Endoscopic Management of Bariatric Surgery Complications

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Columbia University Medical Center
Outline

- Increasing number of bariatric surgeries
- Common complications
  - LSG
    - Stenosis
    - Leaks
    - (Esophageal pathology)
  - RYGB
    - Ulceration and Bleeding
    - Leaks
    - Stenosis
    - (Fistula)
    - (Choledocholithiasis)
    - (Gastrojejunal anastomosis dilation)
- Endoscopic options, approaches and efficacy
Complications of bariatric surgery

1. Bleeding
   • RYGB 1-5%
   • LSG 0-8%
   • LAGB 0-0.5%

• General Treatment Principles
  • Identify and remove foreign body at bleeding site
    • Suture and staple material
    • Band erosion
  • Prefer injection/(spray)/mechanical treatment > thermal therapy
  • Suturing of anastomotic non healing ulcers
  • PPI (open capsule +/- antacid in RYGB)
  • Treat HP infection
  • Smoking cessation

• Success of endoscopic and pharmacologic therapy >97%
Complications of Bariatric Surgery

• 2. Leaks
  • Most feared complications and second most common cause of death after bariatric surgery
  • RYGB
    • First few days: Technical reasons
    • Sub-acute: ischemia
    • 2-5% Laparoscopic RYGB
    • 1.6-2.6% in open RYGB
  • LSG
    • 0.6-7%
    • Most occur near angle of His
    • Ischemia and high pressure in the sleeve is primary etiology
Approach to leak management

• Timing of complication determines initial approach
  • Chronicity correlates with success of closure

• Stabilization of patient is critical – providing sufficient drainage prior to attempting other interventions

• Understand risk factors for impaired healing of leak
  • modifiable risk factors -> smoking, NSAIDs, steroids,
  • presence of stenosis -> creates high pressure that may sustain leak -> dilate
  • tissue ischemia -> less likely to heal, close
  • Presence of foreign bodies - -> impedes healing ->removal
  • Size of the defect -> less then 1 cm early post-op defects have a greater chance of closure
Timing of complication determines initial approach

- **Acute**
  - Technical causes are common (dehiscence)
  - Peritonitis
  - Often without well formed abscess
  - Therapeutic priority: Stabilize, Emergent Drain, Close/Divert

- **Subacute**
  - Tissue Ischemia most likely cause
  - Perigastric abscess/collection
  - Urgent Drain, Cover/Stent

- **Chronic leaks**
  - Often associated with high distal pressure +/- ischemia
  - Fistula or abscess/collection
  - Drain, open>close defect
Endoscopic Treatment Options for Leaks

• Endoscopic Drainage
• Stenting
• Defect closure
• Dilation
• Septotomy
Primary endoscopic internal drainage

- Endoscopic drainage may be the best option in stable small leaks
Primary Endoscopic Internal Drainage

• Drainage of distant cavities may also feasible
Secondary Endoscopic Internal Drainage

- Internal Drainage of surgically drained or IR drained cavities to aid drain removal
Role of Endoscopic Internal Drainage

<table>
<thead>
<tr>
<th>STABLE PATIENT</th>
<th>UNSTABLE PATIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Infection without Sepsis</td>
<td></td>
</tr>
<tr>
<td>- Localized Peritonitis</td>
<td></td>
</tr>
<tr>
<td>- No Malignant Tumor</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NO NEED</th>
<th>NEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>surgical/percutaneous DRAINAGE</td>
<td>surgical/percutaneous DRAINAGE</td>
</tr>
</tbody>
</table>

- EID

- AIM: 1 or more **long** double pigtail stent across the orifice in order to completely drain the collection coupled when necessary with enteral nutrition

- AIM: 1 or more **short** double pigtail stent across the orifice in order to promote healing allowing early drainage retrieval coupled when necessary with enteral nutrition

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<table>
<thead>
<tr>
<th>No. of points cured by EID</th>
<th>50/64 (78.2 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of points under treatment</td>
<td>9/64 (14 %)</td>
</tr>
<tr>
<td>No. of points not cured by EID</td>
<td>5/64 (7.8 %)</td>
</tr>
<tr>
<td>Length of treatment for healing (days)</td>
<td>57.5 (10–206)</td>
</tr>
<tr>
<td>Mean no. of endoscopic sessions</td>
<td>3.14 (2–16)</td>
</tr>
<tr>
<td>Late complications</td>
<td>6 stenosis</td>
</tr>
<tr>
<td>Mean follow-up (days)—50 pts</td>
<td>316 (20–600)</td>
</tr>
</tbody>
</table>

Donatelli G et al
Obes Surg 2015
Management of leaks after LSG Stent placement

• Endoscopic therapy should rarely be undertaken without previous drainage
Management of leaks after SG Stent placement

- Fully Covered
  - easily removable but migrate (>17%)
  - Leakage around stent proximally and distally
- Partially Covered
  - Tissue ingrowth allows a seal
  - Distal reflux can happen around stent
  - Inability to remove in 1 session in >45%
- Long stents or multiple stents to cover entire sleeve length
  Stent in stent configuration
  Long stents not available in US

Long stents not available in US
Management of leaks after SG Stent placement

• Assure seal by two modalities
  • Esophagogram
    • Good at excluding leak around proximal edge of stent and detecting migration
    Leak persists -> stent repositioning; Partially Covered Stent
  • Dye test if external drain in place
    • Leakage can occur around distal edge of the stent
    • Distal -> Extension to duo sweep

• Consider diet modification, jejunal feeding, TPN
Management of leaks after SG Stent placement

• Variable success
  • 60-90% resolution of leak in some studies

• Possible complications
  • 9% inability to remove

• Migration
  • 17% migration rate
  • Anchoring reduces migration rate of stents placed for benign indication
    30% vs 16%

Ngamruengphong S
Endoscopy 2016
Puli SR et al GIE 2012
Management of leaks after SG Closure

• Small early leaks
• Assure concurrent drainage

• Closure devices
  • Clips
  • OTSC/Padlock
  • Suturing
  • (IR or surgical)

• Benefit of de-epithelialization (APC)
• Simultaneous metal stent placement?

Mercky P Dig
Endoscopy 2015
Management of leaks after SG

Dilate

• Stenosis distal to leak leads to increased pressure
• RYGB dilation of GJ using CRE balloon up to 20 mm
• Sleeve dilation for strictures and angulation
  • Pneumatic/Achalasia balloon 30 mm
• Pyloric channel dilation
  • +/- Botox injection
Management of leaks after SG “Open”

• Septotomy
  • Cutting the septum (suture line) between defect and lumen
  • Increase internal drainage
  • Less likely to evolve into abscess
  • ?Epithelialization of the cavity

• (remove most staples and other foreign material)
• APC, NK, IT knife
• Often combined with stenting and dilation
Management of leaks after SG “Open”

- Septotomy
  - remove most staples and other foreign material
  - Irrigate /debride cavity
  - APC, NK, IT knife
  - Often combined with stenting (pigtail) and dilation
Septotomy: video
From Haito - Chavez Y, Kumbhari V, et al at JHU
### Septotomy: our experience (CU + JHU)

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Device used for ES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APC</td>
<td>6</td>
<td>67</td>
</tr>
<tr>
<td>NK</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td><strong>Distal stenosis dilated</strong></td>
<td>5</td>
<td>56</td>
</tr>
<tr>
<td><strong>Complications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate bleeding</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Transfusion</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Delayed complications</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Procedure duration/min, mean (range)</strong></td>
<td>87.2</td>
<td>(28-167)</td>
</tr>
<tr>
<td><strong>Reoperation</strong></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Symptom resolution</strong></td>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td><strong>Persistent cavity open to lumen</strong></td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td><strong>Follow-up/weeks, mean (range)</strong></td>
<td>21.2</td>
<td>(7-33)</td>
</tr>
</tbody>
</table>
Leak after Bariatric surgery: proposed algorithm

- Leak Suspected → CTAP UGIS → Leak Confirmed
- Unstable? Peritonitis?
  - YES: Resuscitate Antibiotics Surgery washout
  - NO: NPO antibiotics
- Drainable Collection
  - YES: EID vs Percutaneous Drain
  - NO: Time since SG
    - <12 WK ACUTE
      - Leak persists: Endoscopic Diversion & Fistula closure → FCSEMS Clips / sutures → Leak Resolves
    - ≥12 WK CHRONIC
      - Leak Persists: Endoscopic Septotomy → Follow Clinically EGD, UGIS
- YES: Resuscitate Antibiotics Surgery washout
- NO: NPO antibiotics

Leak Resolves
Leak after Bariatric surgery: proposed algorithm

Leak Suspected → CTAP

Leak Confirmed

Unstable? Peritonitis?

YES → Resuscitate Antibiotics Surgery washout

NO → NPO antibiotics

EID vs Percutaneous Drain

YES → Drainable Collection

NO → Time since SG

(sub)acute, small defect → Endoscopic Diversion & Fistula closure

Endoscopic Diversion & Fistula closure

FCSEMS Clips / sutures

Leak Resolves

≥12 WK CHRONIC

Leak Persists → Follow Clinically EGD, UGIS

Leak Persists

Follow Clinically EGD, UGIS

Leak Resolves
Leak after Bariatric surgery: proposed algorithm

Leak Suspected → CTAP → Leak Confirmed → Unstable? Peritonitis?

- YES: Resuscitate Antibiotics Surgery washout
- NO: NPO antibiotics

Drainable Collection

- YES: EID vs Percutaneous Drain
- NO: Time since SG

- (sub)acute, small defect: Endoscopic Diversion & Fistula closure → FCSEMS Clips / sutures → Leak Resolves
- ≥12 WK CHRONIC: Endoscopic Septotomy

- Leak persists: Follow Clinically EGD, UGIS

Leak Resolves
Complications of Bariatric Surgery

3. Stenosis

• Stenosis after RYGB
  • Incidence: 3-28%
  • Usually > 10 weeks after surgery
  • Modifiable RF: NSAIDs, smoking and alcohol
  • GJ diameter max 20 mm -> CRE balloon dilation up to 20 mm
  • Endoscopic dilation is successful in 89-100% of cases
  • Perforation risk: 0-3%
Stenosis after RYGB

- High success rate
- Durable Benefit
- Low complication rate

<table>
<thead>
<tr>
<th>Ref.</th>
<th>No. patients</th>
<th>Time interval to stenosis diagnosis (d)</th>
<th>No. of sessions</th>
<th>Success rate (%)</th>
<th>Balloon diameter</th>
<th>Complication rate (%)</th>
<th>Perforation rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baeha et al.</td>
<td>24</td>
<td>26-270</td>
<td>1-5</td>
<td>100</td>
<td>8-13 mm</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cao et al.</td>
<td>38</td>
<td>93.9 (21-168)</td>
<td>1-6</td>
<td>95</td>
<td>12-16 mm</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ross et al.</td>
<td>38</td>
<td>-</td>
<td>1-3</td>
<td>100</td>
<td>-</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Carrasegui et al.</td>
<td>96</td>
<td>52.7 (26-154)</td>
<td>1-4</td>
<td>99</td>
<td>-</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Catalano et al.</td>
<td>26</td>
<td>63 (28-65)</td>
<td>1-7</td>
<td>96.2</td>
<td>8-15 mm</td>
<td>3.8</td>
<td>0</td>
</tr>
<tr>
<td>Pecore et al.</td>
<td>43</td>
<td>92.7 (24-137)</td>
<td>1-5</td>
<td>93</td>
<td>9-20 mm</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>Curri et al.</td>
<td>111</td>
<td>56 (5-237)</td>
<td>1-4</td>
<td>100</td>
<td>6-18 mm</td>
<td>2.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Ukleja et al.</td>
<td>61</td>
<td>60 (50-150)</td>
<td>1-5</td>
<td>100</td>
<td>6-18 mm</td>
<td>2 contained perforations: 1 esophagitis 4.9</td>
<td>2.2</td>
</tr>
<tr>
<td>Mathew et al.</td>
<td>58</td>
<td>96.2 (12-565)</td>
<td>1-7</td>
<td>100</td>
<td>6-20 mm</td>
<td>3 perforations 3.2</td>
<td>3.2</td>
</tr>
<tr>
<td>Da Costa et al.</td>
<td>105</td>
<td>90 (36-250)</td>
<td>1-4</td>
<td>100</td>
<td>6-20 mm</td>
<td>Perforations 3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Esquível et al.</td>
<td>32</td>
<td>126 (26-768)</td>
<td>1-4</td>
<td>100</td>
<td>13-20 mm</td>
<td>1 hemorrhage 4.5</td>
<td>0</td>
</tr>
<tr>
<td>Vincularo et al.</td>
<td>72</td>
<td>46 &lt; 90 (28 &gt; 90)</td>
<td>1-45</td>
<td>84.7</td>
<td>8-18 mm</td>
<td>1 perforation, pneumoperitonem and death 1.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

1 pneumothorax and pneumomediastinum
2 contained perforations: 1 esophagitis
3 perforations
4 hemorrhage
5 perforations: Small tear
Stenosis after LSG

• Incidence 0.3-4%
• Mechanical stenosis: proximal sleeve
• Axial deviation/Functional stenosis: at incisura angularis
• Typical symptoms:
  • GERD
  • Nausea
  • Pain
  • Dysphagia
  • Weight loss
Helix stenosis after LSG – evaluation

Esophagogram

Mechanical stenosis

Functional stenosis

Endoscopy with fluoroscopy
Helix stenosis after LSG – endoscopic treatment options

Pneumatic Dilation

Stenting
Helix stenosis after LSG – endoscopic treatment options

Pneumatic Dilation

Stenting
## Helix stenosis – outcomes after dilation

<table>
<thead>
<tr>
<th>Authors</th>
<th>Publication year</th>
<th>% Successful cases treated endoscopically</th>
<th>Mean # of endoscopic treatments (range)</th>
<th>Endoscopic modalities</th>
<th>Complications</th>
<th>% Failure cases (revisional surgery)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parikh et al. [11]</td>
<td>2012</td>
<td>80% (8/10)</td>
<td>1.6 (1–2)</td>
<td>CRE (range 15–18 mm) Stent (2/10) for long segment stenosis</td>
<td>Not reported</td>
<td>20% (RYGB)</td>
</tr>
<tr>
<td>Shnell et al. [3]</td>
<td>2014</td>
<td>.44% (7/16)</td>
<td>N/A (1–3)</td>
<td>CRE 20 mm (31% success) Achalasia balloon 30 mm (100% success)</td>
<td>None</td>
<td>56% (5 cases RYGB + 1 case re-sleeve + 3 cases lost to follow-up)</td>
</tr>
<tr>
<td>Ogra et al. [5]</td>
<td>2015</td>
<td>100% (26/26)</td>
<td>1.6 (1–4)</td>
<td>CRE &lt;20 mm Achalasia balloon 30 mm (15 psi) + 35 mm (15 psi) Stent (2/26)</td>
<td>4% (1 stent migration)</td>
<td>N/A</td>
</tr>
<tr>
<td>Rehbo et al. [12]</td>
<td>2016</td>
<td>88% (15/17)</td>
<td>2 (1–3)</td>
<td>Achalasia balloon 30 mm (20 psi), then 35–40 mm (20 psi) Stent (2/17)</td>
<td>None</td>
<td>12% (RYGB)</td>
</tr>
<tr>
<td>Nath et al. [14]</td>
<td>2016</td>
<td>69% (23/33)</td>
<td>N/A</td>
<td>CRE (10–18 mm) Achalasia balloons 30–35–40 mm</td>
<td>N/A</td>
<td>31% (N/A)</td>
</tr>
<tr>
<td>Al Sabah et al. [10]</td>
<td>2016</td>
<td>88% (23/26)</td>
<td>2.3 (N/A)</td>
<td>Achalasia balloons 30–35–40 mm</td>
<td>None</td>
<td>12%</td>
</tr>
<tr>
<td>Manos et al. [15]</td>
<td>2017</td>
<td>94.4% (17/18)</td>
<td>1.3 (1–4)</td>
<td>Achalasia balloon 30–35 mm (25 psi) Stent</td>
<td>None</td>
<td>6% (RYGB)</td>
</tr>
</tbody>
</table>

Deslauriers V et al
Surg Endo 2017
Stenosis after LSG – outcomes after stenting

<table>
<thead>
<tr>
<th>Total number of patients</th>
<th>Gastric sleeve stenosis without concomitant leak</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 21</td>
<td>N = 16</td>
</tr>
<tr>
<td>Number of stents/patient</td>
<td>1.5</td>
</tr>
<tr>
<td>Number of endoscopic sessions/patient</td>
<td>2.8 (2–7)</td>
</tr>
<tr>
<td>Mean stent width (mm)</td>
<td>18.2</td>
</tr>
<tr>
<td>Mean stent length (cm)</td>
<td>13.6</td>
</tr>
<tr>
<td>Stent migration</td>
<td>31%</td>
</tr>
<tr>
<td>Median duration of treatment (days)</td>
<td>34.5 (11–73)</td>
</tr>
</tbody>
</table>

Resolution of stricture w/ initial procedure: 70%
Resolution after stent repositioning: 100%

Aburajab MA et al Dig Dis Sci 2017
Possible predictors of success treating post-LSG helix stenosis

- Pneumatic dilation vs CRE
  - 30-35-40 mm achalasia
- Sequential 1-3 (mean 1.7) treatment vs single dilation
- Incisura/angularis stricture > proximal stricture
  - Sequential dilation for incisura strictures (upto 3 sessions): 95% success
  - Stent placement following 1-2 dilation in proximal stenosis: 89% success
Algorithm to manage post LSG stenosis

Endoscopy and UGI Series

- No significant stenosis observed
  - Non endoscopic management

- Proximal stricture
  - Pneumatic Dilation
    - FCSEMS w/ anchoring

- Narrowing at angularis
  - Pneumatic Dilation (30)
    - Pneumatic Dilation (35)
      - Pneumatic Dilation (40)
  - Surgery
  - FCSEMS w/ anchoring

Surgery
Advice for endoscopic management following bariatric surgery (lessons learned...)

• Understand anatomy
• Discuss early with surgery, IR
• Use CO2 and fluoro capable setting
• Remove foreign bodies, sutures, etc
• Consider diversion of feeds early
• Open rather than close defects
• Be patient!
Summary – endoscopic management of bariatric complications

• Bleeding – high success rate with endoscopic and pharmacologic therapy

• Leaks
  • multidisciplinary approach but increasingly endoscopic
  • Increasing role for “opening” rather than “closing” defects

• Stenosis
  • best outcomes for mechanical (especially RYGB) related stenosis
  • Use of Pneumatic balloons improves efficacy in LSG related strictures