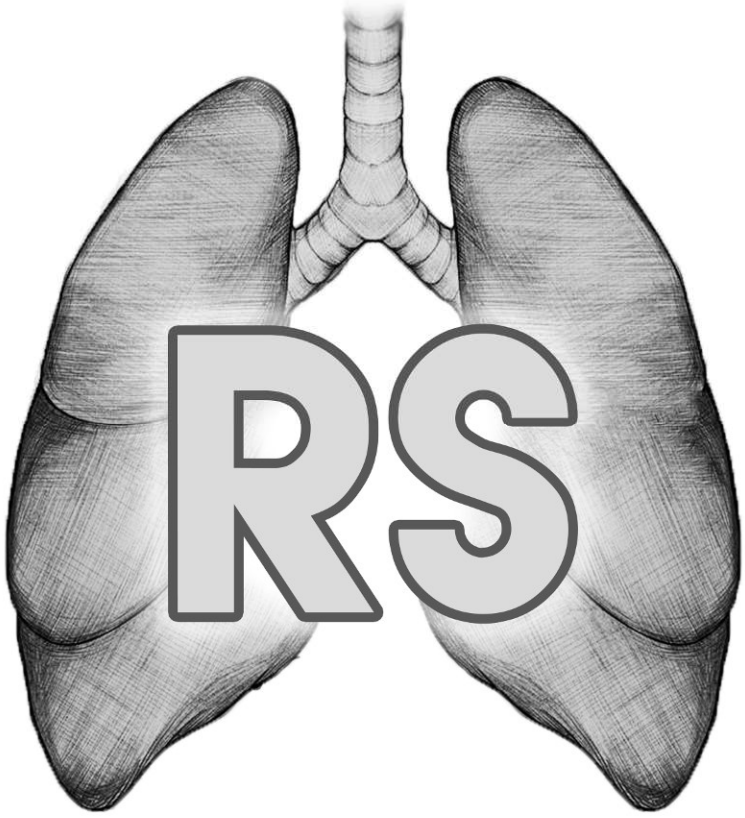

ANATOMY / HISTOLOGY

☑ Sheet ○ Slide ○ Handout

Number

5

Subject

Trachea & Lungs

Done By

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Doctor

Mohammad H. Al-Mohtaseb

Date: 29/11/2016

Price: .....

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Trachea

- Extends <u>from</u> lower border of larynx (lower border of cricoid cartilage) <u>to</u> the sternal angle (Angle of Louis) "level between T4 & T5"
- Contains 16-20 C-shaped hyaline cartilages;

  (C-shaped means that the cartilage is only anterior side, replaced by the trachealis muscle posteriorly)

P.S.) Trachealis muscle is a smooth muscle

- Why is trachealis muscle present on the posterior surface?
  - Because the esophagus lies posterior to the trachea, and for the esophagus to maintain a normal peristaltis movement, it must be covered anteriorly by a smooth muscle.

(If the anterior surface of esophagus was covered by cartilage, it won't be able to maintain normal peristalsis, thus, stopping the bolus movement downwards.)

- Why the C-shaped hyaline cartilage?
  - To maintain a wider lumen in the trachea, so that it remains open for air passage

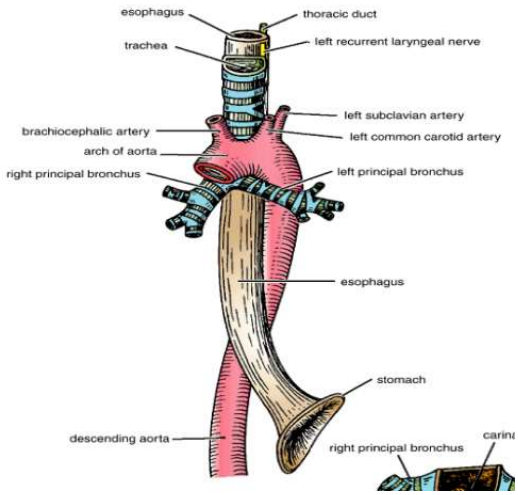
❖ Carina

- ✓ A fold of mucosa & cartilage, present in the end of trachea (bifurcation) "Beginning of right & left primary bronchi" (in sternal angle "between T4 & T5").
- ✓ In deep inspiration, it descends to T6 then returns to T4.
- ✓ It has 2 main functions:
  - <u>*A very sensitive area*</u>; so that if any foreign body enters the trachea, it'll induce coughing.
  - <u>*A landmark for bronchoscopy*</u>; when you enter a bronchoscope and then you see the carina, you know that you're at the end of trachea now.

- Length of trachea ranges between "4.5 - 5 inches"

➔ In adults, it has the diameter of your index.
➔ In children, it has the diameter of pencil. (hard to do a tracheostomy on them)

Relations of the trachea (رح ييجي عليهم سؤال عالأكيد)



Remember: Thymus is a retrosternal organ (behind manubrium sterni)

❖ Anteriorly

- Arch of Aorta (then goes backward & left)
- Origin of the brachicephalic artery (from the arch) (goes to the right)
- Remnants of Thymus
- Isthmus of Thyroid (anterior to 2nd, 3rd, 4th tracheal rings)
- Manubrium sterni

❖ Left

- Arch of Aorta
- Common carotid artery
- Subclavian artery

(Both are left-sided arteries & originating from the arch)

- Left phrenic nerve (anterior to hilum) → (originates from the neck)
- Left vagus nerve (posterior to hilum) → (originates from the neck)
- Left main bronchus

❖ Right

- Azygos arch *(Veinous dr. of the Rt. lung is via azygos vein → azygos arch → S.V.C)*
- Brachiocephalic artery
- Right phrenic nerve (anterior to hilum)
- Right vagus nerve (posterior to hilum)
- Right main bronchus

❖ Posteriorly

- Esophagus
- Thoracic duct
- Left recurrent laryngeal nerve (between trachea & esophagus)

Rt. recurrent laryngeal n. ➔ *originates in the root of neck, below subclavian artery.*

Lt. recurrent laryngeal n. ➔ *originates in the chest, below the aortic arch.*

Route of the "Thoracic duct":

Originates in a lymph sac at the aortic orifice on the diaphragm (cysterna chyli)
→ ascend right to esophagus
→ becomes posterior to trachea
→ ends at the root of neck, at the beginning of "left brachiocephalic vein"

Tracheotomy or (Tracheostomy) has 2 types:

1) Low/Suprasternal/Emergency tracheostomy
2) High tracheostomy

Low (Suprasternal/Emergency) Tracheostomy

- It's done when a foreign object obstructs the trachea.
- You open the skin covering the suprasternal notch and insert a sharp object below the level of obstruction to allow air to pass to the lungs for inflation.
- Some vessels are present on the suprasternal notch, while doing an emergency tracheostomy they might get injured and bleed, but we don't worry about bleeding here as much as we do for the inability to get air! as bleeding here can be easily stopped or might even stop alone after few minutes.
- Examples of vessels that could be injured are:
  Inferior thyroid vein / Thyroid ima artery / Anterior jugular vein / Jugular arch.

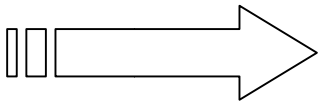
"Anterior jugular vein" – lies close to the midline & appears as a blue line on the neck of white people

High tracheostomy

- Done while the patient is undergoing another OPERATION!

  ➔ e.g.) While doing a Thyroidectomy, you might bilaterally cut the recurrent laryngeal nerve, and when you do this you must do a high tracheostomy.

- You open the skin below the lower border of cricoid cartilage & 1st tracheal ring.



- Why is the high tracheostomy not done above this area?
  - Because above it lies the true vocal cords.
- Why is the high tracheostomy not done below this area?
  - Remember: 2nd, 3rd, 4th tracheal rings are covered anteriorly by thyroid isthmus :)

Intubation (Permanent tube)

- Used in pathologic cases that causes closure of the trachea. e.g.) Larynx cancer
- An opening is made above the isthmus of thryroid "below the lower border of cricoid cartilage & 1st tracheal ring" (just like in high tracheostomy) and then a tube that aids in respiration is inserted from there to reach his trachea and will remain for a lifetime. (بضل الهواء يدخل مجراه التنفسي من هذا الأنبوب طول حياته)

  → P.S.) Permanent tube is different from the "endotracheal tube" which is used only in operations through inserting it through mouth or nose down to the respiratory tract <u>just</u> until the operation is done!

  → P.S.) You must now able to differentiate between tracheostomies & intubation.

Endotracheal tube

(Operational)

Permanent tube

Bronchi

❖ Primary bronchi

- They are extrapulmonary & end up in the hilum of the lung

	Right main bronchus	**Left main bronchus**
Length	Shorter (1")	Longer (2-3")
Lumen	Wider	Narrower
Alignment	More vertical (almost parallel to the trachea, with a small deviation)	More horizontal
IMPORTANT	In the hilum of the right lung, it divides into: - **Eparterial bronchus** (above pulmonary artery) - **Hyparterial bronchus** (below pulmonary artery)	In the hilum of the left lung, it remains as one main bronchus.

- What's the clinical importance of knowing the differences between the right & left main bronchi? 😅 عشان سمعتك بين دكاترة المستشفى
  - → So that if a person swallowed a foreign body (خرزة مثلاً) and it got into his reparatory tract and then he came in to the hospital, you'll know that the foreign body has most probably gone to his right main bronchus, as it's more vertical, wider & shorter than the left one.

❖ Secondary bronchi

- They are intrapulmonary
- Distributed according to the lobes (1 secondary bronchus for each lobe)

- *Right lung*:
  - 2 fissures (Horizontal & Oblique)
  - 3 lobes (Upper, Middle, Lower) ➔ 3 secondary bronchi

A fissure seperates 2 lobes

- *Left lung*:
  - 1 fissure (Oblique)
  - 2 lobes (Upper & Lower) ➔ 2 secondary bronchi

⇨ Total of 5 secondary bronchi.

❖ Tertiary bronchi "Bronchopulmonary Segments"

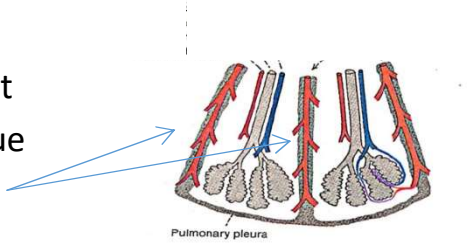
Bronchopulmonary segment → Bronchiole → Terminal bronchiole → Respiratory bronchiole → Alveoli

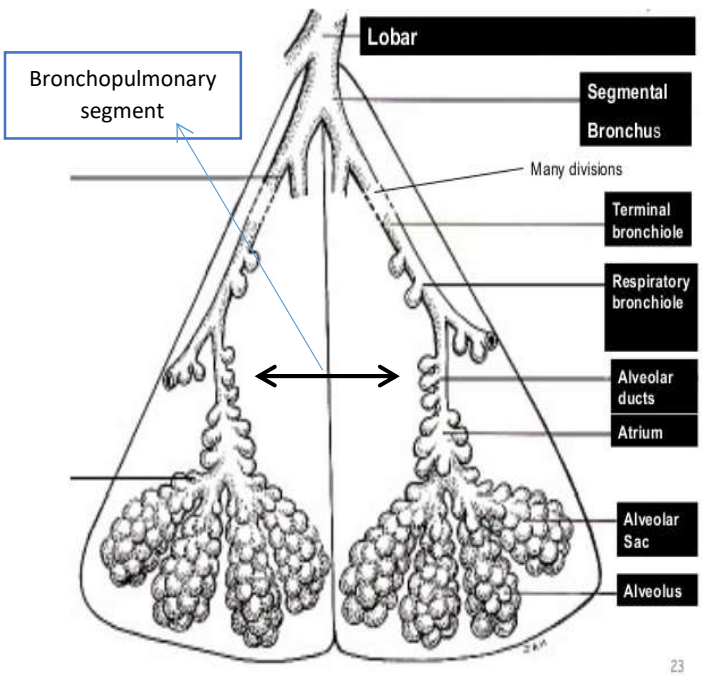
** Lung contains a lot of "**elastic tissue**"

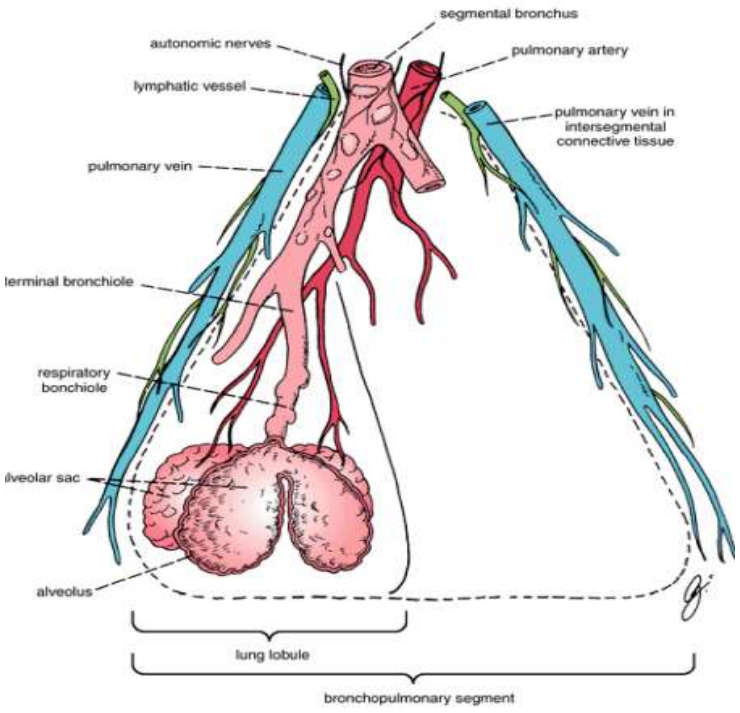
- Bronchopulmonary segment:

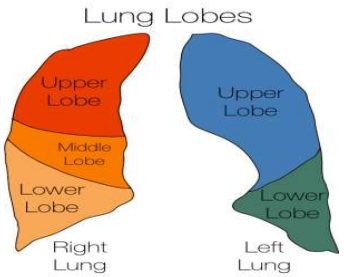
  It's the area of lung supplied by a **segmental bronchus** "tertiary bronchus" and its <u>accompanying</u> **pulmonary artery** "segmental artery", **lymph vessels** and **Autonomic nerves**.

  - <u>Subdivision</u> of a lung lobule.
  - Pyramid shape, with its apex toward the lung root
  - Each segment is surrounded by a connective tissue
  - **Segmental vein (pulmonary vein)** lies **in** the <u>connective tissue</u> between adjacent bronchopulmonary segments.
  - Each Bronchopulmonary segment → contains a lot of **lung lobules**.
  - As it's a structural unit → a diseased segment can be removed surgically.

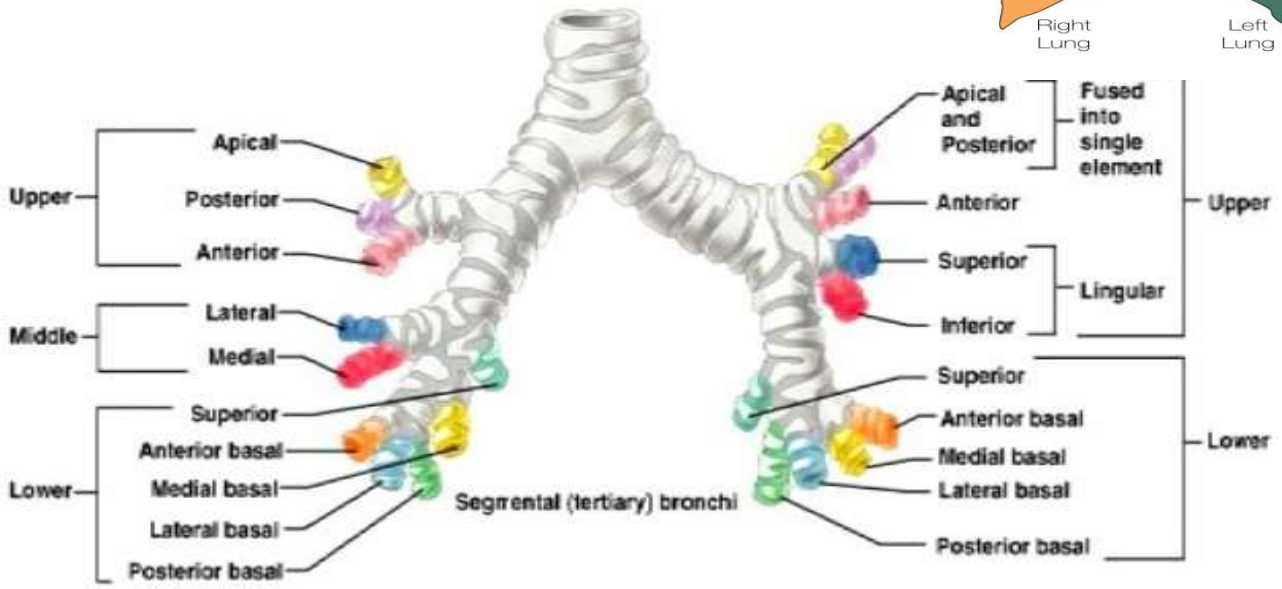






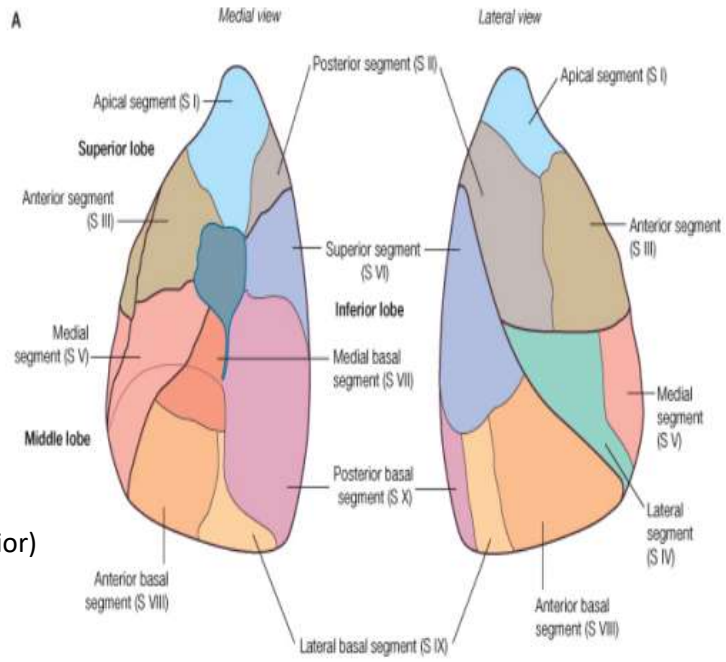


- Right adult lung → 3 lobes → 10 bronchopulmonary segments.
- Left adult lung → 2 lobes → 10 bronchopulmonary segments.

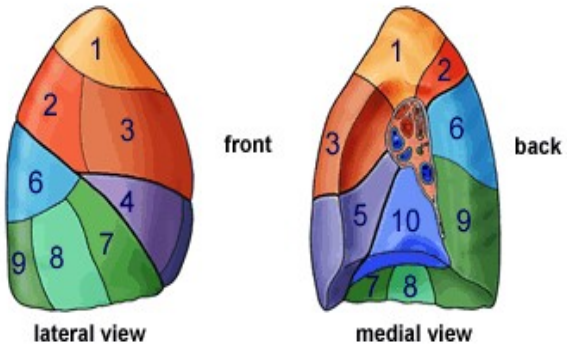


Right Lung's 10 segments

- Upper lobe:
  1. Apical
  2. Posterior
  3. Anterior
- Middle lobe:
  4. Lateral (Costal surface)
  5. Medial
- Basal lobe:
  6. Apical "**apicobasal**" (or superior)
  7. Anterior
  8. Medial
  9. Lateral
  10. Posterior

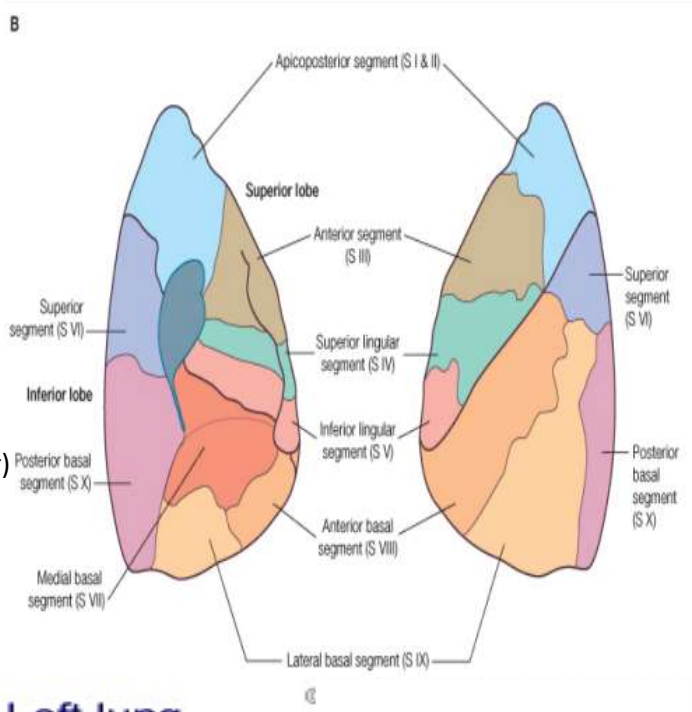


Right lung



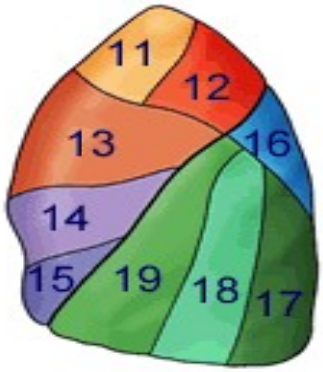
Left Lung's 10 segments

- Upper lobe:
  - 11. Apical
  - 12. Posterior
  - 13. Anterior
  - 14. Superior Lingual
  - 15. Inferior Lingual
- Basal lobe:
  - 16. Apical "**apicobasal**" (or superior)
  - 17. Posterior
  - 18. Lateral
  - 19. Anterior
  - 20. Medial



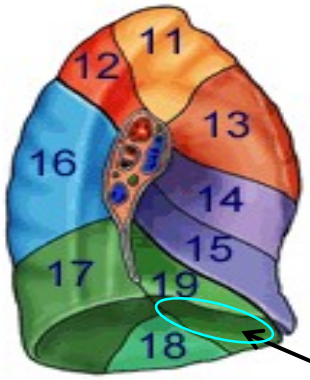
Left lung

front



lateral views

back



medial view

(20) → Medial

Notes:

- ✓ Sup. & Inf. Lingual segments are because of the act of pushing by the heart, and as a result there will be a cardiac notch and a lingula in the left lung.
- ✓ In the past, they used to do Lobectomy "removing a whole lobe" but now they only remove the damaged segments from the same lobe → This is because of its structural unit "pyramidal shape" of segments (each segment has an apex toward the lung root & base is toward the surface), it also has it's own bronchus, bronchioles, alveoli, pulmonary artery, lymphatics, nerves (sym. & parasym.) & on both sides there is connective tissue, with 1 pulmonary vein within each.

Extra note:
Lingula of left lung a small projection from the lower portion of the upper lobe of the Left lung.

- ✓ Whenever you find a connective tissue bordered by 2 pulmonary veins on both sides → Bronchopulmonary segment.

- ✓ Pulmonary Vein → Oxygenated Blood.
  Pulmonary Artery → Deoxygenated Blood.

- ✓ Before Birth: IMPORTANT
  a. Right lung → 10 segments
  b. Left lung → 8 segments: "we have some infused segments"
     - Upper lobe → Apico-posterior (11+12) "1 tertiary tube then after delivery it's divided to apical & posterior"
     - Basal lobe → Antero-medial (19+20) "1 tertiary tube then after delivery it's divided to anterior & medial"

- ✓ Clinical Importance :

This is →"خرزة"
No one eats خرز
Please be No one.

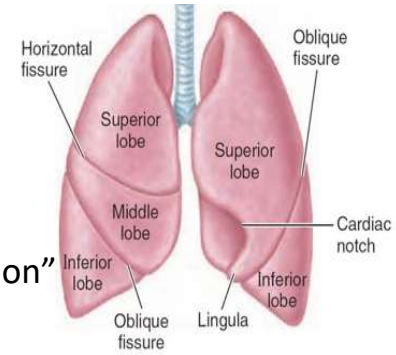
1. **Surgery** "mentioned earlier"
2. Infections
3. No barrier
4. Postural drainage
5. **Bronchoscopy**:
   - If someone was standing "  **خرزة** و حاطّ في تمّه" and suddenly he swallowed it "**الخرزة** ؟؟ وين بتروح" to which bronchopulmonary segment??
     - It will go through the right bronchus →right lung → Basal lobe → Posterior segment.
     "the most vertical path while standing"
   - If you went to a dentist and while you were lying down on your back, and suddenly you swallowed your tooth  to which segment shall it go?
     - It will go to Apicobasal segment.

✿ You need to imagine the path referring to the segments' figures.

Lungs

- Are organs of respiration
- There are 2 lungs:

A. Right lung → 2 fissures "horizontal & oblique" → 3 lobes "upper, middle, lower"
B. Left lung → 1 fissure "oblique" → 2 lobes "upper & lower"



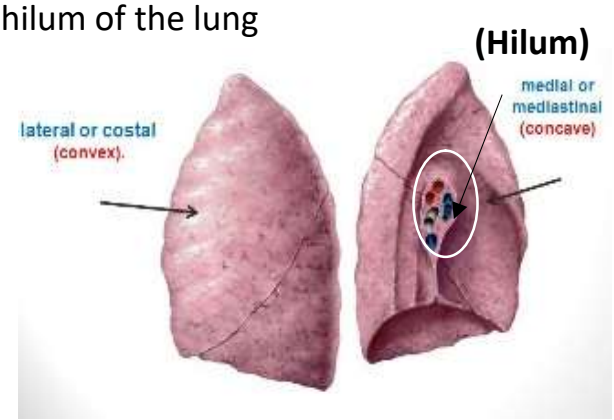
- 600-800gm
  90% is air "in alveoli"
  10% is tissues "mostly **elastic fibers** → inflation & deflation"
- Only left lung has a <u>cardiac notch</u> & <u>lingula</u>.
- Right lung → Shorter & Wider. (Liver is pushing it upwards, compressing it)
- Left lung "تبئى" → Narrower & Longer.

Note from the slides: "wasn't mentioned"
The right lung is normally a little larger than the left lung because the middle mediastinum, containing the heart, bulges more to the left than to the right.

- Each lung has an apex & base:
  - ***Apex*** - present at the root of the neck (it lies 1 inch above the medial 1/3 of clavicle), sometimes during a subclavian cannula they injure the apex → lung will collapse, so you must do an X-ray before putting the cannula and to be sure that both lungs are inflated.

  - ***Base*** (Diaphragmatic surface) - lies above the copula of diaphragm.
    a) **Costal surface** → related to the costal cartilage.
    b) **Mediastinal surface** → contains hilum of the lung

Bronchi & pulmonary vessels enter the lung via the hilum



- Each lung has an <u>anterior border</u> & <u>posterior border</u>.

➢ Lung summary

-(Apex & Base "diaphragmatic surface")
- (Anterior & Posterior boarders)
- (Costal surface & Mediastinal surface "contains Hilum")

➢ Hilum: *<u>"from superior to inferior"</u>*

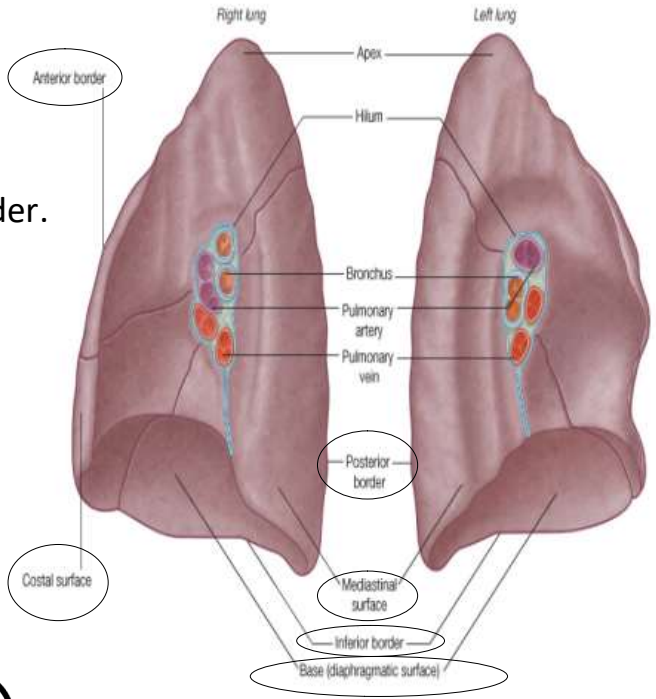
- **Right Hilum**: (Rt. main bronchus in hilum divides into 2 bronchi)
  - Eparterial bronchus (most superior)
  - Pulmonary artery
  - Hyparterial bronchus
  - 2 pulmonary veins (superior & inferior right pulmonary veins).

- **Left Hilum**:
  - Pulmonary artery (most superior)
  - Left main bronchus
  - 2 pulmonary veins (superior & inferior left pulmonary veins).

➢ Lungs are surrounded by the right and left pleural cavities..

- Pleura = visceral & parietal layers with a space in between them → both layers fuse when reaching the hilum "at level between T5 & T7", making a **cuff** around the hilum and inferiorly, they form "**<u>inferior pulmonary ligament</u>**".

➢ Inferior boarder is a <u>sharp boarder</u>; because the copula of the diaphragm bulges upward, so the periphery will be a sharp boarder.
"just so you know"



❀ notes from slides:

- ✓ Inferior border separates the base from the costal surface.
- ✓ The anterior and posterior borders separate the costal surface from the medial surface.
- ✓ the posterior border is smooth and rounded

Surface anatomy of the lungs

- Locating certain structures from the surface body & skeleton
- Taken at the end of expiration

❖ Apex, it's surrounding pleura (parietal & viscera) and the supraplural membrane are all adherent to each other, so they have the same surface anatomy, which is:

→ 1 inch above the medial 1/3 of the clavicle at the level of T1 (or rarely C8).

❖ Anterior border (sharp border):

→ Draw a line from the apex to the sternoclavicular joint

→ then extend it to the midline of the sternal angle

→ then go downwards to the 6th costal cartilage

> ➢ There is a difference between the right & left lungs' anterior border;
>
> - In the left lung, there is a "*cardiac notch*" at the anterior border, between 4th & 6th costal cartilages, 1 inch to the left.
> We draw a semicircle there with a radius of 1 cm.

❖ Posterior border (rounded border):

→ Draw a line from the apex going backwards & downwards until reaching a point that is 4 cm away from the dorsal spine of T10.

This line can be called "*Scapular Line"* (going down with the inferior angle of scapula).

❖ Base:

→ Draw a Midclavicular line that crosses with rib 6 (mark 1)

→ Draw a Midaxillary line that crosses with rib 8 (mark 2)

→ Draw a posterior line that crosses T10 (mark 3)

→ *Now connect the 3 marks together and the resulting line marks the base of lung.*

Notes:

** P.S.) The 1st rib makes a groove on the anterior border of the lungs.*

** P.S.) Plumonary artery is the most superior structure in the lungs.*

Surface anatomy of the pleura

- Apex: Same as the lungs as we said :D
- Anterior border: Same as the lungs (might reach 7th costal cartilage instead of 6th).
- Posterior surface: Line reaches T12 (instead of T10).
- Base:
  - → Draw a Midclavicular line that crosses with rib 8 (mark 1)
  - → Draw a Midaxillary line that crosses with rib 10 (mark 2)
  - → Draw a posterior line that crosses T12 (mark 3)
  - → *Now connect the 3 marks together and the resulting line marks base of pleura.*

- What's the clinical significance in surface anatomy of the pleura? → It's in the base;
  - When lungs become filled with blood or fluid, it will accumulate in the pleural cavity, e.g.) Pleural effusion. → in this case you insert a canula for aspiration (relieving the pericardial cavity from fluid)
- Where is the canula inserted?
  - If you take a midclavicular line, you insert the canula in the 7th costal space (above rib 8)
  - If you take a midaxillary line, you insert the canula in the 9th costal space (above rib 10)

➔ You insert the canula in the lower part of the costal cartilage;

- To avoid hitting intercostal VAN (vein-artery-nerve)
- Closer to the upper edge of the rib

The sheet has been edited and corrected.

Goodluck everyone!

#HalaMadrid <3