Alternative Approaches to Thoracoscopic Lobectomy: Uniportal, Supxiphoid,…

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Disclosures

- Consultant for Scanlan Instruments
- No conflicts related to this presentation
A National Analysis of Long-term Survival Following Thoracoscopic vs Open Lobectomy for Stage I Non-small Cell Lung Cancer


- Lobectomy T1-2N0 NSCLC in the NCDB
- 7,114 patients
- **VATS: 22%**
Variation in Hospital Adoption Rates of Video-Assisted Thoracoscopic Lobectomy for Lung Cancer and the Effect on Outcomes

- All lobectomies in the NCDB
- 55,972 patients
- **VATS: 31%**
Video-assisted thoracoscopic surgery versus open lobectomy for primary non-small-cell lung cancer: a propensity-matched analysis of outcome from the European Society of Thoracic Surgeon database

Pierre-Emmanuel Falcoz**, Marc Puyraveau†, Pascal-Alexandre Thomas‡, Herbert Decaluwe†, Martin Hürtgen*, René Horsleben Petersen†, Henrik Hansen† and Alessandro Brunelli§ on behalf of the ESTS Database Committee and ESTS Minimally Invasive Interest Group
Will Alternative Approaches to Thoracoscopic Lobectomy Improve Adoption?

- Uniportal/modified uniportal
- 2 port
- 3 port
- 4 port
- Robotic (5 port)
- Sub-xiphoid/Sub-costal
- Microportal
Modified Uniport
3 Port
5 Port (Robotic)
2 ports: Camera port (5 mm) + Access incision (4 cm)
Provides the flexibility to use the linear stapler from the “camera” port.
2 Ports: Camera port (5 mm) + Access incision (4 cm)

Facilitates Stapling for Thoracoscopic Upper Lobectomy and Pneumonectomy
Modified Uniportal Video-Assisted Thoracoscopic Lobectomy: Duke Approach

Modified Uniportal Video-Assisted Thoracoscopic Lobectomy: Duke Approach


Traditional 2-port Approach

Modified Uniportal Approach

Cephalad

Anterior

Cephalad

Anterior

5th ICS

2nd incision after lobectomy for tube
Modified Uniport: Facilitates Assistant and Preserves the Stability of the Camera Platform
The evolution of uniportal VATS has improved the adoption rate of VATS in Asia and in South America.
Double sleeve uniportal video-assisted thoracoscopic lobectomy for non-small cell lung cancer

Diego Gonzalez-Rivas, Maria Delgado, Eva Fieira, Ricardo Fernandez
Systematic review and meta-analysis of uniportal versus multiportal video-assisted thoracoscopic lobectomy for lung cancer

Ann Cardiothorac Surg 2016;5(2):76-84

Christopher G. Harris¹, Rebecca S. James¹,², David H. Tian¹,³, Tristan D. Yan¹,⁴,⁵, Mathew P. Doyle⁶, Diego Gonzalez-Rivas⁷, Christopher Cao¹,⁶

- Systematic review and meta-analysis: 8 relevant observational studies were identified
- Uniportal VATS lobectomy associated with reduction in rate of complications, LOS, and chest tube duration
- No significant differences in regard to mortality, operative time, perioperative blood loss, and rate of conversion to open thoracotomy
## LOS

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Uniportal</th>
<th>Multiportal</th>
<th>Std. Mean Difference</th>
<th>Std. Mean Difference</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Total</td>
<td>Mean</td>
</tr>
<tr>
<td>Chung</td>
<td>6.8</td>
<td>3.4</td>
<td>90</td>
<td>8.6</td>
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<tr>
<td>Li</td>
<td>7.2</td>
<td>2</td>
<td>87</td>
<td>7.9</td>
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<tr>
<td>Liu</td>
<td>6.1</td>
<td>1.7</td>
<td>149</td>
<td>6.8</td>
</tr>
<tr>
<td>Mu</td>
<td>6.5</td>
<td>3.8</td>
<td>58</td>
<td>6.3</td>
</tr>
<tr>
<td>Shen</td>
<td>4.7</td>
<td>1.2</td>
<td>100</td>
<td>5.3</td>
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<tr>
<td>Wang</td>
<td>5.9</td>
<td>1.8</td>
<td>50</td>
<td>6.7</td>
</tr>
<tr>
<td>Zhu</td>
<td>6.9</td>
<td>2.4</td>
<td>33</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Total (95% CI): 567 1203 100.0% -0.25 [-0.38, -0.12]

Heterogeneity: Tau² = 0.01; Chi² = 8.60, df = 6 (P = 0.20); I² = 30%
Test for overall effect: Z = 3.73 (P = 0.0002)
• 84 patients: uniport vs multi-port VATS
• Narcotic usage on post-op days 0-2 was lower for patients undergoing uniportal VATS
• No difference in length of stay
• No difference in complications
• Pain and recovery are comparable after either uniportal or multiport video-assisted thoracoscopic lobectomy: an observation study

Philip J. McElnay\textsuperscript{a,*}, Mat Molyneux\textsuperscript{b}, Rakesh Krishnadas\textsuperscript{a}, Timothy J.P. Batchelor\textsuperscript{a},
Douglas West\textsuperscript{a} and Gianluca Casali\textsuperscript{a}

• 110 (15 uniportal, 95 multiport) lobectomy
• No difference in median morphine use in 1st 24 h
• No difference in visual analogue pain score
• No difference in the duration of PCA
• No difference in chest tube duration
Patients were randomly assigned to 2 groups: uniportal VATS (51) and multi-port VATS (55)

- No difference in visual analogue pain scores
- No difference in morphine use in the first 3 days
- No difference in paravertebral catheter duration
- No difference in chest drain duration
- No difference in complications
Duke Uniportal Lobectomy (n=500)

- Better for lower lobes than upper lobes
- Requires more skill from the assistant(s)
- The surgeon may need to navigate camera
- More difficult to optimize the number of instruments in the same incision
- The concept of “direct visualization” is irrelevant because the camera can always be moved from another incision to the access incision
Lung clamp
Lung clamp

Scope rests on the clamp
Lung clamp

Scope rests on the clamp

All other instruments below the clamp
Subxiphoid
Subxiphoid Incisions

Infrasternal angle $\geq 70^\circ$:
Horizontal incision

Infrasternal angle $< 70^\circ$:
Vertical incision
Subxiphoid uniportal video-assisted thoracoscopic surgery (VATS) for lobectomy: a report of 105 cases


Nan Song, De-Ping Zhao, Lei Jiang, Yi Bao, Ge-Ning Jiang, Yu-Ming Zhu, Jia-An Ding

• 105 subxiphoid uniportal VATS lobectomies
• 9 underwent bilateral operations
• Complication rate of 11%
• Pain scores @ 8 hours, day 1, 2 and 3 d were significantly lower than those in the control group (uniportal VATS; P<0.001)
Thoracoscopic surgery via a single-incision subxiphoid approach is associated with less postoperative pain than single-incision transthoracic or three-incision transthoracic approaches for spontaneous pneumothorax

Bing-Yen Wang¹,²,³, Yin-Chun Chang⁴, Yih-Chen Chang⁴,⁵, Kung-Min Wang⁴,⁵, Ching-Hsiung Lin⁶,⁷, Sheng-Hao Lin⁶, Wei-Cheng Lin⁴

• **57 patients**
  – 14 subxiphoid uniport
  – 26 intercostal uniport
  – 17 3-port VATS

• **Subxiphoid: lower postop pain @ 1-, 8-, 24 hours**

• **No difference by the 3rd day**
Subxiphoid VATS

1. Requires longer instruments
2. Upper lobes more difficult than lower lobes
3. Left side more difficult than right side
4. Lymph node dissection more difficult
5. Conversion more complicated
6. ? QOL advantages
7. Bilateral procedures are facilitated
Total port-access lobectomy via a subcostal trans-diaphragmatic approach for lung cancer

Makoto Oda*, Isao Matsumoto, Ryuichi Waseda and Go Watanabe
Subcostal Uniportal
Uniportal Robotic
Non-intubated video-assisted thoracoscopic lung resections: the future of thoracic surgery?

Diego Gonzalez-Rivas\textsuperscript{a, b, *}, Cesar Bonome\textsuperscript{c}, Eva Fieira\textsuperscript{b}, Humberto Aymerich\textsuperscript{d}, Ricardo Fernandez\textsuperscript{a, b}, Maria Delgado\textsuperscript{b}, Lucia Mendez\textsuperscript{b} and Mercedes de la Torre\textsuperscript{a, b}

- **Midazolam** 0.1 mg/kg
- **Nasal canulae, Facial mask, laringeal mask, nasopharingeal tube**
- **Propofol iv** (10 mg/mL) or Gas (Oxygen at 50% with a minimum alveolar concentration of 1.5-2%)
- **Remifentanyl iv** (0.04 mcg/kg/min)
- **Dexmetomidine**
- **Intercostal block, paraverterbral blockade, Epidural**
- **Vagus blockade** (2 mL of 0.25% bupivacaine adjacent to the vagus nerve at the level of the lower trachea for right-sided operations and at the level of the aortopulmonary window for left-sided operations)
- **Topic anesthesia** (hilium, lung surface)
- **Nebulization of Lidocaine**
Conclusions

• It is unlikely that a phase III trial would demonstrate important differences in outcomes among 2-port, uniportal, or subxiphoid VATS

• Alternatives among the spectrum may allow for more surgeons to succeed thoracoscopically

• The advances made by the philosophy of minimally invasive surgery will continue to improve the outcomes of patients with lung cancer
<table>
<thead>
<tr>
<th>Best cases for Uniportal</th>
<th>Advantages for 2 ports</th>
</tr>
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<tbody>
<tr>
<td>1. Lower lobectomy</td>
<td>1. Difficult upper lobes</td>
</tr>
<tr>
<td>2. Middle lobectomy</td>
<td>2. Superior sulcus</td>
</tr>
<tr>
<td>3. Segment 6</td>
<td>3. Pneumonectomy</td>
</tr>
<tr>
<td>4. Segment 2</td>
<td>4. Sleeves</td>
</tr>
<tr>
<td>5. LVRS</td>
<td>5. Decortication</td>
</tr>
</tbody>
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Uniportal VATS subcostal
Left lower lobeectomy
Nonintubated thoracoscopic lung resection: a 3-year experience with 285 cases in a single institution  

Ke-Cheng Chen¹,³, Ya-Jung Cheng², Ming-Hui Hung², Yu-Ding Tseng³, Jin-Shing Chen¹,³

- Lung cancer in 159 patients (56%)
- Lobectomy in 137 (48%), wedge resection in 132 (46%), and segmentectomy in 16 (6%)
- Collapse of the operative lung and inhibition of coughing were satisfactory in most
- 5% conversion to tracheal intubation: mediastinal movement [5], hypoxemia [2], adhesions [2], ineffective epidural anesthesia [2], bleeding [2], and tachypnea [1]; 1 converted to thoracotomy
Intubated general anesthesia with one-lung ventilation was considered necessary for thoracoscopic major pulmonary resections.

Non-intubated thoracoscopic approach has been adapted even for use with major lung resections.

Adequate analgesia obtained from regional anaesthesia techniques allows VATS to be performed in sedated patients, minimizing the potential adverse effects of general anesthesia.
Be on the Left of the Adoption Curve

- Innovators: 2.5%
- Early Adopters: 13.5%
- Early Majority: 34%
- Late Majority: 34%
- Laggards: 16%
Uniportal Lobectomy

1. Is there an advantage for the surgeon?
Uniportal Lobectomy

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No. The camera can always be placed in the “uniportal” position if the surgeon believes there is a visual advantage.
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2. Is there an advantage for the patient to have only one incision vs 2? vs 3? vs 4?
Uniportal Lobectomy

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2. Is there an advantage for the patient to have only one incision vs 2? vs 3? vs 4?

3. Should we continue to try to improve? Yes