Anastomotic Complications after Esophagectomy

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Use of Stomach as Conduit

- Simplest choice after esophagectomy
- Single anastomosis
- Apparently redundant blood supply
- Reaches into the neck if needed
EG Anastomosis Complications

- Stenosis requiring dilation
- Leak
- Gastric tip necrosis
- Late functional problems
What are Current Anastomotic Leak Rates? Do we really need to keep talking about this?

<table>
<thead>
<tr>
<th>Variables</th>
<th>Values</th>
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<tbody>
<tr>
<td>Frequency of operative mortality</td>
<td>135 (3.1%)</td>
</tr>
<tr>
<td>Frequency of major complications</td>
<td>1,429 (33.1%)</td>
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<tr>
<td>Unexpected return to operating room</td>
<td>674 (15.6%)</td>
</tr>
<tr>
<td>Anastomosis requiring medical or surgical treatment</td>
<td>519 (12.0%)</td>
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<tr>
<td>Reintubation</td>
<td>528 (12.2%)</td>
</tr>
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<td>Initial ventilator support &gt; 48 hours</td>
<td>150 (3.5%)</td>
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<tr>
<td>Pneumonia</td>
<td>529 (12.2%)</td>
</tr>
<tr>
<td>Renal failure</td>
<td>85 (2.0%)</td>
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<tr>
<td>Recurrent laryngeal nerve paresis</td>
<td>89 (2.1%)</td>
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</table>
Frequency of Ischemic Complications

- Routine endoscopy after esophagectomy and reconstruction
- “blue to black discoloration of the mucosa, adherence of a green or silver-metallic mucus to the mucosa that could not be removed by irrigation, or a clearly demarcated nonedematous mucosa with ulceration.”
- Prevalance was 9.2% of nearly 400 patients

To Staple or Sew? Does it Matter?

Comparison of outcomes following end-to-end hand-sewn and mechanical oesophagogastric anastomosis after oesophagectomy for carcinoma: a prospective randomized controlled trial

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## Results

<table>
<thead>
<tr>
<th></th>
<th>Hand-sewn (n=232)</th>
<th>Stapled (n=235)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operative time</strong></td>
<td>226 ± 21</td>
<td>193 ± 16</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Anastomotic Leaks</strong></td>
<td>17 (7.3)</td>
<td>7 (3.0)</td>
<td>0.033</td>
</tr>
<tr>
<td><strong>Anastomotic Strictures</strong></td>
<td>16 (7.5)</td>
<td>31 (14.2)</td>
<td>0.027</td>
</tr>
</tbody>
</table>
MIE vs. Open: Impact on leaks

Result:
No impact of MIE vs open on leaks
Odds ratio 0.97

"Staple Line on Staple Line" EG
Anastomosis: A Novel Technique

Mankins, Kesler

https://doi.org/10.25373/ctsnet.5280259
The Specific Problem: Gastric Tip Necrosis

• Results in mediastinitis and empyema
• Requires at least 2 additional operations if managed successfully
• Much higher mortality associated with development of this complication
Local Experience: Conduit Ischemia

• 484 patients treated @ WUSM with esophagectomy from 1997-2007
• 17 described as “gastric tip necrosis”
• Hospital mortality 4/17
• Median hospital stay 35 days
• Median delay to repair: 7 days
• All surgeons represented in proportion to esophagectomy volume
Surrogate Measures of Ischemia
Can we quantify “looks dusky”?

- Direct oximetry of the stomach
- Clark electrode
- Laser Doppler flowmetry
- Tonometry (intramucosal pH)
- H2 gas clearance
- Thermal scanning
- Near Infrared Spectroscopy (NIRS)
- Indocyananine Green (SPY system)
Results of Surrogate Measures

- Demonstrate reproducible decreases in blood flow at various stages of mobilization and transposition
- Imperfect ability to predict leaks or ischemia
- Some ability to demonstrate relative impact of techniques and physiology of patient on stomach perfusion
Factors Influencing Gastric Blood Flow

- Intrinsic blood supply to the stomach.
- Compression of the gastric tube just distal to the anastomosis. (e.g.: azygous)
- Narrow tubularization of the gastric conduit.
- Degree of trauma or struggle with mobilization or transposition of the tube.
- Systemic hypotension.
- Venous congestion or kinking of venous drainage
Possible Practical Solutions Invoked for “Prevention”

• Maintain ideal blood flow via optimization of BP through volume administration
• Dopamine? Neosynephrine?
• Avoid epidural induced hypotension
• Handle the gastric tube gently
• Make a wider gastric tube
• Leave right gastric & left gastric artery intact
• Avoid gastric distention
• Avoid PEEP
Less Practical, but Novel Solutions

• **Surgical Ischemic Preconditioning**
  – Various degrees of starting the mobilization of the stomach in advance of resection
  – Perhaps paired with node assessment

• **Non-surgical Ischemic Preconditioning**
  – Interventional radiology procedure
  – Injection of microspheres into LGA

• **Delay of anastomosis when “subjective” ischemia is detected**
Gastric Preconditioning

- A, Divided omentum preserving the right gastroepiploic.
- B, Left gastroepiploic artery cut.
- C, Kocher maneuver.
- D, Common hepatic and splenic artery cleared.
- E, Left gastric artery and vein cut.
- F, 60-mm endostapling between the distal and middle third of the lesser curvature.
- G, Introduction site of the circular stapler in the chest.
- H, Future esophagogastrostomy.
- I, Linear stapling for completion of the conduit in the chest.

Ann Surg. 2007 February; 245(2): 241
Summary

• Huge topic, hard to capture in 10 minutes
• Careful handling and meticulous technique will improve outcomes
• Gastric conduit ischemia is always present to varying degrees
• Be nimble and open to minor alterations in technique