AATS – 2014

Future of MIS

Robotic Surgery: Is the Future of All MIS Surgery, Including Lung Surgery

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Professor of Surgery, UAB
Financial Disclosure

- Conflict of interest …
- $
- Passion coaching ..... Teaching …
- Now get paid do so ....
- Honorarium from Intuitive to proctor, coach, teacher ....
- Also I devised PRIIME …
- Written book …
SUPER PERFORMING
AT WORK AND AT HOME

The Athleticism of Surgery and Life

Surgeons, Athletes, Spouses, Parents, Mentors, Teachers, Performers

Desire to Improve, Evolve, Get Better
Debates

- Debate based EBM
- Show data …..
- Performed 976: 321 lobes, 83 seg, M (0.0025)
- Teachers, mentors, educators .. businessmen, predict future will be, market will go, prepare children, residents, fellows life … evolve qD
- Safe, superior LN dissection, economically feasible, teachable, excellent 5 yr survival
- Developed reproducible technique CPRL-4
Initial consecutive experience of completely portal robotic pulmonary resection with 4 arms.

Complete portal 4-arm robotic CO₂ insufflation

<table>
<thead>
<tr>
<th>Outcomes:</th>
<th>Robotic operation (N = 106)</th>
<th>Rib- and nerve-sparing thoracotomy (N = 318)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated blood loss (mL, median ± SD)</td>
<td>30 ± 26</td>
<td>90 ± 22</td>
<td>.03</td>
</tr>
<tr>
<td>Operative time (h, median ± SD)</td>
<td>2.2 ± 1.0</td>
<td>1.5 ± 0.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>No. of mediastinal (N2) lymph node stations removed (median)</td>
<td>5</td>
<td>5</td>
<td>&gt;.999</td>
</tr>
<tr>
<td>No. of mediastinal (N2) lymph nodes removed (median)</td>
<td>12</td>
<td>11</td>
<td>.906</td>
</tr>
<tr>
<td>No. of N1 lymph node stations removed (median)</td>
<td>3</td>
<td>3</td>
<td>&gt;.999</td>
</tr>
<tr>
<td>No. of N1 lymph node removed (median)</td>
<td>5</td>
<td>4</td>
<td>.89</td>
</tr>
<tr>
<td>Chest tube duration (d, median and range)</td>
<td>1.5 (1–6)</td>
<td>3.0 (1–67)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Hospital stay (d, median and range)</td>
<td>2.0 (1–7)</td>
<td>4.0 (1–67)</td>
<td>.01</td>
</tr>
<tr>
<td>Morbidity (no.)</td>
<td>28 (27%)</td>
<td>120 (38%)</td>
<td>.05</td>
</tr>
<tr>
<td>Operative mortality (no.)</td>
<td>0</td>
<td>11 (3%)</td>
<td>.11</td>
</tr>
<tr>
<td>Verbal pain score 3 wk postoperatively (median and range)</td>
<td>2.5 (0–7)</td>
<td>4.4 (0–8)</td>
<td>.04</td>
</tr>
</tbody>
</table>

Median operative times:
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Open (n = 466)</th>
<th>VATS (n = 555)</th>
<th>Robotic (n = 391)</th>
<th>p Value(^a)</th>
<th>p Value(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>12 (2.6%)</td>
<td>7 (1.2%)</td>
<td>1 (0.3%)</td>
<td>0.062</td>
<td>0.003</td>
</tr>
<tr>
<td>LOS (mean)</td>
<td>8.0</td>
<td>6.4</td>
<td>6.0</td>
<td>0.454</td>
<td>0.001</td>
</tr>
<tr>
<td>Routine discharge</td>
<td>301 (64.6%)</td>
<td>343 (61.8%)</td>
<td>250 (63.9%)</td>
<td>0.502</td>
<td>0.843</td>
</tr>
<tr>
<td>Prolonged LOS</td>
<td>46 (9.9%)</td>
<td>42 (7.6%)</td>
<td>18 (4.6%)</td>
<td>0.055</td>
<td>0.003</td>
</tr>
<tr>
<td>Any complication</td>
<td>236 (50.6%)</td>
<td>275 (49.5%)</td>
<td>170 (43.4%)</td>
<td>0.065</td>
<td>0.036</td>
</tr>
<tr>
<td>Bleeding complication</td>
<td>12 (2.6%)</td>
<td>8 (1.4%)</td>
<td>7 (1.8%)</td>
<td>0.678</td>
<td>0.430</td>
</tr>
</tbody>
</table>

\(^a\) Between robot and VATS resections.  
\(^b\) Between robot and open resections.

LOS = length of stay.
Open, Video-Assisted Thoracic Surgery, and Robotic Lobectomy: Review of a National Database

Michael Kent, MD,* Thomas Wang, PhD,* Richard Whyte, MD, Thomas Curran, MD, Raja Flores, MD, and Sidhu Gangadharan, MD  Ann Thorac Surg 2014

Division of Thoracic Surgery and Interventional Pulmonology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston Massachusetts; Department of Economics, Harvard University, Cambridge, Massachusetts; and Division of Thoracic Surgery, Mount Sinai Medical Center, New York, New York

Table 4. Propensity-Matched Analysis of Patients Undergoing Open, Video-Assisted Thoracic Surgery (VATS) or Robotic Pulmonary Resection

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Open (n = 1,233)</th>
<th>VATS (n = 1,233)</th>
<th>Robotic (n = 411)</th>
<th>p Value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>p Value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>25 (2.0%)</td>
<td>14 (1.1%)</td>
<td>1 (0.2%)</td>
<td>0.122</td>
<td>0.016</td>
</tr>
<tr>
<td>LOS (mean)</td>
<td>8.2</td>
<td>6.3</td>
<td>5.9</td>
<td>0.454</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Routine discharge</td>
<td>734 (59.5%)</td>
<td>795 (64.5%)</td>
<td>262 (63.7%)</td>
<td>0.828</td>
<td>0.214</td>
</tr>
<tr>
<td>Prolonged LOS</td>
<td>118 (9.6%)</td>
<td>85 (6.9%)</td>
<td>18 (4.4%)</td>
<td>0.118</td>
<td>0.003</td>
</tr>
<tr>
<td>Any complication</td>
<td>667 (54.1%)</td>
<td>558 (45.3%)</td>
<td>180 (43.8%)</td>
<td>0.674</td>
<td>0.003</td>
</tr>
<tr>
<td>Bleeding complication</td>
<td>24 (1.9%)</td>
<td>16 (1.3%)</td>
<td>7 (1.7%)</td>
<td>0.633</td>
<td>0.795</td>
</tr>
</tbody>
</table>

<sup>a</sup> Between robot and VATS resections.  
<sup>b</sup> Between robot and open resections.  

LOS = length of stay; VATS = video-assisted thoracic surgery.
Future robotics bright..

Change, evolution, adaptation, hard ...

Companies, people who fail evolve ... fail

Esp. not forced to do so: top field, Kodak, charge division, head hospital .. political risk

New technology $, learning curve, resistance and naysayers, political - $

Future: robotic syst., genetics for ca, imaging
Robotics in Thoracic Surgery

Honest Observation

• Eliminate politics, $
• Robot: see better, drive camera, instruments better, system inherently adaptable, easier to do VATS, more can do it, do it longer, teach longer, easier to teach
• BEST teaching device
• Any new technology, safety, issues, automobile, airplane, I Phone .. Injuries, bad rep
• Be honest, no debate that robotic better platform for MIS ..... But cost …
Robotics in Thoracic Surgery

Arguments Against

- Availability, learning curve, cost
- Cost: Pt & Institution & Surgeon & Operation
- Perspective antibx and chemotherapy
- Expertise in area, pts’ risks, how well do VATS, # LN, pts’ pain, 30 degree camera, which Country
- Pts. productivity to society
- Cost effectiveness analysis on each pt, each operation

Thymectomy, esophageal resection, achalasia, lobe
Improving Hospital Care
Training / Credentialing
Future of Thoracic Surgery

Solution

- Programmatic
- Robotic
- Minimally Invasive ($I^2$)
- Mentoring
- Experience
- PRI$^2$ME
Robotics in Thoracic Surgery

Technical Limitations

• Hard palpate small nodule, VATS better
• Cause air leaks grasping lung – poorly trained
• Cannot feel tumors rock hard ....
• Ca LN’s ..
• Inexperienced team: injure pt placing instruments never happen with VATS
• Bedside assistant places stapler on vessels
• TRAINING, $, politics ..
Robotics in Thoracic Surgery

**Plusses - Minus**

- +: Completely portal nature … data??
- +: Med tumors, esophageal op. true technical benefits
- -: If good VATS lobe surg and good LN → more costly, takes time learn
- +: Easier LN dissection learn day 1
- -: If open, incisions too low can’t use
- +: lower access port, > room ribs, pain, tumor size
- -: Robot time, cost factor, training, credentialing
- +: Teaching device
Newer robotic systems, other co, Xi
Portfolio robots … 3 arms, Sie, Xi, S, Standard
All 5 mm ports, single incisions
New cameras, allow tag ca cells, immunoflorescence, find smaller nodules, GPS
Analogue - light on stick .. Digital –computer and robot
Always be role for thoracotony, VATS