PLEURAL EFFUSIONS

Under normal circumstances, a thin layer of fluid lies between the visceral and the parietal pleura. A pleural effusion implies the presence of an abnormally large amount of fluid in the pleural space.

In Western countries, the most common cause is *congestive cardiac failure;* followed by malignancy and pneumonia. Worldwide however, tuberculosis is the leading cause.

Terminology:

Pleuritis / pleurisy denotes inflammation of the pleura and can occur with or without significant exudation of fluid into the pleural space. It is a common presentation for a wide range of disease processes; from viral syndromes to pneumonia & pulmonary embolism, through to chronic illnesses such as SLE & other connective tissue disorders.

Parapneumonic effusion is a pleural effusion associated with bacterial pneumonia, bronchiectasis or lung abscess.

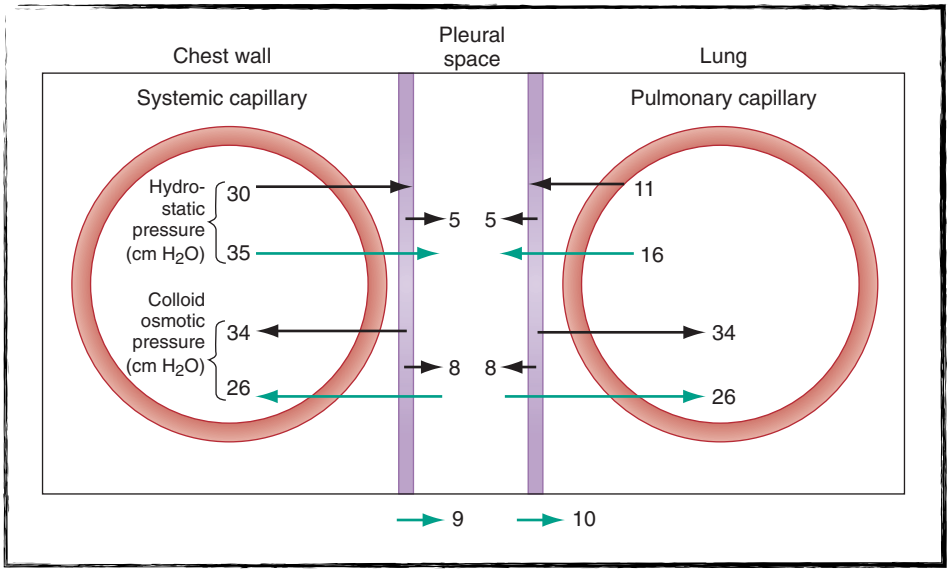
Empyema is pus in the pleural space & requires the presence of bacteria on Gram stain.

Loculated effusion is fluid that is confined and not free flowing in the pleural space.

Pathophysiology:

Under normal circumstances, pleural fluid is produced from systemic capillaries at the parietal pleural surface and absorbed into the pulmonary capillaries at the visceral pleural surface. Lymphatics are also responsible for removing pleural fluid.

The movement of fluid across the pleural surfaces is governed by *Starling's law*. The biggest influence is the difference in *hydrostatic pressure* between the systemic and pulmonary circulations.



Pleural effusions accumulate when influx of fluid into the pleural space exceeds efflux. They are classically divided into two groups; *transudates* and *exudates* according to the composition of the pleural fluid.

Transudates:

- Ultrafiltrates of plasma.
- Very little protein.
- Result from increased hydrostatic pressure or decreased oncotic pressure within pleural micro-vessels.
- CCF (90% of transudates) results from increased hydrostatic pressure; whilst cirrhosis & nephrotic syndrome result

Exudates:

- Relatively high amounts of protein.
- Result from pleural abnormality.
- Results from increased membrane permeability or defective lymphatic drainage.
- Often associated w/ inflammation (eg. parapneumonic).
- Can result from sub-diaphragmatic inflammatory pathology (eg. pancreatitis)

Mixture:

- eg. Pulmonary embolism (increased pulmonary vascular pressure = transudate, ischaemia and pleural breakdown = exudate).

BOX 75-2 CAUSES OF PLEURAL EFFUSION

Transudates
Congestive heart failure
Cirrhosis with ascites
Nephrotic syndrome
Hypoalbuminemia
Myxedema
Peritoneal dialysis
Glomerulonephritis
Superior vena cava obstruction
Pulmonary embolism

Exudates
Infections
Bacterial pneumonia
Bronchiectasis
Lung abscess
Tuberculosis
Viral illness
Neoplasms
Primary lung cancer
Mesothelioma
Pulmonary/pleural metastases
Lymphoma

Connective Tissue Disease
Rheumatoid arthritis
Systemic lupus erythematosus

Abdominal/Gastrointestinal Disorders
Pancreatitis
Subphrenic abscess
Esophageal rupture
Abdominal surgery

Miscellaneous
Pulmonary infarction
Uremia
Drug reactions
Postpartum
Chylothorax

Massive effusions (>1.5-2 L) are most commonly associated with malignancy (but also CCF and cirrhosis). These may restrict respiratory movement, compress lungs & result in intrapulmonary shunting. In rare cases they can cause tension physiology.

Clinical Features:

Symptoms are most often due to the underlying disease process and not the effusion itself. Small effusions may be asymptomatic.

Symptoms:

- *Localised pain* (or pain referred to the shoulder).
- *Pleuritic chest pain* (in the setting of pleuritis or pulmonary infarction).

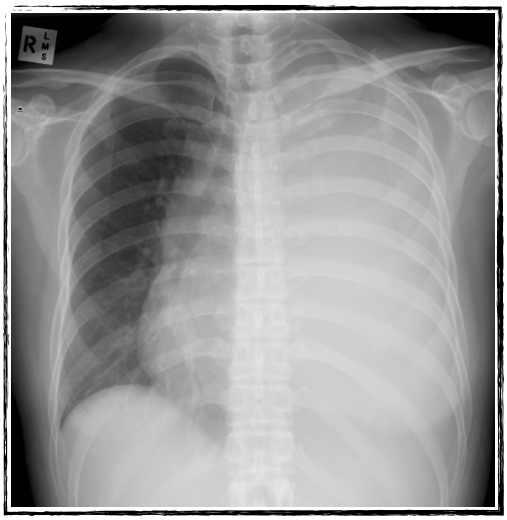
Dyspnoea (usu. with volumes > 500 mL).

- May have *viral prodrome.*

Signs: (*Depend on the size of the effusion)*

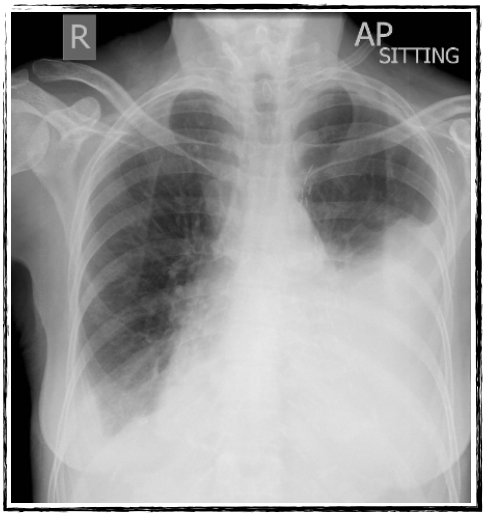
- *Diminished breath sounds*
- *Dullness to percussion*
- *Decreased tactile fremitus.*
- *Pleural friction rub.*

Evidence of mediastinal shift may be present with *massive effusions*.



Diagnostic Strategies:

Radiology:



- CXR:
  - Confirms the Dx & occasionally reveals incidental effusions.
  - Blunting of the costophrenic angle on upright x-rays.
  - ~250-500mL required to show on CXR.
  - In large effusions, obscure diaphragms and lead to meniscus formation.
  - Can extend into fissures (& can loculate).
  - Gravitates to dependent locations.
- CT-CHEST:
  - helpful for localised effusions
- Ultrasound:
  - Additional assistance in guiding thoracentesis & reduce complications.

NB: Pulmonary embolism is the most commonly overlooked disorder in the workup for pleural effusion (*Dyspnoea usually out of proportion to size of effusion).

Laboratory Studies:

- Pleural Fluid Evaluation:

Light's Criteria distinguishes *transudate vs exudate.*

BOX 75-3 LIGHT'S CRITERIA FOR DIFFERENTIATING TRANSUDATES FROM EXUDATES

Pleural fluid is considered an exudate if one or more of the following hold true:

1. Pleural fluid protein level: serum protein level >0.5
2. Pleural fluid lactate dehydrogenase (LDH) level: serum LDH level >0.6
3. Pleural fluid LDH level $> \frac{2}{3} \times$ (upper limit of normal for serum LDH level)

Pleural pH < 7.3 is associated w/

- Parapneumonic effusions
- Malignancies
- Rheumatoid effusions
- TB
- Systemic acidosis.

pH < 7.0 strongly suggests:

- Empyema
- Oesophageal rupture
- Need for tube thoracostomy.

All exudative pleural effusions should under *Gram-staining* and *Culture.*
In the absence of a traumatic tap; bloody fluid suggests trauma, neoplasm or pulmonary infarction; which should prompt for fluid to be sent for *cytology*.

Management:

- In patients with large effusions, urgent therapeutic thoracentesis may stabilise respiratory and circulatory status.

- The presence of empyema mandates insertion of a chest tube to drain the pleural space.
- Haemothorax requires tube thoracostomy to quantify bleeding.
    - > 200mL/hr = consideration of thoracotomy.
- Transient hypoxia (from VQ mismatch) usually occurs following drainage of large pleural effusions.
    - Re-expansion pulmonary oedema rarely occurs (even when > 1500mL drained)
    - Hypotension is also another rare occurrence (usually in volume depleted patients)
- *Analgesia:*
    - NSAIDS & opiates.
- CXR should always be repeated after thoracentesis.
- Large & recurrent effusions may be appropriate for pleurodesis procedures.

Parapneumonic effusions contribute significantly to the morbidity and mortality of pneumonia & its presence should mandate admission. Earlier drainage results in shorter hospital stay