

Pleural Effusion

Pathophysiology Caused by **increased drainage of fluid into the pleural space**, increased production of fluid by cells in the pleural space, or decreased doing of fluid from the pleural space.

Causes

- **CHF is most common cause.**
- Bacterial pneumonia, malignancies (36% of lung, 25% of breast, 10% of lymphoma), PE, viral diseases, and cirrhosis with ascites.

Symptoms Often asymptomatic. **Dyspnea on exertion, peripheral edema, orthopnea, and PND.**

Signs **Dullness to percussion**, decreased breath sounds, and decreased tactile fremitus.

Transudative Effusions Pathophysiology is due to either **elevated capillary pressure in the visceral or parietal pleura** (as in CHF), or **decreased plasma oncotic pressure** (hypoalbuminemia).

- Causes include CHF, cirrhosis, PE, nephrotic syndrome, peritoneal dialysis, **hypoalbuminemia**, and atelectasis.
- pH is normally 7.4-7.55.

Pleural Effusion (cont)

Exudative Effusions Caused by **increased permeability** of pleural surfaces or **decreased lymphatic flow** from the pleural surface because of damage to pleural membranes or vasculature.

- Causes are **bacterial pneumonia**, TB, malignancy, **metastatic disease**, PE, viral infection, and collagen vascular diseases.
- Exudates must have >1 of the following. **Protein pleural/protein serum >0.5. LDH pleural/LDH serum >0.6. LDH > 2/3 upper limit of normal serum LDH.**
- pH is 7.3-7.45. If <7.3, empyema, tumor, fibrosis.

Empyema

Causes

- Exudative pleural effusions left untreated can lead to empyema.
- Most cases occur as a **complication of bacterial pneumonia**, but other foci of infection can spread to the pleural space (mediastinitis, abscess).

Diagnosis CXR and CT

Treatment

- Aggressive drainage of the pleura via thoracentesis and antibiotic therapy.
- Very difficult to eradicate and recurrence is common.
- If severe and persistent, rib resection and open drainage may be necessary.

Tests + Treatment

CXR

- Look for **blunting of the costophrenic angle.**
- 250mL must accumulate before an effusion can be detected.
- Lateral decubitus films are more reliable for detecting small pleural effusions.
- Can also determine if the fluid is free or located.

CT Scan More reliable than CXR.

Treatment

- For **transudative**, diuretics, sodium restriction, and **therapeutic thoracentesis** if massive and causing dyspnea.
- For **exudative**, treat underlying disease.
- For **parapneumonic effusions**, antibiotics alone if uncomplicated.
- **Complicated effusions or empyema require chest tube drainage**, intracellular injection of thrombolytic agents (streptokinase or urokinase) to accelerate drainage, and/or surgical lysis of adhesions.

Tests + Treatment (cont)

Thoracentesis

- Useful if etiology is not obvious.
- Provides a diagnosis in 75% of patients.
- Drainage provides relief of symptoms for large effusions.
- Pneumothorax is a complication in 10-15% of cases, but requires treatment with a chest tube in <5%.
- Do not perform if effusion is <10mm thick on lateral decubitus CXR.
- Send fluid for CBC, protein, LDH, pH, glucose, gram stain, and cytology, Chemistry, cytology, cell count, and culture.

Pleural Fluid Tests

- CBC, glucose, pH, amylase, TGs, microbiology, and cytology.
- **Elevated pleural amylase** is associated with esophageal rupture, pancreatitis, and malignancy.
- Milky, opalescent fluid is a chylothorax.
- Frankly purulent fluid is empyema.
- Bloody effusion is associated with malignancy.
- Exudative effusions that are primarily lymphocytic are associated with TB.
- pH < 7.2 is associated with parapneumonic effusion or empyema.
- If glucose < 60, rule out RA. Can also be low in other causes.

Pneumothorax

Traumatic

- Often iatrogenic.
- Always obtain a **CXR after transthoracic needle aspiration, thoracentesis, and central line** placement.

Pneumothorax (cont)

Spontaneous Primary

- Occur without underlying lung disease.
- Caused by **spontaneous rupture of subpleural blebs** (air-filled sacs on the lung) at the apex of lungs.
- Escape of air from the lung into the pleural space causes lung to collapse.
- More common in tall, lean young men.
- Patients have sufficient pulmonary reserve, so severe respiratory distress does not occur in most cases.
- Recurrence rate is 50% in 2 years.

Spontaneous Secondary

- Occurs as a complication of underlying lung disease, most commonly **COPD**.
- Smoking leads to chronic airway inflammation and formation of respiratory bronchiolitis.
- The chronic destruction of alveoli leads to large alveolar blebs in the upper lobes, which can rupture and leak air into the pleural space.
- Other conditions include asthma, ILD, neoplasms, CF, and TB. **More life-threatening because of lack of pulmonary reserve.**

Symptoms **Ipsilateral chest pain**, usually sudden in onset. Dyspnea, cough.

Pneumothorax (cont)

Signs

Decreased breath sounds, hyperresonance, decreased/absent tactile fremitus, **mediastinal shift toward the side** of the pneumothorax.

CXR Shows visceral pleural line.

Treatment

- If small and asymptomatic, observation as it should resolve spontaneously in ~20 days.
- Small chest tube with one-way valve may benefit some patients.
- If pneumothorax is larger or symptomatic, supplemental oxygen and chest tube insertion.
- If secondary, chest tube drainage is always indicated.

Tension Pneumothorax

Pathophysiology

- Accumulation of **air within the pleural space** such that tissues surrounding the opening into the pleural cavity act as valves, allowing air to enter but not to escape.
- The accumulation of **air under positive pressure in the pleural space collapses the ipsilateral lung** and shifts the mediastinum away from the side of the pneumothorax.

Causes Trauma, CPR, mechanical ventilation with associated barotrauma.

Tension Pneumothorax (cont)

Signs Hypotension (**cardiac filling is impaired due to compression of the great veins**), distended neck veins, **shift of trachea away from pneumothorax**, decreased breath sounds, hyper resonance to percussion.

Treatment Do not order CXR. Medical emergency. The patient is likely to die of hemodynamic compromise. **Immediately decompress with large-bore needle** or chest tube.

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