

Parapneumonic Empyema

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- *Empyema* is defined as accumulation of pus in the pleural space.
- *Pus* is thick, viscous fluid that appears to be purulent.
- *Para-pneumonic effusion* is any pleural effusion secondary to pneumonia (bacterial or viral) or lung abscess.
- It has been reported that 57% of hospitalized patients with bacterial pneumonia had an accompanying pleural effusion.

- While most parapneumonic effusions resolve without specific therapy, approximately 10% will become complicated or progress to empyema.
- Parapneumonic empyema may be localized, or it may involve the entire pleural cavity.
- The morbidity and mortality rates in patients with pneumonia and pleural effusions are higher than in patients with pneumonia alone.

Pathogenesis

- According to the 1962: the evolution of *parapneumonic empyema* can be classified into three phases based on the natural history of the disease.

1- exudative stage

- In which a rapid outpouring of fluid into the pleural space occurs.
- Most of this outpouring is due to an increase in the amount of pulmonary interstitial fluid that traverses the pleura to enter the pleural space, but some of it stems from the increased permeability of the capillaries in the pleural space.
- The pleural fluid at this stage is characterized by negative bacterial studies, a glucose level above 60 mg/dL, a pH above 7.20, and a lactic acid dehydrogenase (LDH) level of less than three times the upper limit of normal in serum.

2-second, or fibropurulent, stage

- If the patient fails to get proper treatment, the effusion may proceed to the :
- The pleural fluid at this point is characterized by positive bacterial studies, a glucose level below 60 mg/dL, a pH below 7.20, and a pleural fluid LDH more than three times the upper limit of normal for serum.
- Now the pleural fluid becomes infected and progressively loculated.

3- third stage

- If a stage 2 effusion is not drained, the effusion may progress to the third stage,
- in which fibroblasts grow into the pleural fluid from both the visceral and parietal pleurae, producing a thick pleural peel.
- The peel over the visceral pleura prevents the lung from expanding.

Clinical Presentation

- The symptoms of parapneumonic empyema are not specific and may be difficult to distinguish from those of pneumonia or lung abscess.
- The clinical presentation depends on the causative organism, the volume of pus in the pleural space, and the patient's circumstances.
- Patients often complain of cough, fever, chills, pleuritic chest pain, and even dyspnea, which are similar to the clinical features of pneumonia.
- patient whose pneumonic process has resolved may be evidence of parapneumonic empyema

Diagnosis

- Based on the clinical presentation + chest radiograph, the diagnosis of parapneumonic empyema is not difficult.
- *Thoracentesis* should be performed and aspiration of pus from the pleural space can help to confirm the diagnosis.
- With concurrent antibiotic use, pleural fluid cultures may fail to grow in 50% of patients. If cultures are repeatedly sterile and the patient fails to improve with therapy, empyema secondary to tuberculosis or fungal infection should be suspected.
- *CT scanning and bronchoscopy* may help to distinguish between lung consolidation or atelectasis and pleural fluid and rule out the possibility of the pneumonic process secondary to bronchial obstruction due to bronchogenic carcinoma. Pleural empyema must be differentiated from an intrapulmonary abscess. An empyema conforms to the shape of the adjacent chest wall, while an abscess in the lung is usually more spherical, does not extend to or conform with the chest wall, and is surrounded by the pneumonia in which it developed.
- Collected data should include patient demographics, size of the effusion, and microbiologic and pleural fluid chemistries that might influence the physician's decision to place a chest tube or perform other therapeutic techniques.

Management

- Effective management of empyema requires
 - (a) control of infection and sepsis by appropriate antibiotic therapy
 - (b) evacuation of pus from the pleural space
 - (c) obliteration of the empyema cavity and reexpansion of the underlying lung to restore function.

treatment for pleural sepsis

- appropriate or empiric antibiotics for the most prevalent bacteria plus expedient and safe drainage of the infected pleural cavity.
- The selection of appropriate methods to treat parapneumonic empyema depends on the category stage of the infectious disease and the patient's overall medical condition.

Various methods are available for the management of the pleural fluid in patients with parapneumonic effusion

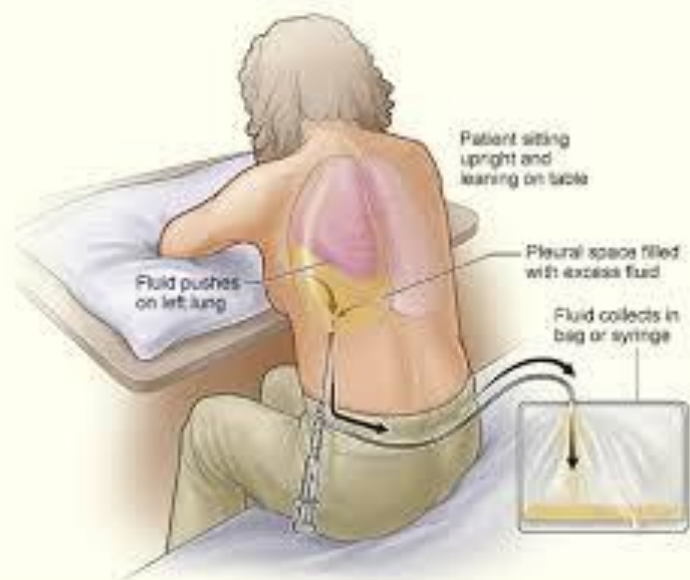
- Observation
- therapeutic thoracentesis
- tube thoracostomy
- intrapleural instillation of fibrinolytics
- thoracoscopy with breakdown of adhesions or decortication,
- thoracotomy with breakdown of adhesions and decortication
- open drainage procedures.

Observation

- For category 1 pleural effusions, specific and effective antibiotic therapy is generally adequate.
- But close observation is necessary, because delays in the drainage of clinically significant effusions may cause loculation, which may result in a complicated disease process thought to be associated with increased morbidity and mortality.

Therapeutic Thoracentesis

- If the empyema is in the acute phase, the combination of thoracentesis and antibiotics can be definitive treatment, particularly in children.
- When thoracentesis produces purulent material, fluid that is positive on Gram's stain, or fluid with a glucose level below 40 mg/dL or a pH below 7, tube thoracostomy is indicated



Example of Thoracentesis



Tube Thoracostomy

- For the past several decades, the most common method by which parapneumonic effusions have been initially drained has been by tube thoracostomy.
- The chest tube should be positioned in a dependent part of the pleural effusion.
- 28- to 36-Fr chest tubes have been recommended
- smaller tubes would become obstructed .
- the correct positioning of the chest tube is more important than its size. In addition, smaller tubes are generally adequate in the absence of sepsis or multiloculated collections.

- Successful closed-tube drainage of complicated parapneumonic effusions is evidenced by improvement in the clinical and radiologic status within 24 hours.
- If the patient has not demonstrated significant improvement within 24 hours of initiating tube thoracostomy, either the pleural drainage is unsatisfactory or the patient is receiving the wrong antibiotic
- If drainage is inadequate, ultrasonography or a CT scan should be obtained to delineate which of the above factors is responsible.

Intrapleural Fibrinolytics

- in the management of empyema remains controversial.
- *streptokinase* (250,000 U) and *urokinase* (100,000 U) along with chest tube drainage .
- The beneficial effect between the fourth and seventh day after initiation of treatment and led to a significantly reduced need for surgical referral.

Thoracoscopy with Lysis of Adhesions

- incompletely drained parapneumonic effusion is thoracoscopy.
- Video-assisted thoracic surgery (VATS) is safe and effective
- A chest CT scan should be obtained before thoracoscopy to provide anatomic information about the size and extent of the empyema cavity. With thoracoscopy, the loculation in the pleural space can be disrupted, the pleural space can be completely drained, and the chest tube can be optimally placed. In addition, the pleural surfaces can be inspected.
- If, with thoracoscopy, the patient is found to have a very thick pleural peel with a large amount of debris and the lung does not reexpand completely, then decortication should be performed without delay. As surgeons become more adept at thoracoscopy, a smaller fraction of patients requiring decortication will need to undergo thoracotomy.

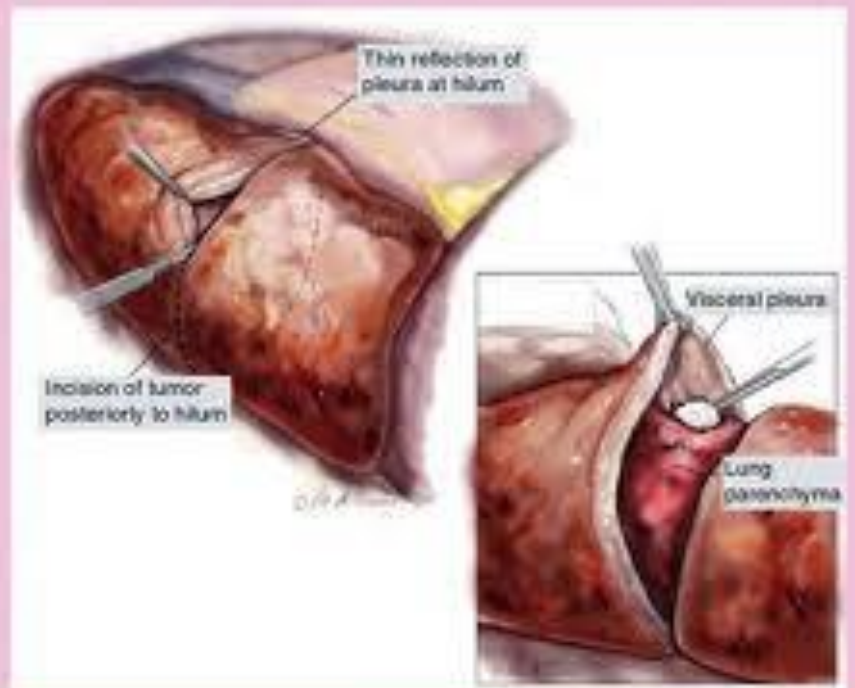


Decortication

- Decortication is a major thoracic operation
- should not be performed on patients who are markedly debilitated.
- Decortication involves the removal of all fibrous tissue from the visceral pleura and parietal pleura and the evacuation of all pus and debris from the pleural space, allowing the underlying lung to expand.
- Even though decortication is a major procedure, the postprocedure hospitalization is not long
- decortication should be considered for the control of pleural infection or for chronic trapped lung.
- Decortication should not be performed just to remove thickened pleura acutely, because such thickening usually resolves spontaneously over several months.
- after 3 to 6 months



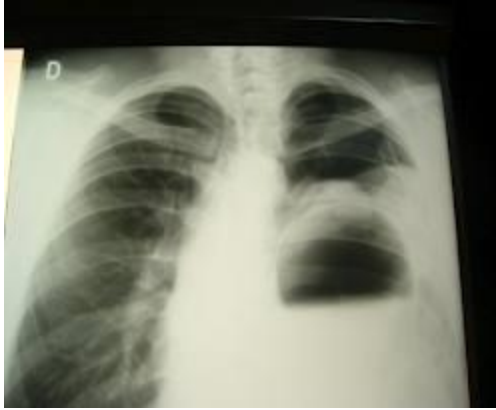
Mesicaps



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Open Drainage

- 1-patients who are too ill to undergo thoracoscopy or thoracotomy.
- 2-Chronic drainage of the pleural space can be achieved with open drainage procedures.
- Two different types of procedures can be performed. With the simplest procedure, segments of one to three ribs overlying the lower part of the empyema cavity are removed and one or more short, large-bore tubes are inserted into the empyema cavity .



- It is important to avoid performing an open drainage procedure too early in the course of a complicated parapneumonic effusion. If the visceral and parietal pleura adjacent to the empyema cavity have not been fused by the inflammatory process, exposure of the pleural space to atmospheric pressure will result in a pneumothorax. Before open drainage procedures, this possibility can be evaluated by leaving the chest tube exposed to atmospheric pressure for a short period and determining radiologically whether the lung has collapsed.