Lumen Apposing Metal Stents: Expanding the Role of the Interventional Endoscopist

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Disclosures

• Consultant for Boston Scientific and Olympus Corporation
• Devices discussed may be used for off-label indications
Goals

- Review the Atlanta classification of pancreatitis
- LAMS pseudocysts
- LAMS WOPN
- GB drainage
- Biliary drainage
- GJ anastomosis
- Strictures
- other
Outline

• Types of pancreatic fluid collections
• Endoscopic therapy for walled off pancreatic necrosis
• Lumen apposing metal stents (LAMS): design and deployment
• Role of LAMS in management of walled off pancreatic necrosis
• Other indications for LAMS
Pancreatic Fluid Collections

Acute pancreatic/peripancreatic fluid collection

Acute necrotic fluid collection

Banks et al; Gut. 2013 Jan;62(1):102-11
Pseudocyst

Walled off necrosis

Banks et al; Gut. 2013 Jan;62(1):102-11
Indications for intervention

• Infected necrosis
• Ongoing organ failure
• Gastric, intestinal or biliary obstruction
• Persistent un-wellness i.e. abdominal pain, nausea/vomiting
Open Surgical Necrosectomy
QUESTION 1

What is the most common complication following open surgical necrosectomy?

a. Hemorrhage
b. Pancreatic/GI Fistula
c. Perforation
d. Infection
e. Incisional hernia
ANSWER 1

What is the most common complication following open surgical necrosectomy for pancreatic necrosis?

a. Hemorrhage

b. Pancreatic/GI Fistula

c. Perforation

d. Infection

e. Incisional hernia
## Complications

<table>
<thead>
<tr>
<th>Mortality</th>
<th>10% - 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Complications</strong></td>
<td></td>
</tr>
<tr>
<td>Pancreatic/Gastrointestinal fistula</td>
<td>55%</td>
</tr>
<tr>
<td>Incisional hernia</td>
<td>24%</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>18%</td>
</tr>
<tr>
<td>Intra-abdominal abscess</td>
<td>5%</td>
</tr>
</tbody>
</table>

Endoscopic Translumenal Drainage (ETD)

Baron et al; Gastroenterology. 1996 Sep;111(3):755-64
Endoscopic Translumenal Necrosectomy (ETN)

Multiple Translumenal Gateway Technique

Varadarajulu et al; Gastrointest Endosc. 2011 Jul;74(1):74-80
Combination of endoscopic and percutaneous drainage

• Of 104 patients:
  • None developed pancreatico-cutaneous fistula
  • None required surgery

Ross et al; Gastrointest Endosc 2010;71:79-84
## Minimally invasive vs. Open necrosectomy

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Minimally invasive Step-up Approach (n=43)</th>
<th>Primary Open Necrosectomy (n=45)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major complications or death</td>
<td>17 (40%)</td>
<td>31 (69%)</td>
<td>0.006</td>
</tr>
</tbody>
</table>
QUESTION 2
Which is the safest procedure for management of walled off pancreatic necrosis?

a. Endoscopic necrosectomy
b. Video-assisted retroperitoneal debridement
c. Open surgical necrosectomy
ANSWER 2

Which is the safest procedure for management of walled off pancreatic necrosis?

a. Endoscopic necrosectomy
b. Video-assisted retroperitoneal debridement
c. Open surgical necrosectomy
Video-assisted Retroperitoneal Necrosectomy vs. Endoscopic Necrosectomy

Major complication or death

80% 20%

Bakker et al; JAMA. 2012 Mar 14;307(10):1053-61
Endoscopic Necrosectomy

- Lengthy, tedious
- Multiple procedures with general anesthesia
- Risk of bleeding during mechanical debridement
Large diameter metal stents

- Permits acid and digestive enzymes into the collection for necrosis
- Egress of necrotic material from the collection into the gastric lumen
Lumen Apposing Metal Stents (LAMS)

NAGI stent
Taewoong Medical, Korea

AXIOS stent
Boston Scientific, USA
LAMS

- Large lumen
- Short length (1 cm)
- Fully covered
- Anchoring flanges
Electrocautery Enhanced Delivery System
Endosonographer-controlled delivery system
QUESTION 3

How effective is LAMS for management of walled off pancreatic necrosis?

a. >80%
b. 60% to 80%
c. 40% to 60%
d. <40%
ANSWER 3

How effective is WON for management of walled off pancreatic necrosis?

- a. >80%
- b. 60% to 80%
- c. 40% to 60%
- d. <40%
# LAMS for WON

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of subjects</th>
<th>Resolution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shah et al</td>
<td>33</td>
<td>91%</td>
</tr>
<tr>
<td>Sharaia et al</td>
<td>124</td>
<td>86%</td>
</tr>
<tr>
<td>Vazquez-Sequeiros et al</td>
<td>211</td>
<td>85%</td>
</tr>
</tbody>
</table>

Sharaia et al; Clin Gastroenterol Hepatol. 2016 14(12):1791-1803
Vazquez-Sequeiros et al; Gastrointest Endosc. 2016 Sep;84(3):450-457
## LAMS vs. dp-plastic for WON

<table>
<thead>
<tr>
<th></th>
<th>dp-plastic n=36</th>
<th>LAMS n=58</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution (%)</td>
<td>92%</td>
<td>95%</td>
<td>0.55</td>
</tr>
<tr>
<td>Requirement of ETN</td>
<td>70%</td>
<td>40%</td>
<td>0.014</td>
</tr>
<tr>
<td>Hospital days, median</td>
<td>13</td>
<td>7</td>
<td>0.056</td>
</tr>
<tr>
<td></td>
<td>dp-plastic n=106</td>
<td>FC-SEMS n=121</td>
<td>LAMS n=86</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------------</td>
<td>---------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Resolution (%)</td>
<td>81%</td>
<td>95%</td>
<td>90%</td>
</tr>
<tr>
<td>Number of endoscopic sessions (mean)</td>
<td>3.6</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Additional radiological and/or surgery</td>
<td>20%</td>
<td>6%</td>
<td>8%</td>
</tr>
</tbody>
</table>

LAMS: safe?

<table>
<thead>
<tr>
<th>Complication</th>
<th>Mukewar et al (n=58)</th>
<th>Shah et al (n=33)</th>
<th>Siddiqui et al (n=86)</th>
<th>Sharaia et al (n=124)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleeding</td>
<td>5.4%</td>
<td>0%</td>
<td>7%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Perforation</td>
<td>1.7%</td>
<td>0%</td>
<td>3.5%</td>
<td>0%</td>
</tr>
<tr>
<td>Stent migration</td>
<td>21%</td>
<td>3.3%</td>
<td>0%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Stent occlusion</td>
<td>3.4%</td>
<td>3.3%</td>
<td>3.5%</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

### LAMS: safe?

<table>
<thead>
<tr>
<th>Complications</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleeding</td>
<td>3/12</td>
</tr>
<tr>
<td>Buried LAMS</td>
<td>2/12</td>
</tr>
<tr>
<td>Biliary stricture</td>
<td>1/12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6/12 (50%)</td>
</tr>
</tbody>
</table>

Bang JY et al Gut 2016 Aug
LAMS for other fluid collections

35 y/o F with Wilm’s tumor s/p nephrectomy c/w lymphocele
LAMS for gallbladder drainage

77 y/o M with multiple co-morbidities and chronic calculous cholecystitis

• Video
LAMS for pancreatoo-gastostomy

44 y/o M with chronic pancreatitis and PD stricture and failed ERCP

Gornals et al; Endoscopy. 2016;48 Suppl 1:E276-7
LAMS for benign GI strictures

5 patients:

- 2 pyloric stricture
- 2 GJ anastomosis stricture
- 1 colonic stricture

LAMS for post-RYGB GJ stricture

LAMS for gastrojejunostomy

<table>
<thead>
<tr>
<th>Study</th>
<th>no.</th>
<th>Technic. success</th>
<th>Clinical success</th>
<th>Adverse events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khashab et al</td>
<td>10</td>
<td>90%</td>
<td>90%</td>
<td>None</td>
</tr>
<tr>
<td>Itoi et al</td>
<td>20</td>
<td>100%</td>
<td>90%</td>
<td>Pneumoperitoneum 1</td>
</tr>
<tr>
<td>Tyberg et al</td>
<td>26</td>
<td>92%</td>
<td>85%</td>
<td>Peritonitis 1, Bleeding 1, Pain 1</td>
</tr>
</tbody>
</table>
Conclusion

• There has been a paradigm shift in mgmt. of walled off pancreatic necrosis from surgical to endoscopic mgmt.

• Endoscopic therapy for walled off pancreatic necrosis is safe and effective

• LAMS are possibly more effective and appear to require less endoscopic sessions than dp-plastic stents
Conclusion

• LAMS are effective in mgmt. of
  • Gallbladder drainage
  • Post surgical and other fluid collections
  • Pancreatic duct obstruction
  • Benign GI strictures
  • Gastric outlet obstruction by creating gastro-enterostomy