PLEURAL DISEASES

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Pleurisy: term used to describe pain arising from any disease of the pleura. The localized inflammation produces sharp localized pain, made worse on deep inspiration, coughing and occasionally on bending movements. Pleurisy occurs with pneumonia, pulmonary infarct and carcinoma. Rarer

Pleural effusion:

pleural effusion is an excessive accumulation of fluid in the pleural space. It can be detected on X-ray when 200 mL or more of fluid is present and clinically when 500 mL or more is present. The amount of effusion range from the obliteration of the costophrenic angle to dense homogeneous shadows occupying part or all of the hemithorax.

Accumulation pus it called **empyema** can be a complication of pneumonia .

Blood accumulation called **haemothorax** as in chest trauma . aAccumulation of chylus called chylus effusion(**chylothorax**) This is due to the accumulation of lymph in the pleural space, usually resulting from leakage from the thoracic duct following trauma or infiltration by carcinoma..

The fluid is divided either transudative or exudative effusion .depend on protein amount in pleural fluid .

Transudates

Effusions that are transudates can be bilateral, but are often larger on the right side. The protein content is less than 30g/L and the lactic dehydrogenase is less than200 IU/L..

Causes include: cardiac failure, renal failure and liver cirrhosis or liver failure or due to hypoproteinemia due to nephrotic syndrome, severe malabsorption syndrome the mechanism of transudative effusion due to increase hydrostatic pressure or decrease oncotic pressure

Exudates:

The protein content of exudates is > 30 g/L and the lactic dehydrogenase is > 200 IU/L.

Causes include: due to increase pleural permeability due to infection pneumonia,TB ,malignancy as(lymphoma , CA lung , metastatic cancer, Mesothelioma) ,Pulmonary embolism ,rheumatoid and SLE.

Light's criteria for distinguishing pleural exudative from transudative effusion:

Exudate criteria :

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

Clinical features of pleural effusion:

The most common symptoms associated with plural effusions are dyspnea .pluritic chest pain (pain on inspiration and coughing) .Non productive cough .Additional feature such as weight change,fever,arthralgia,and orthopnea help further narrow the differential diagnosis .

signs of pleurisy (a pleural rub) often precede the development of an effusion, especially in patients with underlying pneumonia, pulmonary infarction or connective tissue disease. However, when breathlessness is the only symptom, depending on the size and rate of accumulation, the onset may be insidious, usually the classical sign of pleural effusion required around 500 ml of fluid in pleural space in order to be detectable .

Physical signs:

- Inspection → may be unremarkable
- Palpation → Expansion decreased on affected side, Trachea and apex beat may be moved to opposite side.
- Percussion →Stony dull on affected side
- Auscultation →Absent breath sounds and vocal resonance on affected side and bronchial breathing above effusion.

Investigations:

Chest x ray

The classical appearance of pleural fluid on the erect PA chest film is of a curved shadow at the lung base, blunting the costophrenic angle and ascending towards the axilla. Around 200 mL of fluid is required to be detectable on a PA chest X-ray

Chest Ultra sound: smaller effusions can be identified by ultrasound around 20 mL of pleural fluid. Ultrasonography is more accurate than plain chest radiography for determining the volume of pleural fluid and frequently provides additional helpful information guides pleural biopsy.

Chest CT scan :CT displays pleural abnormalities more readily than either plain radiography or ultrasound, and may distinguish benign from malignant pleural disease or lung pathology .

Management:

Therapeutic aspiration may be required to palliate breathlessness but removing more than 1.5 L at a time is associated with a risk of re-expansion pulmonary edema .An effusion should never be drained to dryness before establishing a diagnosis, as pleural biopsy may be postponed until further fluid accumulates .

pleural fluid must aspirated and send for biochemical study regarding protein ,sugar and LDH level, bacteriological study for Grams stain and AFB stain and cultures with cytological study and White cell count with differential study .

Gram stain may indicate parapneumonic effusion. Cytological examination is essential, as the predominant cell type provides useful information.(neutrophils predominant goes with infection while lymphocytic predominant goes with TB or lymphoma).

A low pH suggests infection but may also be seen in rheumatoid arthritis, ruptured esophagus or advanced malignancy.

Typically, an uncomplicated parapneumonic effusion has a PH level greater than 7.3, a glucose level greater than 60 mg/dL and LDH level less than 1000 IU/L .

A pH level of less than 7.2,usually identifies a complicated effusion. However, this finding isn't specific for infection, and the cause may be malignancy, rheumatoid arthritis, or trauma with esophageal disruption causing an associated reduction in pH level.

Pleural aspiration and biopsy

In some conditions (e.g. left ventricular failure ,liver cirrhosis , nephrotic syndrome), it is not necessary to sample fluid for anaylsis or to do pleural biopsy but in others causes as exudative pleural effusion may indicated as in TB pleural effusion or in malignancy . appropriate treatment should be administered and the effusion re- evaluated. However. Simple aspiration provides information on the color and texture of fluid and these alone may immediately suggest an empyema or chylothorax.

The presence of blood is consistent with pulmonary infarction , TB, or malignancy, but may result from a traumatic tap. Biochemical analysis allows classification into transudate and exudates .Exudate is likely if one or more of the light's criteria are present.

Treatment of the underlying cause-for example, heart failure, liver cirrhosis ,nephrotic syndrome pneumonia, pulmonary embolism e.c.t will often be followed by resolution of the effusion.

Combining pleural aspiration with biopsy increases the diagnostic yield, particularly when guided by either ultrasound or CT. The best results are obtained from video-assisted thoracoscopy, allowing the operator to visualise the pleura and guide the biopsy directly.

Malignant pleural effusions that reaccumulate and are symptomatic can be aspirated to dryness followed by the instillation of a sclerosing agent such as tetracycline or bleomycin . Effusions should be drained slowly since rapid shift of the mediastinum causes severe pain and occasionally shock. This treatment produces only temporary relief.

Examples of Pleural Aspiration :

-Transudative Effusion is serous color ,evidence of cardiac , renal failure, nephrotic syndrome .

-**Malignant Effusion**: Color of pleural fluid is bloody ,exudative ,contain serosal fluid ,pleural biopsy yield 40 % and pleural fluid for cytology showed clumps of malignant cells in 60%.

- TB. Effusion :Amber color ,exudative with low sugar ,lymocytosis ,pleural fluid for AFB stain and culture positive in 20% and pleural biopsy positive in 80.. %

-Pulmonary infarction : Bloody stain or serous ,exudative effusion, clinical features of DVT and pulmonary embolism.

- Thoracic duct obstruction : Milky color effusion ,exudative contain chylomicron.

- Acute pancreatitis :blood stain or serous ,exudative , contain high level of chylomicrone.

- Rheumatoid arthritis or SLE : serous ,exudative , lymphocytosis has either rheumatoid factor or anti-nuclear factor .

EMPYEMA:

Empyema means the presence of pus within the pleural cavity. This usually arises from bacterial spread from a severe pneumonia or after the rupture of a lung abscess into the pleural space. Typically an empyema cavity becomes infected with anaerobic organisms and the patient is severely ill with a high fever and a neutrophil granulocytosis. An empyema may involve the whole pleural space or only part of it ('loculated' or 'encysted' empyema) and is usually unilateral. It is always secondary to infection in a neighbouring structure, usually the lung, most commonly due to the bacterial pneumonias and tuberculosis.

An empyema should be suspected in patients with pulmonary infection if there is severe pleuritic chest pain or persisting or recurrent pyrexia, despite appropriate antibiotic treatment. In other cases, the primary infection may be so mild that it passes unrecognized and the first definite clinical features are due to the empyema itself.

Once an empyema has developed, systemic features are prominent these features include:

Pleural pain; breathlessness; cough and sputum, usually because of underlying lung disease; copious purulent sputum if empyema ruptures into a bronchus (bronchopleural fistula)

Clinical features of empyema.

- Pyrexia, usually high and remittent
- Rigors, sweating, malaise and weight loss
- Clubbing fingers

Investigations:

Polymorphonuclear leucocytosis, high CRP and ESR .

Chest X-ray: appearances may be indistinguishable from those of pleural effusion, although pleural adhesions may confine the empyema to form a 'D'-shaped shadow against the inside of the chest wall . When air is present as well as pus (pyopneumothorax), a horizontal'fluid level' marks the air/liquid interface.

Chest Ultrasound: shows the position of the fluid, the extent of pleural thickening and whether fluid is in a single collection or multiloculated, containing fibrin and debris

Chest CT: provides information on the pleura, underlying lung parenchyma and patency of the major bronchi.Ultrasound or CT is used to identify the optimal site for aspiration, which is best performed using a widebore needle.

If the fluid is thick and turbid pus, empyema is confirmed.

Empyema : pus cell trough aspiration low PH ,exudative and WBC elevated with neutrophilia Gram stain and culture positive for bacteria Features suggesting empyema are a fluid glucose of less than 3.3 mmol/L (60 mg/dL), lactate dehydrogenase (LDH) of more than 1000 U/L,or a fluid pH of less than 7.0.

The pus is frequently sterile on culture if antibiotics have already been given. The distinction between tuberculous and non-tuberculous disease can be difficult and often requires pleural biopsy, histology and culture.

Treatment:

An empyema will only heal if infection is eradicated and the empyema space is obliterated, allowing apposition of the visceral and parietal pleural layers. This can only occur if re-expansion of the compressed lung is secured at an early stage by removal of all the pus from the pleural space.

When the pus is sufficiently thin, this is most easily achieved by the insertion of a wide-bore intercostal tube into the most dependent part of the empyema space. If the initial aspirate reveals turbid fluid or frank pus, or if locations are seen on ultrasound, the tube should be put on suction and flushed regularly with 20 mL normal saline.

If the organism causing the empyema can be identified, the appropriate antibiotic should be given for 2–4 weeks.

Empirical antibiotic treatment (e.g. intravenous co-amoxiclav or cefuroxime with metronidazole) should be used if the organism is unknown.
when the pus is thick or loculated, surgical intervention is required to clear the empyema cavity of pus and break down any adhesions.
Surgical ‘decortication’ of the lung may also be required if gross thickening of the visceral pleura is preventing re-expansion of the lung.
Surgery is also necessary if a bronchopleural fistula develops. Despite the widespread availability of antibiotics that are effective against pneumonia, empyema remains a significant cause of morbidity and mortality.

Pneumothorax:

Pneumothorax: means air in the pleural space. In this instance, pleural pressure becomes positive pressure , and there is compression of underlying lung.It may be spontaneous or occur as a result of trauma to the chest.Spontaneous pneumothorax is commonest in young males,

Causes of pneumothorax:

- **Primary:** no evidence of overt lung disease. Air escapes from the lung into the pleural space through rupture of a small subpleural emphysematous bulla or pleural bleb. usually apical due to congenital defects in the connective tissue of the alveolar walls. Both lungs are affected with equal frequency. Often these patients are tall and thin. In patients over 40 years of age.
- **Secondary** :underlying lung disease, most commonly COPD and TB; also seen in asthma, lung abscess, pulmonary infarcts, bronchogenic carcinoma, all forms of fibrotic and cystic lung disease .
- **Traumatic** :Iatrogenic (e.g. following thoracic surgery or biopsy) or chest wall injury

Clinical features of pneumothorax:

Patients with pneumothorax typically have acute onset of dyspnea, sudden-onset unilateral pleuritic chest pain . tachycardia،
Decreased breath sounds, decreased tactile fremitus, a pleural friction rub.
subcutaneous emphysema, hyper resonance , and a tracheal shift to the opposite side.
A small pneumothorax, physical examination may be normal. A larger pneumothorax (> 15% of the hemithorax) results in decreased or absent breath sounds The combination of absent breath sounds and resonant percussion note is diagnostic of pneumothorax

Tension pneumothorax:

A tension pneumothorax is a medical emergency that require immediate decompression by placement of a chest catheter.
communication between the airway and the pleural space acts as a one-way valve, allowing air to enter the pleural space during inspiration but not to escape on expiration. Large amounts of trapped air accumulate progressively in the pleural space and the intrapleural pressure rises to well above atmospheric levels.
mediastinal displacement towards the opposite side, with compression of the opposite normal lung and impairment of systemic venous return, causing cardiovascular compromise . Clinically, the

findings are rapidly progressive dyspnea ,associated with a marked tachycardia, hypotension, cyanosis and tracheal displacement away from the side of the silent hemithorax.

Investigations:

The diagnosis can be made by obtaining an upright chest x ray and rapid assessment can be achieved with point of care chest ultrasound.

Chest X-ray shows the sharply defined edge of the deflated lung with complete translucency (no lung markings) between this and the chest wall.

Care must be taken to differentiate between a large pre-existing emphysematous bulla and a pneumothorax to avoid misdirected attempts at aspiration.An end-expiratory radiograph increases the density of lung while reducing its volume,

Chest CT: is useful in distinguishing bullae from pleural air. X-rays also show the extent of any mediastinal displacement and reveal any pleural fluid or underlying pulmonary disease.

Management:

Intercostal drains are inserted in the 4th, 5th or 6th intercostal space in the mid-axillary line, connected to an underwater seal and secured firmly to the chest wall.

The drain should be removed 24 hours after the lung has fully reinflated and bubbling stopped . Continued bubbling after 5-7 days is an indication for surgery. If bubbling in the drainage bottle stops before full reinflation, the tube is either blocked, kinked or displaced.

Mesothelioma:

It is a malignant tumor affecting the pleura (pleural mesothelioma) or, less commonly, the peritoneum (peritoneal mesothelioma). Although all fiber types are implicated, Blue asbestosis appears to be the most potent cause.

A time lag of 20 years or more between asbestos exposure and the development of mesothelioma is typical .Patient presents with chest pain or breathlessness from a pleural effusion . Fever , night sweating , fatigue and clubbing fingers.

Diagnosed by pleural biopsies.

Treatment by chemotherapy. Radiotherapy may be helpful. Highly selected patients may be considered for radical surgery.

Asbestos-Related Pleural Disease:

Benign pleural plaques
Benign pleural effusion
Diffuse pleural fibrosis
Mesothelioma