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SURGERY FOR OBESITY AND RELATED DISEASES

Surgery for Obesity and Related Diseases 13 (2017) 1272–1277

Original article

Conversion of failed Roux-en-Y gastric bypass to biliopancreatic diversion with duodenal switch: outcomes of 9 case series

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Received April 14, 2017; accepted April 18, 2017

Abstract

Introduction: Weight regain after Roux-en-Y gastric bypass (RYGB) is a frustrating long-term complication in some patients. Revision of RYGB to biliopancreatic diversion with duodenal switch (BPD-DS) is an appealing option. There is a paucity of information in literature regarding this type of conversion.

Setting: Regional referral center and teaching hospital, Pennsylvania, United States; nonprofit.

Methods: Between 2013 and 2016, a retrospective chart review was performed on all our revision cases. Patients who underwent conversion from RYGB to BPD-DS were selected and analyzed.

Results: Conversion from RYGB to BPD-DS was performed on 9 patients (8 females, 1 male; mean age: 49.2 ± 7.6 [36–61] years). The mean body mass index (BMI) before the initial RYGB was 54.2 ± 14.2 (36.2–79) kg/m^2. The lowest mean BMI reached before conversion was 33.9 ± 6.2 (27.9–43.3) kg/m^2 before it increased to 45.6 ± 8.7 (28.8–60.2) corresponding to excess weight loss (EWL) of 33.1% ± 17.7% (10.6%–68.1%), before conversion. The average operative time was 402.6 ± 65.8 (328–515) minutes for 1-stage conversions. No morbidities, reoperation, or readmission over 30 days postoperatively were reported. No leaks or mortalities were identified. The mean duration of follow-up postconversion is 16.3 ± 13.6 (3–42) months. After conversion surgery, the mean BMI was 35.8 ± 8.2 (27.6–49.5) kg/m^2, while mean EWL loss was 64.1% ± 18.8% (45.9%–88.7%). The BMI of the cohort decreased by a mean of 9.8 ± 5.1 (0.5–16.8) and the EWL increased by 31% ± 23.1% (4%–76.6%).

Conclusion: Our results indicate that conversion of failed RYGB to BPD-DS is laparoscopically or robotically safe and effective. A large cohort study with long-term follow-up is necessary to further assess the safety and efficacy of this method. (Surg Obes Relat Dis 2017;13:1272–1277.)

Keywords: Biliopancreatic diversion; Duodenal switch; Weight regain; Failed gastric bypass; Bariatric surgery

Weight regain and failure to achieve sustained weight loss after bariatric surgery is a daunting outcome for both the patient and bariatric surgeon. Laparoscopic Roux-en-Y gastric bypass (RYGB), which was the predominant bariatric surgery for a long time, is currently the second most common in the United States after sleeve gastrectomy [1]. Remarkably, a 10-year follow-up analysis of RYGB outcomes revealed failure and weight regain rates between 20–35% based on final body mass index (BMI) ≥35 kg/m^2 for morbidly obese and super-obese patients with BMI ≥40 kg/m^2. Super-obese patients (BMI >50 kg/m^2), had the highest weight regain with nearly 58% having BMI >35 kg/m^2 [2].

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http://dx.doi.org/10.1016/j.soard.2017.04.021

1550-7289/

In the absence of obvious anatomic reason for weight regain with extreme caution in patient selection, laparoscopic conversion of RYGB to biliopancreatic diversion with duodenal switch (BPD-DS) appears to be the most effective revisional procedure with sustained weight loss and adequate complication rate [3,4].

Herein, we report our case series of 9 patients who were converted from RYGB to BPD-DS due to weight regain, via laparoscopic or robotic approach.

Methods

A retrospective chart review was performed on prospectively collected data between January 1, 2013 and December 31, 2016. Patients who underwent conversion from RYGB to BPD-DS were identified and selected. Patient characteristics and preoperative variables including weight, excess weight (EBW), and BMI were recorded. Additionally, details on the primary RYGB, operative approach, and lowest BMI reached before conversion were obtained. Postconversion and overall Excess Weight Loss (EWL) calculations were determined using the initial BMI before RYGB. Calculation of ideal weight for each patient was based on a BMI of 25 kg/m^2. The EWL was calculated according to this formula: (Initial weight – current weight) / (initial weight – ideal weight (based on a BMI of 25 kg/m^2).

Patient selection and operative technique

Patients who regained weight after RYGB were assessed thoroughly at the office by a specialized team; a nutritionist, bariatric nurse, psychiatrist, and bariatric surgeon. The assessment included a detailed history and physical examination, comprehensive metabolic panel, upper endoscopy to identify pouch anatomy, pouch dilation or ulceration, and an upper gastrointestinal series to rule out any correctable anatomic abnormalities like gastrogastric fistula. It is important to educate the patient about all the possible complications of a complex revision procedure and document the willingness of long-term compliance with vitamin supplementation for BPD-DS. Abdominal CT scan with angiography is routinely performed to determine the integrity of the left gastric artery as the main blood supply for the gastrogastric anastomosis. All patients who are considered for any revision procedure at our bariatric and metabolic institution enrolls in a 6-month revision program. The program includes a comprehensive weight loss diet, monthly nutrition visits, attendance to support group, and educational sessions on revision surgery. One week before surgery, all patients follow a strict preoperative diet consisting of a low carbohydrates and fat, protein rich diet, to minimize the liver size.

Preoperative deep vein thrombosis and antibiotic prophylaxis are given as part of the routine protocol. Whether robotic or laparoscopic approach is chosen, the technique remains the same. First, the excluded stomach and gastric pouch are dissected from adhesions to prepare for a tension free gastrogastric anastomosis. Extreme caution is taken not to compromise the left gastric artery. The greater omentum is separated from the excluded stomach by harmonic sealing device (Ethicon Endo-Surgery, USA). The retrogastric adhesions are cleared with extreme caution. The gastric pouch is resected at the gastrojejonostomy using 4.1-mm green load powered stapler ECHELON FLEX™ GST (Ethicon Endo-Surgery, USA). There is no need to resect the entire original roux limb straight toward the jejunojejunostomy since it merely acts as a blind limb. The gastric continuity is reestablished by hand sewn anastomosis, using laparoscopic or robotic technique. It is essential to line up the lesser curvature to prevent any torsion. The gastrogastric anastomosis should at least accommodate a 32 F tube to prevent anastomotic stricture. Once orogastric continuity is established, the vertical sleeve gastrectomy is performed by firing multiple 4.1-mm green load linear staplers; care must be taken to avoid involving the hand sewn anastomosis in stapling. The rest of the procedure is continued as regular BPD-DS. In brief, a common channel of 100 to 125 cm from the ileocecal valve is selected for the ileoileal anastomosis. A measurement of 150 cm is counted proximal to this point and hand sewn duodenoileal anastomosis is constructed. The mesenteric defect over the ileoileostomy is routinely closed. A detailed video with specific technical consideration on the conversion of failed RYGB to BPD-DS has been described previously by our group [5].

Ethical considerations

In accordance with the United States code of Federal Regulations for the Protection of Human Patients, institutional review board waiver was obtained for this study.

Results

Between 2013 and 2016, conversion from RYGB to biliopancreatic diversion with duodenal switch was performed on 9 patients; 8 females and 1 male of a mean age 49.2 ± 7.6 (36–61) years. All patients had at least one comorbidity. The mean BMI before the initial RYGB was 54.2 ± 14.2 (36.2–79) kg/m^2. Two patients had their RYGB performed by laparotomy. In regard to alimentary limb orientation, 6 patients had an antecolic orientation versus 3 retrocolic. The lowest mean BMI reached before conversion was 33.9 ± 6.2 (27.9–43.3) kg/m^2, mean EWL % 65.6% ± 21.6% (30.6%–91.3%). The average time frame from the initial RYGB to conversion to BPD-DS was 10.6 ± 4.2 (3–17) years. Preoperative endoscopy and upper gastrointestinal series showed a high suspicion of gastrogastric fistula in patient number 3, which could be a source of weight regain (Table 1).

Table 1
Preconversion patient characteristics

Patient number	Age	Gender	BMI Before initial RYGB	RYGB type (Lap VERSUS open, retrocolic or anticolic)	Nadir BMI And EWL%	Time in years from initial surgery to revision to DS.	Preconversion BMI (kg/m2), weight (lb.), and EWL%
1	36	F	60	Open, antegastric-retrocolic RYGB	BMI:36.4 EWL%:67.4	13	BMI: 48.2 W: 284 EWL%: 36.5
2	49	F	53.5	Lap Retrocolic-retrogastric	BMI:27.9 EWL%: 91.3	13	BMI: 44.8 W: 220 EWL%: 32.3
3*	52	F	52.1	Lap antecolic-antegastric	BMI:28 EWL%: 87	11	BMI: 43.2 W: 268 EWL%: 36.5
4	43	F	36.2	Lap antecolic-antegastric	BMI:32.9 EWL%: 30.6	6	BMI: 39.4 W: 192 EWL%: 29
5	61	F	45	Lap antecolic-antegastric	BMI:35.8 EWL%:60	9	BMI: 44.4 W: 236 EWL%:10.6
6	45	F	55.1	Lap Retrocolic-retrogastric	BMI:43.3 EWL%:38.9	10	BMI: 51.7 W: 311 EWL%: 10.6
7	47	F	36.9	Lap antecolic-antegastric	BMI:28.8 EWL%:62.8	3	BMI: 28.8 W: 184 EWL%: 68.1
8	52	M	79	Lap antecolic-antegastric	BMI:43 EWL%:62.2	13	BMI: 60.2 W: 420 EWL%: 26.8
9	58	F	70	Open RYGB. Antecolic-antegastric	BMI:28.7 EWL%:90.5	17	BMI: 49.5 W: 319 EWL%: 47.1

BMI = body mass index; RYGB = Roux-en-Y gastric bypass, EWL = excess weight loss; W: weight
*preoperative evaluation showed a high suspicion of gastrogastric fistula.

Before conversion, the mean BMI and EWL% were 45.6 ± 8.7 (28.8–60.2) kg/m^2 and 33.1% ± 17.7% (10.6%–68.1%), respectively. In 7 patients out of 9, a 1-stage conversion was done in the same setting. A 2-stage conversion was required in 2 patients due to extensive adhesions found intraoperatively probably owing to the previous gastric bypass. The operative approach was robotic assisted in 4 patients, laparoscopic in 4 patients, and 1 with open incision. The length of the common channel from the ileocecal valve to the ileoileal anastomosis was 100 cm in 6 patients and 125 cm in 2 patients, based on the surgeon's preference. One patient had a common channel length of 200 cm as conversion to BPD-DS was mainly due to refractory ulcer formation at the gastrojejunal anastomosis. The average operative time for those patients who underwent 1-stage conversion was 402.6 ± 65.8 (328–515) minutes (Table 2).

No morbidities, reoperation, or readmission over 30 days postoperatively were reported. No leaks or mortalities were identified. The mean duration of follow-up postconversion is 16.3 ± 13.6 (3–42) months. As each patient had different interval of follow-up depending on the time of surgery, BMI and EWL% were recorded according to the last documented visit to our institution. The mean BMI was 35.8 ± 8.2 (27.6–49.5) kg/m^2, while mean EWL% loss was 64.1% ± 18.8% (45.9%–88.7%). The BMI of the cohort decreased by 9.8 ± 5.1 as an average (0.5–16.8) kg/m^2 and the EWL% increased by 31% ± 23.1% (4%–76.6%) (Table 2; Fig. 1).

Discussion

RYGB was the most commonly performed bariatric surgery in the United States for quite some time [6]. Long-term results of RYGB showed dramatic weight loss along with significant resolution of co-morbidities. Nevertheless, up to 58% of patients regained significant weight over time in a 10-year follow-up study [2,7–11]. It is worst for patients who are super-obese with BMI >50 kg/m^2 to maintain a weight loss after RYGB for a long term. Failure to maintain weight loss after RYGB could be behavioral or anatomic. Patients may change their dietary habits and increase calorie intake by consuming more sweets and liquid calories or by eating too frequently. Equally relevant are anatomic factors such as gastrogastric fistula, dilation of gastric pouch, dilation of the gastrojejunal anastomosis, and/or dilation of the roux limb. The counteractive adaptation of the small bowel after malabsorptive procedures produce a compensatory energy retention [12]. While there is no consensus among bariatric surgeons about the optimal

Table 2
Postconversion patient outcome

Patient number	One stage versus 2 stages	Common channel length/approach	Surgery time (minutes)	Length of stay (days)	30 days Morbidity, readmission, reoperation and Mortality	Follow up (month)	BMI and weight in lb.	Overall EWL% since original weight before first operation
1	One	100 cm/Robotic assisted	449	5	None	17	BMI: 43.1 W: 259	48.4%
2	One	125 cm/ Laparoscopic	341	5	None	32	BMI: 30.9 W: 156	78.4%
3	One	100 cm/Robotic assisted	515	5	None	20	BMI: 28.2 W: 175	88.7%
4	One	125 cm/Robotic assisted	386	6	none	6	BMI: 31 W: 181	45.9%
5	One	100 cm/ Laparoscopic	372	6	none	18	BMI: 27.6 W: 149	87.2%
6	One	100 cm/ Laparoscopic	328	5	None	6	BMI: 43.1 W: 259	39.5%
7	Two	200 cm/OPEN	229	5	None	42	BMI: 28.3 W: 181	72%
8	One	100 cm/ Laparoscopic	427	4	None	3	BMI: 49.5 W: 345	49.1%
9	Two	100/ Robotic assisted	322	3	None	3	BMI: 40.1 W: 258	67.5%

BMI: body mass index; EWL: excess weight loss; W: weight

approach for patients who regain weight after gastric bypass, it is of utmost importance to perform extensive assessment. As detailed above in the *Patient selection and operative technique section*, all patients who are considered for any revision procedure in our bariatric and metabolic institution are enrolled in a 6-month revision program.

BPD-DS is one of the most effective bariatric procedures available in regard to weight loss and metabolic co-morbiditiy resolution. The BPD-DS was especially superior in those patients with BMI >50 kg/m^2 [13–17]. We performed more than 700 BPD-DS over the last 7 years. Despite its technical difficulty and potential complications, it is the authors' belief that conversion of failed RYGB to BPD-DS in carefully selected patients and by experienced BPD-DS surgeons offers promising results.

In our case series, 9 patients were converted from RYGB to BPD-DS. The main indication was weight regain. However, in 2 patients, conversion was done due to complications: persistent ulcer formation at the gastro-jejunal anastomosis and the presence of gastrogastric fistula. The mean BMI before the initial RYGB was 54.2 ± 14.2 (36.2–79) kg/m^2. The lowest mean BMI reached before conversion was 33.9 ± 6.2 (27.9–43.3) kg/m^2, with mean EWL% 65.6% ± 21.6% (30.6%–91.3%). After gaining

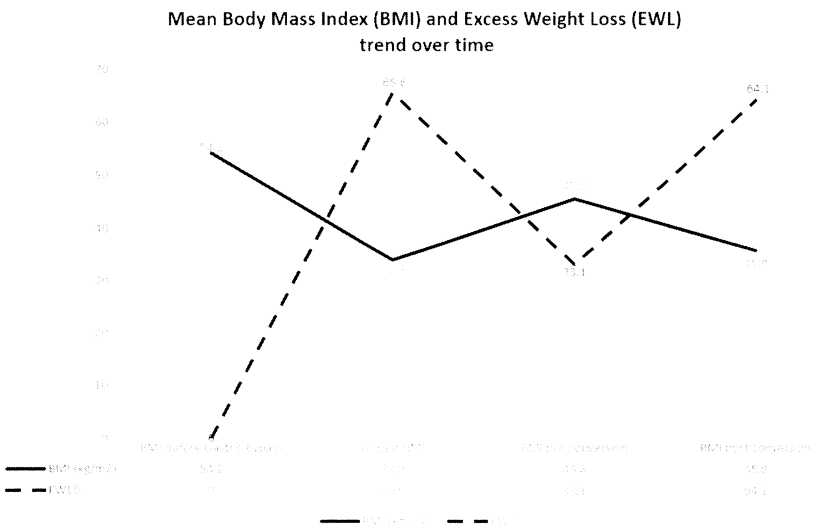

Fig. 1. Mean Body Mass (BMI) Index trend over 4 periods. BMI before gastric bypass, lowest BMI, BMI before biliopancreatic diversion with duodenal switch (BPD-DS) conversion and BMI post BPD-DS conversion.

weight, the mean BMI upturned to 45.7 (28.8–60.2) kg/m^2. The conversion surgery is exceptionally demanding in technique; the average operative time was 402.6 ± 65.8 (328–515) minutes for 1-stage conversions. We aim to perform the conversion in 1 stage. Nonetheless, in 2 patients we had to separate the conversion to 2 stages due to the long time needed in adhesion take down. We prefer to resume the orogastric continuity by a hand-sewn anastomosis to decrease the likelihood of stricture formation. We partially resect the original roux limb after dividing it from the gastrojejunal anastomosis. It is not necessary to resect it straight toward the jejunojejunostomy. It is the authors' opinion that restoring continuity of the original roux limb, rather than resecting it may add extra risk of anastomotic leak with no pronounced benefit in the increase of absorptive surface. On the contrary, unusually long original roux limbs raise the concern of bacterial overgrowth as concluded from previous literature of Jejunoileal bypass [18].

No short-term complications, anastomotic leaks, or mortalities were encountered. From the nutritional point of view, only one patient had correctable vitamin E and D deficiency. To determine the exact EWL% for all patients, it is ideal to report the EWL% for all patients at an identical timeframe. Nevertheless, the number of patients who qualify for these complex conversions are limited. The last measured BMI and EWL% for each patient were documented. The mean BMI was 35.8 ± 8.2 (27.6–49.5) kg/m^2, while mean EWL% loss was 64.1% ± 18.8% (45.9%–88.7%). The BMI of the cohort decreased by 9.8 ± 5.1 as an average (0.5–16.8) kg/m^2 and the EWL% increased by 31% ± 23.1% (4%–76.6%).

In literature, there are 3 case series published which described the results of BPD-DS conversion from failed RYGB. In 2004, Keshishian et al. reported 46 conversions with excess weight loss of 69% at 30-month follow-up. It is important to mention 16 patients out of 46 had vertical banded gastroplasty (VBG), 26 patients underwent RYGB, and 5 patients had previously been converted from VBG to RYGB. No mortalities were reported. However, 4 anastomotic leaks occurred; 2 out of 5 patients were converted from VBG to RYGB before final conversion to BPD-DS [19]. Likewise, in 2007 Gagner et al. reported the results of 12 patients who were laparoscopically converted from RYGB to BPD-DS. At 11 months, the mean excess weight loss was 63% with no mortality or leak recorded. In the same study, Gagner reviewed the literature about possible endoscopic and laparoscopic solution for failed gastric bypass due to weight regain [20]. Recently, Cottam et al. reported the results of 32 patients who were converted to BPD-DS from failed RYGB. Of the 32 patients, 23 patients underwent conversion to single anastomosis duodenal switch and 9 patients with Roux-en-Y reconstruction. The overall EWL percentage was 56.4% at 24-month follow-up and were not statistically significant between both groups [21]. Since the conversion from RYGB to BPD-DS is performed infrequently, long-term results of patients who underwent the conversion will better define its role in revisional surgery. The limitations of the present study are elucidated in retrospective data collection, small number of patients, and variation in follow-up periods.

Conclusion

Conversion of failed RYGB to BPD-DS for weight regain is shown to be technically feasible and offers satisfactory weight loss. Proper patient selection and extensive workup preoperatively may decrease the complication rate of the conversion.

Disclosures

The authors have no commercial associations that might be a conflict of interest in relation to this article.

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SURGERY FOR OBESITY AND RELATED DISEASES

Surgery for Obesity and Related Diseases 13 (2017) 1278–1283

Original article

Bile reflux of the remnant stomach following Roux-en-Y gastric bypass: an etiology of chronic abdominal pain treated with remnant gastrectomy

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Received January 19, 2017; accepted April 6, 2017

Abstract

Background: Bile reflux gastritis of the remnant stomach following Roux-en-Y gastric bypass (RYGB) causing chronic abdominal pain has not been reported. We report a series of symptomatic patients with remnant gastritis treated effectively with remnant gastrectomy (RG).

Objective: The objective was to report our experience with bile reflux remnant gastritis after RYGB and our outcomes following RG.

Setting: Community teaching hospital.

Methods: All patients undergoing RG were retrospectively reviewed for presenting symptoms, diagnostic workup, pathology, complications, and symptom resolution.

Results: Nineteen patients underwent RG for bile reflux gastritis at a mean of 4.4 years (52.3 mo, range 8.5–124 mo) after RYGB. All patients were female and presented with pain, primarily epigastric (18/19; 95%), and described as burning (11/19; 58%), with 10 (53%) reporting nausea. Endoscopy was performed preoperatively on all patients with successful remnant inspection in 13 (68%), using push endoscopy (n = 10) or operative assist (n = 3), with 12 (of 13; 92%) biopsy-positive for reactive gastropathy. Seventeen (90%) completed a hepatobiliary scintigraphy scan with 100% positivity demonstrating bile reflux across the pylorus. Surgical approach was laparoscopic or robotic in 18 (95%) with a hospital length of stay of 2.7 days (range 0–12 d), with no major complications or readmissions. Pathology of the remnant confirmed reactive gastropathy in 90% (n = 17). Ninety percent of patients (n = 17) reported sustained symptom resolution, and 11% of patients (n = 2) remained symptomatic at last follow-up. We followed all patients for a mean of 6.6 years (1–194 mo).

Conclusion: Bile reflux gastritis of the remnant stomach is a new consideration for chronic abdominal pain months to years following RYGB. Hepatobiliary scintigraphy imaging and endoscopic biopsy are highly suggestive. RG is safe and effective treatment. (Surg Obes Relat Dis 2017;13:1278–1283.)

Keywords: Roux-en-y gastric bypass; Complications; Bile reflux; Remnant gastritis; HIDA; Revision

Roux-en-Y gastric bypass (RYGB) is one of the most common and effective metabolic surgery procedures [1]. However, there are several reported long-term complications [2]. Chronic abdominal pain after RYGB is an especially difficult entity to diagnose and treat. Previously described late presentations of abdominal pain after RYGB are caused by internal hernia, anastomotic structure, bowel obstruction, marginal ulcer, cholecystitis, and intussusceptions, but causes of abdominal pain not explained by these

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http://dx.doi.org/10.1016/j.soard.2017.04.007
1550-7289/