# Revisional and conversional operations after bariatric surgery

Radwa Attia, Kamal Abo Sonna, Hoda Abd Elazim

***Introduction*** Bariatric/metabolic surgery is currently the only effective long-term treatment for morbid obesity and obesity-related diseases such as diabetes, heart disease, hypertension, obstructive sleep apnea, and dyslipidemia. With the increasing number of bariatric procedures being performed annually, it is expected that the incidence of revisions will increase. The overall incidence of surgical revision after a primary bariatric operation is 5–50%. Redo (revisional) surgery can be quite complex and technically challenging and may offer the patient a wide variety of solutions for treatment of weight reduction and complications after primary operations.

***Aim*** This study aimed to evaluate the initial experience of redo operations after bariatric surgery.

***Patients and methods*** A total of 20 patients were included in this study who underwent redo operations after bariatric surgery. Their BMI ranged from 25 to 50 kg/m$^2$. They were managed from June 2016 to June 2018 at Al Zahraa University Hospital. The indications, surgical outcomes, and efficacy of the redo surgeries were analyzed.

***Result*** A total of 20 patients underwent redo operations. The primary bariatric procedures included vertical band gastroplasty in seven patients, Scopinaro operation in six patients, laparoscopic adjustable gastric banding in four patients, and sleeve gastrectomy in three patients. The indications for redo surgery included poor weight loss, weight regain, and malnutrition in cases of Scopinaro operation. The weight loss results varied depending on the indication for redo surgery. Postoperative complications revealed one case (5%) developed leak and required reoperation. However, no bleeding cases, no died cases, or other complications were observed during postoperative follow-up period.

***Conclusion*** Redo operation after bariatric surgery can be successfully performed via open or laparoscopic approach with acceptable risk. Deliberate selection for the proper revisional or conversion procedure can efficiently manage undesirable results from the primary surgery.

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Department of General Surgery, Al-Azhar University for Girls, Cairo, Egypt

Correspondence to Radwa Attia, MD.
e-mail: dr.radwamohammad@gmail.com

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## Introduction

Morbid obesity is the ailment of the 21st century. The number of bariatric surgery is significantly increasing in the past decade with a number of revisions [1]. There is little evidence-based guidance regarding indications and outcomes of reoperative bariatric surgery [2]. The aim of reoperative surgery is to treat complications and to achieve further weight loss with unsuccessful weight reduction. The numbers revisional surgery operations are increasing, however, most of the studies have small populations and cove less than 5 years of follow-up [3]. Revision surgeries are performed laparoscopically or can be open, especially if prior bariatric surgery has resulted in extensive scarring. With an increase in the number of weight loss surgeries performed every year, there are growing numbers of individuals who have an unsatisfactory result from their bariatric procedures [4]. Indications for reoperations in bariatric surgery are either related to weight loss and weight regain or complications or adverse effect of the primary bariatric procedure or metabolic and nutritional sequelae [5]. Revision bariatric surgery procedure is chosen depending on the cause of failure of weight loss. Although redo surgery is difficult and riskier than primary bariatric surgery procedures, this risk decreases if performed by an expert surgeon [4]. According to the American Society for Metabolic and Bariatric Surgery, these procedures can be organized into the following categories: revisional, conversion, and reversal surgeries. In revisional procedures, the alterations performed do not modify the basic anatomy of the primary surgery (e.g. rebanding and resleeve) [6]. Normally, these procedures are performed owing to chronic complications (e.g. gastrogastric fistula and recurrent ulcers) from a previous primary operation. They are also performed when weight regain occurs [7]. For cases with poor weight loss or weight regain, conversion procedures are the most common; such procedures represent a change in the structural anatomy of the primary operation into a different type of surgery. Examples of conversion procedures comprise alteration from a purely restrictive surgery to a sleeve gastrectomy (SG) or a malabsorptive procedure [8]. Finally, reversal procedures consist in undoing the primary procedure, usually with the restoration of the original anatomy [9].

Patients with weight loss failure and weight regain were indicated for reoperation as there is little information about long-term efficacy and safety of redo operation, so it is highly recommended to assess long-term follow-up period [10].

## Patients and methods

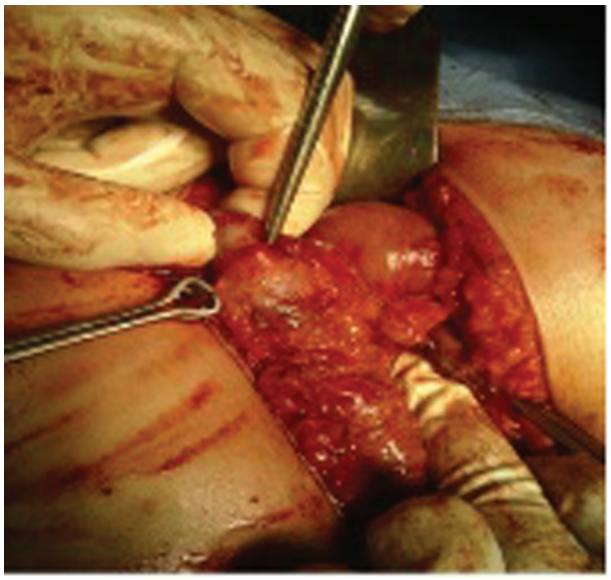
A total of 20 patients underwent revisionary bariatric surgery between January 2016 and January 2018 at Al Zahraa University Hospital. Ethical approval statement according committee of ethics. Some patients had the first bariatric surgery at Al Zahraa University Hospital, and the others were referred from other hospitals. Patients' data were collected, such as age, sex, BMI, types of initial operation, indication for redo surgery, and postredo morbidity and mortality. Preoperative assessment was done in all patients as routine investigations, and serum calcium for patient had combined bariatric surgery. There were 20 cases, 14 (70%) of them had BMI from 35 to 50 kg/m$^2$ with insufficient weight loss, and 6 (30%) Scopinaro operation had malnutrition with BMI from 25 to 35 kg/m$^2$. The comorbidities related to obesity in cases of failure of weight loss were diabetes, hypertension, and hyperlipidemia. Preoperative laboratory investigations included mainly complete blood count, blood glucose level, serum cholesterol, and triglyceride.

### Operative procedures

All the procedures were performed via the open approach under general anesthesia, and the patient was placed in supine position in cases of vertical band gastroplasty (VBG) revised to either Roux-en-Y gastric bypass (RYGB) or minigastric bypass. The first step we tried to separate the stomach wall from the left lobe of the liver and overlying the omentum to identify the site of mesh revision then Bougie 36 was inserted into the stomach to determind the length of the pouch (Figs 1 and 2); if it is passed easily without gastric outlet obstruction, the mesh was not removed and we continued the operation as minigastric bypass in which, the first staple line was placed at the level of the incisura and on the previous VBG staple line, and loop gastrojejunostomy was performed 150 cm from duodenojejunal junction. In cases where the length of the pouch was short, operation was continue as RYGB where the biliopancreatic limb was 50–70 cm and alimentary limb was 150 cm using a linear stapler to create end-to-side gastrojejunostomy and side-to-side jejunojejunostomy (Figs 3–5).

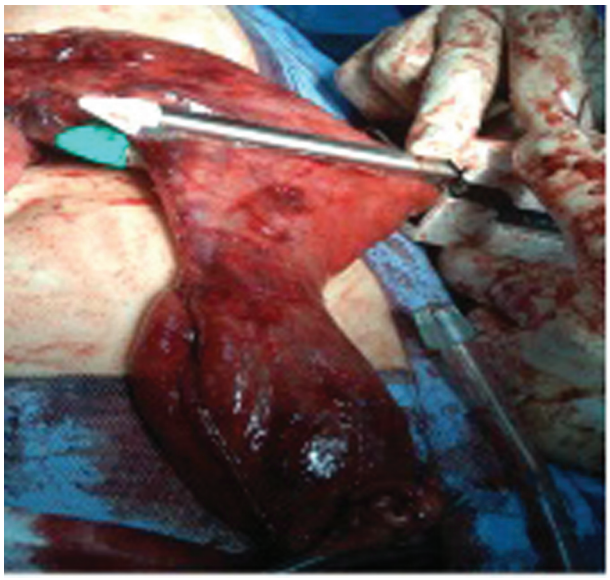
In cases of SG converted to RYGB, the sleeved stomach was transected with creation of a gastric pouch, and then was followed similarly as the usual RYGB procedures. In cases of failed laparoscopic adjustable gastric banding (LAGB), the band was identified intraoperatively by following of the band tube with dissection of adhesion, especially to the left lobe of the liver, and the fibrotic capsule of the band was released with converting a lap band to open RYGB, in addition to the control of food absorption element by connecting the upper intestine (jejunum) to a gastric pouch at the top of the stomach. In this procedure, the gastric band is removed, and a gastric

**Figure 1**



Remmnant part of the stomach.

**Figure 2**



Resection of remnant part of stomach.

**Figure 3**

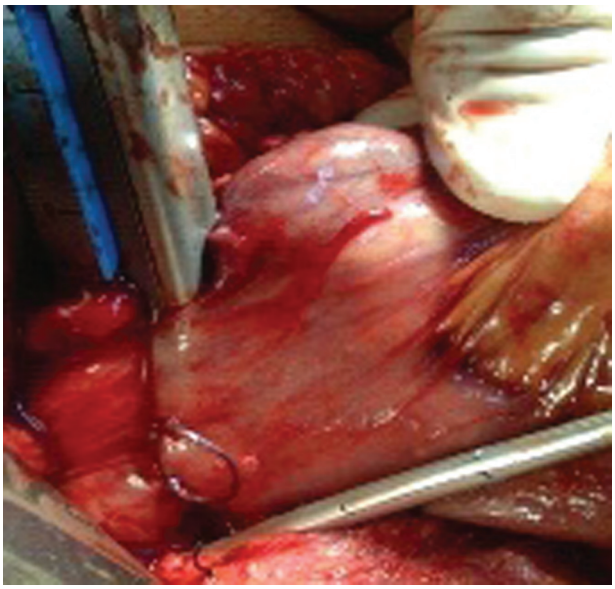
Resection of small intestine.

**Figure 4**

Anastomosis of small intestine.

pouch is constructed from stomach tissue. However, the gastric band also created as a kind of pouch and restriction in the same location. In cases of malnutrition after Scopinaro operation, common limb elongation along biliopancreatic limb can occur to cure relapsing protein malnutrition with diarrhea. The aim is to provide a longer alimentary tract for effective protein absorption, together with longer common channel for absorption of fat and energy. Modified Scopinaro proposes elongating the common channel from 50 to 150 cm, and if conversion occurs, infracolic enteroentrostomy was done.

**Figure 5**



Anastomosis between stomach and intestine.

### Postoperative follow-up

Their pain was under control, and the patients initiated oral intake on the third postoperative day after the absence of anastomotic leakage, and it was confirmed by gastrografin, and patients were discharged once they had achieved adequate oral intake. Patients were discharged after 1 week. The postoperative nutritional regimen was similar to that of primary surgery and consisted of a liquid or soft diet for the first 3 weeks with gradual increases in food texture thereafter. Patients returned to the outpatient clinic 2 weeks after surgery and then every 3 months for the first postoperative year to monitor weight loss, comorbidity status, dysphagia or food intolerance, eating behavior, appetite, and the presence of any complications. Follow-up was then decreased to every 12 months after the first year.

## Results

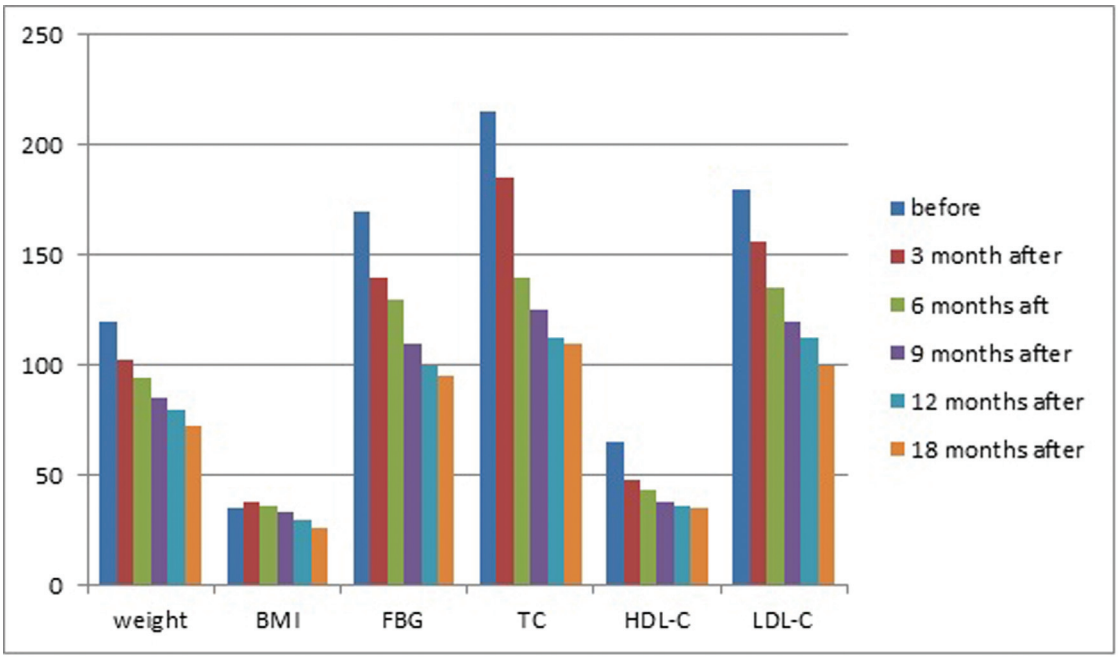
A total of 20 patients underwent reoperations during the study period. The patients' clinical characteristics before redo surgery are shown in Table 1 and Fig. 6. The patients included six men (30%) and 14 women (70%) (Table 2). The previous bariatric procedure was VBG in seven cases, Scopinaro operation in six cases, LAGB in four cases, and laparoscopic SG in three cases. The redo operations were performed as open procedure in all 20 patients. The mean age ranged from 25 to 50 years, and the mean postoperative hospital stay was 5 days with range of 4–7 days. There was no operative mortality, and early postoperative complications revealed leak requiring reoperation, no

**Table 1 Anthropometric and metabolic modifications in obese patients before and after redo operation**

| | Before redo | 3 months after | 6 months after | 9 months after | 12 months after | 18 months after |
|---|---|---|---|---|---|---|
| Weight (kg) | 120±16 | 102±5 | 94±5 | 85±6 | 80±4 | 72±5 |
| BMI (kg/m$^2$) | 35±5 | 38±5 | 36±3 | 33±2 | 30±1 | 26±1 |
| Glucose fasting (mg/dl) | 170±30 | 140±20 | 130±15 | 110±10 | 100±10 | 95±5 |
| TC (0–200) (mg/dl) | 215±30 | 185±20 | 140±15 | 125±10 | 112±10 | 110±13 |
| LDL-C (mg/dl) | 180±28 | 156±16 | 135±12 | 120±10 | 112±12 | 100±10 |
| HDL-C (35–55) (mg/dl) | 65±18 | 48±10 | 43±10 | 38±4 | 36±3 | 35±2 |

HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; TC, total cholesterol.

**Figure 6**




Anthropometric and metabolic modifications in obese patients before and after redo surgery. FBG, fasting blood glucose; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; TC, total cholesterol.

**Table 2 Preoperative characteristic of patients**

| Obese patients | *N*=20 |
|---|---|
| Men/women | 6/14 |
| Age [mean±SD (range)] (years) | 25±15 (25–40) |
| BMI (kg/m$^2$) | 25–50 |
| Hypertension (%) | 25 |
| Diabetes mellitus (%) | 30 |
| Hyperlipidemia (%) | 25 |

**Table 3 Indication for redo operation**

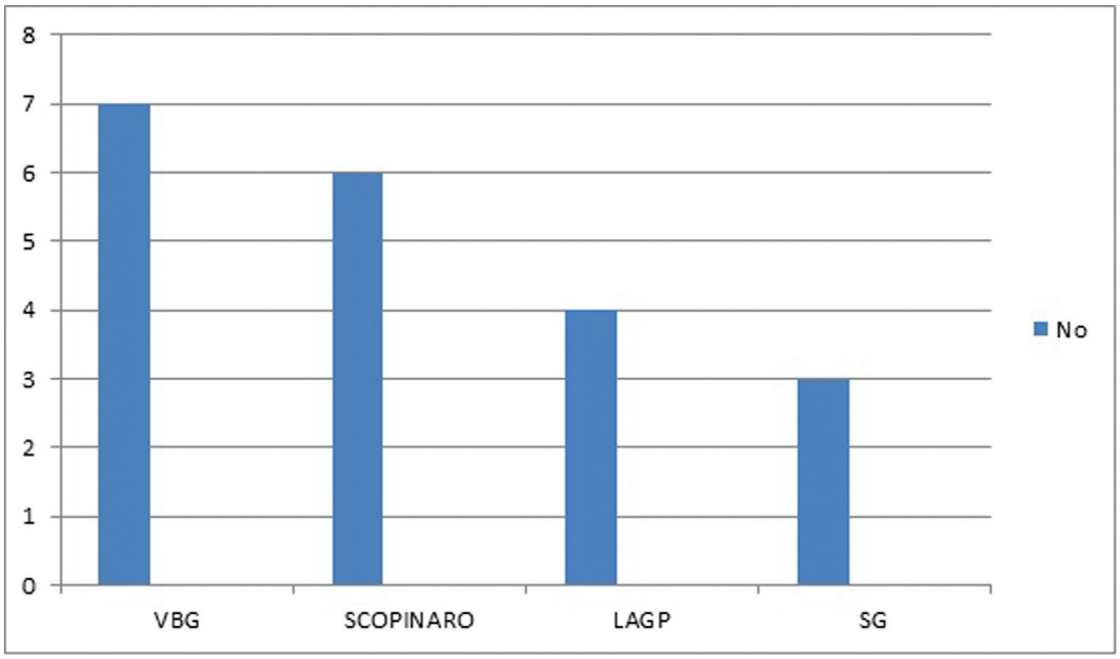
| Previous operation | Indications |
|---|---|
| VBG (*n*=7) | Insufficient weight loss |
| Scopinaro (*n*=6) | Malnutrition (excessive weight loss) and insufficient weight loss |
| LAGP (*n*=4) | Insufficient weight loss, band erosion, and severe reflux |
| SG (*n*=3) | Insufficient weight loss, intolerable reflux symptoms, and gastric stricture |

SG, sleeve gastrectomy; LAGB, laparoscopic adjustable gastric banding; VBG, vertical banded gastroplasty.

bleeding, and no other complications. The mean time interval from the previous bariatric surgery to redo surgery was 35 months, whereas the mean BMI at revision ranged from 35 to 50 kg/m$^2$in cases of failure of weight loss, whereas in cases of malnutrition BMI ranged from 25 to 35 kg/m$^2$. The most common primary indication for redo surgery was inadequate weight loss after duodenal switch [*n*=6 (30%)] VBG [*n*=7 (35%)], SG [*n*=3 (15%)], or LAGB [*n*=4 (20%)], and other indications after failed LAGB include direct band-related complications such as band erosion or intolerable reflux symptoms and psychological band intolerance (Table 3 and Fig. 7). Two other patients decided to undergo revisional bariatric surgery after primary SG because of intolerable reflux symptoms, gastric stricture, and uncontrolled diabetes with insufficient weight loss.

The most commonly selected procedure for revision was RYGB (resectional RYGB). All revisional

**Figure 7**




Indication for redo operation. SG, sleeve gastrectomy; LAGB, laparoscopic adjustable gastric banding; VBG, vertical banded gastroplasty.

operations were successfully performed using an open approach, and the patients were discharged at an average of 5 postoperative days. Anastomosis site bleeding was not noticed in any patient. Gastric pouch leak developed in one patient after revisional RYGB and required reoperation of the primary repair with external drainage on the first postoperative day. The patient was discharged on the fifth postoperative day may be at 7 days postoperative in some patients without further complications with no surgical mortality. Anthropometric and metabolic data of the patients in this study are reported in Table 1. The effect of the operation on comorbid diseases, such as diabetes, hypertension, and hyperlipidemia, revealed improvement, with discontinuation of treatment in five diabetic cases and improvement in one case. Cases of hypertension achieved cure in four cases, whereas in one case, the dose of treatment was reduced. All cases of hyperlipidemia were improved completely.

## Discussion

Revisional bariatric surgery for severe metabolic and nutritional complications is typically performed after previous malabsorptive procedures. The accelerated growth of bariatric surgery during the past decade has led to a proportional increase of bariatric revisions worldwide. Failure to lose weight after bariatric procedures is usually multifactorial. Psychological, dietary, and medical follow-up are very important for long-term weight loss success. Once these factors have been addressed, patients should be offered a surgical re-evaluation, and the assessment of the bariatric patient at this point must begin with a thorough history and physical examination [11].

Primary bariatric surgery is established as the first line of treatment of morbid obesity and this is not the case with revisional surgery, so revisional surgery becomes more risky than the primary one. The rate of revisional surgery is 20–60% after LAGB, 9–17% after RYGB, and 9–11% after SG, which has been recorded in a study [12].

Bariatric surgery is considered unsuccessful when the intended weight loss is not achieved or when complications develop, and therefore, revisional surgery is highly recommended. Patients who present with insufficient weight loss, weight regain, or comorbid diseases after bariatric surgery require reoperative surgery and should be evaluated by multidisciplinary program including behavioral and nutritional assessment with anatomical evaluation depending on original operation [13].

The rate of revisional surgery after bariatric procedures varies depending on the primary procedure but can be as high as 60% in some studies. With such high rates of revisional surgery, more data are emerging on the efficacy and safety of the conversion of each

procedure to another. Short-term and medium-term results have shown acceptable outcomes with favorable results in terms of weight loss and resolution of comorbidities, along with an expected higher yet acceptable rate of short-term complications such as leak when compared with the primary procedures [14].

The reason for this may be owing to its simplicity, reversibility, and relatively low perioperative complications. However, according to many previously published studies, the efficacy of LAGB seems to be limited with a high reoperation rate, and more patients with band device will require revision or conversion to other bariatric procedures in the near future [14]. Several studies have suggested that RYGB or SG could be appropriate as revisional procedures after failed LAGB. Our data also showed that RYGB or SG could successfully manage undesirable results from the primary LAGB, for example, all the patients who underwent band removal owing to implant-related complications in this study eventually showed weight regain shortly after simple band removal and visited our institution to deal with rebound obesity [15].

The reoperative procedure of choice should depend on several factors, including patient history and intraoperative findings. If the initial LAGB achieved adequate weight loss but failure occurred owing to band slippage or pouch dilatation, similar weight loss can be expected for reoperation with a different restrictive procedure [16]. Therefore, SG would be a reasonable alternative procedure. However, when the major reason for considering revisional surgery is weight regain or inadequate weight loss, the commonly advocated key principle is to convert a purely restrictive procedure to include malabsorptive components; the priority was usually given to RYGB, to which most of the patients were converted [17].

Revisional bariatric surgery is complex and technically demanding. It is generally associated with a higher risk of postoperative complications than that of primary procedures, and the perioperative morbidity rate is reportedly 19–50%, and the complication rates for laparoscopic revision have been reported to be 14.5–46.5% in some studies [18]. In some studies, when converting VBG to SG, a leak rate of 14% has been reported, and the leak rate is 22% for patients undergoing VBG conversion to biliopancreatic diversion (BPD)/duodenal switch. Conversions to open BPD or open BPD have had mixed results in our study, with leakage rate of 5% [19]. Shimizu *et al.* [20] perform redo operations after the primary surgery of VBG, SG, LAGB, and BPD, with average BMI before the primary surgery being 54.4±13.8, and BMI before redo operation being 44.0±13.7. The operation done was RYGB. The follow-up duration was 2.4±1.5 years. A total of 50 patients were included, with average age of 30–55 years. The patients comprised 34 female and 16 male patients, with no complications developed after redo operation. There was no mortality, and only one case developed chronic obstructive pulmonary disease. These patients were complaining of failure of weight loss after the primary surgery. Their BMI after redo surgery ranged 37 ±26 $kg/m^2$ [20].

Khaitan *et al.* [21] performed redo surgery after operations of VBG, Scopinaro, and AGB, with follow-up duration of 5 months. Redo operation was RYGB, with indications for redo being failure of loss of weight development of complications, for example, leak. BMI was 43.3±9.9 $kg/m^2$ before redo operation and postredo operation BMI was 37.4±9.2 $kg/m^2$. The complication developed was leak in two patients, which needed reoperation. There were 37 patients, comprising 30 female and seven male patients. Their average age was 27–50 years. There was no mortality [21].

Stefanidis *et al.* [22] performed redo operation after primary operation of LAGB, VBG, and SG, with follow-up period of 6 months. The redo operation was RYGB, with indication of redo being failure of weight loss. The BMI before redo was 35–45 $kg/m^2$ was and after redo, the BMI was 25–30 $kg/m^2$, with no complications developed [22].

In this study, the patients' age range was 25–50 years, with an average similar to the previous study. The BMI of the patients in this study was 35–50 $kg/m^2$ in cases of failure of weight loss, whereas 25–35 $kg/m^2$ in cases of malnutrition, with leak developed in one case, and reoperation was done. The average length of hospital stay was 5 days, with no mortality as the previous study.

Results of the patients with BMI 30 $kg/m^2$ success can be also defined as resolution of comorbidities and improvement of quality of life. RYGP has been considered by many not only as the primary bariatric procedure of choice but also as the preferred redo procedure after unsuccessful restrictive procedure [23]. Regarding weight loss, Fobi *et al.* [24] after 10 years of follow-up reported 20% of weight loss failure, and Power *et al.* [25] reported 30% of failure. These data were also confirmed by others who experienced

weight loss failure between 10 and 20% after 2–3 years of follow-up.

When behavioral or anatomic issues are not present, revisional surgery should be approached with a goal of treating or enhancing excess weight loss. The risks of reoperative bariatric surgery are higher than primary bariatric surgery, so careful patient selection and surgeon expertise are highly recommended [26].

## Conclusion

Reoperative procedure should be based on the primary operation, the patient's anatomy, the patient's weight and comorbidities, and experience of the surgeon. RYGB result is safe and effective for weight loss and for resolution of comorbidities after failure of primary bariatric surgery.

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### Conflicts of interest

There are no conflicts of interest.

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