Original Article

Short-term outcome after Roux-en-Y gastric bypass for revision after failed sleeve gastrectomy versus De novo Roux-en-Y gastric bypass for bariatric patients

Sherif A. Saber, Tarek M. Sehsah and Mahmoud A. Eissa

Department of General Surgery, Faculty of Medicine, Tanta University, Tanta, Egypt.

ABSTRACT

Background: Revisional bariatric surgeries for weight regain are rising; however, they are considered as riskier and less efficient than primary bariatric procedures. This study aimed to study short-term postoperative outcomes after Roux-en-Y gastric bypass (RYGB) for revision after failed Sleeve gastrectomy versus primary RYGB in Bariatric patients regarding Weight loss, comorbidity resolution, Postoperative complications, hospital stay, mortality, and readmissions.

Patients and Methods: This retrospective study was designed to compare early postoperative outcome between 2 groups of patients admitted to General Surgery Department, Tanta University Hospitals during the period from June 2018 and June 2023.

Results: A total of 254 patients were included in the study, with 87 patients in revisional RYGB and 167 patients in primary RYGB. Groups were matched for age, sex, smoking, preoperative weight, and comorbidities. The duration of revisional RYGB was significantly longer than primary RYGB (201.1±49.85 vs. 161.9±45.05; *P <0.001*). Revisional RYGB patients stayed longer in the hospital (2.54±0.74 vs. 1.87±0.78; *P <0.001*). Total weight loss was significantly higher after 6 months and 1 year in Primary RYGB than group revisional RYGB (*P value<0.05*). However, no differences were detected in postoperative complications, readmissions, reoperation rates, and comorbidity resolution.

Conclusion: RYGB as revisional surgery after a previous Sleeve gastrectomy is a complex procedure that must be indicated with care. It is a safe technique, with postoperative complication rates similar to those of primary RYGB, while it may need longer operative time and hospital stay.

Key Words: Bariatric, revision, Roux-en-Y gastric bypass, sleeve, weight loss.

Received: 5 March 2024, **Accepted:** 18 March 2024, **Publish:** 7 July 2024

Corresponding Author: Tarek M. A. Sehsah, MD, Department of General Surgery, Faculty of Medicine, Tanta University, Tanta, Egypt. **Tel.:** +201003572900, **E-mail:** tarek.sohsah@med.tanta.edu.eg

ISSN: 1110-1121, July 2024, Vol. 43, No. 3: 947-955, © The Egyptian Journal of Surgery

INTRODUCTION

Morbid obesity is a serious health problem mainly observed in developed countries, but a recent increase in prevalence is also noted in developing countries[1].

Sleeve gastrectomy (SG) has recently become the most common bariatric procedure worldwide[2]. However, a considerable number of patients face weight regain following primary bariatric surgery, with more than 1 out of 6 patients encountering a >10% rise from their initial weight during follow-up[3]. In a recent meta-analysis, Clapp *et al*. found a 28% revision rate after SG at 7 years, with variability ranging from 14% to 37% among different series[4].

Revisional surgery following SG is recommended for early perioperative complications like staple-line leaks or postoperative hemorrhage, insufficient weight loss, weight regain, or the persistence of obesity-related co-morbidities[5]. It is also indicated for late complications such as gastric sleeve stenosis or gastroesophageal reflux disease (GERD)[6].

The most common revision procedure after SG was Roux-en-Y gastric bypass (RYGB) (75.2%)[7]. Revisional surgery has a high incidence of postoperative complications due to the technical challenges of operating on patients who have already undergone bariatric surgery[8].

Aim

This retrospective study aimed to study short-term postoperative outcomes after RYGB for Revision after Failed SG versus De novo (primary) RYGB in bariatric patients regarding Weight loss, comorbidity resolution, postoperative complications, hospital stay, mortality, and readmissions.

PATIENTS AND METHODS:

Ethical considerations

(a) Informed consent was obtained before operation from each patient and recorded in patients files, but

DOI: 10.21608/EJSUR.2024.273846.1001

regarding this study, which is a retrospective study, no added consent was obtained from patients.

(b) Data were collected anonymously and not used for purposes other than scientific research.

(c) The research ensured complete privacy and confidentiality throughout its duration.

(d) Ethical consideration of the study was carried out according to that of the ethics committee of research at Tanta Faculty of Medicine.

Patient selection

This retrospective study was designed to compare early postoperative outcome between two groups of patients admitted to General Surgery Department, Tanta University Hospitals during the period from June 2018 to June 2023.

Group I Revisional RYGB: patients underwent bariatric surgery in the form RYGB as a revisional operation after failed SG.

Group II Primary RYGB: Patients underwent Bariatric surgery in the RYGB as a primary (de novo) bariatric intervention.

Inclusion criteria

Age between 18 and 65 years old.

(1) Patients who had undergone de novo RYGB operation as a bariatric operation with body mass index more than 35% and completed follow-up for 12 months.

(2) Patients who had undergone RYGB operation as a revisional bariatric operation after SG and presented with

(a) Insufficient weight loss or weight regain (defined as a decrease in the percentage of excess weight loss less than 50% and body mass index more than 35%)

(b) Severe GERD confirmed by endoscopy and pH manometry.

(c) Sleeve stenosis.

Exclusion criteria

(1) Patients who had undergone other bariatric operation other than RYGB (either de novo or after failed SG).

(2) Patients with other major comorbidity (e.g. Cardiac, hepatic or renal).

Study outcomes

1^{ry} outcome

The total weight loss (TWL) at 6 and 12 months postoperative, which was calculated using the following formula: %TWL = ([Preoperative weight -follow-up weight]/ [Preoperative weight] × 100%)

2^{ry} outcomes

(a) Intraoperative and postoperative complications.

(b) Hospital stay.

(c) Comorbidity resolution.

Data recording

Preoperative data

(a) Age.

(b) Sex.

(c) Weight and Body Mass Index (BMI).

(d) Time between SG and RYGB.

(e) History of diabetes mellitus (DM), hypertension (HTN), hyperlipidemia, and obstructed sleep apnea (OSA).

(f) Smoking.

(g) Surgical indication of revision either weight regain, insufficient weight loss, stenosis GERD.

Intraoperative data

(a) Duration of procedure in min.

(b) Blood loss in ml.

Postoperative data

(a) Duration of hospitalization (in days).

(b) Readmission status, together with the identification of the reasons for readmission.

(c) Reoperation.

(d) Postoperative complications such as hematemesis, hemoperitoneum, anastomotic leak, Deep vein thrombosis, pneumonia, atelectasis, and surgical site infection with categorization according to the Clavien–Dindo classification[9].

Methodology

Preoperative workup

Every participant got a comprehensive clinical assessment, standard blood tests, abdominal

ultrasonography, CT Volumetry for revision cases, upper endoscopy, and thromboprophylaxis 12 h preoperative with low molecular weight heparin.

Surgical technique

A gastric reservoir of 30–50 ml capacity was formed via an antecolic Roux-en-Y stapled gastrojejunal anastomosis in the antecolic position. The length of the alimentary limb was 150 cm, whereas the biliopancreatic limb measured 100 cm. A stapled jejunojejunostomy was performed with a 45 mm side-to-side anastomosis. A nonabsorbable polypropylene suture was used to close the mesenteric defect. All patients in the revision RYGB group who had previously had SG now received a RYGB procedure comparable to primary RYGB group with meticulous adhesiolysis.

Postoperative care and follow-up

Enhanced recovery Following the surgery, preventive measures were taken to prevent postoperative nausea and vomiting, along with pain management, thromboprophylaxis using pneumatic stockings and low-molecular-weight heparin, early mobilization, and initiation of fluid intake the day after the procedure. Patients were discharged upon achieving sufficient oral tolerance.

Follow-up

Follow-up was performed 1, 6, and 12 months postoperatively.

Sample size calculation

The sample size calculation was done by G*Power 3.1.9.2 (Universitat Kiel, Germany). According to a previous study[10], the mean±SD of total weight loss (the primary outcome) was 23.8±7.3 kg in primary (de novo) bariatric intervention group and 18.2±6.5 kg in the revisional operation group. The sample size was based on the following considerations: 0.810 effect size, 95% confidence limit, 95% power of the study, group ratio 1:1. Therefore, we will recruit 82 patients at least in our study.

Statistical analysis

The statistical analysis was performed using SPSS v27 (IBM, Armonk, NY, USA). The Shapiro–Wilks test and histograms were utilized to assess the normality of the data distribution. The quantitative parametric data were shown as mean and SD and were assessed using an unpaired Student t-test. Qualitative variables were shown as frequency and percentage (%) and assessed using the χ^2 test or Fisher's exact test as needed. A two-tailed *P value* less than 0.05 was regarded as statistically significant.

RESULTS:

Baseline characteristics

In total, 254 patients were included in the study, with 87 patients in revisional RYGB and 167 patients in primary RYGB. The baseline characteristics at the time of bariatric surgery are presented in (Table 1).

Age, sex, smoking, preoperative weight, preoperative BMI, height, diabetes, hypertension, sleep apnea, GERD, and hyperlipidemia were insignificantly different between both groups. Regarding surgical indications in group I (Revisional RYGB), weight regains was present in 44 (50.57%) patients, insufficient weight loss was present in 22 (25.29%) patients, GERD was present in 10 (11.49%) patients, GERD with weight regain was present in seven (8.05%) patients and stenosis was present in four (4.6%) patients in revisional RYGB group. Weight regain and insufficient weight loss in revisional group were justified by the increase in sweet consumption and portion size in 60% of patients, large remnant pouch size in 30% of patients detected by CT volumetry, and 10% of patients due to emotional eating.

Intra and postoperative outcomes

The duration of revisional RYGB was significantly longer than primary RYGB (201.1±49.85 vs. 161.9±45.05; *P <0.001*). Revisional RYGB patients stayed longer in the hospital (2.54±0.74 vs. 1.87±0.78; *P <0.001*). Regarding readmissions and reoperation, no significant variations were detected (Table 2).

Hematemesis, hemoperitoneum, anastomotic leak, atelectasis, pneumonia, surgical-site infection, oral intolerance, wound hematoma/seroma, intraabdominal abscess, DVT, mortality, Clavien–Dindo < IIIa, >IIIa and total complication were insignificantly different between both groups (Table 3).

Follow-up outcomes

BMI was significantly lower after 6 months and 1 year in Primary RYGB than group Revisional RYGB (*P value=0.046* and 0.001, respectively). TWL was significantly higher after 6 months and 1 year in Primary RYGB than group Revisional RYGB (*P value<0.05*). (Figs 1 and 2) Readmission, reoperation, diabetes, hypertension, sleep apnea, GERD and hyperlipidemia resolution were insignificantly different between both groups (Table 4).

Table 1: Patients baseline characteristics

	Revisional RYGB (*N*=87) [*n* (%)]	Primary RYGB (*N*=167) [*n* (%)]	*P* value
Age (years)	40.13±6.01	39.59±7.22	0.551
Sex			
Male	10 (11.49)	26 (15.57)	0.377
Female	77 (88.51%)	141 (84.43)	
Smoking	5 (5.75)	3 (1.8)	0.125
Surgical indications			
Weight regains	44 (50.57)	–	–
Insufficient weight loss	22 (25.29)	–	–
GERD	10 (11.49)	–	–
GERD + Weight Regain	7 (8.05)	–	
Stenosis	4 (4.6)	–	–
Preoperative weight (kg)	127.33±7.47 (111–140)	129.39±8.36 (120–173)	0.055
Height (cm)	161.48±5.79 (152–172)	161.34±5.49 (154–171)	0.846
Preoperative BMI (kg/m^2)	48.99±4.23	49.86±4.86	0.155
Time between two operations (years)	2.11±0.43	–	–
Diabetes	21 (24.14)	39 (23.35)	0.889
Hypertension	53 (60.92)	97 (58.08)	0.663
Sleep apnea	36 (41.38)	67 (40.12)	0.846
GERD	17 (19.54%)	40 (23.95)	0.424
Hyperlipidaemia	29 (33.33)	47 (28.14)	0.391

*: significant as *P value* less than or equal to 0.05. Data are presented as mean±SD or frequency (%). BMI: body mass index.

Table 2: Readmission, reoperation, and hospital stay of the studied groups

	Revisional RYGB (*N*=87) [*n* (%)]	Primary RYGB (*N*=167) [*n* (%)]	*P* value
Operative time (min)	201.1±49.8 (120–280)	161.9±45.05 (90–230)	**<0.001***
Hospital stay (days)	2.54±0.74 (2–5)	1.87±0.78 (1–3)	**<0.001***
Readmission 30 days	6 (6.9)	11 (6.59)	0.925
Reoperation 30 days	2 (2.3)	3 (1.8)	1

*: significant as *P value* less than or equal to 0.05. Data are presented as mean±SD or frequency (%).

Table 3: Complication of the studied groups

Complication, *n* (%)			
	Revisional RYGB (*n*=87)	Primary RYGB (*n*=167)	
Hematemesis	2 (2.3)	5 (2.99)	1
Hemoperitoneum	1 (1.15)	4 (2.4)	0.663
Anastomotic leak	2 (2.3)	3 (1.8)	1
Atelectasis	3 (3.45)	5 (2.99)	1
Pneumonia	1 (1.15)	3 (1.8)	1
Surgical-site infection	4 (4.6)	7 (4.19)	1

Oral intolerance	3 (3.45)	6 (3.59)	1
Wound hematoma/seroma	2 (2.3)	5 (2.99)	1
Intraabdominal abscess	2 (2.3)	4 (2.4)	1
DVT	2 (2.3)	6 (3.59)	0.719
Mortality	1 (1.15)	2 (1.2)	1
Clavien–Dindo < IIIa	18 (20.69)	35 (20.96)	0.960
Clavien–Dindo >IIIa	5 (5.75)	15 (8.98)	0.465
Total complication	23 (26.4)	50 (29.9)	0.558

DVT, Deep vein thrombosis.

Table 4: Total weight loss, readmissions, reoperation, and comorbidities resolution of the studied groups

	Revisional RYGB (*N*=87) [*n* (%)]	Primary RYGB (*N*=167) [*n* (%)]	*P* value
BMI (kg/m^2)			
After 6 months	34.05±5.03	32.74±4.9	**0.046***
After 1 year	32.27±5.24	29.66±6.37	**0.001***
TWL			
After 6 months	19.61±2.83	27.52±2.38	**<0.001***
After 1 year	24.59±2.29	32.11±2.27	**<0.001***
Readmission			
After 6 months	3 (3)	6 (4)	1
After 1 year	2 (2)	3 (2)	1
Reoperation			
After 6 months	0	0	–
After 1 year	0	0	–
Diabetes resolution			
After 6 months	6 (28.57)	19 (48.72)	0.131
After 1 year	13 (61.9)	25 (64.1)	0.866
Hypertension resolution			
After 6 months	30 (56.6)	65 (67.01)	0.206
After 1 year	35 (66.04)	78 (80.41)	0.051
Sleep apnea resolution			
After 6 months	14 (38.89)	20 (29.85)	0.352
After 1 year	19 (52.78)	38 (56.72)	0.701
GERD resolution			
After 6 months	5 (29.41)	8 (20)	0.768
After 1 year	9 (52.94)	16 (40)	0.368
Hyperlipidaemia resolution			
After 6 months	10 (34.48)	18 (38.3)	0.738
After 1 year	15 (51.72)	28 (59.57)	0.502

*: significant as *P value* less than or equal to 0.05. Data are presented as mean±SD or frequency (%).
BMI, body mass index; TWL, total weight loss.

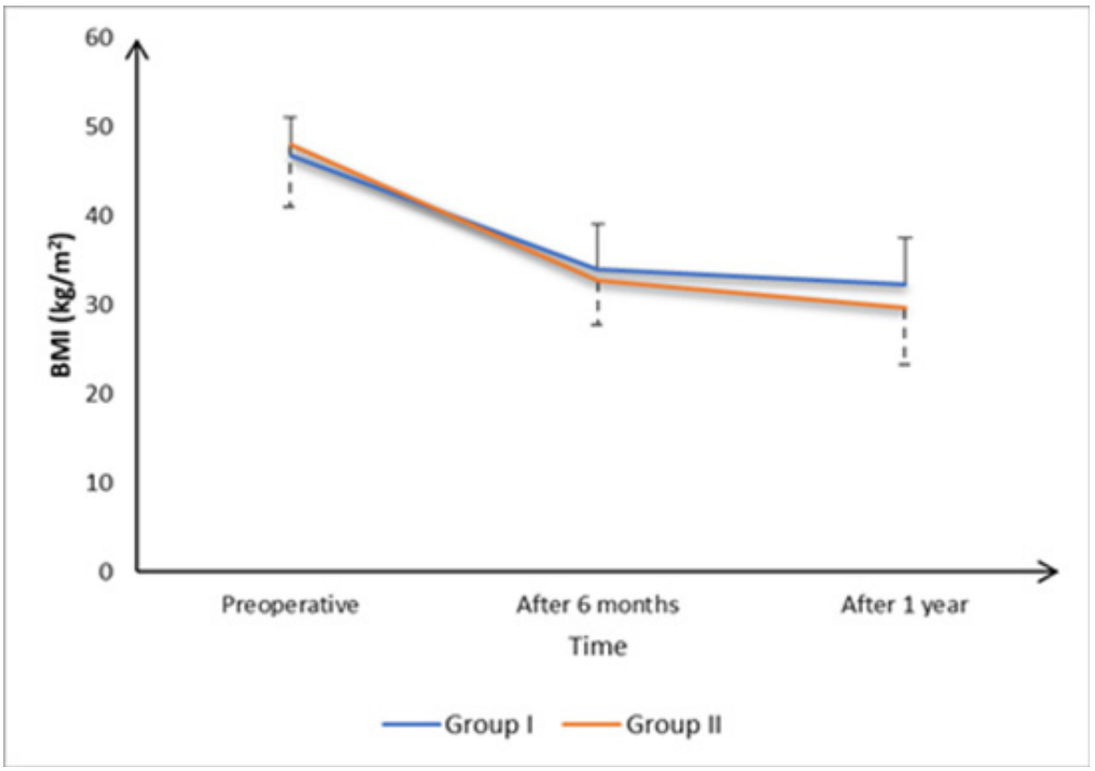

Fig. 1: BMI changes of the studied group.

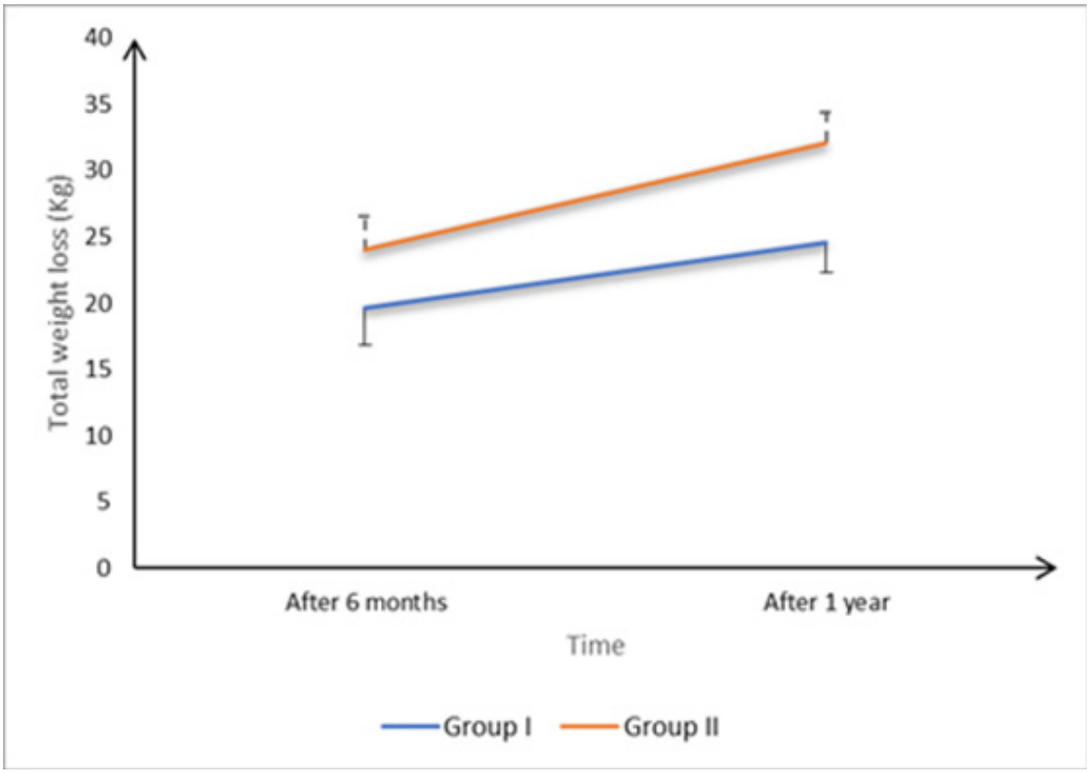

Fig. 2: Total weight loss of studied patient.

DISCUSSION

Our study showed that the revisional RYGB group had significantly longer operative time and hospital stay compared with the primary RYGB group. Additionally patients in Primary RYGB group experienced significantly better weight loss throughout the 1 year follow-up than the revisional RYGB group. On the other hand no significant differences were detected in readmission, reoperation, postoperative complications, and comorbidity resolution at 6 months and 1 years follow-up.

Baseline characteristics regarding preoperative weight and comorbidities were statistically insignificant and this helped us in accurate comparison between the both groups and this was comparative with results of Chowbey *et al*.[11], Vallios *et al*.[12] and Mor A *et al*.[13]. On contrary previous studies have significant difference in baseline characteristics with older patients with lower preoperative BMI in revisional group[14–16] and this represented a selection bias for their studies.

In our study, the most frequent indications of revision were weight regain (50.57%), insufficient weight loss (25.29%), GERD (11.49%), GERD with weight regain (8.05%) and stenosis (4.6%) which were in agreement with Lazzati *et al*.[7], Chowbey *et al*.[11] and Campo-Betancourth *et al*.[15] who showed weight regain (47.9%), insufficient weight loss (25%), weight regain/insufficient weight loss plus GERD (14.6%), and GERD (12.5%).

Our findings aligned with previous studies demonstrating a significantly lower weight loss in Revisional RYGB patients as Giannopoulos *et al*.[10], Vallios *et al*.[12], Mor *et al*.[13], Axer *et al*.[14] and Delko *et al*.[17] and this was justified as the revisional surgeries may need more aggressive procedures to achieve more weight loss. Biliopancreatic diversion with duodenal switch (BPD-DS) and single anastomosis duodeno-ileal bypass (SADI) reprsent the most appropriate second procedure regarding weight loss however they carry an increased risk of deficiencies, protein malnutrition, and intestinal bacterial overgrowth as denoted by Li *et al*.[18].

Furthermore, we showed that Revisional RYGB group was represented by statistically significant longer operative time (*P<0.001*) which is likely due to extensive adhesions and distorted anatomy related to the previous sleeve surgery. Our results align with Giannopoulos *et al*.[10] (203 vs. 153), Chowbey *et al*.[11] (151 vs. 137), Delko *et al*.[17] and with Zhang *et al*.[19] (272.5 vs. 175.5). Nonetheless some studies failed to detect any difference in operative time as Vallios A *et al*.[12] and Campo-Betancourth *et al*.[15].

Regarding the length of hospital stay, revisional RYGB group showed significantly longer hospital stay *P* less than 0.001 and this is justified by the delay in starting oral intake with the longer period the patient can tolerate oral intake and also the longer period to deal with the postoperative nonsurgical complications. Our results were consistent with Vallois *et al*.[12], Mor *et al*.[13], Zhang *et al*.[19], and Dardamanis *et al*.[20], but did not align with Giannopoulos *et al*.[10] and Chowbey *et al*.[11] which showed the insignificant difference between both primary and revisional groups. Also, our results were inconsistent with Campo-Betancourth *et al*.[15] which showed significantly shorter hospital stays in the revision group justified by the fact that revision surgery in their center has been performed mainly since 2016, coinciding with the implementation of the Enhanced Recovery After Surgery protocols in recent years.

When analyzing comorbidity resolution in both groups, we could not detect any significant differences. Our results were comparable with the Chowbey *et al*.[11], Vallois *et al*.[12], and Pędziwiatr *et al*.[21].

Overall, there was no significant difference in the total complications between the revisional and primary RYGB groups *P=0.558* these results were aligned with the results of Campo-Betancourth *et al*.[15] *P=0.597*, Vallois *et al*.[12] *P=0.25*, Chowbey *et al*.[11] and the rate obtained with RYGB in Gero *et al*.[22] However Some studies suggest that morbidity after revisional bariatric surgery greater than those of primary RYGB. Zhang *et al*.[19] showed that more patients in the laparoscopic revisional RYGB had overall complications than primary RYGB patients (38 vs. 19 patients, *P=0.002*). Zingg *et al*.[23] showed that medical morbidity was significantly higher in revisional procedures (9.8% vs. 0%, *P=0.031*). Also Hallowell *et al*.[24] showed that leaks occurred more frequently following revisional surgeries (11% vs. 1.2%) *P<0.0006* but revisional surgery was done by the open approach. El Chaar *et al*. showed that the rate of complications necessitating reoperation or intervention within 30 days after revision RYGB was double that of primary RYGB (3.9% and 4% for Revision bariatric surgery versus 2.4 and 2.7% for primary bariatric surgery, respectively, *P<0.05*)[25].

CONCLUSION

RYGB as a revisional procedure following a SG is a complex surgery that should be indicated with care. The method is safe, with postoperative complication rates comparable to those of primary RYGB, while it may need longer operative time and hospital stay. More systematic studies may be needed to compare the efficacy of RYGB as a revisional surgery after sleeve

with other more complex procedures if the target was to achieve lower BMI.

LIMITATIONS

Our results were retrospective and in a single institution. Also, another limitation was that we didn't exclude the patients undergoing redo for sleeve complications as stenosis and GERD.

CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Yilmaz H, Ece I, Sahin M. Revisional surgery after failed laparoscopic sleeve gastrectomy: retrospective analysis of causes, results, and technical considerations. Obes Surg 2017; 27:2855–2860.

2. Angrisani L, Santonicola A, Iovino P, *et al*. IFSO Worldwide Survey 2016: primary, endoluminal, and revisional procedures. Obes Surg 2018; 28:3783–3794.

3. Athanasiadis DI, Martin A, Kapsampelis P, Monfared S, Stefanidis D. Factors associated with weight regain post-bariatric surgery: a systematic review. Surg Endosc 2021; 35:4069–4084.

4. Clapp B, Wynn M, Martyn C, Foster C, O'Dell M, Tyroch A. Long term (7 or more years) outcomes of the sleeve gastrectomy: a meta-analysis. Surg Obes Relat Dis 2018; 14:741–747.

5. Lacy A, Obarzabal A, Pando E, *et al*. Revisional surgery after sleeve gastrectomy. Surg Laparosc Endosc Percutan Tech 2010; 20:351–356.

6. Braghetto I, Korn O. Late esophagogastric anatomic and functional changes after sleeve gastrectomy and its clinical consequences with regards to gastroesophageal reflux disease. Dis Esophagus 2019; 32:6.

7. Lazzati A, Bechet S, Jouma S, Paolino L, Jung C. Revision surgery after sleeve gastrectomy: a nationwide study with 10 years of follow-up. Surg Obes Relat Dis 2020; 16:1497–1504.

8. El Chaar M, Stoltzfus J, Melitics M, Claros L, Zeido A. 30-Day Outcomes of Revisional Bariatric Stapling Procedures: First Report Based on MBSAQIP Data Registry. Obes Surg 2018; 28:2233–2240.

9. Clavien PA, Barkun J, De Oliveira ML, *et al*. The Clavien-Dindo classification of surgical complications: five-year experience. Ann Surg 2009; 250:187–196.

10. Giannopoulos S, Li WS, Kalantar Motamedi SM, Embry M, Stefanidis D. Outcome comparison between primary and revisional bariatric surgery: A propensity-matched analysis. Surgery. 2024 Mar;175(3):592-598.

11. Chowbey PK, Soni V, Kantharia NS, Khullar R, Sharma A, Baijal M. Laparoscopic Roux-en-Y gastric bypass: Outcomes of a case-matched comparison of primary versus revisional surgery. J Minim Access Surg 2018; 14:52.

12. Vallois A, Menahem B, Le Roux Y, *et al*. Revisional Roux-en-Y gastric bypass: a safe surgical opportunity? results of a case-matched study. Obes Surg 2019; 29:903–910.

13. Mor A, Keenan E, Portenier D, Torquati A. Case-matched analysis comparing outcomes of revisional versus primary laparoscopic Roux-en-Y gastric bypass. Surg Endosc 2013; 27:548–552.

14. Axer S, Szabo E, Näslund I. Weight loss and alterations in co-morbidities after revisional gastric bypass: A case-matched study from the Scandinavian Obesity Surgery Registry. Surg Obes Rel Dis 2017; 13:796–800.

15. Campo-Betancourth CF, Ortiz Sebastián S, Estrada Caballero JL, *et al*. Early postoperative complications after gastric bypass revisional surgery in patients with previous sleeve gastrectomy versus primary gastric bypass. Surg Obes Relat Dis 2022; 18:1246–1252.

16. Iranmanesh P, Fam J, Nguyen T, *et al*. Outcomes of primary versus revisional robotically assisted laparoscopic Roux-en-Y gastric bypass: a multicenter analysis of ten-year experience. Surg Endosc 2021; 35:5766–5773.

17. Delko T, Koštler T, Peev M, Esterman A, Oertli D, Zingg U. Revisional versus primary Roux-en-Y gastric bypass: A case-matched analysis. Surg Endosc 2014; 28:552–558.

18. Li S, Jiao S, Zhang S, Zhou J. Revisional Surgeries of Laparoscopic Sleeve Gastrectomy. Diabetes Metab Syndr Obes 2021; 14:575.

19. Zhang L, Tan WH, Chang R, Eagon JC. Perioperative risk and complications of revisional

bariatric surgery compared to primary Roux-en-Y gastric bypass. Surg Endosc 2015; 29:1316–1320.

20. Dardamanis D, Navez J, Coubeau L, Navez B. A Retrospective Comparative Study of Primary Versus Revisional Roux-en-Y Gastric Bypass: Long-Term Results. Obes Surg 2018; 28:2457–2464.

21. Pędziwiatr M, Małczak P, Wierdak M, *et al*. Revisional gastric bypass is inferior to primary gastric bypass in terms of short-and long-term outcomes—Systematic review and meta-analysis. Obes Surg 2018; 28:2083–2091.

22. Gero D, Raptis DA, Vleeschouwers W, *et al*. defining global benchmarks in bariatric surgery: a retrospective multicenter analysis of minimally invasive Roux-en-Y gastric bypass and sleeve gastrectomy. Ann Surg 2019; 270:859–867.

23. Zingg U, McQuinn A, Divalentino D, Kinsey-Trotman S, Game P, Watson D. Revisional vs. primary Roux-en-Y gastric bypass--a case-matched analysis: less weight loss in revisions. Obes Surg 2010; 20:1627–1632.

24. Hallowell PT, Stellato TA, Yao DA, Robinson A, Schuster MM, Graf KN. Should bariatric revisional surgery be avoided secondary to increased morbidity and mortality? Am J Surg 2009; 197:391–396.

25. El Chaar M, Stoltzfus J, Melitics M, Claros L, Zeido A. 30-Day outcomes of revisional bariatric stapling procedures: first report based on MBSAQIP data registry. Obes Surg 2018; 28:2233–2240.