University of Constantine 3, Faculty of Medicine, Department of General Anatomy
Course for Second-Year Medical Students

Trachea and Bronchial Segmentation

❖ Trachea

1. Introduction :

The trachea is a fibromusculocartilaginous air-conducting tube that forms part of the lower respiratory tract. Located in the midline and anteriorly, it is cervicothoracic, continues from the larynx, and terminates in the mediastinum by bifurcating into two main bronchi. Conducting the respiratory airflow, the trachea also has a drainage function through its mucociliary apparatus, which allows inhaled particles to be eliminated toward the pharynx. It also contains parietal lymphoid aggregates, which provide an immune function.

2. Descriptive Anatomy

2.1. Origin: In the neck, the trachea continues from the larynx at the inferior border of the cricoid cartilage, opposite the sixth cervical vertebra (C6).

2.2. Course: It consists of two segments: a cervical segment and a thoracic segment. It is almost vertical and descends slightly posteriorly and to the right.

2.3. Termination: It terminates by bifurcating into the right and left main bronchi at the level of T4–T5, forming an angle of 70°. The two main bronchi are connected by the interbronchial ligament.

2.4. Shape and structure: cylindrical and flattened posteriorly, it consists of 15 to 20 horseshoe-shaped cartilage rings connected to each other by annular ligaments.

Its posterior wall is flattened and musculofascial.

2.5. Dimensions:

- Length: 12 cm; its structure allows it to elongate during inspiration.
- Diameter: 16 mm. Two impressions are visible on its left side: the thyroid impression superiorly and the aortic impression inferiorly. One impression is present on its right side: the brachiocephalic artery impression.

2.6. Internal Configuration :

It can be examined by bronchoscopy. The tracheal mucosa is pink and marked by circular ridges corresponding to the cartilage rings.

The trachea terminates in two openings separated by a median sagittal ridge: the tracheal carina.

3. Relations :

3.1. Cervical portion:

The cervical trachea is contained within a visceral sheath that encloses the trachea, the esophagus, and part of the thyroid compartment.

*Anterior relations: located in the median infrahyoid region, the cervical trachea is related, from superficial to deep, to:

- The skin and subcutaneous tissue containing the platysma muscle.
- The superficial layer of the cervical fascia enclosing the sternocleidomastoid muscles.
- The pretracheal layer of the cervical fascia enclosing the sternohyoid and sternothyroid muscles.

Note: The medial borders of these muscles delimit a pretracheal rhombus, known as the tracheostomy rhombus.

- The isthmus of the thyroid gland.

*Posterior relations: the trachea is related to the esophagus and the left recurrent laryngeal nerve (in the left tracheoesophageal groove).

*Lateral relations: It is related to:

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

3.2. Thoracic portion

*Anteriorly: in contact with:
- The aortic arch.
- The brachiocephalic artery
- The left common carotid artery
- The left brachiocephalic vein

*Posteriorly: the thoracic esophagus, to which it is connected by a fibrous tract.

*On the right: it is related to:
- The right lung and right pleura.
- The azygos arch, and arterial and venous branches.
- The right vagus nerve.

*On the left: it is related to:
- The left lung and left pleura.
- The aortic arch, and arterial and venous branches.
- The left recurrent laryngeal nerve.

4. Blood Supply

- Arteries: supplied by the inferior thyroid artery, internal thoracic artery, bronchial arteries, and middle thyroid artery.
- Veins: they drain into the esophageal veins and the inferior thyroid vein.
- Lymphatics: they drain into the peritracheobronchial lymph nodes.

5. Innervation: It is supplied by the right and left recurrent laryngeal nerves (branches of the vagus nerve) and by the sympathetic nervous system.

❖ Bronchial Segmentation

1. Definition : These are the two branches resulting from the division of the trachea. They are also called the main bronchi or mainstem bronchi. They are semi-rigid air-conducting tubes. The division of the bronchi forms the bronchial tree, which ultimately allows ventilation of each pulmonary alveolus.

2. Descriptive Anatomy

2.1. Origin: They arise from the tracheal bifurcation, which is located opposite the sternal angle anteriorly, at the level of T5 posteriorly, and 1 cm to the right of the midline.

2.2. Course and termination: Each main bronchus has an extrapulmonary segment and an intrapulmonary segment.

- Right main bronchus: It continues almost vertically in the direction of the trachea. It is short (2–3 cm long) and almost straight. It successively gives rise to the superior lobar bronchus and then the middle lobar bronchus, and terminates as the inferior lobar bronchus.

Note: Its orientation explains the higher frequency of foreign body passage into the right bronchial tree.

- Left main bronchus: It is more horizontal and longer (5–6 cm long) than the right main bronchus. It is more anterior and has a sinuous course. It gives rise to the superior lobar bronchus and terminates as the inferior lobar bronchus.

2.3. External configuration

Extrapulmonary bronchi: Their configuration is similar to that of the trachea: cylindrical and flattened posteriorly.

Intrapulmonary bronchi: They become circular in cross-section, with cartilaginous plates replacing the cartilaginous rings.

3. Bronchial Segmentation :

3.1. Lobar bronchus:

*The right main bronchus gives rise to three branches corresponding to the three lobes of the right lung:
- The right superior lobar bronchus.
- The right middle lobar bronchus.
- The right inferior lobar bronchus.

*The left main bronchus gives rise to two branches corresponding to the two lobes of the left lung:
- The left superior lobar bronchus.
- The left inferior lobar bronchus.

3.2. Right-sided segmental bronchi

- The superior lobar bronchus divides into three segmental bronchi: apical, dorsal, and anterior.
- The middle lobar bronchus divides into two segmental bronchi: lateral and medial.
- The inferior lobar bronchus divides into five segmental bronchi: superior apical (Nelson), basomedial (paracardiac), anterobasal, laterobasal, and posterobasal.

Lobaire supérieure	Lobaire moyenne	Lobaire inférieure
1. Apical 2. Dorsal 3. Anterior	4. Medial 5. Lateral	6. Superior apical (Nelson) 7. Basomedial (paracardiac) 8. Anterobasal 9. Laterobasal 10. Posterobasal

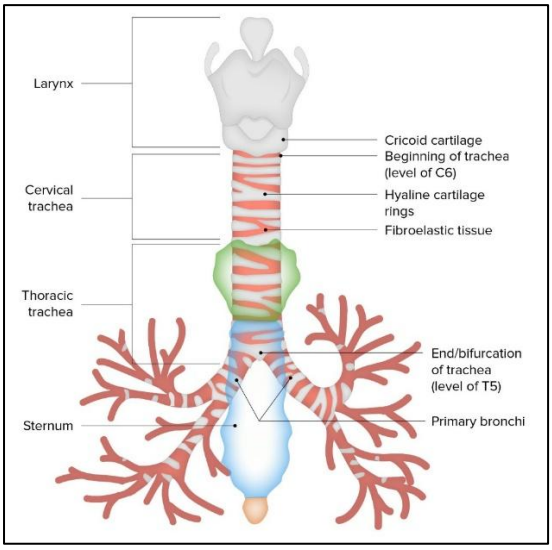
3.3. Left-sided segmental bronchi :

The superior lobar bronchus divides into two trunks:

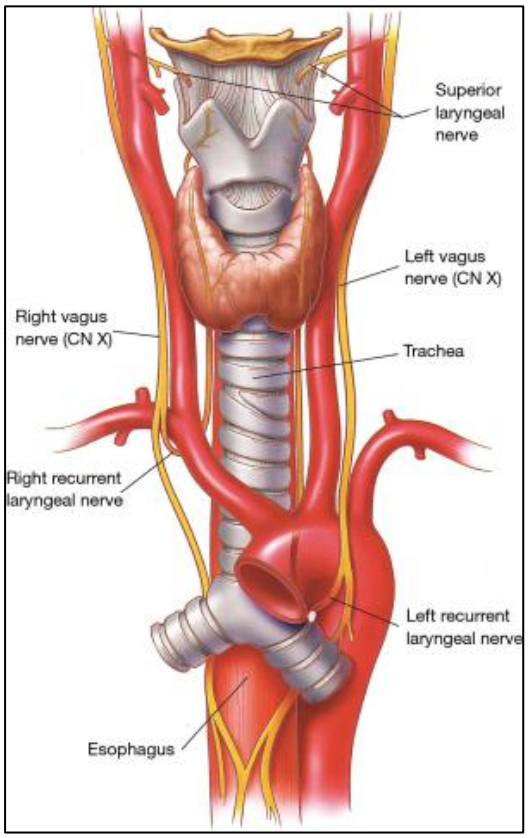
- A culminal trunk ascends and gives rise to an apicodorsal bronchus and an anterior bronchus.
- A lingular trunk descends and gives rise to two lingular bronchi: superior and inferior.
- The left inferior lobar bronchus continues the direction of the left main bronchus and divides into five segmental bronchi similar to those on the right (the only difference is a common trunk between the paracardiac and anterobasal bronchi).

Lobaire supérieure	Lobaire inférieure
A culminal trunk 1–2. Apicodorsal 3. Anterior A lingular trunk 4. Superior 5. Inferior	6. Superior apical (Nelson) 7. Basomedial (paracardiac) 8. Anterobasal 9. Laterobasal 10. Posterobasal

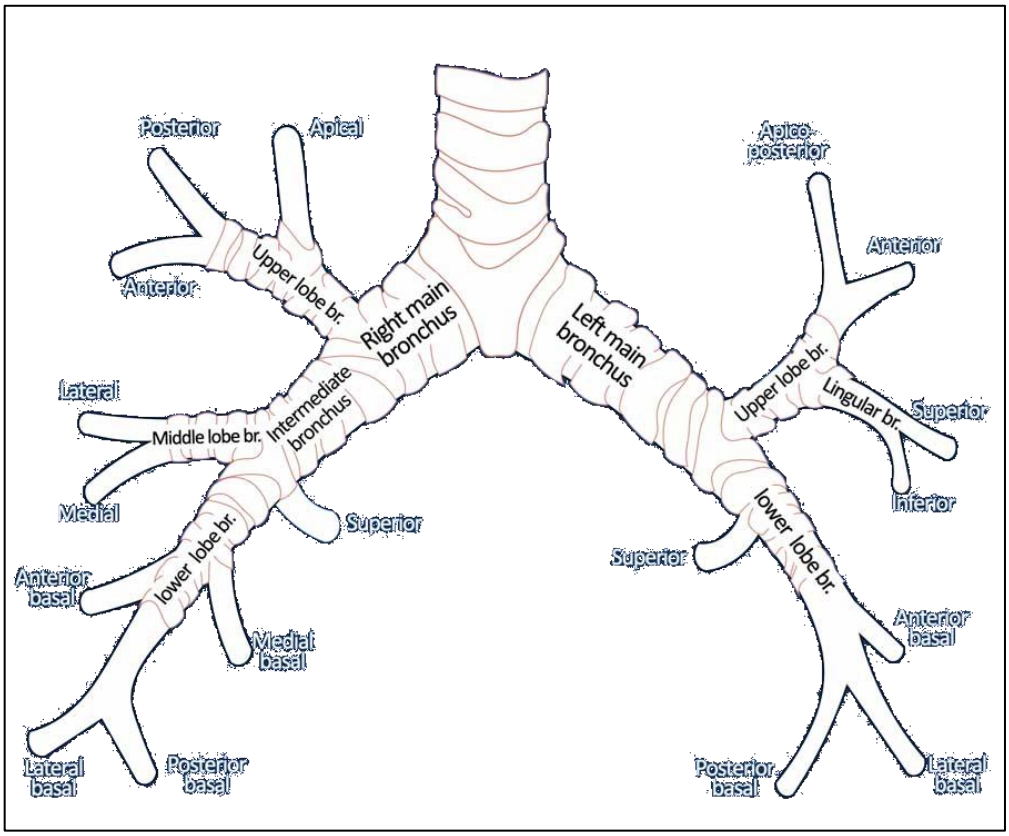
3.4. Subsegmental bronchi and pulmonary alveoli: Segmental bronchi divide into subsegmental bronchi about ten times, continuing to the terminal bronchioles, which end in the alveolar ducts (alveolar sacs).



Anterior View of the Bronchial Tree



Relations of the Trachea (Anterior View)



Bronchial Segmentation (Anterior View)