

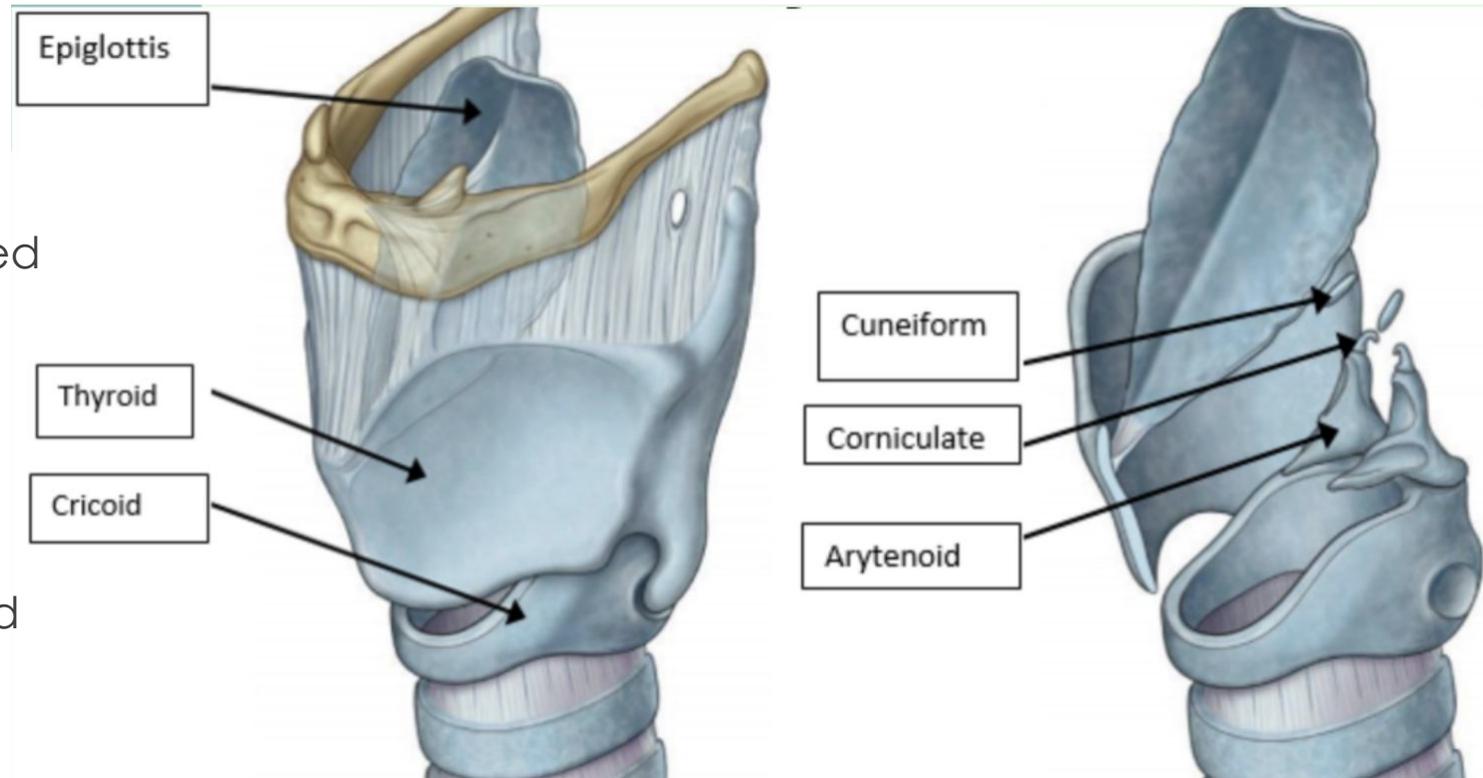
RESP ANATOMY P2

The larynx's cartilages

- ▶ Larynx = functions as a valve to close lower respiratory tract & instrument to produce sound (voice box)

Composed of three paired & three unpaired cartilages:

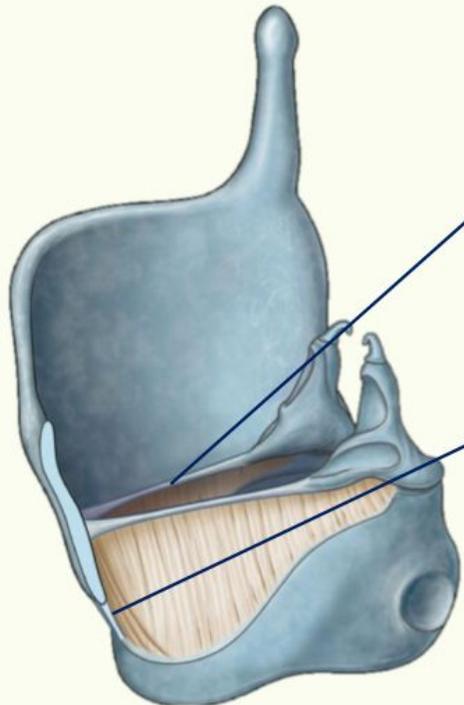
- ▶ Unpaired- epiglottis, thyroid & cricoid
- ▶ Paired- arytenoid, corniculate & cuneiform
- ▶ Trachea begins at C6 (at level of cricoid cartilage)



The Larynx's Ligaments

- ▶ Vocal ligament = composed of upper free margin of cricothyroid ligament

Internal Membranes – Cricothyroid Ligament



- Internal ligament of larynx

Vocal Ligament

Formed by upper free margin of cricothyroid ligament, extending between thyroid cartilage and arytenoid cartilage. It underlines the true vocal fold.

Cricothyroid Ligament

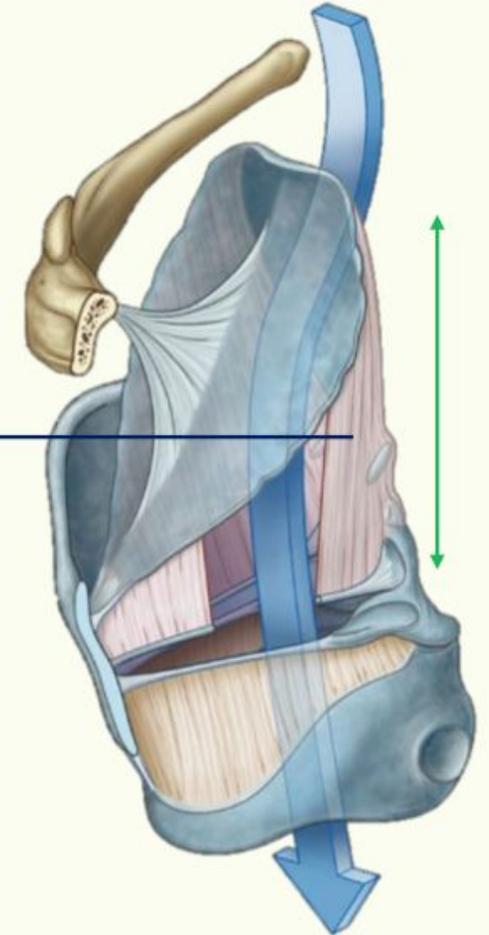
Thickens in the midline to form median cricothyroid ligament (used in emergencies i.e. cricothyrotomy)

The Larynx's Membranes

Internal Membranes – Quadrangular Membrane

- Extends between lateral margin of epiglottis to arytenoid cartilage on either side
- Free upper margin
- Free lower margin (vestibular ligament)
- Vestibular fold overlies vestibular ligament
- False vocal cord
- Role in protecting the entrance to the trachea

Quadrangular Membrane

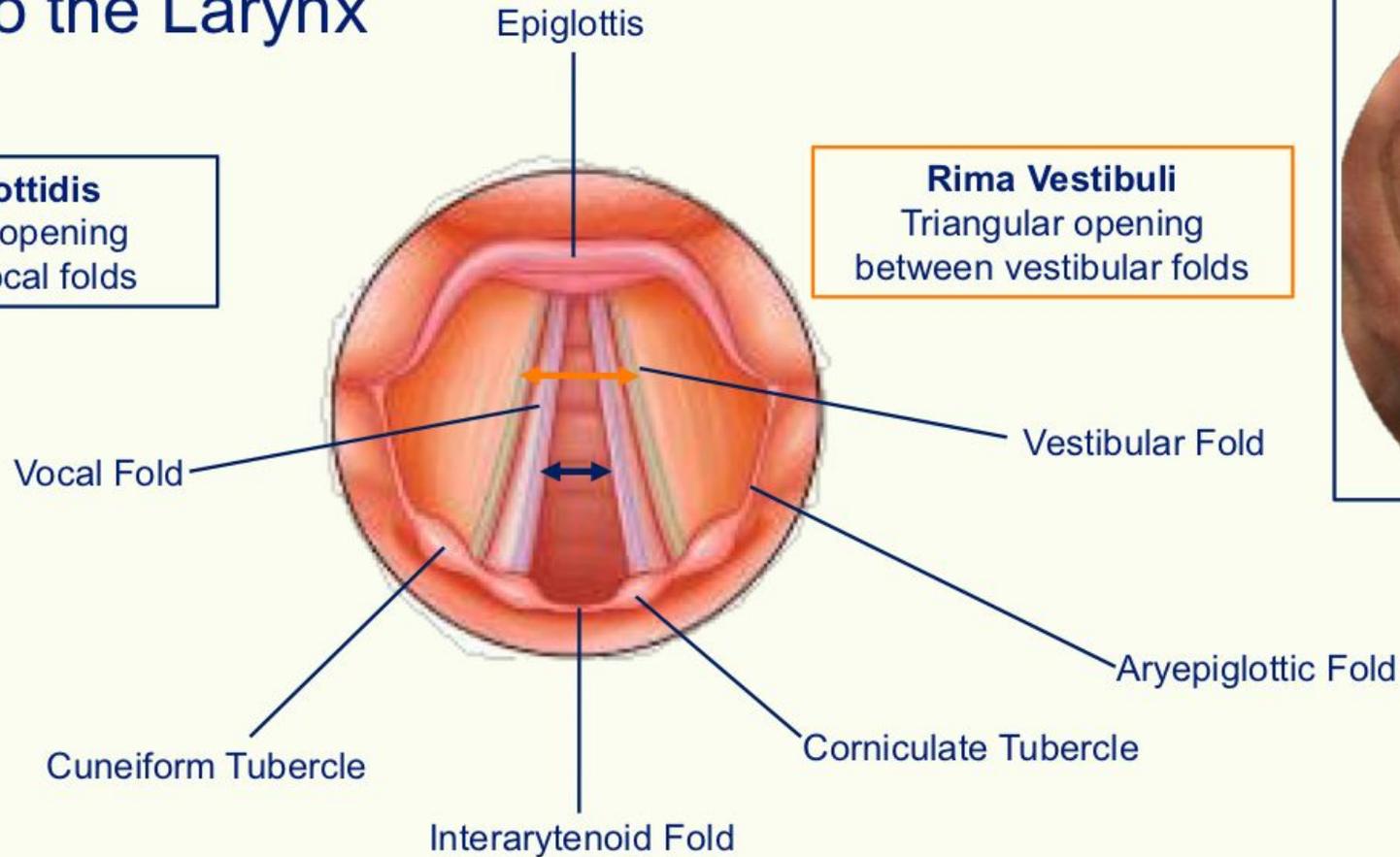


Folds of the Larynx

View into the Larynx

Rima Glottidis
Triangular opening
between vocal folds

Rima Vestibuli
Triangular opening
between vestibular folds



Innervation of the Larynx

Innervation of the Larynx

Innervation to the larynx is by vagus nerve (CN 10)

Superior laryngeal nerve

Sensory above level of vocal folds

External larynx:
motor to cricothyroid

Internal larynx:
sensory above the level of the vocal cords

Recurrent laryngeal nerve

Sensory below level of vocal folds

Right recurrent larynx:
originates in root of neck, and loops underneath right subclavian artery

Left recurrent larynx:
hooks underneath arch of aorta

The cricothyroid muscle changes the pitch of your voice by elongating the vocal folds

Innervation to Larynx

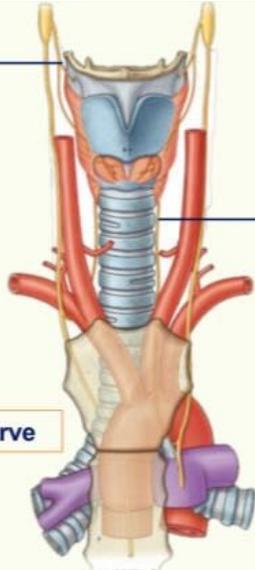
Superior Laryngeal Nerve

Sensory above level of vocal folds

Recurrent Laryngeal Nerve

Sensory below level of vocal folds

Innervation to Larynx derived from **Vagus Nerve**

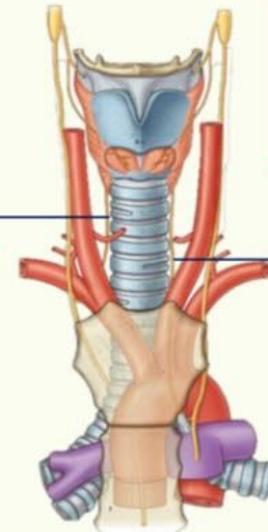


Recurrent Laryngeal Nerve

Right recurrent laryngeal originates in root of neck, and loops underneath right subclavian artery

Left and right recurrent laryngeal innervate all muscles of the larynx except the cricothyroid, which is supplied by the external branch of the superior laryngeal nerve

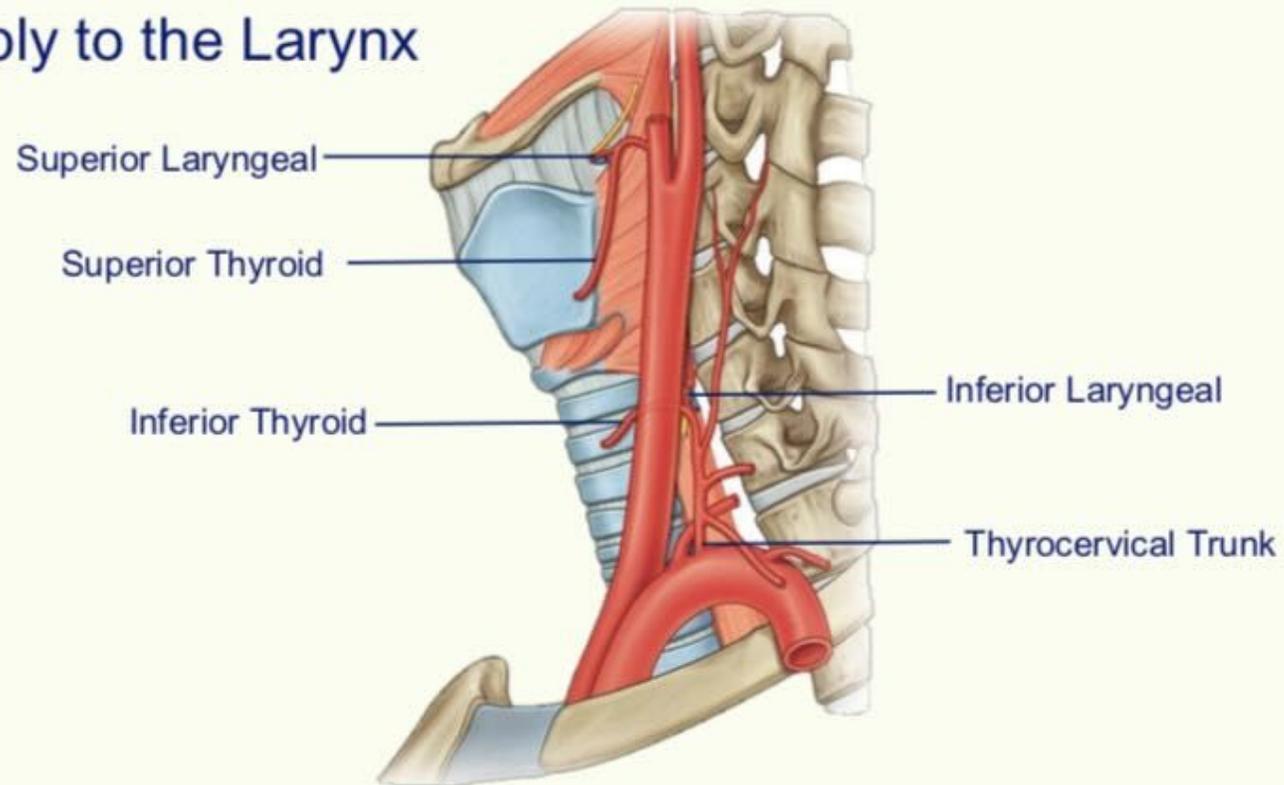
Left recurrent laryngeal hooks underneath arch of aorta



Larynx Blood Supply

- ▶ Common carotid artery -> external carotid A -> superior thyroid A -> superior laryngeal A
- ▶ Subclavian artery -> thyrocervical branch -> inferior thyroid A -> inferior laryngeal A

Blood Supply to the Larynx



Questions p1

What is the cricothyroid innervated by?

- a) External laryngeal nerve
- b) Internal laryngeal nerve
- c) Superior laryngeal nerve
- d) Vagus nerve
- e) Recurrent laryngeal nerve

What is the triangular opening between the vocal folds called?

- a) Rima vestibuli
- b) Rima glottidis
- c) Corniculate folds
- d) Cuneiform folds

Answers p1

What is the cricothyroid innervated by?

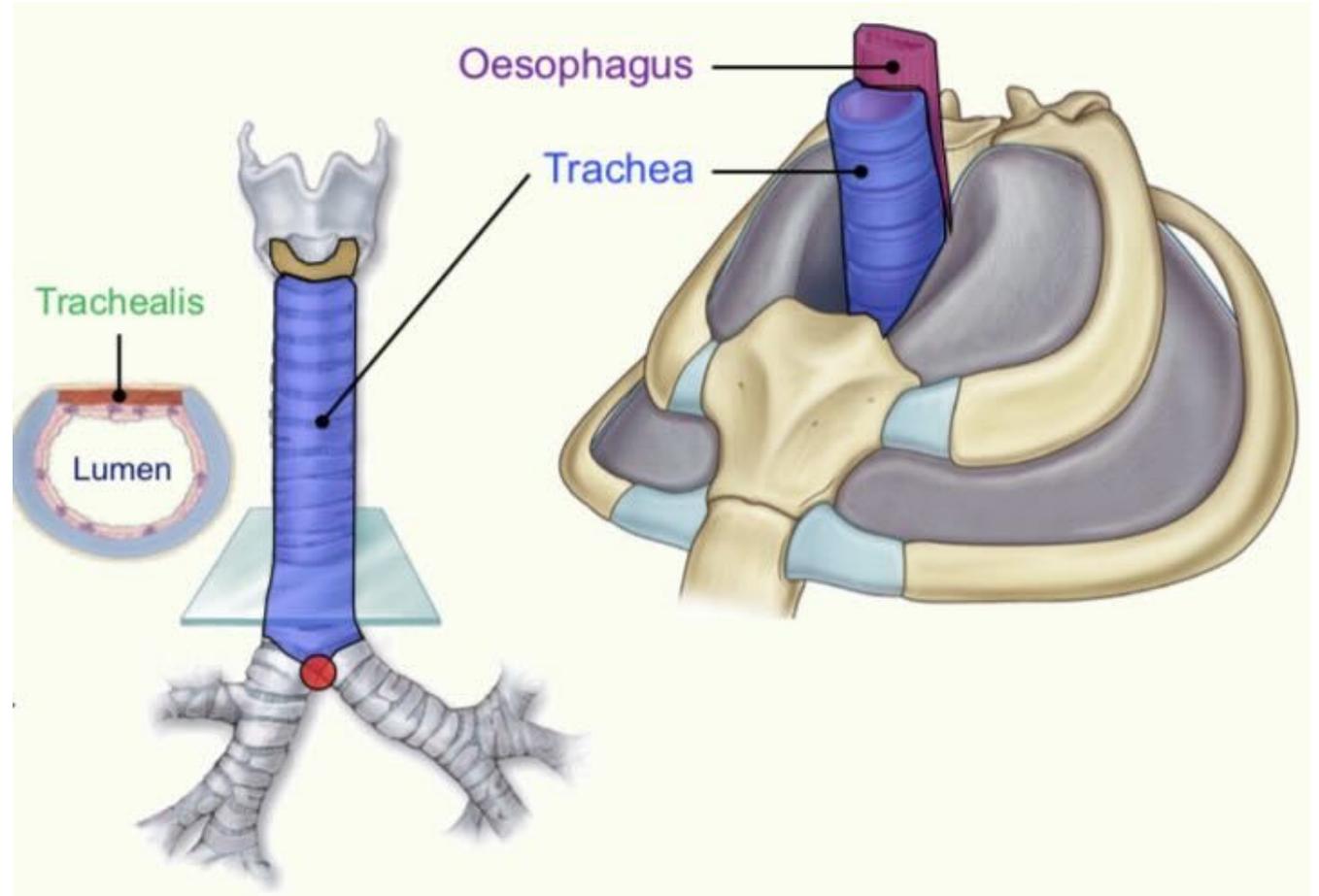
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Trachea

- ▶ Trachea = airway between larynx and primary bronchi; begins at C6
- ▶ Bifurcates at level of carina/sternal angle (of Louis) – T4
- ▶ Patency (openness) maintained by cartilage; C-shaped rings
- ▶ Posterior border is soft; made up of trachealis muscle -> allows expansion of oesophagus for swallowing



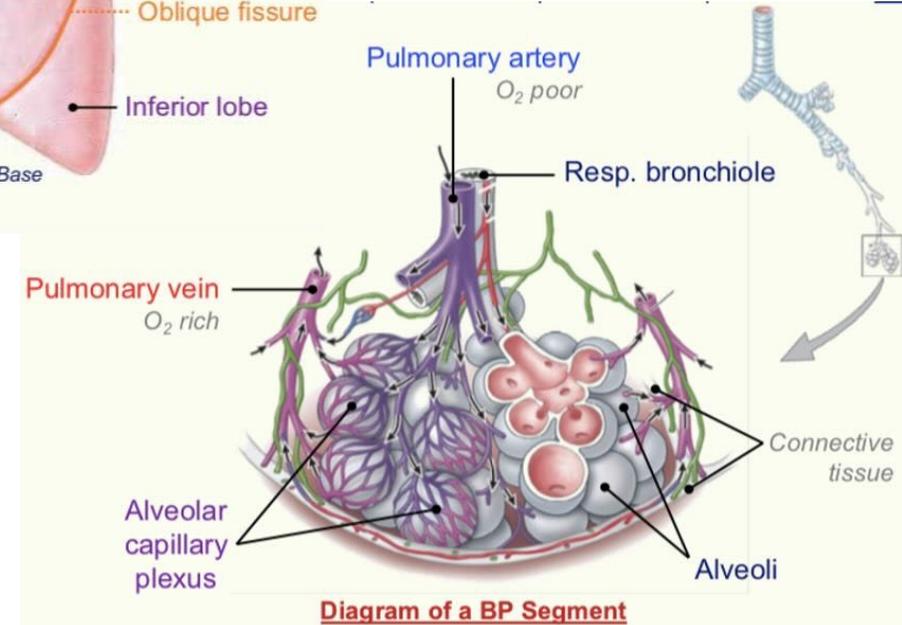
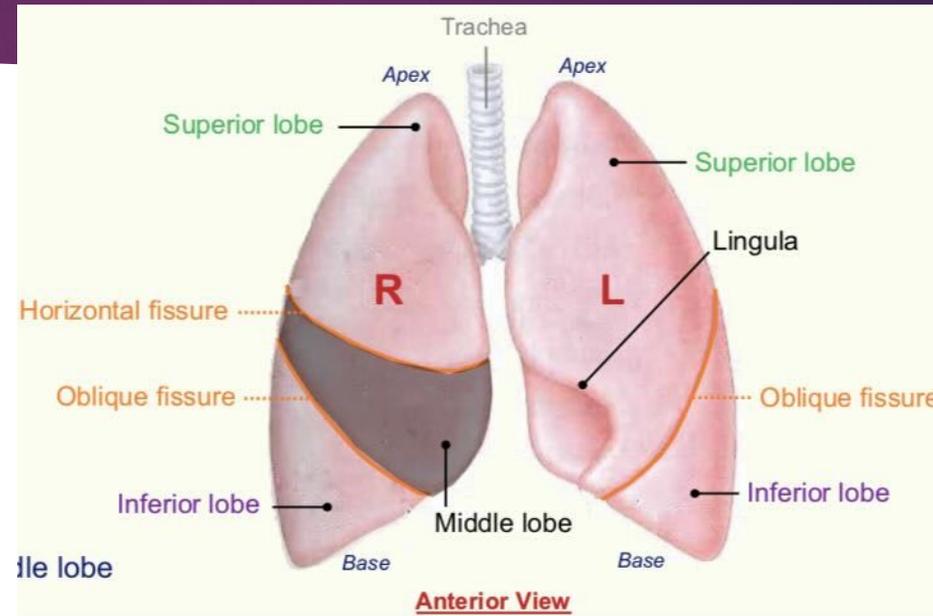
Lung lobes and BP segments

Fissures divide lungs into lobes:

- ▶ Left has 2 lobes- superior & inferior; divided by oblique fissure
- ▶ Right has 3 lobes- superior, middle & inferior; divided by horizontal & oblique fissures

BP segment tissue is served by a single tertiary bronchus, separated by connective tissue and is functionally independent – each BP segment has its own vasculature, lymph etc so is surgically resectable.

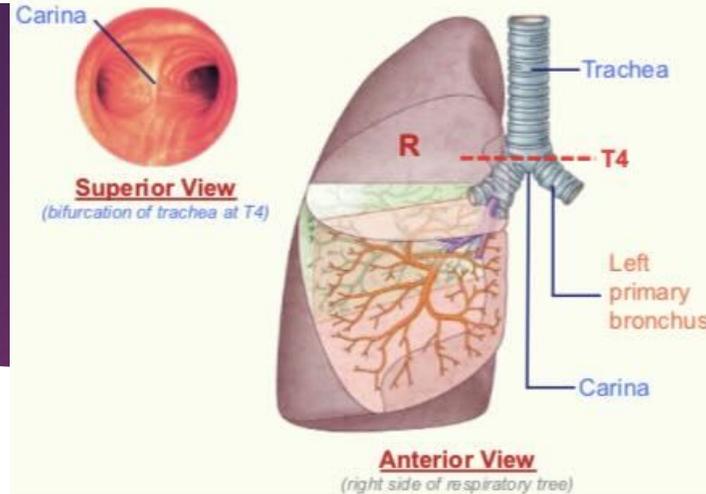
- ▶ Right lung has 10 BP segments
- ▶ Left lung has 8-10 BP segments



Respiratory Tree

- ▶ Right Primary/Main bronchus is wider, straighter and shorter.
- ▶ Left Primary/Main Bronchus is angled and longer
- ▶ Therefore, an aspirated foreign body is more likely to enter the right lung

The Respiratory Tree

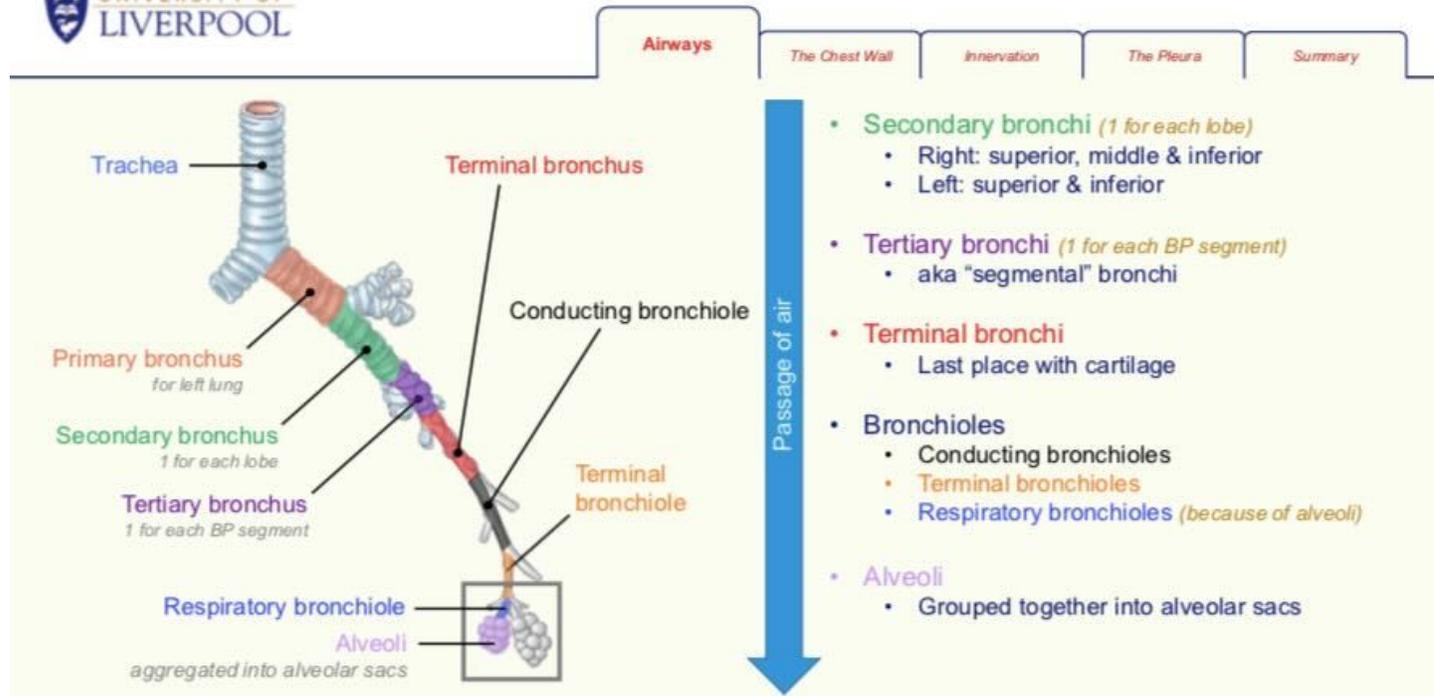


- Airway begins at nasal cavity
- Trachea
 - Begins at C6; bifurcates at T4
- Primary bronchi (1 for each lung)
 - Right is wider, shorter (2.5cm) & more vertical
 - Left is narrower, longer (5cm) & more horizontal
 - (because of heart & aorta on left side)



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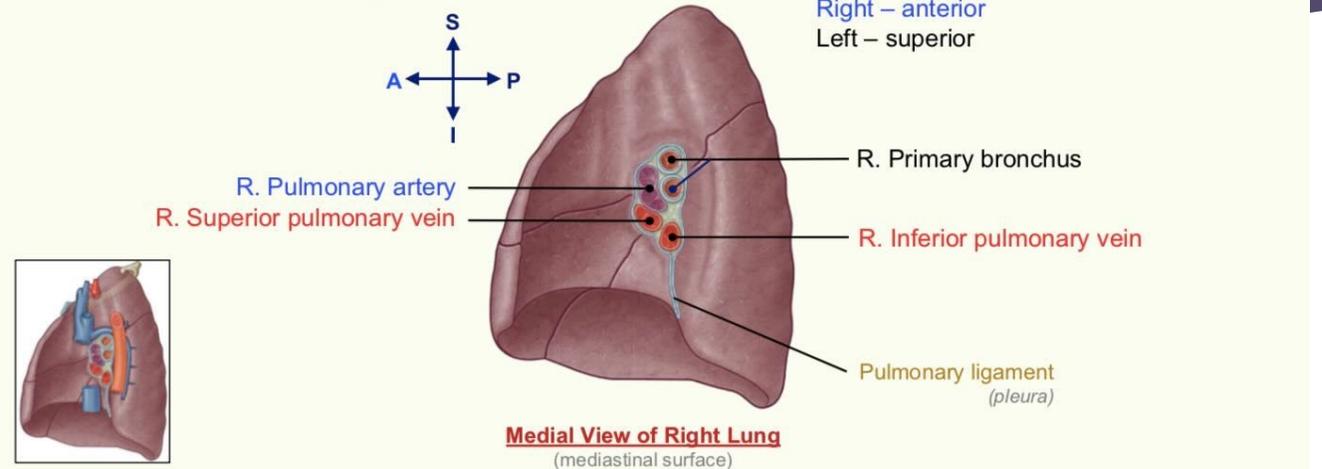


- Secondary bronchi (1 for each lobe)
 - Right: superior, middle & inferior
 - Left: superior & inferior
- Tertiary bronchi (1 for each BP segment)
 - aka "segmental" bronchi
- Terminal bronchi
 - Last place with cartilage
- Bronchioles
 - Conducting bronchioles
 - Terminal bronchioles
 - Respiratory bronchioles (because of alveoli)
- Alveoli
 - Grouped together into alveolar sacs

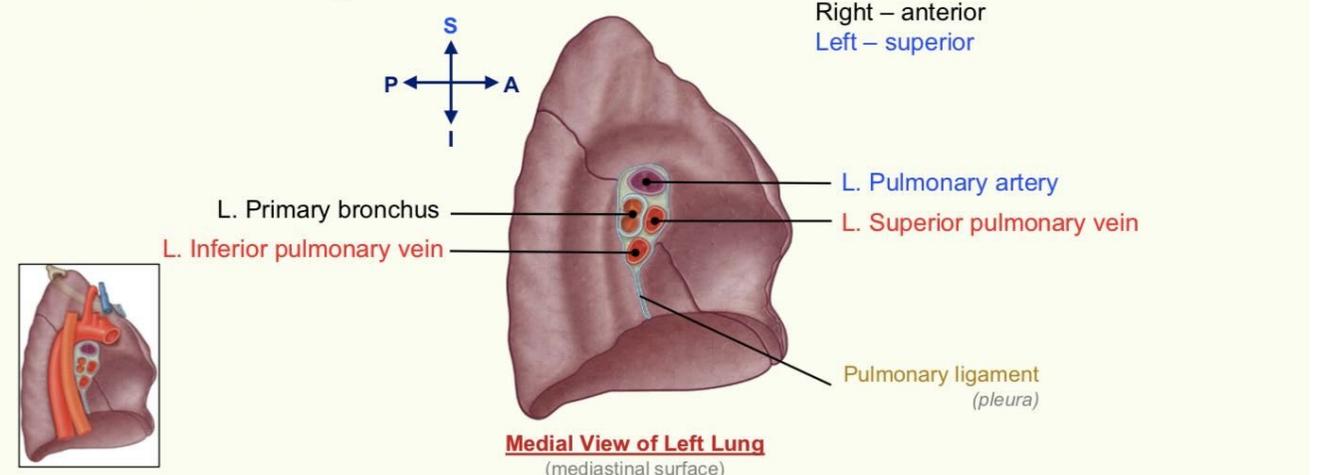
The Lung Hilum's

- ▶ Lung root = collection of structures entering & exiting the lung at its hilum
- ▶ Hilum = point of entry for the bronchus, blood vessels & nerves
- ▶ The SVC, azygos vein & oesophagus all create an impression on the right lung
- ▶ The aorta, aortic arch & descending aorta all create an impression on the left lung
- ▶ RALS gives artery position in relation to bronchus
- ▶ The veins are at the bottom of the hilum, each lung has an inferior and superior pulmonary vein

Hilum of Right Lung

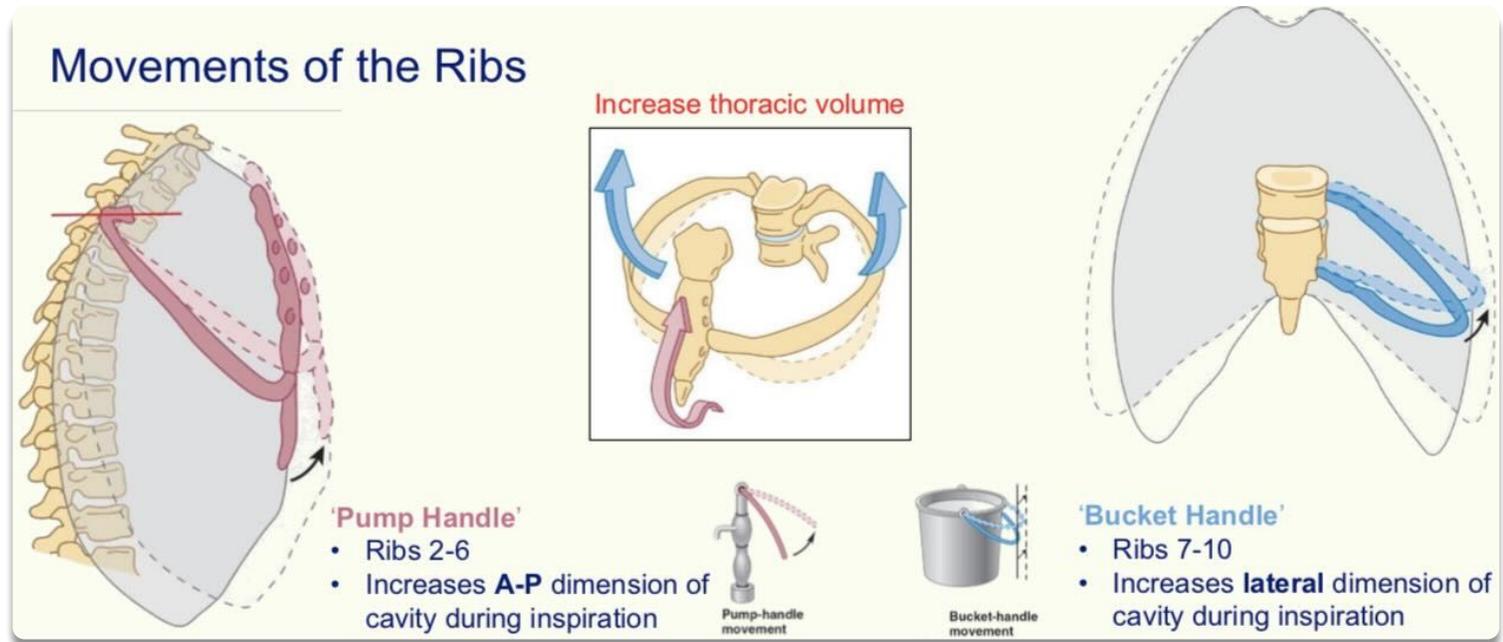


Hilum of Left Lung



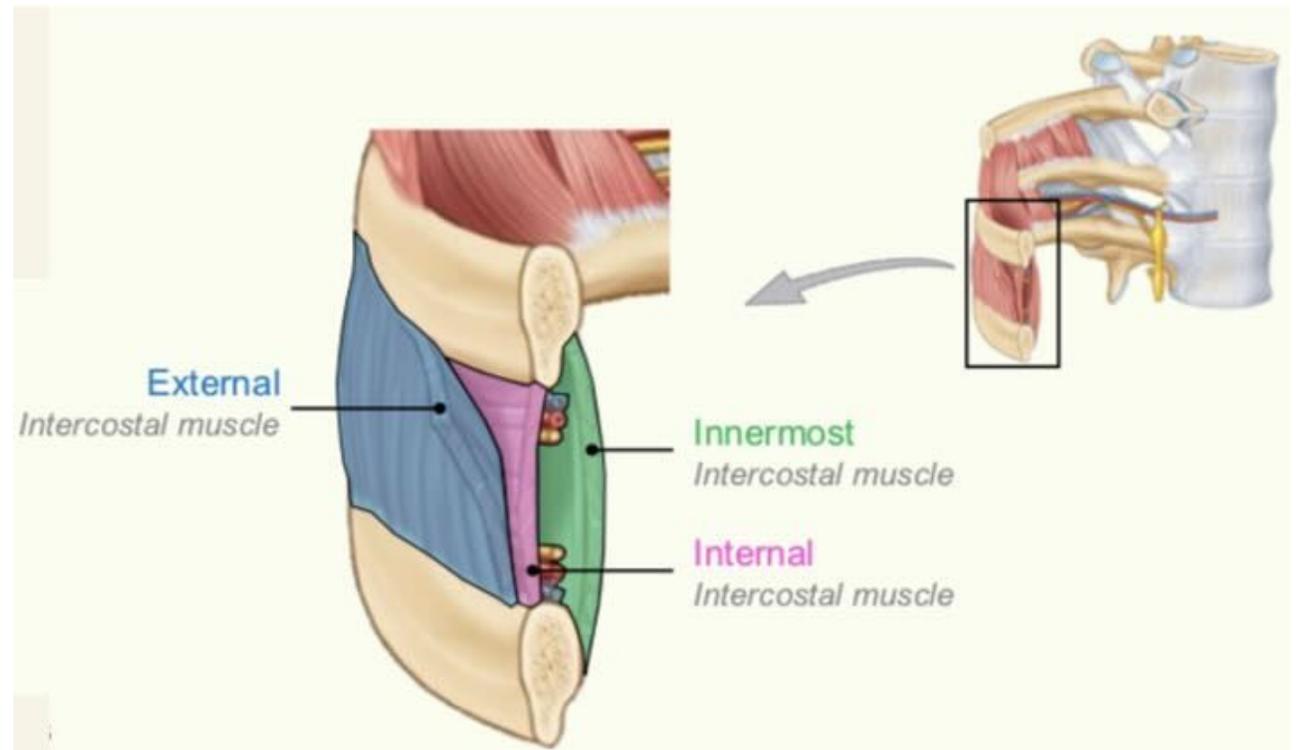
Ribs

- ▶ Functions of chest wall = protect viscera & facilitate breathing
- ▶ Movements of the ribs (due to contraction of intercostal muscles):
- ▶ Ribs 2-6 = pump handle (increases A-P dimension)
- ▶ Ribs 7-10 = bucket handle (increases lateral dimension)
- ▶ During inspiration, diaphragm flattens downwards (increases superior-inferior dimension) -> overall increase in thoracic volume



Muscles of Respiration

- ▶ External intercostals: elevate ribs, quiet and forced inspiration
- ▶ Internal intercostal: depress ribs, forced expiration (quiet expiration is passive)
- ▶ Innermost intercostals: insignificant, act with internals
- ▶ The intercostal neurovascular bundle is found between the internal and innermost intercostal muscles

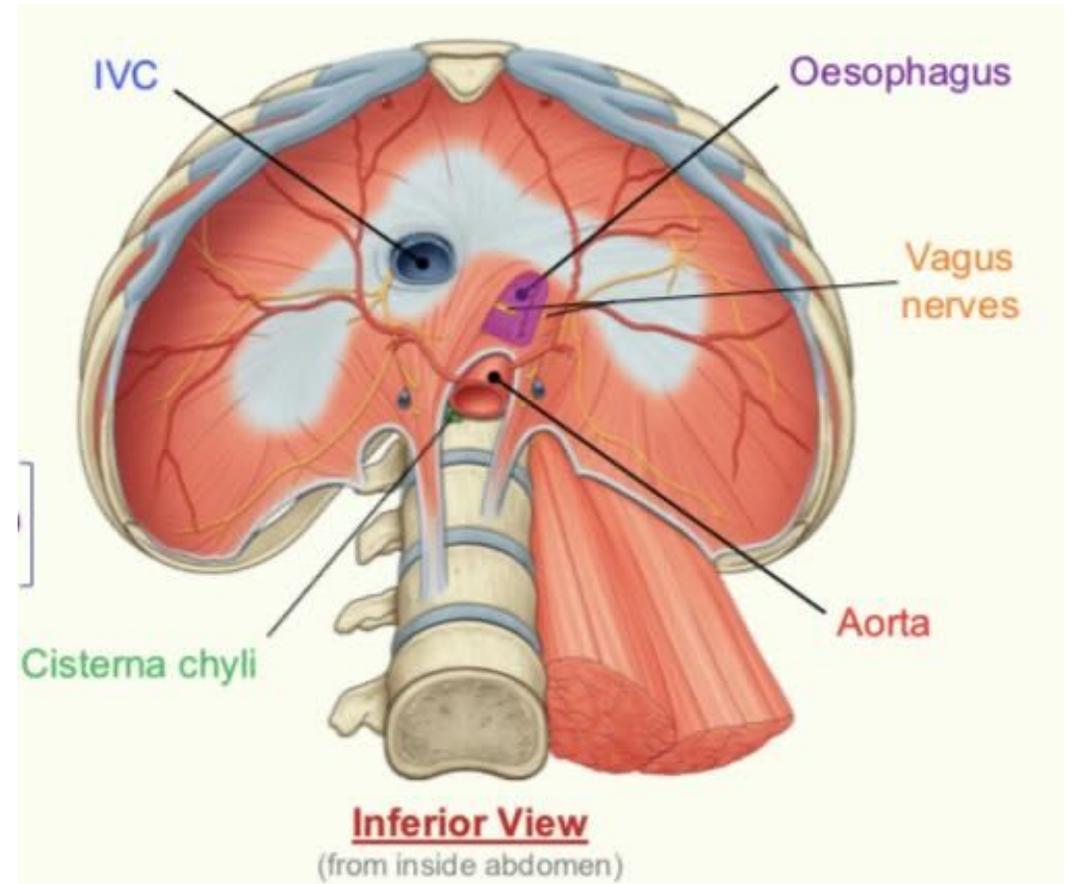


Diaphragm

- ▶ Diaphragm is innervated by phrenic nerve – roots C3,4,5 (C3,4,5 keep the diaphragm alive)

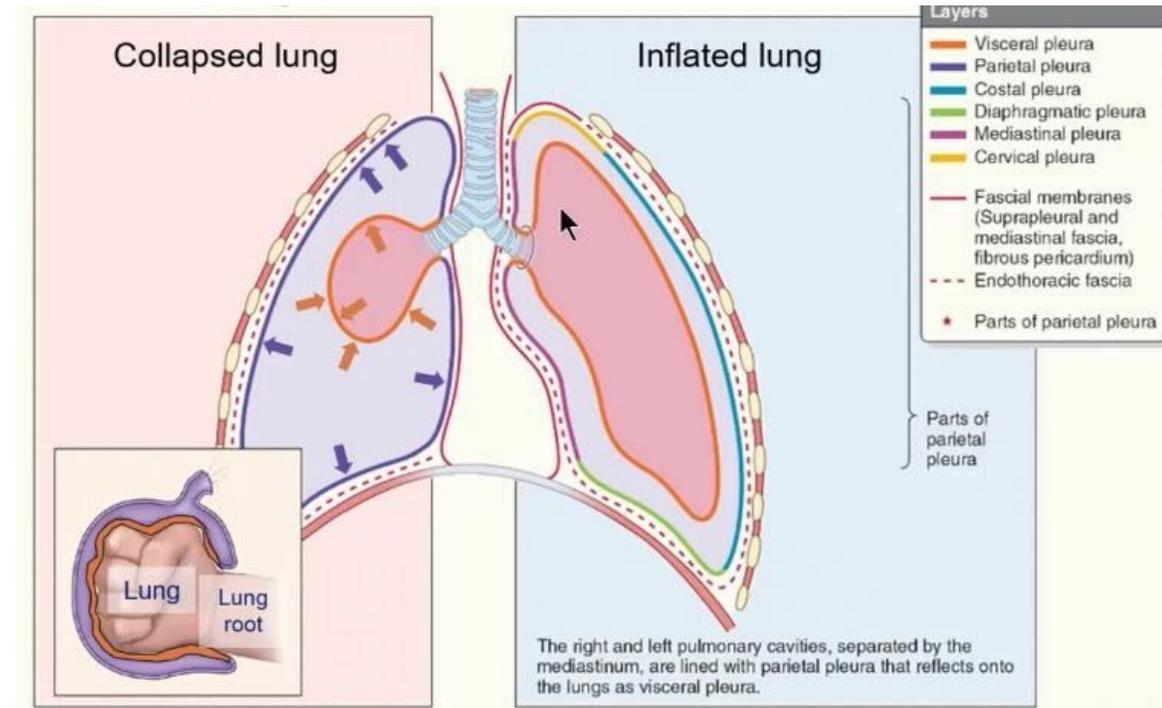
What passes through the diaphragm?

- ▶ T8: inferior vena cava
- ▶ T10: oesophagus and vagus nerve
- ▶ T12: abdominal aorta, azygous vein, cisterna chyli (becomes thoracic duct)



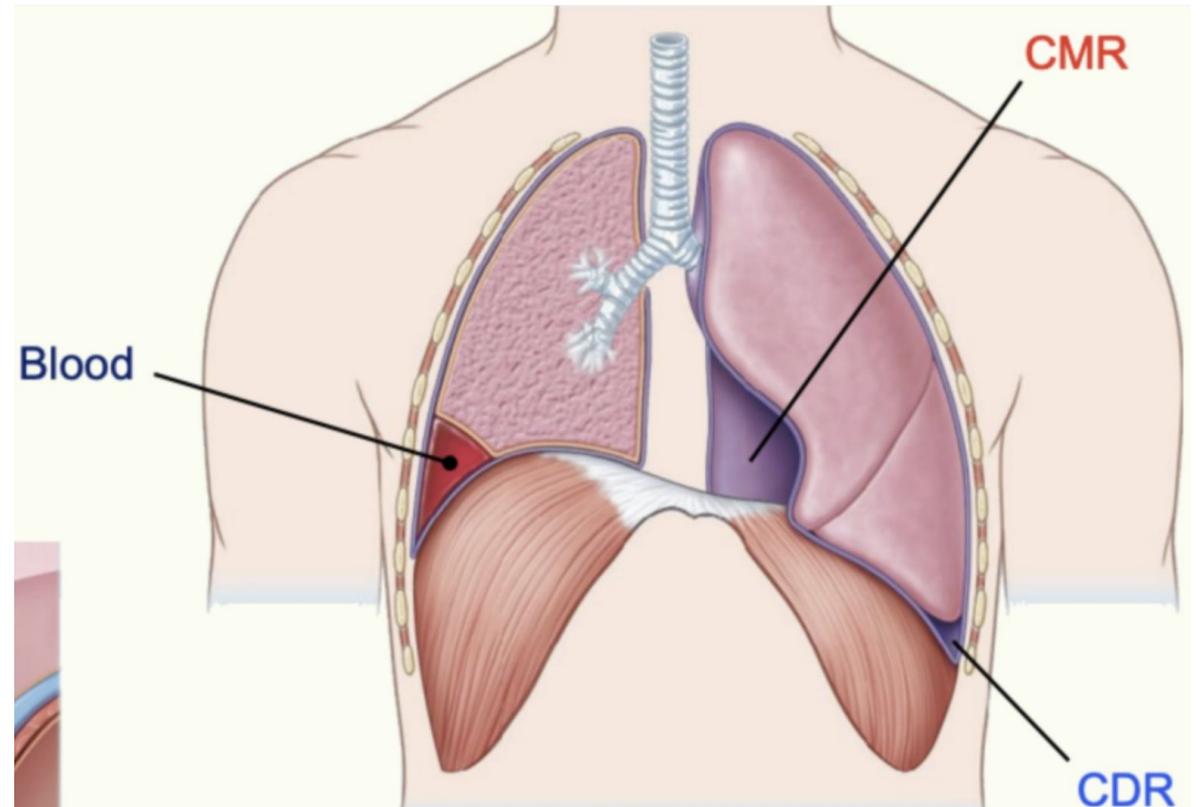
The Pleural Cavity

- ▶ Parietal pleura = lines wall of thoracic cavity
- ▶ Visceral pleura = lines surface of lungs
- ▶ Connect to each other at the lung root
- ▶ Pleural cavity = 'potential' space between parietal and visceral pleura- small in an inflated lung & large in a collapsed lung
- ▶ Contains serous fluid secreted by pleura -> increases in volume when diaphragm contracts
- ▶ Negative pleural pressure = pressure in pleural cavity is less than ('negative') atmospheric pressure
- ▶ -> forces lung expansion and drives ventilation; if greater than atmospheric pressure, can cause lung collapse



The Pleural Recesses

- ▶ Pleural cavity has natural recesses where lung doesn't fill entire thoracic space:
- ▶ Costodiaphragmatic recess (CDR) &
- ▶ costomediastinal recess (CMR)
- ▶ Fluid (including gas) can collect in these spaces; excess = pleural effusion
- ▶ Air inside the pleural cavity = pneumothorax
- ▶ Fluid drained by thoracocentesis



Questions p2

What does the trachea bifurcate into and at which level?

- a) Splits into primary bronchioles at T4
- b) Splits into main bronchus at C6
- c) Splits into primary bronchus at T4
- d) Splits into conducting bronchus at T4

Where is the intercostal neurovascular bundle found?

- a) Between the internal and external intercostal muscles
- b) Between the external and innermost muscles
- c) Between the internal and innermost intercostal muscles

What passes through the diaphragm at level T10?

- a) Abdominal aorta
- b) Oesophagus and vagus nerve
- c) Inferior vena cava
- d) Superior vena cava

What process is used to drain fluid in the pleural recesses?

- a) Culdocentesis
- b) Thoracocentesis
- c) Amniocentesis
- d) Pericardiocentesis

Answers p2

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