Management of Leaks after Gastric Bypass & Sleeves

Chan W. Park, MD, FACS
Assistant Professor of Surgery
LSG  LRYGB
What are the leak rates in the literature?

<table>
<thead>
<tr>
<th>Procedure</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric Bypass?</td>
<td>0.7%</td>
<td>1.9%</td>
<td>3.2%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Sleeve Gastrectomy?</td>
<td>0.5%</td>
<td>1.0%</td>
<td>2.3%</td>
<td>5.6%</td>
</tr>
</tbody>
</table>
What are the leak rates in the literature?

• Gastric Bypass?
  a. 0.7%
  b. 1.9%
  c. 3.2%
  d. 5.8%

• Sleeve Gastrectomy?
  a. 0.5%
  b. 1.0%
  c. 2.3%
  d. 5.6%

Sepsis / death

Drainage, re-exploration

Earlier onset

Later onset

Fibrin glue, stents, botox

Fistula
(Splenic, bronchopleural, pancreatic, colon)
Anastomotic Leaks

• A delay in diagnosis can lead to:
  – Peritonitis
  – Sepsis
  – Death
• Review of 100 consecutive bariatric lawsuits by a consortium of bariatric surgeons and an attorney.
• 32% involved an intraoperative complication
• Most common adverse events for litigation:
  – Leaks (53%)
  – Intra-abdominal abscess (33%)
  – Bowel obstruction (18%)
  – Major airway events (10%)
  – Organ injury (10%)
  – Pulmonary embolism (8%)
• Evidence of potential negligence in 28% of cases

In 52 cases, evidence of a leak was found after:
  – Laparoscopic RYGB (52%)
  – Open RYGB (30%)
  – VBG or revisions (18%)

Average time to diagnosis was 4.9 days (range 0–18)

The dominant allegation of negligence was a delay in diagnosis (60%)

Patient outcomes included death (60%), disability (22%), and full recovery (28%)
Staple line reinforcement

- Oversewing
- Buttress material
  - Seamguard, bovine pericardium
- Fibrin glue
Pressure tolerance of newly constructed staple lines in sleeve gastrectomy and duodenal switch

Marlin Wayne Causey, M.D.*, Emilie Fitzpatrick, M.D., Preston Carter, M.D.

Evaluation of resected stomach with saline infusion and manometric pressure device

9 BPD/DS patients

21 Sleeve gastrectomy

- Mean pressure at the time of the first leak was 25.6 cm H2O (range 12 to 60 cm H2O)
  - 18.8 mm Hg (8.83 to 44.1 mm Hg)
- Volume and leak pressures were similar in the LSG and DS groups

• 18 pigs
• Resection of the stomach:
  – 9 without reinforcement
  – 9 reinforced with bovine pericardial strips
• Leaks evaluated with methylene blue intraoperatively
• Histopathological study of the staple-line was performed

*Obes Surg* 2007;17:222-228.
• 1 small subclinical leak identified in buttress group

• No significant difference in burst pressure for the Control and Buttress groups
  – **152.6 ± 23.5 mmHg** vs. **161.2 ± 15.8 mmHg**

*Obes Surg* 2007;17:222-228.
Randomized 120 patients to 1 of 3 techniques for staple line reinforcement:

- Group 1: Oversewing
- Group 2: Seamguard®
- Group 3: Floseal®

2 leaks (1 in Group 1 and 1 in Group 3)

- No statistically significant difference

*Surg Endosc* 2012;26:2623–2629
Randomized 75 patients to 1 of groups:
  – Group 1: No reinforcement
  – Group 2: Seamguard®
  – Group 3: Suturing

Reduced blood loss in Group 2
No difference in leak rates

90 patients randomly assigned to 1 of 2 groups
- Group 1: Gore Seamguard® (n=48)
- Group 2: Continuous suture (n=42)
- 2 patients in Group 1 had a leak (4.2%) and 1 had a bleed (2%)
- No major surgical complications in group 2

• 3 randomized, controlled trials with 180 patients
  – 91 patients with staple line reinforcement
  – 89 patients with NO staple-line reinforcement
  – SLR is associated with lesser risk of anastomotic leak
    • OR 0.1; 95%CI [0.01, 0.78]; z = 2.2; P<0.03
• 29 publications with 4,888 patients
• Leak rate: 2.4%
  – Staple height and use of buttressing material did not affect leak rate
  – Use of a size ≥40-Fr bougie was associated with a leak rate of 0.6% vs. 2.8% with a smaller size

A Systematic Review of Staple-Line Reinforcement in Laparoscopic Sleeve Gastrectomy

Jean Knapps, MD, Maher Ghanem, MD, John Clements, MPA, Aziz M. Merchant, MD

Reinforcement and No Reinforcement
Individual Study and Pooled Group Leak Rates
Squares indicate rate, bars indicate 95% confidence interval

Leak Rate
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Reinforced, % (CI)</th>
<th>Non-Reinforced, % (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak rate</td>
<td>3.9 (CI, 2.9–5.5)</td>
<td>3.3 (CI, 2.8–4.1)</td>
</tr>
<tr>
<td>Bleed rate</td>
<td>1.7 (CI, 1.1–2.7)</td>
<td>2.6 (CI, 2.0–3.3)</td>
</tr>
<tr>
<td>Infection rate</td>
<td>1.3 (CI, 0.7–2.3)</td>
<td>1.5 (CI, 0.9–2.3)</td>
</tr>
<tr>
<td>Reintervention rate</td>
<td>3.2 (CI, 2.1–4.7)</td>
<td>3.1 (CI, 2.3–4.0)</td>
</tr>
<tr>
<td>Readmission rate</td>
<td>3.2 (CI, 2.0–4.8)</td>
<td>3.5 (CI, 2.7–4.7)</td>
</tr>
<tr>
<td>Conversion rate</td>
<td>1.4 (CI, 0.8–2.5)</td>
<td>0.7 (CI, 0.4–1.2)</td>
</tr>
<tr>
<td>Abdominal collection rate</td>
<td>1.9 (CI, 1.1–3.2)</td>
<td>1.7 (CI, 1.2–2.4)</td>
</tr>
<tr>
<td>Thromboembolic complication rate</td>
<td>0.7 (CI, 0.4–1.3)</td>
<td>0.7 (CI, 0.4–1.1)</td>
</tr>
<tr>
<td>Mortality rate</td>
<td>0.8 (CI, 0.4–1.5)</td>
<td>0.7 (CI, 0.4–1.1)</td>
</tr>
</tbody>
</table>

aValues represent overall percentage pooled rates (CI = 95% confidence interval).

bNo statistically significant difference in pooled rate.
• 30 articles
  – Comparison of patients with reinforcement (n=3293) vs. No reinforcement (n=1588)
  – No statistically significant differences in:
    • staple-line leaks
    • mortality
    • bleeding
    • infectious complications

112 studies with 9,991 patients

Leak rate: 2.2%

- The risk of leak decreased with bougie ≥40 Fr
  - OR=0.53, 95%CI=[0.37–0.77]; P=0.0009
  - Buttressing did not impact leak rates

*Manish Parikh, MD,† Reda Issa, BA,‡ Aileen McCrillis, MLIS,¶ John K Saunders, MD,* Aku Ude-Welcome, MD,* and Michel Gagner, MD*"
Anastomotic Leaks

- Unexplained tachycardia:
  - Leak until proven otherwise
Management of leaks - LRYGB

Gastrojejunal anastomotic leak identified radiographically

Stable

- Yes
  - Contained leak
    - Yes
      - Drained
      - Yes
        - NPO IV Antibiotics Hyperalimentation
      - No
        - Percutaneous Drainage and/or Re-explore
    - No
      - Re-explore
  - No
    - Re-explore

No
Re-explore for Leak

• Laparoscopic vs. open
  – Directed Drainage
  – Gastrostomy tube in excluded stomach
    • Allows for enteral feeding
    • Prevents need for hyperalimentation
    • May prevent staple line dehiscence of excluded stomach due to postoperative ileus
  – If Sleeve, consider feeding jejunostomy
Review of 3,073 patients

- Leak rate: 3.2% leak rate
- Mortality rate: 1.5%
- Overall leak-associated mortality was 16.7%
- Leak was an independent risk factor for death

Review of 3,828 gastric bypasses

- Leak rate: 3.9%
  - 2.6% after open, 5.2% after laparoscopic, and 8.0% after revisional gastric bypass.
- Median time of detection for a GJ leak was longer after open vs. laparoscopic gastric bypass (3 vs 1 days, \( P<0.001 \)).
- Median detection time was longer for JJ leaks than GJ leaks (4 vs 2 days, \( P=0.037 \)).

*J Gastrointest Surg* 2007;11:708-713
Failure to rescue

• Leak-related mortality
  – Gastric bypass: 14.7 – 16.7%\textsuperscript{1,2}
  – Sleeve gastrectomy: 4.5 – 9.1%\textsuperscript{3,4}

Leaks after Sleeve Gastrectomy

• Leak rate: 2.2 - 2.4%
  – Occur in proximal third of stomach near the gastroesophageal junction
• 85 - 89% of cases

Fatal aortoesophageal fistula bleeding after stenting for a leak post sleeve gastrectomy

Majid A Almadi, Fahad Bamihriz, Abdulrahman M Aljebreen

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Management of chronic proximal fistulas after sleeve gastrectomy by laparoscopic Roux-limb placement

Simon van de Vrande, M.D.\textsuperscript{a,*}, Jacques Himpens, M.D.\textsuperscript{a}, Haicam El Mourad, M.D.\textsuperscript{a}, Randy Debaerdemaeker, M.D.\textsuperscript{b}, Guido Leman, M.D.\textsuperscript{b}

<table>
<thead>
<tr>
<th></th>
<th>Total procedures</th>
<th>Total proximal leaks (%)</th>
<th>Gastrobronchial fistula (% of leaks)</th>
<th>Persisting fistula (% of leaks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLSG</td>
<td>728</td>
<td>26 (3.6)</td>
<td>2 (7.7)</td>
<td>7 (26.9)</td>
</tr>
<tr>
<td>CLSG</td>
<td>84</td>
<td>6 (7.1)</td>
<td>1 (16.7)</td>
<td>2 (33.3)</td>
</tr>
<tr>
<td>Total</td>
<td>812</td>
<td>32 (3.9)</td>
<td>3 (9.4)</td>
<td>9 (28.1)</td>
</tr>
</tbody>
</table>

PLSG = primary laparoscopic sleeve gastrectomy
CLSG = corrective laparoscopic sleeve gastrectomy

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• Persistent leaks (>4 months)
  – 7 patients (26.9%) after primary LSG
  – 2 patients (33.3%) after corrective LSG
• 11 patients had a Roux limb laparoscopically sutured to the defect
  – Mean time for a chronic fistula to heal after Roux-limb placement was 12.5 days

Management of gastrobronchial fistula after laparoscopic sleeve gastrectomy

Lionel Rebibo, M.D.\textsuperscript{a}, Abdennaceur Dhahri, M.D.\textsuperscript{a}, Pascal Berna, M.D., Ph.D.\textsuperscript{b}, Thierry Yzet, M.D.\textsuperscript{c}, Pierre Verhaeghe, M.D., Ph.D., F.A.C.S.\textsuperscript{a}, Jean-Marc Regimbeau, M.D., Ph.D.\textsuperscript{a,*}

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Surg Obes Relat Dis 2014;in press.
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- Intraabdominal fistula tract removed
- Total gastrectomy or a 60-cm Roux-en-Y side-to-side gastrojejunal anastomosis was performed
- Lung and diaphragm resection via left posterolateral thoracotomy
- Diaphragm rebuilt by simple suturing, use of a muscle flap, or implantation of a prosthesis

• 8 patients with chronic gastric fistula after LSG requiring operative repair
  – Time from LSG to fistula diagnosis: 3 days – 14 months
  – No mortality
Surgical management of chronic fistula after sleeve gastrectomy

A. Marius Nedelcu, M.D.*, Mehdi Skalli, M.D., Eric Deneve, M.D., Jean Michel Fabre, David Nocca

<table>
<thead>
<tr>
<th>Age</th>
<th>Initial intervention</th>
<th>Initial management</th>
<th>Endoscopic treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 48</td>
<td>Laparoscopic sleeve gastrectomy + band removal</td>
<td>Peritoneal lavage jejunalostomy/laparotomy</td>
<td>Stent—impaction after 4 mo—a second stent placed inside of the first 1</td>
</tr>
<tr>
<td>2. 55</td>
<td>Laparoscopic resleeve gastrectomy (Fig. 1)</td>
<td>Peritoneal lavage/laparoscopy</td>
<td>3 sessions of biologic glue</td>
</tr>
<tr>
<td>3. 48</td>
<td>Laparoscopic sleeve gastrectomy + band removal</td>
<td>Peritoneal lavage + jejunalostomy/laparoscopy</td>
<td>Stent complicated by migration—replacement of another 5 stents with 1 migration</td>
</tr>
<tr>
<td>4. 33</td>
<td>Laparoscopic sleeve gastrectomy</td>
<td>Peritoneal lavage + jejunalostomy/laparotomy</td>
<td>Stent—2 mo after replacement + biologic glue</td>
</tr>
<tr>
<td>5. 40</td>
<td>Laparoscopic sleeve gastrectomy</td>
<td>Peritoneal lavage + jejunalostomy/laparotomy</td>
<td>Endoscopic clips + prosthesis</td>
</tr>
<tr>
<td>6. 38</td>
<td>Laparoscopic sleeve gastrectomy</td>
<td>Endoscopy</td>
<td>Endoscopic clips + prosthesis</td>
</tr>
<tr>
<td>7. 24</td>
<td>Laparoscopic sleeve gastrectomy</td>
<td>Peritoneal lavage + jejunalostomy/laparoscopy</td>
<td>Stent—migration—another stent + biologic glue—2 mo after stent replacement</td>
</tr>
<tr>
<td>8. 28</td>
<td>Laparoscopic sleeve gastrectomy</td>
<td>Peritoneal lavage + jejunalostomy/laparoscopy</td>
<td>3 sessions of biologic glue</td>
</tr>
</tbody>
</table>
• 22 patients with leak or stenosis after LSG
Sleeve Gastrectomy Severe Complications: Is It Always a Reasonable Surgical Option?

David Moszkowicz • Roberto Arienzo • Idir Khettab • Gabriel Rahmi • Franck Zinzindohoué • Anne Berger • Jean-Marc Chevallier

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Table 2  Procedure performed in the entire population

<table>
<thead>
<tr>
<th>Management</th>
<th>n=22 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial outside procedures</td>
<td></td>
</tr>
<tr>
<td>Laparoscopic lavage and drainage</td>
<td>7 (31.8)</td>
</tr>
<tr>
<td>Laparoscopic fistula repair</td>
<td>7 (31.8)</td>
</tr>
<tr>
<td>Fistula transorificial intubation</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Open lavage and drainage</td>
<td>5 (22.7)</td>
</tr>
<tr>
<td>Operative drains maintained</td>
<td>2 (9)</td>
</tr>
<tr>
<td>Endoscopic dilatation of stenosis</td>
<td>2 (9)</td>
</tr>
<tr>
<td>Eso-jejunal anastomosis after complete gastric division</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Procedures in university center</td>
<td></td>
</tr>
<tr>
<td>Emergency care after referral</td>
<td></td>
</tr>
<tr>
<td>Fistula transorificial intubation</td>
<td>3 (13.6)</td>
</tr>
<tr>
<td>Arterial embolization of pseudo-aneurysm</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Delayed management</td>
<td></td>
</tr>
<tr>
<td>Total gastrectomy</td>
<td>6 (27.2)</td>
</tr>
<tr>
<td>Gastrojejunostomy en-Ω after gastric division</td>
<td>3 (13.6)</td>
</tr>
<tr>
<td>Endoscopic covered stent</td>
<td>13 in 9 patients (40.9)</td>
</tr>
<tr>
<td>Endoscopic Ovesco© clip</td>
<td>5 (22.7)</td>
</tr>
<tr>
<td>Endoscopic sealant</td>
<td>2 (9)</td>
</tr>
<tr>
<td>Endoscopic dilatation of stenosis</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Image guided percutaneous drainage of subphrenic abscess</td>
<td>8 (36.3)</td>
</tr>
<tr>
<td>Image guided percutaneous drainage of gastrocutaneous fistula</td>
<td>2 (9)</td>
</tr>
<tr>
<td>Trans-phrenic drainage of gastro-pneurobronchial fistula</td>
<td>1 (4.5)</td>
</tr>
</tbody>
</table>
Gastrointestinal bleeding complication of gastric fistula after sleeve gastrectomy: consider pseudoaneurysms

Lionel Rebibo · David Fuks · Christelle Blot · Brice Robert · Pierre-Olivier Boulet · Abdennaceur Dhahri · Pierre Verhaeghe · Jean-Marc Regimbeau

• 4 patients with gastric fistula and UGI bleeding
  – 10% of overall LSG population
• Median time interval between fistula and UGI bleed was 15 days.
• 3 patients had pseudoaneurysms (75%)
  – 2 affecting the left gastric artery and 1 affecting the splenic artery and 1 case of bleeding related to stent-induced gastric ulceration
• 1 mortality

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Conclusions

- Surgical/percutaneous drainage
- Endolumenental therapy
- Nutritional support
- Don’t forget about bleeds
- Don’t forget about distal obstructions
- Definitive surgical salvage procedure may be required