Trauma to the Thorax

Thoracic Trauma: A Leading Cause of Trauma Mortality

25%

Traumatic Deaths

Chest injuries account for a quarter of all traumatic deaths worldwide.

70–80%

Motor Vehicle Collisions

The primary mechanism of blunt thoracic trauma in high-income countries.

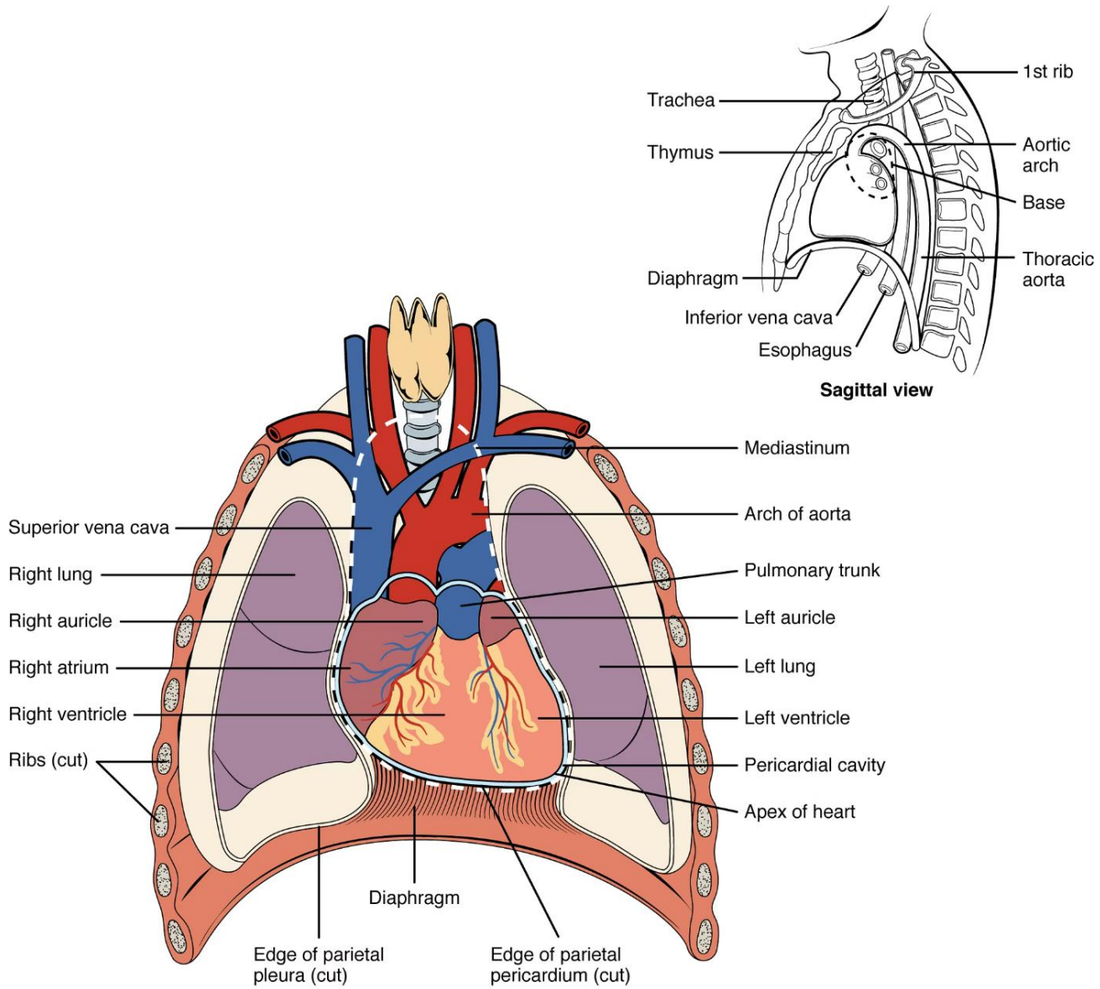
60%

Polytrauma Patients

Up to 60% of patients with multiple injuries sustain concurrent chest injuries.

Thoracic trauma encompasses a broad spectrum of injuries — from isolated rib fractures to life-threatening tension pneumothorax. Prompt recognition and management are essential to reducing preventable mortality.

Anatomy at Risk: The Thoracic Cage and Vital Structures



Structures Protected by the Rib Cage

- Lungs and pleural spaces
- Heart and pericardium
- Great vessels (aorta, vena cava)
- Diaphragm and oesophagus

Multiple rib fractures significantly increase the risk of respiratory failure, pneumonia, and death — especially in elderly patients where the chest wall is less resilient.

Rib Fractures: Frequency and Consequences

Incidence

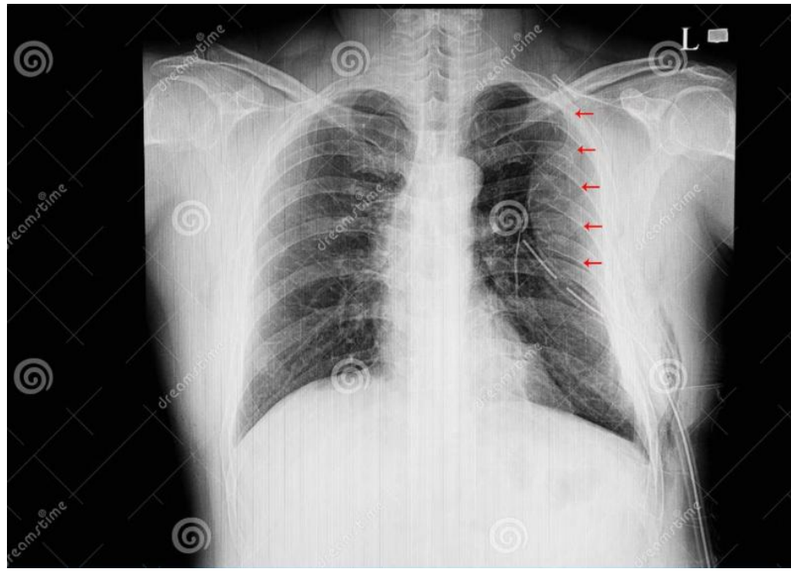
Rib fractures occur in approximately **60% of blunt chest trauma** patients. Multiple fractures — particularly of ribs 4–9 — are common following high-energy impacts.

Clinical Impact

Associated with severe pleuritic pain, splinting, impaired ventilation, atelectasis, and a significantly elevated risk of pneumonia.

Elderly Risk

Patients aged over 65 with rib fractures carry a **19% mortality rate**, rising sharply with fracture number and comorbidities.



Flail Chest: The Most Severe Chest Wall Injury

Definition

≥3 consecutive ribs fractured in ≥2 places, creating a free-floating chest wall segment that moves paradoxically during respiration.

Consequences

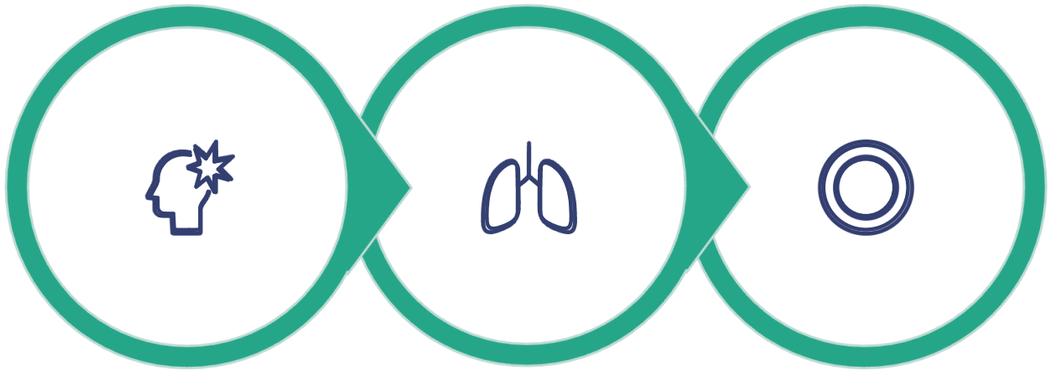
- Paradoxical inward movement on inspiration
- Severe ventilatory compromise and hypoxia
- Underlying pulmonary contusion worsens outcome

Prognosis

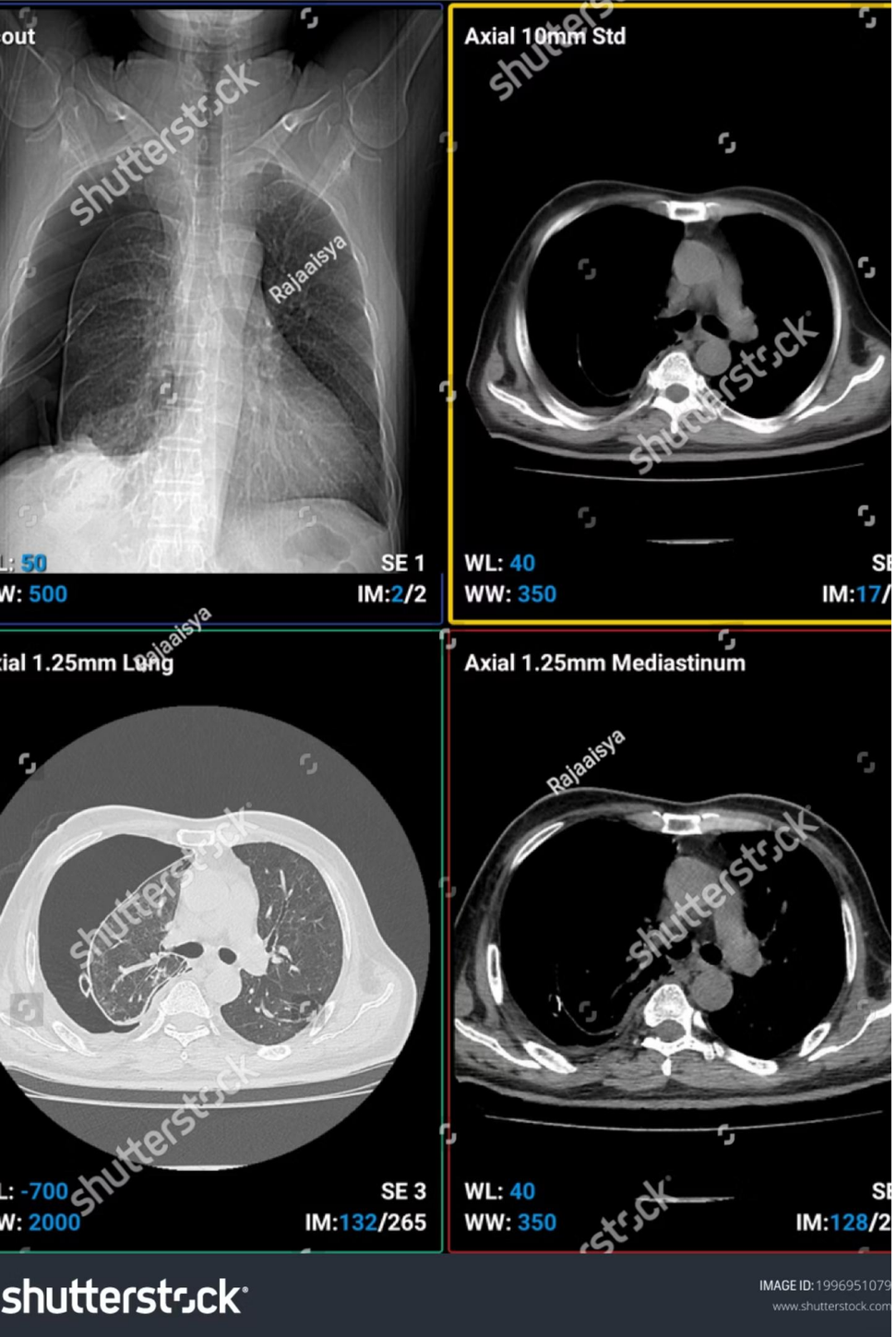
Mortality up to **16%**; mechanical ventilation frequently required.

Management of Rib Fractures and Flail Chest

Early and effective pain control is the cornerstone of management. Regional anaesthesia techniques such as paravertebral and epidural blocks demonstrably improve respiratory outcomes. Surgical rib fixation is increasingly favoured for flail chest to reduce ventilator dependence and ICU stay.



Analgesia Respiratory **Fixation**



Pneumothorax

Air in the Pleural Space

Pneumothorax: Types and Clinical Presentation

Simple Traumatic

Air enters the pleural space from lung parenchyma or chest wall injury. Causes ipsilateral lung collapse with dyspnoea and reduced breath sounds.

Open Pneumothorax

Sucking chest wound — atmospheric air enters pleural space through a chest wall defect. Immediate occlusive dressing required.

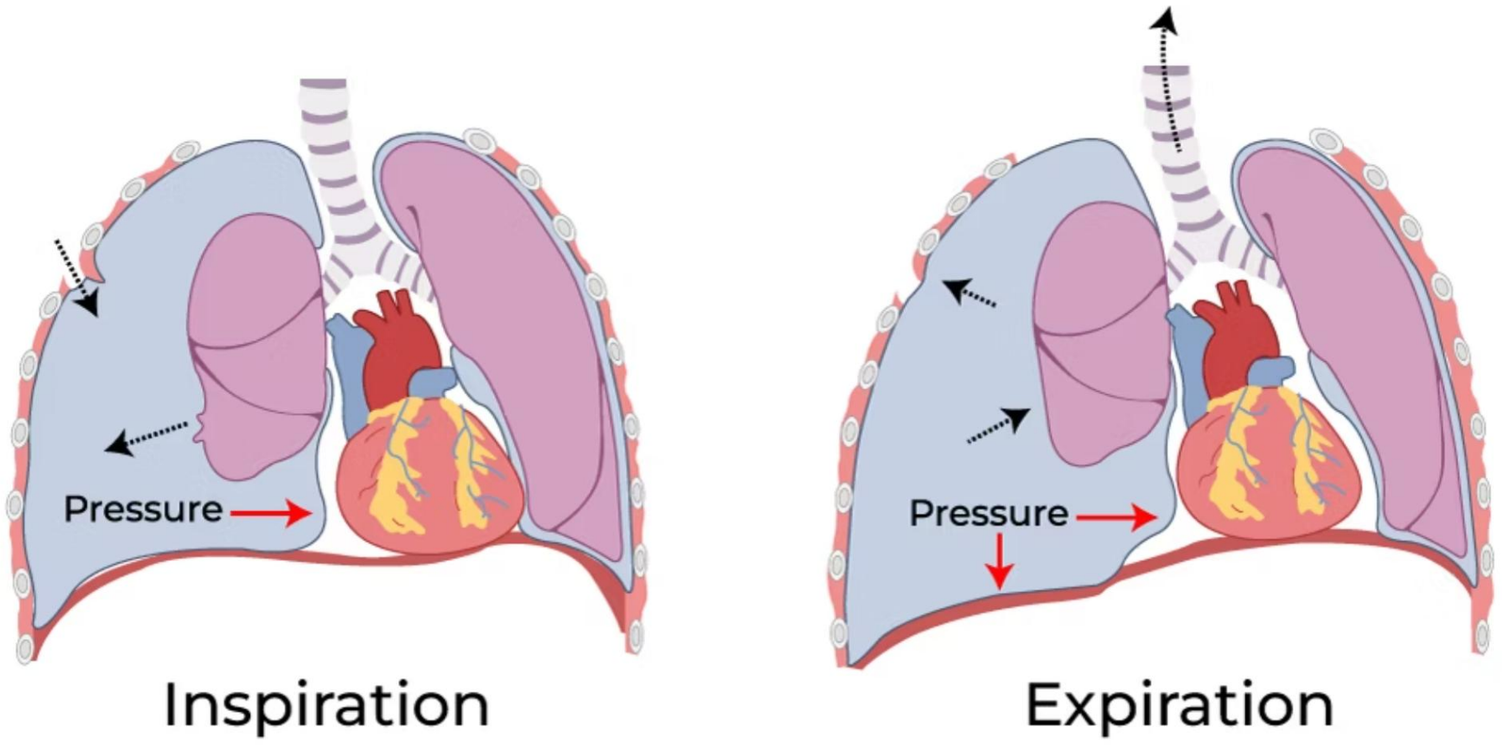
Tension Pneumothorax

Life-threatening. Progressive air accumulation causes mediastinal shift, cardiovascular collapse, tracheal deviation, and obstructive shock.

Key signs: sudden chest pain, dyspnoea, decreased or absent breath sounds, tracheal deviation (tension), and hypotension.

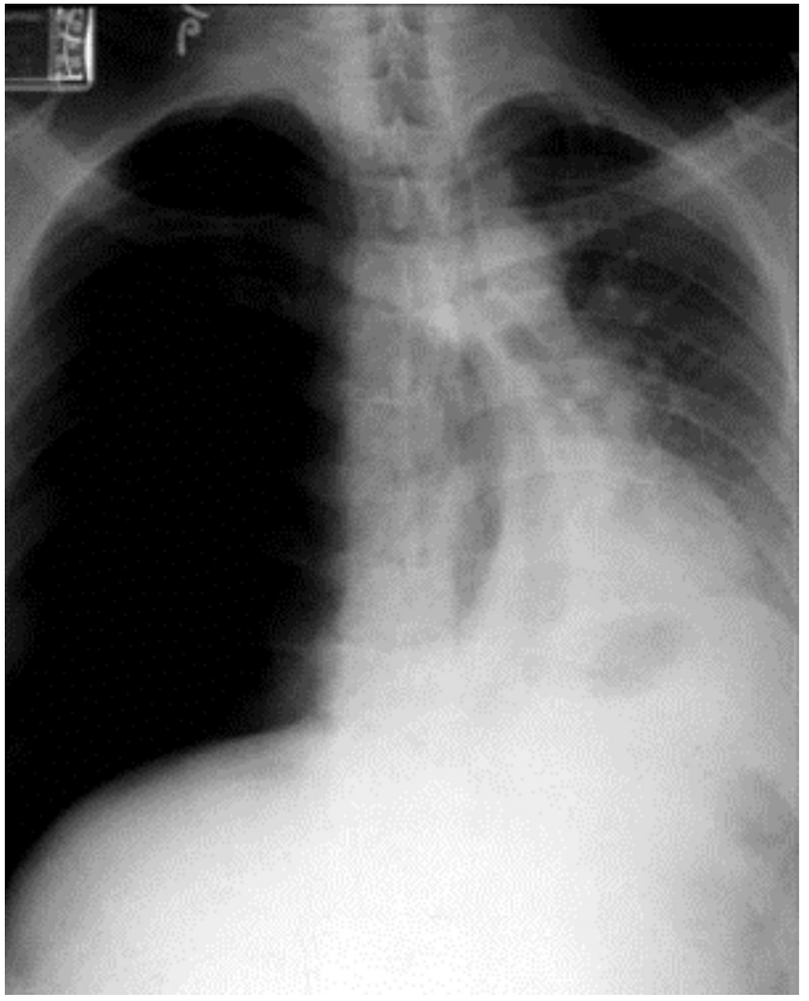
Tension pneumothorax is a clinical diagnosis — do not wait for imaging.

Tension pneumothorax



Inspiration

Expiration



Diagnosis and Emergency Management of Pneumothorax

Diagnostic Tools

Ultrasound (FAST)

Rapid bedside detection — absence of lung sliding indicates pneumothorax.

Chest X-Ray

Standard first-line imaging; may miss small or occult pneumothorax.

CT Thorax

Gold standard for occult pneumothorax and accurate sizing.

Management

01

Tension: Immediate Needle Decompression

2nd intercostal space, mid-clavicular line — or 4th/5th ICS, anterior axillary line.

02

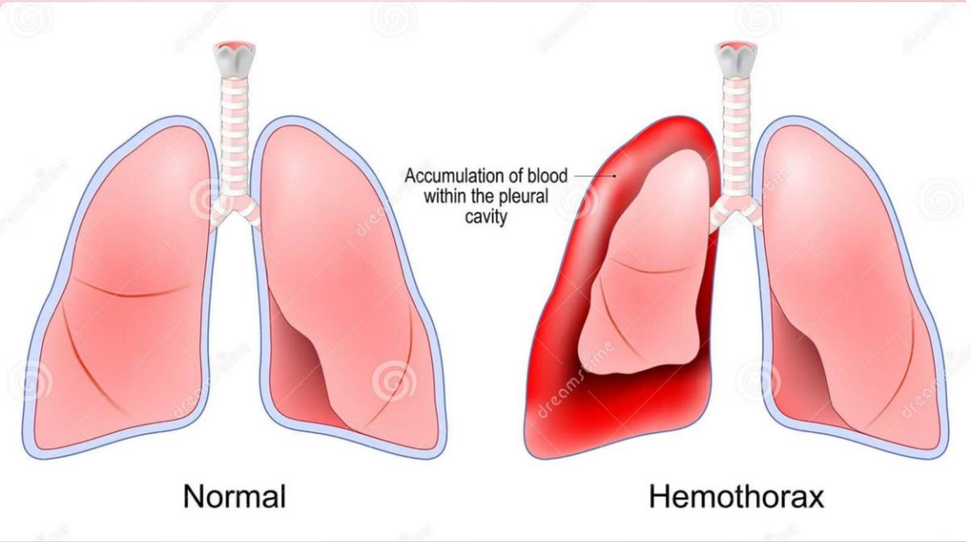
Chest Tube Insertion

Formal intercostal drain placed in the safe triangle; definitive treatment for most pneumothoraces.

03

Observation

Small, stable pneumothoraces in asymptomatic patients may be managed conservatively with close monitoring.



Haemothorax

Blood in the Pleural Space

Haemothorax: Causes and Clinical Impact

Aetiology

Most commonly results from blunt or penetrating chest trauma causing injury to intercostal vessels, lung parenchyma, or major thoracic vessels.

Epidemiology

An estimated **300,000 cases annually** in the US alone, with mortality approximately **9.4%** in blunt trauma settings.

Clinical Features

- Chest pain and dyspnoea
- Hypovolaemic shock signs (tachycardia, hypotension)
- Dull percussion note and reduced breath sounds at base

Diagnosis and Treatment Challenges in Haemothorax

Imaging Modalities

Chest X-ray detects >200 mL of fluid. Ultrasound offers rapid bedside assessment. CT thorax quantifies volume, identifies source, and detects associated injuries.

Chest Tube Drainage

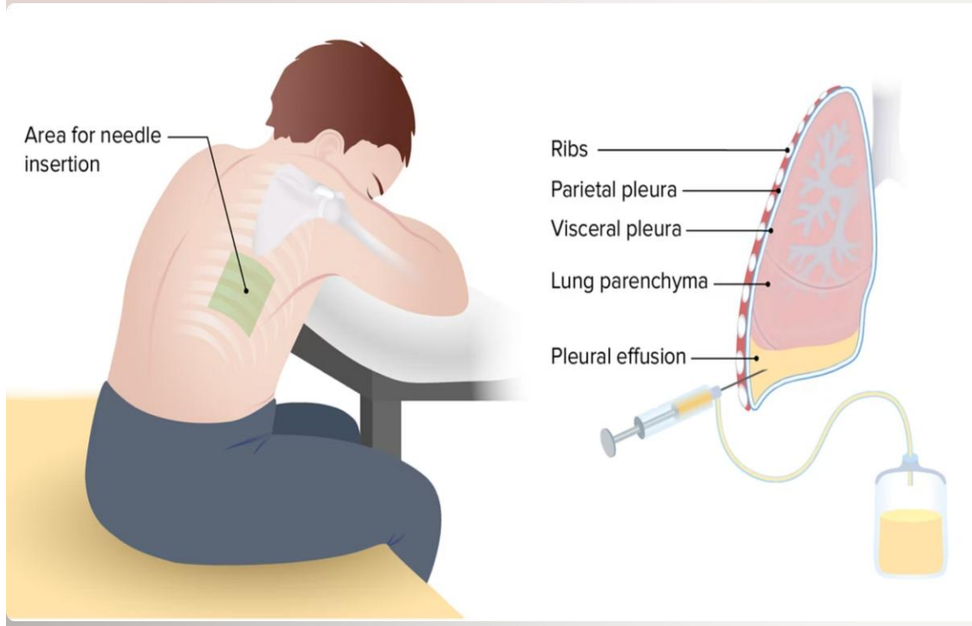
First-line treatment. Large-bore intercostal drain placed in the safe triangle. Immediate drainage of >1,500 mL or ongoing loss >200 mL/hour indicates massive haemothorax.

Surgical Intervention

Thoracotomy or VATS required for massive, persistent, or recurrent bleeding. Delayed haemothorax — occurring days to weeks post-injury — demands vigilance and re-imaging.

VATS =
Video-Assisted Thoracoscopic Surgery

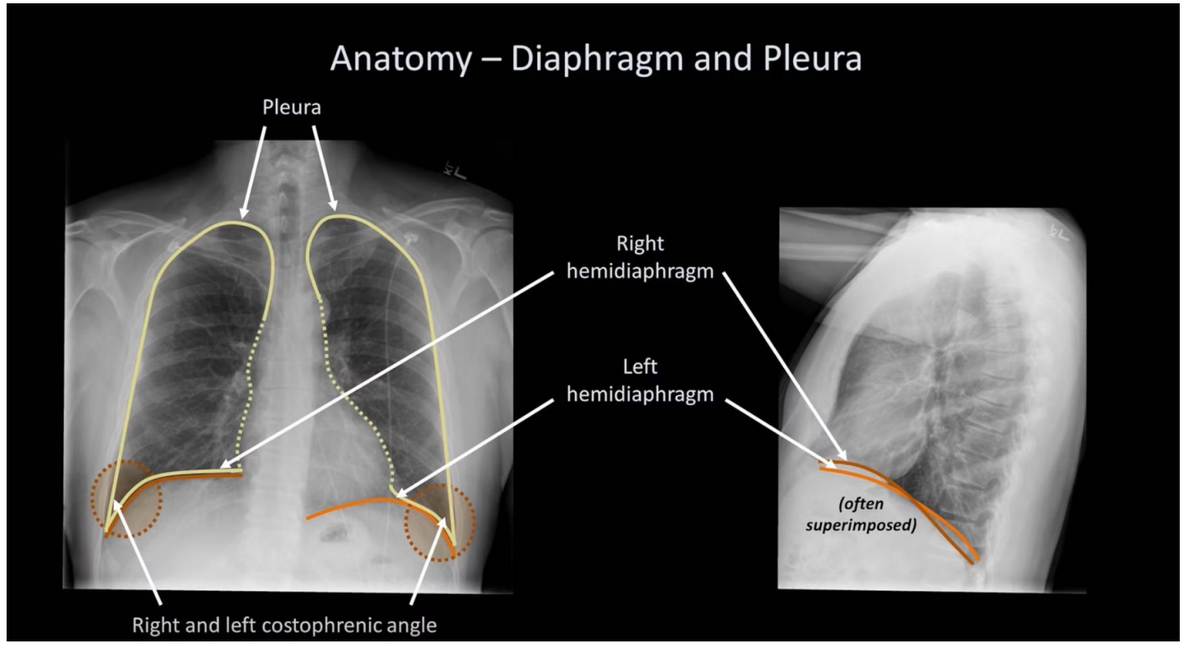
Pleural Effusion and Empyema



Pleural Effusion: Fluid Accumulation in the Pleural Space

Classification Following Trauma

Accumulating fluid compresses lung parenchyma, impairs gas exchange, and creates an environment conducive to bacterial colonisation and infection.



Serous

Reactive transudative fluid; early post-traumatic

Serosanguineous

Mixed blood and serous fluid; haemothorax resolving

Purulent

Frank pus indicating empyema formation

Empyema: Infected Pleural Fluid Collection

Incidence

Develops in **6–20%** of haemothorax cases where drainage is incomplete or delayed, allowing bacterial colonisation of retained blood.

Clinical Presentation

Persistent or spiking fever, pleuritic chest pain, systemic inflammatory response, and failure to improve despite standard management.

Treatment Principles

Systemic antibiotics targeting causative organisms, adequate pleural drainage, intrapleural fibrinolytics, or surgical decortication for organised empyema.

Prevention is paramount: complete drainage of haemothorax in the acute phase significantly reduces the risk of empyema formation.