Pleural effusion

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A pleural effusion results from the accumulation of abnormal volumes (>10–20mL) of fluid in the pleural space.

Commonest causes in the UK and US (in order): cardiac failure, pneumonia, malignancy, PE.

19.14 Causes of pleural effusion

Common causes

- Pneumonia ('para-pneumonic effusion')
- Tuberculosis
- Pulmonary infarction*
- Malignant disease
- Cardiac failure*
- Subdiaphragmatic disorders (subphrenic abscess, pancreatitis etc.)

Uncommon causes

- Hypoproteinaemia* (nephrotic syndrome, liver failure, malnutrition)
- Connective tissue diseases* (particularly systemic lupus erythematosus (SLE) and rheumatoid arthritis)
- Post-myocardial infarction syndrome
- Acute rheumatic fever
- Meigs' syndrome (ovarian tumour plus pleural effusion)
- Myxoedema*
- Uraemia*
- Asbestos-related benign pleural effusion

*May cause bilateral effusions.

Clinical features

May be asymptomatic or associated with breathlessness, dry cough, pleuritic chest pain (suggesting pleural inflammation), chest ‘heaviness’, and sometimes pain referred to the shoulder or abdomen

signs on examination include reduced chest expansion, reduced tactile vocal fremitus, a stony dull percussion note, quiet breath sounds, and sometimes a patch of bronchial breathing above the fluid level. a friction rub may be heard with pleural inflammation.

Imaging CXR

- Sequential blunting of posterior, lateral, and then anterior costophrenic angles are seen on radiographs as effusions increase in size
- PA CXr will usually detect effusion volumes of 200mL or more; lateral CXr is more sensitive and may detect as little as 50mL pleural fluid
- Classical CXr appearance is of basal opacity obscuring hemidiaphragm, with concave upper border.

US has a much higher sensitivity than CXr at detecting and localizing pleural fluid and is useful for distinguishing pleural fluid from pleural masses or thickening.

CT chest with pleural contrast is useful in distinguishing benign and malignant pleural disease: ***nodular, mediastinal, or circumferential pleural thickening and parietal pleural thickening >1cm are all highly specific for malignant disease.*** scans are best performed prior to complete drainage of fluid

Role of MRI is unclear; it may have increasing role in distinguishing benign from malignant pleural disease.

Thoracentesis (= ‘pleural tap’ or pleural fluid aspiration) may be diagnostic and/or therapeutic, depending on the volume of fluid removed.

Following diagnostic tap: • note pleural fluid **appearance**

• Send sample to biochemistry for measurement of **glucose, protein, and lactate dehydrogenase (LDH)**

• Send a fresh 20mL sample in sterile pot to **cytology** for examination for malignant cells (yield 60% in malignancy) and **differential cell count** • Send samples in sterile pot to **microbiology** for Gram stain and microscopy, culture. For suspected pleural infection, also send pleural

fluid in blood culture bottles. Low threshold for AFB stain and tB culture

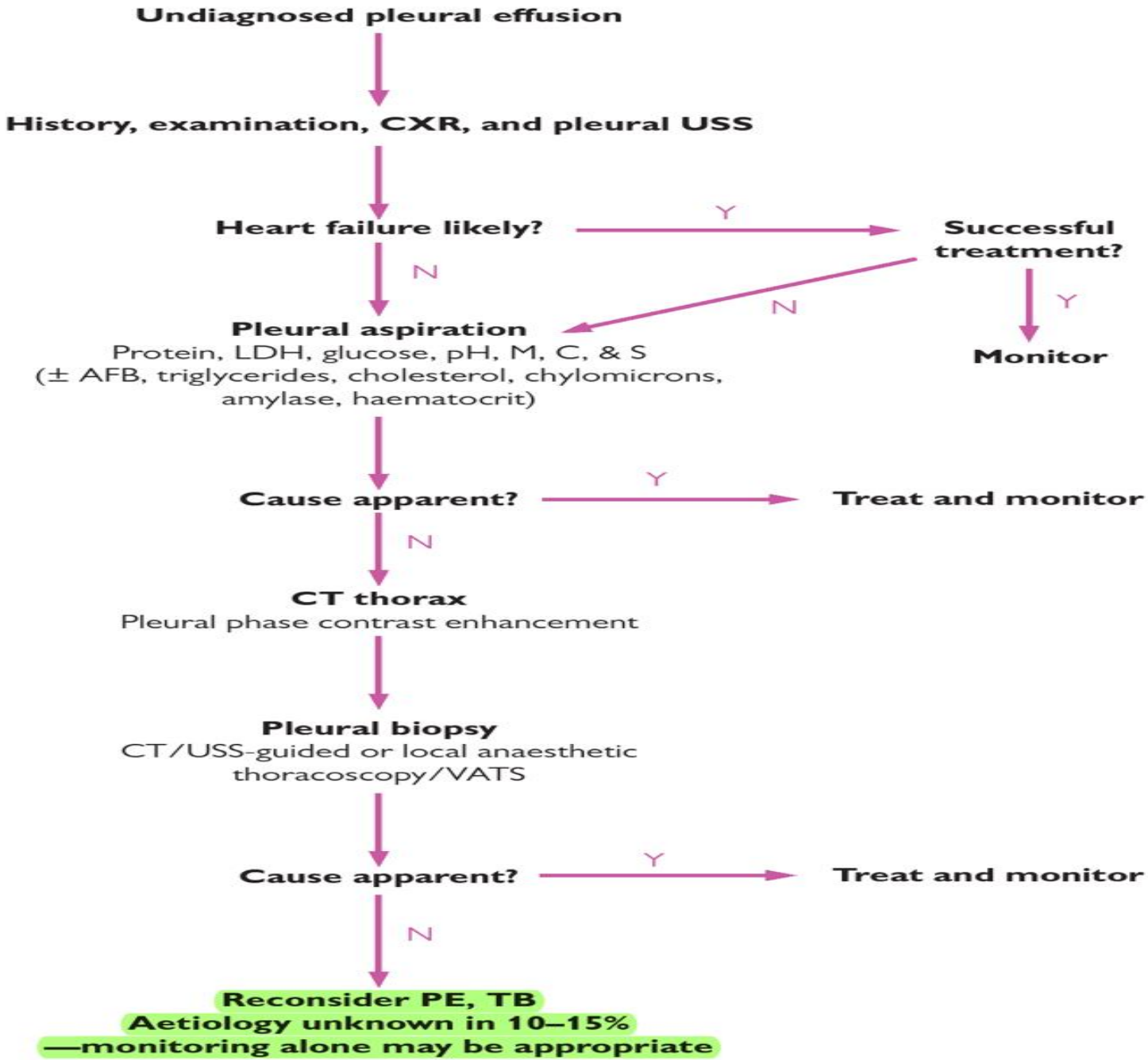
• Process non-purulent, heparinized samples in ABG analyser for **pH**

• Consider measurement of **cholesterol, triglycerides, chylomicrons, haematocrit, adenosine deaminase, and amylase, depending on the clinical circumstances.**

Is the pleural effusion a transudate or an exudate? Helpful in narrowing the differential diagnosis. In patients with a normal serum protein, pleural fluid protein <30g/L = transudate, and protein >30g/L = exudate. In borderline cases (protein 25–35g/L) or in patients with abnormal serum protein, ***apply Light's criteria—effusion is exudative if it meets one of following criteria.***

- Pleural fluid protein/serum protein ratio >0.5
- Pleural fluid LDH/serum LDH ratio >0.6
- Pleural fluid LDH > two-thirds the upper limit of normal serum LDH

Pleural tissue biopsy for histology and tB culture using image-guided or thoracoscopic biopsies.


Undiagnosed pleural effusion
History, examination, CXR, and pleural USS
Heart failure likely?
Y
Successful treatment?
N
Y
N
Pleural aspiration
Protein, LDH, glucose, pH, M, C, & S
(± AFB, triglycerides, cholesterol, chylomicrons, amylase, haematocrit)
Monitor
Cause apparent?
Y
Treat and monitor
N
CT thorax
Pleural phase contrast enhancement
Pleural biopsy
CT/USS-guided or local anaesthetic thoracoscopy/VATS
Cause apparent?
Y
Treat and monitor
N
Reconsider PE, TB
Aetiology unknown in 10–15%
—monitoring alone may be appropriate

Parapneumonic effusion and empyema

Definition and pathophysiology pleural effusions occur in up to 57% of patients with pneumonia. an initial sterile exudate (simple parapneumonic effusion) may, in some cases, progress to a complicated parapneumonic effusion and eventually empyema

pleural infection may also occur in the absence of a preceding pneumonic illness (' primary empyema').

Clinical features

Consider the diagnosis particularly in cases of 'slow-to-respond' pneumonia (e.g. failure of CRP to fall ≥50% in first 3 days), pleural effusion with fever, or high-risk groups with non-specific symptoms such as weight loss , ***anaerobic empyema may present less acutely, often with weight loss and without fever.***

Risk factors for developing empyema include ***diabetes, alcohol abuse, gastro-oesophageal reflux, and IV drug abuse***. anaerobic infection is associated particularly with aspiration or poor dental hygiene.

clinical variables associated with development of pleural infection in those with pneumonia: ***albumin <30g/L, CRP >100mg/L, platelets >400 × 10^9/l, sodium <130mmol/L, IVDU, and chronic alcohol use.***

Bacteriology

Community-acquired infection (% of cases): •Streptococcus 'milleri' group (30%) •anaerobes (5–30%) •Streptococcus pneumoniae (15%) •Staphylococcus aureus (10%)

Hospital-acquired infection (% of cases): •MRSA (25-30%) •Staphylococcus aureus (10–20%) • enterobacteriaceae (20%)

pleural infection is frequently polymicrobial.

Simple parapneumonic effusion	Exudative stage Clear sterile fluid with normal pH, glucose, LDH Frequently resolves with antibiotics alone Drainage not usually required
Complicated parapneumonic effusion	Fibrinopurulent stage Fibrin deposited and septations occur Fluid infected but not yet purulent; appears clear or cloudy/turbid pH <7.2, glucose <2.2mmol/L, and LDH >1,000IU/L Gram stain/culture may be positive Drainage required
Empyema	Pus in pleural space May be free-flowing or multiloculated Gram stain/culture may be positive Drainage required Eventually, fibroblast growth may result in development of thick pleural peel (organizing stage). Treatment at this stage is difficult and decortication may be required