TRACHEO BRONCHIAL TREE

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TRACHEO BRONCHIAL TREE

- The trachea, bronchi and bronchioles form the tracheobronchial tree – a system of airways that allow passage of air into the lungs, where gas exchange occurs.
- These airways are located in the neck and thorax.

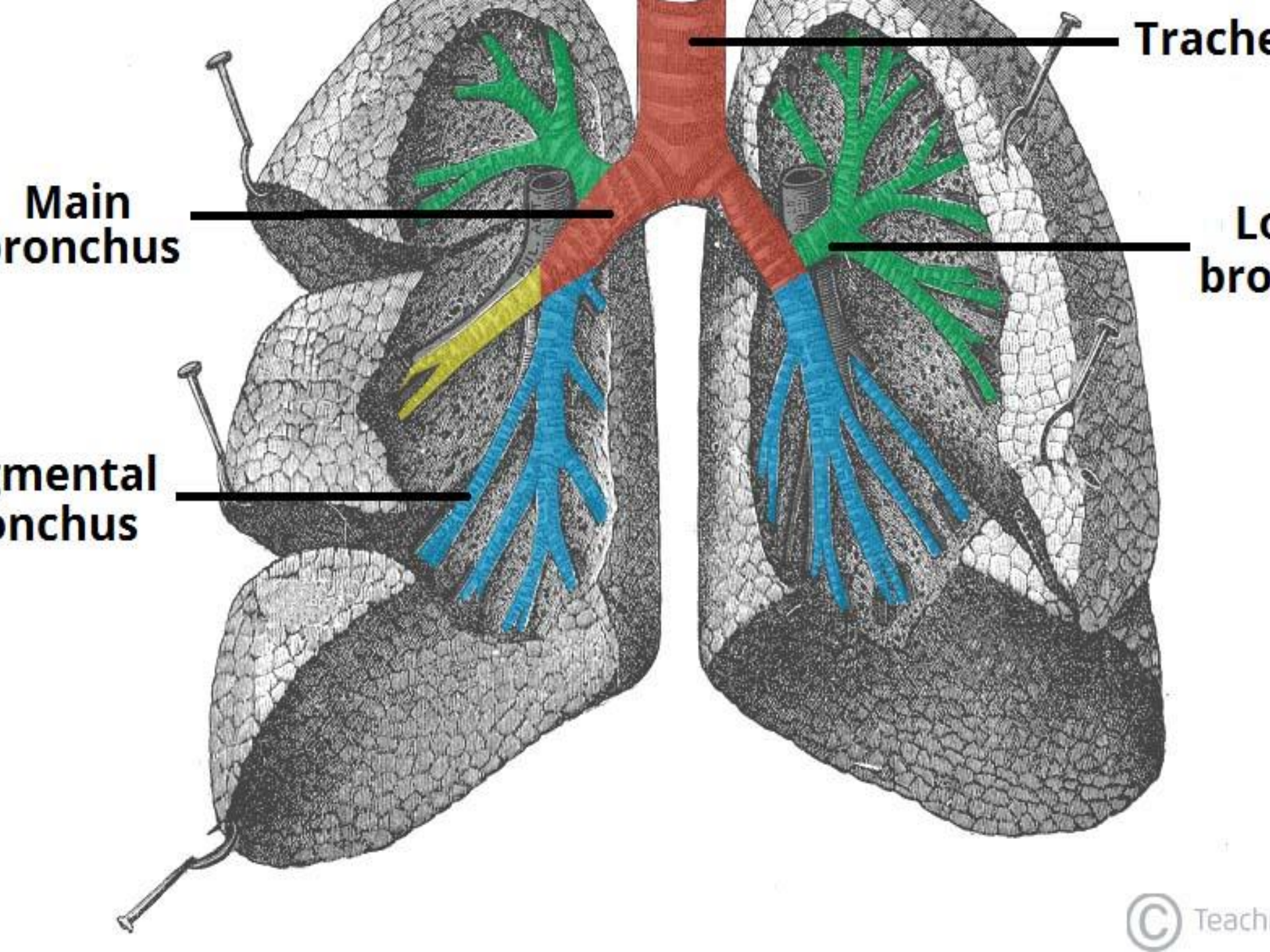
TRACHEA

- The trachea marks the beginning of the tracheobronchial tree. It arises at the lower border of cricoid cartilage in the neck, as a continuation of the larynx.

- It travels inferiorly into the superior mediastinum, bifurcating at the level of the sternal angle (forming the right and left main bronchi).
- As it descends, the trachea is located anteriorly to the oesophagus, and inclines slightly to the right.

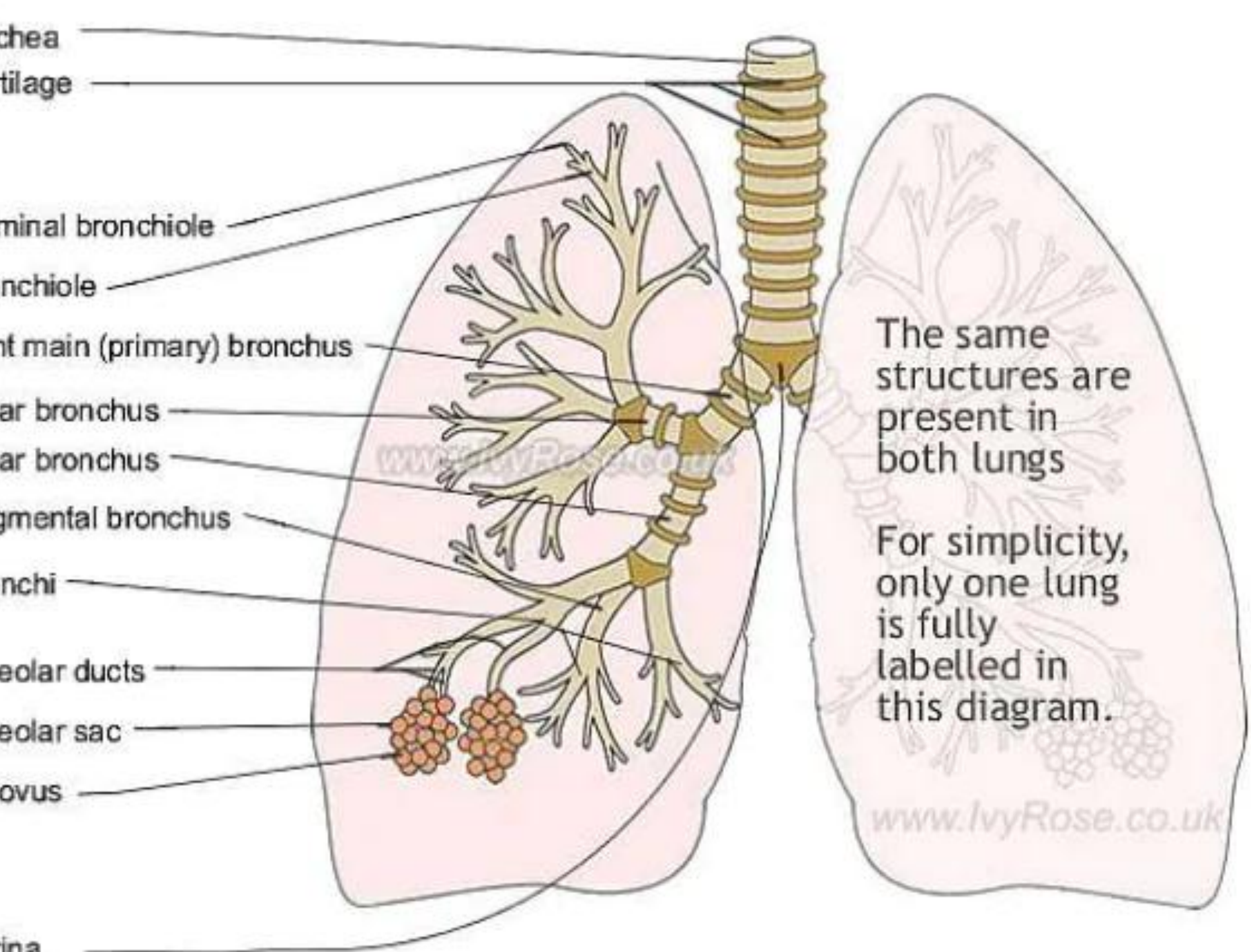
TRACHEA

- The tracheobronchial tree and the lung parenchyma comprise the lower respiratory tract.
- Trachea is a midline structure that extends **from lower end of cricoid cartilage at level of C6 vertebra to its termination at bronchial bifurcation.**
- In preserved dissected room cadever : At level of T4 vertebrae
- Living subject in erect position : Extends to level of upper border of 5^{th} thoracic vertebrae or in full inspiration upto 6^{th} thoracic vertebrae.
- Comprises **16-20 C shaped cartilage rings,** cartilages are joined vertically by fibroelastic tissue and closed posteriorly by non striated trachealis muscle



- Adult
  - Length **10-12cm.**

    Diameter **15-20mm**.
- Children : Trachea is smaller, deeply placed and more mobile.
- 1 st post natal year – Diameter doesn't exceed 4 mm
- During later child hood : Diameter in mm is approx. equal to age in years.


chea
tilage
minal bronchiole
nchiole
nt main (primary) bronchus
ar bronchus
ar bronchus
gmental bronchus
nchi
eolar ducts
eolar sac
ovus
ina
The same structures are present in both lungs
For simplicity, only one lung is fully labelled in this diagram.
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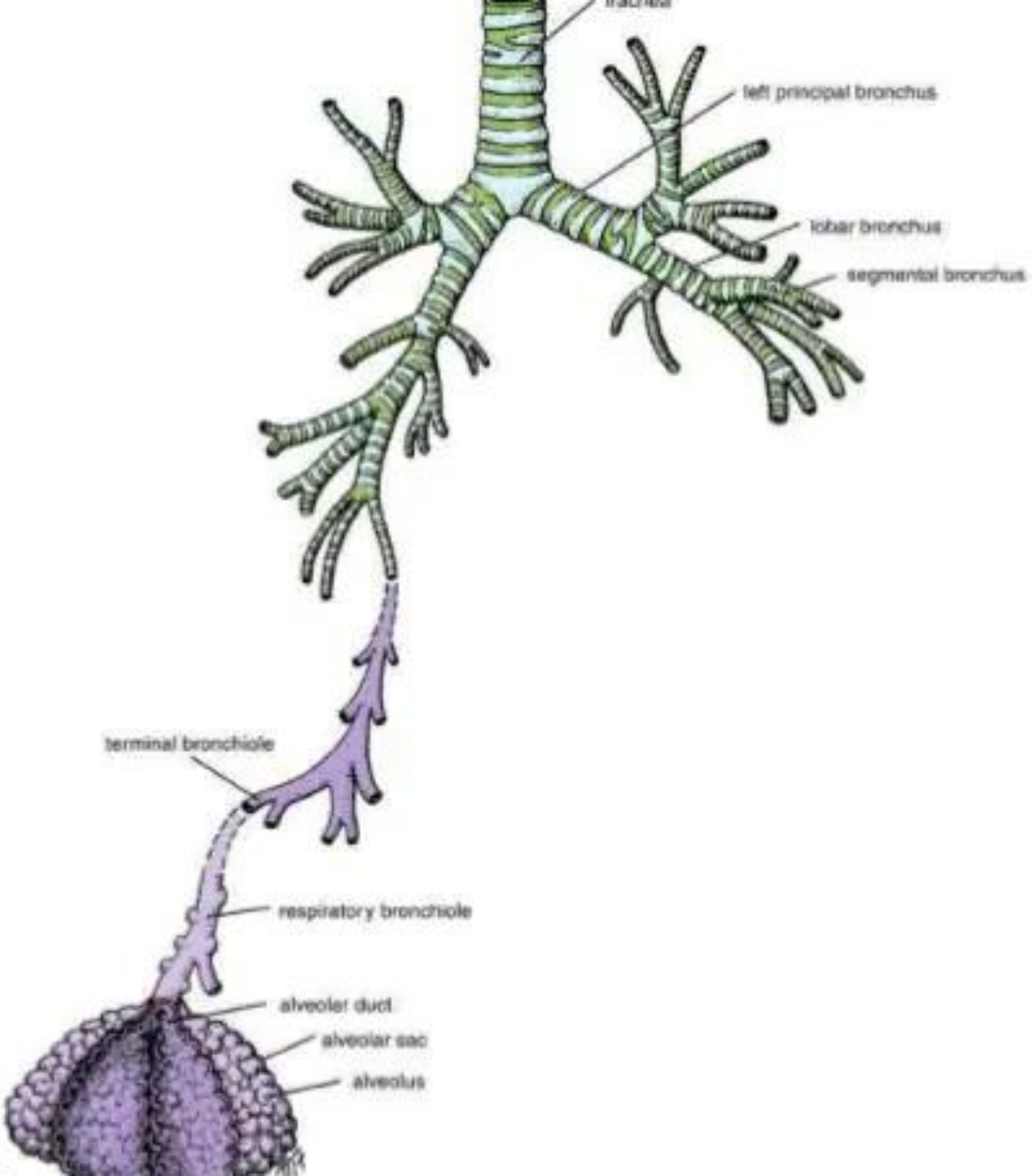
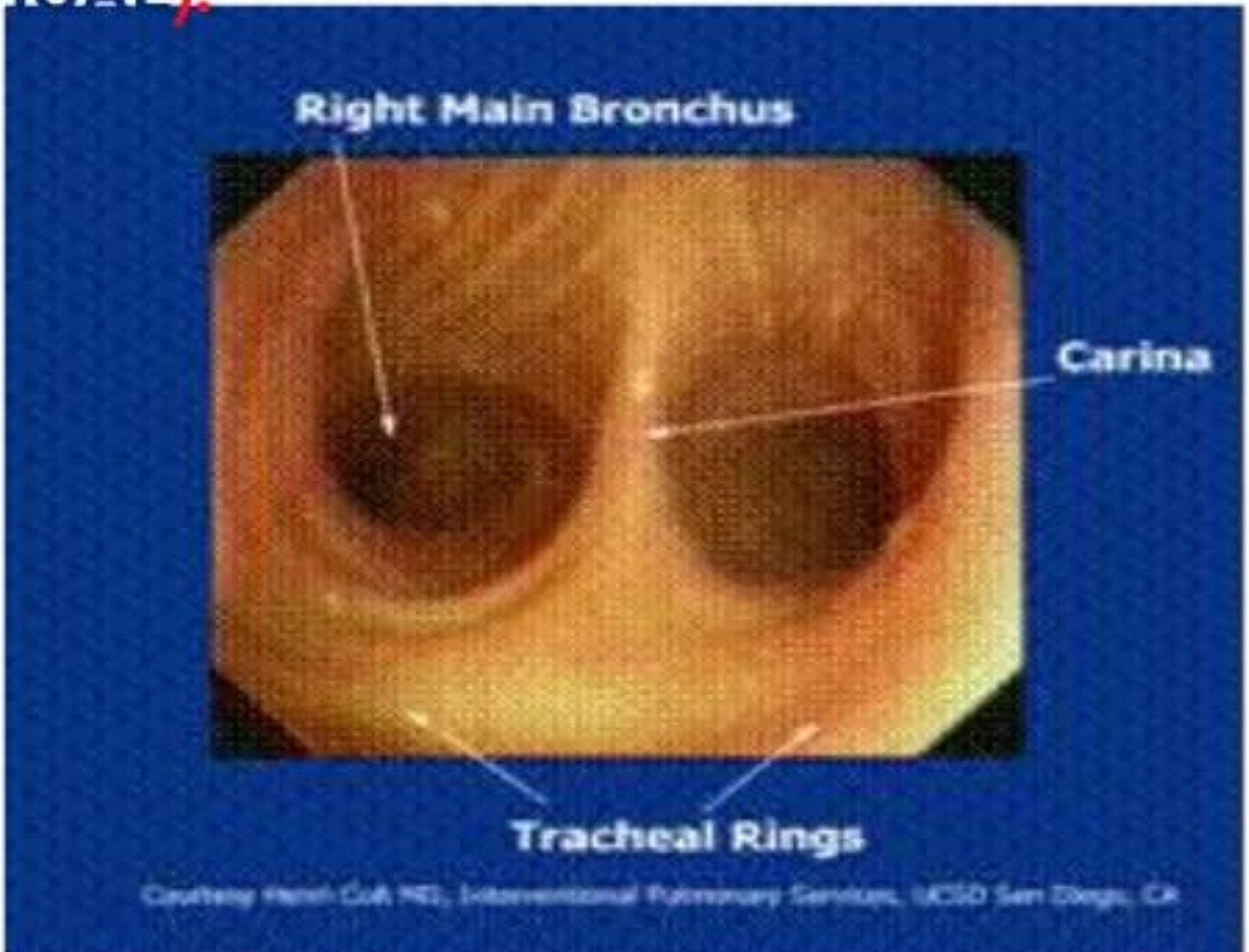
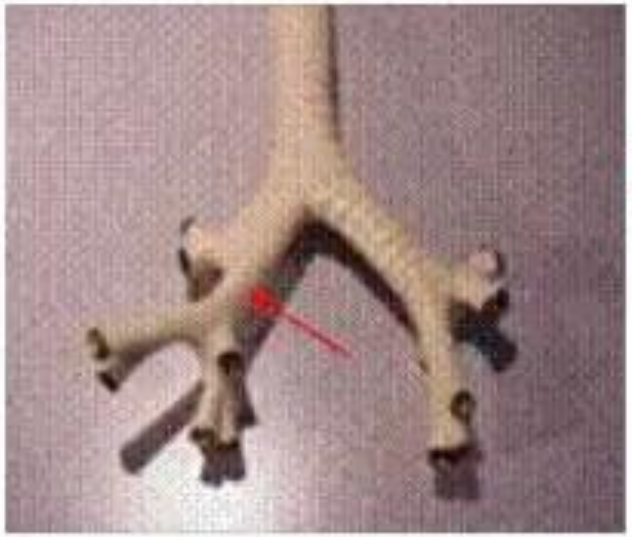
- Trachea divides into **right- and left- primary main bronchi.** Each further divides into **lobar bronchi** which in turn give rise to **segmental bronchi-**supply air to **bronchopulmonary segments.**
- Segmental bronchi divide dichotomously, eventually giving rise to **terminal bronchioles** which further terminates into **respiratory bronchioles**.
- Originating from each respiratory bronchioles are 2-11 **alveolar ducts** leading to **the alveolar sacs** which are extended as a group **of alveoli**.
- Airway becomes progressively narrower, shorter and more numerous, and Cross sectional area, enlarges.
- Areas of tracheobronchial tree furthest from the trachea are collectively called the **"distal respiratory tree"**


trachea
left principal bronchus
lobar bronchus
segmental bronchus
terminal bronchiole
respiratory bronchiole
alveolar duct
alveolar sac
alveolus

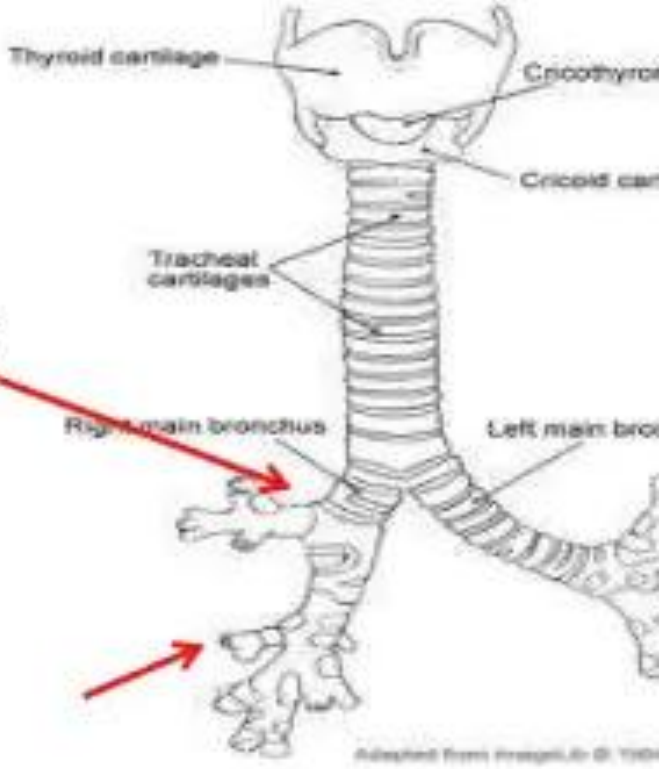
BRONCHOSCOPIC VIEW SHOWING CARINA AND LEFT & RIGHT BRONCHUS (MORE VERTICAL).





RIGHT MAIN BRONCHUS

- **The right main bronchus** is 2 cm long on average and has an internal diameter of 10-16 mm. This is slightly larger than the diameter of the left main bronchus.
- **The bronchus intermedius** of the right bronchial tree is actually quite short ,extending for 1.0-2.5 cm until its anterior wall extends into **and becomes the middle lobe bronchus**. Its posterior wall extends into and becomes the **right lower lobe bronchus.**
- **Volume loss caused by pleural effusion, atelectasis, elevated right hemidiaphragm, as well as traction or torsion from a fibrotic or scarred upper lobe often cause**



- The RIGHT UPPER LOBE BRONC divides into (3)

a. The apical bronchus
b. The anterior bronchus
c. The posterior bronchus

- Distally just beyond the bronchus intermedius, another division occurs into :
- The MIDDLE LOBE BRONCHUS with its anterior direction, dividing into(2)

a).medial and

b).lateral segmental bronchus.

The RIGHT LOWER LOBE BRONCHUS(5)

- The right lower lobe bronchus divides immediately into a a).superior segmental bronchus(jsut across from the right middle lobebron

  b).medial basal segmental bronchus

  a bit more distally and along its med

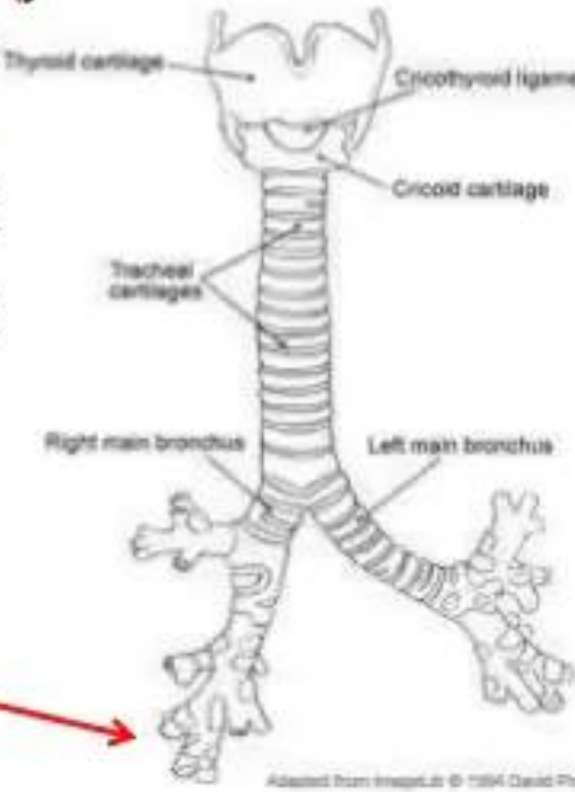
- Finally dividing into three lower lobe b

  (***Three musketeers***):

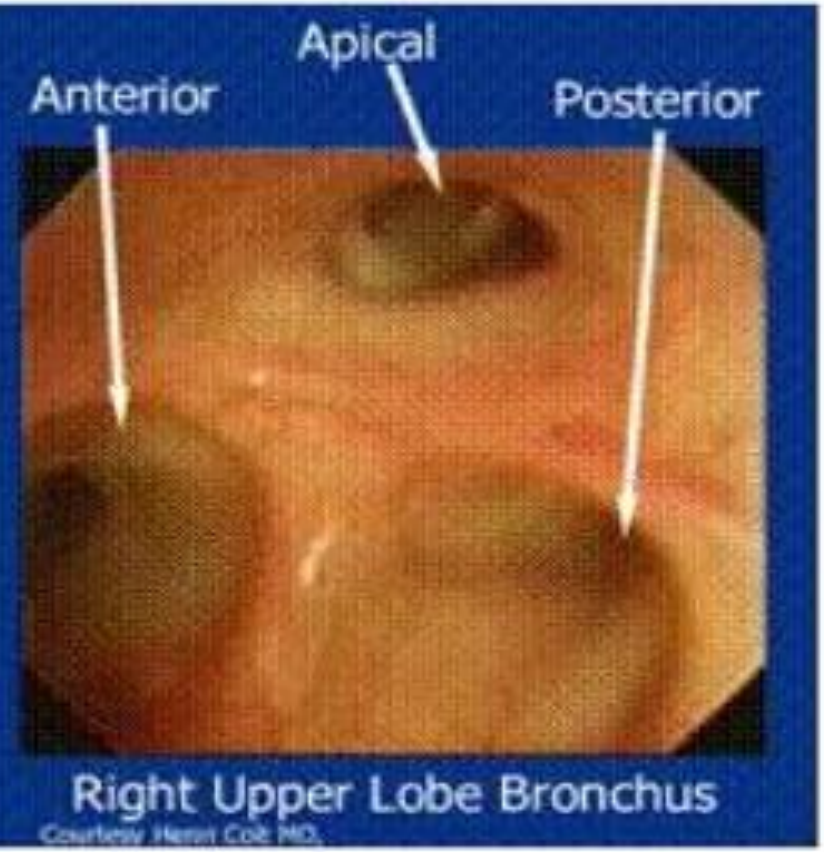
  c).Antero-basal

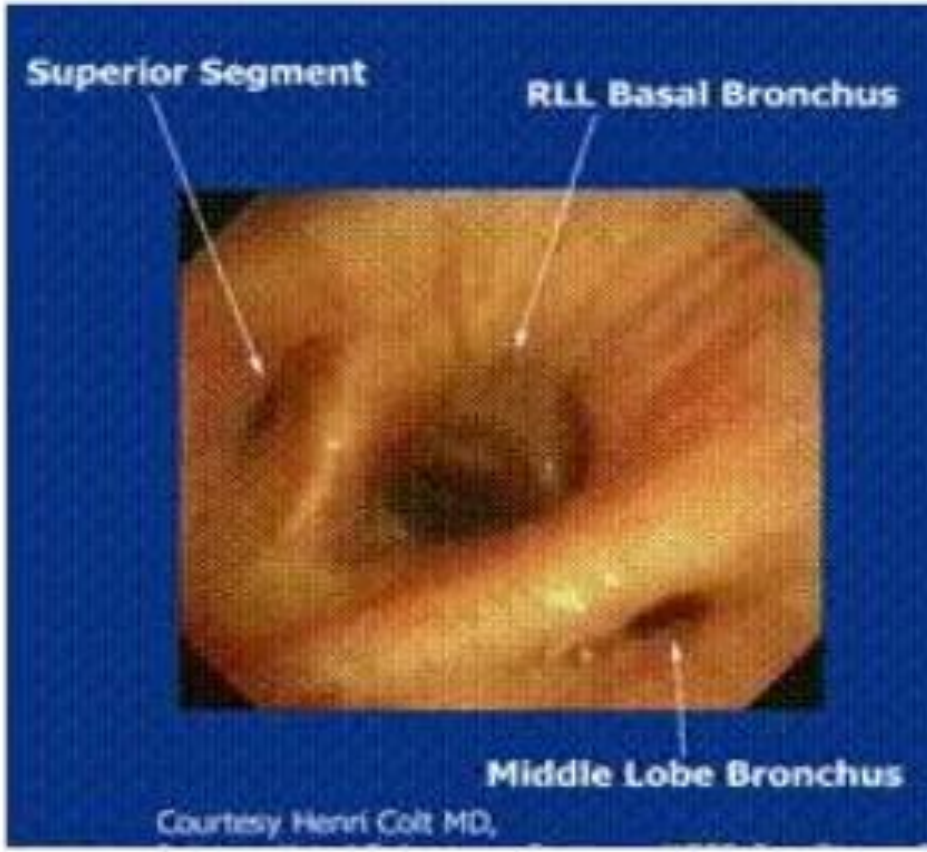
  d).Latero-basal

  e).Postero-basal



RIGHT UPPER LOBE BRONCHUS AND BRONCHUS INTERMEDIUS (SEC. CARINAS)

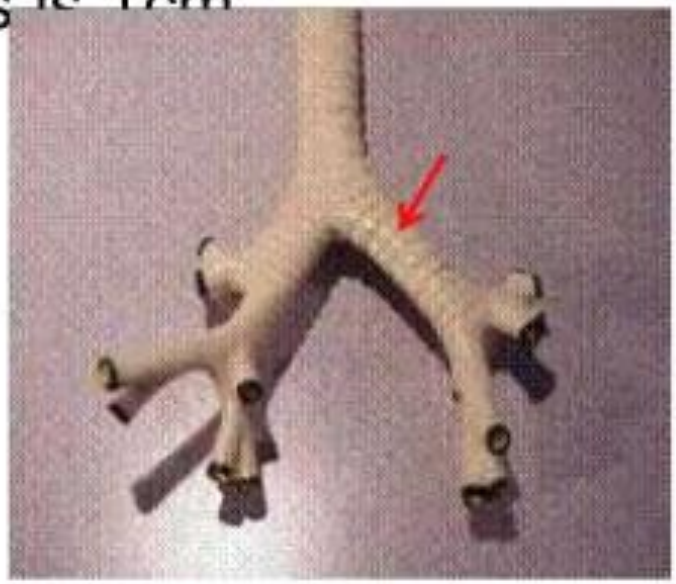




- The carina dividing the right upper lobe from the bronchus intermedius is called the right carina 1 or RC-1.
- On the right, the carina between the right middle lobe bronchus and the bronchus to the right lower lobe is

LEFT MAIN BRONCHUS

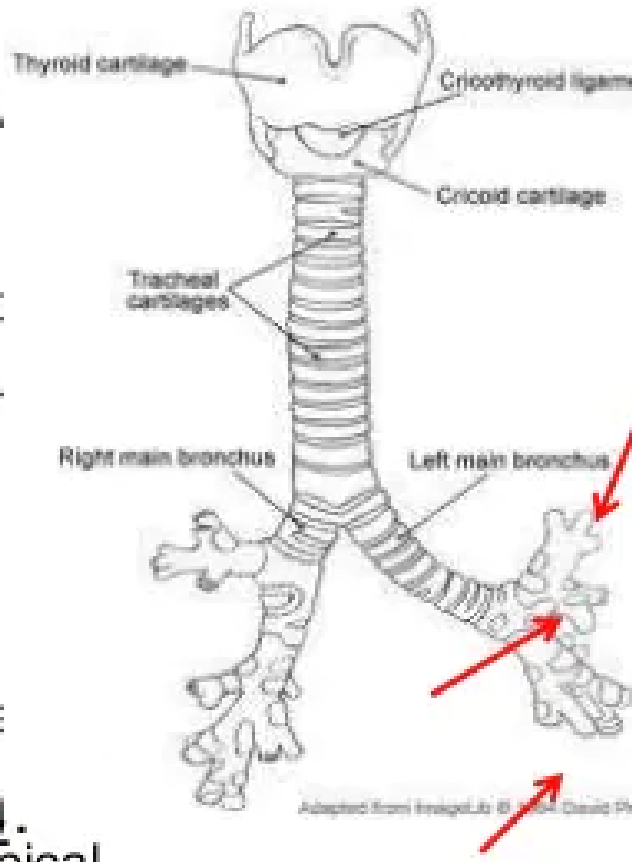
- The **left main bronchus** is usually 4-5cm long(Rt. 2cm long).Its **lumen is narrower** and **relatively horizontal**. The usual length of the left lower lobe bronchus beyond the origin of the superior segmental bronchus is 1cm.
- Divides into : (2)
- a).upper and
- b).lower lobe bronchus.



- The UPPER LOBE BRONCHUS div

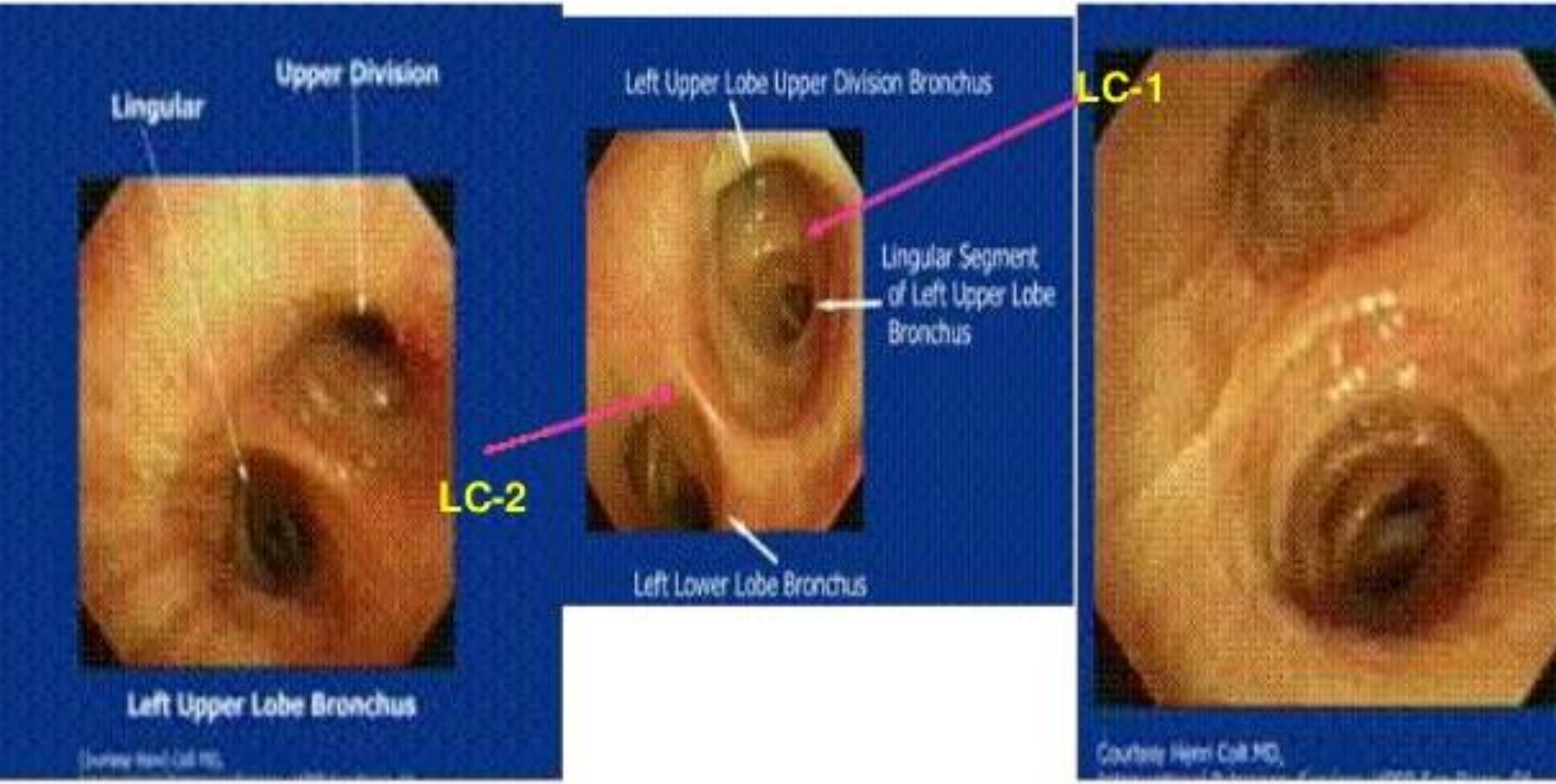
  a). Upper division(3) → Apical
  → Posteric
  → Anterior

  b).Lingular bronchus(2) → Superior div.
  → infe



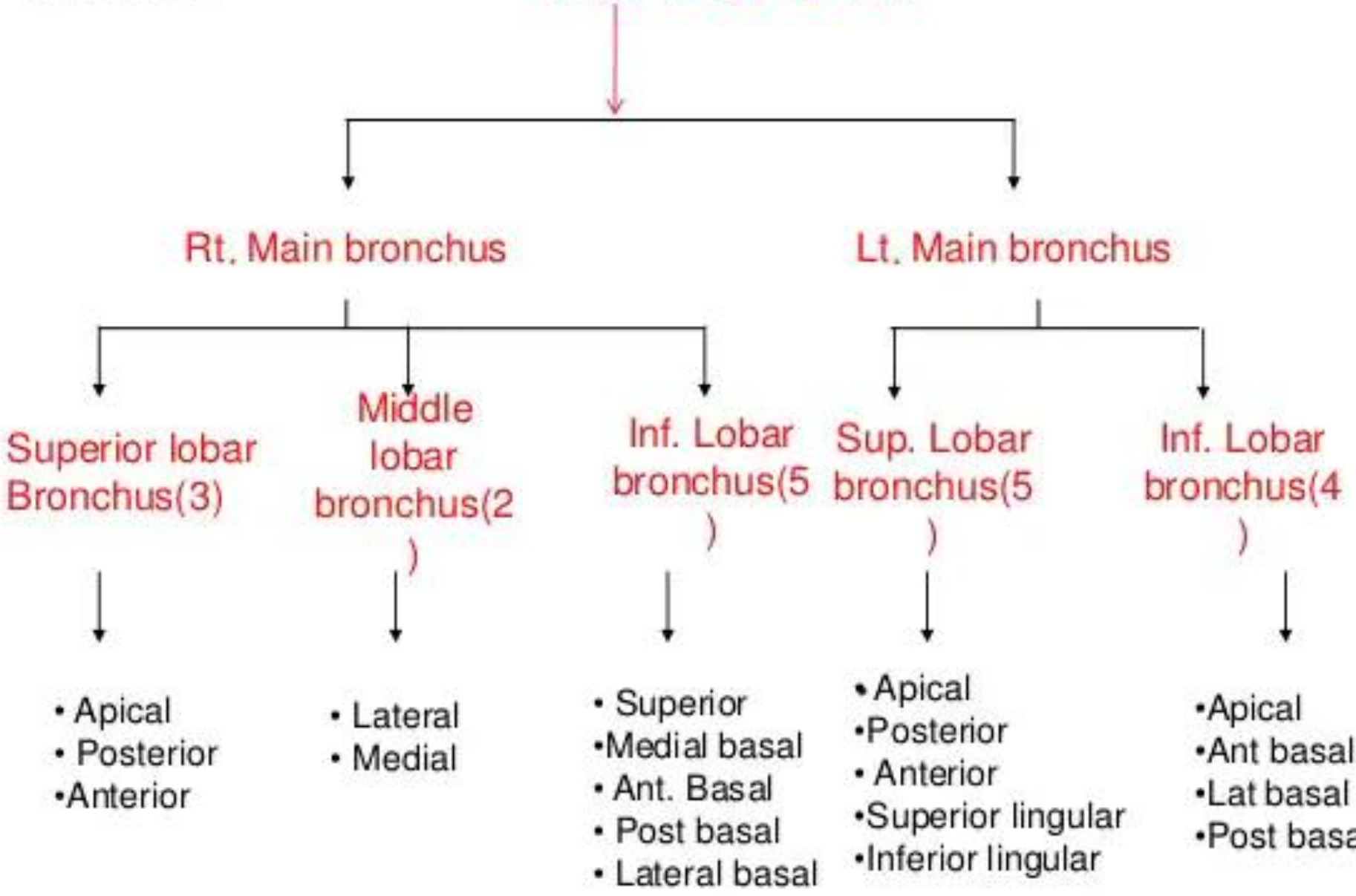
- The LOWER LOBE BRONCHUS(4).
  → Apical
  → Ant.basal
  → Post basal
  → Lat basal
  → ~~Med basal~~

LEFT UPPER LOBE BRONCHUS: UPPER DIVISION AND LINGULA



Contd…

TRACHEA



VASCULAR SUPPLY OF TRACHEA AND BRONCHI

- Arterial supply : Upper 2/3 - Inferior thyroid artery

  Lower 1/3 – Bronchial artery
- Venous supply : Inferior thyroid vein
- Lymphatic : drain into Deep cervical, pretracheal, paratracheal LN.
- Nerve supply : RLN with sympathetic fibres from middle cervical ganglion

Bronchial arteries :

- Rt. Bronchial artery - branch of 3rd posterior intercoastal artery.
- 2 Lt. bronchial arteries – branch of thoracic aorta.

Bronchial vein communicates with pulmonary vein.

- Rt. Side → Azygous vein
- Lt. Side → Accessory hemiazygous vein

APPLIED ANATOMY….ASTHMA

- Asthma is a chronic inflammatory disorder of the airways, characterised by hypersensitivity, reversible outflow obstruction and bronchospasm.

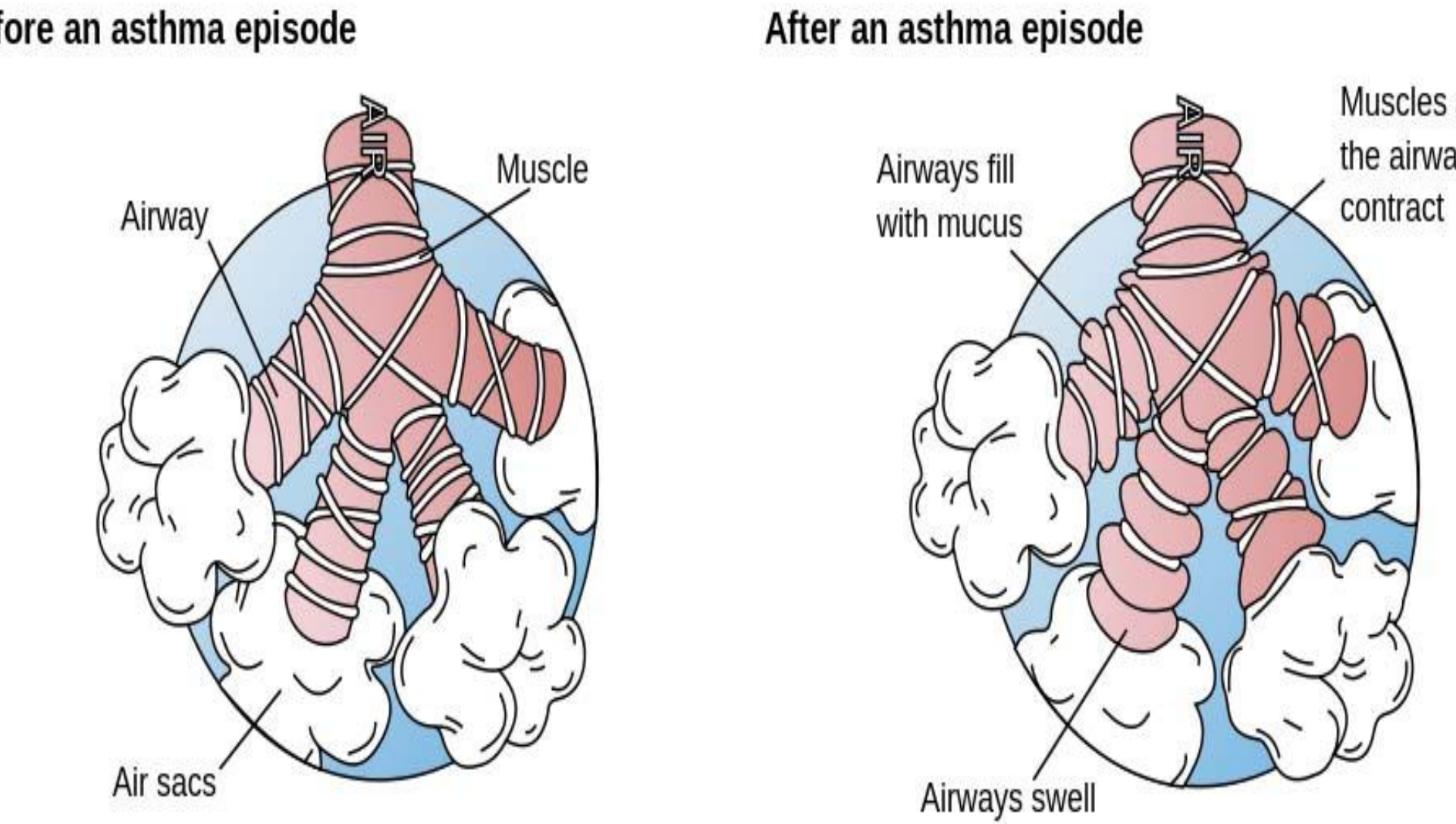
- There is remodelling of the small airways, causing increased smooth muscle thickness around the bronchioles, damaged epithelium and a thickened basement membrane.

ASTHMA

- Asthma attacks” are acute exacerbations of the condition whereby a trigger (e.g. allergens, exercise) causes sudden inflammation and contraction of the smooth muscle around bronchioles (bronchospasm).

- This narrows the airways, causing difficulty in breathing and wheezing, a characteristic feature of asthma.

ASTHMA


fore an asthma episode
AIR
Muscle
Airway
Air sacs
After an asthma episode
AIR
Airways fill
with mucus
Muscles
the airwa
contract
Airways swell

TRACHEOSTOMY

- creation of permanent or semi permanent opening(**surgical airway**) in the anterior wall of trachea. Also k/a *tracheotomy, laryngotomy, pharyngotomy.*

- If a cannula is in place, an unsutured opening heals into a patent stoma within a week. If decannulation is performed (ie, the tracheostomy cannula is removed), the hole usually closes in a similar amount of time.

INDICATIONS:

- In The Acute Setting, indications for tracheotomy include such conditions as severe facial trauma, head and neck cancers, large congenital tumors of the head and neck (e.g., branchial cleft cyst), and acute angioedema and inflammation of the head and neck.

  In the context of failed orotracheal or nasotracheal intubation, either tracheotomy orcricothyrotomy may be performed.
- In The Chronic Setting, indications for tracheotomy include the need for long-term mechanical ventilation and tracheal toilet (e.g. comatose patients, or extensive surgery involving the head and neck).
- In extreme cases, the procedure may be indicated as a treatment for severe Obstructive Sleep Apnea seen in patients intolerant of Continuous Positive Airway Pressure (CPAP) therapy.

Elective tracheostomy:

Anaesthesia: GA

Position: dorsal recumbent with sand bag under the shoulder.

Incision: horizontal incision 1 finger breadth above supra sternal notch parallel to it from one SCM to opp. side or vertical incision in midline extending from cricoid cartilage to suprasternal notch.

Division /retraction of thyroid isthmus thus exposing 3rd & 4th tracheal rings.

Opening of Trachea and insertion of tube.

Emergency Tracheostomy:

Within 2-4 mins with vertical incision.

Cricothyrotomy/mini tracheostomy:

Transverse incision over the cricothyroid membrane. Kept only for 3-5 days,to be replaced with standard tubes after patient's stabilization..

Peadiatric tracheostomy

- Vertical incision in trachea b/w 2nd and 3rd ring.
- No excision of ant. Wall of trachea.
- Secure the tube with neck by two sutures.

PERCUTANEOUS DILATATIONAL TRACHEOSTOMY

- Percutaneous dilatational tracheostomy (PDT) has become a commonly performed procedure in the intensive care unit (ICU) in those patients subjected to prolonged mechanical ventilation.
- It has largely replaced the conventional surgical tracheostomy in critical care patients, with benefits in terms of cost, ease of performance, and reduced complications.
- Use of guide wire and Dilators.
- Under the vision of Bronchoscope through endotracheal tube.
- Not suitable for thick neck and in emergency.
- Significant complications associated with PDT, including haemorrhage, pneumothorax, and paratracheal placement, have ranged in various series from 3 to 18%

PERCUTANEOUS DILATATIONAL TRACHEOSTOMY

LANDMARKS

Daigram showing anterior structures of neck

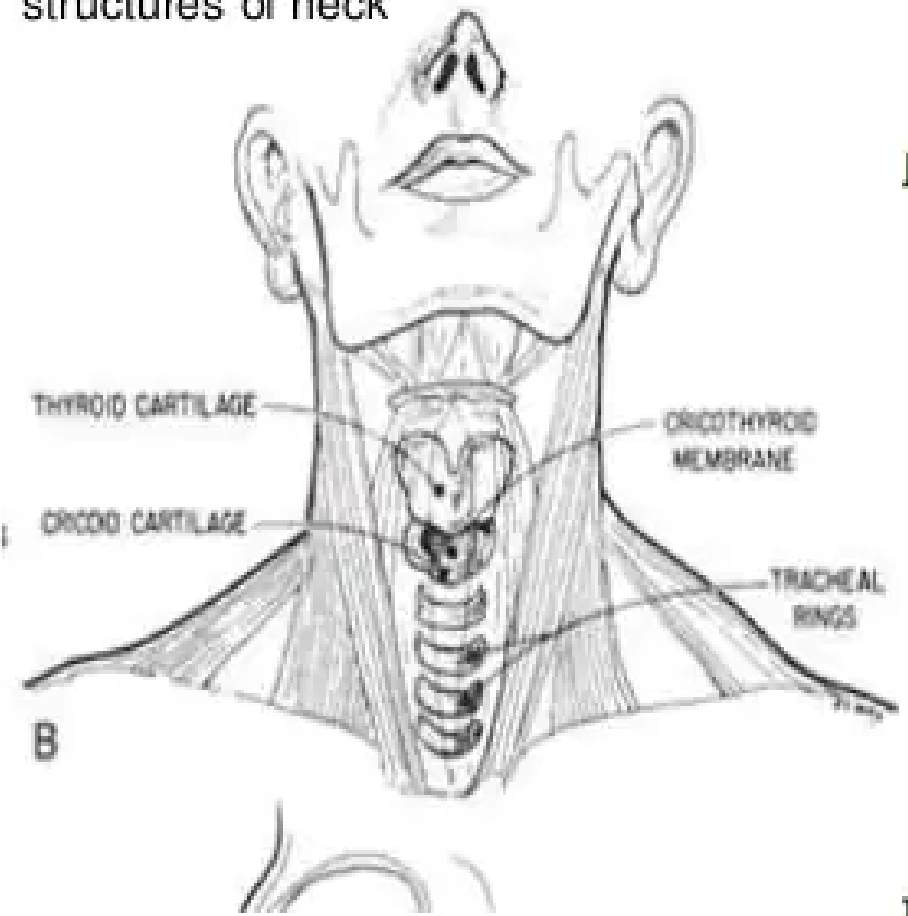


Fig-4: Position of head for tracheostomy

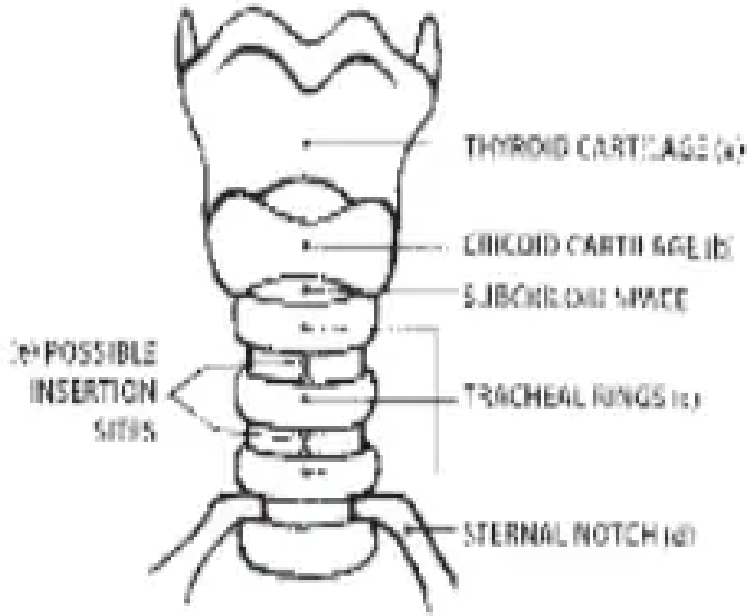


Fig 5: Identification of thyroid, cricoid cartilage & tracheal ring

CONGENITAL ANOMALIES: TRACHEOESOPHAGEAL FISTULA

- Seen in 1:4000 live births.
- M:F::25:3
- 10-40% are pre-term
- Ass. with polyhydramnios(60%)

Embryology:

- Derived from primitive foregut
- 4th week of gestation tracheoesophageal diverticulum forms from the laryngotracheal groove
- Tracheoesophageal septum develops during 4th-5thweeks – muscular + submucosal layer of T + E formed
- Elongates with descent of heart and lung
- 7thweek reaches final length

CLINICAL PRESENTATION:

- Choking on 1st feed
- Drooling of saliva
- Coughing
- Cyanosis
- Aspiration pnuemonia
- Associated anomalies:VACTRAL anomalies in 35-65%

DIAGNOSIS:

Antenatal: In ultrasound polyhydramnios, distended stomach

Immediately after birth: Inability to pass suction catheter into the stomach.

CXR: coiled orogastric tube in the cervical pouch; air in the stomach & intestine

BRONCHOSCOPY

- INDICATIONS
- INSTRUMENTS OF CHOICE
- ANAESTHESIA FOR BRONCHOSCOPY

INDICATIONS:

DIAGNOSTIC

- Cough
- Hemoptysis
- Wheez
- Atelectasis
- Unresolved pnuemonia
- Diffuse lung dis.

PREOPERATIVE EVALUATION

- Rule out metastases
- RLN palsy
- Diaphragm paralysis
- Exclude tracheo esophageal fistula
- During mech ventillation
- Selective bronchography
- Abn. Chest radiograph

THERAPEUTIC

- Foreign Bodies
- Accumulated Secretions
- Aspiration
- Lung abcess
- Reposition endotracheal tubes
- Placement of endobronchial tubes
- LASER surgery for airways.

QUIZ

- The trachea is a continuation of what upper respiratory tract structure?

- Oesophagus
- Oropharynx
- Laryngopharynx
- Larynx

ANSWER

- The trachea marks the beginning of the tracheobronchial tree.
- It arises at the lower border of cricoid cartilage in the neck, as a continuation of the **larynx**.