Pleural effusion

Pleural cavity

**Anatomy:** Parietal & visceral pleura, pleural fluid, negative pressure.

**Embryology:**

- Pericadial, pleural & peritoneal cavities derivatives of intraembryonic coelom

- Lateral plate mesoderm split into parietal(somatopleuric) & visceral (splanchnopleuric) layer.

- Parietal & visceral pleura lined by mesothelial lining (flattened epithelium - smooth lining)

- Intraembryonic coelom - midline portion (pericardial cavity)
  - two lateral parts (peritoneal cavity)
  - narrow pericardo-peritoneal canal-pleural cavities.
Pleural cavity

- Between two surface thin layer of lubricating pleural fluid.
- Constant secretion absorption of fluid, is going on at constant rate 1-2L/24h
- 5-10ml at any time present in pleural cavity
- Network of somatic, sympathetic, parasympathetic fibers in parietal pleura
- Irritation of parietal pleura by inflammation, tumor invasion, trauma & other- chest pain
Pleural effusion

• Refers to any significant collection of fluid within pleural space.

• Any imbalance in formation, absorption lead accumulation of pleural fluid.

• Common condition: CHF
  Bacterial pneumonia
  Malignancy,
  Pulmonary embolism.

• Minimal about 150-200ml of fluid required before radiographic ally diagnosis.

• First indication blunting or abolition of costophrenic angles

• Lateral decubitus chest X-ray for small PE (75-100ml)
Pleural effusion

- Elevated pulmonary capillary pressure: LT atrium pressure increase-increase pul capillary pressure

- Reduced intravascular oncotic pressure:
  Decrease plasma protein - renal & hepatic disease, malnutrition

- Obstruction of mediastinal lymphatic system:
  lymphoma, cancer invade lymphatics

- Excessive permeability of capillary to fluid & electrolytes - inflammatory disease.
### Differential Diagnosis of Pleural Effusions

#### I. Transudative pleural effusions
   - A. Congestive heart failure
   - B. Cirrhosis
   - C. Nephrotic syndrome
   - D. Superior vena caval obstruction
   - E. Fontan procedure
   - F. Urinothorax
   - G. Peritoneal dialysis
   - H. Glomerulonephritis
   - I. Myxedema
   - J. Cerebrospinal fluid leaks to pleura
   - K. Hypoalbuminemia
   - L. Pulmonary emboli
   - M. Sarcoidosis

#### II. Exudative pleural effusions
   - A. Neoplastic diseases
     1. Metastatic disease
     2. Mesothelioma
     3. Body cavity lymphoma
     4. Pyothorax-associated lymphoma
   - B. Infectious diseases
     1. Bacterial infections
     2. Tuberculosis
     3. Fungal infections
     4. Parasitic infections
     5. Viral infections
   - C. Pulmonary embolization

#### C. Pulmonary embolization

#### D. Gastrointestinal disease
   1. Pancreatic disease
   2. Subphrenic abscess
   3. Intrahepatic abscess
   4. Intraspencic abscess
   5. Esophageal perforation
   6. Postabdominal surgery
   7. Diaphragmatic hernia
   8. Endoscopic variceal sclerosis
   9. Post-liver transplant

#### E. Heart diseases
   1. Post-coronary artery bypass graft surgery
   2. Post-cardiac injury (Dressler’s) syndrome
   3. Pericardial disease

#### F. Obstetric and gynecologic disease
   1. Ovarian hyperstimulation syndrome
   2. Fetal pleural effusion
   3. Postpartum pleural effusion
   4. Megis’ syndrome
   5. Endometriosis

#### G. Collagen-vascular disease
   1. Rheumatoid pleuritis
   2. Systemic lupus erythematosus
   3. Drug-induced lupus
   4. Immunoblastic lymphadenopathy
   5. Sjögren’s syndrome
   6. Familial Mediterranean fever
   7. Churg-Strauss syndrome
   8. Wegener’s granulomatosis

#### H. Drug-induced pleural disease
   1. Nitrofurantoin
   2. Dantrolene
   3. Methysergide
   4. Ergot alkaloids
   5. Amiodarone
   6. Interleukin-2
   7. Procarbazine
   8. Methotrexate
   9. Clozapine
Differential Diagnosis of Pleural Effusions (continued)

I. Miscellaneous diseases and conditions
   1. Asbestos exposure
   2. Post-lung transplant
   3. Post-bone marrow transplant
   4. Yellow nail syndrome
   5. Sarcoidosis
   6. Uremia
   7. Trapped lung
   8. Therapeutic radiation exposure
   9. Drowning
   10. Amyloidosis
   11. Milk of calcium pleural effusion
   12. Electrical burns
   13. Extramedullary hematopoiesis
   14. Rupture of mediastinal cyst
   15. Acute respiratory distress syndrome
   16. Whipple’s disease
   17. Iatrogenic pleural effusions

J. Hemothorax

K. Chylothorax
Pleural effusion

- Diagnosis: history & physical examination
- Pleural effusion B/L or unilateral (parapneumonic process)
- Symptoms: cough, fever, dyspnea, leucocytosis.
- Dullness on percussion
- Absent breath sound & vocal fremitus on auscultation
- Massive effusion - mediastinal shift
- Diagnostic thoracentesis (pleural tap) - USG guided for small PE
- Therapeutic for large PE (not more than 1500 ml in one attempt)
- Intercostal drain
- EXUDATE/ TRANSUDATE
Pleural effusion

- **TRANSUDATE**
  - Poor protein ultra-filtrate of plasma,
  - Clear to faint yellow tinge, no odour,
  - pH 7.40-7.55
  - Glucose level equal serum plasma,
  - Specific gravity < 1.015
  - Protein content < 3g/100ml
  - TLC fewer than 1000
  - Common causes: CHF, nephrotic syndrome, ascites & atelectasis
  - Evaluated for these causes.

- **EXUDATE**
  - Often turbid, bloody or purulent,
  - pH < 7.30
  - Specific gravity > 1.016,
  - Protein content > 3g/100ml
  - Common causes: inflammatory, neoplasms of pleura & lungs pulmonary infarction.
  - TLC, DLC-neutrophils > 50% acute inflammation, mononuclear- chronic inflammation,
  - Gram straining & bacterial culture & sensitivity,
  - Glucose level < 60mg/dl,
  - Cytology for malignant cell.
  - Tuberculosis level of adenosine deaminase (>40U/L) in pleural fluid.
Hemorrhagic pleural effusion not included in TRANSUDATE/ EXUDATE
Malignant pleural effusion

- Different malignancy - most common
  lung cancer,
  pleural involvement with primary (mesothelioma)
  secondary (breast cancer),
  mediastinal lymphatic involvement

- Malignant PE: Exudative with tinged blood

- Sign of advance malignancy with mean survival 3-11mth

- Cytology, biopsy, CT guided biopsy, VATS biopsy, open biopsy.

- Symptomatic moderate to large effusion-
  chest tube,
  pigtail drain,
  pleurodesis-bleomycin or doxycycline
Empyema

- Thoracic empyema is *purulent pleural effusion*
- End stage of pleural effusion if not treated properly
- Thick pus with a thick cortex of fibrin and coagulum over lung
- Most common cause: Parapneumonic, Postsurgical & post-traumatic
Empyema

• Empyema due to pneumonia three phase

• The exudative phase: protein > 3g/100 ml
  Infection from lung
  Antibiotics & aspiration or drainage

• The fibrinopurulent phase: (next few days)
  Pleural fluid become thick,
  Drainage must

• The organized phase: Lung trapped by thick peel or cortex
  Surgical management
    VATS,
    thorocotomy
Condition predispose to Empyema

- Pulmonary infection: Unresolved pneumonia
  Broncietasis
  Tuberculosis
  Fungal infection
  Lung abscess

- Aspiration of pleural effusion

- Trauma: Penetrating injury
  Surgery
  Oesophgeal peforation

- Extrapulmonary sources: Subphernic abscess

- Bone infection osteomyelitis ribs and vertebra