Disorders of Pleura

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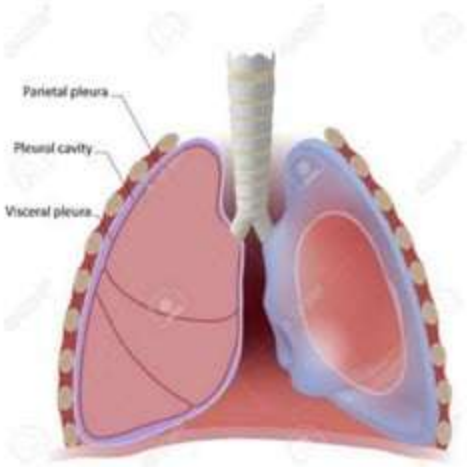
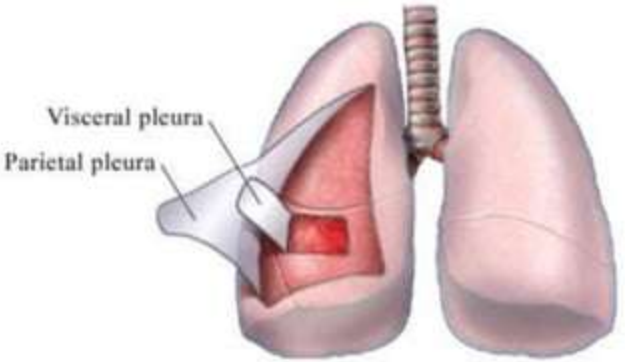


- The pleura is the serous membrane that covers the lung parenchyma, the mediastinum, the diaphragm, and the rib cage.
- This structure is divided into the visceral pleura and the parietal pleura



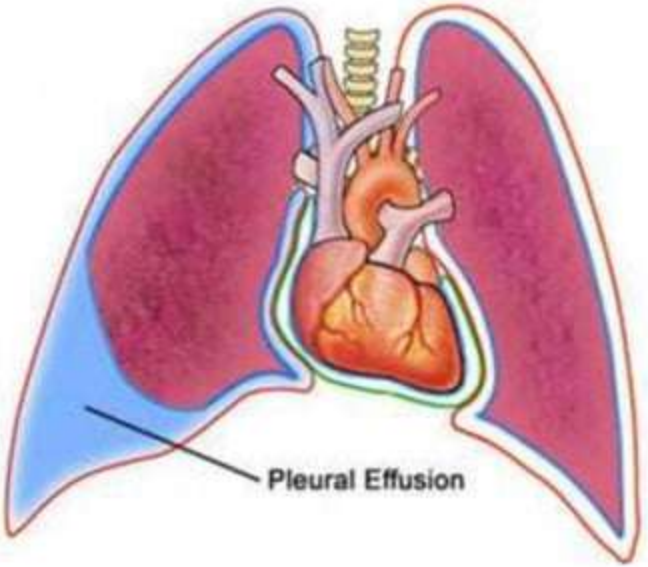
- Visceral and the parietal pleura meet at the lung root.
- Film of fluid (pleural fluid) is normally present between the parietal and the visceral pleura.
- layer of fluid acts as a lubricant and allows the visceral pleura covering the lung to slide along the parietal pleura lining the thoracic cavity during respiratory movements

- Fluid that enters the pleural space can originate in the pleural capillaries, the interstitial spaces of the lung, the intrathoracic lymphatics, the intrathoracic blood vessels, or the peritoneal cavity.

- pleural fluid accumulates as a result of either
- increased hydrostatic pressure or decreased osmotic pressure (‘transudative’ effusion, as seen in cardiac, liver or renal failure), or
- from increased microvascular pressure
- due to disease of the pleura or injury in the adjacent lung (‘exudative’ effusion).

Pleural Effusion

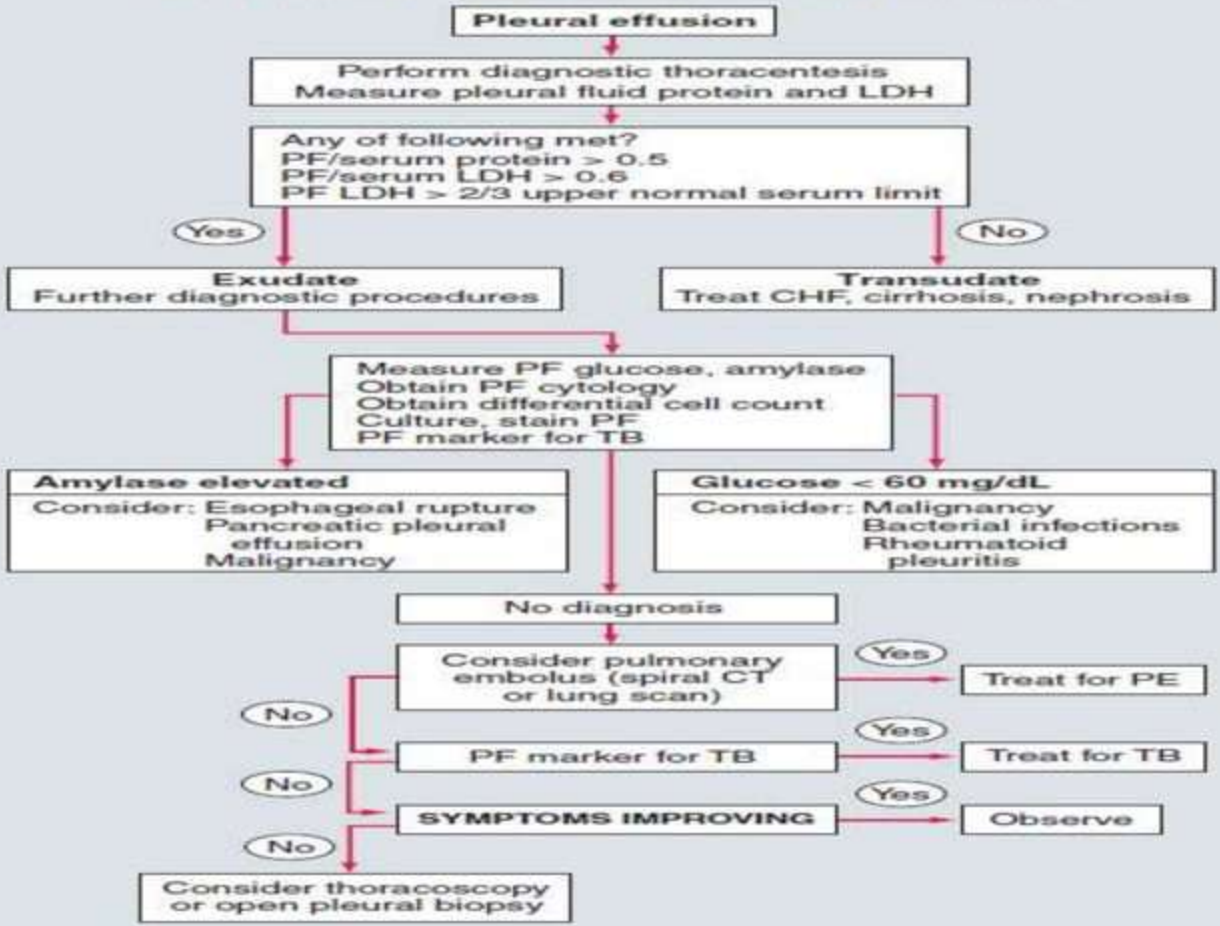
- an excess quantity of fluid in the pleural spac



General Causes of Pleural Effusions

- ***Increased pleural fluid formation***
  - Increased interstitial fluid in the lung
    - Left ventricular failure, pneumonia, and pulmonary embolus
  - Increased intravascular pressure in pleura
    - Right or left ventricular failure, superior vena caval syndrome
  - Increased permeability of the capillaries in the pleura
    - Pleural inflammation
    - Increased levels of vascular endothelial growth factor
  - Increased pleural fluid protein level
  - Decreased pleural pressure
    - Lung atelectasis or increased elastic recoil of the lung
  - Increased fluid in peritoneal cavity
    - Ascites or peritoneal dialysis
  - Disruption of the thoracic duct
  - Disruption of blood vessels in the thorax

- ***Decreased pleural fluid absorption***
  - Obstruction of the lymphatics draining the parietal pleura
  - Elevation of systemic vascular pressures
    - Superior vena caval syndrome or right ventricular failure
  - Disruption of the aquaporin system in the pleura


DIAGNOSTIC ALGORITHM OF PLEURAL EFFUSION
Pleural effusion
Perform diagnostic thoracentesis
Measure pleural fluid protein and LDH
Any of following met?
PF/serum protein > 0.5
PF/serum LDH > 0.6
PF LDH > 2/3 upper normal serum limit
Yes
No
Exudate
Further diagnostic procedures
Transudate
Treat CHF, cirrhosis, nephrosis
Measure PF glucose, amylase
Obtain PF cytology
Obtain differential cell count
Culture, stain PF
PF marker for TB
Amylase elevated
Consider: Esophageal rupture
Pancreatic pleural effusion
Malignancy
Glucose < 60 mg/dL
Consider: Malignancy
Bacterial infections
Rheumatoid pleuritis
No diagnosis
Consider pulmonary embolus (spiral CT or lung scan)
Yes
Treat for PE
No
PF marker for TB
Yes
Treat for TB
No
SYMPTOMS IMPROVING
Yes
Observe
No
Consider thoracoscopy or open pleural biopsy

Transudative Pleural Effusions

Congestive heart failure
Cirrhosis
Peritoneal dialysis
Nephrotic syndrome
Superior vena cava obstruction
Myxedema
Pulmonary thromboemboli

Exudative Pleural Effusions
Infectious diseases
Bacterial infections
Tuberculosis
Fungal infections
Viral infections
Parasitic infections
Pulmonary thromboembolization
Gastrointestinal disease
Pancreatitis
Esophageal perforation
Intra-abdominal abscesses
Collagen vascular diseases
Rheumatoid arthritis
Lupus erythematosus
Churg-Strauss syndrome
Drug-induced pleural disease
Nitrofurantoin
Dantrolene
Methysergide
Bromocriptine
Interleukin-2
Procarbazine
Amiodarone
Asbestos exposure
Chylothorax
Hemothorax
Postsurgical
Abdominal surgery
Coronary artery bypass
Sarcoidosis
Post-cardiac-injury (Dressler's) syndrome
Uremic pleuritis
Yellow nail syndrome

Effusion Due to Heart Failure

- most common cause of pleural effusion is left ventricular failure.
- patient has a transudative effusion.
- treated with diuretics.
- A pleural fluid N-terminal probrain natriuretic peptide (NT-proBNP) >1500 pg/mL is virtually diagnostic of an effusion secondary to congestive heart failure.

Hepatic Hydrothorax

- patients with cirrhosis and ascites.
- direct movement of peritoneal fluid through small openings in the diaphragm into the pleural space.
- usually right-sided

Parapneumonic Effusion

- associated with bacterial pneumonia, lung abscess, or bronchiectasis.
- *Empyema* refers to a grossly purulent effusion.
- presence of free pleural fluid can be demonstrated with a lateral decubitus radiograph, computed tomography (CT) of the chest, or ultrasound.

1. loculated pleural fluid
2. pleural fluid pH < 7.20
3. pleural fluid glucose < 3.3 mmol/L (<60 mg/dL)
4. positive Gram stain or culture of the pleural fluid
5. the presence of gross pus in the pleural space

Effusion Secondary to Malignancy

- Secondary to metastatic disease.
- three tumors that cause ~75% of all malignant pleural effusions are lung carcinoma, breast carcinoma, and lymphoma.
- pleural fluid is an exudate
- diagnosis is usually made via cytology of the pleural fluid.

Mesothelioma

- primary tumors that arise from the mesothelial cells that line the pleural cavities.
- asbestos exposure
- CXR = pleural effusion, generalized pleural thickening, and a shrunken hemithorax.

Effusion Secondary to Pulmonary Embolization

- Exudate
- spiral CT scan or pulmonary arteriography

Tuberculous Pleuritis

- exudative pleural effusion
- Primarily due to a hypersensitivity reaction to tuberculous protein in the pleural space.
- TB markers in the pleural fluid (adenosine deaminase > 40 IU/L, interferon γ > 140 pg/mL, or positive polymerase chain reaction (PCR) for tuberculous DNA)

Effusion Secondary to Viral Infection

- sizable percentage of undiagnosed exudative pleural effusions.
- resolve spontaneously

AIDS

- Kaposi's sarcoma, followed by parapneumonic effusion , TB, cryptococcosis

Chylothorax

- thoracic duct is disrupted and chyle accumulates in the pleural space.
- milky fluid
- Triglyceride level that exceeds 1.2 mmol/L (110 mg/dL).
- insertion of a chest tube plus the administration of octreotide.
- Pleuroperitoneal shunt

Hemothorax

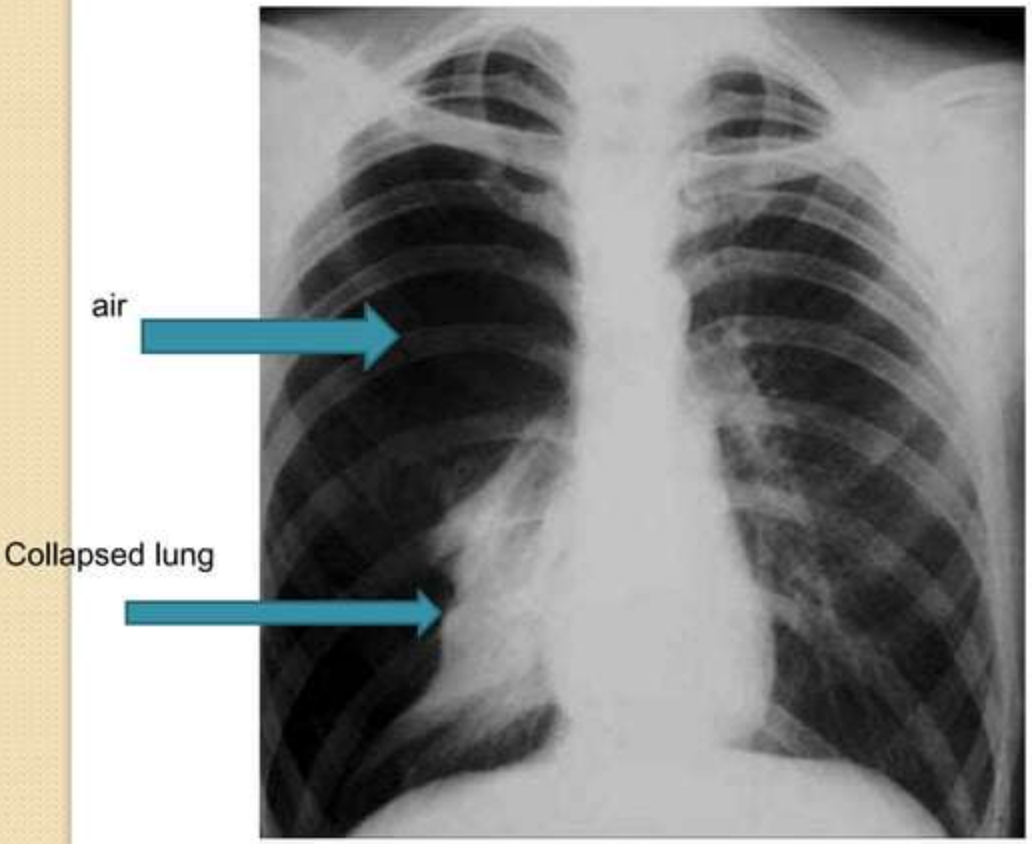
- Hematocrit is more than half of that in the peripheral blood.
- Trauma, rupture of a blood vessel or tumor.
- treated with tube thoracostomy

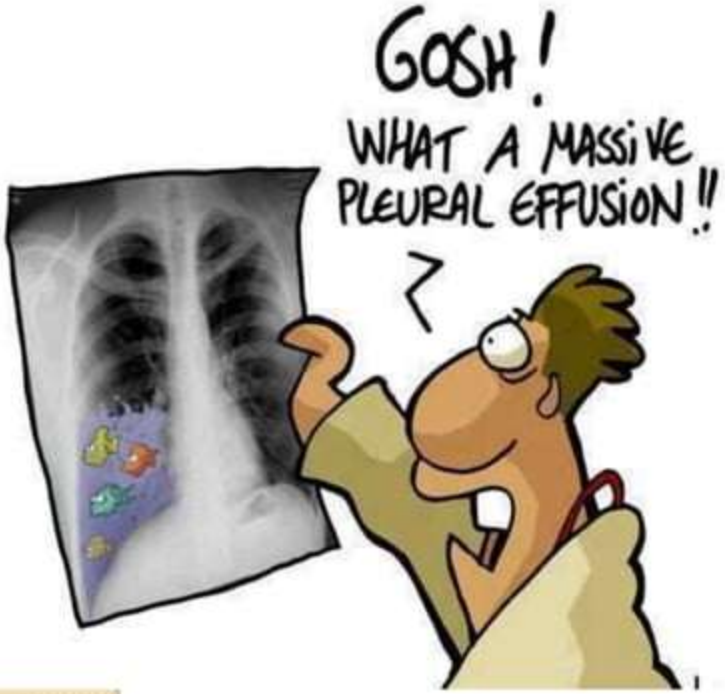
Miscellaneous Causes of Pleural Effusion

- pleural fluid amylase level is elevated - esophageal rupture or pancreatic disease
- Benign ovarian tumors can produce ascites and a pleural effusion (Meigs' syndrome)
- Abdominal surgery; radiation therapy; liver, lung, or heart transplantation; or the intravascular insertion of central lines.

PNEUMOTHORAX

- *Spontaneous pneumothorax* is one that occurs without antecedent trauma to the thorax.
- *traumatic pneumothorax* results from penetrating or nonpenetrating chest injuries.
- *tension pneumothorax* is a pneumothorax in which the pressure in the pleural space is positive throughout the respiratory cycle.


air
Collapsed lung



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