Imaging of Complications of Common Bariatric Surgical Procedures

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KEYWORDS

• Obesity • Bariatric surgery complications • Roux en Y • Sleeve gastrectomy • Gastric banding • Laparoscopy

KEY POINTS

- Several techniques for the surgical management of obesity are available to bariatric surgeons.
- These interventions are performed more frequently with worsening of the obesity epidemic.
- Radiologists should be familiar with the surgical techniques, normal postoperative appearances, and potential complications for which imaging may be employed to establish a diagnosis to optimize patient care.

INTRODUCTION

The prevalence of adult obesity in the United States exceeds 30% and seems to be increasing, particularly among adult men.[1] Obesity has been associated with a number of medical comorbidities that can negatively affect quality of life and life expectancy, including type 2 diabetes, cardiovascular disease, osteoarthritis, and obstructive sleep apnea, as well as an increased risk of cancer of the breast, endometrium, and colon.[2]

Bariatric surgery is an effective therapy to achieve significant, sustained weight loss in obese patients. It is cost effective and associated with improvement in associated comorbidities, particularly hypertension and type 2 diabetes, and reduces overall mortality.[3–5] In addition, improvements in minimally invasive techniques and a declining surgical mortality rate has resulted a significant increase in the number of bariatric surgeries performed in the United States (400%–450% increase from 1998–2002).[6,7] Despite this marked increase, the vast majority of eligible obese adults have not undergone treatment,[7] suggesting that the future number of bariatric surgeries in the United States will continue to increase.

The radiologist should be familiar with the imaging appearance of the most commonly performed bariatric surgeries and their associated complications to provide optimal care for this growing patient population.

We discuss the most common operative techniques, imaging appearance, and most frequently encountered complications, for laparoscopic Roux-en-Y gastric bypass (LRGB), sleeve gastrectomy (SG), and adjustable gastric band.

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LRGB

The Roux-en-Y gastric bypass is the most common procedure for the treatment of obesity worldwide, accounting for approximately 47% of bariatric surgeries in 2011.[8] This procedure was initially described as an open surgery in 1967; however, a laparoscopic technique was reported in 1994, and has evolved into the reference standard procedure for surgical weight management, now accounting for more than 90% of these procedures.[9–11]

Technique

The LRGB involves dividing the stomach to form a small, proximal gastric pouch, followed by manipulation of the small bowel and gastrojejunostomy to create a contiguous alimentary tract. The gastric pouch is then completely separated from the larger lower stomach, now termed the gastric remnant.[10] The resulting gastric pouch is typically 20 to 40 mL, with smaller pouches associated with greater weight loss.[12]

The alimentary and biliopancreatic limbs of the Roux-en-Y are then constructed. The jejunum is divided approximately 50 cm distal to the ligament of Treitz to create the biliopancreatic limb. The jejunum is then measured between approximately 75 and 150 cm (75 cm for a body mass index <50 kg/m^2, and 150 cm for a body mass index ≥ 50 kg/m^2) distal to this division for the site of the end-to-side jejunojejunostomy connecting the biliopancreatic and Roux limbs.[13] The Roux limb is then brought up to the stomach by dividing the greater omentum at the inferior margin of the transverse colon and anastomosed to a gastrostomy created at the inferior right aspect of the gastric pouch. This can be achieved with 2 different techniques, either an antecolic/antegastric approach, where the Roux limb is brought up anterior to the stomach and transverse colon, or a retrocolic/retrogastric approach, where the Roux limb is brought up posterior to the transverse colon and stomach through a surgically created window in the transverse mesocolon. Petersen's space between the Roux limb and the transverse colon mesentery is sutured closed to prevent future small bowel herniation (**Fig. 1**).[10]

There are advantages and disadvantages to both the antecolic/antegastric and the retrocolic/retrogastric approaches for constructing the Roux limb. The retrocolic/retrogastric approach generally requires longer operating times and is more technically challenging.[14] This approach has been previously associated with an higher incidence of small bowel obstruction (SBO) related to internal hernias (IH) through the transverse mesocolon defect, the jejunojejunostomy mesenteric defect, and into Petersen's space between the mesentery of the Roux limb and the transverse mesocolon.[15–17] The antecolic/antegastric technique is less technically challenging and requires less operative time[18]; however, it requires a longer Roux limb and may be prone to increased tension at the gastrojejunostomy (**Fig. 2**). Data thus far do not support an increased propensity for anastomotic leak owing to Roux limb tension with the antecolic/antegastric approach. The overall complication rate for this approach is at least equal to the retrocolic/retrogastric technique.[19,20]

Complications

The mortality rate for LRGB is low, at up to 0.3%. For some complications, in the postoperative period, imaging plays an important role. These include SBO from IH or adhesions, anastomotic stenosis, and anastomotic leak.

Anastomotic leak

Anastomotic leak, although relatively uncommon (approximately 1%–5.6%), is a very serious complication of LRGB, and is an independent risk factor for patient mortality in the perioperative period.[21–24] Approximately one half of anastomotic leaks occur at the gastrojejunostomy, followed by the gastric remnant site and the jejunojejunostomy.[20] The clinical presentation of this complication may be nonspecific, including tachycardia, fever, and abdominal pain. Imaging is frequently employed to clarify the clinical picture and to expedite optimal patient management, including operative reexploration if necessary.

Fluoroscopic evaluation of the upper gastrointestinal tract (UGI) is frequently the initial imaging modality of choice for evaluation of complications, including anastomotic leak and obstruction, and is routinely requested at some centers on postoperative day 1.[20] Evaluation of the biliopancreatic limb, however, is not possible with a routine UGI series.

Gastrojejunostomy leaks on UGI typically manifest as extraluminal contrast extending into the left upper quadrant. Care must be taken to carefully evaluate indwelling drains during the fluoroscopic examination, because subtle opacification of the drain tubing may be the only sign of extraluminal contrast.[25,26]

The UGI series has the advantages of being a relatively fast and inexpensive test; however, it has been demonstrated to be somewhat unreliable for the detection of anastomotic leaks, with a detection rate of just 30%, compared with 56%