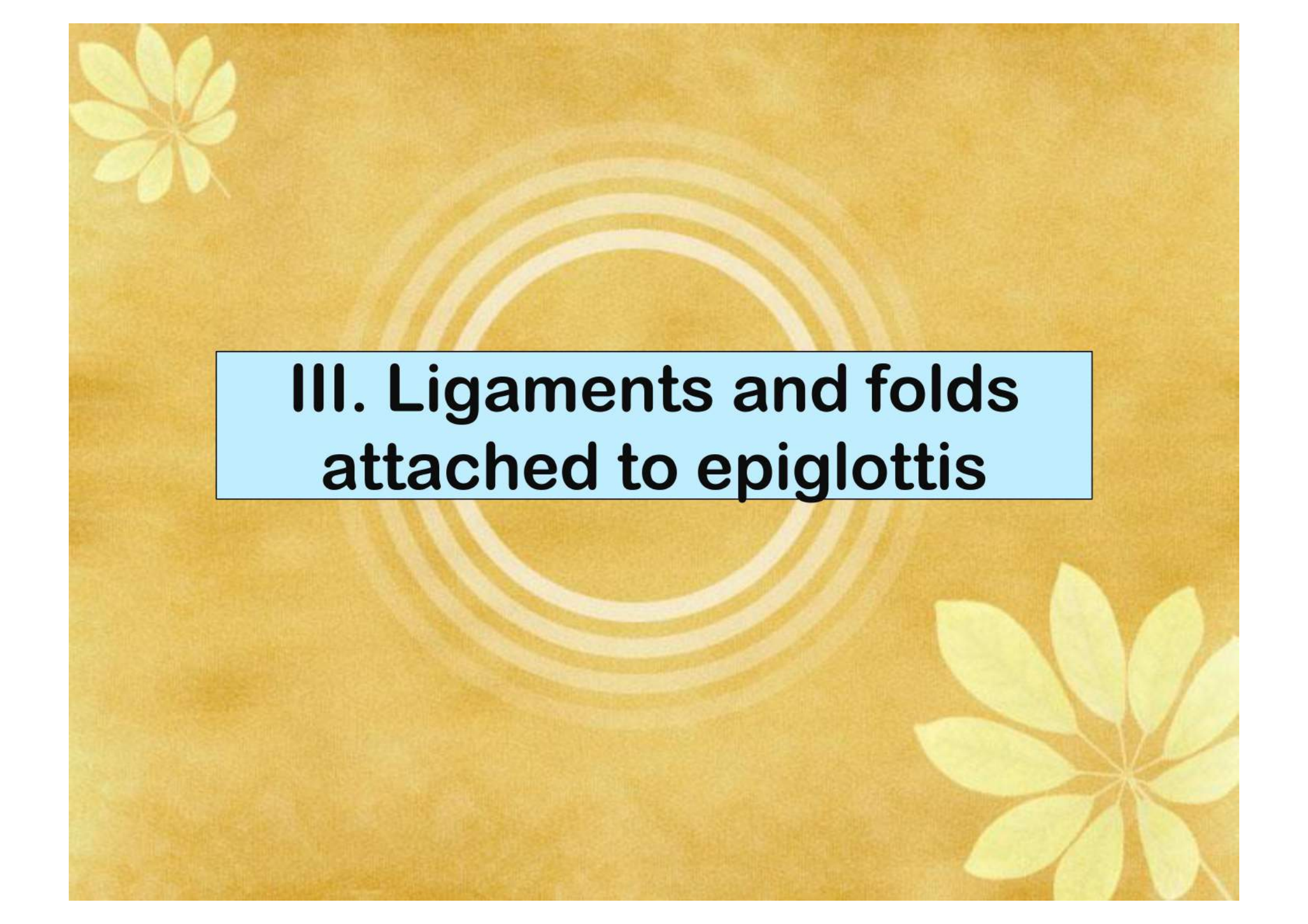
Source: Gray s Atlas of Anatomy – 2nd edition

2- Cricothyroid ligament

a- Median thick anterior part (cricothyroid ligament): It connects the anterior parts of thyroid and cricoid cartilages.

b- Lateral thin part (cricovocal membrane):

- **Below:** It is attached to the upper border of cricoid cartilage.
- **Above:** Its upper border is free and thick; it extends from the vocal process of arytenoid cartilage to the inner surface of angle of thyroid cartilage, it is called the **vocal fold or vocal ligament**.



III. Ligaments and folds attached to epiglottis

a. Ligaments

1. Hyo-epiglottic ligament

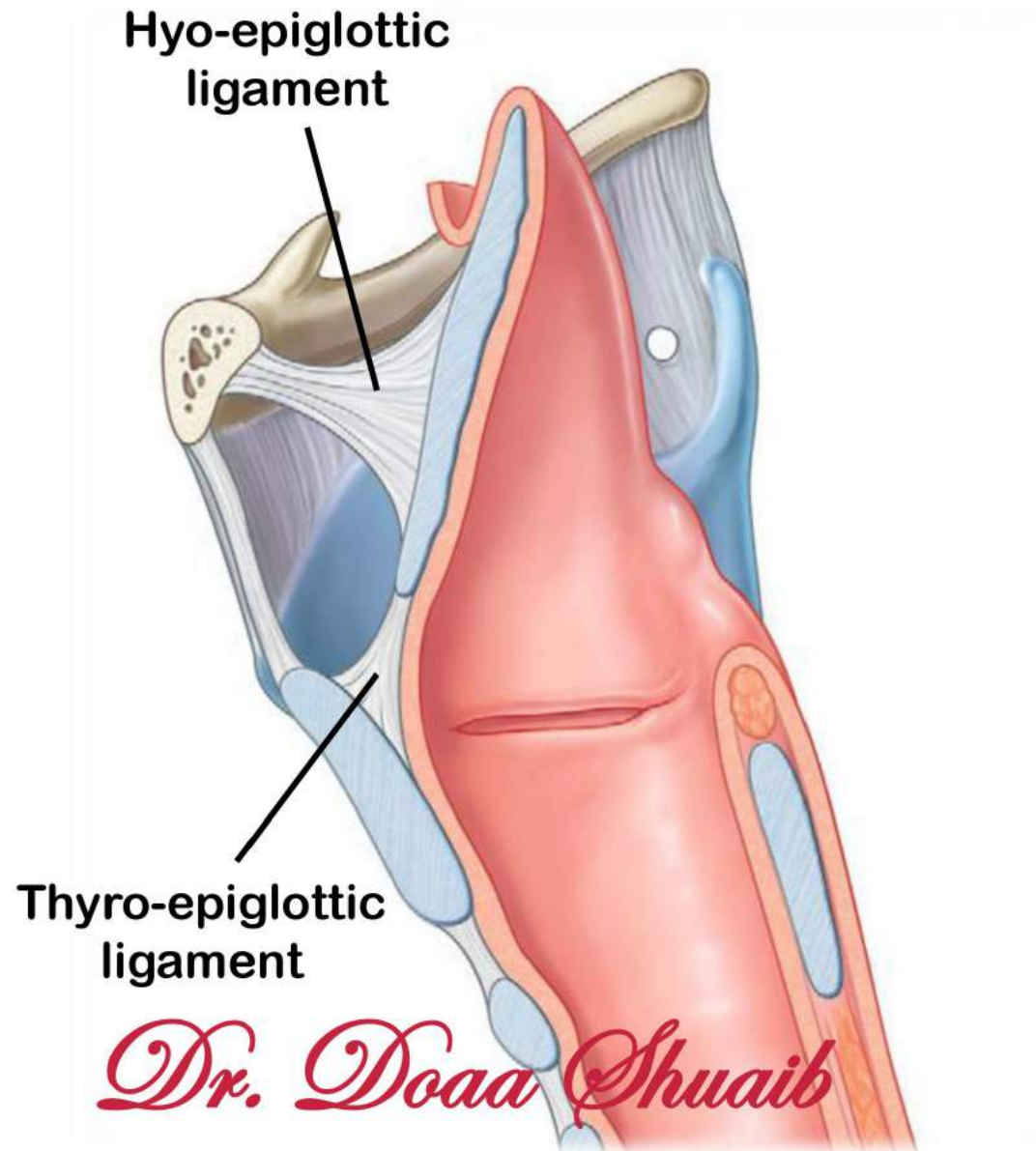
Attachment:

- Anterior surface of epiglottis
- Hyoid bone

2. Thyro-epiglottic ligament

Attachment:

- Stalk of epiglottis
- Inner surface of thyroid angle

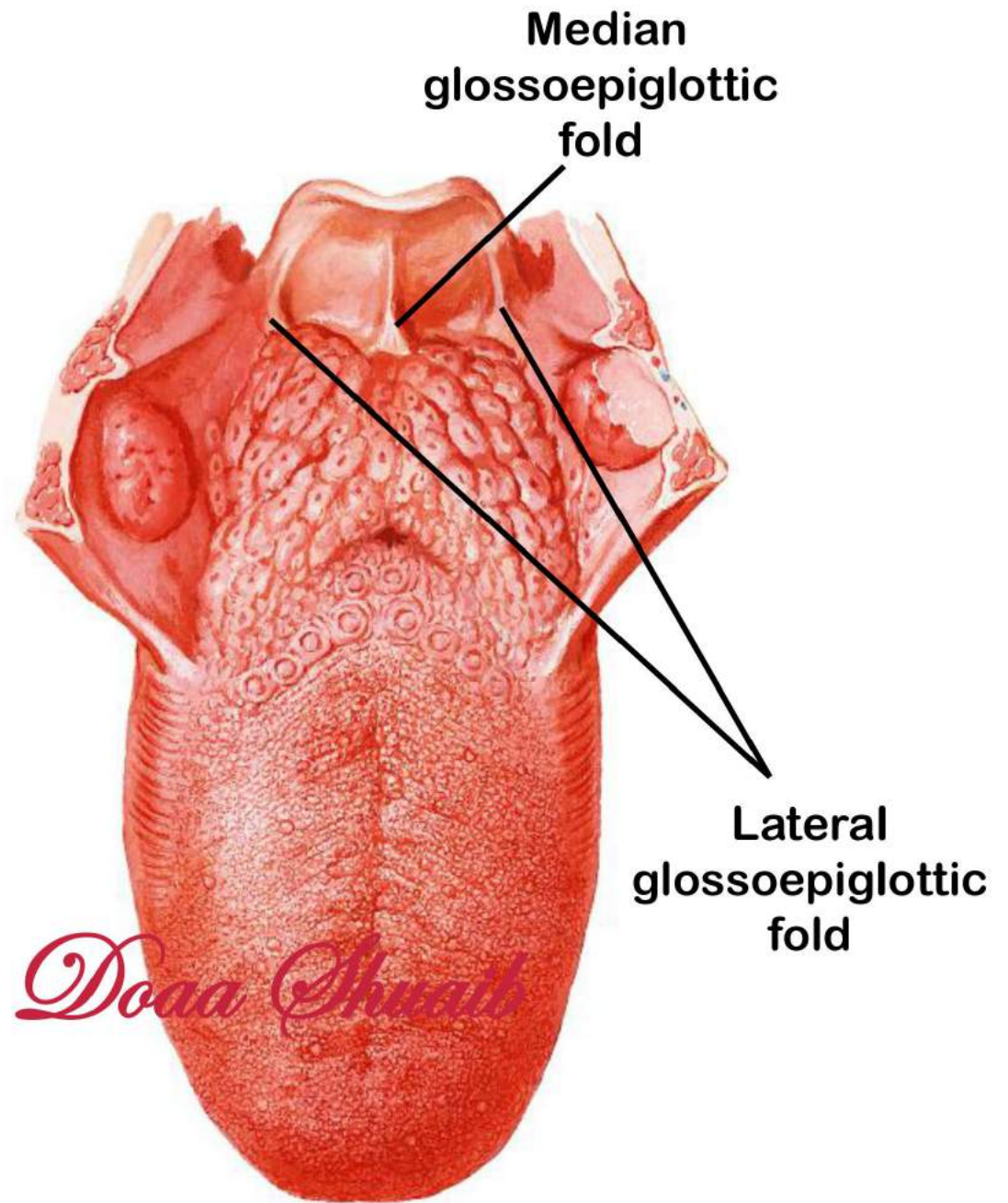


Source: Gray's Atlas of Anatomy – 2nd edition

b- Folds

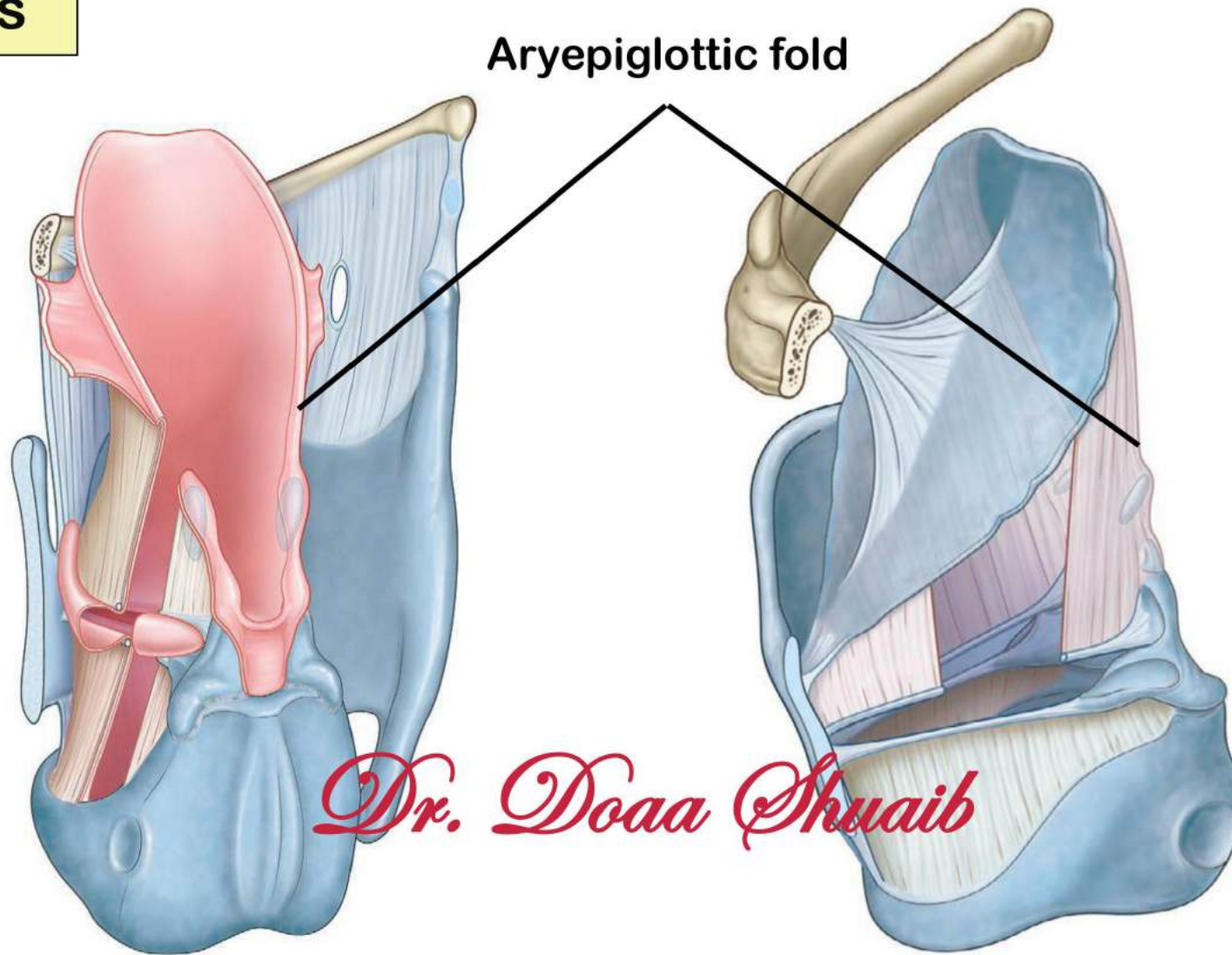
1- Three glossoepiglottic folds

- One median and two lateral folds
- Connect the upper part of epiglottis to the root of the tongue



Source: Atlas of Human Anatomy, Sixth Edition- Frank H. Netter, M.D

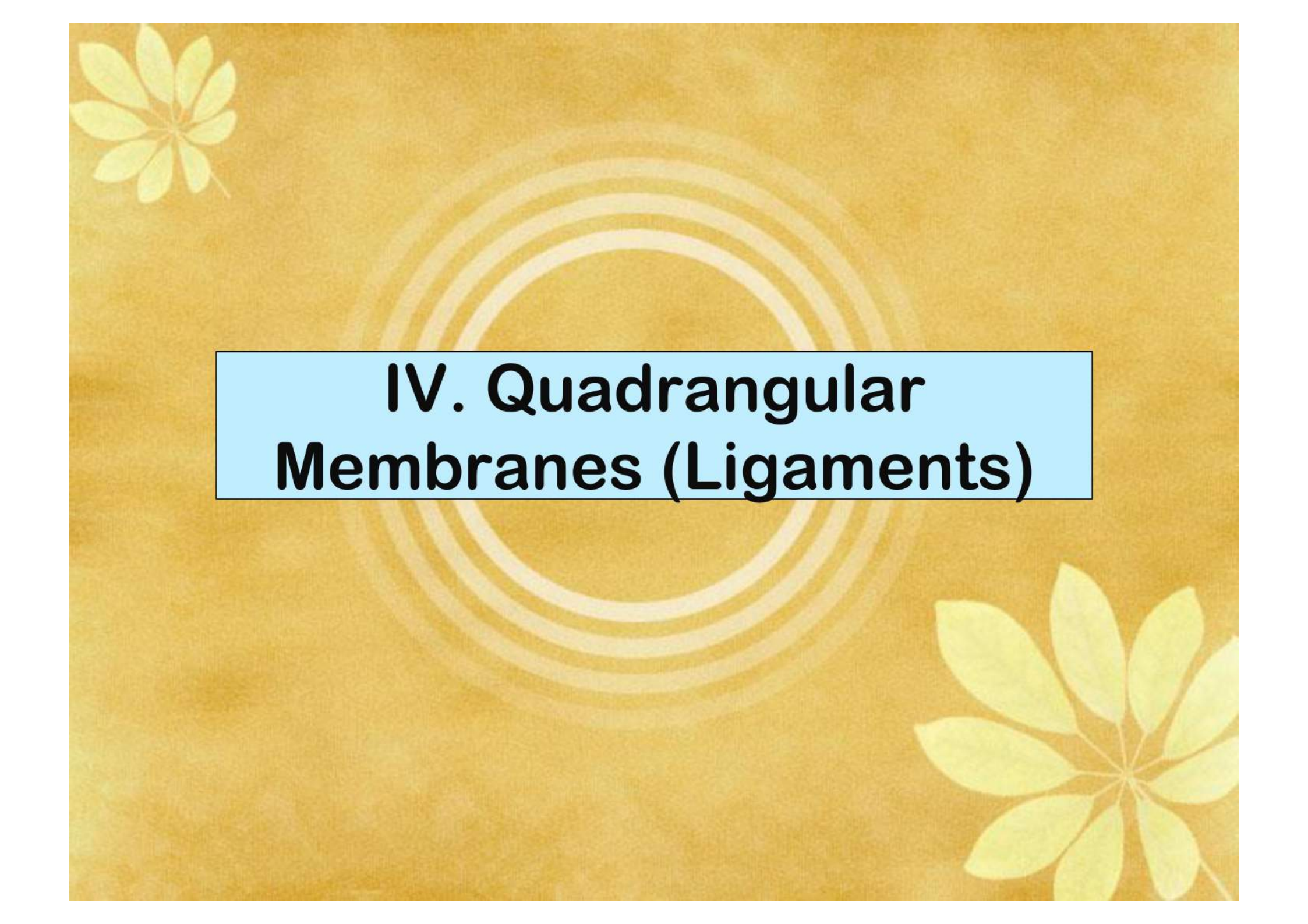
b- Folds



Source: Gray's Atlas of Anatomy – 2nd edition

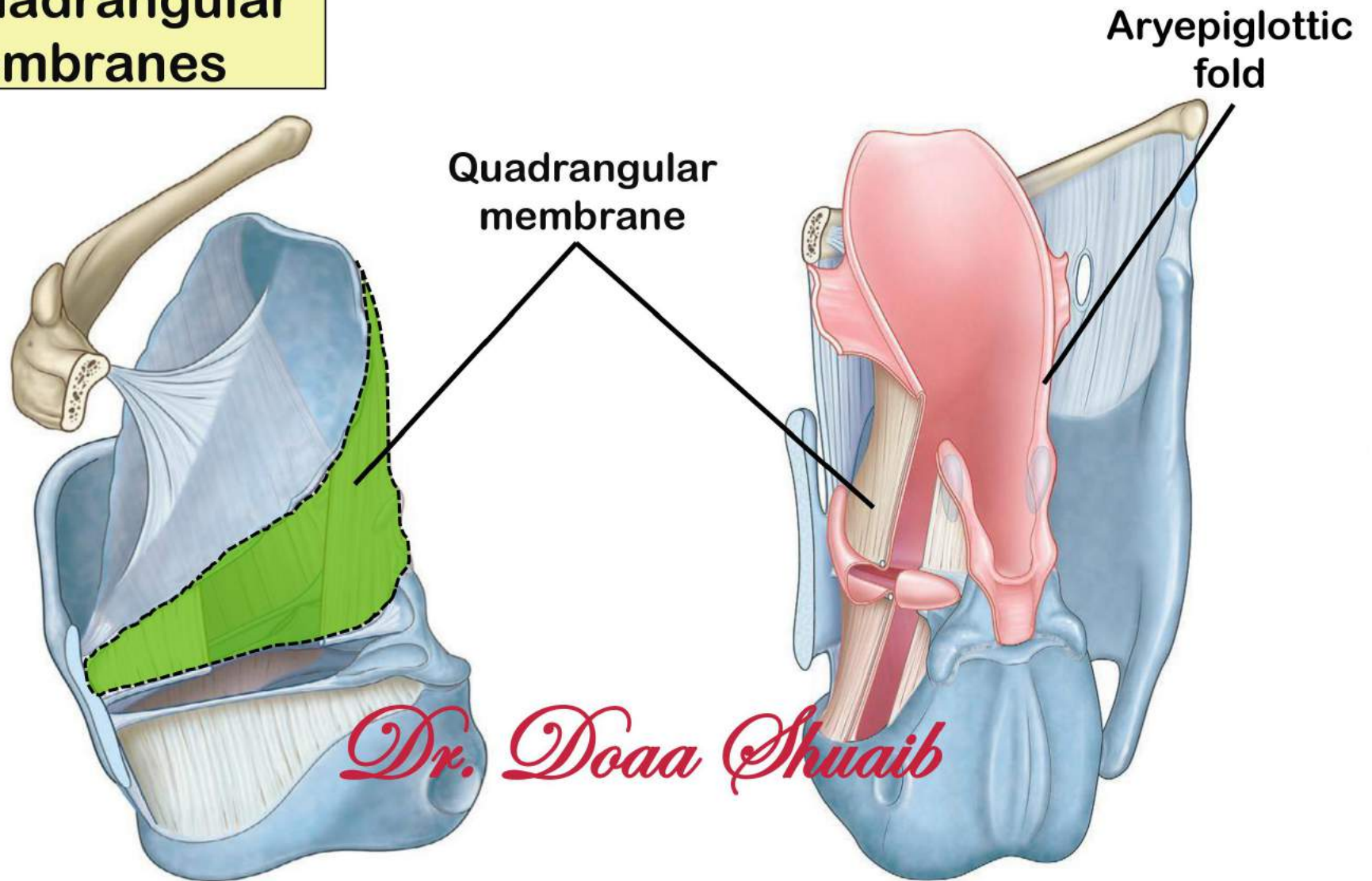
**2- Two
aryepiglottic folds**

Connect the sides of epiglottis to the apices of arytenoid cartilages.



IV. Quadrangular Membranes (Ligaments)

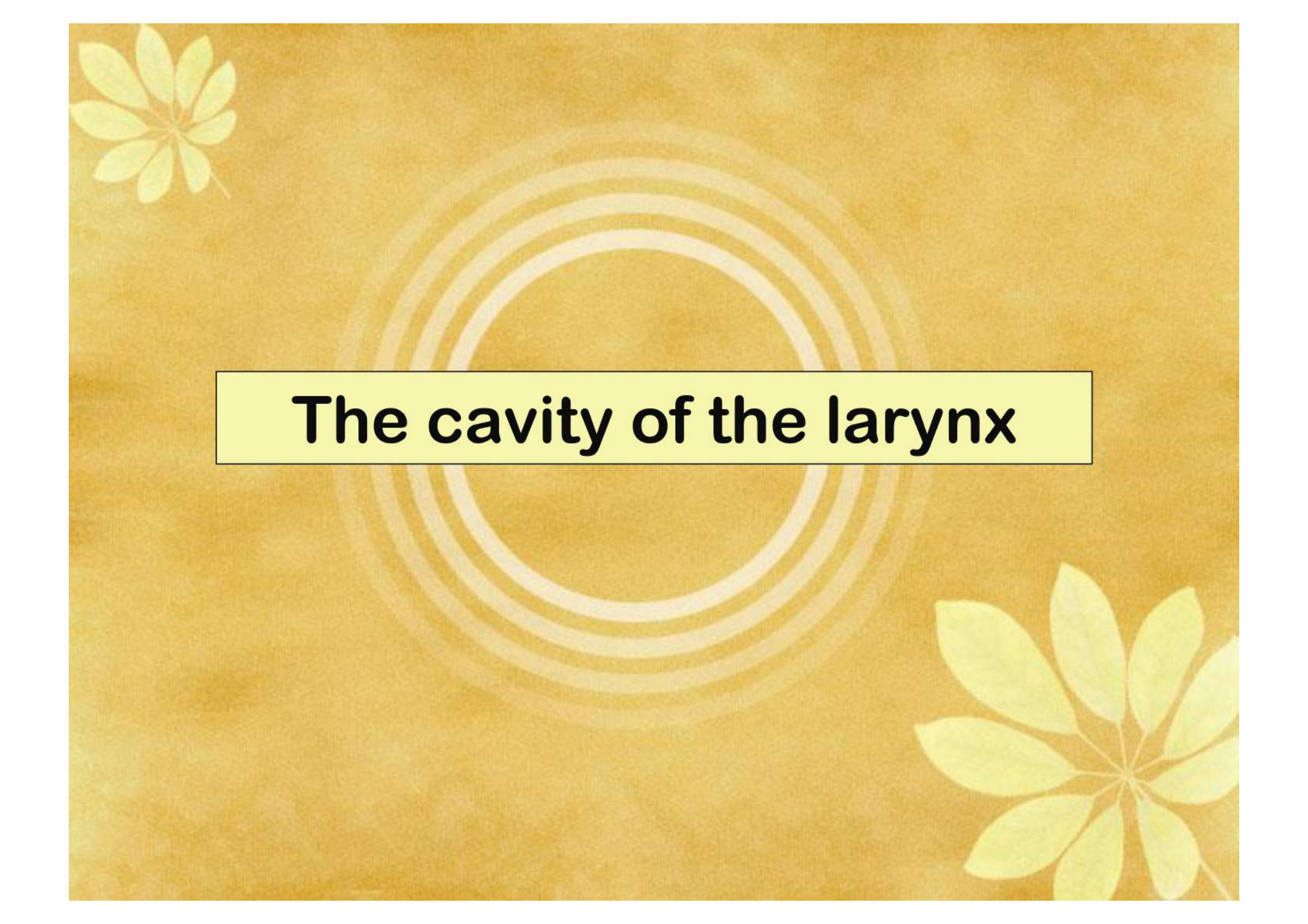
IV. Quadrangular membranes



Source: Gray's Atlas of Anatomy – 2nd edition

Attachment

- **Anteriorly:** Sides of epiglottis
- **Posteriorly:** Arytenoid cartilages
- **Above:** - Free - It forms aryepiglottic fold.
- **Below:** - Free - It forms vestibular fold.

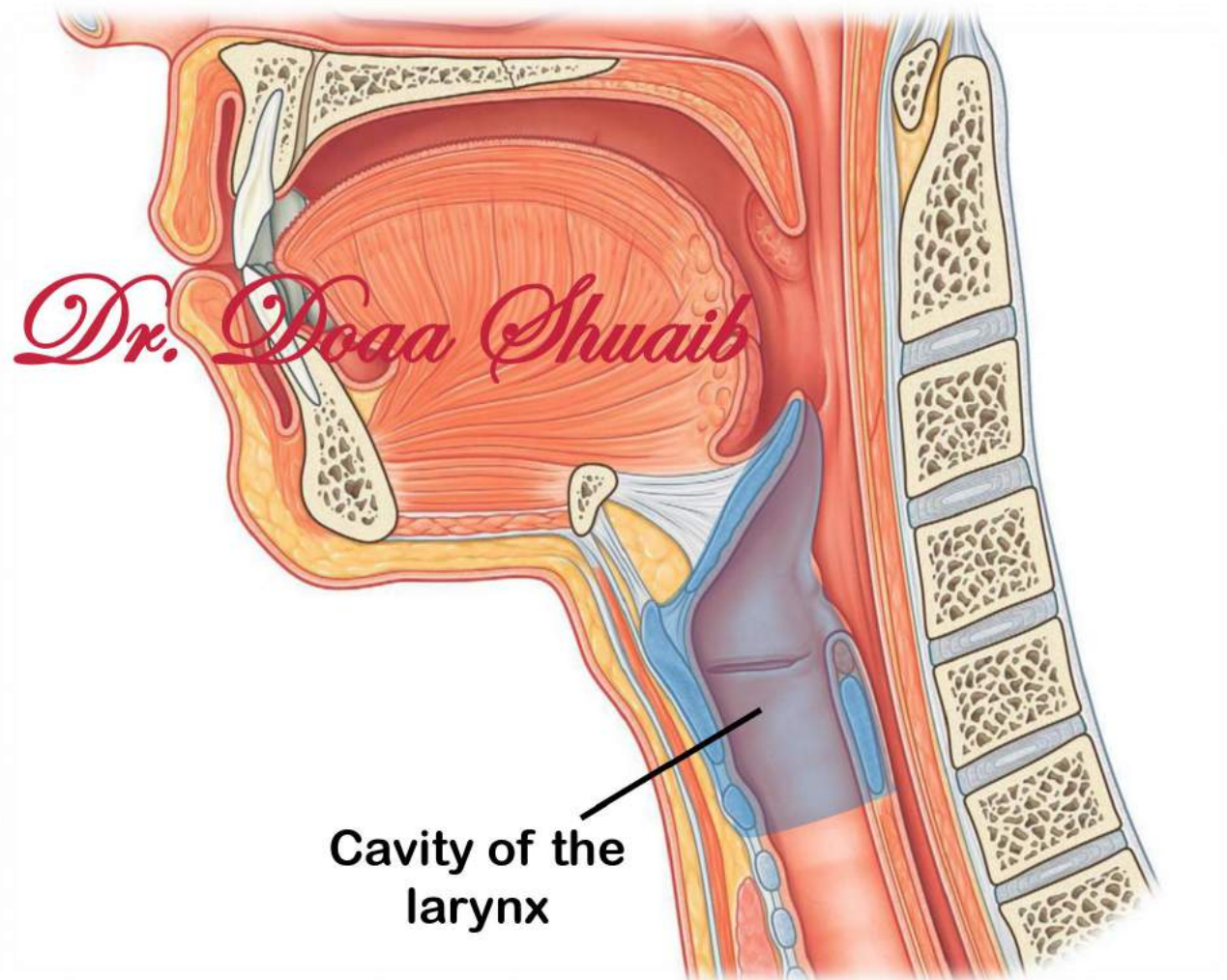
The background is a textured, golden-yellow color. In the center, there are several concentric circles of varying shades of yellow and white, creating a ripple effect. In the top-left and bottom-right corners, there are stylized floral motifs with multiple pointed petals in a light yellow-green color.

The cavity of the larynx

The cavity of the larynx

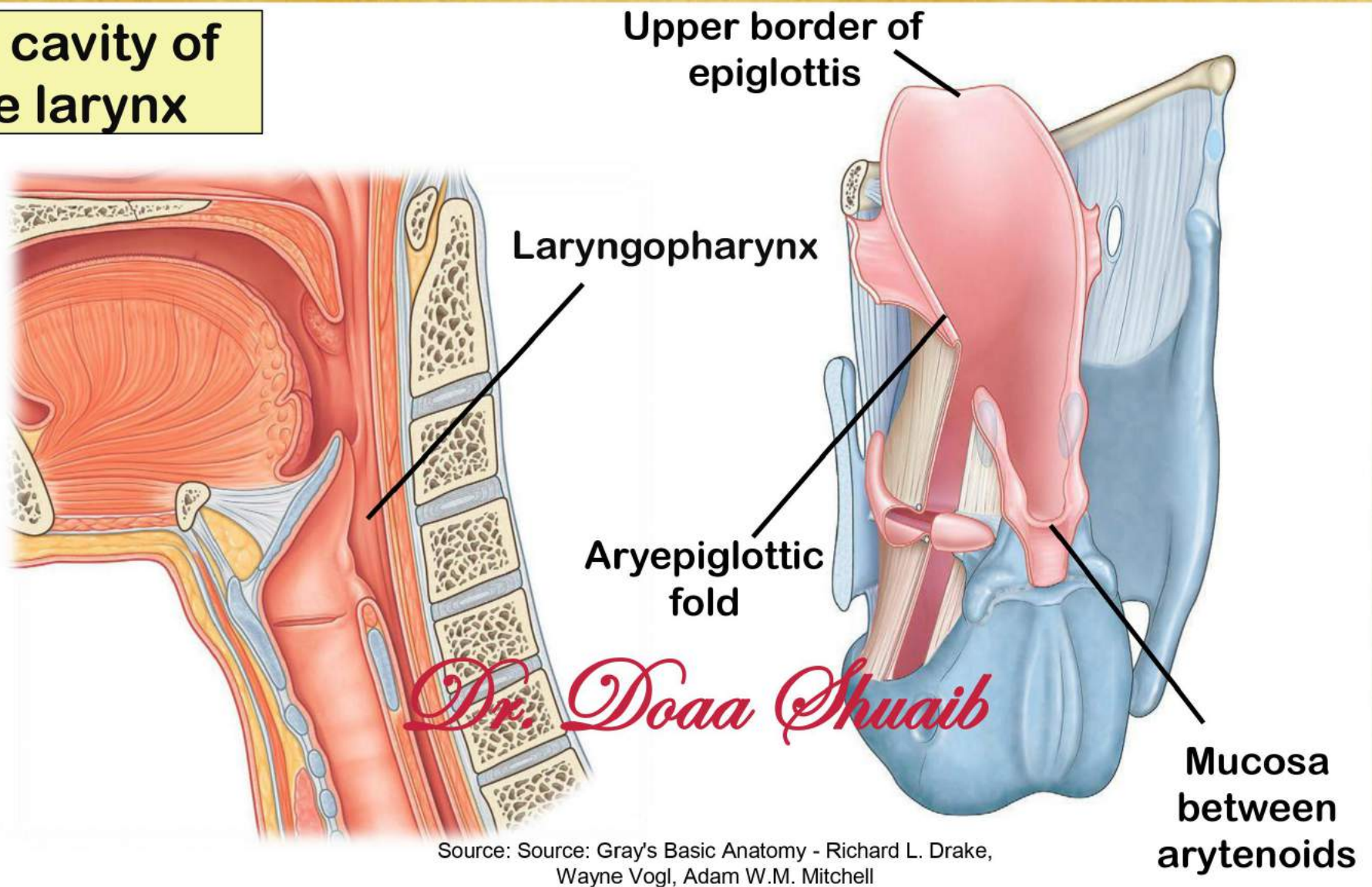
Extent

It extends from the inlet of larynx to the lower border of cricoid cartilage



Source: Source: Gray's Basic Anatomy - Richard L. Drake, Wayne Vogl, Adam W.M. Mitchell

The cavity of the larynx



The inlet of larynx

Direction: It is directed upwards and backwards and communicates the larynx with laryngopharynx.

Boundaries:

- **Anteriorly:** The upper border of the epiglottis.
- **Posteriorly:** The mucosa between the arytenoids.
- **Laterally:** Aryepiglottic folds, on each side

The cavity of the larynx

Parts

The vestibule:

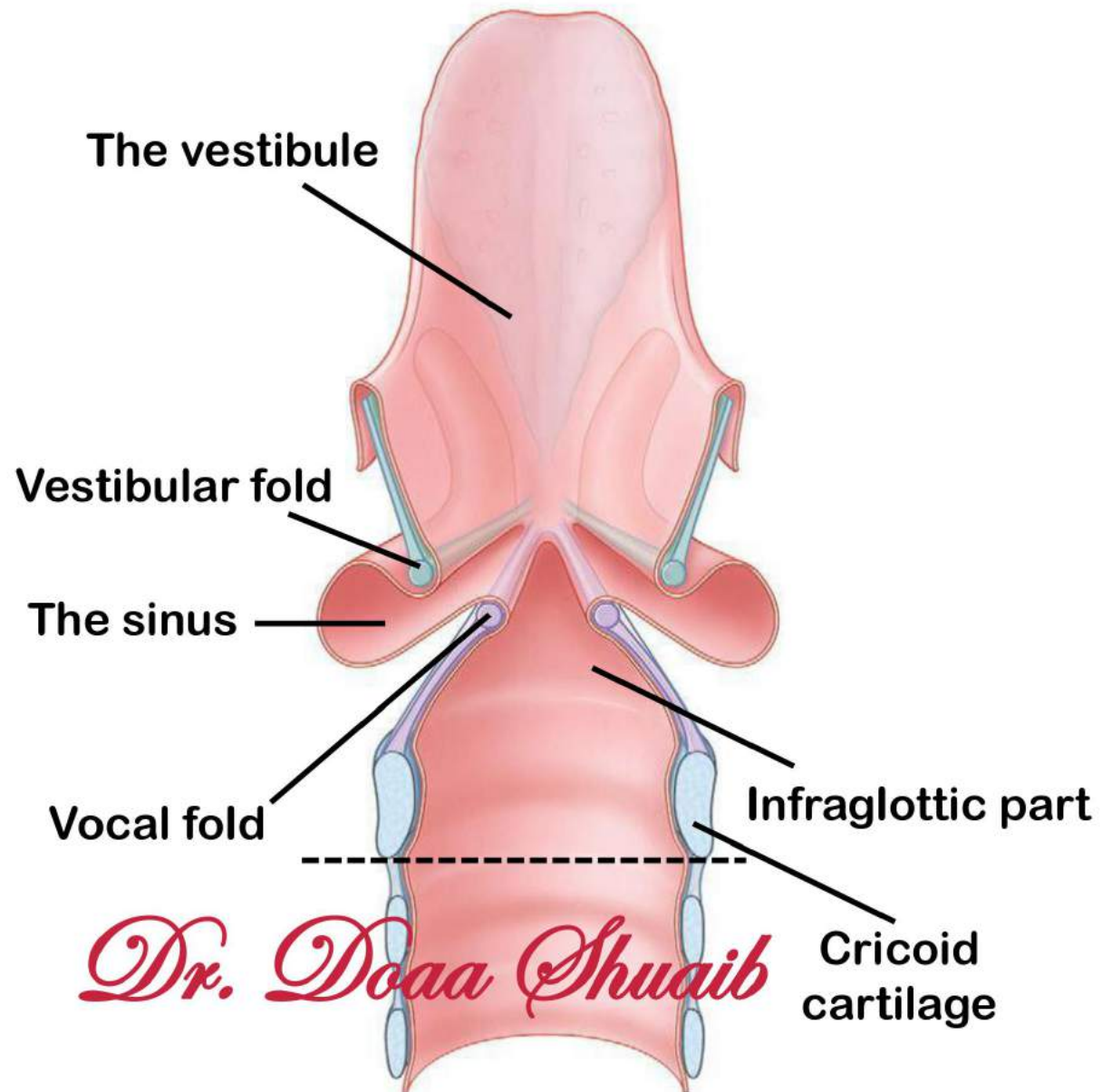
- The upper part
- From laryngeal inlet
- To the vestibular folds

The sinus of the larynx:

- The middle part
- From the vestibular folds above
- To the vocal folds below.

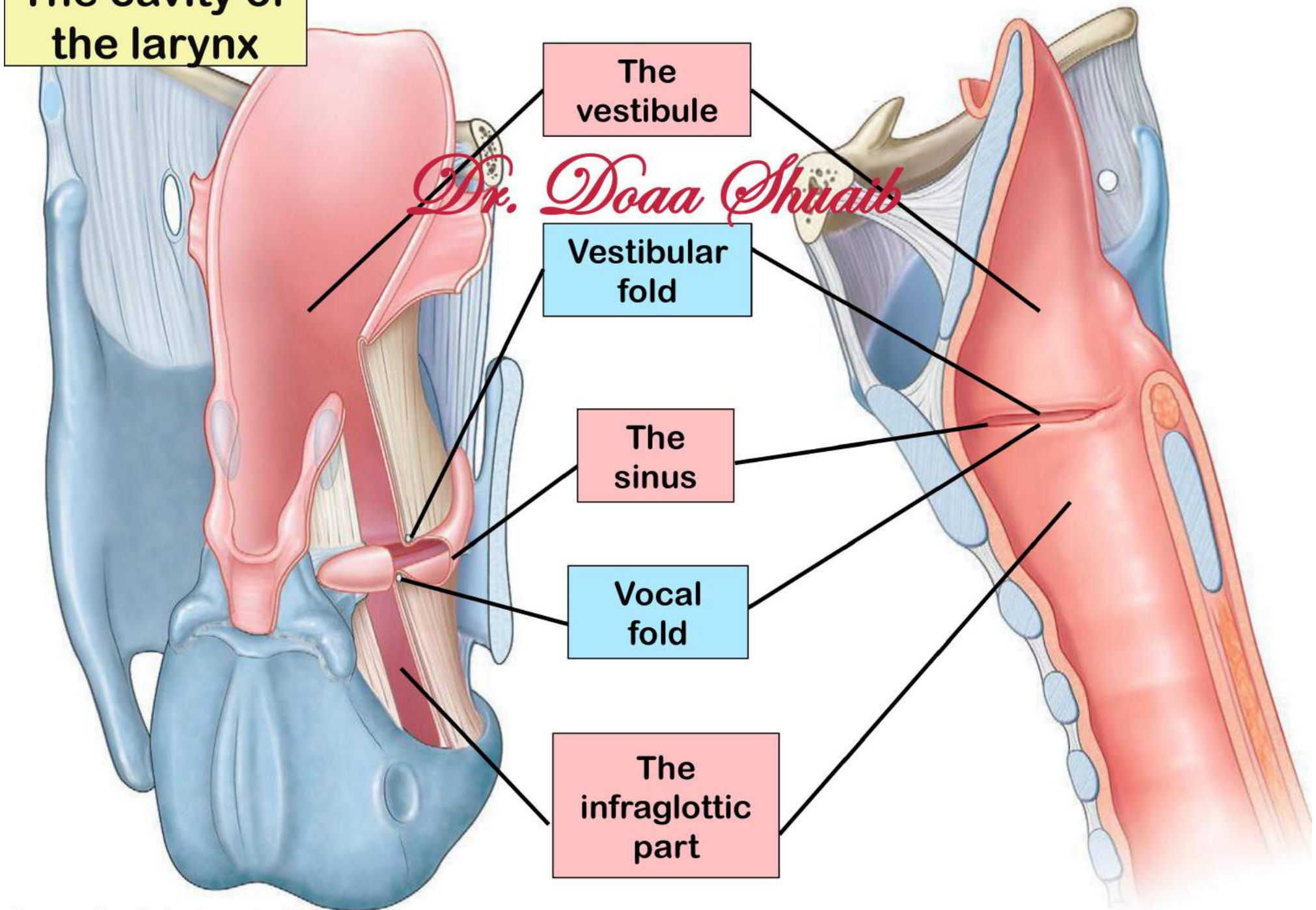
The infraglottic part:

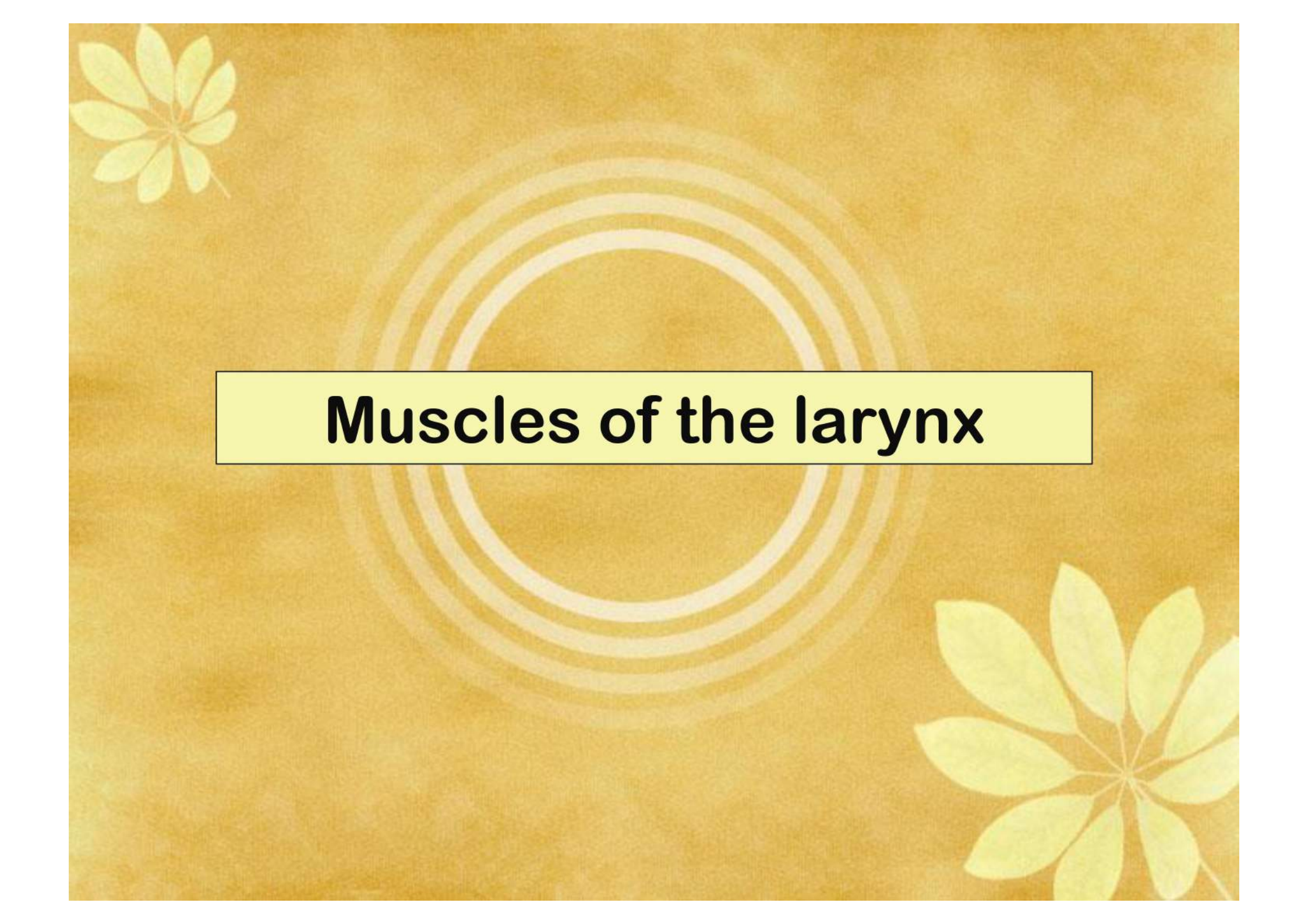
- The lower part
- From the vocal folds
- To the lower border of cricoid cartilage.



Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

The cavity of the larynx



The background is a textured, golden-yellow surface. In the center, there are several concentric, light-colored circles that create a ripple effect. In the top-left and bottom-right corners, there are stylized, light-green floral motifs with multiple pointed petals.

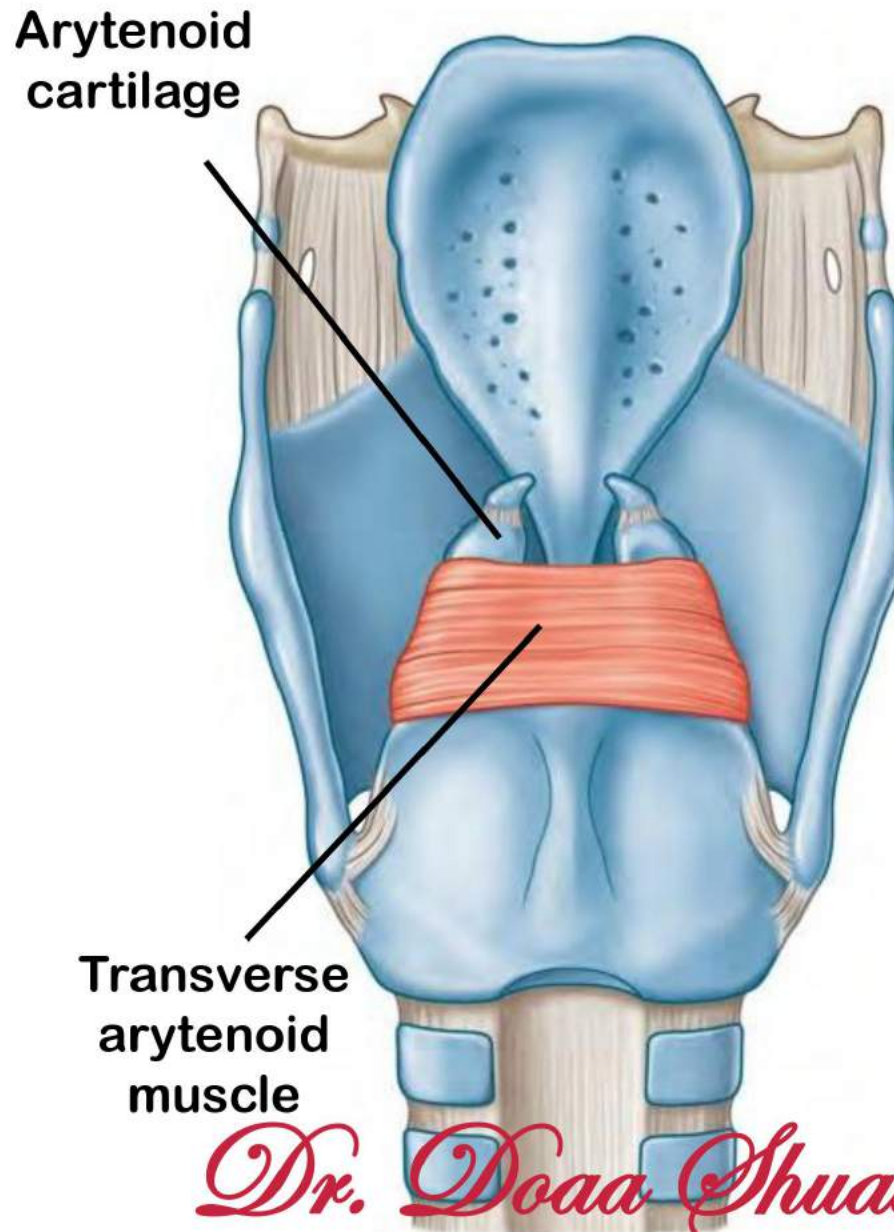
Muscles of the larynx

**A. Muscles which close the
inlet of larynx**

Muscles which close the inlet of larynx

1- Transverse arytenoid muscle

- Single muscle covers the posterior surfaces of both arytenoid cartilages.
- It extends between the lateral margins of these cartilages.



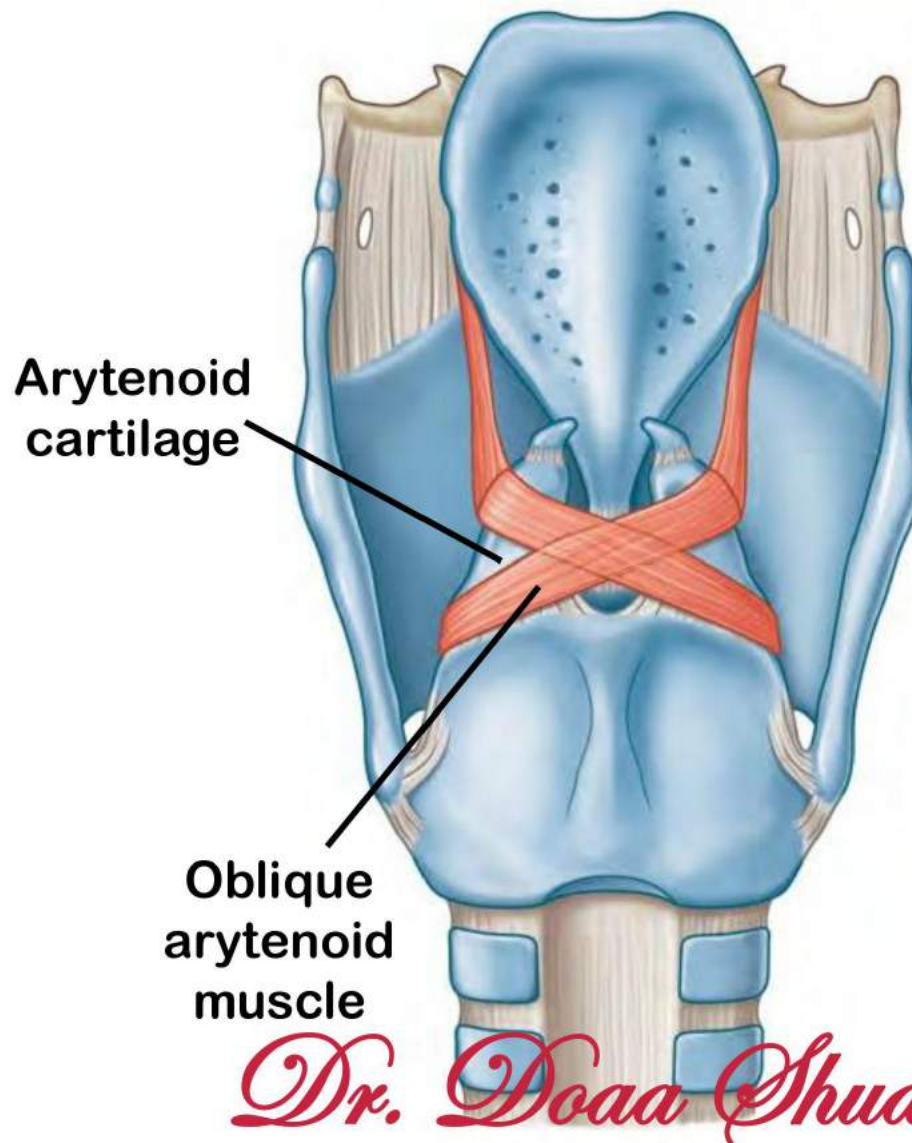
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Source: Gray's Anatomy - 40th edition

Muscles which close the inlet of larynx

2- Oblique arytenoid muscles

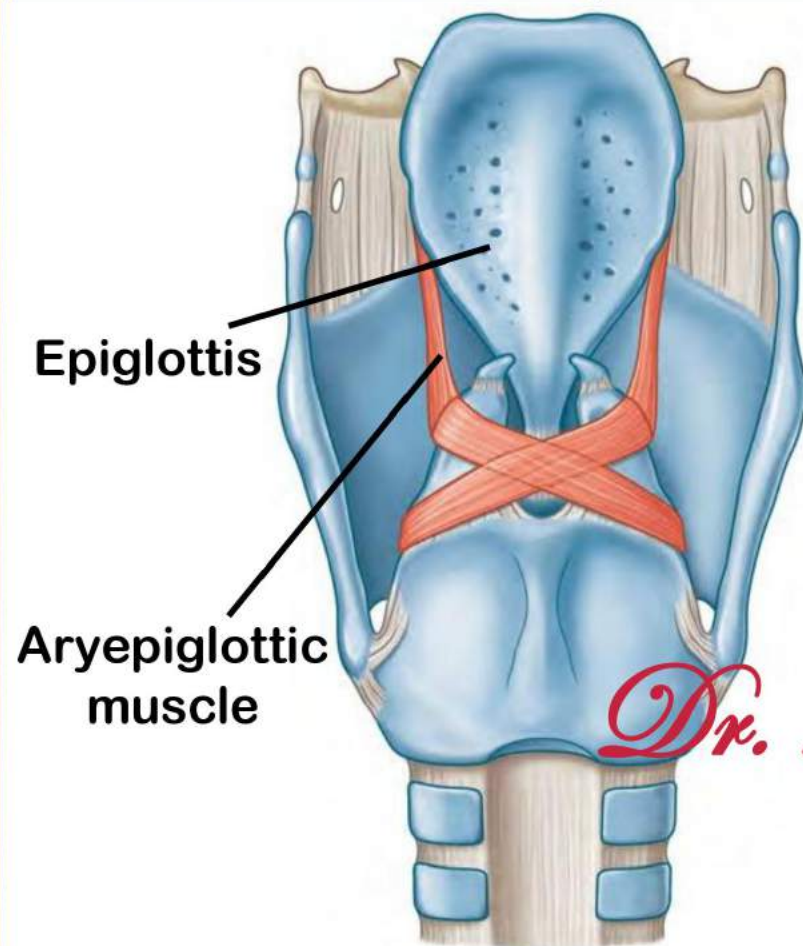
- Two muscles crossing each other like the letter (x)
- They lie superficial to transverse arytenoid muscle.
- Each one extends from the posterior surface of one arytenoid to the apex of the other arytenoid cartilage.



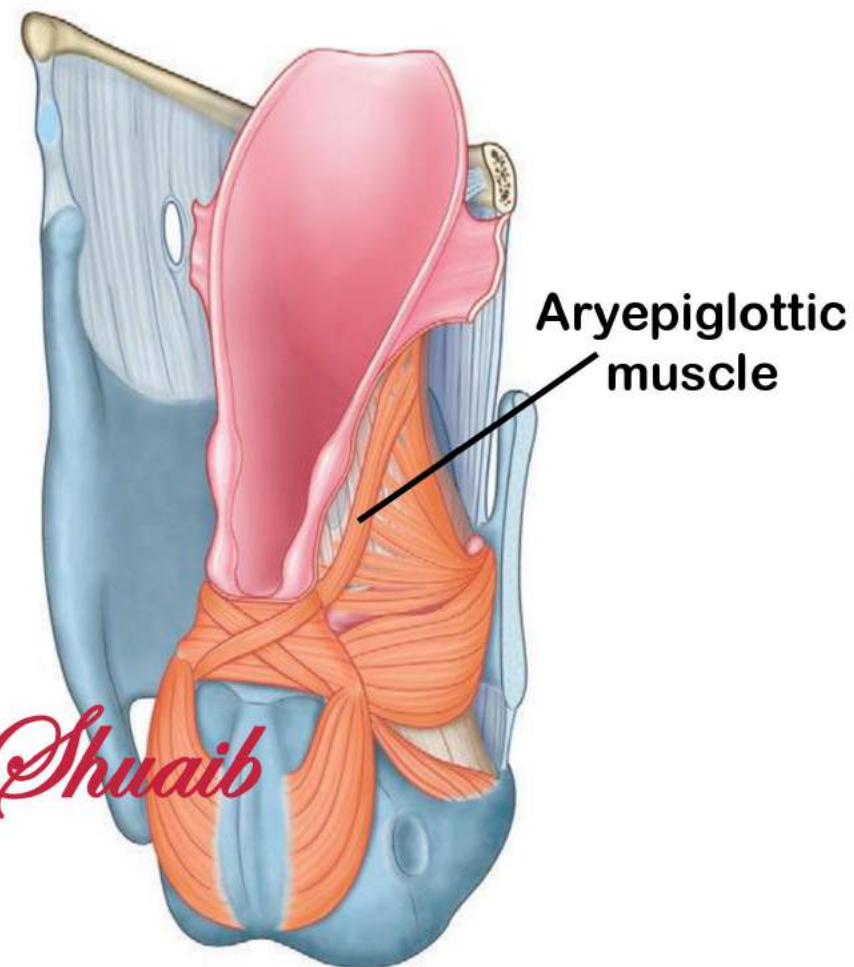
Dr. Doaa Shuaib

Source: Gray's Anatomy - 40th edition

Muscles which close the inlet of larynx



Source: Gray's Anatomy - 40th edition

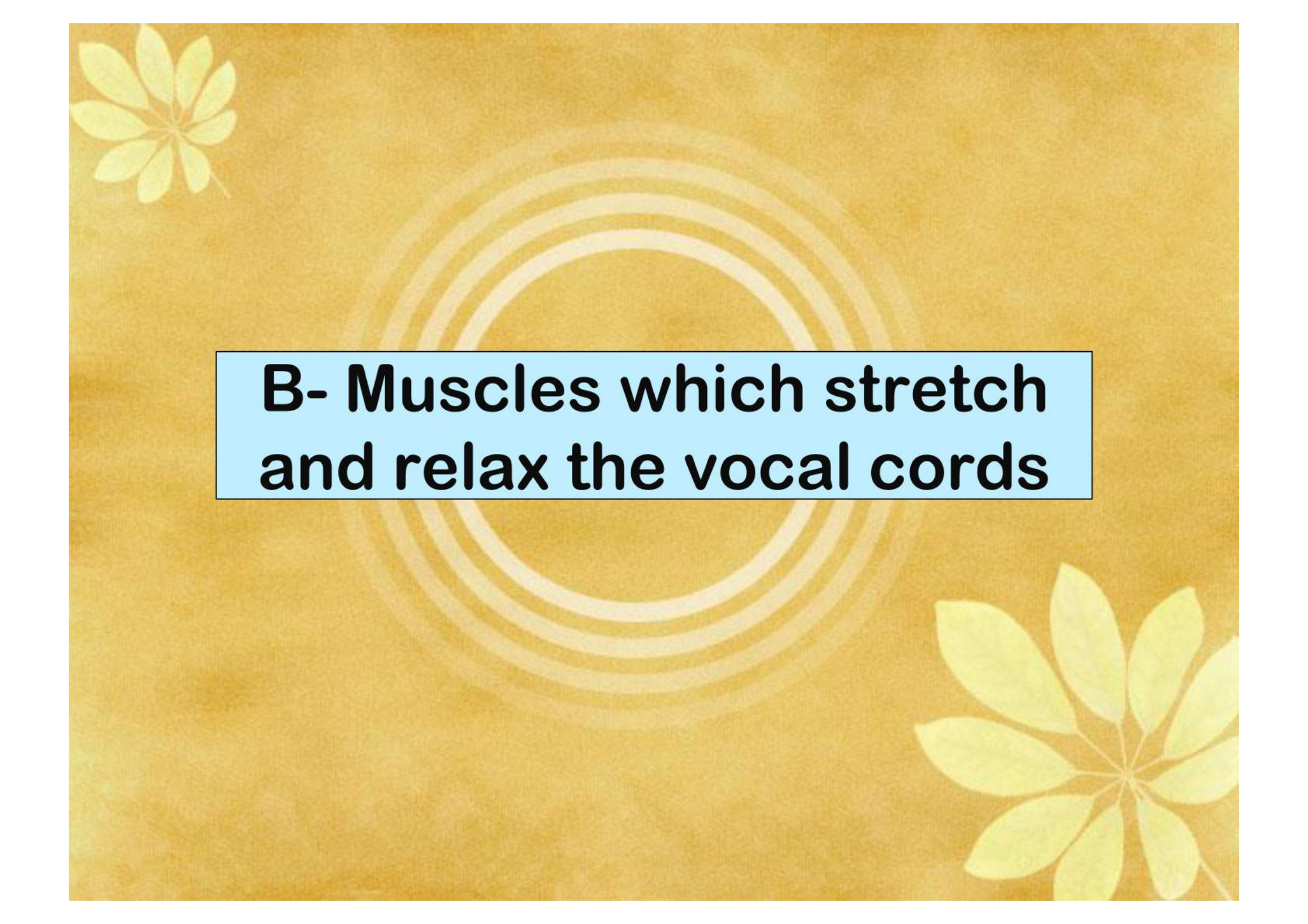


Source: Source: Gray's Basic Anatomy - Richard L. Drake, Wayne Vogl, Adam W.M. Mitchell

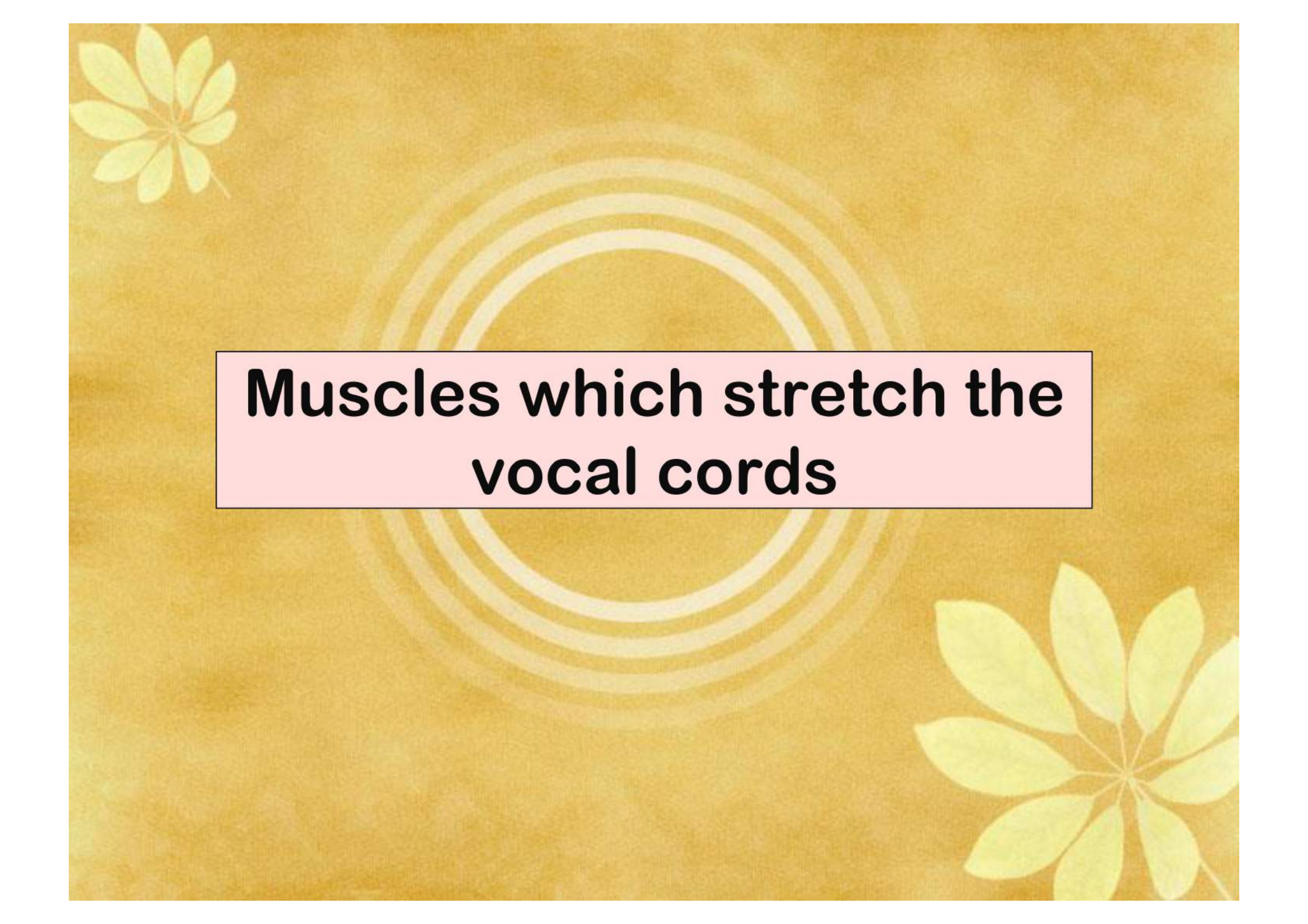
Dr. Doaa Shuaib

3- Aryepiglottic muscle

- It is the prolongation of the oblique arytenoid muscle into the aryepiglottic fold.
- It arises from the apex of arytenoid cartilage and is inserted into the side of epiglottis



**B- Muscles which stretch
and relax the vocal cords**

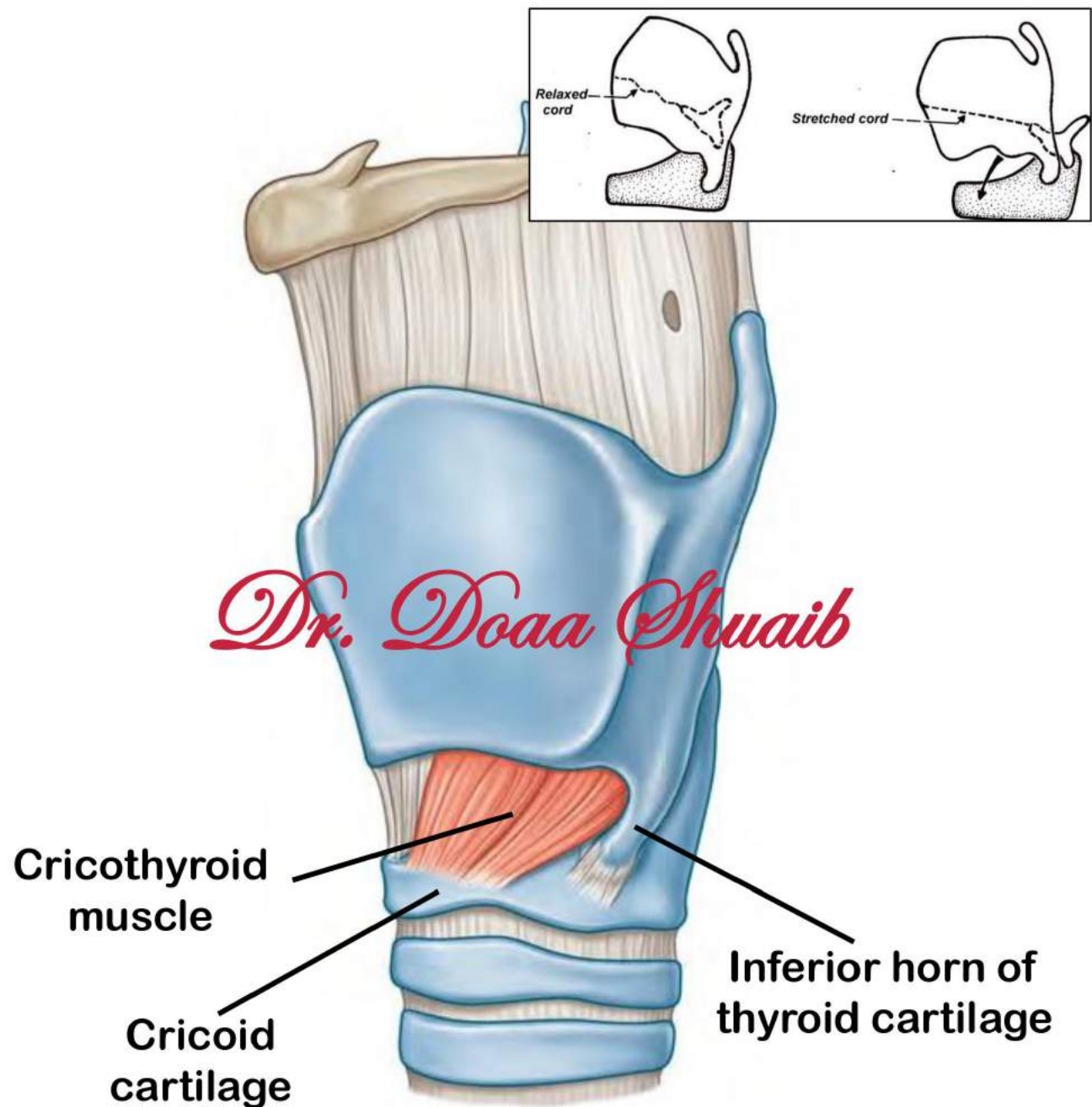


Muscles which stretch the vocal cords

Muscles which stretch the vocal cords

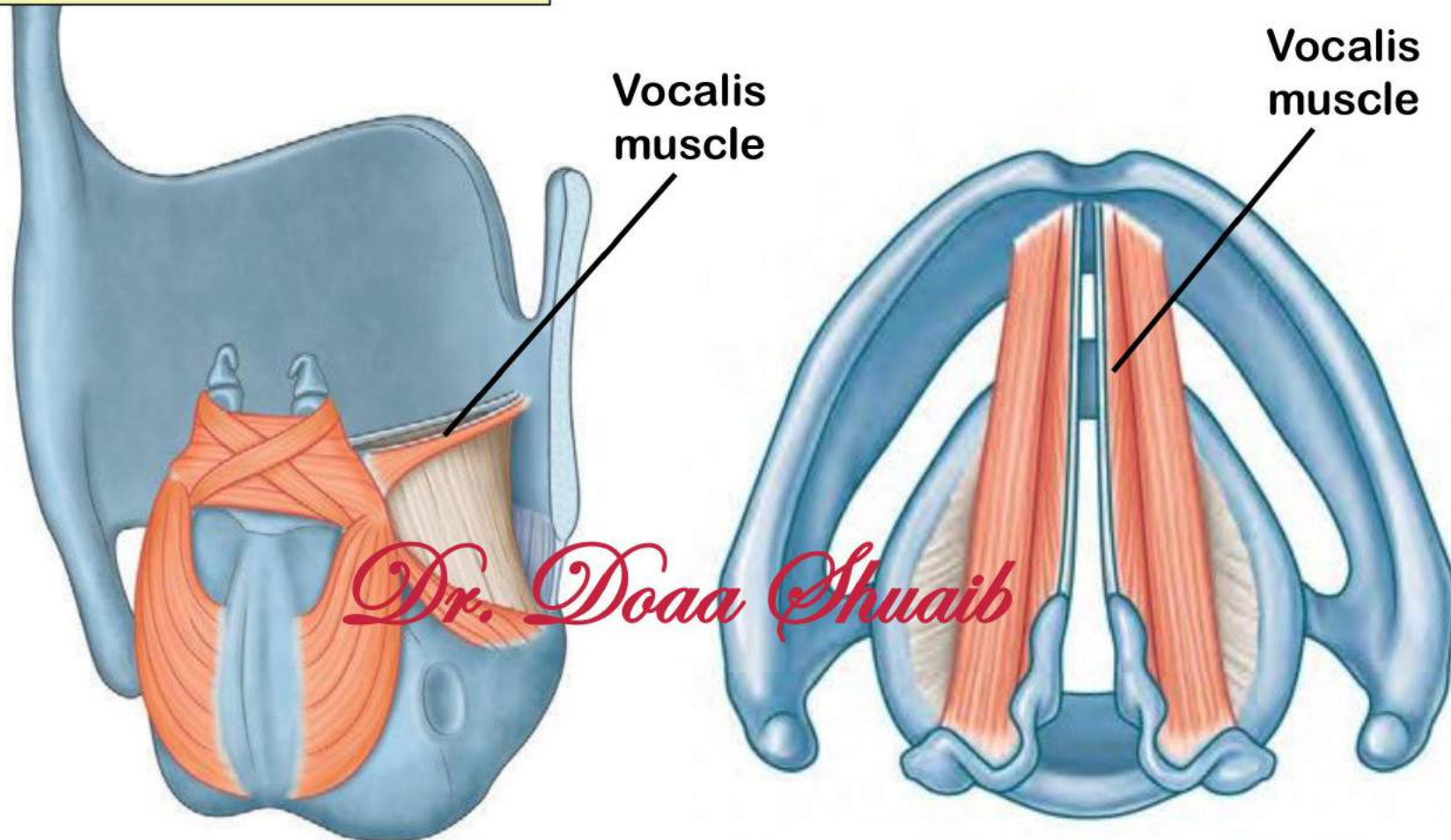
1- Cricothyroid muscle

- **Origin:** Anterolateral aspect of arch of cricoid cartilage.
- **Insertion:** Lower border and inferior horn of thyroid cartilage



Source: Gray s Anatomy - 40th edition

Muscles which stretch the vocal cords

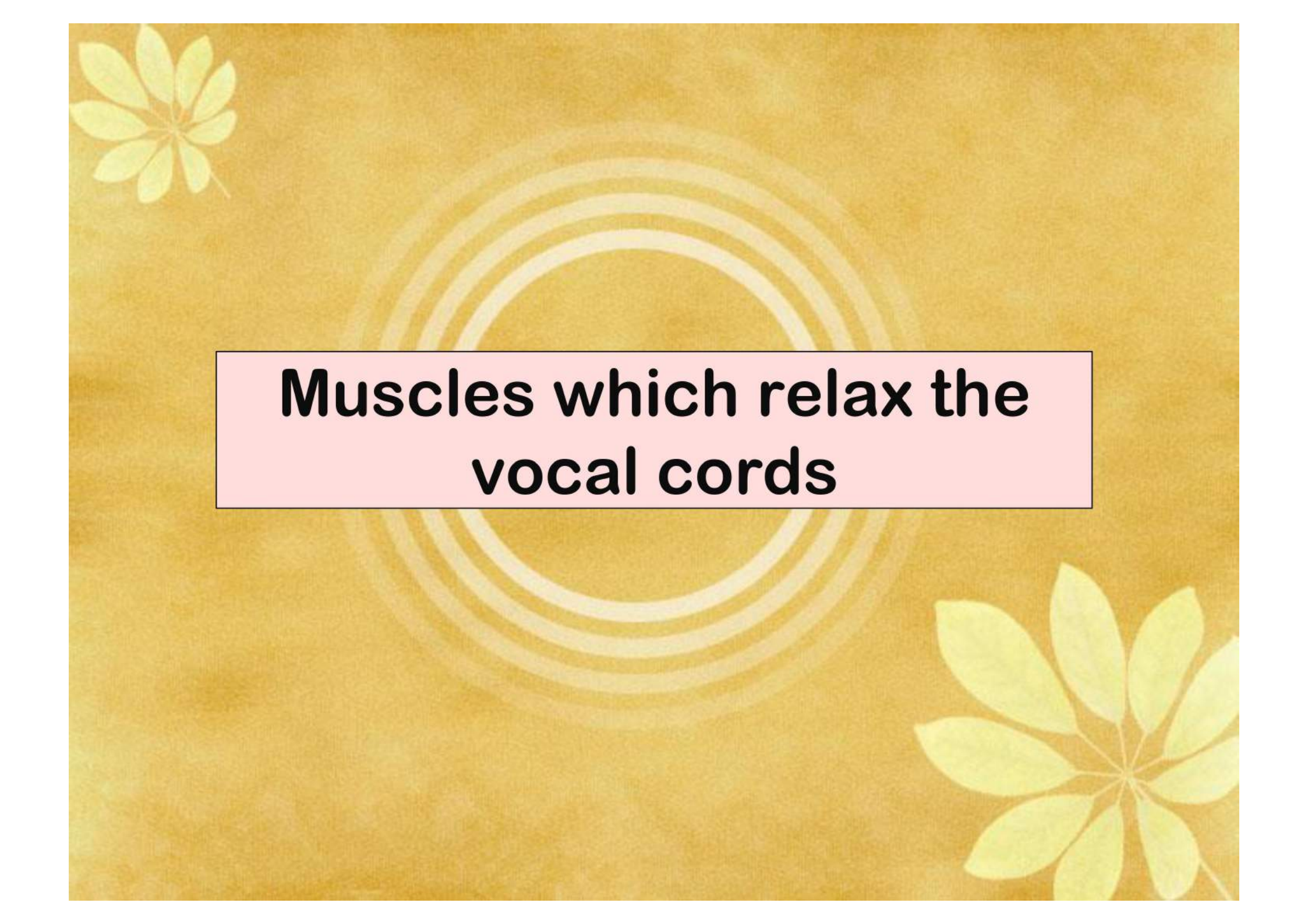


Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

Source: Gray s Anatomy - 40th edition

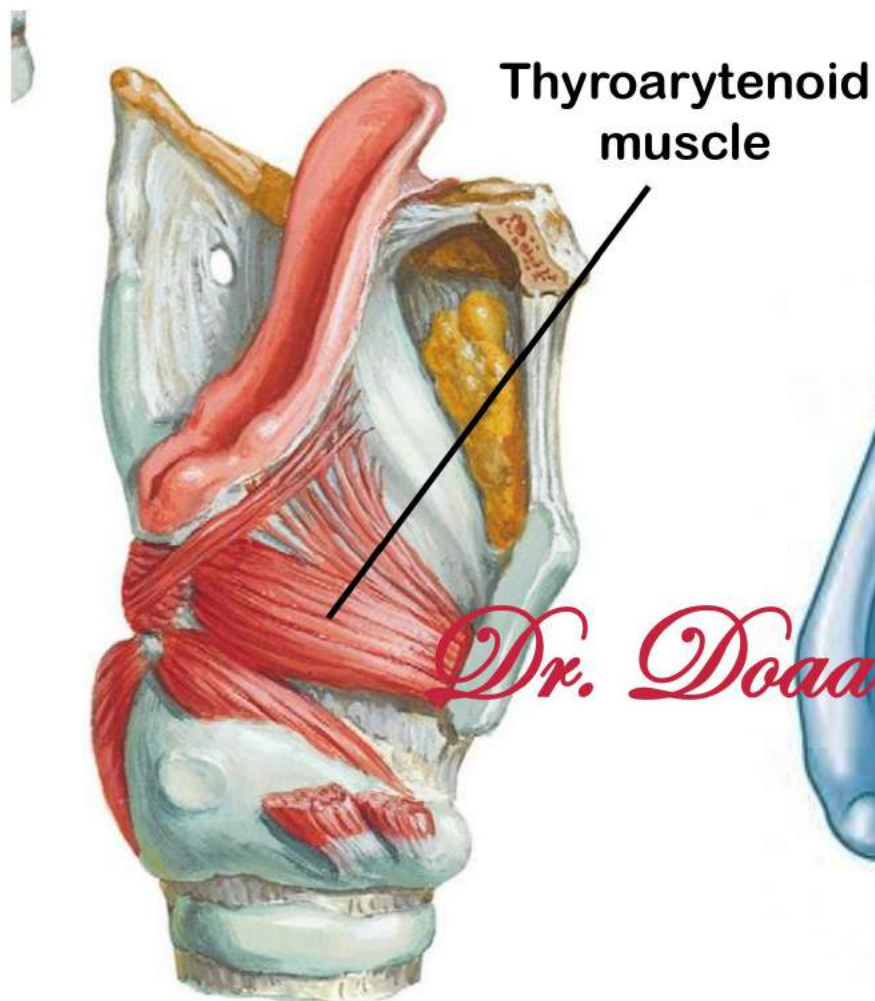
2- Vocalis muscle (anterior part)

- Lies lateral to vocal cord.
- It stretch the anterior part of the cord.

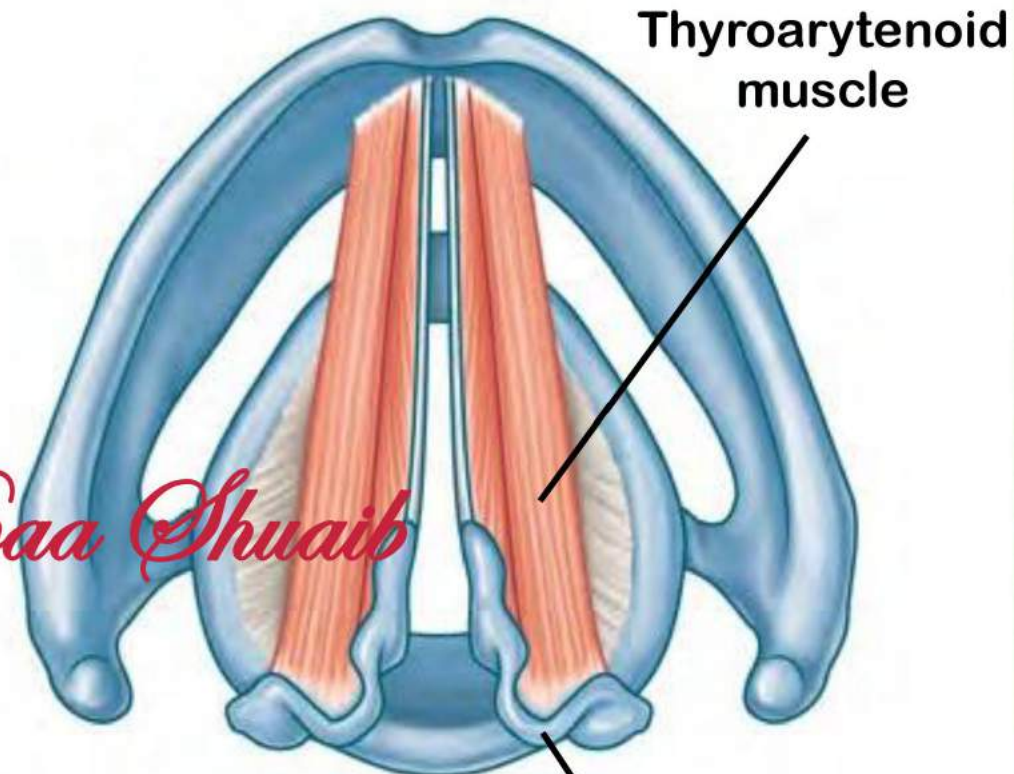
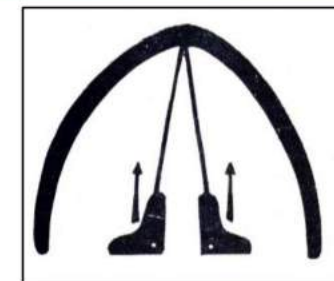


Muscles which relax the vocal cords

Muscles which relax the vocal cords



Source: Atlas of Human Anatomy, Sixth Edition-
Frank H. Netter, M.D

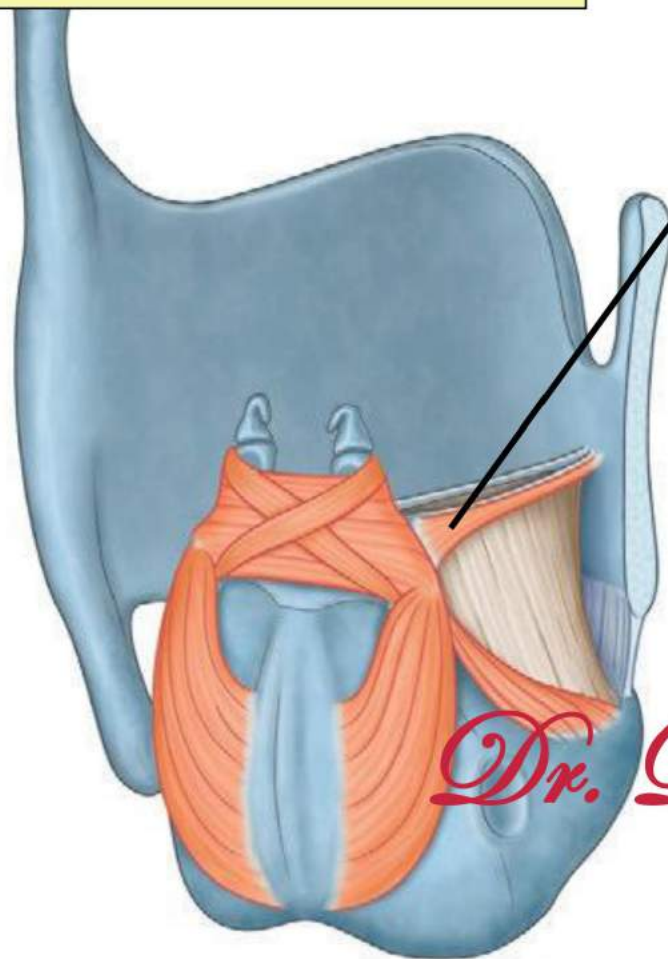


Source: Gray's Anatomy - 40th edition

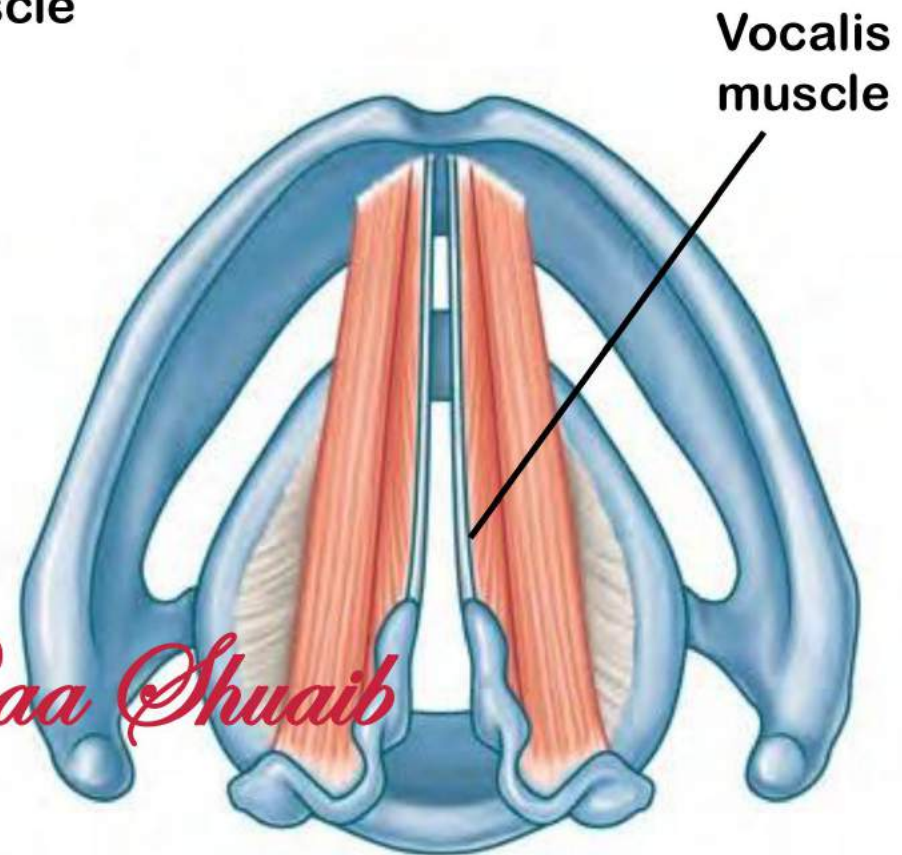
1- Thyroarytenoid muscle

- **Origin:** Lower $\frac{1}{2}$ of the inner surface of angle of thyroid cartilage & cricothyroid ligament.
- **Insertion:** Anterolateral surface of arytenoid cartilage.

Muscles which relax the vocal cords



Vocalis muscle



Vocalis muscle

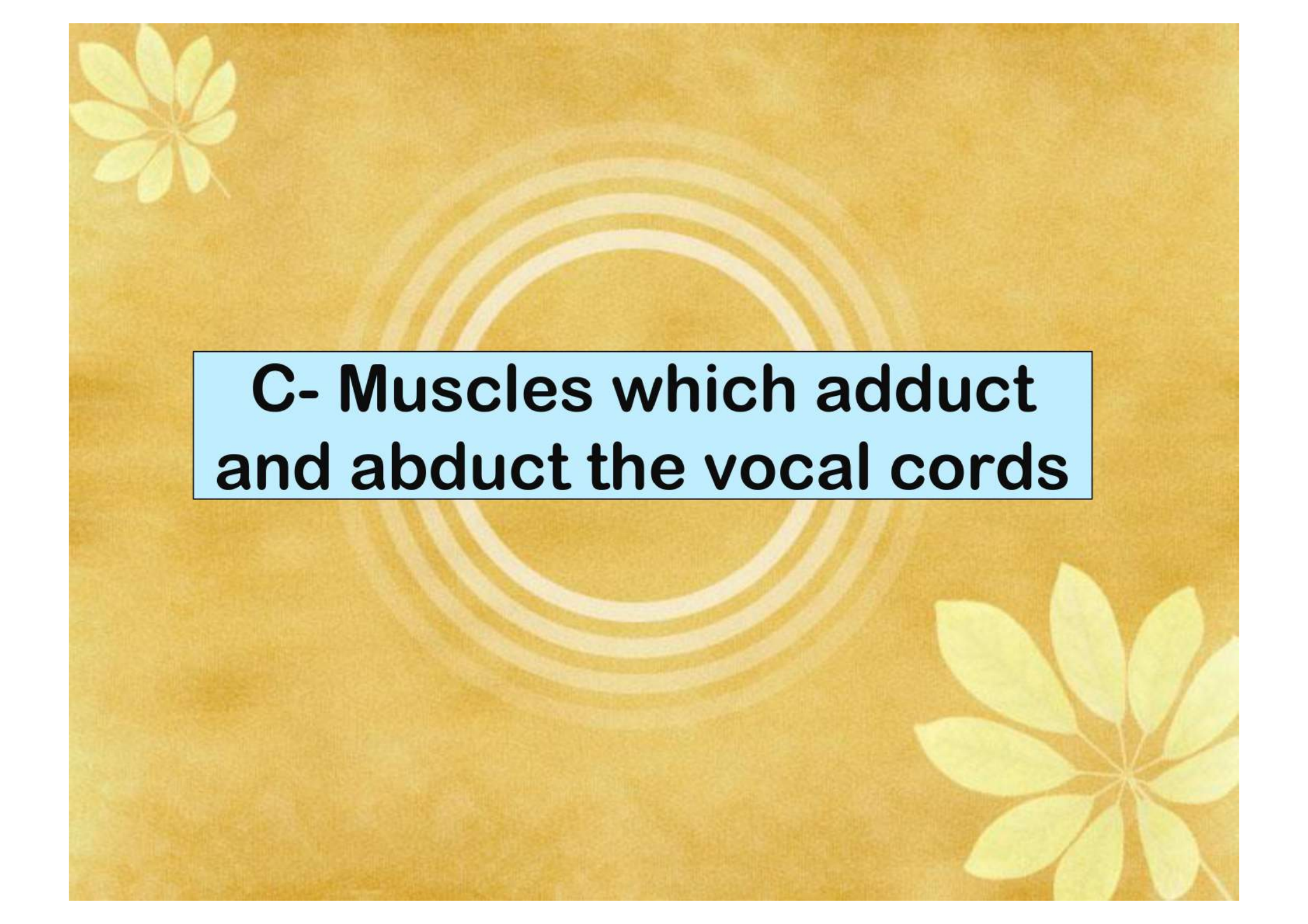
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Source: Source: Gray's Basic Anatomy - Richard L. Drake,
Wayne Vogl, Adam W.M. Mitchell

Source: Gray s Anatomy - 40th edition

2- Vocalis muscle (posterior part)

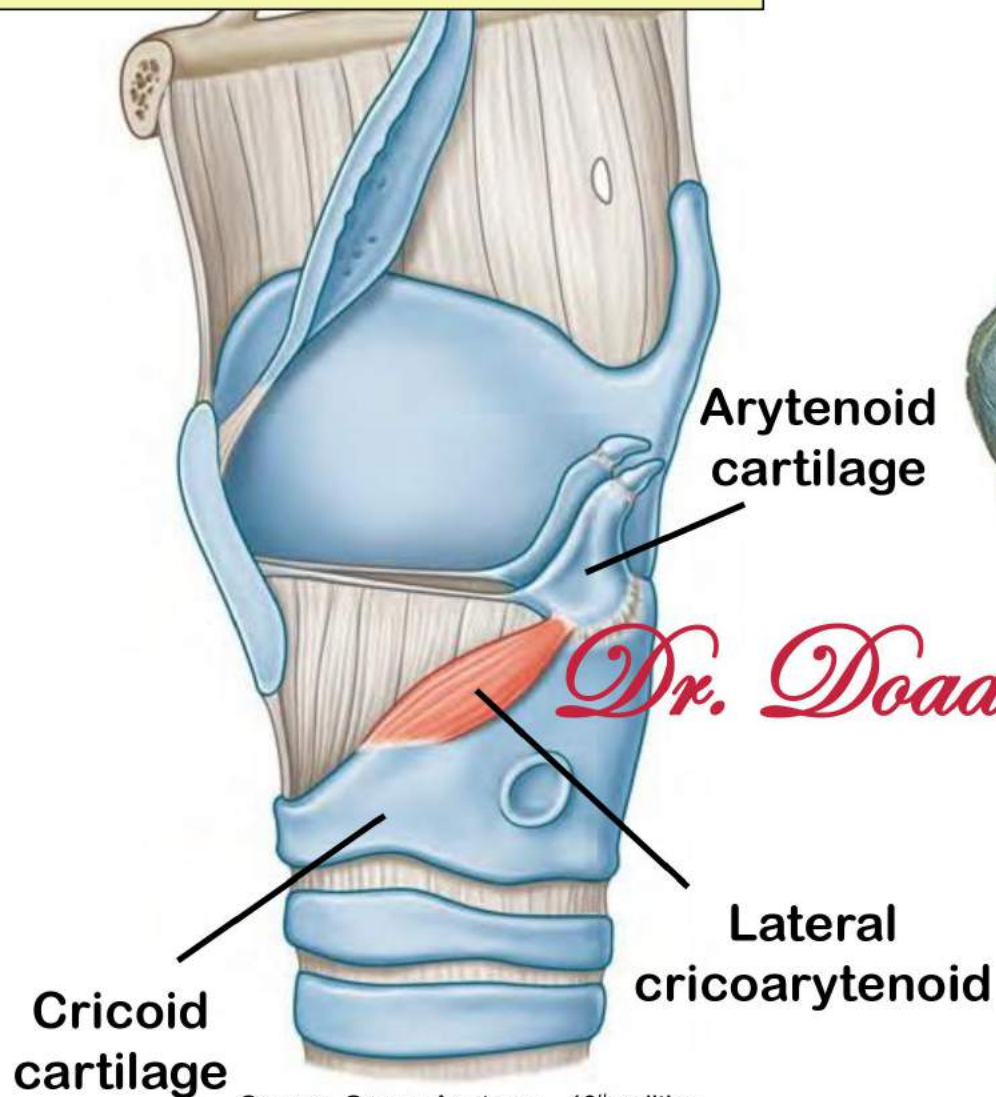
- Lies lateral to vocal cord.
- It relaxes the anterior part of the cord.



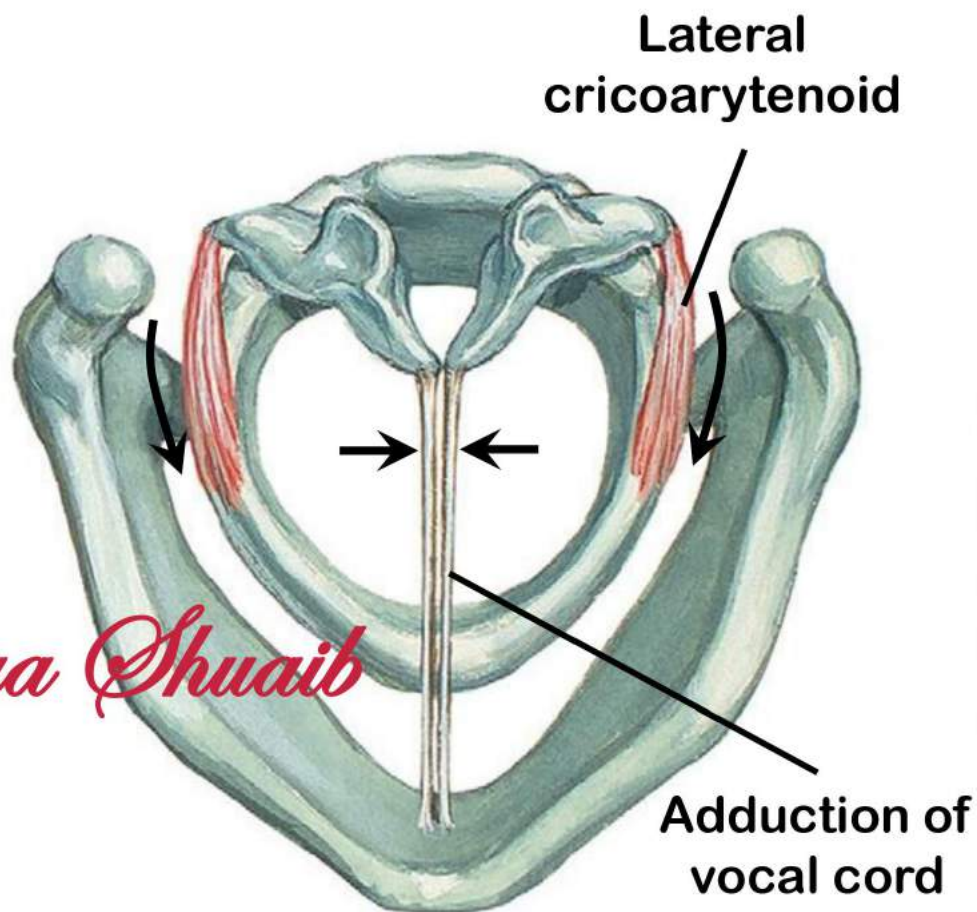
**C- Muscles which adduct
and abduct the vocal cords**

**Muscles which adduct the
vocal cords**

Muscles which adduct the vocal cords



Source: Gray's Anatomy - 40th edition

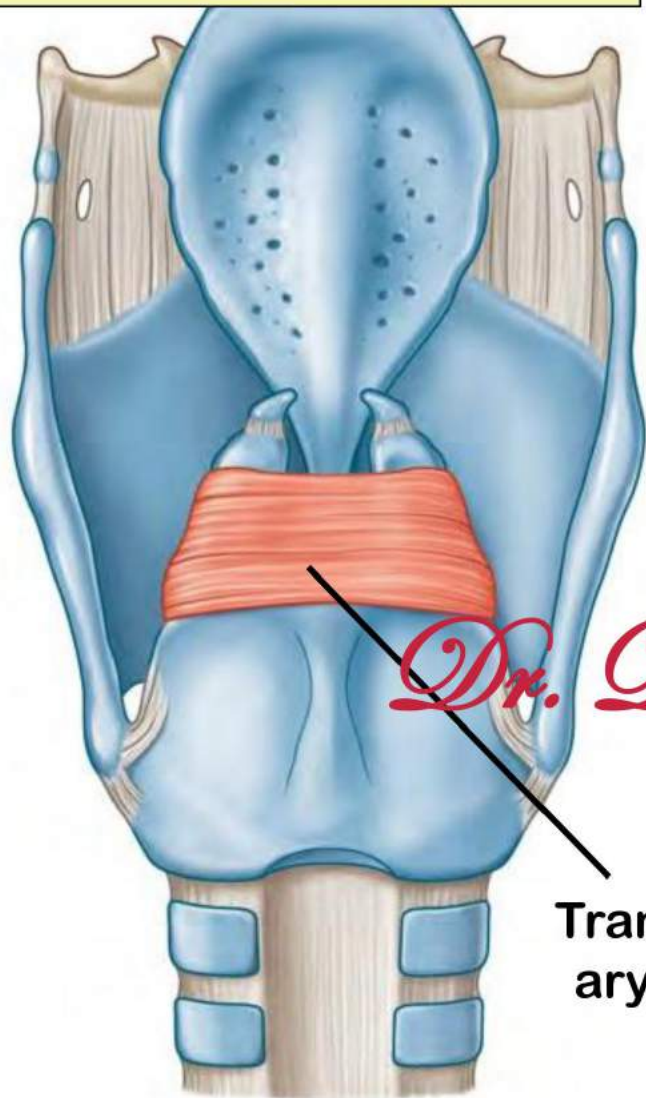


Source: Atlas of Human Anatomy, Sixth Edition-
Frank H. Netter, M.D

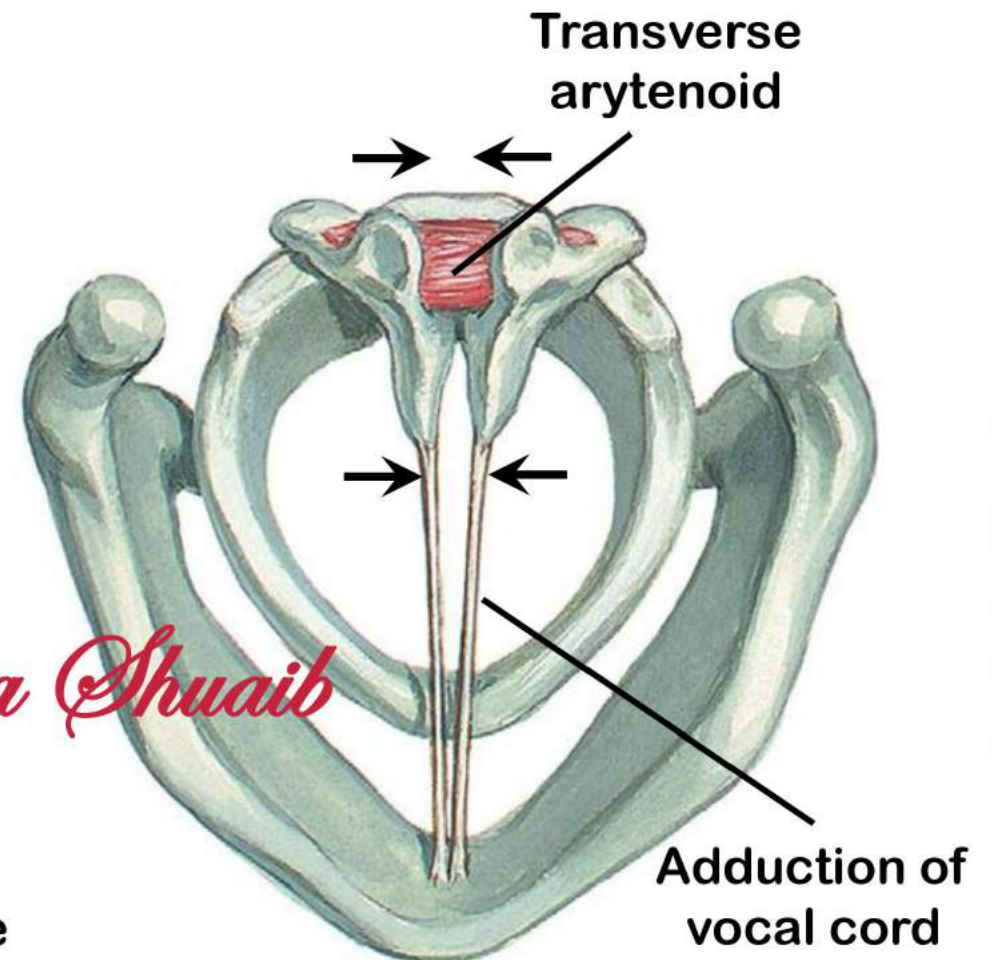
1- Lateral cricoarytenoid

- **Origin:** Superior surface of the arch of cricoid cartilage.
- **Insertion:** Anterior surface of the muscular process of arytenoid cartilage.

Muscles which adduct the vocal cords



Source: Gray's Anatomy - 40th edition



Source: Atlas of Human Anatomy, Sixth Edition-
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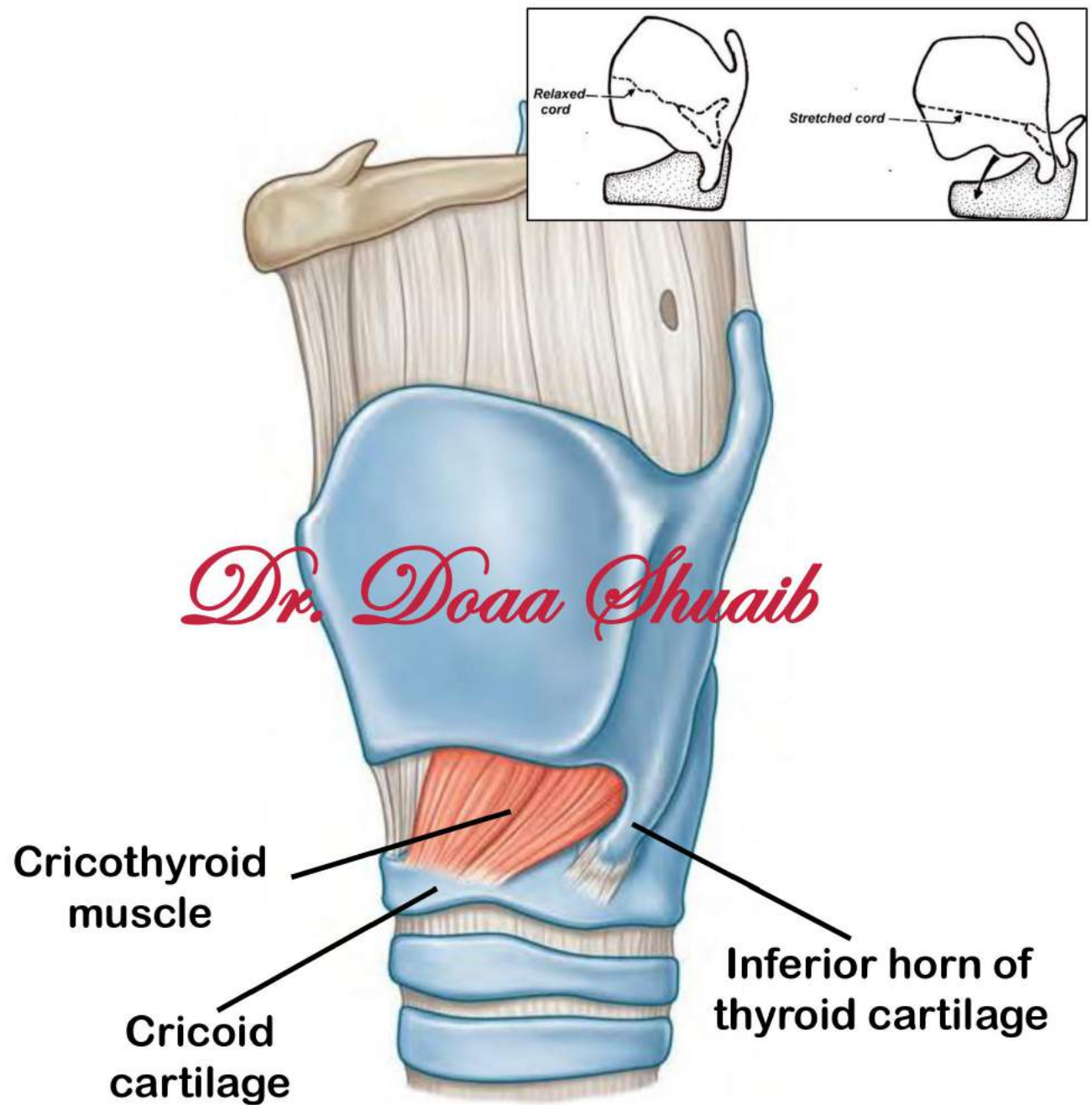
2- Transverse arytenoid

- See before

Muscles which adduct the vocal cords

1- Cricothyroid muscle

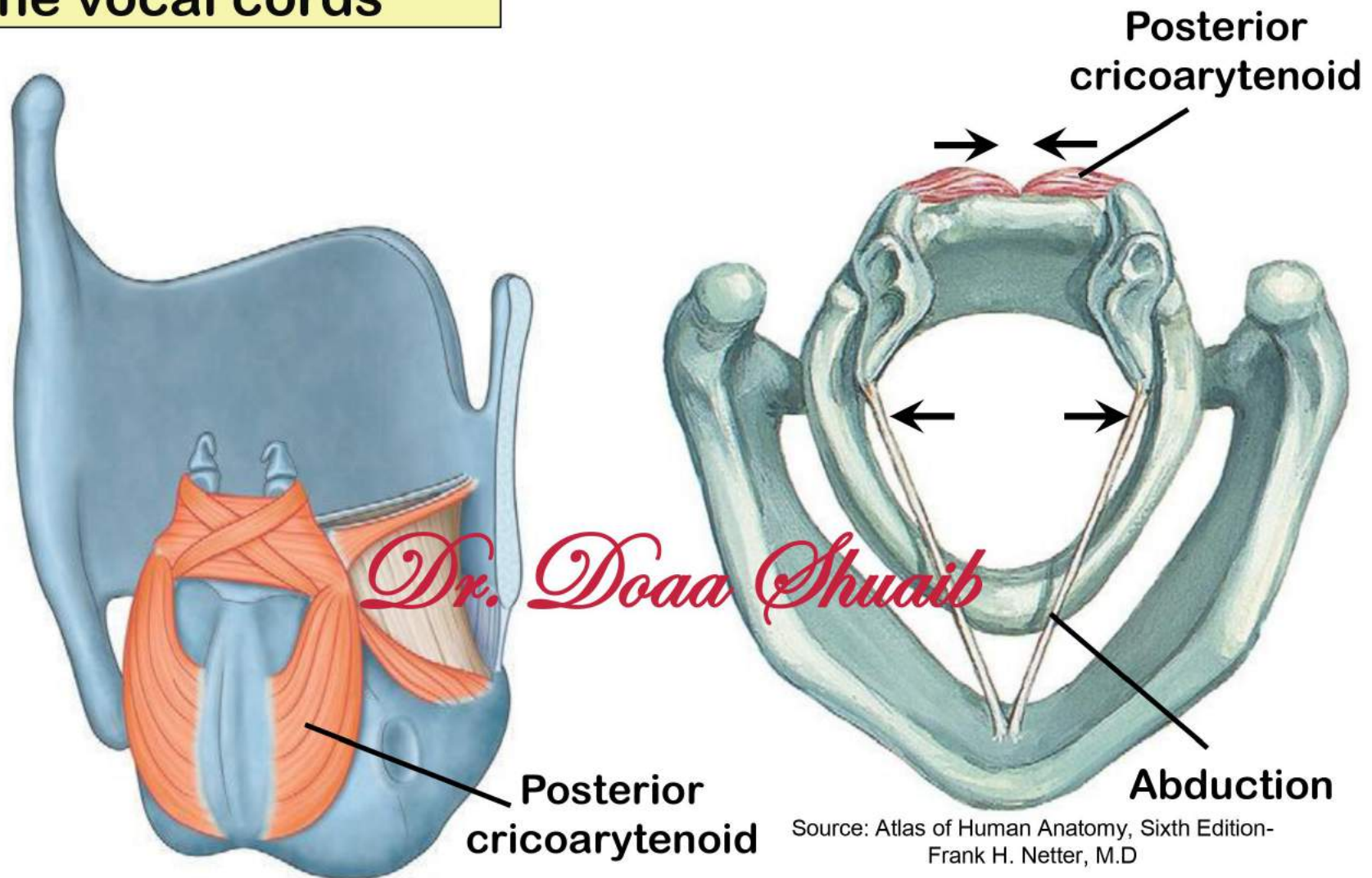
- See before



Source: Gray s Anatomy - 40th edition

**Muscles which abduct the
vocal cords**

Muscles which abduct the vocal cords



Source: Source: Gray's Basic Anatomy - Richard L. Drake, Wayne Vogl, Adam W.M. Mitchell

Posterior cricoarytenoid

- **Origin:** Posterior surface of the cricoid lamina.
- **Insertion:** Posterior surface of the muscular process of arytenoid cartilage.

The background is a solid mustard yellow color. In the center, there are several concentric circles in a lighter, cream-colored shade. In the top-left and bottom-right corners, there are stylized floral motifs with multiple pointed petals in a pale yellow-green color.

Nerve supply of the larynx

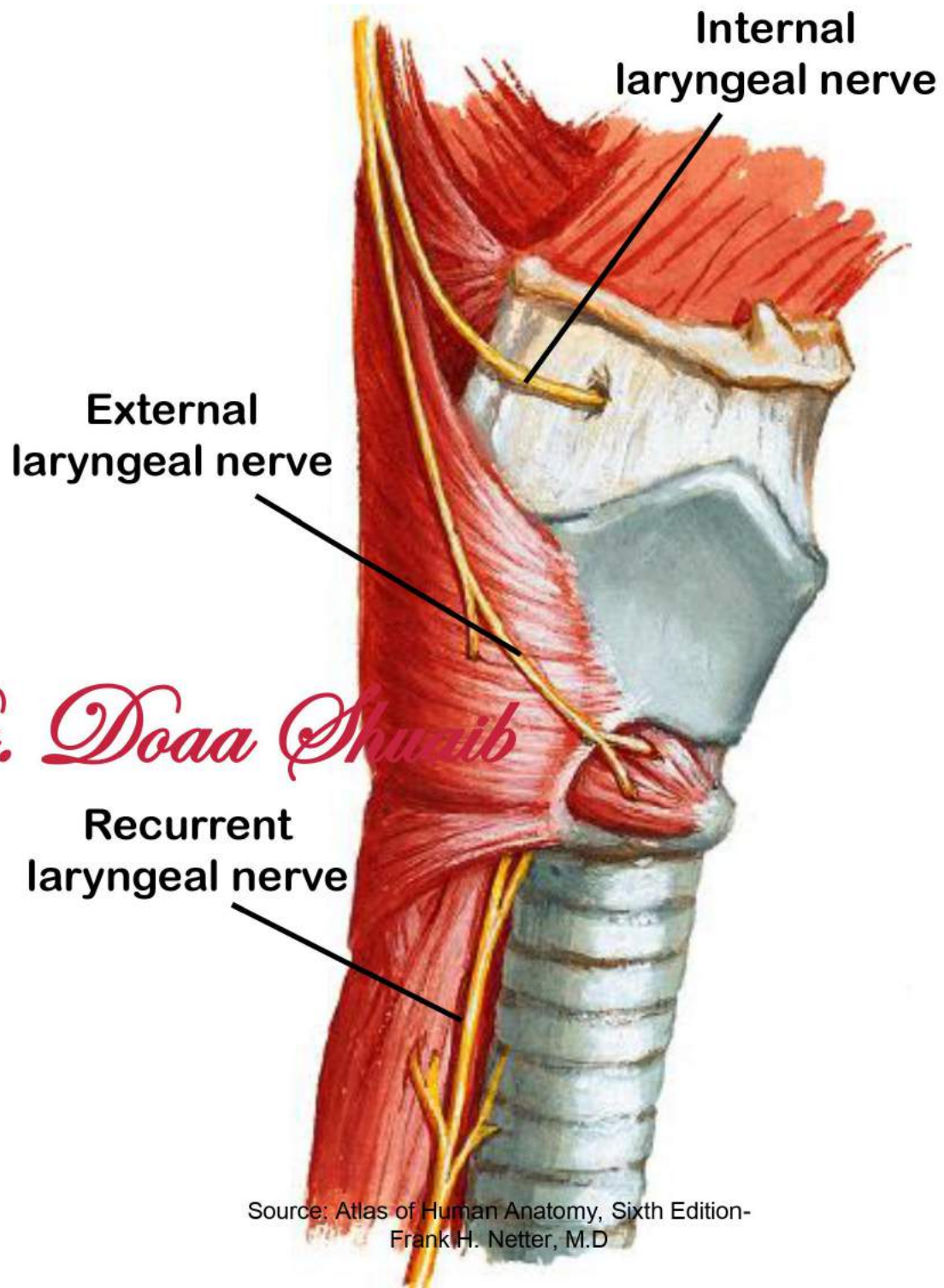
Nerve supply

Recurrent laryngeal nerve

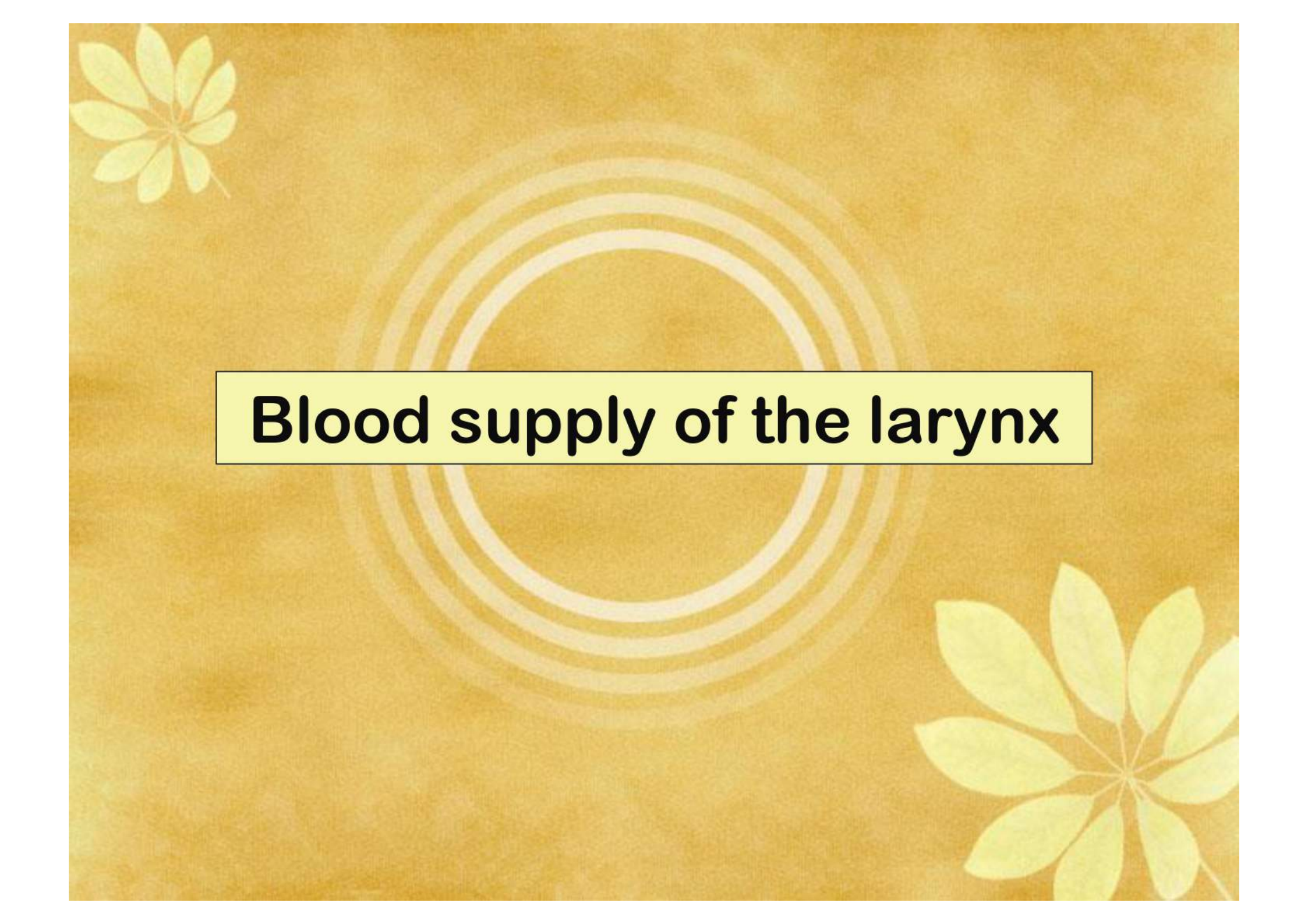
- **Motor:**
All muscles of larynx except cricothyroid
- **Sensory:**
Mucosa of larynx below vocal cords.

Superior laryngeal nerve

- **External laryngeal N:**
Cricothyroid muscle
- **Internal laryngeal N:**
Mucosa of larynx above vocal cords & epiglottis.



Source: Atlas of Human Anatomy, Sixth Edition-
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The background is a solid mustard yellow color. In the center, there are several concentric circles in a lighter, cream-colored shade. In the top-left and bottom-right corners, there are stylized floral motifs with multiple pointed petals in a light greenish-yellow color.

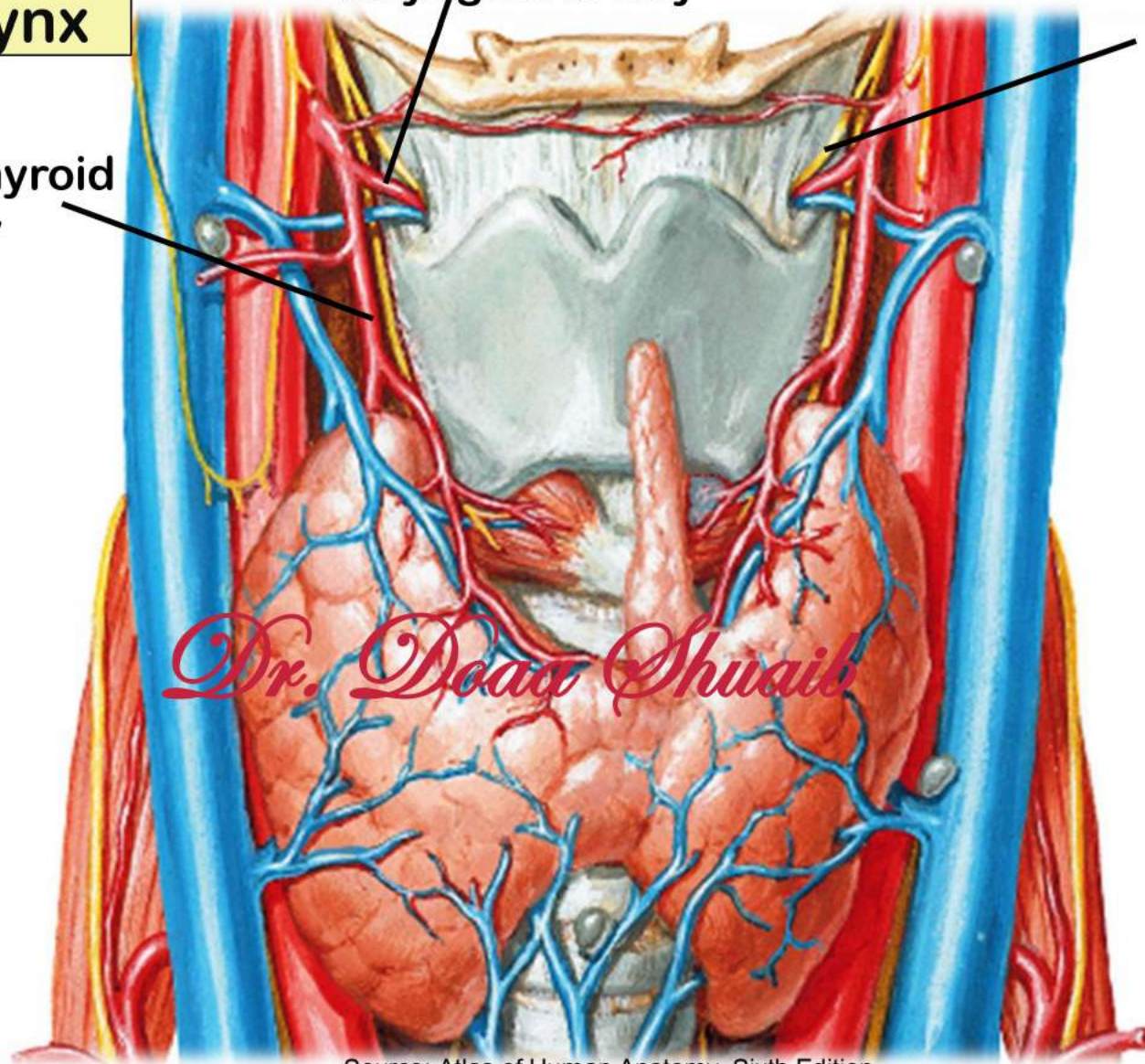
Blood supply of the larynx

Blood supply of the larynx

Superior thyroid artery

Superior laryngeal artery

Internal laryngeal nerve



Source: Atlas of Human Anatomy, Sixth Edition-
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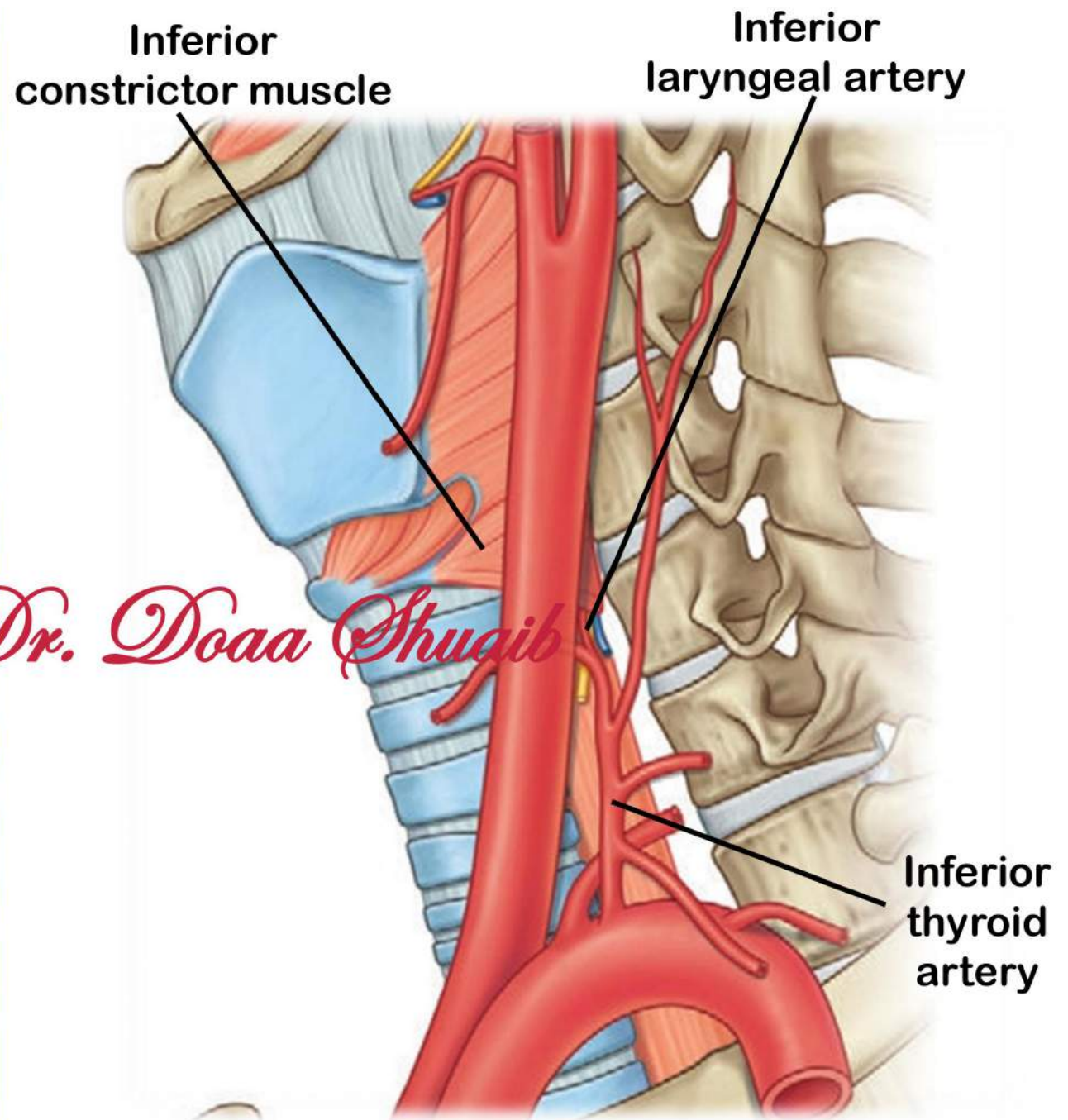
1- Superior laryngeal artery

- Arises from superior thyroid artery
- It pierces thyrohyoid membrane with internal laryngeal nerve to supply the upper part of larynx..

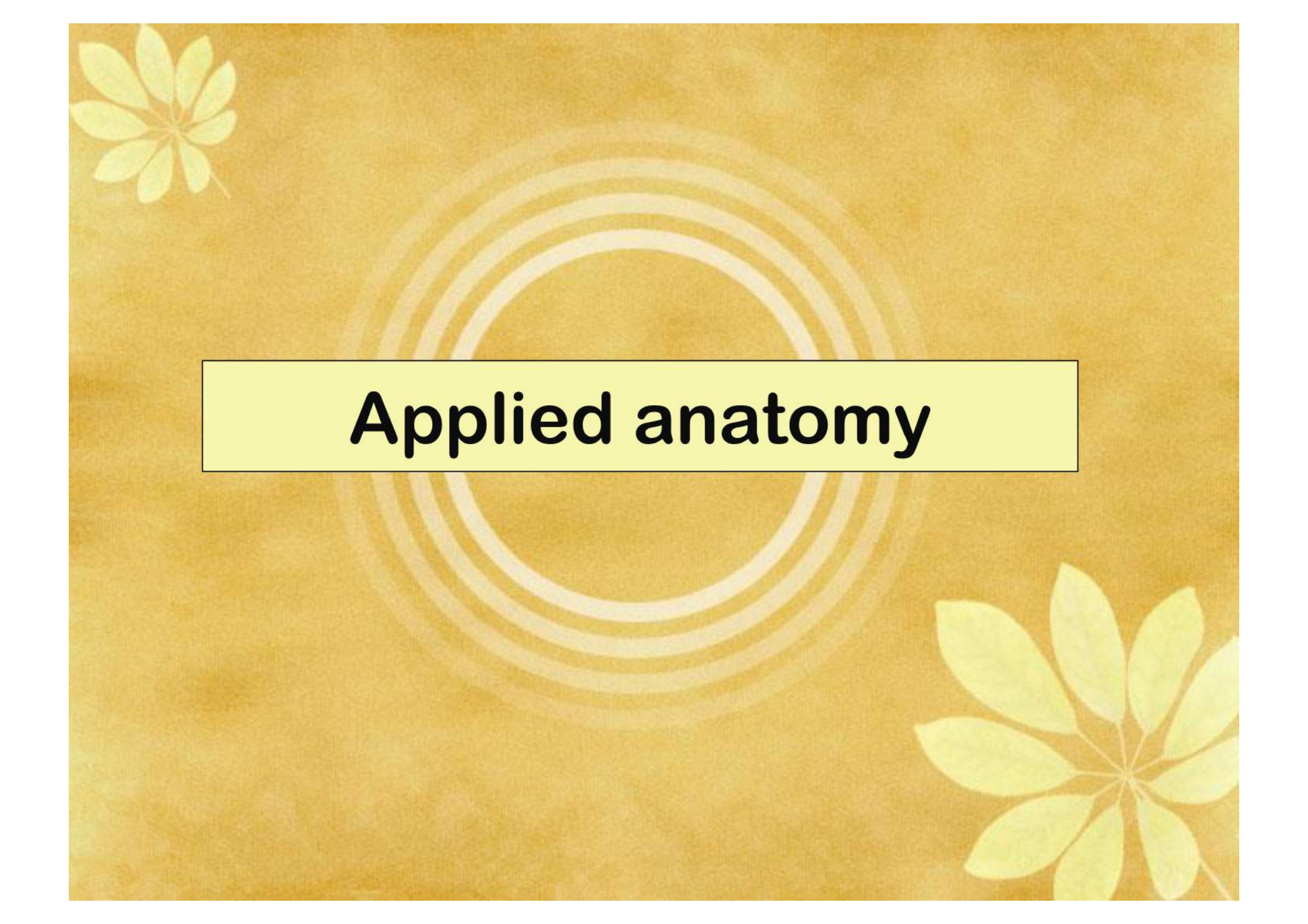
Blood supply of the larynx

2- Inferior laryngeal artery

- Arises from inferior thyroid artery
- It ascends with recurrent laryngeal nerve below the lower border of inferior constrictor muscle of pharynx to reach and supply the lower part of larynx.



Source: Source: Gray's Basic Anatomy - Richard L. Drake, Wayne Vogl, Adam W.M. Mitchell

The background is a textured, golden-yellow color. In the center, there are several concentric, light-colored circles that create a subtle ripple effect. In the top-left and bottom-right corners, there are stylized, light-green floral motifs with multiple pointed petals.

Applied anatomy

Injury to both external laryngeal nerves

Paralysis of both
cricothyroid muscles

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Loss of tightening
effect of the muscle
on the cords

Weakness
(hoarseness of voice)

Injury of recurrent laryngeal nerves

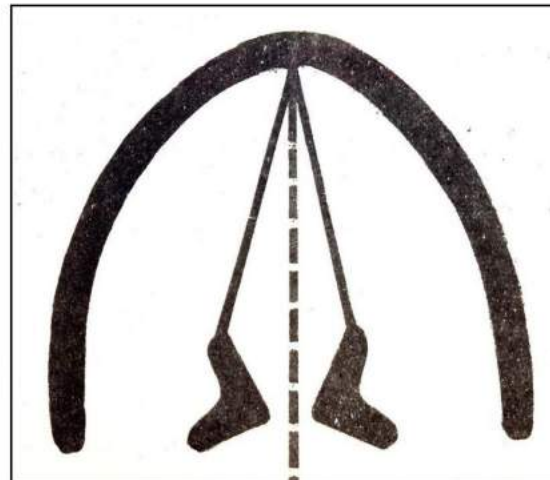
On one side

It leads to hoarse
breathy voice

On both sides

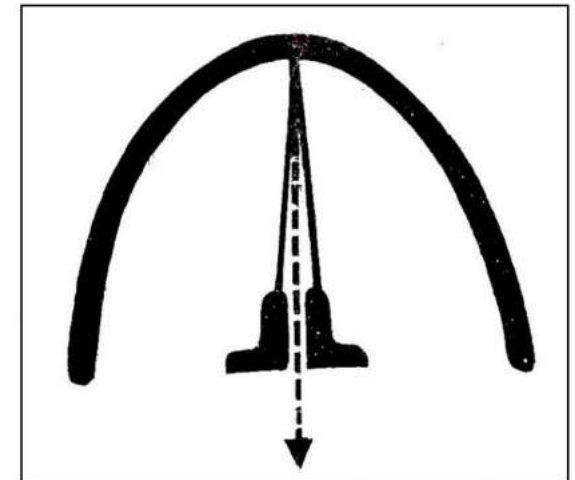
Complete injury

Complete loss of voice
Difficult breathing

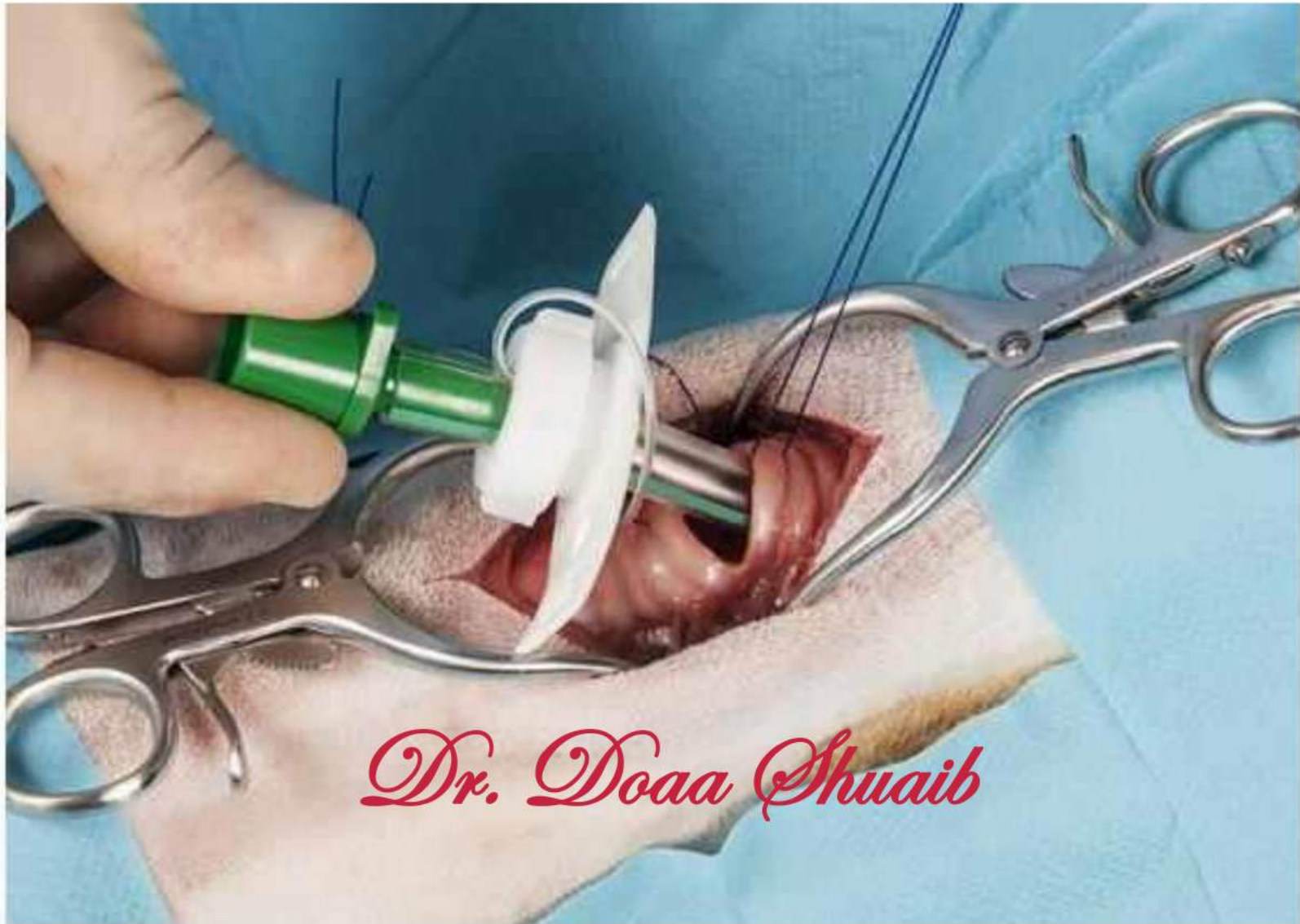


Incomplete injury

Stridor & suffocation
Urgent tracheostomy is
needed

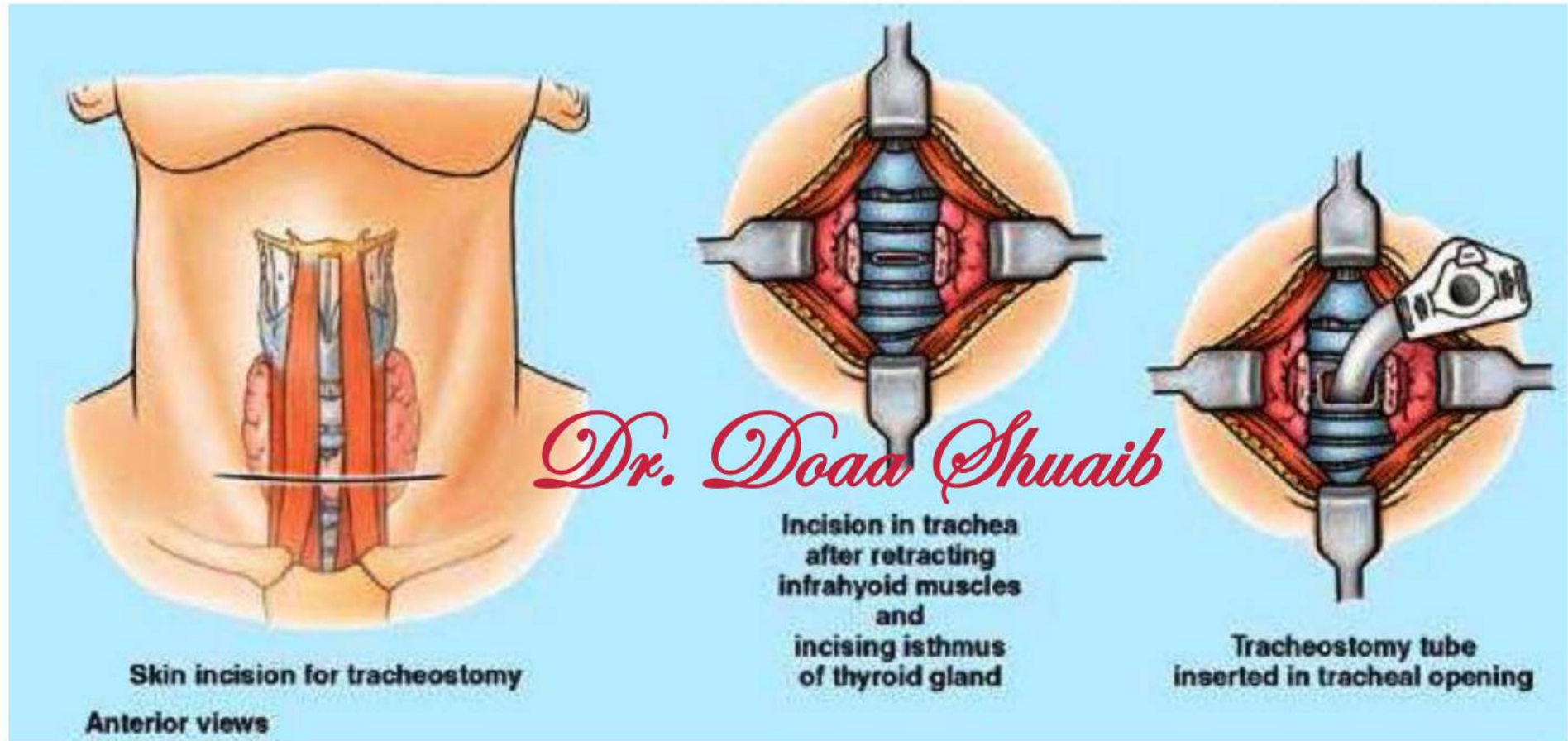


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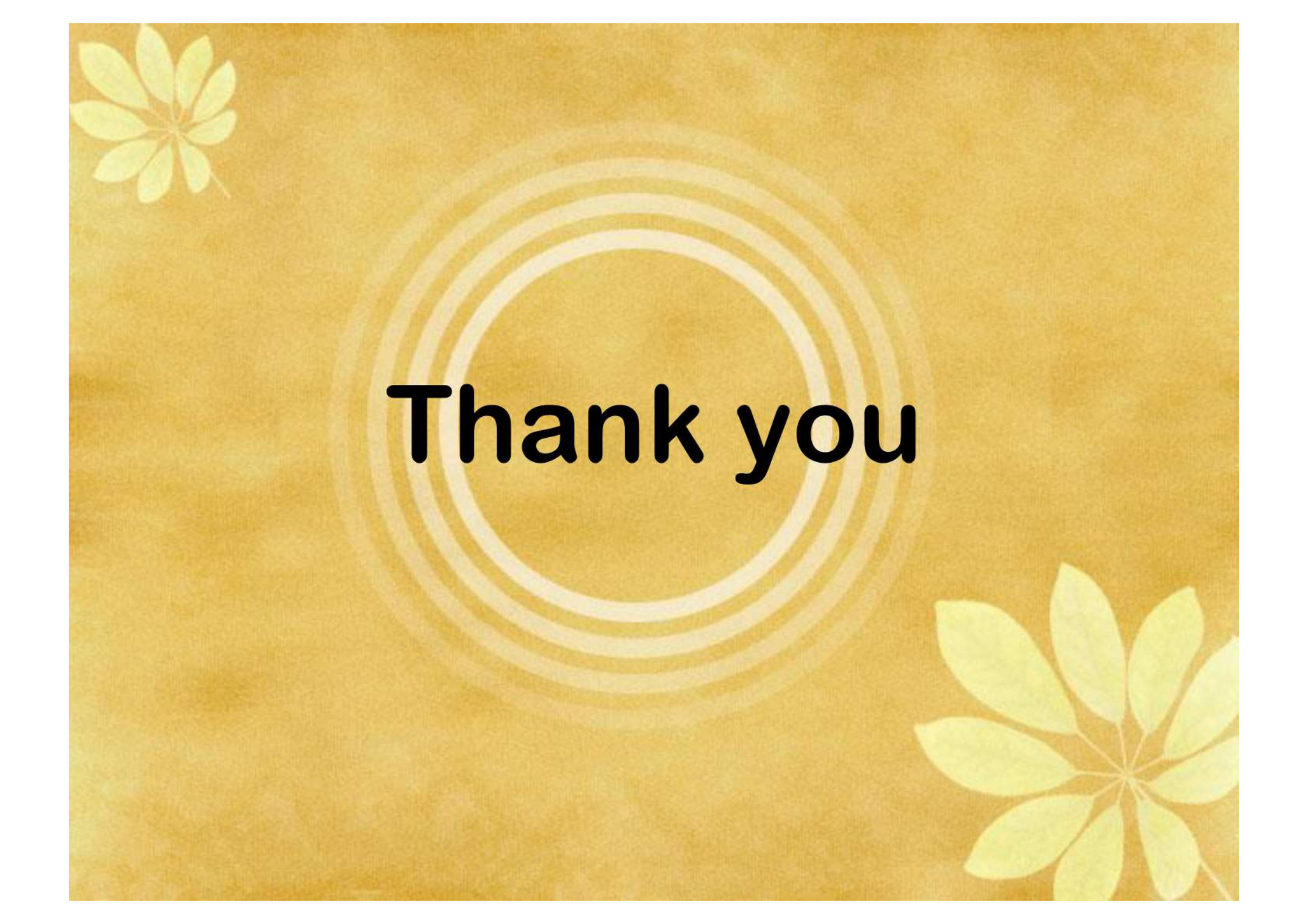


Tracheostomy

- Is a procedure in which a hole is made in the trachea and a tube is inserted to enable ventilation.
- In the emergency situation a tracheostomy is typically performed when there is obstruction to the larynx, either due to inhalation of a foreign body, severe edema secondary to anaphylactic reaction, or severe head and neck trauma.



- A small transverse incision is placed in the lower third of the neck anteriorly.
- The strap muscles are deviated laterally and the trachea can be easily visualized.
- Occasionally it is necessary to divide the isthmus of thyroid gland.
- An incision is made in the second and third tracheal rings and a small tracheostomy tube is inserted.
- After the tracheostomy has been in situ for the required length of time it is simply removed.
- The hole through which it was inserted almost inevitably closes without any intervention.



Thank you