Anatomic Resection is the Superior Strategy for Lung Cancer

Post Graduate Course
American Association for Thoracic Surgery
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No conflicts of interest related to this topic
Wedge resection 3y ago; T1aNx
2 cm Hilar mass
Pathology

- Completion left upper lobectomy, with no evidence of residual parenchymal tumor
- Positive for residual adenocarcinoma in the form of 3 hilar lymph nodes
- Levels 5, 6, 7, 8 negative for malignancy

Wedge resection was an ineffective and unsuccessful strategy
Role of Thoracoscopic Segmentectomy

1. Lobectomy vs Segmentectomy
   When is lobectomy preferred?

2. Segmentectomy vs Wedge Resection
   Is there a role for wedge?

3. Thoracoscopic vs Open Segmentectomy
Treatment Of Stage I Lung Cancer In High-risk And Inoperable Patients: Comparison Of Prospective Clinical Trials Using Stereotactic Body Radiotherapy (RTOG 0236), Sublobar Resection (ACOSOG Z4032), And Radiofrequency Ablation (ACOSOG Z4033)

SBRT vs RFA vs Sub-lobar resection

• Outcomes compared: RTOG 0236 (n = 55), ACOSOG Z4032 (n = 211), and ACOSOG Z4033 (n = 51)

• 30-day grade 3+ adverse events more common with surgery than SBRT (28% vs 9%, \( P = .004 \)), although no difference between the 2 groups at 90 days
SBRT vs RFA vs Sub-lobar resection

• Propensity-matched comparison: no difference between SBRT and surgery for 30-day grade 3+ adverse events
• Among patients with c-stage IA in ACOSOG Z4032, 29% had more advanced p-stage
• 13% of patients in the sublobar resection trial had no documented lymph node staging
• ? 3 mediastinal lymph nodes
Randomized Trial of Lobectomy vs Limited Resection for T1N0 NSCLC

• 276 patients with T1N0 NSCLC (1982-1988)
• Randomized at thoracotomy to limited resection or lobectomy
• Limited resection associated with
  – 75% increase in recurrence rate (p=0.02)
  – 30% increase in overall death rate (p=0.08)
  – 50% increase in cancer-specific death rate (p=0.09)
Overall Survival

- Lobectomy
- Limited Resection

Logrank $p=0.088$ (one-tailed)

Number at Risk

Lobectomy: 90
Limited Resect.: 93

Time in Months

12 24 36 48 60 72 84 96
Segmentectomy

What are the oncologic indications for sublobar resection?

- Histology (GGO)
- Tumor size
- Margins
- CT characteristics
Effect of tumor size on prognosis in patients with NSCLC: The role of segmentectomy


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<thead>
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<th>Tumor Size</th>
<th>Patients</th>
<th>5-year Survival</th>
<th>Stage I</th>
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Overall Survival

B

Survival (%)

<21-30mm

- Lobectomy (n=174)
- Segmentectomy (n=64)
- Wedge resection (n=14)

Month

87.4%
84.6%
81.3%
62.9%

p=0.9094
p<0.0001
p<0.0001
p=0.0492
p=0.0012
p<0.0001

C

Survival (%)

>30mm

- Lobectomy (n=216)
- Segmentectomy (n=34)
- Wedge resection (n=6)
Effect of tumor size on prognosis in patients with NSCLC: The role of segmentectomy

Adversely affected survival

- Tumor size, stage, age, male, wedge resection

Conclusions:

- < 20 mm  Consider segmentectomy
- 21-30 mm  Further study required
- > 30 mm  Lobectomy only
Sublobar Resection for Patients With Peripheral Small Adenocarcinomas of the Lung: Surgical Outcome is Associated With Features on CT


- 63 patients: Sublobar resection
- c-stage IA adenocarcinoma ≤ 2 cm
- Classified according to the tumor shadow disappearance rate on high-resolution CT
  - "air-containing type" (46 patients)
  - "solid-density type" (17 patients)
"air-containing type"
"solid-density type"
Sublobar Resection for Patients With Peripheral Small Adenocarcinomas of the Lung: Surgical Outcome is Associated With Features on CT

- Air-containing tumors: 38/46 “BAC”
  (BAC=non-invasive Adenocarcinoma)
- No patient with air-containing tumors had recurrence (median f/u 70 months)
Sublobar Resection for Patients With Peripheral Small Adenocarcinomas of the Lung: Surgical Outcome is Associated With Features on CT


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5-year survival

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<th>Tumor Type</th>
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<td>Air-containing tumors</td>
<td>95%</td>
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<td>Solid-density tumors</td>
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SEER database lobectomy vs segmentectomy

1998 - 2007: 14,473 patients: Stratified based on tumor size (<2.0 cm, 2.1-3.0 cm, 3.1-7.0 cm)

Lobectomy conferred superior 5-year survival compared with segmentectomy (unadjusted): overall survival ($p < 0.0001$) as well as cancer-specific survival ($p=0.0053$)
• Even after adjusting for patient factors, tumor characteristics, and geographic location, patients who underwent lobectomy had superior overall and cancer-specific survival rates, regardless of tumor size
Cancer Specific Survival, All

Log-rank P=0.0053
2.1-3.0 cm

![Graph showing survival rates for Lobectomy and Segmentectomy with a Log-rank P=0.0047](image-url)
3-7 cm
Lobectomy vs Segmentectomy

Segmentectomy may be considered in selected patients with tumors < 2cm, and

- Tumor type (GGO; adenocarcinoma in situ)
- Advanced age
- Poor performance status
- Poor pulmonary function
- Especially in the Lower lobe
Segmentectomy vs Wedge Resection
• 210 patients, 64% VATS, 36% thoracotomy
• Segmentectomy 27%, wedge resection 73%
• No differences in nodal upstaging, stations sampled, or parenchymal margin obtained between VATS and thoracotomy
However, significant differences were observed between segmentectomy and wedge resection:

- Parenchymal margin: 1.5 cm vs 0.8 cm, $p=0.0001$
- Nodal upstaging: 9% vs 1%, $p=0.006$
- Nodal stations sampled: 3 vs 1, $p < 0.0001$
Notably, 41% of patients treated by wedge resection had no nodes sampled at the time of operation compared with 2% of those who underwent segmentectomy (p < 0.0001)
Segmentectomy vs Wedge Resection

- Superior margin
- Superior nodal upstaging
- Superior nodal resection
- Superior survival?
Thoracoscopic Segmentectomy: Summary

• Selected patients with tumors <2cm
  – GGO
  – Advanced age, compromised pulmonary function
  – Poor performance status
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• Surgical margin > tumor diameter (at least 2 cm)
Thoracoscopic Segmentectomy: Summary

• **Selected patients with tumors <2cm**
  – GGO
  – Advanced age, compromised pulmonary function
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• **Surgical margin > tumor diameter (at least 2 cm)**

• **Thoracoscopic segmentectomy is oncologically equal to open segmentectomy, with fewer complications**
Thoracoscopic Segmentectomy: Summary

- Selected patients with tumors <2cm
  - GGO
  - Advanced age, compromised pulmonary function
  - Poor performance status
- Surgical margin > tumor diameter (at least 2 cm)
- Thoracoscopic segmentectomy is oncologically equal to open segmentectomy, with fewer complications
- Anatomic resection: the standard for most tumors