Acute Care Surgery Emergencies in the Bariatric Patient: Syllabus
Colonel Matthew Martin, MD, FACS
Trauma Medical Director, Madigan Army Medical Center
contact email: matthew.j.martin16.mil@mail.mil

Summary: The field of bariatric surgery has changed rapidly over the past 2 decades, with bariatric procedures evolving from last-ditch measures to the primary effective intervention for morbid obesity and obesity-related comorbidities. The proven efficacy coupled with major reductions in perioperative morbidity and mortality has contributed to the widespread acceptance in the adult population, as well as an increasing acceptance in select pediatric and geriatric populations. Any practicing acute care surgeon can expect to increasingly encounter the post-bariatric surgery patient who requires urgent evaluation and potentially surgical intervention. Therefore, a basic understanding of the common bariatric surgical procedures being performed and their associated short and long-term complication profiles is necessary to safely and effectively evaluate, triage, and manage these patients. If a bariatric surgeon is not immediately available at your center to assist or advise, then a telephone conversation with a bariatric specialist at a local referral center can be invaluable in providing advice and determining the necessity for transfer. This syllabus will provide a review of the most important bariatric-specific problems that may present to an acute care surgeon.

Review of Common Current Bariatric Procedures and Terminology

<table>
<thead>
<tr>
<th>Current Restrictive</th>
<th>Restrictive + Malabsorptive</th>
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<tbody>
<tr>
<td>adjustable gastric band</td>
<td>gastric bypass (aka “Roux-Y” bypass)</td>
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<tr>
<td>sleeve gastrectomy</td>
<td>biliopancreatic diversion+duodenal switch</td>
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<tr>
<td>Historical/Uncommon</td>
<td></td>
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<tr>
<td>gastric plication</td>
<td>biliopancreatic diversion</td>
</tr>
<tr>
<td>vertical banded gastroplasty (VBG)</td>
<td>jejuno-ileal bypass</td>
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<tr>
<td>horizontal gastroplasty</td>
<td>mini or single loop gastric bypass</td>
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</table>

- The simplest classification is whether the operation is purely restrictive or whether it is a combined restrictive/malabsorptive procedure
- Restrictive means that only the stomach has been manipulated and there is no anastomosis or small bowel manipulation to worry about.
- Combined operations involve both the stomach and small bowel and have at least 2 anastomoses. Problems can involve the stomach, the small bowel, or both
- The adjustable gastric band (or “lap band”) was previously the fastest growing procedure, but now is being widely abandoned in favor of the sleeve gastrectomy
- The sleeve gastrectomy and gastric bypass are the two most commonly performed procedures now, and will make up the majority of patients presenting with acute abdominal emergencies requiring surgery or some other intervention
- Any procedure that involved a prosthetic device (gastric band, VBG) has the potential for the band/tubing to slip out of position or to erode into surrounding structures (stomach, small bowel)
Top 10 Principles for Bariatric Emergencies

1. There is nothing unique about abdominal emergencies in the bariatric patient versus other patients who have undergone prior foregut surgery, but there are specific additional considerations and triggers for interventions that the acute care surgeon should be aware of. Bariatric patients still develop appendicitis, gallstones, etc., so work up the common problems also.

2. A bariatric history is critical! Establish exactly what procedure the patient had done (many times they will all be lumped as having a “prior gastric bypass”), when and where it was done, open vs laparoscopic, and were there any immediate postoperative complications or problems. If possible, contacting the original bariatric surgeon can provide critical information or advice.

3. In the early postop period (1-4 weeks) any patient presenting with significant abdominal complaints should be assumed to have a leak (anastomotic or staple line) until proven otherwise.

4. Leaks can present insidiously with minimal abdominal complaints. Reliable early signs are fever, tachycardia, unexplained elevation WBC count.

5. Many abdominal emergencies present with associated pulmonary symptoms, and pulmonary embolism can present similar to a leak. Both should be considered and ruled out, usually by CT imaging.

6. Postoperative bowel obstructions after a gastric bypass are due to an internal hernia until proven otherwise. CT scan can provide evidence of an internal hernia, but no imaging study is reliable enough to rule out an internal hernia. This “proof” usually requires surgical exploration done in a timely fashion to avoid catastrophic small bowel strangulation/necrosis or blowout of a proximal staple line.

7. The sleeve gastrectomy is the fastest growing bariatric procedure now being performed, so be familiar with the anatomy and the common emergencies with this procedure. Although touted as a “safer and less invasive” option than gastric bypass, the leak rate is similar (or higher).

8. Many acute abdominal complaints with the adjustable gastric band can be relieved by complete band deflation (can be done at bedside), turning an urgent issue into an elective one.

9. Upper GI contrast studies will miss a significant number of leaks. Following the UGI study with a CT scan (combined CT/Swallow protocol) will greatly improve detection of leak and evaluate for most other emergent abdominal pathologies.

10. The acutely decompensating patient belongs in the OR as soon as possible, and the stable patient with persistent and unexplained abdominal pain after complete radiologic evaluation usually warrants endoscopy and possible surgical exploration.
**Sleeve Gastrectomy**

- Formation of narrow gastric tube
- Lateral divided portion of stomach removed
- Antrum/pylorus left intact
- No small bowel manipulation or rearrangement
- No anastomoses
- Long staple line at risk for leaks
- Risk of narrowing, particularly at incisura
- Leaks most commonly occur at the angle of His, just below or at the GE junction
- Entire anatomy still accessible by endoscopy

**Gastric Bypass (Roux-en-Y)**

- Formation of very small gastric “pouch”
- Remainder of bypassed stomach (remnant) left in-situ
- Small bowel divided into roux limb (RL, aka “alimentary limb”) and biliopancreatic limb (BP limb)
- RL anastomosed to pouch (gastrojejunostomy or GJ)
- BP limb anastomosed to RL (jejunojejunostomy or JJ)
- Length of RL dictates the degree of malabsorption
- Leaks most likely at GJ, but also possible at JJ or from the staple line of excluded gastric remnant
- Mesenteric defects usually closed, but can re-open due to technical failure or just from the weight loss (patients will lose fat in the mesentery also)
- Gastric remnant, duodenum, and biliary system now NOT accessible by standard endoscopy

**Adjustable Gastric Band or “Lap Band”**

- Prosthetic circular band with inflatable balloon
- Placed on upper stomach just below GE junction
- Long tubing brought out abdominal wall and connected to an injection port in a subcutaneous pocket
- Band gradually inflated after surgery to obtain restriction
- Touted as the “safest and lowest risk” procedure, but also has the lowest success rate for weight loss and 25-50% of patients require band revision or removal eventually
- Most complications related to band/tubing erosion, band slippage, or mechanical problems with band, tubing, or port
**Bariatric Evaluation and Management Principles for the Acute Care Surgeon**

**Table 1. Bariatric-Specific Complications in the Early and Late Postoperative Periods**

<table>
<thead>
<tr>
<th></th>
<th>Gastric Bypass</th>
<th>Sleeve Gastrectomy</th>
<th>Adjustable Gastric Band</th>
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</thead>
<tbody>
<tr>
<td>Early (1-4 weeks)*</td>
<td>anastomotic leak</td>
<td>staple line leak</td>
<td>dysphagia/GERD</td>
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<tr>
<td></td>
<td>GI bleeding</td>
<td>GI bleeding</td>
<td>band slippage</td>
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<td></td>
<td>intraluminal clot</td>
<td>gastric outlet obstruction</td>
<td>balloon or tubing fracture</td>
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<tr>
<td></td>
<td>early stricture</td>
<td>early stricture</td>
<td>edema/stenosis at band site</td>
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<tr>
<td></td>
<td>surgical site infection</td>
<td>surgical site infection</td>
<td>surgical site infection</td>
</tr>
<tr>
<td></td>
<td>early postop SBO</td>
<td>early postop SBO</td>
<td>iatrogenic gastroesophageal injury</td>
</tr>
<tr>
<td>Late (&gt;30 days)</td>
<td>internal hernia</td>
<td>leak or fistula</td>
<td>band slippage or erosion</td>
</tr>
<tr>
<td></td>
<td>stricture</td>
<td>stricture</td>
<td>band over-inflation</td>
</tr>
<tr>
<td></td>
<td>marginal ulcer</td>
<td>gastric outlet obstruction</td>
<td>port malposition</td>
</tr>
<tr>
<td></td>
<td>gastro-gastric fistula</td>
<td>portal/SMV vein thrombosis</td>
<td>band/tubing fracture</td>
</tr>
<tr>
<td></td>
<td>gallstones</td>
<td>gallstones</td>
<td>gallstones</td>
</tr>
<tr>
<td></td>
<td>Intussusception (at J-J)</td>
<td>severe GERD</td>
<td>intolerance to band inflation</td>
</tr>
</tbody>
</table>

* additional iatrogenic complications of surgery such as a missed enterotomy should be considered as with any early postoperative patient

+ an intra-abdominal abscess should be assumed to be due to a contained leak

**Key Points in the Evaluation of the Bariatric Emergency**

- Most critical piece of history is identifying what prior procedure was performed; this will help guide the workup and areas of main concern on imaging studies (see Table 1 above)

- Patients manifesting with hemodynamic instability or signs of rapid progression of sepsis or clinical deterioration should be explored without undue delays or extensive workups

- Liberal use of imaging (fluoro, CT, or combined) to rule out major life-threatening complications such as a leak or internal hernia is warranted, but beware the false negative study (can miss leaks and internal hernias)

- Bariatric patients become easily dehydrated and this is primarily due to the restrictive effect limiting Po intake and not due to the malabsorptive component. They also should be given a decreased volume of oral contrast and do not require a “full oral prep”

- Radiologists not familiar with bariatric imaging may have problems sorting out the anatomy. Face to face discussion and review of the studies is critical

- A common mistake in evaluating the patient in the early postoperative period is interpreting concerning imaging findings as normal postop variants. Free air and fluid are not normal at 1 week or later after surgery

- Persistent emesis after any bariatric surgery is highly abnormal, and should raise a red flag of concern for an acute surgical emergency
PROCEDURE-SPECIFIC EVALUATION & MANAGEMENT TIPS

I. Prior Gastric Bypass
   A. Early (within 30 days): Leaks, bleeding, and early postop SBO

   • The top 3 concerns should be leak, leak, and leak; most commonly from the G-J anastomosis but can be from any anastomosis or staple line. Most early complications of laparoscopic gastric bypass can be managed laparoscopically in experienced hands, but do not hesitate to convert to open as needed.

   • Leaks may present as florid peritonitis and sepsis (uncontained) or with subacute symptoms of pain, fever, tachycardia, nausea/emesis (usually contained).

   • Signs of uncontained leak should prompt immediate surgical exploration, otherwise a contrast swallow study should be obtained (CT or combined UGI followed by immediate CT have highest sensitivity).

     ✗ reliable only for leaks from G-J (arrow in figure), can easily miss leaks from J-J or from gastric remnant (although these are fortunately much less common)

   • There has been a paradigm shift over the last 5 years away from routine operative exploration and repair for locally contained G-J leaks in stable patients.

     ✗ nonoperative management highly successful with the use of percutaneous drain placement and endoscopic stent placement

     ✗ additional options include fibrin glue injection, endoscopic clip or suture closure of leak

   • The next concern should be for a small bowel obstruction. Early SBO after laparoscopic gastric bypass is rarely due to adhesions, and is more commonly due to: 1) technical error with narrowing or kinking of the J-J, 2) intraluminal obstruction from a formed hematoma, or 3) a port-site hernia.

     ✗ luminal J-J obstruction due to a formed hematoma can be a surgical emergency if completely obstructing

     ✗ early obstruction of the J-J will cause both proximal dilation and emesis - these are both risk factors for disrupting the G-J anastomosis if not promptly treated by surgery or endoscopy

     ✗ obstruction at or distal to the J-J will also dilate the BP limb and gastric remnant (GR in figure), which has no outlet for decompression. This is a surgical emergency!
B. Late (after 30 days): Internal hernia, strictures, and marginal ulcer

- The most important concept to understand in the gastric bypass patient is the difference in the management of postop small bowel obstruction. In the gastric bypass patient any postoperative SBO is assumed to be due to an internal hernia, and should not be managed expectantly for 2 primary reasons: 1) the herniated bowel can rapidly progress to ischemia and necrosis if not promptly reduced and 2) an NG tube will not decompress the BP limb and gastric remnant.

- **Internal hernias:** most commonly occur through the mesenteric defect at the J-J (lower arrow in figure), followed by herniation through Petersen’s defect (upper arrow). If the roux limb was routed through a retrocolic defect, then herniation at this site is possible also.

- Although there are a number of signs on CT scan suggestive of an internal hernia, none are highly sensitive or specific. These include:
  - a mesenteric “swirl sign” indicating vascular torsion (arrow in Figure) is the most reliable sign
  - clustered loops of bowel in the left upper quadrant
  - small bowel loop behind the SMA
  - J-J anastomosis to the right of midline (should be on left normally)

- **Structures:** typically take at least 4-6 weeks to develop and are most commonly at the G-J anastomosis. Progressive intolerance to solids > liquids and pain with eating are the usual presenting signs. Upper endoscopy should be performed and most strictures respond to serial balloon or bougie dilation. Upper GI contrast studies are not reliable, and can be read as normal even in the presence of a tight stricture.

- **Marginal ulcer (MU):** ulceration at the gastrojejunostomy. This is typically only seen after gastric bypass and not with other bariatric procedures. The incidence is 2-15% and varies by anastomotic techniques and patient populations. Common symptoms are epigastric pain with eating, but they can also present as spontaneous perforations.
  - the most common etiologies are smoking and NSAID use, but they can also be seen with large or dilated pouches that have more acid producing parietal cells
  - the majority should heal with acid suppression and smoking/NSAID cessation
  - perforated MU – suture repair and plug or buttress with omentum, intraoperative endoscopy can be useful if the exact site of perforation is unclear
II. Prior Sleeve Gastrectomy

A. Early (within 30 days): Leaks and bleeding

• **Leaks:** Similar to gastric bypass, the first concern should be a leak. They can occur anywhere along the sleeve staple line, but are almost always at the proximal end (Figure).

  ✚ likely due to poor blood supply, thinner tissue close to esophagus, or backpressure blowout from relative narrowing of sleeve or pyloric dysfunction

• Initial management principles are similar to gastric bypass and include surgical exploration for uncontrolled leak with sepsis or instability, or percutaneous drainage for a contained leak/abscess. Attempts at primary repair in acute phase usually fail.

• These can be incredibly challenging to manage and achieve permanent resolution. Endoscopic stenting to achieve adequate coverage of the leak is much more difficult compared to gastric bypass leaks, and should be referred to a very experienced endoscopic surgeon or gastroenterologist.

• **Bleeding:** staple line bleeding has been greatly decreased by the use of buttressing materials, but can still occur. If intraluminal bleeding forms a large hematoma it can cause obstruction and result in a proximal blowout leak as described above. Urgent endoscopy or surgical re-exploration should be performed to evacuate the hematoma.

III. Prior Adjustable Gastric Band (AGB)

A. Late (after 30 days): Band slippage

• The primary reason for an acute emergent presentation with a prior AGB will be a slippage of the band causing gastric obstructive symptoms and possible strangulation of the stomach above the slipped band (Figure).

  ✚ note that the band has slipped distally, and excess fundus/body is herniated upwards. In addition to obstructive symptoms this can cause acute gastric necrosis if left untreated

• Diagnosis can be made by a plain AP x-ray. The figure shows measurement of the “phi angle”. This is the angle formed by a straight line through the long axis of the band and a vertical line through the spinal column. Normal position is approximately 45 degrees (as shown in Figure), and anything > 58 degrees indicates slippage. In addition, an AGB in normal position should look like a hockey-puck viewed from the side as shown here.
• The 2 figures here show signs of a slipped band.
• Note the increased phi angle in the upper figure, now at almost 90 degrees relative to the vertical axis of the spine.
• An additional sign of slippage is when the appearance of the band on an AP x-ray changes from a solid disc (as seen in the upper figure) to a circular shape with the lumen visualized (lower figure).
• This is known as the “O sign” and should prompt immediate evaluation or intervention for slippage.

• The patient will usually present with acute intolerance to oral intake, persistent emesis and even difficulty with oral secretions. Although the diagnosis can be made based on the clinical picture and plain x-ray, a contrast swallow or CT scan can be helpful in equivocal cases or to delineate the degree of slippage and gastric herniation, and rule out a perforation.

• The ultimate treatment is removal of the band, but in many cases deflating the band by accessing the subcutaneous port and aspirating all fluid will relieve the symptoms and obviate the need for emergent surgery. This can also allow the band to slip back into normal position, but should still be followed by band removal or revision.

**Simplified Algorithm for the Bariatric Patient with Acute Abdominal Complaints**

```
Unstable, Peritonitis, or rapid deterioration?

Yes

Surgical exploration

Stent & Drain* Observe

No

Imaging: CT/Swallow

Endoscopy Laparoscopy Observation

Neg

Leak

SBO

Abscess

Positive

Surgical exploration and eval for internal hernia

Standard SBO treatment

Perc drain and eval for anastomotic or staple line leak
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*Fig 1. Simplified algorithm for acute abdominal complaints after bariatric surgery*
Attached is an excellent wall chart created by the American Society of Metabolic and Bariatric Surgery outlining key algorithms and management strategies for the bariatric patient in the emergency setting is available for order through the ASMBS website or for free download here: http://s3.amazonaws.com/publicASMBS/ASMBS_Store/ASMBS_ER_Poster9-20-10.pdf

Clinical Pearls for Emergency Care of the Bariatric Surgery Patient

EMERGENCY PRESENTATIONS:
1. Unstable Vital Signs
   • Fever > 101°F
   • Hypotension
   • Tachycardia > 120 bpm x 4 hours
   • Tachypnea
   • Nausea ± Vomiting > 4 hours
   • Vomiting ± Abdominal Pain

2. Bright Red Blood by Mouth or Rectum, Melena, Bloody Drainage
3. Abdominal Pain or Colic > 4 hours
4. Decreased urine output

INTRA-ABDOMINAL BLEEDING

I. Emergency Presentation
Bright Red Blood Oral or Rectal, Melena, Bloody Drainage, Tachycardia, Hypotension, Faintness
• < 48 hrs postop indicates potential bleed from staple line
• > 48 hrs postop indicates potential marginal ulcer hemorrhage

II. Bleeding via oral route indicates potential poch source
Melena or bleeding via rectal route indicates potential duodenal ulcer or distal stomach or bowel source.

PULMONARY EMBOLISM

I. Emergency Presentation
Unstable vital signs with tachycardia ± chest pain

II. Emergency Assessment and Treatment
• Chest X-ray
• CT of abdomen with oral contrast
• CT of chest with HR contrast

SLEEVE GASTRECTOMY

“FAST HUG”
• Food: Enteral or parenteral nutrition within 24 hours
• Abscess: Consult for patient comfort
• Sedation: For inpatient or patient comfort
• Thromboembolic prophylaxis: Mechanical and chemical
• Head-UP 90° ELEVATION: 30° for hip and foot
• Ulcer prophylaxis: Pressure pump
• Gastroesophageal: Tightened but with gentle slide

VOMITING ± ABDOMINAL PAIN

I. Emergency Presentation
Vomiting associated with abdominal pain needs prompt surgical evaluation and observation until resolved or surgical exploration.

II. Emergency Assessment → To Surgery

CLINICAL PATHWAY FOR EVALUATION OF VOMITING (V)/ABDOMINAL PAIN

ABDOMINAL COMPARTMENT SYNDROME

I. Emergency Presentation
• Progressive respiratory insufficiency
• Hypotension
• Hyporeflexic abdomen
• Elevated intra-abdominal pressure

II. Emergency Treatment → To Surgery

BARIATRIC COMPLICATIONS:
• Intra-Abdominal Bleeding
• Leaks and Sepsis
• Obstruction
• Pulmonary Embolism
• Vomiting ± Abdominal Pain
• Abdominal Compartment Syndrome

LEAKS AND SEPSIS

I. Emergency Presentation
Unstable vital signs within 72 hours of bariatric surgery

II. Emergency Assessment and Treatment
• Hypotension
• Early anastomotic leak
• Wound disruption
• Peritonitis
• CT abdomen/pelvis

OBSTRUCTION

I. Emergency Presentation
Abdominal pain or Colic > 4 hours

II. Emergency Treatment
• Consider laparotomy, lavage, and resection
• Consult CT abdomen with oral contrast
• Consult CT abdomen with oral and IV contrast
• Consult CT abdomen with oral and IV contrast
• Consult CT abdomen with oral contrast

For more information, please visit www.asmbs.org

Adjustable Gastric Band

Normal LABG - Band Tited Up
LABG Tie Tight - Normal Tie
LABG Staple - Pneumostomy
LABG Staple - Antiseptics
Deferal Band with Holder Needle

Principles to Guide Management of Bariatric Emergencies

I. Critical Time Frame
• Exposure within 2 hours
• T6 within 24 hours

II. Critical Warnings
• Call Bariatric surgeon/1st available, call general surgeon on call
• There are no standard bariatric emergency pathways, each patient is unique in their response to surgery and symptoms, and they have no known predictors to other complications
• NPO:胃
• Avoid “Fast A §” due to risk of perforation
• Avoid enemas or rectal washout
• Avoid NSAIDS, ASA, Phenylbutazone
• Check vital signs, pulse, blood pressure, temperature

III. To Surgery if:
• Hypotension
• Early anastomotic leak
• Drainage (100ml/hr)
• Peritonitis
• Wound disruption
• CT abdomen/pelvis
• Elevated temperature, hypothermia, tachycardia, hypotension, acidosis, altered mental status

IV. Intra-abdominal abscess
• Cardiac tamponade
• Hemoperitoneum
• Pancreatic pseudocyst
• Enterocutaneous fistula
• Secundum atrial defect
• Cerebral ischemia
• Severe electrolyte disturbances
• Other

V. Laparoscopy
• Consult CT abdomen with oral contrast
• CT abdomen/pelvis
• Consult CT abdomen with oral contrast
• Consult CT abdomen with oral contrast

VI. Postoperative:
• Check vital signs
• NPO:胃
• Avoid enemas or rectal washout
• Check vital signs
• Check pulmonary function
• Check electrolytes
• Check blood glucose

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