Complex Thoracoscopic Resections

Duke Minimally Invasive Surgery Course
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Disclosure

- Consultant for Scanlan
- No conflicts related to this presentation
Thoracoscopic Lobectomy: Duke Approach

2 incisions: Camera port (1 cm) + Access incision (4.5 cm)
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Thoracoscopic Lobectomy: Duke Approach

Anterior superior iliac crest
Provides the flexibility to use the linear stapler from the “camera” port.
Provides the flexibility to use the linear stapler from the “camera” port.
Modified Uniportal Video-Assisted Thoracoscopic Lobectomy: Duke Approach


Traditional 2-port Approach

Modified Uniportal Approach
Oncologic Complex Thoracoscopic Resections

- Larger tumors, central tumors, N1
- Lobectomy with chest wall resection
- Lobectomy after induction therapy
- Sleeve resections
- Pneumonectomy
## Impact of T status and N status on perioperative outcomes after thoracoscopic lobectomy for lung cancer

*Nestor R. Villamizar, MD, Marcus Darrabie, MD, Jennifer Hanna, MD, Mark W. Onaitis, MD, Betty C. Tong, MD, Thomas A. D’Amico, MD, and Mark F. Berry, MD*

### Thoracoscopic Lobectomy: 2000-2010

<table>
<thead>
<tr>
<th>Description</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral, ≤ 3cm, and Clinical N0</td>
<td>329</td>
</tr>
<tr>
<td>Central tumor, or</td>
<td>504</td>
</tr>
<tr>
<td>&gt; 3 cm tumor, or</td>
<td></td>
</tr>
<tr>
<td>Clinical N1-N3</td>
<td></td>
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</tbody>
</table>
Risk Factors for Morbidity

Complications: incidence is not related to

- Central location
- Tumor size >3cm
- Clinical node status

Conversions

- Not higher for central tumors or for tumors > 3cm
- Higher for clinically node positive disease

<table>
<thead>
<tr>
<th>Node Status</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>cN0</td>
<td>3.3%</td>
</tr>
<tr>
<td>cN1-N3</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

p=0.03
Hybrid Approach to Chest Wall Tumors

- Thoracoscopic hilar dissection and ligation
- Small counter incision centered over lesion
- Chest wall resection and specimen removal
- Advantages
  - Smaller incision overall
  - Precise dissection
  - No rib spreading
  - No scapular retraction/rotation
Feasibility of hybrid thoracoscopic lobectomy and en-bloc chest wall resection

Mark F. Berry*, Mark W. Onaitis, Betty C. Tong, Stafford S. Balderson, David H. Harpole and Thomas A. D’Amico

Eur J Cardiothorac Surg 2011; 41: 888-892

- 78 patients: lobectomy and chest wall resection
- 68 patients: resection via thoracotomy
- 10 patients: hybrid thoracoscopic approach
- Pre-op, peri-op, and outcome variables assessed using standard descriptive statistics
- All patients underwent complete resection with negative margins
<table>
<thead>
<tr>
<th></th>
<th>Open (n=68)</th>
<th>VATS-Hybrid (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>58.5±12.0</td>
<td>63.4±12.2</td>
</tr>
<tr>
<td># ribs resected</td>
<td>3.2±1.1</td>
<td>2.6±1.1</td>
</tr>
<tr>
<td>Chest tube duration</td>
<td>4.4±1.6</td>
<td>4.3±1.5</td>
</tr>
<tr>
<td>Hospital stay</td>
<td>12.5±18.6</td>
<td>6.1±3.6</td>
</tr>
<tr>
<td>Overall morbidity</td>
<td>41 (60%)</td>
<td>4 (40%)</td>
</tr>
<tr>
<td>Technical complications</td>
<td>23 (34%)</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>Respiratory complications</td>
<td>22 (32%)</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>Cardiovascular complications</td>
<td>20 (29%)</td>
<td>1 (10%)</td>
</tr>
<tr>
<td>Peri-Op death</td>
<td>2 (3.4%)</td>
<td>0</td>
</tr>
</tbody>
</table>
# Thoracoscopic Lobectomy: A Safe and Effective Strategy After Induction Therapy for Non-Small Cell Lung Cancer

Rebecca P. Petersen, MD, MS, DuyKhanh Pham, MD, Eric M. Toloza, MD, PhD, William R. Burfeind, MD, David H. Harpole, Jr, MD, Steven I. Hanish, MD, and Thomas A. D’Amico, MD

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<table>
<thead>
<tr>
<th>Outcomes (N=97)</th>
<th>VATS N=12 (%)</th>
<th>Thoracotomy N=85 (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Resection</td>
<td>12 (100)</td>
<td>85 (100)</td>
<td>1.00</td>
</tr>
<tr>
<td>Chest tube duration</td>
<td>2 (2-3)</td>
<td>4 (2-12)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LOS</td>
<td>3 (2-6)</td>
<td>5 (2-63)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>30-Day mortality</td>
<td>0 (0)</td>
<td>4 (5)</td>
<td>0.44</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>1 (8)</td>
<td>1 (1)</td>
<td>0.10</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>0 (0)</td>
<td>8 (9)</td>
<td>0.27</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>0 (0)</td>
<td>2 (2)</td>
<td>0.59</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>0 (0)</td>
<td>10 (12)</td>
<td>0.21</td>
</tr>
</tbody>
</table>
Long-term Survival Following Lobectomy After Induction Therapy for NSCLC: VATS Approach Does Not Compromise Outcomes

- 273 patients: lobectomy after induction chemo: 70 (26%) VATS and 203 (74%) thoracotomy
- Compared to thoracotomy patients, VATS pts
  - Higher stage (p=0.03)  Older (p<0.001)
  - Greater BMI (p=0.01)
  - More CAD (p=0.008)  More COPD (p=0.02)
- Induction RT more common in open patients
Long-term Survival Following Lobectomy After Induction Therapy for NSCLC: VATS Approach Does Not Compromise Outcomes

- Perioperative mortality similar between the VATS (3%) and open (4%) groups (p=0.67)
- 7 (2.6%) converted to thoracotomy due to bleeding (n=2) or difficulty in dissection of fibrotic tissue, adhesions (n=5)
- None of these conversions led to perioperative deaths
Univariate analysis: VATS patients had improved 3-year survival compared with thoracotomy (61% vs 43%; p=0.008)

Multivariable analysis: VATS approach was associated with improved overall survival (p=0.04)
Overall Survival Stratified by Surgical Approach

- VATS: 61%
- Thoracotomy: 43%

p = 0.01

Number at risk:
- Open: 203, 142, 97, 78, 68, 54
- VATS: 69, 58, 39, 22, 15, 8
Propensity-Matched Survival Stratified by Surgical Approach

Overall Survival (Probability)

VATS 36.3%

Thoracotomy 30.2%

Number at risk
Open  30  21  13  8  6  3
VATS  30  25  19 12  9  6

p = 0.56
Thoracoscopic Pneumonectomy: Duke

- Attempted VATS pneumonectomy: 23 patients
- Completed VATS: 17 (74%)
- Converted to thoracotomy: 6 (26%)
- There were no peri-operative mortalities
- Conversions were more likely to have CAD, DM, CHF, poorer pulmonary function and to have received induction chemotherapy or previous thoracic surgery
Thoracoscopic Pneumonectomy

Reasons for Conversion (n=6)

• anatomical hilar dissection not amenable to VATS (n=4)
• pulmonary artery bleeding (n=1)
• adhesions (n=1)
Thoracoscopic Pneumonectomy

Compared to 44 matched thoracotomy patients:

- VATS patients had shorter hospital stay (median LOS = 4 vs. 5 days, p < 0.01)
- Operative time, morbidity, and mortality were not significantly different
- Adjuvant chemotherapy was started sooner in VATS patients
- No differences in short or long term survival
Thoracoscopic Pneumonectomy in Management of Histoplasmosis and Fibrosing Mediastinitis

Thoracoscopic Extended Resections

• Feasible, and safe, adhering to the principle of conversion whenever oncologic standards would be compromised

• Thoracoscopic lobectomy after induction therapy is particularly advantageous

• The role of VATS pneumonectomy is uncertain