Novel Robotic Techniques for Endoscopic Resection of Large Polyps

Joe Carmichael, MD | February 2, 2018
10th Annual Gastroenterology & Hepatology Symposium
Disclosures

• Medrobotics
Large Polyps

• Some large rectal polyps (and many early rectal cancers) cannot be removed endoscopically

• These patients are frequently referred for surgical excision

• Surgical options have traditionally included:
  • Transanal excision (TAE)
  • Transanal endoscopic microsurgery (TEM)
  • Transanal Minimally Invasive Surgery (TAMIS)
TEM of Neuroendocrine Tumor

Chen WJ et al. World J Gastroenterol 2015.
TEM of Neuroendocrine Tumor

Chen WJ et al. World J Gastroenterol 2015.
Traditional Transanal Excision
Transanal Endoscopic Microsurgery (TEM)

Santos BF et al. World J Gastroenterol 2011
Asano M. World J Gastrointest Endosc 2012.
Transanal Minimally Invasive Surgery (TAMIS)

Garcia-Florez LJ et al. World J Gastroenterol 2015
Transanal Minimally Invasive Surgery (TAMIS)

Garcia-Florez LJ et al. World J Gastroenterol 2015
TEM/TAMIS Advantages over Transanal Excision

• Transanal excision:
  • Limited to polyps tumors 6-8cm from the anal verge
  • Limited to smaller polyps/tumors
  • Associated with higher recurrence rates of polyps and tumors compared with TEM/TAMIS

• TEM/TAMIS:
  • Allows for excision of mid/high rectal tumors
  • Allows for excision of large tumors
  • Allows for full thickness excision
  • Limited by need for straight anoscope

• Low Rectum \(\rightarrow\) Transanal Excision
• Mid Rectum \(\rightarrow\) TEM/TAMIS
• High Rectum \(\rightarrow\) ??
Flex® Robotic System

• Operator-controlled, computer-assisted flexible endoscope

• Enables the physician to easily access and visualize anatomical structure through a transoral approach

• Provides 2 accessory channels for compatible flexible instruments
Flex® Robotic System
Flex® Robotic System

- This system was originally applied to oral surgery
- Feasibility was originally demonstrated in removing lesions in the oropharynx, hypopharynx and larynx
Why can’t flexible robotics be an alternative to TEM and TAMIS to reach high rectal/sigmoid lesions?
Technical Challenges for Transanal Access

- Need to seal the links of the robot to maintain pneumorectum
- Develop compatible access device
- Refine instrumentation
- Cadaveric and procine testing to demonstrate feasibility for transanal surgery
**Cadaveric Assessment**

<table>
<thead>
<tr>
<th>Objectives/Hypothesis</th>
<th>To evaluate the Medrobotics Flex® Robotic System and Flex® Rectoscope’s ability to facilitate access for and visualization of surgical resection and closure within the rectum using Flex® Instruments via a transanal entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Design</td>
<td>Preclinical anatomic study utilizing 6 cadavers</td>
</tr>
</tbody>
</table>
| Methods               | 2 surgeons participated in this study  
Each participant utilized the Flex® Robotic System to excise and close rectal wall specimens.                                                                                                      |
| Results               | 14/14 (100%) resected successfully  
13/14 (93%) closed successfully                                                                                               |
| Conclusion            | This study provides evidence that the Flex® Robotic System, Flex® Rectoscope, and Flex® Instruments can be used to perform transanal colorectal surgical procedures (tissue resection and resection closure) with a high degree of success. |
Porcine Assessment

• The porcine study was designed to evaluate Flex® Robotic System’s wound closure vs a TEM system (Storz® TEO) in a live tissue model

• Eight swine
  • 2 control animals
  • 6 test animals
  • Rectal wall excision and closure

• Grade excision site 7 days after closure

<table>
<thead>
<tr>
<th>Porcine Wound Scoring &amp; Characteristics</th>
<th>Storz® TEO</th>
<th>Flex® Robotic System</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 No separation of wound edges/No edema/No inflammation</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>1 Mild (&lt; 2 mm) separation of wound edges; mild tissue edema, bleeding surfaces or inflammation</td>
<td>0</td>
<td>0.3</td>
</tr>
<tr>
<td>2 Moderate separation of wound edges (&gt;2 mm but &lt; 1 cm): moderate surrounding tissue edema, moderate oozing surfaces, or inflammation</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>3 Complete separation of wound edges (&gt;1 cm): severe tissue edema, extensive oozing surfaces, or inflammation</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean Surgical Site</th>
<th>StDevP Surgical Site</th>
<th>Mean Surgical Area</th>
<th>StDevP Surgical Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.3</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Excision of Rectosigmoid Junction Polyp
Novel Robotic Techniques for Endoscopic Resection of Large Polyps

Joe Carmichael, MD | February 2, 2018
10th Annual Gastroenterology & Hepatology Symposium