Sublobar resection for early-stage lung cancer

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Sublobar resection for early-stage lung cancer

Disclosures:

Lecture fee from (greater than 5,000 USD)

1. Johnson and Johnson, Co.
2. Covidien Japan, Co.
Evolution of Lung Cancer Surgery

No Surgical Indication

Pneumonectomy

- **Nissen**: First successful left-sided pneumonectomy as a two-stage procedure (1930)
- **Graham** and Singer: First successful en bloc left pneumonectomy for lung cancer (1933)
- **Overholt**: First successful en bloc right pneumonectomy for carcinoid tumor (1935)

Lobectomy

- **Cahan W.** “Radical lobectomy” (1962)

Limited resection

Lung Cancer Study Group (Ginsberg RJ). Randomized trial of lobectomy versus limited resection for T1N0 non-small cell lung cancer. (1995)
History of Segmentectomy: “Segmental pneumonectomy” by Churchill


A report on 86 patients who underwent lingular segmentectomy for bronchiectasis at MGH.
History of Segmentectomy: Segmentectomy for Lung Cancer by Jensik

Segmental resection for lung cancer

A fifteen-year experience

Robert J. Jensik, M.D., L. Penfield Faber, M.D., Frank J. Milloy, M.D.
(by invitation), and David O. Monson, M.D. (by invitation), Chicago, Ill.


Results:
5YSR: 56%
Local recurrence rate: 10%
Evolution of Lung Cancer Surgery

No Surgical Indication

Pneumonectomy

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30 Years

Lobectomy

Cahan W. “Radical lobectomy” (1962)

30 Years

Lung Cancer Study Group (Ginsberg RJ). Randomized trial of lobectomy versus limited resection for T1N0 non-small cell lung cancer. (1995)
Randomized trial of Lobectomy versus Limited Resection for T1N0 Non-small Cell Lung Cancer


Study cohort: Total 276 pts., 247 pts. eligible for analysis.

Lob (125), Lim (122, Seg 82, WWR 40)

Results:

• 75% increase in rec rates (P=0.02), 3 fold increase in local rec rate for Lim (P=0.008).
• 30% increase in overall death rate (P=0.08), 50% increase in death with cancer rate for Limited.
• Pulmonary function: Follow-up and reporting were judged to be not totally reliable because funding terminated early.

Conclusions:

(1) Lim does not confer improved perioperative morbidity/mortality/late postoperative pulmonary function.

(2) Because of the higher death rate and locoregional rec rate associated with Lim, Lob still must be considered the surgical procedure of choice for pts. with peripheral T1N0 NSCLC.
State of the Art 2014: Surgery

Standard mode of pulmonary resection for lung cancer in 2014

1) At least LOBECTOMY
   +
2) Hilar and mediastinal LNS/LND by Open/VATS approach
Anatomical Basis of Segmental Resection

Technique for Segmentectomy:

• Anatomical sublobar resection
• Division of bronchus, pulmonary vessels at the hilum (not periphery)
• Several technical variations

Asamura’s Operative Thoracic Surgery

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Technical Variations of Segmentectomy: Classic Segmentectomy
Anterior Segmentectomy of the Right Upper Lobe

Division on intersegmental plane

After segmental resection
"Intersegmental Plane"

Ramsay BH. The anatomic guide to the intersegmental plane. Surgery 1948: 533-538
Technical Variations of Segmentectomy: How to deal with intersegmental vein?

Asamura’s Operative Thoracic Surgery

National Cancer Center
How to Deal with Intersegmental Veins?:
A Cautious Note on Lymphatics in the Lung
Worst Scenario after Segmentectomy (First surgery at another hospital)
Pathology at Initial Surgery

Surgery: Left upper division segmentectomy
Pathology: Invasive adenocarcinoma, papillary predominant pT1aN0M0 stage IA

Micropapillary pattern

No description of resectional margin

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CT Findings 43 Months after Surgery

A new nodule on the staple line
Completion Pneumonectomy

Tumor included surgical staples in the center.
Immunohistochemical Study

At initial surgery
EGFR L858R-positive

At second surgery
Summary of This Case

Segmentectomy performed at previous hospital was **technically inappropriate**, leaving cancer cells behind (incomplete segmentectomy) probably on the staple lines.

**Penny wise and pound foolish.**

Penny wise and pound foolish.

tight adhesion at the interlobar fissure around pulmonary artery.

This patient would not have had tumor recurrence, if he had had **lobectomy** at the first operation.
Worst Scenario

More segmentectomies, more recurrences.
# Table 6. Summary of Studies Comparing Sublobar With Lobar Resection for Stage I Non–Small Cell Lung Cancer

<table>
<thead>
<tr>
<th>Study</th>
<th>Sublobar Resection</th>
<th>Lobar Resection</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>5-year Survival (%)</td>
</tr>
<tr>
<td>Pro lobar resection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCGS [15]</td>
<td>122</td>
<td>44</td>
</tr>
<tr>
<td>Warren [22]</td>
<td>66</td>
<td>43</td>
</tr>
<tr>
<td>Miller [23]</td>
<td>25</td>
<td>33</td>
</tr>
<tr>
<td>Martini [24]</td>
<td>62</td>
<td>59</td>
</tr>
<tr>
<td>Pro sublobar resection</td>
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<td></td>
</tr>
<tr>
<td>Errett [25]</td>
<td>100</td>
<td>69</td>
</tr>
<tr>
<td>Pastorino [26]</td>
<td>61</td>
<td>55</td>
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<td>Read [27]</td>
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<td>84</td>
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<td>Landreneau [28]</td>
<td>102</td>
<td>62</td>
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<tr>
<td>Okada [17]</td>
<td>130</td>
<td>91</td>
</tr>
<tr>
<td>Kodama [29]</td>
<td>46</td>
<td>93</td>
</tr>
<tr>
<td>Koike [30]</td>
<td>74</td>
<td>89</td>
</tr>
</tbody>
</table>

* Statistically significant.

LCGS = Lung Cancer Study Group; NA = not available.

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Indication of Segmentectomy?

**GGO**: a CT Form of Early Peripheral Cancer

[Images of medical scans and histological sections]
Radiographically determined noninvasive adenocarcinoma of the lung: Survival outcomes of Japan Clinical Oncology Group 0201

Hisao Asamura, MD, Tomoyuki Hishida, MD, Kenji Suzuki, MD, Teruaki Koike, MD, Kenichi Nakamura, MD, Masahiko Kusumoto, MD, Kanji Nagai, MD, Hirohito Tada, MD, Tetsuya Mitsudomi, MD, Masahiro Tsuboi, MD, Taro Shibata, MSc, and Haruhiko Fukuda, MD, on behalf of the Japan Clinical Oncology Group Lung Cancer Surgical Study Group


CTR = C/T

FIGURE 1. Calculation of the C/T ratio to define radiologic noninvasive lung cancer on TSCT. The maximum diameter of consolidation (C) is divided by the maximum tumor diameter (T) to give the C/T ratio. GGO, Ground-glass opacity; C/T, consolidation/tumor; TSCT, thin-section computed tomography.
Radiological noninvasive cancer:
- T1a (<2.0 cm)
- CTR < 0.25


**FIGURE 4.** Overall (A) and relapse-free (B) survival curves for the cT1a (≤2.0 cm) group (n = 289). OS, Overall survival; RFS, relapse-free survival.

**FIGURE 5.** Overall (A) and relapse-free (B) survival curves for radiologically noninvasive (n = 35) and invasive (n = 254) adenocarcinomas based on a C/T ratio of 0.25 or less in cT1a (≤2.0 cm) for noninvasiveness on TSCT. The differences in overall and relapse-free survival are not statistically significant (P = .259 and .106, respectively). OS, Overall survival; RFS, relapse-free survival; C/T, consolidation/tumor; TSCT, thin-section computed tomography.
Evolution of Lung Cancer Surgery: A Reevaluation

- **Pneumonectomy**
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- **Lobectomy**
  - Cahan W. “Radical lobectomy” (1962)

- **Limited resection**
  - Lung Cancer Study Group (Ginsberg RJ).
    Randomized trial of lobectomy versus limited resection for T1N0 non-small cell lung cancer. (1995)
  - JCOG trial
  - CALGB trial
JCOG0804 PII Wide wedge resection

JCOG0802 PIII Lobectomy vs Segmentectomy

JCOG1211 PII Segmentectomy

Standard procedure Lobectomy

Tumor size

0 cm

2.0 cm

3.0 cm

C/T ratio

0

0.25

0.5

1.0
**JCOG0802/WJOG4607**: Phase III Randomized Trial between Lobectomy and Limited Resection for Small-sized carcinoma (Part-solid GGO – Solid 2cm or Less)

**Endpoints:**
- Primary: OS
- Secondary: pulmonary function

**Sample size**: 1,100

**Stratified factors:**
- Institute
- Gender
- Histology (Ad vs. Non-ad)
- Solid or non-solid

**Non-inferiority design**

**PI**: Asamura H.

**Randomize**

Peripheral carcinoma, <=2 cm
Negative hilar node

**Lobectomy**

**Segmentectomy**

*Japan Clinical Oncology Group*

*National Cancer Center*
**JCOG0802/WJOG4607**: Phase III Randomized Trial between Lobectomy and Limited Resection for Small-sized carcinoma (Part-solid GGO – Solid 2cm or Less)

As of 2014. March., Total accrual: 995 patients
Target accrual: 1,100 patients
Target closure: 2014. July?

*第4回改訂2012年7月より登録期間を3年から6年に延長。*
Peripheral carcinoma, $\leq 2$ cm
Negative hilar node
C/T ratio $\leq 0.25$

Endpoints:
- Recurrence-free survival rate at any site

Sample size: 330

JCOG0804/WJOG4507L; Phase II Trial of Limited Resection (Wide wedge resection) for Possible Early Adenocarcinomas (GGO – Part-solid GGO); (Single-arm study)
Final enrollment: 334 cases in April, 2011
A JCOG Strategy for Small Lung Cancers

JCOG0102

Radiological study to define noninvasive adenocarcinoma on TSCT

JCOG0804

One-arm, WWW/Seg (phase II)

T<= 2cm

JCOG0802

Lob vs. Seg (phase III)

T<= 2cm

JCOG1211

One-arm, Seg (phase II)

2<T<= 3cm

JCOG0804

One-arm, Seg (phase II)

JCOG0802

Lob vs. Seg (phase III)

2<T<= 3cm

T<= 2cm
1. Use of sublobar resection should be scientifically evaluated in terms of:
   • Prognostic equivalence
   • Functional advantage
   • Perioperative outcome.

2. Until the final results of on-going prospective trials become available, we should remain prudent to do sublobar resection as a radical procedure for lung cancer.

2. Reasonable indication as of now is that for early, peripheral adenocarcinoma termed as GGO-AIS/MIA tumors.
Let us calculate the volume of a segment. If Segment is a cube, ...

\[ 120 - 350 \text{ cm}^3 = \text{same volume as a cube with sides 6 cm long.} \]
“Intersegmental plane”?

Ramsay BH. The anatomic guide to the intersegmental plane. Surgery 1948: 533-538