

Reasons and Operative Outcomes After Reversal of Gastric Bypass and Jejunioileal Bypass

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Abstract Limited information is available regarding reversal of gastric bypass. While reversal will lead to weight regain and return of comorbid conditions, procedure reversal is sometimes necessary due to complications. The decision to reverse versus revise is difficult; currently, there are no established guidelines. The objective was to review one center's experience with reversals of gastric bypass and jejunioileal bypass procedures and identify potential indications as well as technical feasibility and short-term outcomes. A retrospective review of a prospectively collected database from 1999 to 2010 was conducted; 12 patients who underwent reversal of non-banding bariatric procedures were included. There was no major perioperative morbidity in elective patients; one patient whose reversal was part of a second-look operation had massive intestinal necrosis. There was one (8.3 %) non-procedure-related postoperative death. No leaks were identified in any of the reversals. Leak rates were compared with other revisional procedures such as reversals, revisions, and conversions, with no statistical significance regarding leak rates between all three groups; however, revisions and conversions were performed via open or laparoscopic approach, while reversals were performed exclusively via open approach. Reversals of

bariatric (non-banding) procedures, either combined or purely malabsorptive, are technically challenging. Indications remain poorly defined. In our experience, short gut syndrome, renal failure, marginal ulceration, and malnutrition were the most common indications for reversal, differing from previously published data. Indications can depend on patient and surgeon preferences, but primarily on surgeon experience and type of complications. Based on this initial experience, these operations can be performed using the open approach with good outcomes.

Keywords Revisions · Reversal · Gastric bypass · Morbid obesity

Introduction

Bariatric surgery has experienced a dramatic growth in the last decade. This growth was driven mainly by its safety, low morbidity, and very low mortality, as well as the ability to achieve remission of serious medical conditions such as diabetes mellitus, hypercholesterolemia, obstructive sleep apnea, and arterial hypertension. As a result of the obesity epidemic, millions of patients become surgical candidates and hundreds of thousands of those undergo complex bariatric procedures on an annual basis worldwide [1]. As a consequence, and mainly due to failures or complications, an increased number of reoperations are also being performed [1, 8]. It is estimated that 25 percent of patients who undergo bariatric operations will require a second intervention [8]. Reoperative bariatric procedures can constitute revisions, conversions, and reversals [1]. As the obesity epidemic continues to grow, bariatric surgeons find themselves performing more revisional procedures, with the primary intent to improve the quality of life (QOL) and prevent reoccurrence of obesity [2, 8].

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It is known that the reversal of a bariatric procedure will result in weight regain and recurrence of obesity-related comorbid conditions. However, there are special circumstances in which a reversal of a bariatric operation cannot be avoided [1–3, 6].

To the authors' knowledge, few references in the bariatric literature exist that analyze the technical pitfalls, indications, and outcomes of patients that require reversal of their bariatric operations [1]. The aim of this study was to review one center's experience with reversals of gastric bypass and jejunoileal bypass (JIB) procedures and identify potential indications, as well as technical feasibility and operative outcomes.

Materials and Methods

Between October 1999 and May 2010, following Institutional Review Board approval and in accordance with Health Insurance Portability and Accountability Act guidelines, the authors retrospectively reviewed the center's prospectively collected database and identified those patients who underwent reoperative bariatric surgery. All reoperations, including revisions, reversals, and conversions, were recorded and analyzed. Twelve subjects who underwent reversals were identified and eight of those had undergone reversal of gastric bypass. The authors analyzed patient demographics, indications for surgery, and outcomes; these outcomes were then compared to the other types of reoperative procedures, including leak rate and death. For all patients who underwent reoperation, unless emergent, attempts were made to obtain old operative reports, and the authors conducted a preoperative endoscopy and an upper gastrointestinal series to define the anatomy since the vast majority of the patients in this group had their primary operations performed elsewhere.

Results

A total of 3,726 bariatric operations were performed from 1999 to 2010, with a total of 384 reoperations. After excluding all band-related procedures and immediate re-interventions, 259 procedures were identified. Of those, there were 205 (5.5 %) revisions, 42 (1.13 %) conversions, and 12 (0.32 %) reversals. The latter group is the one subject to analysis in this manuscript. All of the patients in the reversal group were female. The average age of our study population was 51.2 years (22–79), and body mass index (BMI) at the time of reoperation averaged 19 (17–32). Ten of the 12 patients had their original bariatric procedures performed at an outside institution; likewise, those ten patients were treated at different institutions for original complications and presented to the Bariatric Institute with inability to tolerate oral intake and total parenteral nutrition (TPN) dependence.

Charts of the 12 patients who underwent reversals were reviewed. Patient demographics as well as indications for reversal are depicted in Table 1. Of the 12 patients who underwent reversal procedures, four underwent reversal of JIB. These patients had severe metabolic complications leading to renal failure and malnutrition. The remaining eight underwent reversal of gastric bypass; this discussion focuses on these eight patients.

In all cases except for one (Table 2), the reversal was to normal anatomy with the creation of a latero-lateral gastro-gastrostomy between the gastric pouch and the gastric remnant. The gastrojejunal anastomosis was taken down and a jejuno-jejunosomy was performed to restore intestinal continuity; there was one patient (patient 8) in whom a different approach was used and it is detailed in the succeeding text discussions.

Patient 1 was a 57-year-old female who had undergone a Roux-en-Y gastric bypass at an outside institution; she

Table 1 Patient demographics/indication for reversal

Patient number	Age	BMI	Indication	Type of bypass
1	57	–	Short gut s/p cecal volvulus extensive resection, gastrocutaneous fistula	Gastric bypass
2	51	16	Malnutrition	Gastric bypass
3	41	32	Anemia/hypokalemia, recurrent marginal ulcers	Gastric bypass
4	22	23	Short gut TPN s/p internal hernia	Gastric bypass
5	60	17	Dysphagia, vomiting recurrent ulceration	Gastric bypass
6	35	19	Emergent/internal hernia	Gastric bypass
7	53	19	Malnutrition, persistent pain	Gastric bypass
8	36	–	Recurrent marginal ulceration, persistent pain	Gastric bypass
9	79	–	Diarrhea, renal failure	Jl bypass
10	64	17	Malnutrition, renal failure	Jl bypass
11	62	25	Malnutrition, renal failure	Jl bypass
12	55	21	Malnutrition	Jl bypass

Jl bypass jejunoileal bypass

Table 2 Type of reversal/ complications

Patient number	Reversal	Complications	Tolerate PO	Readmissions/ further surgery
1	Normal anatomy/elective	No	Yes	No
2	Normal anatomy/elective	No	Yes	No
3	Normal anatomy/elective	No	Yes	No
4	Normal anatomy/elective	No	Yes	Dehydration
5	Normal anatomy/elective	No	Yes	No
6	Normal anatomy/emergency	Portal vein thrombosis	Yes	Small bowel obstruction
7	Normal anatomy/elective	No	Yes	No
8	Normal anatomy/elective	Gastric atony	No	Redo gastric bypass
9	Normal anatomy/elective	No	Yes	No
10	Normal anatomy/elective	No	Yes	No
11	Normal anatomy/elective	No	Yes	No
12	Normal anatomy/elective	No	Yes	No

subsequently developed a cecal volvulus for which she required ileocecal resection. Several years later, she developed an internal hernia that also required intestinal resection, after which she developed short gut syndrome and required TPN. Short bowel syndrome is clinically defined as a combination of malabsorption, diarrhea, steatorrhea, and fluid and electrolyte abnormalities leading to malnutrition. She returned to the Bariatric Institute after several months of TPN searching for an alternative. Reversal of gastric bypass was offered and was performed successfully.

Patient 2 was a 51-year-old female who had undergone distal gastric bypass at a different institution; she was malnourished, with a BMI of 16, and had severe electrolyte disturbances requiring multiple hospital admissions. A gastrostomy tube was placed preoperatively to improve her nutritional status and she later underwent reversal of her gastric bypass.

Patient 3 was a 39-year-old African-American female that had gastric bypass in an outside institution and required multiple hospital admissions for severe electrolyte imbalances that resulted in septic episodes due to PIC line infections and port implantation. She underwent a reversal of her gastric bypass.

Patient 4's original gastric bypass was performed in South America; she subsequently had an extensive small bowel resection due to a missed Petersen's hernia. She was first introduced to our center after being admitted with an episode of line sepsis. She had multiple admissions in the past to different hospitals in Florida for electrolyte disturbances and line-related complications. Patient 4 underwent reversal of her gastric bypass at our center and was able to be weaned off TPN. This patient was readmitted on two occasions post-reversal to treat electrolyte abnormalities associated with abdominal pain. Further workup was unrevealing and the patient improved clinically after hydration, pain control, and electrolyte replacement.

Patient 5 was a 60-year-old female with dysphagia, vomiting, and recurrent marginal ulcerations. She was treated with high doses of proton pump inhibitors and carafate and developed an allergy to the proton pump inhibitors. The patient was adamant in having her gastric bypass reversed.

Patient 6 was a 35-year-old female who was transferred from the Bahamas after being admitted for several days with abdominal pain and vomiting. The patient was in shock and was taken as an emergency case to the operating room where she underwent an extensive small bowel resection. She remained critically ill and was managed with an open abdomen; 48 h later, a second-look operation was undertaken. Since the patient was stable, the operating team decided to reverse her gastric bypass. Patient 6 had a long postoperative course due to the acute nature of her illness. She developed portal vein thrombosis during her initial ischemic event and required systemic anticoagulation. She was discharged home from the hospital and was tolerating oral intake. Patient 6 was readmitted on a couple of occasions with a diagnosis of partial small bowel obstruction that improved with conservative therapy.

Patient 7 was a 54-year-old female who underwent gastric bypass at our institution; she then developed recurrent marginal ulcerations and a gastrogastic fistula, which were treated operatively with a takedown of the gastrogastic fistula and redo gastrojejunostomy. Patient 7 persisted with recurrent marginal ulcerations and inability to eat to the point of malnutrition. She underwent a feeding gastrostomy to improve her preoperative nutritional status and subsequently underwent reversal of her gastric bypass.

Patient 8 was a 42-year-old female who had gastric bypass at the age of 18 at an outside institution. She presented with a clinical picture of chronic anemia requiring blood transfusions, persistent pain, and recalcitrant marginal ulcerations; a large gastrogastic fistula was also identified on preoperative workup. This patient requested reversal of her bypass and

would not consider a revision. Her gastrojejunal anastomosis was dismantled and her gastrogastic fistula was left in situ, with creation of a side-to-side enteroenterostomy. Postoperatively, she developed severe gastric atony with an hourglass-shaped stomach that required a repeat gastric bypass. The failure on this patient is felt to be a technical issue; we believe that we should have taken down the gastrogastic fistula and created a new anastomosis.

All of the patients who underwent reversal of JIB had their index operations performed at different institutions. They all had severe nutritional and metabolic sequelae from their procedure. Reversal of the JIB is much less technically challenging than reversal of gastric bypass; however, one must be careful at the time of performing the entero-enteric anastomosis due to a large size discrepancy between the defunctionalized limb and the alimentary limb.

There were no major postoperative complications in the seven patients who underwent an elective reversal of a gastric bypass and the four patients who underwent JIB reversal. The patient who was operated on as an emergency case had preoperatively developed a partial portal vein thrombosis that was treated with postoperative anticoagulation.

All patients were approached via laparotomy. After take-down of the gastrojejunosomy, the gastric continuity was reestablished with a stapled side-to-side gastrostomy, while intestinal continuity was established in a similar fashion with a side-to-side enteroenterostomy. A decompressive/feeding gastrostomy had either been placed previously to improve the nutritional status or was placed as a part of the reversal procedure.

There was one death (8.3 %) in this series involving a patient who underwent a reversal of JIB and was known to be very non-compliant and addicted to narcotics. Unfortunately, this patient's autopsy confirmed lethal drug overdose after discharge 3 weeks postoperatively while recovering at home. Since the patient had no other medical conditions, the cause of her cardio-respiratory arrest was directly related to opioid abuse.

All patients were able to resume oral intake and conveyed improvement in their QOL after reversal, although no specific QOL assessment tools were used for measurement. Follow-up ranged from 1 to 36 months and was carried out by reviewing office charts and performing telephone interviews. Eight patients were available for follow-up. One patient who was 2 years post-reversal of JIB returned to the clinic seeking an alternative procedure due to weight regain. The remainder of the patients who were available for follow-up had either recently been reversed or remain with normal weight.

In the follow-up of this series, two patients who required new bariatric operations after their gastric bypass reversals were identified. One patient (not included in our series since she had her reversal performed at a different institution) required a sleeve gastrectomy after multiple abdominal operations that

included reversal of gastric bypass. This patient had worsening intracranial hypertension and pseudotumor cerebri. Another patient (patient 8) developed severe gastroparesis and required a repeat gastric bypass as mentioned earlier.

Discussion

Reversals of bariatric procedures (excluding banding) are both conceptually and technically challenging. Some bariatric procedures, such as sleeve gastrectomy, are completely irreversible.

The decision to perform a reoperation after bariatric surgery is always a difficult one. There are currently no guidelines for deciding whether a patient needs a conversion, a revision, or a reversal of prior surgery [1]. The decision to reverse versus revise tends to be highly individualized, and it is unclear whether it is patient-driven, surgeon-driven, or a combination of both [1]. In most instances, reoperations are performed for failure of weight loss, weight regain, and surgical complications; in the authors' experience, reversals are only performed for complications. When performing reoperative surgery, the surgeon must be prepared to anticipate a longer and more technically challenging operation with a higher morbidity and mortality [1, 2].

It has been shown that reversing bariatric operations may lead to weight regain and return of comorbidities [1–3]. To our knowledge, there are only anecdotal reports of reversal of biliopancreatic diversion and duodenal switches resulting in weight regain. On the other hand, there is abundant literature regarding reversal of JIB [3–7]. There is only one paper aside from this report that focuses on reversal of gastric bypass [1].

In certain circumstances, such that with a patient with short gut syndrome, reversal is the only option that allows the patient to resume oral intake and correct life-threatening electrolyte abnormalities. Other situations that can lead patients to seek a reversal procedure are the inability to tolerate solid food, recurrent marginal ulceration, intractable pain, and persistent vomiting, although revisions are also possible for these patients.

Patients with addictive behavior, such as substance abuse and active cigarette smoking, are at an increased risk for complications [1]. They are frequently non-compliant with diet and medical instructions that may lead to poor weight loss and complications. The literature supports consideration of reversals rather than revisions in these patients [1], and in the authors' experience, whereby the only mortality occurred from substance abuse, this recommendation is supported.

Essentially all patients who underwent JIB surgery should be considered as potential candidates for reversal and must be monitored very closely for liver cirrhosis. It has been reported that greater than 20 % of patients who undergo JIB will

develop life-threatening complications [3–5, 7]. Series dating back to 1980 report 5 % mortality and 25 % reversal rate for this procedure [11]. Reasons to consider reversing a JIB include progressive hepatocellular disease, intractable diarrhea resulting in electrolyte abnormalities and lifestyle disruption, nephrolithiasis resulting in renal failure from hyperoxaluria, changes in mental status, lethargy, and migratory arthralgias [3–5, 7, 10, 11]. Unlike JIB, the indications for reversal of gastric bypass have not yet been well established.

The perioperative risks of reversals appear to be acceptable when performed via laparotomy as evidenced by Brolin et al. [1] and supported by this series. No data is currently available on reversals performed laparoscopically. We believe that an open approach is safe and should be the method of choice for this complex operation due to the complex changes in anatomy as well as the multiple adhesions that are likely to exist from prior surgical interventions. Unlike the Brolin series [1], all except for one of the patients in our series were underweight or of normal weight at the time of their reversals. Improvement of nutritional status prior to performing the reversal was attempted in all patients either by means of parenteral nutrition or by placement of a gastrostomy tube in the gastric remnant. A thorough nutritional assessment was performed prior to each reversal operation, and all patients who underwent elective operations had normal albumin values preoperatively.

Reversal of gastric bypass in emergency situations is also feasible but can be considered only if the patient remains in stable condition throughout the operation and is not in septic or hemorrhagic shock. It is always better to return to the operating room at a later date once the patient's status is stable and the septic or bleeding episode is resolved. In this series, the patient that underwent a reversal procedure as an emergency was operated on two occasions. The first intervention was to remove the necrotic intestine and the second intervention was performed once the hemodynamic and septic episodes resolved for reconstruction. In all instances, a gastrostomy tube that can be utilized for decompression and/or feeding should be left in place.

As the obesity epidemic continues to grow, bariatric surgeons find themselves performing more revisional procedures, with the primary intent to improve the quality of life and prevent reoccurrence of obesity [2, 8]. In other series, dietary non-compliance and substance abuse have been cited as major factors for reversal [1]. Our series focuses on a different subgroup of patients in which complications such as pain, recalcitrant marginal ulcerations, malnutrition, electrolyte imbalances, and short gut syndrome are the main indications for the reversal. Surgeons must be made aware that in a select group of patients, when complications become chronic and difficult to manage, reversing the patient to an original anatomy might be the only way for the patient to resume oral intake [2]. Most patients

in this series had sought advice from several other surgeons prior to their consultation with us, which evidences the fact that many bariatric surgeons are reluctant to care for these difficult patients—even experienced bariatric surgeons tend to defer the treatment in this patient population.

We believe that revisional bariatric surgery should be performed only by bariatric surgeons in centers of excellence due to the high level of complexity in managing these patients perioperatively.

Another more complex group of patients will be identified as the experience with reversals increases; these are the patients who will require additional bariatric procedures for weight regain and return of comorbidities after reversal. In the era of jejunoileal bypass, several studies quoted that they performed gastric partition operations concomitantly with the reversal [3–7]. Bariatric surgery is complex and requires extensive preoperative evaluation and preparation. Although it has been demonstrated that reoperative surgery can be performed safely, morbidity is still significantly higher than for an original operation [9].

Since the first operation we perform with virgin anatomy is usually the best setting for avoidance of complications, patient and procedure selection should be carefully reviewed. Addictive behaviors should be aggressively screened for and addressed preoperatively as they have been objectively associated with negative outcomes. Despite aggressive screening and careful patient selection, there will still be patients who require reoperations such as revisions, conversions, or reversals. Close follow-up postoperatively may lead to early recognition of complications and therefore may potentially eliminate the need for reoperations. The strengths and weaknesses of this study are that, while it supports the results of Brolin et al., it is a small series with a relatively low percentage of follow-up.

Conclusion

Due to the complexity and increasing frequency of bariatric surgery, more patients are requiring reoperations such as revisions, conversions, and reversals. In most instances, failure of weight loss, weight regain, and surgical complications lead to conversions or revisions, while reversals are performed in patients mainly after postoperative complications.

Reversals can be performed safely with low perioperative morbidity through an open approach.

The group of patients that require reversal of their bariatric operation is one of the new subsets that are emerging. There is very little literature available from which to draw objective conclusions in order to guide decision-making. In our limited experience, the most common indications are complications leading to malnutrition and electrolyte imbalances due to inability to tolerate oral intake or as a result of short bowel

syndrome. This differs from previously published data in which the most common indication is substance abuse and non-compliance [1]. The reversal of the operation allows the patient to reestablish oral intake and maintain nutritional status without the need for TPN. Although the laparoscopic approach may be feasible at the time of surgery, we prefer to conduct reversal operations via laparotomy since our experience with this type of procedure is limited.

More information and better follow-up is needed in order to provide better recommendations on how to manage this complex group of patients.

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References

1. Brolin RE, Asad M. Rationale for reversal of failed bariatric operation. *Surg Obes Relat Dis*. 2009;5:673–7.
2. Rosenthal R. Comment on: rationale for reversal of failed bariatric operation. *Surg Obes Relat Dis*. 2009;5:676–7.
3. Requarth JA, Burchard KW, Colacchio TA, et al. Long term morbidity following jejunioleal bypass: the continuing potential need for surgical reversal. *Arch Surg*. 1995;130:318–25.
4. Robertson JW, Woodward ER. Gastric partition after reversal of jejunioleal bypass for morbid obesity: three year follow-up. *South Med J*. 1985;78:1314–16.
5. Economou TP, Cullen JJ, Mason EE, et al. Reversal of small intestinal operations and concomitant vertical banded gastroplasty: long term outcome. *J Am Coll Surg*. 1995;181:160–4.
6. Kuzmak LI. A simple technique to reverse stapling gastric restriction operations. *Curr Surg*. 1987;6:462–6.
7. Soyer MT, Ceballos R, Aldrete JS. Reversibility of severe hepatic damage caused by jejunioleal bypass after re-establishment of normal intestinal continuity. *Surgery*. 1976;79:601–4.
8. Gagner M, Gentileschi P, de Csepel J, et al. Laparoscopic reoperative bariatric surgery: experience from 27 consecutive patients. *Obes Surg*. 2002;12:254–60.
9. Patel S, Szomstein S, Rosenthal R. Reasons and outcomes of laparoscopic revisional surgery for failed bariatric procedures excluding adjustable gastric banding. Presented at the American College of Surgeons Clinical Congress, October 2009.
10. Singh D, Laya AS, Clarkston WK, Allen MJ. Jejunioleal bypass: a surgery of the past and a review of its complications. *World J Gastroenterol*. 2009;15:2277–9.
11. Halverson JD, Scheff RJ, Gentry K, Alpers DH. Long term follow up of jejunioleal bypass patients. *Am J Clin Nutr*. 1980;33:472–5.