



MED437
KING SAUD UNIVERSITY



Anatomy of the Larynx, Trachea & Bronchi

Lecture 3



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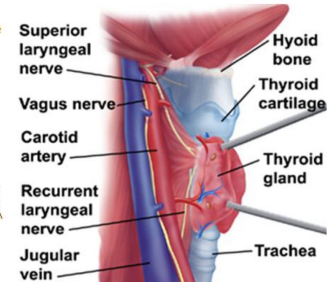
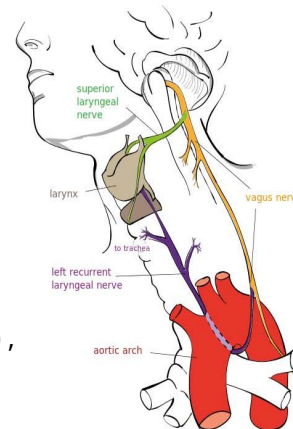
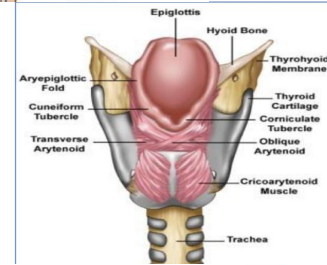
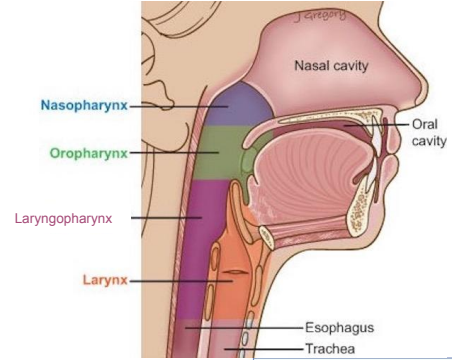
Objectives

- Describe the Extent, structure and functions of the larynx.
- Describe the Extent, structure and functions of the trachea.
- Describe the bronchi and branching of the bronchial tree.
- Describe the functions of bronchi and their divisions.

- Text in **BLUE** was found only in the boys' slides
- Text in **PINK** was found only in the girls' slides
- **Text in RED is considered important**
- Text in **GREY** is considered extra notes

Larynx

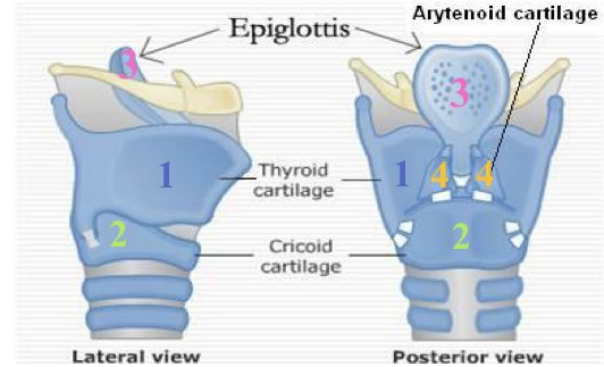
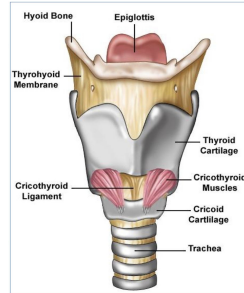
- The larynx is the part of the respiratory tract which contains the **vocal cord**
- In adult it is **2 inch long tube**
- It opens above into the laryngeal part of the **pharynx** (**Laryngopharynx**)
- Below, it is continuous with **trachea**
- **The larynx has function in:**
 1. respiration [breathing] "continues with trachea"
 2. Phonation [voice production]
 3. Deglutition [swallowing]
- The larynx is related to major **critical** structures in the neck
 - **Arteries:** **carotid arteries** (common , external and internal)
thyroid arteries (superior and inferior thyroid arteries)
 - **Veins:** **jugular veins** (external and internal)
 - **Nerves:** **laryngeal nerves** (superior laryngeal and recurrent laryngeal) , **vagus nerve**



Larynx

The larynx consist of **four** basic components:

1. Cartilaginous skeleton
2. Membranes and ligaments
3. Mucosal lining
4. Muscles (intrinsic and extrinsic)



1. Cartilaginous skeleton

The cartilaginous skeleton composed of -9 cartilages- :

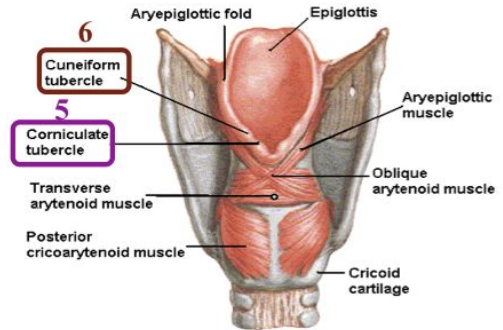
3 single:

1. Thyroid (adam's apple)
2. cricoid
3. Epiglottis (leaf like)

3 pairs:

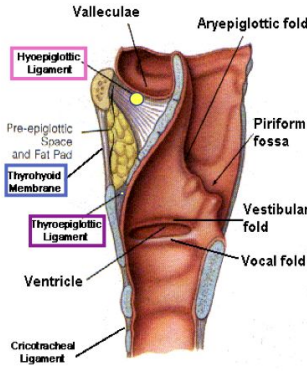
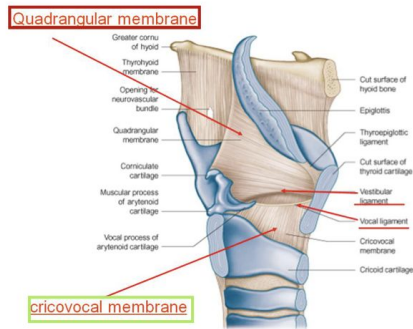
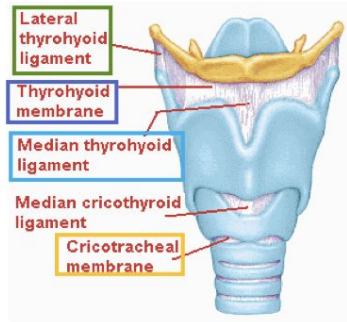
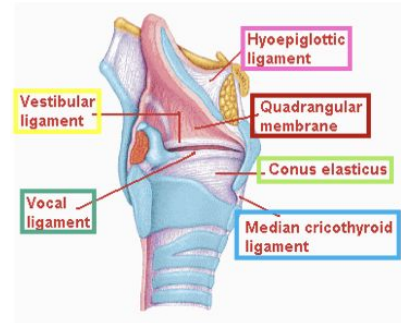
4. Arytenoid
5. Corniculate
6. Cuneiform*

- All the cartilages are **Hyaline** EXCEPT the **Epiglottis** which is **Elastic** cartilage.
- The cartilages are :
 1. Connected by joints, membranes and ligaments
 2. Moved by muscles



*The Cuneiform and the Corniculate lies in the Aryepiglottic fold.

Larynx



2. Membrane and ligaments (6 main structures)

- **thyroid membrane** : the thyroid membrane is thickened in the median plane to form median thyrohyoid ligament and on both sides to form lateral thyrohyoid ligaments
- **Cricothyroid membrane**
- **Cricotracheal membrane**
- **Hyoepiglottic ligament**
- **Thyroepiglottic ligament**

- **Quadrangular membrane or (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**) - **ممکن یچی سوال** which one of the following forms the vestibular fold? -

- **cricothyroid membrane (conus elasticus)**

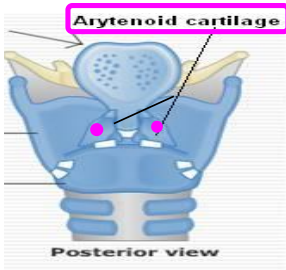
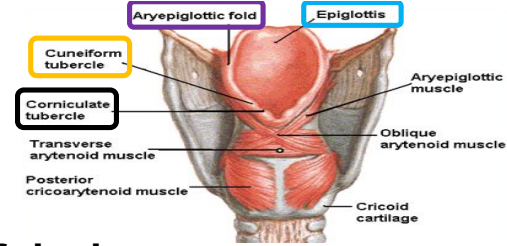
- Its lower margin is attached to the upper border of cricoid cartilage.
- Upper free margin forms vocal ligament which forms (**true vocal cord**) which one forms the vocal ligament?

The Cricothyroid membrane

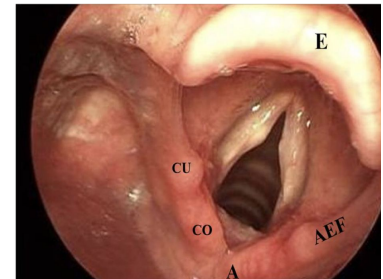
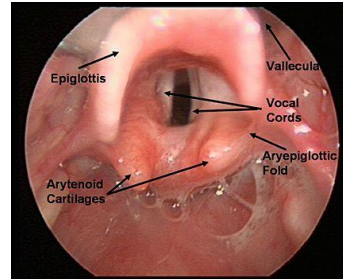
Larynx

Laryngeal inlet

- What is the laryngeal inlet? **It is the upper opening of the larynx**
- It faces **upward** and **backward** and open into the laryngeal part of the pharynx (**laryngopharynx**)
- **Bounded by:**
 - *Anteriorly* : by the upper margin of epiglottis [E]
 - *Posteriorly* and below: by arytenoid cartilage [A]
 - *Laterally*: by the Aryepiglottic folds [AEF]

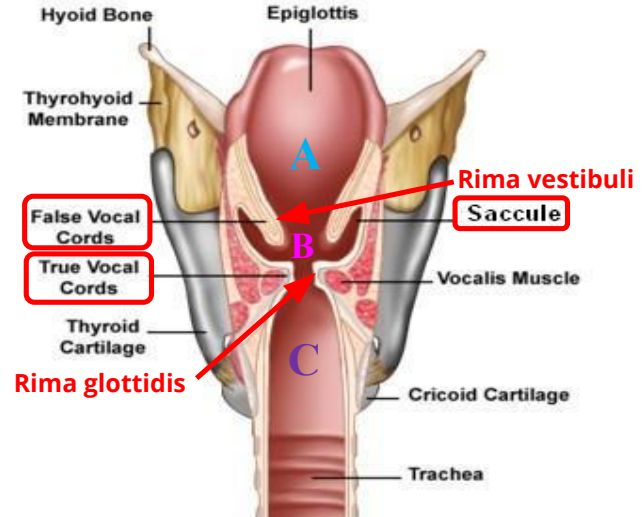


Contains : coneiform tubercle and Corniculate tubercle



Laryngeal Cavity

- Extends from **laryngeal inlet** to **lower border** of the **cricoid cartilage**.
- **Narrow** in the region of the vestibular folds “false vocal cord” (**rima vestibuli**).
- **Narrowest** in the region of the vocal folds “true vocal cord” (**rima glottidis**).
- **Divided into three parts:**
 - **Supraglottic part or vestibule:** it is the part above the vestibular folds (**A**).
 - **Ventricle:** it is the part between the vestibular folds & the vocal folds (**B**), has an upward invagination called **saccul** * which is rich in goblet cells.
 - **Infraglottic part:** the part below the vocal folds (**C**).
 - * **saccul** : is a small sac, pouch, or cyst.



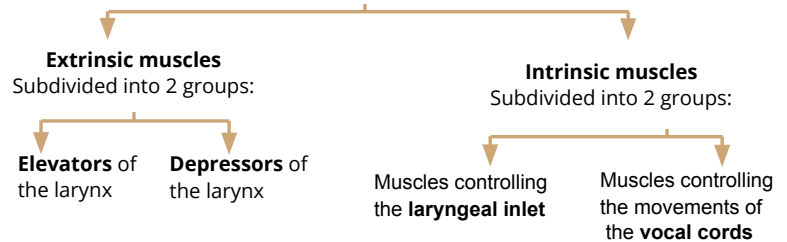
Mucous Membrane

- The **cavity** "Laryngeal 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**(voice production).
- It contains many **mucous glands**, **more numerous** in the region of the **sacculus** (for lubrication * of vocal folds).

* **lubrication:** the action of applying a substance such as oil or grease to minimize friction and allow smooth movement. " زي الشحم او الزيت يرطب الأحبال الصوتية "

Muscles

Laryngeal muscles are divided into **two groups**

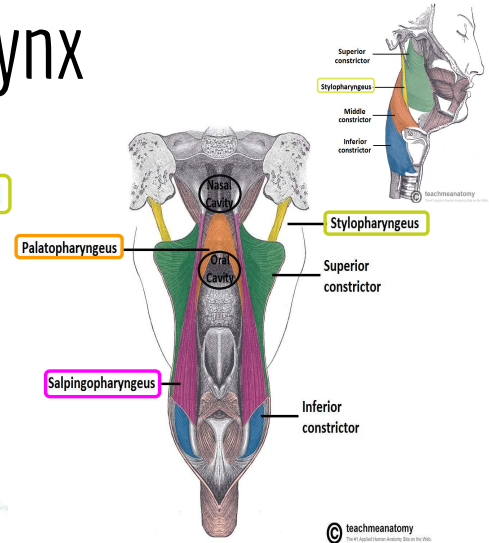
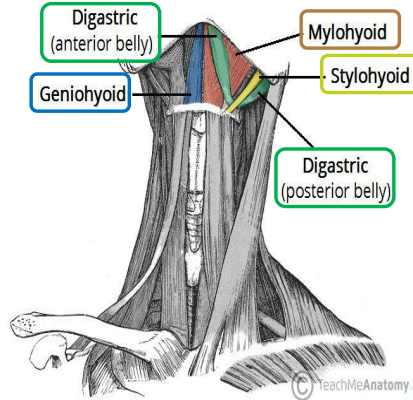


Extrinsic muscles of Larynx

Elevators of the Larynx:

A- The Suprahyoid Muscles (MSGD):

- Mylohyoid.
- Stylohyoid.
- Geniohyoid.
- Digastric.



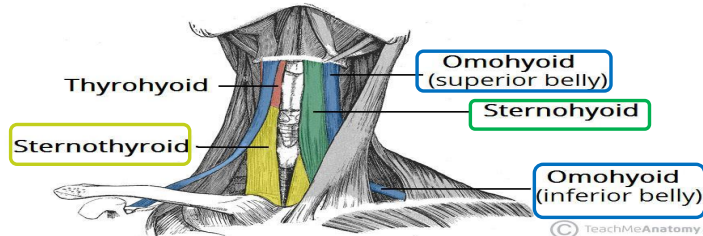
B- The Longitudinal Muscles of the Pharynx:

- Stylopharyngeus.
- Salpingopharyngeus.
- Palatopharyngeus.

Depressors of the Larynx:

The Infrahyoid Muscles:

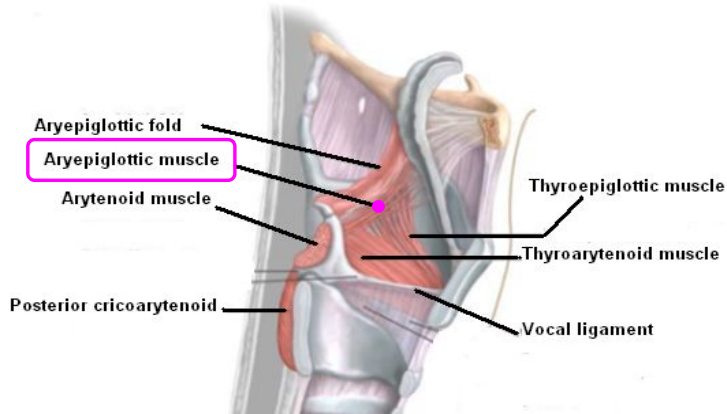
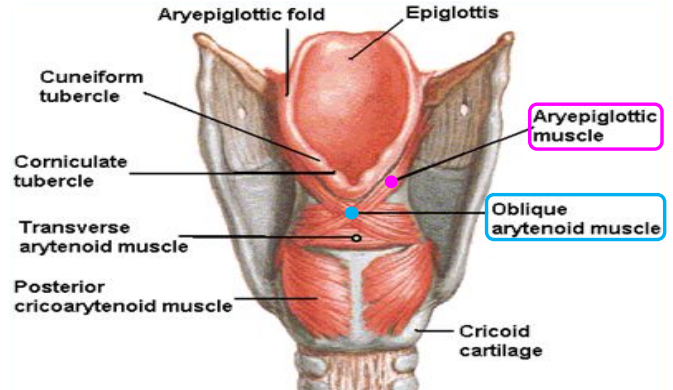
- Sternohyoid.
- Sternothyroid.
- Omohyoid.



Intrinsic muscles of Larynx

Muscles Controlling the Laryngeal Inlet:

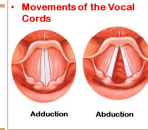
- Oblique arytenoid muscle.
- Aryepiglottic muscle.*
 - * the continuation of Aryepiglottic muscle will give us the Oblique arytenoid muscle.



Intrinsic muscles of Larynx : Muscles controlling the vocal cords

Length And Tension

Adduction And Abduction



Muscle

Thyroarytenoid (vocalis)

Cricothyroid

Lateral cricoarytenoid

Transverse arytenoid.

Posterior cricoarytenoid

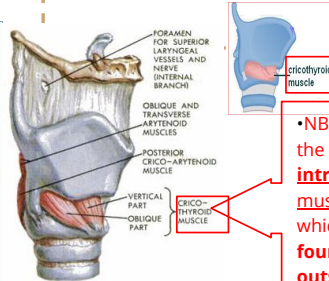
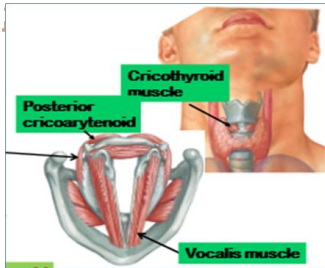
Action

Decrease the Length & Tension of Vocal Cords (relax vocal cords).

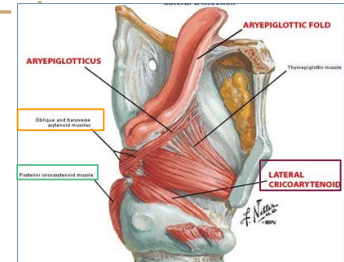
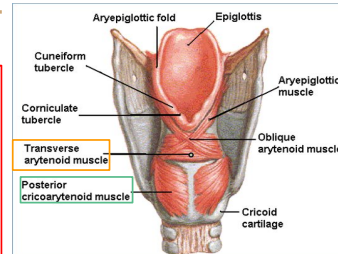
increase the Length & Tension of Vocal Cords. (تعلي الصوت)

Adductors
(close rima glottis)

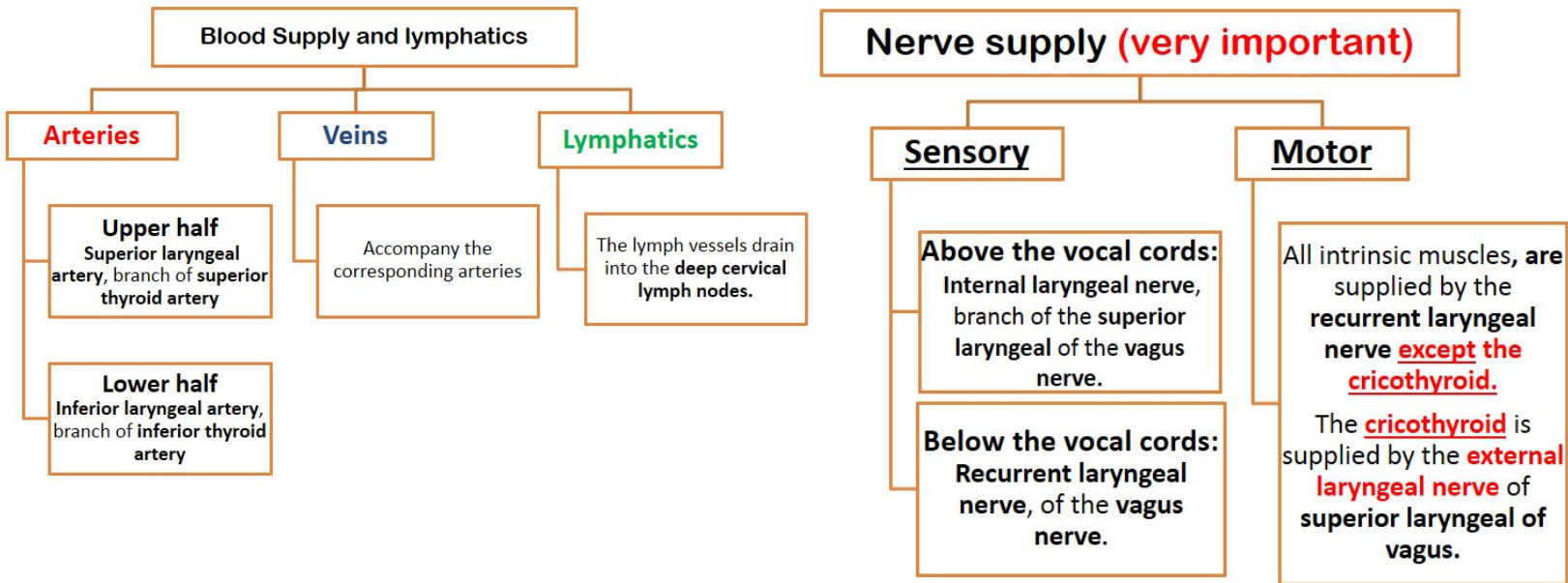
Abductor
(open rima glottis)
(in case this muscle did not work we can't breath.so, it is the most valuable muscle in the body)



•NB. It is the **only intrinsic muscle** which found outside the larynx.



Larynx Blood Supply and Nerve Supply

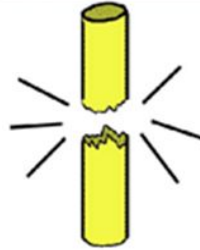


SEMON'S LAW

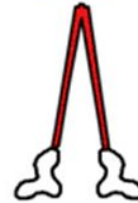
SEMON'S LAW OR **DAMAGE** OF THE recurrent LARYNGEAL Nerve

Semon's Law indicates the different effect between **damage** (surgical trauma) and **transection** (قطع) of the recurrent laryngeal nerve due to surgery in region of the neck (e.g. thyroidectomy or parathyroidectomy).

Transection of recurrent laryngeal nerve



Cords



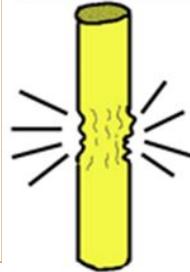
Midway, half adducted and half abducted

- Complete paralysis
- Cords half abducted/adducted
- Cannot speak or cough

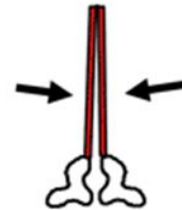
But can breath

Vocal cords lie in Cadaveric position

Trauma but no transection



Cords



- Partial paralysis
- Adducted cords as posterior crico-arytenoid most vulnerable
- Cannot breathe

BILATERAL → DISASTER

Damage occurs to both sides of the nerve

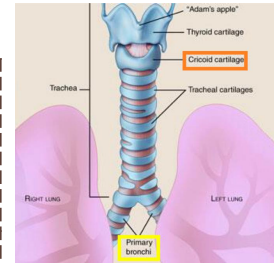
UNILATERAL → CAN PARTIALLY COMPENSATE

Damage occurs only to one side one side of the nerve

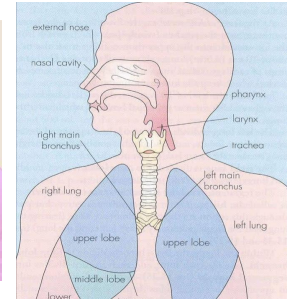
Trachea (windpipe)

- Mobile, fibrocartilaginous tube.
- **5 inches** long, 1 inch in diameter.

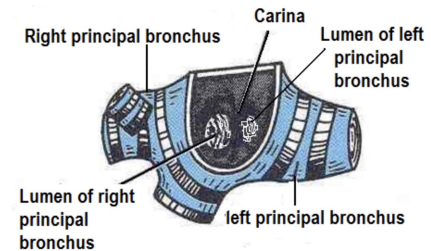
Begins	In the <u>neck</u> below the cricoid cartilage of the larynx (at lower border of cricoid cartilage at (C6).
Ends	In the <u>thorax</u> at the level of sternal angle (lower border of T4), by dividing into <u>right and left principal (main, primary) bronchi</u> .



Extra picture

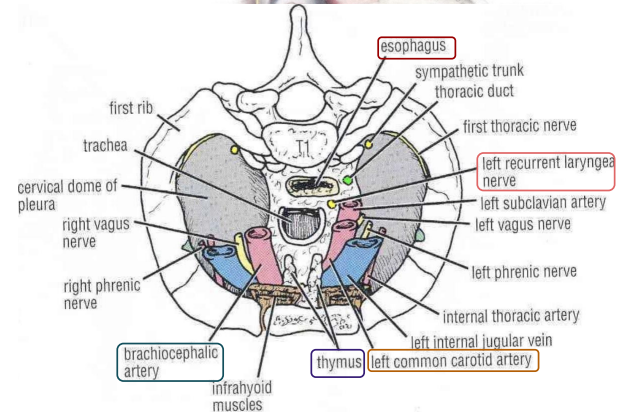
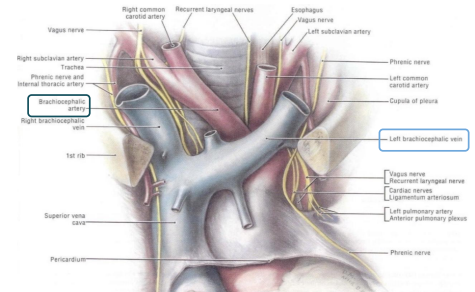


- The ridge at the bifurcation **زاوية الانقسام** from inside is called **carina**.
- It is the most sensitive part of the respiratory tract and is associated with the **cough reflex**.



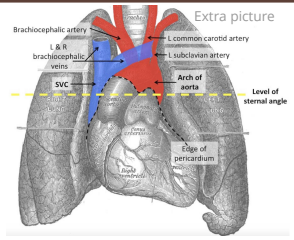
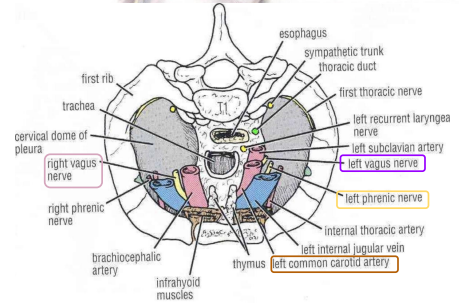
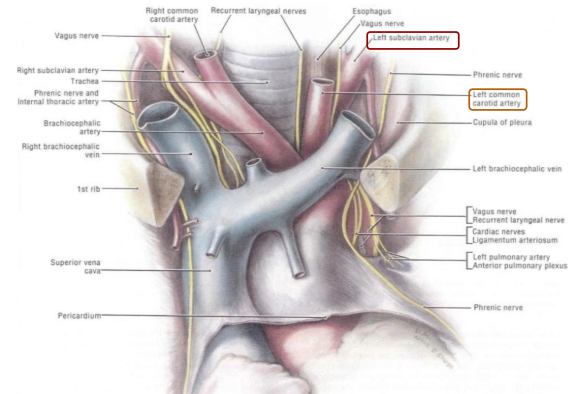
Relations in the Superior Mediastinum

Anterior	Posterior
<ul style="list-style-type: none"> • Sternum. • Thymus, (remains of thymus gland). • Left brachiocephalic vein. • Arch of aorta. <p>Origin of:</p> <ul style="list-style-type: none"> • Brachiocephalic artery. • left common carotid artery. 	<ul style="list-style-type: none"> • Esophagus. • Left recurrent laryngeal nerve.



Relations in the Superior Mediastinum

Left side	Right side
<ul style="list-style-type: none"> ● Arch of aorta. ● Left common carotid artery. ● left subclavian artery. ● Left vagus nerve. ● Left phrenic nerve. ● Pleura. 	<ul style="list-style-type: none"> ● Azygos vein. ● Right vagus nerve. ● Pleura.



Trachea

Blood supply:

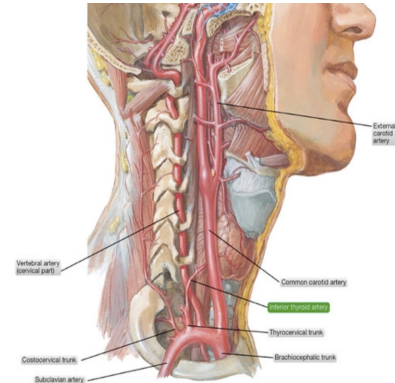
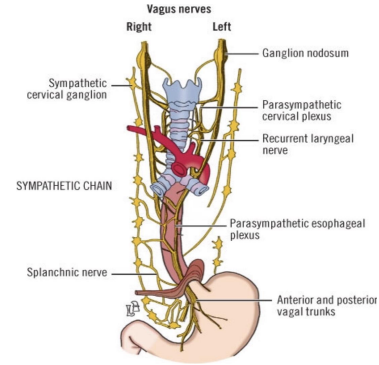
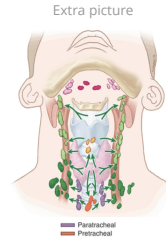
- **Arteries:** Branches from the inferior thyroid and bronchial arteries (from descending thoracic aorta)
- **Veins:** Drain to inferior thyroid veins.

Lymphatic Drainage:

Into the pretracheal and paratracheal lymph nodes.

Nerve supply:

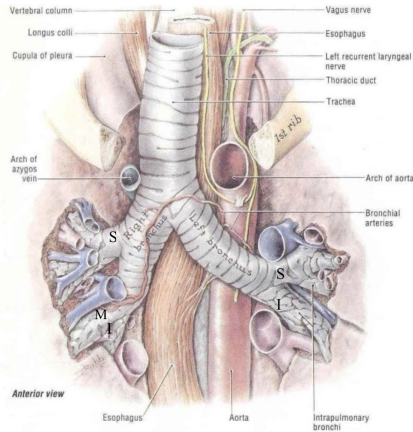
- ❖ Branches of the vagus nerve and recurrent laryngeal nerve give sensory fibers to supply the **mucous membrane**.
- ❖ Branches from the sympathetic trunks supply the **trachealis muscle** and the **blood vessels**.



Right and Left Principal 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.



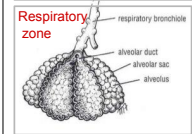
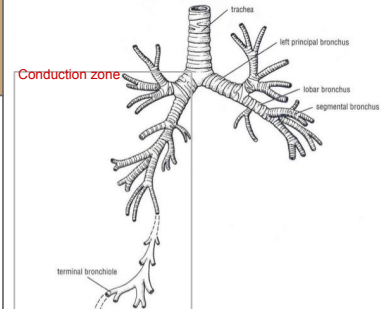
Left Principal Bronchus:

- ❖ 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.

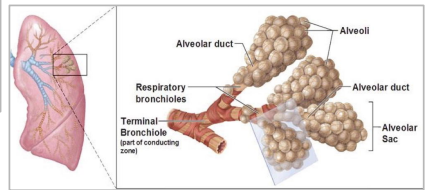
Bronchial Divisions

Within the lung, each bronchus divides and redivides into number of branches that can be divided into two groups:

Conduction zone branches	Respiratory zone branches
<ol style="list-style-type: none"> 1. Primary (main) bronchi. 2. Secondary (lobar) bronchi. 3. Tertiary (segmental) bronchi. (supply the bronchopulmonary segment). 4. Smaller bronchi. 5. Bronchioles. 6. Terminal bronchioles. 	<ol style="list-style-type: none"> 1. <u>Respiratory</u> bronchioles. 2. Alveolar ducts. 3. Alveolar sacs. 4. Alveoli.



Structures of the respiratory zone



MCQs

1)The larynx is continuous with ?

A-trachea

B- pharynx

C- esophagus

2)functions of larynx

A-respiration

B-phonation

C-deglutition

D-all above

3)one of the major veins in the neck?

A-jugular vein

B-carotid vein

C-thyroid vein

4)basic components of the larynx

A-cartilage

B- membrane and ligament

C- muscles

D- cartilage ,membrane and ligament, muscles, and mucosal lining

5) laryngeal inlet bounded anteriorly by?

A-arytenoid cartilage

B-upper margin of epiglottis

C-aryepiglottic fold

6)..... is the part between the vestibular fold and the vocal cord

A-ventricle

B-supraglottic part

C-infraglottic part

7) upward invagination which is rich in goblet cell?

A-Rima glottidis

B- saccule

C-rima vestibuli

8) depressor of the larynx?

A-sternohyoid

B-mylohyoid

C-geniohyoid

Answers

1)A

2)D

3)A

4)D

5)B

6)A

7)B

8)A

Team Members

Lamia Abdullah Alkuwaiz (Team Leader)

Rawan Mohammad Alharbi
Abeer Alabduljabbar
Afnan Abdulaziz Almustafa
Ahad Ahmed Algrain
Albandari Alshaye
AlFhadah abdullah alsaleem
Ghaida Alsanad
Layan Hassan Alwatban
Lojain Azizalrahman
Maha Barakah
Majd Khalid AlBarrak
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Mohammed Alomar
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Hassan Aloraini
Abdullah Alomar
Fahad Alfaiz
Saad Aloqile
Abdulmajeed Alwardi
Rayyan Almousa
Sultan Alfuhaid
Ali Alammari
Fahad alshughhaithry

Fayez Ghiyath Aldarsouni
Mohammed Alquwayfili
Saleh Almoaiqel
Abdullah Almeaither
Abduljabbar Al-yamane
Sultan Al-nasser
Majed Aljohani
Zeyad
Al-khenaizan
Mohammed Nouri
Abdulaziz Al-drgam
Fahad Aldhowaihy
Omar alyabis
Akram Alfandi
Abdulhaziz Alabdulkareem