

# Pneumothorax and Chest Tube Problems

# Pneumothorax

- Definition

Air accumulation in the pleural space with secondary lung collapse

- Sources

- Visceral pleura
- Ruptured esophagus
- Chest wall defect
- Gas-forming organisms

- Factors determining gas reabsorption

- Diffusion properties of the gases
- Pressure gradients
- Area of contact
- Permeability of pleural surface

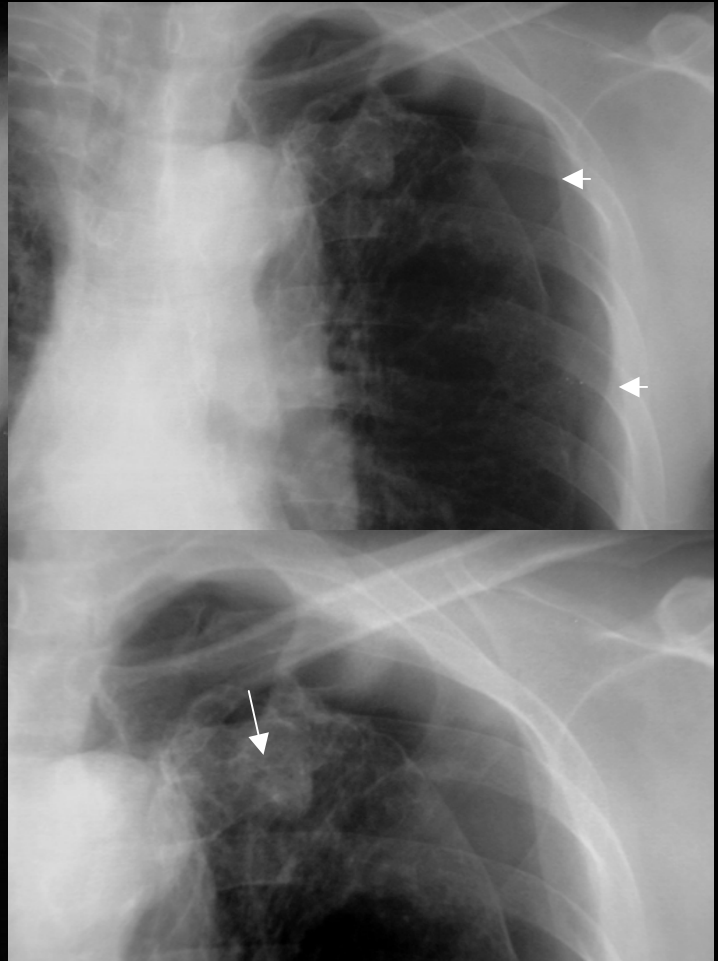
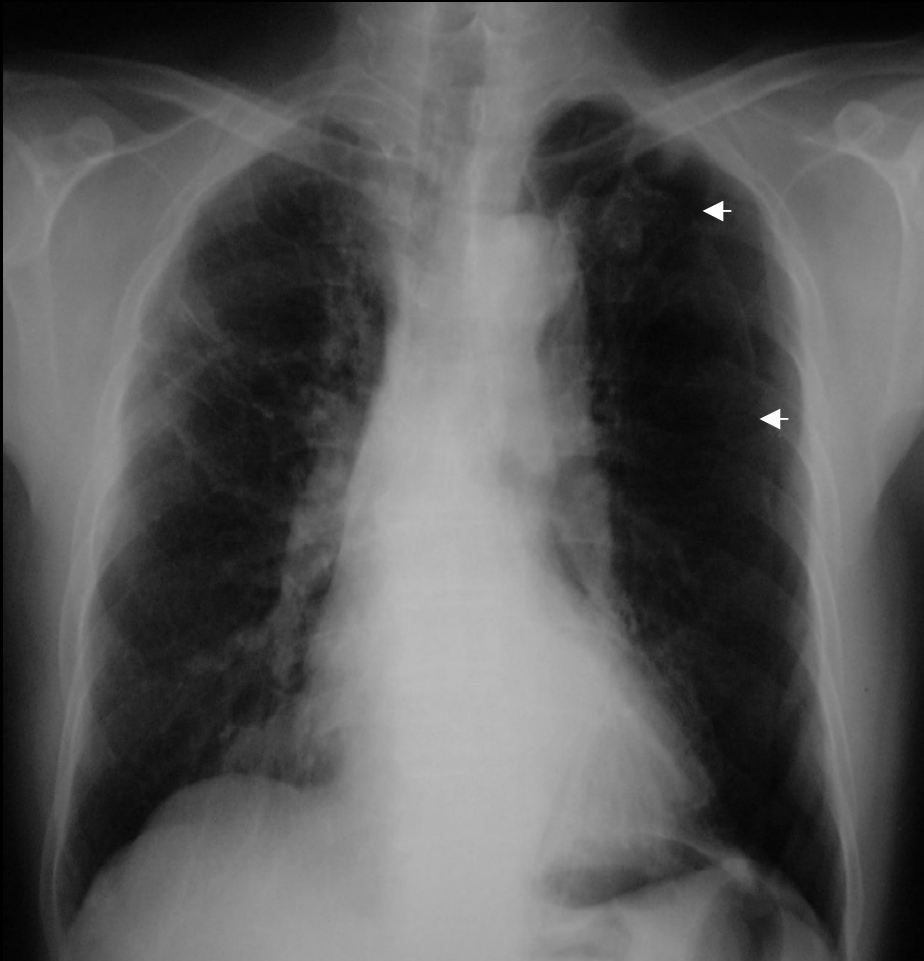
# Classification of Pneumothorax

- Spontaneous
  - Primary
  - Secondary
    - COPD
    - Infection
    - Neoplasm
    - Catamenial
    - Miscellaneous
- Traumatic
  - Blunt
  - Penetrating
- Iatrogenic
  - Inadvertent
  - Diagnostic
  - Therapeutic

# Primary Spontaneous Pneumothorax

- Symptoms and signs
  - Sudden onset chest pain
  - Shortness of breathing
  - Non-productive cough
- Physical examination
  - Decrease in chest wall movement on inspection
  - Chest cavity hyperresonant and tympanic on percussion
  - Decrease breath sounds on auscultation
- Diagnosis—CXR
- Differential diagnosis
  - Skin fold
  - Giant bulla

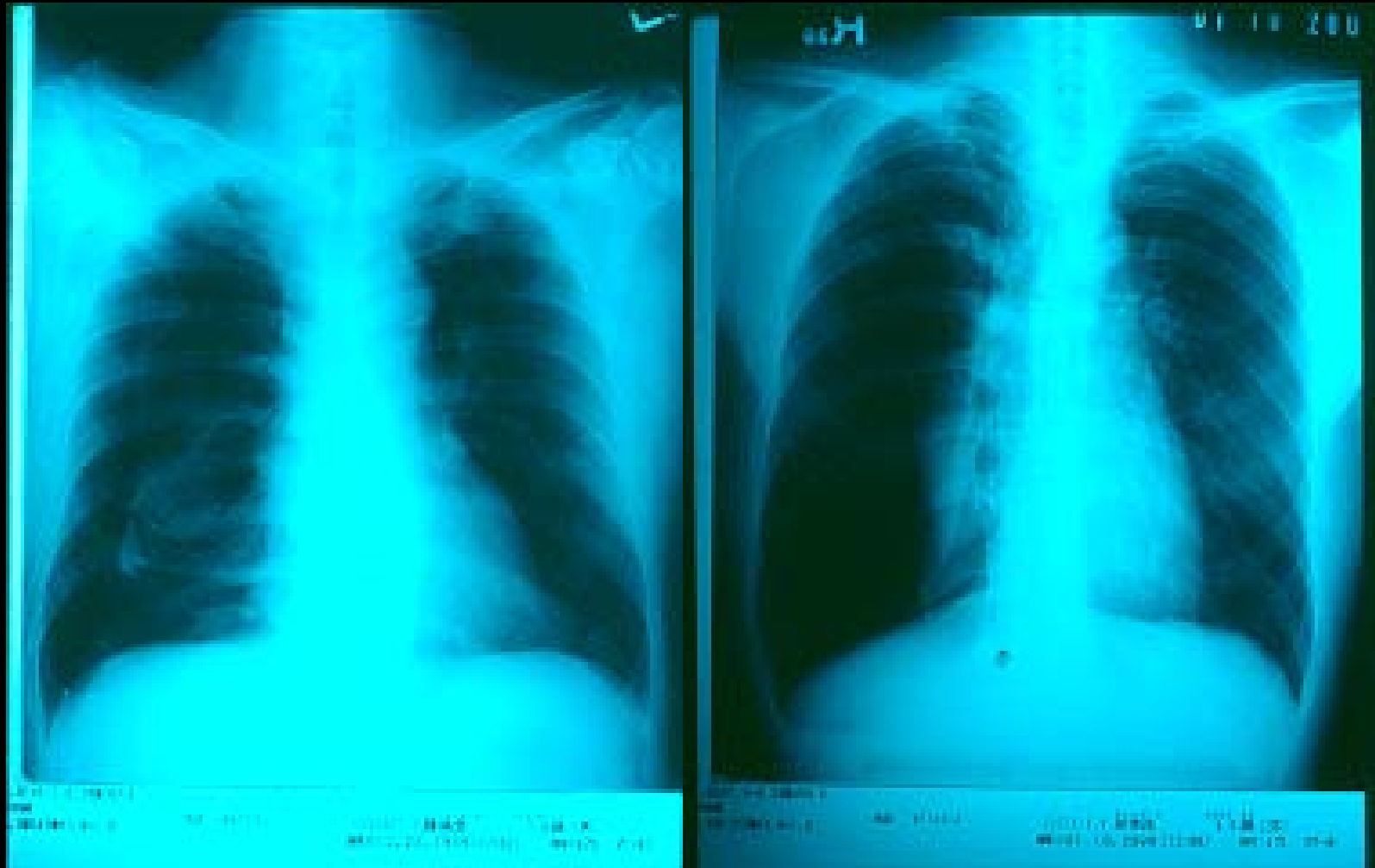
# Pneumothorax (Left)



# Pneumothorax (Right Apex)



# Pneumothorax (Right)



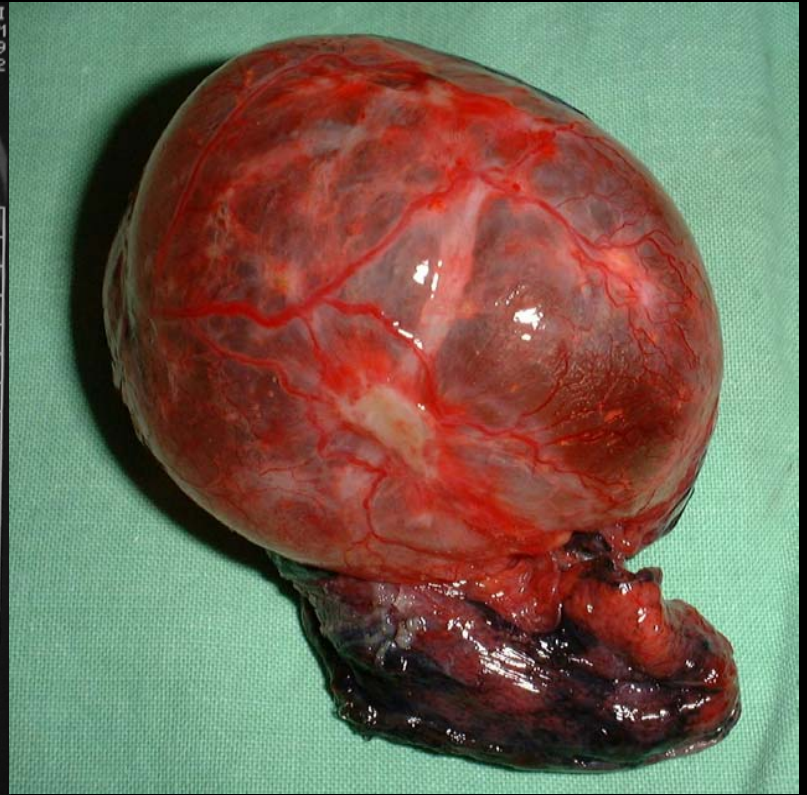
# Pneumohemothorax





# Emphysema of the Lung

## - Solitary giant bulla, RLL



# Treatment Options for Primary Spontaneous Pneumothorax

- Observation
- Needle aspiration and small chest tube drainage
- Convention tube thoracostomy
  - Water seal Pleur-evac type
  - Heimlich valve
- Tube thoracostomy with instillation of pleural irritant—Tetracycline HCL, Talc
- Surgical intervention

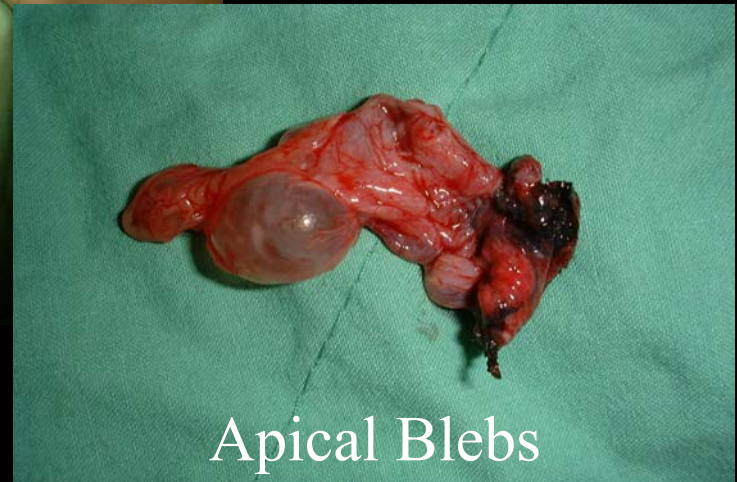
# Indications for Surgical Intervention

- Second episode
- Persistent air leakage for greater than 7-10 days
- First episode with unexpanded, “trapped” lung
- History of contralateral pneumothorax
- Bilateral pneumothorax
- Occupational risk (driver, airplane pilot)
- Living in a remote area
- Large bulla
- Large undrained hemothorax
- First episode in a patient with one lung
- First episode in a patient with severely compromised pulmonary function

# Surgical Intervention for Primary Spontaneous Pneumothorax

- Principal
  - Resection of the blebs or bulla
  - Obliteration of the pleural space
- Approach
  - Video-assisted thoracoscopic surgery
  - Thoracotomy
- Procedures for obliteration of the pleural space
  - Parietal pleurectomy
  - Abrasion pleurodesis
  - Laser pleurodesis

# Vertical Approach for Pneumothorax



# Recurrence of Primary Spontaneous Pneumothorax

• Therapy	Recurrence (%)
– Expectant	30
– Aspiration	20-50
– Chest tube drainage	20-30
– Pleurodesis (tetracycline)	25
– Pleurodesis (talc)	7
– Surgery	2

# Complication of Primary Spontaneous Pneumothorax

- Tension pneumothorax
- Re-expansion pulmonary edema
- Persistent air leak
- Hemothorax (<5%)
- Bilateral pneumothorax (<1%)
- Pneumomediastinum (rare)

# Indications for Tube Thoracostomy

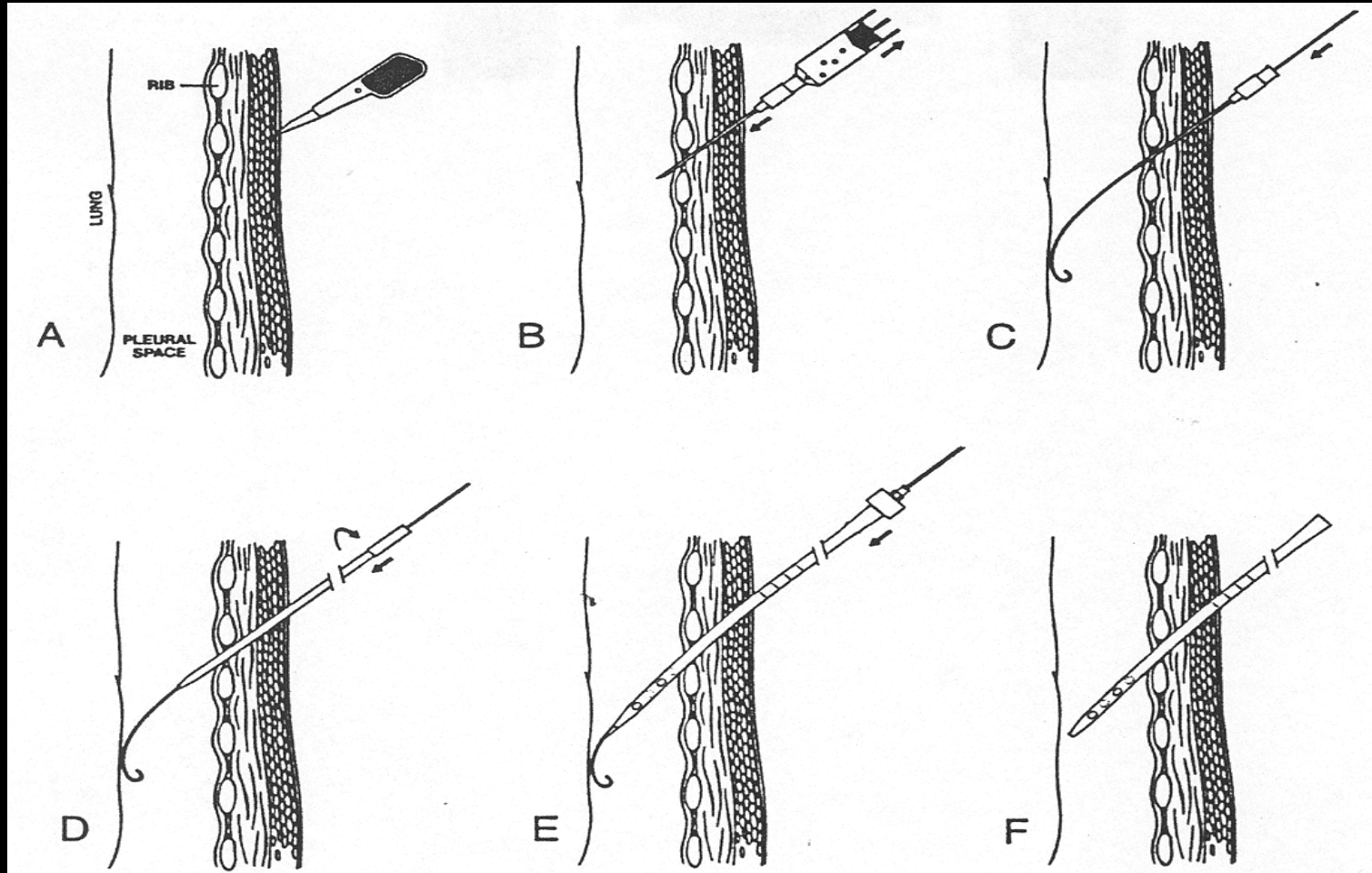
- Pneumothorax--open, tension, trauma or iatrogenic
- Hemothorax
- Empyema
- Pleural effusion
- Chylothorax
- Post-operative drainage--thoracic or cardiac



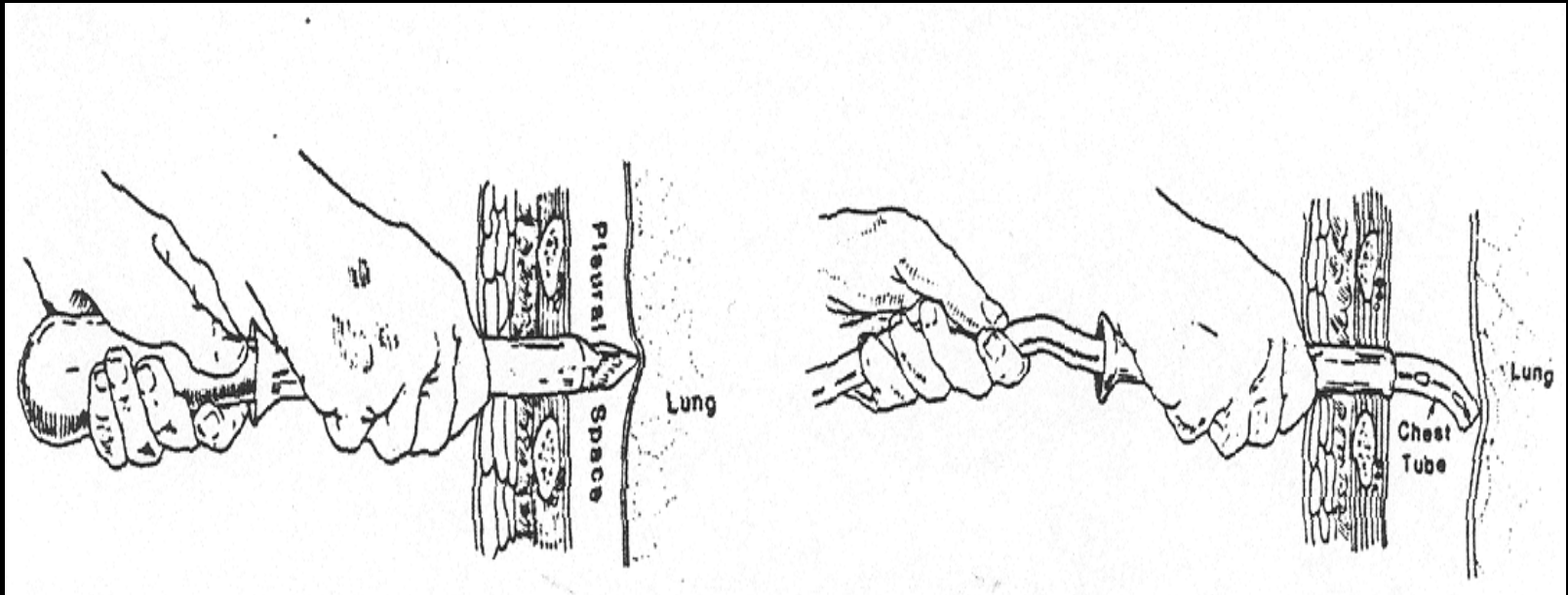
# Chest Tube Insertion

- Guide-wire tube thoracostomy
- Trocar tube thoracostomy
- Operative tube thoracostomy

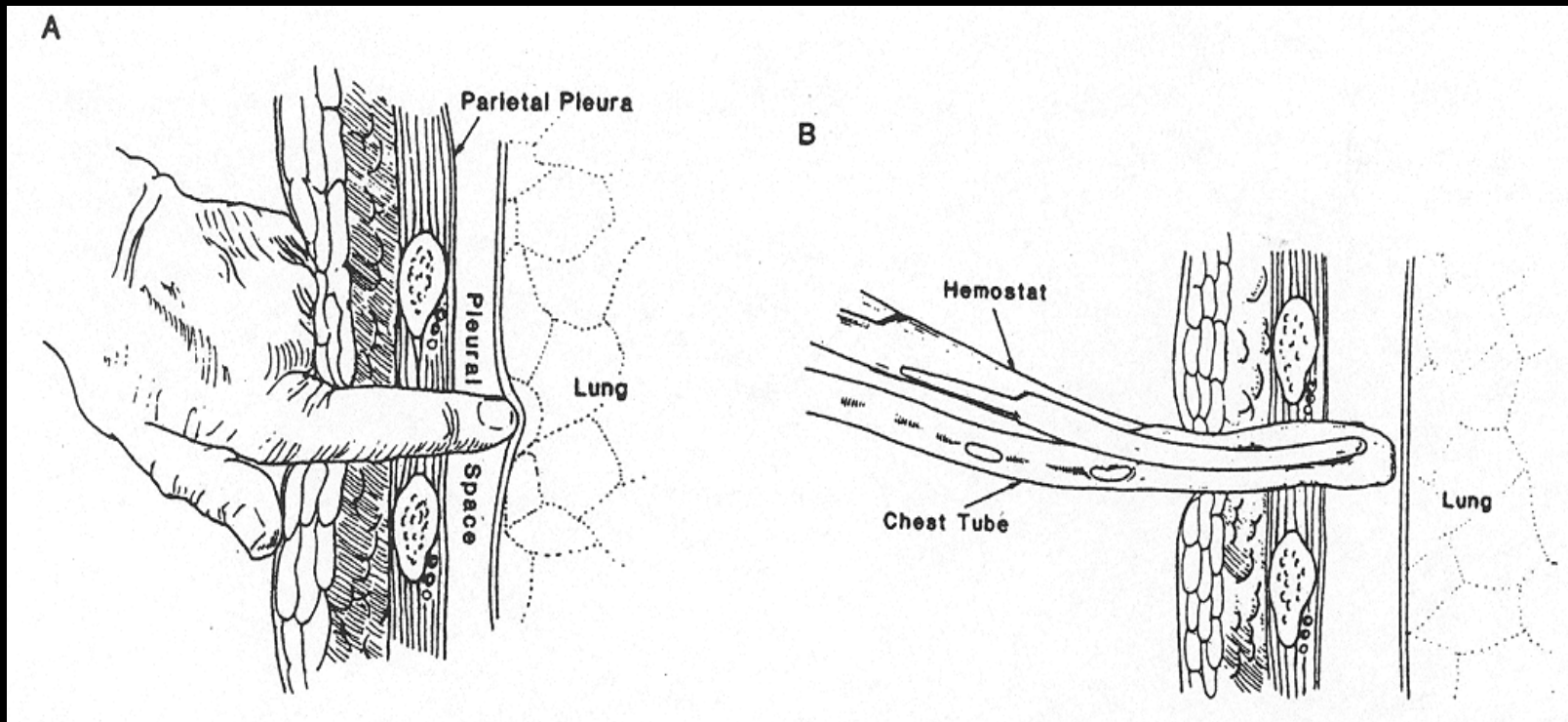
# Guide-Wire Tube Thoracostomy



# Trocar Tube Thoracostomy



# Operative Tube Thoracostomy



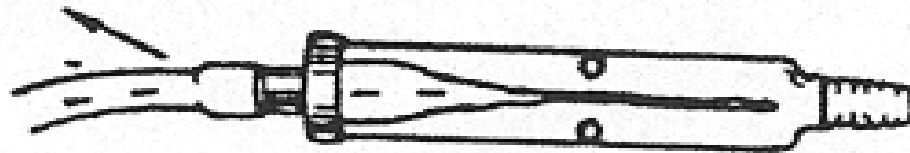
# Pleural Drainage System

- One-way (Heimlich) valve
- One-bottle collection system
- Two-bottles collection system
- Three-bottles collection system
- Commercial drainage system

# One-Way (Heimlich) Valve

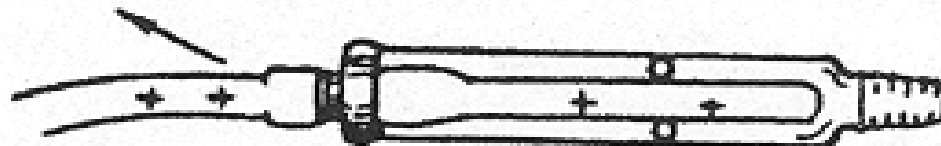
A

TO PATIENT

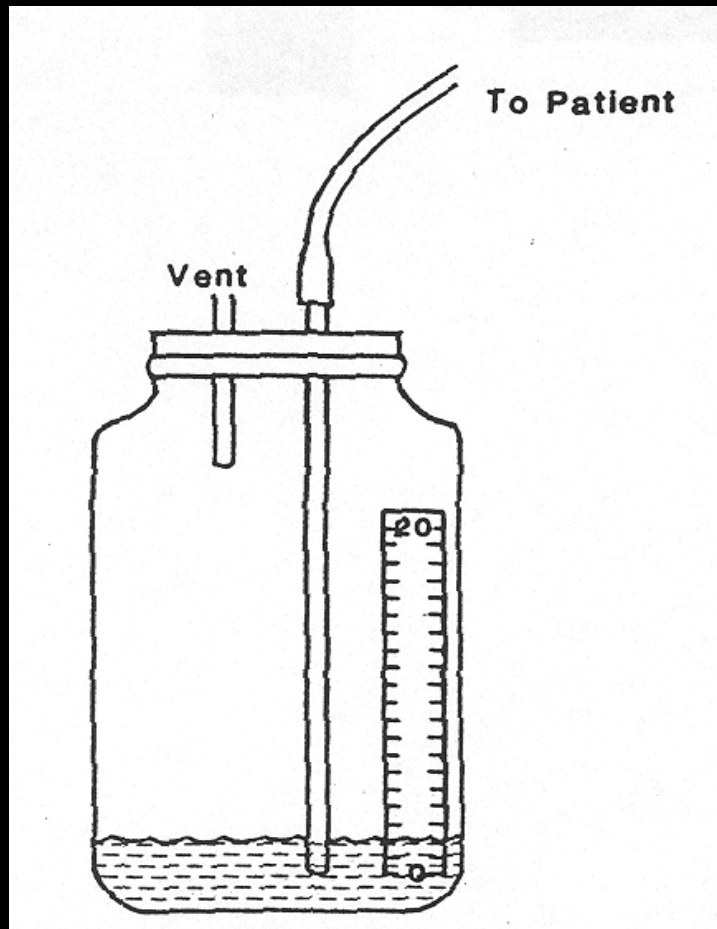


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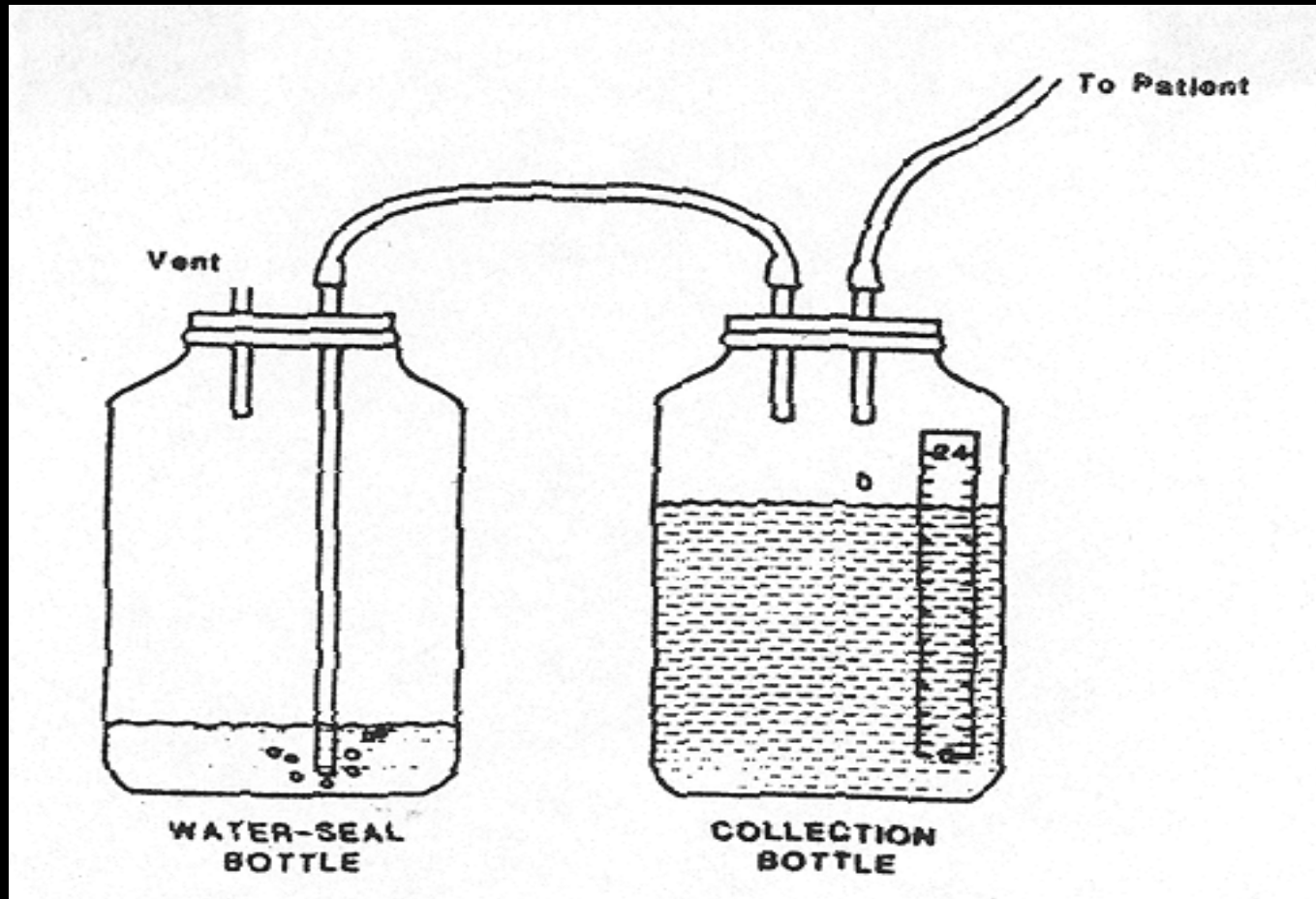


# One-Bottle Collection System



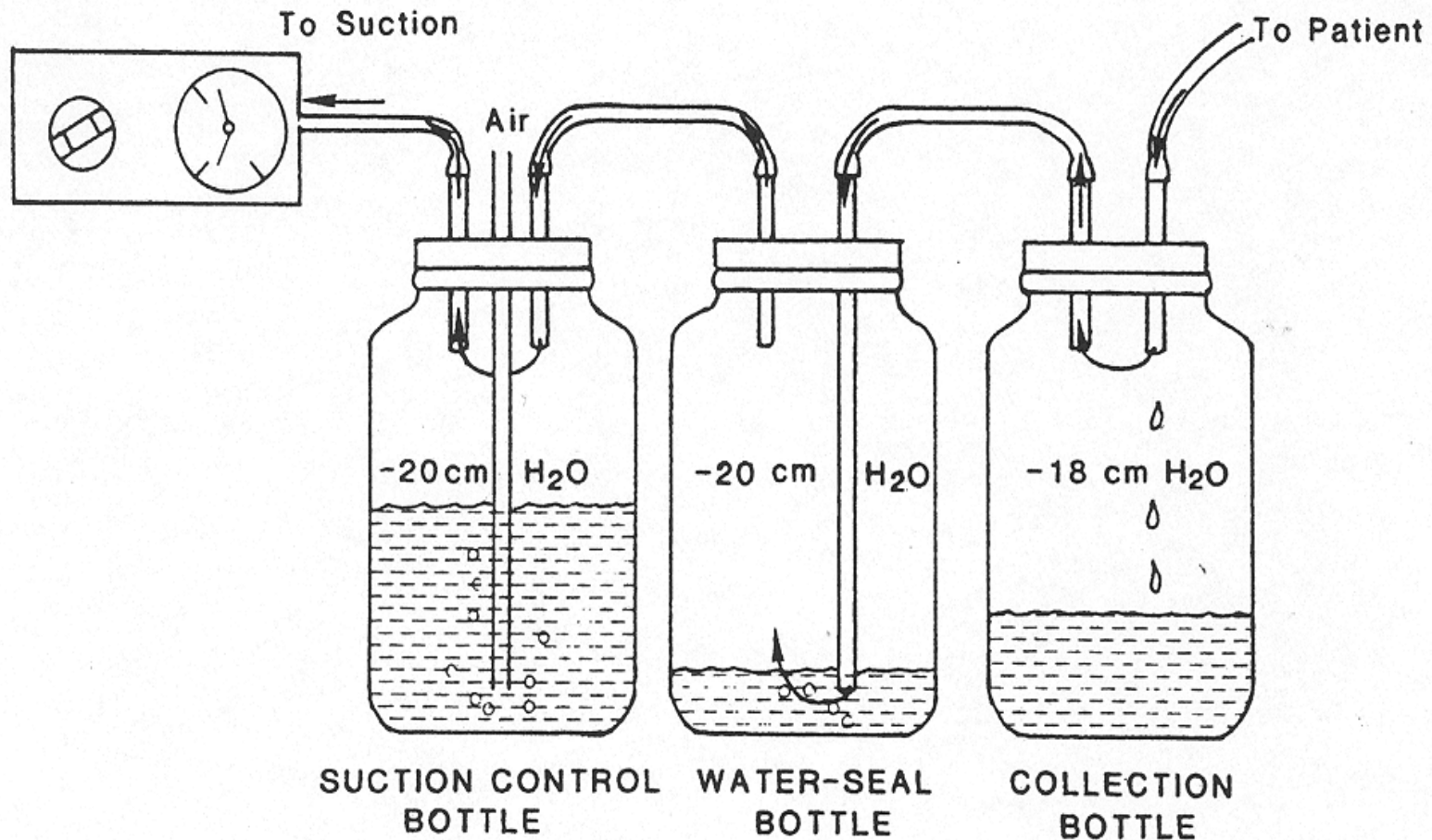


# Two-Bottle Collection System

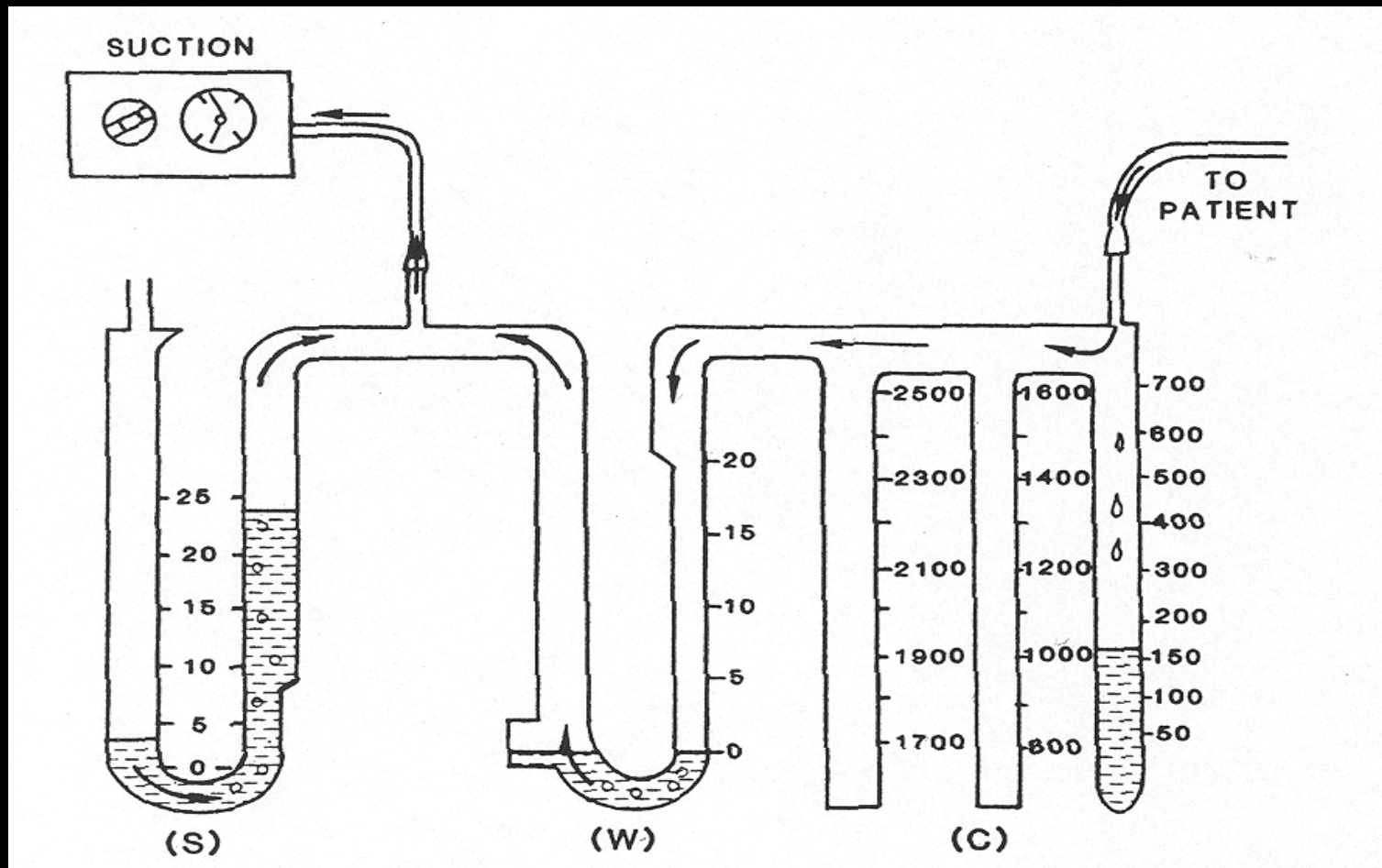




# Three-Bottle Collection System



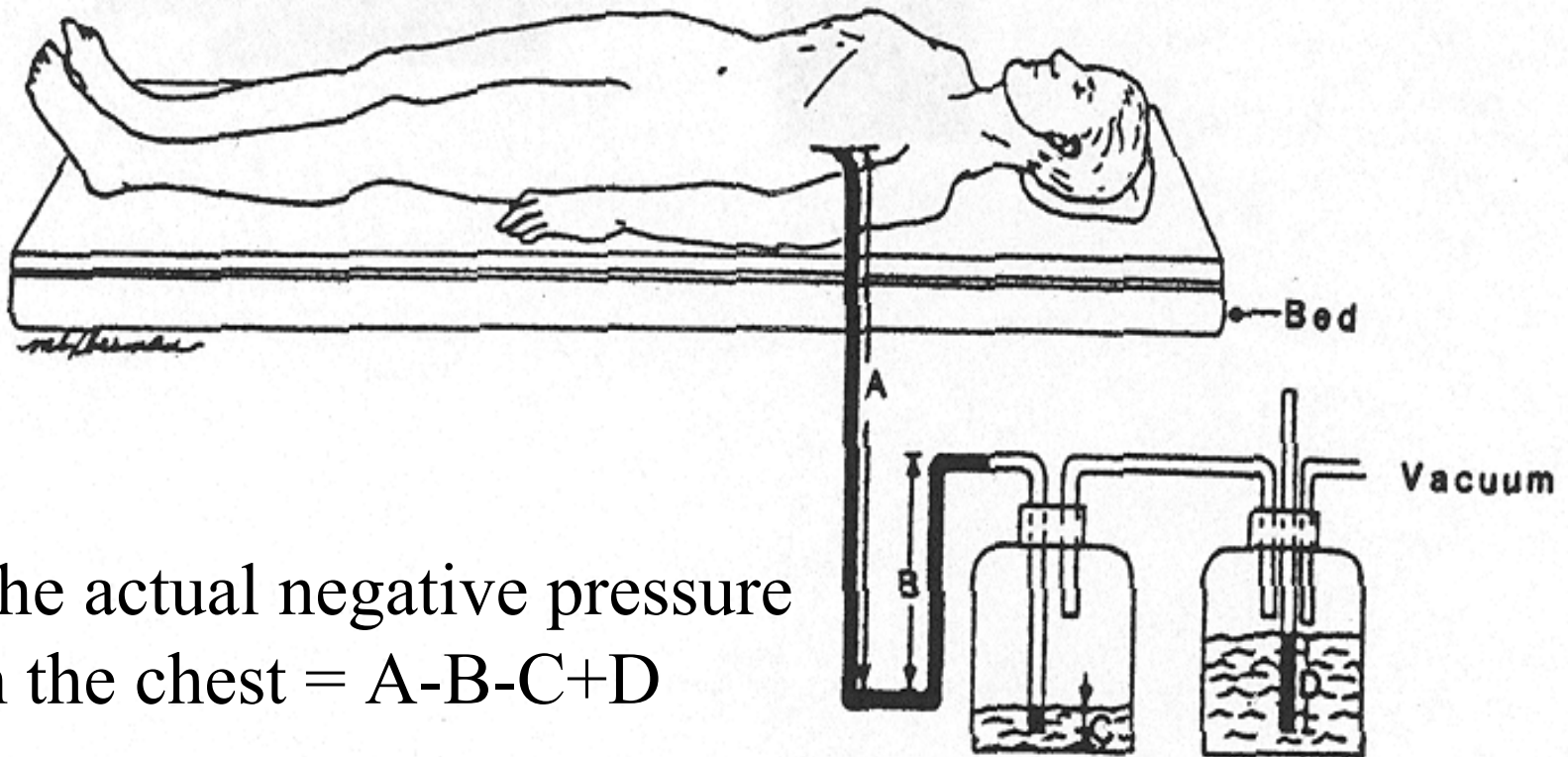
# Commercial Drainage System



# Care of Chest Tubes

- Is there bubbling through the water-seal bottle/chamber ?
- Is the tube functioning?
- What is the amount and type of drainage from the tube?

# Actual Drainage Pressure



The actual negative pressure  
in the chest =  $A - B - C + D$

# Complications of Chest Tubes

- Misplacement of chest tube
- Pleural infection

# Malposition of Chest Tube



# Malposition of Chest Tube



# Malposition of Chest Tube

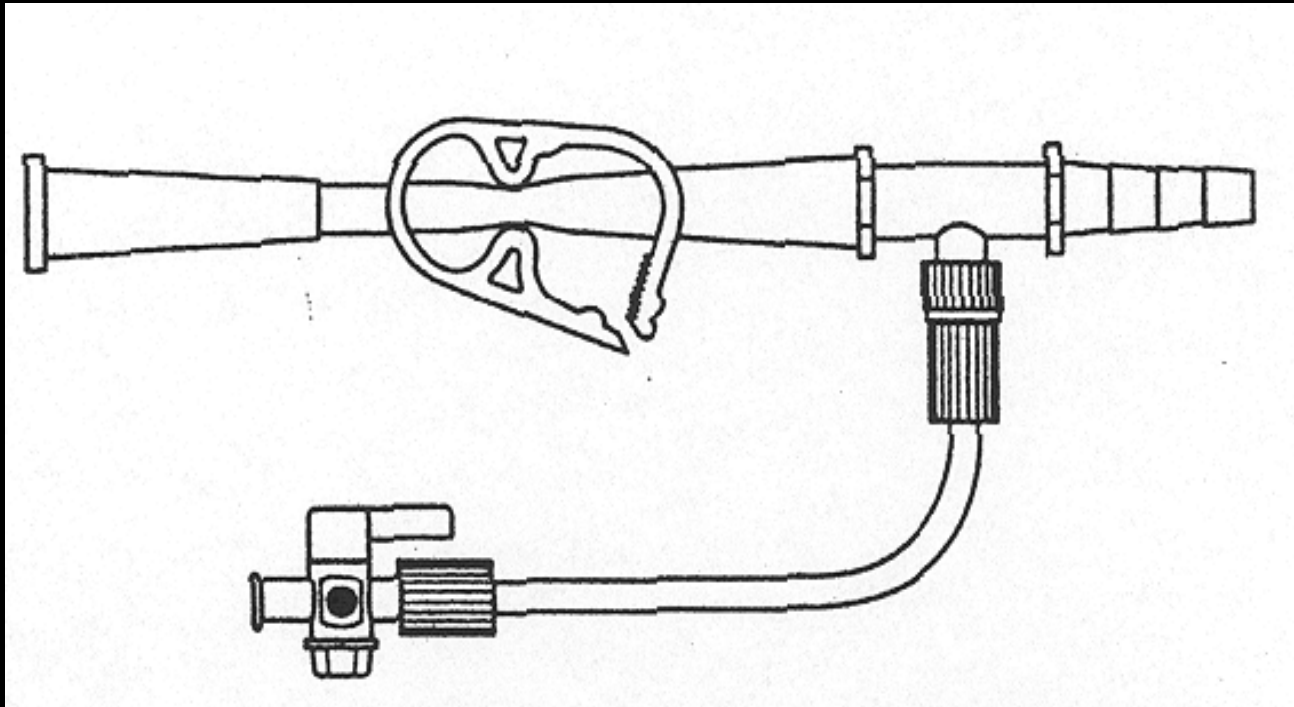




# Other Functions for Chest Tubes

- Injection of Materials
- Auto-transfusion

# Thal-Quick Chest Tube Adapter



# Removal of Chest Tubes

- Indications
- Methods