Airway Cryoablation: Indications, Technique and Risks

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AATS Innovations Course
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Nothing to Disclose
**Mechanism of Action**

**Flash Freeze**
196°C liquid nitrogen flash freezes benign and malignant tissue, causing instant cell death.

**Preserved Extracellular Matrix**
Combination of fast, deep freeze and subsequent thaw destroys cellular components while preserving the extracellular matrix (ECM).

**Healing Response**
Intact ECM enables healing response with limited scarring and fibrosis compared to heat ablation. Tissue remains amenable to future therapeutic options.
Cryoprobe versus cryospray
Indications

- Benign
  - Granulation tissue
  - Stenoses
  - Amyloidosis?
  - Papillomatosis?
  - Bronchitis (destroy goblet cells and glands)

- Malignant: mets, local involvement
  - Obstruction
  - Bleeding
Cryotherapy

[Images of medical equipment and cryotherapeutic devices]
Technique

- The challenge = passive venting
- Endotracheal tube ($\geq 8.5$) or
- Suspension laryngoscopy
Technique

- 100% oxygen
- ETT: deflate cuff and hold ventilation or
- Suspended laryngoscopy and hold ventilation
- 5” treat $\rightarrow$ 60 sec thaw and vent $\rightarrow$ 5” treat
- 10 seconds okay with lower flow
- Desaturations?
Airway Spray Cryotherapy: Initial Outcomes From a Multiinstitutional Registry

David J. Finley, MD, Joe Dycoo, BS, Saiyad Sarkar, MD, William S. Krimsky, MD, John T. Sherwood, MD, Dominic Dekeltra, MD, Gordon Downie, MD, PhD, Joel Atwood, BS, Hiran C. Fernando, MD, and Valerie W. Rusch, MD

Table 2. Histology of Tumors Treated With Spray Cryotherapy

<table>
<thead>
<tr>
<th>Histology</th>
<th>Patients No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metastasis</td>
<td>26 (32)</td>
</tr>
<tr>
<td>Squamous</td>
<td>20 (25)</td>
</tr>
<tr>
<td>Non-small cell lung cancer</td>
<td>17 (21.5)</td>
</tr>
<tr>
<td>Carcinoid</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Small cell lung cancer</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Head and neck malignancies</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Adenoid cystic carcinoma</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Thyroid carcinoma</td>
<td>2 (2.5)</td>
</tr>
<tr>
<td>Benign</td>
<td>2 (2.5)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (2.5)</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complications</td>
<td>22 (19.3)</td>
</tr>
<tr>
<td>Hypotension</td>
<td>13 (11.4)</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>6 (5.3)</td>
</tr>
<tr>
<td>Desaturation</td>
<td>7 (6.1)</td>
</tr>
<tr>
<td>Massive hemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>3</td>
</tr>
<tr>
<td>Chest tube placement</td>
<td>1</td>
</tr>
<tr>
<td>Grade 3 or greater</td>
<td>10 (8.8)</td>
</tr>
<tr>
<td>Intra-op death</td>
<td>2</td>
</tr>
<tr>
<td>Post-op death (comfort care)</td>
<td>3</td>
</tr>
</tbody>
</table>

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Treatment of Benign Tracheal Stenosis Using Endoluminal Spray Cryotherapy

Faiz Y. Bhora, MD; Adil Ayub, MD; Craig M. Forleiter, MD; Chyun-Yin Huang, MD; Khalid Alshehri, MD; Sadiq Rehmani, MD; Adnan M. Al-Ayoubi, MD, PhD; Wissam Raad, MD; Robert S. Lebovics, MD

Figure 1. Change in Grade of Stenosis Before and After Spray Cryotherapy (SCT)

Post-SCT grade was obtained at the last available outpatient follow-up (range, 1-26 months).
Summary

- Indications:
  - Malignant
    - Concurrent chemoradiation
    - Stent
  - Benign
    - Decrease re-intervention rate
- Hemostatic
- Analgesic
- Well-tolerated
- SAFETY
Conclusions

- Cryotherapy may be better than hyperthermia
- Be innovative but be safe!

- Future studies:
  - QOL
  - Spirometry