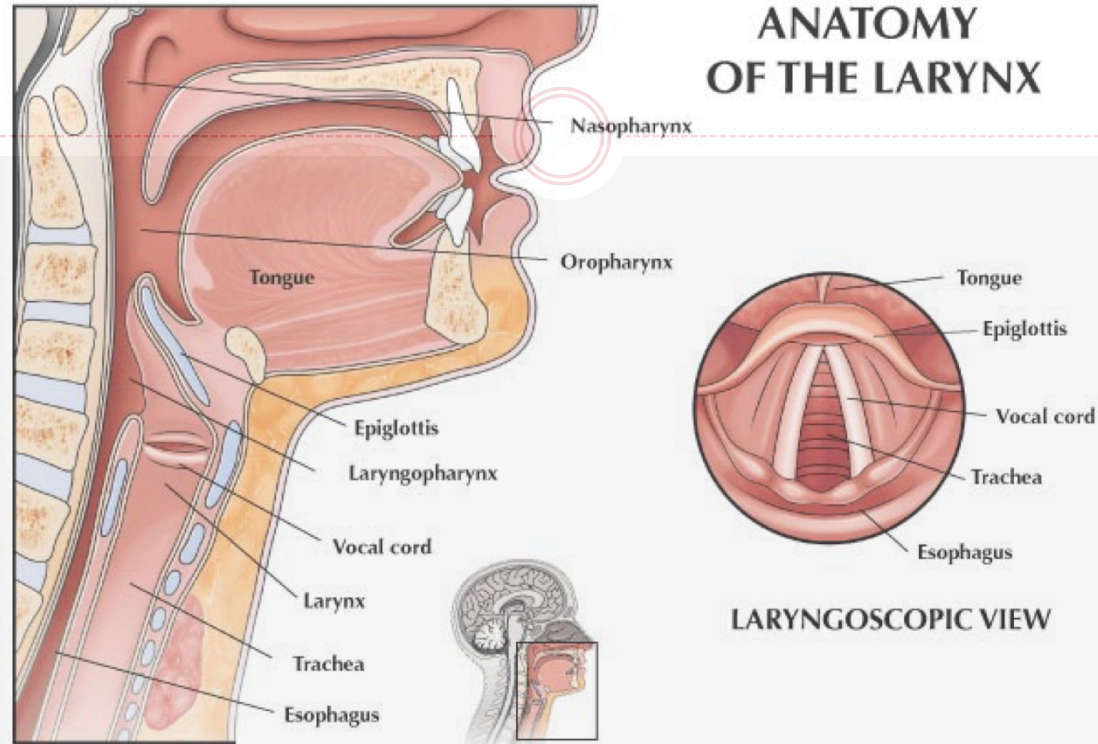


# LARYNX ANATOMY



## ANATOMY OF THE LARYNX

## LARYNGOSCOPIC VIEW

MID-SAGITTAL VIEW

FOR SAMPLE USE ONLY

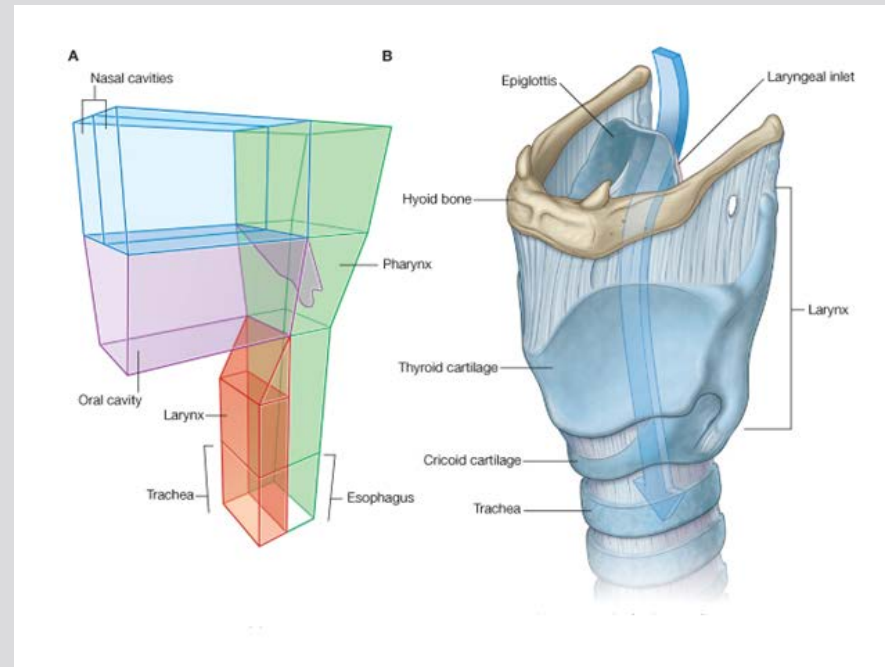
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Elena Rizzo Riera  
R1 ORL HUSE

# INTRODUCTION

- ❖ Odd and median organ
- ❖ Infrahyoid region
- ❖ Phonation, swallowing and breathing
  
- ❖ Triangular pyramid
- ❖ Postero- superior base → pharynx and hyoid bone
- ❖ Bottom point → upper orifice of the trachea



# INTRODUCTION



- C4-C6
- Tongue – trachea
- In women it is somewhat higher than in men.

	<b>Male</b>	<b>Female</b>
Length	44mm	36mm
Transverse diameter	43mm	41mm
Anteroposterior diameter	36mm	26mm

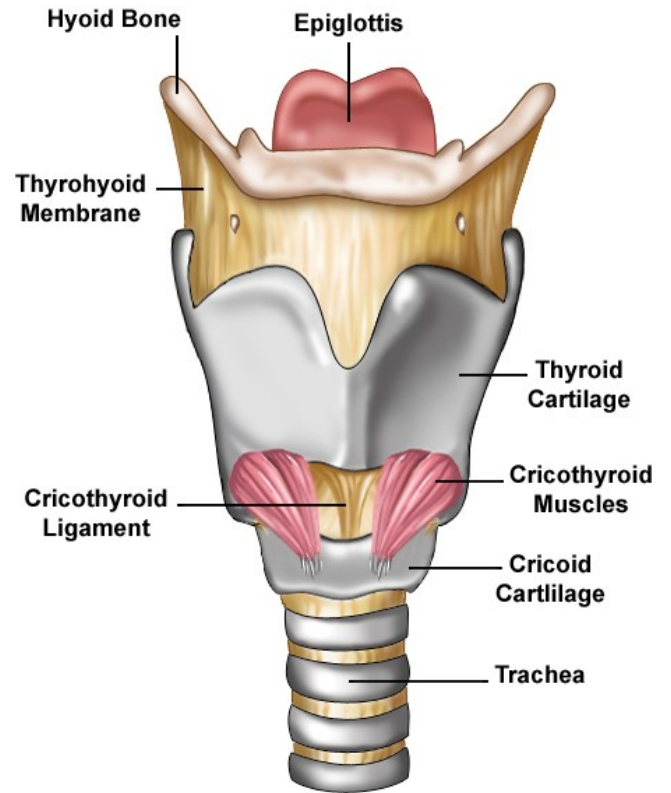
# SKELETAL STRUCTURE

- Framework: 11 cartilages linked by joints and fibroelastic structures

- 3 odd-and median cartilages: the thyroid, cricoid and epiglottis cartilages.

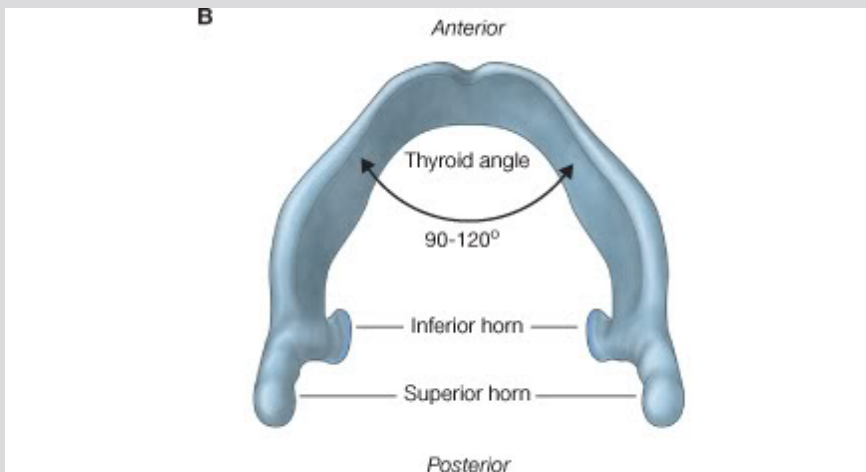
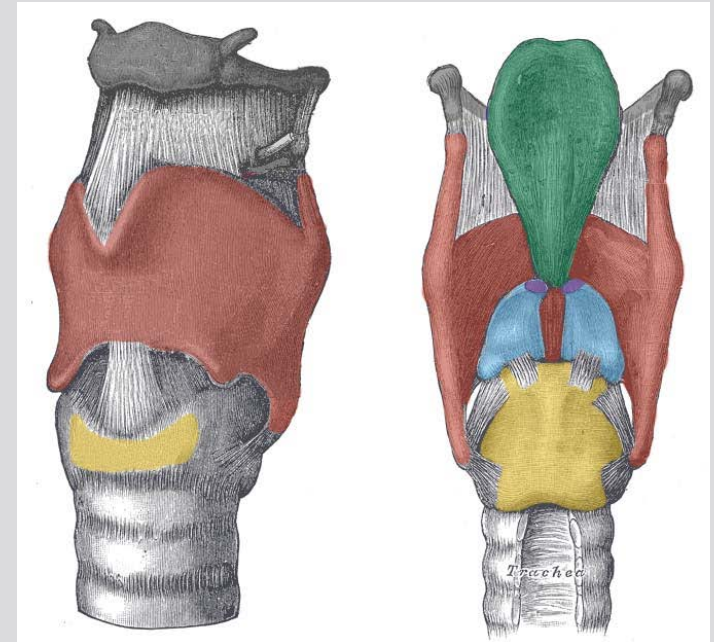
- 4 pair cartilages: corniculate cartilages of Santorini, the cuneiform cartilages of Wrisberg, the posterior sesamoid cartilages and arytenoid cartilages.

- Intrinsic and extrinsic muscles



# THYROID CARTILAGE

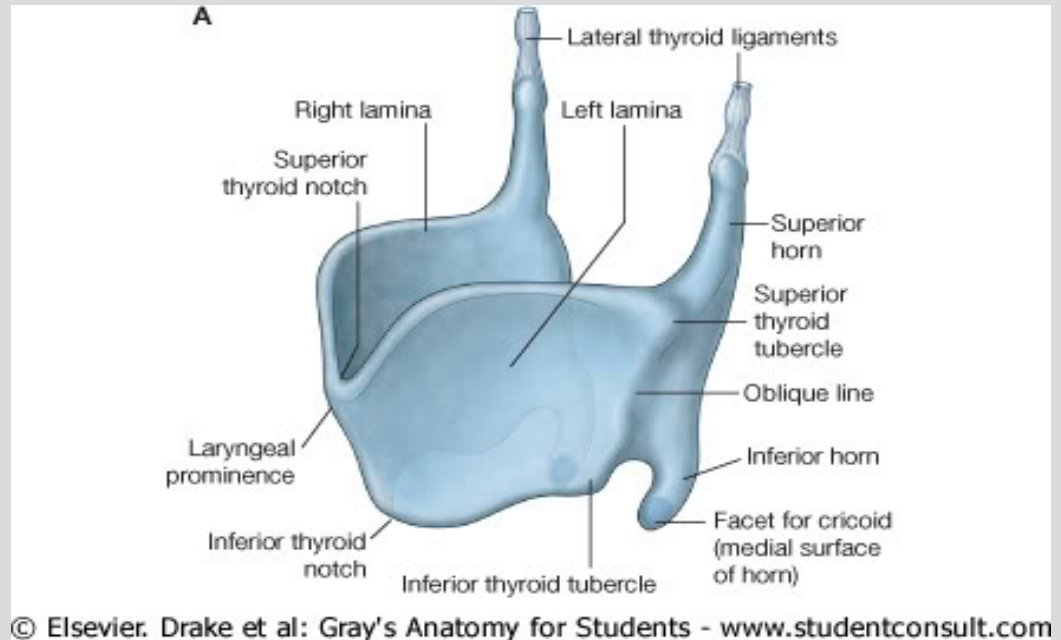
- Shield shaped cartilage
- Right and left vertical *lamina* → laryngeal prominence (Adam's apple)
- M:  $90^{\circ}$     F:  $120^{\circ}$
- Children: intrathyroid cartilage



# THYROID CARTILAGE



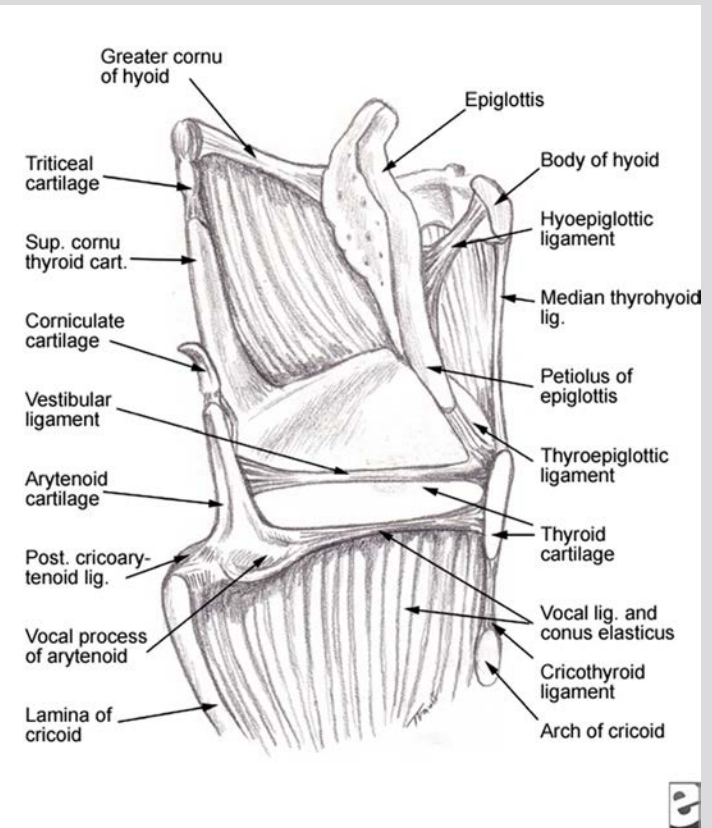
- Outer surface → oblique line
- Inner surface
- Superior border → superior thyroid notch
- Inferior border → inferior thyroid notch
- Superior horns → lateral thyrohyoid ligaments
- Inferior horns → cricothyroid articulation



# THYROID CARTILAGE



- The oblique line gives attachment to the following muscles:
  - Thyrohyoid muscle
  - Sternothyroid muscle
  - Inferior constrictor muscle
- Ligaments attached to the thyroid cartilage:
  - Thyroepiglottic lig
  - Vestibular lig
  - Vocal lig

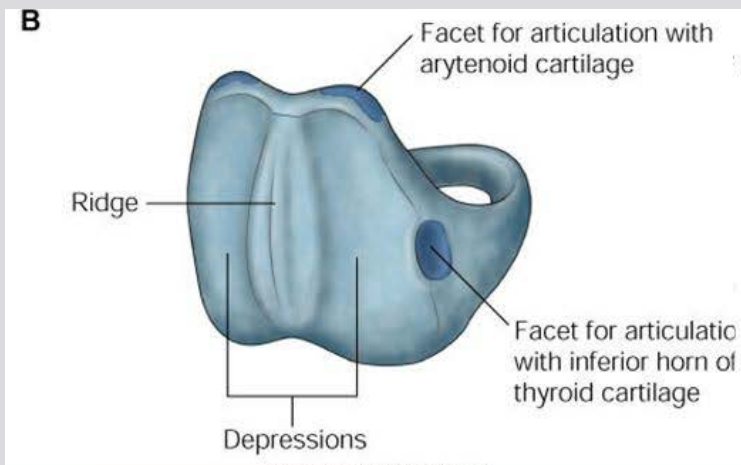
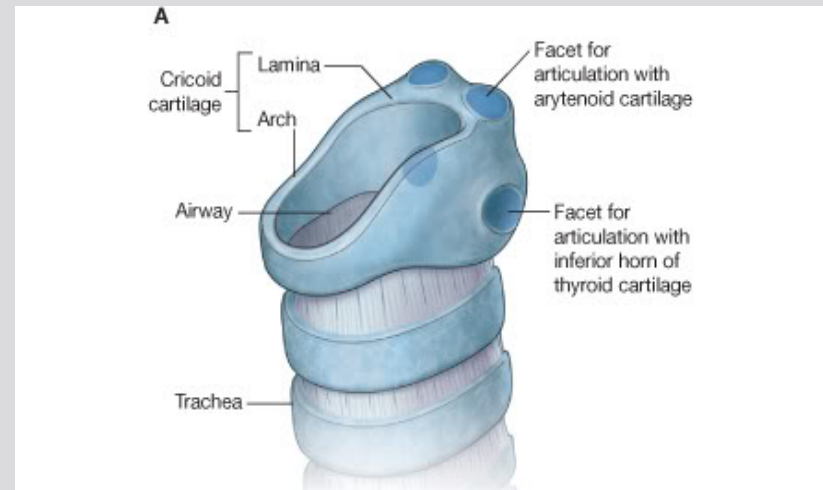




# CRICOID CARTILAGE



- Complete signet ring
- Anterior arch and posterior lamina
- Ridge and depressions

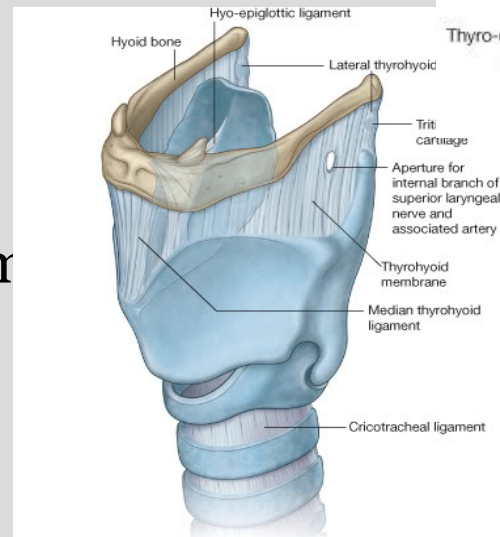
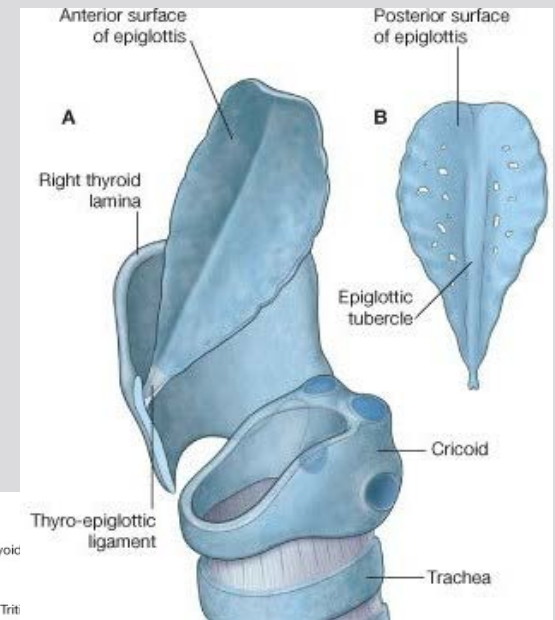


- Cricothyroid articulation
- Cricothyroid membrane
- Cricotracheal ligament
- Cricoarytenoid articulation
- Ridge → longitudinal muscle of the esophagus.

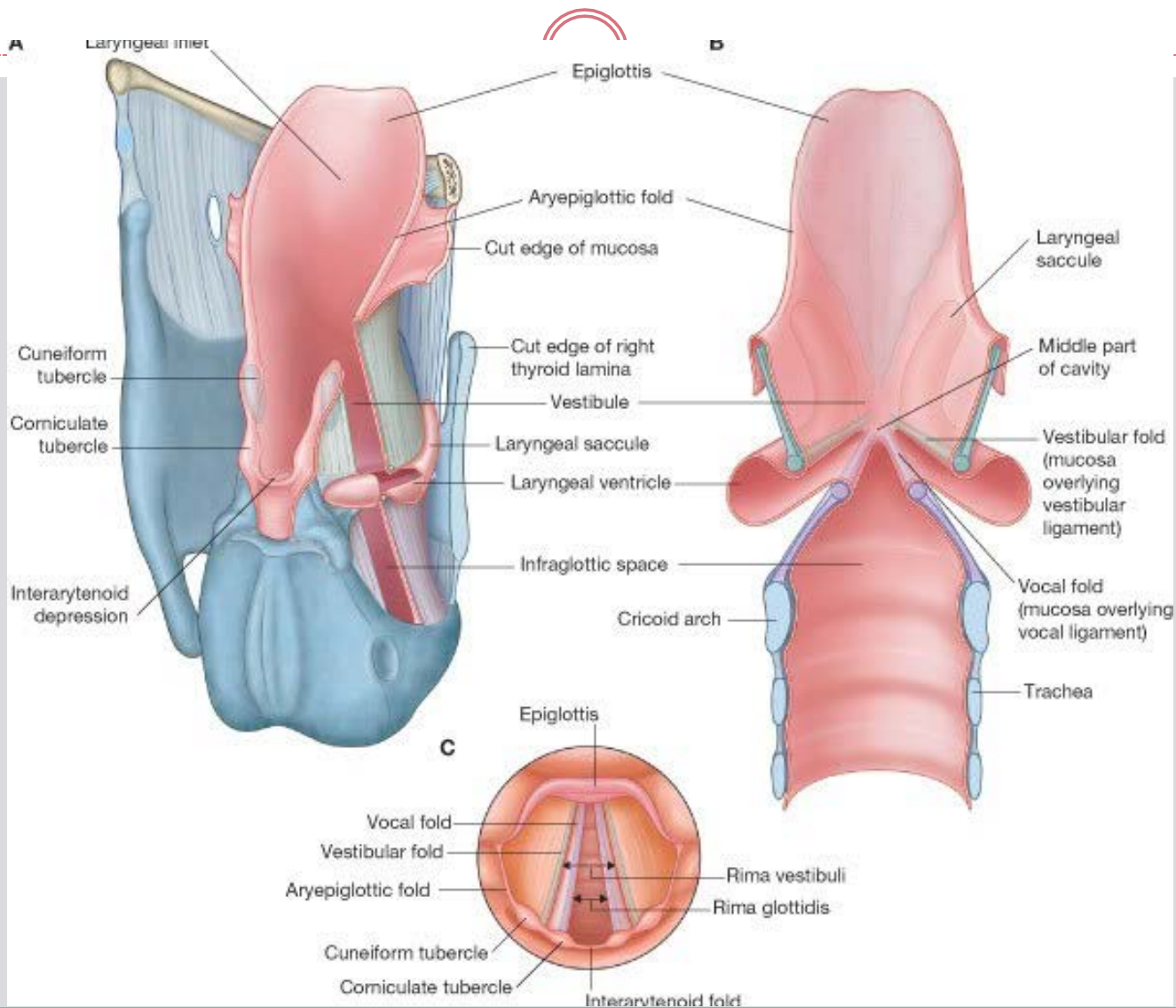


# EPIGLOTTIC CARTILAGE

- Racket shaped cartilage
- Anterior wall of the laryngeal aditus
- Covered by mucous membrane.
- Hyoepligottic ligament
- Thyroepiglottic ligament
- Aryepiglottic folds
- Laryngeal surface
- Lingual surface
- Preepligottic space → carcinoma
- New borns: omega shaped

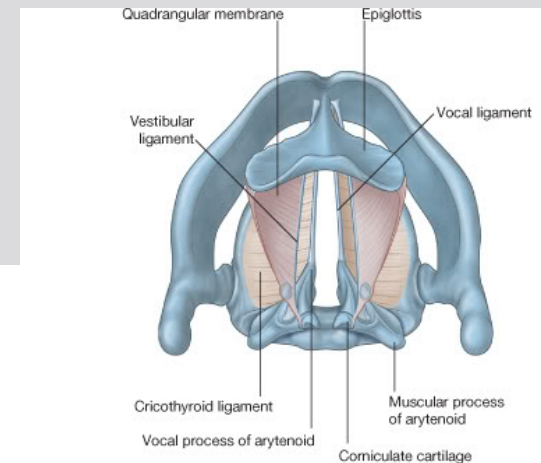
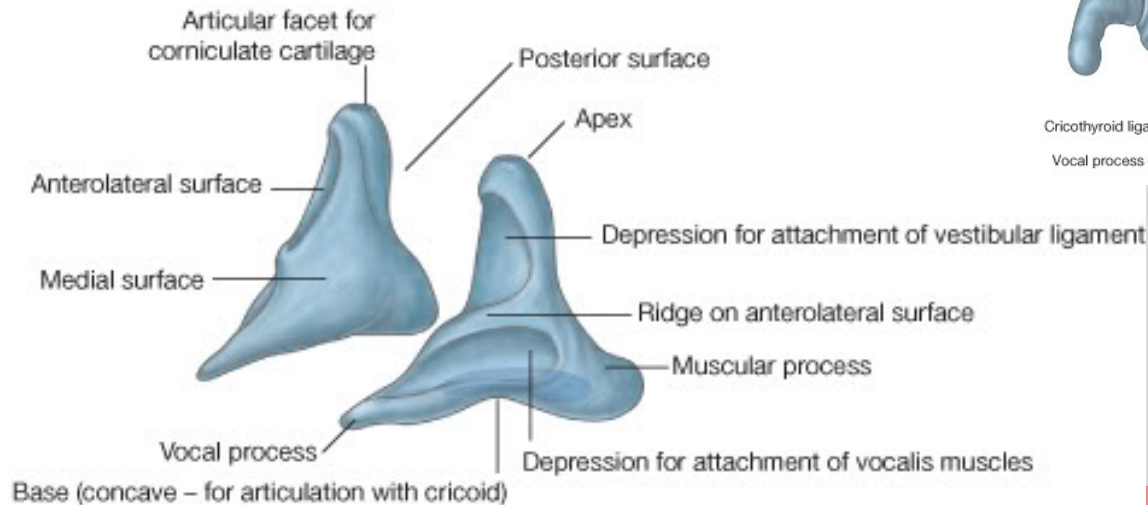


# EPIGLOTTIC CARTILAGE



# ARYTENOID CARTILAGES

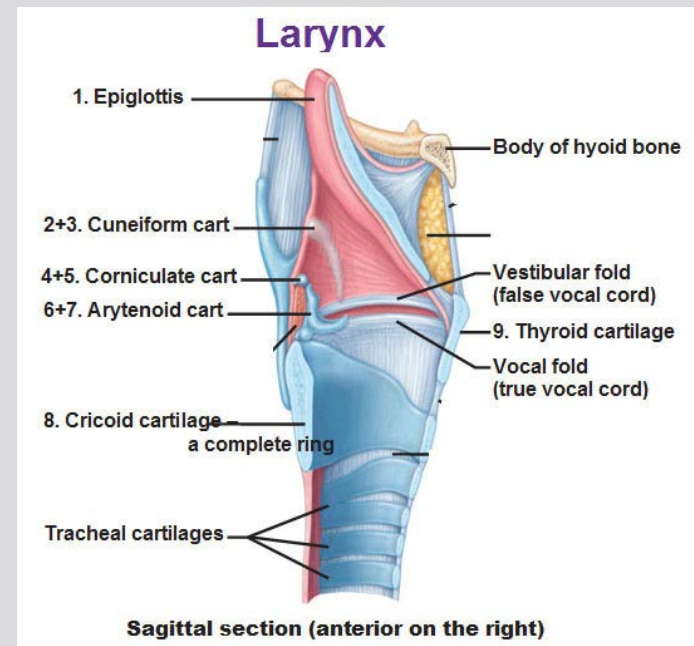
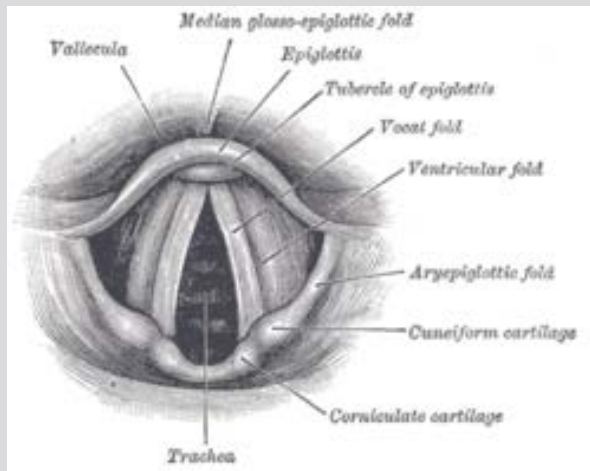
- On the upper surface of the cricoid cartilage
- Vocal process → vocal folds
- Vestibular ligaments
- Muscular process → posterior and lateral cricoarytenoid muscles
- Posterior surface → transverse arytenoid muscle
- Apex → corniculate cartilages (Santorini)
- Base → cricoarytenoid joint



# OTHER CARTILAGES



- Corniculate cartilages (of Santorini) articulating with the apices of arytenoid cartilages.
- Cuneiform cartilages (of Wrisberg) in each margin of the aryepiglottic fold.



# ELASTIC TISSUE

## INTRINSIC LIGAMENTS

(connect the laryngeal cartilages)

**Quadrangular membrane** (upper part)

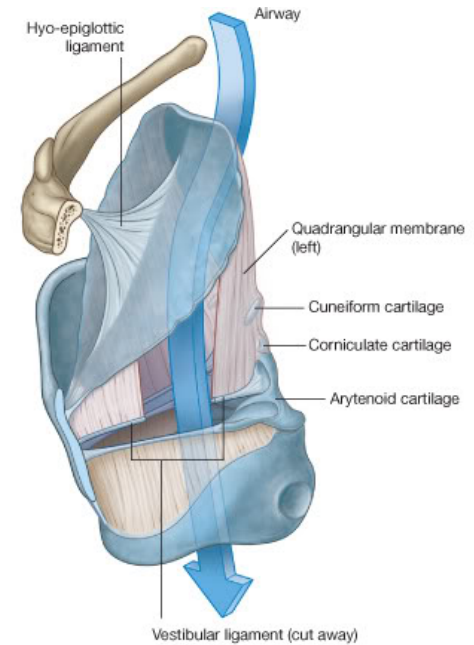
From the sides of the epiglottic cartilage to the corniculate and arytenoid cartilages.

- ✓ Aryepiglottic folds
- ✓ Vestibular ligaments and vestibular folds

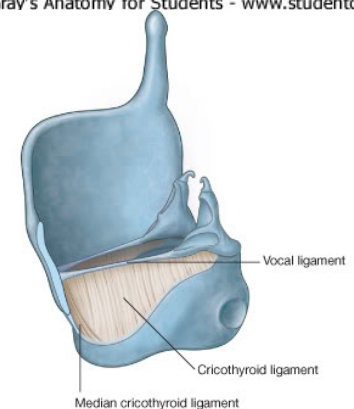
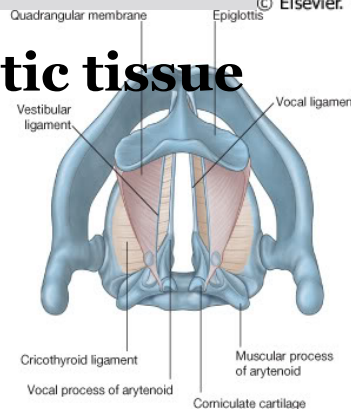
**Ventricular segment of fibroelastic tissue**

**Conus elasticus** (lower part)

- ✓ Cricothyroid ligament (anteriorly)
- ✓ Vocal ligaments



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# ELASTIC TISSUE

## EXTRINSIC LIGAMENTS

(connect the laryngeal cartilages to the hyoid bone above and trachea below)

- **Thyrohyoid membrane**

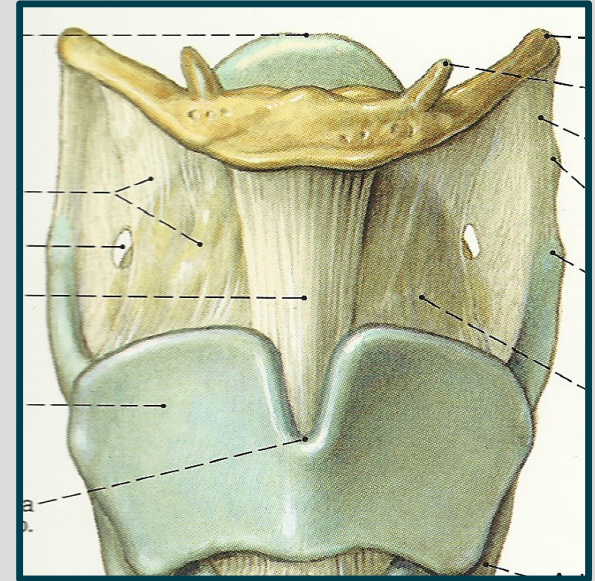
- Median thyrohyoid ligament
- Lateral thyrohyoid ligaments
- Pierced by the superior laryngeal artery and nerve (i.b.)
- Mobility of the hyoid bone and larynx during swallowing and fonation.

- **Cricotracheal membrane**

- Cricoid cartilage and the first tracheal ring

- **Cricothyroid membrane**

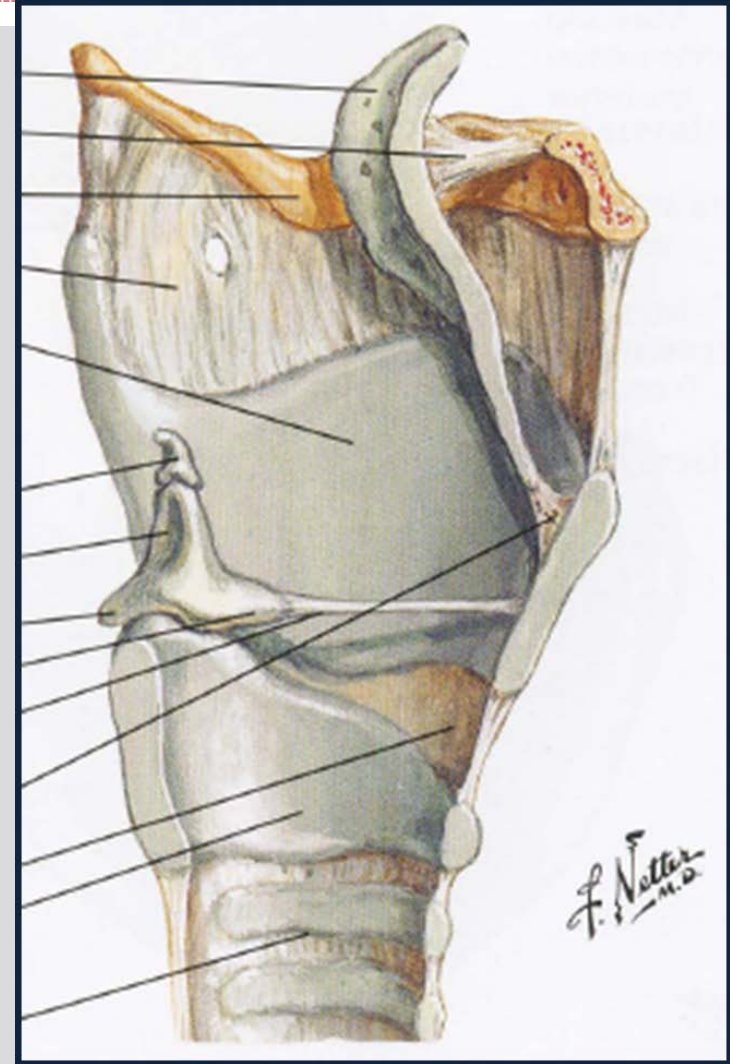
- Middle cricothyroid ligament
- External branch of the superior laryngeal nerve and the middle laryngeal artery perforate it.



# ELASTIC TISSUE

## LIGAMENTS OF THE EPIGLOTTIS

- Middle and lateral glosso epiglottic ligaments
- Pharyngoepiglottic ligaments
- Thyroepiglottic ligament
- Hyoepiglottic membrane, muscle and ligament
- Aryepiglottic ligaments

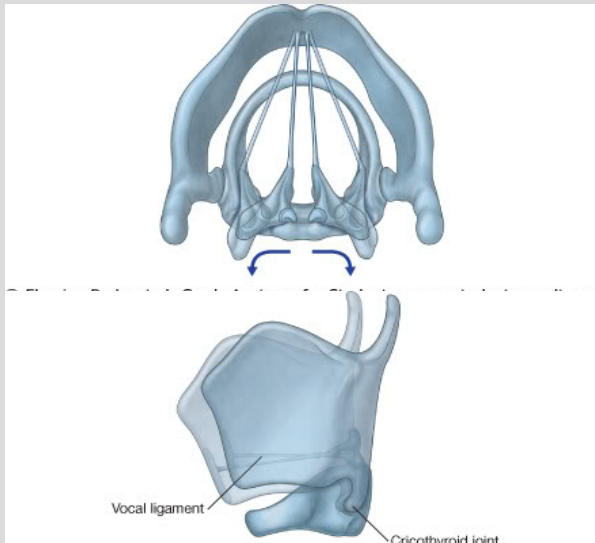




# JOINTS OF THE LARYNX

## Cricothyroid joint

Allows to tilt forward or behind the thyroid cartilage changing the tension of the vocal chords.

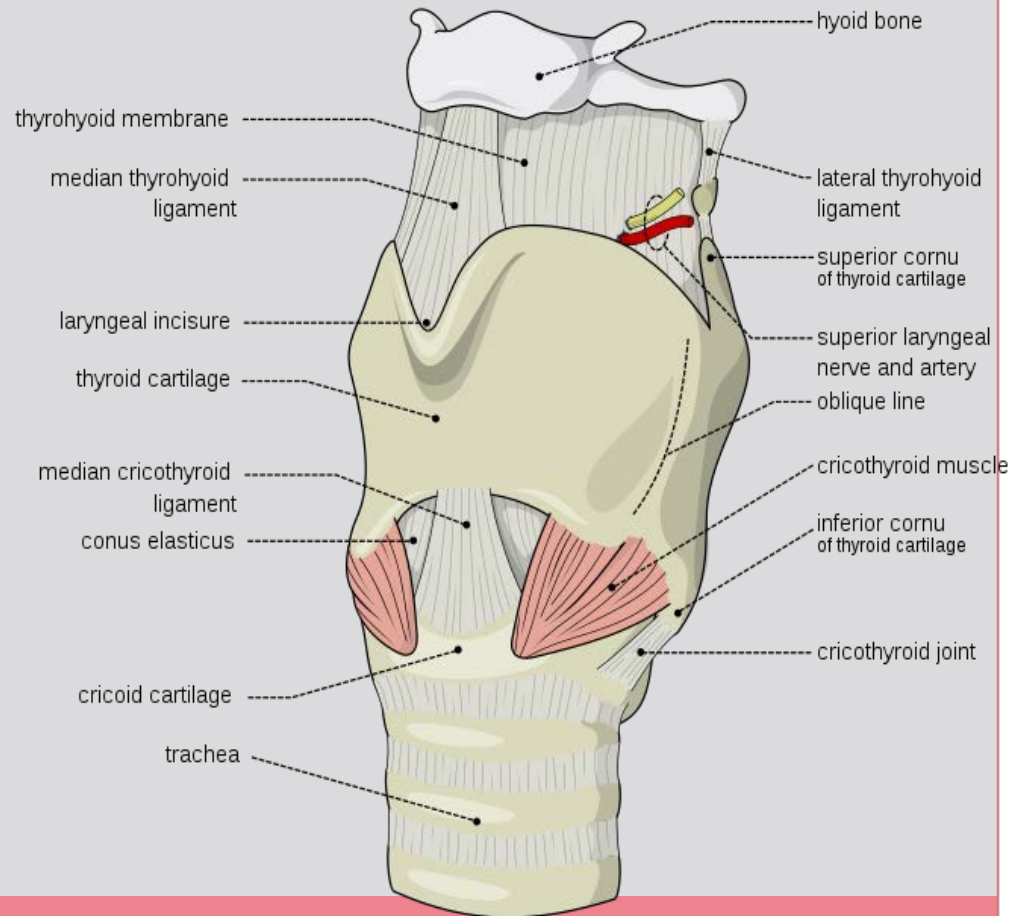


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## Cricoarytenoid joint

Allows fronto-translational movements to get away or close the arytenoid cartilages.

Separate or approximate the vocal chords.

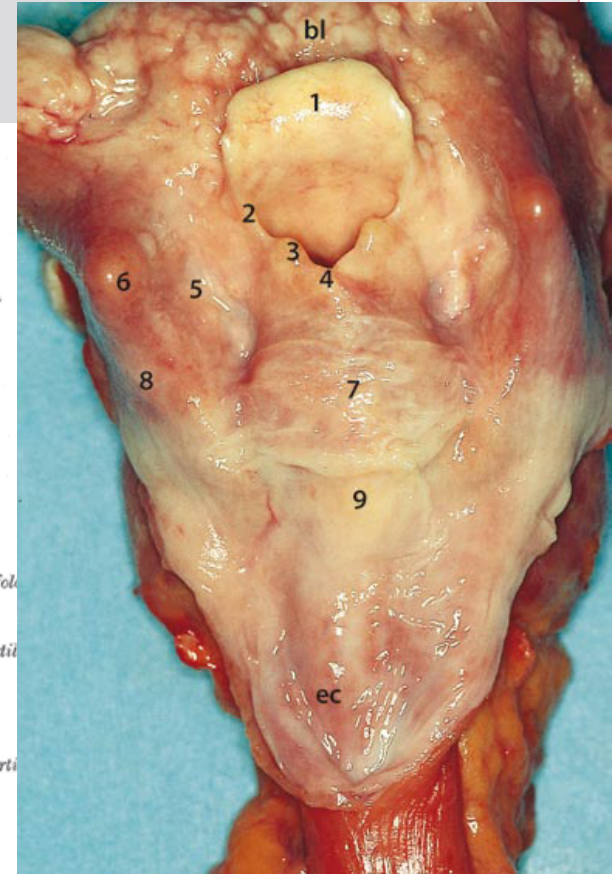
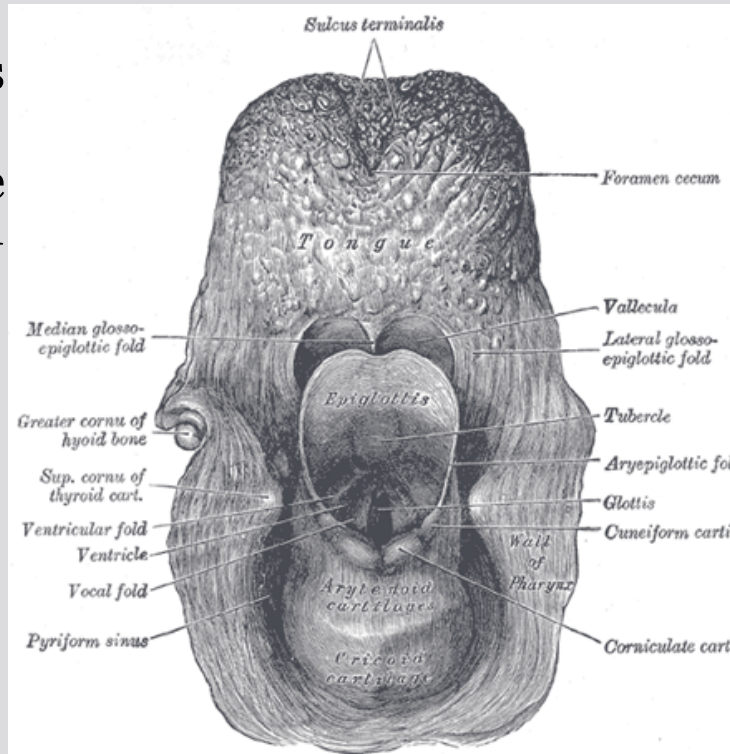


# INTERNAL ANATOMY

## LARYNGEAL ADITUS

- Epiglottis (ant)
- Aryepiglottic folds (laterally)
- Corniculate cartilages and arytenoideus muscle (post)

- ✓ Glossoepiglottic folds and valleculae
- ✓ Piriform recesses



- Vestibule ————— Vestibular folds
- Ventricle ————— Vocal folds
- Subglottic cavity

## LARYNX

# INTERNAL ANATOMY

- **Vestibule**

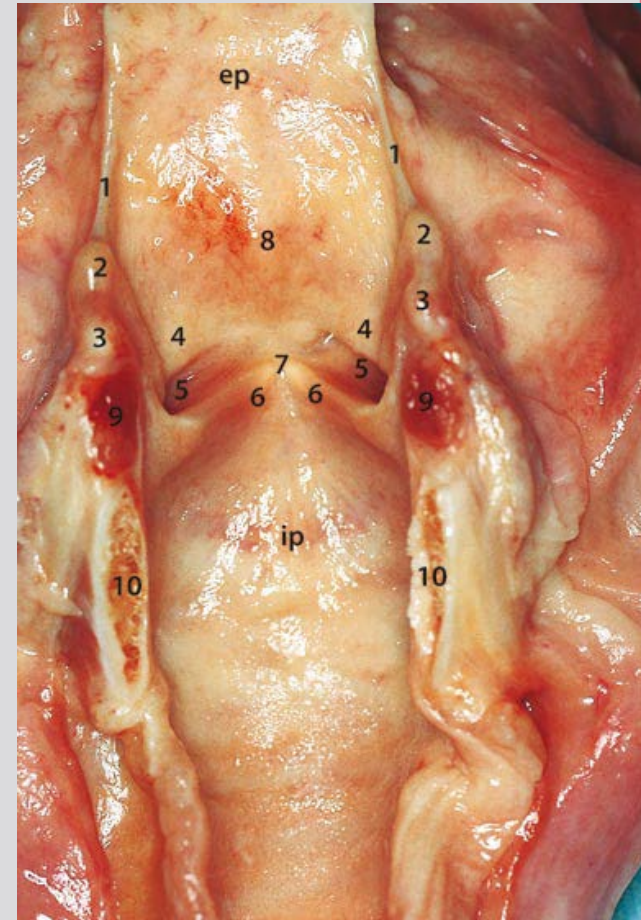
- Aditus → vestibular folds

- **Vestibular folds**

- Mucous membrane + connective tissue (vestibular ligament)
  - Thyroid cartilage → arytenoid cartilage

- **Ventricle of the larynx**

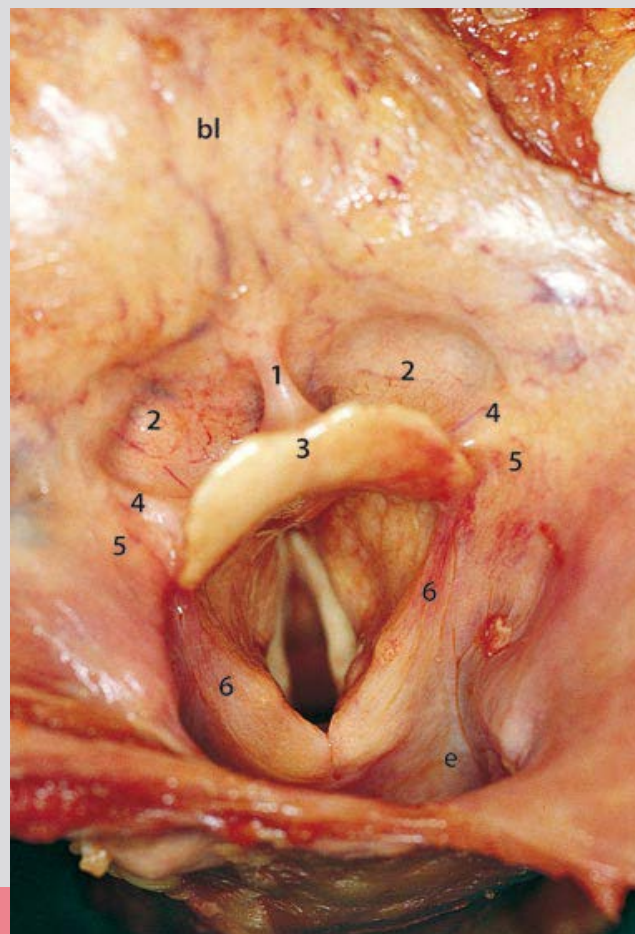
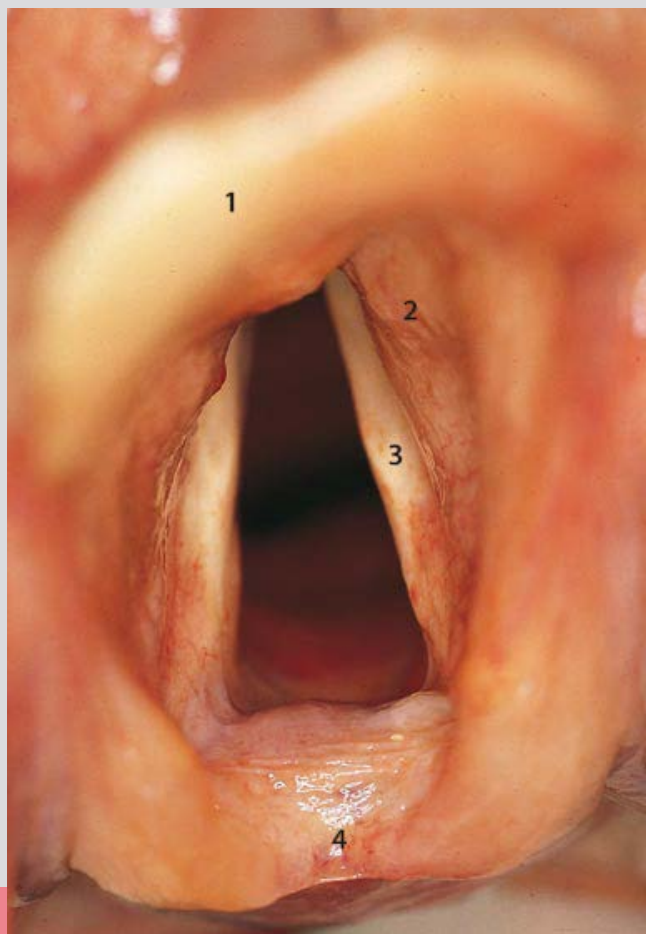
- Recess between the vestibular and the vocal folds.
  - Laryngeal saccule (ant): contains mucous glands to lubricate the vocal folds.
  - Thyroarytenoid muscle







- **Glottis:** vocal folds + space between them
  - The narrowest portion of the larynx
  - Anterior 3/5 → vocal chords → intermembranous portion
  - Posterior 2/5 → vocal process → intercartilaginous portion

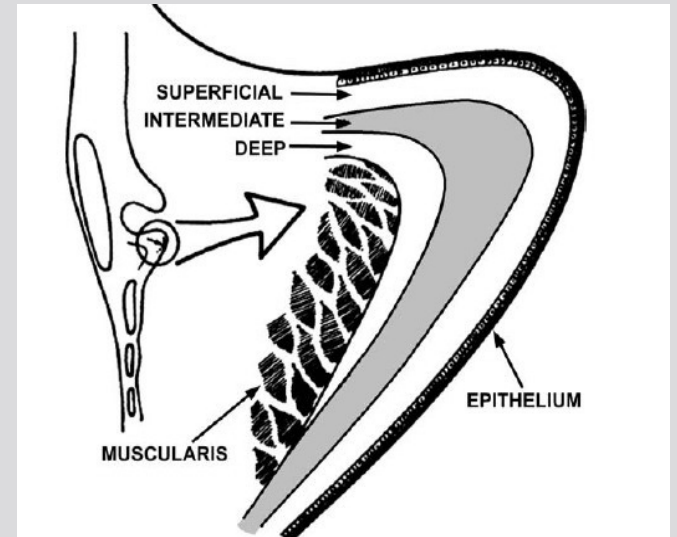


# STRUCTURE OF ADULT VOCAL FOLD

- Epithelium (mucosa)
- Basal lamina
- Superficial layer of lamina propria

- Intermediate layer of lamina propria
- Deep layer of lamina propria

- Vocalis muscle (thyroarytenoid muscle)



## The Cover

## The transition

## The body



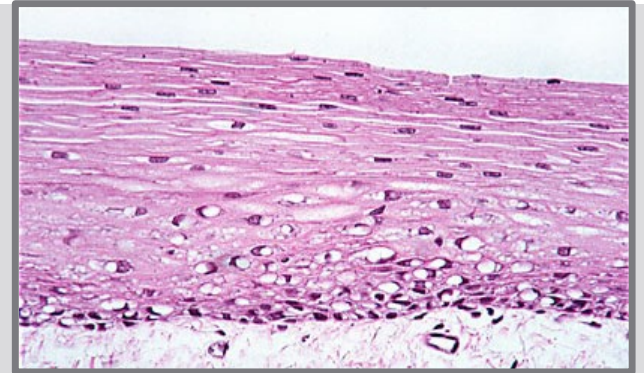
# STRUCTURE OF ADULT VOCAL FOLD



## COVER

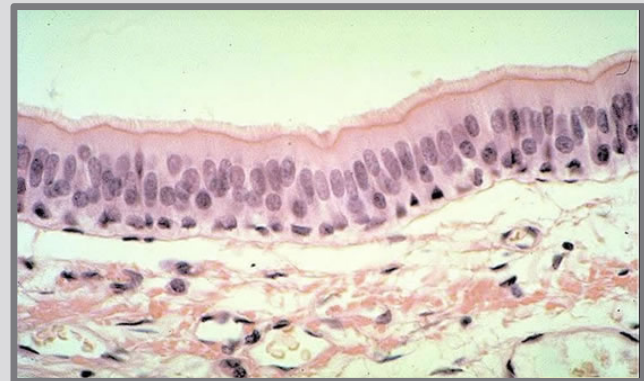
- Epithelium

- Anterior glottis → stratified squamous
- Posterior glottis → pseudostratified ciliated



- Basal lamina → physical support

- Lamina lucida
- Lamina densa



- Superficial layer of lamina propria

- Reinke's space (potential space) → Reinke's edema
- Fibrous components + extracellular matrix



# STRUCTURE OF ADULT VOCAL FOLD

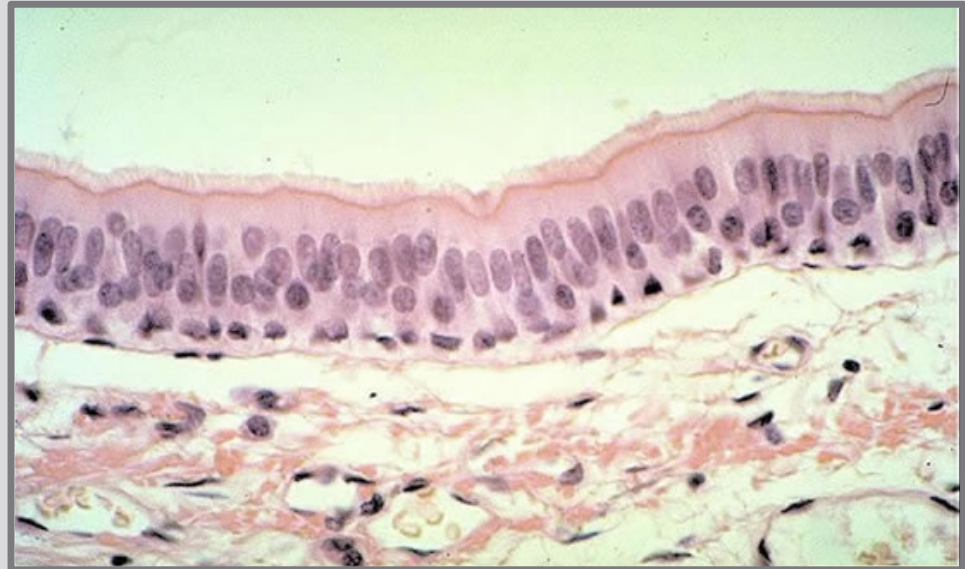
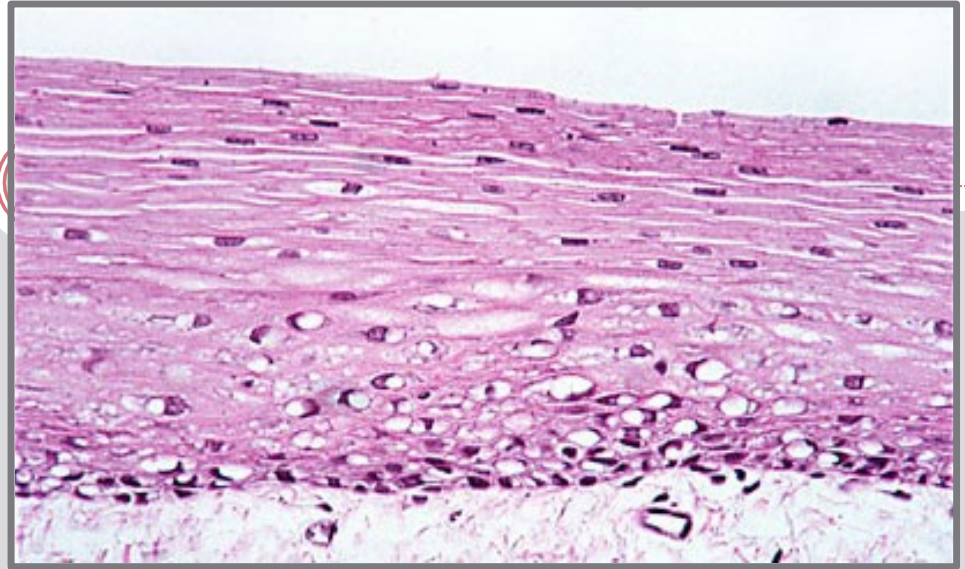


## TRANSITION

- Intermediate layer of the lamina propria
  - Elastic fibers
- Deep layer of the lamina propria
  - Collagenous fibers

## BODY

- The vocalis muscle



# MUSCULATURE

## EXTRINSIC MUSCLES

### GROUP 1:

- **INFRAHYOID:** omohyoid, sternohyoid, sternothyroid and thyrohyoid muscles
- Depressors (exception thyrohyoid)

### GROUP 2: (suprahyoid)

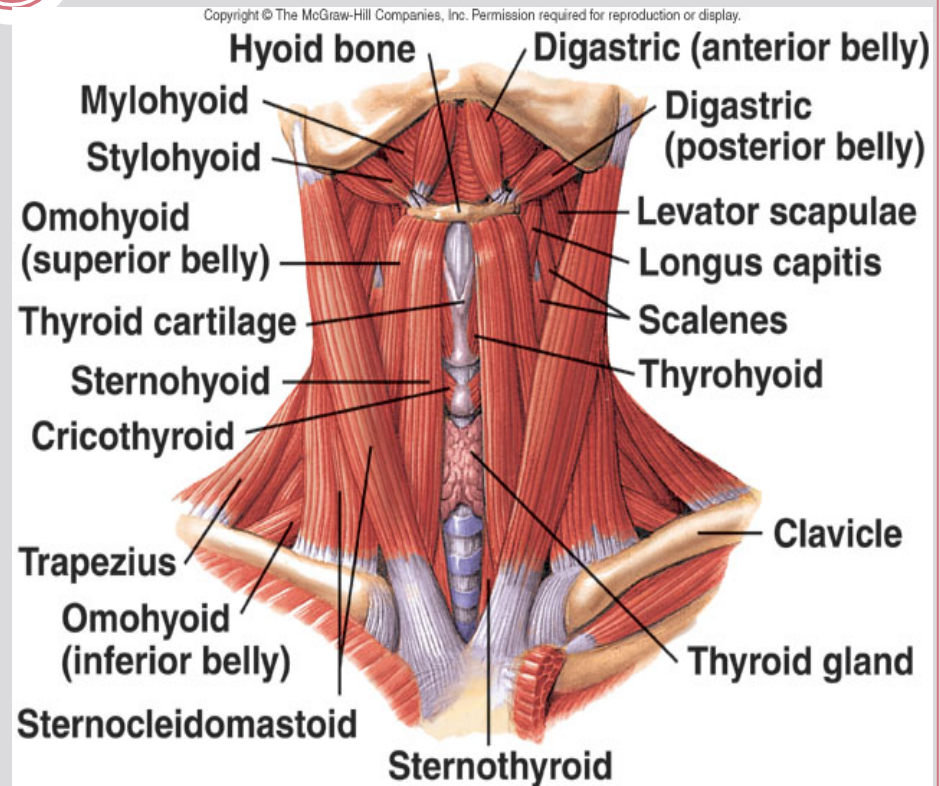
- Stylohyoid, digastric and mylohyoid muscles
- Elevate the larynx

### GROUP 3:

- Stylofaryngeal and palatofaryngeal muscles
- Elevate the larynx and the pharynx

### GROUP 4:

- Middle and inferior constrictor muscles of the pharynx

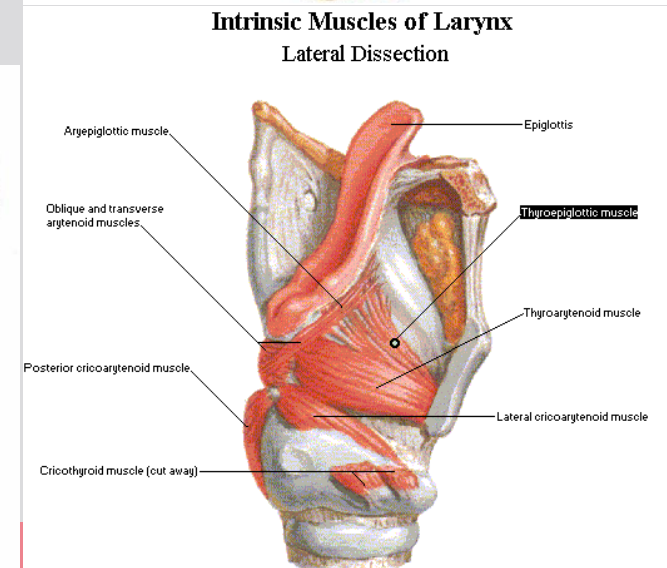
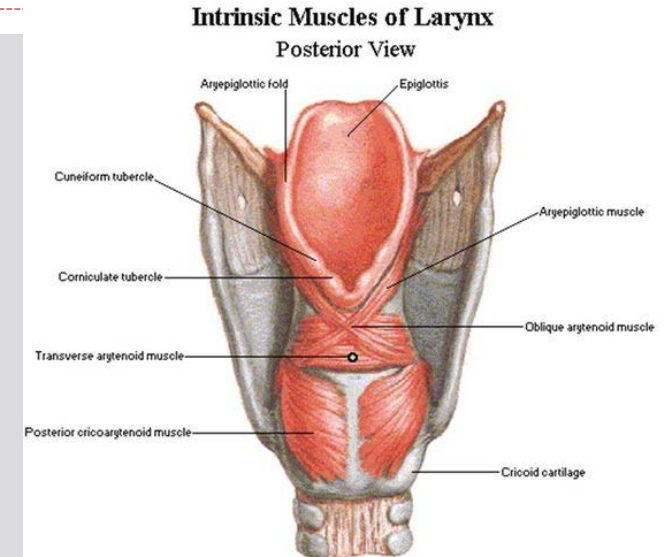
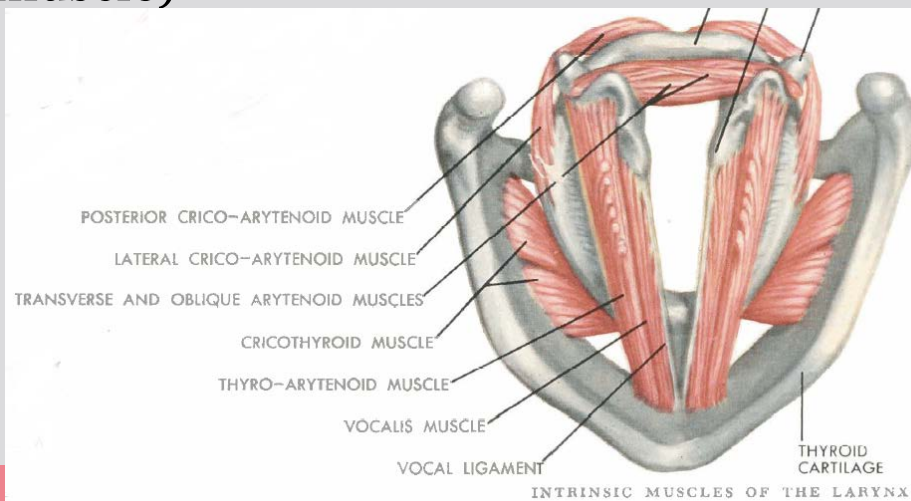




# MUSCULATURE

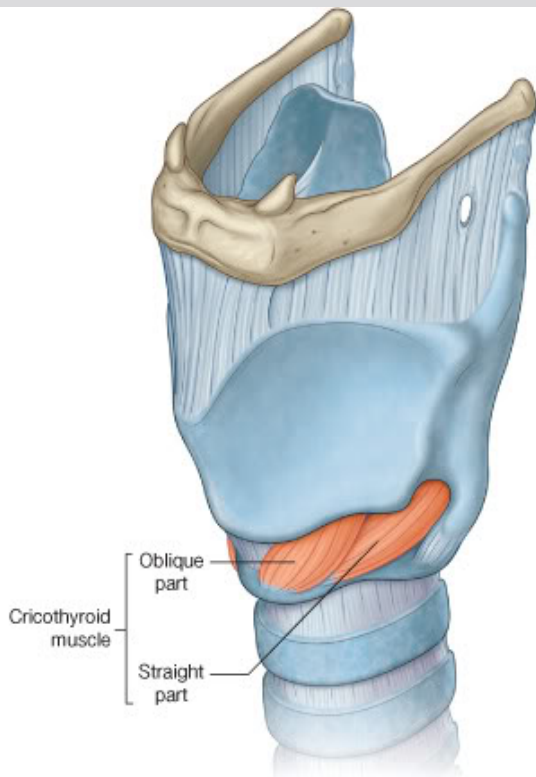
## INTRINSIC MUSCLES

- Shape and size of the aditus and glottis
- Cricothyroid → lateral and outer aspect of the larynx
- Posterior and lateral cricoarytenoid
- Transverse and oblique arytenoid
- Lateral and medial thyroarytenoid (vocalis muscle)

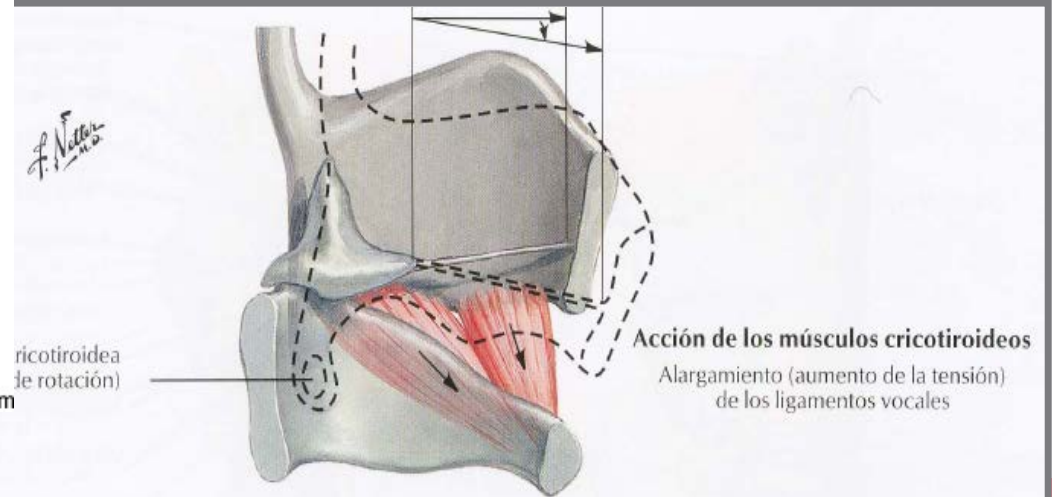


# Cricothyroid muscle

External surface of the arch of the cricoid cartilage

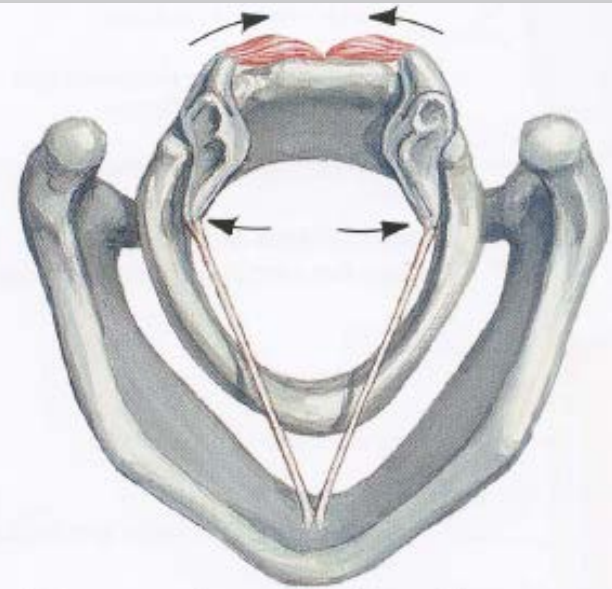
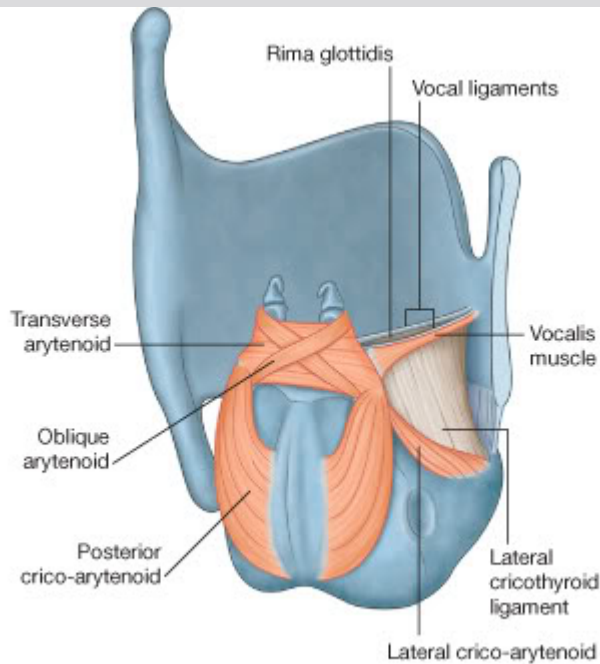


- Straight part
- Oblique part
- To lengthen, tense and adduction of the vocal chords
- Superior laryngeal nerve



# Posterior cricoarytenoid muscle

- ✓ Origin: posterior surface of the cricoid lamina
- ✓ Insertion: muscular process of the arythenoid cartilage
- ✓ Midline crest - Cricoesophageal tendon
- ✓ Function: the only ABDUCTOR of the vocal chords

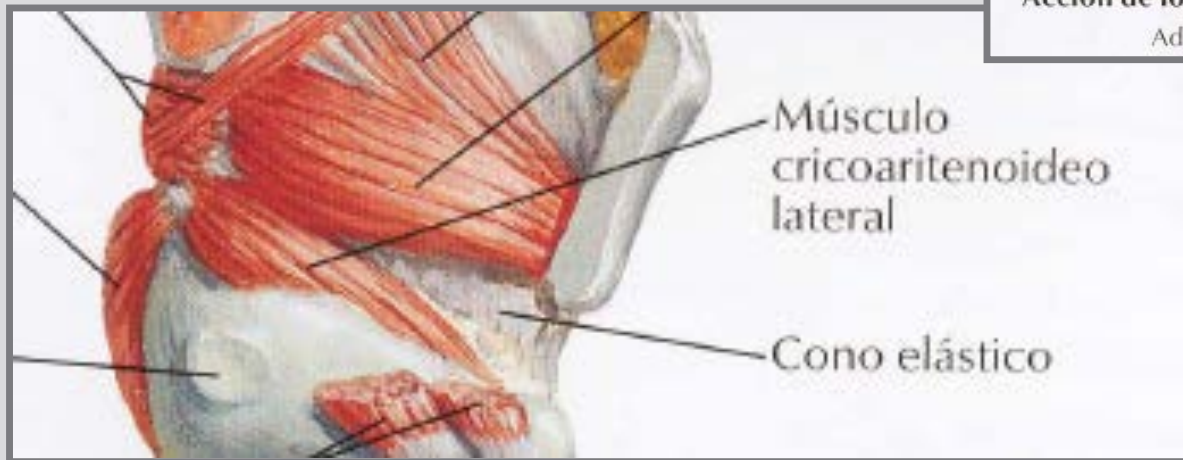
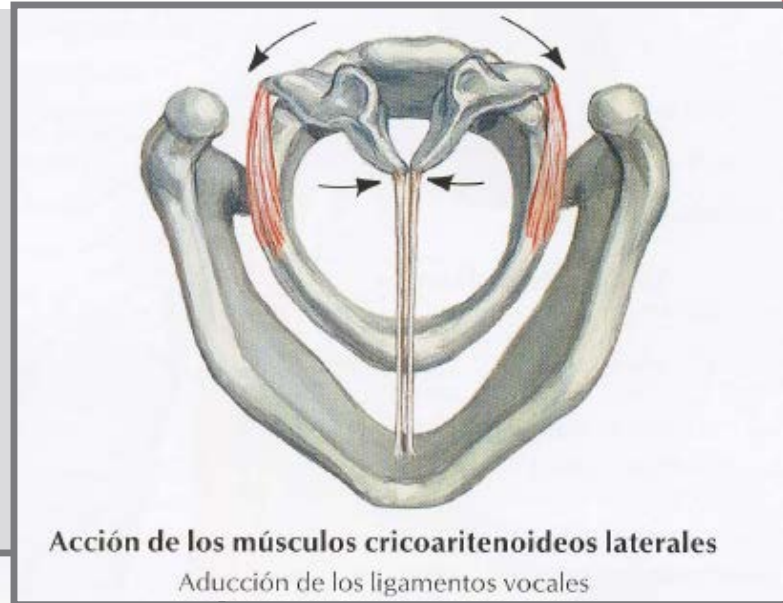


**Acción de los músculos cricoaritenoideos posteriores**  
Abducción de los ligamentos vocales

# Lateral cricoarytenoid muscle



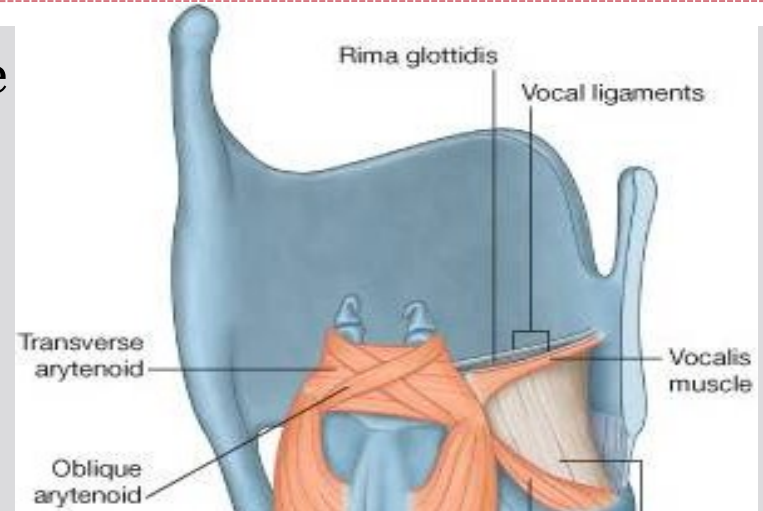
- ✓ Origin: upper border and outer surface of the cricoid arch
- ✓ Insertion: anterior surface of the muscular process of the arytenoid cartilage
- ✓ Antagonist of the posterior cricoarytenoid → adduction vocal chords





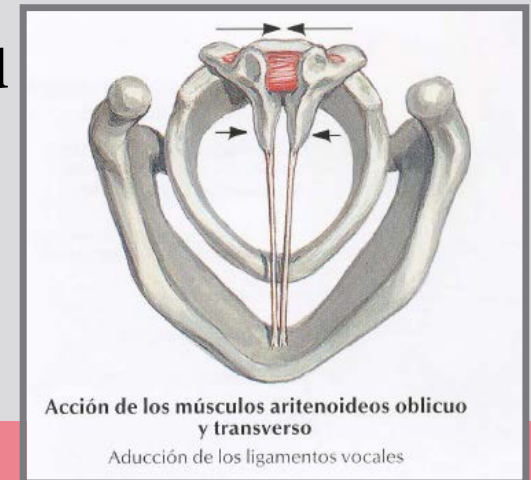
# Transverse arytenoid muscle

- ✓ Between the posterior surfaces of the the two arytenoid cartilages
- ✓ It approximates the two arytenoid cartilages.



# Oblique arytenoid muscle

- ✓ Origin: posterior surface of the transverse arytenoid muscle
- ✓ Insertion: the tip of the opposite arytenoid cartilage
- ✓ Adduction of the vocal chords.



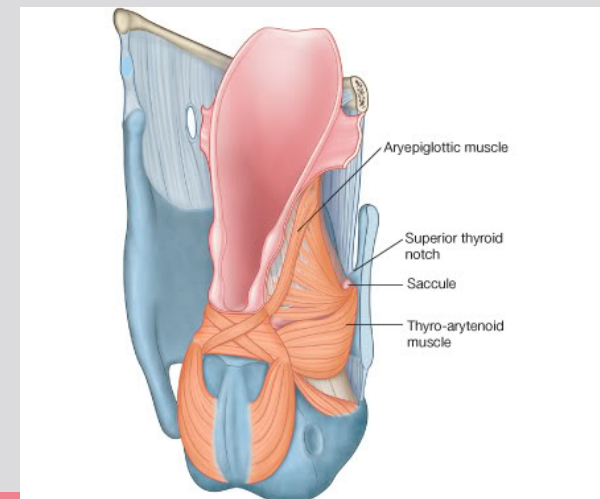
# (Lateral) Thyroarytenoid muscle

- ✓ Origin: inner surface of thyroid cartilage
- ✓ Insertion: lateral surface of arytenoid cartilage
- ✓ Thyroepiglottic muscle
- ✓ Function: to shorten the vocal ligaments.
- ✓ Adduction of vestibular folds



## Vocalis muscle

- ✓ Origin: the same
- ✓ Insertion: vocal process of arytenoid cartilage
- ✓ Thicker, deeper and better developed.
- ✓ Function: adducts the vocal fold



# PHONATION

## Extrinsic muscles

Pull up (high tones) and pull down (low tones) the larynx

## Intrinsic muscles

### 1. Adduction of the chords

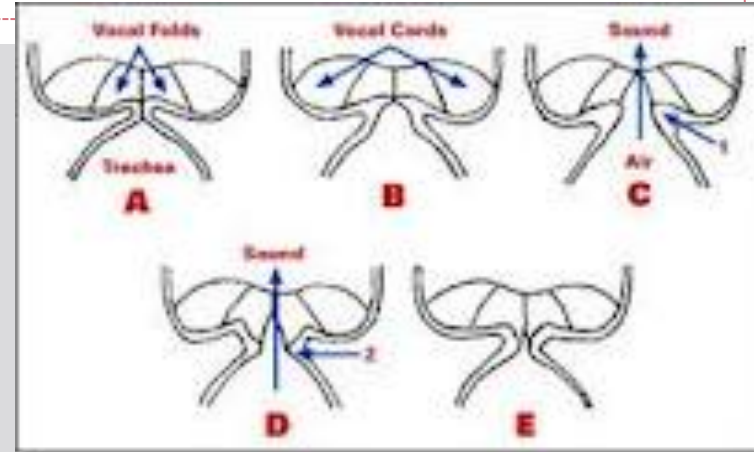
Lateral cricoarytenoid / transverse arytenoid / vocalis muscles (medial thyroarytenoid)

### 2. Variation of the length and tenseness of the chords

Cricothyroid and thyroarytenoid muscles → tone of the voice.

### 3. Abduction of the chords

Posterior cricoarytenoid

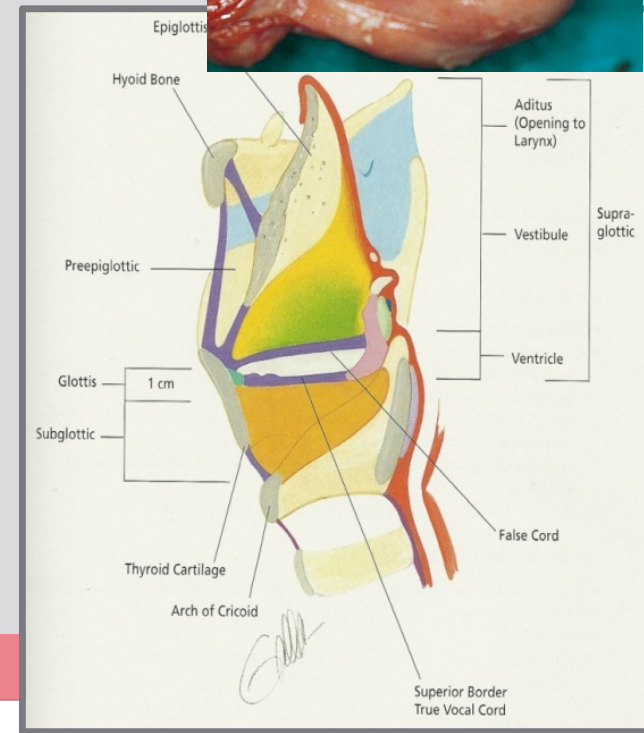
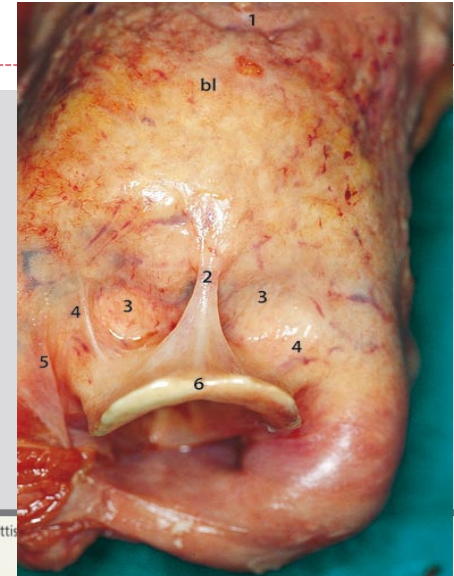


# LARYNGEAL SPACES

- **Subglottic:**
  - Glottis
  - Lower border of the cricoid cartilage
- **Preepiglottic**
  - Ant.: thyroid cartilage and thyrohyoid m.
  - Above: hyoepiglottic lig. and vallecula
  - Posteriorly: epiglottis

The epiglottic tumors can extend in this region.

- **Paraglottic**
  - Anterolat: thyroid cartilage
  - Medially: laryngeal ventricle, quadrangular m. and conus elasticus



# BLOOD SUPPLY

- Superior laryngeal artery

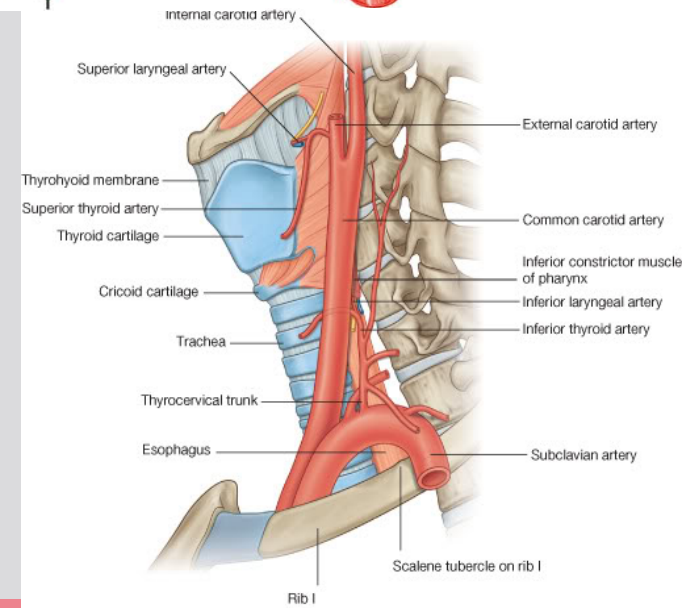
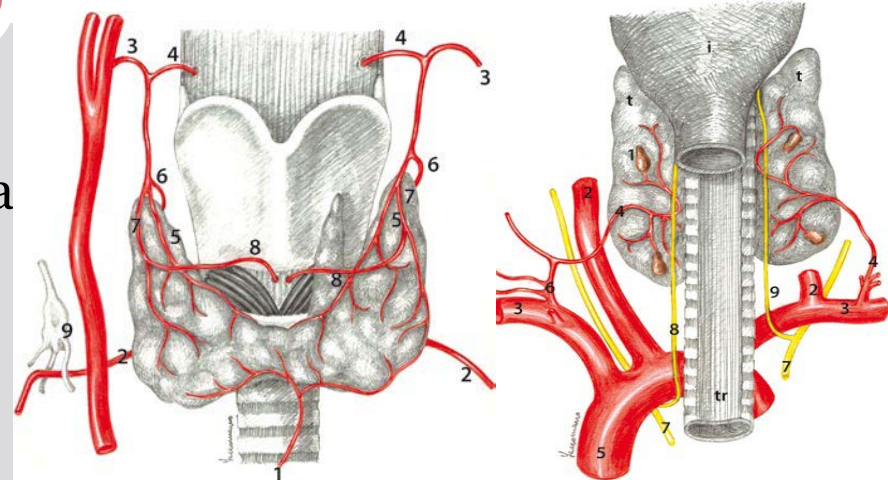
- Arises from the sup. thyroid aa
- Internal branch of the superior laryngeal nerve
- Runs horizontally across the thyrohyoid membrane.

- Inferior laryngeal artery

- Inf. thyroid artery
- Killian-Jamieson area (cricothyroid art)
- Inf border of inf. Constrictor m.

- Cricothyroid artery

- Sup. thyroid artery
- Cricothyroid membrane





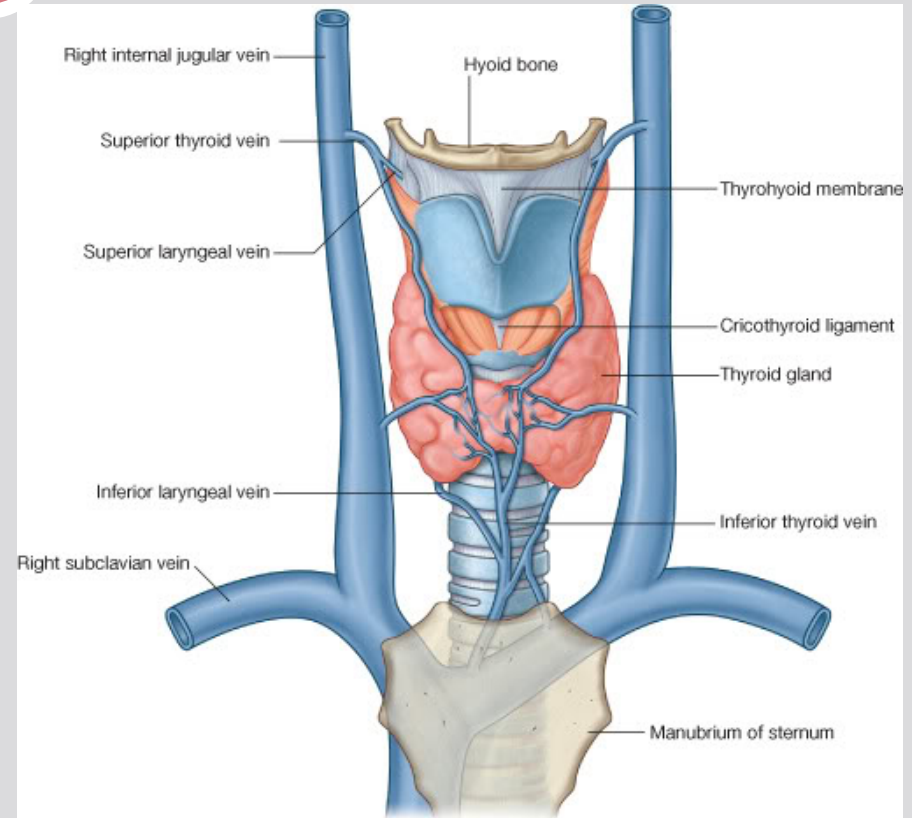
# Veins

## Superior laryngeal vein

- Sup. thyroid vein
- Internal jugular vein

## Inferior laryngeal vein

- Inferior thyroid vein
- Brachiocephalic vein



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# Lymphatics



## Superior group



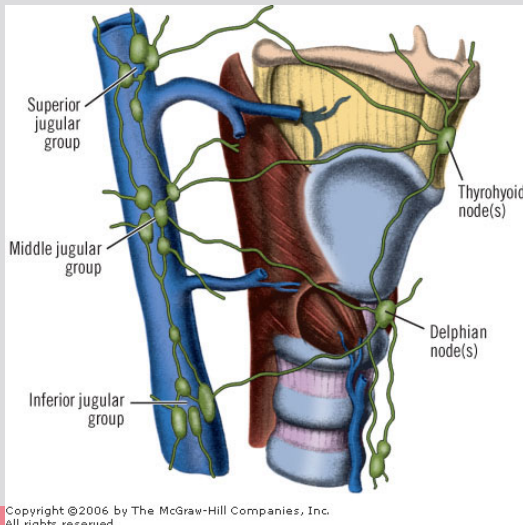
- Prelaryngeal nodes
- **Upper portion of deep cervical chain**

Vocal folds

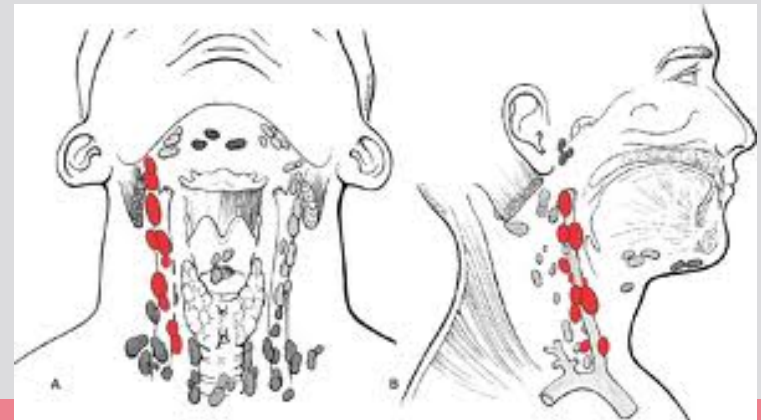
## Inferior group



- Pre and paratracheal nodes
- Laryngeal nodes
- **Lower deep cervical nodes**
- Supraclavicular nodes



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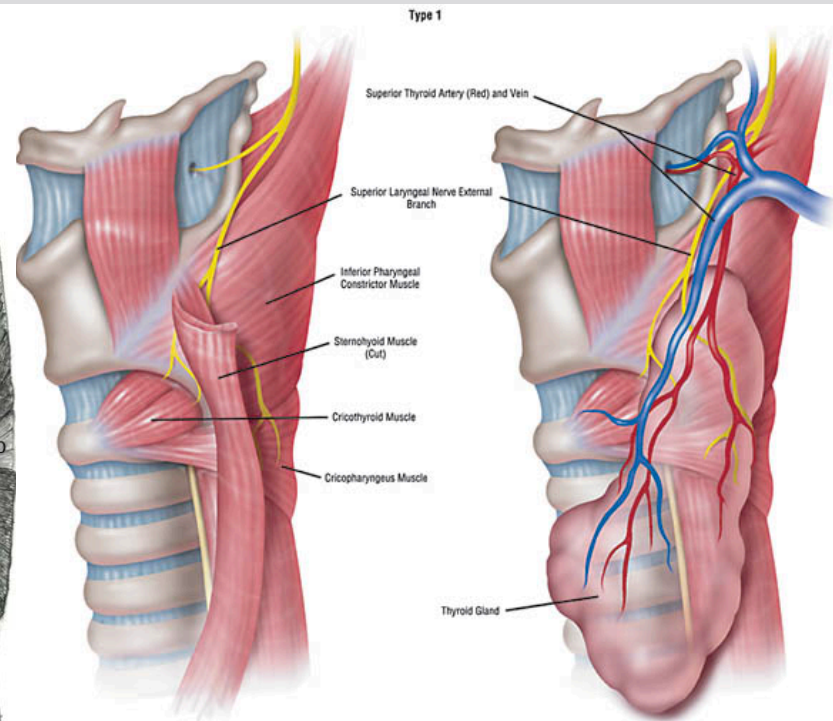
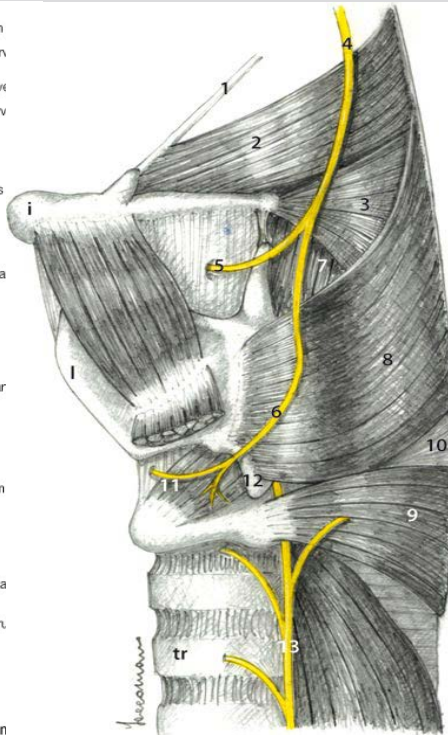
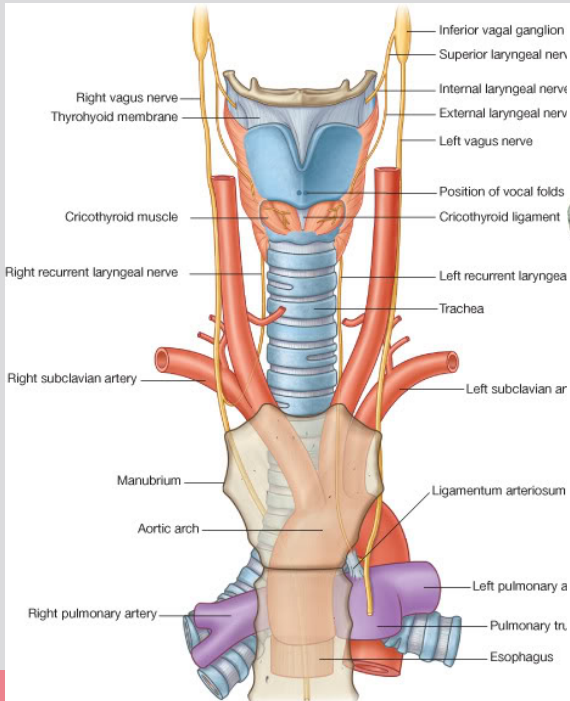


# NERVES



## SUPERIOR LARYNGEAL NERVE

- ✓ Inferior ganglion of X nerve
- ✓ **External branch**
  - Ends in the cricothyroid muscle



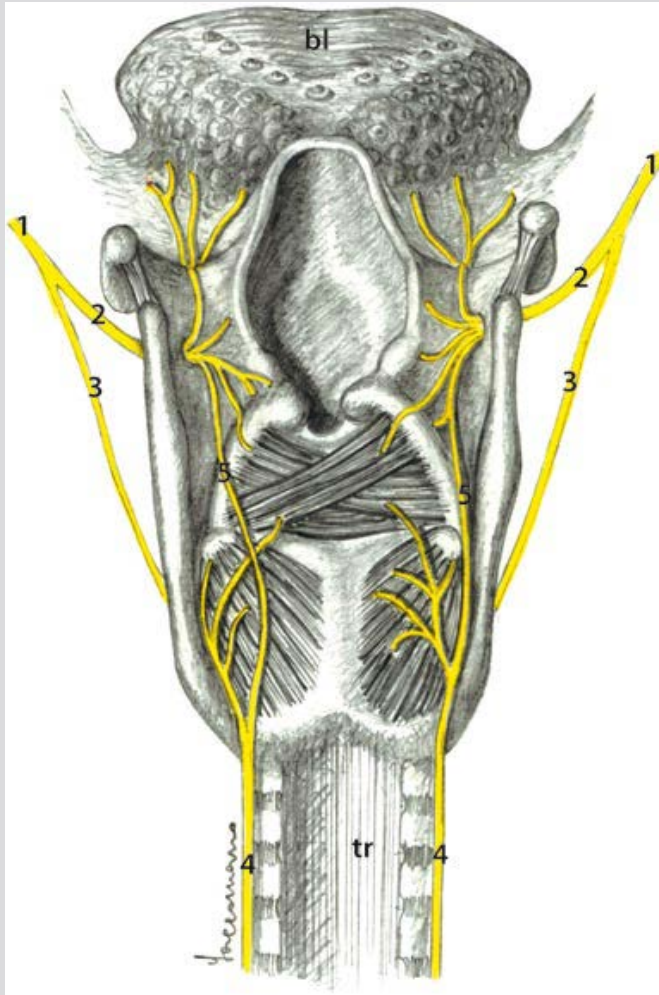
## ✓ Internal branch

- Thyrohyoid membrane/ superior laryngeal artery



## - Sensitive

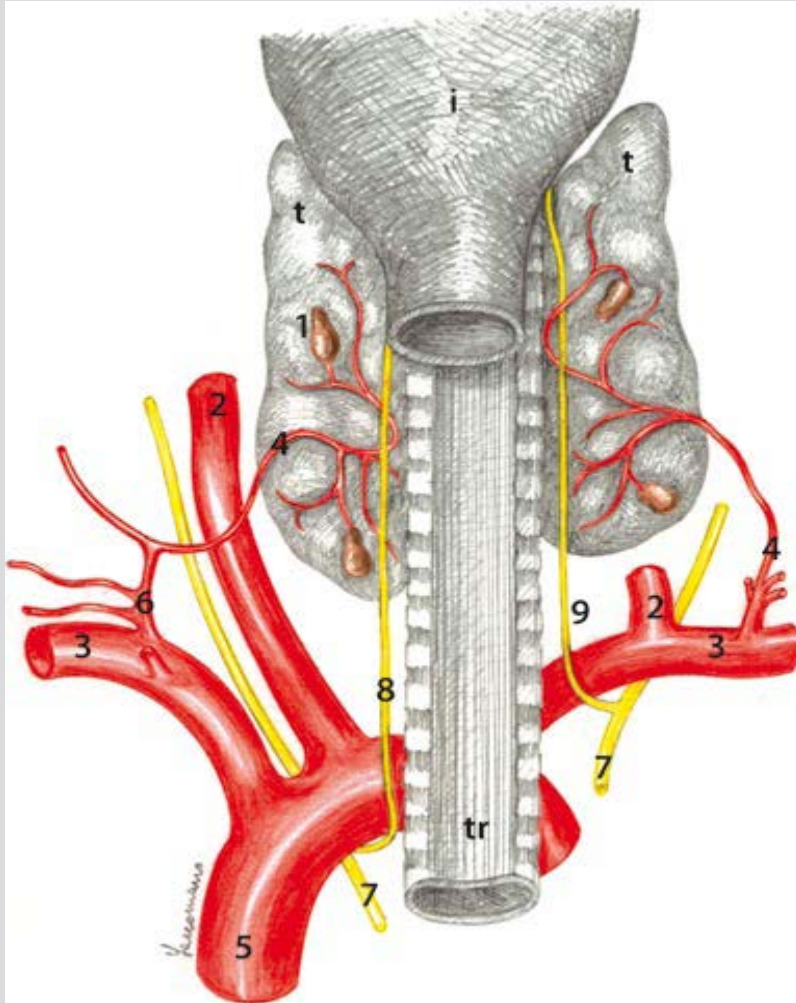
- Root of tongue
- Epiglottis and valleculae
- Piriform recess
- Vestible, vestibular folds, ventricle
- Posterior wall of larynx
- Anterior wall of pharynx
- Mucosa of hypopharynx



- Sympathetic/parasympathetic fibres

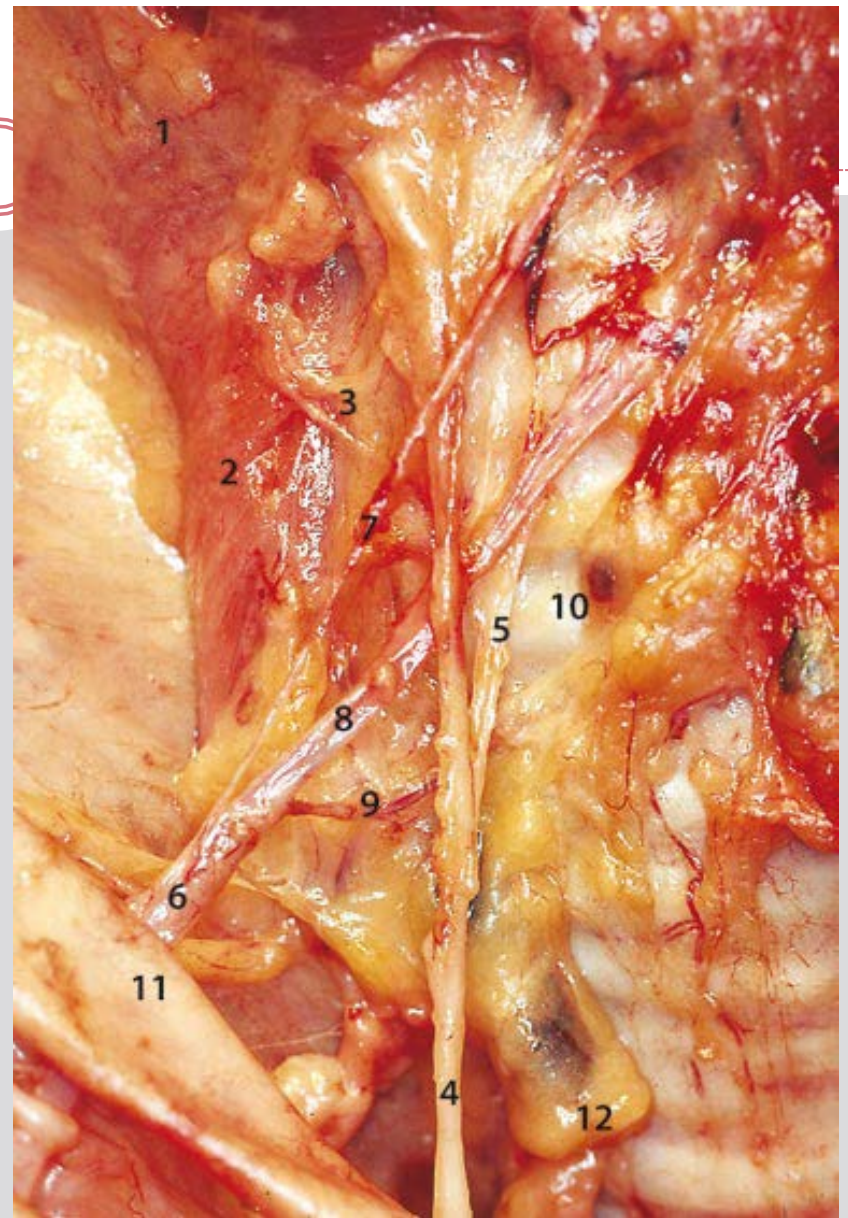
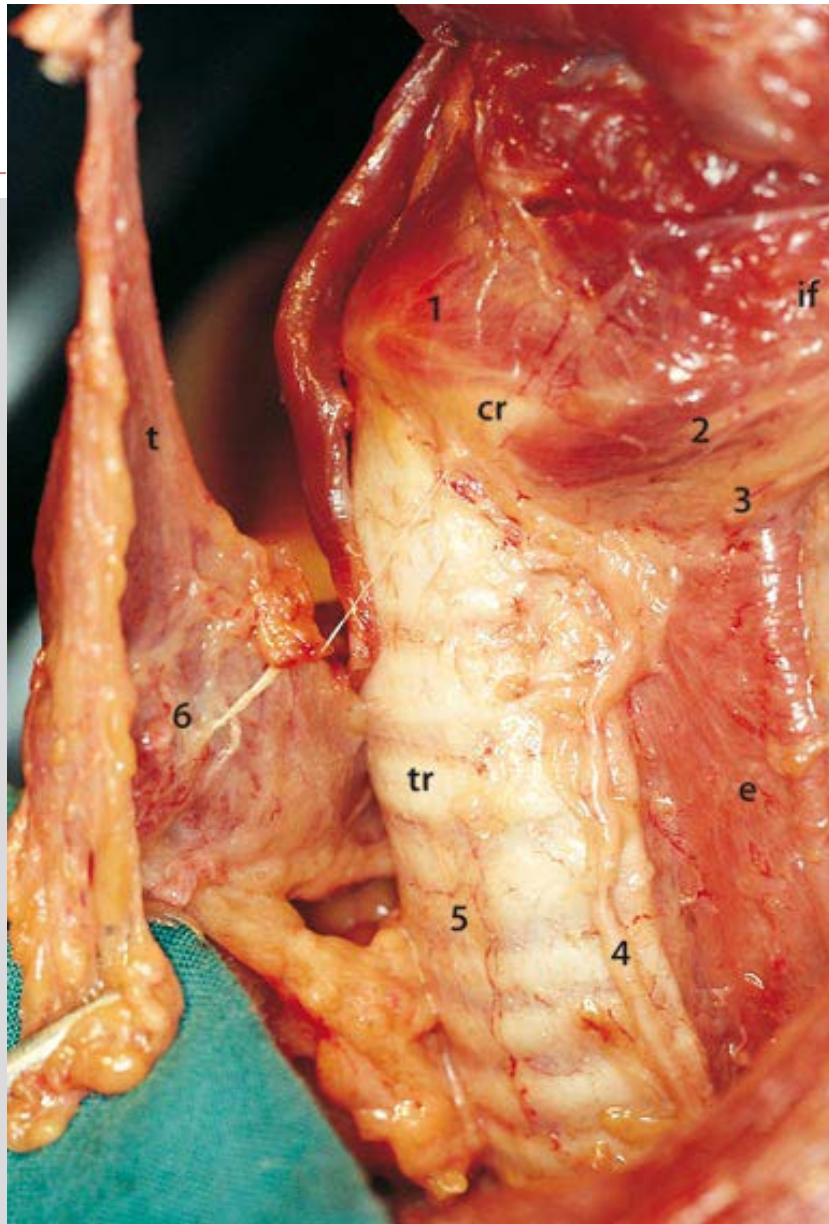
# NERVES

## INFERIOR LARYNGEAL (RECURRENT) NERVE



- ✓ The most important MOTOR nerve
- ✓ Longer on the left side
- ✓ Related to the inferior thyroid aa and the thyroid gland
  
- ✓ The left nerve originates in the chest and surrounds the aortic arc. It penetrates into the larynx behind the cricothyroid articulation.
- ✓ The right nerve originates in the base of the neck, anteriorly to the subclavian aa. It penetrates into the larynx behind the cricoarytenoid articulation.





## ✓ Anterior branch (adductor)

- Lateral cricoarytenoid m.
- Thyroarytenoid m.
- Vocalis and aryepiglottic m.



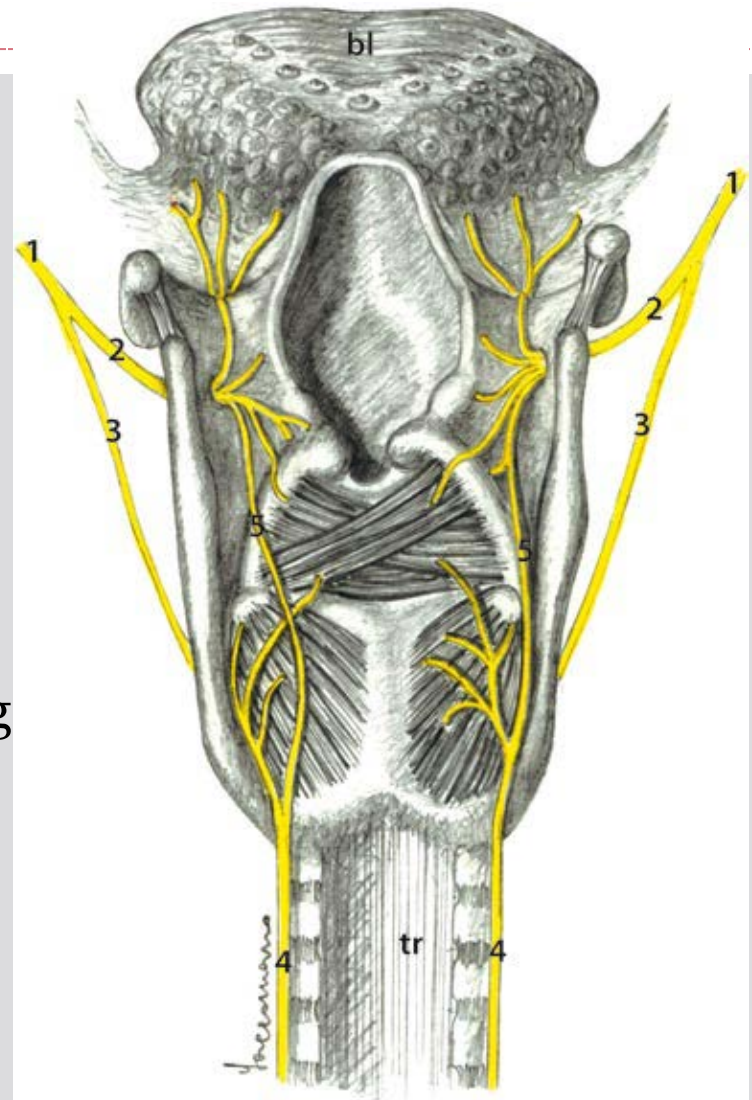
## ✓ Posterior branch (abductor)

2 branches

- Posterior cricoarytenoid m. (abductor)
- Arytenoid m. (adductors)

## ✓ Anastomotic branch

- With a branch from the superior laryng
- Interarytenoid m.
- Posterior cricoarytenoid m.
- Pressure of subglottic airflow
- Reflex of the cough



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