MEDICAL EDUCATION RESOURCE

Facts to Remember and Clinicoanatomical Problems on Mediastinum

Facts to Remember — Mediastinum

- The **mediastinum** is the **central compartment** of the thoracic cavity, lying between the **two pleural sacs** and containing **all thoracic viscera except the lungs**.

- It extends **from the thoracic inlet (above)** to the **diaphragm (below)**, and **from the sternum (front)** to the **vertebral column (back)**.
- A **transverse plane** drawn from the **sternal angle to the lower border of T4 vertebra** divides it into:
    - **Superior mediastinum** (above)
    - **Inferior mediastinum** (below)

- The **inferior mediastinum** is further divided into:
    - **Anterior mediastinum** – in front of pericardium.
    - **Middle mediastinum** – occupied by heart and pericardium.
    - **Posterior mediastinum** – behind pericardium and in front of vertebral column.

- The **superior mediastinum** acts as a **gateway between neck and thorax**, transmitting large vessels, trachea, and esophagus.

- **From anterior to posterior**, its structures are arranged as:
  Thymus ? Veins ? Arteries ? Trachea ? Esophagus ? Thoracic Duct ? Vertebral Column.

- **Contents of Superior Mediastinum:**
  - Thymus
  - Great veins (brachiocephalic veins, SVC)
  - Arch of aorta and its branches
  - Trachea, esophagus, thoracic duct
  - Vagus, phrenic, and cardiac nerves

- **Contents of Inferior Mediastinum (Summary):**
  - **Anterior:** Thymic remnants, fat, lymph nodes, small vessels.
  - **Middle:** Heart, pericardium, ascending aorta, pulmonary trunk, SVC, phrenic nerves.
  - **Posterior:** Descending aorta, azygos system, thoracic duct, esophagus, vagus nerves, sympathetic trunks, and splanchnic nerves.

- **Arch of the aorta** lies in the **superior mediastinum**, beginning and ending at the **sternal angle (T4)**.

- The **trachea** bifurcates at the same level — an important landmark both radiologically and surgically.

- **Left recurrent laryngeal nerve** hooks around the **arch of the aorta** under the **ligamentum arteriosum**, while the **right recurrent laryngeal nerve** hooks under the **right subclavian artery**.

- The **thoracic duct**, the largest lymphatic channel, ascends through the posterior mediastinum, crosses to the left at **T5**, and ends at the **junction of left internal jugular and subclavian veins**.

- The **esophagus** passes through the **posterior mediastinum**, and pierces the diaphragm at **T10** level (esophageal hiatus).
  (Mnemonic: I 8, 10 Eggs, At 12 ? IVC T8, Esophagus T10, Aorta T12).

- The **descending thoracic aorta** gives off:
  - **Posterior intercostal arteries (3rd–11th)**
  - **Bronchial arteries**
  - **Esophageal arteries**
  - **Subcostal arteries**
  - **Pericardial and mediastinal branches**

- The **azygos vein system** provides a **collateral pathway** between the **superior and inferior vena cava**, especially important during venous obstruction.

- The **phrenic nerves** run anterior to the roots of the lungs, while the **vagus nerves** run posterior to them — a key relation for thoracic surgeries.

- The **fibrous pericardium** is firmly attached to the **central tendon of diaphragm** and **posterior sternum** (via sternopericardial ligaments).

- The **pericardial cavity** contains **a small amount of fluid** that reduces friction between heart movements.

- **Mediastinal widening** on radiographs can indicate:
    - Aortic aneurysm
    - Mediastinal tumor
    - Lymphadenopathy
    - Hemorrhage after trauma

- **Mediastinal shift** occurs:
    - **Toward** lesion in lung collapse.
    - **Away** from lesion in pleural effusion or pneumothorax.

- The **4 common tumors** of anterior mediastinum — *"Four Ts"*:
  Thymoma, Teratoma, Thyroid mass, Terrible lymphoma.

- **Cardiac tamponade** is a life-threatening accumulation of fluid in the pericardial cavity, treated by **pericardiocentesis** through **left 5th intercostal space near sternum**.

- **Referred pain** from the pericardium and diaphragmatic pleura is felt at the **shoulder tip (C4 dermatome)** via the **phrenic nerve**.

- The **posterior mediastinum** serves as a **major communication corridor** between the thorax and abdomen — transmitting aorta, esophagus, thoracic duct, and sympathetic pathways.

- Knowledge of **mediastinal divisions** is crucial for interpreting **CT, MRI, and chest radiographs**, as different diseases localize to characteristic mediastinal compartments.

Clinicoanatomical Problems — Mediastinum

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1. Mediastinal Shift

Case:
A patient with left-sided pneumothorax presents with chest pain and breathlessness.
Anatomical Basis:
The accumulation of air in the left pleural cavity increases intrathoracic pressure, pushing the **mediastinum to the opposite side**.
This compresses the contralateral lung and great veins, reducing venous return and cardiac output.
In contrast, **lung collapse or fibrosis** may pull the mediastinum **toward** the affected side.

2. Superior Vena Cava (SVC) Obstruction

Case:
A patient with bronchogenic carcinoma develops swelling of face, neck, and upper limbs with visible dilated chest veins.
Anatomical Basis:
The **SVC lies in the superior mediastinum**, and its obstruction (by tumor or lymph nodes) blocks venous drainage from the upper body.
Collateral flow occurs through the **azygos system, internal thoracic, and vertebral veins**, but venous congestion causes **cyanosis and edema of face and arms**.

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3. Aortic Aneurysm

Case:
A middle-aged man complains of chest pain radiating to the back and difficulty swallowing.
Anatomical Basis:
An **aneurysm of the arch of the aorta** in the superior mediastinum may compress:

- **Trachea** ? cough, dyspnea.
- **Esophagus** ? dysphagia.
- **Left recurrent laryngeal nerve** ? hoarseness of voice.
- **Sympathetic chain** ? Horner’s syndrome (ptosis, miosis, anhidrosis).

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4. Mediastinal Widening

Case:
A trauma patient’s chest X-ray shows a widened mediastinum.
Anatomical Basis:
Widening may indicate **aortic rupture**, **lymphadenopathy**, or **hematoma** within the loose areolar tissue of the mediastinum.

Immediate imaging and surgical exploration are essential to rule out **aortic dissection**.

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5. Mediastinal Tumors

Case:
A young adult presents with cough, chest heaviness, and venous congestion.
Anatomical Basis:
Tumors in specific mediastinal compartments cause characteristic syndromes:

- **Anterior mediastinum:** thymoma, teratoma, thyroid mass, lymphoma (the “4 Ts”).
- **Middle mediastinum:** pericardial cysts or lymphadenopathy compressing heart/great veins.
- **Posterior mediastinum:** neurogenic tumors compressing sympathetic chain or esophagus.

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6. Mediastinal Emphysema

Case:
A patient after blunt chest trauma develops neck swelling with a crackling sensation on palpation.
Anatomical Basis:
Rupture of alveoli or tracheobronchial tree allows **air to escape into the mediastinum**, which then spreads to subcutaneous tissue of neck and face, producing **surgical emphysema**.
Air may track along fascial planes into the neck and retroperitoneum.

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7. Mediastinitis

Case:
Post-esophageal surgery, a patient develops fever, chest pain, and difficulty breathing.
Anatomical Basis:
Infection spreads through **loose connective tissue** of mediastinum — an area continuous with neck fascial planes.

This leads to **acute suppurative mediastinitis**, which may cause **sepsis or pericardial infection**.
Rapid diagnosis and drainage are crucial.

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8. Pericardial Effusion and Cardiac Tamponade

Case:
A patient with tuberculosis develops hypotension, distended neck veins, and muffled heart sounds.
Anatomical Basis:
Fluid accumulation in the **pericardial cavity (middle mediastinum)** compresses the heart, impairing ventricular filling — a condition known as **cardiac tamponade**.
It is relieved by **pericardiocentesis**, performed through the **left 5th intercostal space near the sternum**.

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9. Esophageal Compression

Case:
A patient with difficulty swallowing is found to have a posterior mediastinal mass.
Anatomical Basis:
The **esophagus** lies in the **posterior mediastinum**, closely related to the **aorta, left bronchus, and heart**.
Compression or invasion by an aneurysm, tumor, or enlarged lymph nodes leads to **dysphagia**.

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10. Chylothorax

Case:
After esophageal surgery, a patient develops milky pleural effusion.
Anatomical Basis:
Injury to the **thoracic duct** (posterior mediastinum) causes leakage of **chyle (lymph rich in fat)** into the pleural cavity.
This results in **chylothorax**, which may require surgical ligation of the duct.

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11. Azygos Vein Enlargement

Case:
A patient with right heart failure shows a paratracheal shadow on chest X-ray.
Anatomical Basis:
The **azygos vein** in the posterior mediastinum becomes distended due to **back pressure**.
It provides an important **collateral pathway** between superior and inferior vena cava.

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12. Thymic Enlargement (Thymoma)

Case:
A middle-aged woman with myasthenia gravis presents with chest fullness and venous congestion.
Anatomical Basis:
The **thymus**, located in the **anterior and superior mediastinum**, may enlarge or develop a **tumor** (thymoma).
It compresses the **SVC or trachea**, and is strongly associated with **autoimmune neuromuscular disorders**.

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13. Hiatus Hernia

Case:
A patient reports regurgitation and retrosternal pain after meals.
Anatomical Basis:
Herniation of the stomach through the **esophageal opening of the diaphragm (T10)** brings part of the stomach into the **posterior mediastinum**, causing reflux and pain.

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14. Horner’s Syndrome due to Mediastinal Mass

Case:
A patient has unilateral ptosis, miosis, and facial anhidrosis.
Anatomical Basis:
Compression of the **sympathetic trunk** in the **posterior mediastinum** by a tumor (neurogenic or bronchogenic) disrupts sympathetic pathways to the head and neck.

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15. Mediastinal Pain and Referred Symptoms

Case:

A patient with pericarditis complains of pain radiating to the left shoulder and neck.

Anatomical Basis:

The **fibrous pericardium and diaphragmatic pleura** are supplied by the **phrenic nerve (C3–C5)**.

Inflammation in the middle mediastinum causes **referred pain** to the shoulder tip area corresponding to the **C4 dermatome**.