

## Pleural Effusion

### Definition of pleural effusion

- Accumulation of fluid between the pleural layers

### Epidemiology of pleural effusion

- Estimated prevalence of pleural effusion is 320 cases per 100,000 people in industrialized countries, with a distribution of etiologies related to the prevalence of underlying diseases.

### Causes of pleural effusion

- Can be divided into Transudative or Exudative

#### Transudative pleural effusion

- Involve increased hydrostatic pressure or reduced osmotic pressure in the microvascular circulation (commonly caused by organ failures)
- Failures
  - Left ventricular failure
  - Liver failure (cirrhotic liver disease)
  - Nephrotic syndrome and hypoalbuminaemia
- Pulmonary
  - Pulmonary embolism (can be transudates or exudates)
  - Atelectasis
  - Malignancy (5% are transudate)
- Cardiac
  - Constrictive pericarditis
- Other
  - Hypothyroidism
  - Meig's syndrome (ovarian tumours producing right-sided effusion)

#### Exudative pleural effusion

- Involve an increase in capillary permeability and impaired pleural fluid resorption
- Infection
  - Parapneumonic
  - TB
  - Empyema
- Malignancy
- Rheumatological
  - Rheumatoid arthritis
  - Connective tissue disease (RA, SLE)
- Pulmonary embolism (can be transudates or exudates)
- Rare causes
  - Post-MI, pancreatitis, mesothelioma, sarcoidosis, asbestosis
  - Drug induced (methotrexate, amiodarone, bromocriptine, phenytoin, nitrofurantoin)
  - Radiotherapy
  - Yellow-nail syndrome, familial Mediterranean fever
  - Lymphangioleiomyomatosis
    - Pneumothoraces and cylothoraces in middle-aged women.

- Tx: progesterone (but not very good)

### Presentations of pleural effusion

Clinical examination will usually pick up effusion >500ml

- SOB
- Cough
- Chest pain
- Reduced chest wall movement
- Mediastinal deviation away (if large)
- Stony dullness to percussion
- Decreased breath sounds
- Decreased Vocal resonance
- Bronchial breathing or aegophony (bleating vocal resonance) over top of effusion, due to lung compression

### Differential diagnosis of pleural effusion (decreased air entry on auscultation)

- Consolidation
- Collapse
- Pleural thickening

### Investigation of pleural effusion

- Bloods
  - Including amylase, LDH, TFT
  - RF and autoimmune profile
- ABG
- CXR
  - Sensitive to effusion >300ml (some places say 200)
- USS
  - For assessing pleural effusion
  - For guiding aspiration
- **Aspiration**
  - Must be USS guided (BTS Guidelines)
  - Note appearance of fluid
  - Sent for
    - Biochem: protein, LDH, pH, glucose
    - Cytology (at least 20ml sample)
    - MCS and AFB
    - pH
    - Other: Amylase, cholesterol, RF and ANA
- Further tests
  - CT
    - Ideally scan before fluid removal as can improve images of pleural surfaces.
  - Pleural tissue biopsy for histology and TB culture

### Diagnostic criteria for pleural effusion

- Normal
  - Clear or straw, pH 7.60-7.64, protein <2, WCC<1, LDH<50% plasma, glucose similar to plasma

- Transudate
  - Protein <30 g/l: in patients with normal serum protein
- Exudate
  - Protein >30 g/l: in patients with normal serum protein
  - **Light's criteria**
  - More sensitive for diagnosis of exudative effusions and helpful if fluid protein between 25-35 g/l. Positive if one of these is true:
    - Pleural:serum protein ratio; >0.5 = exudate
    - Pleural:serum LDH ratio; >0.6 = exudate
    - Pleural LDH >2/3 the upper limit of normal serum LDH
  - NB. With diuretics, pleural protein and LDH are generally higher.
- Empyema
  - pH<7.2
  - Glucose usually <3.3
  - Bacteria in it
  - Fluid LDH generally >1000 in empyema
- LDH>1000
  - Empyema, malignant, rheumatoid, paragonamiasis
- Bloody
  - Malignancy, TB, PE, trauma
- Chylothorax
  - Milky white, chylomicrons, cholesterol>4, Triglyceride level > 110mg/dl
- High amylase
  - Pancreatitis, malignancy, oesophageal rupture
- Low glucose or low pH
  - Empyema, malignancy, TB, oesophageal rupture, SLE
- pH>7.3 in malignancy means:
  - More pleural involvement, higher cytology yield, decreased success in pleurodesis, decreased life expectancy

### Management of pleural effusion

- Treat the underlying cause
  - diuretics, antibiotics, immunosuppressants
- Aspiration (USS guided)
- Indications for chest drain:
  - Empyema or parapneumonic effusion with purulent fluid or pH<7.2
  - Malignant effusions which are candidates for pleurodesis
  - Large effusions in acutely unwell patients
- Pleurodesis
- Medical or VATs

### Complications of pleural effusion

- Respiratory failure
- Infection and empyema

### Prognosis of pleural effusion

- Dependent on underlying cause

### Procedure for Thoracocentesis:

- Explain procedure to patient
- Obtain written consent
  - Complications include pneumothorax, cough, bleeding, empyema, spleen or liver puncture, malignant seeding (particularly in mesothelioma – may need prophylactic radiotherapy to area later)
- Check clotting (INR <1.5)
- Must be done under USS Guidance (by a doctor trained in USS – see BTS guidance)
- Aseptic technique
- Infiltrate site (skin, intercostals muscle and parietal pleura) with 10ml 1% lidocaine.
- Aim above the upper border of the appropriate rib to avoid neurovascular bundle that runs below each rib.
- **For Diagnostic Thoracocentesis:**
  - Aspirate pleural fluid with a green (21G) needle and 50ml syringe
  - If uncomplicated – no need for CXR post procedure
- **For Therapeutic Thoracocentesis:**
  - Hospitals vary as to kit available
  - Verify that insertion site is correct by aspirating fluid with a green (21G) needle
  - Advance a large bore cannula along the same track
  - Remove needle and attach a 3 way tap
  - Aspirate fluid with a 50ml syringe via the 3 way tap and flush the fluid out into container through extension tubing connected to remaining port of 3 way tap.
  - Drain maximum of 1.5l in one go – risk of re-expansion pulmonary oedema
  - Stop aspirating if any resistance felt or if patient experiences any discomfort or severe coughing
  - CXR post to document extent of improvement and to exclude pneumothorax or trapped lung

### Questions about pleural effusions

#### How do you define a transudate and exudate in pleural effusions?

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### **What are the causes of transudative pleural effusions?**

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### **What are the causes of exudative pleural effusions?**

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### **What should you send pleural fluid for after aspiration?**

- Note colour
- Biochemistry: protein, LDH, glucose, pH
- To get a reliable and quick pH take a sample in an ABG syringe – can run this on blood gas machines
- Cytology (at least 20ml sample)
- MCS and AFB
- Other if indicated: amylase, cholesterol, RF and ANA