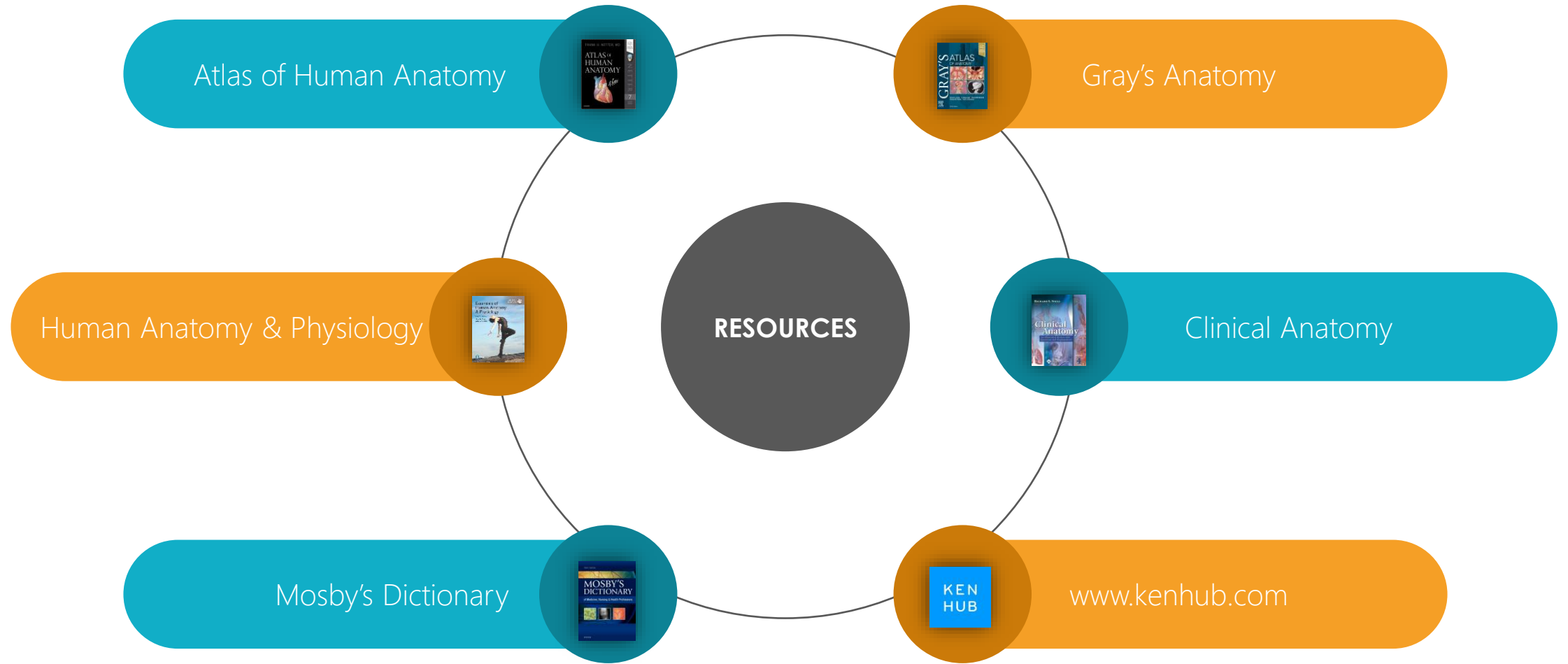




LARYNX, TRACHEA & BRONCHI

Khaleel Alyahya, PhD, MEd
www.khaleelalyahya.net

RESOURCES



OBJECTIVES

One

Describe the Extent, structure and functions of the **larynx**.

Two

Describe the Extent, structure and functions of the **trachea**.

Three

Describe the bronchi and branching of the **bronchial tree**.

Four

Describe the functions of **bronchi** and their divisions

Five

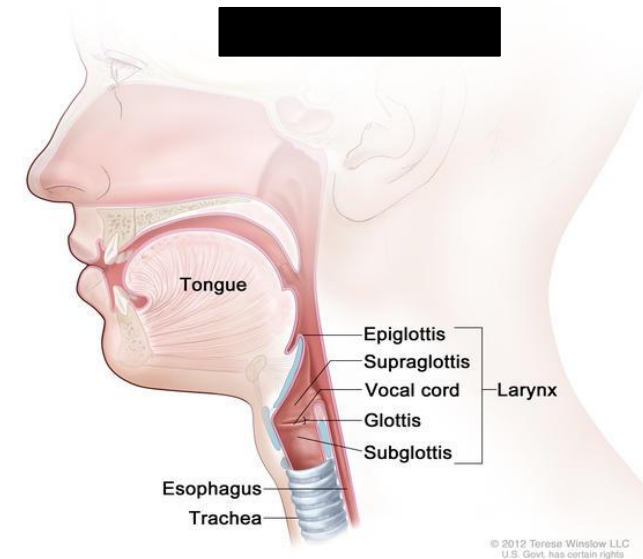
Clinical anatomy



Larynx

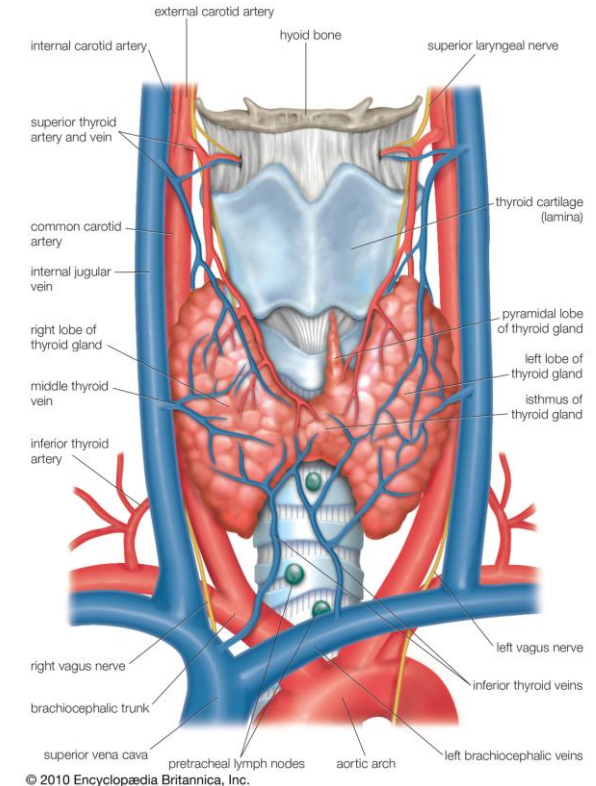
INTRODUCTION

- The larynx is the part of the respiratory tract which contains the vocal cords.
- In adult it is 2-inch-long tube.
- It opens above into the laryngeal part of the pharynx.
- Below, it is continuous with the trachea.
- The larynx has functions in:
 - Respiration (breathing).
 - Phonation (voice production).
 - Deglutition (swallowing).



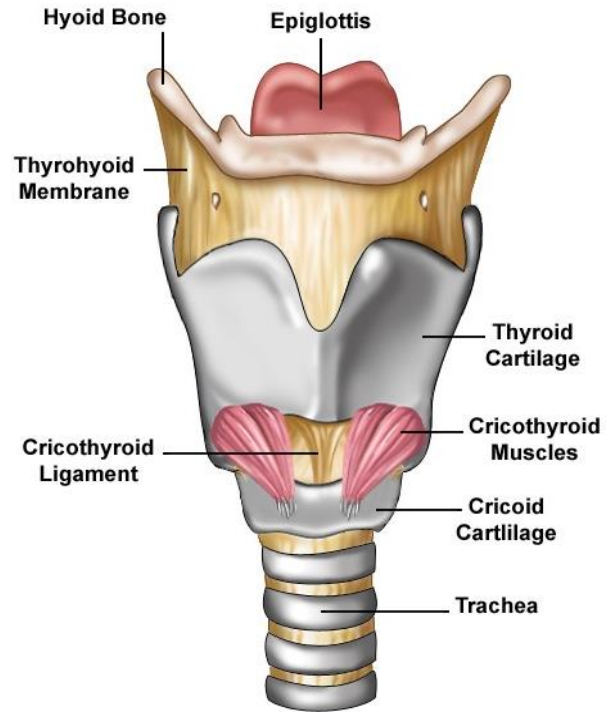
RELATIONS

- The larynx is related to major critical structures in the neck.
- **Arteries**
 - Carotid arteries: (common, external and internal).
 - Thyroid arteries: (superior & inferior thyroid arteries).
- **Veins**
 - Jugular veins, (external & internal)
- **Nerves**
 - Laryngeal nerves (Superior laryngeal & recurrent laryngeal).
 - Vagus nerve.



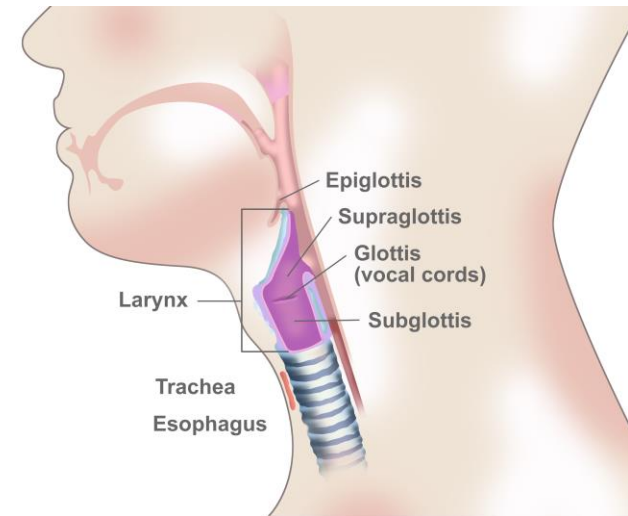
STRUCTURES

- The larynx consists of four basic components:
 - Cartilaginous skeleton.
 - Membranes and ligaments.
 - Muscles (Intrinsic & extrinsic muscles).
 - Mucosal lining.



FUNCTIONS

- Protective sphincter at the air passage.
- Phonation.
- Regulates air passage in inspiration and expiration.
- Opens & closes during swallowing, coughing & sneezing.



CARTILAGES

■ Unpaired (Single) Cartilages

- Epiglottis
- Thyroid cartilage
- Cricoid

■ Paired Cartilages

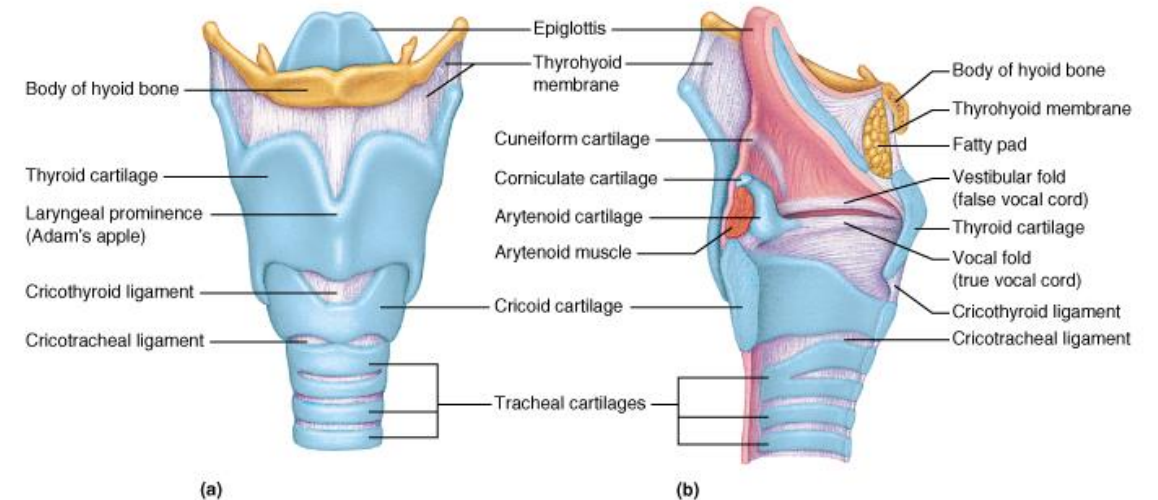
- Arytenoid
- Corniculate
- Cuneiform

■ All cartilages are **hyaline**

- Except the epiglottis
 - **elastic** cartilage

■ Cartilages are connected by joints, membranes and ligaments.

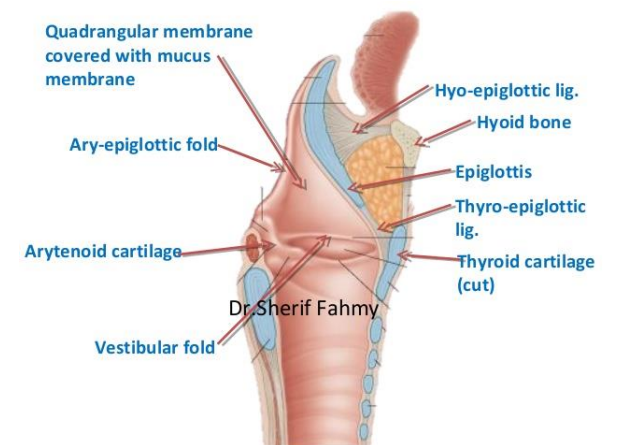
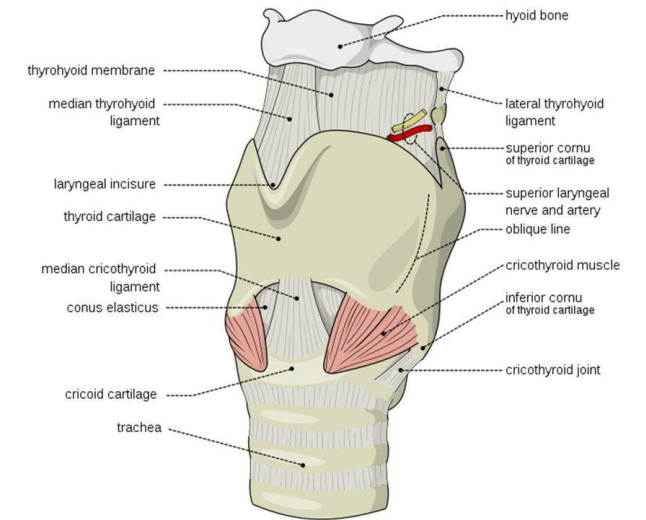
■ Cartilages are moved by muscles.



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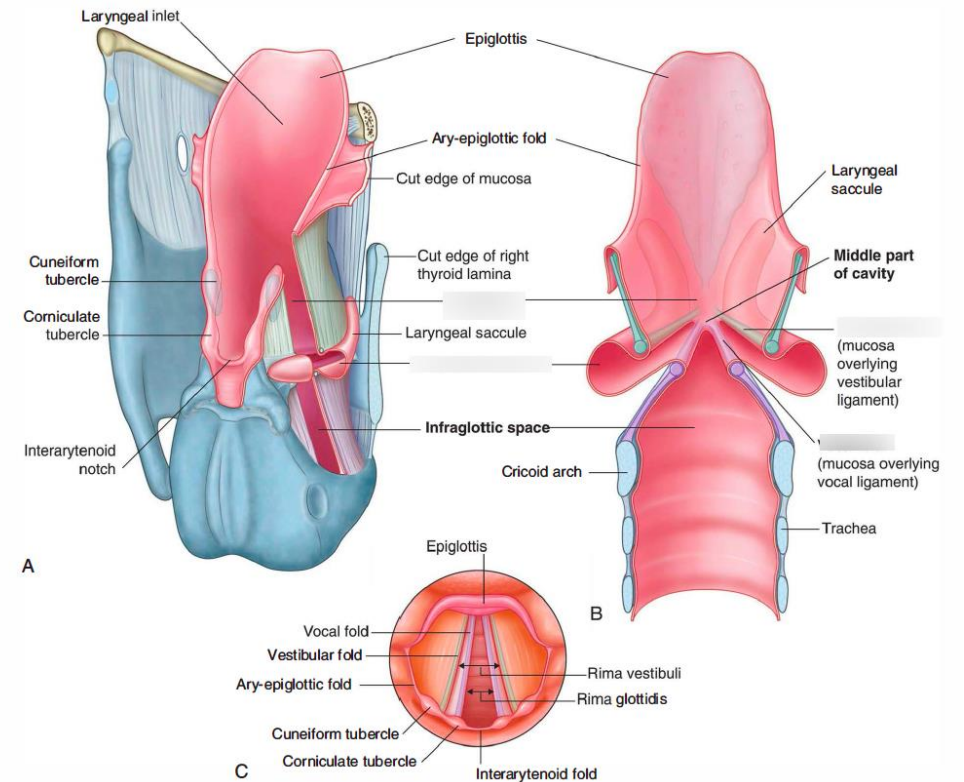
MEMBRANES & LIGAMENTS

- Thyrohyoid membrane
 - The thyrohyoid membrane is thickened in the median plane to form **median thyrohyoid ligament** and on both sides to form **lateral thyrohyoid ligaments**.
- Cricothyroid membrane (conus elasticus)
 - Its lower margin is attached to the upper border of cricoid cartilage.
 - Upper free margin forms vocal ligament which forms the true vocal cord.
- Cricotracheal membrane
- Hyoepiglottic ligament
- Thyroepiglottic ligament
- Quadrangular membrane (aryepiglottic membrane):
 - It extends between the arytenoid and epiglottis.
 - Its lower free margin forms the vestibular ligament which forms the vestibular fold (false vocal cord).



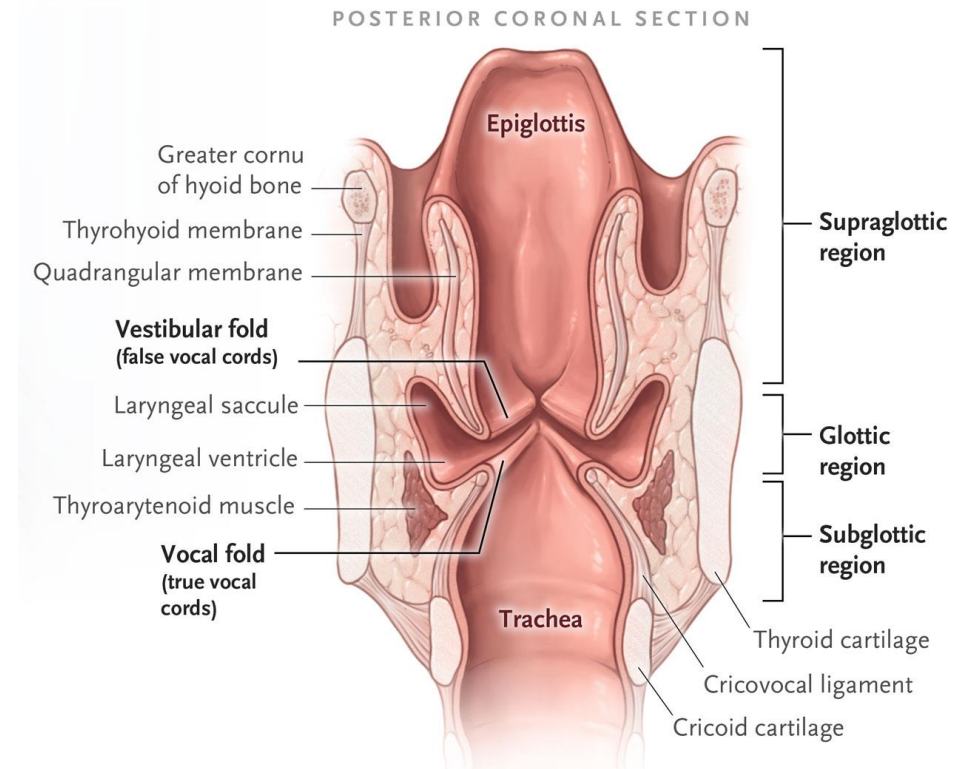
LARYNGEAL INLET

- It is the upper opening of the larynx.
- It faces upward and backward and opens into the laryngeal part of the pharynx, (laryngopharynx).
- Bounded:
 - Anteriorly by the upper margin of epiglottis (E)
 - Posteriorly & below by arytenoid cartilages (A)
 - Laterally by the Aryepiglottic folds (AEF)



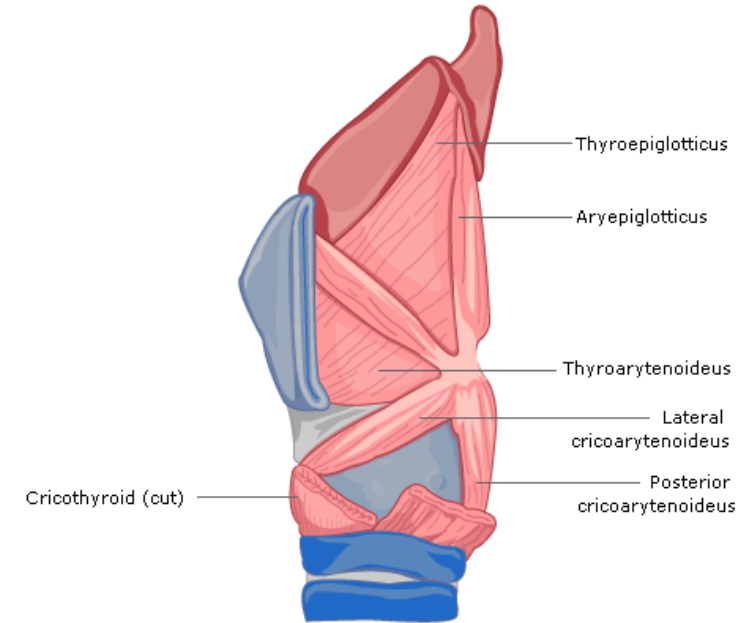
LARYNGEAL CAVITY

- Extends from laryngeal inlet to lower border of the cricoid cartilage
- Narrow in the region of the vestibular folds (rima vestibuli)
- Narrowest in the region of the vocal folds (rima glottidis)
- Divided into three parts:
 - Supraglottic part or vestibule: it is the part above the vestibular folds.
 - Ventricle: it is the part between the vestibular folds & the vocal folds.
 - Infraglottic part, the part below the vocal folds.
 - NB. The ventricle has an upward invagination called saccule which is rich in goblet cells.
- The cavity is lined with ciliated columnar epithelium except the surface of the vocal cords.
- The surface of vocal folds, is covered with stratified squamous epithelium because of exposure to continuous trauma during phonation.
- It contains many mucous glands, more numerous in the region of the saccule (for lubrication of vocal folds).



MUSCLES

- Laryngeal muscles are divided into two groups:
 - Extrinsic muscles: subdivided into two groups:
 - Elevators of the larynx.
 - Depressors of the larynx.
 - Intrinsic muscles: subdivided into two groups:
 - Muscles controlling the laryngeal inlet.
 - Muscles controlling the movements of the vocal cords.



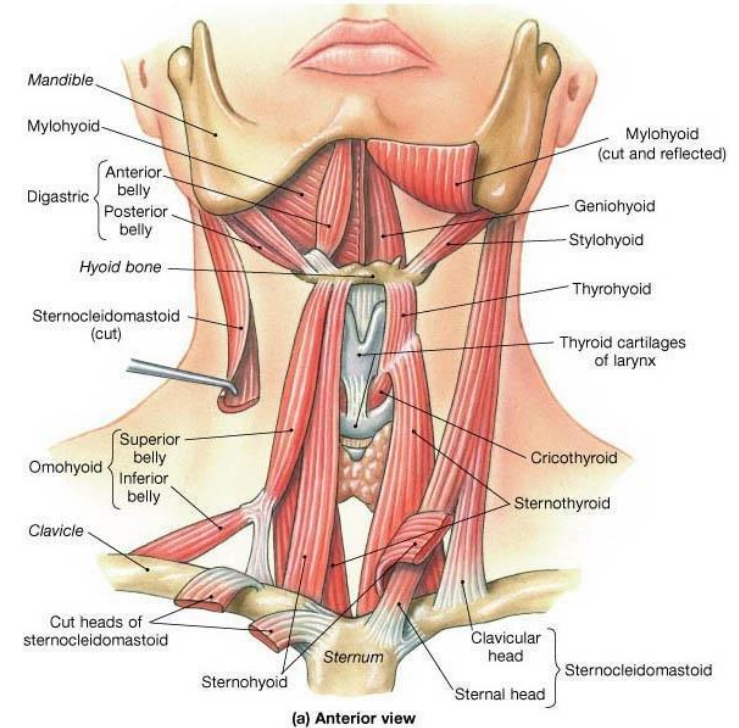
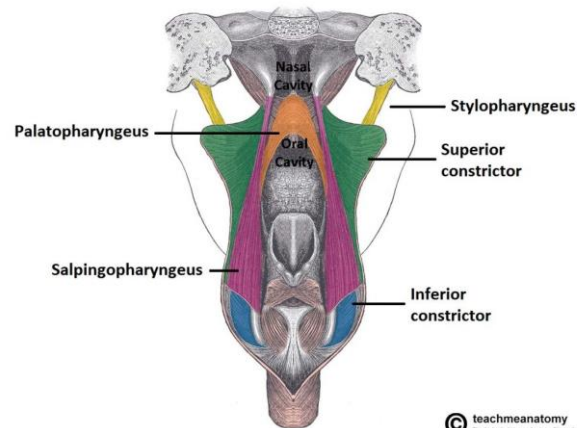
EXTRINSIC MUSCLES

■ Elevators of the Larynx

- The Suprahyoid Muscles (MSGD)
 - Mylohyoid
 - Stylohyoid
 - Geniohyoid
 - Digastric
- The Longitudinal Muscles of the Pharynx
 - Stylopharyngeus
 - Salpingopharyngeus
 - Palatopharyngeus

■ Depressors of the Larynx

- The Infrahyoid Muscles
 - Sternohyoid
 - Sternothyroid
 - Omohyoid



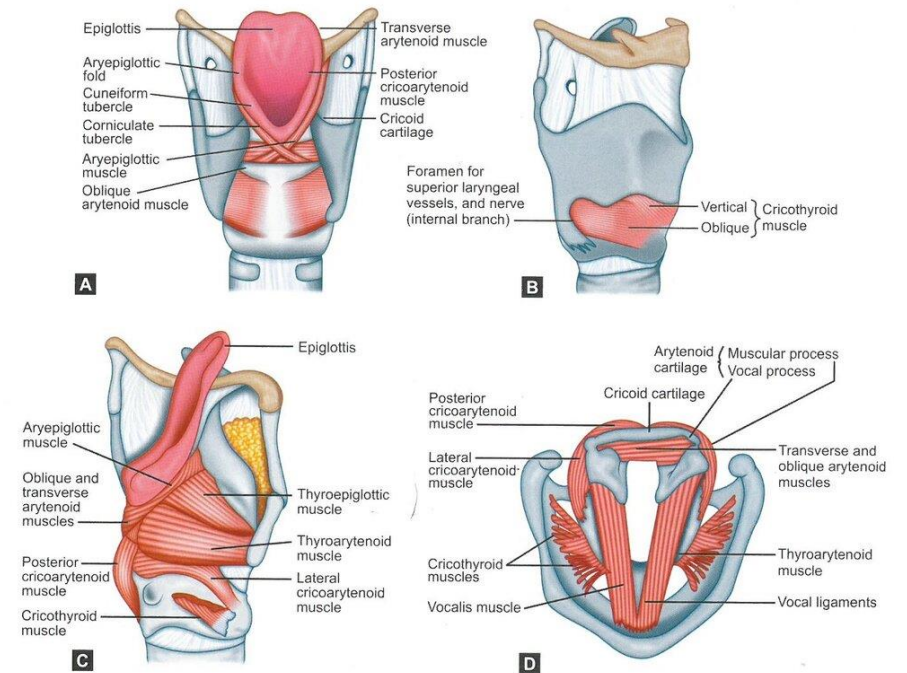
INTRINSIC MUSCLES

■ Muscles Controlling the Laryngeal Inlet

- Oblique arytenoid.
- Aryepiglottic muscle.

■ Muscles controlling the vocal cords

- Muscle decreasing the Length & Tension of Vocal Cords (relax vocal cords).
 - Thyroarytenoid (vocalis).
- Muscle increasing the Length & Tension of Vocal Cords.
 - Cricothyroid.
 - NB. It is the only intrinsic muscle which found outside the larynx.
- Adductors (close rima glottis)
 - Lateral cricoarytenoid.
 - Transverse arytenoid.
- Abductor (open rima glottis)
 - Posterior cricoarytenoid.



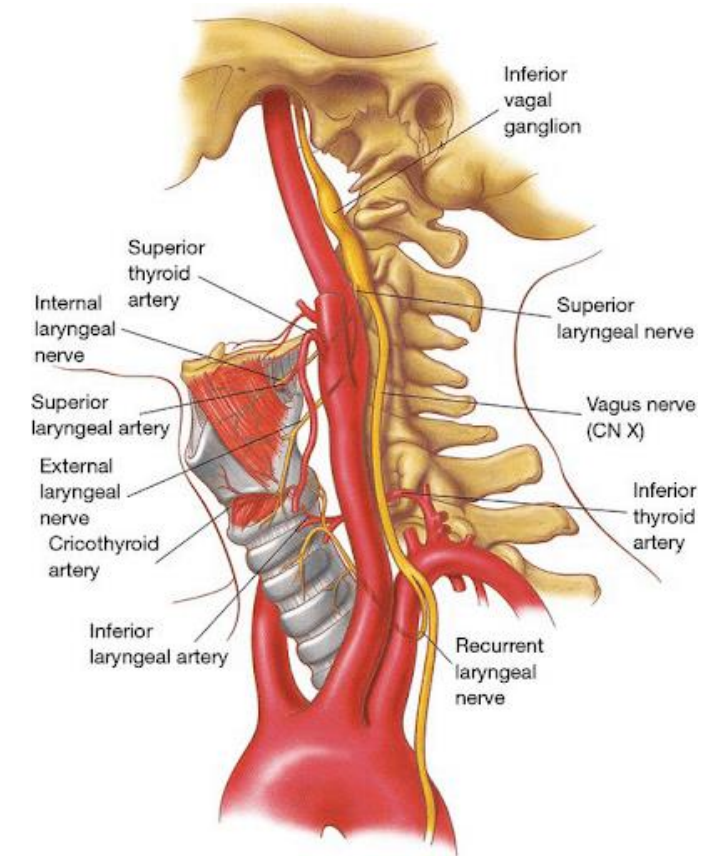
BLOOD SUPPLY

■ ARTERIES

- Superior Laryngeal Artery
 - branch of superior thyroid artery
- Inferior Laryngeal Artery
 - branch of inferior thyroid artery

■ VEINS

- The superior and inferior laryngeal veins drain the larynx and share the same course as the arteries.
- Superior Laryngeal Vein
 - drain into the superior thyroid veins, which empty into the internal jugular veins.
- Inferior Laryngeal Vein
 - drain into the inferior thyroid veins, which empty into the left brachiocephalic vein.



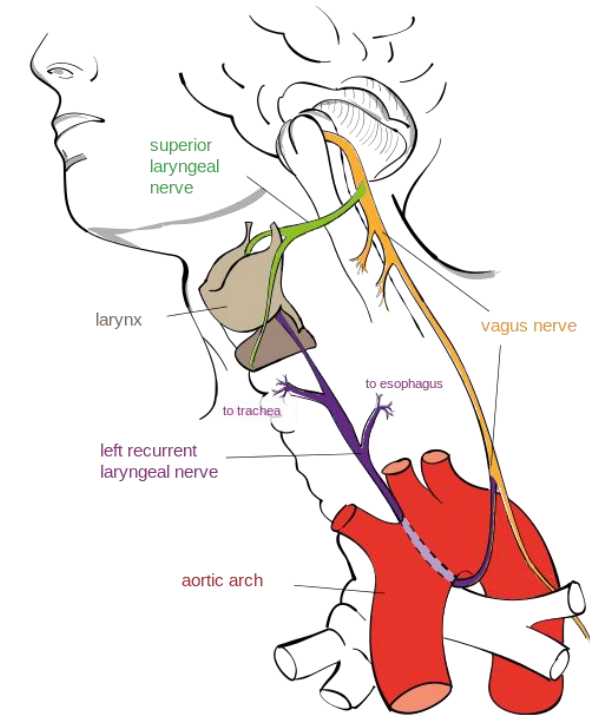
INNERVATION

■ Sensory

- Above the vocal cords: Internal laryngeal nerve, branch of the superior laryngeal of the vagus nerve.
- Below the vocal cords: Recurrent laryngeal nerve, of the vagus nerve.

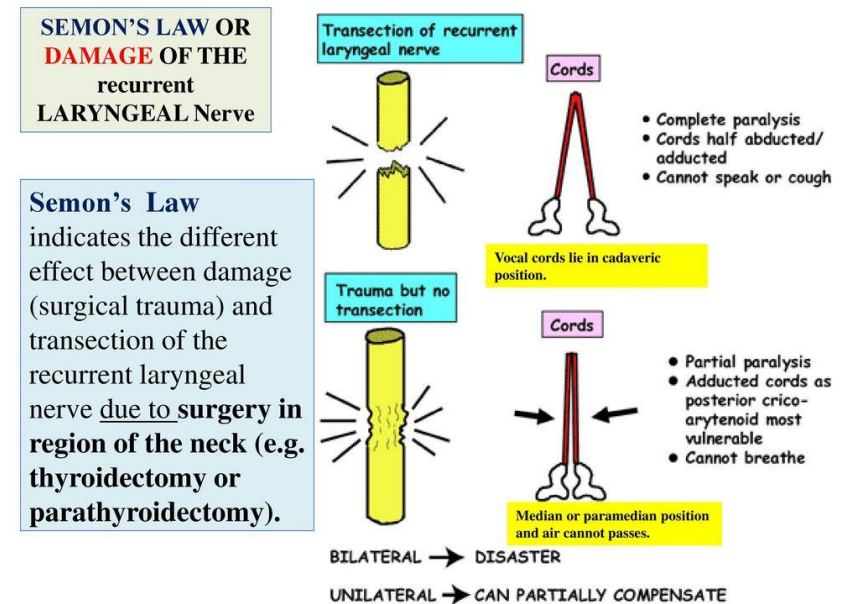
■ Motor

- All intrinsic muscles, are supplied by the recurrent laryngeal nerve except the cricothyroid.
- The cricothyroid is supplied by the external laryngeal nerve of superior laryngeal of vagus.



SEMON'S LAW

- It is the damage of the recurrent laryngeal Nerve.
- Semon's Law indicates the different effect between damage (surgical trauma) and transection of the recurrent laryngeal nerve due to surgery in region of the neck (e.g., thyroidectomy or parathyroidectomy).
 - **N.B:** The nerve fibers supplying the abductors of the vocal folds lie in the periphery of the recurrent laryngeal nerve and any progressive lesion involves these fibers first before involving the deeper fibers that supply the adductors.

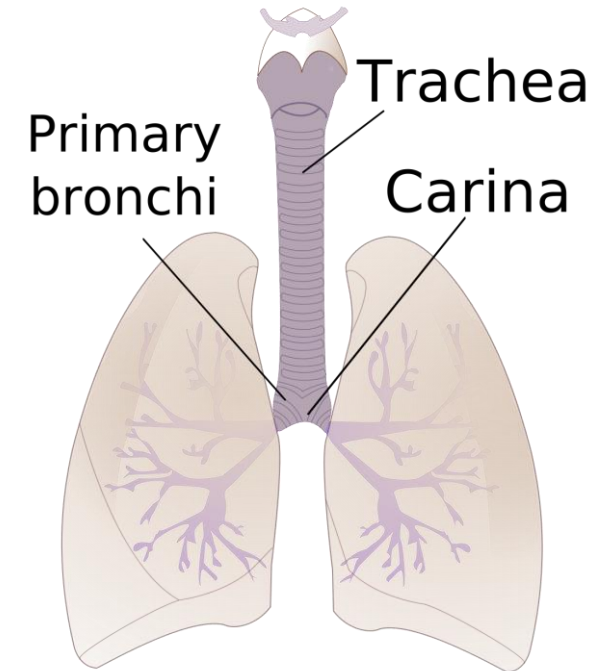




Trachea

INTRODUCTION

- The windpipe.
- Mobile, fibrocartilaginous tube, 5 inches long, 1 inch in diameter.
- It begins in the neck below the cricoid cartilage of the larynx (at lower border of cricoid cartilage at (C6).
- It ends in the thorax at the level of sternal angle (lower border of T4), by dividing into right and left principal (main, primary) bronchi.
- The ridge at the bifurcation from inside is called carina.
- It is the most sensitive part of the respiratory tract and is associated with the cough reflex.



RELATIONS

■ Anterior

- Sternum.
- Thymus, (remains of thymus gland).
- Left brachiocephalic vein.
- Arch of aorta.
- Origin of:
 - Brachiocephalic artery.
 - left common carotid artery.

■ Posterior

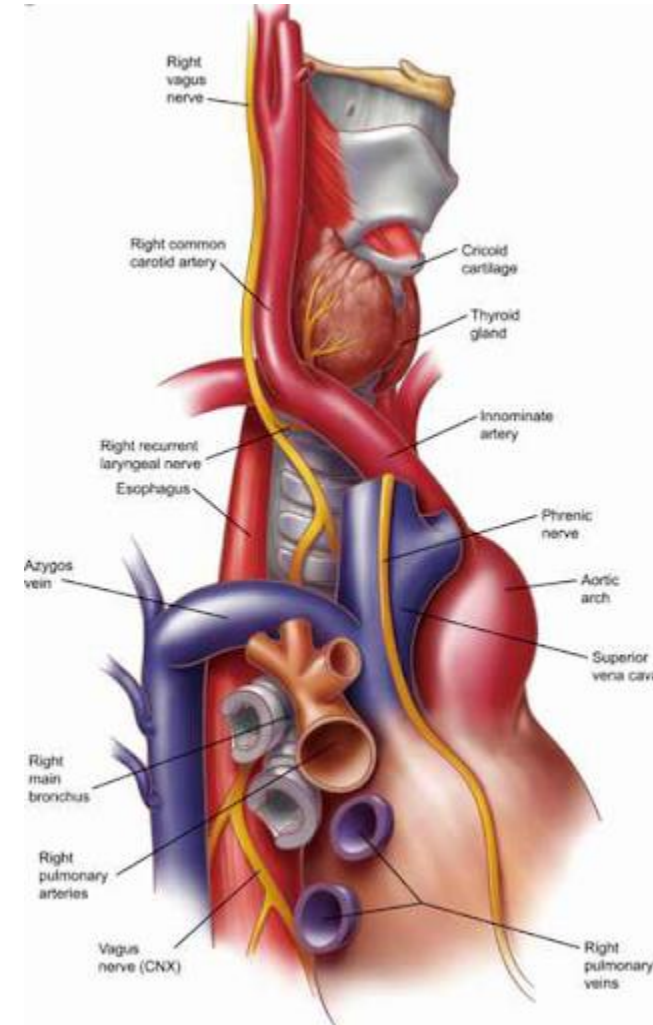
- Esophagus.
- Left recurrent laryngeal nerve.

■ Left side

- Arch of aorta.
- Left common carotid artery.
- left subclavian artery.
- Left vagus nerve.
- Left phrenic nerve.
- Pleura.

■ Right side

- Azygos vein
- Right vagus nerve.
- Pleura



BLOOD SUPPLY

■ Arteries

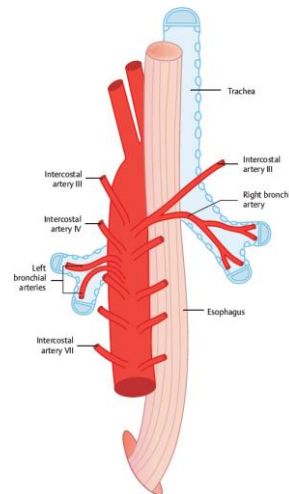
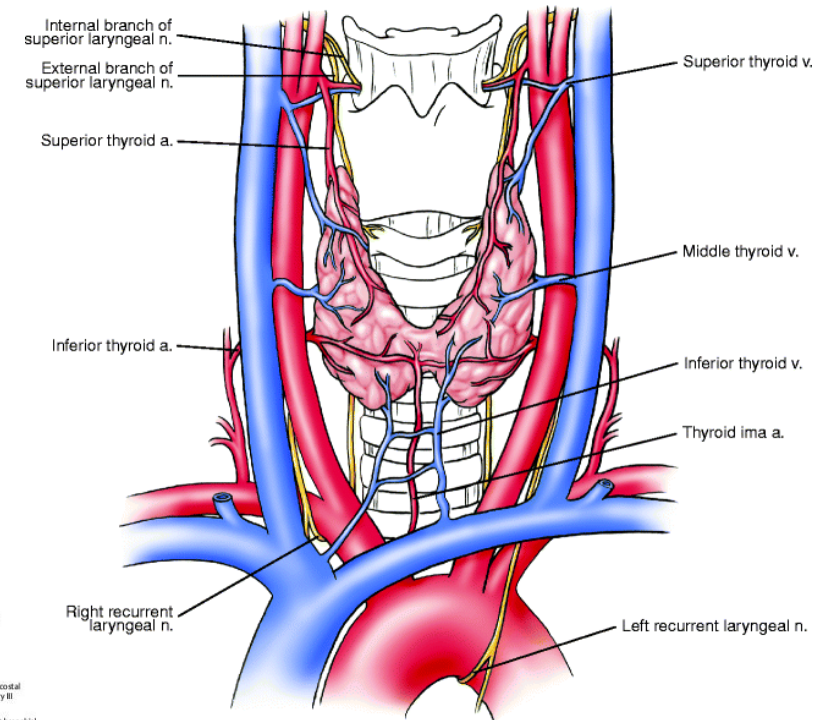
- Branches from the inferior thyroid and bronchial arteries (from descending thoracic aorta)

■ Veins

- Drain to inferior thyroid veins.

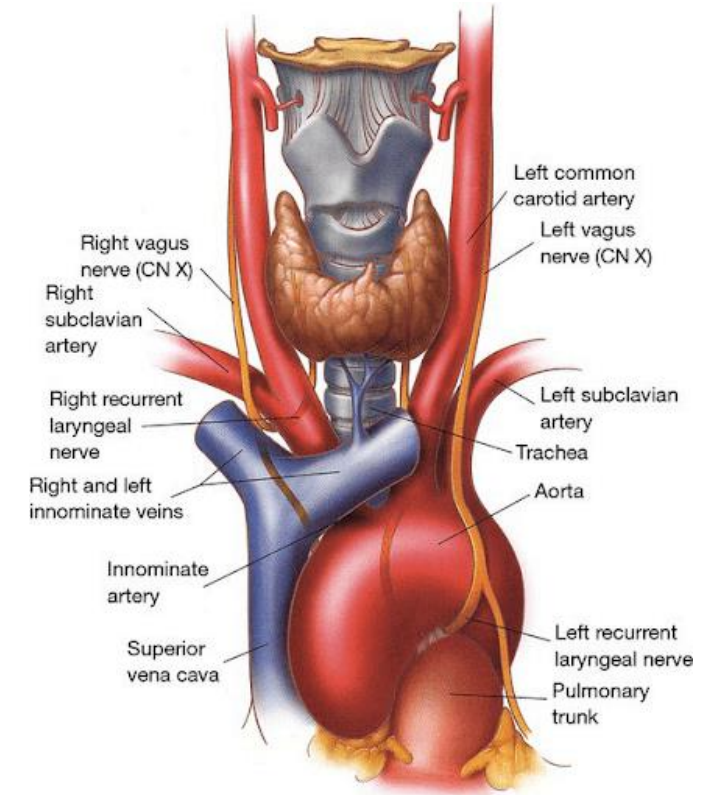
■ Lymphatic Drainage

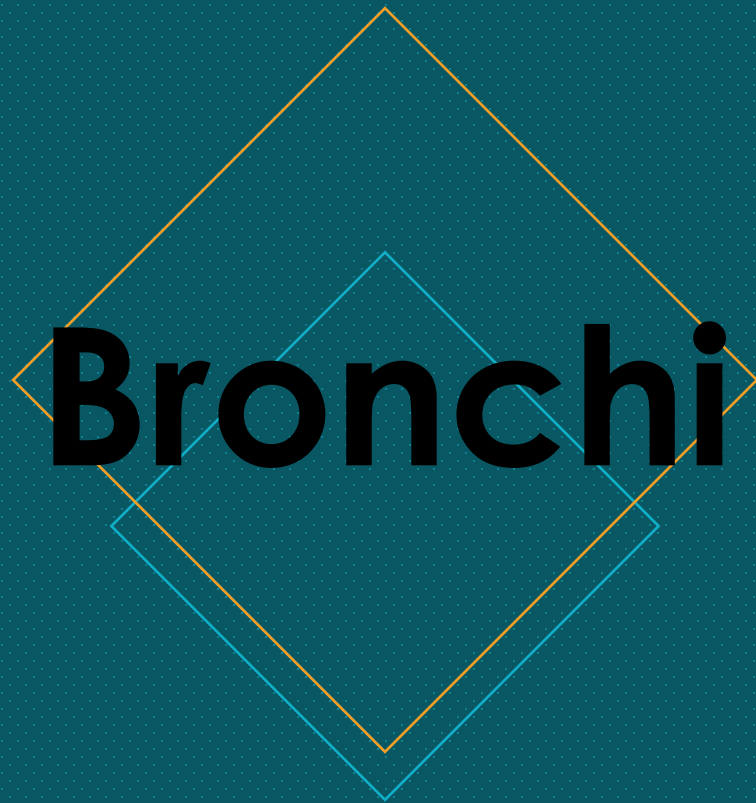
- Into the pretracheal and paratracheal lymph nodes.



INNERVATION

- Branches of the **vagus nerve** and **recurrent laryngeal nerve** give sensory fibers to supply the mucous membrane.
- Branches from the **sympathetic trunks** supply the trachealis muscle and the blood vessels.

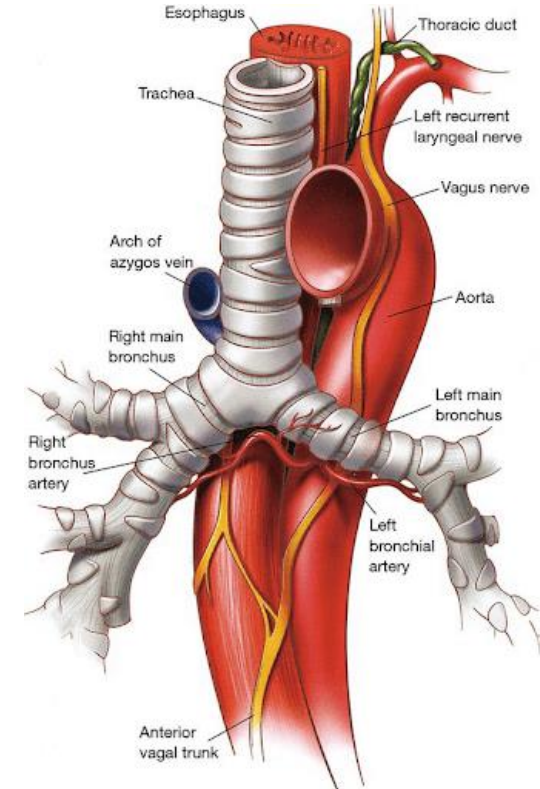




Bronchi

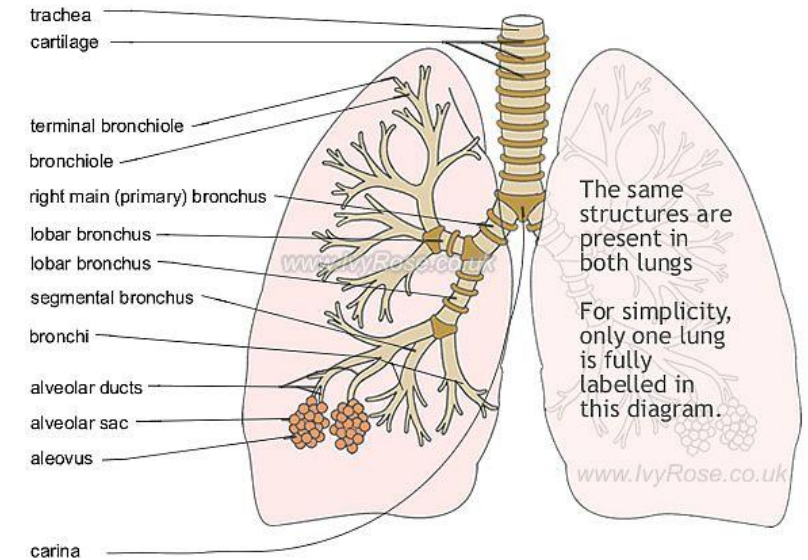
BRONCHUS

- Right Principal Bronchus
 - About one inch long.
 - Wider, shorter and more vertical than the left.
 - Gives superior lobar bronchus before entering the hilum of the right lung.
 - On entering the hilum, it divides into middle and inferior lobar bronchi.
- Left Principal Bronchus
 - About two inches long.
 - Narrower, longer and more horizontal than the right.
 - Passes to the left below the aortic arch and in front of esophagus.
 - On entering the hilum of the left lung, it divides into superior and inferior lobar bronchi.



BRONCHIAL DIVISION

- Within the lung, each bronchus divides and redivides into number of branches that can be divided into two groups:
 - Conduction zone branches
 - Primary (main) bronchi.
 - Secondary (lobar) bronchi.
 - Tertiary (segmental) bronchi. (supply the bronchopulmonary segment).
 - Smaller bronchi.
 - Bronchioles.
 - Terminal bronchioles.
 - Respiratory zone branches
 - Respiratory bronchioles.
 - Alveolar ducts.
 - Alveolar sacs.
 - Alveoli.





Questions?

alkhaleel@ksu.edu.sa