Robotic Esophagectomy

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Robotic Thoracic Surgery

Disclosures

• Bard: Speaker
• Baxter: Consultant board
Robotic Thoracic Surgery

Robotic Esophagectomy

- Robotic assisted transhiatal dissection
- Robotic thoracic mobilization followed by laparoscopic or open gastric mobilization and then cervical anastomosis
- Robotic thoracic mobilization, gastric mobilization, and cervical anastomosis
- Robotic Ivor-Lewis
Robotic Esophagectomy: Is It an Advance and What is the Future?

Thomas J. Watson, MD
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• Advantages:
  – Wristed instruments and visualization

• Disadvantages:
  – Set-up time
  – Cost
  – Limited instruments
  – Need for experienced assistant at bedside
The first series of completely robotic esophagectomies with three-field lymphadenectomy: initial experience

K. H. Kernstine,1 D. T. DeArmond,2 D. M. Shamoun,3 J. H. Campos4

Background: This study investigated the use of robotics to perform extended esophageal resection in a series of patients.

Methods: A total of 14 patients with a median age of 64 years underwent esophagectomy using the da Vinci robot. At presentation, there were 12 cases of cancer, staged at T2N1 (n = 2), T3N0 (n = 2), T3N1 (n = 6), T4N1 (n = 1), and M1a (n = 1); 2 cases of high-grade dysplasia; 8 cases of adenocarcinoma; and 4 cases of squamous cell cancer; as well as 2 middle third, 9 lower third, and one gastroesophageal junction tumor. Nine patients had undergone preoperative chemoradiotherapy, and six had undergone prior abdominal surgery. The patients were categorized into three chronological groups according to the procedure performed. Group 1 consisted of the first three patients in the series, whose surgery was thoracic only (robotically assisted esophagectomy). Group 2, the next three patients, had robotically assisted thoracic esophagectomy plus thoracic duct ligation using a laparoscopic gastric conduit. Group 3, the last eight patients, underwent completely robotic esophagectomy.

Results: For Group 3, the total operating room time was 11.1 ± 0.8 h (range, 11.3–13.2 h), with a console time of 5.0 ± 0.5 h (range, 4.8–5.8 h). The estimated blood loss was 400 ± 300 ml (range, 200–950 ml). One patient in group 1 had a thoracic duct leak. In groups 2 and 3, thoracic duct ligation resulted in no further leaks. Other postoperative complications included severe pneumonia (1 case), atrial fibrillation (5 cases), cervical anastomotic leak (2 cases), wound infection (1 case), and bilateral vocal cord paresis requiring tracheostomy (1 case). In seven of the cases, no intensive care unit time was required. There was one death from pneumonia 72 days after the procedure. The rate of disease-free survival was 87%.

Conclusion: The robotic approach facilitates an extended three-field esophagolympadenectomy even after induction therapy and abdominal surgery. Larger scale trials are needed to define the role of this technique.

Table 2. Results in group 3 with completely robotic procedures (8 patients)

<table>
<thead>
<tr>
<th>Intraoperative time</th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating room time (h)</td>
<td>11.1 ± 1.1</td>
<td>11.2</td>
<td>9.5–13.0</td>
</tr>
<tr>
<td>Console timea (h)</td>
<td>5.0 ± 0.5</td>
<td>4.9</td>
<td>4.2–5.9</td>
</tr>
<tr>
<td>Estimated blood loss (ml)</td>
<td>400 ± 300</td>
<td>275</td>
<td>50–950</td>
</tr>
<tr>
<td>Intraoperative transfusion (n)</td>
<td>No transfusion</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Days in the intensive care unit</td>
<td>No days</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Hospital length of stay (days)</td>
<td>8–9</td>
<td>13–18</td>
<td>18–30, 72</td>
</tr>
<tr>
<td>Pain medication on POD 3 (n)</td>
<td>Acetaminophen</td>
<td>5</td>
<td>2, 1</td>
</tr>
</tbody>
</table>
Robotic Thoracic Surgery

Robotic Esophagectomy
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Robotic Esophagectomy

- 5-port configuration for abdominal portion
- Patient supine
- Robotic cart placed at the head of the OR table
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Robotic Esophagectomy

- Perform hiatal dissection and mobilize esophagus
- Dissect greater curve of the stomach
- Divide left gastric artery.
- Begin the esophagogastrrectomy specimen
- Place jejunostomy tube
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Robotic Esophagectomy

- Patient in lateral decubitus with slight prone positioning
- 4 robotic ports and one assistant port
- Dock robot (come in from back)
- Anastomosis:
  - Circular stapling
  - Hand sewn
  - Linear stapling
Robotic Thoracic Surgery
Robotic Esophagectomy
## Robotic Thoracic Surgery

**Robotic Esophagectomy**

### A Systematic Review for Robot-Assisted Minimally Invasive Esophagectomy

#### TABLE II. Peroperative Statistics

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Cases (n)</th>
<th>Operation</th>
<th>Perioperative complications (n (%))</th>
<th>Blood loss (ml)</th>
<th>Total operative time (min)</th>
<th>Thoracic phase/Console (min)</th>
<th>Conversions (n (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson</td>
<td>2007</td>
<td>9</td>
<td>TT/TH</td>
<td>0</td>
<td>350</td>
<td>482</td>
<td>NR</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Kernstine(^b)</td>
<td>2007</td>
<td>10</td>
<td>TT</td>
<td>Bronchus injury 1 (7)</td>
<td>275</td>
<td>672</td>
<td>294</td>
<td>1 (7.1)</td>
</tr>
<tr>
<td>Galvani</td>
<td>2008</td>
<td>11</td>
<td>TH</td>
<td>0</td>
<td>54</td>
<td>267</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td>Kim</td>
<td>2010</td>
<td>12</td>
<td>TT</td>
<td>0</td>
<td>150</td>
<td>410</td>
<td>108.8</td>
<td>0</td>
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<tr>
<td>Boone</td>
<td>2011</td>
<td>6</td>
<td>TT</td>
<td>Bleeding 1 (2)</td>
<td>625</td>
<td>450</td>
<td>180</td>
<td>7 (15)</td>
</tr>
<tr>
<td>Puntambekar</td>
<td>2011</td>
<td>13</td>
<td>TT</td>
<td>NR</td>
<td>80</td>
<td>210</td>
<td>100</td>
<td>0</td>
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<tr>
<td>Sutherland</td>
<td>2011</td>
<td>14</td>
<td>TH</td>
<td>NR</td>
<td>97</td>
<td>312</td>
<td>NA</td>
<td>NR</td>
</tr>
<tr>
<td>Hernandez</td>
<td>2012</td>
<td>15</td>
<td>TT</td>
<td>NR</td>
<td>442(^c)</td>
<td>442</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td>Weksler</td>
<td>2012</td>
<td>16</td>
<td>TT</td>
<td>0</td>
<td>200</td>
<td>439</td>
<td>NR</td>
<td>0</td>
</tr>
<tr>
<td>Cerfolio</td>
<td>2013</td>
<td>17</td>
<td>TT</td>
<td>NR</td>
<td>6075</td>
<td>367</td>
<td>NR</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Dunn(^a)</td>
<td>2013</td>
<td>18</td>
<td>TH</td>
<td>NR</td>
<td>97.2</td>
<td>311</td>
<td>NA</td>
<td>5 (12.5)</td>
</tr>
<tr>
<td>Sarkaria</td>
<td>2013</td>
<td>19</td>
<td>TT</td>
<td>NR</td>
<td>307</td>
<td>556</td>
<td>NR</td>
<td>2 (9.5)</td>
</tr>
<tr>
<td>Suda</td>
<td>2013</td>
<td>20</td>
<td>TT</td>
<td>NR</td>
<td>144.5</td>
<td>692.5</td>
<td>335.5</td>
<td>NR</td>
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<tr>
<td>Coker</td>
<td>2014</td>
<td>21</td>
<td>TH</td>
<td>0</td>
<td>100</td>
<td>231</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td>Kim</td>
<td>2014</td>
<td>22</td>
<td>TT</td>
<td>Bleeding 1 (3)</td>
<td>156.7</td>
<td>428.6(^c)</td>
<td>186.7(^c)</td>
<td>1 (2.5)</td>
</tr>
<tr>
<td>Trugeda</td>
<td>2014</td>
<td>23</td>
<td>TT</td>
<td>NR</td>
<td>75</td>
<td>NR</td>
<td>222</td>
<td>0</td>
</tr>
</tbody>
</table>

\(^a\)Benign cases.
\(^b\)For eight patients who underwent the complete robotic procedure.
\(^c\)Mean instead of median.

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Conclusions

• There remains growing interest in utilization of robotic technology for MIS esophagectomy
• There are technologically superior aspects of robotics that benefit the surgeon – patient benefits are less clear
• Esophagectomy, regardless of approach, remains a challenging procedure
Thank You!