كليه الرشيد الجامعه

قسم الصيدله

المرحله الاولى

Lecture two

Anatomy

The Respiratory system

The Respiratory system

Functions of the Respiratory system :

1. Delivering oxygen(O2) to the blood for transport to cell in the body.
2. Excreting the waste product of (cellular respiration); carbon dioxide(CO2)
3. Filtering , cleansing , adjusting temperature and humidifying air taken into the lungs.
4. Regulating the PH of the blood
5. Helping the production of sound (phonation) for speech and singing
6. Providing the tissue that receives the stimulus for the sense of smell (olfaction).

[the respiratory partens with the circulatory system to deliver oxygen and remove carbon dioxide from the cells of the body]

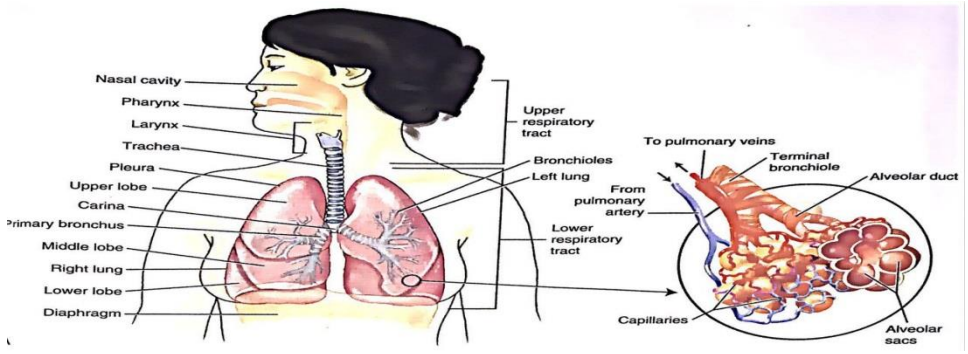
1.Delivering (O_2) to the blood :

This is done by process of inspiration

(or inhalation) :- (is breathing in)

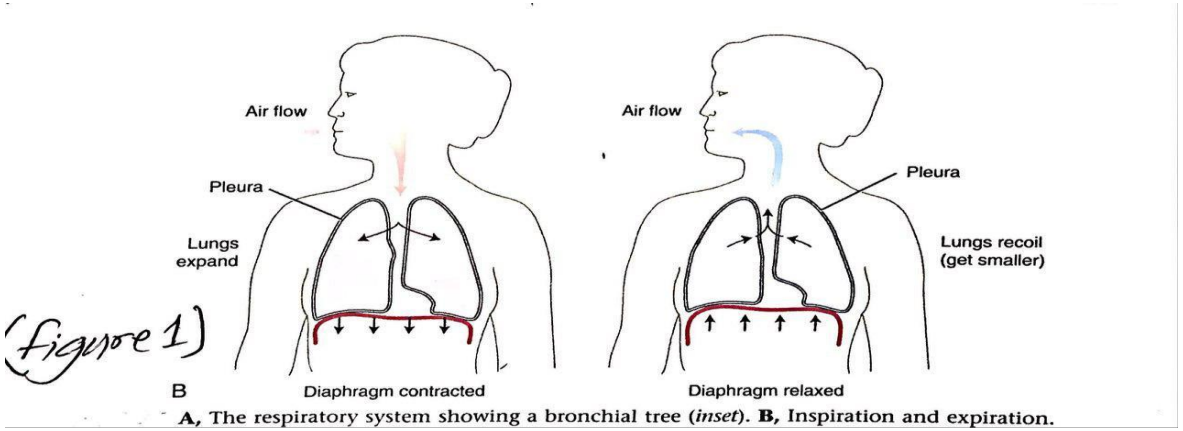
Pulls air containing oxygen into the lungs ,

where it passes to the circulation .(figure 1A)



2.Excretion of CO2

This is done by process of expiration (or Exhalation) , when air is pushed out of the lungs , and CO2 is released.



(figure 1)

A, The respiratory system showing a bronchial tree (*inset*). **B,** Inspiration and expiration.

3. Filtration , cleansing , conditioning , and humidifying of air taken into the lungs these are important processes that protect the lungs from diseases , and allow for optimal environment for gas exchange

4. Regulation of pH the blood

This is accomplished through mechanisms that control the respiratory rate of breathing , to keep pH within an arrow limit .

5. Help in phonation

Accomplished by interaction of air and structures of the larynx , and the hollow cavities (the paranasal sinuses)

6. Olfaction

Although it is not a function of the respiratory system ; it is accomplished by the tissue in the nasal cavity ; which receives the stimuli for smell route them to the brain via the olfactory nerve.

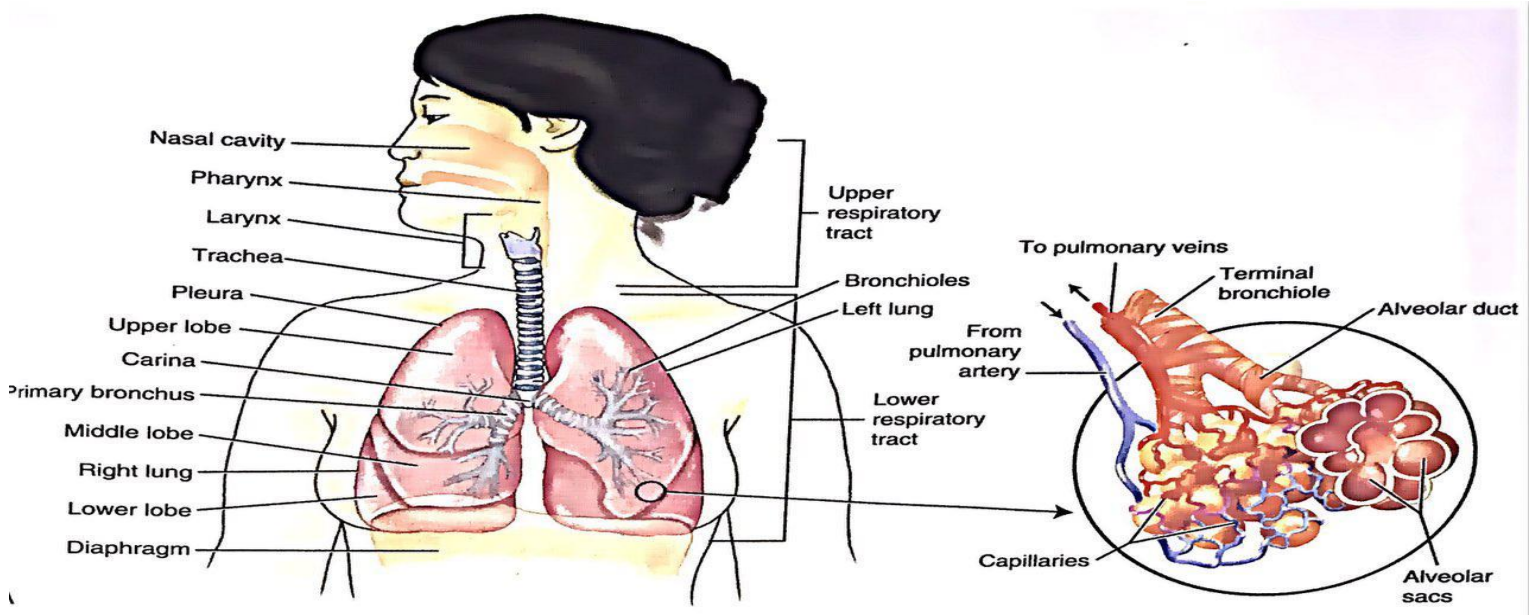
The Respiratory system

Includes the lungs and a series of air passages .

Functional components of the respiratory system

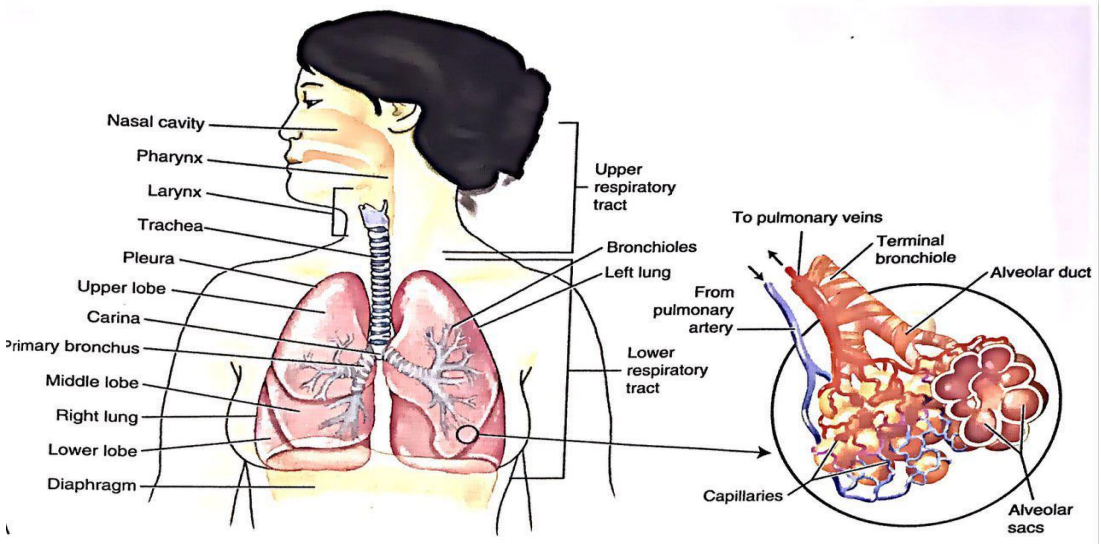
I. Conducting component .

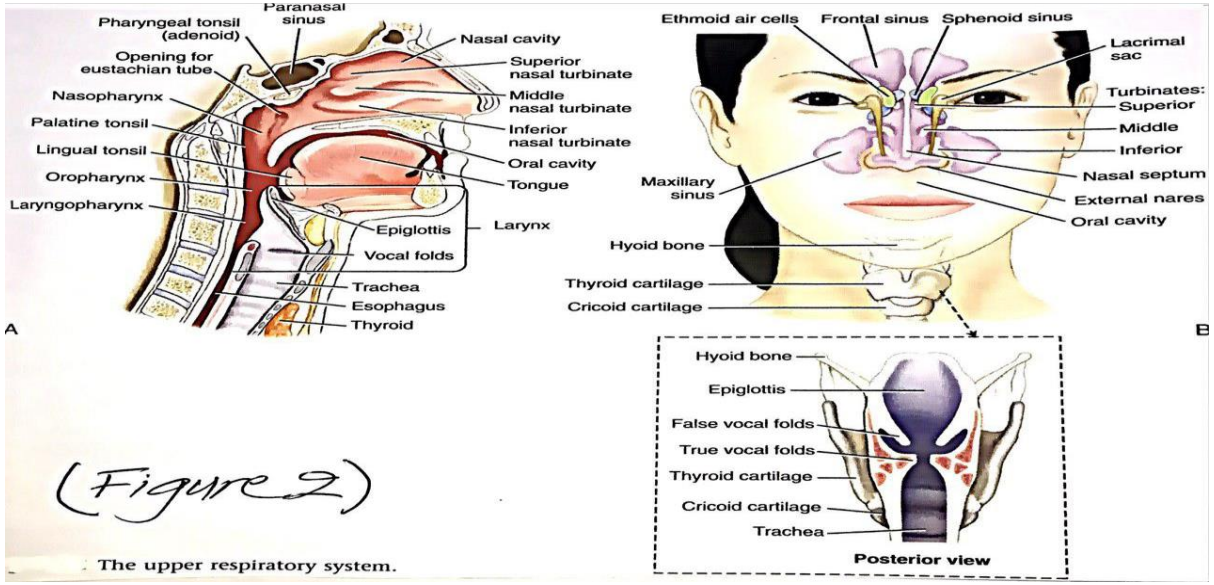
II. Respiratory component .



I. The conducting component .

- is for transport of inspired and expired gases into and out of the lungs .
- Begins essentially as a single tube , which divides repeatedly (to about 30 orders of division) to form an air way of ever decreasing diameter.
- The terminal bronchiole open into blind – ended sac (the alveolus) which are the site of gas exchange.





Parts of the conducting component :-

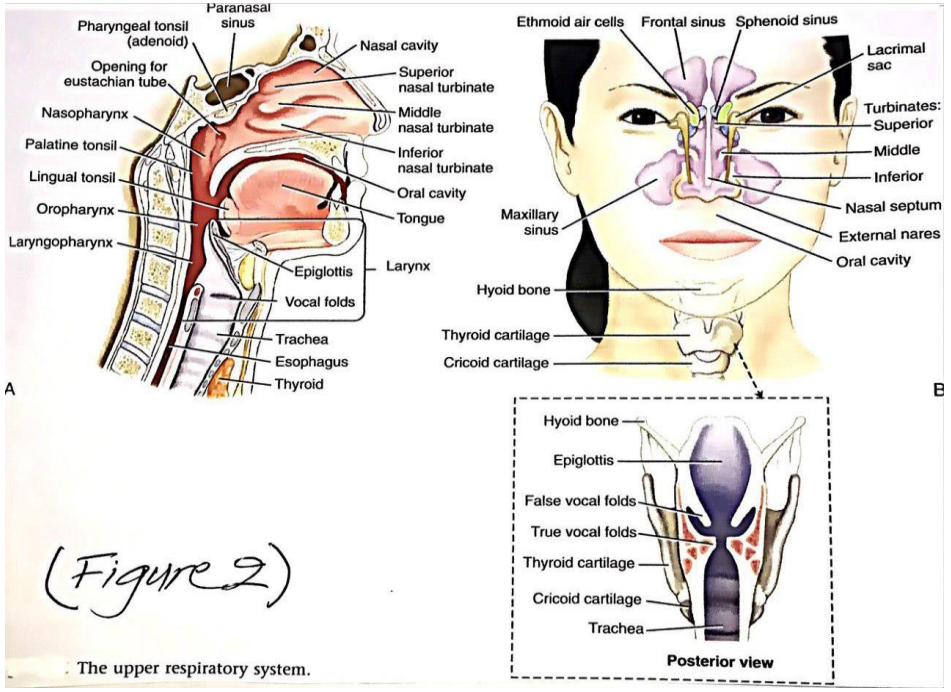
A. Upper respiratory tract : which includes .

1. Nasal cavities .
2. Paranasal sinuses
3. Pharynx

Whose function is : filtration , cleansing humidification and adjustment of temperature

B. Lower respiratory tract : which include

1. The larynx
2. The trachea
3. Bronchi
4. Bronchioles (down to the terminal bronchiole)

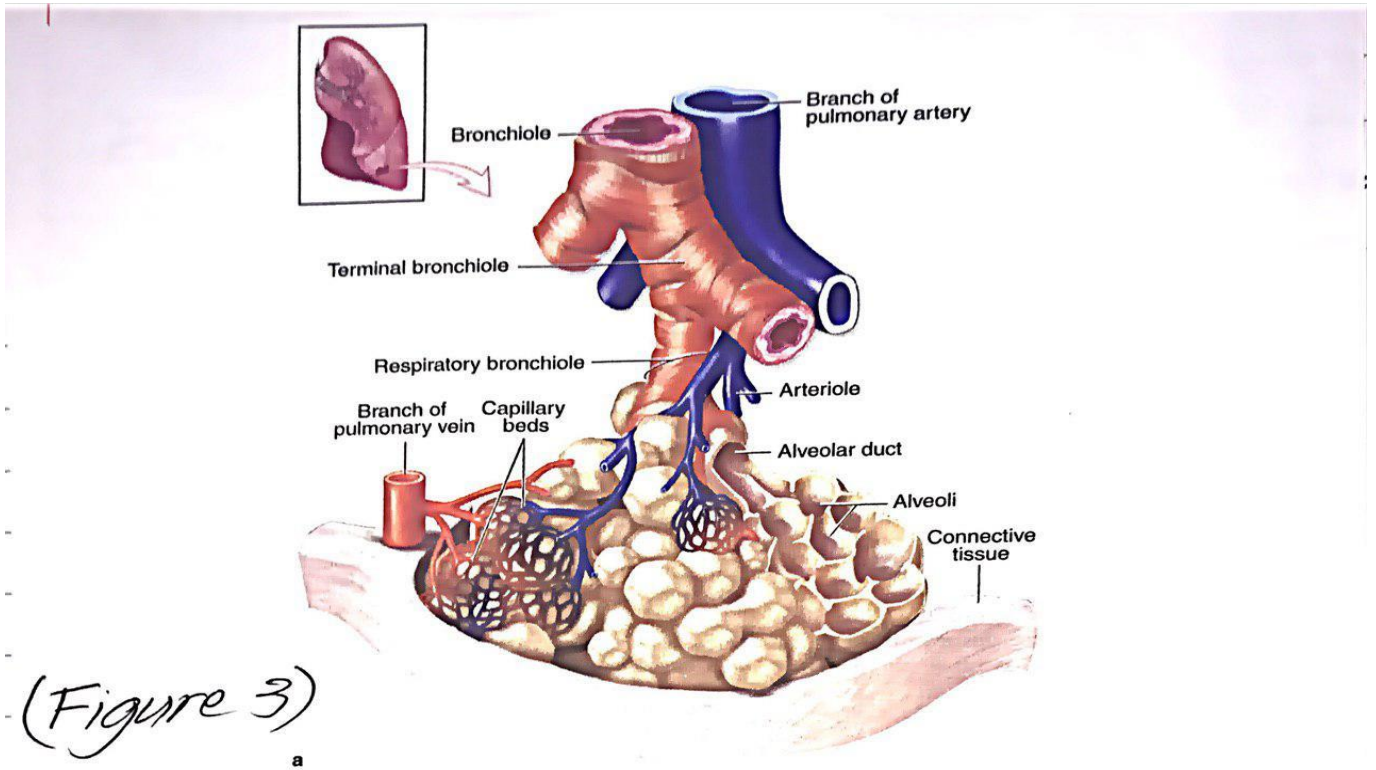


II. The respiratory component .

Is an interface for passive exchange of gases between the atmosphere and blood . It includes :

1. The respiratory bronchiole .
2. Alveolar ducts .
3. Respiratory sacs .
4. Alveoli .

Where respiration occurs



(Figure 3)

a

Terminal bronchioles, respiratory bronchioles, and alveoli. Terminal bronchioles branch into respiratory bronchioles, which then branch further into alveolar ducts and individual alveoli. Respiratory bronchioles are similar in most respects to terminal bronchioles except for the presence of scattered alveoli along their length.

(a): Diagram shows the branching relationship, as well as the pulmonary blood vessels that travel with the bronchioles and the dense layer of branching capillaries that surrounds each alveolus for gas exchange between blood and air. **(b):** The micro-

Respiration

Is the process of gaseous exchange between the organism and its environment .

Forms of respiration .

1.External respiration

In which : oxygen is taken by the capillaries of the lung alveoli , and carbon dioxide is released from the blood capillaries to the alveoli .

- This is done according to the : (principle of gaseous exchange) :

The gas moves from high pressure areas into low pressure areas

- The oxygen pressure in the alveoli (100 mm hg) is the higher

than that in the capillaries (40 mm hg)

- the carbon dioxide pressure in the capillaries

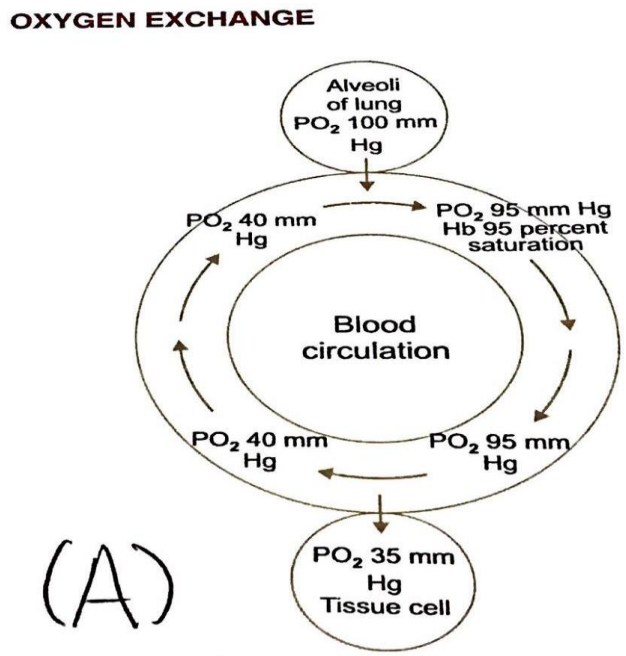
(46 mm hg) is higher than that in the alveoli (40 mm hg) .

- This is made possible by :
- **a) the continuous pulmonary circulation :**

1)the arteries bring blood with low pressure of oxygen

and 2) the pulmonary veins leaving the lungs with blood

of the high pressure of oxygen , and low pressure of carbon dioxide .



- And by **b) the continuous breathing**

1) Inspiration bringing air to alveoli with high pressure of oxygen and low pressure of carbon dioxide and

2) Expiration : air leaving the alveoli , and lungs and conducting stem to the atmosphere with high pressure of co2 and low pressure of o2

- And by **c) the presence of respiratory membrane** (between alveoli and capillaries) that allows the gaseous exchange of o2 and co2 according to a simple pressure gradient (principle of gaseous exchange)

2.Internal respiration

- This is also done by the application of the principle of gaseous exchange .
- And it is the reverse of external respiration

➢ The oxygen pressure in the capillaries at the tissue levels(95 mm hg) is higher than that of the tissue cells (35 mm hg)

➢ The carbon dioxide pressure in the tissue cells(46 mm hg) is higher than that in

(40 mm hg) (the carbon dioxide is waste product of celllular respiration : metabc

process and the oxygen is utilized in the same process)

➢ This is made possible by

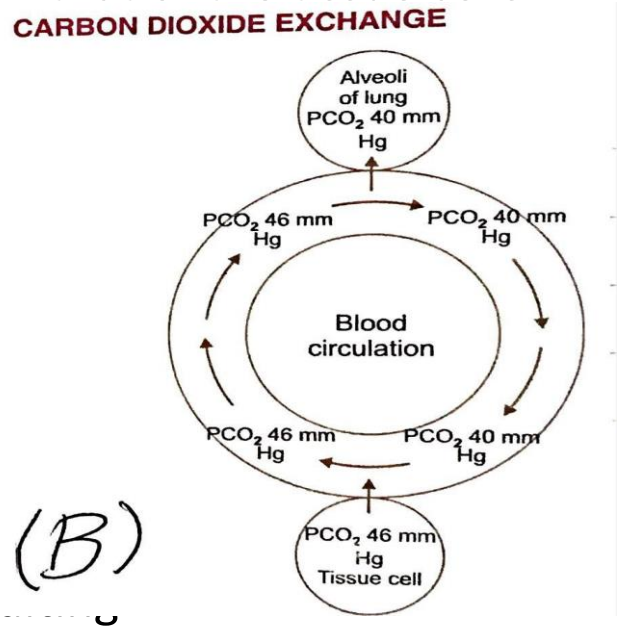
a) The continuous systemic circulation :-

1) Arteries bring blood with high pressure of oxygen and low carbon dioxide pre

2) Veins carry blood with low pressure of oxygen and high pressure of carbon diox

b) Continuous utilization of oxygen for cellular respiration (metabolic processes re

in low oxygen pressure .



Production of carbon dioxide as a waste product at the same processes resulting in high pressure of carbon dioxide .

➢ So a simple pressure gradient is created between the tissue cells and capillaries.

There is another type of respiration .

The cellular respiration

(metabolic respiration)

Is the process by which cells produce energy which occurs inside the cell; where oxygen is utilized in metabolic process of organic molecule resulting in the production of energy , water , and waste production (carbon dioxide is among then)

NB. (the transfer of air between the atmosphere and lungs , and the external respiration are the function of the respiration system)

BREATHING

- Is the alternation of active inspiration (or inhalation) of the air into the lungs through the nose (or mouth) , with the passive expiration (or exhalation) of air.
- Breathing is part of respiration

Ventilation

Describes the movement of air into the lungs whether its natural or artificial

The Nose

- Is the part of the respiratory system superior to the hard palate .
- It contains the peripheral organ of smell.

Functions of the nose.

1. Respiration (breathing)
2. Filtration (of dust)
3. Humidification of inspired air .
4. Adjustment of temperature of inspired air
5. Reception and elimination of secretions from the nasal mucosa paranasal sinuses nasolacrimal ducts
6. Olfaction (smelling)

Parts of nose

I. external nose

II. nasal cavities

I. external nose

- Varies considerably in size and shape because of differences in the nasal cartilages.
- Nares(nostrils) ,(anterior nasal apertures) are the two elliptical orifices in the inferior surface of the nose .

The framework of the external nose

1. Bony part (above)

Formed by the following bones

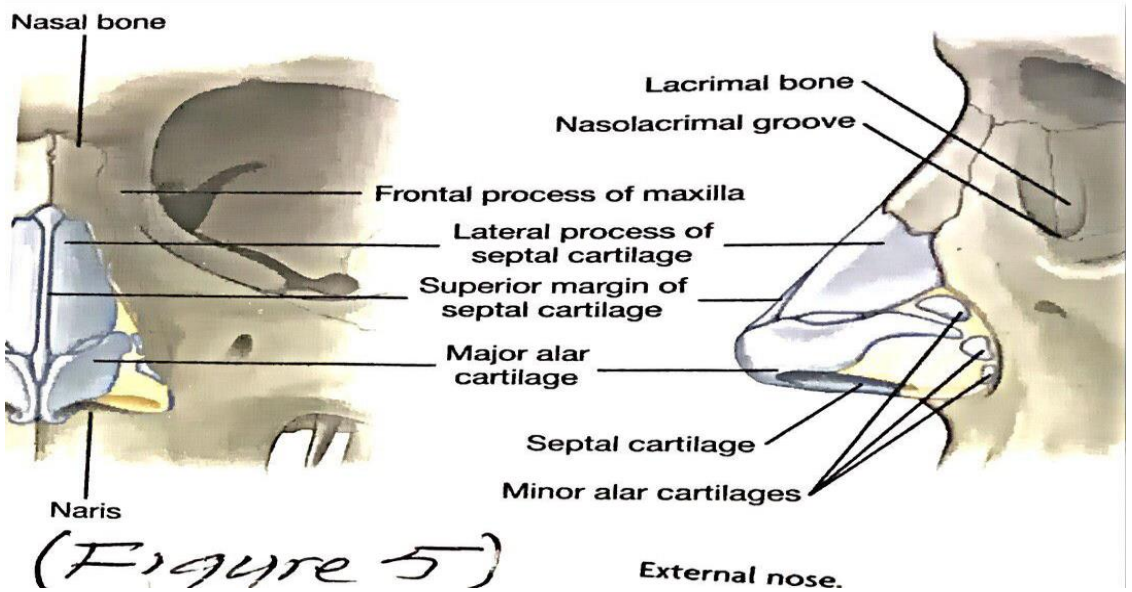
a. Paired nasal bones

b. Frontal processes of the maxilla

c. Nasal process of the frontal bone

2. Cartilaginous part (below)

formed by different shapes and sizes of cartilaginous plates .



II. Nasal cavities

The two nasal cavities are elongated wedge – shaped spaces , with a large inferior base , and a narrow superior apex

- **The nares (nostrils) :**

Are the anterior apertures of the nasal cavities , which opens onto the inferior surface of the nose

- **The choanae**

Are the posterior apertures of the nasal cavities , which open into nasspharynx.

Regions of the nasal cavities

1. **The nasal vestibule**

- Is a small dilated space just internal to the nares .
- Is lined by skin and contains hair follicles

2. **The respiratory region .**

- Largest part of the nasal cavity
- Has rich neurovascular supply.
- Is lined by respiratory epithelium (pseudostratified ciliated columnar epithelium) with mucous cells

3**. Olfactory region**

- Is small area in the apex region
- Lined by olfactory epithelium , and contains olfactory receptors of the olfactory nerve.

The skeletal framework of the nasal cavities

A. **Four unpaired bones :**

1. ethmoid
2. Sphenoid
3. Frontal
4. Vomer

B. **Four paired bones :**

1. Maxillary
2. Palatine
3. Lacrimal
4. Inferior conchae

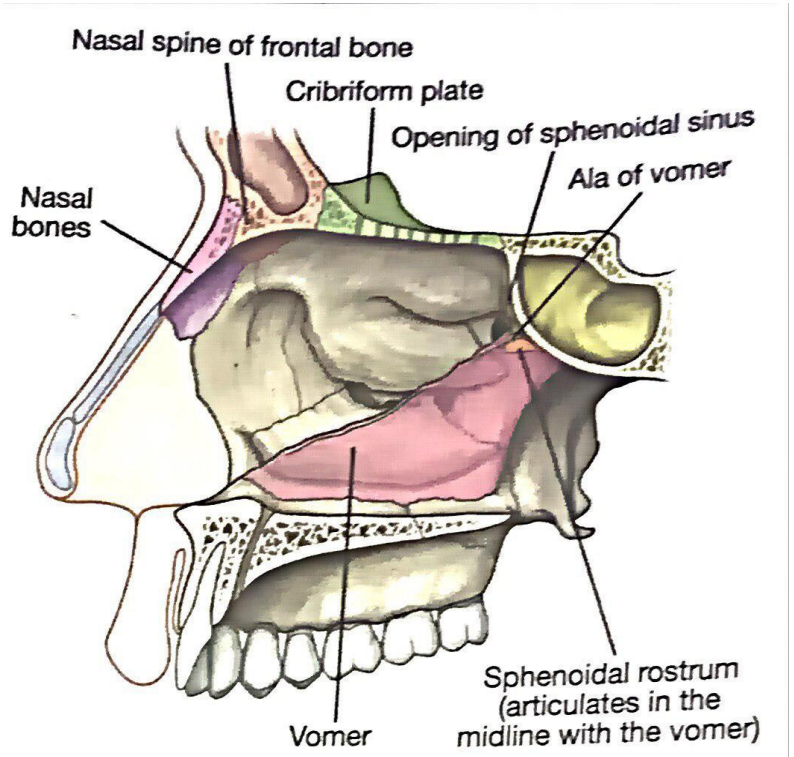
Walls of the nasal cavities .

- Each nasal cavity has roof , floor , medial wall and lateral wall .

1. The roof .

- Is narrow
- Is the highest part
- Formed by the cribriform plate of the ethmoid bone
- Lined by the olfactory epithelium

in its most part



Roof of the nasal cavity. (Figure 6)

Walls of the nasal cavities .

2. The floor

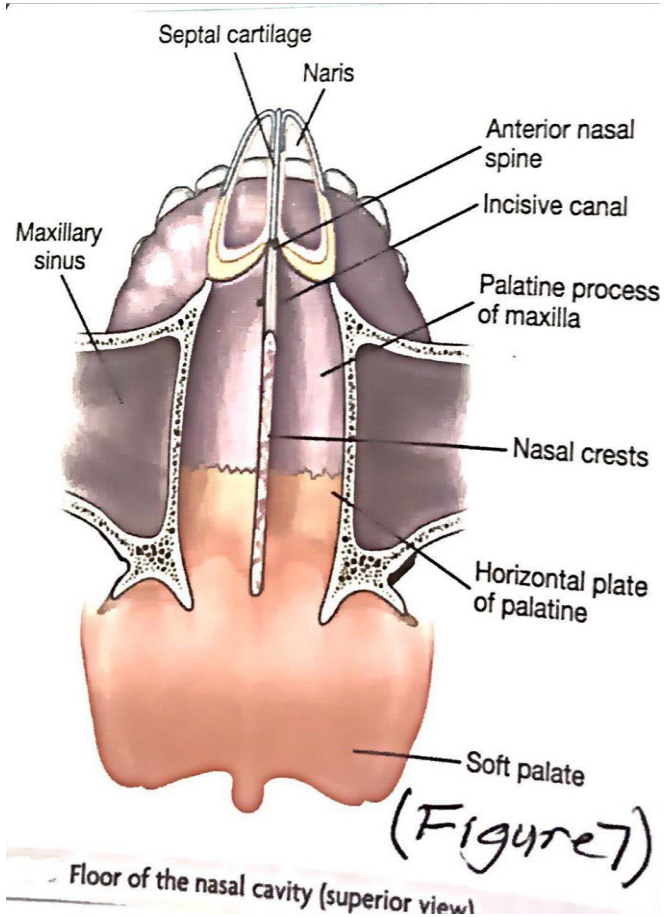
- Is smooth concave wider than the roof .
- It is formed by

a. Soft tissue of the external nose

b. Hard palate which is formed by

1) Upper surface of the palatine process of the maxilla on each side .

2) Upper surface of the horizontal plate of the palatine bone on each side



Walls of the nasal cavities .

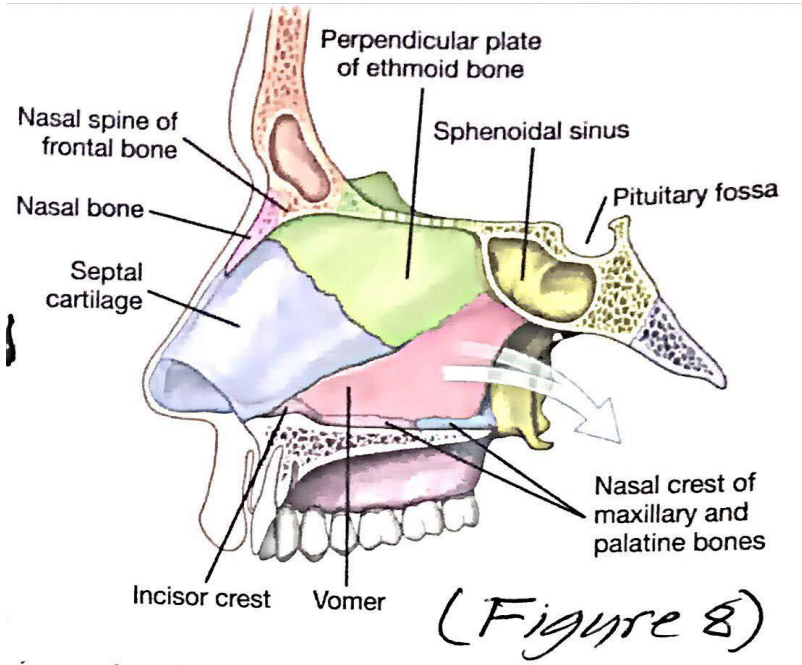
3. The medial wall

- Is the mucosa – coated surface of the nasal septum .
- Oriented vertically in the median sagittal plane .
- Separates the right and left nasal cavities
- It is formed by :

a. Anteriorly : septal nasal cartilage

b. Posteriorly : 1) the vomer .

2) Perpendicular plate of the ethmoid bone .



Medial wall of the nasal cavity—the nasal septum.

Walls of the nasal cavities .

4. The later wall : it is formed by

a. Ethmoid bone

b. Perpendicular plate of the palatine bone

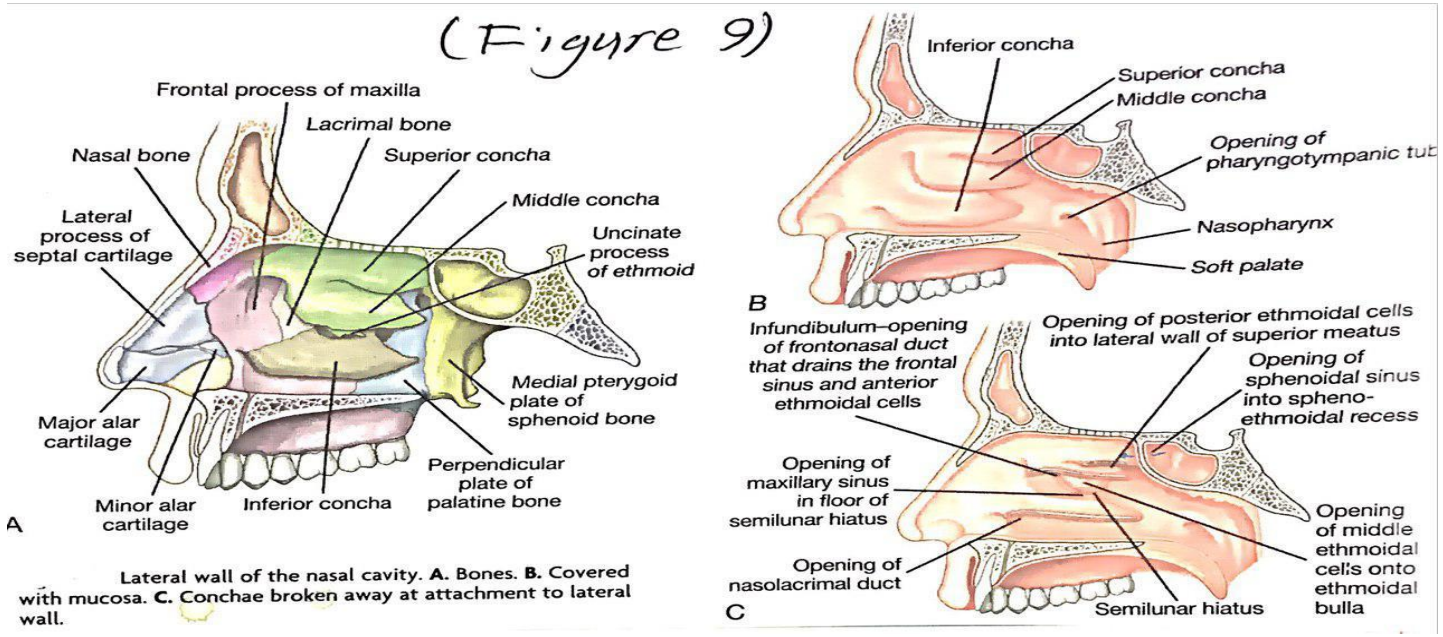
c. The medial plate of the pterygoid process of the sphenoid bone .

d. The medial surface

of the lacrimal bone

e. The maxilla

f. The inferior concha.



Lateral wall of the nasal cavity. **A.** Bones. **B.** Covered with mucosa. **C.** Conchae broken away at attachment to lateral wall.

The lateral wall

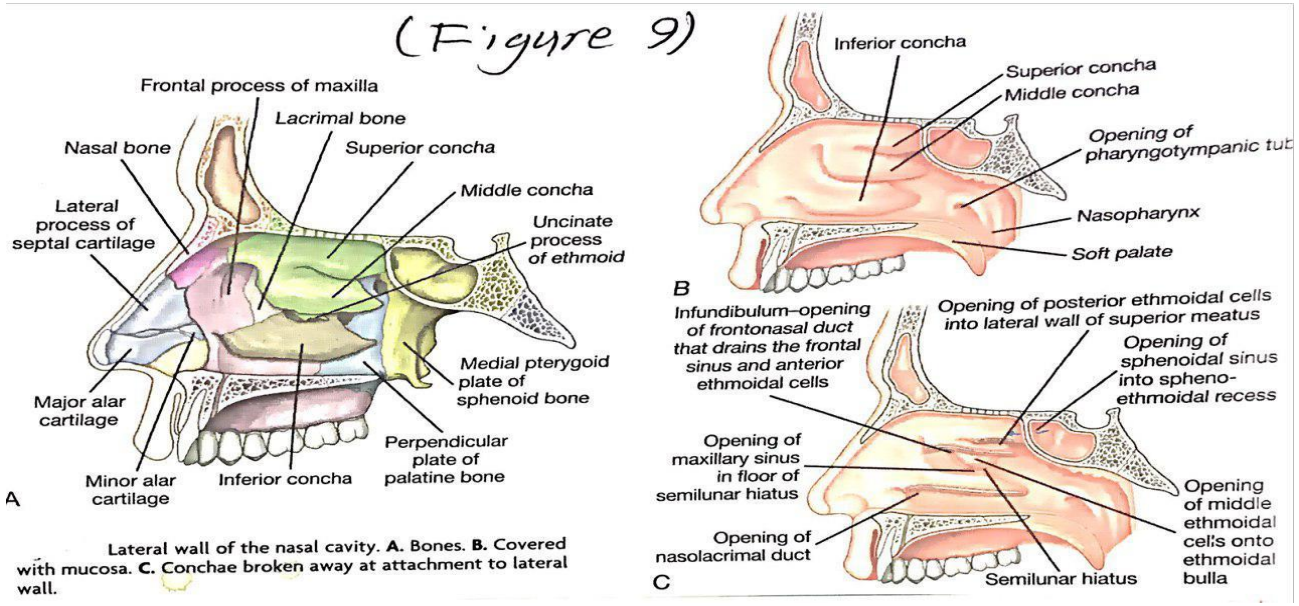
It is the characterized by the presence of tree curved shelves bones :

The conchae.

- Three curved shelves of bones

1. Superior concha .
2. Middle concha .
3. Inferior concha .

- They are one above the other .



- Project medially across the nasal cavity
- The medial , anterior , and posterior margins of the conchae are free

The conchae divide each nasal cavity into four air chambers :

1. **The spheno – ethmoidal recess :**

Between the superior concha and the nasal roof .

- it is the site of drainage of secretions of the sphenoidal air sinus .

2. **The superior nasal meatus**

- Between the superior and middle conchae
- It is the site of drainage of secretions of the posterior group of air cells of the ethmoid

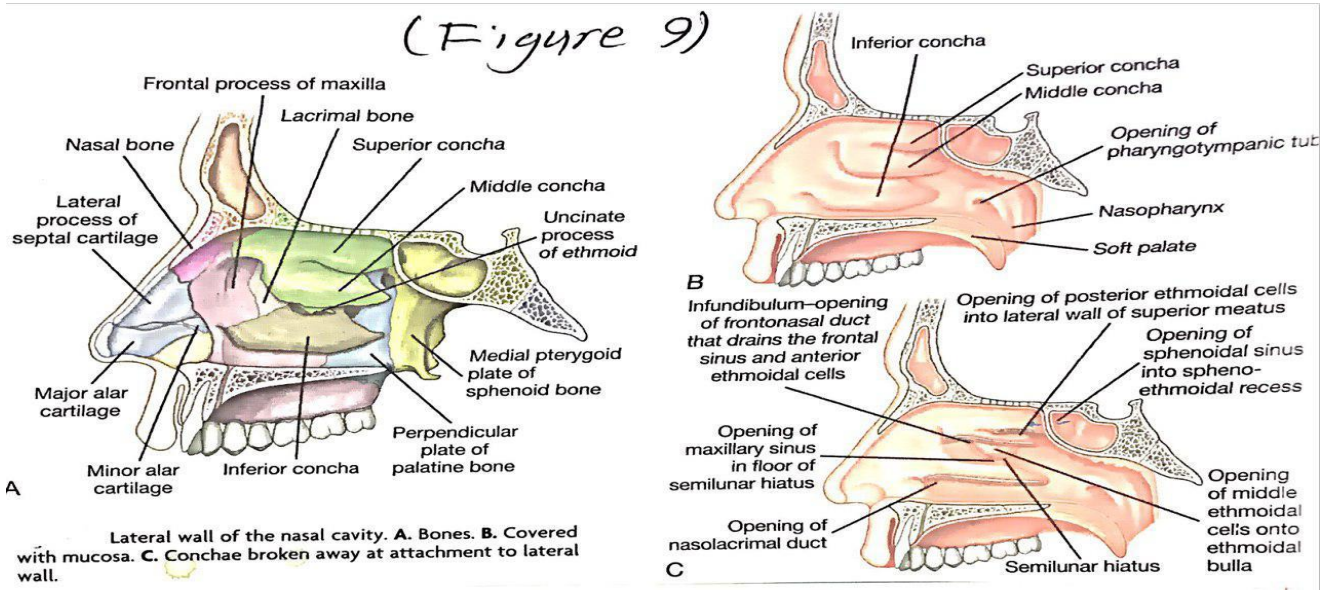
3. **The middle nasal meatus .**

- Between the middle and inferior conchae .
- It is the site of drainage of secretions of

a. Middle group of ethmoidal air cells.
b. Anterior group of ethmoidal air cells .
c. Frontal paranasal sinus .
d. Maxillary paransal sinus .

4. The inferior nasal meatus

- Between the inferior concha and the nasal floor
- It drains tears from the nasolacrimal duct .



Lateral wall of the nasal cavity. **A.** Bones. **B.** Covered with mucosa. **C.** Conchae broken away at attachment to lateral wall.

Nerve supply

1. Sensory – ophthalmic nerve[v1] and maxillary nerve [v2] branches of trigeminal nerve [V]
2. Smell : olfactory nerve[I]

Paranasal sinuses

- They develop as outgrowths from the nasal cavity , and erode into the surrounding bones .
- There are four paranasal sinuses , each

Is named after the bone in which

it is found

The paranasal sinuses are

1. The ethmoidal
2. The sphenoidal
3. The frontal
4. The maxillary

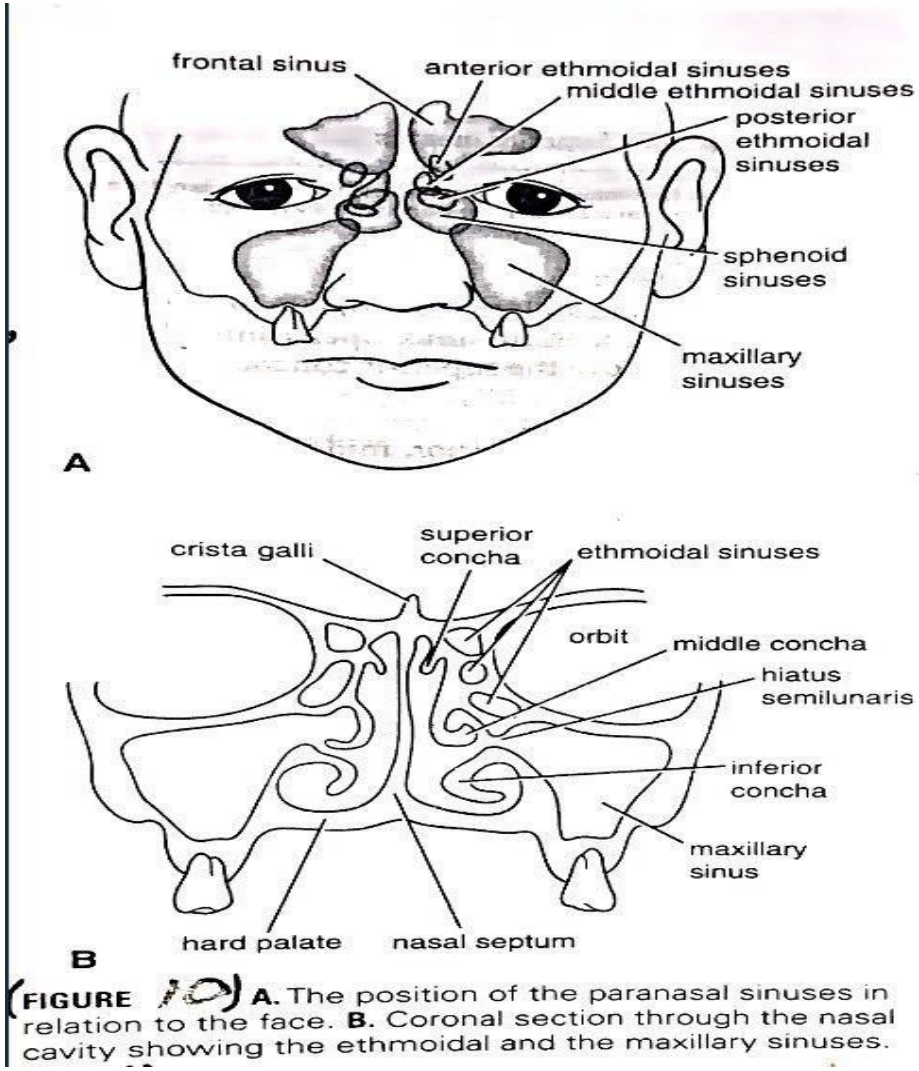


FIGURE 10 A. The position of the paranasal sinuses in relation to the face. B. Coronal section through the nasal cavity showing the ethmoidal and the maxillary sinuses.

Features.

1. Filled with air
2. Lined by respiratory epithelium and mucous cells .
3. Open into the nasal cavities
4. Innervated by trigeminal nerve [V]

Functions of the paranasal sinuses

1.Act as a resonator to voice

2. Reduce the weight of skull bones

Drainage of the paranasal sinuses

into the nasal cavities

1. The maxillary sinus into middle meatus .
2. The frontal sinus into the middle meatus .
3. The sphenoidal sinus : into the sphenoethmoidal recess
4. The ethmoidal sinus:

   Anterior group : middle meatus

   Middle group : middle meatus

   Posterior group : superior meatus

TABLE 1 Paranasal Sinuses and Their Site of Drainage into the Nose*

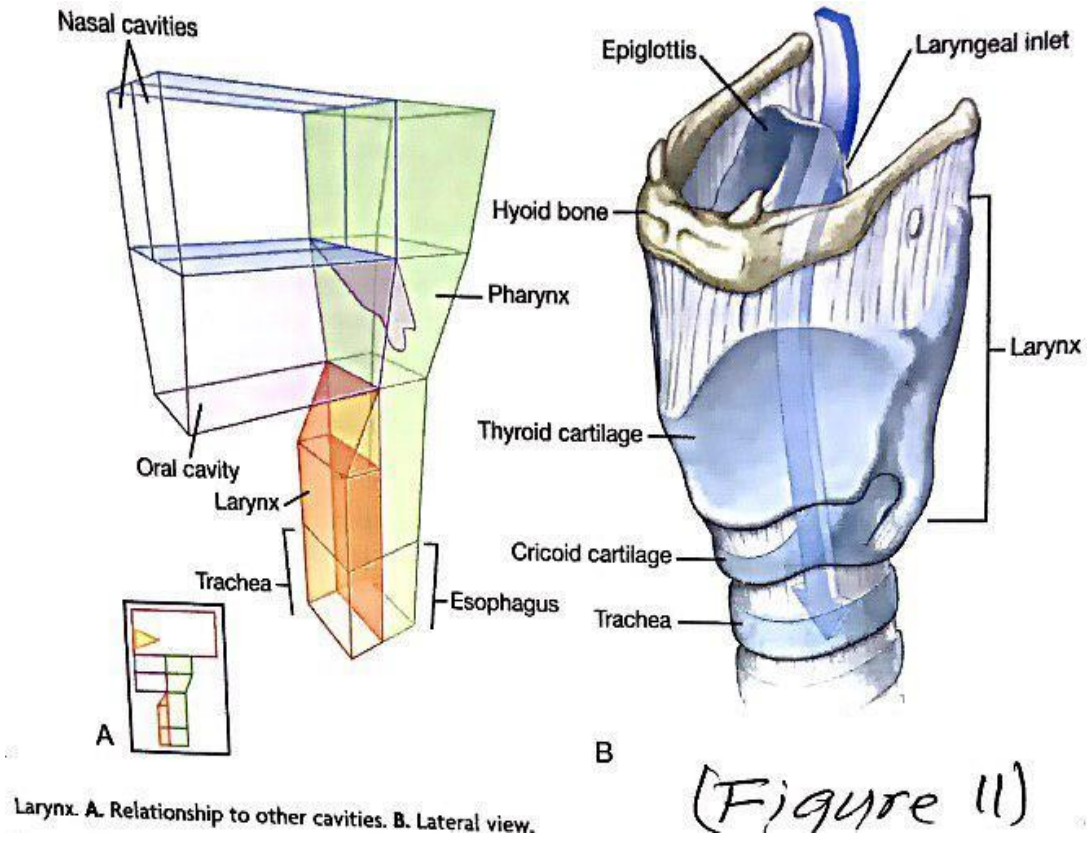
Sinus	Site of Drainage
Maxillary sinus	Middle meatus through hiatus semilunaris
Frontal sinuses	Middle meatus via infundibulum
Sphenoidal sinuses	Sphenoethmoidal recess
Ethmoidal sinuses	
Anterior group	Infundibulum and into middle meatus
Middle group	Middle meatus on or above bulla ethmoidalis
Posterior group	Superior meatus

The larynx

- Is a hollow musculoligamentous structure with cartilaginous framework , that caps the lower respiratory tract .
- Below : the cavity is continuous with the trachea .
- Above : opens into laryngopharynx immediately posterior to the tongue.

Site:

- Lies at the level of the 4^{th} , 5^{th} and 6^{th} cervical vertebrae .
- Below the tongue and hyoid bone.
- Lies between great vessels of the neck .
- The sides are related to the thyroid gland .
- It is covered anteriorly by skin , fascia and infrahyoid strap muscles .



Larynx. A. Relationship to other cavities. B. Lateral view.

(Figure 11)

The larynx

the skeletal framework of the larynx .

I**. Is formed by nine cartilages :**

A. Three large unpaired cartilages .

1. The cricoid
2. The thyroid
3. The epiglottis .

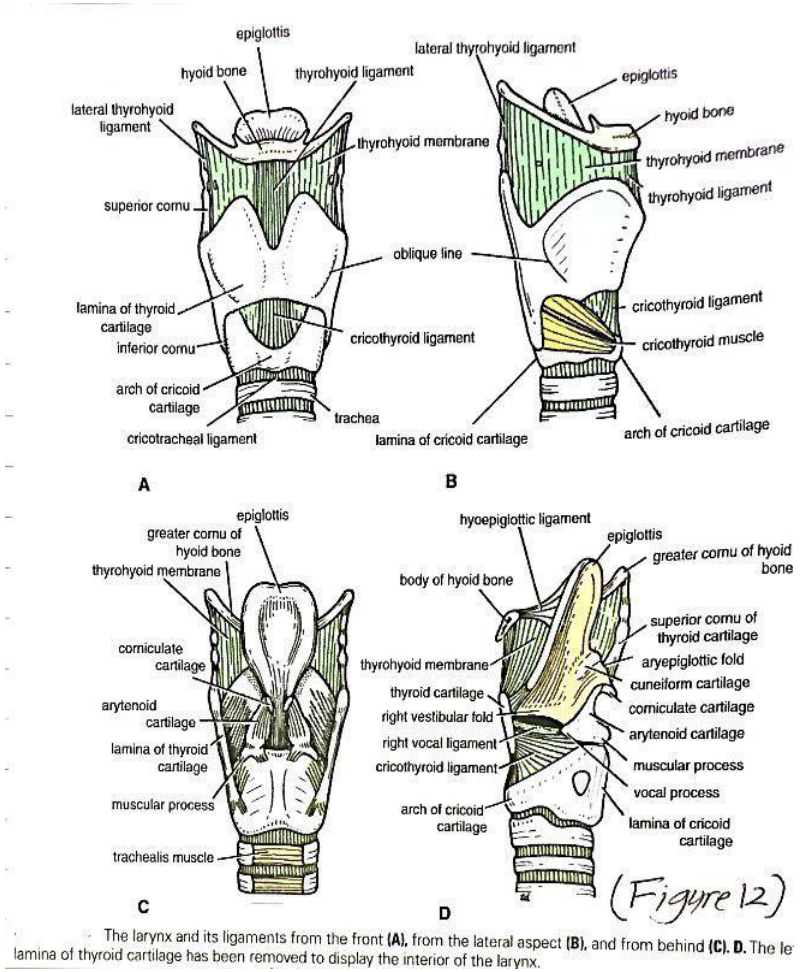
B. Three pairs of smaller cartilages .

1. Arytenoid
2. Corniculate
3. Cuneiform

II**. Fibroelastic membranes**

III. **Numerous intrinsic and extrinsic muscles** ,

for movement of the cartilages and vocal cords



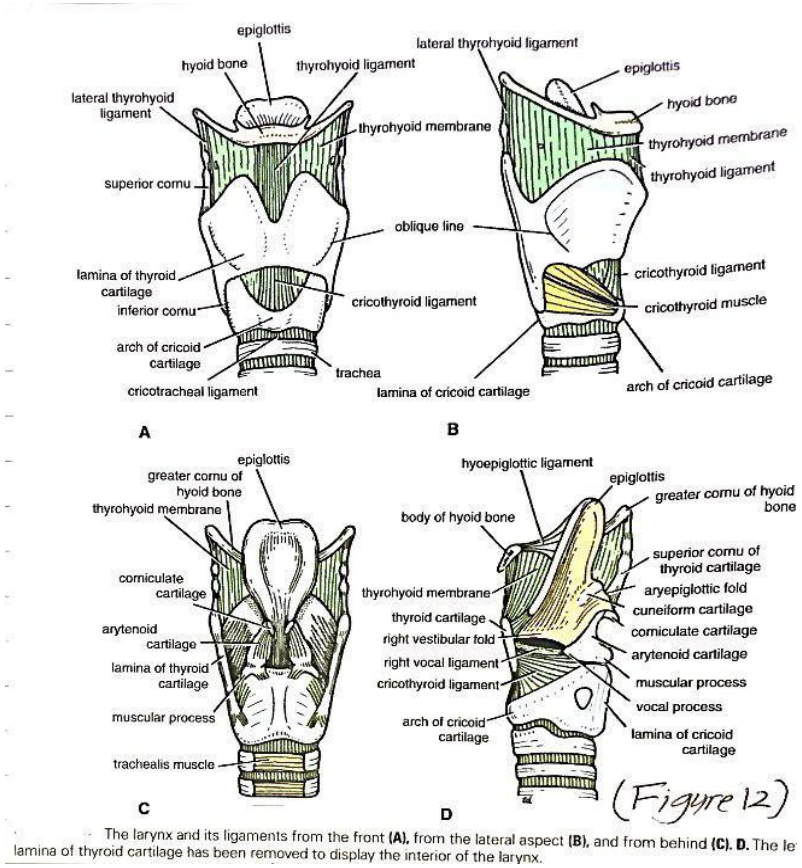
The larynx and its ligaments from the front **(A)**, from the lateral aspect **(B)**, and from behind **(C)**. **D.** The le
lamina of thyroid cartilage has been removed to display the interior of the larynx.

The larynx

The Epiglottis

Is a leaf-shaped lamina of elastic cartilage

- Lies behind the root of the tongue .
- Its stalk is attached to laryngeal cartilages and its upper edge is free .
- It guards the inlet of the larynx from swallowed material (acts as a valve)



The larynx and its ligaments from the front **(A)**, from the lateral aspect **(B)**, and from behind **(C)**. **D.** The le lamina of thyroid cartilage has been removed to display the interior of the larynx.

The larynx

Functions of the larynx

1. Acts as a valve (or sphincter) to close the lower respiratory tract .
2. Acts as an instrument to produce sound (phonation)

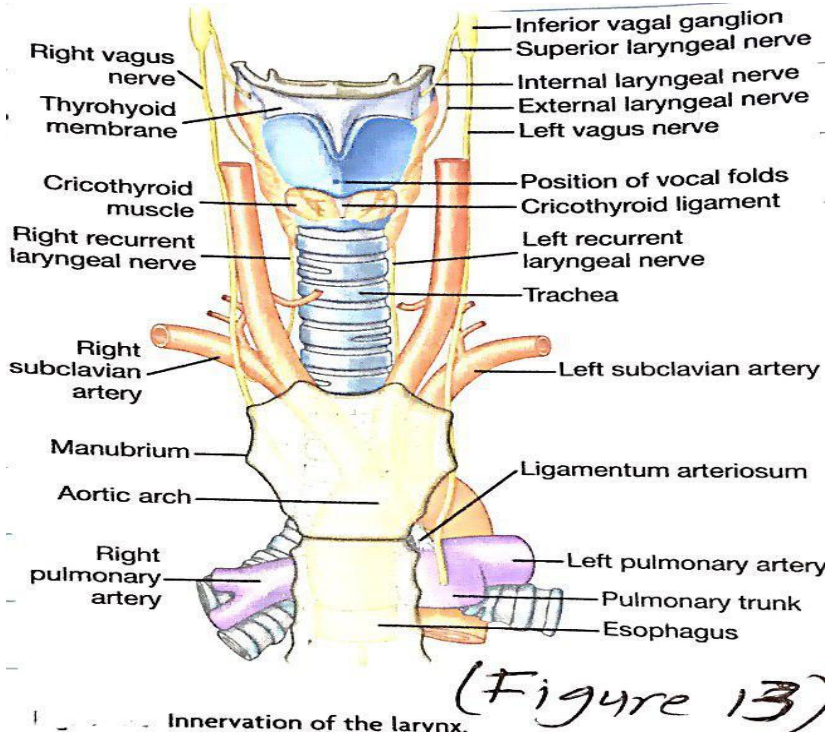
The larynx

Nerve supply of the larynx

Both motor and sensory innervation by vagus nerve [x]

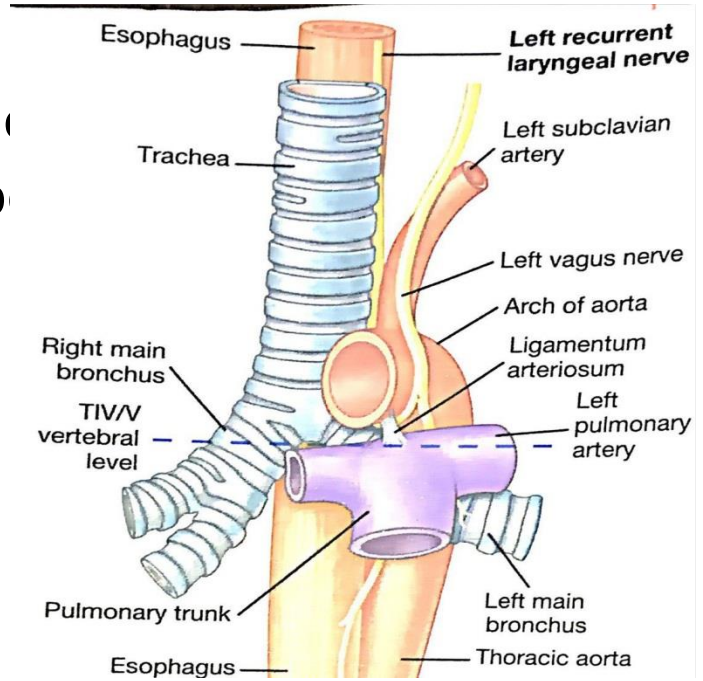
a. **Above the vocal cords** by the superior laryngeal nerve

b. **Below vocal cords** by the recurrent laryngeal nerve



The trachea

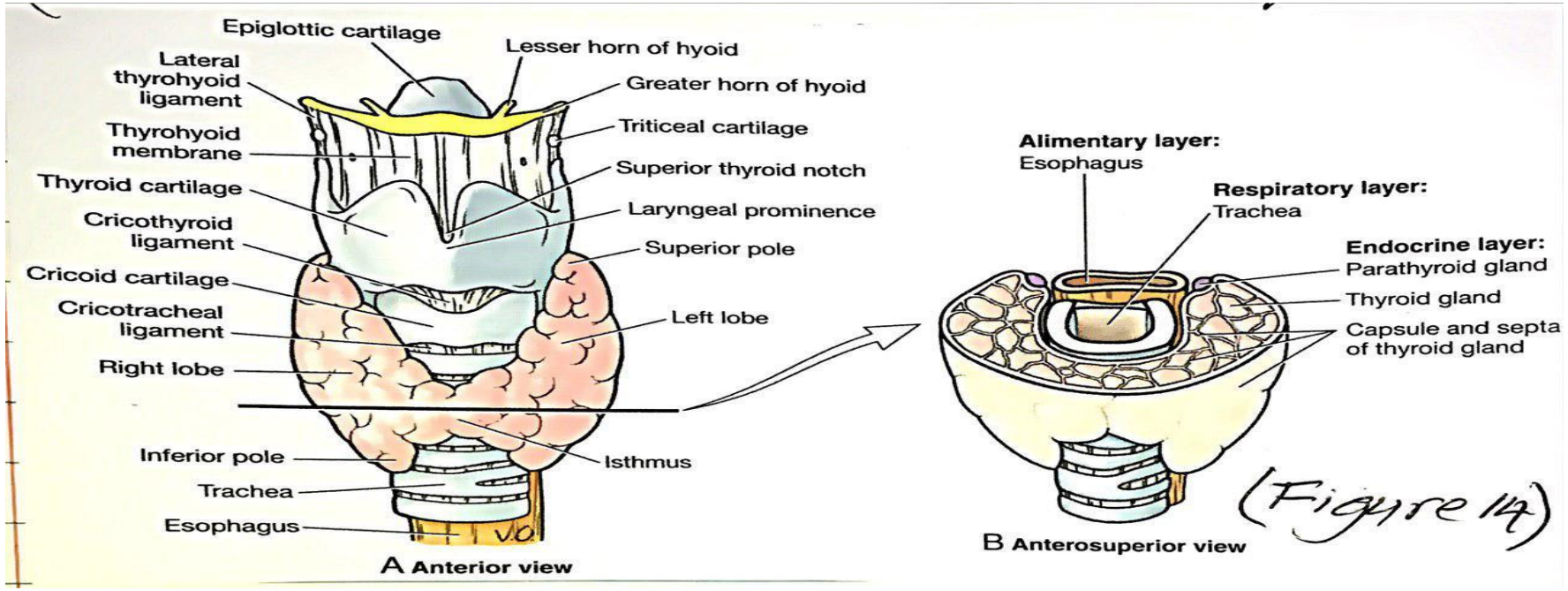
- Is a mobile cartilaginous and membranous tube
- It is about 11.5cm long .
- And 2.5 cm in diameter .
- Begins as a continuation of the larynx at the lower border of the cricoid cartilage at the level of the 6th cervical vertebra .
- It descends in the midline of the neck .
- It ends in the thorax at the carina by dividing into right and l
  main (primary) bronchi at the level of the sternal angle opp
  the intervertabral disc between the 4th and 5th thoracic
  vertebrae .
- The fibro – cartilaginous tube is kept patent by
  the presence of a U-shaped cartilaginous plate.



The trachea

Cartilaginous bar (ring) of hyaline cartilage embedded in wall .

- The posterior ends of the cartilage are connected by smooth muscle : the trachialis.



The trachea

Relations of the trachea

A. In the neck

- **Anteriorly :**

1) skin , fascia

2) Isthmus of the thyroid gland

(in front of the 2nd - 4th rings)

- **Posteriorly :**

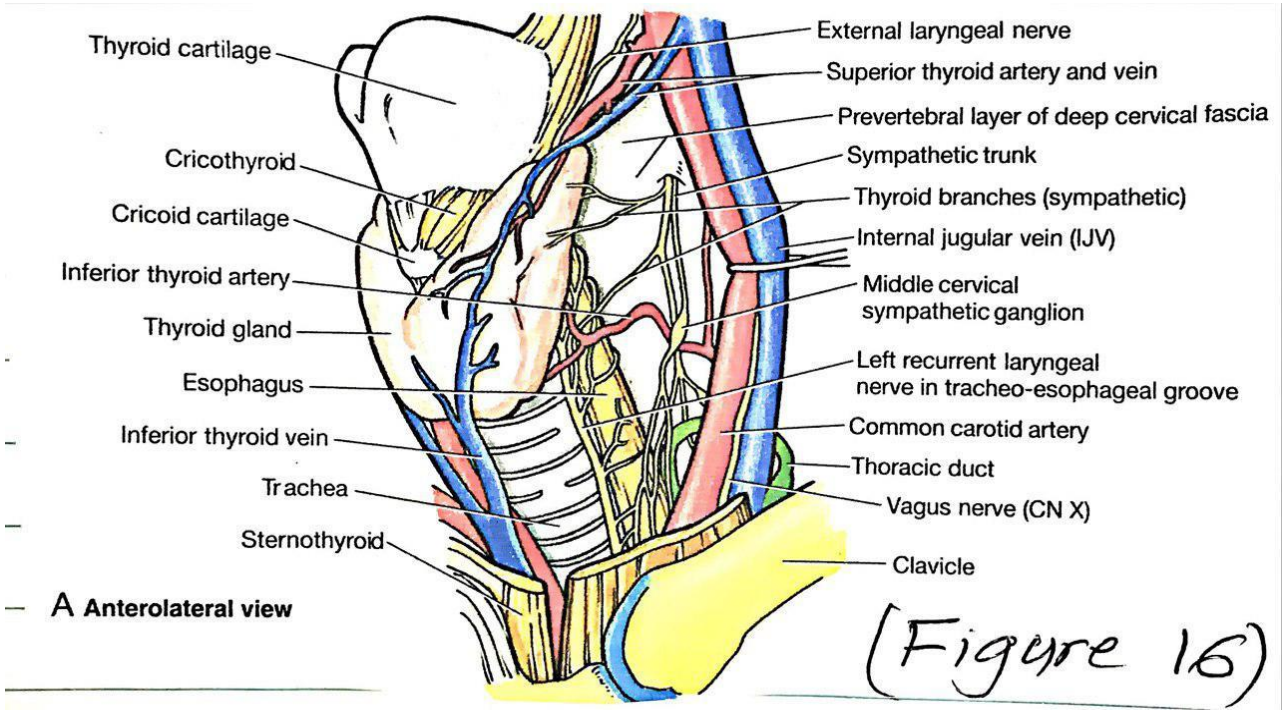
1) right and left recurrent laryngeal nerves

2) Esophagus

- **Laterally on both sides :**

1) Lobes of the thyroid gland

2) Carotid sheath and its content



The trachea

B. In the thorax , in the (superior mediastinum)

- **Anteriorly**

1. The sternum
2. The thymus
3. Left brachiocephalic vein
4. Origin of the brachiocephalic artery and left common carotid artery from the arch of the aorta

- **Posteriorly**

1. Esophagus
2. Left recurrent laryngeal nerve

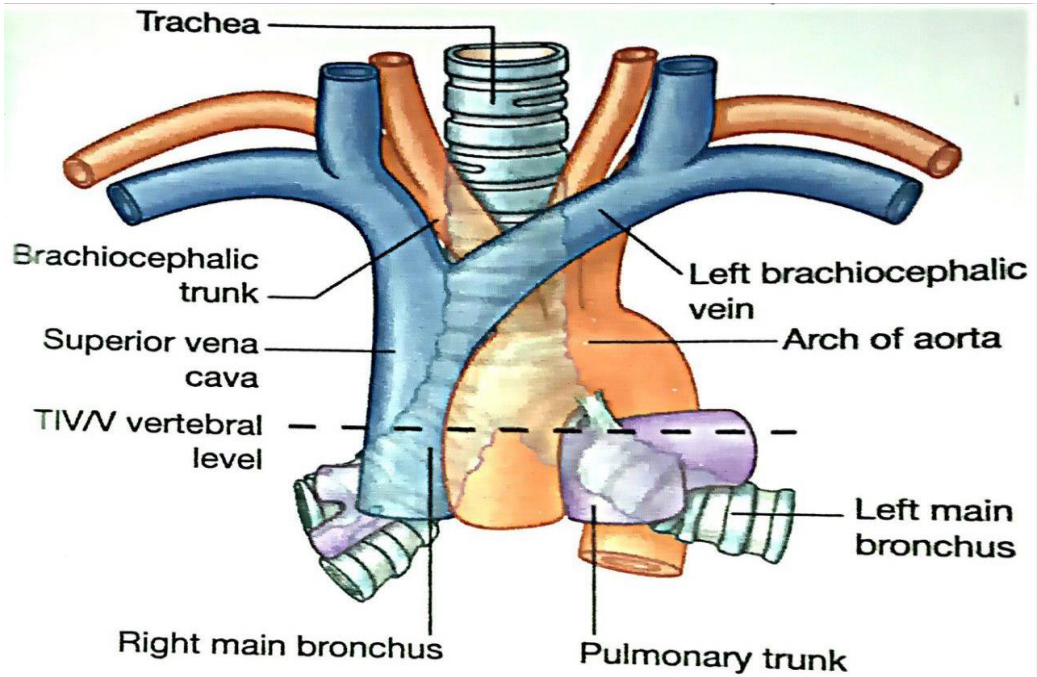
- **Laterally**

On The right side :

1. The azygos vein
2. The right vagus nerve[x]
3. The pleura

On the left side :

1. The arch of the aorta
2. The left vagus nerve[X]
3. The left common carotid and left subclavian arteries
4. The pleura



Trachea in the superior mediastinum.

The trachea

- **Mucosa of the trachea** :

Lined by respiratory epithelium with goblet mucous cells .

- **Nerve supply :**

Vagus nerve[X] recurrent laryngel nerve (a branch vagus nerve [X]).

The bronchi

- The trachea bifurcates behind the aorta into right and left main (primary or principal) bronchi
- The bronchi divide repeatedly

(to 30 orders of division)

giving rise to great number

of terminal bronchioles

- That terminate in one or

more respiratory bronchiole ;

which divides into 2-12

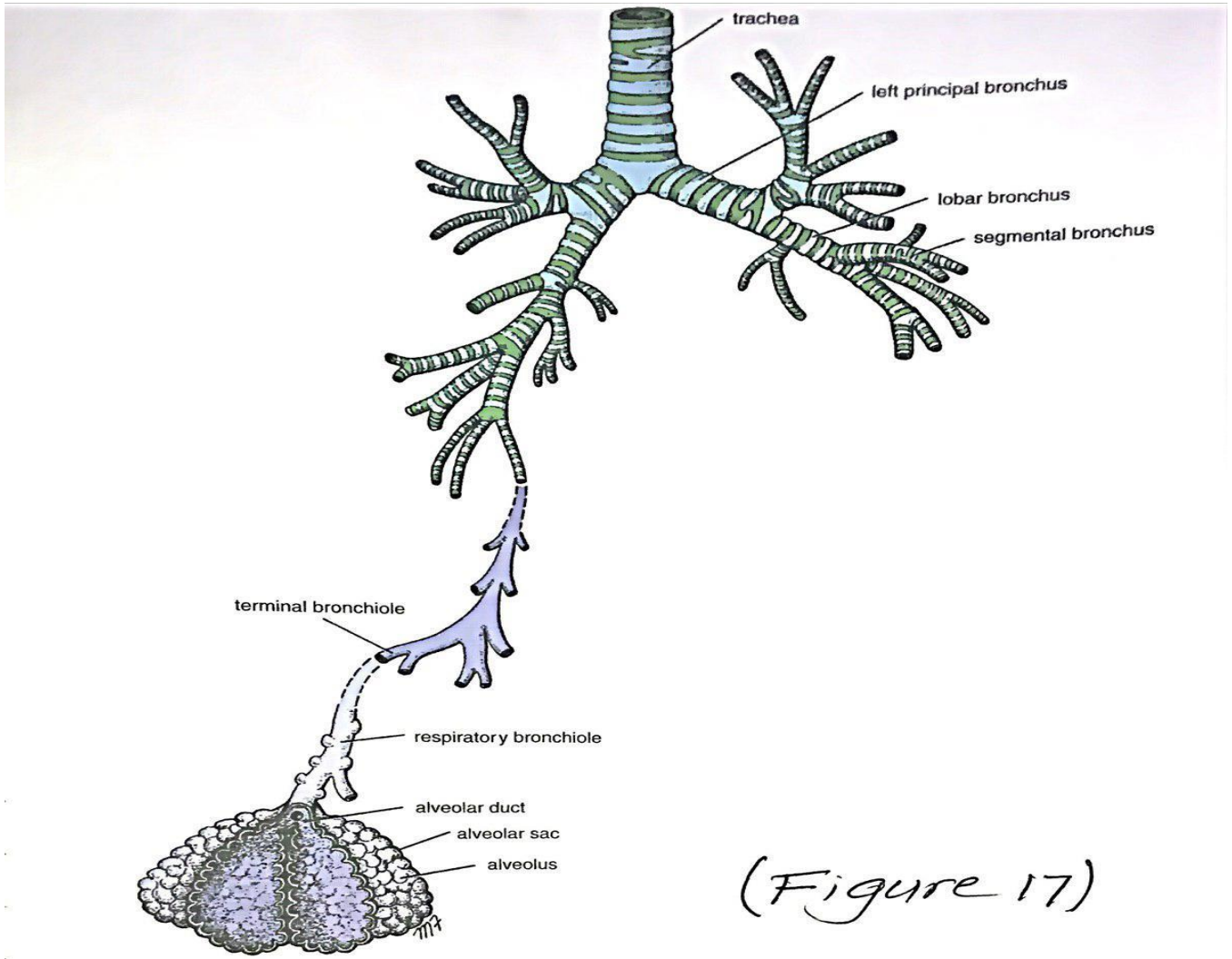
alveolar ducts ; that enter

the alveolar sacs .

- The alveoli arise from

the wall of the alveolar sac as

a diverticulum



Trachea, bronchi, bronchioles, alveolar ducts, alveolar sacs, and alveoli. Note the path taken by inspired air from the trachea to the alveoli.

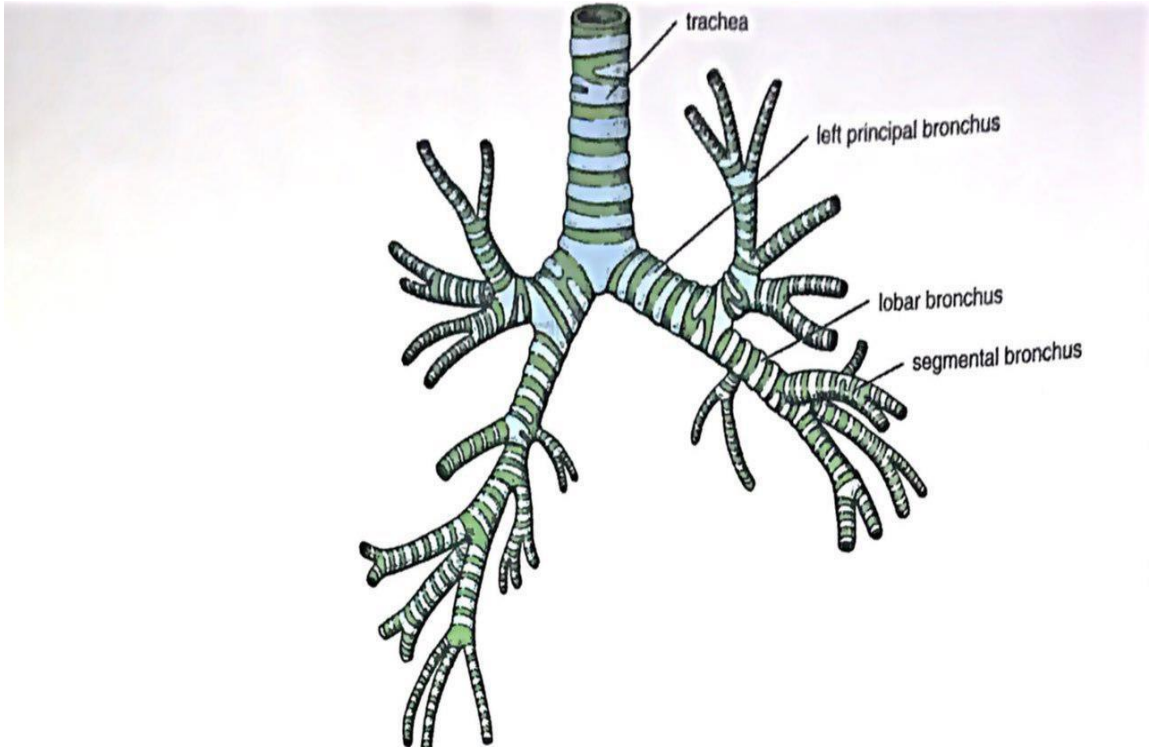
The main bronchi

The right main bronchus:

- Is wider , shorter and more vertical than the left main bronchus .
- It divides into superior , middle and inferior lobar (secondary) bronchi .

The left main bronchus :

- Is narrower , longer , and more horizontal than the right main bronchus
- It is 5cm long.
- It passes to the left below the arch of the aorta , and in front of the esophagus to reach the left lung.
- It divides into superior and inferior lobar (secondary) bronchi .



The lungs

- The two lungs are the organs of respiration
- They lie on either sides of the mediastinum in thorax .
- Surrounded by right and left pleural cavities .
- Air enters and leaves the lungs via the main bronchi .
- The pulmonary arteries deliver deoxygenated

blood to the lungs from the right ventricle

of the heart .

- Oxygenated blood returns to the left

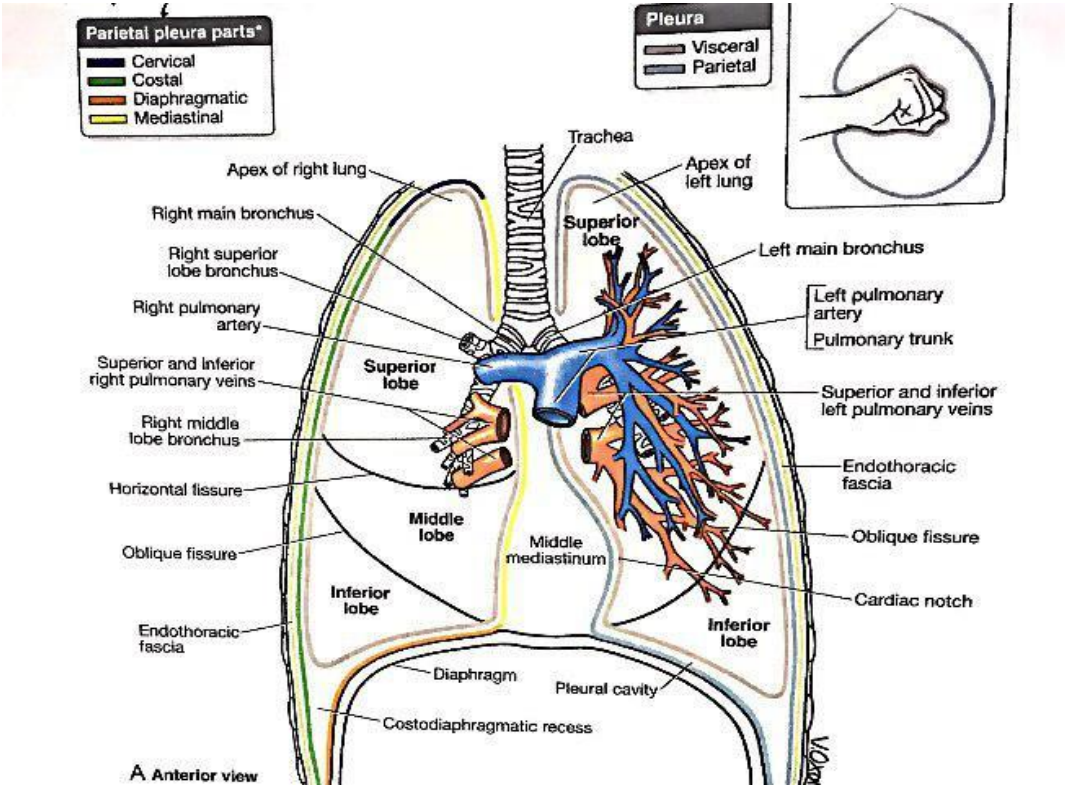
atrium of the heart from the lungs via the

four pulmonary veins

- 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 ri



The lungs

- Each lung is a half – cone shape with :
- Base and apex
- Two surfaces
- Three borders

The base of the lung

Sits on the diaphragm .

The apex of the lung

Projects above the first rib into the root of the neck

(The two surfaces of the lung.)

1. The costal surface

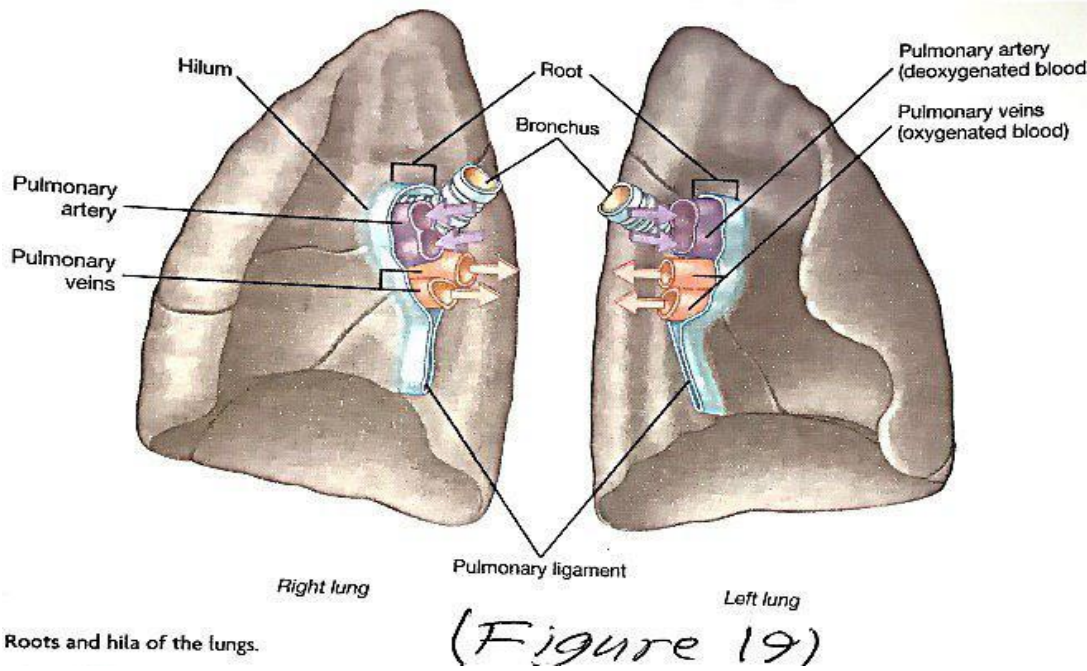
   Lies immediately adjacent to the ribs, and intercostal spaces .

2. The Mediastinal surface

   -Lies against the mediastinum anteriorly.

   -And the vertebral column posteriorly .

   -And the coma-shaped Hilum of the lung , through which structures enter and leave .



Roots and hila of the lungs.

(Figure 19)

The lungs

The three borders

1. <u>The inferior border of lung</u>

   Is sharp , and separates the base from the costal surface .

2,3. <u>The Anterior and posterior borders</u>

   Separate the costal surface from the medial (mediastinal) surface .

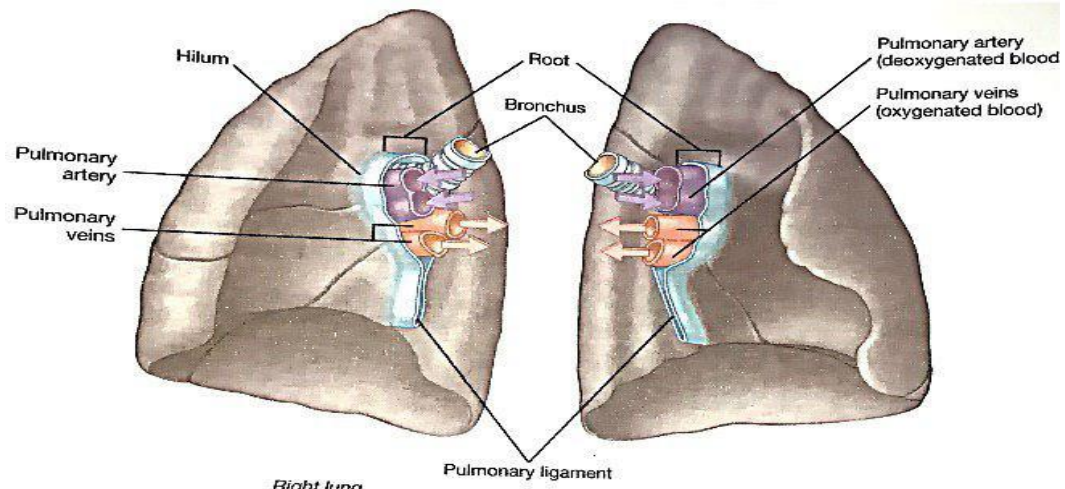
- The anterior and inferior borders are sharp .

  The posterior borders is smooth and rounded .

- The lunges lie directly adjacent to and are indented by structures :
- The heart and great vessels-indent the medial surfaces .
- Ribs indent the costal surface.

Root of Lung

- Is a short tubular collection of structures that together attach the Lung to structures in the mediastinum.
- It is covered by a sleeve of mediastinal pleura that reflects onto the surface of the Lung as visceral pleura.



Roots and hila of the lungs.

(Figure 19)

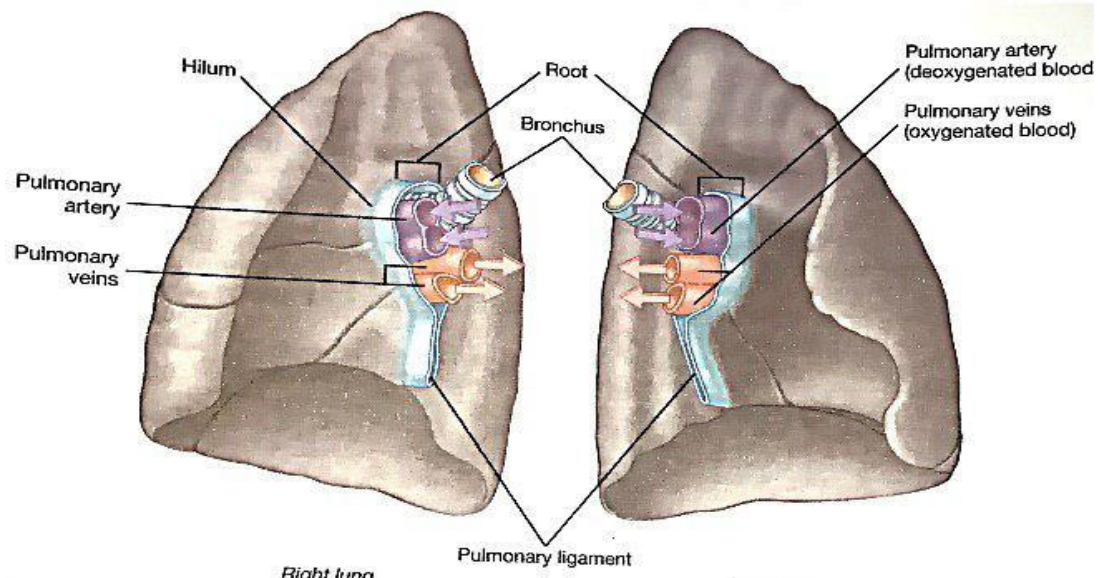
The Hilum of the Lung

Is the region outlined by pleural reflection on the medial surface of the Lung , where structures enter and leave.

Structures in the Hilum of the Lung

(within each root and located in the hilum)

1. A pulmonary artery.
2. Two pulmonary veins .
3. A main bronchus.
4. Bronchial arteries.
5. Bronchial veins.
6. Nerves.
7-Lymphatics.



Roots and hila of the lungs.

(Figure 19)

The lungs

The Right Lung.

- Has three Lobes: superior , middle and inferior .
- Has two fissures .

1. The oblique fissure:

separates the inferior lobe from the superior lobe and middle lobe.

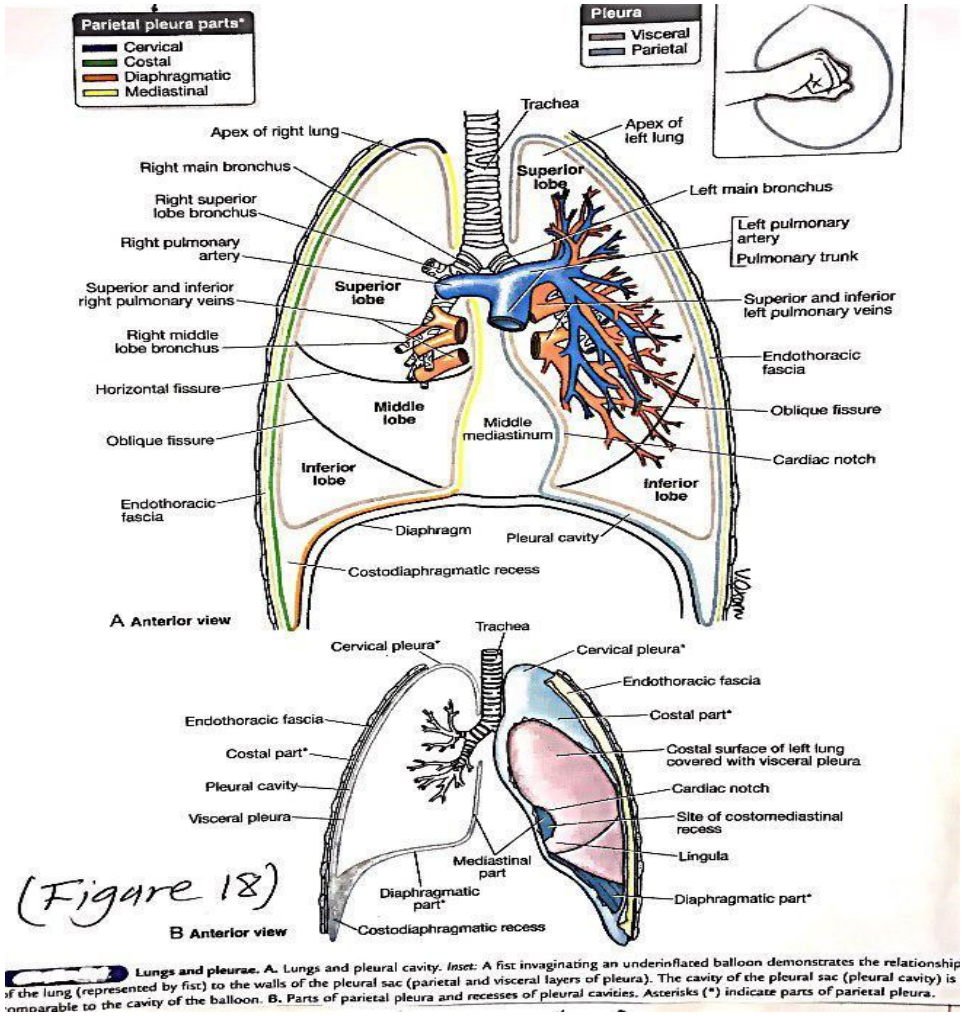
2.The Horizontal fissure:

separates the superior lobe from the middle lobe.

The left Lung.

- smaller than the right Lung.
- Has two lobes : superior and inferior.
- Has one fissure : the oblique fissure

separates the two lobes .



Lungs and pleurae. A. Lungs and pleural cavity. *Inset:* A fist invaginating an underinflated balloon demonstrates the relationship of the lung (represented by fist) to the walls of the pleural sac (parietal and visceral layers of pleura). The cavity of the pleural sac (pleural cavity) is comparable to the cavity of the balloon. **B.** Parts of parietal pleura and recesses of pleural cavities. Asterisks (*) indicate parts of parietal pleura.

The lungs

Bronchial tree

Each main (primary) bronchus enters

The root of Lung , passes through the hilum into the Lung itself.

- **The main bronchus** divides within the Lung into

Lobar (secondary) bronchi , each of which supplies

a Lobe.(on the right side the lobar bronchus to the superior Lobe branches within the hilum of the Lung)

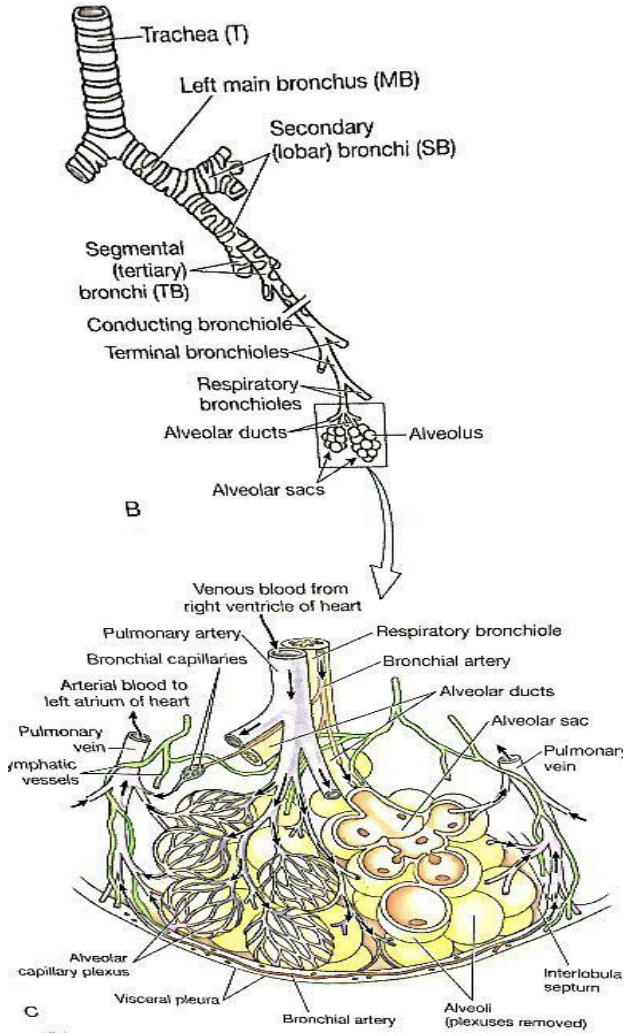
- **the Lobar bronchi** further divide into segmental

(Tertiary) bronchi which supply the bronchopulmonary segments .

- Within each bronchopulmonary segment, the

segmental bronchus gives rise ultimately to bronchioles.

- which further subdivide respiratory surfaces : The Respiratory bronchioles ,alveolar ducts , Alveolar sacs and alveoli.



The lungs

The Bronchopulmonary segment.

It is the area of lung that has the following characteristics.

1.It is supplied by a segmental (Tertiary) bronchus. and it's accompaning pulmonary artery branch , Lymphatics and autonomic nerves.

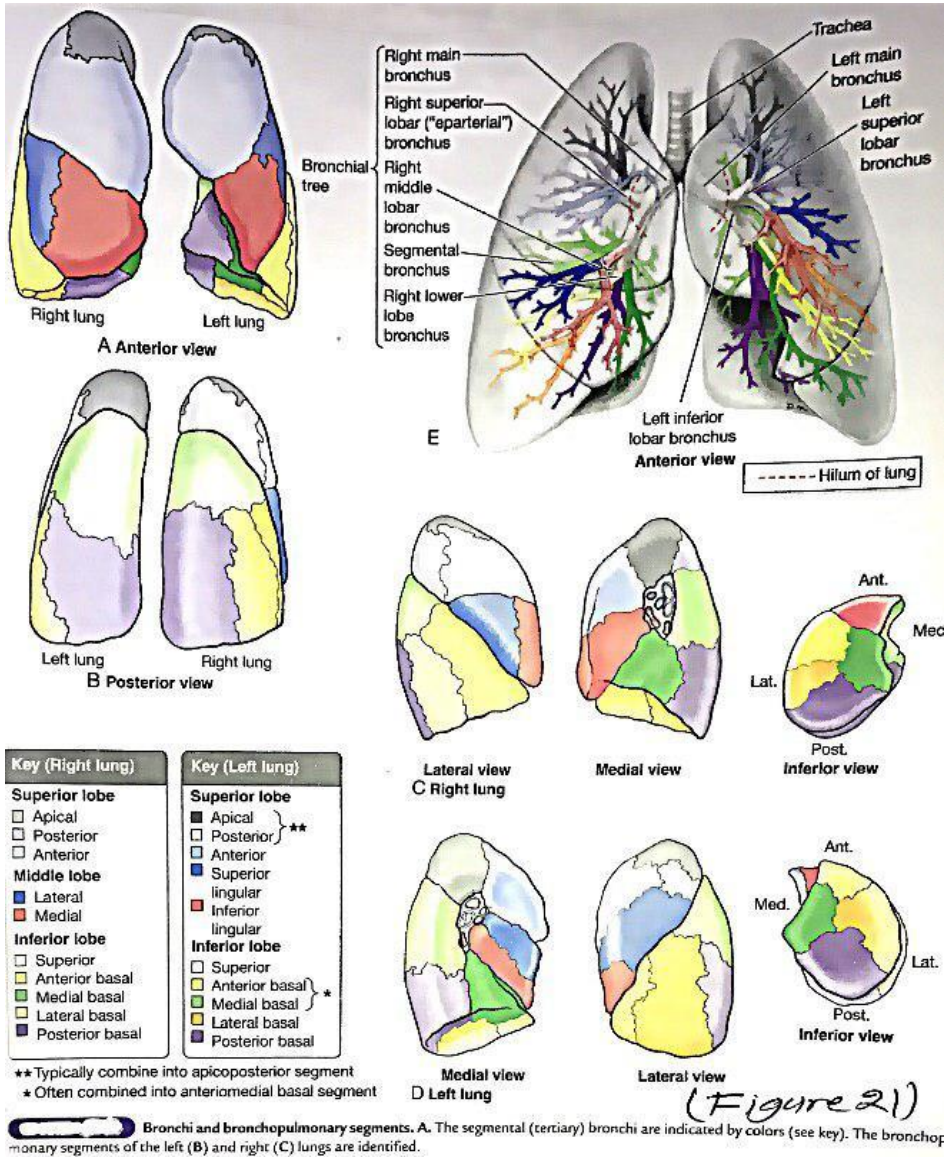
2. Tributaries of the pulmonary vein tend to pass intersegmentally, between and around the margins of the segments.

3. Shape of segments is like an irregular cone with its apex at the origin of the segment toward the hilum and the base projects peripherally on the surface of the Lung.

4. Anatomically, the bronchopulmonary segment is the smallest functionally independent region of Lung.

5. It is also the smallest area of the Lung that can be isolated ,and removed surgically without affecting the adjacent region.

- There are 10 broncho pulmonary segments in each Lung.



Bronchi and bronchopulmonary segments. A. The segmental (tertiary) bronchi are indicated by colors (see key). The bronchopulmonary segments of the left (B) and right (C) lungs are identified.

The lungs

Blood supply

Arteries: from bronchial arteries ,branches of descending aorta.

Veins: bronchial veins, drain into Azygos and hemiazygos veins

----> superior vena cava.

Lymphatic drainage.

- From the superficial and deep lymphatics into the Tracheobronchial lymph nodes along the bronchi and trachea.
- Efferent lymphatics then drain into the right and left broncheomediastinal trunks

The lungs

Nerve supply

Each Lung is supplied by pulmonary plexus :

A. **sympathetic innervation** from the sympathetic trunk.

Stimulation of sympathetic causes:

1-Vasoconstriction.

2-Bronchodilatation .

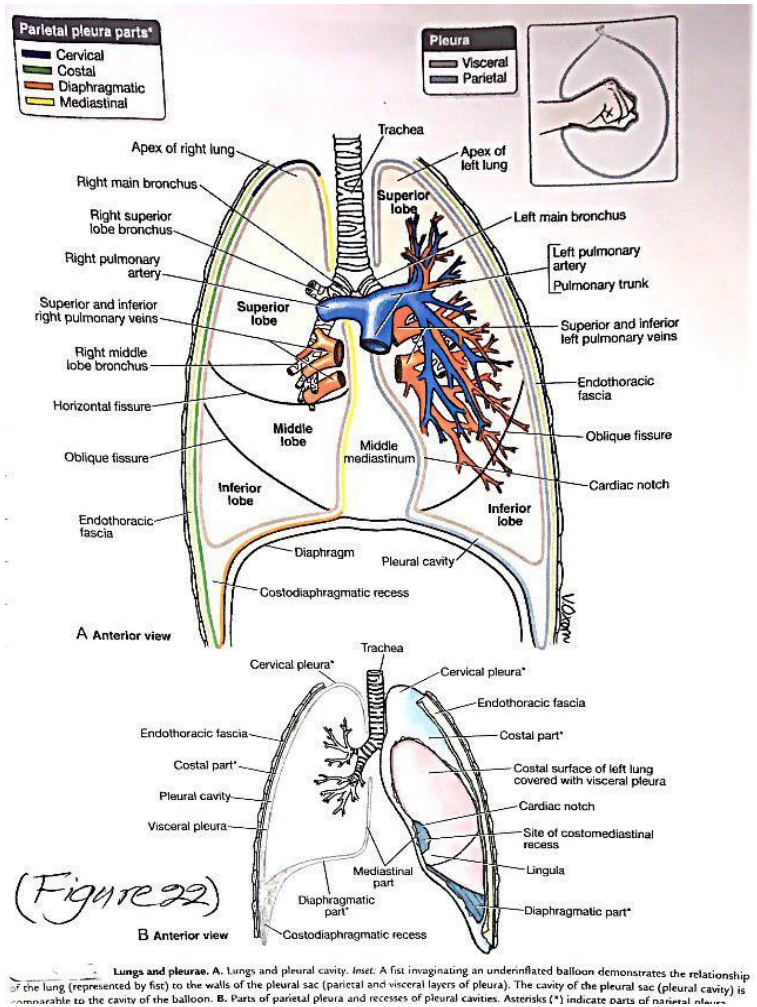
B. **Parasympathetic innervation** from Vagus nerve.

its stimulation causes:

1. constriction of bronchioles.
2. Increase glandular secretion.

Pleural cavities

- One on either side of the mediastinum, surround the Lungs
- Superiorly they extend above the clavicle.
- Inferiorly : they extend to a level just above the costal margin.
- The medial wall of each pleural cavity is the mediastinum



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Pleura

Each parietal pleura is lined by a single layer of flat cells (Mesothelium) and an associated layer of supporting connective tissue , to gather they from the pleura.

Type of pleura

Divide into two major types , depending on the location :

1.The parietal Pleura.

Is the pleura associated with the walls of the pleural cavity.

2.The visceral pleura.

Is the pleura that reflects from the medial wall onto the surface of Lung.

It is adherent to | and cover the Lung.

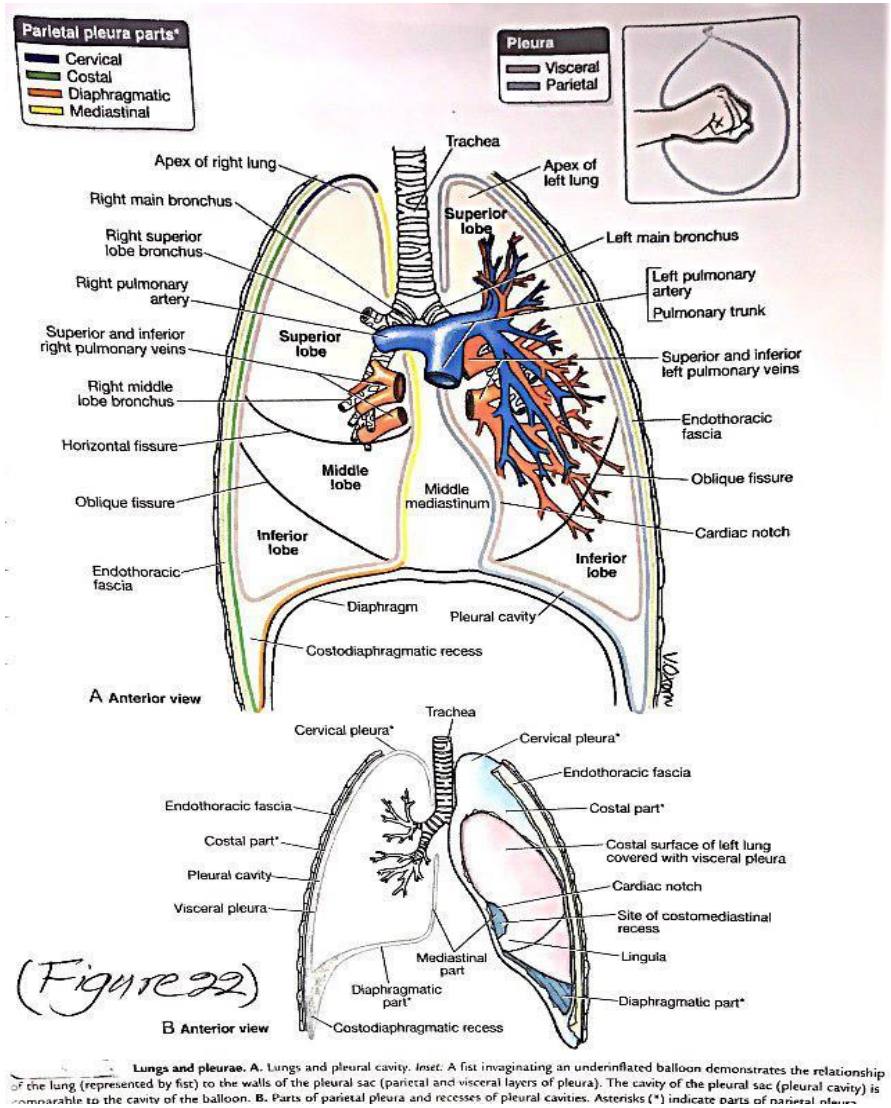
The Pleural cavity

-Each pleural cavity is the potential space enclosed between the visceral and parietal pleurae

-They normally contain only with layer of serous fluid (The pleural fluid).

Nerve Supply

Parietal pleura: general sensation by the intercostal nerves.



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Chest Wall

Structures forming the chest wall

1-Bones and cartilage .

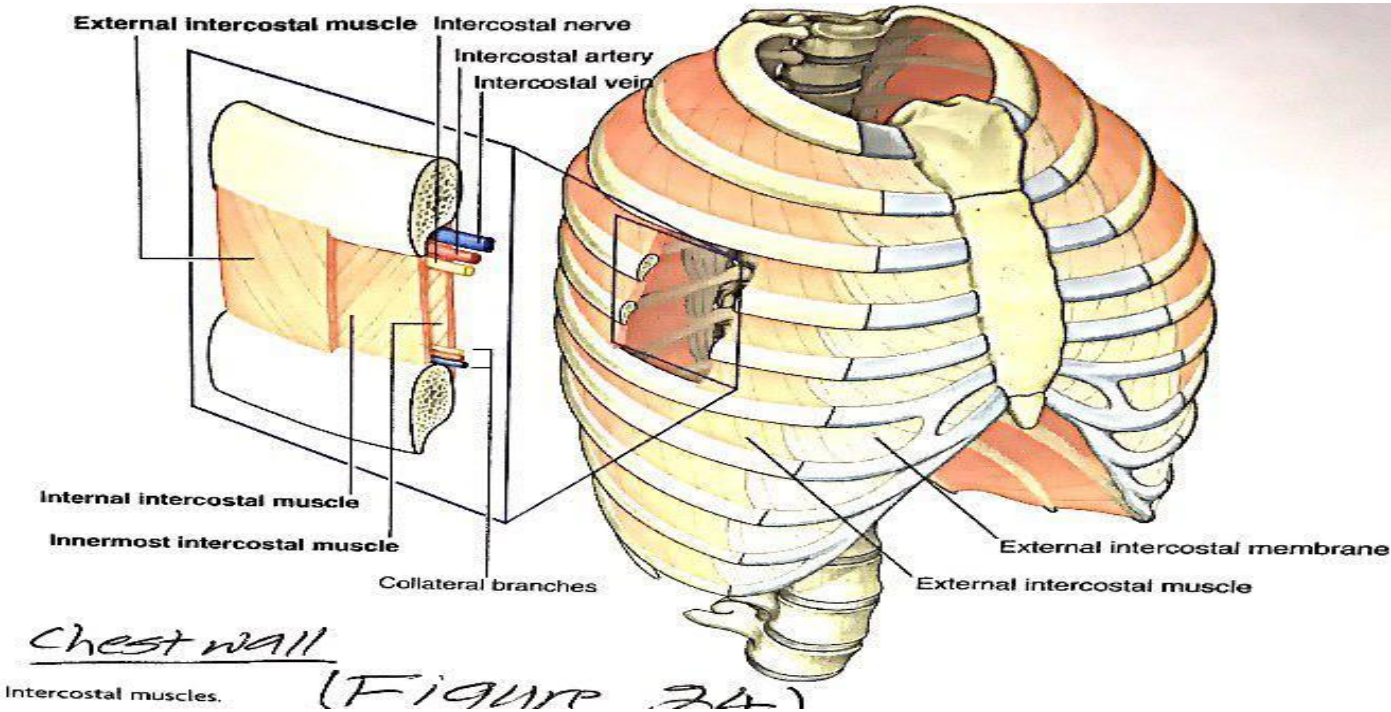
sternum ,ribs and costal cartilages.

2-Joints.

Manubiriosternal ,

xiphisternal,

costovertebral, costochondral joints.



Chest wall

Intercostal muscles. (Figure 34)

Chest Wall

Muscles of the chest wall

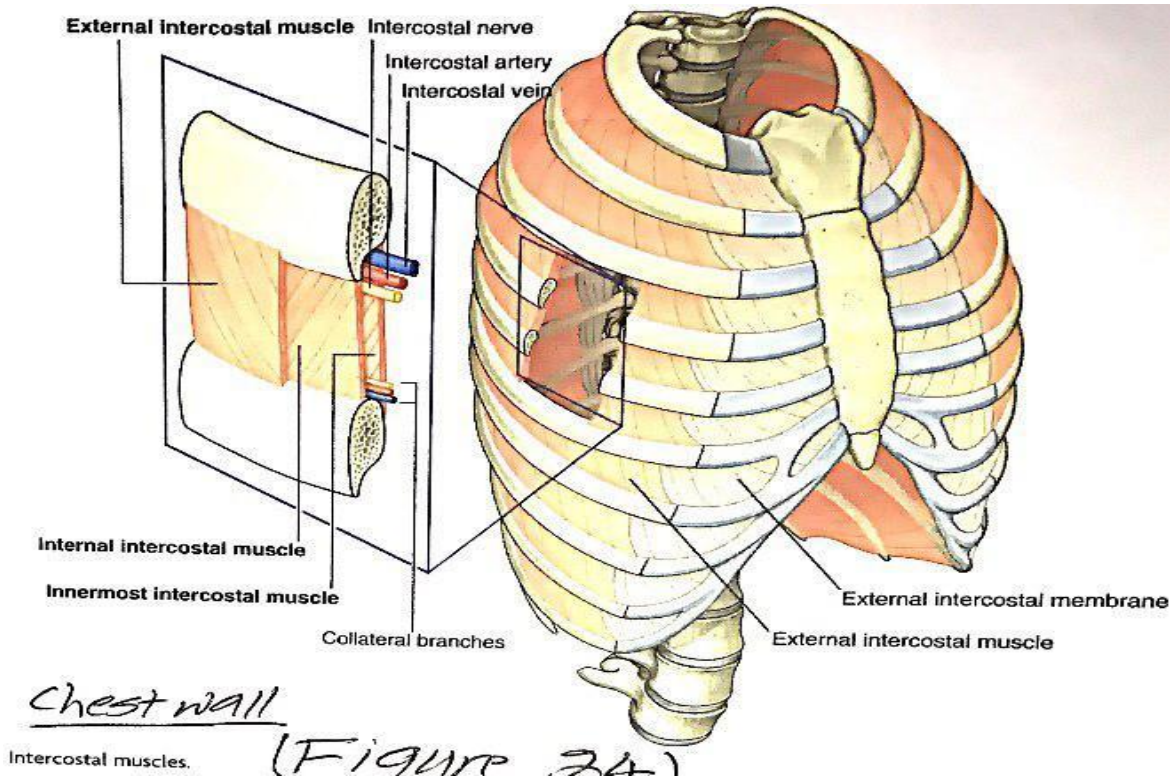
1-Intercostal muscles

External, internal, innermost.

2-Levator costorum .

3-Serratus posterior superior.

4-Serratus posterior Inferior.



The Diaphragm.

- Is the most important muscle of respiration (inspiratory muscle)
- Is a musculotendinous structure.
- That fills the inferior thoracic aperture .
- And separates the thoracic cavity from the

abdominal cavity.

Origin: attached peripherally to :

1-Xiphoid process of the sternum.

2-Costal margin of the thoracic wall.

3-ends of the 11^{th} and 12^{th} ribs.

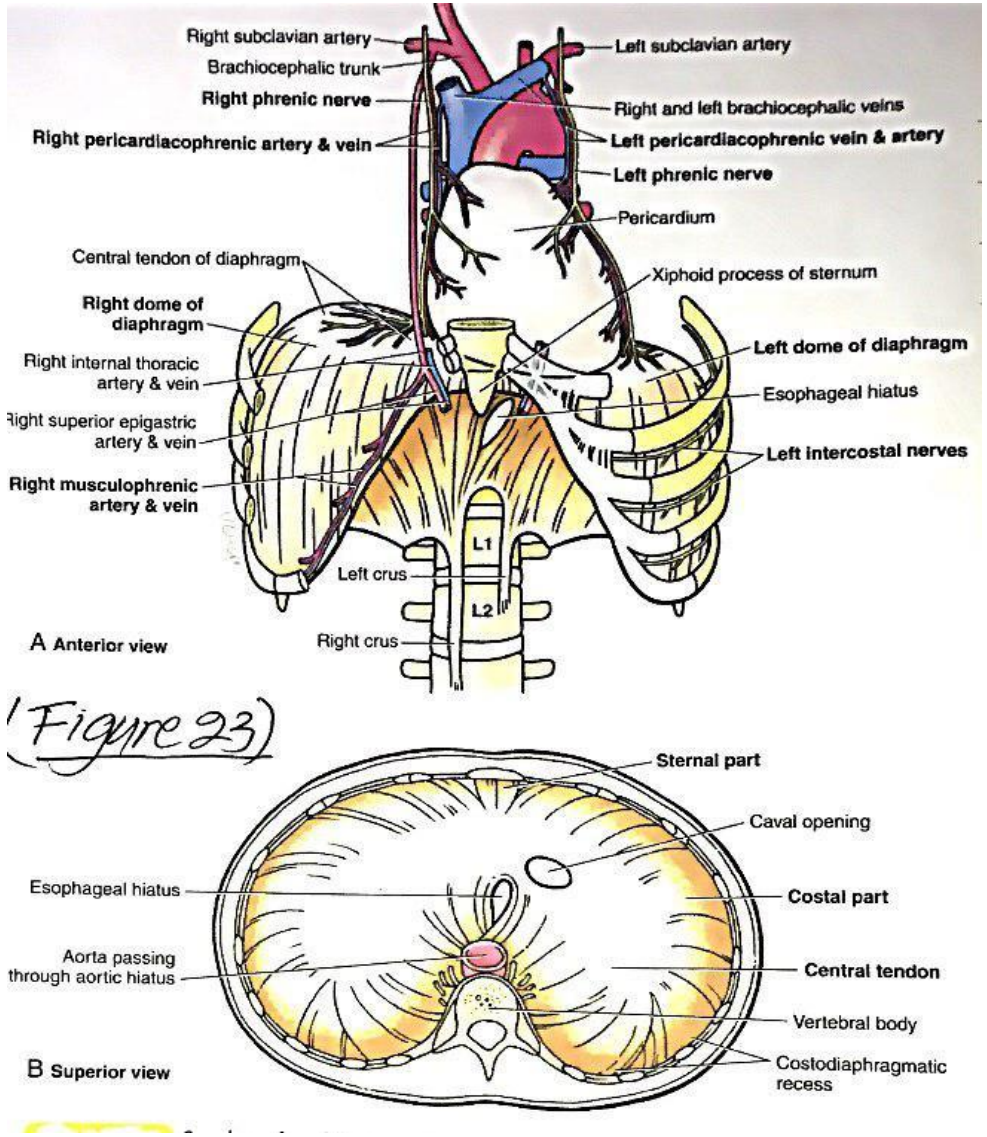
4-Vertebrae of the lumbar region.

Insertion :into the central tendon, the muscle fibers converge from the periphery to this tendon

Nerve supply :Phrenic nerves(c3,c4,c5)

Action:

Contraction of dome of diaphragm →flattens the diaphragm →Increase the thoracic volume by increasing its vertical diameter .



The Diaphragm.

Openings in the diaphragm.

1.caval opening.

At the level of the 8th thoracic vertebra structures passing through it are

a-The inferior vena cava: passing through the central tendon.

b-Branches of the phrenic nerves.

2.Esophageal hiatus

At the level of the 10th thoracic vertebra structures passing through are

a-The Esophagus, passing through the muscular part.

b- Vagus nerves[X]

3.Aortic hiatus.

At the level of the 12ththoracic vertebra structures passing through it are

a-The Aorta.

b-The Thoracic duct.

c-Azygnus and hemiazygus veins.

Movements of thoraeic wall and the Diaphragm during Breathing.

During breathing , the dimensions of the thorax change in the

A) vertical

B) Lateral

C) antero posterior directions.

1-Elavation and depression of they diaphragm significantely alter the vertical dimension of the thorax

a-Depression results when the muscle fibers of the diaphragm contract.

b-Elevation occurs when diaphragm relaxes.

2-changes in the anteroposterior and Lateral dimensions result from elevation and depression of the ribs.

-These active mechanisms result in Inspiration.

-Expiration result from recoil action of the Lungs and the llrexation of the above mentioned muscles.