Pleural Disease: Tough Diagnostic and Therapeutic Cases (Beyond the Basics)

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Disclosures

I have no financial disclosures.

Off label use mentioned for:
Endobronchial valves
Thrombolytics, DNase,
The Pleural Space

Parietal Pleura

Visceral Pleura

Pleural disease

- **Air:** Pneumothorax
- **Fluid:** Effusion, Hemothorax, Empyema
- **Tissue:** Thickening, Tumors, Plaques

*** Look at lung parenchyma for clues
69 year old man presenting to ED

Hypoxic
Hypotensive

What do you do?
PNEUMOTHORAX

But, what do you do about a BPF?
But, what do you do about a BPF?

A. Chest Tube to suction for as long as it takes!
B. VATS with glue / repair the BPF
C. Pleurodesis
D. Endobronchial valve placement
E. Send patient home with chest tube with one way valve (Heimlich) attached.

Grading of Air Leaks: Cerfolio Classification System

1. **Continuous (C):** throughout respiratory cycle
2. **Inspiratory (I):** during the inspiration phase
3. **Expiratory (E):** only during expiratory phase
4. **Forced Expiration (FE):** only when patient coughs or forces exhalation

Wood DE. Clin Chest Med. 2010 Mar;31(1):127-33,
Things that have been tried

- Glues: fibrin, albumin, glutaraldehyde, acrylic
- Gel foam or cellulose
- Ethanol
- Antibiotics
- Metal coils
- Decalcified spongy calf bone
- Watanabe spigots
- Cautery
- Laser

Wood DE. Clin Chest Med. 2010 Mar;31(1):127-33,

Endobronchial valves for BPF

- 40 patients: 15 women; age 60 ± 14 yrs
- December 2002 - January 2007
- 1-9 endobronchial valves / patient
- BPF Etiology:
  - Recurrent spontaneous pneumothorax (n = 21)
  - postoperative (n = 7)
  - iatrogenic (n = 6),
  - 1st spontaneous pneumothorax (n = 4)
  - bronchoscopic lung volume reduction (n = 1)
  - trauma (n = 1)

Endobronchial valves for BPF

Resolution of BPF:
- 19 (47.5%) had complete resolution
- 18 (45%) had a reduction
- 2 had no change
- 1 had no reported outcome

Time to Chest Tube removal: Mean 21 days (median, 7.5 days; interquartile range [IQR], 3-29 days)


Endobronchial valves

- The Spiration IBV Valve System:
  - In 2008, FDA approved under the Humanitarian Device Exemption (HDE) program for post-surgical BPFs

- Emphasys Medical valve (EBV) → Pulmonx approved for use in Europe

Wood DE. Clin Chest Med. 2010 Mar;31(1):127-33,
Spiration IBV Valve System


Case of a pneumothorax

2 weeks later
Case of a pneumothorax

Endronchial valves

Valves Removed

More to come...
28 year old man presents to ED

- 1 week of SOB
- R pleuritic chest pain

PLEURAL EFFUSION
“Never let the sun set on a pleural effusion”

Thoracentesis is done...

1. Observe fluid
   ✦ Color,
   ✦ Consistency,
   ✦ Smell

2. Transudate or Exudate...
   ✦ What do you send...
Pleural effusion: What to send?

In EVERY Patient:
- Cell count / differential
- Protein*
- LDH*
- Glucose*
- pH
- Gram Stain
- Cultures
- Cytology

In appropriate patients:
- Amylase
- Cholesterol
- Triglycerides
- Flow Cytometry
- Adenosine deaminase
- MTB PCR

* DON’T FORGET TO SEND SERUM FOR COMPARISON

Transudate or Exudate?

- Protein ratio 0.48
- LDH ratio 0.59
By any 1 of the following:
- Pleural Fluid/ Serum protein ratio >0.50
- Pleural Fluid/ Serum LDH > 0.6
- Pleural Fluid /upper limit normal LDH > 0.67

Transudate vs. Exudate

Transudates
- CHF
- Hepatic hydrothorax
- Nephrotic syndrome
- Peritoneal dialysis
- SVC syndrome
- Myxedema
- (PE)
- (Malignancy)

Exudates
- INFLAMMATION
- INFECTION
- MALIGNANCY
Evaluating a Pleural Effusion

1. Observe fluid
2. Transudate or Exudate
3. Cell counts

Does patient have a hemothorax?

- Bloody effusion
- RBC count is 1,000,000/µl
Bloody Effusions

- Hemothorax is defined as having Hct at least 50% peripheral blood Hct
  - Average circulating blood count = 5,000,000/μl
  - To make 1,000,000/μl, would be 1:20 dilution
    - THUS Hct ~ 10%
Causes of bloody effusions:

**Bloody Effusion**
Hct >1 and <50%
- Malignancy
- Pulmonary infarct
- Trauma

**Hemothorax**
Hct > 50%
- Trauma
- Iatrogenic
- Non-traumatic
  - Malignant
  - Complication of anticoagulation

Adapted from slide courtesy of V.C. Broaddus

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So if it is a HEMOTHORAX

➢ What do you do?

“while the available evidence suggests that small bore drains may be as effective as large bore drains . . . there is insufficient evidence to recommend a change to standard practice”

What about a thoracentesis on...

- Aspirin ??
- Clopidogrel ??

Zalt et al. *J Bronchology Interv Pulmonol* 2012 (retrospective)
Abouzgheib et al. *Respirology* 2012; (retrospective)
Dammert et al. *Interv Pulmonol* 2013; (retrospective)

EOSINOPHILIC PLEURAL EFFUSIONS
Pleural fluid with eosinophilia???

- Pleural eosinophils = 15%

Cell differentials subdivide exudates

- Lymphocytes (>50%)
  - TB
  - Malignancy
  - Chylothorax
  - Post-CABG
  - Sarcoidosis

- Neutrophilic (>50%)
  - Acute Infections
  - PE
  - Collagen-vascular
  - Radiation

- Eosinophilic (>10%)

Adapted from slide courtesy of V.C. Broaddus
Cell differentials subdivide exudates

- **Lymphocytes (>50%)**
  - TB
  - Malignancy
  - Chylothorax
  - Post-CABG
  - Sarcoidosis

- **Neutrophilic (>50%)**
  - Acute Infections
  - PE
  - Collagen-vascular
  - Radiation

- **Eosinophilic (>10%)**
  - *** AIR ***
  - *** BLOOD ***
  - Malignancy
  - Tuberculosis
  - PE
  - Drug
  - Other:
    - Asbestos
    - Parasitic / Fungal
    - Churg - Strauss

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**Eosinophilia from air/blood**

- With air, often appears within 3 days
  - Peaks at 6 days
  - Correlates with IL-5

- Following trauma, may not appear until second week

Adapted from slide courtesy of V.C. Broaddus
68 year old man presents to ED

➢ 1 week of SOB
➢ R pleuritic chest pain

Physical Exam

VS: T 36.7, HR 90, BP 115/80, RR 22, O2Sat 98% on RA
Neck: Trachea midline
Lungs: Crackles at R lung base, Dullness to percussion & Decreased fremitus at R base
CV: s1 s2 with RRR
Extrem: no edema
Thoracentesis is done

<table>
<thead>
<tr>
<th></th>
<th>SERUM</th>
<th>PLEURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>4.5</td>
<td>Protein 4.7</td>
</tr>
<tr>
<td>LDH</td>
<td>175</td>
<td>LDH 368</td>
</tr>
<tr>
<td>Albumin</td>
<td>2.4</td>
<td>Glucose 35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pH 7.18</td>
</tr>
</tbody>
</table>

Gram Stain: Negative  
Cell count: 70% Neut

What do you do next?
Empyema: Definition

- Pus
- Positive gram stain OR culture
- $pH < 7.2$ or $\text{Glucose} < 40 \text{ gm/dl}$

in a patient with a pneumonia

Adapted from slide courtesy of V.C. Broaddus
Stages of the Pleural Infections

1. **Exudative stage**: small amount of sterile fluid
2. **Fibropurulent stage**: higher neutrophil counts, fibrin deposition, fluid tends to be loculated
3. **Organized stage**: fibroblasts grow into the pleural walls and produce a thick pleural peel that prevents lung from reexpansion

Diagnostic algorithm for the management of patients with pleural infection

- History, examination & Chest X-ray
- Pleural effusion and evidence of infection?
  - YES: INVOKE RESPIRATORY PHYSICIAN
  - NO: Consider CT scan and further image-guided aspiration

- Fluid pH
- Send M/C & S
- Poor clinical response

- Gram stain & culture positive & pH < 7.2
  - YES: Observers unless clinical indication for chest tube
  - NO: Repeat fluid sampling

- Diagnostic pleural aspiration using Ultrasound guidance
- Failed sampling? Small, loculated effusion?
  - YES: Consider CT scan and further image-guided aspiration
  - NO: Repeat fluid sampling

- Insert chest tube

Adapted From Davies H E et al. Thorax 2010;65
58 y.o. woman with increased SOB x 1 month

What do you do?
Patient has fever and pleuritic pain and abnormal CT. What do you do?

Image courtesy of V.C. Broaddus

Empyema vs. Lung Abscess

Images courtesy of V.C. Broaddus
Empyema: NEXT step after chest tube

**Chest tubes**
- Patient has
  - Fever
  - Loss of appetite
  - Leukocytosis
- Large undrained pocket

**Thoracoscopy**
- Patient has
  - Fever
  - Loss of appetite
  - Leukocytosis
- Extensive loculation
  - Immunosuppressed

**Observe**
- Patient improving

---

Pleural Infection Management

- Insert chest tube
- Is the patient better?
  - CXR fluid drained & sepsis improved, Day 5?
    - YES
      - Remove tube
    - NO
      1. Check tube position on chest X ray
      2. Assess tube, residual collection with contrast enhanced CT imaging
      3. Early liaison with thoracic surgeons
      - Is the patient fit for radical treatment?
        - YES
          - Surgical therapy
        - NO
          - Consider large bore drain insertion, less radical surgical techniques, palliative care measures

Adapted From Davies H E et al. Thorax 2010;65
So what about lytics?

Tokuda et al in Chest 2006;129(3).
- no evidence that intrapleural administration of fibrinolytic agents reduced mortality or need for surgery for empyema and complicated parapneumonic effusion

So what about lytics?

Rahman et. al. MIST2 trial. *NEJM* 2011; 365.
- Patients receiving DNase and t-PA had
  - Improved radiographic outcomes
  - Lower rates of surgery at 3 mo.
  - Decreased hosp. stay
The future

- For loculated effusions:
  - Thrombolytics
  - DNAse
  - Saline infusions
Malignant Pleural Effusion

68 year old woman with Stage IV NSCLC has a R malignant pleural effusion, for which she has undergone therapeutic thoracenteses, with significant relief of her dyspnea.

She underwent her most recent thoracentesis 2 wks ago, but now has recurrent dyspnea, with reaccumulation of fluid on CXR.
Case Example

Which of the following interventions would be best to recommend for management of her pleural effusion?

A. Repeat Thoracenteses
B. Placement of an indwelling pleural catheter
C. Talc pleurodesis via chest tube
D. Thoracoscopy with talc insufflation

Malignant Pleural Effusion (MPE)

- Pleural effusion with positive fluid cytology or pleural biopsy diagnostic of cancer.
- Disabling dyspnea
- Mean Life expectancy = 4-6 months
Goals of MPE Management

- Provide rapid symptom relief
- Improve QOL
- Minimize
  - need for repeat procedures
  - time in hospital
  - adverse events

MPE Management Options

<table>
<thead>
<tr>
<th>Treatment Option</th>
<th>Indication</th>
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<tbody>
<tr>
<td>Observation</td>
<td>Asymptomatic</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>May be effective in: lymphoma, breast, small cell lung, germ cell tumors, prostate, ovarian</td>
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<tr>
<td>Radiation Therapy</td>
<td>If predominant mediastinal lymphadenopathy</td>
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<tr>
<td>Thoracentesis or Chest Catheter</td>
<td>Rapid symptomatic relief of dyspnea. But, most effusions recur.</td>
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<td>Pleurodesis • Chest tube • Thoracoscopy</td>
<td>Control of effusion and improved symptoms in most patients; Requires hospitalization. Avoids long-term indwelling catheter.</td>
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<td>Control of effusion and improved symptoms in most patients; fewer hospital days.</td>
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<td>Pleurectomy</td>
<td>Major surgical procedure. For patients with mesothelioma or failed pleurodesis with long survival expected.</td>
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<td>Pleuroperitoneal shunt</td>
<td>Rarely used; high complication rate.</td>
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#### Initial Steps in Management

- **Therapeutic thoracentesis**
  - Obtain diagnostic specimen
  - Confirm symptom improvement
Determining the Next Step

- Evaluate rate of reaccumulation
- Consider patient’s overall prognosis
  - Cancer cell type
  - Pleural fluid characteristics
- Evaluate severity of patient symptoms

Observation

- Option if patient is asymptomatic
- BUT usually ultimately require intervention
Thoracenteses

- Repeat therapeutic thoracentesis is option for MPEs that reaccumulate slowly
- Usually in patients with very short expected survival (<3 months)

Repeat Thoracenteses

**Advantages**
- Outpatient Procedure
- No catheter or chest tube

**Disadvantages**
- Recurrence of symptoms
- Repeat procedures
- Risk of reperfusion edema
- Risk of pneumothorax / hemothorax
Pleurodesis

- Via Chest Tube or Thorascopically*
- Talc most effective agent

*RCTs showed no superiority of one technique over another

Advantages
- If successful, then should not require additional procedures
- Thoracoscopy with talc insufflation can include lysis of adhesions or partial decortication for trapped lung

Disadvantages
- Requires hospitalization
- Limited success rates
- Pain
- Fever
- Risk of ARDS
Indwelling Pleural Catheter (IPC)

- Placement of an indwelling pleural catheter by Pulmonologist, IR, Surgeon
- Intermittent outpatient drainage by patient or a caregiver
- Requires little if any time in the hospital, as the catheter is usually placed during an outpatient
- Can be placed even with trapped lung

Indwelling Pleural catheter

**Advantages**
- Outpatient procedure with minimal time in hospital
- Pleurodesis may occur (2-11 weeks)

**Disadvantages**
- Risk of empyema
- Risk of cellulitis as insertion site
- Long-term catheter
- Family member must perform drainage at home
Comparisons of IPC vs. Pleurodesis

Effect of an Indwelling Pleural Catheter vs Chest Tube and Talc Pleurodesis for Relieving Dyspnea in Patients With Malignant Pleural Effusion

The TIME2 Randomized Controlled Trial

Contact: Malignant pleural effusion causes disabling dyspnea in patients with a short life expectancy. Talc pleurodesis is achieved by fluid drainage, but the most effective frontline method has not been determined.

Objective: To determine whether indwelling pleural catheters (IPC) are more effective than chest tube and talc pleurodesis trials in relieving dyspnea.

Design: Unblinded randomized controlled trial. Second Therapeutic Intervention in Malignant Effusion Trial (TIME2) comparing IPC and talc (1:1) for which 195 patients with malignant pleural effusion who had not previously undergone pleurodesis were recruited from 12 centers who were pooled at 7 US hospitals. Patients were screened from April 2007 to February 2011 and were followed up for 2 years.

Intervention: Indwelling pleural catheters were inserted on an outpatient basis, followed by initial large-volume drainage, education, and subsequent serial drainage. The talc group were admitted for chest tube insertion and talc for chest pleurodesis.

Main Outcome Measure: Patients completed daily 100-mm visual analog scale (VAS) of dyspnea over 42 days after undergoing the intervention (0 mm represents no dyspnea and 100 mm represents maximum dyspnea; 10 mm represents minimum clinically significant difference). Mean difference was analyzed using a mixed-effects linear regression model adjusted for minimization variables.

Results: Dyspnea improved in both groups, with no significant differences in the test.
JAMA 2012: IPC vs. Pleurodesis

- RCT (Unblinded)
- IPC and talc (1:1)
  - Talc Pleurodesis via Chest Tube
- 106 patients with MPE
- 7 UK hospitals
- April 2007-February 2011
- 1 year follow up

JAMA 2012: IPC vs. Pleurodesis

- Primary Endpoint: **DYSPNEA**
  - Daily 100-mm line visual analog scale of dyspnea x 42 days
### JAMA 2012: IPC vs. Pleurodesis
#### Demographics

<table>
<thead>
<tr>
<th>Baseline Characteristics</th>
<th>IPC (n=52)</th>
<th>Pleurodesis (n=54)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), y</td>
<td>67 (11)</td>
<td>67 (12)</td>
</tr>
<tr>
<td>Male:female (% men)</td>
<td>23:29 (44%)</td>
<td>23:31 (43%)</td>
</tr>
<tr>
<td>Malignancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Breast</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Lung</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>Other</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Inpatient:outpatient at enrollment (% inpatient)</td>
<td>19:33 (35)</td>
<td>22:31 (42)</td>
</tr>
</tbody>
</table>

### VAS dyspnea, mean (SD), mm

- IPC (n=52): 62 (22)
- Pleurodesis (n=54): 55 (26)

### VAS chest pain, mean (SD), mm

- IPC (n=52): 29 (30)
- Pleurodesis (n=54): 22 (29)

### EORTC QLQ-30: global health status, % (SD)

- IPC (n=52): 37 (23)
- Pleurodesis (n=54): 37 (20)
JAMA 2012: IPC vs. Pleurodesis
Outcomes

DYSPNEA
- No significant difference in dyspnea until 6 months
- At 6 mo: Decrease in dyspnea in the IPC group compared with talc group ($P = .01$)


QUALITY OF LIFE
- QOL increased in both groups at 6 wks
- No significant difference in QOL btwn 2 groups at any time point

**JAMA 2012: IPC vs. Pleurodesis**

**Outcomes**

**HOSPITAL DAYS** (in 12 mo. Follow up)

- IPC group spent a median of 1 day
- Talc group spent a median of 4.5 days

\( (P < .001) \)

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**CHEST 2012: Indwelling Pleural Catheters Reduce Inpatient Days Over Pleurodesis for Malignant Pleural Effusion**

Edward T. H. Fyh, MBBS; Grant W. Wetterer, PhD; Peter A. Knudell, MBBS; Peter R. Reenner, MBChB; Sharif Z Diba, RN; Elizabeth Gellman, PhD; Kate McCarron, RN; Sue Morey, NP; Michael Milne, MA; A. W. (Bill) Mosk, MD, FCCP; and Y. C. Greg Lee, PhD, FCCP

Background: Patients with malignant pleural effusion (MPE) have limited prognoses. They require long-lasting symptom relief with minimal hospitalization. Indwelling pleural catheters (IPC) and talc pleurodesis are approved treatments for MPE. Establishing the implications of IPC and talc pleurodesis on subsequent hospital stay will influence patient choice of treatment. Therefore, our objective was to compare patients with MPE treated with IPC vs pleurodesis in terms of hospital
CHEST 2012: IPC vs. Pleurodesis

- 65 patients with MPE
- Multicenter (3 hospitals in Australia)
- IPC or talc pleurodesis - based on patient choice (NOT Randomized)
  - Pleurodesis = bedside talc slurry OR thoracoscopic poudrage, as preferred by the clinician

Primary Endpoint: Hospital Days
- Total
- Effusion Related

Secondary Endpoints:
- QOL
- Dyspnea
CHEST 2012: IPC vs. Pleurodesis

Demographics

<table>
<thead>
<tr>
<th>Baseline Characteristics</th>
<th>IPC (n = 34)</th>
<th>Pleurodesis (n = 31)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (IQR), y</td>
<td>69 (65-78)</td>
<td>73 (66-82)</td>
<td>.32</td>
</tr>
<tr>
<td>Male sex</td>
<td>25 (73.5)</td>
<td>19 (61.3)</td>
<td>.88</td>
</tr>
<tr>
<td>Right-sided effusion</td>
<td>21 (61.8)</td>
<td>16 (51.6)</td>
<td>.57</td>
</tr>
<tr>
<td>Trapped lung</td>
<td>16 (47.1)</td>
<td>1 (3.2)</td>
<td>.001</td>
</tr>
</tbody>
</table>

3 patients in the pleurodesis group subsequently underwent IPC placement due to fluid reaccumulation
1 patient treated with an IPC later underwent pleurectomy

CHEST 2012: IPC vs. Pleurodesis

Demographics

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<th>Pleurodesis (n = 31)</th>
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<tbody>
<tr>
<td>Mesothelioma</td>
<td>18 (52.9)</td>
<td>12 (38.7)</td>
<td>.37</td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>13 (38.2)</td>
<td>17 (54.8)</td>
<td>.28</td>
</tr>
<tr>
<td>Lung</td>
<td>7</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>4</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Ovarian</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Endometrial</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Esophageal</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>3 (8.7)</td>
<td>2 (6.4)</td>
<td></td>
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</table>
### CHEST 2012: IPC vs. Pleurodesis

#### Outcomes

<table>
<thead>
<tr>
<th>Observed Outcome</th>
<th>IPC (n=34)</th>
<th>Pleurodesis (n=31)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hospital Days</td>
<td>6.5</td>
<td>18.0</td>
<td>0.002</td>
</tr>
<tr>
<td>Effusion Related Hospital Days</td>
<td>3.0</td>
<td>10.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>QOL Significantly improved</td>
<td>93.3%</td>
<td>50%</td>
<td>0.02</td>
</tr>
<tr>
<td>Dyspnea Score improved</td>
<td>93.3%</td>
<td>78.6%</td>
<td>0.33</td>
</tr>
<tr>
<td>Complications</td>
<td>18.9%</td>
<td>45.2%</td>
<td>0.04</td>
</tr>
</tbody>
</table>

#### Complications

<table>
<thead>
<tr>
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<th>IPC (n = 37)</th>
<th>Pleurodesis (n = 31)</th>
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<tbody>
<tr>
<td>Pain postprocedure</td>
<td>2 (5.4)</td>
<td>4 (12.9)</td>
<td>.40</td>
</tr>
<tr>
<td>Symptomatic loculation/ failed pleurodesis</td>
<td>5 (13.5)</td>
<td>10 (32.3)</td>
<td>.12</td>
</tr>
<tr>
<td>Empyema</td>
<td>4 (10.8)</td>
<td>2 (6.4)</td>
<td>.68</td>
</tr>
<tr>
<td>Hemothorax</td>
<td>1 (2.7)</td>
<td>2 (6.5)</td>
<td>.59</td>
</tr>
<tr>
<td>Dislodgement of catheter</td>
<td>1 (2.7)</td>
<td>3 (9.7)</td>
<td>.32</td>
</tr>
<tr>
<td>No. of patients experienced a complication</td>
<td>7 (18.9)</td>
<td>14 (45.2)</td>
<td>.04</td>
</tr>
</tbody>
</table>
ATS 2012: IPC vs. Pleurodesis

Demographics

- Retrospective chart review
- Single institution (Swedish Medical Center)
- 2005 to June 2011.
- VATS with pleurodesis vs.
- Tunneled Pleural Catheter placement
  - 47 of 59 (80%) under concious sedation
  - 12 of 59 (20%) during VATS (lung failed to reexpand)
ATS 2012: IPC vs. Pleurodesis
Demographics

- Primary outcomes:
  1. LOS
     - overall LOS,
     - LOS after the procedure
  2. Reintervention


<table>
<thead>
<tr>
<th>Baseline Characteristics</th>
<th>IPC (n = 59)</th>
<th>Talc Pleurodesis (n = 50)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, years</td>
<td>66</td>
<td>66</td>
<td>0.95</td>
</tr>
<tr>
<td>Male</td>
<td>21 (36%)</td>
<td>23 (46%)</td>
<td>0.36</td>
</tr>
<tr>
<td>Cancer Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>27 (46%)</td>
<td>15 (30%)</td>
<td>42 (39%)</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>5 (8%)</td>
<td>15 (30%)</td>
<td>20 (18%)</td>
</tr>
<tr>
<td>Breast</td>
<td>10 (17%)</td>
<td>5 (10%)</td>
<td>15 (14%)</td>
</tr>
<tr>
<td>Ovarian</td>
<td>11 (19%)</td>
<td>4 (8%)</td>
<td>15 (14%)</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>2 (3%)</td>
<td>6 (12%)</td>
<td>8 (7%)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (7%)</td>
<td>5 (10%)</td>
<td>9 (8%)</td>
</tr>
</tbody>
</table>
ATS 2012: IPC vs. Pleurodesis

Outcomes

<table>
<thead>
<tr>
<th>Variables</th>
<th>IPC (n = 59)</th>
<th>Pleurodesis (n = 50)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS, Mean (days)</td>
<td>7</td>
<td>8</td>
<td>0.006</td>
</tr>
<tr>
<td>LOS, Mode (days)</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Postprocedure LOS Mean (days)</td>
<td>3</td>
<td>6</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Postprocedure LOS Mode (days)</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Reintervention</td>
<td>1 (2%)</td>
<td>8 (16%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Complications</td>
<td>3 (5%)</td>
<td>7 (14%)</td>
<td>0.18</td>
</tr>
<tr>
<td>Readmission for ipsilateral effusion</td>
<td>7 (12%)</td>
<td>6 (12%)</td>
<td>0.78</td>
</tr>
<tr>
<td>In-hospital mortality</td>
<td>2 (3%)</td>
<td>4 (8%)</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Summary of 3 Recent Studies

- IPC appears **superior** compared with Talc Pleurodesis for management of MPE
  - Decrease in hospital days
  - Improvement in Dyspnea
  - Perhaps better QOL
  - No difference in complications
  - Less need for repeat procedure
Potential Future Management Strategies

1. Combining thoracoscopic talc insufflation with insertion of an IPC
2. Intrapleural administration of nonsclerosing Chemotherapeutic agent
3. Drug eluting IPC

BTS 2010 Guidelines: Algorithm for Management of Malignant Pleural Effusion
Proposed Algorithm for Management of Malignant Pleural Effusion

1. Malignant Pleural Effusion
2. Symptoms?
   - NO: Observation
   - YES: Thoracentesis
3. Thoracentesis
   - NO: Observation
   - YES: Rapid Reaccumulation < 1 mo.
4. Rapid Reaccumulation < 1 mo.
   - NO: Observation
   - YES: IPC OR Pleurodesis
5. IPC OR Pleurodesis
   - Trapped Lung
Thank you!

- Questions