Pleural Effusion

- normally we have minimal fluid for lubrication inside the pleural space which is a potential space
- this normal fluid is drained continuously by the lymphatic system in a dynamic exchange process
- both visceral and partial layers have microvessels running through them (bronchial and intercostal) and the space between them has microvascular filtrate that is partly reabsorbed by lymphatics
- The remaining low protein interstitial liquid flows across the leaky pleural mesothelial layers into the pleural space
- Fluid characteristics
    - normal amount is 15 cc
    - low proteins levels : 1-1.5
    - alkaloid (7.6-7.7 pH)
    - low WBCs (< 1000) which are mainly macrophages
- Mechanism for Pleural Fluid Formation
    - Increase in hydrostatic pressure - heart failure
    - Decrease in oncotic pressure - hypoalbuminemia
    - Increase in pleural pressure - atelectasis
    - Increase in endothelial permeability - PNA
    - Decrease in lmphatic drainage- malignancy
    - Movement from peritoneal space - hepatic hydrothorax
    - Thoracic duct rupture - lymphoma
    - Iatrogenic - drug-induced
- Transudate vs exudate
    - Light's criteria
        - Pleural fluid Total protein/serum total protein > 0.5
        - Pleural fluid LDH/serum LDH > 0.6
        - Pleural fluid LDH value > 2/3 upper limit of normal for serum normal values
        - If meets one of these criteria, then fluid is classified as exudate (very serious causes)
    - Exudate causes (inflammation or cellular damage) : mainly malignancy (stage 4) or infections / pulmonary embolism / collagen vascular diseases / post surgical / uremia / asbestos exposure / lupus pleuritis / hemothorax
    - Transudate causes (overproduction of water or loss of proteins) : heart failure / Liver disease / Nephrotic syndrome / urinothorax / peritoneal dialysis / Myxedema
- The most common cause of a pleural effusion is Cirrhosis followed by heart failure,

Pneumonia and Malignancy

- Most common symptoms are dyspnea and chest pain
- Physical examination
  - decreased breath sounds
  - dull percussion
  - decreased tactile vocal fremitus
  - decreased expansion on side of effusion
- Radiology evaluation
  - chest xray : position must be AP & Lateral (lateral is more sensitive : we only need 50 cc compared to 200 cc to detect the effusion)
  - ultrasound : to differentiate small effusions vs pleural thickening (can show septations in the fluid)
  - CT scan : the gold standard / not routinely indicated but can evaluate lung parenchyma and masses obscured by effusion / more sensitive than CXR
  - Lateral Decubitus : to see wether it is free flowing or loculated (contained in a sac)
- Thoracentesis
  - Indicated in any pleural effusion of adequate size where there is no obvious cause
  - used to make the final diagnosis
  - Color
    - Pale Yellow : Transudate (most common)
    - red / bloody : Malignancy / hemothorax / Pulmonary infarction due to embolism
    - White / Milky : Chylothorax / Cholesterol effusion
    - Brown : Chronic bloody effusion / rupture of amebic liver abscess
    - Black : Aspergillus infection
    - Yellowish green : Rheumatoid pleurisy
  - Characteristic
    - Urine Like : Urinothorax
    - Pus : Empyema
    - Viscous : Mesothelioma and Empyema
    - Debris : Rheumatoid pleurisy
    - Turbid : Inflammatory exudate or lipids
    - Anchovy paste : Amebic liver abscess rupture
    - Satin like sheen : Cholesterol effusion
- Other diagnostic testing for pleural fluid
  - Glucose : reduced in infections or Rheumatoid pleurisy or malignancy
  - pH : reduced in infections, malignancy, RA, esophageal rupture (low glucose is

associated with low pH)
        - pH 7.45-7.55 : transudate
        - pH 7.3-7.45 : exudate
        - pH < 7.3 : empyema or RA or lupus or TB or malignancy
    - Cytology (not sensitive) : malignancy
    - Cultures : for infections like bacteria, TB or fungal
    - Amylase : Elevated in esophageal rupture, pancreatitis, and malignancy
    - Triglyceride : chylothorax
    - Adenosine deaminase : Elevated in tuberculous pleuritis
- Cell Count and Type
    - high RBC (more than 100K) : Malignancy / hemothorax / embolism / pneumonia
    - high Lymphocytes (normal < 10%) : Malignancy / embolism / infections / TB / Post CABG / Chylothorax / Yellow nail / Sarcoid / Lymphoma / Acute Lung Rejection / Chronic Rheumatoid Effusion
    - Neutrophils : Parapneumonic effusion / embolism / infections with empyema / Malignancy
    - Eosinophils : drug interactions / hemothorax / pneumothorax / parasitic infections / benign asbestos pleural effusion BAPE / Fungal Disease
- Indicators of complicated parapneumonic pleural effusion that require thoracostomy
    - Empyema : positive Gram stain of fluid or gross pus noted on thoracentesis
    - Multiple septations or loculations noted on ultrasound or CT chest
    - pH < 7.2 indicates complicated infection and < 7.0 will likely need drainage or decortication
    - Pleural fluid glucose < 60 mg/dL
- Treatment of parapneumonic pleural effusion
    - drainage and antibiotic therapy.
    - repeat thoracentesis, percutaneous catheter drainage, chest tube thoracostomy or possible surgical decortication
    - Can use intrapleural thrombolytics to help facilitate drainage
- Rheumatoid Pleurisy
    - Occurs after arthritis has been present for years
    - Associated with subcutaneous nodules
    - More common in men with RA
    - Can be associated with other pulmonary manifestations such as pulmonary nodules
    - Does not tend to respond to treatment of RA
    - Can have cholesterol crystals
- Chylothorax and Pseudochylous effusions

    - Chylothorax
        - presence of chyle in the pleural space with Triglyceride level > 110 mg/dL
        - causes :
            - Trauma to thoracic duct (surgery)
            - lymphoma
    - Pseudochylous effusion
        - presence of cholesterol in the pleural space with Cholesterol level > 250 mg/dL
        - May have cholesterol crystals
        - causes :
            - Tuberculous pleurisy
            - Rheumatoid arthritis
- Mesothelioma
    - a primary neoplasm involving the pleura
    - related to prevous asbestosis exposure
    - Mesothelin levels in pleural fluid may suggest diagnosis
    - Can treat localized mesothelioma with surgical excision but most disease is extensive
- Asbestos related pleural disease
    - Can cause disease many years after exposure
    - may cause pleural fibrosis
    - May cause calcified pleural plaques
    - Eosinophils may be noted in fluid
    - associated with hemorrhagic effusion