

THORAX OVERVIEW

FROM GRAY'S ANATOMY

- **ARTERIAL SUPPLY OF BREAST**
 1. Laterally – vessels from axillary artery, superior thoracic, thoraco-acromial, lateral thoracic, and subscapular
 2. Medially – branches from internal thoracic artery
 3. Second to fourth intercostal arteries
- **COSTOTRANSVERSE JOINT** – synovial joint between tubercle of rib and transverse process of related vertebrae
- **COSTOTRANSVERSE LIGAMENT**
 - Medial to costotransverse joint
 - Attaches neck of rib to transverse process of vertebra
- **LATERAL COSTOTRANSVERSE LIGAMENT**
 - Lateral to costotransverse joint
 - Attaches tip of transverse process of vertebra to roughened non-articular part of tubercle of rib
- **SUPERIOR COSTOTRANSVERSE LIGAMENT**
 - Attaches neck of rib to transverse process of vertebra above
- **CONTENTS OF COSTAL GROOVE OF RIBS**

(superior to inferior) Mnemonic – VAN

 1. Intercostal vein
 2. Intercostal artery
 3. Intercostal nerve (often not protected by groove)
- **Endothoracic Fascia** – present deep to intercostal spaces and ribs, separating them from underlying pleura
- External intercostal muscles are most active in inspiration
Internal intercostal muscles are most active during expiration
- Vessels that supply the thoracic wall consist mainly of posterior and inferior intercostal arteries, which pass around the wall between adjacent ribs in intercostal spaces.

These arteries originate from aorta and internal thoracic arteries, which in turn arise from the subclavian arteries in the root of the neck.

- **ORIGIN OF POSTERIOR INTERCOSTAL ARTERIES**

Subclavian artery → Costocervical trunk → Supreme Intercostal artery → posterior intercostal arteries

Remaining 9 pairs arise from posterior surface of thoracic aorta

- **ORIGIN OF ANTERIOR INTERCOSTAL ARTERIES**

Subclavian artery → Internal thoracic arteries → Anterior intercostal arteries

- The intercostal veins ultimately drain either into:

1. Azygos veins
2. Brachiocephalic veins
 - Left superior intercostal vein empties into left brachiocephalic vein
 - Right superior intercostal vein empties into azygos vein

- The esophagus and inferior vena cava penetrate the diaphragm; the aorta passes posterior to the diaphragm

- **ARTERIAL SUPPLY TO DIAPHRAGM**

1. Pericardiophrenic arteries
2. Musculophrenic arteries
3. Superior phrenic arteries
4. Inferior phrenic arteries

- Elevation and depression of the diaphragm significantly alter the vertical dimensions of the thorax.

Depression results when muscle fiber of the diaphragm contract.

Elevation occurs when diaphragm relaxes.

- Changes in anteroposterior and lateral dimensions result from elevation and depression of the ribs

When ribs are elevated, they move the sternum upward and forward

When ribs are depressed, the sternum moves downward and backward

- **INNERVATIONS OF PLEURA**

1. Parietal pleura – somatic afferent fibers
2. Costal pleura – branches from intercostal nerves
3. Diaphragmatic pleura and mediastinal pleura – phrenic nerves
4. Visceral pleura – visceral afferent nerves

- Within each root and located in the hilum are
 1. A pulmonary artery (superior)
 2. Two pulmonary veins (inferior)
 3. A main bronchus (posterior)
 4. Bronchial vessels
 5. Nerves
 6. Lymphatics

- The medial surface of right lung lies adjacent to a number of important structures in the mediastinum and the root of the neck. These include the:
 1. Heart
 2. Superior vena cava
 3. Inferior vena cava
 4. Azygos vein
 5. Esophagus

- The medial surface of the left lung lies adjacent to a number of important structures in the mediastinum and root of neck. These include:
 1. Heart
 2. Aortic arch
 3. Thoracic aorta
 4. Esophagus

- There are ten bronchopulmonary segments in each lung; some of them fuse in the left lung.

- **Right pulmonary artery passes:**
 - Anteriorly and slightly inferiorly to the tracheal bifurcation and anteriorly to the right main bronchus, and
 - Posteriorly to ascending aorta, superior vena cava, and upper right pulmonary vein

- Left pulmonary artery lies anterior to the descending aorta and posterior to superior pulmonary vein

- Visceral efferents (in lung and visceral pleura) from
 - The vagus nerve constricts the bronchioles
 - From sympathetic system dilates the bronchioles

- **MAJOR STRUCTURES IN ANTERIOR MEDIASTINUM:**
 1. Inferior extension of thymus gland
 2. Fat

3. Connective tissue
4. Lymph nodes
5. Mediastinal branches of internal thoracic vessels
6. Sternopericardial ligaments (passes from posterior surface of body of sternum to the fibrous pericardium)

- **MAJOR STRUCTURES IN MIDDLE MEDIASTINUM**

1. Heart
2. Pericardium
3. Origin of great vessels
4. Various nerves
5. Smaller vessels

- **MAJOR STRUCTURES IN SUPERIOR MEDIASTINUM**

1. Thymus
2. Right and left brachiocephalic veins
3. Left superior intercostal vein
4. Superior vena cava
5. Arch of aorta with its three large branches
6. Trachea
7. Esophagus
8. Phrenic nerves
9. Vagus nerves
10. Left recurrent laryngeal branch of the left vagus nerve
11. Thoracic duct
12. Other small nerves, blood vessels, and lymphatics

- **FIBROUS PERICARDIUM**

Nerve Supply – Phrenic nerves

Vessels – pericardiophrenic nerves

- **BASE OF HEART**

The base of the heart is quadrilateral and directed posteriorly. It consists of:

- The left atrium
- A small portion of the right atrium
- The proximal parts of great veins (superior and inferior venae cavae and pulmonary veins)

- **APEX OF HEART**

From the base the heart projects forward, downward, and to the left, ending in the apex. The apex of the heart is formed by the inferolateral part of the left ventricle.

- **SURFACES OF HEART**

1. **ANTERIOR SURFACE OF HEART**

- Consist mostly of right ventricle
- Some of right atrium on the right
- Some of left ventricle on the left

2. **DIAPHRAGMATIC SURFACE OF HEART**

- Consist of left ventricle
- A small portion of right ventricle

3. **LEFT PULMONARY SURFACE**

- Consist of left ventricle
- A portion of right atrium

4. **RIGHT PULMONARY SURFACE**

- Consist of right atrium

- **RADIOLOGICAL EVALUATION OF HEART**

1. **RIGHT BORDER CONSIST OF**

- Superior vena cavae
- Right atrium
- Inferior vena cavae

2. **LEFT BORDER**

- Arch of aorta
- Pulmonary trunk
- Left auricle
- Left ventricle

3. **INFERIOR BORDER**

- Right ventricle
- Left ventricle at apex

4. **LATERAL VIEW**

- Right ventricle seen anteriorly
- Left atrium visualized posteriorly

- Blood returning to the right atrium enters through one of the three vessels. These are:

- The superior and inferior venae cavae; which together deliver blood to heart from body; and
- The coronary sinus, which returns blood from the walls of the heart itself.

- **MUSCLES IN ATRIA**
 - Pectinate muscles

- **MUSCLES IN RIGHT VENTRICLE**
 - Three papillary muscles that attach to the cusps of the tricuspid valve
 1. Anterior papillary muscle
 2. Septal papillary muscle
 3. Posterior papillary muscle

- **MUSCLES IN LEFT VENTRICLE**
 - Two papillary muscles
 1. Anterior papillary muscle
 2. Posterior papillary muscle

- The papillary muscles and associated chordae tendinae keep the valves closed during the dramatic changes in ventricular size that occur during contraction.

- Pulmonary valve consist of three semilunar cusps; left, right and anterior semilunar cusps

- Unlike the crista terminalis in the right atrium, no distinct structures separates the two components of the left atrium

- Aortic valve consist of three semilunar cusps; right, left and posterior semilunar cusps. The right and left coronary arteries originate from right and left aortic sinuses.

- **BRANCHES OF RIGHT CORONARY ARTERY**
 1. Sinu-atrial nodal branch (supply SA node)
 2. Right marginal branch
 3. Posterior interventricular branch

- **BRANCHES OF LEFT CORONARY ARTERY**
 1. Anterior interventricular branch (Left anterior descending artery – LAD)
 2. Circumflex branch

- **RIGHT CORONARY ARTERY SUPPLIES**
 1. Right atrium
 2. Right ventricle
 3. SA node
 4. AV node
 5. Interatrial septum
 6. A portion of left atrium

7. Postero-inferior one-third of interventricular septum
8. A portion of posterior part of left ventricle

- **LEFT CORONARY ARTERY SUPPLIES**

1. Left atrium
2. Left ventricle
3. Most of interventricular septum
4. AV bundle and its branches

- **The coronary sinus receives four major arteries:**

1. Great cardiac vein (anterior interventricular vein)
2. Middle cardiac vein (posterior interventricular vein)
3. Small cardiac vein – is a companion of the right coronary artery throughout its course
4. Posterior cardiac vein – lies on the posterior surface of left ventricle just to the left of middle cardiac vein

- **Other veins of heart**

1. Anterior veins of right ventricle (Anterior cardiac veins)
2. Venae cordis minimae or veins of Thebesius

- **Basic components of cardiac conducting system**

1. SA node
2. AV node
3. Atrioventricular bundle with its right and left bundle branches
4. Purkinje fibers

- The pulmonary trunk is contained within the pericardial sac, is covered by visceral layer of serous pericardium, and is associated with ascending aorta in a common sheath.