ANATOMY OF THE LUNGS - 1

• THE LUNGS-
  – BLOOD SUPPLY
  – INNERVATION
  – LYMPHATICS
  – SURFACE MARKING
  – SURFACE PROJECTION

• THE MEDIASTINUM

• THE PLEURAE
THE BLOOD SUPPLY OF THE LUNGS
- THE BRONCHIAL ARTERIES
- THE PULMONARY ARTERIES
Bronchial Arteries

- Supply lung parenchyma between carina & respiratory bronchioles.

**RIGHT-**
- one artery
- arises from 3rd right post intercostal artery, br of aorta

**LEFT-**
- two arteries
- arise directly from aorta
  - **sup left bronchial artery**
  - **inf left bronchial artery**
The pulmonary arteries

- The right pulmonary artery passes to right lung below aortic arch. At hilum it divides into –
  - upper branch accompanying the RUL bronchus
  - lower branch accompanying middle and lower lobe bronchi.
The pulmonary arteries (contd)

- The left pulmonary artery (shorter)
  - two branches at hilum to upper and lower lobes.
  - Connected to the aortic arch by the ligamentum arteriosum, the obliterated ductus arteriosus.
Venous Drainage of the Lungs

• The Pulmonary Veins
  – carry oxygenated blood to left atrium.

  – A main vein drains each broncho-pulmonary segment,

  – right & left sup pulmonary veins drain superior & middle & superior lobes of the respective lungs.

  – right & left inferior pulmonary veins drain inferior lobe of respective lungs.
Venous Drainage of the Lungs (contd)

• The Bronchial Veins
  – only drain the part supplied by bronchial arteries
  – right bronchial vein drains into azygos vein.
  – left bronchial vein drains into accessory hemiazygos vein / left superior intercostal vein.
Pulmonary vessels, seen in a dorsal view of the heart and lungs.
Nerves of the Lung

• **Innervation of the Lungs**
  by anterior & posterior pulmonary plexuses.

  – located ant & post to root of lung.

  – mixed plexuses -vagal (parasympathetic) & sympathetic fibres.
Sympathetic Fibres

Efferent fibres

• Inhibitors of bronchial tree (bronchodilator).

• Motor to pulmonary vs (vasoconstrictor).

• Inhibitor to glands of bronchial tree.

Afferent fibres

• Function is unknown.
Vagus Nerve (parasympathetic)

- **Efferent fibres**
  - Motor to smooth muscle of bronchial tree (bronchoconstrictor).
  - Inhibitor to pulmonary vessels (vasodilator).
  - Secretor to glands of bronchial tree (secretomotor).

- **Afferent fibres**
  - Sensory to respiratory epithelium (touch, pain) & to brs of bronchial tree (stretch).
INNERVATION OF LUNG (CONT'D)

- **Cough receptors** innervated by vagus, are located in larger bronchi & trachea. Sensitive to contact and irritants. Stimulation provokes cough reflex & bronchoconstriction.

- **Stretch receptors** within smooth muscle layer of extrapulmonary airways, excited by increase in bronchial transmural pressure. As the lung is inflated they reflexly inhibit inspiration and promote expiration.

- **J-receptors (juxtacapillary)** in substance of lung, their excitation stimulates ventilation. Pulmonary edema and pulmonary embolism may excite these receptors.

- **Irritant receptors** distributed in distal bronchioles. Irritation and local distortion may stimulate these resulting in increased ventilation (in asthma, inhalation of irritant vapours and gases, pneumonia etc). There is associated bronchoconstriction.
Lymphatics of the lung

Superficial efferents converge to end in glands at hilus; Deep efferents - conducted to hilus along pulmonary vs and bronchi, & end in tracheobronchial glands.
Lymphatics of the Lungs
Surface marking (ant)

- Apex projects 1 inch above medial 1/3 of clavicle
- Oblique fissures project anteriorly at 6th rib & costal cartilage,
- Horizontal fissure follows 4th rib on right side
- Lower borders follow costal cartilage 6 on ant side, cross rib 6 at mid-clavicular line
Surface marking (post)

- Post border of lung coincides with post pleural reflection
- Except that its lower end lies at T10
Surface Projection (ant)
Surface projection (post)

- most of lower lobe projects posteriorly
THE MEDIASTINUM
• THE MEDIASTINUM divided into:

1. SUPERIOR MEDIASTINUM
2. ANTERIOR MEDIASTINUM
3. MIDDLE MEDIASTINUM
4. POSTERIOR MEDIASTINUM
ANTERIOR MEDIASTINUM

- only on left side
- **BOUNDED**
  - in front - sternum,
  - lat - pleuræ,
  - behind - pericardium.
  **ant wall** - left
  Transversus thoracis & 5th, 6th, 7th left costal cartilages.
- **CONTENTS** - areolar ts, lymphatics from liver, lymph glands, mediastinal brs of int mammary artery.
Transverse section of thorax, (contents of middle & post mediastinum).
MIDDLE MEDIASTINUM

- heart pericardium,
- asc. aorta,
- lower ½ of SVC with azygos vein,
- bifurcation of trachea into the 2 bronchi,
- pulmonary artery dividing into its 2 brchs,
- right & left pulmonary veins,
- phrenic ns,
- bronchial lymph glands.
• **POST. MEDIASTINUM**

• **BOUNDED:** front - pericardium above, by post surface of diaphragm below, behind- T4 - T12, either side- mediastinal pleura.

• **CONTENTS** - thoracic part of desc aorta, azygos & 2 hemiazygos veins, vagus & splanchnic nvs, esophagus, thoracic duct, lymph glands.
Transverse section through T2
(SUP. MEDIASTINUM)
Superior Mediastinum

- lies between manubrium sterni & upper thoracic vertebrae.
- **BOUNDED: below** by oblique plane passing backward from junction of manubrium & body of sternum to T4 vertebra, **laterally** by pleurae.
- **CONTENTS:** Sternohyoidei & Sternothyreoidaei, Longi colli; aortic arch; innominate vs & left common carotid & left subclavian arteries; svc; left highest intercostal vein; vagus, cardiac, phrenic, & left recurrent nvs; trachea, esophagus, thoracic duct; thymus, lymph glands.
THE PLEURAE
The pleural cavities

- The pleural cavities are closed sacs enveloping each lung.
- Each cavity comprises a visceral layer and a parietal layer.
THE PLEURAL LAYERS

- Visceral layer - apposed to the lungs & cannot be dissected from the surface.
- Parietal layer - thicker, attached to walls of thorax (diaphragm, ribs, etc).
- The layers are continuous at hilum.
Pleurae-Arteries

• *Arterial Supply of Pleurae*

**Parietal pleura** - from arteries of thoracic wall (intercostal, int. thoracic, musculophrenic).

**Visceral pleura** - bronchial arteries (brs of thoracic aorta).
Nerve Supply of the Pleura

- **Parietal pleura**
  - **costal**: intercostal nvs
  - **mediastinal, diaphragmatic**: phrenic nv

- **Visceral pleura**
  - Autonomic nerves from pulmonary plexuses - spinal segments T4, T5 (not sensitive to pain)
Pleurae-Venous drainage

- **VENOUS DRAINAGE** -
  
  - **Parietal pleura** - azygos & internal thoracic veins
  
  - **Visceral pleura** - bronchial & pulmonary veins
Pleurae - Lymphatics

- **LYMPHATICS**
  
  - **Parietal pleura** - drains into intercostal, internal mammary, posterior mediastinal & diaphragmatic nodes.
  
  - **Visceral pleura** - drained by broncho-pulmonary lymph nodes.
Surface marking (pleura)

Apical pleura - covered by fascia (suprapleural membrane of Sibson’s fascia), attached to inner border of 1st rib. This prevents lung & pleura expanding too much into neck during deep inspiration.
Generally, the visceral pleura are 2 ribs more superior than the parietal pleura at mid inspiration.

- **Anteriorly**
  - (1) the pleura reach the midline at **rib 2**
  - (2) the pleura deviate to the left at **rib 4** (cardiac notch)
  - (3) the pleura deviate to the right at **rib 6**
  - (4) the visceral pleura reaches **rib 6** at the mid-clavicular line (vertical bar)
  - (5) the parietal pleura reaches **rib 8** at the mid-clavicular line (arrow)
SURFACE MARKING OF THE PLEURA (CONT'D.)

- **Laterally**

- the visceral pleura reaches **rib 8** at the mid-axillary line (vertical bar)

- the parietal pleura reaches **rib 10** at the mid-axillary line

- **Posteriorly**

- the visceral pleura reaches **rib 10**

- the parietal pleura reaches **rib 12**
All the best..