

Doctor.021

no. 5

# RS ANATOMY



**Writer:**

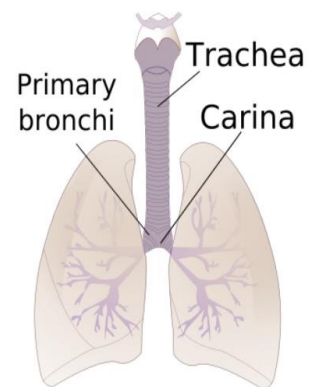
**Corrector:**

**Doctor:**



# Trachea

- The trachea is a flexible tube that extends from vertebral level C6 (or the lower border of cricoid cartilage) in the lower neck to vertebral level T4/5
- it bifurcates into a right and a left main bronchus (carina) at the level of sternal angle (T4)
- The trachea is held open by 'C-shaped' cartilage rings (16-20) embedded in its wall-
- the open part of the 'C' facing the posterior wall of the trachea is composed mainly of smooth muscle (trachealis) and connective tissue.
- In adults the trachea is about 4½ in. (11.25 cm) long and 1 in. (the doctor said 5½ in (13cm)), (2.5 cm) in diameter (the diameter of your index)
- The trachea widens and lengthens slightly with each inspiration, returning to its resting size with each expiration.



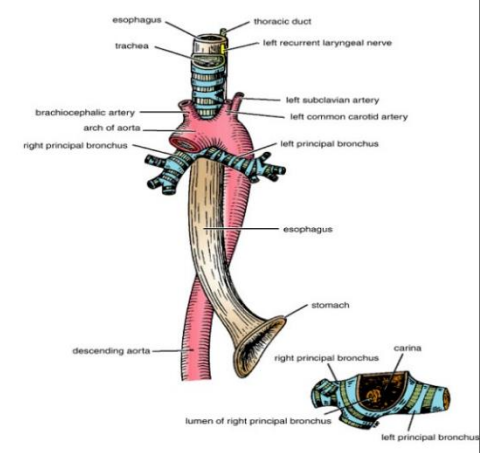
## Relations of Trachea

Posterior to the trachea we have the esophagus between them the left recurrent laryngeal nerve which is longer than the right as we said before.

This pic shows the relation in the superior mediastinum.

### ➤ Anteriorly

- Aortic arch
- Thymus
- thyroid (the isthmus (that connects the two lobes lies anteriorly to 2<sup>nd</sup>,3<sup>th</sup> ,4<sup>th</sup> tracheal rings).
- Origin of brachiocephalic artery
- Manubrium sterni



➤ **Left**

- **Arch of aorta**
- **Lt. subclavian art.**
- **LT. common carotid art.**
- **Lt. Phrenic n.** (anterior to the hilum, also gives motor supply to diaphragm)
- **Lt. Vagus n.** (posterior to the hilum of the lung)
- **Lt. main bronchus** (narrow, long & horizontal)

➤ **Right**

- **Azygous arch** (the venous drainage on the right side that ends in SVC).
- **Brachiocephalic artery**
- **Rt. Vagus**
- **Rt. Phrenic**
- **Rt. main bronchus** (which is more vertical, dilated and shorter)

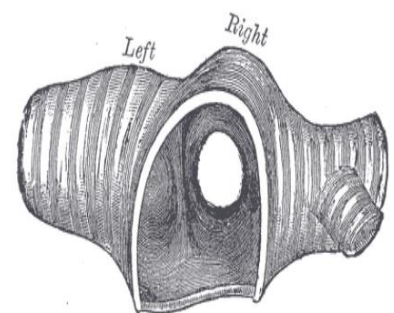
➤ **Post.**

- **Esophagus**
- **Thoracic duct** (in the middle of the thorax to be exact)
- **left recurrent laryngeal nerve**

• **carina is a cartilaginous ridge within the trachea that runs anteroposteriorly between the two primary bronchi at the site of the tracheal bifurcation (T4-T5).**

• **The mucous membrane of the carina is the most sensitive area of the trachea and larynx for triggering a cough reflex.** (that's why when doing bronchoscope, the doctor tries to avoid touching the carina to avoid triggering a cough reflex)

• **In deep inspiration it descends to the level of 6th thoracic vertebra**

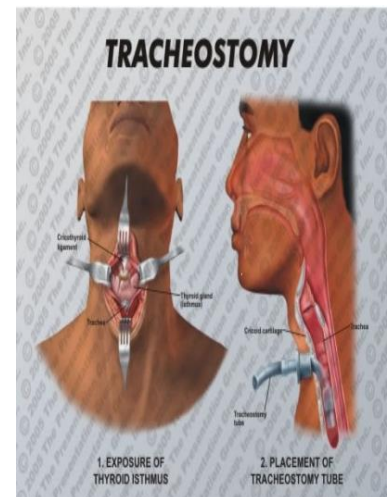


# Tracheotomy and intubations

any obstruction in the respiratory tract especially above the vocal cords the solution is tracheotomy.

In emergencies the cut is in the suprasternal region.

- **Used to reestablish airflow past a tracheal obstruction.**
- **If the obstruction is superior to the larynx a tracheotomy may be performed**
- **A longitudinal incision below the cricoid cartilage** (for example in the cricotracheal membrane)
- **The patient can the breath through a metal or plastic tube.**
- **in intubation the tube is inserted through the mouth or nose and push aside any flexible obstruction**



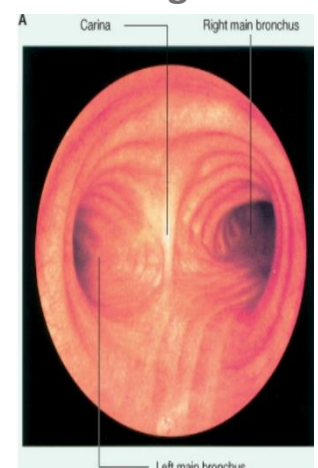
Oral cavity → inlet of larynx → between the 2 vocal cords. It's used in most surgeries to prevent suffocation.

- **Any mucous clogging can be suctioned through the tube**

The blood vessels that can be injured in the suprasternal region: anterior jugular vein and the arch, inferior thyroid vein, thyroidemia art. But as we said the bleeding isn't important compared to the low oxygen.

## Bronchi

- Each main bronchus enters the root of a lung and passes through the hilum into the lung itself.
- **The right main bronchus is wider and takes a more vertical course and is about 1 in. (2.5 cm)**
- **principal bronchus gives off the superior lobar bronchus. On entering the hilum, it divides into a middle and an inferior lobar bronchus. (the doctor only mentioned that on the right side it gives 3 lobar bronchi & on the left side it gives 2)**



- the left main bronchus is narrower, longer, and more horizontal than the right and is about 2 in. (5 cm) long
- passes to the left below the arch of the aorta and in front of the esophagus
- the principal bronchus divides into a superior and an inferior lobar bronchus.
- Therefore, inhaled foreign bodies tend to lodge more frequently on the right side than on the left.

## Bronchial tree

- The main bronchus divides within the lung into lobar bronchi (secondary bronchi (interpulmonary)).
- each of which supplies a lobe.
- On the right side, the lobar bronchus to the superior lobe originates within the root of the lung.

on the right side it gives hyparterial (goes to inferior & middle lobes) & epiarterial (goes to the superior lobe)

- The lobar bronchi further divide into segmental bronchi (tertiary bronchi 10 on the right and 10 on the left), which supply bronchopulmonary segment.

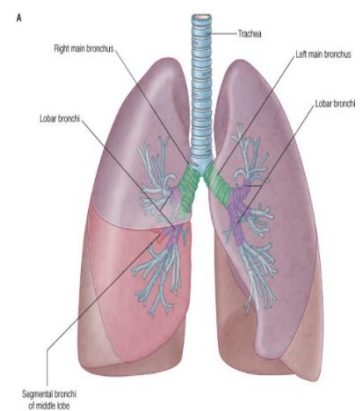
In the right lung:

1-The upper lobe has three bronchopulmonary segments: apical, anterior, and posterior.

2-The middle lobe has two segments: medial and lateral.

3-The lower lobe (the basal) has five segments: apicobasal (the most superior & lies posteriorly), medial, lateral, anterior, and posterior.

So, after understanding the anatomy we can now say that if someone was lying down and something got into his airway it will most likely



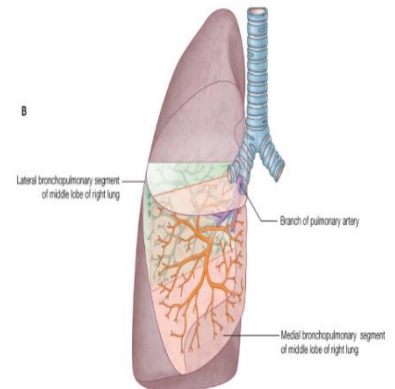


go to apicobasal segment of the lower lobe in contrast of in a standing position that will go to the posterior segment of the right lower lobe.

- **bronchopulmonary segment further divides into terminal bronchioles & these into respiratory bronchioles which end in the pulmonary unit.**

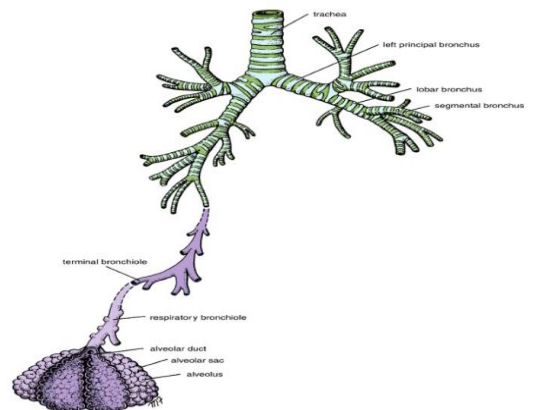
- **Pulmonary unit consist of alveolar ducts, atria air sacs pulmonary alveoli.**

- **The walls of the bronchi are held open by discontinuous elongated plates of cartilage, but these are not present in bronchiole.**



the gas exchange occurs in the alveoli but how does it happen?

The respiration has a center in the medulla oblongata called the respiratory center, and from there the phrenic nerve origin (C3, C4, C5) as we said it gives motor innervation to the cupula of diaphragm.



## The diaphragm

consists of:

1. Right cupula: that lies under the right pleura and beneath it there is the liver.
2. left cupula: that lies under the left pleura and beneath it there is the stomach & spleen.

When it is stimulated it descends downward increasing the intraabdominal pressure and decreases intrathoracic pressure that becomes negative, that lead to air suction.

This mechanism is active (due to the diaphragm contraction) but the deflation (expiration) is passive.

- ❖ The intercostal muscles have a small role in inspiration-expiratory on the anterior-posterior & transvers axis of the thorax.

### **Origin & insertion:**

It originates peripherally from:

1. the sternum anteriorly
2. inferior border of costal cartilages laterally
3. lumbar vertebrae posteriorly

And it inserts in the central tendon. Which has an opening called the IVC orifice.

### **Orifices of the diaphragm**

➤ We have 3 main orifices:

1. IVC orifice (T8)

Passes through it:

- i. IVC
- ii. branches of phrenic nerve
- iii. lymphatic duct.

2. Esophageal orifice (T10)

Passes through it:

- i. Esophagus
- ii. Ant. & post. Vagal trunks
- iii. Small esophageal arteries

3. Aortic orifice (T12)

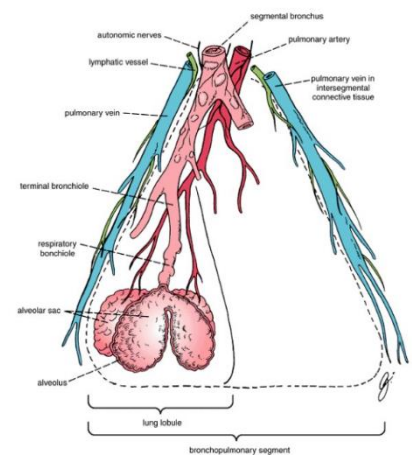
Passes through it:

- i. Aorta
- ii. Azygos vein
- iii. Thoracic duct & cisterna chyli

- And 3 minor orifices:
  1. Greater & lesser & least splanchnic nerves (go to celiac ganglia)
  2. Sympathetic chain (below the arcuate ligament of diaphragm)
  3. Superior epigastric branch of the internal thoracic.
  4. Phrenic nerve.

## Bronchopulmonary segments

- A bronchopulmonary segment is the area of lung supplied by a segmental bronchus and its accompanying pulmonary artery branch
- It is a subdivision of a lung lobe.
- It is **pyramid shaped, with its apex toward the lung root.**
- It is **surrounded by connective tissue.** (on the lateral sides and on the base)
- It has a **segmental bronchus, a segmental artery, lymph vessels, and autonomic nerves.**
- The **segmental vein lies in the connective tissue between adjacent bronchopulmonary segments.**
- **Because it is a structural unit, a diseased segment can be removed surgically** (They are important clinically because now they only look to remove these segments in cases like cancer.)
- ❖ Also, outside the segment there is 2 pulmonary veins, during resection the surgeon looks for the pulmonary veins in the connective tissue and resect the segments in between thus the veins are an important landmark.





❖ Rt. Lung 10 segments

➤ Upper lobe

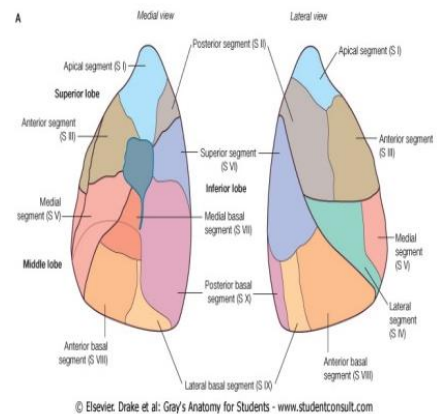
- Apical
- posterior
- Ant.

➤ Middle lobe

- Medial
- Lateral

➤ Basal lobe

- Apical (apicobasal)
- Ant.
- Med.
- Lat.
- Post.



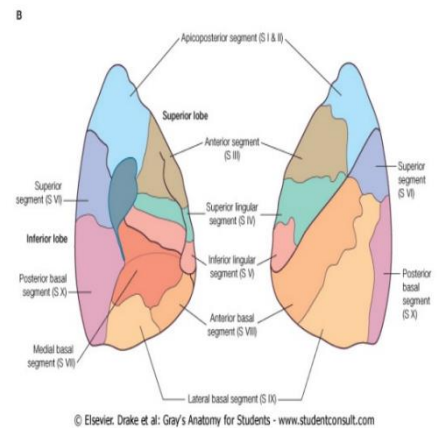
❖ Lt. lung 10 segments

➤ Upper lobe

- Apical.
- Posterior.
- Ant.
- sup. Lingual
- inf. lingual

➤ Basal lobe

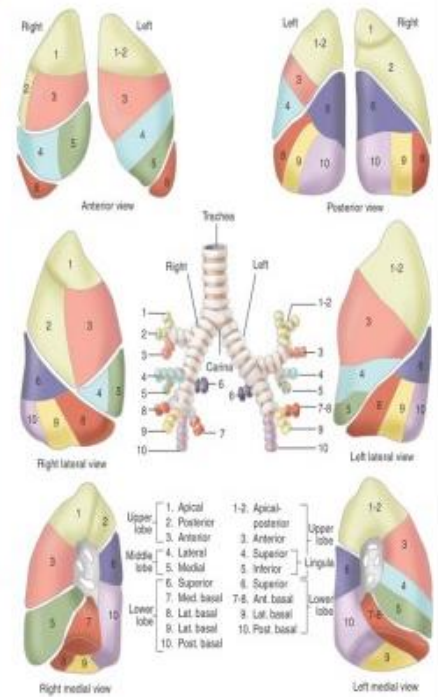
- Apical (apicobasal)
- Ant.
- Med.
- Lat.
- Post.



**Table 7-6** ▶▶ Bronchopulmonary Segments\*

Segment	Number	Segment	Number
<b>Right Upper Lobe</b>		<b>Left Upper Lobe</b>	
Apical	1	Upper division	
Posterior	2	Apical-posterior	1 and 2 <sup>†</sup>
Anterior	3	Anterior	3
<b>Right Middle Lobe</b>		Lower division (lingula)	
Lateral	4	Superior lingula	4
Medial	5	Inferior lingula	5
<b>Right Lower Lobe</b>		<b>Left Lower Lobe</b>	
Superior	6	Superior	6
Medial basal	7	Anterior basal	7 and 8
Anterior basal	8	Lateral basal	9
Lateral basal	9	Posterior basal	10
Posterior basal	10		

\*The subdivisions of the lung and bronchial tree are fairly constant. Slight variations between right and left sides are noted by combined names and numbers.  
**Note:** Some authors feel that the left lung should be numbered so that there are eight segments, where the apical-posterior is numbered 1 and the anteromedial is numbered 6.



**Before birth:**

- Rt. Lung 10 segments
- Lt. lung 8 segments
  - Apicpo posterior
  - Antero medial

**Clinical importance of pulmonary segments**

- Infections
- No barrier (infection may spread)
- Surgery
- Postural drainage
- Bronchoscopy