Laparoscopic Reversion of One-Anastomosis Gastric Bypass to Normal Anatomy: Case Series and Literature Review

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Case series
Patients: Female, 40-year-old • Female, 30-year-old • Female, 40-year-old • Female, 28-year-old • Female, 52-year-old
Final Diagnosis: Revision bariatric surgery
Symptoms: Biliary reflux • depression • edema • food intolerance • gastritis • liver failure • neuropathy • social pressure
Medication: —
Clinical Procedure: —
Specialty: Surgery
Objective: Unusual or unexpected effect of treatment
Background: Revisional bariatric surgeries to other restrictive or malabsorptive procedures are considered for inadequate weight reduction, weight regains, or complications. Literature on the application of reversion of one-anastomosis gastric bypass (OAGB) to normal anatomy is limited. We aimed to report our experiences with 5 OAGB reversion surgeries to normal anatomy that were conducted for different reasons.

Case Reports:
Case 1: A 40-year-old woman underwent OAGB. She had peripheral neuropathy, lower limb edema, food intolerance, and biliary reflux. For those reasons, we performed revisional surgery. Case 2: A 30-year-old woman underwent OAGB. She had tiredness, dizziness, multiple fainting, and lower limb edema. Laboratory results showed hypoglycemia, mild hypoproteinemia, and proteinuria. Dietary instructions were unsuccessful. Therefore, we performed revisional surgery. Case 3: A 40-year-old woman underwent OAGB. She had reached a body mass index (BMI) of 19, which was not appreciated by her social contacts and caused her to experience depression. After a psychiatric assessment, she insisted on revisional surgery. Case 4: A 28-year-old woman underwent OAGB. Her BMI was 18, which was not accepted by her spouse, who criticized her body image. For that, we did revisional surgery. Case 5: A 52-year-old woman with hypothyroidism underwent OAGB. She had poor compliance with dietary instructions, complicated by liver failure, which was conservatively managed. She underwent revisional surgery after optimizing her condition. She was discharged in stable condition.

Conclusions: A multidisciplinary team should evaluate patients, and the decision to revise should come only after the failure of all conservative management methods.

Keywords: Bariatric Surgery • Gastric Bypass • Liver Failure

Abbreviations: OAGB – revisional one-anastomosis gastric bypass; BPL – biliopancreatic limb; BMI – body mass index

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Background

Obesity is an epidemic experienced worldwide [1]. According to the World Health Organization, since 1975, obesity has tripled throughout the world, affecting 13% of adults as of 2016 [2]. Many comorbidities are related to obesity. Bariatric surgeries, used to treat obesity, have possible complications, including surgical, nutritional (after surgery), medical, and psychological. One-anastomosis gastric bypass (OAGB) is the third-most commonly performed bariatric surgery worldwide [3]. Many studies have demonstrated OAGB to have low complication rates, short operative duration, and excellent weight-reduction results [4].

Revisional bariatric surgeries to other restrictive or malabsorptive procedures are considered for inadequate weight reduction, weight regain, or complications [5]. In the literature, revisional bariatric surgery to normal anatomy has been reported from certain bariatric surgery types for malnutrition reasons, intolerance, or complications. However, cases of reversion of OAGB to normal anatomy are limited in the literature. In this case series, we aimed to report our experience with 5 OAGB revisional surgeries to normal anatomy, which were conducted for various reasons.

Case Reports

All 5 patients were women. Their ages ranged between 28 and 52 years. Four patients had no past medical history, and 1 had hypothyroidism. A multidisciplinary team (bariatric surgery, internal medicine, clinical nutrition, and psychiatry) assessed all 5 patients before surgery. The patients had undergone OAGB between 2013 and 2018 and revisional surgery between 2015 and 2019, with the shortest period to revisional surgery being 8 months. Two patients had preoperative esophagogastro-duodenoscopy (EGD). Patient 1’s EGD showed a short gastric pouch, biliary reflux, and gastritis. While the EGD for Patient 5 showed only gastritis. We did not conduct postoperative EGD.

Three patients had postoperative complications. Four patients were discharged in stable condition within 5 days after surgery, except Patient 5, who was discharged on day 8. All patients had a short-term follow-up 1 year after the reversal. However, 4 patients had no long-term clinical follow-up, and Patient 1 had a 5-year follow-up.

Case 1

A 40-year-old woman with no past medical history came to the bariatric clinic in a wheelchair with concerns of severe weakness, severe peripheral neuropathy, and clinical lower limb edema. She underwent OAGB in 2013 in another hospital 18 months before this presentation. The patient was assessed by a multidisciplinary team and diagnosed with severe intolerance of food and biliary reflux. The patient had a body mass index (BMI) of 21. Upon examination, she was vitally stable, and we noted symptoms of peripheral neuropathy.

Preoperative investigations were done, including a computed tomography (CT) scan and gastroscopy. Endoscopy showed gastritis, biliary reflux, and a rather short gastric pouch. The patient’s laboratory results showed hypoproteinemia, hypocalcemia, mild anemia, and hypomagnesemia.

We started her on a rehabilitation program comprised of multivitamin replacements, thiamin, B12, iron, and calcium, as well as a high-caloric diet and physiotherapy. The patient was admitted to our hospital after 4 weeks of following the program; improvements in micronutrient deficiency, reduction of edema, and the normalization of albumin were seen. Three days before surgery, the patient was started on albumin and iron supplementation. We revised the OAGB to normal anatomy. The surgery was uneventful. We gradually began the diet on the second postoperative day. The patient was discharged in good condition. She had regular follow-ups during the first year, and 5 years after surgery, the patient had gained weight to a BMI of 32 and was walking with mild limping in her right lower limb.

Case 2

A 30-year-old woman with no past medical history presented with a BMI of 34 and a history of gastric banding. We performed OAGB after the removal of the gastric banding in 2015. The operation was uneventful. The patient lost her excess weight, dropping to a BMI of 19. However, she experienced tiredness, dizziness, and multiple fainting episodes. Additionally, she had lower limb edema. Her laboratory results showed hypoglycemia, mild hypoproteinemia, and proteinuria during the first year of follow-up. She was referred to the Nephrology and Endocrinology Departments for investigation of the proteinuria and recurrent hypoglycemia to rule out insulin-secreting tumors and to conduct all necessary investigations; these results were negative.

The patient was compliant with dietary instructions for multiple meals and was well educated; however, she was not successful in preventing hypoglycemia. To address this, we performed an OAGB reversal to normal anatomy. The surgery was uneventful. She had a postoperative drop of hemoglobin that was treated via blood transfusion, and the patient’s condition stabilized; her blood glucose level was controlled and returned to normal, and her nutritional status improved. Upon follow-up, the patient had regained weight to a BMI of 25 and was in good condition.

Case 3

A 40-year-old woman with no past medical history underwent OAGB in 2014. The surgery was uneventful. Later, she
had concerns of mild diarrhea with a bad odor. Her BMI decreased from 42 to 19. Socially, her lower BMI was not accepted by those around her, who blamed her for being underweight. This caused her to experience mild depression. Upon preoperative assessment by a clinical nutrition specialist and psychiatrist, however, the patient insisted on reversal surgery. We revised the OAGB to normal anatomy in 2016. The surgery was uneventful. She had postoperative gastroparesis, which was managed by the insertion of a nasogastric tube for feeding and intravenous fluids, as well as proton pump inhibitors. At follow-up, she improved and was satisfied and happy due to regaining weight.

Case 4

A 28-year-old woman with no past medical history underwent OAGB in 2014. The surgery was uneventful. She reduced her BMI from 39 to 18, which was not socially accepted by her spouse, who criticized her of being underweight. She had mild depression because of her body image. Clinical nutrition and psychiatric consultations were done. We revised the OAGB to normal anatomy in 2016. The surgery was uneventful. At follow-up, the patient was satisfied with regaining weight.

Case 5

A 52-year-old woman with known hypothyroidism and a BMI of 45 underwent OAGB in 2018. The surgery was uneventful. She began to experience depression, poor compliance with protein supplements and multivitamins, and food intolerance 2 months after surgery. We performed gastroscopy, which showed mild gastritis. She was started on proton pump inhibitors and vitamin B12 and received a psychological consultation. Two months later, she visited our hospital with lower limb edema, urinary tract infection, and generalized weakness. For this, we admitted her, and her laboratory results showed hypoproteinemia, hypocalcemia, and hypoalbuminemia. Her condition was managed, and she was advised to revise to normal anatomy surgery, which she refused. Four months later, she presented to the Emergency Department with severe jaundice, liver impairment, and hepatic encephalopathy. She was transferred to a tertiary hospital. Her brain MRI showed patterns of hepatic encephalopathy, and her liver biopsy resulted in a diagnosis of nonalcoholic steatohepatitis. She also developed pulmonary edema, which required mechanical ventilation. Her condition was conservatively managed in the Intensive Care Unit. During the same admission, she developed nonconvulsive-status epilepticus and critical-illness polyneuropathy, which were managed by the neurology team in the tertiary hospital.

After 3 months, when her condition improved, she was transferred back to our hospital for revisional surgery. She had 4 days of preoperative preparation with condensed enteral feeding and intravenous magnesium, phosphate, albumin, vitamin B12, and thiamin. She underwent uneventful revision surgery. She was transferred to the Intensive Care Unit after surgery. On the eighth postoperative day, she was discharged in stable condition. She was seen in the second week after discharge. She was satisfied and was taking all her protein and vitamin supplements.

Table 1 summarizes the above cases.

Discussion

The advent of new surgeries throughout the last millennium, such as bariatric surgery catering to patients with obesity-related health issues, has led to the evolution of medical practices. As such, the development of surgical techniques and the standardization of operative steps have helped in attaining successful outcomes [6,7]. Additionally, intraoperative or postoperative complications are preventable and can be corrected through the sharing of views and experiences by experts in the field. However, depending on the type of bariatric surgery, compliance of the patient, and experience of the surgeon, complications can cause significant health disturbances.

This study presents a retrospective review of 5 laparoscopic reversal cases of OAGB to normal anatomy that were conducted in a Center of Excellence accredited to perform bariatric surgery. The reversals were necessary as a last resort for the patients in improving their health status, and in 1 case, even resolving liver failure complications. Furthermore, the patients had macronutrient and micronutrient deficiencies, as well as the experience of social and psychological pressures. At our center, we make the gastric pouch to be long and narrow, using 45-mm linear staples from 2 cm below the incisura angularis horizontally; we then use multiple 60-mm staples vertically toward the angle of His, guided by a gastric calibration tube size 36-French, making the gastric pouch 17 to 20 cm. After this, we use biliopancreatic limb (BPL) lengths ranging from 150 to 200 cm, depending on the patients’ BMI before OAGB. We used 150 cm in patients with a BMI between 35 and 40; then, we increased 10 cm with each 1 percentage increase in BMI up to 200 cm maximum for patients with BMI equal to or greater than 45. Out of 750 patients, only 3 patients (0.4%; Patients 1, 2, and 5) had severe nutritional deficiency. All patients were served by a multidisciplinary team that provided holistic approaches to care for, address, and manage the patients’ active problems.

Reversals of OAGB have been less common compared to other types of bariatric surgeries, as the popularity of OAGB has only increased over the last decade. However, reversal is a safe, relatively easy, and feasible procedure, as it does not
Our patients’ preference for complete reversion was the main indication, instead of the shortening of the BPL length. Furthermore, our patients had BPL lengths between 150 and 200 cm. Further shortening can cause bile reflux; thus, we performed laparoscopic revisional surgery in all 5 cases. We placed the patients in the supine position. We then inserted the laparoscopic trocars in the previous OAGB scars. We used 5 ports: 3 ports were 12 mm, and 2 ports were 5 mm (Figure 1). The primary surgeon transected the upper border of the gastrojejunostomy anastomosis with a 60-mm staple line to separate the gastric pouch from the intestine. The surgeon then created 2 gastrostomies in the lower end of the gastric pouch and another in the remnant mother stomach. We used two 60-mm staple lines to create an anastomosis between the gastric pouch and the remnant stomach. Then, we closed the gastrostomy with double layers by 2-0 Vicryl with continuous suturing and 2-0 silk interrupted. After this, we pushed 300 cc of methylene blue by nasogastric tube to rule out leakage. Finally, we inserted a drain.

Jammu et al reported on 2 patients who underwent reversion of OAGB to normal anatomy out of a sample of 473 patients. The 2 patients had severe hypoalbuminemia, which necessitated reversal. In these 2 patients, the bypass lengths were 270 cm and 300 cm [10]. A retrospective chart review conducted by Genser et al collected data for 2934 patients who had undergone OAGB over 10 years. Of these patients, 26 of them had nutritional deficiencies that put them in need of a reversion procedure to normal anatomy. Two-thirds (68.5%) of the total patients also underwent the reversal within their second postoperative year after undergoing an OAGB [8].

In 2021, an article was published that reported the reversal prevalence for OAGB to normal anatomy at 1%, with most indicators being protein-energy undernutrition and hypoalbuminemia. The mean BPL length was 215 cm. In the YOMEGA

## Table 1. Summary of the cases.

| Patient | Age | Sex | Pre-OAGB BMI* (kg/m²) | Pre-reversal BMI (kg/m²) | Past medical illness | Time to revisional surgery | Reason for reversal surgery | Post-reversal complications | Follow-up |
|---------|-----|-----|-----------------------|-------------------------|----------------------|--------------------------|----------------------------|----------------------------|-----------|
| Case 1  | 40  | Female | 41                     | 21                      | None                 | 2 years                  | Generalized weakness, peripheral neuropathy, lower limb edema, severe intolerance of food and biliary reflux | None                                      | BMI 32    |
|         |     |        |                        |                         |                      |                          |                            |                            | Walking with mild limping in right limb |
| Case 2  | 30  | Female | 35                     | 19                      | None                 | 1 year                   | Hypoglycemia, hypoproteinemia, and proteinuria | Drop of hemoglobin treated with blood transfusion | BMI 25    |
|         |     |        |                        |                         |                      |                          |                            |                            | She was in good condition |
| Case 3  | 40  | Female | 42                     | 19                      | None                 | 1 year                   | Social pressure and depression | Mild gastroparesis            | BMI: 28   |
|         |     |        |                        |                         |                      |                          |                            |                            | She was satisfied and happy due to regaining weight |
| Case 4  | 28  | Female | 39                     | 18                      | None                 | 2 years                  | Social pressure and depression | None                                      | BMI: 30   |
|         |     |        |                        |                         |                      |                          |                            |                            | She was satisfied with regaining weight |
| Case 5  | 52  | Female | 45                     | 18                      | Hypothyroidism       | 8 months                 | Liver failure, and hepatic encephalopathy managed conservatively | Delayed Refeeding Syndrome         | BMI: 23   |
|         |     |        |                        |                         |                      |                          |                            |                            | Liver function within normal |

BMI – body mass index; OAGB – one-anastomosis gastric bypass.

have a high anatomical level of gastrointestinal anastomosis compared with Roux-en-Y gastric bypass, when considering the laparoscopic approach [8,9].
trial, 21.4% of nutritional adverse events were seen in OAGB patients with BPL lengths of 200 cm [11]. Protein-rich food intolerance might also be caused by a small gastric pouch, which can result in the patient failing to adapt to bariatric food instructions and behaviors. Overall, the hospitalization rate is 1% yearly due to protein malnutrition, which is associated with poor patient health outcomes. In the early postoperative phase, patients are put on a strict liquid diet; thus, they are not allowed to consume large quantities of food, as complications can include protracted vomiting. Insufficient protein intake and absorption are factors resulting in a high risk of malnutrition of protein in post-bariatric patients [12]. Post-bariatric surgery patients encounter micronutrient deficiencies due to a combination of factors, such as malabsorption from duodenal bypass. Effects on nutritional and malnutrition deficiencies have been studied by looking at different BPL lengths and their effects. A correlation has been shown to exist between BPL length and the incidence of malnutrition, as presented in a randomized controlled trial and 1 retrospective study [7]. Other studies have also supported the presented fact by acknowledging that out of the 36 952 individuals, 0.37% had reoperations for malnutrition. Of these individuals, 92.3% had a BPL longer than 200 cm [7]. Severe nutritional issues can be prevented by careful bowel measurement [13]. Maintaining appropriate BPL length to avoid insufficient weight loss or the risk of malabsorption is essential.

Liver failure after bariatric surgeries is rare, especially in OAGB. In reviewing the literature, we found most patients required liver transplantation and subsequent reversion surgery to prevent the failure of the transplanted liver [14]. In our case, the liver failure was managed conservatively and then treated by a reversion to normal anatomy. Multidisciplinary preoperative screening is a requirement for bariatric surgery candidates that prepares them for lifestyle changes, since information is obtained for educating and preparing them. The support offered to these patients also helps them with additional psychological interventions, maximizing their weight loss after surgery [15]. It is possible that implementing these strategies before and after the primary bariatric procedure might have prevented the problems we encountered in this case series.

Patients undergoing bariatric surgery experience depression at a rate of 19%, according to a meta-analysis conducted on 68 studies [16]. Therefore, multidisciplinary team interventions must be embraced to address issues of depression. Few studies have been conducted on the post-bariatric treatment of patients with depression [17]. To the best of our knowledge, there are no reported cases in which patients have undergone revisional surgery due to depression.

The feasibility of OAGB reversal is evident and has minimal complications. Kermansaravi et al showed that complications after Roux-en-Y gastric bypass reversal were 3 times higher than that of OAGB reversal (29% vs 10.9%). The explanation for this is that OAGB procedures are less technically challenging [11]. In our series, 1 patient had a serious complication, namely delayed refeeding syndrome. This complication had not been previously reported after OAGB reversal. Our sample was relatively small and thus not applicable for offering a complication rate.

This case series study had certain strengths, as all 5 patients underwent the OAGB and reversal surgery by the same bariatric surgeon. This ensured standardization in the operative steps and postoperative management. However, the study had some limitations, as it was a single-center study and did not include long-term clinical follow-up. Finally, we encourage bariatric surgeons to publish and share their experiences in OAGB reversal to normal anatomy, since there are few such studies in the literature.

Conclusions

In this study, it was evident that the early detection of malnutrition and psychological pressure played a critical role in patients’ full recovery. The reversal of OAGB to normal anatomy...
is feasible as a last resort, after the failure of other interventions. A multidisciplinary team should evaluate patients after surgery to avoid the need for reversion and to educate patients on the required lifestyle changes.

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