SUPPURATIVE LUNG DISEASES
SUPPURATIVE DISEASE OF THE LUNG

• Suppurative disease of the lung -
  Bronchiectasis
  Lung abscess
  Empyema

• Time to develop suppurative disease -
  Empyema –days
  lung abscess -days to a week
  bronchiectasis -few weeks to a month
PARAPNEUMONIC EFFUSION AND EMPYEMA
PARAPNEUMONIC EFFUSION AND EMPYEMA

• Pleural effusion associated with pneumonia - Parapneumonic effusion (Effusion result - spread of inflammation & infection to pleura).

• Presence of pus in pleural cavity- Empyema
DEFINITION

- Empyema is an accumulation of pus in the pleural space

- Empyema can occur following:-
  - Bacterial Pneumonia
  - Penetrating trauma to chest
  - Oesophageal perforation
  - Surgery of the chest
EMPYEMA - ORGANISMS

• Common organisms
  • Streptococcus pneumoniae
  • Staphylococcus aureus
  • H. influenza
  • Klebsiella
  • Group A streptococcus
  • Community acquired
EMPYEMA – PHASES

1. Exudative phase
   • Increased permeability of the inflamed pleura

2. Fibrinopurulent phase
   • By accelerated fibrin deposition leading to loculations and pus formation.

3. Organizational phase
   • Begins 1 week after infection
   • Multiloculated empyema and pleural peel with subsequent lung entrapment
<table>
<thead>
<tr>
<th>Pleural fluid characteristics</th>
<th>Exudative phase</th>
<th>Fibrinopurulent phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>Normal</td>
<td>Decreased</td>
</tr>
<tr>
<td>pH</td>
<td>Normal</td>
<td>Decreased</td>
</tr>
<tr>
<td>Cell count</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>LDH</td>
<td>Normal</td>
<td>$&gt;1000$</td>
</tr>
<tr>
<td>Duration</td>
<td>24-72 hours</td>
<td>7-10 days</td>
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</tbody>
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EMPYEMA- THIRD PHASE

- Organizational - third stage
- Fibroblasts grow on parietal and visceral pleural surfaces - form inelastic membrane - "pleural peel"
- Lung expansion restricted & function impaired
- Thoracocentesis - may yield a "dry tap"
- Occurs 2-4 weeks after empyema
EMPYEMA - THIRD STAGE PLEURAL PEEL
EMPYEMA- SYMPTOMS

• Symptoms related to empyema
  • Persistent fever
  • Malaise
  • Decreased appetite
  • Cough, chest pain, and dyspnea
  • Lie on affected side to splint the chest (provide temporary analgesia)
  • Weight loss if longer than one to two weeks.

• Symptoms of pneumonia
  • But remain febrile or unwell 48 hours after initiation of antibiotic therapy for pneumonia
• Appear ill - rarely toxic
• Tachypnea
• Febrile
• Shallow breaths (minimizes pain)
• Scoliosis (child splinting affected side)
• Mediastinal shift (tracheal deviation and apical impulse shift to opposite side)
• Dullness to percussion
• Absent breath sounds
X Ray Chest

- First investigation of choice
- Shift of mediastinum to opposite side
- Opaque hemithorax
- Absence of normal Broncho vascular markings
- Widening of intercostal spaces
X RAY CHEST

• Does not differentiate empyema from parapneumonic effusion
• May reveal other findings
  • Cardiomegaly
  • Hilar lymphadenopathy
  • Bone lesions
ULTRASONOGRAPHY

- Confirms presence of fluid in pleural space
- Detection of early loculations and septations
- Quantification & determination – nature of effusion
- Localise - optimal sites for thoracentesis / ICD
- Limitations - Cannot distinguish between density of an early exudate and that of solid fibrin
RADIOLOGY IN EMPYEMA

Chest CT

- Failure to aspirate pleural fluid
- Failure of medical management
- Before surgery (thoracotomy or thoracoscopy)
LAB INVESTIGATIONS

• CBC with differential
  • Evidence of infection and/or anemia
  • Helpful in monitoring progress
• Blood cultures -all children with parapneumonic effusion
• CRP- useful- monitoring progress
• Serum LDH (pleural fluid LDH/serum LDH ratio > 0.6 – indicates empyema )
• Serum electrolytes (to detect SIADH)
• Secondary thrombocytosis ( >500,000/microL) and hypoalbuminemia - common
PLEURAL FLUID

• Pleural tap
  • Before starting antibiotic therapy-single antibiotic dose can decrease the yield of culturing
  • Gram stain and bacterial culture (aerobic and anaerobic culture)
  • Latex agglutination
  • Counter immunoelectrophoresis
• pH, glucose, LDH & differential cell count
• PMN > 50,000 cells/microL - typical of complicated parapneumonic effusions
DIAGNOSTIC THORACOCENTESIS

Counter Immuno Electrophoresis or Latex Agglutination tests of Pleural fluid- may identify pathogens if infection by organisms with capsular polysaccharide antigen in antibiotic exposed cases.
Empyema - right

Lung re-expansion after ICD
PARAPNEUMONIC EFFUSION

Different management strategies at different stages

• Hospitalization and IV antibiotics

• If the Effusion - increasing/compromising respiratory function
  • Intercostal chest tube drainage- (ICD)
  • Left in place until fluid drainage -minimal(<15 ml/day)
EMPYEMA- PRINCIPLES OF THERAPY

• IV antibiotics with intercostal drainage tube placement
• IV Co-amoxyclav (OR) IV 3rd generation cephalosporin (IV ceftriaxone) with cloxacillin
• Vancomycin - drug of choice to treat MRSA
• IV antibiotics - up to two weeks
• Antibiotic therapy – modified-sensitivity results
• Oral antibiotics – at discharge
• Duration of treatment 4-6 weeks
EMPHYEMA- PRINCIPLES OF THERAPY

• Supportive care- antipyretics, analgesia, and early mobilization
• Adequate analgesia-for pleuritic pain- prevent secondary scoliosis
• IV Fluids - poor intake and increased losses from fever and tachypnea
EMPYEMA

Surgical
- If no improvement with medical management
- Loculated or organized pleural effusion

Debridement of pleural space
- Video assisted thoracoscopic surgery (VATS)
- Thoracotomy - Open decortication
COMPLICATIONS

• Bronchopleural fistula
• Lung abscess
• Empyema necessitatis (perforation through the chest wall)
BRONCHO PLEURAL FISTULA

- Complication of Empyema
- Should be suspected if air leak persists
- Occasionally heralds cure by expectoration of pus through the bronchus which is coughed out
- Resistant cases are treated by Surgery
  - Closure of stump
  - Reinforcement by Neuro vascular muscle pedicles
LUNG ABSCESS
LUNG ABSCESS

- Definition - necrosis of pulmonary tissues by microbial infection and formation of cavities that contains pus (necrotic debris and fluid)
- Acute or chronic - duration of symptoms prior to starting treatment
  - Acute - less than 4 to 6 weeks old
  - Chronic - longer duration
LUNG ABSCESS

Primary lung abscess

• Abscesses caused by an infectious agent in a healthy host

Secondary lung abscess

• Abscess caused by an infectious agent in children with decreased immune function

Pathogenesis- involves an area of initial pneumonitis that leads to necrosis, cavitation and abscess formation
LUNG ABSCESS - PREDISPOSING FACTORS

• Aspiration – when bacteria enter the pulmonary system.

• Impaired or ineffective mucociliary defence mechanism

• Underlying diseases such as pneumonia.

• Children with neurocognitive impairment or disabilities
LUNG ABSCESS - SYMPTOMS

1. Cough
2. Fever +/- Chills
3. Pleuritic chest pain
4. Difficulty breathing
5. Diaphoresis
6. Foul-smelling, bloody, or purulent sputum
LUNG ABSCESS- COURSE

• May spontaneously rupture into pleural space - empyema, pyothorax or pneumothorax.

• Connection between abscess cavity & pleural space may persist-formation of broncho- pleural fistula

• Rupture into bronch
LUNG ABSCESS - DIAGNOSIS

Basic diagnostic test - Chest x-ray
- Air fluid level seen
CT chest rarely needed
LUNG ABSCESS - MANAGEMENT

1. Admission & IV antibiotic
2. Intravenous antibiotics-third-generation cephalosporin and clindamycin /vancomycin
3. Postural drainage –facilitate discharge- pus or necrotic material
4. Chest physiotherapy – includes coughing and deep breathing- facilitate expectoration - necrotic material
5. Surgical treatment- rarely needed
LUNG ABSCESS

• Medical treatment (90% success)

• Prognosis for children with primary lung abscess - favorable.

• Radiological improvement may take longer than clinical resolution
THANK YOU