Stents in Central Airway Obstruction: Malignant and Benign Disease

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Scope of The Problem

- 185,000 new cases of lung cancer
- Resection remains therapy of choice for early stage disease
- 3/4 of patients present with latter stage disease
- A reported incidence of ¼ develop airway obstructive phenomena

Overview

- Tracheobronchial Stents
  - Charles Stent
    - Overview of Stent Technology
      - Types of stents
    - Metallic Stents
      - Less Migration
      - More Granulation
  - Silicone Stents
    - Removable
    - Movable

Indications for Stent Placement

- Airway obstruction from intrinsic or extrinsic compression
- Tumor in-growth despite laser treatments
- Loss of cartilaginous support
- Treatment of tracheoesophageal fistula
- Relief of post-obstructive pneumonia in septic patient
Contraindications
- Concurrent fistula of the tracheobronchial tree, unless a covered stent is being used
- Compression by vascular structure due to risk of erosion and

Benign Obstructions
- Post-traumatic
  - Post-intubation or post-tracheostomy stenoses
- Tracheo-esophageal Fistulae
- Fibrotic Stenosis
  - Sarcoidosis
  - Tuberculosis
  - Wegener’s granulomatosis
  - Lye ingestion
  - Secondary to infection
- Tracheobronchial Malacia
  - Post radiation therapy
  - Diffuse idiopathic, relapsing polychondritis
- Post-Lung Transplantation
  - Anastomotic stenosis

Stent types

Stent Technology

<table>
<thead>
<tr>
<th>Type</th>
<th>The Good</th>
<th>The Bad</th>
<th>The Ugly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicone Stent</td>
<td>Removable min. granulation</td>
<td>Requires rigid bronch</td>
<td>Migration risk (benign)</td>
</tr>
<tr>
<td>Dumon, Polyflex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balloon dilated metal</td>
<td>Thin will not migrate</td>
<td>Rigid bronch</td>
<td>Requires balloon</td>
</tr>
<tr>
<td>Cordis Corp-Palmaz</td>
<td></td>
<td></td>
<td>Radial force may injure airway /instent regrowth</td>
</tr>
<tr>
<td>Self Expanding Metal</td>
<td>flexible bronch thinner</td>
<td>Difficult to remove</td>
<td>Granulation tissue</td>
</tr>
<tr>
<td>Ultraflex, Alveolus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covered Self Expanding</td>
<td>Easier to remove and flex bronch</td>
<td>Obstruction of bronchial orifice</td>
<td></td>
</tr>
<tr>
<td>Ultraflex, Wallstent</td>
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</tr>
</tbody>
</table>
Complications

- Stent migration
- Stent occlusion due to tumor overgrowth of Stent granuloma formation
- Restenosis Recurrent obstructive dyspnea
- Death
  - Progression of disease with mean LOS (8.4 mo)
  - Procedure Related Mortality low (4%)
- Bleeding
- Infection

Procedure Outcomes Data
Miyazawa, T. CHEST 2000; 118: 956 – 965

Evaluation of Dyspnea Before and After Implantation of the Ultraflex™ Stent

<table>
<thead>
<tr>
<th>Dyspnea Grade</th>
<th>Before (n=34)</th>
<th>Day 1 (n=33)</th>
<th>Day 30 (n=26)</th>
<th>Day 60 (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>I</td>
<td>3</td>
<td>14</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>II</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>III</td>
<td>8 (68%)</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>IV</td>
<td>15</td>
<td>2</td>
<td>1</td>
<td>2</td>
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</tbody>
</table>

85%

Patients, No.

Evaluation of Dyspnea Before and After Implantation of the Ultraflex™ Stent

Procedures Outcomes Data
Miyazawa, T. CHEST 2000; 118: 956 – 965

Complications by type

<table>
<thead>
<tr>
<th>Indication</th>
<th>N</th>
<th>Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonmalignant airway obstruction</td>
<td>301</td>
<td>46 (15)</td>
</tr>
<tr>
<td>Malignant airway obstruction</td>
<td>253</td>
<td>62 (25)</td>
</tr>
<tr>
<td>Endobronchial (intrinsic)</td>
<td>27</td>
<td>10 (37)</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>30</td>
<td>8 (27)</td>
</tr>
</tbody>
</table>


Intrinsic versus Extrinsic

Tracheal obstruction-malignant - Case 1
Pre and post NBF treatment
Stent Placement - Deployment Confirmation

- Deployment Confirmed:
  - Via bronchoscopic examination
  - Via fluoroscopic examination
- Delivery System Removed:
  - Delivery system is removed
  - Bronchoscope is removed

Silicone Airway Stents
Silicone Airway Endoprosthetics

Ultraflex Stent Placement:
Under Rigid Bronchoscopy

Post Intubation airway injury
Conclusions

- Airway stenting has emerged as an important therapeutic option for patients with endotracheobronchial obstruction.
- While Benign and Malignant disease can be managed with stents, stents are not ideally suited for long term use.
- Choice of Stent is governed by nature of airway obstruction.

Thank You