Current Management of Postpneumonectomy Bronchopleural Fistula

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AATS Focus on Thoracic Surgery
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Conflict of Interest

• None
How do you manage this?
Overview

1. BPF overview
2. Prevention
3. Acute issues and initial management
4. Surgical management
   - Clagett vs Weder approach
   - Open window thoracostomy
   - Stump management
   - Thoracoplasty
5. Endoscopic management
6. A management algorithm
• **Definition:** a communication between bronchus and pleural space

• **Incidence:**
  - 0.9 – 6% post-pneumonectomies
  - 10% completion pneumonectomies

• **Risk factors**
  - Right side
  - Long stumps
  - Radiotherapy
  - Diabetes
  - Tumor-positive margins
  - Prolonged mechanical ventilation

• **Mortality 20 – 71%**
  - Sepsis
  - Aspiration pneumonia, ARDS, malnutrition

• **Timing**
  - Early BPF < POD 30 < Late BPF
  - More aggressive strategies are needed in early BPF
Presentation can vary…

- Fever
- Elevated WBC
- Drop in air-fluid level in pneumonectomy space
- Increased subcutaneous emphysema
- Cough
- Coughing up bloody fluid
- Acute respiratory failure
- General malaise – loss of appetite, feeling “unwell”
- Pneumopericardium – CXR or CT
- Fistula demonstrated on CT – radiologic call
Prevention

Special attention if:
- Neoadjuvant therapy
- Right side

1. Short bronchial stump
2. Gentle manipulation of airway, avoid devascularization
3. Routine bronchial reinforcement
   - Pericardial fat pad – always
   - Intercostal muscle
   - Serratus or diaphragm muscle flap, pericardial or azygous flap
   - Omental flap (routine in post radiation)
4. Secure closure of thoracotomy
   - which comes first: empyema vs. BPF
Acute issues & initial management

1. Chest tube drainage
   - Tension pneumothorax, manage sepsis
   - Position of patient: drowning via fistula as you place chest tube!
   - Microbiology samples

2. Nursing - operative side down – prevent further soiling of lung

3. IV broad-spectrum antibiotics
   - adapt depending on cultures

4. Bronchoscopy
   - assess magnitude of the fistula
Surgical Management

Aims:

1. Empyema drainage
2. Pleural cavity debridement & decortication
3. Bronchial stump debridement & closure
4. Packing
5. Obliteration of the cavity
Clagett Procedure

Steps
1. Creation of an open window thoracostomy
2. Debridement, curettage and irrigation
3. Pack the cavity with povidone-iodine soaked dressings
4. *Repeat until macroscopically clean: weeks to months*
5. Fill with antibiotic solution and close
6. Delayed definitive closure of the chest

**Technical aspects of Open Window Thoracostomy**
- H or U shaped incisions, Eloesser flap
- In the most dependent portion of the infected space
- Incision placement to preserve musculocutaneous flaps
- Marsupialization of skin to pleura
Open window thoracostomies

U-shape

dependent portion of infected space

Two ribs removed

Skin flap

Inverted U-shape

Eloesser flap

Skin flap sutured to parietal pleura

→ marsupialization

Adapted from Sugarbaker, Adult Chest Surgery, 2nd ed.
Weder accelerated approach to Early Empyema / BPF

Steps

1. Use the initial thoracotomy
2. Aggressive mechanical debridement
3. Packing with antiseptic soaked dressings
4. Temporary closure with chest tube
5. Suction with negative-pressure (? vacuum therapy, -75mmHg)
6. Repeat 2-3 times q 48h over an 8-day period
7. When “clean” - fill with antibiotic solution and close

Adapted from Kuzdzal, ESTS Textbook of Thoracic Surgery.
Managing the bronchial stump

1. Stump shortening if possible

2. Primary closure
   - Hand-sewn
   - Stapler closure if technically possible, early revision

3. Flap-assisted closure
   - Local muscle flap: intercostal transposition
   - Distant muscle flap: Lat dorsi, Pec major, Rect abdominis, Serratus
   - Omental flap
   - Pericardial or azygos vein flap
Managing the bronchial stump

4. **Trans-sternal trans-pericardial approach**
   - No prior cardiac surgery
   - No major mediastinal shift

5. **Sleeve resection of carina**
   - Short or open stumps

6. **Right sided approach of a left stump**

7. **Combined approaches**
   - Abruzzini technique (Cervical mediastinoscopy, R ant. mediastinotomy, parasternal thoracoscopic port)

Adapted from Kuzdzal, ESTS Textbook of Thoracic Surgery.
Flaps for bronchial reinforcement / closure

Local intercostal flap

Distant flaps

Omental Flap

- Technically easy
- Most reliable for difficult healing situations
  - Infection
  - Post radiation
  - Compromised vascularity of airway
  - Residual space issues
Thoracoplasty / Thoracomyoplasty

Ultimate surgical option to obliterate the empyema cavity

- Removing ribs allows collapse of intercostal muscles and cavity closure.
- Additional myoplasties may help control residual volumes.
Endoscopic management

Adjunct to bronchial stump management

- If fistula size < 5-8mm
- Patient unfit for surgery

- Fibrin glue sealing

- Tracheobronchial stents
  - In patients requiring MV
Algorithm for Management of Postpneumonectomy BPF

Preventive measures

Empyema + BPF

Chest drainage + IV ABs

Early BPF

Selected

Endo

Stump repair + Weder

Clagett Window

Late BPF

Unfit and small

Unfit and large

Fit

Endo

Stump repair + Weder

Clagett Window

Thoracoplasty

Initial

Rescue
Management of Postpneumonectomy BPF: Take home messages

• Post pneumonectomy BPF is a life threatening situation that requires urgent management

• Use preventive strategies in all pneumonectomies, but especially in high-risk patients

• Initial management: chest tube and antibiotics to manage acute situation

• Diagnosis- clinical, bronchoscopy, CT scan

• Clagett and Weder are the main procedures to manage acutely – control sepsis, achieve cavity sterilization and ultimate closure

• Fistula closure techniques depend on timing and case specific considerations

• Weder procedure is preferred – more expeditious management, less morbidity and cost, better for the patient