Gastrojejunal sleeve as a revisional surgery for a failed Roux-en-Y gastric bypass

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Background
Roux-en-Y gastric bypass (RYGBP) is one of the best solutions for morbid obesity, but secondary weight regain is seen in about 15–25% of cases. In this prospective study, we assessed the short-term success of gastrojejunal sleeve along with jejunojejunostomy distalization as a revisional procedure in cases of failed RYGBP.
Patients and methods
This study included 13 cases of failed RYGBP done at least 3 years earlier; all were assessed using three-dimensional virtual gastrography. All patients were followed up for 2 years.
Results
Mean BMI decreased from 44.2±6.04 to 30.7±4.06 kg/m^2; mean excess weight loss was 28.1±23%; and comorbidities improved in 62.5% of cases. Mean operative time was 204±33 min, while the mean postoperative hospital stay was 3 days. No mortalities, conversions, or major complications were observed among the patients included in this study.
Conclusion
Gastrojejunal sleeve with jejunojejunal distalization is a safe, feasible, and effective revisional procedure for a failed RYGBP.

Keywords:
bariatric surgery, gastrojejunal sleeve, laparoscopy, morbid obesity, Roux-en-Y gastric bypass

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Introduction

The number of obese people worldwide is ~500 million (representing 10% of the world's population [1,2]) and bariatric surgery is the most effective method for treating morbid obesity [3]. A Roux-en-Y gastric bypass (RYGBP) surgery typically shows excellent early results, but secondary weight regain has been observed in 15–25% of RYGBP patients. This represents the main indication for a reoperation, which usually occurs 3–5 years after the original surgery [4]. This weight regain may be due to behavioral or anatomical factors in the form of poor eating habits, gastric pouch dilatation, anastomotic stomal dilatation, or jejunal dilatation [5]. Revisional bariatric surgery can be technically challenging and it carries a high rate of complications [6,7]. There is no ideal technique for the revisional surgery. It may involve reducing the size of the pouch, narrowing the anastomosis or making a new one, or even converting to a more distal bypass [8].

In this prospective study, we assess the effects of using a gastrojejunal sleeve (GJS) with a distalization of the jejunojejunostomy and its short-term success as a revisional procedure for a failed RYGBP in morbidly obese patients.

Patients and methods

This prospective study was conducted between January 2015 and May 2018. The study was approved by the ethical committee in our department and all the patients signed a written consent after full explanation of the procedure and its possible complications. Thirteen failed RYGBP cases underwent GJS surgeries and were assessed for a period of 2 years following the operation. The primary follow-up included measurement of weight loss, while the secondary follow-up included assessment of comorbidities. The patients were operated upon after fulfilling the bariatric procedure criteria, as follows: BMI more than 40 kg/m^2 without comorbidities or BMI more than 35 kg/m^2 with associated bariatric-related comorbidities, according to 1992 National Institutes of Health guidelines [9]. All of the patients had undergone laparoscopic RYGBPs at least 3 years before the revisional surgery (range, 3–7 years), and they exhibited weight regain with or without a recurrence or worsening of their comorbidities.

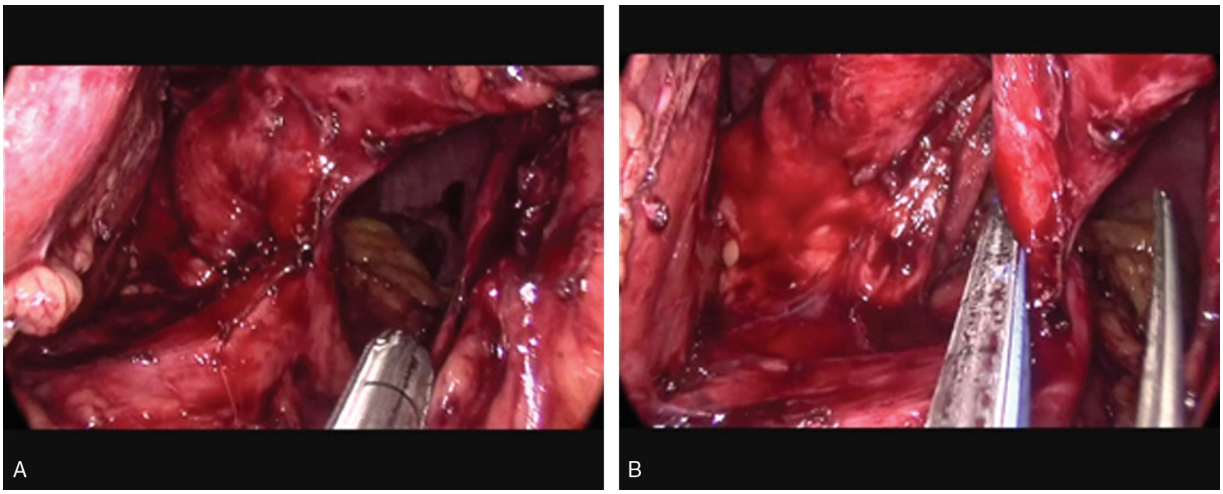
Each of the patients was subjected to a thorough clinical examination and full laboratory investigation with regard to the preoperative requirements, as well as special investigations when needed. Additionally, each patient underwent a preoperative three-dimensional computed tomography virtual gastrography (Figs 1–6) in order to assess the gastric pouch size and the presence of any other abnormalities.

Our operative technique included placing ports similar to those used in an RYGBP and the dissection of the

Figure 1

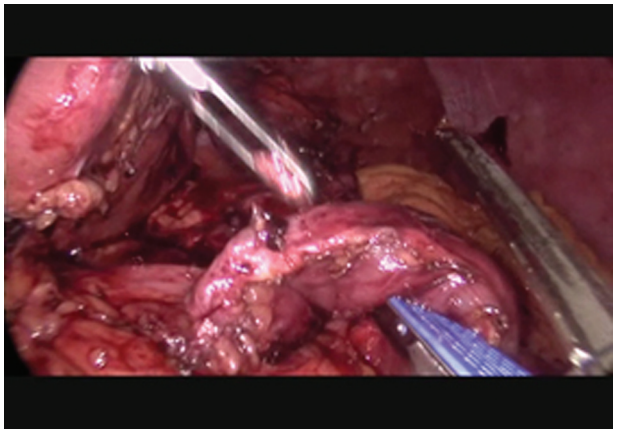
(a) Three-dimensional computed tomography scan used for the assessment of the pouch size and (b) a large pouch with a gastro-gastric fistula.

Figure 2



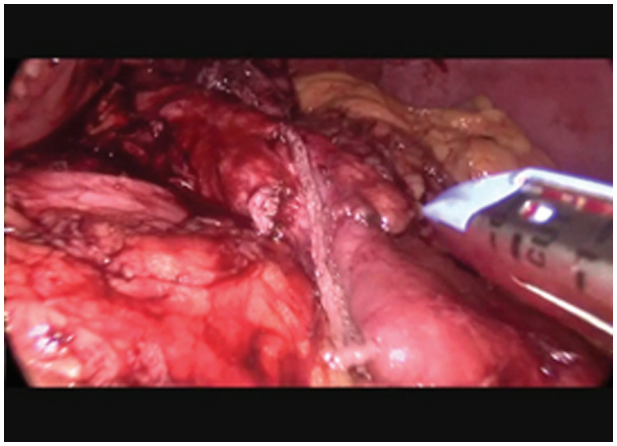
(a, b) Gastro-gastric fistula stapling.

Figure 3



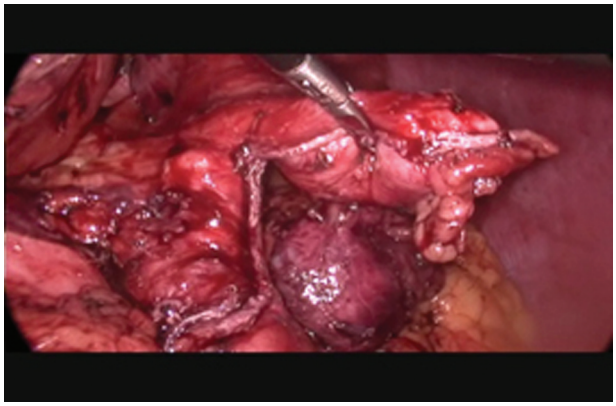
Roux loop excision.

Figure 4



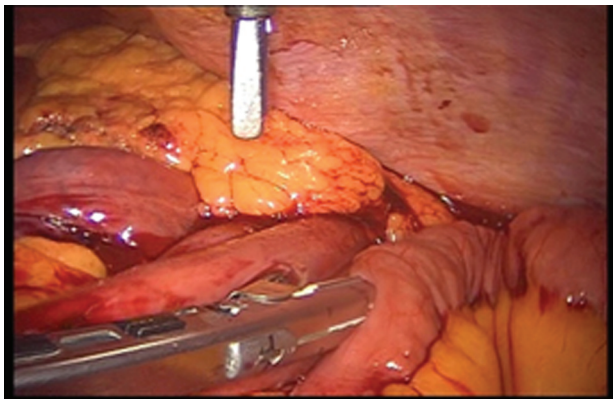
Jejunal sleeving over the bougie.

Figure 5



Gastric pouch reduction.

Figure 6



Distalization of the enteroenterostomy.

adhesions was conducted using sharp dissection and a vessel sealing system (LigaSure; Covidien, Medtronics, Minneapolis, USA). After identifying the anatomical landmarks, a 38 Fr bougie was passed through the pouch to the Roux loop, and the end of the Roux loop was excised using an Endo GIA 60 mm blue cartridge (Covidien). We used Endo GIA blue cartridges to

tighten the jejunal loop beginning ~12 cm away from the anastomosis. Green or purple cartridges were used with tri-stapler purple loads in accordance with tissue thickness (Covidien).

We continued upwards toward the hiatus, over the bougie, and the whole segment was excised and placed outside of the body. The small bowel was inspected and measured from the duodenojejunal junction and the previous enteroenterostomy was identified. The anastomosis was divided using one or two blue cartridges and a 1.5 m distalization of the anastomosis was then conducted, keeping at least 250 cm of the common channel, which was confirmed by measuring from the ileo-cecal junction. The new enteroenterostomy was created using a 60 mm blue cartridge. Any anatomical abnormalities were also corrected, including reduction of hiatal hernias along with crural repair, using nonabsorbable sutures or division of gastro-gastric fistula using blue 60 mm cartridges. Finally, methylene blue testing was conducted, followed by the application of a nasogastric tube (for the first 24 h) along with a nonsuction intra-abdominal drain (Nelaton 20 Fr catheter).

Each patient was kept nil *per os* for 24 h postoperatively, after which they started oral fluids within the ward. The postoperative anticoagulation treatment was maintained for at least 5 days, along with antibiotic coverage and suitable analgesia until discharge. The patients were followed up regularly at 1 week and at 3, 12, 18, and 24 months.

The patients were assessed with regard to any intraoperative or postoperative complications, the operative time, the hospital stay, any excess weight loss (EWL), and any improvements in their comorbidities.

Results

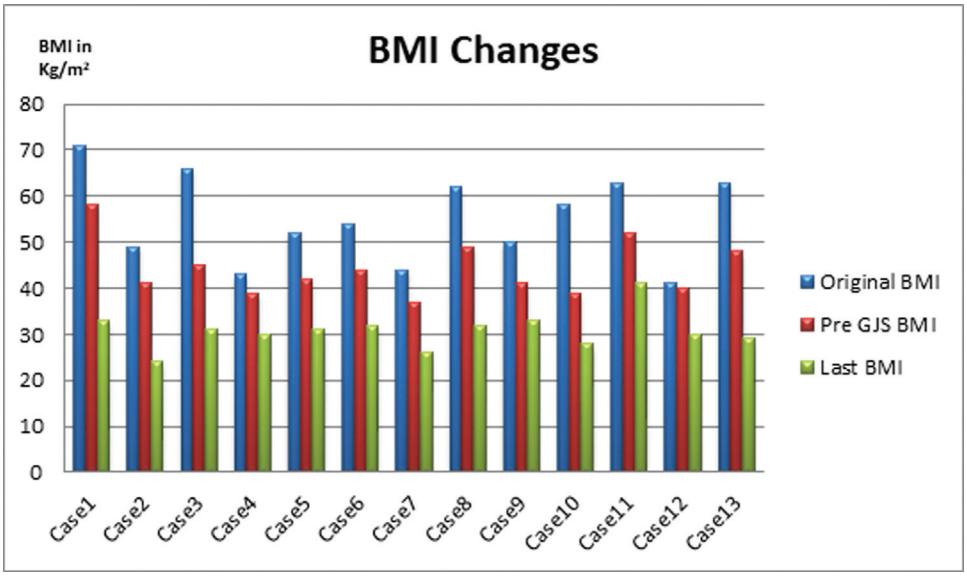
Demographic data

Five men and eight women were included in this study with a mean age of 38.6±9.6 years. The mean BMI prior to RYGBP was 55.07±9.5 kg/m^2. The period between the RYGBP and the GJS ranged between 36 and 81 months, with a mean of 53.4±14.3 months. The mean of the prerevision BMIs was 44.2±6.04 kg/m^2, which changed after the GJS surgeries to 30.7 ±4.06 kg/m^2; thus, the mean of the additional BMI losses after the GJS surgeries was 13.3±4.85 kg/m^2 (Fig. 7). The mean of the prerevision EWLs was 34 ±12%, which changed after the GJSs to 58.6±25.3% (thus GJS offered an EWL of 28.1±23%). Comorbidities improved in five cases and persisted in three, with an improvement rate of 62.5% (Table 1).

Complications

There was a single case with significant intraoperative bleeding from a major branch of the left gastric vessels that was successfully controlled by clipping. Additionally, there was another case of bleeding from a left lobar hepatic injury that was controlled using compression and a LigaSure (Covidien) device. Surgicel Fibrillar (Ethicon US, LLC, Somerville, New Jersey, USA) was then applied and the patient received

Figure 7



BMI changes associated with RYGBP and GJS. GJS, gastrojejunal sleeve; RYGBP, Roux-en-Y gastric bypass.

Table 1 Preoperative and postoperative data

Cases	Age (years)	Sex	Original BMI	Time between procedures (months)	Prerevision BMI (kg/m^2)	Postrevision BMI (24 months)	Comorbidity	3D CT findings	Preoperative EWL (%)	Postoperative EWL (%)	Improved comorbidity
Case 1	33	M	71	53	58	33 (–25)	HTN	Large pouch + GG fistula	28	32 (+4)	–
Case 2	27	F	49	46	41	24 (–17)	–	Large pouch	33	104 (+71)	–
Case 3	45	F	66	38	45	31 (–14)	DM+HTN	Large anastomosis	51	30 (+21)	HTN
Case 4	39	F	43	40	39	30 (–9)	DM	Large pouch	22	35 (+13)	–
Case 5	24	F	52	44	42	31 (–11)	Osteoarthritis	NA	37	35 (+2)	–
Case 6	48	M	54	51	44	32 (–12)	–	Large pouch	34	37 (+3)	–
Case 7	53	F	44	43	37	26 (–11)	IHD+HTN	Large pouch+HH	36	91 (+55)	IHD
Case 8	25	F	62	59	49	32 (–17)	–	Large pouch	35	70 (+35)	–
Case 9	33	M	50	81	41	33 (–8)	–	NA	36	62 (+26)	–
Case 10	49	F	58	63	39	28 (–10)	Bronchial asthma	HH	57	78 (+21)	–
Case 11	41	M	63	67	52	41 (–11)	–	NA	29	40 (+11)	–
Case 12	38	M	41	36	40	30 (–10)	DM	Large pouch	6	66 (+60)	–
Case 13	47	F	63	74	48	29 (–19)	DM +osteoarthritis	GG fistula	39	82 (+43)	DM
Average	38		55	53	44	30 (–13)			34	58 (+28)	62.5

3D, three dimensional; CT, computed tomography; DM, diabetes mellitus; EWL, excess weight loss; GG, gastro-gastric; HH, hiatal hernia; HTN, hypertension; F, female; IHD, iscaemic heart disease; M, male.

1 U of blood. There was a single case with an intestinal injury caused by a grasper that was identified intraoperatively and closed with 3-0 Vicryl sutures (Ethicon Inc.). Finally, there was one case with a small diaphragmatic injury received during the dissection of a hiatal hernia and it was closed with nonabsorbable Ethibond sutures (Ethicon Inc.).

There were no mortalities, no conversions to open surgery, and no major postoperative complications, with the exception of a single case of postoperative pneumonia that was managed successfully in the ICU with no further complications.

Only three of the patients required postoperative ICU admissions.

The mean operative time for all patients was 204 ±33 min, while the mean postoperative hospital stay was 3 days for most of the patients. Three patients stayed in the hospital between 4 and 6 days (two cases were admitted to the ICU; one had pneumonia; and the other had suspected deep vein thrombosis that was eventually ruled out).

There were two late readmission cases. One case developed acute appendicitis 7 months later and the patient underwent a laparoscopic appendectomy. The other case developed symptomatic gallstones and persistent biliary colic, for which the patient underwent a laparoscopic cholecystectomy 11 months after the GJS.

Discussion

Weight regain after an RYGBP is not uncommon and can be due to poor eating habits or anatomical causes such as a pouch dilatation, anastomotic stoma dilatation, or jejunal dilatation with increased food absorption.

In this study, we revised the RYGBPs using a laparoscopic reduction of the gastric pouch size, anastomotic stoma, and proximal jejunum. This was done over a 38 Fr bougie using a linear stapler. A complementary resection of the blind end of the alimentary limb at the gastroenterostomy site was then conducted, along with a distalization of the previous enteroenterostomy. The restriction of the pouch size and the proximal jejunum helped the patients lose weight as a consequence of an easier technique than that used by Mason *et al.* [10] for their RYGBP revisions. They resected the gastrojejunostomy and reconstructed it in order to create a new narrow stoma. This was a difficult technique that carried with it the risks related to creating a new anastomosis and the results were unsatisfactory: 15% of the patients required an additional operation [10]. In the present study, the distalization of the enteroenterostomy provided an element of malabsorption and added to the aforementioned benefits.

Schwartz *et al.* [11] used the same technique as that of Mason and colleagues, and the reported complication rate was 50% greater and with poor weight loss. In a study done by Parikh and colleagues on 13 patients, the failed RYGBPs were revised by using a 40 Fr bougie guided into the jejunum. A linear stapler was then used along the jejunum, anastomosis, and gastric pouch. After a mean follow-up of 12 months, the EWL was only 12.8% and the BMI decreased by only 2.7 kg/m^2, while the comorbidity resolution rate was 22% (two out of nine cases). Moreover, the mean operative time was 156 min and the mean hospital stay was 3 days [12]. In our study, after a follow-up period of 24 months the EWL was ~28% and BMI had decreased by ~13 kg/m^2. The comorbidity resolution was 62.5% (five out of eight cases); the mean operative time was 204 min; and the mean postoperative hospital stay was 3 days. Thus, our study had a longer postoperative follow-up period (24 months) and distalization was done in all of the patients, unlike the study by Parikh and colleagues.

In another study carried out by Müller and colleagues on five patients with dilated pouches after RYGBPs, pouch resizing was conducted along with a reanastomosis using a circular stapler. The mean BMI decreased by 3.9% after 1 year, while the comorbidity rate of improvement was 80% (four out of five cases). The mean operative time was 109 min and the mean hospital stay was 8.4 days [13].Many other surgical techniques have been established as revisional procedures for failed RYGBPs, including the application of an adjustable gastric band to the proximal pouch. This was the case for two studies which achieved EWLs of 47 and 49%, respectively [8,14]. Several studies have found that conversion to a distal RYGBP carries a high risk of malabsorptive complications (up to 33%) [15–17], while another study found that conversion to sleeve gastrectomy resulted in a mean EWL at the end of 1 year of 35.8% [18].

Conclusion

On the basis of our results, we conclude that a GJS with an anastomotic distalization is a safe, feasible, and

effective revisional procedure for a failed RYGBP in the management of morbidly obese patients.

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Nil.

Conflicts of interest
There are no conflicts of interest.

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