Indwelling Pleural Catheter - What the Non-Interventionalist Needs To Know

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Speaker Disclosure

In accordance with the policy of the Thoracic Society of Australia and New Zealand the following presenter has indicated that they have a relationship which in the context of their presentation, could be perceived as a real or apparent conflict of interest but do not consider that it will influence their presentation. The nature of the conflict is listed:

No disclosures
Trapped lung
Malignant pleural effusion: Significant problem worldwide

- MPE affects >8000/year in Australia
- MPE affects
  - >90% mesothelioma
  - ~30% lung & breast cancer patients
- Heralds incurable cancer in most cases
Talc pleurodesis is the standard treatment: 

*Significant shortcomings*

- Adverse effects - Pain, fever, hypoxia
- Unsuitable in many patients - Eg. trapped lung
- High failure rate
  - Fluid recurs in ~30% by 30 days
  - Mesothelioma - >30% pleural further interventions

Dressler. Chest 2005  
Fysh. Thorax 2013
Median survival in MPE is 4-12 months: *Symptom palliation is the key goal*
Key goals of MPE management

• Relieve symptoms, eg breathlessness
• Improve patient-reported outcomes, eg QoL
• Use least invasive & no. of procedures
• Reduce hospitalisation
• Cost-effective

Thomas. Respirology 2015
Indwelling pleural catheter: *Alternative treatment for MPE*

- Small bore 16F catheter
- Can remain in-situ indefinitely
  - Subcutaneously tunelled
  - Anchored by a cuff
  - One-way valve
Allows ambulatory drainage

- Gives patients control over their disease management
Insertion is by Seldinger technique
Advantages of IPC

• Improvement in breathlessness, chest pain & QoL is similar to that after pleurodesis

• Less time in hospital for initial procedure
  - 0-1 vs. 4-6.5 days

• Less further pleural interventions - 9 vs 22%

**Improvement in dyspnoea & chest pain**

- Mean VAS improved by 30mm (pleurodesis) & 37mm (IPC) at 42 days
### Less Initial hospitalisation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pleural catheter</th>
<th>Doxycycline pleurodesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>94</td>
<td>43</td>
</tr>
<tr>
<td>Hospitalization days (median)</td>
<td>1.0</td>
<td>6.5&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Fluid drained first 24 hours (mL)</td>
<td>1905 ± 916</td>
<td>1500 ± 916</td>
</tr>
<tr>
<td>Recurrence of effusion postdischarge (%)</td>
<td>12 of 91 (13)</td>
<td>6 of 28 (21)</td>
</tr>
</tbody>
</table>

Putnam JB. Cancer 1999
Less total hospital bed days

**Graphical Abstract**

- **Title:** Indwelling Pleural Catheters Reduce Inpatient Days Over Pleurodesis for Malignant Pleural Effusion
- **Authors:** Edward T. Al Fyf, MBBS, Grant W. Winterer, PhD, Peter A. Rossell, MBBS, Peter B. Brennan, MBBS, Sheryl D. Deve, RN, Elizabeth Glairwood, PhD.
- **Details:**
  - **Background:** Patients with malignant pleural effusions (MPEs) have limited prognosis. 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 can influence patient choice of treatment. Here, we evaluated the cost and outcomes of patients with MPE treated with IPC vs. pleurodesis in terms of hospital stays and medical costs.
  - **Methods:** In this prospective, 13-month, multicenter study, patients with MPE were treated with IPC or talc pleurodesis, based on patient choice. Key endpoints were hospital bed days from procedures to death (total and for each cause). Complications, including infection and pleural effusion, were monitored longitudinally.
  - **Results:** One hundred sixty-five patients with MPE were recruited, and 65 required additional fluid removal. All IPCs and 31 pleurodesis cases resulted in total hospital bed days. Patients who received IPC had significantly fewer bed days (median 6.5, interquartile range [IQR]: 2.75-14.0) vs. pleurodesis (median 18.0, IQR: 5.0-35.0), **P < 0.001**. Patients with IPCs spent significantly fewer days in hospital (9.0 days, **P < 0.001**). Efficacy was similar in terms of chest tube survival (100% vs. 85%, **P < 0.001**). The total cost of hospitalization was also lower in the IPC group ($35,000 vs. $90,000, **P < 0.05**). Costs were comparable between groups.

**Table**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Median Bed Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPC</td>
<td>34</td>
<td>6.5</td>
</tr>
<tr>
<td>Pleurodesis</td>
<td>31</td>
<td>18.0</td>
</tr>
</tbody>
</table>

**Significance:** *p* < 0.002
Australasian Malignant Pleural Effusion Trial

- RCT - 146 patients
- Primary end-point:
  - Total all-cause hospital days at 12mths/death
- Secondary end point:
  - Effusion-related days, QoL & breathlessness
IPC-related complications
Most patients have no complications

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of Studies</th>
<th>Percent with Outcome</th>
<th>% Combined participants with outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without complication</td>
<td>10</td>
<td>87.5 (517/591)</td>
<td></td>
</tr>
<tr>
<td>Symptomatic improvement</td>
<td>12</td>
<td>95.6 (628/657)</td>
<td></td>
</tr>
<tr>
<td>Spontaneous pleurodesis</td>
<td>12</td>
<td>45.6 (430/943)</td>
<td></td>
</tr>
</tbody>
</table>

Van Meter MEM. A Systematic Review. J Gen Intern Med 2011
Adverse events are uncommon

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<th>Percent with Outcome</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Combined Results</td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td>6</td>
<td>0.4 (4/903)</td>
<td></td>
</tr>
<tr>
<td>Infection, unspecified</td>
<td>3</td>
<td>2.0 (7/346)</td>
<td></td>
</tr>
<tr>
<td>Cellulitis</td>
<td>10</td>
<td>3.4 (32/935)</td>
<td></td>
</tr>
<tr>
<td>Empyema</td>
<td>13</td>
<td>2.8 (33/1168)</td>
<td></td>
</tr>
<tr>
<td>Dislocated catheter</td>
<td>7</td>
<td>2.2 (14/648)</td>
<td></td>
</tr>
<tr>
<td>Malfunction of catheter</td>
<td>2</td>
<td>9.1 (11/121)</td>
<td></td>
</tr>
<tr>
<td>Obstructed / clogged catheter</td>
<td>10</td>
<td>3.7 (33/895)</td>
<td></td>
</tr>
</tbody>
</table>

Van Meter MEM. A Systematic Review. J Gen Intern Med 2011
IPC-related pleural infection

- Fear of infection is usually the biggest concern

- Largest series
  - 11 centers
  - 1021 IPC cases
  - 50 pleural infection (4.8%)
  - Most infections after >2m
A wide range of organisms - *S. aureus* most common
IPC-related infection outcomes

• 94% successfully treated with antibiotics
  - 63% IV; others oral antibiotics
  - 71% treated as in-patient
  - None required surgery

Fysh. Chest 2013
IPC-related infection mortality

• 3/50 (6%) died
  - <0.3% of all IPC inserted
  - In the setting of advanced cancers
  - Usual empyema mortality is ~15%

Fysh. Chest 2013
IPC use and chemotherapy

• 2 studies (n=262 and n=82)
  - No increase in pleural infection rates
  - ~5% with chemotherapy

Mekhail. J Bronch Interv Pulmonol 2013
Morel. Thorax 2010
IPC-related infection - Practical tips

• ~10% IPCs may have colonization
  - Bacteria on PF culture; No signs of infection
• Differentiating from infection not easy
  - Fever
  - ↑ inflamm marker eg CRP, procalcitonin
  - Change in fluid biochemistry eg LDH, pH
  - Organism type
Treatment principles are similar to other pleural infections

- Appropriate antibiotics
- Continuous drainage
  - Connect IPC to underwater-seal drainage
- Consider intrapleural tPA-DNase, if loculated
- Change/remove catheter ONLY if infection is not controlled
Catheter tract metastasis

• Concerns about risk of tract metastasises
  - In-situ for a long time
  - May allow continual tumor seeding along catheter tract
  - Mesothelioma cases known to have higher risk of NTMs
• 10% incidence (11 CTMs/110 IPCs)
  - Mesothelioma (9) & adenocarcinoma (2)
  - Often develop late - median 280d (56-693)
  - Responsive to radiotherapy, no damage to IPC
  - Duration after IPC insertion was sole risk factor
Catheter tract metastasis
Histology of removed IPC

- 41 IPCs
  - 18 mesothelioma
- No direct cancer invasion or growth along catheter surface

Tobin. Respirology 2016
IPC-related symptomatic loculation

- 8-14% cases develop symptomatic loculation
  - Fibrinous loculations
  - Ineffective drainage & fluid accumulation
  - Increased breathlessness
- Intra-pleural fibrinolytic therapy is used in pleural infections & MPE
- Fibrinolytics often used for treatment of SL
• 4 centres

• 66 cases (>1400 IPCs)
  - ↑ drainage (93%)
  - Improved SOB (83%)
  - Improved CXR
  - 2 non-fatal pleural bleed
  - Recurrence in 40%
Removal of IPC

• Spontaneous pleurodesis
  - ~40%
  - Post-pleural infections (usually S. aureus) - 60%
• Rarely for pleural infection (uncontrolled)
• Removed as a day procedure
  - Careful dissection around the cuff and tube
IPC fracture during removal

- Removal may be difficult
  - Fracture/deliberate severing
  - Retained IPC portion inside
- Retained fragment is safe
  - Aggressive retrieval unnecessary

Fysh. Chest 2012
Practical Aspects of IPC Use
Indications

• Definite
  - Failed pleurodesis
  - If pleurodesis is inappropriate, trapped lung

• Used in many American & European centers
  - As first-line treatment & pleurodesis alternative
Other situations

• Case reports and small case series
  - Refractory benign effusions
  - Recurrent malignant ascites*

*Wong. TSANZ poster 2016
Contra-indications

• Absolute CI
  - Patient/carer unable to look after IPC

• Other CIs
  - Symptoms not improved by fluid drainage
  - Local skin infection
  - Pleural infection
  - Very short expected survival
Aftercare - Most important

- Becomes your patient for remaining lifespan
- Drainage education for patient/community carers
- Funding for drainage kits/consumables
- Regular follow-up
  - Management of complications
  - IPC removal when needed
- May require management of other cancer issues
Future directions

• Increasing quality evidence
• Many IPC-related trials currently underway
  - AMPLE 2 - Daily vs symptom-guided drainage
  - Daily vs 3/week drainage
  - IPC-Plus - IPC + talc pleurodesis
  - Thoracoscopic talc + IPC placement
IPCs fulfill key goals of MPE management

- Relieve symptoms & improve QoL
- Less invasive and no. of interventions
- Less hospitalisation
- Complications are uncommon & treatable
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