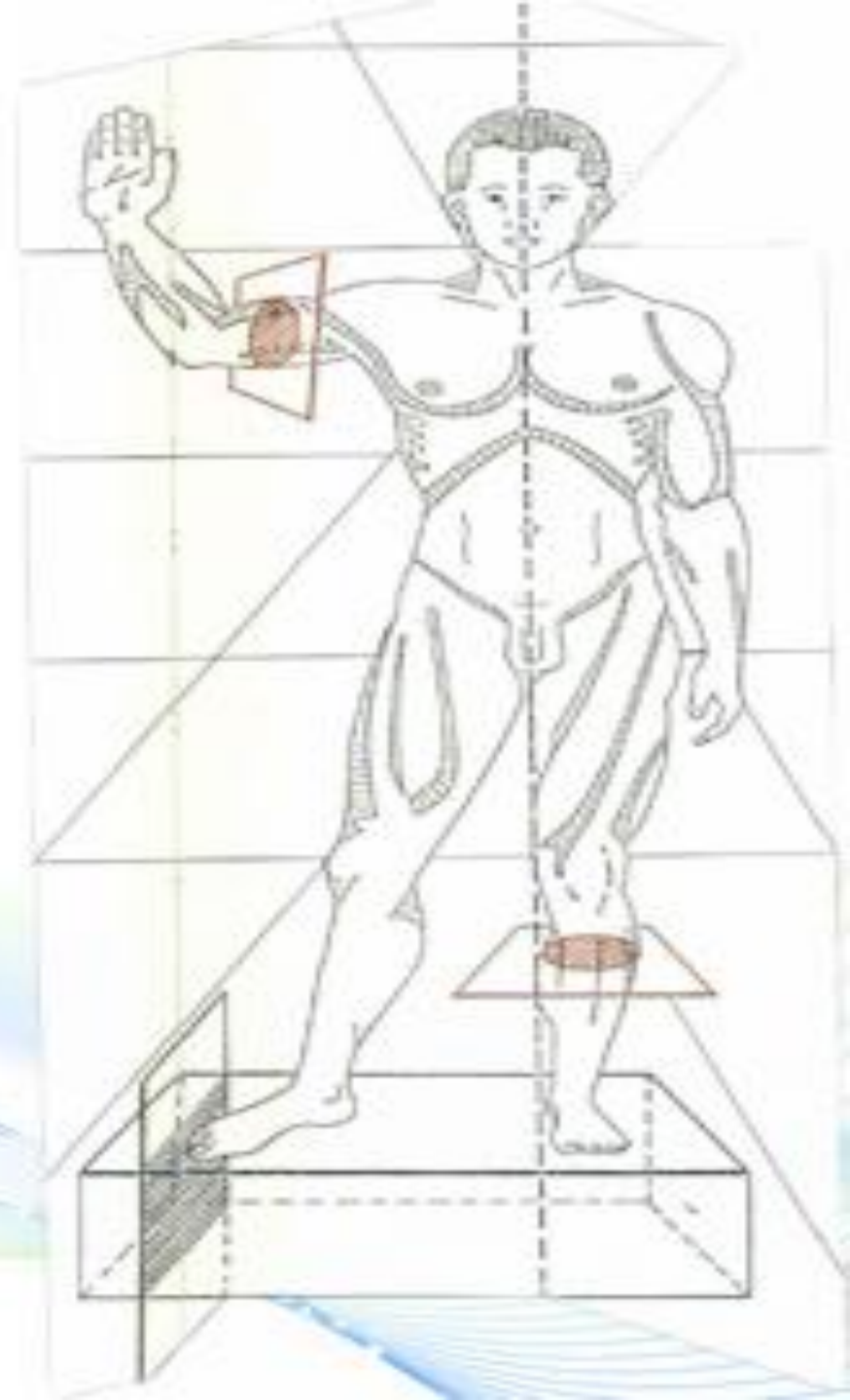


THE TRACHEA AND BRONCHI



Plan

I. INTRODUCTION

II. TRACHEA :

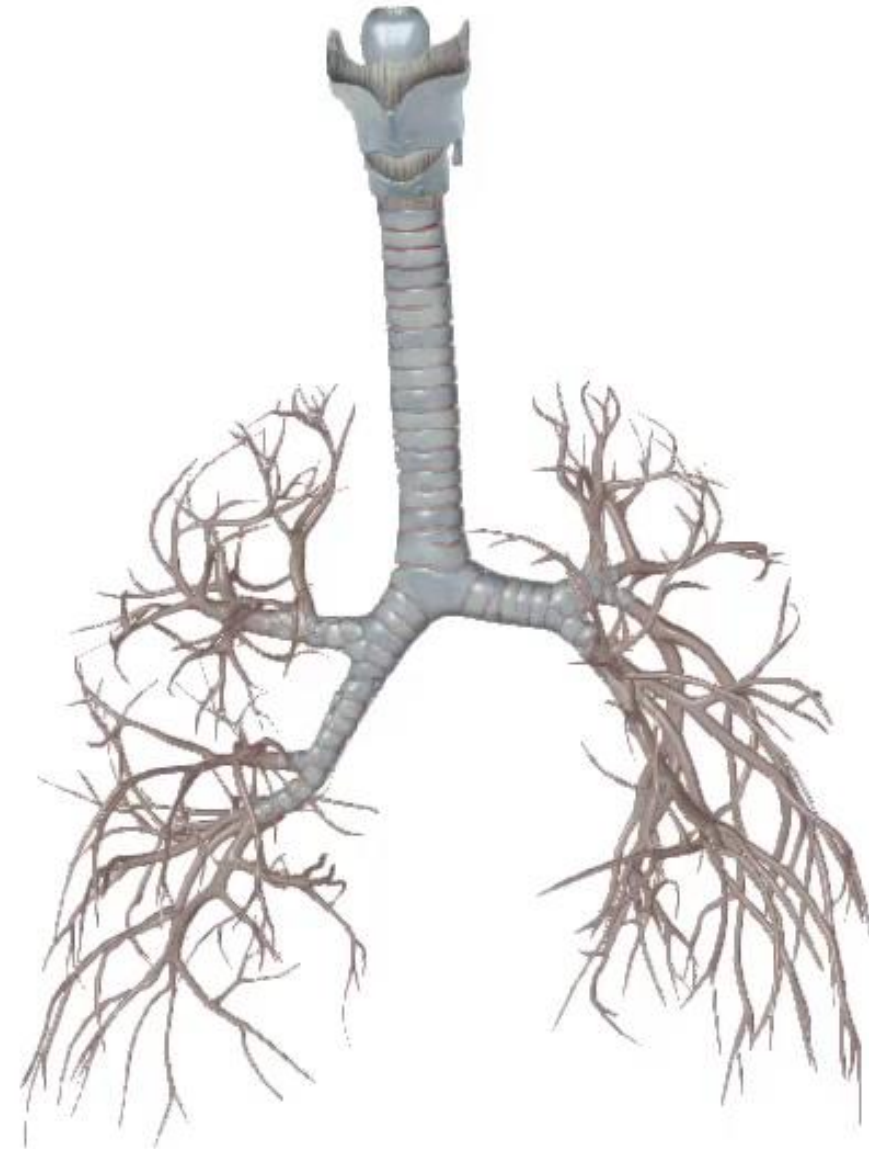
1. Descriptive anatomy
2. Anatomical relations
3. Vascularization - innervation - lymphatic drainage system

III. BRONCHI :

1. Descriptive anatomy
2. Anatomical relations
3. Vascularization - innervation - lymphatic drainage system

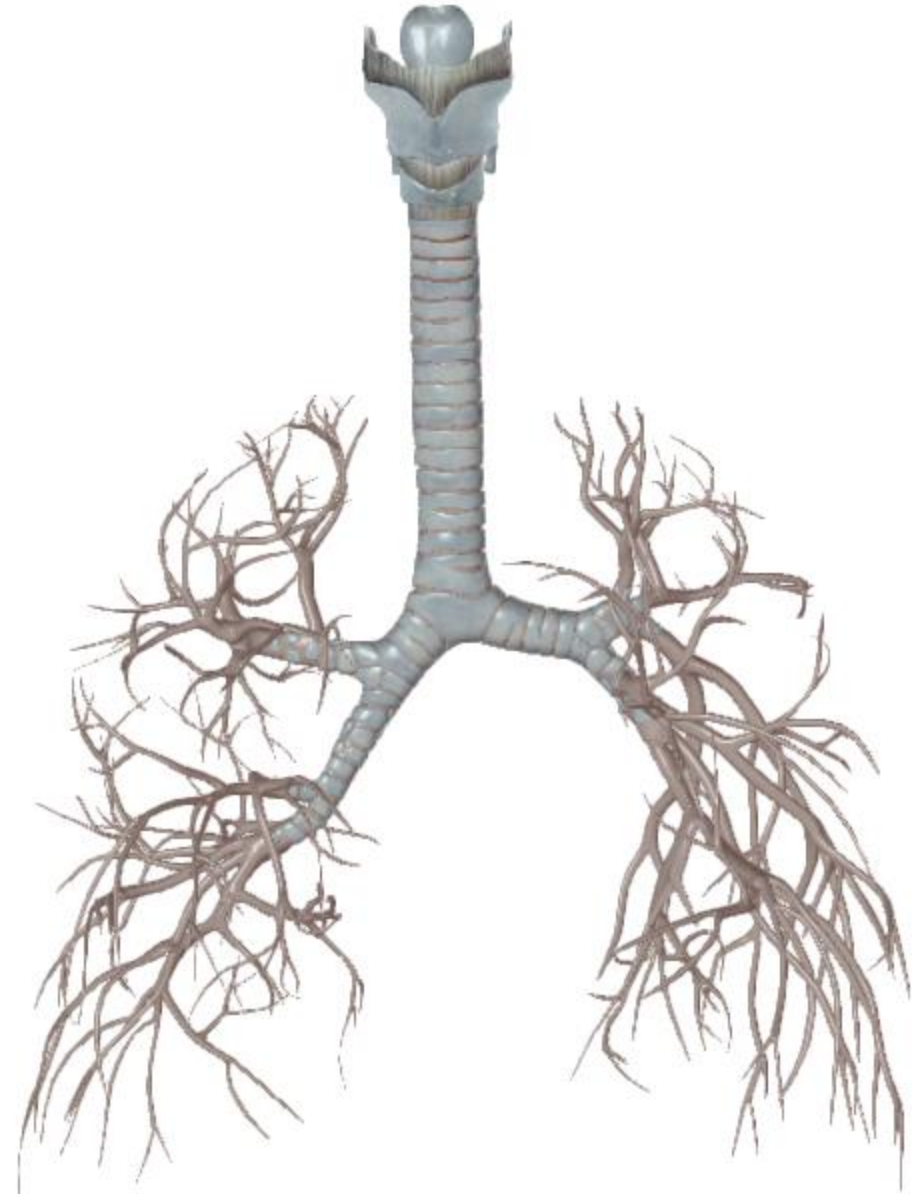
IV. CLINICAL APPLICATIONS

V. CONCLUSION



I. INTRODUCTION :

- The trachea and the bronchi are cartilaginous and membranous airways.
- They are designed to convey the respiratory and phonatory airflow.



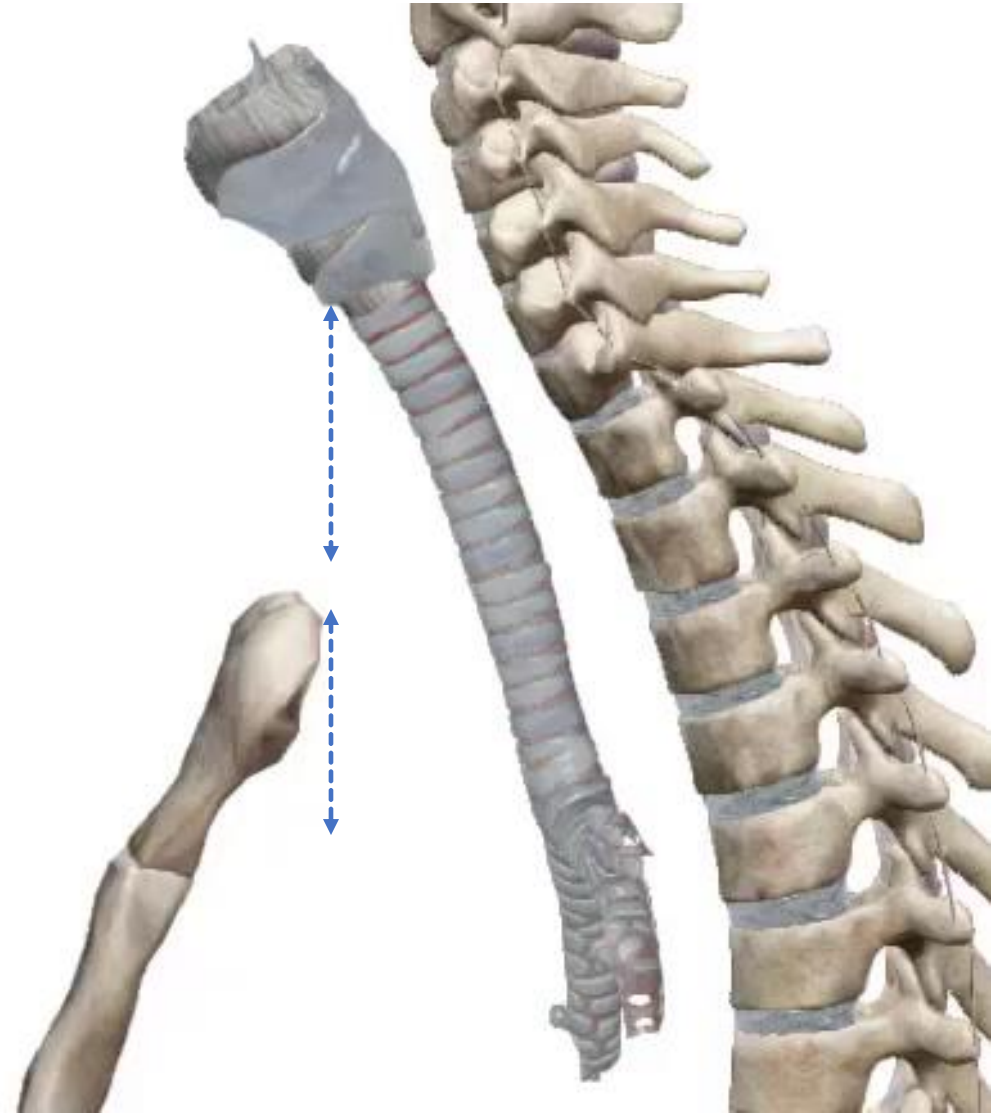
II. TRACHEA :

1. Descriptive anatomy:

Origin - Course - Termination :

The trachea has two segments :

- A cervical segment,
- A thoracic segment.



External configuration:

- The trachea has the shape of a cylindrical tube, flattened on its posterior surface.
 - The anterior part is made up of overlapping, prominent **cartilaginous rings**, separated by **inter-ring depressions**.
 - The posterior part consists of **a flat and flexible membrane**.

Dimensions :

- Length : [12 to 14 cm]
 - Cervical segment :
[6 to 7 cm]
 - Thoracic segment :
[6 to 7 cm]
- Caliber : [12 to 16 mm]



Internal configuration:

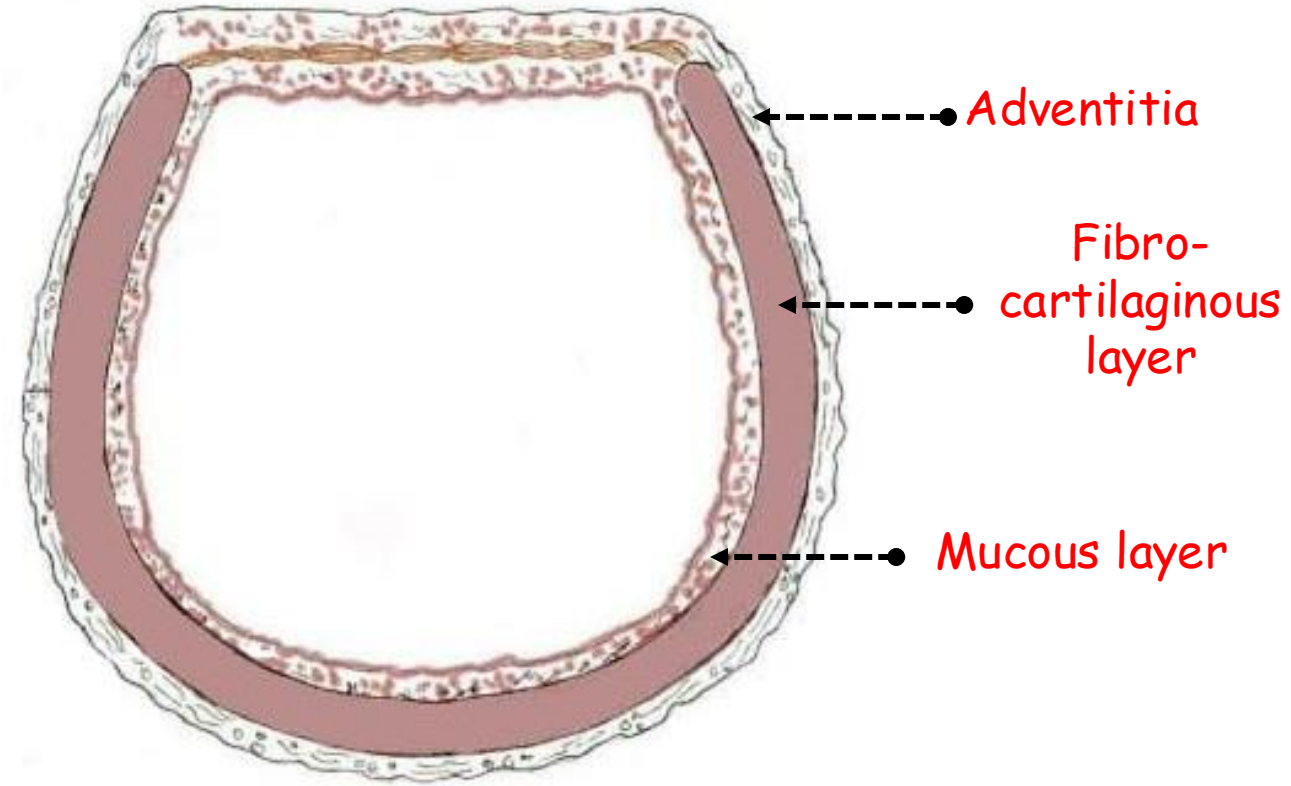
- The tracheal mucosa is white-pink in color.
- It is raised in the front by a series of folds corresponding to the tracheal cartilages.
- At the lower end of the trachea, the two bronchial openings, left and right, are separated by an anteroposterior prominence : the carina, or the tracheal spur.



Structure :

The trachea is made up of two essential layers :

- An external layer :
 - Fibro-musculo-cartilaginous,
 - Covered by an adventitia.
- An internal layer :
 - It is a mucous layer.



TRANSVERSE SECTION OF THE TRACHEA

Means of fixation :

➤ Cervical portion :

It is held in place by its continuity with the larynx and its adhesion to the esophagus and the thyroid gland.

➤ Thoracic portion :

It is held in place by its continuity with the cervical trachea and larynx, and its adhesion to the esophagus and the aortic arch.



2. Anatomical relations:

Cervical trachea:

Anteriorly :

- The thyroid isthmus,
- The superior thyroid arteries,
- The inferior thyroid veins,
- The brachiocephalic trunk,
- The thymus.

Superficially, the trachea is covered by

- The sternothyroid muscles,
- The sternohyoid muscles,
- The pretracheal lamina of the cervical fascia.



Cervical trachea :

Posteriorly :

- The esophagus.

Laterally :

- The thyroid lobes,
- The common carotid arteries,
- The inferior thyroid arteries.



Thoracic trachea :

Anteriorly :

- The aortic arch,
- The brachiocephalic artery,
- The left common carotid artery,
- The tracheobronchial lymph nodes,
- The nerves of the cardiac plexus,
- The left brachiocephalic vein,
- The thymus
- The manubrium sterni.

Posteriorly :

- The esophagus.



Thoracic trachea:

Laterally :

On the right :

- The right lung and pleura,
- The right brachiocephalic vein
- The superior vena cava,
- The right vagus nerve,
- The azygos vein.

On the left :

- The aortic arch,
- The left common carotid artery,
- The left subclavian artery,
- The left recurrent laryngeal nerve.



3. Vascularization - innervation - lymphatic drainage system:

Arterial vascularization:

- The inferior thyroid arteries,
- The internal thoracic arteries,
- The bronchial arteries,
- The middle thyroid artery (when it exists)

Venous vascularization:

- The venules of the trachea drain into:
 - The inferior thyroid veins,
 - The esophageal veins,
 - The azygos vein on the right side and the superior hemiazygos vein on the left side.



Lymphatic drainage system;

- The lymphatic vessels from the mucosal and submucosal networks drain in :
 - The recurrent chain lymph nodes
 - The peritracheobronchial lymph nodes.

Innervation:

- Vagus nerve through the **recurrent laryngeal nerves**.
- Sympathetic nervous system through **the cervical ganglia** and **the first thoracic ganglia**.



III. BRONCHI:

1. Descriptive anatomy :

Definition and origin :

- The bronchi are the two branches that divide from the trachea, one on the right and one on the left.
- They are called the **primary or main bronchi**.
- The tracheal bifurcation occurs at the level of T5.

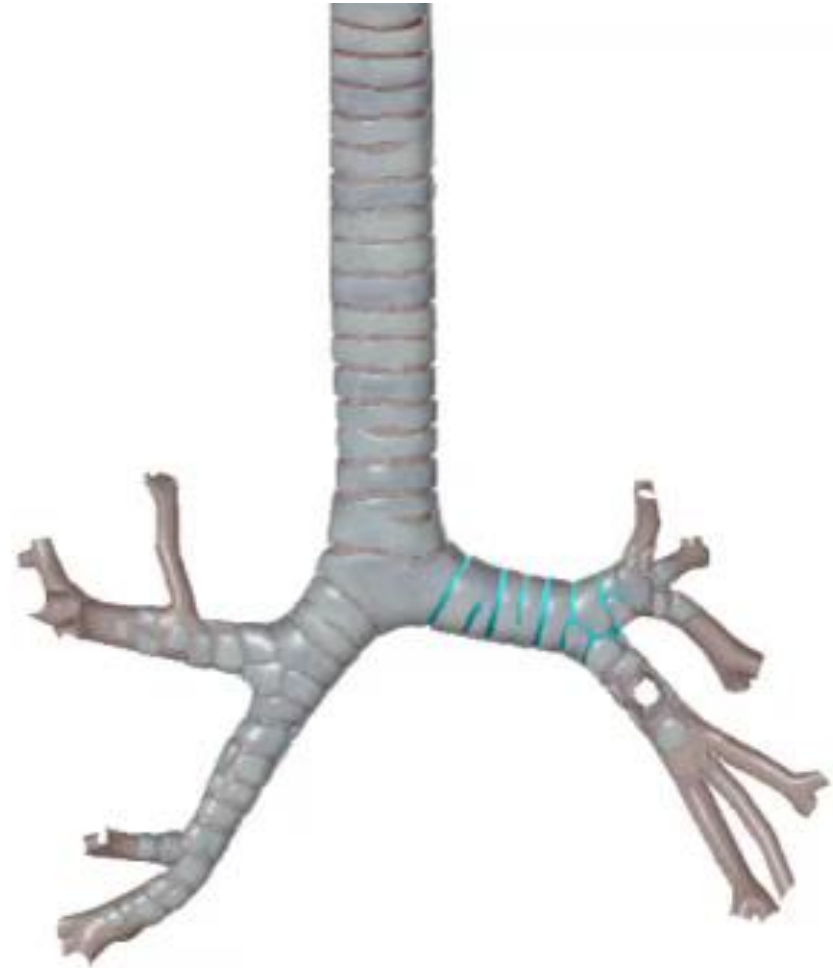
Arrangement and direction :

- The main bronchi have an asymmetrical arrangement in relation to the tracheal bifurcation.
- They form an angle of approximately 70°.



Segments and branches:

- The main bronchi present two segments :
 - An extra-pulmonary segment.
 - An intra-pulmonary segment.



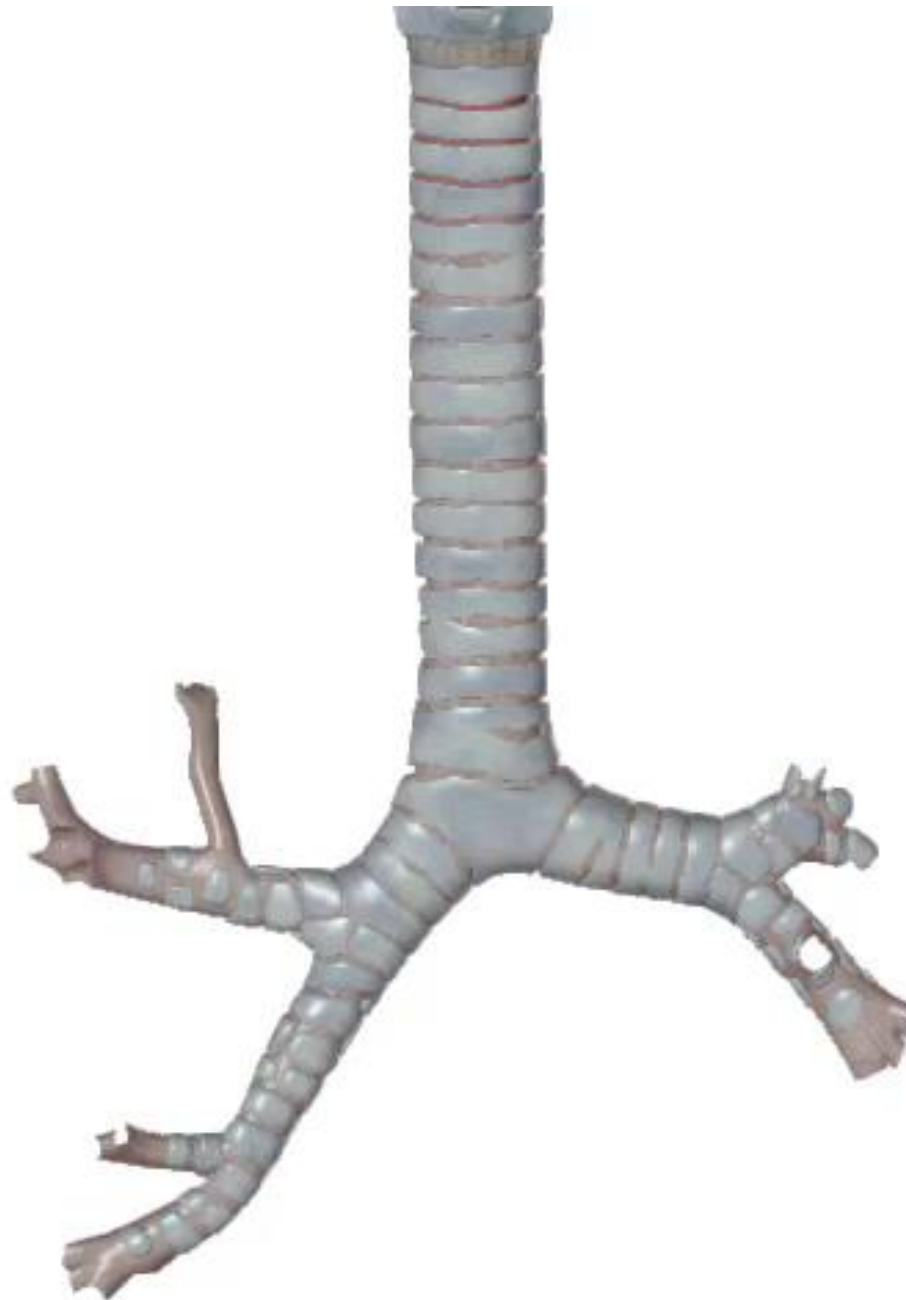
a. Extra-pulmonary segment :

➤ Right main bronchus :

- It extends from the tracheal bifurcation to the superior lobar bronchus.
- It is almost vertical.
 - ✓ Length : 2 to 3 cm.
 - ✓ Diameter : 12 to 14 mm.

➤ Left main bronchus :

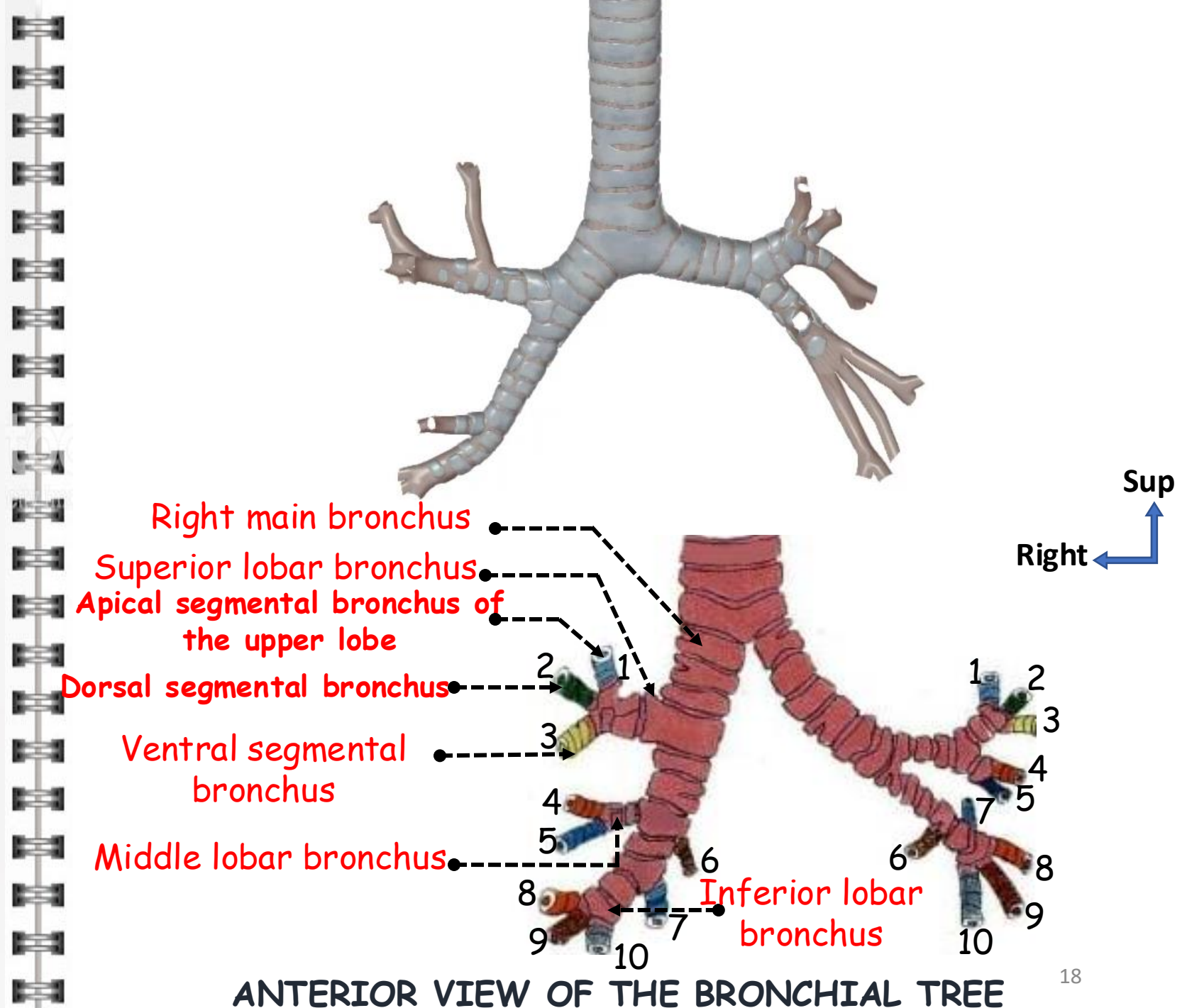
- It extends from the tracheal bifurcation to the superior lobar bronchus and almost horizontal.
 - ✓ Length : 5 to 6 cm.
 - ✓ Diameter : 9 to 11 mm.



b. Intrapulmonary segment and bronchial segmentation :

Right main bronchus :

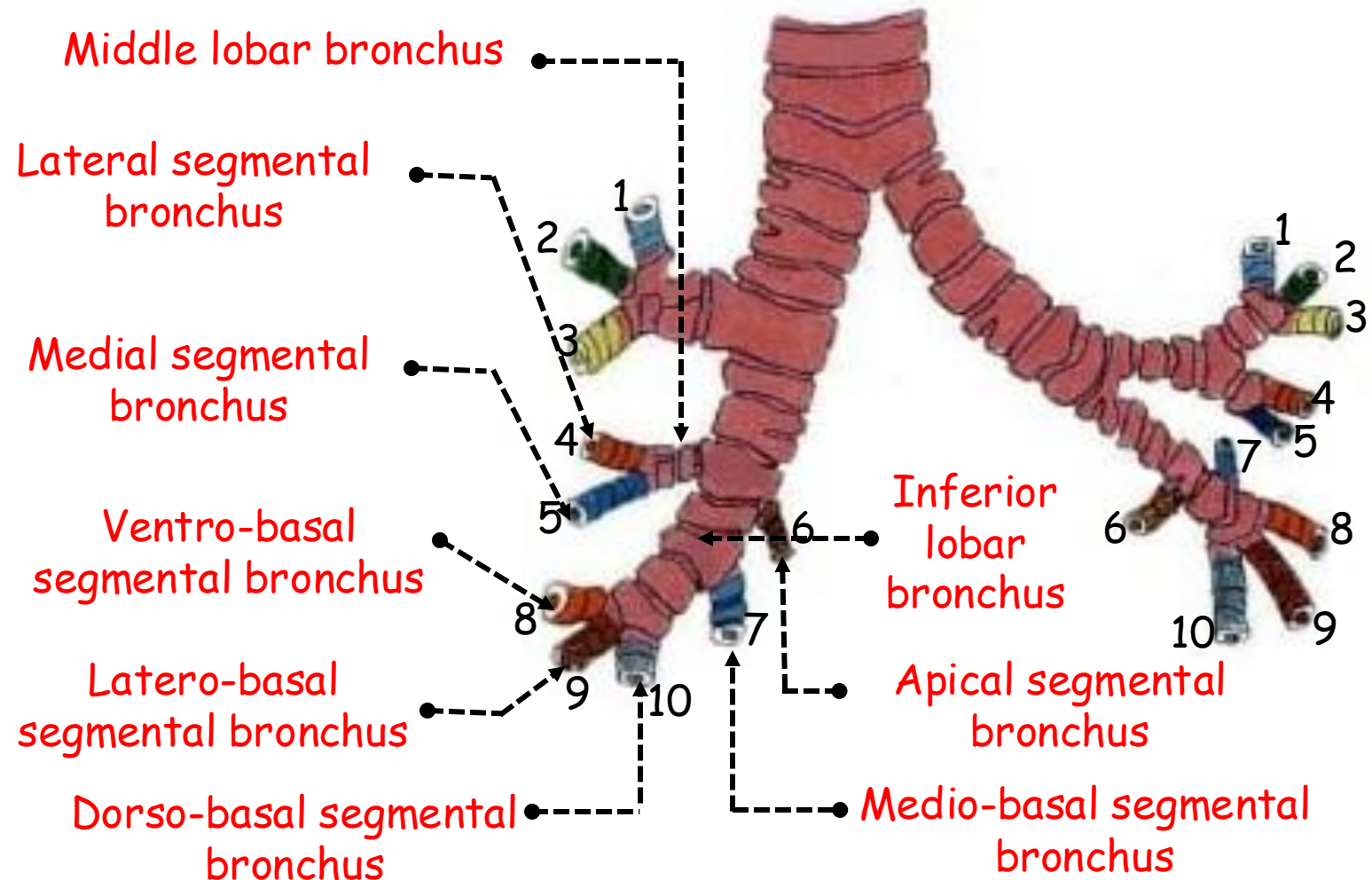
- It gives rise to :
 - ✓ Superior lobar bronchus,
 - ✓ Middle lobar bronchus,
 - ✓ Inferior lobar bronchus.
- The superior lobar bronchus divides into three segmental bronchi for the upper lobe:
 - ✓ Apical segmental bronchus of the upper lobe,
 - ✓ Dorsal segmental bronchus,
 - ✓ Ventral segmental bronchus.



b. Intrapulmonary segment and bronchial segmentation :

Right main bronchus :

- The middle lobar bronchus divides into two segmental bronchi for the middle lobe:
 - ✓ Lateral segmental bronchus.
 - ✓ Medial segmental bronchus.
- The inferior lobar bronchus divides into five segmental bronchi for the lower lobe:
 - ✓ Apical segmental bronchus,
 - ✓ Medio-basal segmental bronchus,
 - ✓ Ventro-basal segmental bronchus,
 - ✓ Latero-basal segmental bronchus,
 - ✓ Dorso-basal segmental bronchus.



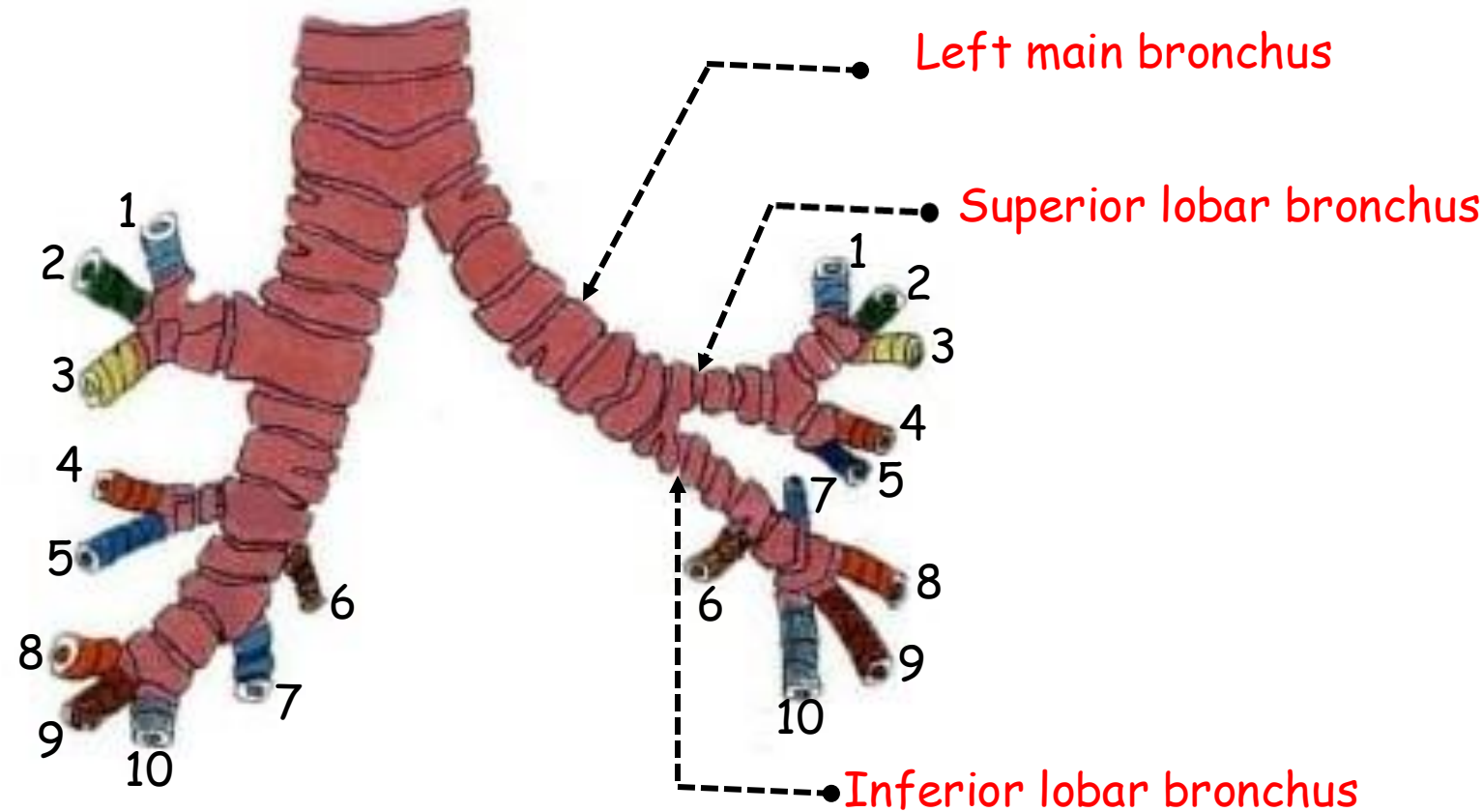
ANTERIOR VIEW OF THE BRONCHIAL TREE

Segments and branching :

b. Intrapulmonary segment and bronchial segmentation :

Left main bronchus :

- It gives rise to :
 - ✓ Superior lobar bronchus,
 - ✓ Inferior lobar bronchus.

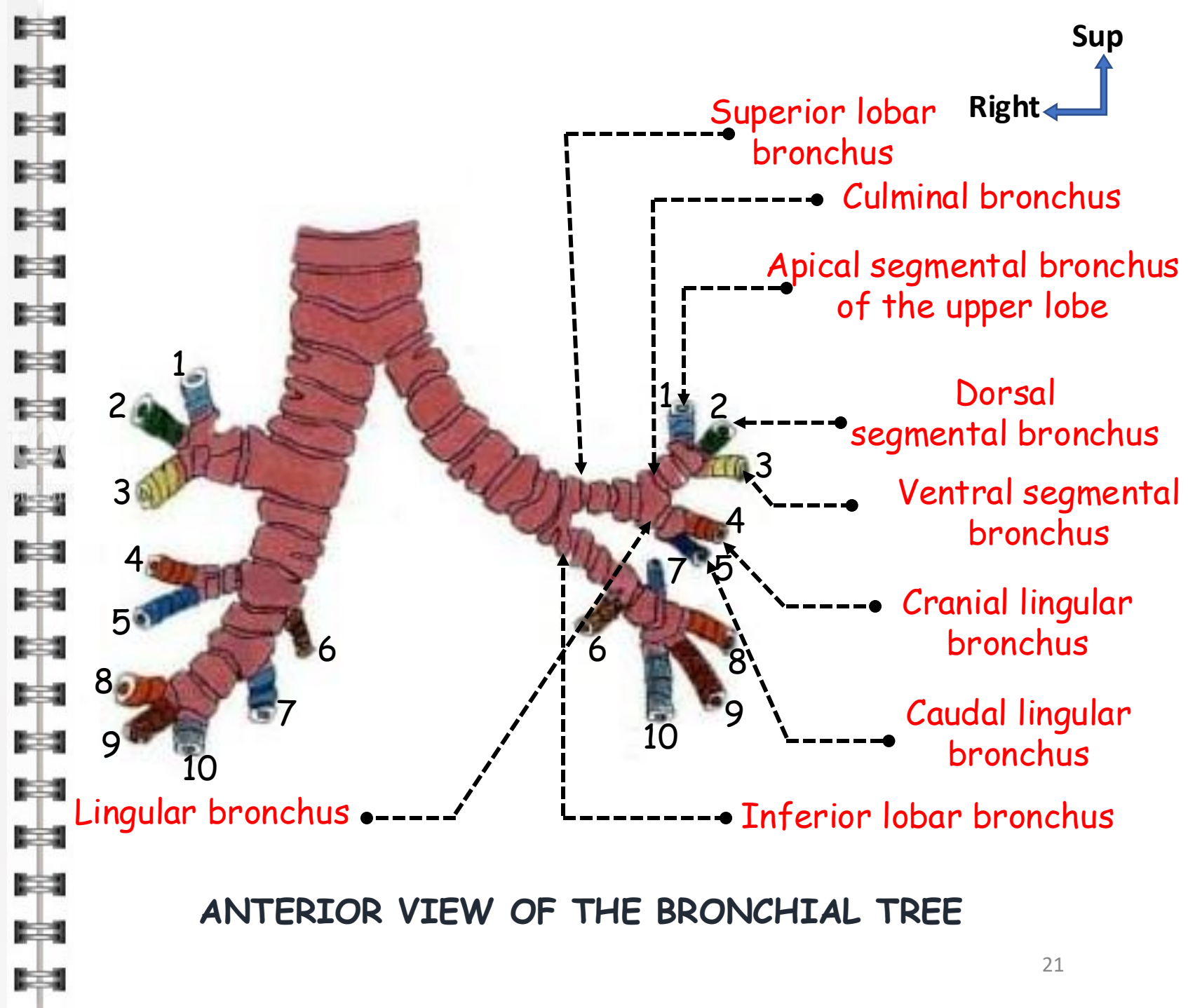


ANTERIOR VIEW OF THE BRONCHIAL TREE

b. Intrapulmonary segment and bronchial segmentation :

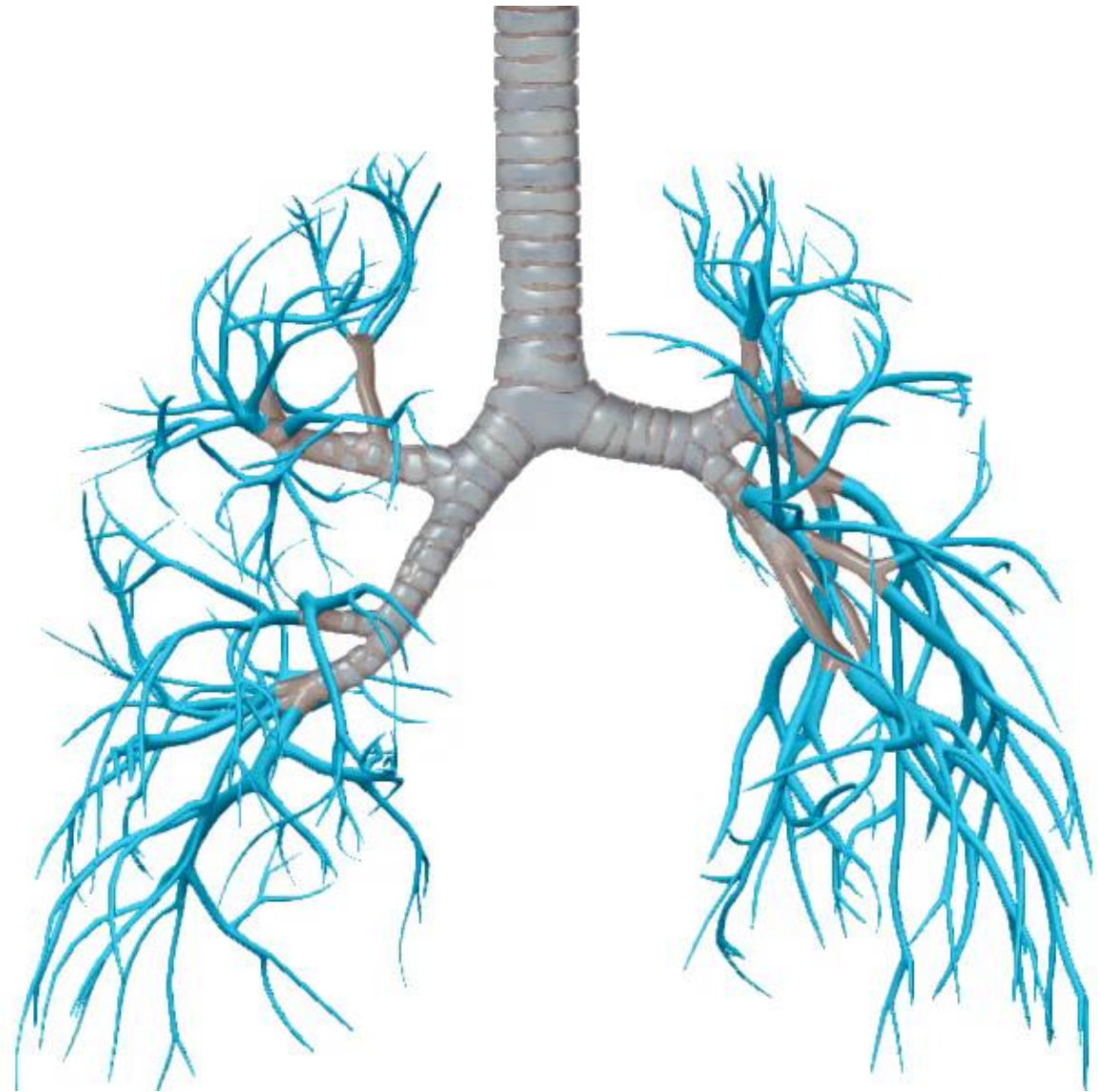
Left lobar bronchus :

- The superior left lobar bronchus first divides into :
 - ❖ The culminal (superior) bronchus:
 - ✓ Apical segmental bronchus of the upper lobe
 - ✓ Dorsal segmental bronchus,
 - ✓ Ventral segmental bronchus.
 - ❖ The lingular (inferior) bronchus:
 - ✓ Cranial lingular segmental bronchus.
 - ✓ Caudal lingular segmental bronchus.
- The inferior left lobar bronchus.



c. Subsegmental bronchi :

- They divide into subsegmental bronchi, about approximately ten times eventually leading to the terminal bronchioles, which end in the alveolar ducts (or sacs).

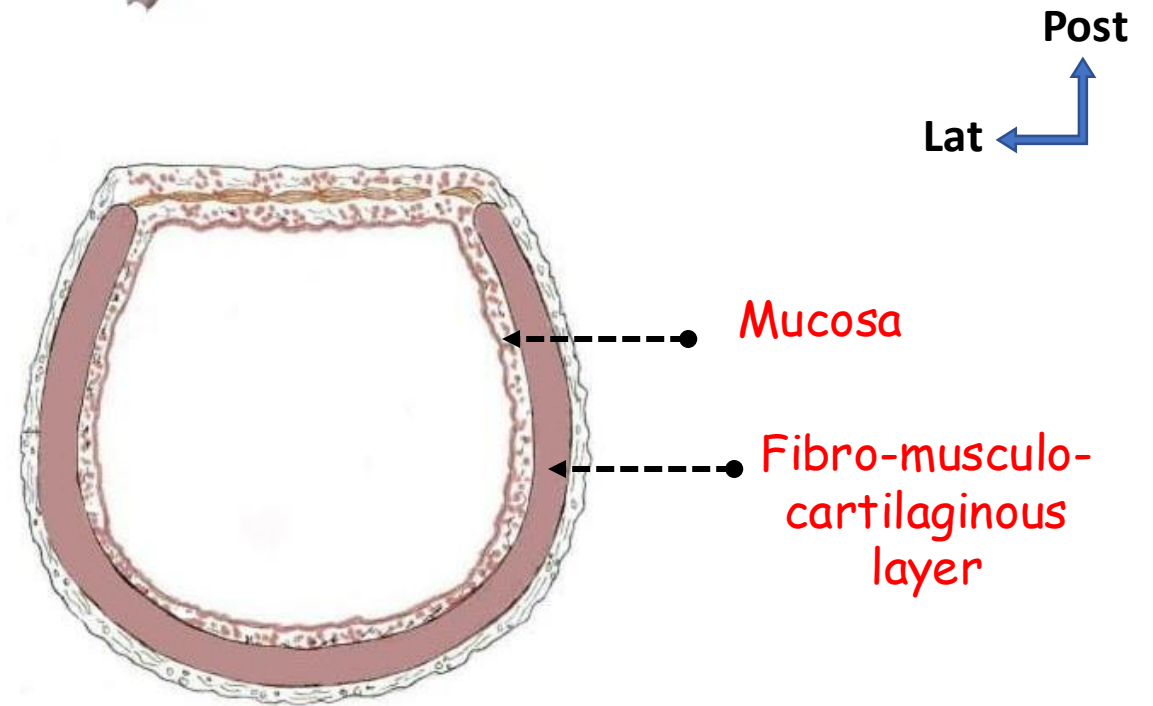
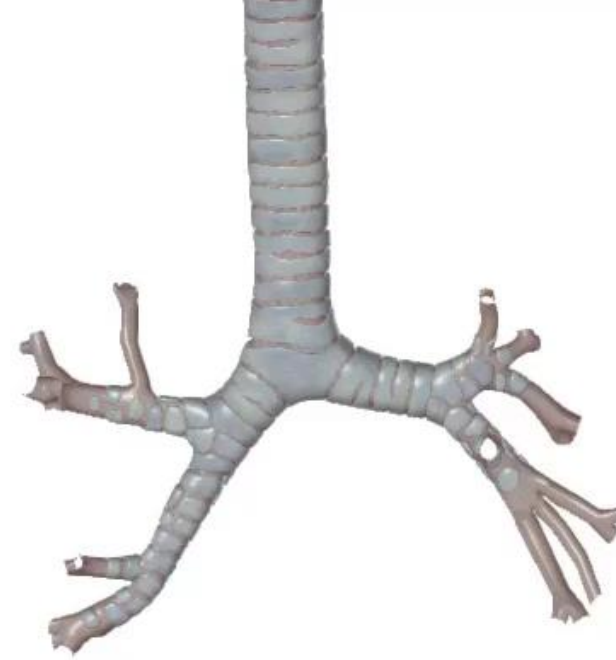


External configuration :

- The extra-pulmonary bronchi have an external configuration similar to the trachea.
- Inside the lung, they become circular in cross-section with the cartilaginous rings being replaced by cartilaginous plates, which eventually disappear in bronchi of 1 mm in diameter.

Structure :

- They are also composed of two layers, similar to the trachea :
 - A internal layer : mucosa,
 - An external layer : fibro-musculo-cartilaginous.

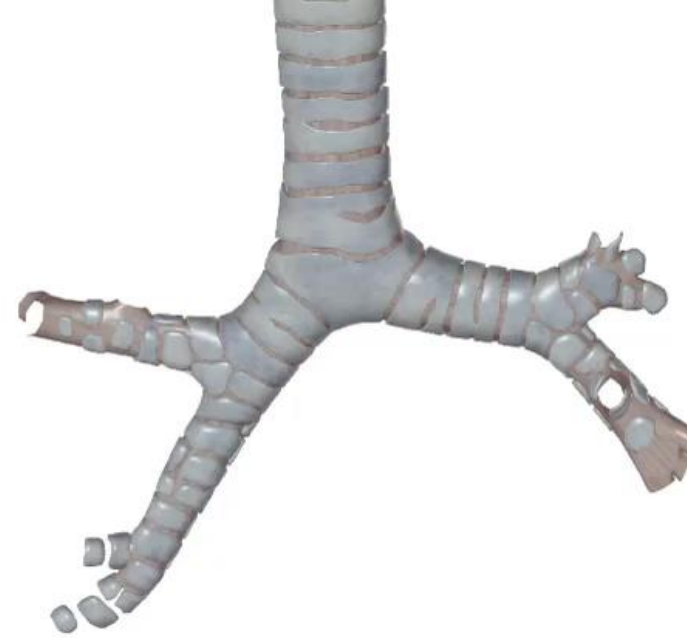


TRANSVERSE SECTION OF THE TRACHEA

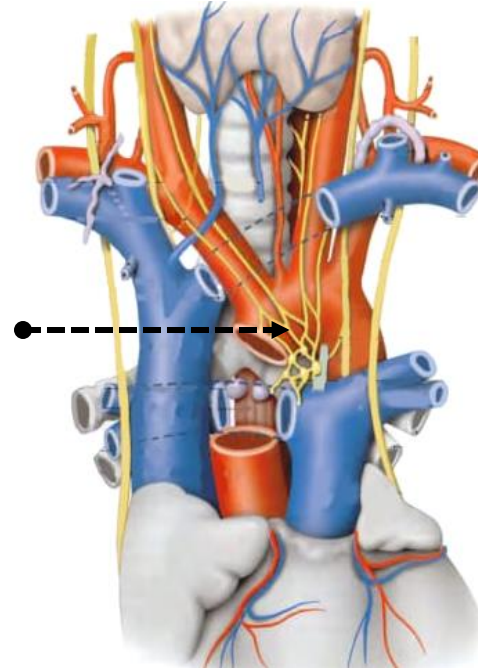
2. Anatomical relations:

Anatomical relations of the tracheal bifurcation :

- Inferiorly :
 - ✓ The bifurcation of the pulmonary artery,
 - ✓ The inter-tracheo-bronchial lymph nodes,
 - ✓ The left atrium.
- Anteriorly :
 - ✓ The aortic arch,
 - ✓ The right branch of the pulmonary artery,
 - ✓ The superior vena cava,
 - ✓ The Wrisberg cardiac ganglia,
 - ✓ The thymus.
- Posteriorly :
 - ✓ The esophagus,
 - ✓ The thoracic duct.



The cardiac ganglia



Sup
Right

Anatomical relations of the tracheal bifurcation :

- Superiorly :
 - ✓ The arch of the azygos vein.
 - ✓ The aortic arch.
- To the right :
 - ✓ The right vagus nerve.
 - ✓ The right lateral trachea-bronchial lymph nodes.
- To the left :
 - ✓ The left vagus nerve.



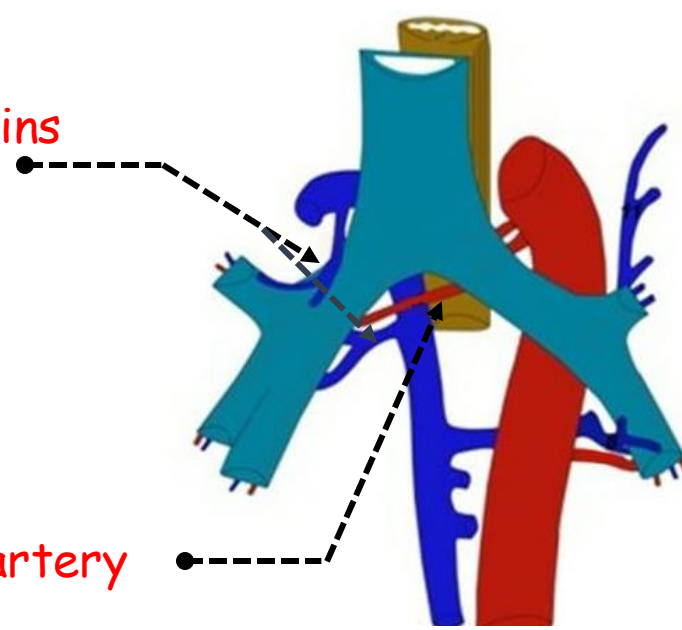
Anatomical relations of the main bronchi with elements of the nourishing pulmonary pedicle :

- On the right :

- ✓ The right bronchial artery,
- ✓ The bronchial veins,
- ✓ Lymphatics :
 - The interlobar peri-bronchial lymph nodes,
 - The inter-tracheo-bronchial lymph nodes.
 - The paratracheal lymph nodes.
- ✓ The bronchial nerves:
 - Sympathetic nerves,
 - The vagus nerve.

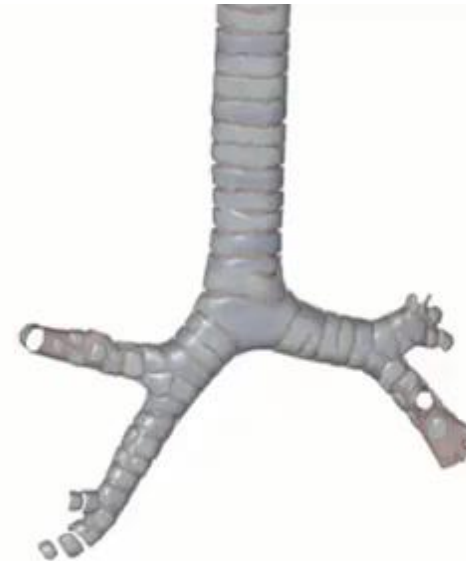
Right bronchial veins

Right bronchial artery



Sup
Right

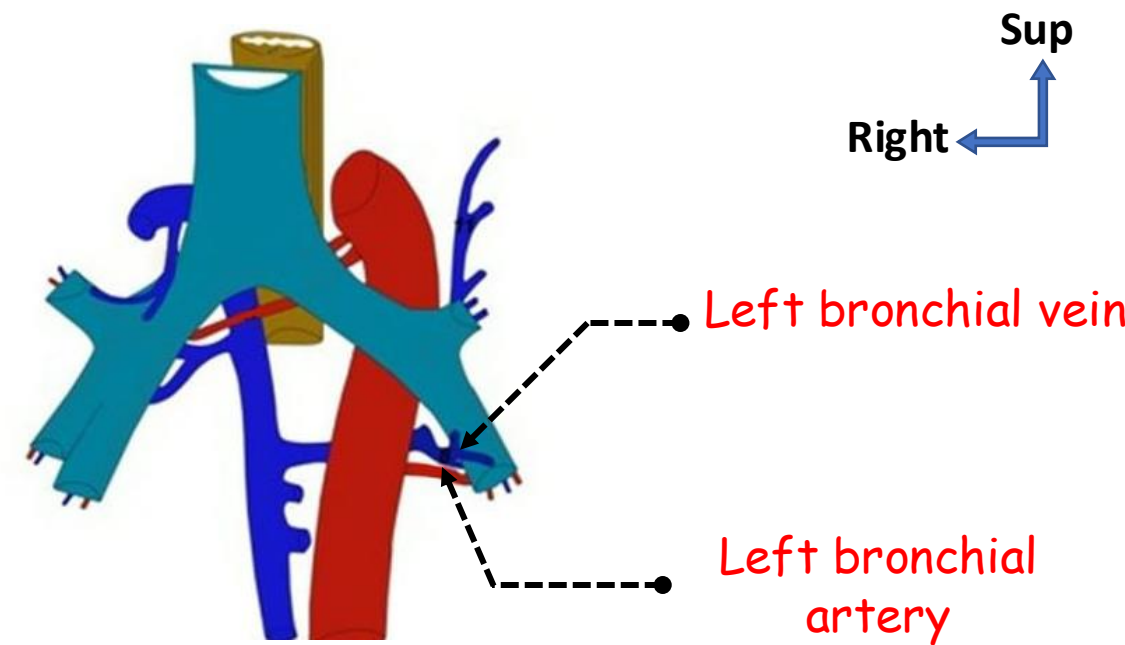
BRONCHIAL ARTERIES AND VEINS



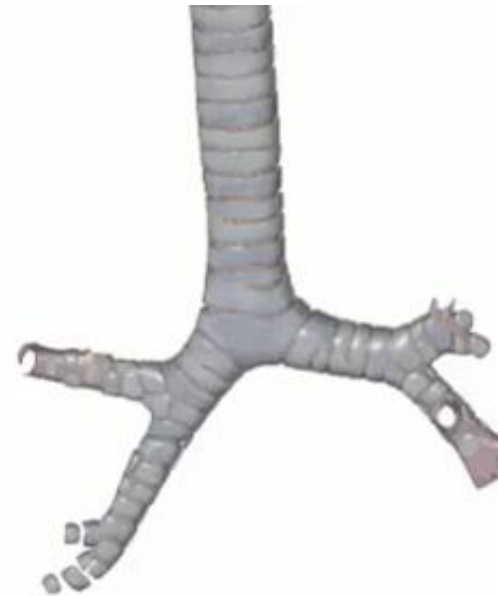
Anatomical relations of the main bronchi with nourishing elements of the pulmonary pedicle :

- On the left :

- ✓ The left bronchial arteries,
- ✓ The left bronchial veins,
- ✓ Lymphatics :
 - The interlobar peri-bronchial lymph nodes,
 - The left inter-tracheal bronchial and the paratracheal lymph nodes.
 - The prevascular lymph nodes.
- ✓ The bronchial nerves :
 - Sympathetic nerves,
 - Vagus nerves.

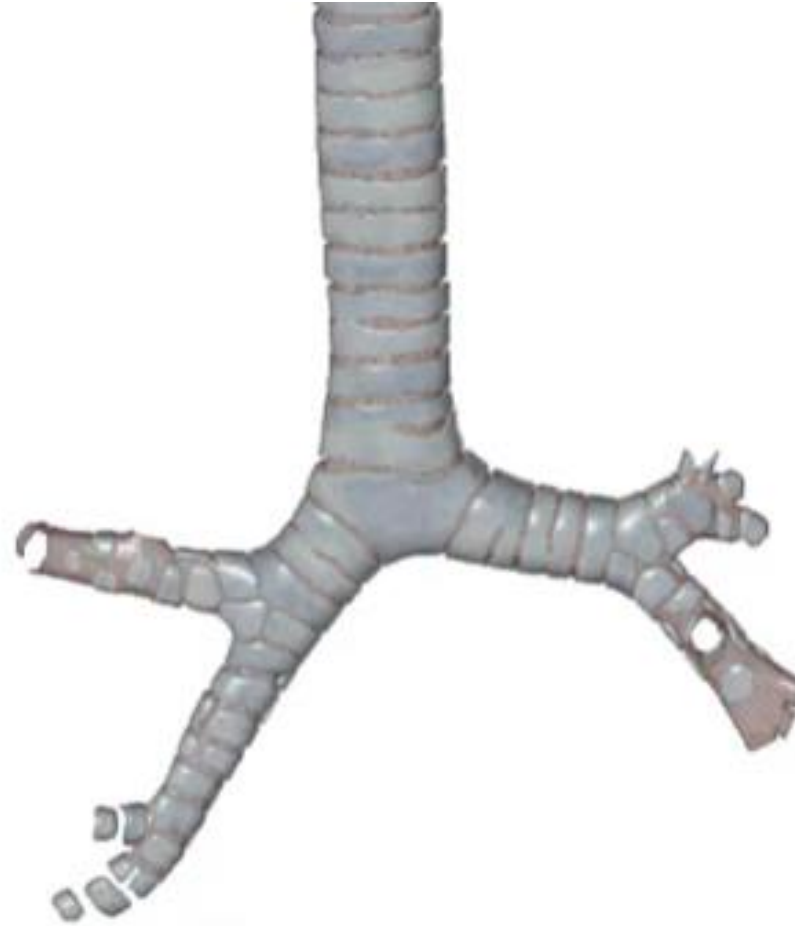


BRONCHIAL ARTERIES AND VEINS



Anatomical relations of the main bronchi with the functional pedicle elements :

- On the right :
 - ✓ The right pulmonary artery,
 - ✓ The right pulmonary veins
- On the left :
 - ✓ The left pulmonary artery,
 - ✓ The left pulmonary veins.



3. Vascularization - innervation - lymphatic drainage system :

Arterial vascularization:

- The right and left bronchial arteries.

Venous vascularization:

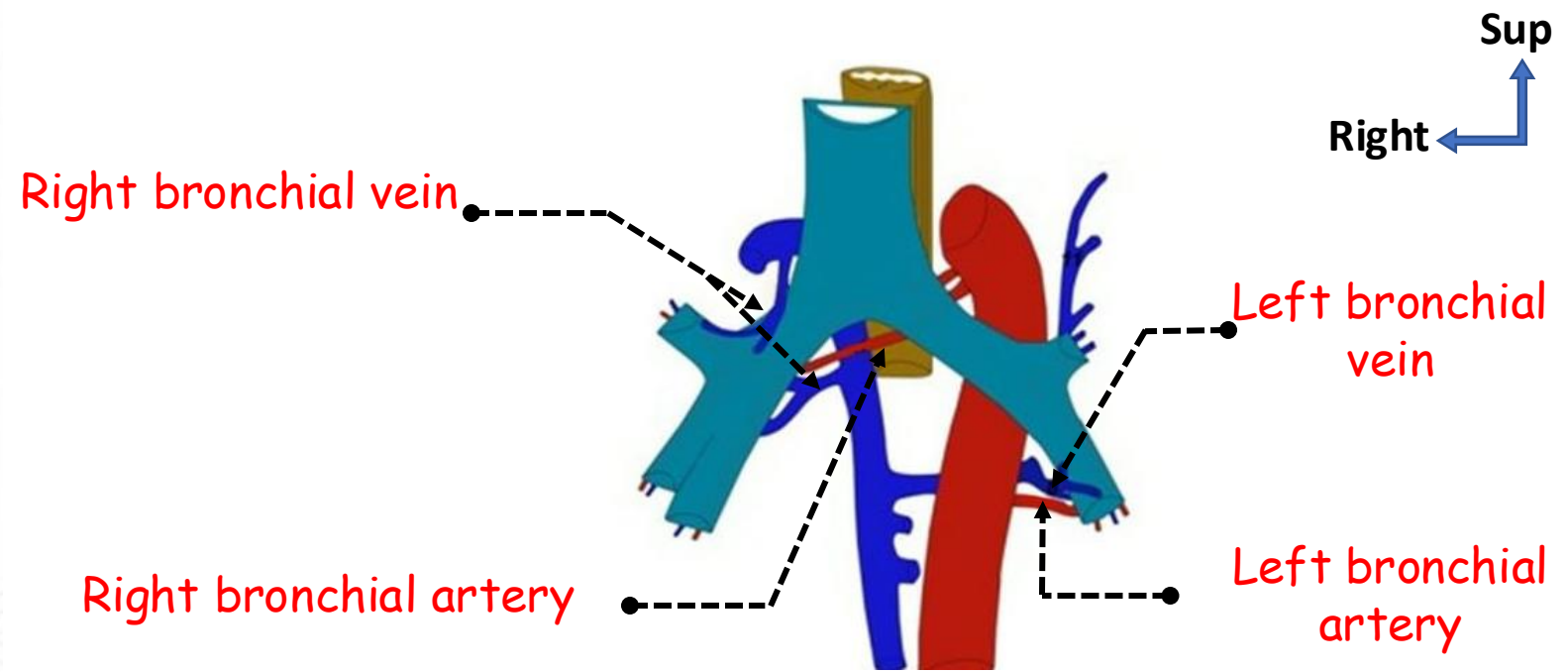
- The left and right bronchial veins.

Lymphatic drainage system :

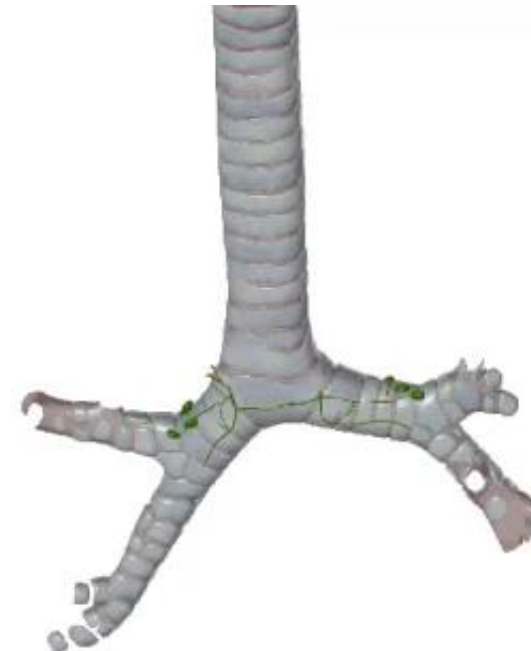
- The collecting trunk of the peri-lobular network are adjacent to the vessels and the bronchi, draining into the hilar lymph nodes located at the bronchial lobar bifurcations.

Innervation:

- The nerves of the bronchi are formed by :
 - Branches from the vagus nerve (pneumogastric nerve),
 - Branches from the sympathetic nervous system, particularly branches from the cardiac plexus.



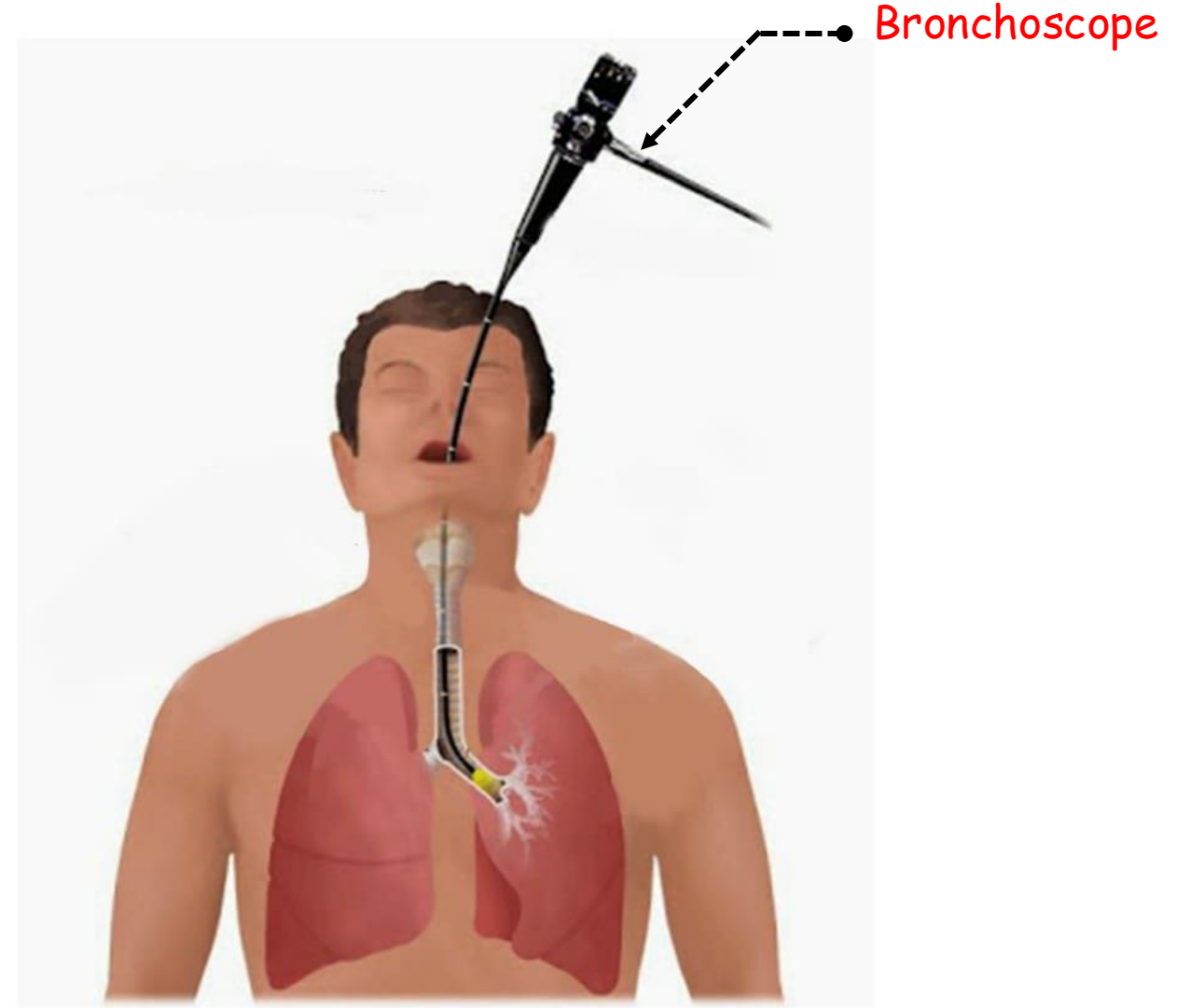
BRONCHIAL ARTERIES AND VEINS



IV. CLINICAL APPLICATIONS:

➤ Bronchial fibroscopy:

The search for a bronchial pathology obstructing the bronchi, such as cancer, involves examining of the tracheo-bronchial mucosa through via fibroscopy.



➤ Tracheotomy :

- It is an emergency surgical procedure.
- It is performed at the following anatomical sites :
 - ✓ Lower tracheotomy,
 - ✓ Upper tracheotomy,
 - ✓ Crico-thyroidotomy or coniotomy.



V. CONCLUSION :

- The trachea and bronchi are part of the lower respiratory tract.
- They allow the passage of oxygen-rich air from the larynx to the lungs.
- Knowledge of their anatomy is essential, as it allows for an appropriate diagnostic and therapeutic approach.

