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ORIGINAL CONTRIBUTIONS

Gastric Bypass as a Third Bariatric Procedure—Our Experience with 42 Cases

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Abstract

Background It is not uncommon to encounter patients seeking a third, fourth, or even fifth bariatric procedure. With higher expected complication rates and questionable patient benefit, the indication for multiple revisions is still in doubt. To evaluate the perioperative and post-operative outcomes of patients undergoing gastric bypass after two previous bariatric surgeries or more.

Methods We identified all patients that underwent gastric bypass following at least 2 previous bariatric surgeries. We looked at patient demographics, previous bariatric surgeries, pre-operative body mass index (BMI) and obesity-related co-morbidities, perioperative complications, length of stay (LOS), re-admissions and re-operations, percentage of excess weight loss, and resolution or improvement in comorbidities.

Results Forty-two patients met the inclusion criteria, the majority being females (31, 73.8%). Average age was 45.6 years (range 27–62), average weight and BMI was 116 kg (range 75–175 kg) and 41.1 kg/m^2 (range 25.6–58.7 kg/m^2), respectively. Thirty-two patients had two previous bariatric surgeries (73.8%), and 10 patients had 3 former bariatric surgeries (23.8%), and for one patient, this was the fifth bariatric procedure (2.4%). Mean LOS was 10 days (range 2–56 days). Eight patients (19%) needed re-admission and 5 (11.9%) needed re-operation. At a median follow up of 48 months (range 7–99 months), the average BMI was 34.5 kg/m^2 (range 23.7–55.1 kg/m^2) reflecting an excess BMI loss of 43.3%.

Conclusions Gastric bypass as a third or more bariatric procedure is effective yet associated with high complication rates, re-admissions, and re-operations.

Keywords Bariatric surgery · Revisional bariatric surgery · Failed bariatric surgery, weight loss failure · Weight regain

Introduction

Bariatric surgery gained popularity in the laparoscopic era, with nearly 500,000 procedures performed worldwide in 2013 [1]. With millions of procedures performed in recent years, revisional bariatric surgery has become a significant aspect of many bariatric centers.

It has been shown to be highly effective when compared to non-surgical treatment [2].

Re-do surgery is more challenging, requiring higher technical skills and usually associated with higher complication rates. Long-term outcomes regarding weight loss and co-morbidity resolution are usually inferior to those of primary bariatric surgery [3, 4].

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Different bariatric procedures have been suggested over time, all very promising at presentation. Some were abandoned along the way due to high complication rates and others due to poor long-term results. The undivided staple line of the silastic ring vertical gastroplasty (SRVG) frequently opened over time leading to rapid weight regain [5]. Hardware failure of the laparoscopic adjustable gastric band (slippage, erosion, leak, etc.) lead to frequent band removal [6, 7]. The most recent example is the laparoscopic sleeve gastrectomy (LSG), which has been around for nearly a decade, practically replacing the laparoscopic adjustable gastric banding (LAGB). Early reports were very optimistic, showing a high safety profile with short- and medium-term outcomes similar to the gold-standard laparoscopic roux-en-y gastric bypass. But as long-term data is acuminating, failure rates of up to 64% have been reported [8].

Bariatric surgeons have to be familiar with the evolution of bariatric surgery and the different procedures performed over time, in order to correctly evaluate the patients' complication in some cases, and in others to identify the reason for failure.

It is not uncommon to encounter a patient who underwent a silastic ring vertical gastroplasty (SRVG) in the 90s, later revised to an LAGB in early 2000, who now presents with a second failure and requests a third bariatric procedure. Another classic triad is an LAGB which has been removed and converted to a sleeve gastrectomy, now presenting with weight loss failure, severe GERD, or sometimes both.

Little data is available on the effectiveness of a third bariatric procedure. It can be anticipated that such procedures will show higher complication rates and lower efficacy, but is the added surgical risk worth it?

This was the aim of this study—to evaluate the perioperative and long-term outcomes of a third, fourth, or even fifth bariatric procedure.

Methods

We retrospectively reviewed our prospectively collected database for all patients who underwent gastric bypass (GBP) following at least two previous bariatric surgeries in the bariatric surgery unit of the Tel-Aviv Sourasky medical center between May 2008 and Sept. 2015.

We looked at patient demographics, previous bariatric surgeries, pre-operative body mass index (BMI), obesity-related co-morbidities, operative and post-operative course, re-admissions and re-operations, and long-term outcomes regarding body weight and co-morbidity resolution.

Weight loss failure or weight regain were defined as a BMI > 35 or and EWL < 50%.

Excluded from this study were patients with less than 6 months of follow up.

This study was approved by the Tel-Aviv Sourasky Medical Center institutional review board (IRB).

Statistical Analysis

The probability that variances in categorical parameters between the groups are significantly different was calculated using Fisher test. Parametric data are presented as mean ± standard deviation (SD), and statistical analysis was performed using Student's *T* test.

Perioperative Care and Surgical Technique

The operation was performed under general anesthesia in supine position with the table in reverse Trendelenburg position. Intravenous cephalosporin and a prophylactic dose of heparin were administered prior to incision. Open or laparoscopic approach was based on surgeon judgment after considering specific patient considerations, mainly previous surgical history, as the procedures were performed by four bariatric surgeons. A standard roux-en-y gastric bypass was performed, with a 50-cm biliopancreatic limb and a 150-cm roux limb.

Prophylactic anticoagulant treatment and proton pump inhibitors were started in all patients post-operatively and continued for 3 weeks and 6 months, respectively. Limited clear liquid intake was initiated on post-operative day (POD) 1 and clear liquids ad-lib on POD 2. Patients were discharged home after adequate liquid intake was achieved on a prophylactic dose of Clexane, 6 months of proton pump inhibitors, and supplemental vitamins. First follow-up appointment was scheduled for 10 days from discharge.

Results

Forty-two patients failed more than one bariatric procedure and underwent conversion to RYGB.

There were 31 females (73.8%), with a mean age of 45.6 years (range 27–62 years), and a mean BMI of 41.1 kg/m^2 (range 25.6–58.7 kg/m^2). Mean time interval from the latest bariatric procedure and the current revisional gastric bypass procedure was 5.8 years (range 1–37 years) (Table 1).

Ten patients had three former bariatric surgeries (23.8%), and for one patient, this was the fifth bariatric procedure (2.4%). Previous bariatric procedures are summarized in Table 2.

Indications for revisional surgery were primary weight loss failure, weight regain after successful weight loss, complications of a previous bariatric procedure, or a combination of a complication with weight loss failure/weight regain (Table 3).

Table 1 Demographic and peri-operative

Gender(42)	
Male	11 (16.2%)
Female	31 (73.8%)
Mean age (range)	45.6y (27–62)
Mean interval from last bariatric procedure (range)	5.8y (1–37)
Mean BMI (kg/m^2) previous to GBP (range)	41.1 (25.6–58.7)
Surgical approach:	
Laparoscopic	19 (45%)
Open	23 (54%)
Conversion	1 (5.3%)
Median length of stay (range)	7.5d (2–56)

Six patients were operated for surgical complication only—and had a pre-op BMI < 35 kg/m^2.

Nineteen cases (45.2%) were approached laparoscopically, 1 of which required conversion to open access due to technical difficulties (5.3%). Another 23 cases underwent open gastric bypass (54.8%). Operative approach was based on surgeon judgment after considering specific patient considerations, mainly previous surgical history—12 of 14 SRVG revisions were done via laparotomy.

Five patients underwent concomitant procedures with the revisional gastric bypass—an LAGB removal, two cholecystectomies, and two ventral hernia repairs.

Mean operating time was 159 min (range 77–265 min), and median length of stay was 7.5 days (range 2–56 days).

Early postoperative complications occurred in 15 patients (35.7%), 5 of which required reoperation (11.9%). These are summarized in Table 4.

At a median follow-up of 48 months (range 7–99 months), the average BMI was 34.5 kg/m^2 (range 23.7–55.1 kg/m^2)

Table 2 Previous bariatric procedures

Pervious bariatric surgeries 1 (N = 42)	LAGB	26 (61.9%)
	SRVG	14 (33.3%)
	LSG	2 (4.76%)
Pervious bariatric surgeries 2 (N = 42)	LSG	18 (42.8%)
	SRVG	2 (4.76%)
	LAGB	21 (50%)
	GBP	1 (2.38%)
Pervious bariatric surgeries 3 (N = 10)	LAGB	3 (30%)
	GBP	1 (10%)
	GBR	3 (30%)
	LSG	3 (30%)
Pervious bariatric surgeries 4 (N = 1)	GBP	1 (100%)

LSG laparoscopic sleeve gastrectomy, *GBE* gastric banding replacement, *GBP* gastric bypass, *LAGB* laparoscopic adjustable gastric banding, *SRVG* silastic ring vertical gastroplasty

Table 3 Indications for surgery

Weight loss failure	5
Weight regain	17
Surgical complications	13
+ Weight loss failure	2
+ Weight regain	5

Weight loss failure defined as BMI > 35 or EBW > 50%. Weight regain—long-term weight loss failure. Surgical complications—strictures, anastomotic leak, reflux

reflecting an excess BMI loss of 43.3%. Diabetes, hypertension, and dyslipidemia improved in 42.8%, 50%, and 25% of patients, respectively. Long-term failure rate, defined as a BMI > 35 or and EWL < 50%, was 45.2% (Table 5) [9].

Discussion

Bariatric surgery is a highly effective tool for weight loss and co-morbidity improvement/resolution [10, 11]. But because morbid obesity is considered by many a chronic medical condition, surgical failure is not uncommon.

Over the past decades, different bariatric procedures have been proposed. Early outcomes were always promising, with enthusiastic adopters of the technique pushing it forward [12–14]. Usually, as medium- and long-term outcomes were published, significant failure rates, complications, and re-operations were reported. High-volume bariatric centers often encounter the patient who underwent an LAGB a decade ago, later revised to a sleeve gastrectomy, who now presents once more with either weight regain, severe GERD, or sometimes both. Referring such a patient to a third bariatric procedure—an RYGB in this case—can make the experienced bariatric surgeon feel slightly uncomfortable. The main question being is the operative risk worth the potential benefit.

It has been shown that revisional bariatric surgery is less effective than primary procedures [15]. It is also common surgical knowledge that re-operations are always associated with increased surgical risk. Thus, the justification for performing a third, fourth, or even fifth bariatric procedure is questionable.

There are three main patterns for surgical failure—primary weight loss failure, weight recidivism, and operative complications such as GERD or dysphagia. We report the largest cohort of patients undergoing a third or more bariatric procedures.

The baseline BMI of the patients was 41, reflecting the fact that most patients were still morbidly obese after their previous procedures, and that the indication for surgery was rarely isolated complications. As expected, the majority were female.

Table 4 Complications

Complications		
CD2	10	
CD3a	0	
CD3b	5	
Re-operation	5	• [1] Anastomotic stricture—brown anastomosis • [2] Suspected leak—negative re-operation • [1] Small bowel obstruction—lysis of adhesions • [1] Anastomotic intraluminal bleeding
Re-admission	8	
Late complications (> 30 days)	2	• [1] Chronic abdominal pain • [1] Internal hernia

CD Clavien-Dindo

Surgical approach—laparoscopic or open—was dependent on surgeon preference.

One surgeon preferred approaching hostile abdomens, especially those following SRVG, via laparotomy, while two others were more comfortable with a laparoscopic attempt even in difficult cases. Routine LOS following primary LRYGB is 2–3 days. Median LOS was longer in this subgroup of patients reflecting over 50% laparotomies and higher complication rates.

Although we report 35.7% complication rate, it must be emphasized that the majority of these complications (10/15) are minor—Clavien-Dindo II—as seen in Table 4. High rates of complications have been reported previously when reporting revisional surgery with rates as high as high as 50% [16, 17, 20].

Five patients needed re-operation, but two of these had a negative exploration, maybe a sign of high index of suspicion for complications in this patient population.

At 4 years follow-up, %EBMIL was 43.3%, with an objective failure rate of over 45%. Not surprisingly, this figure is inferior to weight loss outcomes following primary gastric bypass, a well-known fact regarding revisional bariatric surgery. Two main hypotheses can explain this: (1) technical difficulties compromise outcome—it is much more difficult to form a small enough gastric pouch for example. (2) Patient population is biased—the fact we are operating patients who have failed at least two previous attempts might suggest their difficulty in complying with post-op instructions. This figure is similar to that published by Nesset et al., who reported a 46% success rate in achieving a 50% EWL [18].

It should be mentioned that revisions of purely restrictive primary procedures to RYGB have better outcomes when compared to revisions of cases which have a malabsorptive component [19].

When comparing patients who were operated for complications (with or without obesity) to those seeking weight loss only, we found the initial BMI to be significantly higher in the latter group. Duration of surgery and length of stay were longer for those operated for complications (Table 6).

We then compared cases that were approached laparoscopically to those approached with laparotomy. The only parameter with statistical significance was pre-op BMI, with higher BMI patients more likely to be operated through a laparotomy (Table 7).

Finally, we compared patients who had their fourth or fifth procedure to those having their third operation. Most

Table 5 Outcomes

	At time of index GBP	At follow-up (mean 48 m)
Mean BMI (KG/M^2)	41.1	34.5
EBMIL (%)		43.3
Objective failure, no. (%)		19 (45.2%)
Diabetes, no. (%)	7(16.6%)	4 (9.5%)
Hypertension, no. (%)	8 (19.5%)	4 (9.5%)
Hyperlipidemia, no. (%)	8 (19.5%)	6 (14.2%)

Objective failure—defined as BMI > 35 or EWL < 50%

BMI body mass index (kg/m^2), *EBMIL* excess BMI loss

Table 6 Indications for revision

	WLF/WR	Complications ±WLF\WR	*p* value
N	22	20	
Laparoscopic	11 (50%)	9 (45%)	NS
Open	11 (50%)	11 (55%)	NS
Conversion	1 (3.34%)		
Initial BMI (kg/m^2)	43.5	38.4	0.03
Current BMI (kg/m^2)	35.9	33.1	NS
EBMIL (%)	38.1	48.9	NS
Complications	1 (4.5%)	4 (20%)	0.08
DOS (minutes)	145	176	0.05
LOS (days)	7	15	0.01

Complications—Clavien-Dindo > 3

DOS duration of surgery, *LOS* length of stay, *BMI* body mass index (kg/m^2), *EBMIL* excess BMI loss, *WLF* weight loss failure, *WR* weight regain

parameters compared did not reach statistical significance, with only post-op complications significantly higher in the former group (Table 8).

This manuscript has several drawbacks. Our cohort is quite small and the sub-classifications based on even smaller numbers. The power of the statistical analysis is limited.

Our cohort is quite heterogeneous, too. All patients had a RYGB in one bariatric center. But they were operated by different surgeons, via laparoscopy or laparotomy, and had different previous bariatric procedures, and for different indications.

And yet, this is the largest series reported on multiple bariatric procedures on the same patient. We expect more and more patients to present with recurrent failures seeking good medical advice from bariatric professionals. We believe this manuscript can assist in managing patient expectations when seeking a third (fourth or fifth) bariatric procedure.

Table 7 Surgical approach

	Laparoscopic	Open	p value
N	20	22	NS
Initial BMI (kg/m^2)	38	43.6	0.01
Current BMI (kg/m^2)	34.7	33.6	NS
EBMIL (%)	38.7	49.1	NS
Complications	3(15%)	2(9%)	NS
DOS (minutes)	160	161	NS
LOS (days)	9	21	NS

Complications—Clavien-Dindo > 3

BMI body mass index (kg/m^2), *EBMIL* excess BMI loss, *DOS* duration of surgery, *LOS* length of stay

Table 8 Number of bariatric procedures

	3rd Procedure	4th/5th procedure	*p* value
N	32	10	
Open	15(46.8%)	3(30%)	NS
Laparoscopic	17(53.12%)	7(70%)	NS
Initial BMI (kg/m^2)	40.5	46.2	NS
Current BMI (kg/m^2)	34.2	35.7	NS
EBMIL (%)	42.3	47.1	NS
Complications	2(6.25%)	3(30%)	0.04
DOS (minutes)	155	174	NS
LOS (days)	10.5	11.5	NS

Complications—Clavien-Dindo > 3

BMI body mass index (kg/m^2), *EBMIL* excess BMI loss, *DOS* duration of surgery, *LOS* length of stay

Conclusion

Gastric bypass as a third or more bariatric procedure is effective yet candidates should be informed regarding inferior weight loss outcomes and higher complication rates, re-admissions, and re-operations. Long-term failure is not uncommon.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval Statement For this type of study, formal consent is not required.

Informed Consent Statement Does not apply.

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