Management of Failed Laparoscopic Roux-en-Y Gastric Bypass

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Background: Laparoscopic Roux-en-Y gastric bypass (LRYGB) has emerged as the gold standard for the management of morbid obesity. Accordingly, patients who fail to lose weight after LRYGB present a difficult problem for the bariatric surgeons. A literature review was performed to evaluate the management options for this select bariatric population.

Methods: A literature search was conducted in the EMBASE and MEDLINE databases using the most comprehensive timeline. All relevant articles were identified and full texts were obtained and reviewed.

Results: Thirteen articles were retrieved based on key word searches. Management for weight failure following LRYGB included revision using the following options: laparoscopic adjustable gastric banding, pouch/anastomotic revision with or without endoluminal techniques, laparoscopic distal Roux-en-Y gastric bypass, and laparoscopic biliopancreatic diversion with duodenal switch. Laparoscopic sleeve gastrectomy may be considered in patients who fail LRYGB with nutritional deficiencies.

Conclusion: Failed LRYGB should be managed based on the patient presentation and diagnostic evaluation. Patients may present with significant nutritional deficiencies/complications, failure to lose weight, or weight recidivism. A treatment algorithm is proposed based on the literature to guide bariatric surgeons with respect to management options. However, given the paucity of research with respect to this problem, additional studies are needed to provide more insight on the optimal surgical management.

Introduction

LAPAROSCOPIC ROUX-EN-Y gastric bypass (LRYGB) is the most commonly performed operation in the United States to treat morbid obesity and considered the gold standard for weight loss surgery.^{1–4} Patients who eventually fail to lose weight after LRYGB present a difficult problem for bariatric surgeons. In fact, the most common reason for re-operative bariatric surgery in this population is inadequate weight loss.⁴ Failure after bariatric surgery is defined as achieving or maintaining less than 50% of excess weight loss (EWL) over 18 to 24 months or a body mass index (BMI) of greater than 35.⁴ The failure rate of LRYGB has been reported to be ~15% with a long-term failure rate of 20–35% and a revision rate of 4.5%.^{1,4,5} Salvage procedures for failed LRYGB are known to be technically challenging given the potential of distorted planes and anatomic changes. In fact, stapled revisional bariatric surgery has been associated with higher rates of complications and questionable efficacy when compared with primary operations.^{1,2,4}

Few articles have addressed the various treatment options for patients who fail LRYGB, and currently, there is no literature proposing a treatment algorithm for this select popu-

lation. The purpose of this literature review is to evaluate the options for patients who fail LRYGB and suggest an approach for their management.

Materials and Methods

A literature search was performed using the most comprehensive timeline for the EMBASE and MEDLINE databases. The following key terms were used: “bariatrics or obesity,” “laparoscopic roux-en-y gastric bypass,” “laparoscopic adjustable gastric banding,” “pouch or anastomotic revision,” “laparoscopic sleeve gastrectomy,” “laparoscopic biliopancreatic diversion with duodenal switch,” “revision or salvage or rescue or conversion,” “weight loss or reduction or decrease,” “postoperative or surgical complication.” The abstracts of citations were reviewed and 24 articles were found to be potentially relevant. The full text for these articles were obtained and thoroughly reviewed. Articles chosen for inclusion provided pertinent data following revisional surgery for patients with inadequate weight loss or complications related to their primary LRYGB procedure. A total of 13 studies were included in the final review. Data extracted from each article included sample size, weight loss

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TABLE 1. SUMMARY OF LITERATURE ON REVISIONAL PROCEDURES FOR WEIGHT FAILURE FOLLOWING LAPAROSCOPIC ROUX-EN-Y GASTRIC BYPASS

Study	n	Procedure	Outcomes	
			Weight loss	Mean follow-up (months)
Bessler 2005 ¹	8	LAGB	EWL 38%	12
			EWL 44%	24
Bessler 2010 ⁷	10	LAGB	EWL 47.3%	24
	2		EWL 47%	60
Chin 2009 ⁸	8	LAGB	EWL 24%	12
Gobble 2008 ²	11	LAGB	EWL 21%	12
Irani 2011 ⁵	42	LAGB	EWL 38.3%	26
Müller 2005 ¹⁰	5	Pouch resizing with redo anastomosis	BMI loss 3.9 kg/m ²	11
Parikh 2011 ¹¹	13	Gastrojejunal sleeve reduction	EWL 12%	12
Spaulding 2003 ¹²	15	Sclerotherapy	EWL 9%	6
	5		EWL -4%	
Horgan 2010 ¹³	96	Incisionless operating platform	EWL 18%	6
Mikami 2010 ¹⁵	14	StomaphyX	EWL 17%	6
	6		EWL 19.5%	12
Sugerman 1997 ⁹	25	LDRYGB	EWL 61%	12
	11		EWL 69%	60
Parikh 2007 ¹¹	12	LBPDDS	EWL 63%	11
Keshishian 2004 ²⁰	46	LBPDDS	EWL 69%	30

BMI, body mass index; EWL, excess weight loss; LAGB, laparoscopic adjustable gastric banding; LBPDDS, laparoscopic biliopancreatic diversion with duodenal switch; LDRYGB, laparoscopic distal Roux-en-Y gastric bypass.

after revisional procedure, and mean follow-up time. The results are summarized in Table 1.

Results

The following review will address the evidence behind the various options available for patients who fail LRYGB. Options used for revision include the following: laparoscopic adjustable gastric banding (LAGB), pouch/anastomotic revision with or without endoluminal techniques, laparoscopic sleeve gastrectomy, laparoscopic distal Roux-en-Y gastric bypass (LDRYGB), and laparoscopic biliopancreatic diversion with duodenal switch (LBPDDS).

Laparoscopic adjustable gastric banding

Pouch dilation is a frequent finding after LRYGB even in patients who maintain good weight loss.¹ There is evidence that LAGB provides external reinforcement to help regulate the pouch size over time.¹ As a result, it may be used to reduce hunger and increase satiety in patients who fail to lose weight after LRYGB. A study by Dixon *et al.* showed that LAGB effectively controls hunger after LRYGB.⁶ The safety and efficacy of LAGB as a rescue procedure for failed LRYGB has also been demonstrated.^{1,2,7,8} Bessler *et al.* found that LAGB after LRYGB produced an EWL of 38% and 44% at 12 and 24 months, respectively, for 8 patients.¹ A follow-up study of 22 patients was published by the same group and showed an EWL of 47.3% at 2 years for 10 patients and 47% at 5 years for 2 patients.⁷ A larger study by Irani *et al.* reported a mean EWL of 38.3% on 42 patients with a mean follow-up of 26 months (range 6–66) after LAGB placement.⁵ However, the harm from erosion (i.e., intragastric band migration) or slippage was found to be a genuine concern after the application of band. Their reoperation rate for complications related to LAGB was 10%

and included two band erosions, one band slippage and one port flip.⁵ The study also noted a higher complication rate compared with primary LAGB patients, which was expected given that band placements were part of a revisional procedure.

Pouch or anastomotic revision with or without endoluminal techniques

Some small series have shown that pouch resizing and anastomotic revision can be performed safely. However, most revisional procedures designed to correct dilated pouches are almost always unsuccessful, likely due to recurrent dilation.^{1,9} In a small series by Müller *et al.*, pouch resizing and reconstruction of the gastrojejunal anastomosis were deemed feasible, safe, and effective.¹⁰ In this procedure, the dilated gastric pouch is transected above the anastomosis, creating a new pouch volume of about 15 mL.¹⁰ A new anastomosis is created using a circular stapler. The anvil is brought into the pouch using a gastric tube and an opening is made for the stapler just distal to the former pouch-jejunal anastomosis. Afterward, the former pouch, including the previous anastomosis is resected from the proximal end of the alimentary limb using a linear stapler.¹⁰ This technique has also been reported to help with further weight loss and improve symptoms due to poor pouch emptying.¹⁰ Parikh *et al.* evaluated another type of revisional procedure, termed “gastrojejunal sleeve reduction.” In this procedure, an orogastric bougie (e.g., 40F) is guided into the jejunum and a linear stapler is serially fired and buttressed along the limb across the gastrojejunostomy and pouch toward the left crus.¹¹ However, the study concluded that this technique did not appear to offer any significant therapeutic benefit since only 12% EWL was seen after a mean follow-up of 12 months in 13 patients.¹¹

Some endoscopic techniques have also been employed to revise pouches. Spaulding proposed circumferential sclerotherapy injections (1 mL of 5% morrhuate sodium) into the muscular wall at the gastrojejunostomy to decrease the diameter.¹² Although this was 100% successful in reducing the size of the stoma, more than one session was often required and the clinical effect in terms of weight loss was marginal. Only 75% lost weight and experienced an average 9% EWL by 6 months.¹² Other concerns included the risk of chemical esophagitis, stricture, or fatal hemorrhage if injected into the aorta.¹²

Surgical devices have also been developed to endoluminally reduce the pouch or stoma size after LRYGB.¹³ Thompson *et al.* studied transoral endoscopic suturing and plication of the gastrojejunostomy and found that, although the stoma size could be reduced, the long-term benefits are unknown because the sutures are lost within a year and the stoma likely redistends.¹⁴ A large prospective trial by Horgan *et al.* evaluated post-LRYGB patients who underwent a restorative obesity surgery procedure endoluminally using the incisionless operating platform. This procedure uses expandable tissue anchors made of biocompatible, nonabsorbable suture and nitinol to create stomal and pouch tissue folds.¹³ The authors found that 84 out of 96 patients (88%) stopped regaining weight at 6 months of follow-up, with an average EWL of 18%.¹³ Early results of StomaphyX, another new surgical endoscopic device, demonstrated 19.5% EWL at 1 year, but the patient follow-up rate was only 15% (6 of 39 patients).¹⁵ This device suctions the surrounding tissue and fires a total of 20–22 polypropylene H-fasteners to form a circular pleat of tissue about 1 cm proximal to the anastomosis. The result of this full-thickness tissue approximation is a reduced stomal diameter.¹⁵ Although recent studies have demonstrated that the above-mentioned endoscopic techniques are safe and effective, further evaluation is necessary given that their long-term benefits are unknown.¹⁵

Laparoscopic sleeve gastrectomy

Any bariatric procedure with a malabsorptive effect, such as LRYGB, may have an increased risk of postoperative nutrient deficiencies.¹⁶ A prospective study by Geherer *et al.* reported significantly more vitamin B12 and vitamin D deficiencies and hyperparathyroidism in patients who had undergone LRYGB compared with LSG.¹⁷ Therefore, conversion to LSG is an option to consider when patients fail LRYGB with nutritional deficiencies. Another consideration for conversion to LSG is as a first step for a planned LBPDDS. Dapri *et al.* have shown that conversion of LRYGB to LSG for this reason is both feasible and safe.¹⁸ Patients were in a better condition after losing considerable weight to undergo the second step of a LBPDDS.¹⁸

Laparoscopic distal Roux-en-Y gastric bypass

Classically, reduction to a LDRYGB has been the most common revision for inadequate weight loss after LRYGB.¹⁹ In a proximal Roux-en-Y gastric bypass, the Roux limb is constructed with a length of 80–150 cm, preserving most of the small bowel for absorption of nutrients. Conversion to a LDRYGB is formed much closer to the lower end of the small bowel, usually 100–150 cm from the ileocecal valve. However, this type of reconstruction can be associated with sig-

nificant negative nutritional sequelae.¹ Fobi *et al.* found that revisional LDRYGB can allow patients to lose more weight, but at the expense of a higher risk for protein malnutrition and significant diarrhea.³ Therefore, patients who undergo revisional LDRYGB require more frequent monitoring and nutritional supplementation. Authors have recommended supplemental fat-soluble vitamins and calcium to prevent night blindness and osteoporosis.⁹ Protein malabsorption will require protein supplements and oral pancreatic enzymes to improve absorption.⁹ Patients can also develop symptoms of bacterial overgrowth (i.e., diarrhea, fever, and malaise) due to overgrowth of bacteria in their bypassed intestine, but intermittent courses of metronidazole are usually effective.⁹

Sugerman *et al.* converted LRYGB patients with less than 40% EWL to a distal gastric bypass and as a result they achieved an EWL of 61% at 1 year and 69% at 5 years after revision. However, these patients suffered severe vitamin and mineral deficiencies and one third had severe malnutrition requiring parenteral nutrition and revision back to long-limb LRYGB.⁹ Therefore, given the potential of significant harm, the study concluded that a 50 cm common tract LDRYGB should not be used at all in severely obese patients because it has an unacceptable morbidity and mortality.⁹ The study also recommended that a 150 cm common tract should only be considered for patients who are super obese and have severe comorbidity.⁹ Although lengthening the common tract to 150 cm may reduce the risk of the aforementioned complications, it is important to recognize that revision to a LDRYGB is potentially dangerous and mandates long-term follow-up.⁹

Laparoscopic biliopancreatic diversion with duodenal switch

Conversion of failed LRYGB to LBPDDS is a technically complex operation and has been reported in small numbers with long-term results still unavailable.^{1,19} Parikh *et al.* found that conversion to LBPDDS is a feasible and highly effective revisional procedure with a 63% EWL and 11 kg/m² BMI decrease at 11 months of follow-up.⁴ Keshishian *et al.* also reported an average weight loss of 5.4 kg (range 0.3–16.1 kg) per month in this select population, which led to 69% EWL at 30 months.²⁰ In fact, LBPDDS appears to be the most effective bariatric operation to date, producing the most sustained weight loss without the unwanted side effects seen in other bariatric operations.²⁰ Of note, the study also reported a leak rate of 15% for 26 patients who underwent conversion to LBPDDS for failed LRYGB.²⁰ Keshishian *et al.* concluded that patients who present with surgical complications, such as dumping syndrome, intolerance to solids, or persistent nausea and vomiting (i.e., quality of life has deteriorated) would benefit from conversion to LBPDDS.²⁰ Their data show that 100% of initial complaints from patients resolved following revision. However, their study also stipulated that patients who present with weight gain or inappropriate weight loss with a preoperative BMI lower than the guidelines set by the National Institute of Health should not be converted to a LBPDDS due to unjustifiable risk of serious complications.²⁰

Discussion

Failure to lose weight after bariatric procedures is usually multifactorial. Psychological, dietary, and medical follow-up

FIG. 1. Algorithm for patients with failed laparoscopic Roux-en-Y gastric bypass. BMI, body mass index; LAGB, laparoscopic adjustable gastric banding; LBPDDS, laparoscopic biliopancreatic diversion with duodenal switch; LDRYGB, laparoscopic distal Roux-en-Y gastric bypass; LRYGB, laparoscopic Roux-en-Y gastric bypass; LSG, laparoscopic sleeve gastrectomy.

are very important for long-term weight loss success. Once these factors have been addressed, patients should be offered a surgical re-evaluation.¹⁵ The assessment of the bariatric patient at this point must begin with a thorough history and physical examination. Failure may be characterized based on the patient's follow-up presentation. A patient may fail LRYGB for several reasons, including significant nutritional deficiencies/complications, failure to lose weight, or weight recidivism. Appropriate further investigations should include either an esophagogastroduodenoscopy or upper gastrointestinal study to rule out a gastrogastroic fistula, hiatal hernia, or gastric pouch/anastomotic dilatation.

There are two cohorts of patients tending to regain weight after their bypass: volume eaters and sweet eaters (grazers). In fact, 15% of gastric bypass will fail because of inadequate weight loss or regain from excessive ingestion of high-fat junk foods.⁹ Patients can also develop dumping syndrome with the ingestion of high calorie liquids and sweets, also known as soft calories.⁹ Patients who are volume eaters may benefit from banding or pouch revision since their pouch size becomes larger. Studies have proven a strong statistical relationship between the pouch size after primary LRYGB and subsequent weight loss outcomes.¹³ Indeed, most patients who present with weight regain after LRYGB have had evidence of a dilated stoma and/or pouch.¹³ However, sweet eaters usually do not have a dilated pouch and converting to a more malabsorptive procedure such as LBPDDS or LDRYGB would render better results. Patients who fail to lose weight at the outset of their LRYGB may also opt to undergo a LBPDDS or LDRYGB. These procedures will create malabsorption of both micro- and macronutrients and lead to better sustained weight loss (see Fig. 1).

Conclusion

Failed LRYGB should be managed after careful evaluation of the patient's presentation. Patients may present with sig-

nificant nutritional deficiencies/complications, failure to lose weight, or weight recidivism. A treatment algorithm has been proposed based on the literature to guide bariatric surgeons with respect to management options. However, given the paucity of research with respect to this issue, additional studies are needed to provide more insight on the optimal surgical management.

Disclosure Statement

No competing financial interests exist.

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