MEDICAL EDUCATION RESOURCE

Mnemonics, Facts to Remember and Clinicoanatomical problems

Mnemonics — Thoracic Cavity and Pleurae

1. Parts of Parietal Pleura

Mnemonic: *“Come Down My Chest”*

- **C** ? *Costal pleura*
- **D** ? *Diaphragmatic pleura*
- **M** ? *Mediastinal pleura*
- **C** ? *Cervical pleura*

These are the four regions of the parietal pleura lining the thoracic wall, diaphragm, mediastinum, and the apex of the lung respectively.

2. Recesses of Pleura

Mnemonic: *“Cool Cat”*

- **C** ? *Costomediastinal recess*
- **C** ? *Costodiaphragmatic recess*

These are potential spaces of the pleural cavity into which the lungs expand during deep inspiration.

3. Nerve Supply of Pleura

Mnemonic: *“I Miss Pain”*

- **I** ? *Intercostal nerves* (for costal and peripheral diaphragmatic pleurae)
- **M** ? *Mediastinal pleura* (by phrenic nerve)
- **P** ? *Phrenic nerve (C4)* for central diaphragmatic pleura
- **A** ? *Autonomic nerves* for visceral pleura (sympathetic and parasympathetic)
- **I** ? *Insensitive to pain* (visceral pleura)
- **N** ? *Nerve roots from T2–T5 (sympathetic)* and *vagus nerve (parasympathetic)*

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4. Layers Pierced During Pleural Tap (Paracentesis Thoracis)

Mnemonic: *“Some Doctors Intervene Carefully, Preventing Pain”*

- **S** ? *Skin*
- **D** ? *Deep fascia*
- **I** ? *Intercostal muscles* (external, internal, innermost)
- **C** ? *Costal parietal pleura*
- **P** ? *Pleural cavity*

This sequence helps recall the structures traversed by the needle during pleural tapping.

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5. Causes of Air or Fluid in Pleural Cavity

Mnemonic: *“PHEHE”*

- **P** ? *Pneumothorax* – Air
- **H** ? *Haemothorax* – Blood
- **E** ? *Empyema* – Pus
- **H** ? *Hydropneumothorax* – Air + Fluid
- **E** ? *Effusion (Pleural)* – Serous fluid

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6. Boundaries of Costodiaphragmatic Recess

Mnemonic: *“Ribs Dine Medially”*

- **Ribs** ? *Costal pleura (outer wall)*
- **Diaphragm** ? *Diaphragmatic pleura (floor)*
- **Medially** ? *Mediastinal pleura (medial wall)*

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7. Pain Referral in Pleurisy

Mnemonic: *“Shoulder for Phrenic, Chest for Intercostal”*

- Irritation of **phrenic nerve** ? pain at **shoulder tip** (C4 dermatome).
- Irritation of **intercostal nerves** ? pain along **thoracic wall**.

These mnemonics simplify recall of **pleural anatomy, innervation, and clinical procedures**, making them ideal for quick revision during **viva or exams**.

Facts to Remember — Thoracic Cavity and Pleurae

- The **thoracic cavity** is divided into **three parts**: right pleural cavity, left pleural cavity, and the **mediastinum** in the centre.
- Each **pleural cavity** is lined by a **serous membrane** called the **pleura**, which has two layers — **parietal** and **visceral**.
- The **pleural cavity** contains a **thin film of serous fluid**, which lubricates the surfaces and allows smooth movement of lungs during respiration.
- **Parts of parietal pleura:**
    - *Costal pleura* — lines ribs and intercostal spaces.
    - *Diaphragmatic pleura* — covers diaphragm's upper surface.
    - *Mediastinal pleura* — forms lateral wall of mediastinum.
    - *Cervical pleura (cupula)* — extends into the root of neck.
- The **pleural reflections** mark the junctions of various parts of the pleura; they form **recesses** where the lungs expand during deep inspiration.
- The **costodiaphragmatic recess** is the **deepest part** of pleural cavity, situated between the **8th and 10th ribs** along the midaxillary line.
- The **costomediastinal recess** is more prominent on the **left side**, near the **cardiac notch** of the left lung.
- The **pulmonary ligament** is a **double fold of pleura** below the lung root that allows **descent of the lung root** during inspiration.

- The **parietal pleura** is **pain sensitive**, supplied by **intercostal nerves** and **phrenic nerve**.
    - *Costal and peripheral diaphragmatic pleurae* ? intercostal nerves.
    - *Mediastinal and central diaphragmatic pleurae* ? phrenic nerve.
- The **visceral pleura** is **pain insensitive**, supplied by **autonomic nerves** (sympathetic and vagal).
- **Blood supply:**
    - Parietal pleura ? intercostal, internal thoracic, and musculophrenic arteries.
    - Venous return ? azygos and internal thoracic veins.
- **Lymphatic drainage:**
    - Anteriorly ? internal mammary nodes.
    - Posteriorly ? posterior intercostal nodes ? thoracic duct.
- **Clinical conditions:**
    - *Pleurisy* ? inflammation of pleura with severe pain due to parietal pleural irritation.
    - *Pleural effusion* ? collection of fluid in pleural cavity.
    - *Pneumothorax* ? air in pleural cavity causing lung collapse.
    - *Haemothorax* ? accumulation of blood.
    - *Empyema* ? pus in pleural cavity.

- **Referred pain:**
    - *Intercostal nerve supply* ? pain along chest wall.
    - *Phrenic nerve supply* ? pain referred to **shoulder tip (C4 dermatome)**.
- **Pleural tap (paracentesis thoracis):**
    - Needle inserted in **lower intercostal space**, just **above the upper border of a rib**, to avoid injury to intercostal vessels and nerve.
- The **pleura is derived embryologically** from **mesoderm** — parietal pleura from **somatopleuric layer**, and visceral pleura from **splanchnopleuric layer**.
- The **pleural cavity** is a **potential space** — under normal conditions, it contains only a minimal amount of fluid to reduce friction between the pleural surfaces.

These facts give a concise yet complete overview of the **thoracic cavity and pleura**, integrating their **structure, nerve supply, and clinical significance** for quick revision.

Clinicoanatomical Problem — Thoracic Cavity and Pleurae

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1. Case of Pleuritic Pain

Problem:
A 40-year-old patient presents with severe, sharp pain on the right side of the chest that worsens during deep breathing and coughing.

Diagnosis:
Acute Pleurisy (Pleuritis)

Anatomical Explanation:

- The **parietal pleura** (especially costal part) is supplied by **intercostal nerves**, making it pain-sensitive.
- Inflammation causes friction between pleural layers, producing sharp, localized pain along the affected intercostal dermatome.
- The **visceral pleura** is insensitive to pain, so discomfort is absent if only it is involved.

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2. Referred Shoulder Pain in Diaphragmatic Pleurisy

Problem:
A patient with right-sided pleural effusion complains of pain in the right shoulder tip.

Diagnosis:
Referred pain due to diaphragmatic pleurisy

Anatomical Explanation:

- The **central diaphragmatic pleura** and **mediastinal pleura** are supplied by the **phrenic nerve (C4)**.
- The **C4 dermatome** corresponds to the **shoulder tip**, hence irritation is perceived as shoulder pain.

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3. Pleural Effusion

Problem:
A 50-year-old man develops breathlessness and dullness on percussion over the right lower chest. X-ray shows fluid level in the pleural cavity.

Diagnosis:
Pleural Effusion

Anatomical Explanation:

- Fluid collects in the **costodiaphragmatic recess**, the most dependent part of the pleural cavity.

- As the fluid accumulates, it compresses the underlying lung, reducing expansion and causing dyspnea.

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4. Pneumothorax after Chest Trauma

Problem:
A young man develops sudden breathlessness following a stab wound to the chest.

Diagnosis:
Pneumothorax

Anatomical Explanation:

- The penetrating wound allows air to enter the **pleural cavity**, destroying the negative intrapleural pressure and causing **lung collapse**.

- If air enters during inspiration but cannot escape during expiration, **tension pneumothorax** develops — a medical emergency causing mediastinal shift.

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5. Thoracocentesis (Pleural Tap)

Problem:
Where should the needle be inserted for safe aspiration of pleural fluid?

Answer:

- The needle should be introduced **in the lower intercostal space**, **just above the upper border of a rib** (commonly in the **8th intercostal space, midaxillary line**).

- This avoids injury to the **intercostal vein, artery, and nerve** lying in the costal groove of the rib above.

6. Empyema

Problem:
A patient with pneumonia develops fever, chest pain, and accumulation of pus in the pleural cavity.

Diagnosis:
Empyema Thoracis

Anatomical Explanation:

- Infection spreads from the lung parenchyma through the **visceral pleura** into the **pleural cavity**.
- The **pleural cavity** becomes filled with purulent fluid, often requiring drainage.

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7. Haemothorax

Problem:
After a road accident, a patient's X-ray reveals fluid level consistent with blood in the pleural cavity.

Diagnosis:
Haemothorax

Anatomical Explanation:

- Rupture of **intercostal vessels** or **internal thoracic artery** causes bleeding into the **pleural cavity**.
- The **costodiaphragmatic recess** fills first, leading to respiratory distress.

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8. Pulmonary Collapse

Problem:
A patient with penetrating chest injury shows collapsed right lung with tracheal deviation to the opposite side.

Diagnosis:
Tension Pneumothorax

Anatomical Explanation:

- One-way entry of air into the pleural cavity raises intrathoracic pressure.
- This compresses the opposite lung and shifts the **mediastinum**, compromising venous return and causing respiratory failure.

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9. Recurrent Pleural Effusion in Tuberculosis

Problem:
A 30-year-old patient with tuberculosis presents with recurrent right-sided pleural effusion.

Anatomical Explanation:

- Tubercular infection causes **exudation into the pleural cavity** and thickening of the pleura.
- Repeated inflammation leads to **pleural adhesions** and **restricted lung expansion**.

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10. Phrenic Nerve Irritation

Problem:
A patient with lower lobe pneumonia experiences shoulder pain and hiccups.

Diagnosis:
Irritation of phrenic nerve due to diaphragmatic pleurisy

Anatomical Explanation:

- The **phrenic nerve (C3–C5)** supplies the **diaphragm and its pleura**.
- Inflammation irritates the nerve, producing **referred pain to the shoulder (C4)** and **hiccups** due to diaphragmatic spasm.

Additional Clinicoanatomical Problems — Thoracic Cavity and Pleurae

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1. Dry Pleurisy

Problem:
A patient complains of sharp, stabbing chest pain on deep inspiration but no fluid collection is found on imaging.

Diagnosis:
Dry (Fibrinous) Pleurisy

Anatomical Explanation:

- Inflammation of the **parietal pleura** causes its roughened surfaces to rub against the visceral pleura during breathing, producing **pleuritic friction rub** and severe localized pain.
- Since the **parietal pleura** is supplied by **intercostal and phrenic nerves**, the pain is sharp and well localized.

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2. Adhesive Pleura

Problem:
A patient who had recurrent pleurisy now shows thickened, adherent pleural layers with restricted lung movement.

Diagnosis:
Pleural Adhesion (Fibrosis)

Anatomical Explanation:

- Repeated inflammation leads to fibrosis of the **parietal and visceral pleura**, obliterating the pleural cavity.
- The normally smooth movement of pleurae is lost, leading to **stiff lungs** and **reduced ventilation**.

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3. Chylothorax

Problem:
After an injury to the neck, a patient develops accumulation of milky white fluid in the pleural cavity.

Diagnosis:
Chylothorax

Anatomical Explanation:

- Damage to the **thoracic duct** (especially near its termination in the left venous angle) causes leakage of **lymph (chyle)** into the **left pleural cavity**.
- The fluid has a characteristic **milky appearance** due to its high fat content.

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4. Open Pneumothorax

Problem:
Following a penetrating chest wound, air enters and escapes freely through the chest wall during respiration.

Diagnosis:
Open Pneumothorax

Anatomical Explanation:

- Air moves in and out of the pleural cavity with each breath, preventing normal lung expansion.
- Negative intrapleural pressure is lost, and the affected lung collapses.
- The **mediastinum** may swing with respiration (**mediastinal flutter**), impairing venous return.

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5. Tension Pneumothorax

Problem:
A patient develops severe dyspnea, tracheal deviation, and cyanosis following chest trauma.

Diagnosis:
Tension Pneumothorax

Anatomical Explanation:

- Air enters the pleural cavity during inspiration but cannot escape during expiration due to a flap-valve effect.
- The pressure rises, compressing the opposite lung and shifting the **mediastinum** to the opposite side, reducing **venous return** and **cardiac output** — a life-threatening emergency.

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6. Diaphragmatic Pleurisy Mimicking Abdominal Pain

Problem:
A patient with basal pneumonia complains of pain in the right upper abdomen.

Diagnosis:
Referred pain due to diaphragmatic pleurisy

Anatomical Explanation:

- The **diaphragmatic pleura** (central part) is supplied by the **phrenic nerve (C4)**.
- Irritation refers pain to the **right shoulder** and **upper abdomen**, simulating **gallbladder or hepatic pain**.

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7. Hydrothorax in Congestive Heart Failure

Problem:
A patient with congestive heart failure develops fluid accumulation in both pleural cavities.

Diagnosis:
Hydrothorax

Anatomical Explanation:

- Increased **venous pressure** in systemic and pulmonary circulation leads to **transudation of fluid** into the pleural cavity.
- The **costodiaphragmatic recess** fills first, restricting lung expansion.

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8. Fibrothorax

Problem:
A patient recovering from tuberculous pleurisy shows dense pleural fibrosis causing mediastinal shift.

Diagnosis:
Fibrothorax

Anatomical Explanation:

- Chronic infection or effusion leads to **organization of exudate**, forming a thick fibrous layer.

- This causes **lung entrapment** and **restricted ventilation**, with possible deviation of mediastinum toward the affected side.

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9. Pleuritic Pain after Thoracic Surgery

Problem:
A patient complains of severe pain over the chest wall after thoracotomy.

Diagnosis:
Intercostal nerve irritation or entrapment

Anatomical Explanation:

- The **intercostal nerves** lie in the **costal groove** under each rib.
- If sutures or retractors compress these nerves, **neuralgic pain** arises along the thoracic wall dermatomes.

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10. Subpulmonic Effusion

Problem:
An X-ray shows elevation of the diaphragm due to fluid under the lower lung base.

Diagnosis:
Subpulmonic Pleural Effusion

Anatomical Explanation:

- Fluid collects between the **diaphragmatic pleura** and the **base of the lung**, often misinterpreted as diaphragmatic elevation.
- The **costophrenic angle** becomes blunted on imaging.

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11. Phrenic Nerve Palsy and Pleural Pain

Problem:
A patient with lung cancer involving the mediastinum presents with unilateral diaphragmatic paralysis and shoulder pain.

Diagnosis:
Phrenic nerve involvement secondary to mediastinal pleural irritation

Anatomical Explanation:

- The **mediastinal pleura** is supplied by the **phrenic nerve**.
- Tumor infiltration irritates the nerve, leading to **referred shoulder pain** and **diaphragmatic paralysis** on the same side.

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12. Pneumothorax in Tall Thin Males

Problem:
A young, tall, thin man develops sudden breathlessness without trauma.

Diagnosis:
Spontaneous Pneumothorax

Anatomical Explanation:

- Rupture of a **subpleural bleb** (small air blister) allows air into the pleural cavity.
- The resulting loss of negative intrapleural pressure causes **partial or complete lung collapse**.

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13. Pleural Thickening after Empyema

Problem:
A patient treated for empyema develops a non-expanding lung despite clear X-ray.

Diagnosis:
Trapped Lung due to Pleural Thickening

Anatomical Explanation:

- Organization of pus in the pleural cavity forms a **fibrous peel** on the visceral pleura, preventing lung expansion even after drainage.

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14. Malignant Pleural Effusion

Problem:
A patient with known bronchogenic carcinoma develops massive right-sided pleural effusion.

Diagnosis:
Malignant (Secondary) Pleural Effusion

Anatomical Explanation:

- Tumor invasion of **parietal pleura** or **blockage of pleural lymphatics** causes accumulation of malignant exudate.

- Cytological examination of pleural fluid confirms malignant cells.

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15. Pneumothorax following Central Line Insertion

Problem:
A patient develops sudden dyspnea and decreased breath sounds after attempted subclavian vein catheterization.

Diagnosis:
Iatrogenic Pneumothorax

Anatomical Explanation:

- The **cervical pleura (cupula)** projects into the neck above the first rib.

- Accidental puncture during central line insertion allows air to enter the pleural cavity, collapsing the lung apex.