Minimally Invasive Esophagectomy: McKeown vs. Ivor Lewis

Masters of Minimally Invasive Thoracic Surgery

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Outline

• Define minimally invasive esophagectomy (MIE)
• MIE technical details
  – Abdomen
  – Chest
  – Anastomosis
• Review Outcomes
• What is optimal?
  – Ivor Lewis
  – McKeown
  – Others
Esophagectomy

- More complex than resection of most other organs with highest correlation between volumes and outcomes.
Esophagectomy

- Requires access to at least two body cavities
  - Risk of injury to adjacent structures
  - Patient repositioning

- Requires reconstruction to reestablish GI continuity
  - Vascular supply to conduit
  - Wide margins (5cm)

Diagram showing distances and landmarks related to the esophagus, including cervical, thoracic, and abdominal esophagus, with narrowings and distances noted in centimeters.
Esophagogastrectomy - Surgical Options

• Transhiatal
• Ivor Lewis
• McKeown / 3-incision
• Left Thoracoabdominal
• Left Thoracotomy
• Transabdominal
What is a Minimally Invasive Esophagectomy (MIE)?

• Use minimally invasive techniques to replace a laparotomy and/or thoracotomy for dissection and anastomosis
  – Laparoscopy
  – Thoracoscopy
  – Robotic
  – Hybrid
What is a Minimally Invasive Esophagectomy (MIE)?

• The result: less pain, less blood loss, less morbidity, faster recovery, and perhaps better outcomes.
Minimally invasive versus open oesophagectomy for patients with oesophageal cancer: a multicentre, open-label, randomised controlled trial

Surya S A Y Biere, Mark Ivan Berge Henegouwen, Kirsten W Maas, Luigi Bonavina, Camiel Rosman, Josep Roig Garcia, Suzanne S Gisbertz, Jean H G Klinkenbijl, Markus W Hollmann, Elly S M de Lange, H Jaap Bonjer, Donald L van der Peet, Miguel A Cuesta


- Multicenter (5) study in 3 countries
- Randomized patients to open (n=56) versus minimally invasive 3-incision esophagectomy – 14% conversions
- Decreased pulmonary complications for MIE
Laparoscopic Abdominal Port Placement

- Place camera port above the umbilicus
- Two 5 step ports on the left
  - One will eventually be the j-tube site
- One 5 step port on the right
- Place liver retractor through a more lateral 5 port on the right or just to the left of the xyphoid
  - Retract left lateral segment away from the hiatus
- Place a 10 Step port on the patient's right side lateral to the umbilicus
Abdominal Dissection

- Start dissection at the pars lucida and then perform hiatal dissection.
- Dissect greater curve of the stomach.
- Divide left gastric artery.
- Begin the esophagogastrectomy specimen.
- Place jejunostomy tube.
Abdominal Dissection
VATS Chest Port Placement

- Place camera port in the 8th intercostal space in the anterior axillary line.
- Anterior utility in the 5th intercostal space
- Posterior utility incision in the 10th intercostal space if performing an Ivor-Lewis and planning a chest anastomosis
  - Not necessary for McKeown, but can be helpful for mobilization
Chest Dissection

- Take down inferiorly pulmonary ligament, dissect Level 7, divide azygos vein
- Encircle esophagus and mobilize it from above the hiatus to:
  - above the azygos for an Ivor-Lewis
  - the thoracic inlet for a McKeown
Chest Dissection
Esophagogastric Anastomosis

• Divide esophagus
  – Just above the azygos vein in the chest

• Bring stomach up into the chest/neck
  – Complete the specimen in the abdomen for a cervical incision
  – Can complete the specimen in the chest for an Ivor-Lewis

• Create anastomosis
  – Circular Stapler (chest only)
  – Handsewn
  – Stapler/Handsewn
Anastomosis – Stapled + Suture
Anastomosis – Circular Stapler
Other Considerations

OrVil

(Ann Thorac Surg 2011;92:1862–9)
Other Considerations

Positioning: lateral vs. prone vs. lateral-prone

- Theoretical advantages of prone positioning include:
  - Improved V-Q distribution
  - Alveolar recruitment
  - Clear field
  - Improved surgeon ergonomics

- Data are lacking

Robotic transthoracic esophagectomy in the prone position: Experience with 32 patients with esophageal cancer

Shailesh Padmakar Puntambekar, MS, Neeraj Rayate, MS, DNB, Sourabh Joshi, MS, and Geetanjali Agarwal, MS, Pune, India
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The Cervical Anastomosis

www.ctsnet.org accessed 8/1/2015
Outcomes

- 6-7% conversion rates (thoracotomy 5.4%, laparotomy 1.8%)
  - Median hospital stay of 7 days at experienced centers
  - Mortality rates still as high as 6% and morbidity rates of 46%
  - Pulmonary complications lower
  - Vocal cord palsy higher
  - Leak rate probably the same

- Prolonged operative times as high as 7.5 hours early in a surgeon’s experience
  - Typically similar to open procedures after more than 20 cases

- Improved results seen with minimally invasive techniques are probably due not only to the approach, but also to the fact that in general very experienced and highly trained esophageal surgeons are utilizing these approaches
• Review of 1932 MIE patients from 1992-2007
  – Retrospective reviews, highly selected patients

• 2.9% mortality, 46% morbidity
  – 5.9% conversion rate
  – 8.8% leaks, 22% respiratory complications, 7.1% vocal cord palsy

• Lymph node retrieval appeared worse than open procedures
  – Long-term oncologic data not available

• 54 procedures done robotically
  – 5.5% conversion rate, 14 day hospital stay, 2.6% mortality
  – 23% leaks, 31% respiratory complications, 10% vocal cord palsy
Outcomes After Minimally Invasive Esophagectomy

Review of Over 1000 Patients

James D. Luketich, MD, Arjun Pennathur, MD, Omar Awais, DO, Ryan M. Levy, MD, Samuel Keeley, MD, Manisha Shende, MD, Neil A. Christie, MD, Benny Weksler, MD, Rodney J. Landreneau, MD, Ghulam Abbas, MD, Matthew J. Schuchert, MD, and Katie S. Nason, MD, MPH

• 1011 MIEs from 8/96–3/11
  – 481 (48%) cervical anastomosis
  – 530 (52%) Ivor-Lewis
• 1.7% operative mortality
• 8 day median length of stay

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**TABLE 3. Comparison of Postoperative Adverse Outcomes After Elective MIE With Either a Cervical (MIE-Neck) or Intrathoracic (MIE-Chest) Anastomosis**

<table>
<thead>
<tr>
<th>Major morbidity, n (%)</th>
<th>MIE-Neck, n = 481 (48%)</th>
<th>MIE-Chest, n = 530 (52%)</th>
<th>Total, n = 1011</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocal fold paresis/paralysis</td>
<td>37 (8)</td>
<td>5 (1)</td>
<td>42 (4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Empyema</td>
<td>31 (6)</td>
<td>28 (5)</td>
<td>59 (6)</td>
<td>0.431</td>
</tr>
<tr>
<td>ARDS</td>
<td>18 (4)</td>
<td>8 (2)</td>
<td>26 (3)</td>
<td>0.026</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>9 (2)</td>
<td>11 (2)</td>
<td>20 (2)</td>
<td>0.809</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>20 (4)</td>
<td>10 (2)</td>
<td>30 (3)</td>
<td>0.033</td>
</tr>
<tr>
<td>Anastomotic leak requiring surgery</td>
<td>26 (5)</td>
<td>23 (4)</td>
<td>49 (5)</td>
<td>0.439</td>
</tr>
<tr>
<td>Gastric tube necrosis</td>
<td>15 (3)</td>
<td>9 (2)</td>
<td>24 (2)</td>
<td>0.140</td>
</tr>
<tr>
<td>Mortality at 30 days, n (%)</td>
<td>12 (2.5)</td>
<td>5 (0.9)</td>
<td>17 (1.7)</td>
<td>0.083</td>
</tr>
</tbody>
</table>

ARDS indicates acute respiratory distress syndrome.
Summary

- Minimally invasive techniques can be used to perform most esophagectomy procedures
- Evidence of patient benefit is starting to accumulate in both retrospective single-center studies and prospective, multi-center trials
  - Less chance of pulmonary morbidity
  - Shorter hospitalization