# Outcome of Pouch Reduction Following Roux-en-Y Gastric Bypass

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## ABSTRACT

***Background:*** *Revision bariatric surgery has become common due to postoperative weight gain or failure to lose adequate weight as seen more frequently following Roux-en-Y gastric bypass (LRYGB) after long-term follow-up.* ***Patients and methods:*** *Patients who underwent RYGB and needed a revision surgery for weight regain or failure to lose weight, were selected and underwent their surgery at the Department of General Surgery at Ain Shams University hospitals in the period from April 2014 to May 2016. Twenty four patients (24) fulfilled the entry criteria of the study. Data collection included the surgical technique, the postoperative assessment, postoperative morbidity and mortality, excess weight loss, body weight and body mass index and it was statistically analyzed.* ***Results:*** *Data was collected postoperatively. The mean operative time and hospital stay were 108.1±28 min (range: 74-186 min.) and 3 days (range: 2-18 days), respectively. Postoperative mean excess weight loss (%EWL) was 33.4% (range: 23-65%) and BMI was 33.9±5.1kg/m$^2$ with no mortality reported. The overall complication and reoperation rates were 16.6% and 8.3% respectively.* ***Conclusion:*** *Revision LPR following RYGB for weight regain or failure to lose weight adequately, is a safe and effective procedure for weight reduction.*

***Key words:*** *Revision bariatric surgery, roux-en-Y gastric bypass, pouch reduction.*

## INTRODUCTION

Bariatric surgeries are becoming fast growing due to the continuous rise in the prevalence of obesity and the associated comorbidities. They are most effective in achieving weight loss and improving comorbidities in morbidly obese patients.[1-3] The target is to achieve an excess weight loss (EWL) ≥50%, associated with resolution of obesity related comorbidities.[4-6] Roux en-Y gastric bypass (RYGB) has been a very successful procedure compared to other types of bariatric operations. However, it carries a long-term failure rate of up to 20-35%,[7] particularly in the super obese (BMI > 50kg/m$^2$), with inability to achieve a BMI of< 35 kg/m$^2$.[8] The primary indication for revision bariatric surgery is inadequate weight loss or weight regain.[9,10] Multiple factors contribute to weight regain, but substantial number of literature attribute this to gastric pouch dilatation.[11-14] Procedures that include lengthening of the Roux limb, correction of large gastric pouch and stoma, and takedown of gastro-gastric fistula are concerned with the treatment of the main reasons for insufficient weight loss or weight regain.[15] Elongation of the Roux limb tends to correct the failed weight loss but requires adequate nutritional support to prevent macro- and micronutrient deficiencies as well as protein-calorie malnutrition.[16,17]

The treatment of these patients remains a therapeutic challenge to the surgeon. Restoration of the restrictive property of the RYGB, pouch reduction (PR), entitles pouch resection to reduce its size, a procedure which is currently advocated by several studies.[18,19] However, as some researchers find the procedure safe and effective,[20] others did not find that it offers any major therapeutic benefit.[21]

**Aim of the Study:**

We evaluated the weight loss, body mass index (BMI) outcome and complication rates following laparoscopic pouch reduction (LPR) in patients who underwent RYGB and failed to lose weight effectively or experienced weight regain.

**Study Design:**

This is a prospective interventional non-randomized non-controlled study.

## PATIENTS AND METHODS

Medical data was collected from 24 patients who met our study entry criteria. Those patients underwent revision bariatric surgery in the Department of General Surgery at Ain Shams University hospitals in the period from April 2014 to May 2016. Patients were included if they met

the NIH criteria for weight loss surgery;[22,23] with previous RYGB operation and regained >30 % of their weight that was achieved after their original RYGB, loss of satiety despite intensified nutritional regimen and physiotherapeutic treatment. An important additional criteria for selection were the finding of an enlarged gastric pouch on upper gastrointestinal barium study (>6 cm width in antero-posterior view, referenced on vertebral height presumed as 2.5 cm), or if the pouch was larger than 30 cc as assessed by radiological studies or the upper part of the pouch was visible during endoscopic retroversion.[20] Patients were excluded from the study if they did not meet any of the above criteria, had other causes for weight regain or unfit for surgical intervention. A written informed consent was obtained from all patients prior to inclusion in the study. Patients were informed about the purpose of the study, the benefits, risks and side effects associated with the surgical intervention.

**Preoperative Assessment:**

Preoperative routine blood tests: complete blood count, bleeding profile, liver and renal function tests, serum electrolytes, thyroid hormones and lipid profile was performed for all patients. Ultrasound examination of the liver and gallbladder, upper gastrointestinal contrast study and gastroscopy were done to evaluate gastric pouch size, stoma size, and the presence of gastro-gastric fistula. Cholecystectomy was performed at the time of revision, if gallstones were present on abdominal ultrasound, for both symptomatic and asymptomatic patients. Patient demographics, comorbidities, indication for revision, time after RYGB, preoperative weight and BMI were recorded.

**Surgical Technique: (Figure 1)**

All patients received preoperative low molecular weight heparin in addition to elastic stocking application during surgery. Prophylactic antibiotics were given preoperatively and continued until patient discharge. Patients underwent LPR. All the procedures were performed laparoscopically. Two patients were converted to open surgery following the finding of extensive intraoperative adhesions. After creation of pneumoperitoneum, trocars were inserted in positions similar to those used for laparoscopic sleeve gastrectomy. The adhesions between the gastric pouch, liver, and remnant were divided. The gastric pouch was completely mobilized to the esophagogastric junction and left crus. Next, an orogastric bougie (36Fr) was inserted by the anesthesiologist and laparoscopically guided into the jejunum. A 4.8mm linear stapler (60 mm in length) was serially fired along the left side of gastric pouch towards the left crus. When done, the surgeon clamped the roux limb distally, and a methylene blue leak test was performed. Patients were given clear liquids on the first postoperative day and were discharged home by the second or third postoperative day after doing a contrast study to confirm absence of leakage. Proton pump inhibitors were prescribed for up to 4 weeks and life-long vitamin supplementation was strictly recommended to be continued.

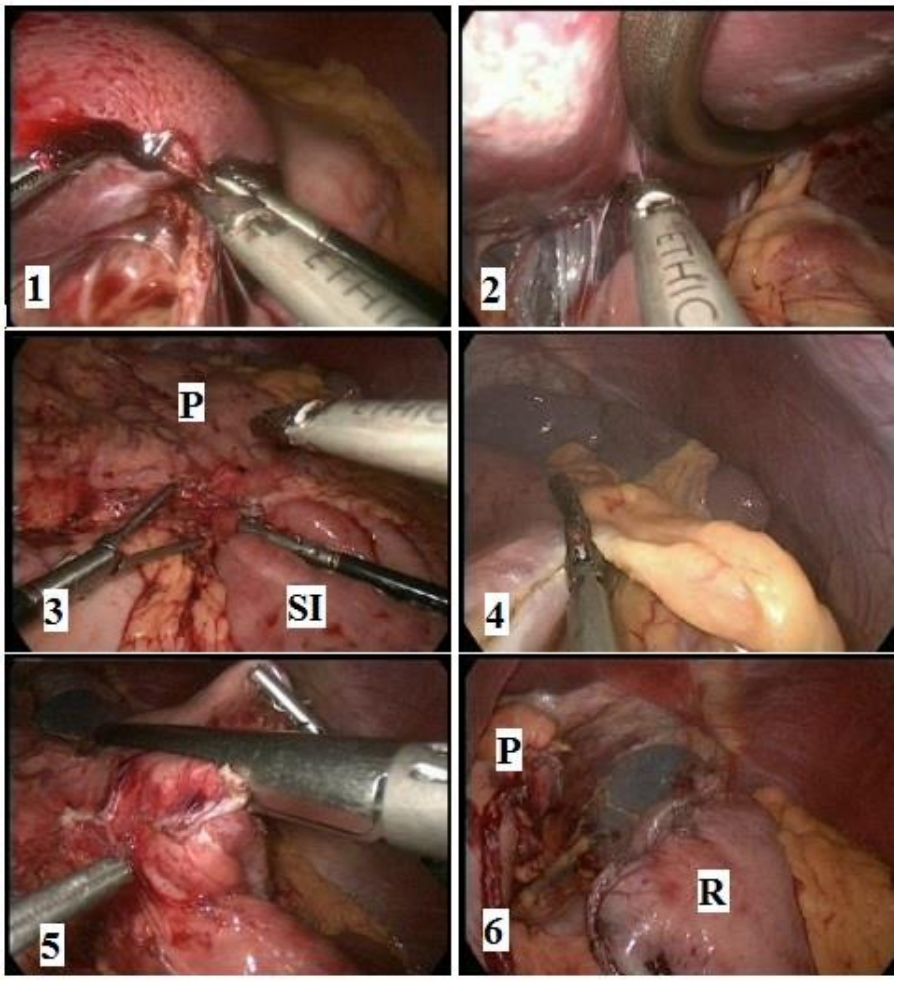


**Figure 1: (1,2)** Dissecting the pouch and remnant from the liver, **(3,4)** Dissection of the left side of the pouch (P) and the small intestine (SI), **(5)** application of the stapler to the left side of the bougie, and **(6)** the resulted reduced pouch (P) and the remnant after reduction (R).

**Postoperative Follow-Up:**

Patients were followed up in the outpatient clinic of El Demerdash hospital on monthly basis. Patient operative time, conversion rate during LPR, operative time, length of hospital stay, mean BMI loss, percentage of excess weight loss (% EWL), indications for surgery, reoperation rate, morbidity and mortality were collected and recorded.

**Data Analysis:**

Statistical analysis was performed using paired t-test on SPSS software package version 23.0 (Statistical Package for Social Science, Chicago, IL, USA).

## RESULTS

Twenty four patients, who met the criteria of the study, (6 males: 25%, 18 females: 75%). The mean age at the time of revision surgery was 39.1±8.3 (range 22-57) years. The mean preoperative BMI was 43±17.2 kg/m$^2$ and weight was 103.7±27.9 kg. The time interval between the initial RYGB and the revision LPR was 26.2±19 months. All but three patients had their initial RYGB performed laparoscopically, the other three had open surgery. Seven patients had relapse of comorbidities (29.2%); two Obstructive Sleep Apnea (OSA), two with hypertension and three with recurrence of diabetes mellitus type 2 (Table 1).

**Table 1: Patients' demographics and preoperative co-morbidities.**

| ***Sex*** | ***Male*** | ***Female*** |
|---|---|---|
| | **6(25%)** | **18(75%)** |
| **Age (years)** | **Mean±SD** | **Range** |
| | 39.1±8.3 | 22-57 |
| **Time interval between initial RYGB and LPR (months)** | **Mean±SD** | **Range** |
| | 26.2 ±19 | 22 – 35 |
| **Preoperative weight (kg)** | 103.7±27.9 | |
| **BMI (kg/m$^2$)** | 43 ± 17.2 | |
| **Co-morbidities** | **Diabetes Mellitus II** | 3 |
| | **Hypertension** | 2 |
| | **OSA** | 2 |

The mean operative time and hospital stay were 108.1±28 min. (range: 74-186 min.) and 3 days (range: 2-18 days), respectively. Two of our patients were converted to open laparotomy for extensive intra-abdominal adhesions. The overall complication and reoperation rates were 16.7 and 8.3 %, respectively. Two patients developed a postoperative superficial surgical site infection at the stapler port site. One patient developed an incisional hernia which was repaired at a later stage. One patient required several re-interventions; 4 days post LPR, the patient presented with tachypnea and fever. Abdominal ultrasonography and computed tomography were done and revealed perigastric pouch minor collection and a leakage at the gastro-esophageal junction. A stent was inserted though endoscopy by the gastroenterologist. Collection was drained by ultrasonic guidance and a pig tail catheter was inserted. A feeding jejunostomy was done and removed with stent removal after 8 weeks.

There was no mortality in our study group. Compliance with postoperative vitamin intake was seen in 88 % of cases after LPR.

**Comorbidities:**

7 out of 24 (29.16%) of our patients had obesity-related comorbidities prior to LPR, including hypertension (2 patients), OSA (2 patients) and diabetes mellitus type 2 (3 patients). Hypertension resolved in the two patients within a 12 and 15 months postoperative period, OSA resolved in one patient at 6 months postoperative and diabetes mellitus type 2 resolved completely in two patients and the third had a reduction in insulin dose. After a 24-month follow-up post LPR, the mean postoperative weight and BMI were 83.5±11.7 kg and 33.9±5.1 kg/m$^2$, respectively, and the mean %EWL was 33.4 % (range 23–65 %). The mean total weight loss and BMI reduction after the LPR were 11.8 kg and 5.3 kg/m$^2$, respectively (Table 2).

**Table 2: Postoperative data, co-morbidities changes and postoperative complications.**

| | ***Preoperative*** | ***Postoperative*** | **P *Value*** |
|---|---|---|---|
| **Weight (kg) mean ± SD** | 103.7±27.9 | 83.5±11.7 | <0.05 |
| **BMI kg/m$^2$ mean ± SD** | 43 ± 17.2 | 33.9±5.1 | NS |
| **%EWL median (range)** | | 33.4 (23-65) | NS |
| **Hypertension n. (%)** | 2 (8.3%) | 0 (0%) | NS |
| **OSA n. (%)** | 2 (8.3%) | 1 (4.2%) | NS |
| **Diabetes mellitus II n. (%)** | 3 (12.5%) | 1 (4.2%) | NS |
| **Surgical Site Infection** | | 2 (8.3%) | |
| **Incisional Hernia** | | 1 (4.2%) | |

## DISCUSSION

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 consultations for nutritional support, physical and psychosocial support, and reoperation if necessary.[24] The benefits of bariatric re-interventions have to dramatically outweigh the increased adverse outcomes and the higher complication rates of revision procedures.[1,11] The role of surgery in weight regain after RYGB is controversial, as the significance of pouch and stoma size enlargement in the follow-up remains unclear.[15,25-27] However, newer interventional measures might provide different safety profiles with so far disappointing results regarding weight loss.[25] These patients' gastric pouch dilates over time and they lose their sense of satiety. One surgical option for these patients is to "trim" this dilated gastric pouch (and proximal jejunum) by a linear stapler along an orogastric bougie. In our study, we present a small number of patients who underwent the LPR procedure. Our results indicate a considerable but not significant BMI decrease (9.1 kg/m$^2$) and %EWL (11.8%). In a study comparing 175 patients after RYGB with successful weight loss to 205 patients with weight regain, pouch and stoma size were 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.[28] 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, with a morbidity of 50%.[27,28] ***Abdulrahman Hamdi and colleagues***[26] addressed the midterm outcomes specific to revision of failed RYGB, and concluded that laparoscopic gastric pouch revision can be performed safely with significant weight loss up to 1year postoperatively. Different techniques have been suggested to assess the size of the gastric pouch, but no ideal method has yet been defined. In our study, we used endoscopic and contrast study assessment (>30 cc or the upper part of the pouch visible during retroversion). We found this method of assessment easy and practical to follow. ***Hamdi et al.,***[26] have shown statistically significant weight loss at 3, 6, 9, and 12 months after revisional surgery for gastric pouch and gastrojejunal anastomosis in patients with weight regain after gastric bypass. There was no statistically significant weight loss at 24 months in spite of BMI reduction from 54.6 to 44.2 kg/m$^2$. In our study, BMI reduction after LPR dropped from 43 to 33.9 kg/m$^2$ over a mean follow-up of 22.7±4.9 months.

## CONCLUSION

In our study, we concluded that the exact reasons for weight loss failure after Roux-en-Y gastric bypass remain incompletely elucidated and are probably multifactorial. Proper evaluation of all therapeutic modalities to correct Roux-en-Y failure, including LPR, should be done. Our study showed that the procedure lead to a considerable weight loss and reduction in the BMI. Safety of the procedure with low complication rates is to be appreciated. However, additional studies with larger population and longer follow up period are required to evaluate longer-term success.

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