Endoscopic Treatment of Luminal Perforations and Leaks

Ali A. Siddiqui, MD
Professor of Medicine
Director of Interventional Endoscopy
Jefferson Medical College
Philadelphia, PA

When Do You Suspect a Luminal Perforation?

- Subcutaneous air/crepitus
- Chest pain
- Abdominal distention
- Pneumothorax
- Endoscopically difficult to maintain endoluminal air/luminal collapse
- Hemodynamic instability (hypotension, tachycardia)
- Respiratory distress (oxygen desaturation, tachypnea)

Baron et al. GIE. Volume 76, Issue 4, Pages 838–859
Proximal Esophageal Perforation

- Rare!
- Etiology
  - Blind passage of a endoscope or cautery device
  - Inadvertent passage through a Zenker diverticulum
- Patient Symptoms
  - Dysphagia
  - Sore throat and chest pain
  - Subcutaneous emphysema

CONFIRM by Esophagogram or CT with Oral Contrast

Proximal Esophageal Perforation Therapy

- Conservative
  - Nasogastric tube feeding
  - Suspension of oral intake
  - Intravenous antibiotics

- Endoscopic (Technically difficult)
  - Endoscopic through-the-scope (TTS) clip closure
    - For perforations < 2cm
  - Endoscopic over-the-scope (OTS) clip closure
    - For perforations 2-3cm in size
  - Stent placement is not technically feasible
Mid and Distal Esophageal Perforations

- **Etiology**
  1. Impaction of the endoscope against osteophytes
  2. Severe retching (Boerhaave’s syndrome)
  3. Endoscopic dilation or polyp resection
  4. Foreign body removal

- Outcomes of endoscopic therapy best when perforation recognized early.
- Esophageal perforations that are recognized late (≥12 hours) are better treated by surgery.

Endoscopic Management of Mid and Distal Esophageal Perforations

- Perforations less than 2cm
  - close by using TTS clip with or without stent
- Perforations between 2-3cm
  - OTSC more effective
- Perforations greater than 3cm or linear perforations
  - Sealed by temporary placement of esophageal FCSEMS and Overstich

I recommend endoscopic suturing of proximal end of SEMS to reduce stent migration.
 Management of Esophageal Perforation After Closure

- Oral intake must be stopped for 3-5 days
- The patient should be treated with intravenous antibiotics and proton pump inhibitors
- Partial diversion of luminal content may be achieved by insertion of a nasogastric tube
- Post-endoscopy contrast studies recommended within 24 hours after the procedure
- If radiologic investigations show fluid collection in mediastinum, percutaneous drainage indicated
Gastric Perforation Etiology

1. Impaction of the endoscope against the anterior wall of the stomach
2. PEG tube placement
3. Transmural endoscopic drainage interventions
4. EMR and ESD
5. Dilation of gastroenteric anastomotic strictures
6. Over-distension by gas (barotrauma) during argon plasma coagulation

Endoscopic Therapy of Gastric Perforation

- Early Perforation without Sepsis
  - Defect < 20mm: TTS Clips
  - Defect ≥ 20mm: OTSC
  - Defect ≥ 30mm: Overstich Suturing

Healing Rate = 85.94%
Endoscopic Therapy of Periampullary Duodenal Perforations

- Lateral wall perforations are large and usually caused by the tip of the endoscope
  - Historically, these perforations required immediate surgery
  - Case reports describe OTSCs closure of large lateral wall perforations
- Perforations after biliary sphincterotomy can be treated using:
  - Nasoduodenal tube
  - FCSEMS biliary stent
  - TTS clips

Endoscopic Therapy of Duodenal Perforations

- Duodenal perforations are due to:
  - endoscope trauma
  - duodenal polypectomy
  - attempts to pass forcibly beyond a duodenal stricture
- Typically require surgical intervention
- Use of TTS clips and OTSCs effective in closing duodenal perforations < 2cm
- Covered SEMSs can be placed across duodenal perforations
  - especially those associated with stricture
Etiology of Colon Perforation

- Sigmoid colon and rectum most common sites of diagnostic perforation due to mechanical injury
- Iatrogenic perforation risk is 0.05%–0.8% for diagnostic colonoscopies
- Therapeutic colonoscopy carries a 5% risk of perforation:
  - advanced polyp EMR and ESR
  - endoscopic balloon dilation
  - colonic stent placement
Colorectal Perforation

TTS, OTSC, or Overstich within 4 hours of perforation

Supportive measures
IV Antibiotics

Clinically Stable
Discharge on oral antibiotics

Clinically Unstable
CT suggests contrast extravasation
Surgical Repair

89-93% Efficacy

General Management of Luminal Perforations

Endoluminal closure (metallic clips, stents, suturing)
Nasogastric or nasoduodenal decompression
Abdominal/chest decompression if there is air under tension
Radiographic evaluation
Intravenous administration of broad-spectrum antibiotics
Fluid resuscitation
Nothing by mouth
Percutaneous or surgical intervention if needed
My Thoughts…

- Good evidence that endoscopic treatment of perforations is effective
- Wide use of CT allows early diagnosis in subtle perforation cases
  - This prevents delays in endoscopic or surgical management
- Perforations recognized after 24 hours are better managed surgically

Gastrointestinal Leaks

- Result from:
  - Inflammatory disease
  - Malignancy
  - Postsurgical states
- Goal of endoscopic therapy: interruption of flow of luminal contents across a GI defect
- Undrained cavities and fluid collections must often first be drained percutaneously
Endoscopic Stent Placement

- Stent placement used for luminal disruptions within the upper GI tract
  - Covers the region of leakage
  - FCSEMS are preferred
- Major limitations: their migration rate (25%)
- Increased motility of colon allows for easy stent migration
  - This not only prevents fistula closure but also increases the chances of obstruction and perforation

Stent Success to Close Leaks

<table>
<thead>
<tr>
<th></th>
<th>Bakken et al</th>
<th>Senousy et al</th>
<th>Eloubeidi et al</th>
<th>Buscaglia et al</th>
<th>El Hajj et al</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total patients with leaks (%)</td>
<td>22</td>
<td>7</td>
<td>12</td>
<td>15</td>
<td>44</td>
</tr>
<tr>
<td>Overall stent migration rate (%)</td>
<td>28</td>
<td>39</td>
<td>34</td>
<td>33</td>
<td>28</td>
</tr>
<tr>
<td>Long-term closure of leak (%)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>86</td>
<td>44</td>
<td>80</td>
<td>83</td>
</tr>
</tbody>
</table>
Clip Closure of Leaks

- TTS clips useful in small leaks
- Tissue surrounding the leak or fistula must be robust enough to be held within the jaws of the clips.
- OTSCs more robust than TTS for closure of leaks
  - OTSC devices enable reliable closure of larger defects
- Success Rate=83-100%

Protocol for OTSC Closure of Leaks

1. The tissue edges ablated with APC
2. A cytology brush is then used to abrade the lateral aspects
3. OTSC device then deployed
4. Contrast is injected to access adequacy of the closure
5. Any ongoing leak may be managed by further clipping or stenting
Endoscopic Suturing

- Endoscopic suturing is an appealing concept for its ability to closely mimic surgical closure.
- Significantly more difficult from a technical aspect than clipping.
- Sutures appose edges of the tissue at the leak site and are then cinched together.
- Suturing systems may be capable of closing larger defects.
Suturing Gastro-Gastric Leaks

- Leaks at fistula site closed by sutures reopened in 65%.
- None of fistulae >20 mm remained closed during the follow-up.
- One-third of patients with fistula size ≤10 mm achieved long-term closure.
- For long-term closure, best results for gastro-gastric fistulae are seen with fistulae ≤10 mm.


---

PRINCIPLES OF ENDOSCOPIC LUMINAL LEAK CLOSURE

- Patients require multispecialty involvement (GI, Surgery, Radiology).
- Delineation of the sites of the leak is needed using contrast radiology studies.
- If fluid collection exists, insertion of percutaneous drain needed before endoscopic closure.
- Main goal is interruption of flow of luminal contents across the defect.
- Adequacy of endoscopic closure should be studied using contrast radiology studies.
THANK YOU