Minimally Invasive Open Surgery (MIOS) Approach: A Radical Lobectomy for Lung Cancer

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Various Incision Size

Big PL Thoracotomy

Small PL Thoracotomy

Hybrid VATS

Complete VATS
Recent Trends in Lung Cancer Surgery

Toward less (Minimally) invasive procedures
WHY?

- Lower morbidity/mortality
- Wider indication of surgery (elderly, comorbid)
- Better QOL after surgery
- Quicker recovery to normal life
- Less pain
- Patients’ strong desire
If so, “minimally invasiveness” needs to be scientifically documented for the approval.
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)

History of Minimization!

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)

National Cancer Center
State of the Art 2015: Surgery

Standard mode of pulmonary resection for lung cancer in 2015

1) At least **LOBECTOMY**

+ 

2) Hilar and mediastinal LNS/LND by Open/VATS approach
3 Components of Lung Cancer Surgery

Minimization!

Lymph nodes
Chest wall
Lung parenchyma
Minimally Invasive Surgery in a Wide Meaning: What Could Be Minimized or Less Invasive?

Chest wall: thoracotomy approach
- Conventional PL thoracotomy
- VATS approach
- MIOS approach (Hybrid)
- Robotic approach

Lung parenchyma: Extent of lung resection
- Lobectomy
- Limited resection
  - WWW
  - Segmentectomy

Lymph nodes: Extent of dissection
- Systematic hilar/mediastinal dissection
- Lobe-specific dissection
- (Systematic) sampling
- Selective biopsy
JCOG0802/WJOG4607: Phase III Randomized Trial between Lobectomy and Limited Resection for Small-sized carcinoma (Part-solid GGO – Solid 2cm or Less): LOB vs. SEG

**Lobectomy vs. Segmentectomy**

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

**Non-inferiority design**

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

Sample size: 11,000

**PI:** Asamura H.
JCOG0802/WJOG4607L (Small NSCLC LB vs SG P3)登録完了！！！

2014年9月登録数：18例、累積登録数：1106例
2次登録予定症例数：1100例（3年間）、30.5例（月）

*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。
Results as of December, 2014

OS: 91.8% at 5 years
N=952
Event=27 cases

PFS: 86.9% at 5 years
N=952
Event=60 cases
Results of the ACOSOG Z0030 Trial
Randomized Trial of Mediastinal Lymph Node Sampling Versus Complete Lymphadenectomy During Pulmonary Resection in the Patient with T1 or T2, N0 or N1 (Less Than Hilar) Non-Small Cell Carcinoma

Gail E. Darling, M.D., Mark S. Allen, M.D., Paul A. Decker, M.S., Karla Ballman PhD, Richard A. Malthaner, M.D., Richard I. Inculet, M.D., David R. Jones, M.D., Robert J. McKenna, M.D., Rodney J. Landreneau, M.D., Valerie W. Rusch M.D., Joe B. Putnam, M.D.

and the ACOSOG thoracic coinvestigators

NSCLC N0 or Non-hilar N1

Mediastinal lymph node sampling

RANDOMIZE

Resection Only

Resection plus complete mediastinal lymph node dissection
Minimising Chest Wall Incisions

Intrathoracic surgery

Conventional Posterolateral Thoracotomy

Hybrid VATS Minimally invasive Open (MIOS)

Extra-thoracic surgery

VATS Lobectomy
VATS vs. Open

An oncological issue? No!

A pulmonary function issue? No!

AN INCISIONAL ISSUE
VATS vs. Open

Video-Assisted Thoracic Surgery Lobectomy: Report of CALGB 39802—A Prospective, Multi-Institution Feasibility Study
Scott J. Swanson, James E. Herndon II, Thomas A. D’Amico, Todd L. Demmy, Robert J. McKenna Jr, Mark R. Green, and David J. Sugarbaker

- Feasibility study of VATS lobectomy: One 4-8cm access and two 0.5-cm port incision, videoscopic guidance and a traditional hilar dissection without rib spreading mandatory.

- 128 patients with peripheral lung nodules <= 3 cm

- Conclusion: A standardized approach to VATS lobectomy as specifically defined with avoidance of rib spreading is feasible.
VATS vs. Open

Better perioperative parameters

Fewer recurrence, better prognosis

<table>
<thead>
<tr>
<th>Study (first author)</th>
<th>Patients</th>
<th>Outcomes</th>
<th>Results</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kirby [3], 1995</td>
<td>25 VATS; 30 Open</td>
<td>LOS, OR time, complications</td>
<td>Fewer complications in VATS, no other differences</td>
<td>Stage I tumors, 3 VATS excluded due to conversion</td>
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<td>Sugi [4], 2000</td>
<td>48 VATS; 52 Open</td>
<td>Survival, recurrences</td>
<td>No differences</td>
<td>All patients had MLND</td>
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<td>Craig [5], 2001</td>
<td>22 VATS; 19 Open</td>
<td>Acute phase reactants</td>
<td>Lower CRP and IL-6 in VATS</td>
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<td>Shigemura [6], 2004</td>
<td>18 cVATS; 16 aVATS</td>
<td>OR time, LOS, pain, complications, markers</td>
<td>Longer OR, shorter LOS, lower CRP with cVATS</td>
<td>Complete VATS—no rib-spreading</td>
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aVATS = assisted VATS;  
CRP = C-reactive protein;  
cVATS = complete VATS;  
IL-6 = interleukin 6;  
LOS = length of stay;  
MLND = mediastinal lymph node dissection;  
OR = operating room;  
VATS = video-assisted thoracic surgery.
VATS vs. Open

Better postoperative prognosis for VATS?

- Less perioperative immunological suppression?
- Selection bias?

Fig 4. Survival of patients with stage I lung cancer undergoing video-assisted thoracic surgery lobectomy and open thoracotomy.
Minimally Invasive Open Surgery (MIOS) Approach

NCC-MITO (Minimally Invasive Thoraco-Opener)
Minimally Invasive Open Surgery (MIOS) Approach as a Radical Resection for Lung Cancer

1. A direct vision, direct approach with thoracoscopic assistance.
2. Individual isolation and division technique of intrathoracic structures with endostaplers.
3. Shorter operative time than VATS.
4. Low morbidity/mortality.
5. Similarly short hospital stay as VATS.
6. Better opportunity for education to resident.
Minimally Invasive Open Surgery (MIOS) Approach
Which is More Painful?

Multiple intercostal injury
COMPARISON BETWEEN IASLC-GLOBAL AND JAPANESE SURVIVAL CURVES: P-STAGE
A COMPARISON BTWN : SURVIVAL OF NSCLC BY P-STAGE (UICC 7)

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<tr>
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<th>IASLC</th>
<th>JAPAN (2009)</th>
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<tbody>
<tr>
<td>c-Stage</td>
<td>5-YSR (%)</td>
<td>c-Stage</td>
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<tr>
<td>IA</td>
<td>73</td>
<td>IA</td>
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<td>IB</td>
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<tr>
<td>IV</td>
<td>13</td>
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Survival Curve of 1,865 Resected Lung Cancers by STAGE (2007-2011)

Survival Function

Stage I 92.6% (IA 94.3%, IB 87.6%)
Stage II 72.6% (IIA 73.8%, IIB 70.6%)
Stage III 58.2% (IIIA 59.1%, IIIB 45.7%)
Stage IV 32.5%
In NCC population, age was significantly prognostic.

Those older between 76 and 80 had the worst prognosis.
Survival Curve of **Stage I Resected Lung Cancers of the Elderly (over 70 Years)** (2007-2011)

- In NCC population, age was significantly prognostic.
- Those between 76 and 80 had worst prognosis than others.
Number of Resections and Mortality: NCC, Tokyo

Cases / yr

- Postoperative Mortality

Mortality

Minimally invasive surgery
Future Surgery: Minimally Invasive?

Conventional OR Robotic

OR
Master’s hand-made Sushi
シャリを練らず固めず、究極のふんわりしたシャリ玉を握ります
カン数指定ができ、欲しい数だけシャリ玉が生産できます
Which Sushi bar do you prefer?