Clinical Anatomy,Facts to Remember,Clinicoanatomical Problem

Clinical Anatomy of the Walls of Thorax

1. Intercostal Neuralgia

- Pain caused by irritation or inflammation of an **intercostal nerve**, often due to **herpes zoster**, **trauma**, or **compression**.
- The pain follows a **dermatomal distribution**, typically unilateral and severe, and worsens with coughing or deep breathing.

2. Herpes Zoster (Shingles)

- Reactivation of the **varicella-zoster virus** in the dorsal root ganglion produces a **painful vesicular rash** along the affected intercostal space.
- The condition demonstrates the **segmental nature** of intercostal nerves.
- Lesions and pain are confined to one side of the thorax.

3. Intercostal Nerve Block

- Local anesthetic injection near the **inferior border of a rib** to block intercostal nerves for **pain relief** after rib fractures or thoracic surgery.
- Usually given at multiple levels since adjacent dermatomes overlap.
- Care is taken to avoid injury to the **pleura** and **intercostal vessels**.

4. Rib Fracture

- Commonly occurs near the **angle of the rib**, where the bone is weakest.
- Multiple fractures can cause a **flail chest**, leading to paradoxical respiratory movement—depression during inspiration and bulging during expiration.

5. Thoracocentesis (Pleural Tap)

- Performed to **aspirate pleural fluid**; needle inserted **just above the upper border** of a rib to avoid the **neurovascular bundle** in the costal groove.
- Common site: **7th or 8th intercostal space** in the midaxillary line.

6. Azygos System in Venous Obstruction

- The **azygos and hemiazygos veins** provide an important **collateral pathway** between the superior and inferior vena cava.
- During **IVC obstruction**, venous blood from the lower body can bypass through this system to the **SVC**.

7. Internal Thoracic Artery in CABG

- The **internal thoracic artery** is preferred for **coronary artery bypass grafting (CABG)** because it is resistant to atherosclerosis and remains patent for years.
- The artery runs close to the **sternum**, hence care is required during **sternal puncture** or **chest surgery**.

8. Referred Pain from Parietal Pleura

- The **parietal pleura** of the thoracic wall receives sensory fibres from intercostal nerves, hence pleuritic inflammation may cause **sharp chest pain** localized along the intercostal space.

9. Damage to Sympathetic Trunk

- Injury to the **thoracic sympathetic trunk** (especially upper part) may produce **Horner's syndrome**, characterized by **ptosis**, **miosis**, and **anhidrosis** on the affected side.

10. Mediastinal Collateral Circulation

- In **SVC obstruction**, blood can flow from **upper thoracic intercostal veins ? azygos ? hemiazygos ? lumbar veins ? IVC**, maintaining venous return.

- Prominent **chest wall veins** are visible clinically in such cases.

Facts to Remember — Walls of Thorax

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- **Arrangement in the Costal Groove:**
  Structures from above downward are — **Vein, Artery, Nerve (VAN)**.

- **Muscular Layers of Intercostal Space:**
  From superficial to deep — **External intercostal, Internal intercostal, Innermost intercostal**.

- **Neurovascular Plane:**
  Lies between **internal** and **innermost intercostal muscles**.

- **First Rib Distinction:**
  The **first intercostal space** lacks an **intercostal muscle**, being filled with **fibrous tissue** .

- **Branches of Posterior Intercostal Artery:**
  - **Dorsal branch:** to vertebrae and muscles of back.
  - **Collateral branch:** runs along upper border of rib below.
  - **Lateral cutaneous branch:** supplies overlying skin.
- **Source of Intercostal Arteries:**
  - **Posterior intercostal arteries:** from **thoracic aorta** (except 1st & 2nd spaces, from superior intercostal artery).
  - **Anterior intercostal arteries:** from **internal thoracic** (upper six) and **musculophrenic artery** (lower spaces).
- **Drainage of Intercostal Veins:**
  - Right side ? **Azygos vein**.
  - Left upper spaces ? **Left superior intercostal vein**.
  - Left lower spaces ? **Hemiazygos and accessory hemiazygos veins**.
- **Lymphatic Drainage:**
  - **Anterior intercostal lymphatics** ? Internal mammary (parasternal) nodes.
  - **Posterior intercostal lymphatics** ? Posterior intercostal nodes ? Thoracic duct or bronchomediastinal trunk.
- **Internal Thoracic Artery:**

- Arises from **first part of subclavian artery**.
- Divides into **superior epigastric** and **musculophrenic arteries** at the **6th intercostal space**.
- Lies **1 cm lateral to the sternum**.

- **Azygos System of Veins:**
  - **Azygos vein** drains right posterior thoracic wall.
  - **Hemiazygos vein** drains lower left spaces.
  - **Accessory hemiazygos vein** drains upper left spaces.
  - Provides **collateral venous pathway** between **superior and inferior vena cava**.
- **Sympathetic Trunk:**
  - Lies anterior to **neck of ribs**.
  - Gives rise to **greater (T5–T9), lesser (T10–T11), and least (T12) splanchnic nerves**.
- **Clinical Associations:**
  - **Herpes zoster** involves intercostal nerves.
  - **Thoracocentesis** performed above upper border of rib to avoid intercostal neurovascular bundle.
  - **Internal thoracic artery** used in **CABG**.

- **Azygos system** provides collateral flow in **vena caval obstruction**.

Clinicoanatomical Problems — Walls of Thorax

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1. Case of Intercostal Neuralgia

Problem:
A 45-year-old patient complains of sharp, stabbing pain along the right chest wall, increasing on coughing or deep breathing.
Anatomical Explanation:
Pain follows the course of the **intercostal nerve**, commonly due to compression, inflammation, or viral infection (herpes zoster). The pain distribution corresponds to the **dermatome** supplied by the affected nerve.

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2. Flail Chest after Trauma

Problem:
A man with multiple rib fractures shows a segment of chest wall moving inward during inspiration and bulging outward during expiration.
Anatomical Explanation:
Fractures in **two or more adjacent ribs at two points** produce a **free-floating segment** called a flail chest. It moves paradoxically to the rest of the thoracic wall, impairing respiration and oxygenation.

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3. Post-Thoracotomy Pain

Problem:
After thoracic surgery, the patient has persistent neuralgic pain along the incision line.
Anatomical Explanation:
Pain arises due to injury or entrapment of **intercostal nerves** running along the **costal groove**. Surgical incisions should therefore be placed **just above the upper border of a rib**.

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4. Intercostal Nerve Block

Problem:
A patient with multiple rib fractures is given an intercostal nerve block for pain relief.
Anatomical Explanation:
The anesthetic is injected near the **inferior border of the rib above**, where the intercostal nerve runs in the neurovascular bundle. Blocks are given at **several levels** due to overlapping dermatomes.

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5. Herpes Zoster Eruption

Problem:
A vesicular rash appears over the left side of the chest along one intercostal space.
Anatomical Explanation:
Reactivation of latent **varicella-zoster virus** in the **dorsal root ganglion** of the corresponding thoracic nerve produces pain and rash along the **nerve's dermatome**.

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6. Thoracocentesis Site

Problem:
A doctor plans to remove fluid from the pleural cavity. Where should the needle be inserted?
Anatomical Explanation:
The needle is introduced **just above the upper border of the rib** (commonly in the **7th or 8th intercostal space** in the midaxillary line) to avoid damaging the **intercostal vessels and nerve** lying in the costal groove.

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7. Referred Pain from Pleurisy

Problem:
A patient with pleural effusion complains of sharp pain along the chest wall.
Anatomical Explanation:
The **parietal pleura** of the thoracic wall is supplied by **intercostal nerves**, hence inflammation causes pain referred to the same intercostal dermatome.

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8. Internal Thoracic Artery in CABG

Problem:
Why is the internal thoracic artery preferred for coronary bypass grafting?
Anatomical Explanation:
It has a **strong wall**, **excellent collateral supply**, and **resistance to atherosclerosis**. It can be mobilized easily from the posterior surface of the **anterior thoracic wall** for anastomosis with a coronary artery.

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9. Azygos Vein Dilatation

Problem:
CT scan shows a markedly dilated azygos vein in a patient with inferior vena cava obstruction.
Anatomical Explanation:
The **azygos system** provides a **collateral venous pathway** between the superior and inferior vena cava. In IVC blockage, blood from the lower body ascends via the **azygos and hemiazygos veins** to reach the SVC.

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10. Horner’s Syndrome

Problem:
A patient presents with ptosis, miosis, and anhidrosis on one side of the face.
Anatomical Explanation:
Lesion of the **upper thoracic sympathetic trunk** (especially T1) interrupts sympathetic fibres to the **eye and face**, producing **Horner’s syndrome**.