Handsewn antireflux one-anastomosis gastric bypass: a novel technique

Ahmed S. Saad[a], Ahmed Elnabil-Mortada[b], Ramy M. Nageeb[b], Rabbah A. Khaled[b]

Departments of, [a]General and Upper Gastrointestinal Surgery, [b]General and Bariatric Surgery, Faculty of Medicine, Ain Shams University Hospitals, Cairo, Egypt

Correspondence to Ahmed S. Saad, MD, Department of General Surgery, Faculty of Medicine, Ain Shams University, Cairo, Abbasiya 11517, Egypt
e-mail: ahmedsaeed@med.asu.edu.eg

Received: 10 April 2022
Revised: 28 April 2022
Accepted: 12 May 2022
Published: 04 January 2023

The Egyptian Journal of Surgery 2023, 41:772–780

Purpose
Many studies have reported the advantages of one-anastomosis gastric bypass (OAGB) over other bariatric procedures. Despite that, there are still concerns about the risk for biliary reflux gastritis, esophagitis, and consequently gastric pouch/esophageal cancer after OAGB. The anastomosis during OAGB can be handsewn or mechanical using a linear stapler, with the stapler being the preferred method. There is currently a knowledge gap regarding the outcomes for different anastomosis techniques during OAGB. We proposed a new technique for performing the anastomosis in OAGB (a totally handsewn anastomosis creating a double mucosal intraluminal flap). This technique has the potential to minimize possible biliary reflux and its consequences. This study was done to evaluate the feasibility, safety, and efficacy of this new technique.
Patients and methods
The included patients underwent OAGB using the new technique. Patients were regularly followed up for a minimum of 12 months. At each visit, the percentage of excess weight loss and subjective symptoms of gastroesophageal reflux disease (GERD) using the GERD-Health-Related Quality of Life score were recorded. Patients were evaluated with an upper gastrointestinal endoscopy after 1 year.
Results
A total of 36 patients completed the minimum 1-year follow-up period after the operation. The mean operative time was 65 ± 23 min with no cases of conversion to open surgery. No major postoperative complications or mortality was recorded during the follow-up period. After 1 year, the mean total weight loss % was 39.4 ± 9.3%, the mean excess weight loss % was 78 ± 14%, and the mean GERD-Health-Related Quality of Life score decreased from 24 ± 6 preoperatively to 12 ± 6. Endoscopic findings revealed improvement of esophagitis in 10 of 12 patients. No cases of de novo esophagitis nor cases of significant bile pooling at gastric pouch were detected during endoscopy after 1 year.
Conclusion
Our new handsewn OAGB technique is a feasible and safe technique with results comparable to the standard stapled technique. It may minimize possible future bile reflux.

Keywords:
biliary reflux, handsewn, one-anastomosis gastric bypass

Egyptian J Surgery 2023, 41:772–780

1110-1121

Background

One-anastomosis gastric bypass (OAGB) is a relatively new bariatric operation. The mini-gastric bypass was first performed in 1997 by Rutledge, who published his first series of 1274 cases in 2001 [1]. In 2005, Carbajo *et al*. [2] published a report about his version of the operation, with various technical modifications calling it the OAGB. Since its introduction, OAGB had rapidly gained popularity outside the United States. In 2018, the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) published a position statement recognizing the OAGB as an established bariatric/metabolic procedure [3].

Many studies have reported the advantages of OAGB over other bariatric procedures, such as shorter operative time and hospital stay, lower risk of anastomotic leakage, and easy reversibility [4].

Despite its advantages, there are still concerns about the risk for chronic biliary reflux gastritis, esophagitis, and consequently gastric pouch/esophageal cancer after OAGB. Unlike laparoscopic sleeve gastrectomy,

where the intragastric pressure rises due to functional obstruction by pylorus, the pouch in OAGB is considered a low-pressure pouch. This is achieved through creation of a wide gastrojejunal anastomosis using a linear stapler. The wide anastomosis has the disadvantage of increasing biliary reflux and its consequences [2,5–8]. Previous research had established that chronic exposure to bile reflux in rats and humans (in nonbariatric patients) induces esophageal intestinal metaplasia and esophageal adenocarcinoma. However, controversy remains regarding the long-term theoretical risk of gastric/esophageal cancer owing to biliary reflux following OAGB [6].

In their procedure (OAGB), Carbajo *et al*. [2,7] adopted Rutledge's concept but added some modifications to counteract the occurrence of biliary reflux and its consequences. They used a linear stapler to create a latero-lateral side-to-side gastrojejunostomy. In contrary to Rutledge's wide anastomosis, Carbajo's OAGB anastomosis was only 1.5–2-cm wide.

The anastomosis during OAGB can be performed manually using handsewn stitches or mechanically using a linear stapler, with the stapler being the preferred method owing to ease of use and shorter operative time [9]. Published data had established that there are no significant differences between mechanical and handsewn anastomosis during laparoscopic Roux-en-Y gastric bypass (RYGB) except for greater incidence rates of postoperative bleeding and wound infection with the use of circular staplers [10,11]. On the contrary, there is currently a knowledge gap regarding the outcomes of different anastomosis techniques during OAGB, especially, short-term and long-term benefits or complications of handsewn anastomosis [9].

Objectives

Our team had proposed a new technique for performing the anastomosis in OAGB (a totally handsewn anastomosis to create a double mucosal intraluminal flap which would act as an antireflux valve). This technique respects the principles of OAGB, in addition to its potential to minimize possible biliary reflux. This study was done to evaluate the feasibility, safety, and efficacy of this new technique. We present here our initial experience with this technique.

Patients and methods

This was a prospective study performed between January 2017 and February 2021 at Ain Shams University Hospitals, Cairo, Egypt, and Elnokhbah Specialized Hospital, Riyadh, KSA. Approval from the General Surgery Department's Ethical Committee (IRB) was obtained before the study initiation.

The study included patients with BMI more than or equal to 40 kg/m^2, or more than or equal to 35 kg/m^2 with at least one obesity related comorbidity. Patients were required to pass routine preparations for bariatric surgery as well as nutritional and psychological assessment. The following patients were excluded from the study: patients with history of previous gastric, bariatric, or antireflux surgery; patients with Barrett's esophagitis; patients with BMI more than 65; and patients younger than 18 years or older than 60 years. All patients were required to sign an informed consent.

All patients underwent an upper gastrointestinal endoscopy and routine *Helicobacter pylori* testing preoperatively. Subjective assessment of gastroesophageal reflux disease (GERD) symptoms using the GERD-Health-Related Quality of Life (GERD-HRQL) score (Fig. 1) was done for all patients before surgery.

Surgical technique

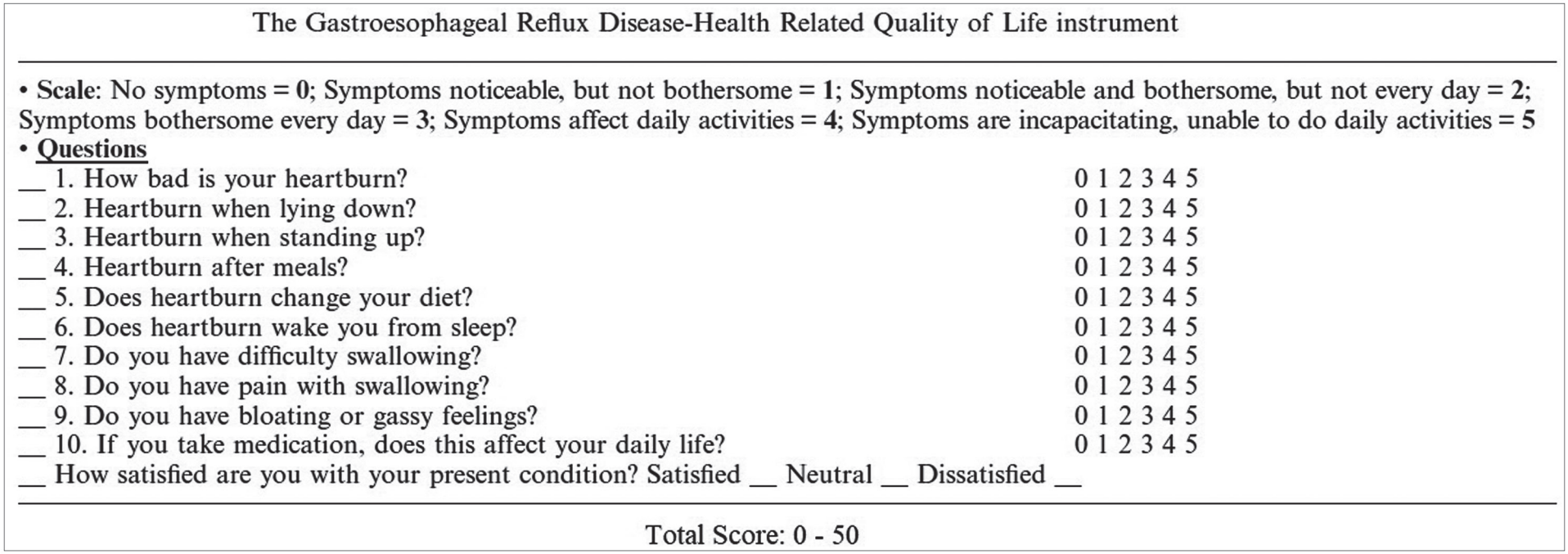
CO_2 insufflation was started using a Veress needle inserted two fingers below the left subcostal region at midclavicular line. A standard five-port technique was utilized in the operation.

The first step was to create a window in the lesser omentum just proximal to the antrum to enter the lesser sac using the Ligasure 5 mm (Medtronic Inc., Minneapolis, Minnesota, USA). Through this window, a 60-mm Endo GIA stapler load (Medtronic Inc.) was fired in a horizontal direction. Then, a 60-mm Endo GIA load was fired in a near vertical direction to the first firing. A 36-French calibration tube was then passed to the newly formed pouch. Then, a vertical tube was formed through sequential firings of Endo GIA stapler loads along the calibration tube, upward to the angle of Hiss. Any posterior attachments were taken down after every fire using the Ligasure 5 mm.

After creation of the pouch, identification of ligament of Treitz was done and the whole small bowel length was counted. The greater omentum was selectively divided in patients with marked central obesity or if it is too thick.

The site of gastrojejunostomy was chosen after an average limb length of 1.5–2 m according to the patient's BMI. The chosen limb should have long mesentery and was brought above the colon to lie underneath the gastric pouch smoothly forming a gentle curve with no tension, as shown in Fig. 2a.

Figure 1



The Gastroesophageal Reflux Disease-Health Related Quality of Life instrument

• **Scale**: No symptoms = **0**; Symptoms noticeable, but not bothersome = **1**; Symptoms noticeable and bothersome, but not every day = **2**; Symptoms bothersome every day = **3**; Symptoms affect daily activities = **4**; Symptoms are incapacitating, unable to do daily activities = **5**

• **Questions**

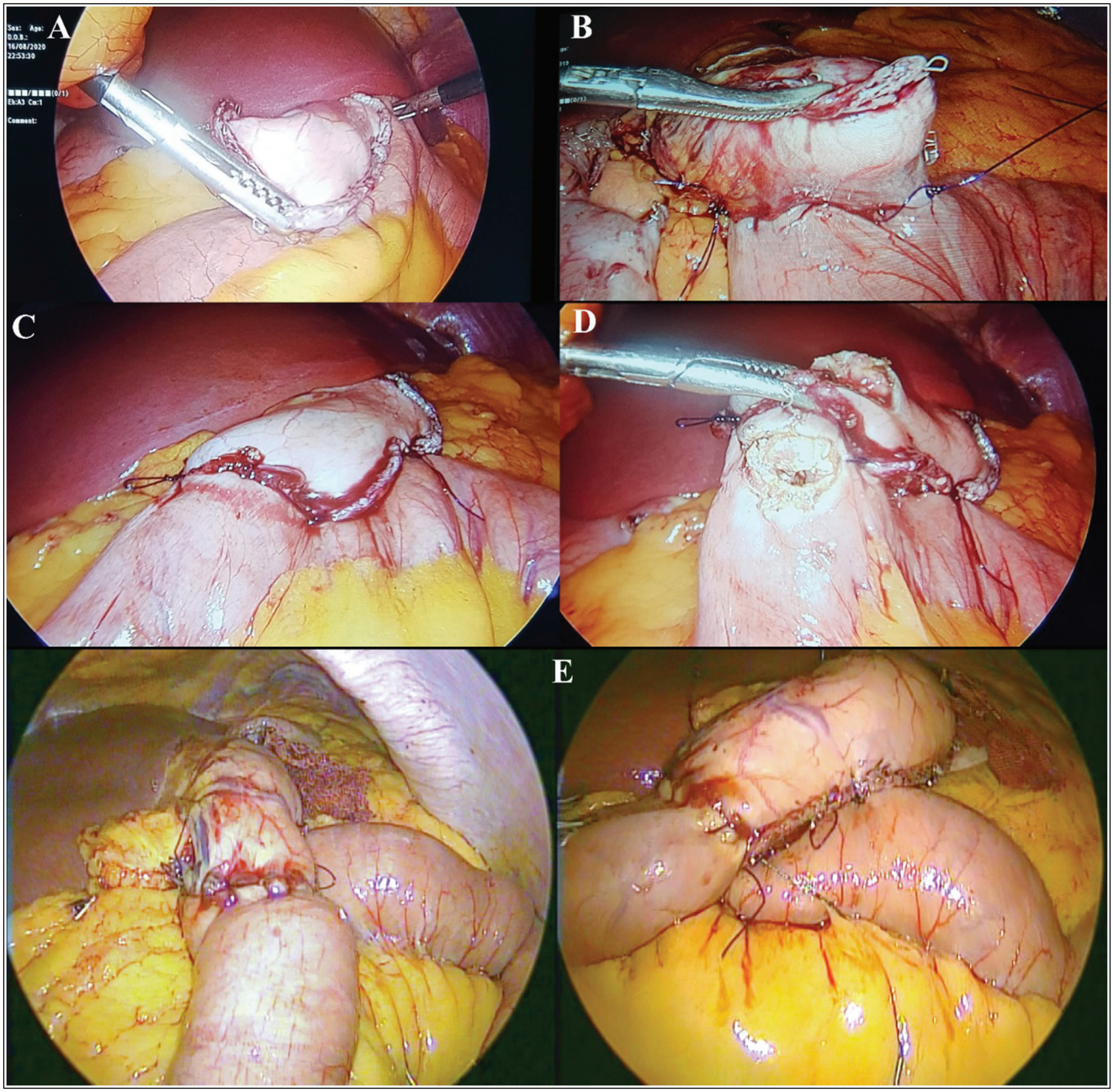
__ 1. How bad is your heartburn?	0 1 2 3 4 5
__ 2. Heartburn when lying down?	0 1 2 3 4 5
__ 3. Heartburn when standing up?	0 1 2 3 4 5
__ 4. Heartburn after meals?	0 1 2 3 4 5
__ 5. Does heartburn change your diet?	0 1 2 3 4 5
__ 6. Does heartburn wake you from sleep?	0 1 2 3 4 5
__ 7. Do you have difficulty swallowing?	0 1 2 3 4 5
__ 8. Do you have pain with swallowing?	0 1 2 3 4 5
__ 9. Do you have bloating or gassy feelings?	0 1 2 3 4 5
__ 10. If you take medication, does this affect your daily life?	0 1 2 3 4 5

__ How satisfied are you with your present condition? Satisfied __ Neutral __ Dissatisfied __

Total Score: 0 - 50

GERD-Health-Related Quality-of-Life (GERD-HRQL) score. GERD, gastroesophageal reflux disease.

Figure 2



Laparoscopic view showing: (a) the chosen limb brought underneath the gastric pouch smoothly forming a gentle curve with no tension. (b) The antimesenteric border of the jejunal loop sutured continuously to the back of the gastric pouch. (c) The gastric horizontal staple line sutured continuously to the antimesenteric jejunal border. (d) The transverse gastrotomy and enterotomy. (e) The final orientation of the completed anastomosis.

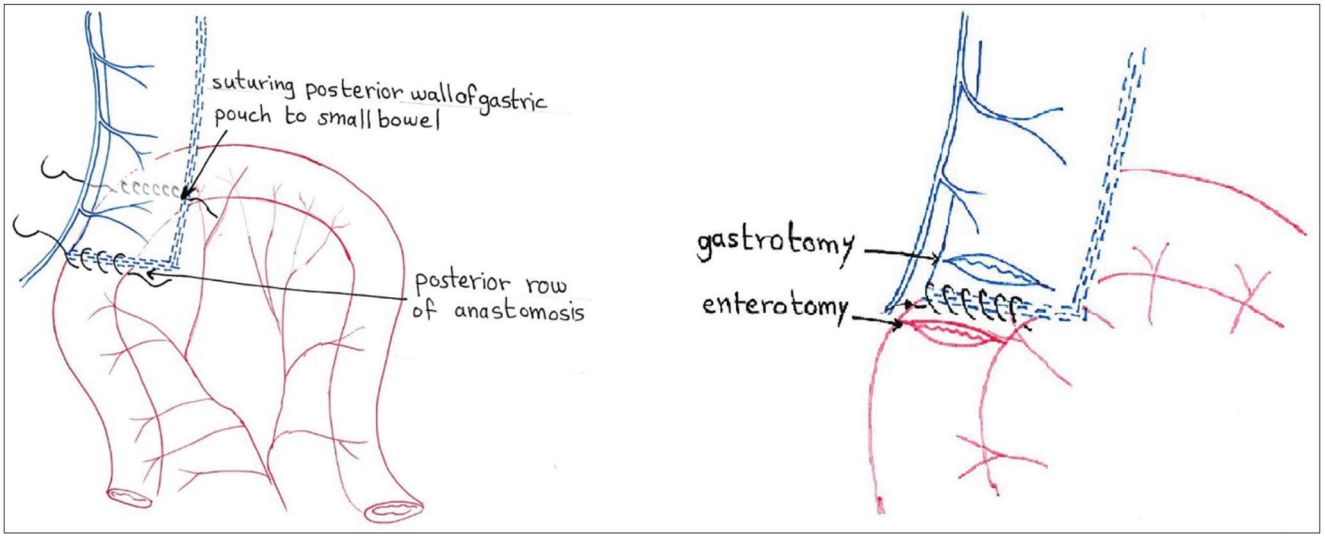
The antimesenteric border of the jejunal loop was sutured to the back of the gastric pouch using a PDS (polydioxanone) 3/0 running suture, starting 2–3 cm above the horizontal gastric staple line. At the jejunal side, the suture was started at 3 o'clock position running distally in an oblique fashion to maintain the gentle arc configuration of the loop, as shown in Fig. 2b.

Then, the horizontal gastric staple line is sutured continuously to the antimesenteric jejunal border at a more distal position without tension or twist, as shown in Fig. 2c. These double layers (back of gastric pouch and antimesenteric area of jejunum) between the previous two suture line will form the antireflux, double-walled intraluminal septum.

A small (2.5–3 cm) transverse gastrotomy and a similar size enterotomy are then created close to the gastric staple using the hook, as shown in Fig. 2d.

The anastomosis is then completed using a PDS 3/0 running suture, with the potentially ischemic bridge

Figure 3



Sketch drawing of the concept of the technique.

between the gastrotomy and horizontal gastric staple line incorporated intentionally in the posterior layer suturing. Figure 3 shows a sketch drawing of the concept of our technique.

The staple lines and anastomosis are then tested for any leak using the methylene blue test. The staple line is also evaluated for any bleeding, which is controlled by endoclips. A drain is inserted, and trocar sites are closed with 3–0 Vicryl sutures.

Postoperatively, patients were allowed to drink clear fluids at day one. A gastrografin swallow test was done on the second day to exclude the presence of an anastomotic leak. Patients were discharged after full ambulation and proper oral fluid intake. Patients were regularly followed up at 1, 6, and 12 months after discharge. At each visit, the percentage of total and excess weight loss (TWL and EWL%) together with subjective symptoms of GERD using the GERD-HRQL score were recorded and compared with the preoperative score, together with any need for antireflux treatment. Patients were also evaluated after 1 year with an upper gastrointestinal endoscopy.

Results

A total of 38 patients were enrolled in the study, but 36 patients completed the minimum follow-up period of 1 year, and the remaining two patients were lost to follow-up in the first 3 months and were excluded from the analysis. Table 1 shows the preoperative characteristics of the study group.

All cases were completed laparoscopically utilizing our new technique. The mean operative time was 65 ± 23 min (range, 50–105 min) with no cases of conversion to open surgery or major intraoperative complications. The mean intraoperative blood loss was 75 ± 20 ml.

Table 1 Preoperative characteristics of the study group

Variables	Value
Sex [*n* (%)]	
Male	14 (38.9)
Female	22 (61.1)
Mean age	37.8 ± 14.9 years (range, 24–56)
Mean preoperative weight	141.3 ± 36.8 (range, 97–191)
Mean preoperative BMI	47.6 ± 11.3 kg/m^2 (range, 44.2–62.7)
Mean preoperative GERD-HRQL	24 ± 6
Associated comorbidities [*n* (%)]	
Hypertension	10 (27.8)
DM	17 (47.2)
Sleep apnea	20 (55.6)
Osteoarthritis	22 (61.1)
Back pain	23 (63.9)
Dyslipidemia	11 (30.6)
Reflux	12 (33.3)

DM, diabetes mellitus; GERD, gastroesophageal reflux disease; HRQL, Health-Related Quality of Life.

The median postoperative hospital stay length was 2 days. Two cases had early postoperative chest infection (mild pneumonia), which was treated medically, and one patient had a nonsymptomatic port-site hernia discovered after 10 months, which was treated by elective repair. No major complications were recorded during the follow-up period. No cases of mortality or reoperation were recorded during the follow-up period.

After 1 year of follow-up, the mean TWL% was 39.4 ± 9.3% (range, 28–49%) and the mean EWL%

Table 2 Operative and postoperative data of the study group

Variables	Value
Mean operative time	65 ± 23 min
Mean TWL%	39.4 ± 9.3
Mean EWL%	78 ± 14
Mean postoperative BMI	28.8 ± 7.3 kg/m^2
Mean preoperative GERD-HRQL	12 ± 6

EWL, excess weight loss; GERD, gastroesophageal reflux disease; HRQL, Health-Related Quality of Life; TWL, total weight loss.

Table 3 Remission and improvement of comorbidities in the study group

Comorbidity	Remission [*n* (%)]	Improvement [*n* (%)]	No change [*n* (%)]
Hypertension	3 (30)	5 (50)	2 (20)
DM	7 (41.2)	7 (41.2)	3 (17.6)
Sleep apnea	5 (25)	12 (60)	3 (15)
Osteoarthritis	5 (22.7)	10 (45.5)	7 (31.8)
Back pain	4 (17.4)	12 (52.2)	7 (30.4)
Dyslipidemia	4 (36.4)	5 (45.5)	4 (18.2)
Reflux	10 (83.3)	NA	2 (16.7)

DM, diabetes mellitus.

was 78 ± 14% (range, 58–97). The mean BMI decreased from 47.6 ± 11.3 kg/m^2 preoperatively to 28.8 ± 7.3 kg/m^2 after 1 year.

The mean GERD-HRQL score decreased from 24 ± 6 preoperatively to 12 ± 6 after 1 year (Table 2).

All 36 patients were scoped after 1 year. Endoscopic findings revealed improvement of esophagitis in 10 (83.3%) out of 12 patients with stationary course of the remaining two patients. No cases of de novo esophagitis, marginal ulcer, or significant bile pooling at gastric pouch were detected during endoscopy. These results are shown in Table 3 and Fig. 4.

Discussion

Bariatric and metabolic surgery is a dynamic and continuously evolving field, with the accumulating knowledge and experience driving the quest for new procedures and better outcomes.

Rutledge had designed the mini-gastric bypass as a relatively safe, less complex, and effective bariatric operation in comparison with the established RYGB [1]. Initially, the OAGB did not pick up well, owing to the stigma of bile reflux attached to the similar old Mason loop horizontal gastric bypass, which is considered by many surgeons a critical drawback associated with OAGB [12]. However, the excellent results of OAGB published by many authors had changed the perception of the procedure in the surgical community. It is now widely accepted that OAGB is a well-established bariatric and metabolic procedure with a relatively short learning curve [3,13].

The most common anastomosis technique in OAGB is linear mechanical stapling, with closure of the enterotomies using sutures. This technique allowed the operation to be done in a fast and reproducible way. As with RYGB, handsewn anastomosis is not commonly used nowadays, as it is technically demanding and not reproducible by all surgeons [14–16].

Yet, the potential benefits of handsewn anastomosis in OAGB, mainly the creation of an anastomosis with less bile reflux, are not completely understood.

In our institution, we started performing OAGB more than 10 years ago. Our team had proposed a new technique for performing the anastomosis in OAGB (a totally handsewn anastomosis creating a double mucosal intraluminal flap). This study aims to evaluate the feasibility, safety, and efficacy of this new technique.

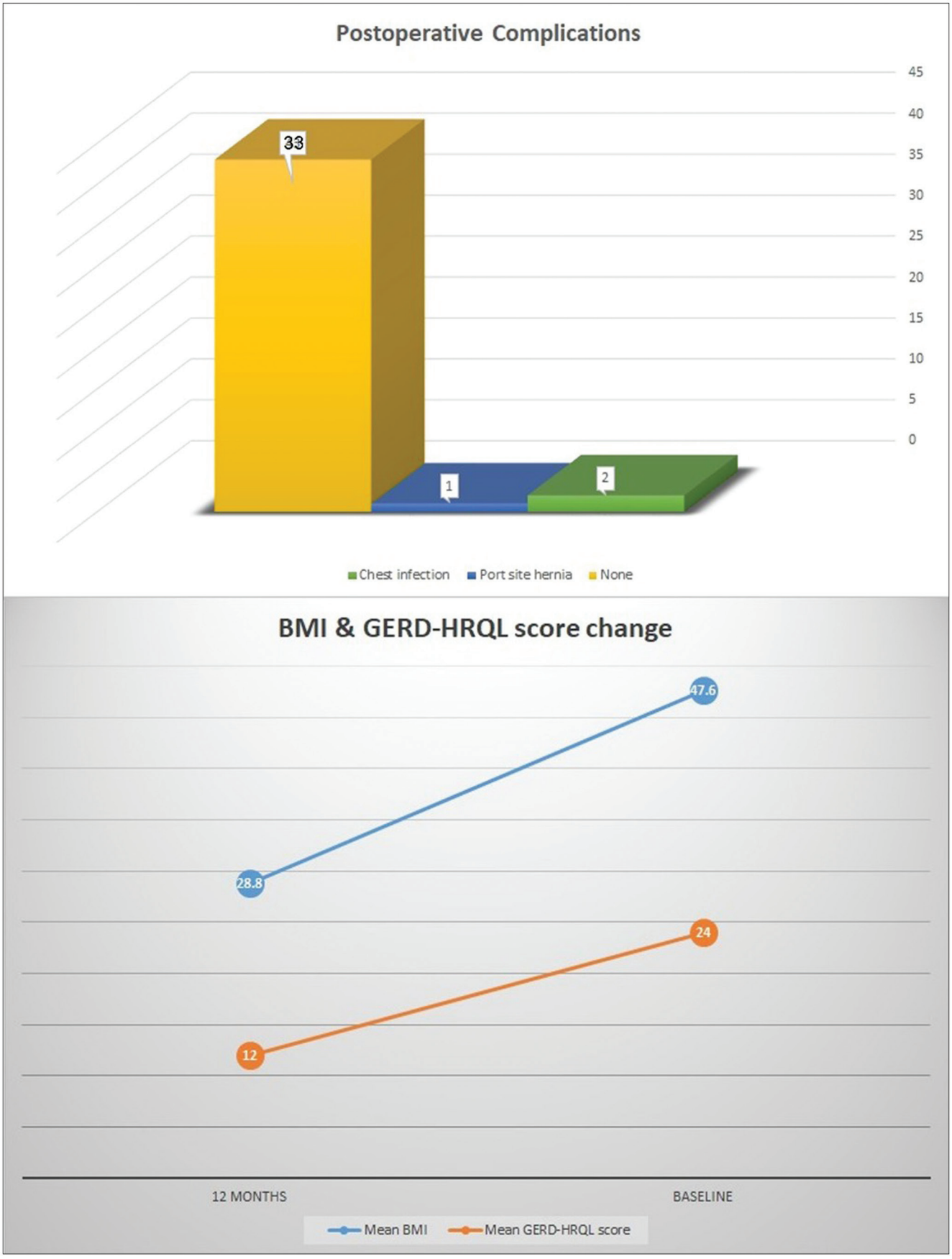
Our study had shown that the new technique is feasible as it was successfully adopted in all cases in a reasonable operative time with no cases conversion to open surgery. The mean operative time in our study was 65 min. Our results are very close to those published by Blanc *et al*. [17], in their study on performing handsewn anastomosis using an absorbable bidirectional monofilament barbed suture (Stratafix) in OAGB. Their mean operative time was 60 min.

These results are very close to those reported for stapled OAGB. Wang *et al*. [18], and Magouliotis *et al*. [19] published two meta-analyses comparing stapled RYGB and OAGB. Wang *et al*. [18] reported a mean operative time for OAGB ranging between 57.5 and 124.6 min, whereas Magouliotis *et al*. [19] reported a mean operative time ranging between 35 and 147.7 min. This observation can be explained by the fact that handsewn anastomosis is more likely to be performed by experienced surgeons.

Our study had shown that the new technique is safe. No major postoperative complications (as leakage, stenosis, or major bleeding) or mortality was reported in our study. Three cases of minor complications were recorded, and only one needed operative intervention (port-site hernia repair).

Blanc *et al*. [17] reported similar results in their previously mentioned study. In their series of 50 patients,

Figure 4



Postoperative results in the study.

there were no fistulas, strictures, deaths, or conversions to open laparotomy. Sohrabi Maralani *et al*. [9] published their results of handsewn OAGB in 805 patients, with longer follow-up duration (up to 10 years). They reported a complication rate lower or almost similar to that reported in the literature for stapled anastomosis. The most notable complications in their study were one case of anastomosis leak, two cases of malnutrition, and two cases of severe reflux disorders requiring conversion to RYGB.

Similar findings were previously reported for RYGB. Jiang and colleagues published a meta-analysis of handsewn versus mechanical gastrojejunal anastomosis during laparoscopic RYGB for morbid obesity. In their meta-analysis, Jiang *et al*. [10] reported no significant difference in anastomotic leak rates between handsewn (8.7%) and stapled (6.9%) gastrojejunal anastomosis during RYGB. In addition, there was no significant difference in stricture rates between handsewn and all other gastrojejunostomy techniques. They also found that circular stapled anastomosis had a significantly higher rate of postoperative bleeding compared with linear stapled and handsewn anastomosis.

Our new technique did not compromise the efficacy of OAGB as a bariatric and metabolic procedure. After 1 year, the TWL% was 39.4 ± 9.3% and the EWL% was 78 ± 14%. These results are generally similar to those recorded with our stapled technique and very close to results reported by Sohrabi Maralani *et al*. [9]; in their series, EWL% was 85.7% after 1 year of follow-up.

A similar trend was reported by Jiang *et al*. [10], in their meta-analysis about the RYGB. They found that the weight loss and metabolic results of the operation were similar between different anastomotic techniques in RYGB.

Our study had shown good results concerning GERD and bile reflux. The GERD-HRQL score showed a modest decrease from 24 ± 6 to 12 ± 6 after 1 year. Endoscopic findings after 1 year revealed improvement of esophagitis in 83.3% of patients, with stationary course in the remaining patients. No cases of de novo esophagitis, marginal ulcer, or significant bile pooling at the gastric pouch were detected during endoscopy after 1 year. Sure, these results should be taken with caution as the duration of follow-up in our study was relatively short.

Sohrabi Maralani *et al*. [9] obtained similar results in their previously mentioned study. Two-thirds of patients with reflux symptoms in their study reported resolution of symptoms after surgery with no need for medication. Moreover, they had only two (0.2%) cases that needed revision to RYGB.

In contrary to these results, the published literature had reported higher rates of reflux after stapled OAGB. In their study of 2780 cases that underwent stapled OAGB, Kassir *et al*. [20], reported that 1.2% of cases experienced refractory GERD despite medical treatment requiring revision to RYGB. Similarly, Carbajo *et al*. [7], in their study of 1200 morbidly obese patients who underwent stapled OAGB, reported that 2% of patients had symptomatic reflux. Chevallier *et al*. [21] reported seven cases of bile reflux in their report of 1000 patients after OAGB with stapled anastomosis who needed revision to RYGB. The work of Saarinen *et al*. [22] on stapled OAGB patients revealed that up to 31.6% of patients had at least some degree of bile reflux into the pouch.

According to these data and results of our study, we can hypothesize that our handsewn anastomosis technique is associated with less bile reflux. Theoretically, several factors may contribute to this. First, a handsewn technique achieves a smaller anastomosis size. Second, the valve function created by continuous suturing may help to decrease bile reflux. Moreover, the antimesenteric site of insertion of the anastomosis at the top of the jejunal loop may decrease bile reflux into the pouch. Finally, the handsewn anastomosis technique allows for creation of a longer pouch, which has the potential to decrease GERD rates. We adopted these principles in our technique by creating a relatively narrow anastomosis (2–2.5 cm), after fixing the jejunum to the back of the gastric pouch in a horizontal plane, a double-walled septum is created between lower gastric pouch and afferent jejunum.

Our study has several limitations. The main limitation of our study is the lack of a control group, to compare our results with. Future randomized clinical trials could better characterize and compare the efficiency and complications of these techniques. Moreover, we did not do any manometry or pH study for the patients and relied on endoscopy and symptoms to diagnose reflux. This may make our findings less objective. The sample size in our study was relatively small, limiting the statistical power to support our conclusions. Finally, the follow-up period was relatively short. Proper assessment of bariatric and metabolic outcomes needs longer follow-up periods.

Conclusion

Our new handsewn OAGB technique is a feasible and safe technique with results comparable to the standard

stapled technique. The antireflux, double mucosal valve may minimize possible future bile reflux and its consequences.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Rutledge R. The mini-gastric bypass: experience with the first 1,274 cases. Obes Surg 2001; 11: 276–280.

2 Carbajo M, Garcia-Caballero M, Toledano M, Osorio D, García-Lanza C, Carmona JA. One-anastomosis gastric bypass by laparoscopy: results of the first 209 patients. Obes Surg 2005; 15:398–404.

3 De Luca M, Tie T, Ooi G, Higa K, Himpens J, Carbajo M, *et al*. Mini gastric bypass-one anastomosis gastric bypass (MGB-OAGB)-IFSO position statement. Obes Surg 2018; 28:1188–1206.

4 Mahawar KK, Carr WR, Balupuri S, Small PK. Controversy surrounding 'mini' gastric bypass. Obes Surg 2014; 24:324–333.

5 Tolone S, Cristiano S, Savarino E, Lucido FS, Fico DI, Docimo L. Effects of omega-loop bypass on esophagogastric junction function. Surg Obes Relat Dis 2016; 12: 62–69.

6 Bruzzi M, Chevallier JM, Czernichow S. One-anastomosis gastric bypass: why biliary reflux remains controversial?. Obes Surg 2017; 27:545–547.

7 Carbajo MA, Luque-de-León E, Jiménez JM, Ortiz-de-Solórzano J, Pérez-Miranda M, Castro-Alija MJ. Laparoscopic one-anastomosis gastric bypass: technique, results, and long-term follow-up in 1200 patients. Obes Surg 2017; 27:1153–1167.

8. Rosenthal RJ. International sleeve gastrectomy expert panel consensus statement best practice guidelines based on experience of >12,000 cases. Surg Obes Relat Dis 2012; 8:8–19.

9 Sohrabi Maralani, M, Azadnajafabad S, Elyasinia F, Abolhasani M, Bagheri M, Kor F, *et al*. Postoperative outcomes and advantages of hand-sewn laparoscopic one-anastomosis gastric bypass: experience on 805 patients. Obes Surg 2021; 31:627–633.

10 Jiang H-P, Lin L-L, Jiang X, Qiao H-Q. Meta-analysis of hand-sewn versus mechanical gastrojejunal anastomosis during laparoscopic Roux-en-Y gastric bypass for morbid obesity. Int J Surg 2016; 32:150–157.

11 Abellán I, López V, Lujan J, Abrisqueta J, Hernández Q, Frutos MD, Parrilla P. Stapling versus hand suture for gastroenteric anastomosis in Roux-en-Y gastric bypass: a randomized clinical trial. Obes Surg 2015; 25:1796–1801.

12 Kular KS, Naveen Manchanda N, Rutledge R. Physiology of the MGB: how it works for long-term weight loss. In: Deitel M, editor. *Essentials of mini-one anastomosis gastric bypass*. Toronto: Springer; 2018. p. 31–37.

13 Lee WJ, Ser KH, Lee YC, Tsou JJ, Chen SC, Chen JC. Laparoscopic Roux-en-Y vs. mini-gastric bypass for the treatment of morbid obesity: a 10-year experience. Obes Surg 2012; 22:1827–1834.

14 Kassir R, Lointier P, Iannelli A, Blanc P. Measurement of the bowel loop in Roux-en-Y gastric bypass. Obes Surg 2014; 24:2169–2170.

15 Giordano S, Salminen P, Biancari F, Victorzon M. Linear stapler technique may be safer than circular in gastrojejunal anastomosis for laparoscopic Roux en-Y gastric bypass: a meta-analysis of comparative studies. Obes Surg 2011; 21:1958–1964.

16 Madan AK, Harper JL, Tichansky DS. Techniques of laparoscopic gastric bypass: on-line survey of American society for bariatric surgery practicing surgeons. Surg Obes Relat Dis 2008; 4:166–172. discussion 172–173.

17 Blanc P, Lointier P, Breton C, Debs T, Kassir R. The hand-sewn anastomosis with an absorbable bidirectional monofilament barbed suture Stratafix® during laparoscopic one anastomosis loop gastric bypass. retrospective study in 50 patients. Obes Surg 2015; 25:2457–2460.

18 Wang FG, Yan WM, Yan M, Song MM. Outcomes of mini vs Roux-en-Y gastric bypass: a meta-analysis and systematic review. Int J Surg 2018; 56:7–14.

19 Magouliotis DE, Tasiopoulou VS, Tzovaras G. One anastomosis gastric bypass versus Roux-en-Y gastric bypass for morbid obesity: an updated meta-analysis. Obes Surg 2019; 29:2721–2730.

20 Kassir R, Petrucciani N, Debs T, Juglard G, Martini F, Liagre A. Conversion of one anastomosis gastric bypass (OAGB) to Roux-en-Y gastric bypass (RYGB) for biliary reflux resistant to medical treatment: lessons learned from a retrospective series of 2780 consecutive patients undergoing OAGB. Obes Surg 2020; 30:2093–2098.

21 Chevallier JM, Arman GA, Guenzi M, Rau C, Bruzzi C, Beaupel N, *et al*. One thousand single anastomosis (omega loop) gastric bypasses to treat morbid obesity in a 7-year period: outcomes show few complications and good efficacy. Obes Surg 2015; 25:951–958.

22 Saarinen T, Pietiläinen KH, Loimaala A, Ihalainen T, Sammalkorpi H, Penttilä A, *et al*. Bile reflux is a common finding in the gastric pouch after one anastomosis gastric bypass. Obes Surg 2020; 30:875–881.