

Pouch Reshaping for Significant Weight Regain after Roux-en-Y Gastric Bypass

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Abstract

Background Significant weight regain after Roux-en-Y gastric bypass (RYGB) occurs in around 20 % of patients in the long term. Anatomical reasons include dilatation of the gastric pouch and/or the pouch-jejunal anastomosis, leading to loss of restriction. Pouch reshaping (PR) aims at reestablishing restriction with a subsequent feeling of satiety. This study reports the outcome of PR embedded in a multidisciplinary treatment pathway.

Methods Twenty-six patients after PR for weight regain >30 % following RYGB in a university hospital between October 2010 and March 2016 were analyzed. Excluded were patients with PR for gastro-gastric fistulae, hypoglycemia, candy cane syndrome, and concomitant alteration of limb lengths. PR consisted in laparoscopic lateral resection of the gastric pouch, the anastomosis and the proximal 5 cm of the alimentary limb over a 32F bougie.

Results Median follow-up after PR was 48 months (range 24–60). Median BMI at PR was 39.1 kg/m² (32.7–59.1). Median operation time was 85 min (25–190), and median length of stay was 3 days (1–35). Minor complications (grade ≤ 2) occurred in seven (27 %) patients and major complications

(grade ≥ 3) in four patients (15 %). Nadir BMI and %EBMIL after PR were 32.9 kg/m² and 43.3 %, reached after a median of 12 months (3–48). Comorbidities were resolved in 81 %. After 48 months, median BMI was 33.8 kg/m² (20.4–49.2) and %EBMIL was 61.4 (39.1–121.2).

Conclusions Used selectively in a multidisciplinary treatment pathway, PR leads to prolonged weight stabilization around the previous nadir. However, its associated perioperative morbidity must not be disregarded.

Keywords Weight regain · Weight recidivism · Revisional bariatric surgery · Pouch reshaping · Pouch resizing · Roux-en-Y gastric bypass · Weight gain · Weight loss · Body mass index · *Gastric bypass/methods · Humans · Laparoscopy · Obesity, morbid/surgery · Reoperation · Surgery

Introduction

Bariatric surgery has proven to be the most effective therapy against the worldwide obesity epidemic in the short and long term [1, 2]. The so far most frequently performed procedure worldwide is the Roux-en-Y gastric bypass (RYGB) [3]. It involves the creation of a small gastric pouch as restrictive component.

Following RYGB, an initial rapid weight loss decelerates to reach a nadir after 1.5–2 years at around 90 % excessive weight loss (EWL) [4, 5]. In the long term, %EWL diminishes to 68 % after 10 years [6]. There is no uniform consensus on the definition of physiological weight regain [4, 7]. Significant weight regain, often defined as ≥25 % weight gain from nadir, occurs in 10–37 % of patients accompanied by a rebound of comorbidities such as hypertension, obstructive sleep apnea (OSA), and diabetes (T2DM) [6–10].

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Reasons for weight regain are multifactorial. Behavioral aspects interfere with mental health issues, hormonal imbalances, and anatomical abnormalities [11]. Enlarged pouch size and widened diameter of pouch-jejunostomy are anatomical factors contributing to loss of satiety with subsequent excessive weight regain [12]. Pouch resizing (PR) aims at reestablishing restriction and at disequilibrating over-the-years adjusted adaptational processes.

In this study, we report our experience with pouch reshaping as the last option in a multidisciplinary treatment pathway to address significant weight regain after RYGB in patients with enlarged pouch size and loss of satiety.

Materials and Methods

Data of patients undergoing PR for weight regain after RYGB in a university hospital between October 2010 and July 2013 were recorded in a prospective computer database according to a standardized protocol. Excluded were patients with pouch revisions for gastro-gastric fistulae, hypoglycemia, candy cane syndrome, and concomitant alteration of limb lengths.

Preoperative evaluation consisted in gastroscopy, upper gastrointestinal (UGI) series, endocrinological, and psychological workup. Data of initial RYGB were obtained in patients referred from outside. A nutritionist counseled all patients multiple times. All patients were embedded in a pathway of psychological and nutritional guidance; further, all were part of intensified group physical therapy. An interdisciplinary team evaluated all candidates. Patients were followed up according to the guidelines of the Swiss Society for the Study of Morbid Obesity and Metabolic Disorders at 3, 6, 12, 18, and 24 months and yearly thereafter.

Patients with weight regain >30 % of their lowest post-RYGB weight despite intensified nutritional, physiotherapeutic and psychological treatment, loss of satiety, and enlarged gastric pouch in UGI (>6 cm width in anterior-posterior view, referenced on vertebral height presumed as 2.5 cm [13]) qualified for PR.

Surgical Technique

All patients received preoperative, prophylactic subcutaneous low-molecular-weight heparin that was continued for 1 month after discharge. The gastric pouch and alimentary limb were identified and prepared free until the left crus could be identified. Alongside a 32F bougie, the lateral part of the gastric pouch was stapled off strictly laterally and on the antimesenteric side 5 cm into the jejunum. Enlarged jejunal segments left from a previous anastomosis were resected in this step as well (Fig. 1). An absorbable suture was used to invert the staple line and adjust to the bougie even more. Blue dye tests were

performed routinely. In case of marginal ulcers, the gastrojejunostomy was refashioned using a linear stapled technique akin to our standardized RYGB [14] (3 cm pouch-jejunostomy).

Patients were encouraged a fast return to solid food and left the hospital only when having reached that goal. Proton pump inhibitors for 4 weeks and life-long vitamin supplementation were continued.

Data Analysis

Data analysis was performed using GraphPad Prism 7.0a, GraphPad Software, San Diego, CA, USA. Values are reported as medians with range (min–max).

Results

A total of 26 patients were included in this study. Demographic data are listed in Table 1. Eleven patients had a history of open and 15 of laparoscopic RYGB; 5 had a complicated postoperative course (anastomotic leakage in 3 and stenosis requiring dilations in 2). Prior to RYGB, one patient underwent sleeve gastrectomy and nine adjustable gastric banding. Six patients underwent incisional hernia repair with placement of an intraperitoneal mesh after RYGB but prior to PR.

Patients underwent PR after a median of 77 months (range 14–178) after RYGB. Indications were weight regain in all with relapse of comorbidities in ten patients (39 %). In four patients (15 %), the procedure was combined with an incisional hernia repair; four (15 %) had marginal ulcers requiring a new gastrojejunostomy.

Intraoperative/Perioperative Characteristics

All procedures were begun laparoscopically; six patients (23 %) were converted to open due to massive subhepatic adhesions.

Median operation time was 85 min (25–190), and median blood loss was 20 ml (0–450 ml). Median length of stay was 3 days (1–35). Minor complications (grade ≤ 2) occurred in seven (27 %) patients and major complications (grade ≥ 3) in four patients (15 %) [15]. Those were pneumonia with pleural effusion requiring drainage, esophageal leak (probably by instrumentation with bougie leading to several abscesses in the retroperitoneal space), and staple line leaks treated with stents and relaparoscopy in two patients. Both were late leaks detected after 12 days. Of note, both patients had anastomotic insufficiencies after the initial RYGB.

Table 1 Demographic data

Female/male	22:4	85:15 %
Age (years)	46.5 (21.7–70.6)	
BMI (kg/m ²)	39.1 (32.7–59.1)	
Time interval between initial RYGB and PR (months)	77 (14–178)	
Type 2 diabetes mellitus (insulin dependent)	10	38.5 %
Antiplatelet/anticoagulant therapy	3	11.5 %
Arterial hypertension	16	61.5 %
Congestive heart failure	2	7.7 %
Renal insufficiency	2	7.7 %
Degenerative joint disease	16	61.5 %
Obstructive sleep apnea syndrome	11	42.3 %
ASA ≥ III	14	53.8 %

BMI body mass index, RYGB Roux-en-Y gastric bypass, PR pouch reshaping, ASA American Society of Anesthesiologists physical status

Follow-up

Median follow-up after PR was 48 months (24–60) and 120 months (50–226) after the initial RYGB.

Median initial BMI at RYGB was 48.9 kg/m² (41.4–70.2), after a median of 12 months (6–24), a nadir of 31.5 kg/m² (17.8–53.9), and %EBMIL of 82.3 (32.6–154.5) were reached. Median BMI at PR was 39.1 kg/m² (32.7–59.1), and median %EBMIL was 43 % (–3–63 %). Nadir BMI and %EBMIL post-PR were 32.9 kg/m² (20.4–42) and 43.3 % (15.6–157.2), reached after 12 months (3–48). There was no significant difference between nadir BMI after RYGB and PR. Figures 2 and 3 show the detailed evolution of BMI.

Long-term complications were anastomotic stenoses requiring dilation in two patients, persistent marginal ulcer in one patient, and incisional hernia in one patient.

At time of PR, T2DM was present in 10 (38 %), arterial hypertension in 16 (62 %), and OSA in 11 (42 %) patients; resolution during follow-up could be noted in 8 (80 %), 12 (75 %), and 10 (91 %), respectively.

Discussion

Bariatric physicians are increasingly faced with patients presenting with weight regain and relapse of comorbidities following RYGB [9]. The pathophysiology behind excessive weight regain is multifactorial; behavioral, psychological, metabolic, and anatomical reasons converge to a vicious cycle [11]. PR addresses enlarged pouch size as anatomical contributing factor to weight regain with the intent to reestablish a feeling of satiety through enhanced restriction. This study reports our experience with PR in patients with enlarged pouch as last step in a pathway combining intensive nutritional, physiotherapeutic, and psychological guidance. PR led to a

weight reduction comparable to after the initial RYGB and prolonged stabilization over a median follow-up of 4 years.

The role of surgery in weight regain after RYGB is controversially discussed, as the significance of pouch and stoma size enlargement in the follow-up remains unclear [13, 16–20]. In a study comparing 175 patients after RYGB with successful weight loss to 205 patients with weight regain, pouch and stoma size was abnormal in around a third in the former but in over 70 % in the latter. Stoma diameter, pouch length, and volume correlated inversely with excess weight loss [12]. However, in another study, functional pouch volume, determined by the volume of cottage cheese eaten until comfortably satisfied, increased over the years without correlation to weight loss [21].

The concept of surgical revision to address weight regain after RYGB is not novel. Decades ago, open stoma revision, and PR were reported to reach a similar nadir BMI as after initial RYGB, albeit with a morbidity of 50 % [20, 22]. Actual series vary considerably in their reported outcomes. Interpretation is complicated by inclusion of patients with weight regain and insufficient weight loss, lack of uniform definition for enlarged pouch size and weight loss, and

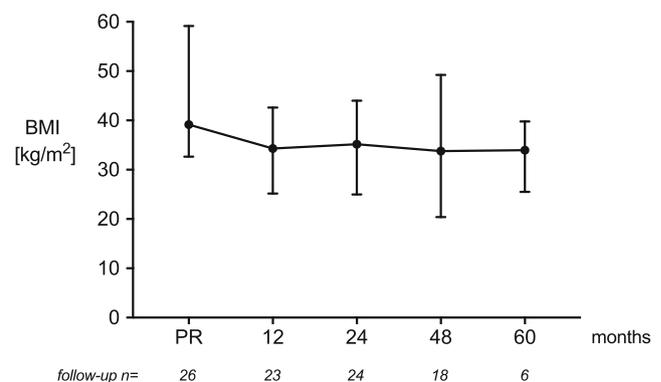


Fig. 1 Evolution of body mass index (BMI) after pouch reshaping (PR)

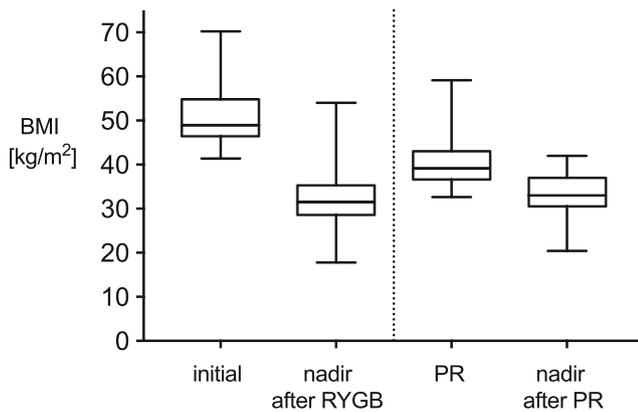


Fig. 2 Body mass index (BMI) during follow-up ($n = 26$ at all time points). *RYGB* Roux-en-Y gastric bypass, *PR* pouch reshaping

heterogeneous patient populations with different initial BMI and follow-ups after RYGB and PR.

A small series of five patients with a median BMI of 32 kg/m² undergoing laparoscopic PR and refashioning of pouch-jejunostomy showed a change of a median 4.6 BMI units after 12 months. Morbidity was 40 % (one reoperation due to jejunal perforation, one dilation of anastomotic stenosis) [17].

Another study included 20 patients with both weight regain and insufficient weight loss. Isolated PR was performed in all patients without addressing the stoma, as it was not dilated. Mean BMI was 35.6 kg/m²; after 18 months, a mean BMI of

29.6 kg/m² or 68.8 %EWL was reported, and a nadir was reached after 6 months at a BMI of 28.7 kg/m² or 72%EWL. Major postoperative morbidity was 30 % (three leaks, one volvulus of small bowel, two pulmonary emboli) [13].

Discouraging results were reported in a study of 14 patients undergoing laparoscopic sleeve reduction of the gastro-jejunal complex over a 40Fr bougie (akin to the technique used in this study), partially combined with lengthening of the Roux limb. Mean BMI at PR was 35.5 kg/m²; after 12 months, a BMI of 32.9 kg/m² was reached. Comorbidity improvement/resolution was 33 % [18].

In a further study, 25 patients with PR including refashioning of the anastomosis showed good weight loss in the short term with regain to prerevisional levels after 24 months. BMI at PR was 41 kg/m²; a nadir of BMI 33 kg/m² was reached after 12 months. BMI at initial RYGB was high, 54.6 kg/m²; further, a major loss of follow-up (only 1/3 of patients after 6 months) limits this study and might have contributed to these results [19].

This series differs to others in several points. Only patients with weight regain but not insufficient weight loss due to enlarged pouch size were included. Patients responded well to the initial RYGB (median EBMIL of 82.3 %) followed by a slowly rising weight curve and gradual loss of satiety. During revision, we used a standardized technique to reshape the pouch-stomal-jejunal complex over a 32F bougie. Even though this might lead to a higher morbidity than endoscopic stoma reduction, it follows our subjective observation of enlargement not only on the gastric but also on the jejunal side. In a study measuring distension-induced sensations in the Roux limbs after RYGB using gradual balloon inflation, intraluminal pressure correlated negatively to meal size, suggesting a contribution to food regulation via flow resistance [23]. This supports the rationale of addressing not only the gastric pouch or the anastomosis as isolated entities, but rather the whole pouch-stoma-jejunal complex as a functional unit. To our knowledge, the follow-up of 48 months is the longest so far. Emphasis was put on patient selection; PR was offered to only patients with good compliance and distinctive enlarged pouch, a fact we perceive as crucial to provide for acceptable long-term outcomes in this patient group. Our median BMI at RYGB (48.9 kg/m²) is on the higher end of the published series, and so is the time interval to PR (77 months). However, our conversion rate is high (23 %), as is the morbidity (minor 27 %, major 15 %), even though it ranges within the rates of other series. The high rate of patients with RYGB as redo procedures (38 %), complicated postoperative course after RYGB (19 %), and incisional hernia repair in the follow-up (23 %) might be contributing factors. Of note, a concomitant hernia repair at time of PR was performed in 15 %. However, to further enhance the morbidity profile of PR, a

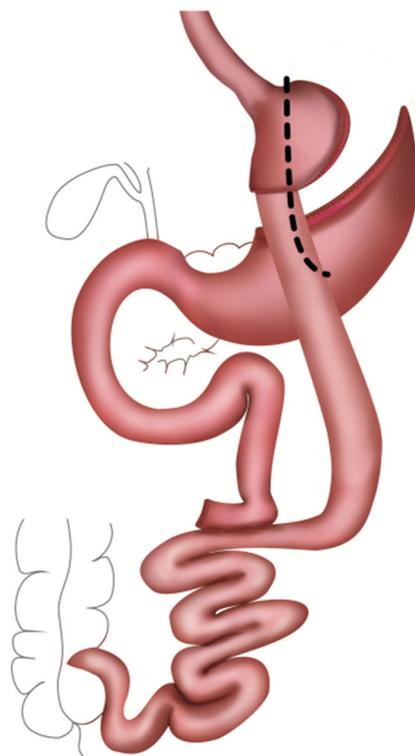


Fig. 3 Surgical technique: the enlarged pouch and parts of the proximal alimentary limb are resected lateral to a 32F bougie. The *dashed line* represents the resection line

change in technique of stapling to plication has to be discussed [24].

Repeating restrictive measures after “failure” of such a concept might be regarded as questionable [24, 25]. This certainly is true for patients with insufficient weight loss; however, significant weight regain implies the achievement of a satisfactory nadir BMI in the first place. Even more, for patients with insufficient weight loss, RYGB might not have been the optimal procedure to begin with. Though, options other than adding restriction, such as elongation of alimentary limbs to form a distal bypass or reversal of RYGB with subsequent conversion to sleeve gastrectomy with duodenal switch, are complicated by severe metabolic sequelae and/or risk of high morbidity [24].

As morbid obesity is a chronic, life-long disease, an effective treatment should entail a multi-interventional approach with a lifetime follow-up of intensive lifestyle consultations, and reoperation if necessary [26]. However, the benefits of bariatric reinterventions have to drastically outweigh the increased adverse outcomes and higher complication rates of redo procedures [1, 24]. Newer, interventional measures might provide different safety profiles albeit with so far disappointing results regarding weight loss [27].

There are limitations to this study. It is a single-center, small patient series without control group. Even though the follow-up rate after 36 months was 92 %, it was 23 % after 60 months; higher patient numbers might have an influence on the long-term results. Diagnosis of enlarged pouch is based upon UGI and not on newer techniques such as 3D computed tomography scans. However, the usefulness of the additional data gained, especially regarding shape, has yet to find its clinical importance. Further, no statement can be made associating post-PR pouch size and correlation to weight course, as follow-up endoscopies and radiographic evaluations were not performed routinely.

Conclusion

Pouch reshaping to address significant weight regain following RYGB in selected patients leads to sustained weight stabilization around the previous nadir. However, there is considerable associated perioperative morbidity, especially in patients with a complication-prone course after initial RYGB.

Compliance with Ethical Standards The study was approved by the local medical ethics committee.

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

Formal Consent For this type of study, formal consent is not required.

Informed Consent For this type of study, informed consent was not required. No identifying details are present.

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