Laparoscopic Roux EN-Y gastric bypass technique and results in 150 cases

Medhat Helmy[a], Ali El Anwar[b], Tarek Youssef[b]

[a]Saint Maria Nouva Hospital, Reggio Emilia, Italy, [b] Department of General surgery, Faculty of Medicine, Ain Shams University, Cairo, Egypt

Correspondence to Tarek Youssef, MD, MRCS, 55 Al Moltaka Al Araby, Masaken Sheraton, 3rd floor, Cairo, 11361, Egypt
Tel: +20 122 736 5165; fax: 0224192424;
e-mail: tarekyoussef@yahoo.com

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Introduction
Obesity is a major public health challenge in the 21st century, where medicopsychological management has shown its limitations. Bariatric surgery is now acknowledged as the most efficient therapy, potentially offered to severely obese patients. Among other options, Roux En-Y gastric bypass (RYGBP) is the most frequently performed procedure.

Patients and methods
This is a retrospective study of 150 patients who underwent a laparoscopic RYGBP at the Saint Maria Nouva Hospital (Reggio Emilia, Italy) and the Ain Shams University hospitals during 2011–2013 with a 1-year follow-up. There were 29 male (19%) and 121 female (81%) patients, with an age range of 18–58 years. Their mean BMI (kg/m²) was 45.The outcome of this technique was evaluated by the incidence of early surgical postoperative complications, including gastrojejunostomy leakage, postoperative intra-abdominal bleeding or hematoma, reoperation, and mortality rate, and late postoperative complications, such as gastritis, vitamin deficiency, gastrojejunostomy stricture, incisional hernia, and internal hernia, after 12 months' follow-up. Weight loss was followed up every 3 months up to 12 months.

Results
The average operative time was ~75–90 min. There was no mortality in our series. Early postoperative intra-abdominal hematoma formation occurred in three cases (2%). Anastomotic leaks occurred at the gastrojejunostomy site in three cases (2%). There was no incidence of pulmonary complications or early postoperative wound infection. With long-term follow-up every 3 months up to 12 months, there was one case of incisional hernia after reoperation for leakage (0.6%) and there was no complain of gastritis, no incidence for gastrojejunostomy stricture, or internal hernia. There was no vitamin deficiency during the 12-months follow-up, except for two cases (1.2%) of iron deficiency anemia that needed additional iron supplementation. Regarding weight loss, the mean weight loss after 12 months' follow-up was 35.2 kg and the mean BMI of the patients decreased from 45 kg/m^2 preoperatively to 32.3 kg/m^2 after 12 months.

Conclusion
The primary desirable outcomes after bariatric surgery include low rates of perioperative and long-term complications, sustained and meaningful weight loss, significant improvement in the quality of life, improvement or resolution of obesity-associated comorbidities, and extension of life span. All the five outcomes have been shown to be feasible results of laparoscopic RYGBP.

Keywords:
bariatric, bypass, obesity, Roux EN-Y

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Introduction

Obesity is defined as 20% or more than the ideal body weight or a BMI [1] of 30 or more; morbid or severe obesity was traditionally defined as a weight of 45 kg or more or 100% over the ideal body weight defined by standard life insurance tables; more recent classification systems define morbid obesity as a BMI of 40 or more or a BMI of 35 or more with the presence of comorbidities [2].

The first-choice therapy for severe obesity is a nonsurgical program that integrates behavior modifications, adequate physical activity, and psychological support. However, in many cases of severe obesity, nonsurgical treatment fails in providing sustained weight loss, and so surgical treatment is indicated [1], because even a modest weight loss (10–15% of the initial weight) usually results in improvement or resolution of multiple medical comorbidities; surgical treatment of severe obesity appears to be cost effective by eliminating the use of medications and absenteeism from work in patients who were previously morbidly obese [3].

Bariatric surgeries are divided into restrictive, restrictive/malabsorptive, and malabsorptive procedures, which are performed either by open or by laparoscopic procedures [4].

Purely restrictive procedures include vertical banded gastroplasties and silastic ring vertical gastroplasties; these procedures are based mainly on the reduction of the gastric capacity and reducing food intake. The weight loss in these techniques is modest in general, and less than that established as the criterion of success

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[excess weight loss (EWL) >50% sustained for at least 5 years after surgery] [5].

The classical restrictive/malabsorptive surgery is the Roux En-Y gastric bypass (RYGBP). In this procedure, the gastric capacity is reduced by 90–95%. It is considered as the most common bariatric procedure because with gastric bypass, weight loss is more rapid as patients undergo 50–77% EWL 1 year after the procedure. The weight loss after gastric bypass most likely results from anatomic changes that confer hormonal and malabsorptive advantages in addition to restriction, with less complication rate, specially with very low vitamin deficiency and protein malnutrition compared with biliopancreatic diversion [4].

Gastric bypass and gastric band are the most common bariatric procedures that are performed nowadays. Gastric bypass was associated with a greater average EWL than gastric band at each postoperative measurement period (6, 12, 18, and 24 months) over the 2-year follow-up. Thus, there was a higher success rate and fewer treatment failures with gastric bypass than with gastric band. Mortality rates are low for both operations: ~1% for gastric bypass and 0.1% for gastric band. The perioperative risk for severe complications is greater with gastric bypass than with gastric band, but the lifetime risk for complications requiring reoperation may be greater for gastric bands. Postoperative care generally entails more treatment visits for band than for bypass patients because band adjustments are needed every 2–6 weeks. Gastric bypass patients, however, need to return to the clinic only three to four times per year after surgery [6].

The National Institutes of Health [2] Consensus Development Conference Panel for gastrointestinal surgery for the treatment of severe obesity identified RYGBP as one of the recommended surgical procedures for the treatment of those with severe obesity. Since then, gastric bypass in its different variations has become the most frequently performed bariatric surgery.

The aim of this study was to evaluate the outcome of this technique with regard to the incidence of early surgical postoperative complications, including postoperative intra-abdominal bleeding, hematoma, reoperation, and mortality rate, and late postoperative complications, such as gastritis, vitamin deficiency, gastrojejunostomy stricture, incisional hernia, and internal hernia, after 12 months of follow-up as well as weight loss follow-up every 3 months up to 12 months.

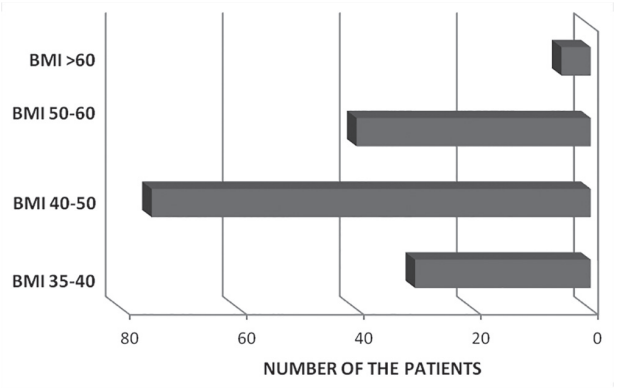
Patients and methods

This is a retrospective study of 150 patients who underwent a laparoscopic RYGBP at the Saint Maria Nouva Hospital (Reggio Emilia, Italy) and Ain Shams University hospitals during 2011–2013 with a 1-year follow-up. There were 29 male (19%) and 121 female (81%) patients, with an age range of 18–58 years. The BMI (kg/m^2) was 35–40 in 30 patients (20%), 40–50 in 75 patients (50%), 50–60 in 40 patients (27.7%), and more than 60 in five patients (3.3%). Patients' criteria are shown in Table 1 and Fig. 1.

The outcome of this technique was evaluated as follows:

(1) The incidence of early surgical postoperative complications, including gastrojejunostomy leakage, postoperative intra-abdominal bleeding or hematoma, reoperation, and the mortality rate.
(2) Late postoperative complications, such as gastritis, vitamin deficiency, gastrojejunostomy stricture, incisional hernia, and internal hernia, after 12 months' follow-up.

Figure 1



BMI (kg/m^2) of the patients preoperatively.

Table 1 Patients' criteria

Patients	(*N* = 150)
Age (years) (range)	18–58
Male/female [*n* (%)]	29/121 (19/81)
ASA [*n* (%)]	
I	15 (10)
II	15 (10)
III	30 (20)
IV	90 (60)
Smoker/nonsmoker (%)	31/69
COPD (%)	40
BMI (kg/m^2) [*n* (%)]	
35–40	30 (20)
40–50	75 (50)
50–60	40 (27.7)
>60	5 (3.3)

ASA, American Society of Anesthesiologists; COPD, chronic obstructive pulmonary disease.

(3) Weight loss follow-up every 3 months up to 12 months.

Preoperative evaluation

Because of the under-nutrition imposed on the patient and inherent complications after all bariatric procedures, patients should be regularly accompanied, in both the preoperative and postoperative periods, by a multidisciplinary team with medical, surgical, psychiatric, and nutritional expertise, which leads to fast improvement of major obesity complications after bariatric surgery; hence, after the patients were evaluated by a surgeon, a dietician, a psychologist, and an anesthesiologist evaluated the patients 5–6 weeks preoperatively, and then the patients went through a preoperative 3–6-week program with minor weight reduction and no smoking (Table 2). Table 3 illustrates the comorbidities that must be detected and controlled preoperatively to improve the postoperative outcome. The preoperative evaluation includes the following sections.

Laboratory evaluation

It included a basic chemistry panel, complete blood count, thyroid function tests, serum cortisol, urine cortisol, serum cholesterol, and serum triglycerides.

Upper endoscopy

It was performed to rule out inflammatory ulcerous gastric pathology, which would no longer be accessible by gastroscopy after the bypass procedure, and also to detect and treat *Helicobacter pylori* infection when present.

Ultrasound of the abdomen

It was performed to rule out cholelithiasis, which would necessitate cholecystectomy along with the gastric bypass procedure.

Cardiovascular evaluation

It was performed to exclude any contraindications to anesthesia, with echocardiography to assess the left ventricle function.

Psychiatric evaluation

It was performed to rule out any behavioral abnormalities that would contraindicate limited food intake.

Endocrine evaluation

It was performed to rule out an endocrine abnormality as the etiology of morbid obesity (Table 4).

Table 2 Comorbidities evaluated as potential predictors of added morbidity after Roux En-Y gastric bypass

System	Disease
Cardiac	Congestive heart failure
	Cardiomyopathy
	Arrhythmia
	Lower extremity edema
	Tobacco abuse
	Hypertension
	Coronary artery disease/myocardial infarction
	Hypercholesterolemia/hyperlipidemia/ hypertriglyceridemia
Respiratory	Obstructive sleep apnea
	Asthma/chronic obstructive pulmonary disease
	History of pneumonia
	Shortness of breath
Gastrointestinal/ hepatic	Alcohol abuse
	Gall bladder disease
	Peptic ulcer disease
	Gastro-esophageal reflux/pyrosis
	Hiatal hernia
	Hepatitis
	Cirrhosis
	Nonalcoholic fatty liver disease
Endocrine	Diabetes
	Hypothyroidism
Hematologic	History of thromboembolism
	Anemia
Vascular	Varicose veins
	Peripheral vascular disease

Table 3 Early postoperative results after laparoscopic RYGB

Early postoperative complication	Number of patients (%)
Mortality	0 (0)
Intra-abdominal hematoma	3 (2)
Leakage	3 (2)
Reoperation	3 (2)
Pulmonary embolism	0 (0)
Wound infection	0 (0)
Total	9 (6)

RYGB, Roux En-Y gastric bypass.

Table 4 Late postoperative results after 12 months' follow-up

Late postoperative complications	Number of patients (%)
Incisional hernia after reoperation	1 (0.7)
Stomal stricture	0 (0)
Gastritis	0 (0)
Internal hernia	0 (0)
Vitamins deficiency	0 (0)
Iron deficiency	2 (1.3)
Total	3 (2)

Operative technique

Set-up and positioning

The patient is placed supine with legs apart on an operating table capable of securely holding someone who may weigh up to 800 lb and is strapped above and below the waist. After the induction of general anesthesia and endotracheal intubation, a bladder catheter is inserted, and then

sequential compression devices are placed around the lower extremities to prevent intraoperative venous thrombosis. A nasogastric tube (18 Fr) was temporarily placed to decompress the stomach (removal before gastric stapling is required). Care is taken to ensure that excessive pressure is not applied to any parts of the limbs to avoid pressure injuries sustained after a lengthy procedure. Intravenous access through the upper extremity is usually sufficient. Occasionally, central access through the internal jugular or subclavian vein is necessary for monitoring. Monitors with the associated equipments (camera box, light source, insufflator) are placed above the patient's shoulders on each side and aimed at the surgical team.

Access pneumoperitonium and port placement

Initial access is obtained by the Veress needle technique at the left anterior subcostal site, because this site is generally a safer position for needle placement than the rest of the abdomen. Carbon dioxide pneumoperitonium is established to a pressure of 15 mmHg. With this technique, we use five ports as shown in Fig. 2.

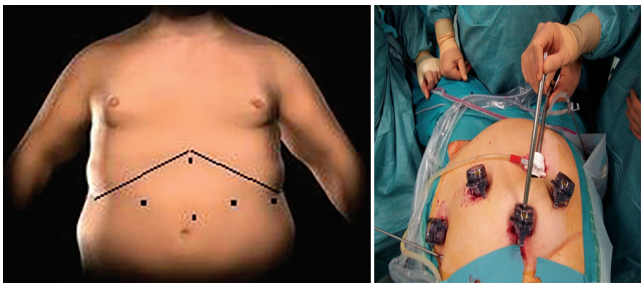
(1) A 10-mm optical port just above the umbilicus and to the left.
(2) A 12-mm port in the right mid-clavicular line (working port).
(3) A 12-mm port in the left mid-clavicular line (working port).
(4) A 10-mm port below the Xiphoid process (liver retractor).
(5) A 12-mm port on the left anterior axillary line.

The surgeon (standing between the patient's legs) operates through the right and the left upper abdominal 12-mm ports, and the assistant surgeon (standing on the left side of the patient) holds a camera in one hand and a grasper device in the other hand; the second assistant on the right side of the patient holds the liver retractor.

Creation of the gastric pouch

After positioning and port placement have been completed, the abdomen is inspected and adhesions are lysed with blunt and sharp dissection as needed; the patient is transferred to a steep reverse Trendelenburg position to facilitate the exposure of the upper abdomen. The upper stomach is exposed by retracting the liver anteriorly with a retractor from the 10-mm port just below the Xiphoid process (Figs. 3–5).

Figure 2

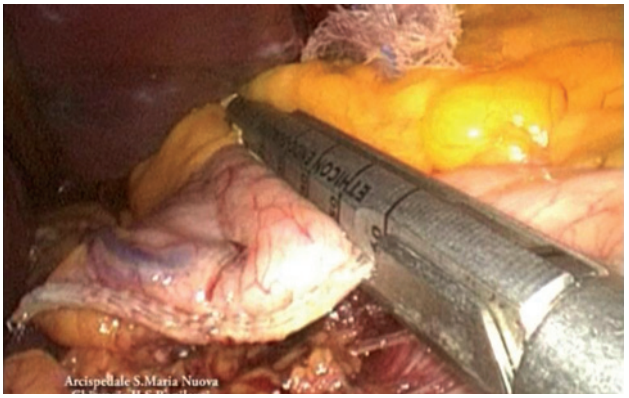


Port positions.

Figure 3

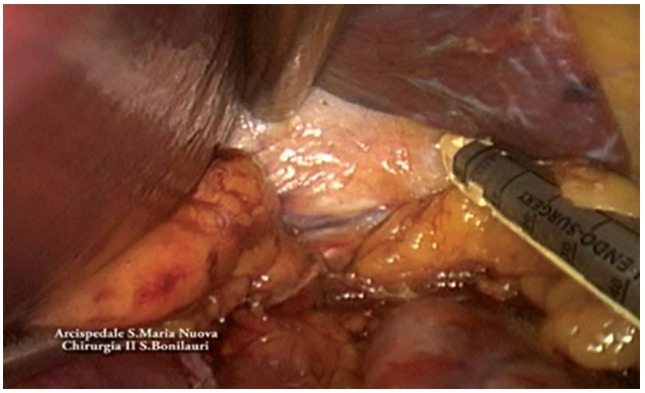
The stapler used in our technique (white 2.5 mm, blue 3.5 mm).

Figure 4



Creation of the gastric pouch.

Figure 5



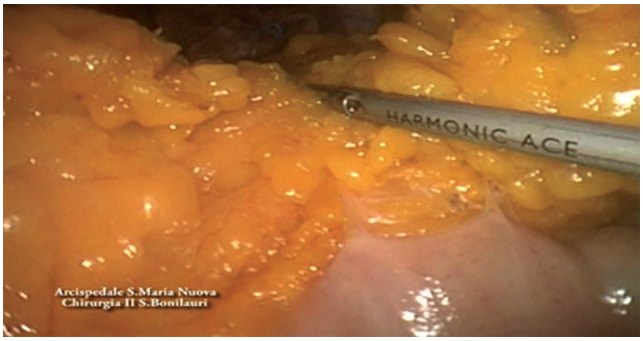
Complete separation of the pouch from the rest of the stomach.

Ultrasonic dissectionis started 5–6 cm from the gastroesophageal junction on the lesser curvature, to access the retro-cavity behind the stomach. After it has been ascertained that the nasogastric tube has been withdrawn, using a Endo-GIA stapler, with 3.8 mm staple height and 60 mm cartridge length, the stomach is dissected horizontally, starting from the lesser curvature level through the 12-mm right port. Then, another Echelon 60 (Ethicon, Cincinnati, Ohio, USA), with 3.8 mm staple height and 60 mm cartridge length, is placed level with the left end of the horizontal suture line in the cranial direction towards the Hiss angle through the left 12-mm port, while the anesthesiologist inserts a calibrated tube through the mouth. After firing the second longitudinal stapler, dissection of the angle of Hiss is performed to ensure proper stapling up to it. Staple lines on both sides of the transected stomach are examined to ensure that they are intact and not bleeding.

Construction of the biliopancreatic limb and gastrojejunostomy anastomosis

First, the omentum is divided by ultrasonic dissection from the transverse mesocolon to its inferior edge.

Figure 6



Omental division by a harmonic scalpel until the transverse colon.

Figure 8

The nearest jejunal loop from the ligament of Treitz for gastrojejunostomy anastomosis.

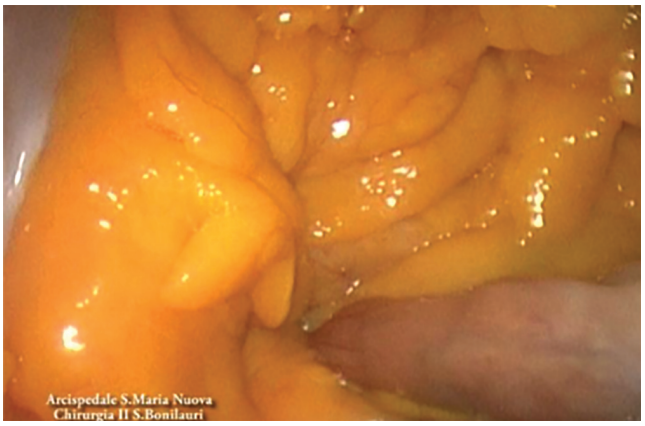
Dividing the omentum reduces tension on the Roux limb as it passes in front of the colon up to the gastric pouch, and then advanced toward the upper abdomen to expose the ligament of Treitz. The nearest jejunum loop that can reach the pouch from the ligament of Treitz without tension is taken (Figs 6–11).

Gastrojejunostomy is performed with a linear stapler by opening the stomach and the jejunum with a harmonic scalpel, then introducing the Endo-GIA stapler, with 3.5 mm staple height and 60 mm cartridge length, through the 12-mm port on the left side of the surgeon, and then closing the opening by a V-LOC continuous stitch.

Construction of the Roux limb and jejuno-jejunostomy anastomosis

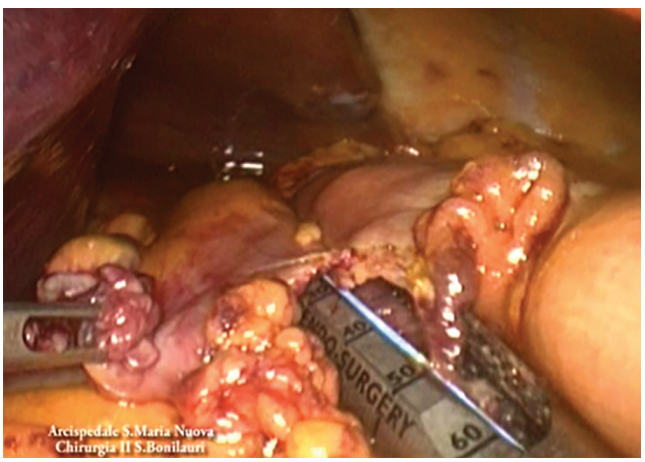
Then we measured 150 cm from the gastrojejunostomy anastomosis as the Roux limb length by a marked

Figure 7



Identification of the Treitz ligament.

Figure 9



Gastrojejunostomy anastomosis using a 60-mm linear stapler.

grasper on the right hand of the surgeon. At this point, the first assistant holds this point on the Roux limb through a grasper in the most lateral port and the second assistant holds the biliopancreatic limb through a grasper in the 10-mm port at the Xiphoid process; a suture is placed to approximate both limbs, and the second assistant, on the right side, holds this suture and then pulls it upward. The jejunum is positioned in a C configuration to facilitate the placement of the Endo-GIA stapler for division. The Endo-GIA stapler is placed through the 12-mm port on the left anterior axillary line, and it is applied perpendicular to the jejunum and parallel to the mesenteric vascular arcade to create the jejuno-jejunostomy with a 1.0 mm cartridge (2.5 mm staple height, 60 mm cartridge length) that is used to minimize staple line bleeding, followed by closure of the entrostomy opening by a continuous V-LOC suture (Figs. 12–15).

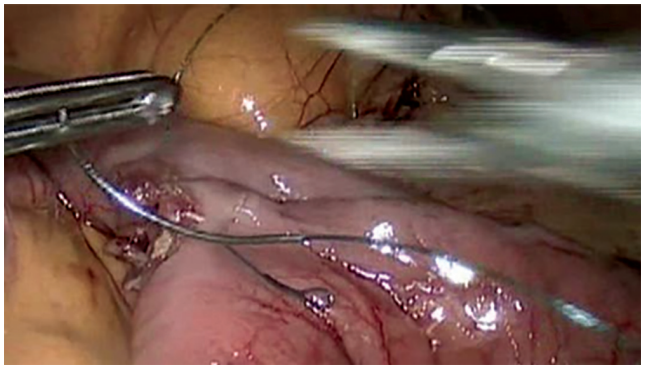
Then, a window is made by a harmonic in the mesentery of the small intestine just at its mesenteric border between the two anastomoses, without opening the jejunum mesentery, and then an Edo-GIA stapler with 2.5 mm staple height and 60 mm cartridge length is introduced through the 12-mm right side port to cut the intestine.

The blue dye test is performed by injecting 50 ml in the nasogastric tube with closure of the Roux limb to ensure the integrity of the gastrojejunostomy, and then a suction drain is placed. All port sites 10 mm and larger are closed with fascia stitches of 0 Polysorb. All carbon dioxide is evacuated, and the skin incisions are closed with interrupted 4–0 Polysorb (Figs. 12-14).

Postoperative management

The nasogastric tube is removed at the end of the procedure. On postoperative day 1 (POD1), the patient is allowed to drink water. The patients were followed for any sign of complication during the 2–3 days of hospital stay before discharge; the patient can leave the hospital on or after POD3. Follow-up is performed 1 week after discharge, when sutures or clips are removed.

Figure 10

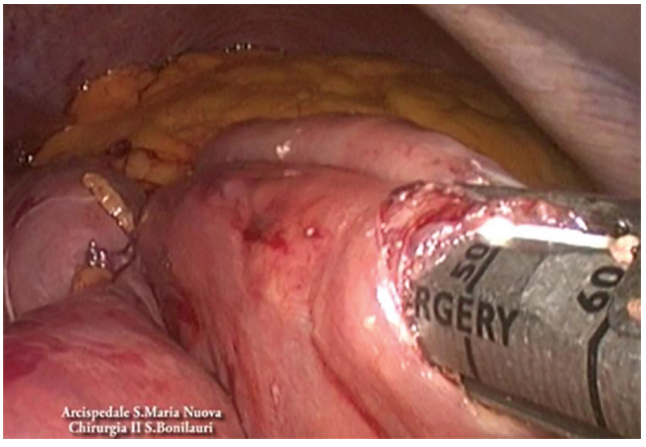


Closure entrostomy and gastrectomy openings by V-LOC.

Figure 11

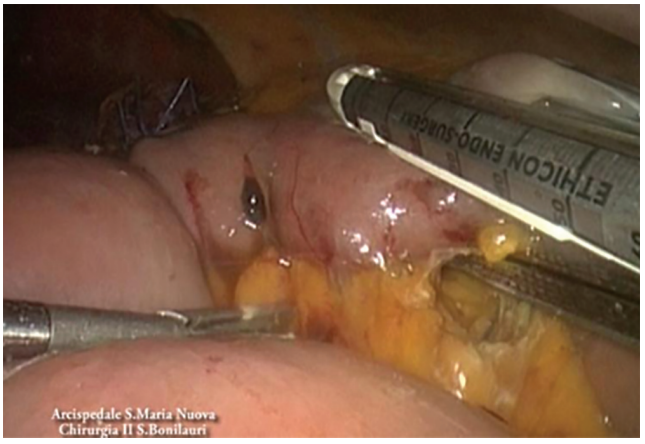
The V-LOC suture used in closing the stomach and the intestinal opening.

Figure 12



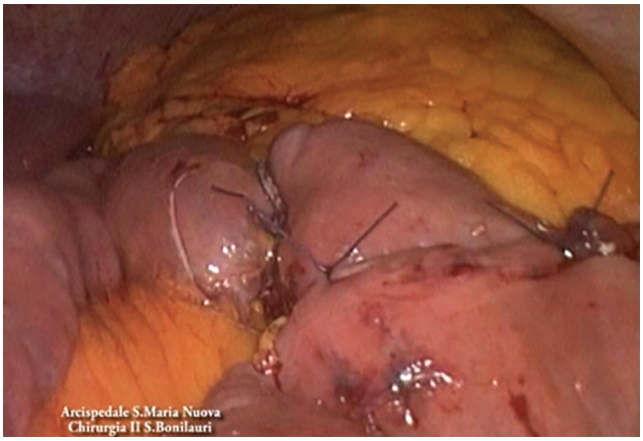
Jejuno-jejunal anastomosis, with Roux limb 150 cm.

Figure 13



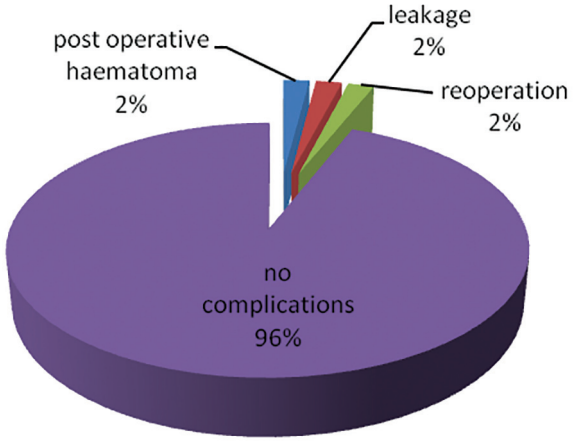
Cutting the jejunum between two anastomoses (gastrojejunostomy and jejuno-jejunostomy).

Figure 14



The blue dye test for the integrity of gastrojejunostomy anastomosis.

Figure 15



The percentage of early postoperative complications.

From POD2 to POD9, the patient remains on a liquid diet. During the 3 weeks after surgery, food must be soft or chopped. After these 3 weeks, the patient may progressively start consuming small bites of food. The patient consults a dietician before discharge and 3 weeks after surgery.

Long-term follow-up

After surgery, patients received long-term follow-up care from a physician specialized in the treatment of obesity, an expert in clinical nutrition, and a psychologist. The purpose of follow-up is not just to achieve a greater loss of weight, but also to prevent nutritional deficiencies. Patients are seen every 3 months in the first year after surgery, because this is the period of most rapid weight loss. The frequency of follow-up appointments depends on the dynamics of weight loss in the individual patient and any problems and complications that may arise.

A well-balanced diet is the best from a nutritional-medical point of view; it should be accompanied during the phase of rapid weight loss, and then permanently, after gastric bypass by the supplementation of vitamins (B_{12} and D), trace elements (iron), minerals (calcium), and, if necessary, protein. With the follow-up, laboratory monitoring is necessary as the dietary supplementation may need readjustment.

Women of childbearing age who undergo bariatric surgery should use contraception during the rapid phase of weight loss to prevent malnutritional developmental disturbances in the unborn child.

Results

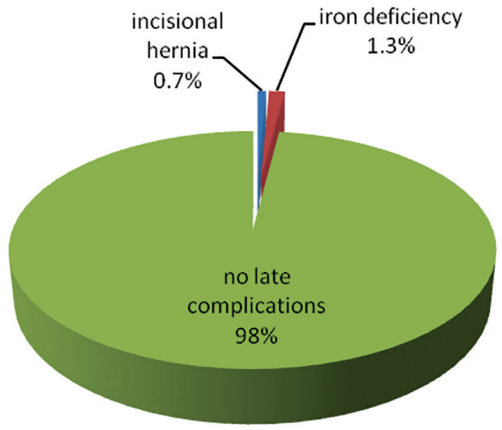
The average operative time was ~75–90 min. There was no mortality in our series. There was early postoperative intra-abdominal hematoma formation in three cases (2%), but it did not require reoperation as these patients were haemodynamically stable and conservative management was carried out.

Anastomotic leaks occurred at the gastroentrostomy site in three cases (2% of cases); postoperative tachycardia unresolved by fluid resuscitation was considered as a sensitive marker for anastomotic leakage; fever, hypotension, and leucocytosis were considered as additional supporting evidence for the presence of an anastomotic leak; if so, the gastrograffin swallow study and/or computed tomography scan with oral contrast were performed, and reoperation was performed by the open technique for refashioning of the anastomosis. There was no incidence of pulmonary complications or early postoperative wound infection (Table 3).

During long-term follow-up every 3 months up to 12 months, there was one case of incisional hernia after reoperation for leakage, and there was no complain of gastritis as the patient took proton pump inhibitors postoperatively. There was no incidence of gastrojejunostomy stricture or internal hernia. There was no vitamin deficiency during 12 months' follow-up, except for two cases of iron deficiency anemia that needed additional iron supplementation after 12 months' follow-up (Fig. 16 and Table 4).

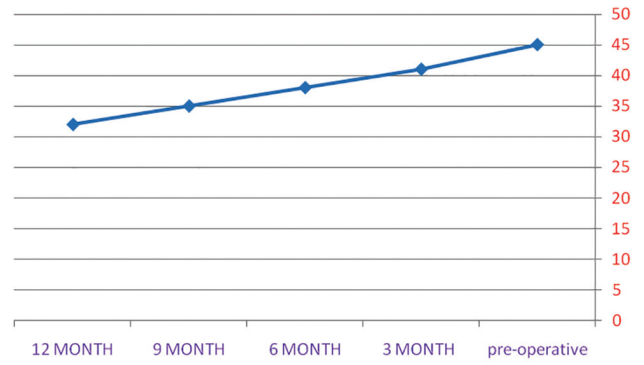
Regarding weight loss, the mean weight loss after 12 months' follow-up was 35.2 kg, and the mean BMI of the patients decreased from 45 kg/m^2 preoperatively to 32.3 kg/m^2 after 12 months. Table 5 shows the mean BMI of the patients at 3, 6, 9, and 12 months postoperatively (Fig. 17).

Figure 16



The percentage of late postoperative complications after 12-month follow-up.

Figure 17



The decrease in patients' mean BMI with follow-up every 3 months for 12 months.

Table 5 The mean BMI of the patients preoperatively and with postoperative follow-up every 3 months for 12 months

Time of follow-up	Mean BMI (kg/m^2) of the patients	SD
0 (Preoperative)	45	8.5
3 months	40.7	8.25
6 months	38	7.36
9 months	34.6	7.52
12 months	32.3	7.13

Discussion

Since the introduction of minimally invasive general surgery, a revolution in surgical techniques has occurred as most surgical procedures have been adapted to limited access techniques; because bariatric procedures are well standardized, they are very suitable for advanced laparoscopic methods. The demonstrated benefits of laparoscopic bariatric surgery include a shorter hospital stay, earlier return to normal activity, superior cosmoses, and less pain. The incidence of incisional hernia is markedly diminished. In addition, there is less systematic stress, less immunologic stress, reduced adhesion formation, and diminished incidence of ileus. Overall, the exposure is actually enhanced in very obese patient when compared with that achieved with laparotomy [7].

The primary desirable outcomes after bariatric surgery include low rates of perioperative and long-term complications, sustained and meaningful weight loss, significant improvement in the quality of life, improvement or resolution of obesity-associated comorbidities, and extension of life span. All five outcomes have been shown to be feasible results of laparoscopic gastric bypass [8]. Since Wittgrove *et al.* [9] described the first laparoscopic gastric bypass, many variations of the original technique have been reported to achieve these outcomes. Some possible technical variations in the laparoscopic RYGBP are the gastrojejunostomy anastomosis technique, the length of the Roux limb, and the use of rings at the gastric pouch (Fig. 15).

Complications involving gastrojejunostomy including stricture, bleeding, leaks, and fistulas frequently result in additional procedures and sometimes require hospital readmission. Recently, Cottam *et al.* concluded that the level of restriction or the presence of stenosis achieved by different stapler sizes does not play a significant causative role in weight loss (Fig. 16). Also, Takata *et al.* [10] concluded that the use of a 21 mm circular stapler (CS) was the only independent predictor of a gastrojejunostomy stricture in 379 patients who underwent RYGBP with four gastrojejunostomy techniques: hand-sewn, linear stapler, 21 mm circular stapler, and 25 mm circular stapler. Giordano *et al.* [11] documented that the use of the linear stapler may be associated with a reduced risk of anastomosis stricture and wound infection and a shorter operative time compared with circular stapler for GJ during laparoscopic RYGBP for morbid obesity. Our results support the study by Giordano *et al.* [11], as we had no gastrojejunostomy stricture with the use of the linear stapler technique with 12 months' follow-up.

The restriction imposed by a small pouch size is one of the most important aspects of RYGBP [12]. Roberts *et al.* [13] demonstrated an inverse correlation between the initial gastric pouch size and EWL after RYGBP and that EWL was poorer in patients with larger pouches. It also demonstrates the variability in how different surgeons in different centers create a gastric pouch, and so we estimated the pouch size by measuring the distance from the estimated location of the gastroesophageal junction to a variable distance (around 6 cm) in the lesser curvature of the stomach; we believe that it is critical to stress the importance

of the creation of a small gastric pouch and to better standardize the technique used for pouch creation.

Extending the alimentary and/or the biliopancreatic limb is one of the few technical variations of RYGBP that have been proposed to decrease the failure rate. Inabnet *et al.* [14] concluded that in patients with a BMI less than 50 undergoing laparoscopic RYGBP, increasing the length of the Roux limb does not improve weight loss and may lead to a higher incidence of internal hernias and increase the risk of nutritional deficiencies. Orci *et al.* [15] suggest that the tailoring of a longer Roux limb might be efficient only in super-obese patients. In this technique, standardizing the length of the alimentary limb to 150 cm showed a decrease in the mean BMI of the patients from 45 preoperatively to 32.3 12 months postoperatively.

The total operative time with this technique was 75–90 min; using the linear stapler for the gastrojejunostomy anastomosis and using V-LOC suturing for the closure of the entrostomy and gastrostomy opening reduces the operative time and makes the technique easier, with a very low rate of leakage, as the V-LOC suture is characterized by the distribution of tension throughout the wound, it grasps tissue at numerous points, spreading tension across the wound, and evenly spaced barbs throughout the strand provide secure closure.

Because the stomach and duodenum are bypassed, iron, vitamin B_{12}, and other micronutrient deficiencies can occur after standard gastric bypass. The incidence of these deficiencies is related to the length of the Roux limb, [16] and according to the literature, more than 44% of the patients have low levels of hemoglobin, iron, and ferritin, especially among menstruating women and one-third of the patients with B_{12} deficiency after 4 years of RYGBP [17]. In our study, there is no detectable vitamin deficiency, but two cases of iron deficiency in the 12-month follow-up were detected, and they had iron supplementation; hence, to avoid severe nutritional deficiencies as seen after bariatric surgery, it is important to predict, prevent, and promptly treat nutritional abnormalities in vulnerable patients.

Successful long-term weight management is a function of intensive long-term patient support and follow-up, built on a foundation of an effective surgical procedure [18]. Because the number of gastric bypass surgery patients is increasing substantially, and because many patients do not follow-up with their surgeons as advised, it is vital for all primary care physicians and others to be aware of the medical complications of weight loss surgery. It is especially important to be cognizant of vitamin deficiencies and their various presentations in this unique patient population. Patient education is paramount, and emphasis regarding the importance of vitamin and other nutrient supplementation should begin before surgery and continue throughout the postoperative period and beyond. Hence, we recommend strict follow-up of these patients with 3-month follow-ups in the first year, with a multidisciplinary team of surgeon, dietitian, and psychiatrist, as bariatric surgery should be performed only in the context of a comprehensive program of weight management [18].

Conclusion

The primary desirable outcomes after bariatric surgery include low rates of perioperative and long-term complications, sustained and meaningful weight loss, significant improvement in the quality of life, improvement or resolution of obesity-associated co-morbidities, and extension of life span. All the five outcomes have been shown to be feasible results of Laparoscopic RYGBP.

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Conflicts of interest

None declared.

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