Care of the Post-Pneumonectomy Patient

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Background

- Lung cancer – 220,000 cases / year
- CT screening - the **NEW** standard of care
- More tumors diagnosed early
- More lung surgery
- Major complications - 10% of patients
  - of which cardiopulmonary complications constitute over 50%.
Anatomy

- Right Lung
- Left Lung
- Pericardium
- Phrenic Nerve
- Recurrent Laryngeal Nerve (left)
- Diaphragm
Types of Pneumonectomies

- Standard Pneumonectomy
- Radical Pneumonectomy
- Intrapericardial Pneumonectomy
- Extrapleural Pneumonectomy
- Sleeve Pneumonectomy
Normal post pneumonectomy recovery

• POD1 – ICU
• POD 2 and 3 TICU or Step down
  • (cardiac monitor and O2 Sat)
• Pod 4 – Regular Floor
• Pod 5 - Home
Complications

Non-operative Complications

Versus

Operative Complications
Non-operative Complications

- Atelectasis and pneumonia
Routine care

Must clear secretions

1. Pain control
2. Chest Physiotherapy
3. Bronchoscopy
Pain Control

- Systemic Opioids
- Non-steroidal anti-inflammatory agents, intercostal blocks, Intrapleural analgesia
- Epidural Analgesia
  - Meta-analysis suggests that thoracic epidural with local anesthetic plus opioid is the most effective
Chest Physiotherapy

- Incentive spirometry
- Coughing
- Chest percussion
- Vibration
- Postural drainage

• WALKING
When they still cannot clear secretions

Bronchoscopy
Acute Lung Injury

- ALI, ARDS, Pulmonary edema
- Fluid Restriction - “Dry lungs work better than wet lungs” (DIURECTIC)
- Aspiration (Left Recurrent laryngeal nerve Injury)
Cardiac Arrhythmia

- Atrial Fibrillation
  - Normal BP - Meds
  - Dropping BP - Shock
- Ventricular Fibrillation / Tachycardia
- Cardiac Herniation
Operative Complications

- Bleeding
- Bronchopleural Fistula
- Empyema
Post-Pneumonectomy Empyema

- 42 y/o M hx of Right Squamous cell cancer of the lung
CXR POD#1
Right Pneumonectomy
Normal CXR
2 Week Post pneumonectomy
CXR
3 Week Postpneumonectomy
Coughing up thin secretions
Immediate LIFE SAVING Maneuvers

- Right side down
- Chest tube set up (above the incision)
- Bronchoscopy – identify BPF and pulmonary toilet
- ABC’S ??????????????????????????
Bronchopleural Fistula (BPF) vs None

- Physical exam
- CXR
- CT
- Bronchoscopy
Empyema Fluid Characteristics

- pH < 7.0
- Glucose < 40 mg/dL
- LDH > 1000 IU/dL
- Positive Gram stain
- Specific gravity > 1.018
- WBC > 500 cells mm$^3$
- Protein > 2.5 g/dL
Post-Pneumonectomy Empyema

• Uncommon but serious complication
• Mortality 16-71%
• May be higher with Bronchopleural Fistula
Post-pneumonectomy empyema

- Typically 2-3 weeks post operation
- Anorexia
- Malaise
- Chills, fever, sweating
- Rapid fluid accumulation within space
- Occasionally not evident for ~ 1 year
Management of Empyema

- *Initial* management of empyema typically chest tube thoracostomy ± BPF
- 1-2 weeks to allow for mediastinal stabilization prior to open drainage
A PROCEDURE FOR THE MANAGEMENT OF POSTPNEUMONECTOMY EMPYEMA

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PNEUMONECTOMY has become a relatively common surgical procedure during the last 25 years. It is most commonly performed for carcinoma of the lung, but it is also used in the management of other lung tumors, of tuberculosis, and of a variety of congenital and inflammatory conditions. After pneumonectomy, the thoracic cage is customarily tightly closed without drainage, and the huge space formerly occupied by lung is left for nature and the patient to deal with. Fortunately, in most instances, this works out well. The air in the pleural space is gradually absorbed, and the space is filled by a serous or serosanguineous effusion. This accumulated fluid clots and eventually becomes a solid, fibrotic mass. However, it is recognized by all thoracic surgeons that a closed pleural space and its contents provide an ideal incubator and culture medium in which bacteria can thrive, and that postpneumonectomy empyema will occur occasionally, regardless of any measures that can be taken to prevent it. Although postpneumonectomy empyema does not occur frequently, its management presents a difficult problem when it does occur.

CLINICAL MANIFESTATIONS

Usually, postpneumonectomy empyema manifests itself within the first 2 or 3 weeks after operation, with anorexia, malaise, chills, fever, sweating, increasing thoracic pain, and evidence of fluid accumulation within the pleural space at a rapid rate. Occasionally, however, postpneumonectomy empyema...
Clagett’s Method

• OR
  • Edges débrided & mobilized
  • Cavity irrigated & cleaned
  • Cavity filled with saline (+250 mg neomycin/100 cc NSS)
  • Closed in layers as watertight as possible

Clagett, JTCVS 45:141-145, 1962
Eloesser Procedure

- Superficial fascia sutured to periosteum of resected rib (Eloesser)
- No tubes inserted
- Cavity irrigated daily with antibiotic solution
- Daily irrigations for 6-8 weeks (shower)
- Dressing changes
Single Stage Complete Muscle Flap Closure

• 5 consecutive pts 1981-1983
• 2/5 with BPF
• Prior to closure 3 managed with chest tubes, 2 with open window thoracostomy
• All managed with single-stage complete muscle flap closure
• Omental, Latissimus dorsi flaps in all + other muscles prn

Miller, Ann Thor Surg 38:227-231, 1984
Omental Graft
Fig 3. An entire pleural space filled with muscle flaps and their usual anatomical location. (PM = pectoralis major; LD = latissimus dorsi; REC = rectus abdominis; SA = serratus anterior.)
Fig 4. Usual sites of rib resection for entrance of the pectoralis major (PM) and latissimus dorsi (LD) flaps into the pleural space. (REC = rectus abdominis; SA = serratus anterior.)
Suggested Treatment Algorithm

POSTPNEUMONECTOMY EMPYEMA SPACE

ACUTE PHASE

Without BPF
- Chest tube drainage

With BPF
- Chest tube drainage

CHRONIC PHASE

Attempt modified Clagett

- Success
- fail
  - complete flap

Possible modified Clagett

- fistula closed
- fistula open

Eloesser procedure

Complete flap

(See Saborio, 2001)

Miller, Ann Thor Surg 38:227-231, 1984
Conclusions

• Basic Anatomy
• Must Clear Secretions (pain control, chest physiotherapy, bronchoscopy)
• Dry lungs work better than wet lungs
• Atrial Fibrillation
• Infected Space with or without BPF (Hole in Bronchus)
• Acute BPF (Life saving Maneuvers)
• Eloesser Flap
• Must be Proactive