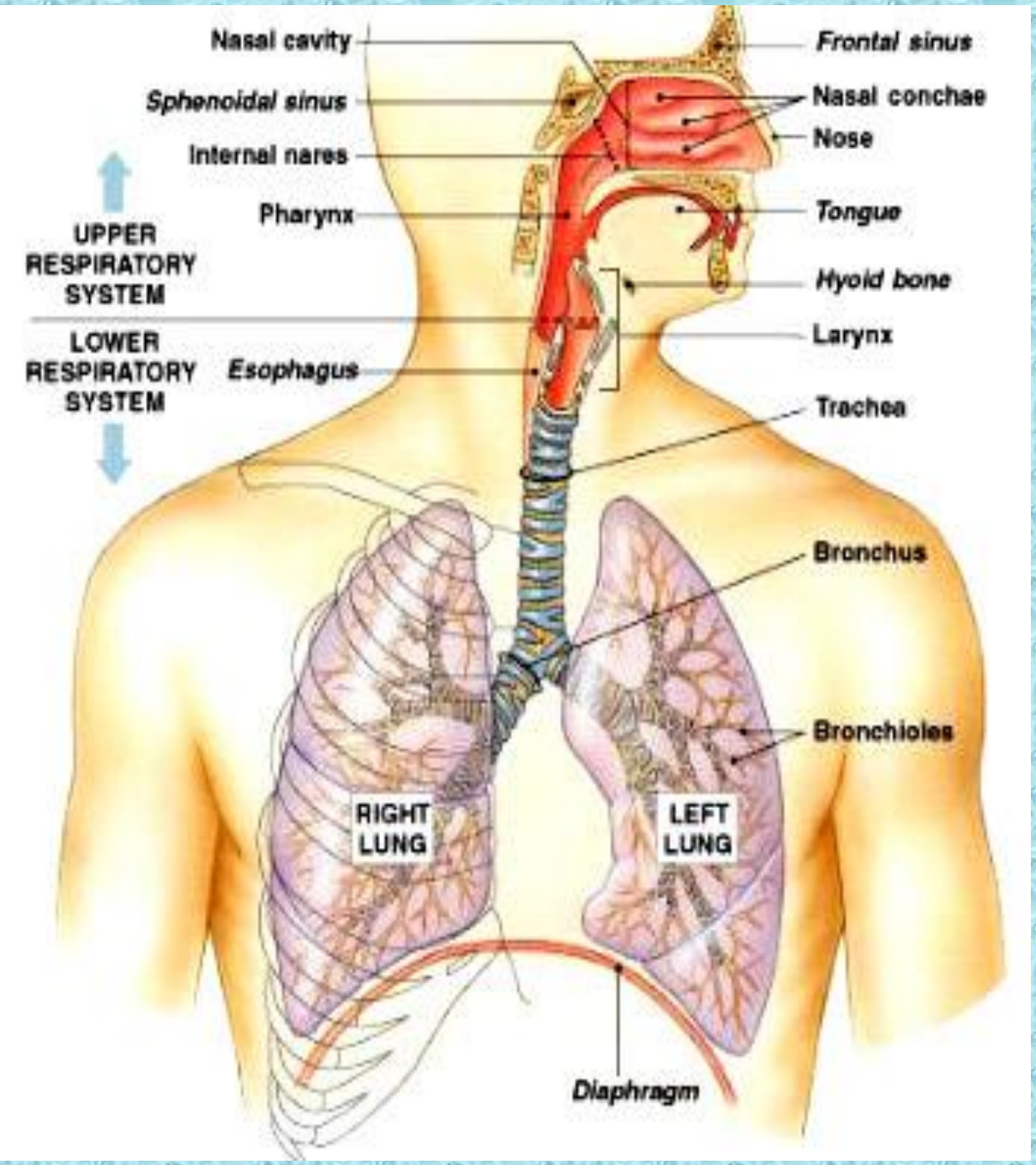
Functional anatomy of the respiratory system

1.General characteristic of the respiratory system
2. Functional anatomy of the air passages
3. Functional anatomy of the lungs
4. Functional anatomy of the pleura
5.Development of the respiratory system
6. Examination of the respiratory organs
7. Anomalies of the respiratory organs

Author: PhD, professor Tamara Hacina



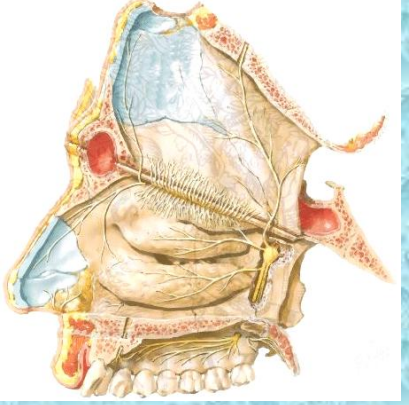
Anatomical classification of the respiratory organs:

1- the air passage:

(*upper* - the nasal cavity and nasal part of the pharynx; *lower* - the larynx, trachea, bronchi);

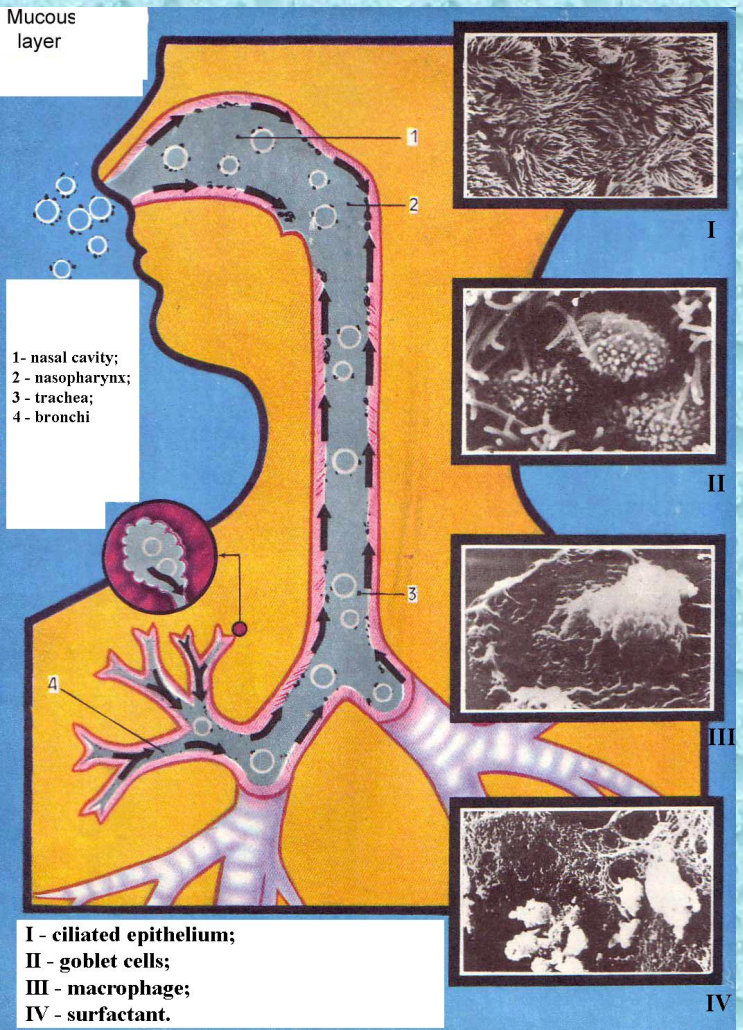
2 - the organs accomplishing the function of the change of the gases:

the lungs.



Structural peculiarities of the air passages

1) They *don't collaps* (their walls contain the bones and cartilages)
2) Their walls are covered by *ciliated epithelium*
3) Epithelium consists of *goblet cells* /these are glandular simple columnar epithelial cells whose sole function is to secrete mucin, which dissolves in water to form mucus/ and *columnar epithelial cells, serous and mucous glands./*



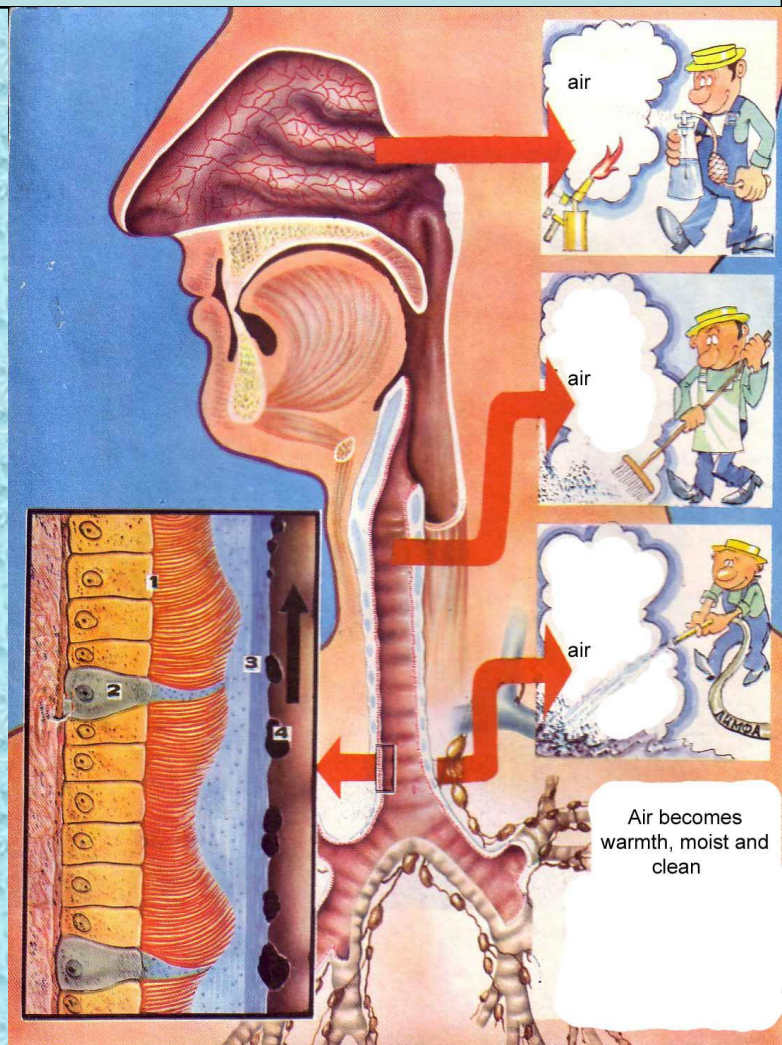
Functions of air passages

warming,

humidification,

purification

of inhaled air



Functions of the nasal mucosa

Heat Exchange The nose may be considered as a heat exchange system where two fluids are in thermal but not direct contact. It is the inspired air and the other fluid is the blood supply of the nose.

Humidification It is generally accepted that water from humidification comes directly from the serous glands which are extensive through out the nasal mucosa.

Nasal Reflexes Several reflexes are initiated in the nasal mucosa. Sneezing is a protective reflex when particles foreign to the mucosa are expelled followed by the copious flow of nasal secretions help on to wash them out.

Olfaction. Olfactory epithelium is located at the roof of the nasal cavity and the adjoining parts of the nasal septum and the superior turbinate.

The nasal mucosa contains a series of ***adjustments for treatment of the inspired air***:

1) it is covered with ciliated epithelium whose *cilia* form a carpet on which dust settles; the vibration of the cilia in the direction of the choanae drives out the settled dust;
2) the mucous membrane contains *mucous glands* whose secretions wrap around the dust and make its expulsion easier and also humidify the air;
3) the submucous tissue is rich in *veins (plexus venosus),* which form thick networks (resembling cavernous bodies) on the inferior concha and the lower border of the middle concha; under different conditions these networks may swell and be cause of nose bleeding.

The Nose

Dorsum
- Root
- Apex (tip)

Ala

Vibrissae

Naris

Columella = skin that seperates the naris

- **The turn up Nose:** This type of nose is also called as the Celestial nose. It is so called because it runs continuously from the eyes towards the tip.

- **The Roman or Aquiline Nose**: This type of nose is convex in shape, like a hook. It is also known as 'hooknose' because of its shape. The word aquiline is derived from the Latin word 'aquilinus' which means 'eagle like'.

- **The Greek or Straight Nose.** This type of nose is perfectly straight with no curves or hooked like shape. It is known as Greek nose because it is generally noticed that the Greek people have this kind of nose.

- **The Nubian Nose:** This type of nose has wide nostrils. It is generally a little narrow at the top, thick and broad at the middle and wide at the end. The term 'Nubian' comes from the ethnic group 'Nubians' who belong to northern Sudan.

- **The Hawk Nose:** The hawk nose is so called because it is very convex, to the extent that it almost looks like a bow. It is very thin and sharp as well. Since it resembles the beak of a Hawk, it is known as the hawk nose.

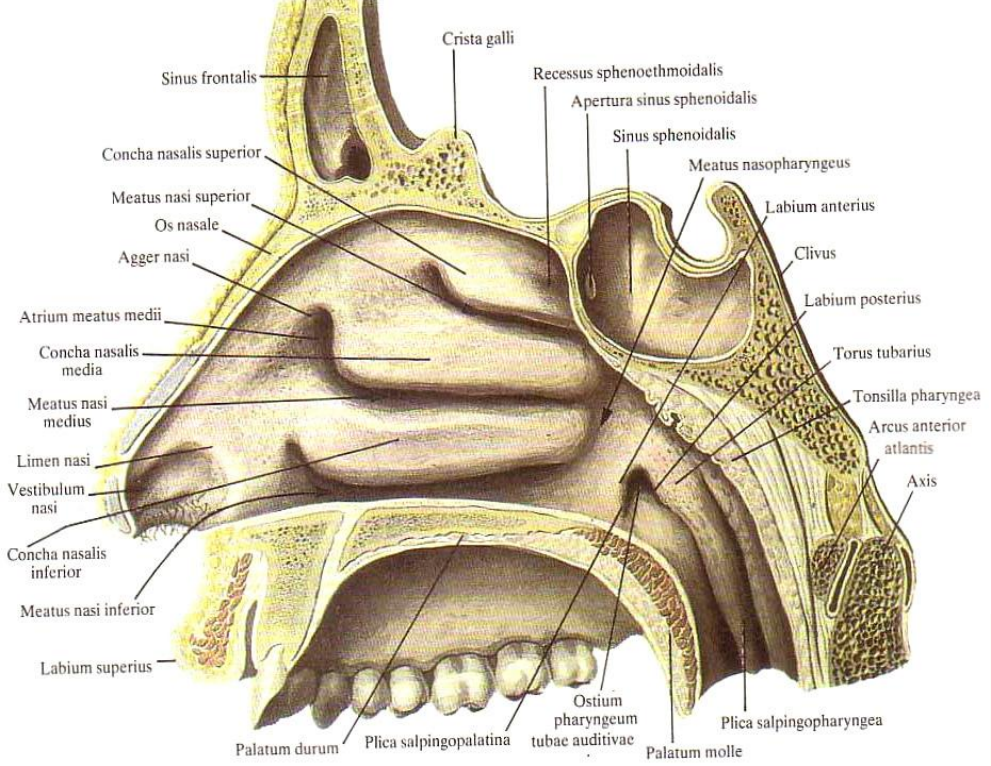
- **Snub Nose:** This type of nose is quite short in length and is neither sharp, nor hook like nor wide. It is almost as short as a nose possibly can be. Hence, it is known as snub nose

- **Ratio of width and length of the external nose grows among the peoples of the North to the South Pole**

- **The anthropological literature points to the relationship of nasal index and climate: the distribution of leptorrine forms in cold and dry climates, hamerrine - in hot and humid climates**

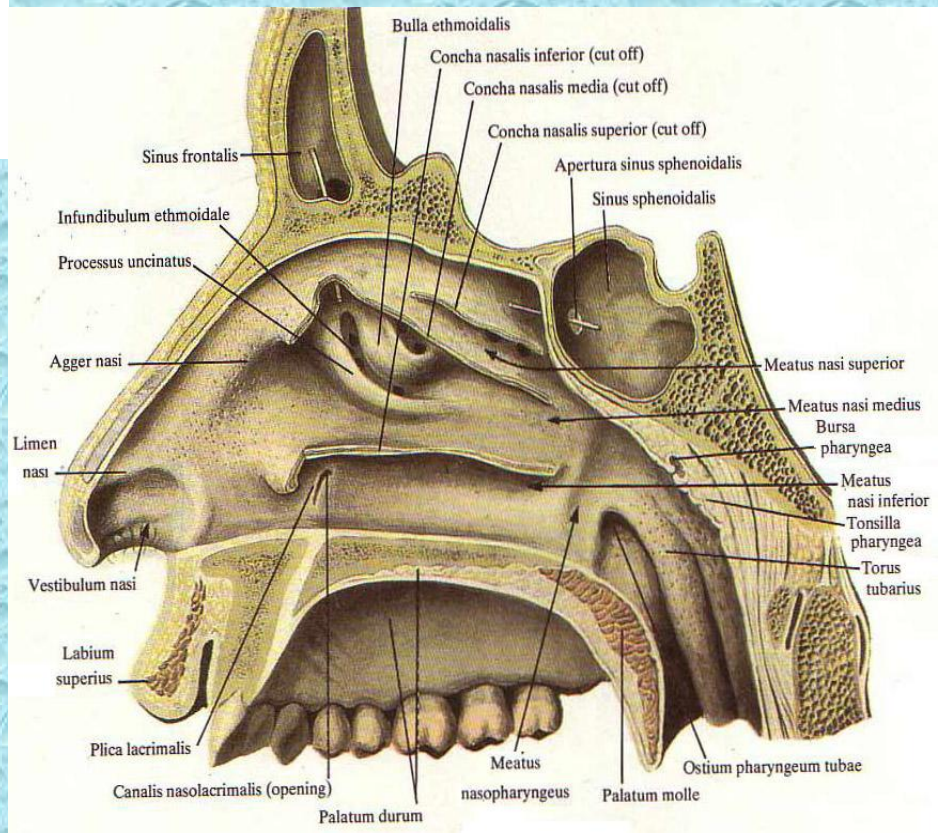
- **<u>Congenital deformations of the external nose</u> are classified as follows:**

- ***saddle nose*** **(rinolordosis) hooked nose (rinokyphosis),**
- ***lateral displacement of the nasal pyramid*** **(rinoskoliosis),**
- ***flattened nose*** **(platyrrine), a wide nose (brachyrrine),**
- ***narrow nose*** **(leptorrine), long, short;**
- ***soft, pliable nose*** **(mollirinia), combined deformation**



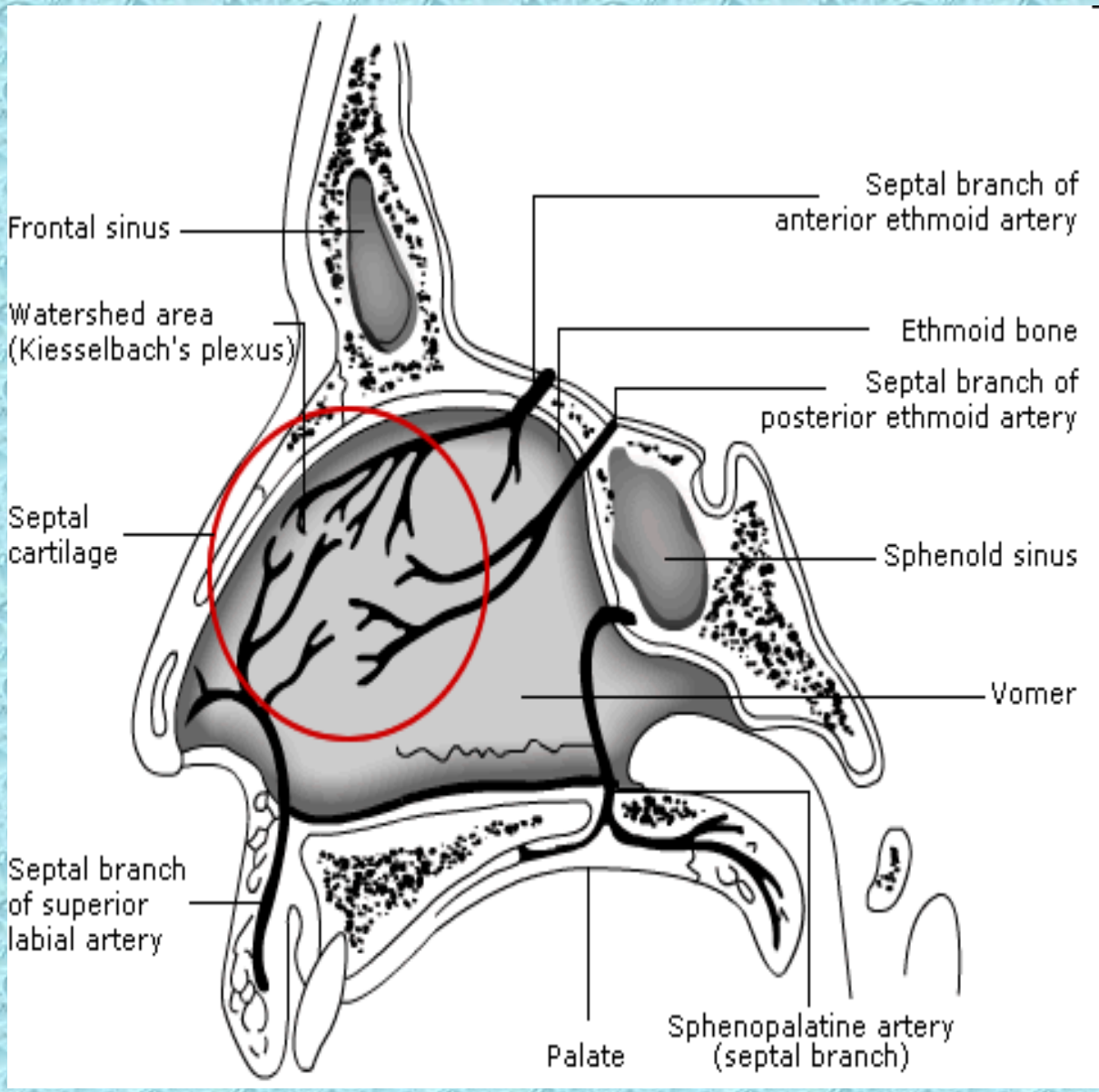
Nasal Vestibule is the most anterior part of the ***nasal cavity***. It is enclosed by the ***cartilages*** of nose and lined by the same ***epithelium*** of the ***skin*** (Stratified squamous, keratinized). The other part of the nasal cavity, which is lined by the ***respiratory epithelium***, is called ***nasal cavity proper***. Inside the vestibule are small hairs called ***vibrissae***, which filter dust and other matter that you breathe in.

The forward section, within and above each nostril, is called the ***vestibule***. Behind the vestibule and along each outer wall are three elevations, running generally from front to rear. Each elevation, called a ***nasal concha*** or ***turbinate***, hangs over an air passage. Beside and above the uppermost concha is the ***olfactory region*** of the nasal cavity. The rest of the cavity is the ***respiratory portion***. The respiratory area is lined with a moist ***mucous membrane*** with fine hairlike projections known as cilia, which serve to collect debris. ***Mucus*** from cells in the membrane wall also helps to trap particles of dust, carbon, soot, and bacteria.



Kiesselbach's area, also **Kiesselbach's plexus**, **Kiesselbach's triangle**, and ***Little's area***, is a region in the anteroinferior part of the nasal septum, where five arteries anastomose to form a vascular plexus:

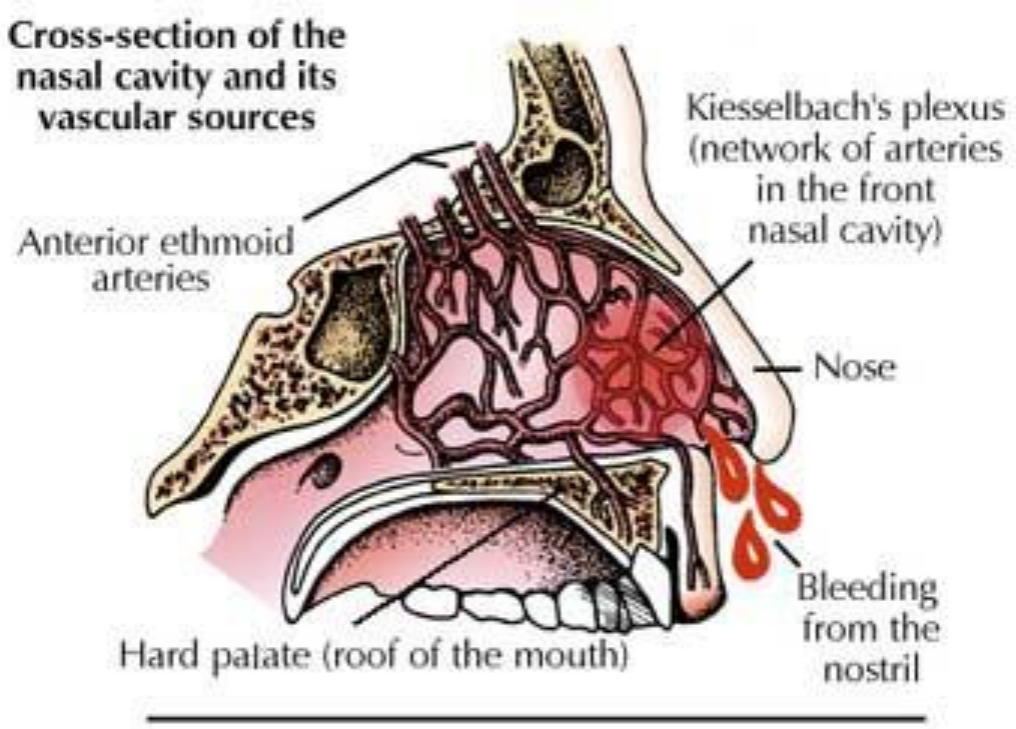
- anterior ethmoid artery
- great palatine artery
- sphenopalatine artery
- superior labial artery
- lateral nasal branch of facial artery

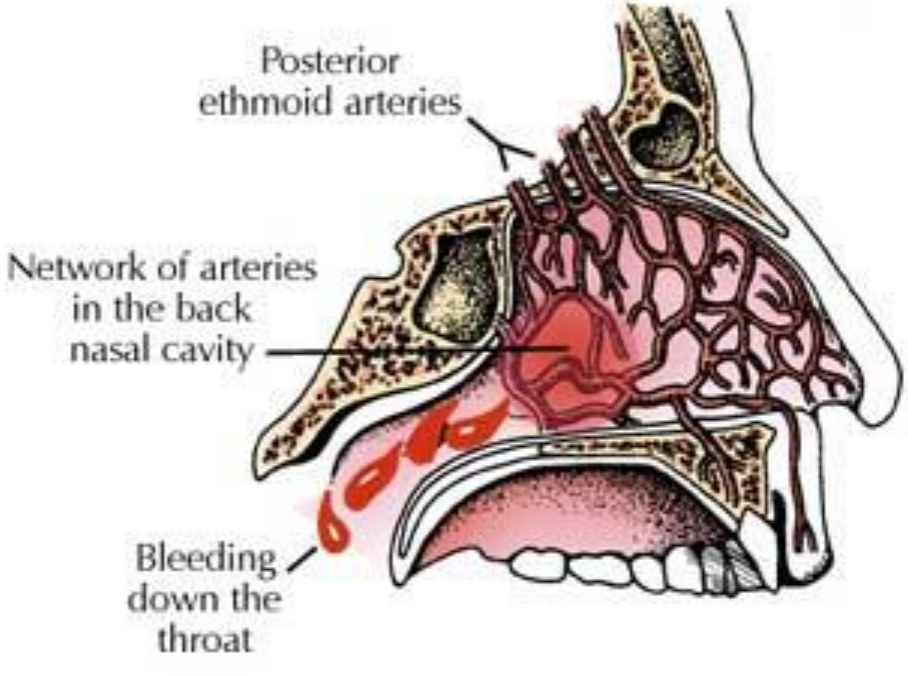


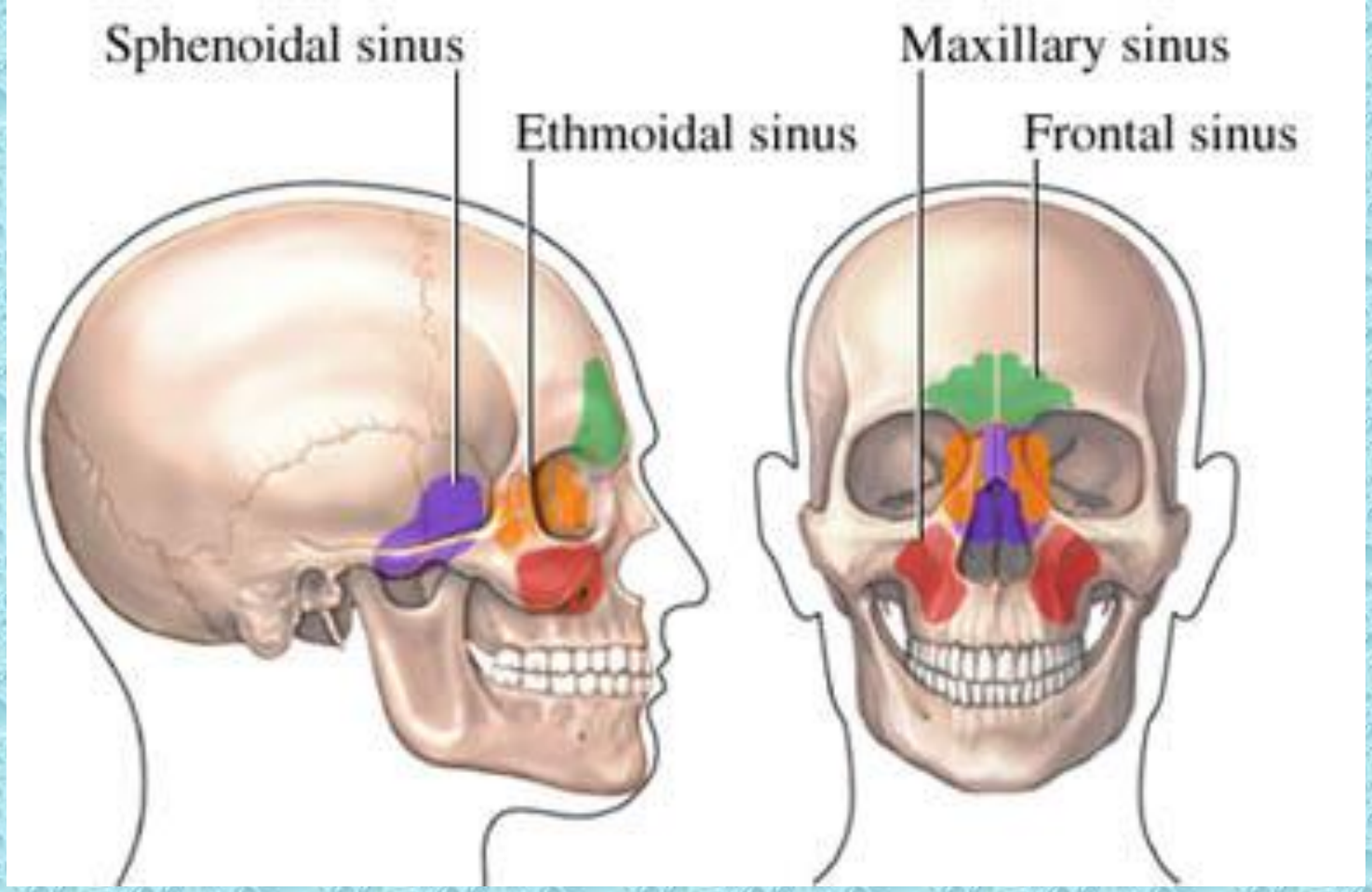
Epistaxis

- Anterior nasal septum is the Kiesselbach area
  - Plexus of all five arteries supplying the septum
  - Epistaxis = nose bleed
- Generally minor nose bleeds are from arterial of venous plexus
- Spurting of blood likely larger artery

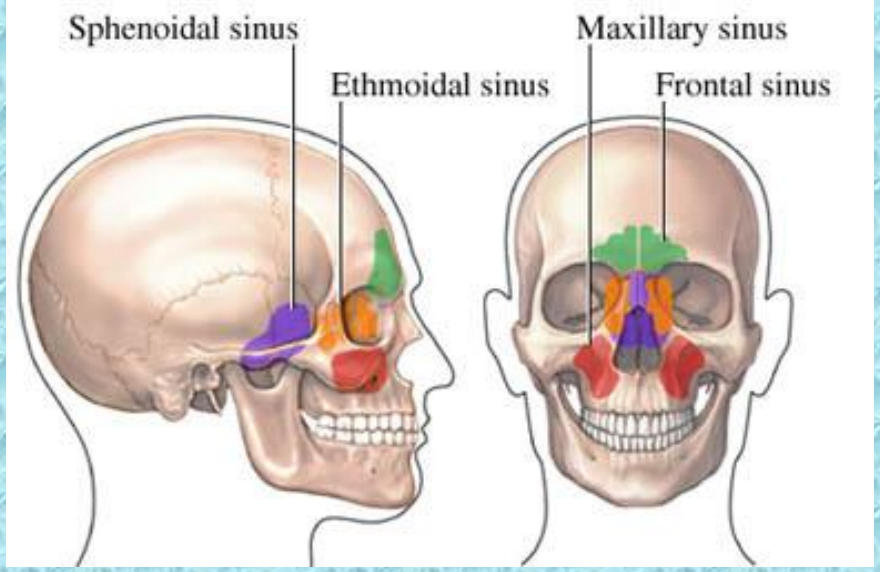
  (e.g.sphenopalitine)







An additional adjustment for ventilation of the air are *the paranasal sinuses*, which are also lined with mucous membrane, a direct continuation of the nasal mucosa.



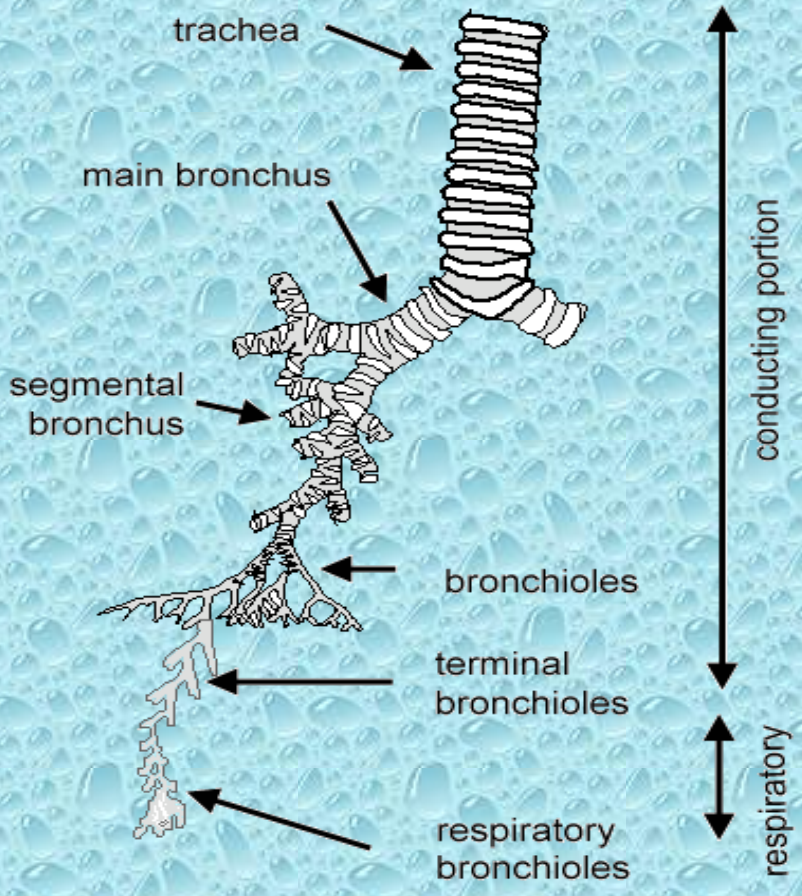
The functions of the sinuses are as follows:

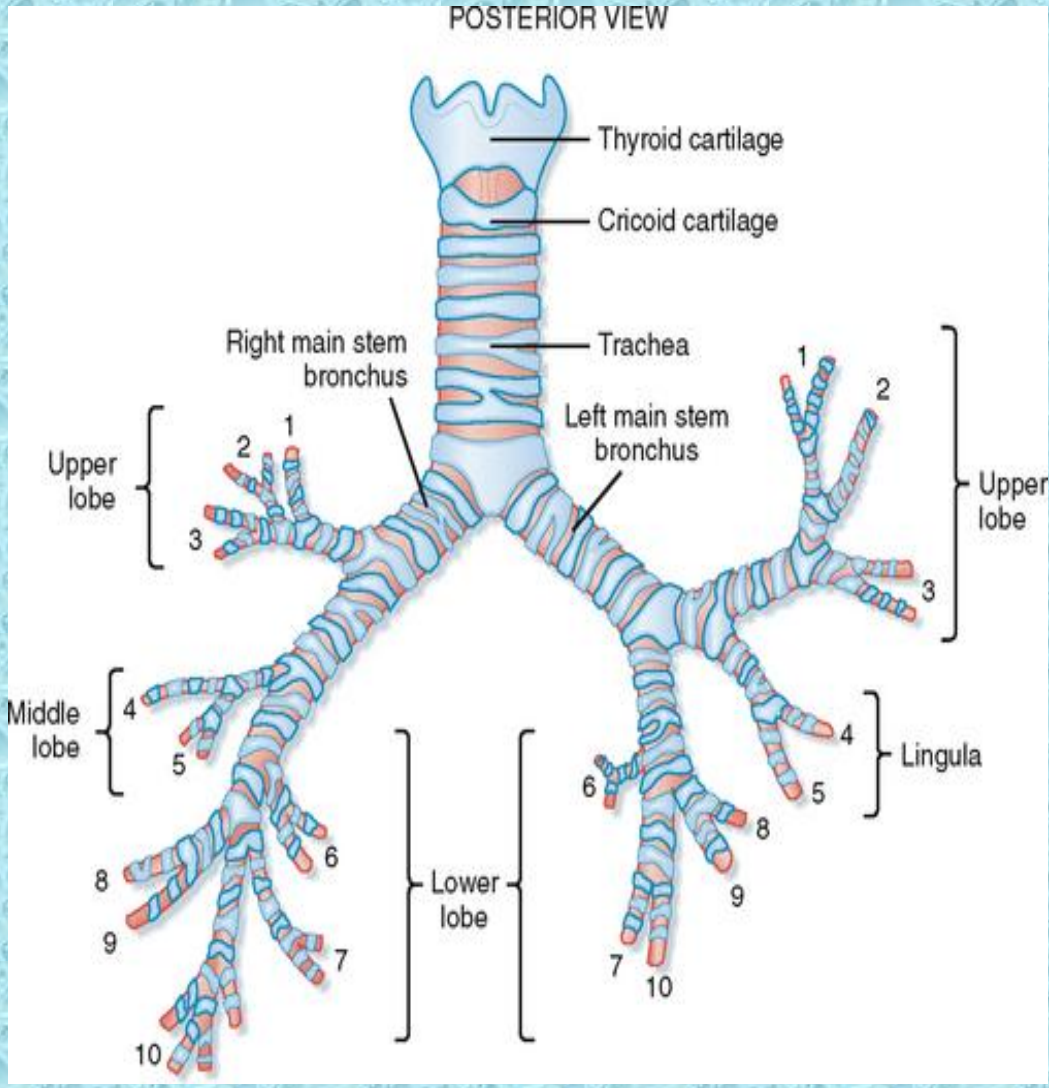
1. air conditioning
2. reduction of skull weight, lighten the skull for better balance
3. heat insulation
4. flotation of skull in water
5. increasing the olfactory area
6. areas for the production of mucus to moisten the nasal chambers and inspired air
7. vocal resonance

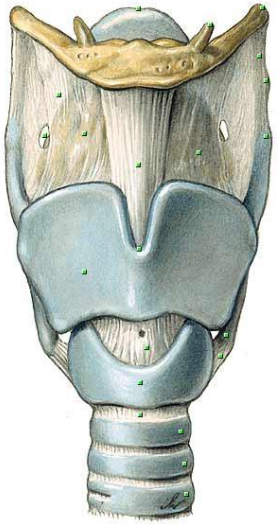
The lower respiratory pathways

is also called the **respirator tree** or **tracheobronchial tree**, to describe the branching structure of airways supplying air to the lungs, and includes:

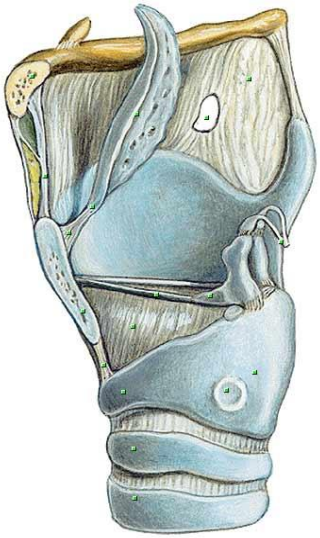
Larynx
Trachea
Main bronchi
Lobar bronchi
Segmental bronchi (8-10 orders)
Lobular bronchi (18-20 orders)



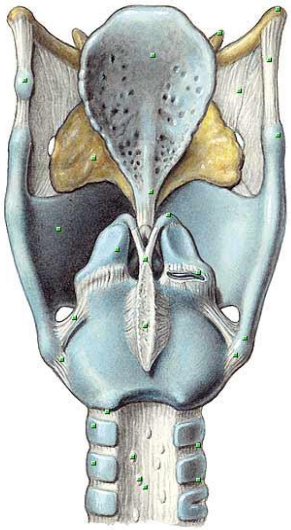




Larynx and hioid bone
/anterior view/

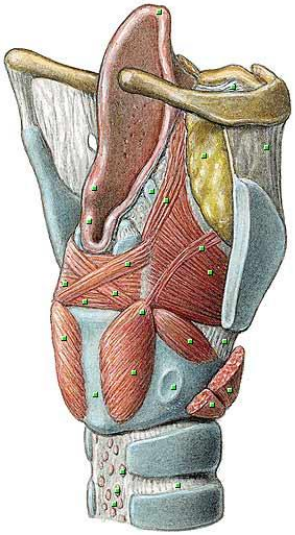


Laryngeal cartilages /lateral view/

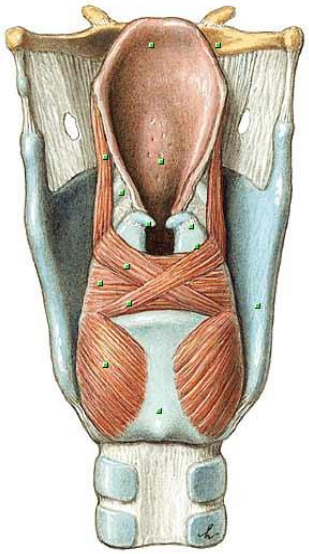


Laryngeal cartilages /posterior view/

Laryngeal muscles /lateral view/

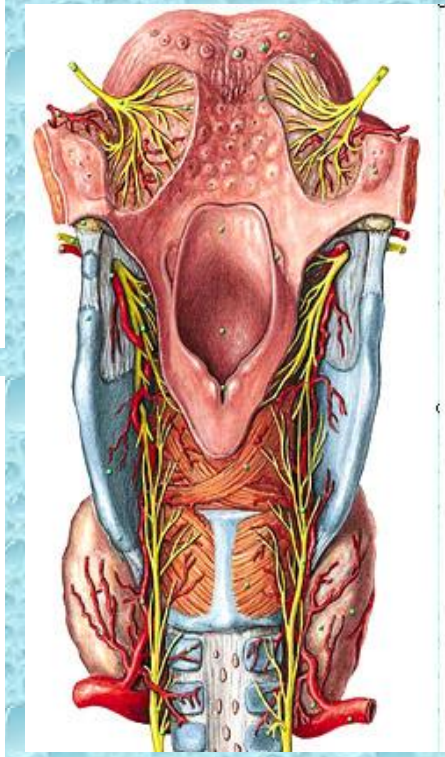


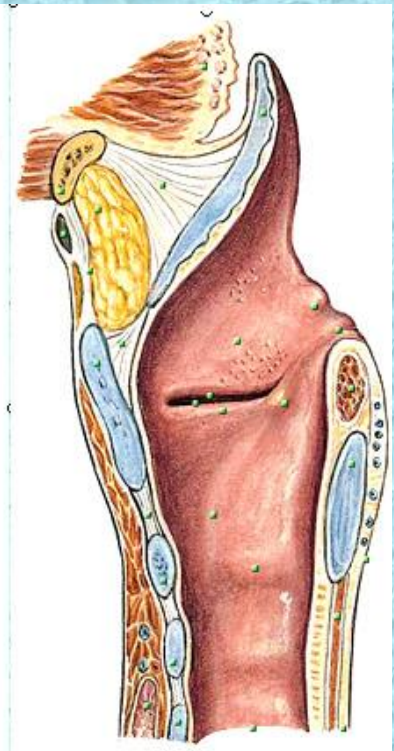
Laryngeal muscles /latero-posterior view/



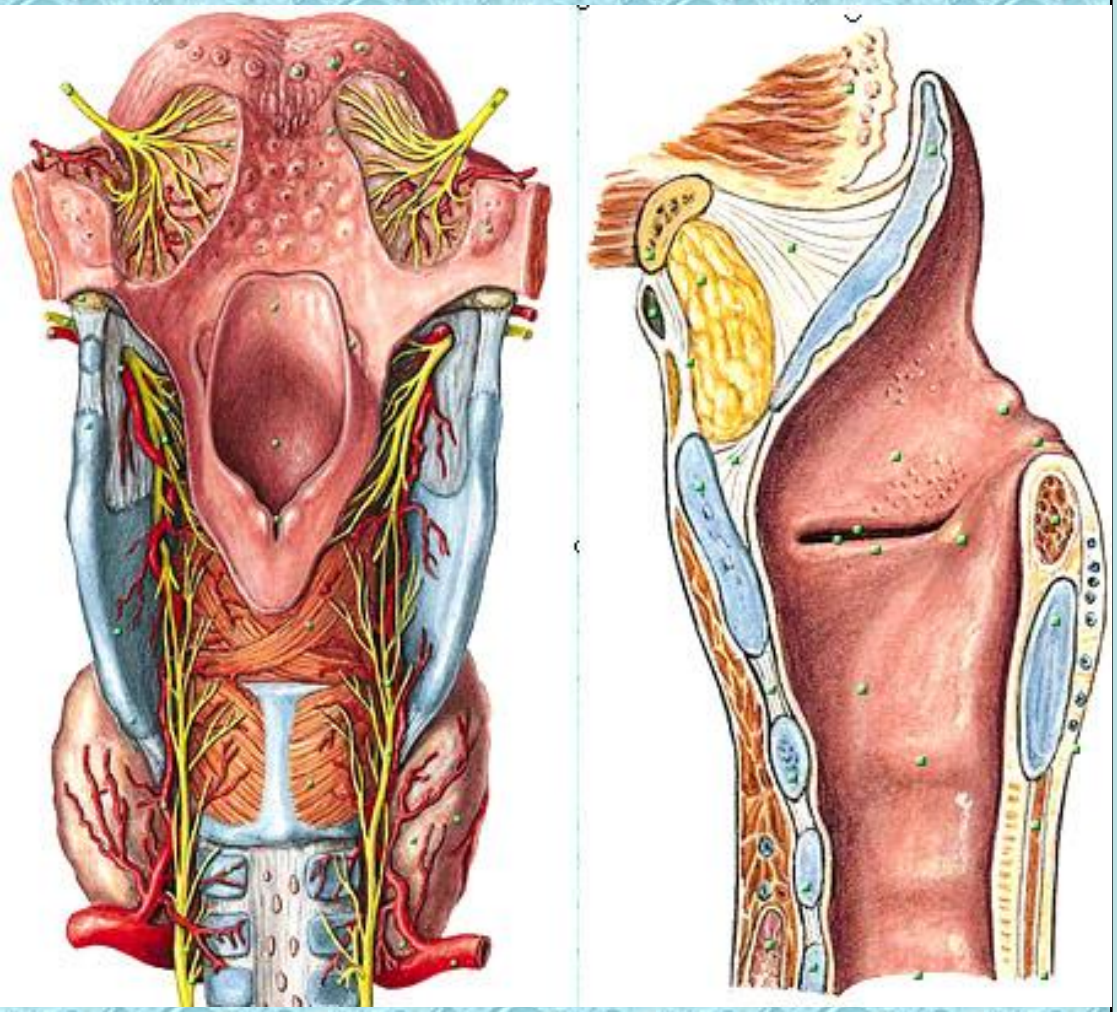
Laryngeal muscles /posterior view//

- **The mucous lining of the larynx:**
- ***Mainly stratified squamous epithelium*** **in the <u>upper</u> part**
- ***Ciliated columnar*** **in the <u>lower</u> part of the larynx.**





Functions of the larynx



It acts as a *valve to prevent air from escaping the lungs*, e.g. weightlifting

It *prevents foreign substances from entering* the lungs, trachea and glottis, e.g. while swallowing, the epiglottis covers the opening to the larynx;

It expels foreign substances which threaten the trachea, e.g. *coughing*

Production of sound

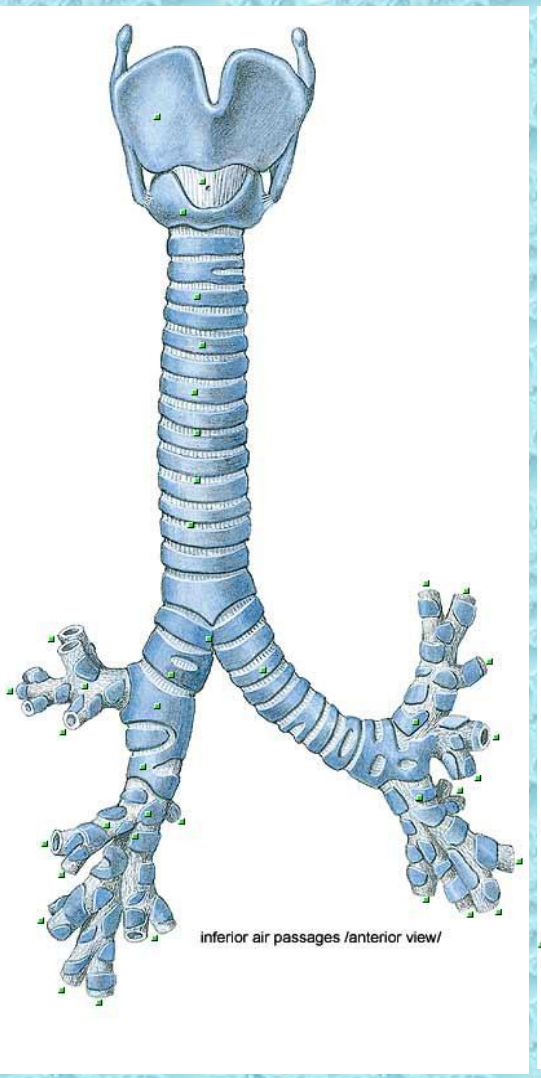
Fixation of the chest This less known function of the larynx is important for increasing intra abdominal pressure. Closure of the vocal cords achieves fixation of the chest necessary to raise intra abdominal pressure required for daily activities like lifting weights, climbing and even for passing urine and stools.

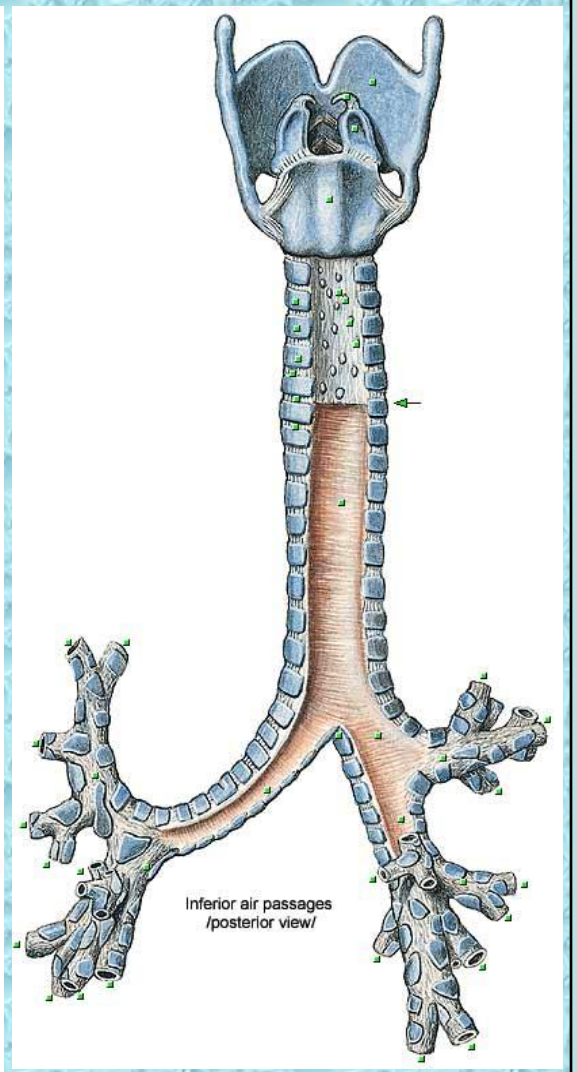
Sex differences of the larynx:

- By puberty, the larynx descends to the level of C6 or C7.
- Adult males typically have longer and thicker vocal folds than females (differences occur at puberty).
- In males, the rise in testosterone at puberty stimulates the anterior growth of the thyroid notch and wide growth of the pharynx.

The Bronchi, Roots, and Bronchopulmonary Segments of the Lungs

The principal or main bronchus, one for each lung, passes inferolaterally from the bifurcation of the trachea.





The **right main bronchus** is **wider, shorter** and **more vertical** than the left one.
It is about 2.5 cm long and passes directly into the root of the lung.

The **left main bronchus** is about 5 cm long and passes inferolaterally, inferior to the arch of aorta, and anterior to the oesophagus and the descending aorta.

Within each lung, the bronchi divide in a constant fashion and in constant directions so that each branch supplies a **clearly defined sector of the lung**.

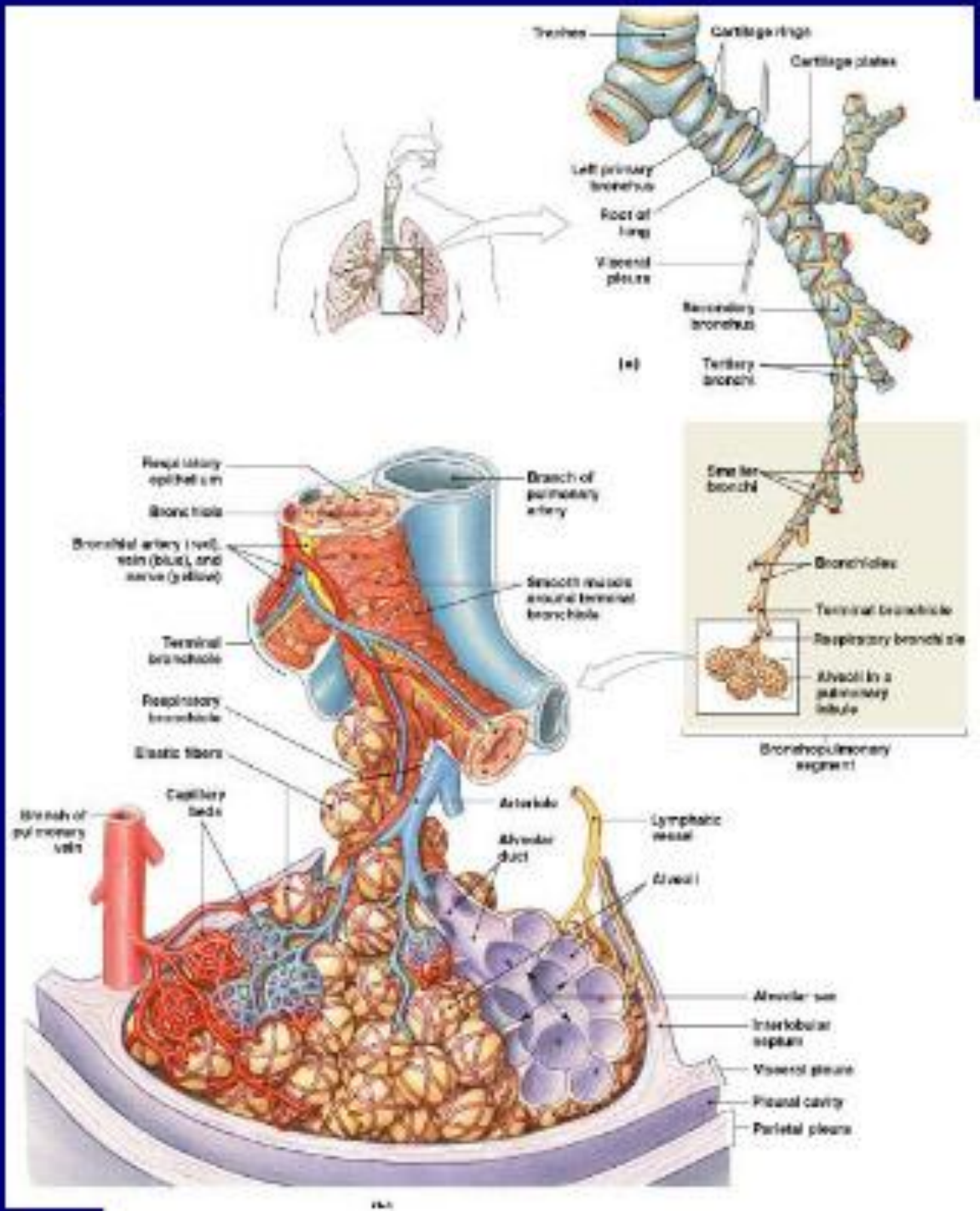
Each main bronchus divides into **secondary or lobar bronchi,** each of which supplies a lobe of the lung.

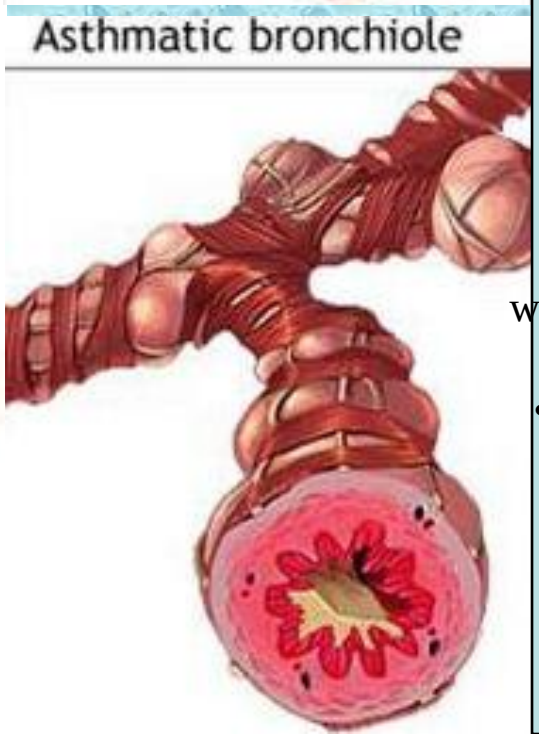
Each lobar bronchus divides into **tertiary or segmental bronchi**, which supply segments of the lung = **bronchopulmonary segments**.

Bronchial Structure

The walls of primary, secondary, and tertiary bronchi:

- contain progressively less cartilage and more smooth muscle
- increasing muscular effects on airway constriction and resistance





Terminal bronchioles:

- ***No cartilage*** as the smooth muscle is thicker to help maintain the structure.

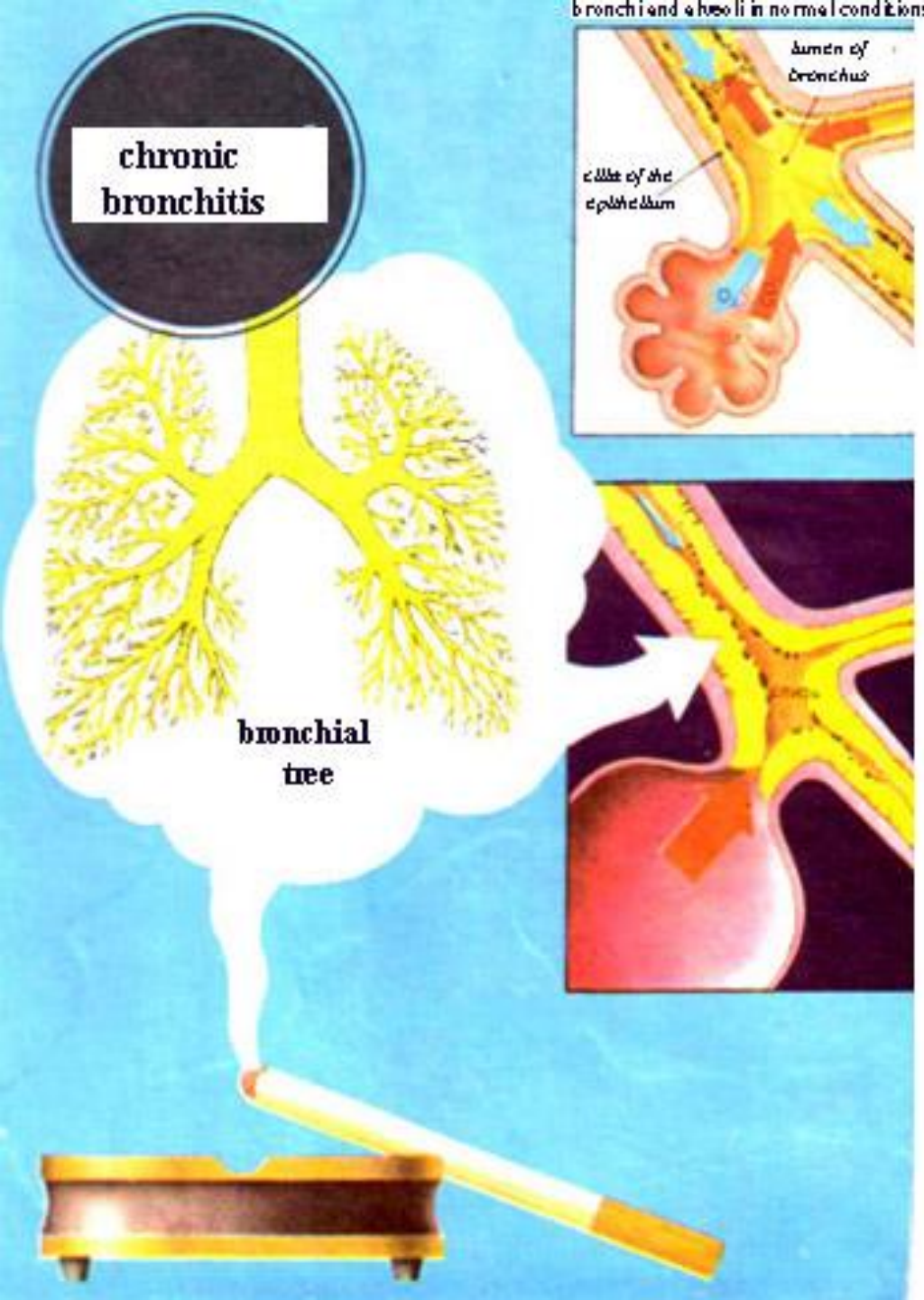
- The internal walls are lined with ***ciliated columnar mucous membrane*** but as the walls extend towards the distal bronchiole this membranous layer ***changes to non-ciliated cuboidal-shaped cells***.

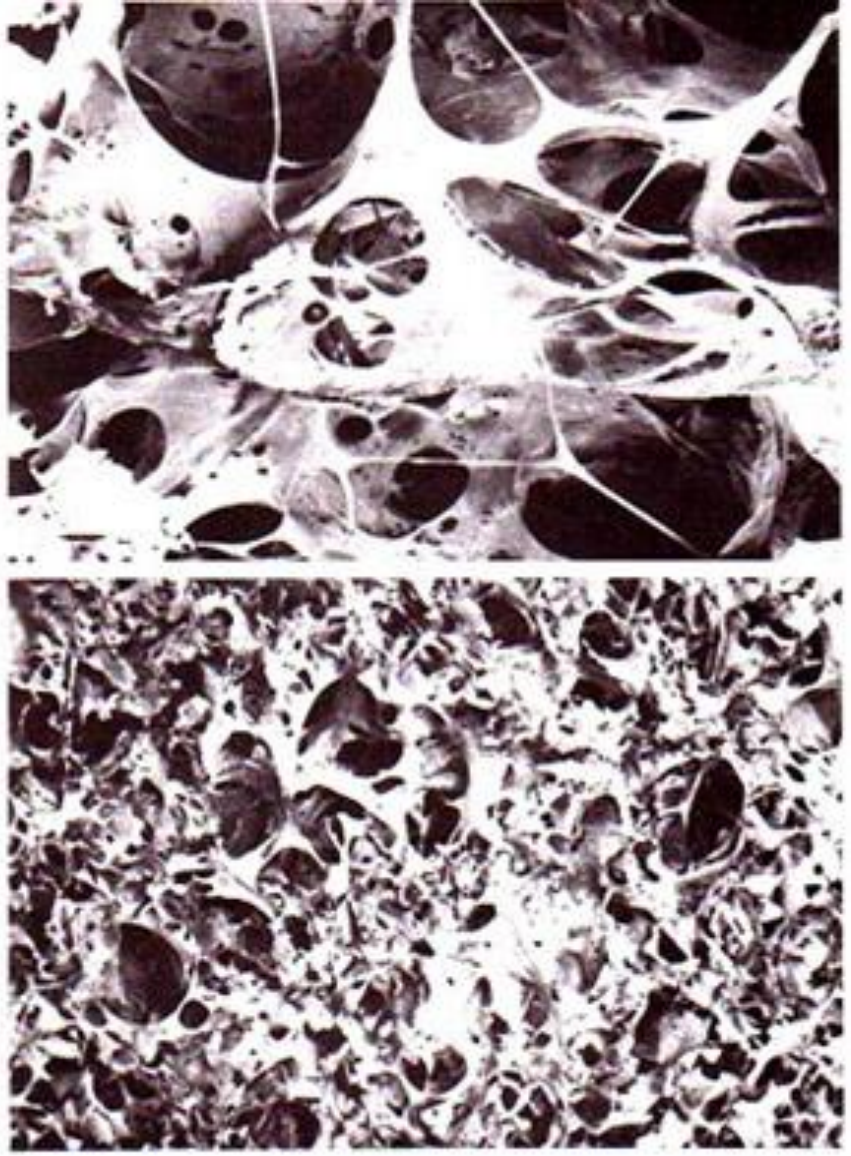
- Split into 2 or more ***respiratory bronchioles***

- Thinner walls and are lined with ***ciliated columnar epithelium***

- Do not contain any ***goblet cells***.

- Increased numbers of clara cells that line the lumen and secrete an agent similar to ***surfactant***





Contrast of the emphysematous lung /above/ with the normal lung /below/, showing extensive alveolar destruction

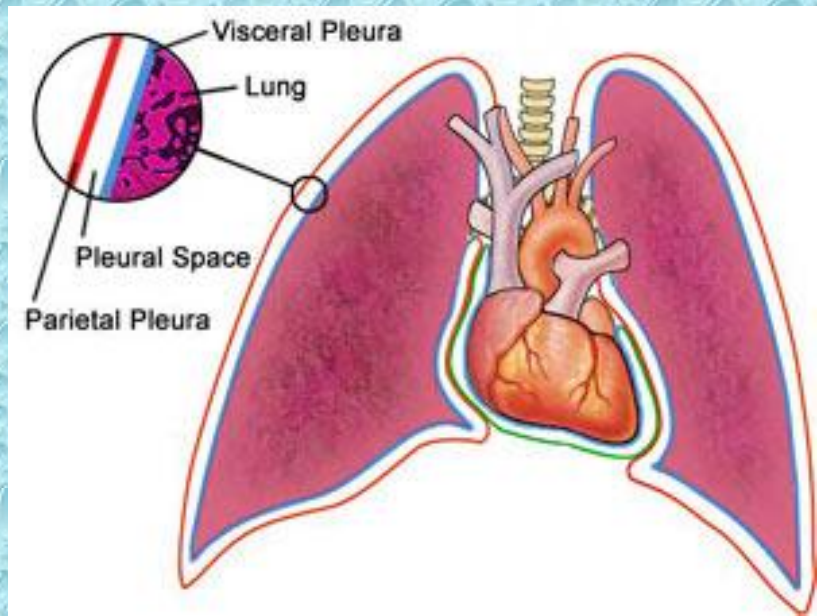
The lungs are separated from each other by the **heart and great vessels** in the middle mediastinum.

The lungs are attached to the **heart and trachea** by the structures in the **root of the lungs** and to the pericardium by the **pulmonary ligaments**.

The Root of the Lung

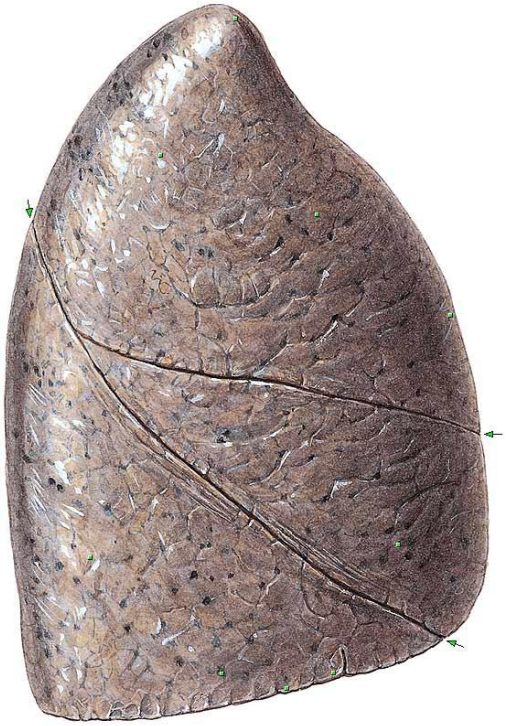
The root serves as the **attachment of the lung** and is the "highway" for the **transmission of the structures entering and leaving** the lung at the hilum.

It is surrounded by the reflection of parietal to visceral pleura.



The Hilum of the Lung

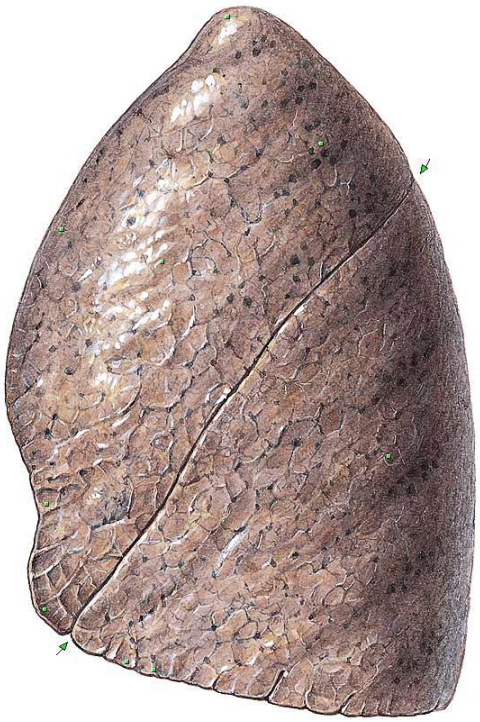
It contains the main bronchus, pulmonary vessels (one artery and two veins), bronchial vessels, lymph vessels, and nerves entering and leaving the lung.



Right lung /anterior view/

The Main Differences Between the Right and Left Lungs

- **The right lung has *3 lobes* while the left has *2 lobes*.**
- **The right lung is larger and heavier than the left lung, but is shorter and wider because the right dome of the diaphragm is higher and the heart and pericardium bulge more to the left.**
- **The anterior margin of the right lung is straight, whereas the margin of the left lung has a deep cardiac notch.**



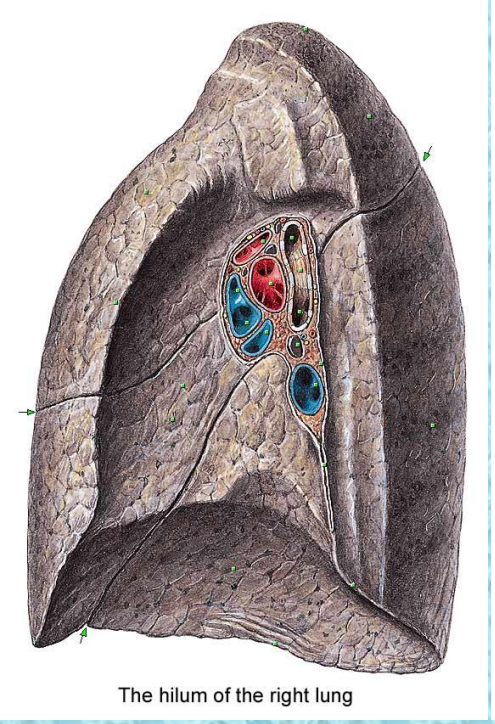
The left lung /latero-anterior view/

The Right Lung

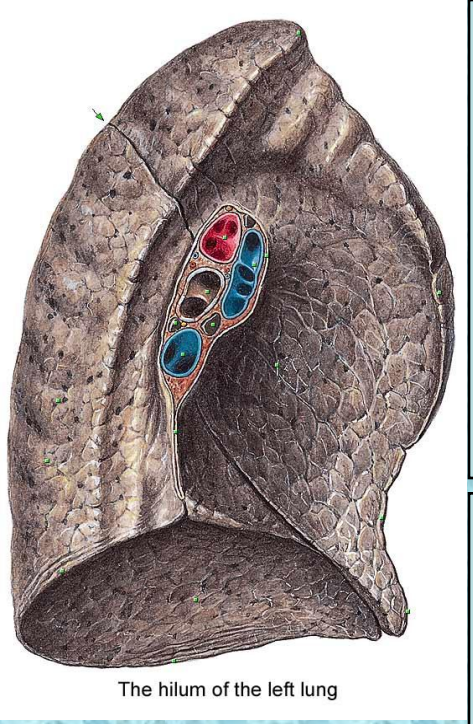
- This is divided into **superior (upper)**, **middle**, and **inferior (lower)** lobes by **horizontal and oblique fissures**.
- The **horizontal fissure** separates the **superior and middle lobes**.
- The **oblique fissure** separates the **inferior lobe** from the **superior and middle lobes**.
- The superior lobe is smaller than in the left lung, and the **middle lobe is wedge-shaped**.

The Left Lung

This is divided into **superior (upper)** and **inferior (lower)** lobes by a long deep **oblique fissure**.
This extends from its costal to its medial surface.
The **superior lobe** has a large **cardiac notch** on its anterior border, where the lung is deficient owing to the bulge of the heart.
The **anteroinferior** part of the superior lobe has a small **tongue-like** projection called the **lingula**.
The **inferior lobe** of the left lung is larger than the superior lobe and lies inferoposterior to the oblique fissure.



The hilum of the right lung



The hilum of the left lung

Differences of the right & left hilum

On the right: **R main bronchus is located above the pulmonary artery.**

On the left: **L pulmonary artery is located above the main bronchus**

Impressions of the right lung

- ***above*** **the hilum: groove for azygous vein & for superior vena cava;**
- ***behind*****: groove for oesophagus;**
- ***in front*****: the cardiac impression;**
- ***inferiorly*****: a groove for the inferior vena cava**

Impressions of the left lung

- ***above*** **the hilum, groove of the aortic arch,**

- upward from this is a groove accommodating the left subclavian artery;

- a slight impression in front of the latter lodges the left innominate vein.

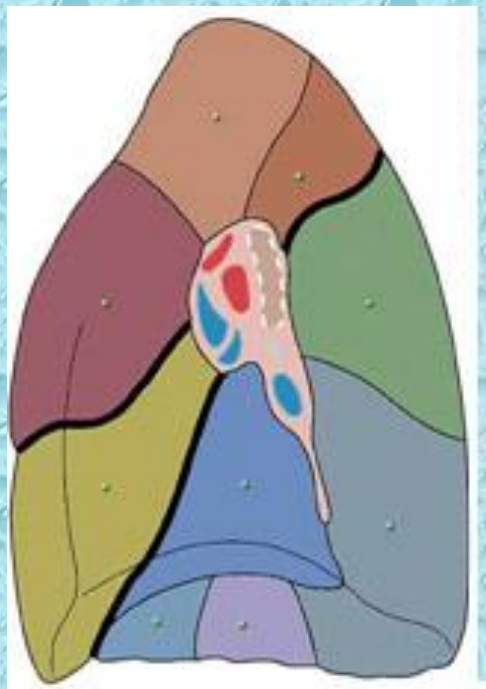
- ***behind*** **the hilum and pulmonary ligament is a vertical furrow produced by the descending aorta,**

-in front of this, near the base of the lung, the lower part of the esophagus causes a shallow impression;

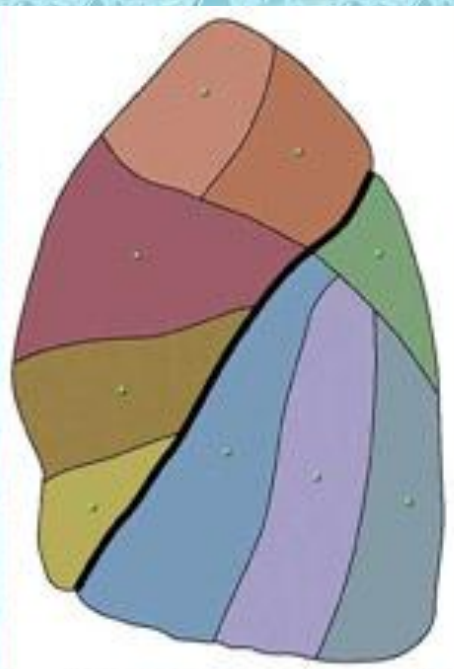
- ***in front*** **of hilum: the cardiac impression.**

Bronchopulmonary Segments:

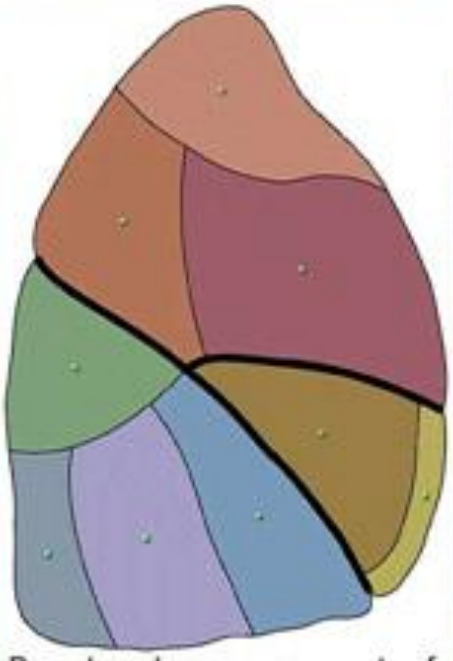
10 – right;
8-9 - left



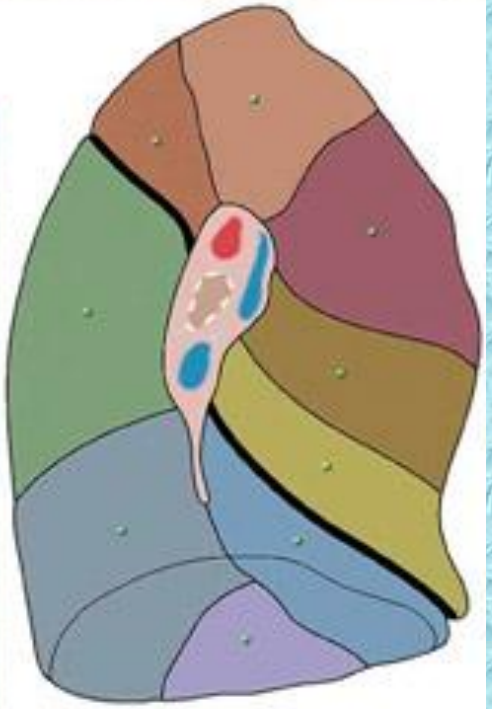
Right lung, medial view



Bronchopulmonary segments of the left lung /lateral view/



Bronchopulmonary segments of the right lung /lateral view/



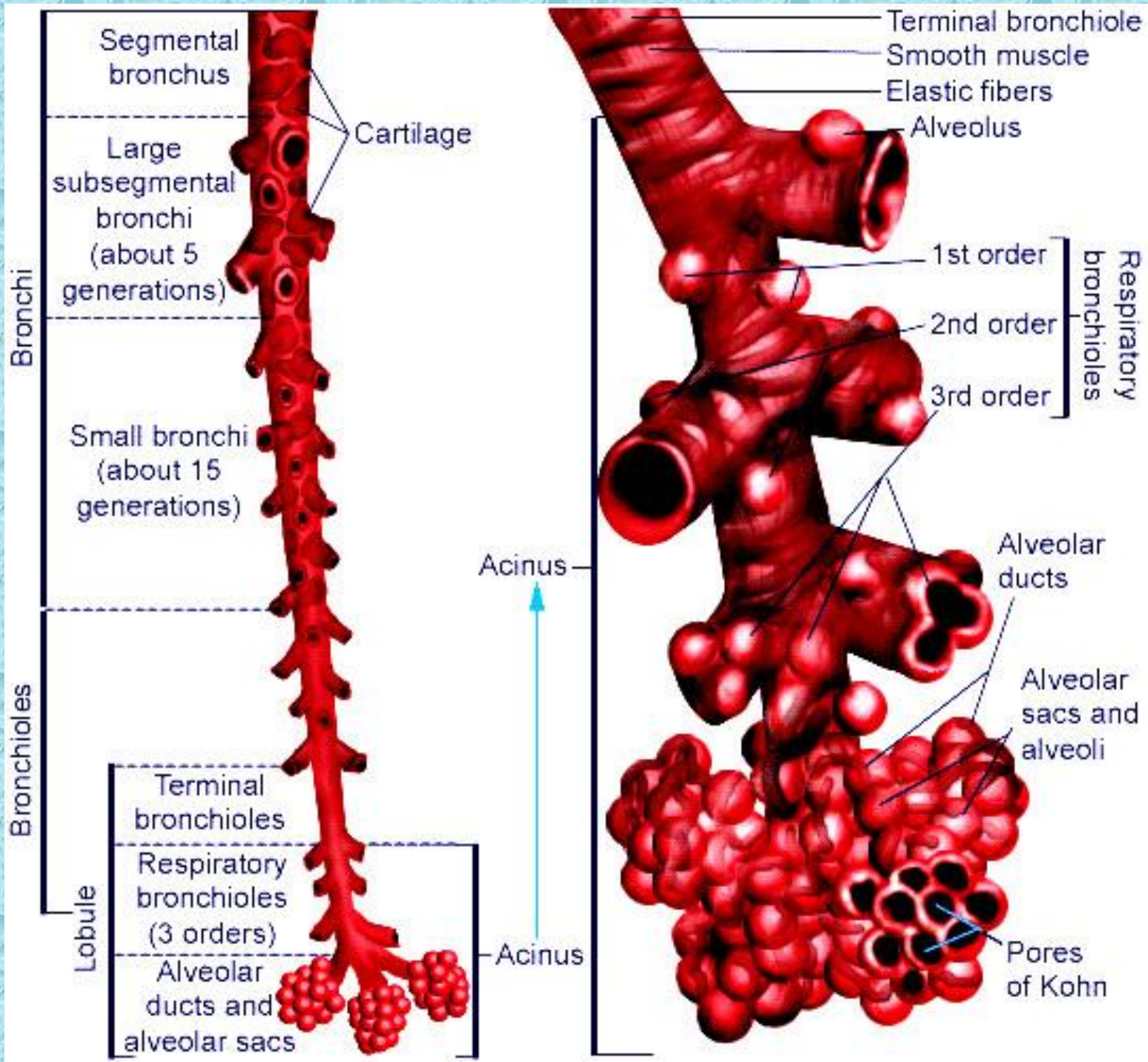
Left lung, medial view

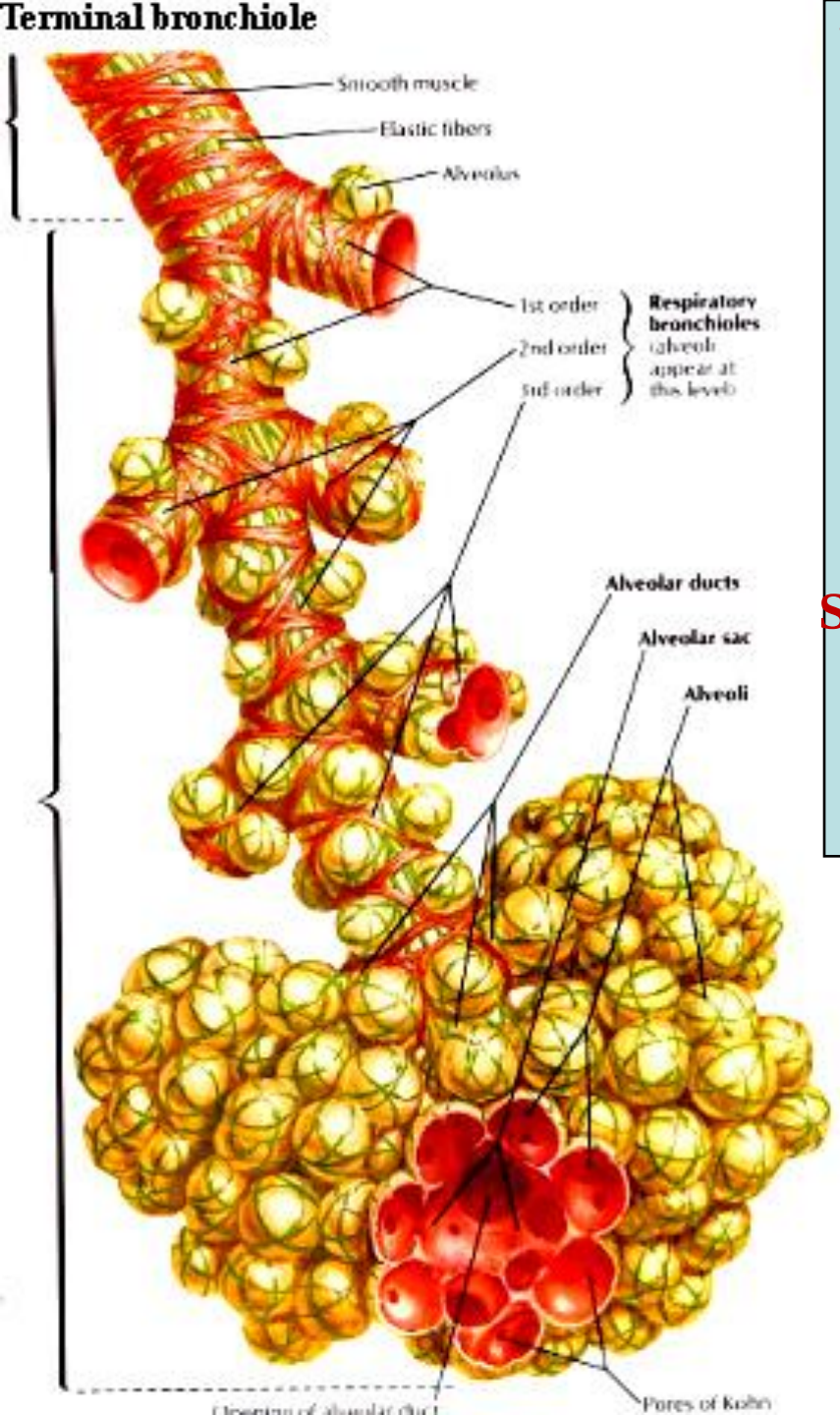
Bronchial tree

/22-23 generations of the bronchi/

Alveolar tree

/respiratory bronchioles, alveolary ducts, air sacculi with the alveoli/

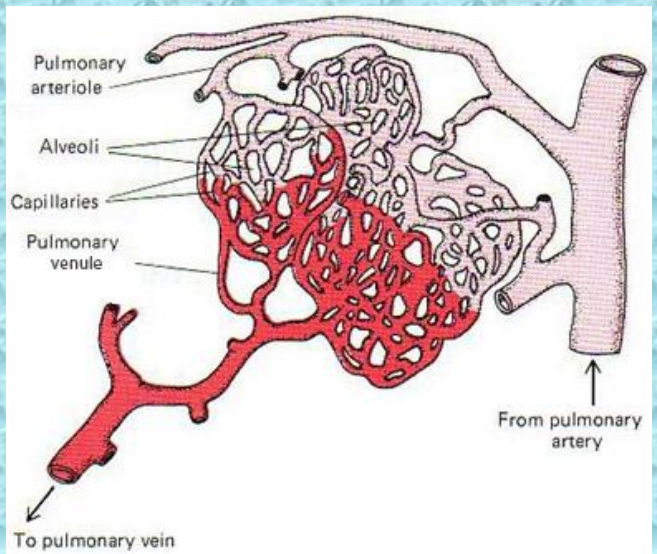




Primary pulmonary lobule consists of all alveolar ducts, alveolar sacs, and alveoli distal to last respiratory bronchiole and their cognate blood, lymphatics and nerves.

Morphofunctional unit of the lungs is acinus: distal to terminal bronchiole, including respiratory bronchioles, alveolar ducts, alveolar sacs, and alveoli.

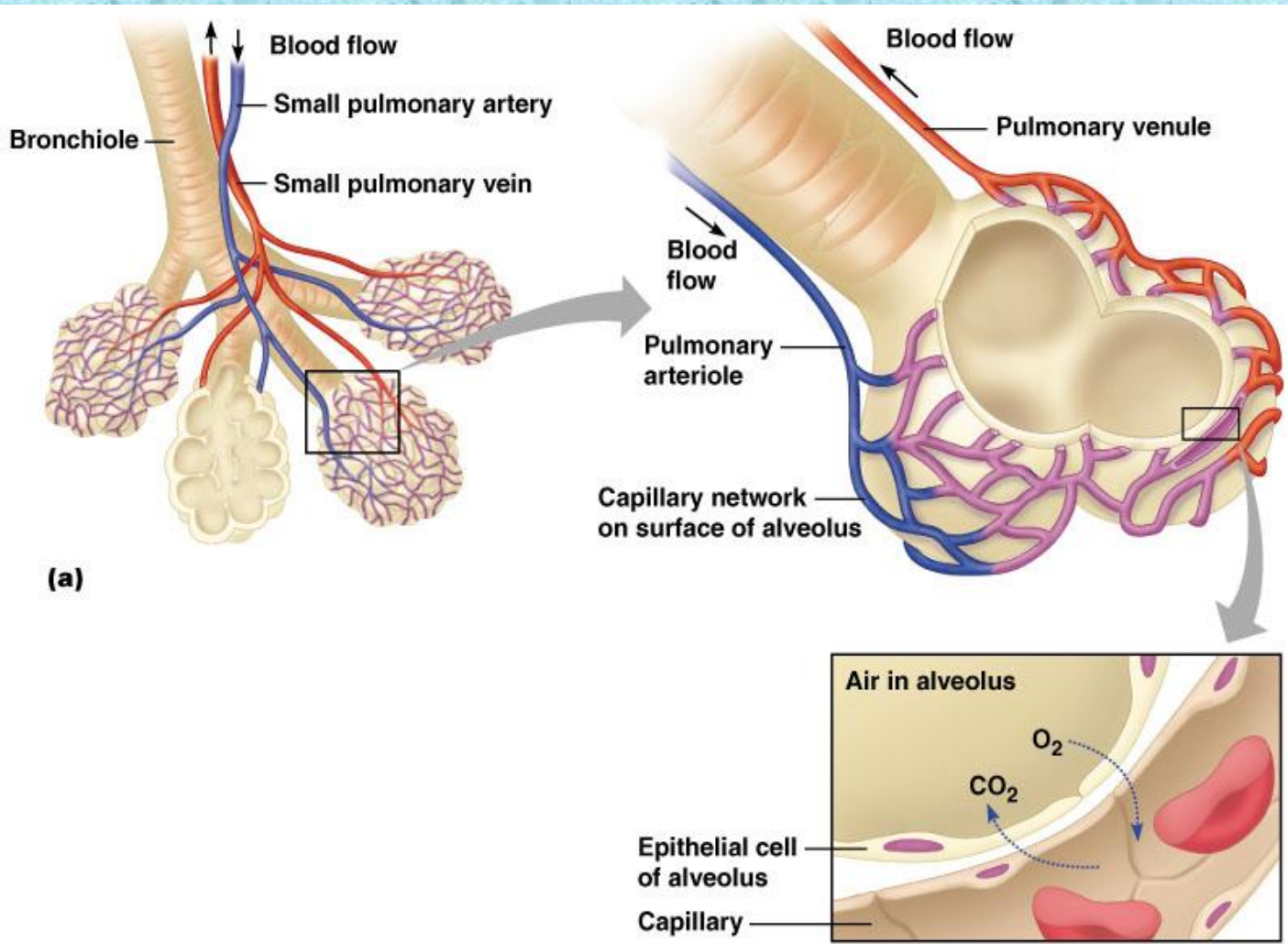
Secondary pulmonary lobule is a 1–2.5 cm structure which is the smallest unit of lung tissue invested by connective tissue septa, and contains 3 to 5acini.



Gas Exchange Between the Blood and Alveoli

The Respiratory Epithelium

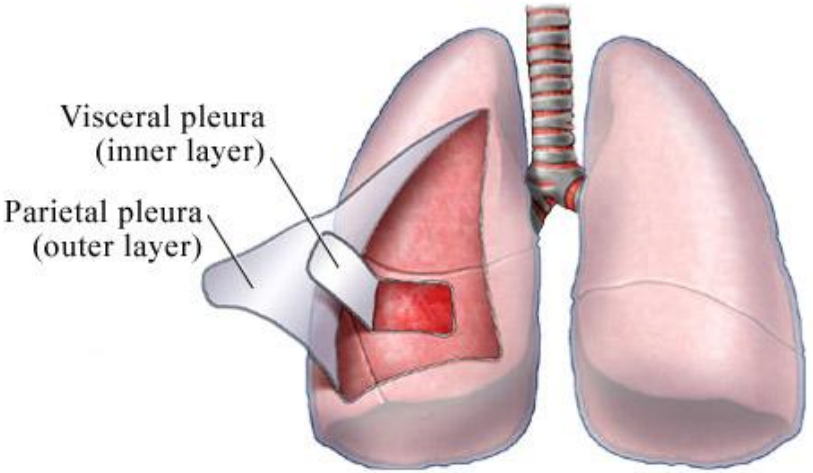
- For gases to exchange efficiently:
  - alveoli walls must be very thin (< 1 μm)
  - surface area must be very great (about 35 times the surface area of the body)

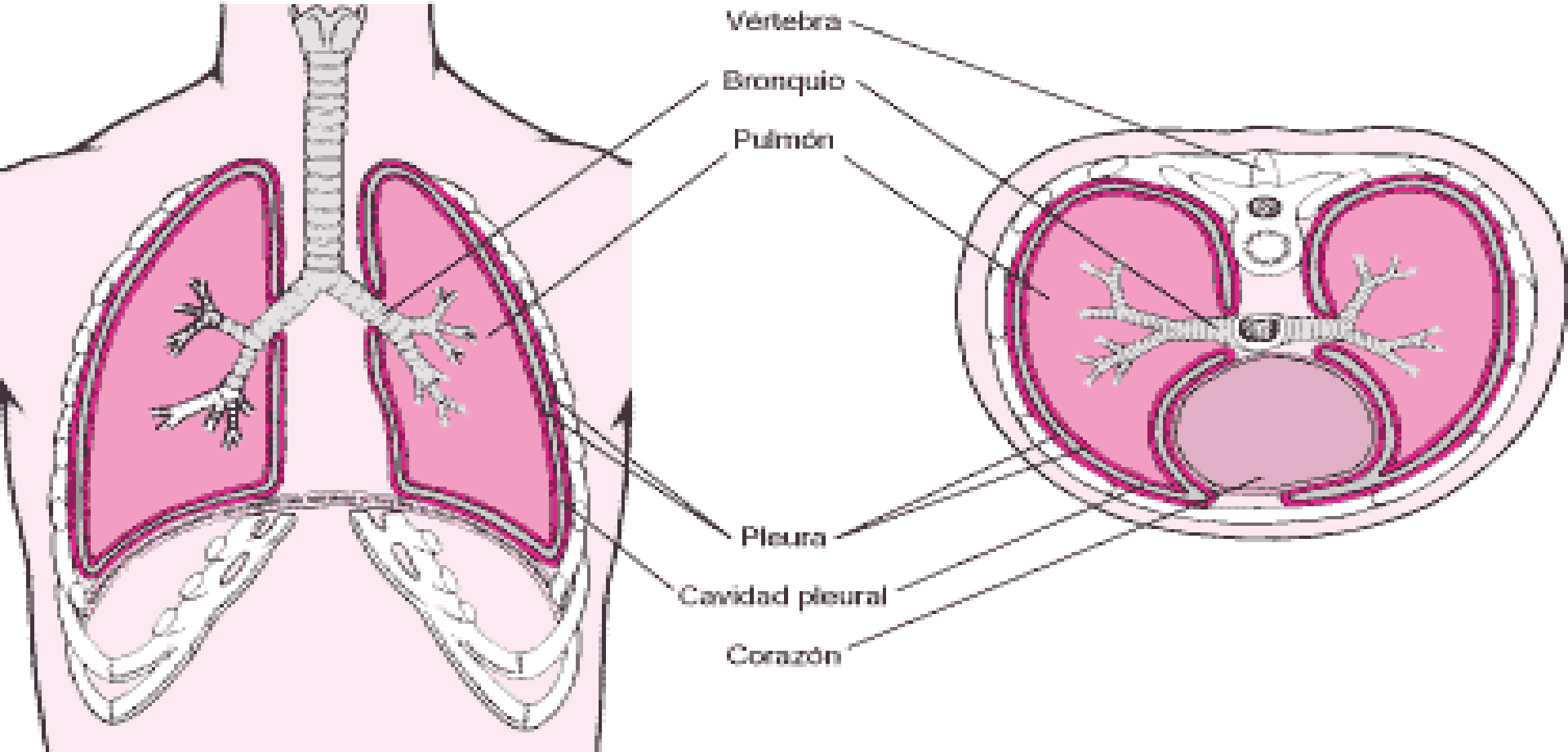


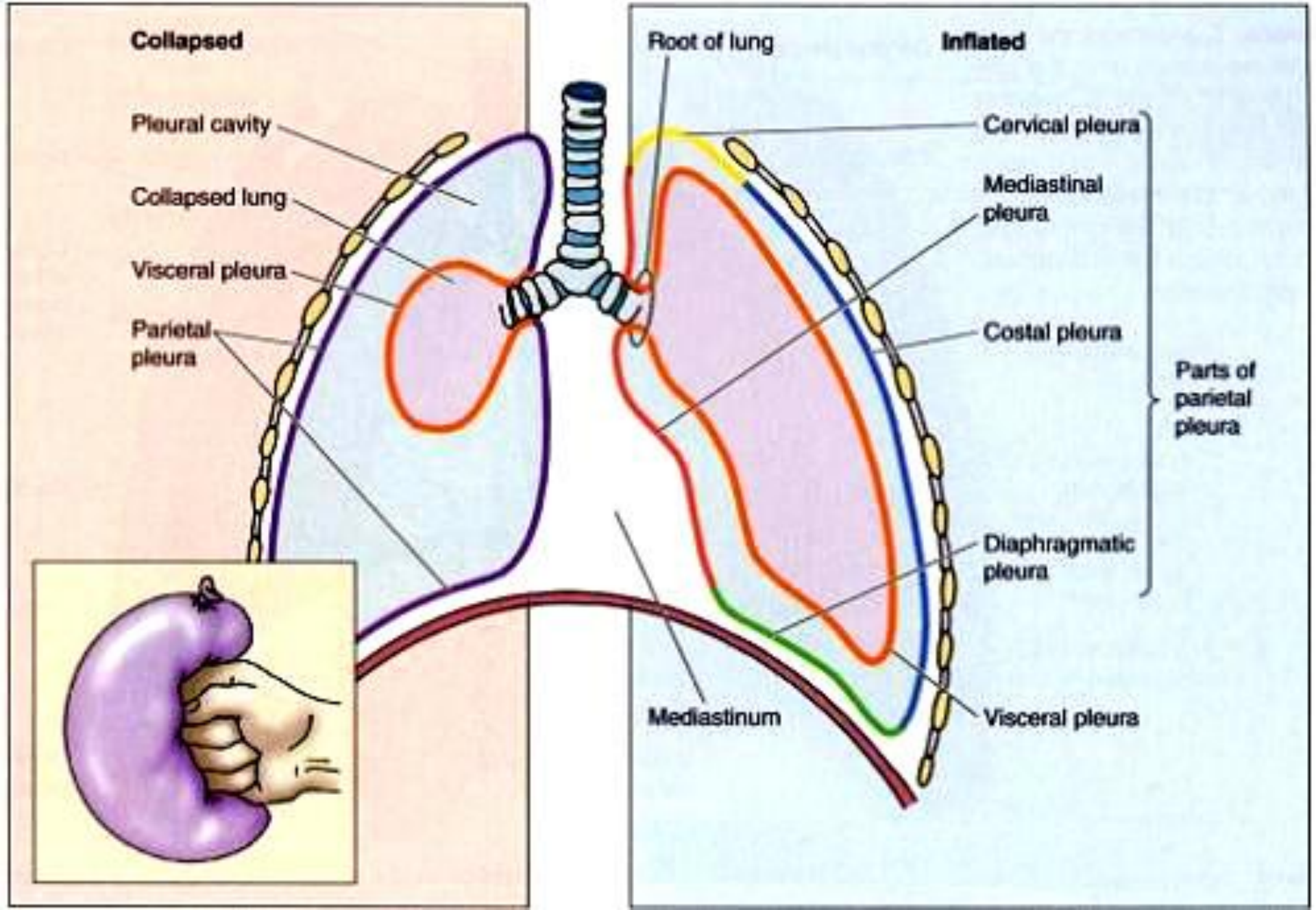
Surfactant

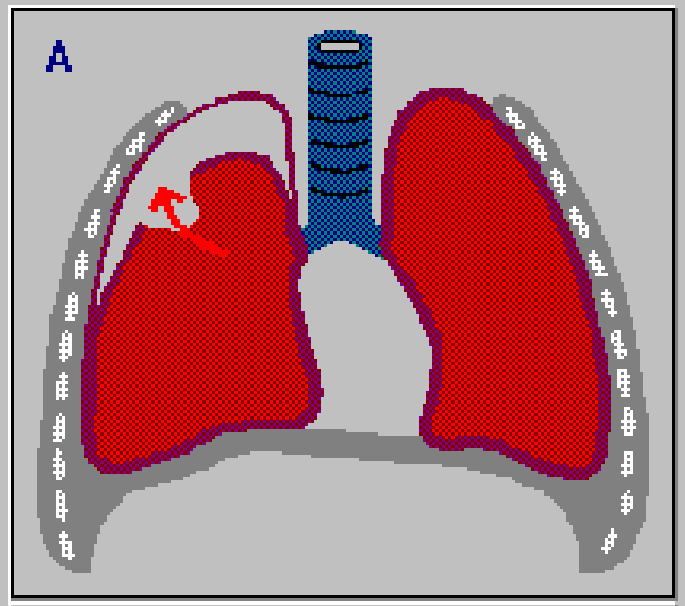
- It is oily secretion
- Contains the phospholipids and Proteins
- Coats alveolar surface and reduces surface tension

Pleura

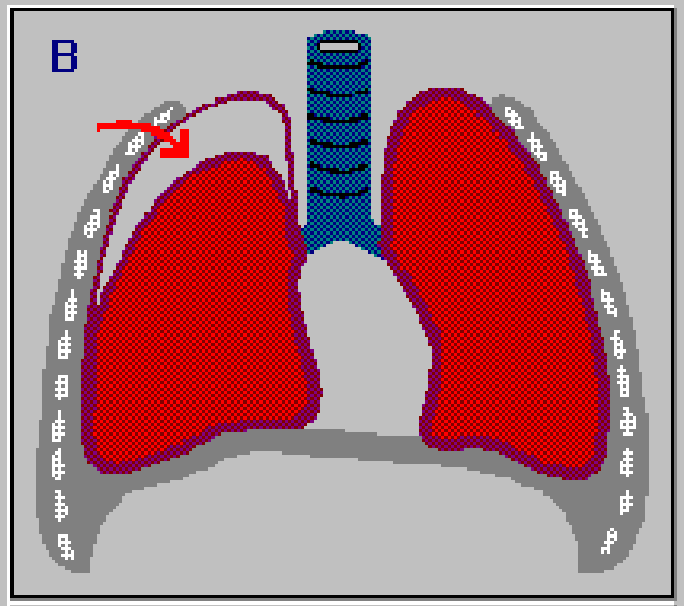

Visceral pleura
(inner layer)
Parietal pleura
(outer layer)


Vértebra
Bronquio
Pulmón
Pleura
Cavidad pleural
Corazón


Collapsed
Pleural cavity
Collapsed lung
Visceral pleura
Parietal pleura
Root of lung
Inflated
Cervical pleura
Mediastinal pleura
Costal pleura
Parts of parietal pleura
Diaphragmatic pleura
Mediastinum
Visceral pleura



Closed Pneumothorax



Open Pneumothorax

ABNORMALITIES OF THE PLEURAL SPACE

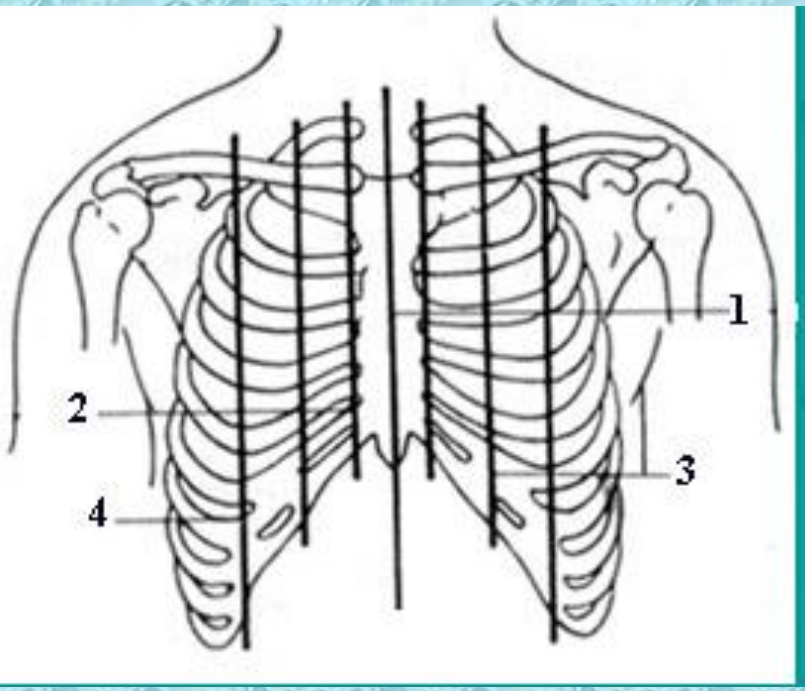
A closed pneumothorax is caused by air leaking into the pleural space from an opening within the lung (see A above). In this situation, there is a perforation of the visceral pleura while the outer chest wall and the parietal pleura remain intact. For example, the sharp end of a fractured rib may pierce or tear the visceral pleura, causing a closed-type pneumothorax.

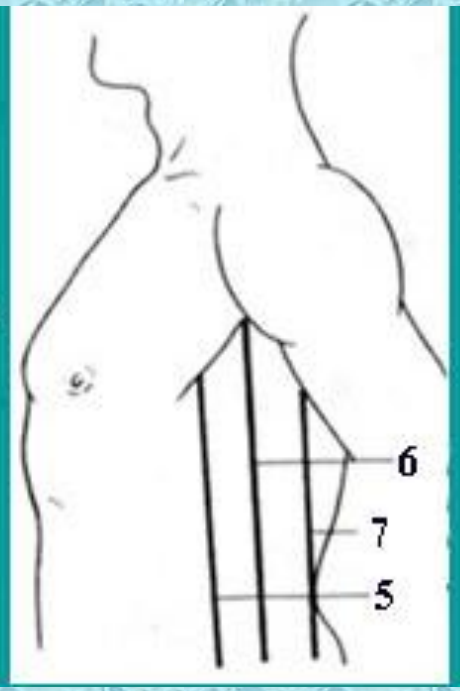

Collapsed
lung
A.D.A.M.

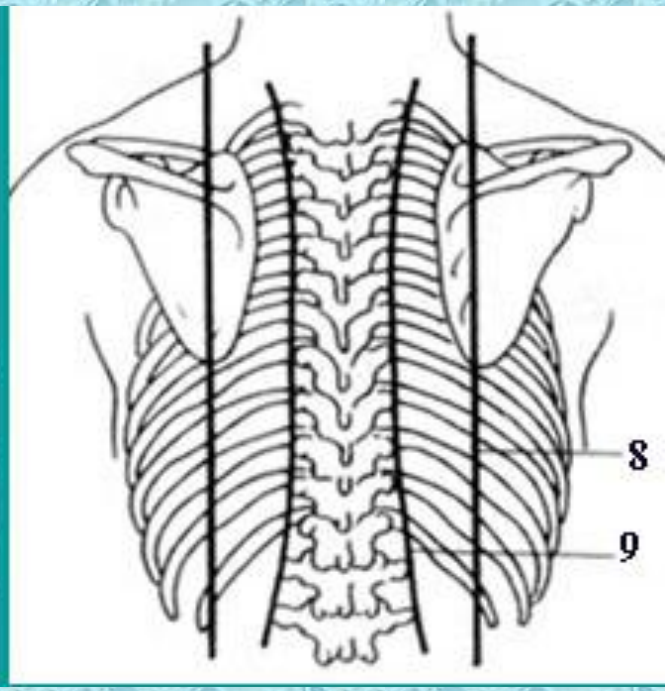
Reference lines of the thorax

1 - Anterior median line
2 - Lateral sternal line
3 - Parasternal line
4 - Midclavicular line
5 - Anterior axillary line

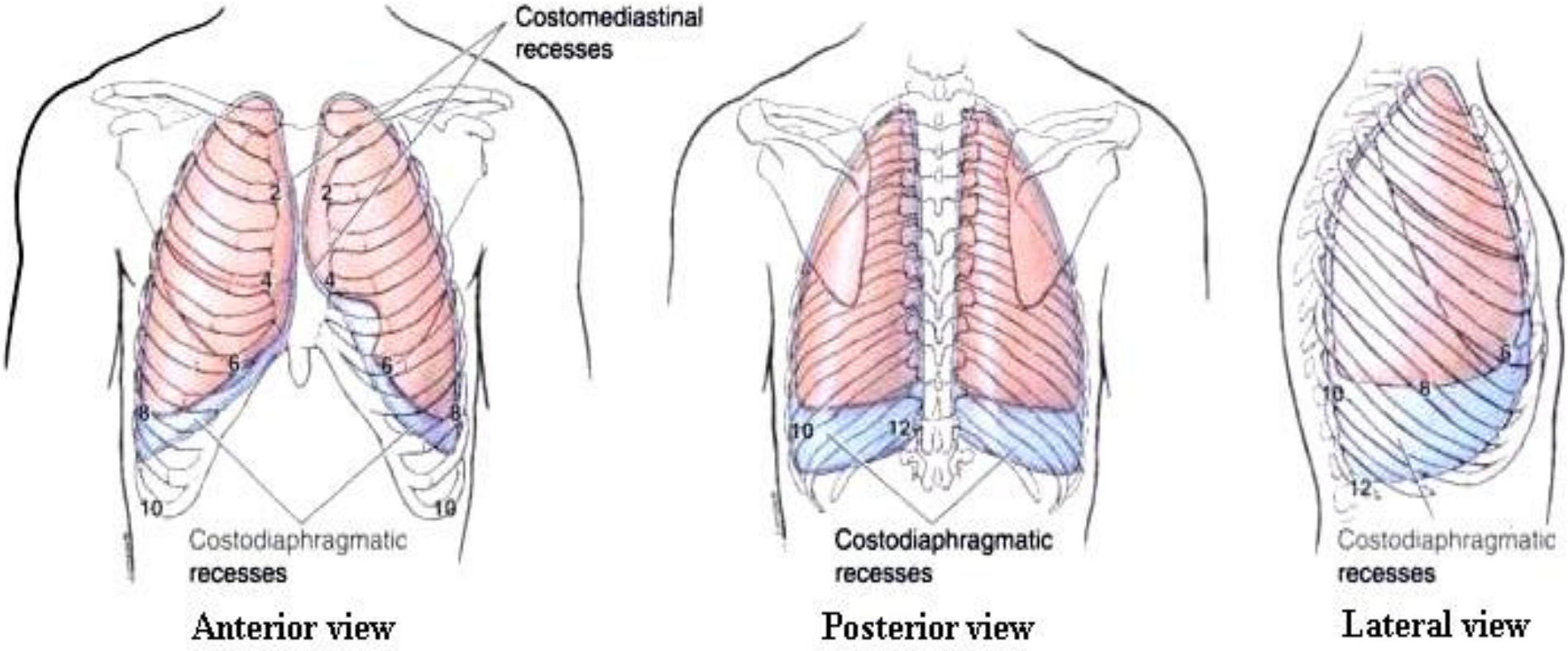
6 - Midaxillary line
7 - Posterior axillary line
8 - Scapular line
9 - Paravertebral line



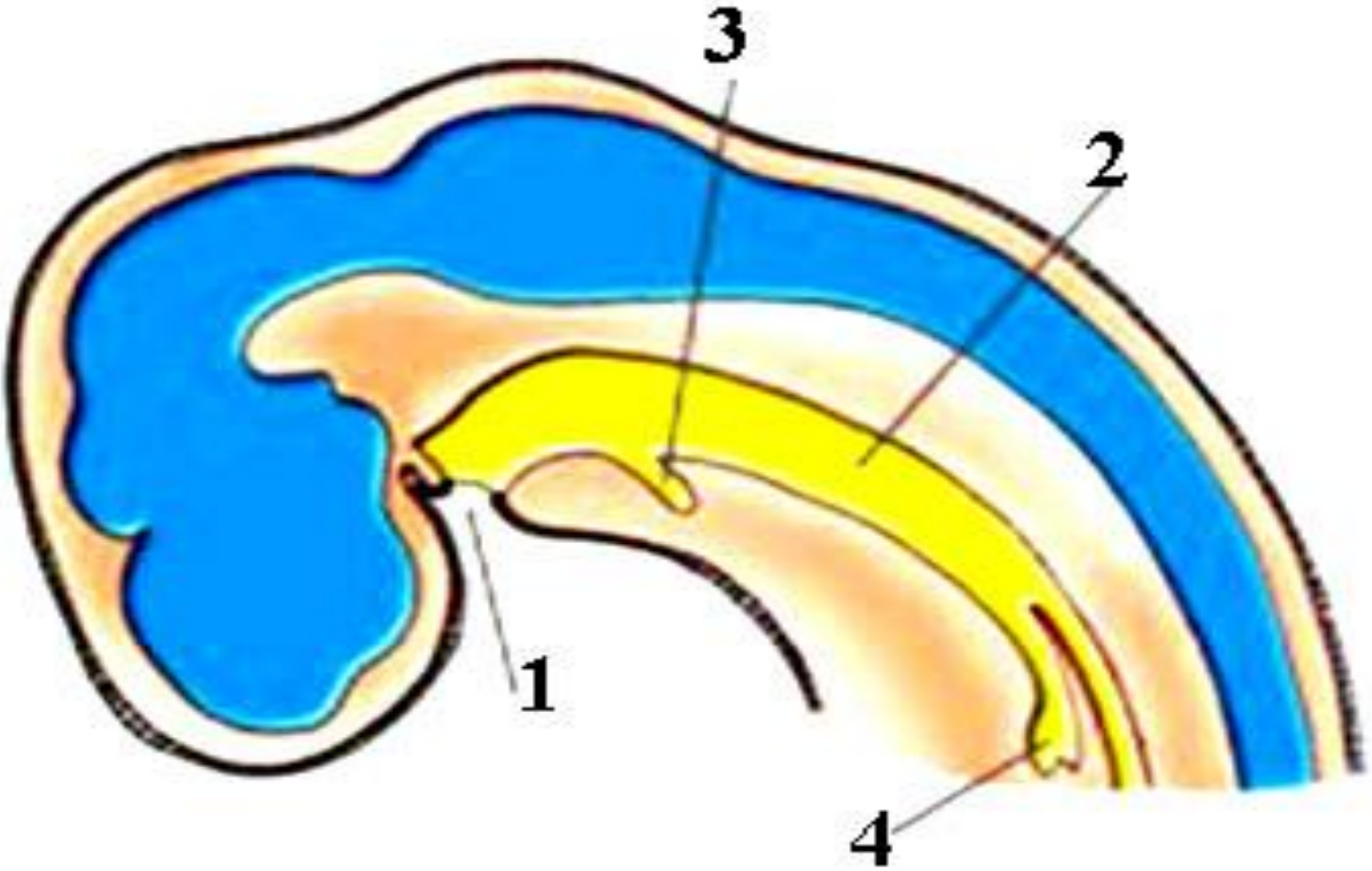




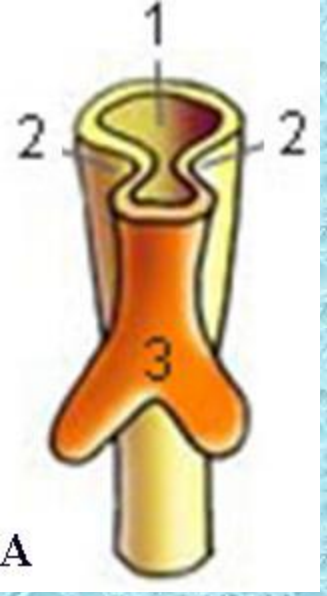
Topography of the lungs and pleura

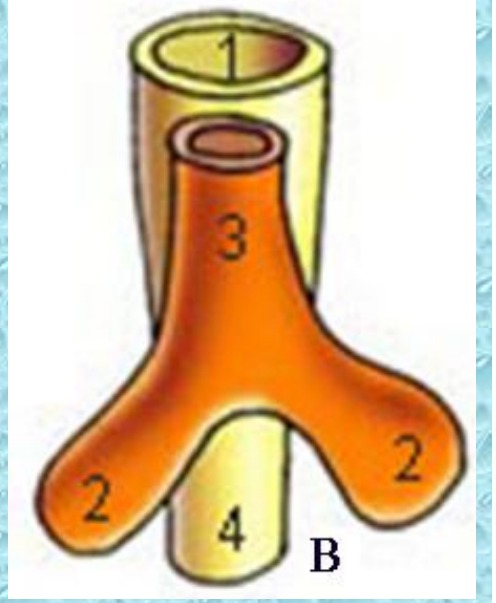


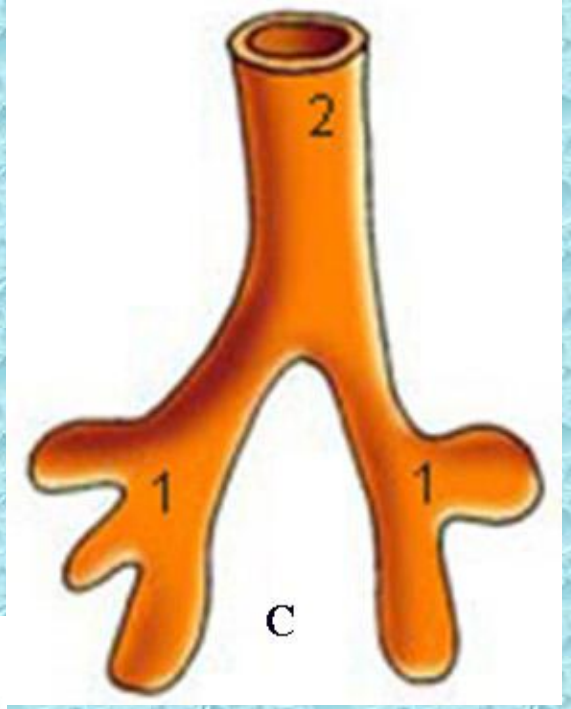
Development of the respiratory organs



1. Stomodeum 2. Pharyngeal gut 3. Thyroglossal duct 4. Tracheobronchial diverticulum

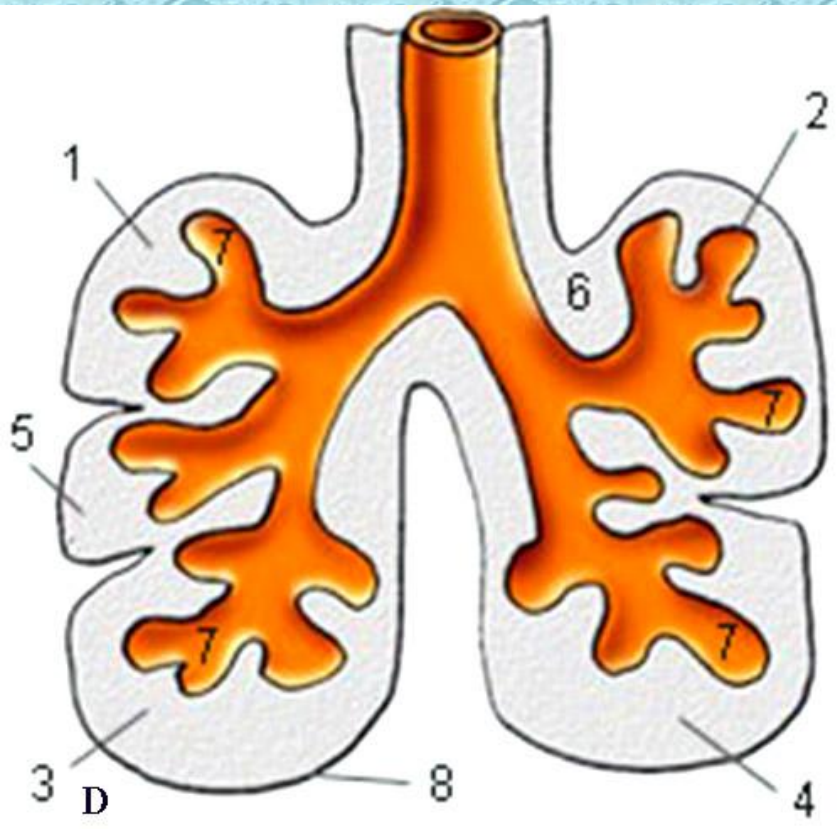






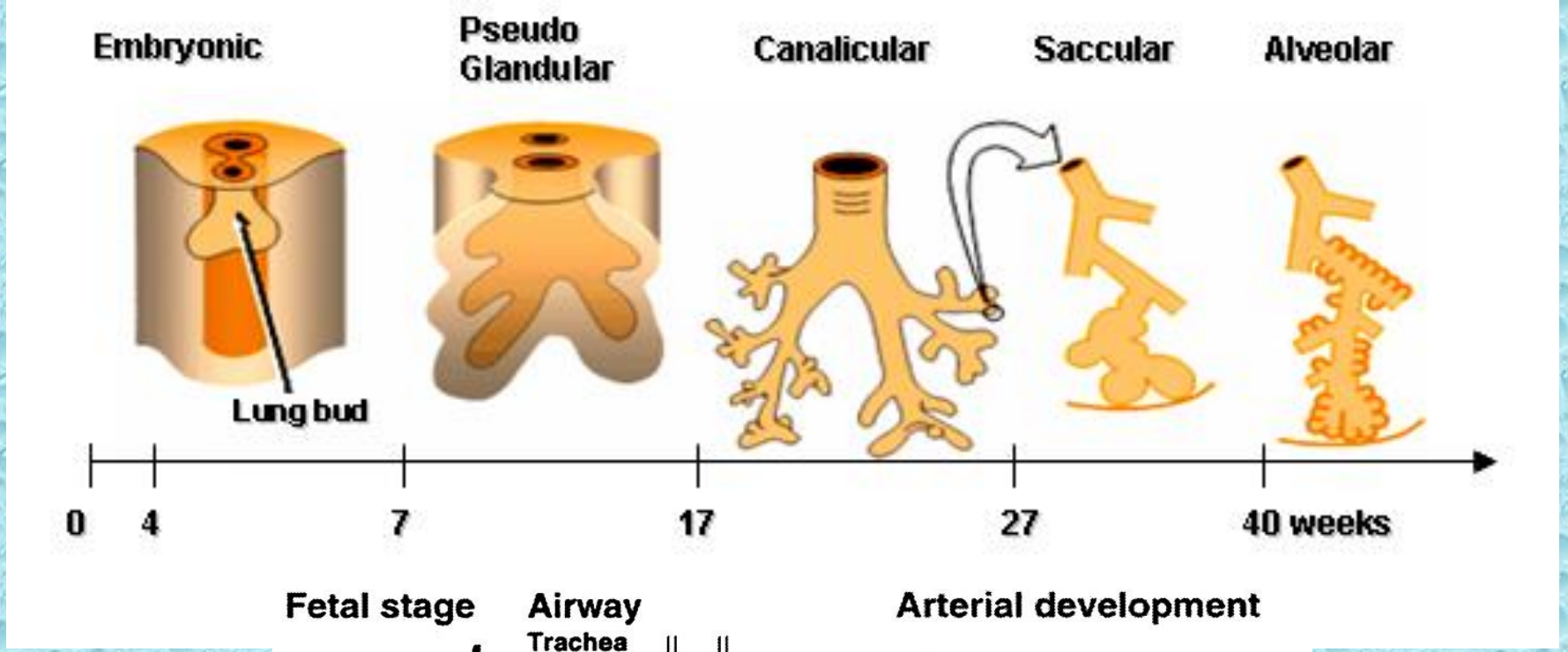
A.1. Foregut
2. Esophagotracheal septum
3. Respiratory diverticulum

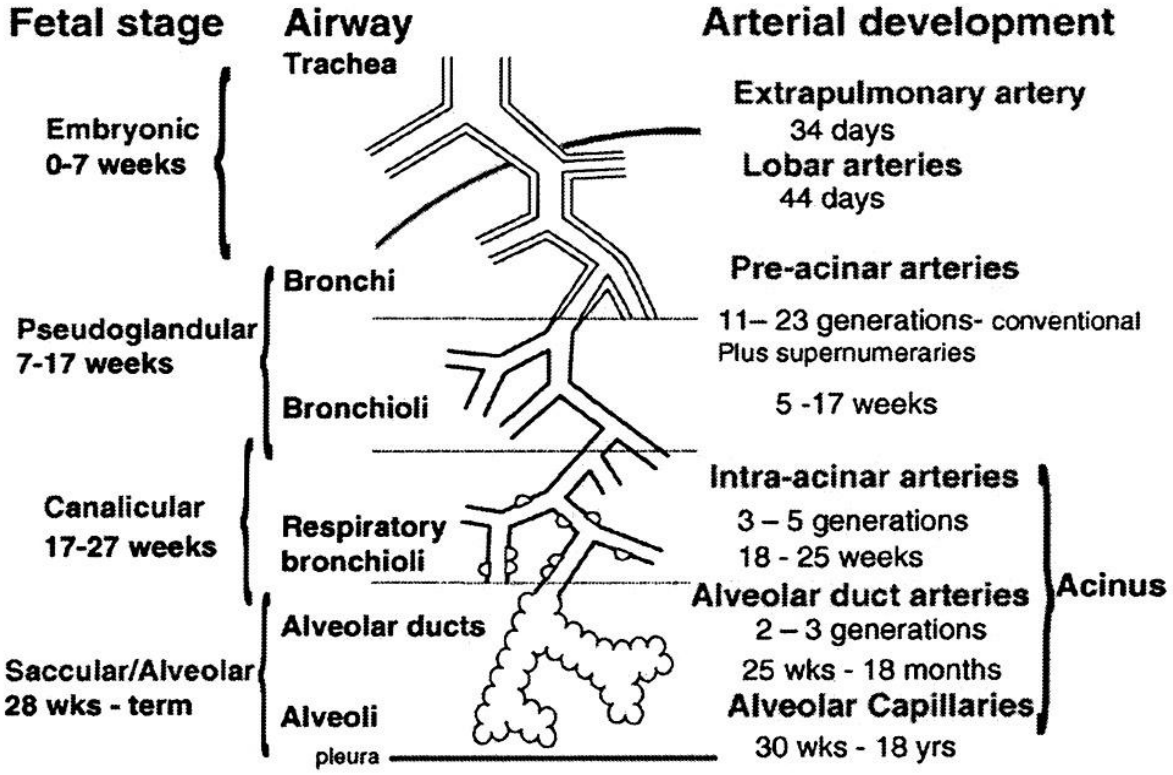
B.1. Pharynx
2. Lung buds
3. Trachea
4. Esophagus



C.1. Lung buds
2. Trachea

D.1. Right upper lobe
2. Left upper lobe
3. Right lower lobe
4. Left lower lobe
5. Right middle lobe
6. Splanchnic mesoderm
7. Bronchial buds
8. Visceral pleura


Embryonic
Pseudo Glandular
Canalicular
Saccular
Alveolar
Lung bud
0
4
7
17
27
40 weeks


Fetal stage
Airway
Arterial development
Trachea
Embryonic
0-7 weeks
Extrapulmonary artery
34 days
Lobar arteries
44 days
Bronchi
Pre-acinar arteries
Pseudoglandular
7-17 weeks
11– 23 generations- conventional
Plus supernumeraries
Bronchioli
5 -17 weeks
Canalicular
17-27 weeks
Intra-acinar arteries
3 – 5 generations
18 - 25 weeks
Respiratory bronchioli
Alveolar duct arteries
2 – 3 generations
25 wks - 18 months
Acinus
Alveolar ducts
Saccular/Alveolar
28 wks - term
Alveolar Capillaries
30 wks - 18 yrs
Alveoli
pleura

Stages of the lung development

Time period	*Stage*	*Notes*
5-17 weeks	**Pseudoglandular**	**Developing lungs resemble an exocrine gland. Respiration is not possible. Fetuses born during this time *cannot survive*.**
16-25 weeks	**Canalicular**	**Terminal bronchioles divide and primitive alveolar sac develop /terminal sac/. Some respiration may be possible towards the end of this stage. Fetuses born towards the end of this perior *can survive if given intensive care but often die anyway*.**
24-birth	**Terminal sac**	**Many more alveoli develop and the epithelium lining the terminal sacs become thin enough to allow respiration. Type I and type II pneumocytes develop.** **Type II pneumocytes begin producing pulmonary surfactant, which counteracts surface tension and facilitates expansion of the terminal sac at birth.** **Fetuses born *after 24 weeks may survive, and those born after 32 weeks have a good chance of survival*.**
Birth-year 8	**Alveolar**	**Respiratory bronchioles, terminals, alveolar ducts continue to increase in number.**

Methods of examination of the nose

INSPECTION

A) Skin appearance - color same as face.

B) Shape - symmetrical.

C) Nares - septum midline, symmetrical

Methods of examination of the nose

A) Firmness, nodules, pain

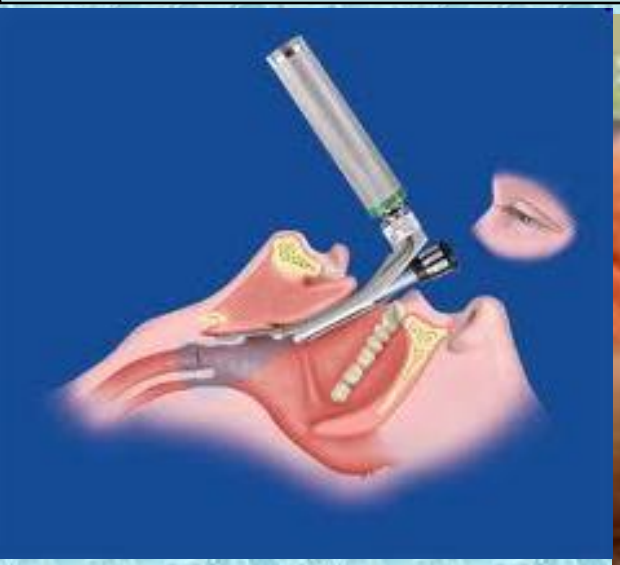
B) Patency of nares (Have client close mounth and occlude one nare)

Examining the Larynx

The larynx is positioned low in the neck and requires some special skills and tools for examination.

Direct Laryngoscopy this type of examination involves directly looking at the larynx. Because of the gag reflex, direct laryngoscopy is most often done in the operating room under a general anesthetic. The examiner holds an instrument called a laryngoscope in his or her hand, and looks through this instrument to examine the larynx.

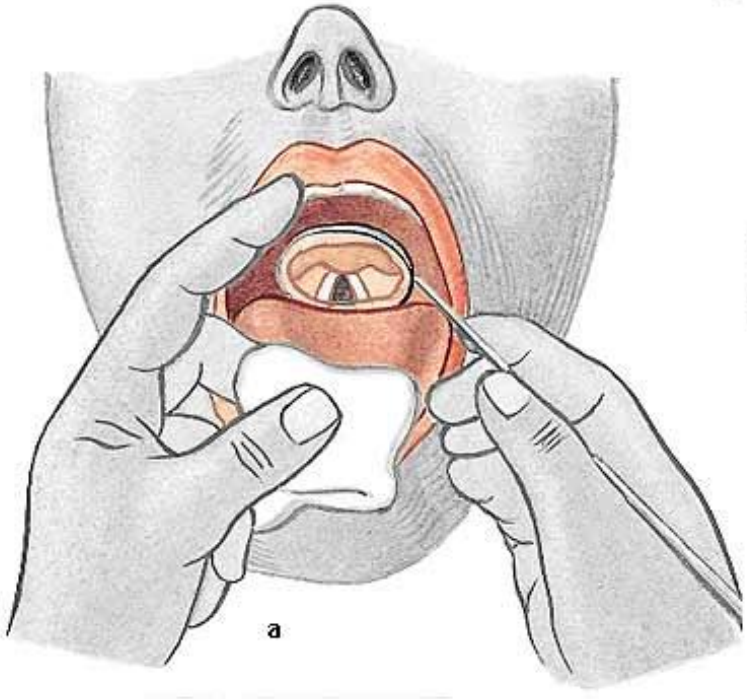
Indirect Laryngoscopy The examiner can place a small mirror in the back of the throat and angle it down towards the larynx. Light can be reflected downward and the larynx can be seen in the mirror. Indirect laryngoscopy is quick an easy, and gives a three dimensional view of the larynx in true color.



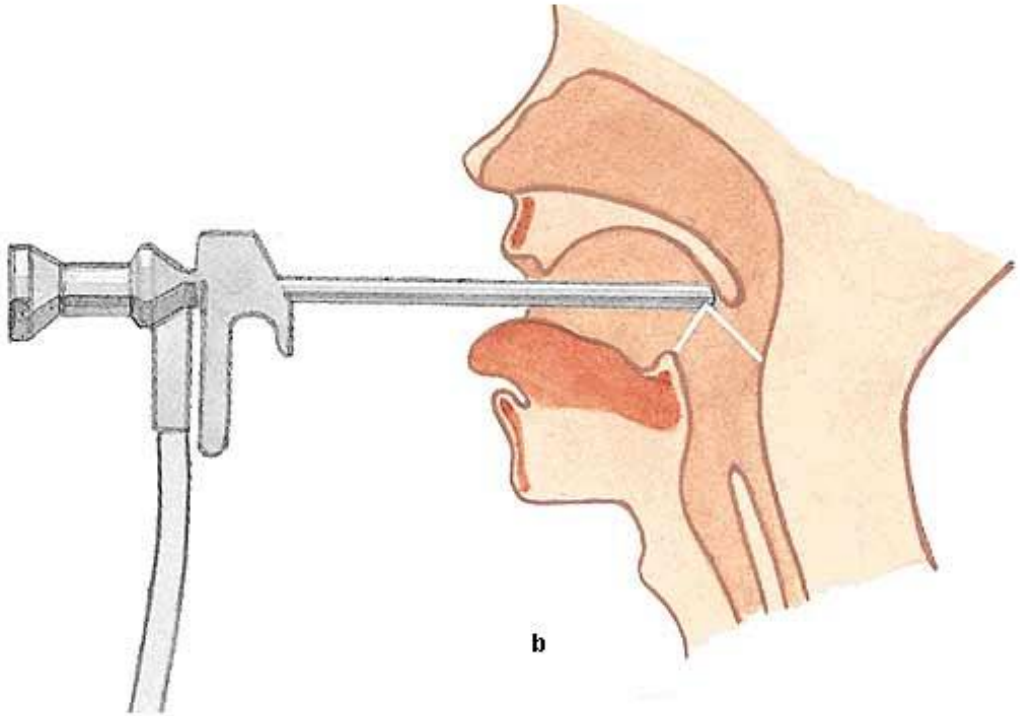
The True Vocal Cords.

High-resolution freeze-frame digital laryngoscopy reveals the normal anatomy of the true vocal cords during phonation. In this image, anterior is toward the bottom.

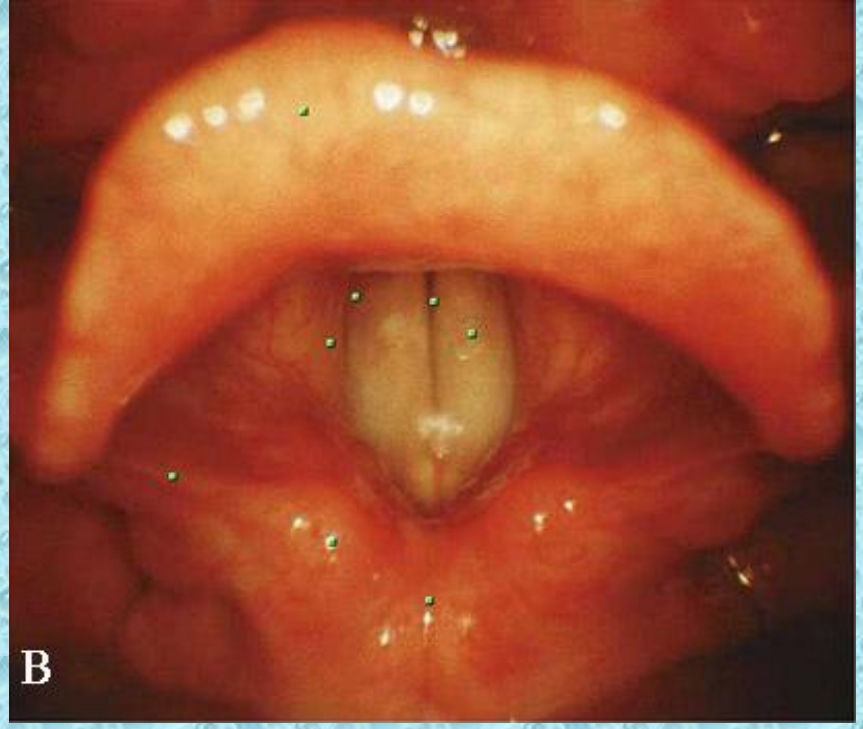
Methods of examination of respiratory organs

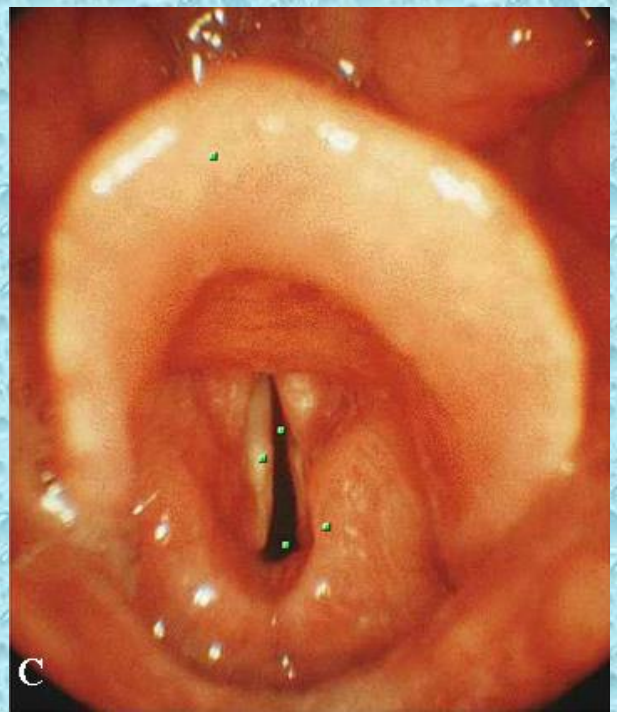


Indirect laryngoscopy



Direct laryngoscopy





Direct laryngoscopy

A.Vocal folds are opened for deep inspiration

B. Vocal folds are closed: fonation position

C. The intercartilaginous part of the rima glottidis is open, as during whispering

Flexible and Rigid Endoscopy **There are two special optical instruments that can assist the physician in examination of the larynx during an office visit. The instrument shown below on the left is a nasopharyngoscope. The curved part of the scope is a flexible fiberoptic cable that can be passed through the nose and through the pharynx until it gives a view of the vocal folds.**

Stroboscopic Examination During speech, the vocal folds vibrate 100 times per second or more. This is too fast to be seen by our eyes. ***In order to more carefully examine the vocal folds in action, a special light source called a strobe light is used***. The strobe sends off a very bright and very short flash of light. If the strobe flash is repeated at the exact same rate that the vocal folds are vibrating, they will appear "frozen" in time. If the firing rate is then adjusted so that it is a little faster or a little slower than the vibration rate of the folds, the folds will appear to move in slow motion. The strobe exam is extremely useful because it allows us to see how the vocal folds are functioning.

Inspection of anterior chest wall

6) Inspect patient's chest normal breathing movement.
7) Inspect patient's chest for accessory muscle use.
8) Inspect patient's chest for retraction of lower intercostal spaces.
9) Stand again to the right of patient and look tangentially for apical and epigastric pulsation.
10) Inspect the chest wall and skin for swelling, scars, skin eruption or engorged veins.

Funnel chest

Pigeon chest

Barrel chest

Pectus excavatum

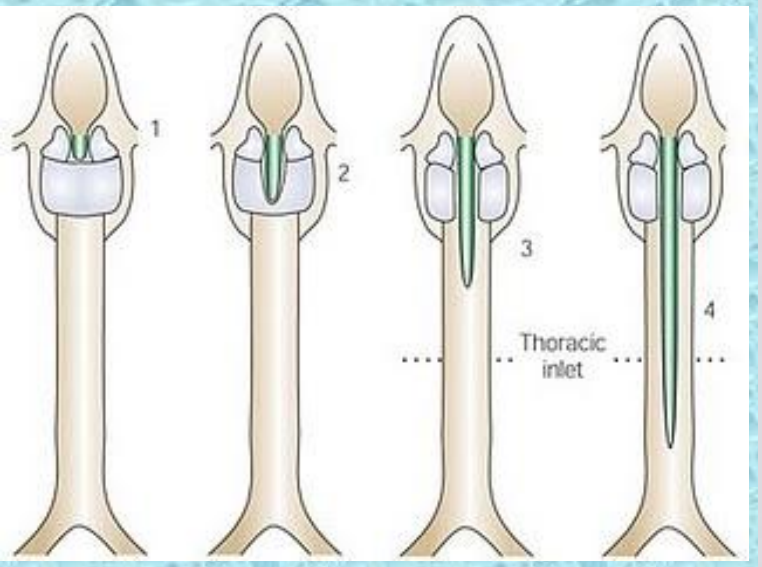
Pectus carinatum

Percussion

Auscultation

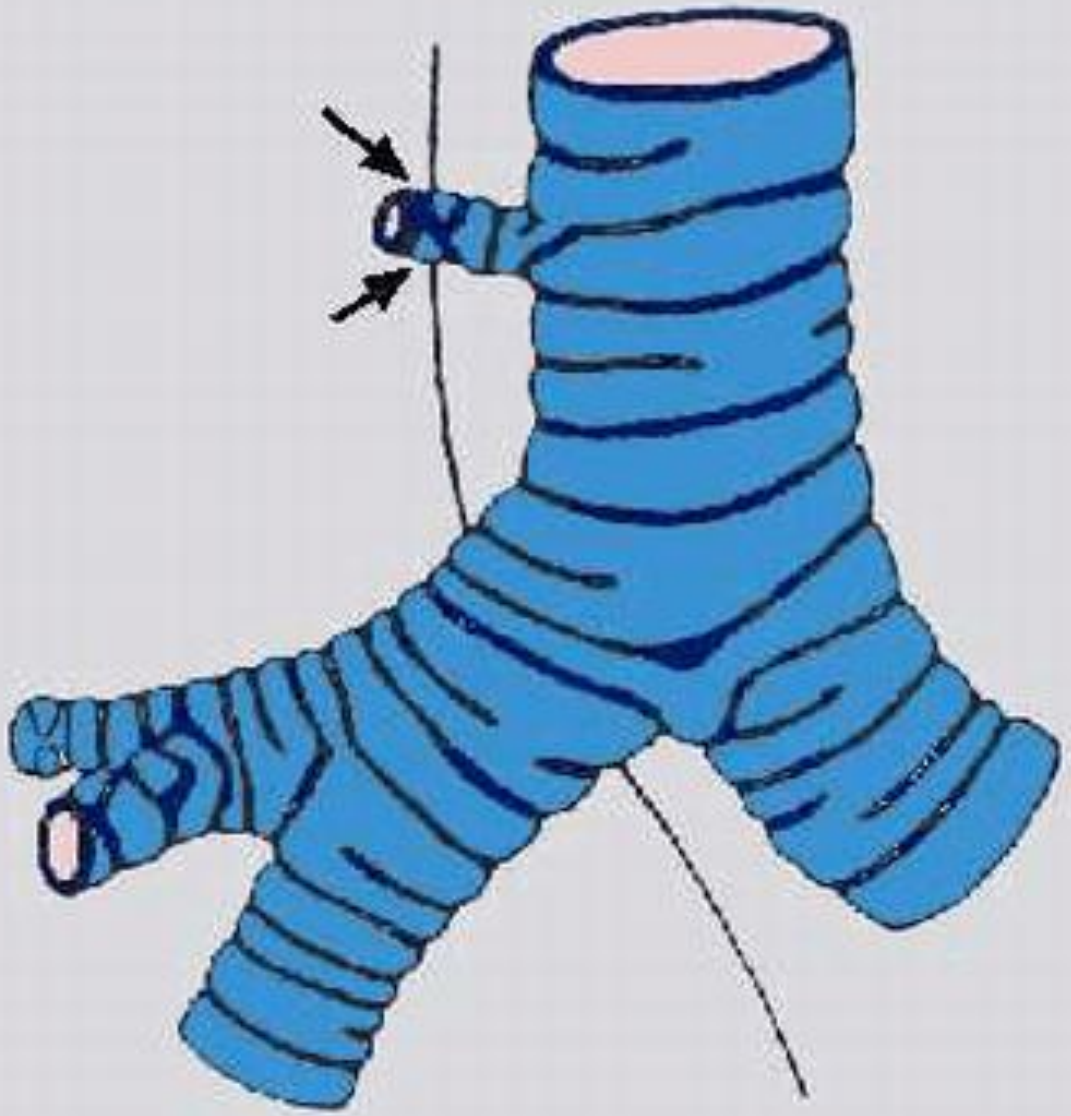
Anomalies of the respiratory organs

1. **Absence or agenesis of:** bronchus, larynx, trachea
2. **Anomaly (of):** cricoid cartilage, epiglottis, thyroid cartilage, tracheal cartilage
3. **Atresia (of):** epiglottis, glottis, trachea
4. **Cleft of the larynx**
5. **Congenital dilation of the trachea**
6. **Stenosis of the larynx, trachea**
7. **Diverticulum of the bronchus, trachea**
8. **Rudimentary tracheal bronchus**
9. **Congenital cystic lung**
10. **Agenesis, hypoplasia, and dysplasia of the lung**
11. **Absence of lung (lobe)**
12. **Hypoplasia of lung (lobe)**



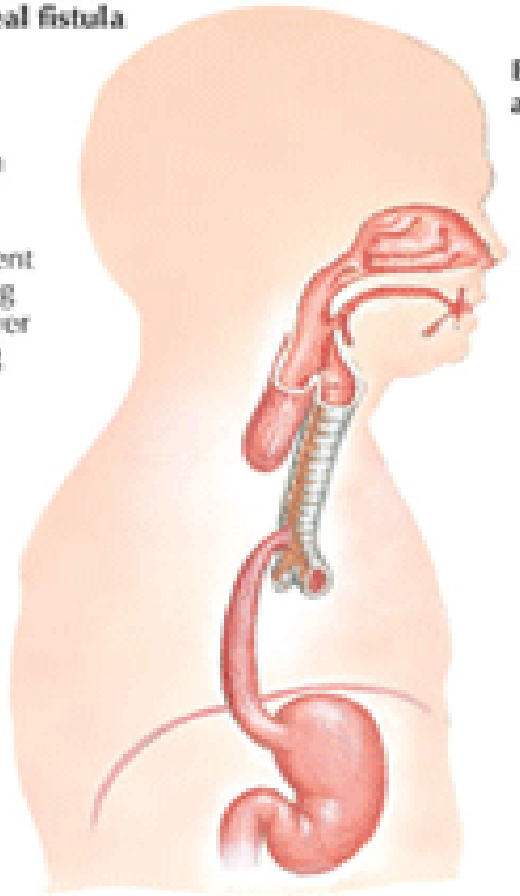
Laryngeal cleft

Tracheal Bronchus



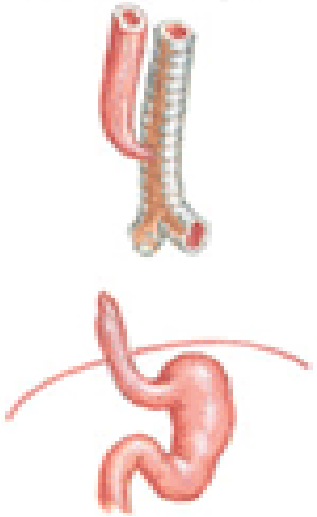
A. Tracheoesophageal fistula

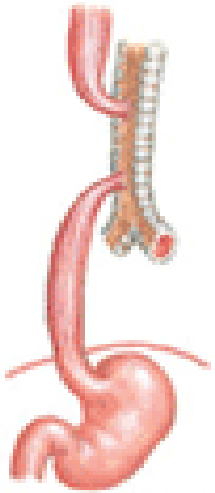
Most common form (90% to 95%) of tracheoesophageal fistula. Upper segment of esophagus ending in blind pouch; lower segment originating from trachea just above bifurcation. The two segments may be connected by a solid cord



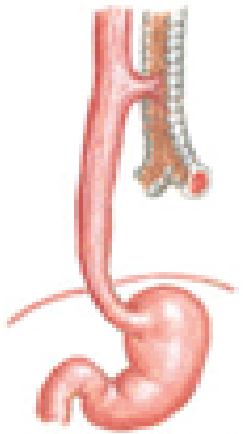
B. Variations of tracheoesophageal fistul and rare anomalies of trachea

Upper segment of esophagus ending in trachea; lower segment of variable length

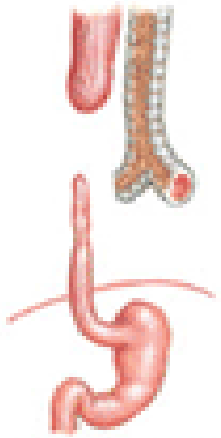




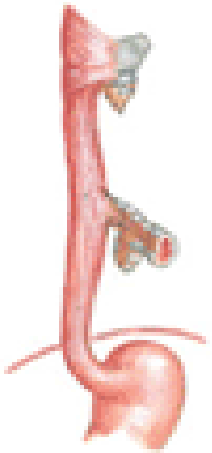
C. Double fistula



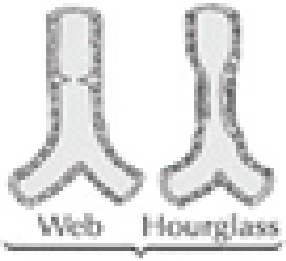
D. Fistula without esophageal atresia



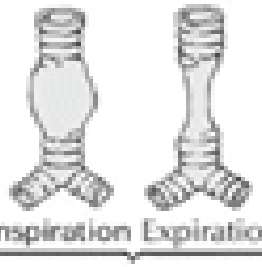
E. Esophageal atresia without fistula



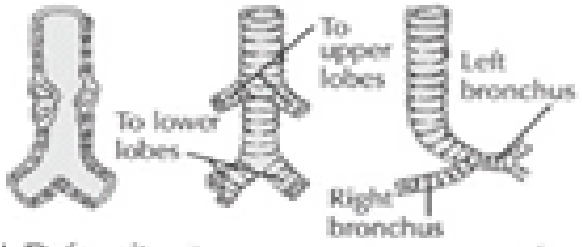
F. Aplasia of trachea (lethal)



G. Stricture of trachea



H. Absence of cartilage



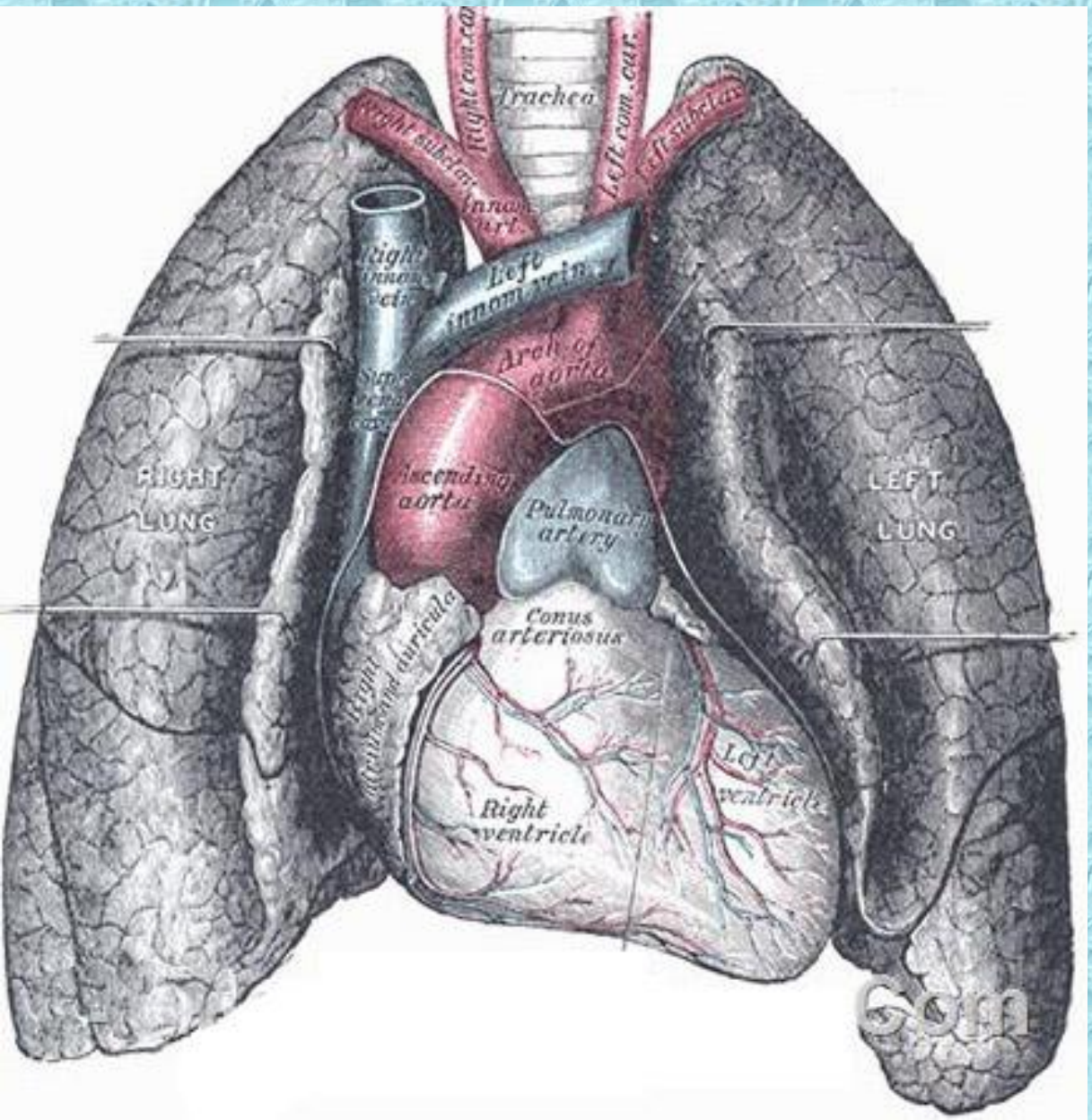
I. Deformity of cartilage

J. Abnormalities of bifurcation

Mediastinum

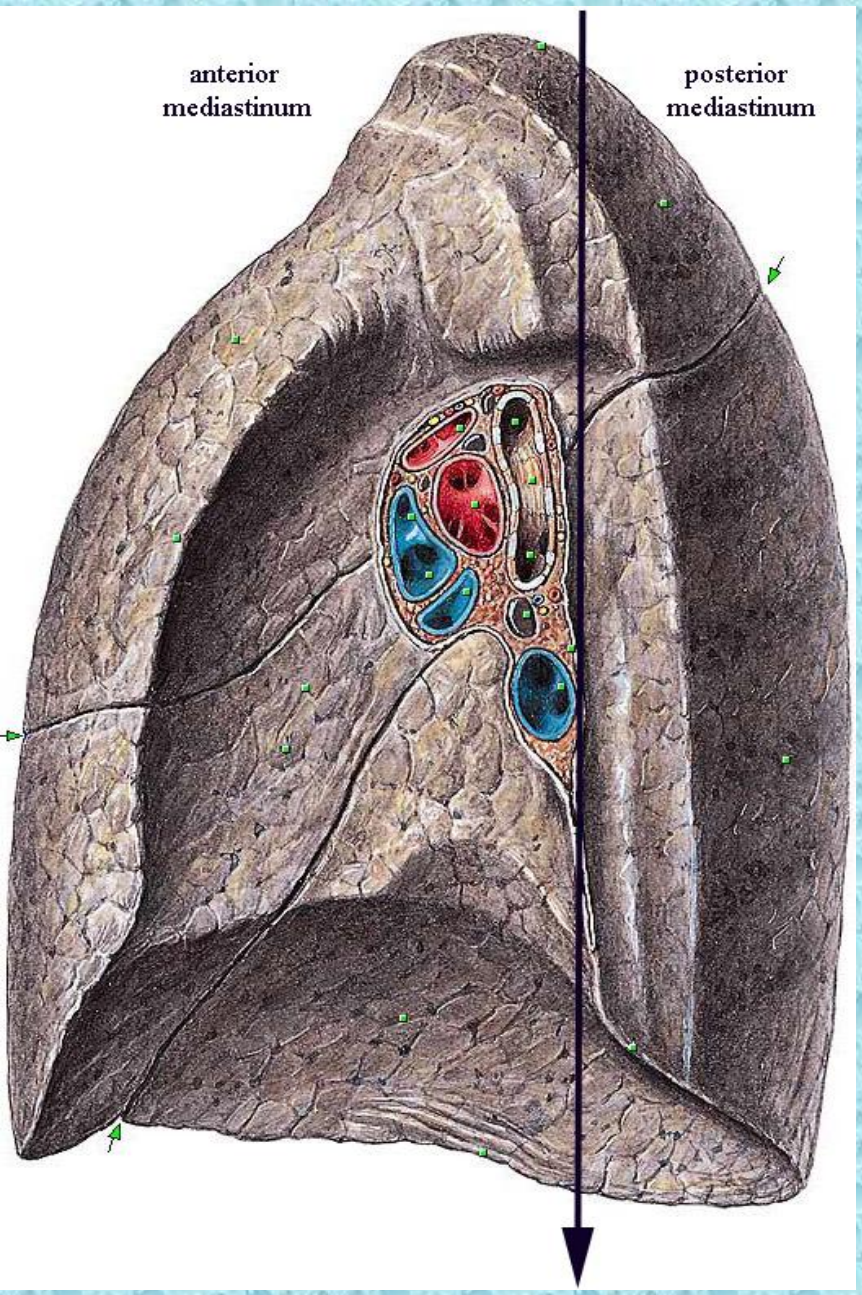
it is the mass of tissues and organs separating

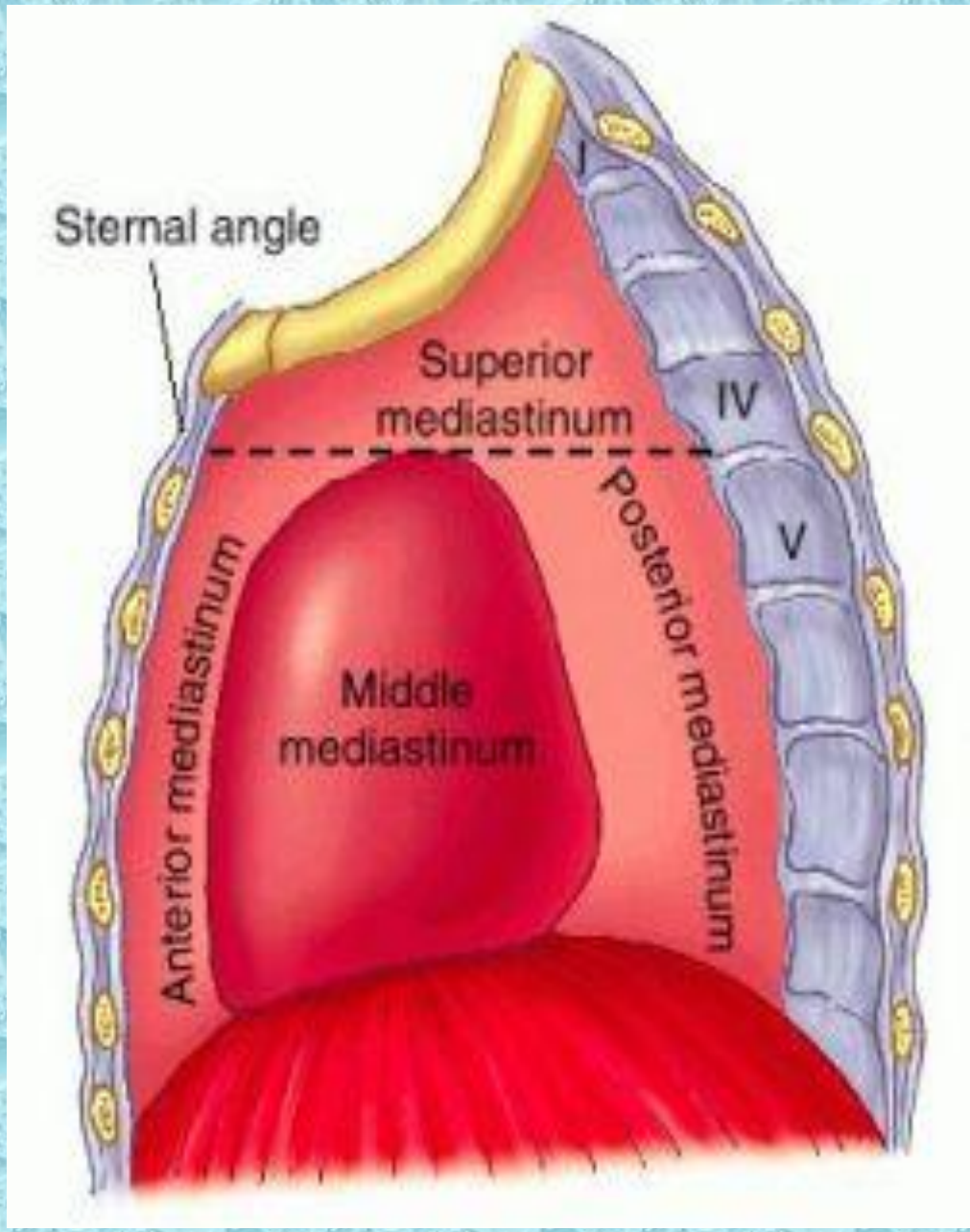
the two pleural sacs



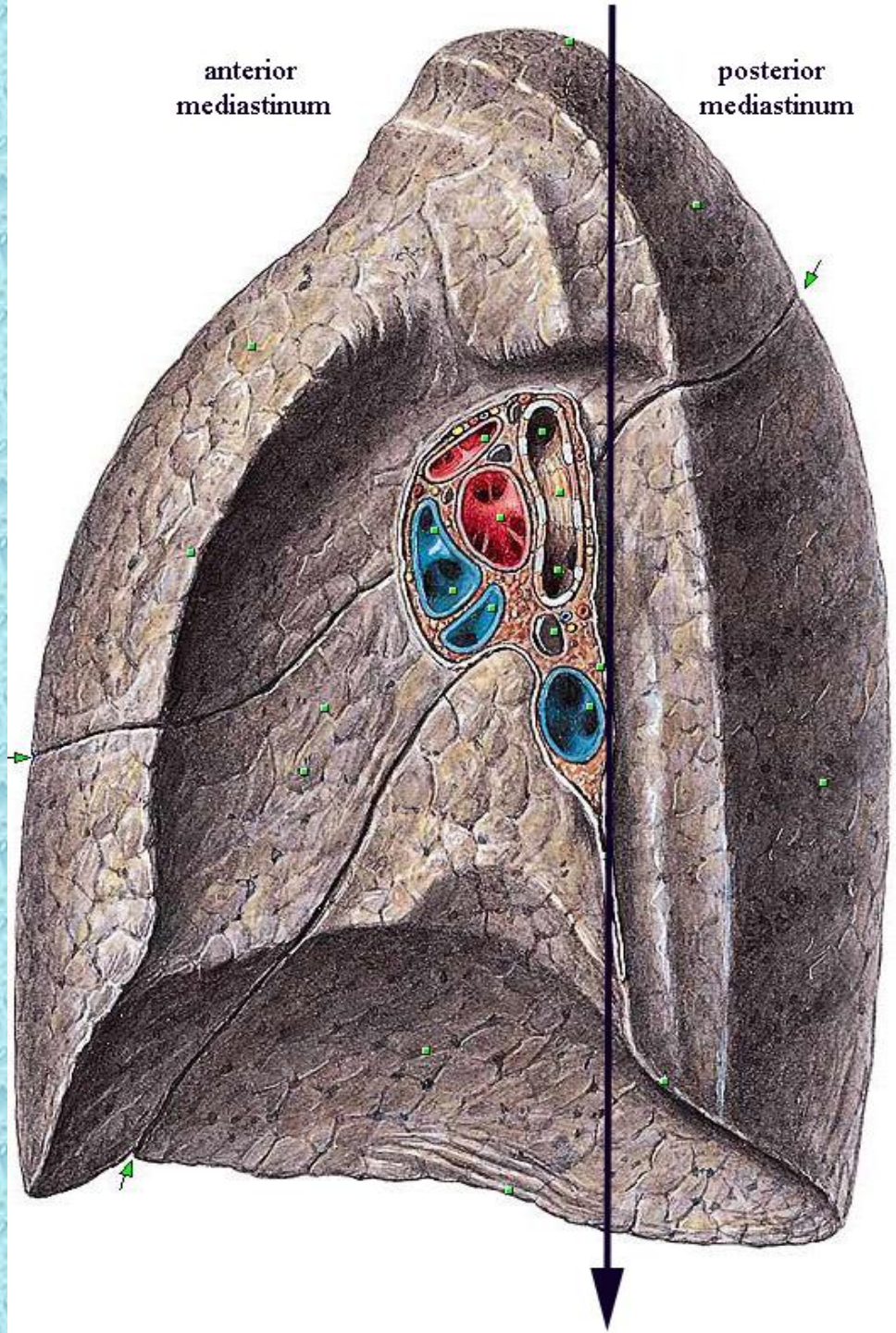
An anterior and posterior parts are distinguished in the mediastine in accordance to **BNA.**

The boundary between them is a frontal plane drawn through the posterior part of both pulmonary roots.


anterior
mediastinum
posterior
mediastinum


Sternal angle
I
Superior
mediastinum
IV
V
Posterior mediastinum
Anterior mediastinum
Middle
mediastinum

An anterior & posterior parts are distinguished in the mediastinum, the boundary between which is a frontal plane drawn through the posterior part of both pulmonary roots



Limits of the mediastinum

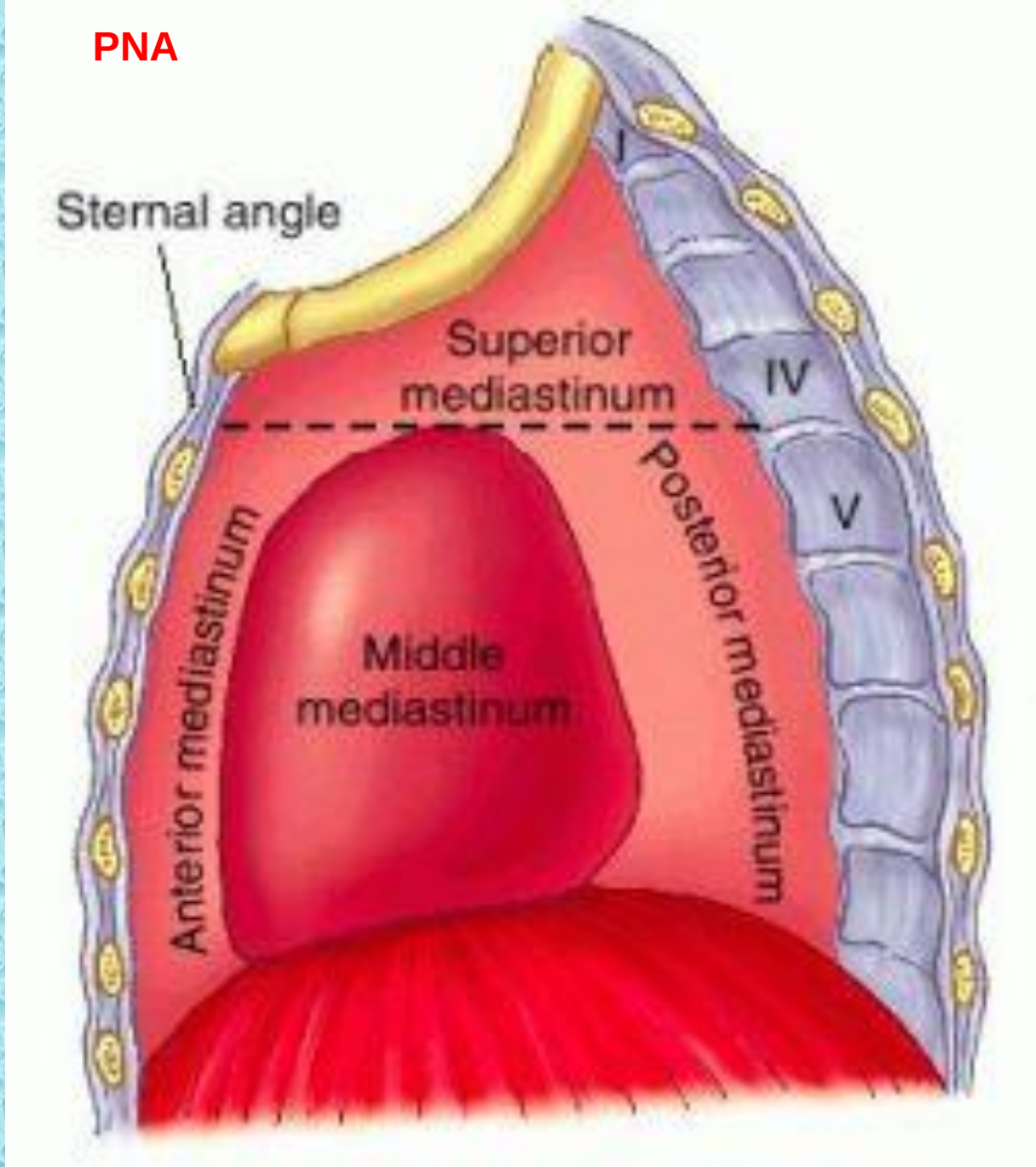
Anterior – sternum

Posterior - vertebral column

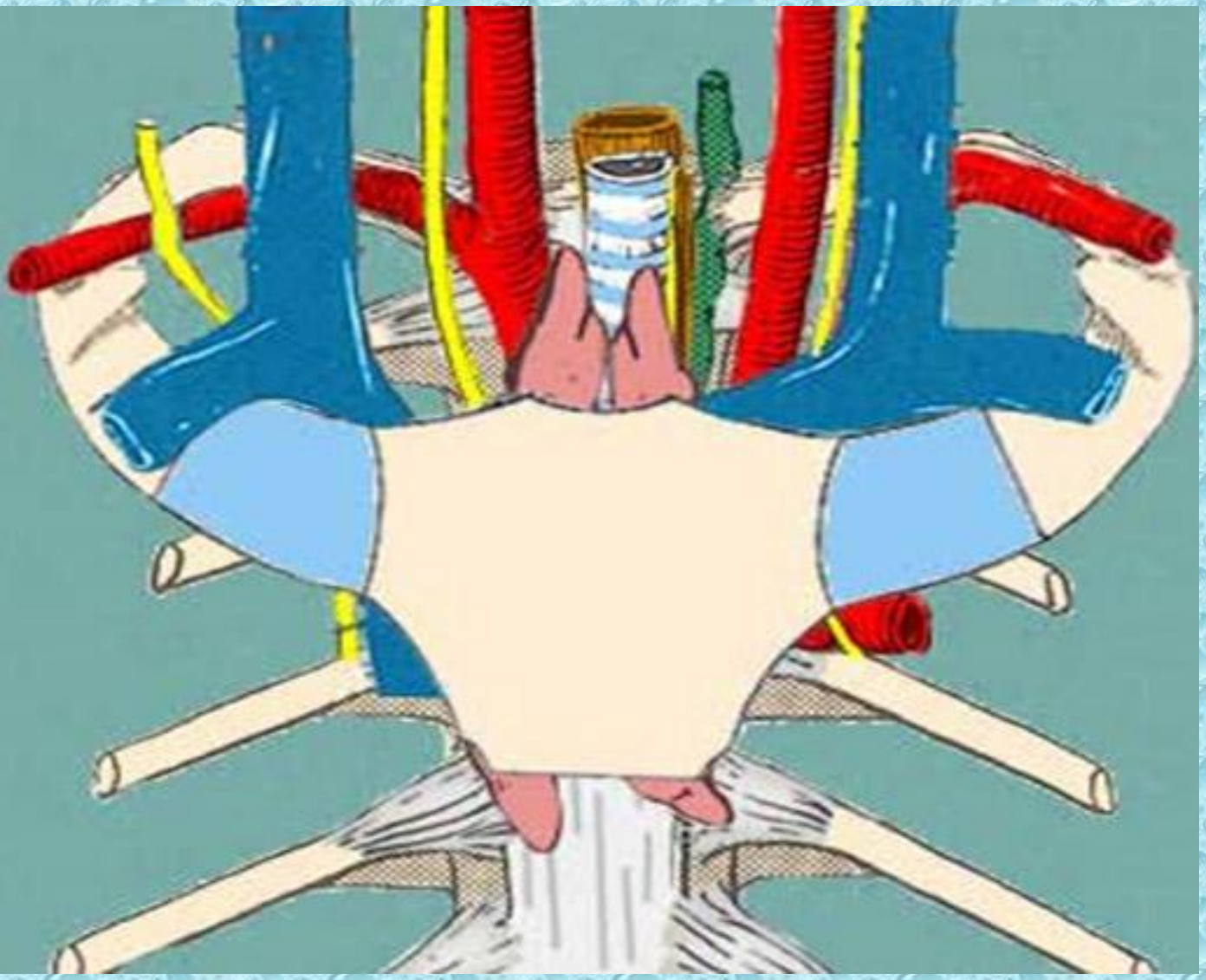
Inferior : diaphragm

Superior: superior thoracic aperture

Lateral – pleural sacs



Contents of the superior mediastinum



/in planes from anterior to posterior/:

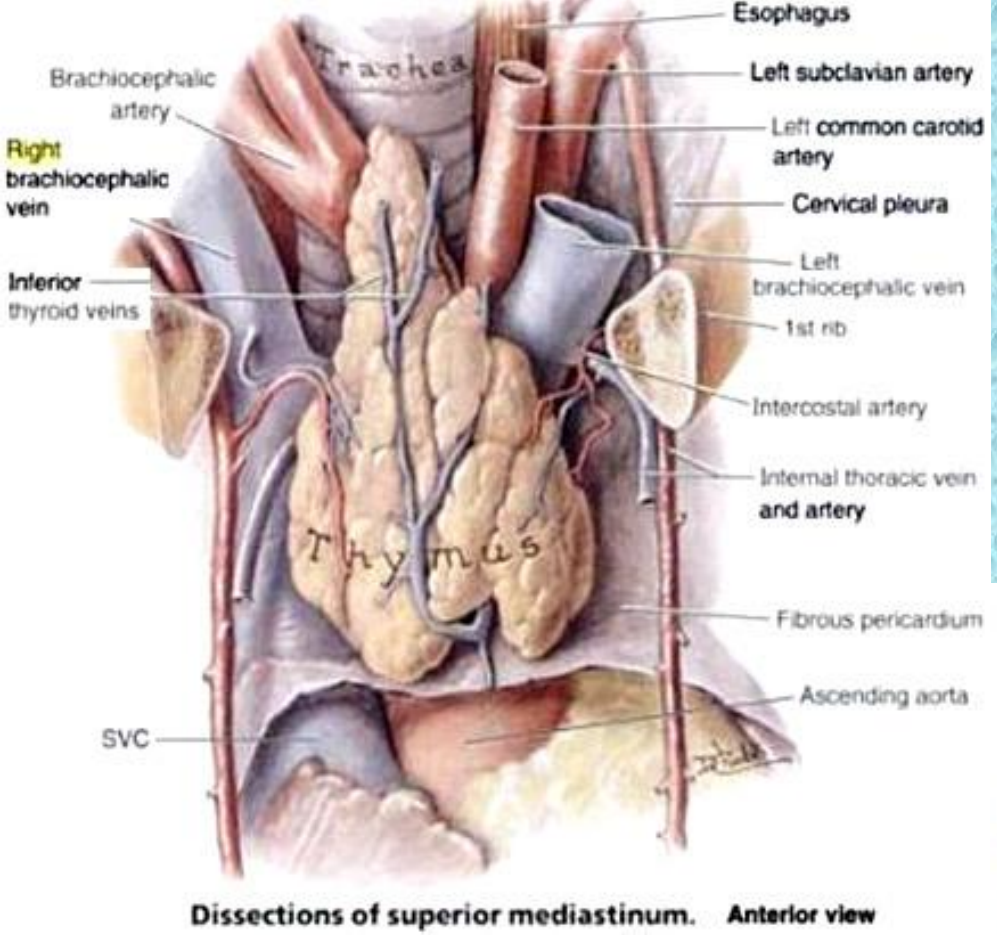
glandular plane;

venous plane;

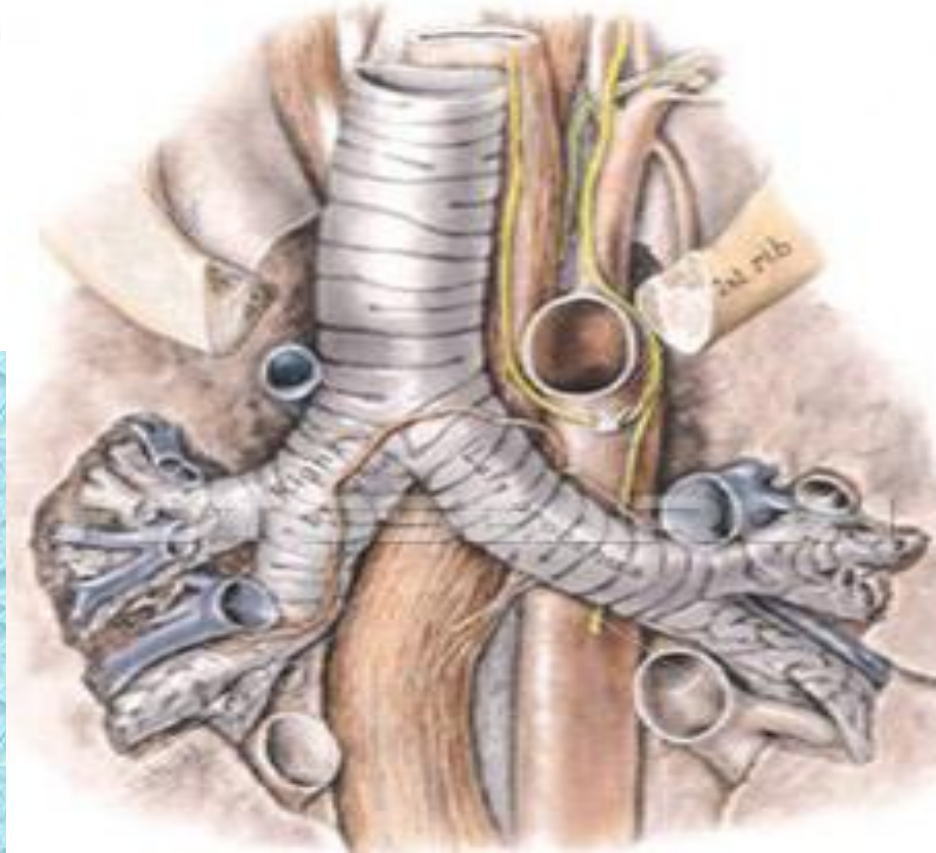
arterial-nervous plane;

visceral plane;

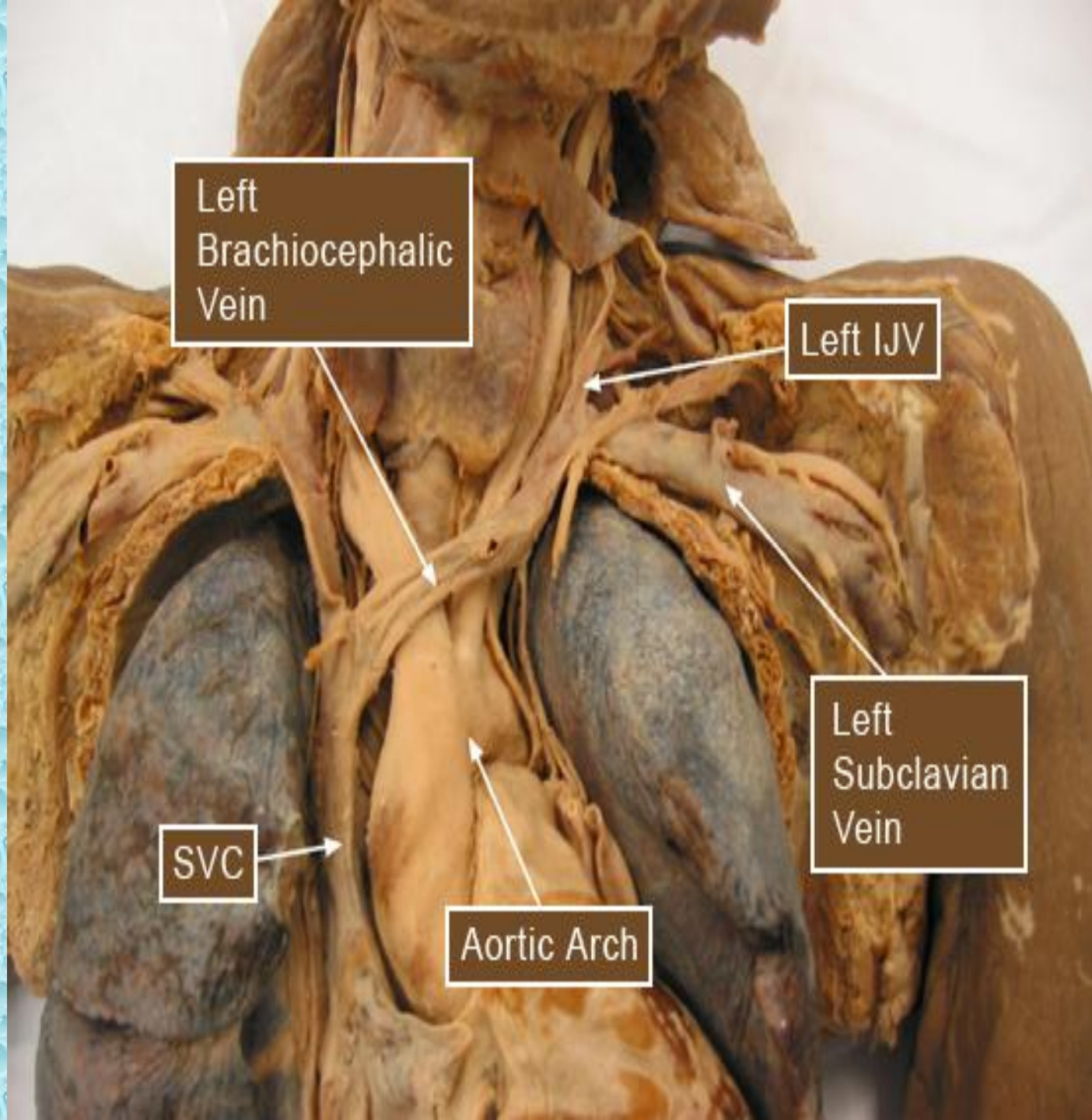
lymphatic plane



Dissections of superior mediastinum. **Anterior view**



Contents of anterior mediastinum



Contents of anterior inferior mediastinum BNA

- **2/3 inf. –heart, pericardium**
- **1/3 sup. (above the III-d intercostal space)**

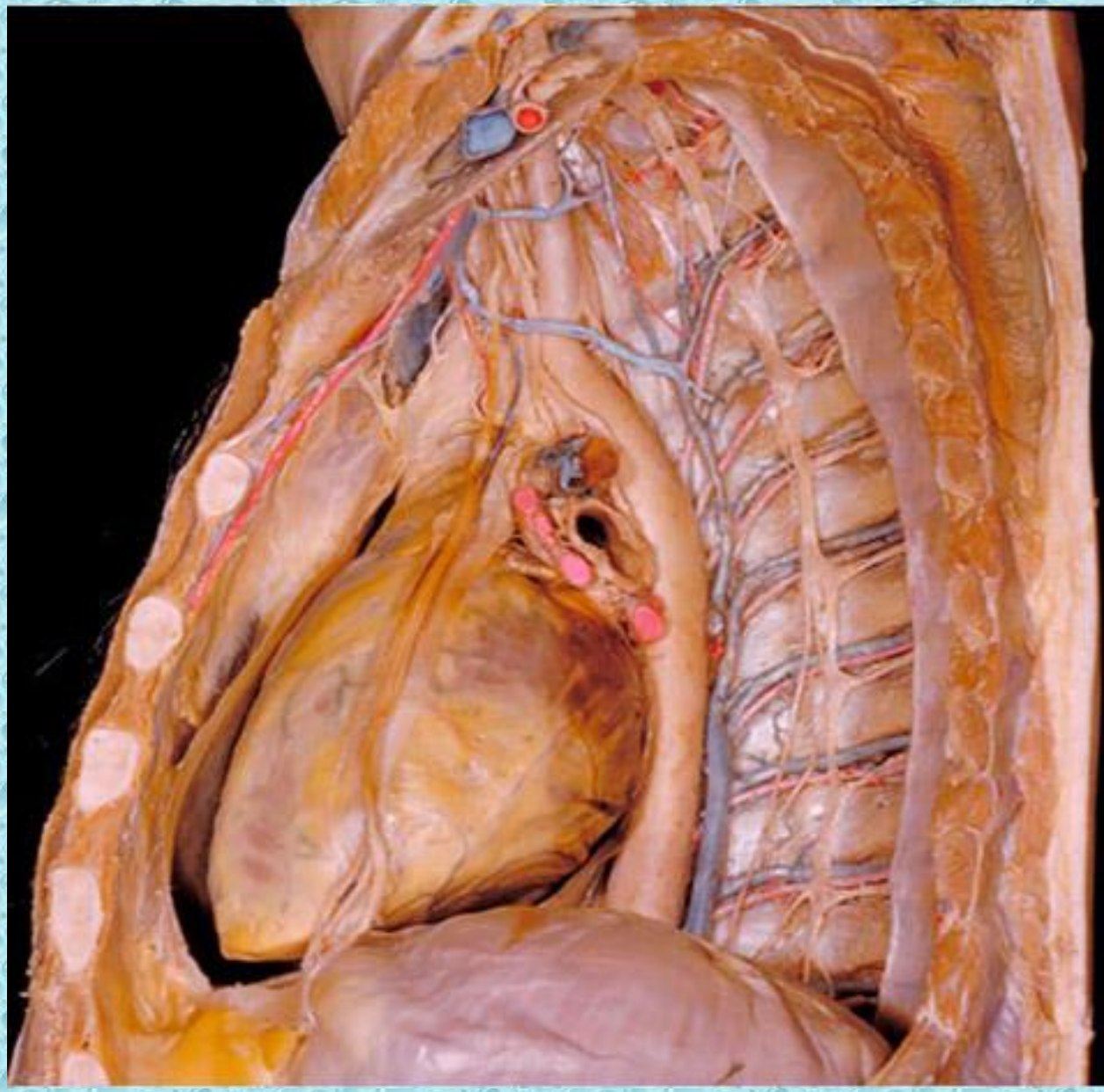
Thymus;

Brahiocephalic veins

Connective & fat tissue;

Frenic nerves

Lymph nodes

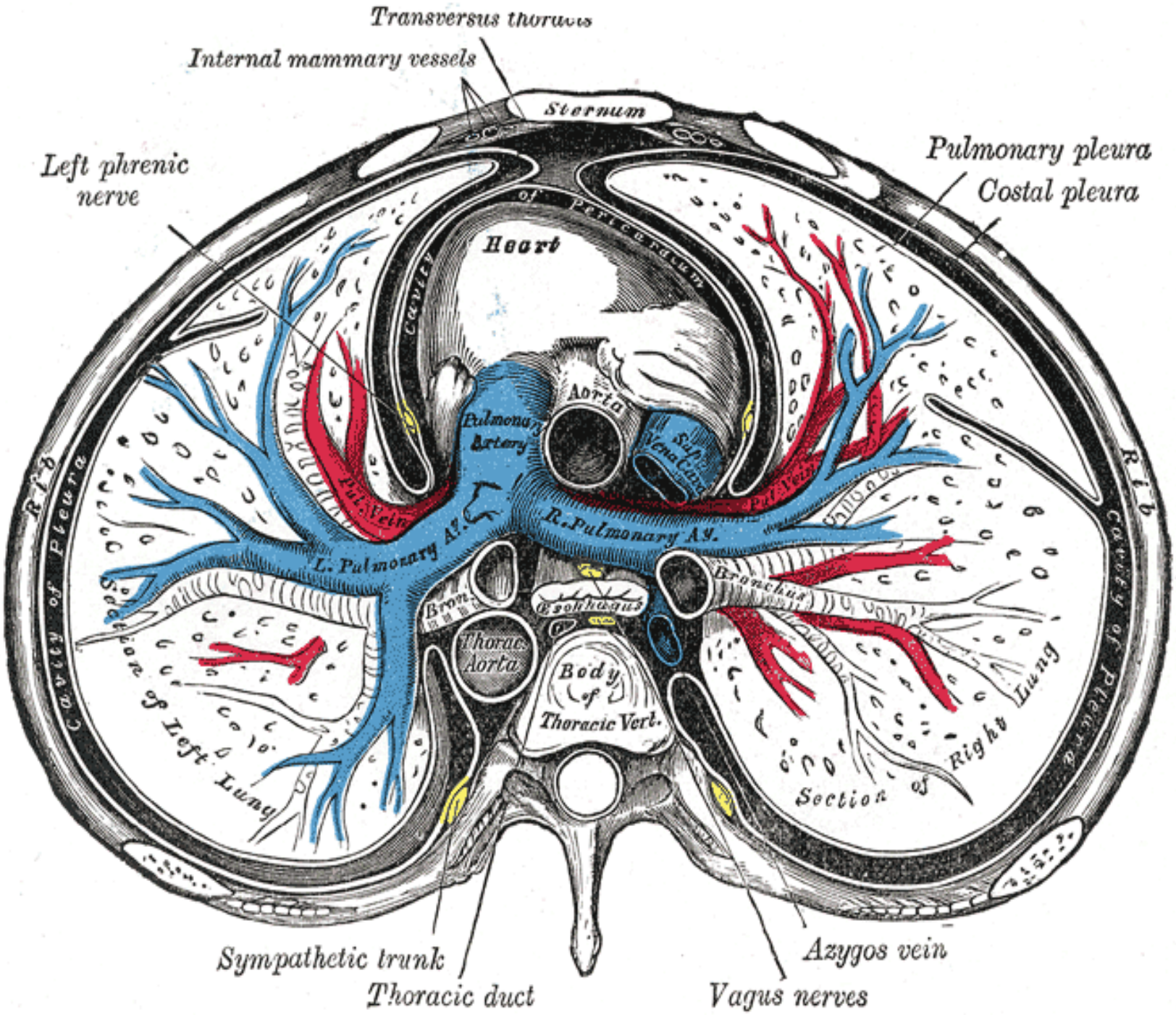


Contents of the middle mediastinum

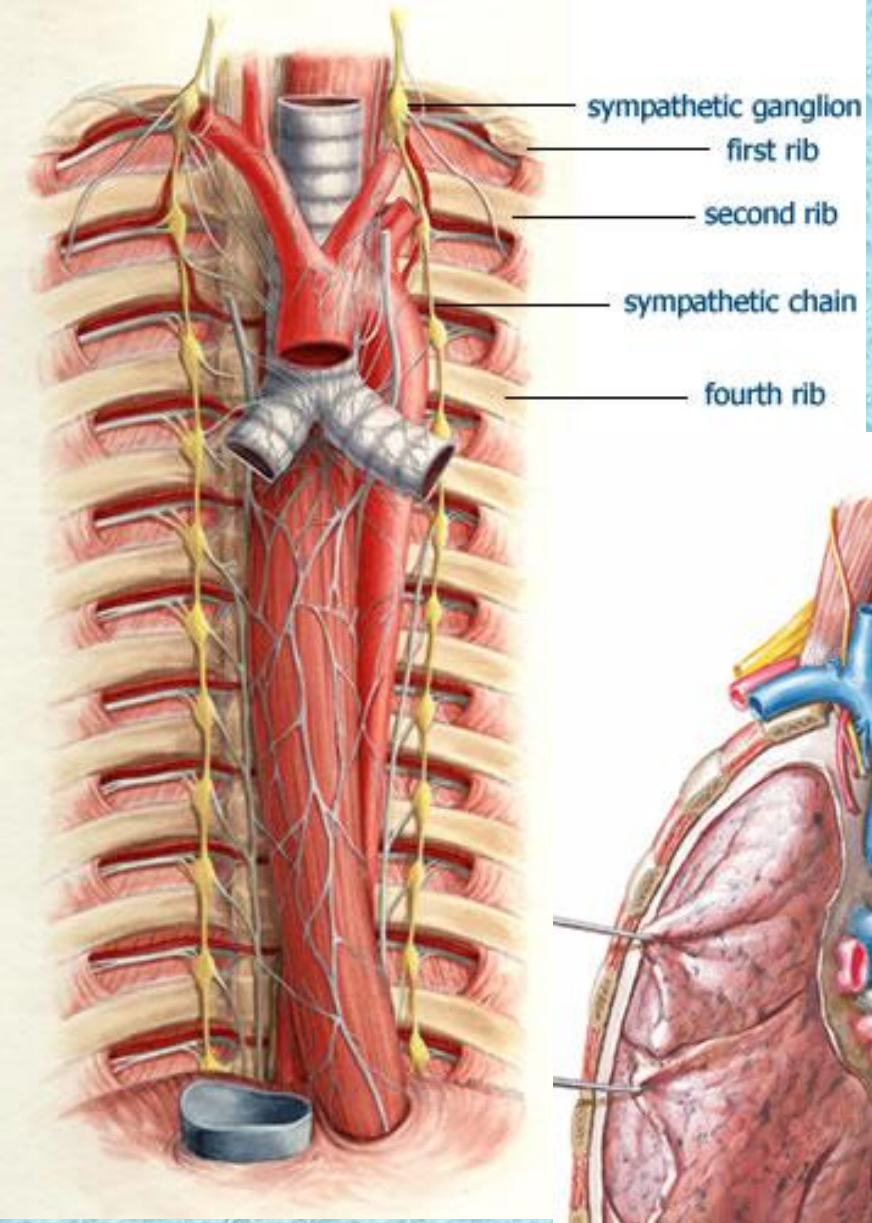
The Middle Mediastinum is the broadest part of the interpleural space.

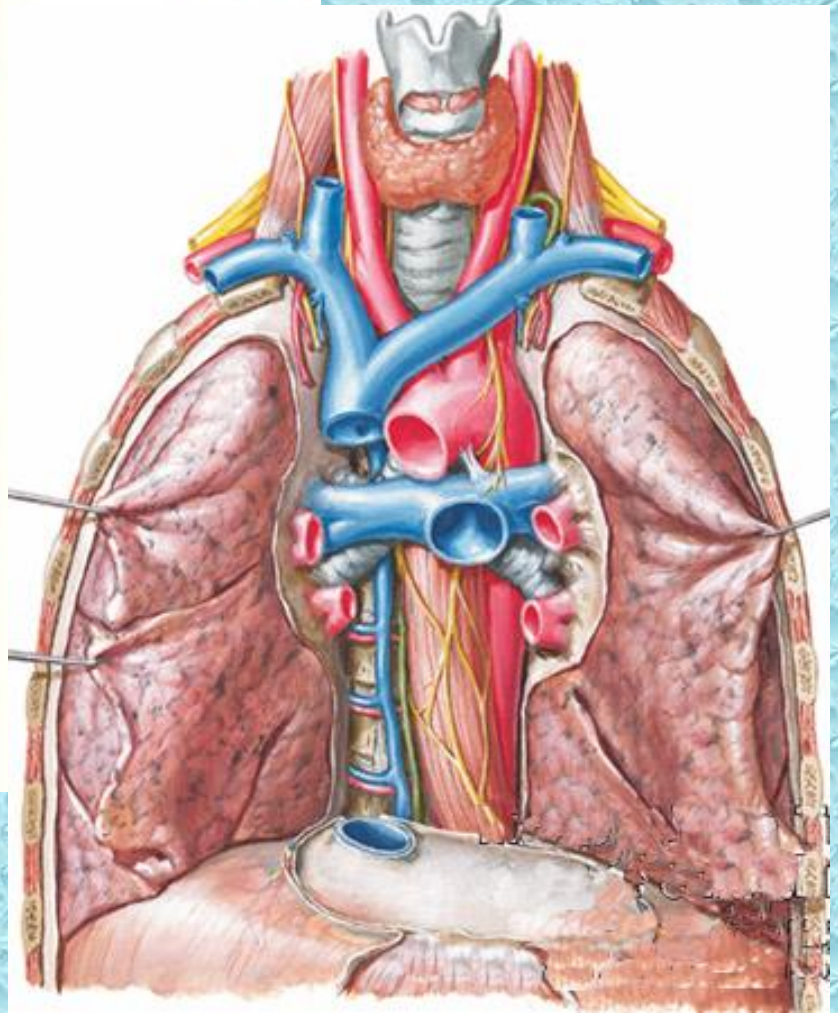
It contains:

- **the *heart* enclosed in the *pericardium*,**
- **the *ascending aorta*,**
- ***the lower half of the superior vena cava* with the azygos vein opening into it,**
- **the *bifurcation of the trachea* and the two bronchi,**
- **the *pulmonary trunk* dividing into its two branches,**
- **the *right and left pulmonary veins*,**
- **the *phrenic nerves*,**
- **some *bronchial lymph nodes*.**


Transversus thoracis
Internal mammary vessels
Sternum
Left phrenic nerve
Pulmonary pleura
Costal pleura
Heart
Aorta
Pulmonary Artery
L. Pulmonary Ay.
R. Pulmonary Ay.
Bronchus
Esophagus
Thorac. Aorta
Body of Thoracic Vert.
Section of Left Lung
Section of Right Lung
Sympathetic trunk
Thoracic duct
Azygos vein
Vagus nerves

Contents of the inferior posterior mediastinum





- *Sympathetic chain*
- *Splanchnic nerves*
- *Vagus nerves*
- *Oesophagus*
- *Descending aorta*
- *Veins azygos, hemiazygos*
- *Thoracic duct*
- *Fat tissue,*
- *Lymph nodes*

END