

Laparoscopic one anastomosis gastric bypass: a revisional procedure for failed open vertical banded gastroplasty in treatment of morbid obesity: a prospective study

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Background

The main indications for revision of bariatric surgery are inadequate weight loss, weight regain, or complications, so laparoscopic one anastomosis gastric bypass (LOAGB) is a promising bariatric procedure used as a revisional procedure for failed open vertical banded gastroplasty (VBG).

Aim

The aim was to evaluate LOAGB as a revisional bariatric procedure for failed open VBG regarding technical feasibility, weight loss, improvement in comorbidities, and complications.

Patients and methods

This prospective cohort study was carried out at the Gastrointestinal and Laparoscopic Surgery Unit, General Surgery Department, Tanta University, between October 2017 and October 2018. It included 20 patients who underwent LOAGB as a revisional bariatric procedure for failed open VBG.

Results

The study population included 17 females and three males, with a mean age of 38.25 ± 5.36 years. The mean preoperative BMI was 48.15 ± 4.35 kg/m². The mean operative time was 145.36 ± 25.19 min, and the mean postoperative hospital stay was 3.12 days. Neither conversion to open technique or to other bariatric procedures nor mortality occurred. Early complications were encountered in 3 patients (15%). Late complications included four (20%) patients. Severe biliary gastritis occurred in one (5%) patient, who was managed by side-to-side jejunojejunostomy. The mean postoperative excess body weight loss percent (EBWL%) achieved was 47.14 ± 15.24 at 1 year and 60.85 ± 12.17 at 2 years. The mean BMI achieved was 32.72 ± 5.46 at 1 year and 28.14 ± 4.45 at 2 years.

Conclusion

LOAGB surgery as a revisional procedure for failed open VBG is an effective bariatric surgical procedure producing significant weight loss and resolution or improvement of comorbidities with low perioperative complications.

Keywords:

laparoscopic, obesity, one anastomosis gastric bypass, vertical banded gastroplasty

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Introduction

All bariatric operations have incidence of failure. Failure means insufficient weight loss, weight regain, inadequate resolution of comorbidities, and complications. Insufficient weight loss following restrictive procedures is usually caused by dietary changes in patients who shifted to high-calorie diet [1].

The incidence of revision after open vertical banded gastroplasty (VBG) is 56% compared with a 12% incidence of revision after gastric bypass [2].

In 1997, Rutledge with the purpose to carry out an ideal bariatric procedure that should be effective, safe, and easy to perform introduced laparoscopic one anastomosis gastric bypass (LOAGB) [3], which is an alternative to LRYGB, having shorter operative

time with less morbidity and easier to perform and teach [4].

Although LOAGB is well established as a primary procedure, many authors have also reported experience with secondary LOAGB [5].

Patients and methods

This prospective cohort study was carried out at the Gastrointestinal and Laparoscopic Surgery Unit,

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General surgery Department, Tanta University, between October 2017 and October 2018. It included 20 patients underwent LOAGB for failed open VBG performed for the treatment of morbid obesity. Written informed consent was obtained from the patients. The study was approved by the Research Ethics Committee, Quality Assurance Unit, Faculty of Medicine, Tanta University.

Preoperative assessment and preparation

Data from all operated patients were routinely collected prospectively in a database. The hospital files of included patients have been reviewed, and the following data were collected: (15 of 20 patients who underwent previous open VBG were done in our institute, whereas the other five were operated outside our institute) anthropometric measurements in the form of weight, height, BMI; laboratory investigations; imaging investigations; and evaluation of the associated comorbidities.

Operative technique

The surgery was performed through the right-sided position, which was more convenient for us than the French position even in primary cases, in which the patient was positioned supine with legs adducted, and the surgeon and cameraman stood on the patient's right side, whereas the assistants stood on the patient's left side. The procedure was performed through five abdominal trocars. Exploration was done first, then adhesiolysis along the incision, and then completely freeing the stomach from inferior surface of the liver reaching to the hiatus. A transverse stapling was done using a 4 cm of gold or green cartridge (Ethicon Endo-surgery, Cincinnati, Ohio, USA) according to tissue thickness through a window created by the harmonic scalpel between the neurovascular bundle and the lesser curve of the stomach just above the new pylorus. Further firings were made vertically using (three to four cartridges) 6 cm of gold or blue cartridges (Ethicon Endo-surgery) according to tissue thickness toward the angle of His to create the gastric pouch with 36-French bougie moved in and out before each firing to ensure neither tight nor wide pouch and loop gastrojejunostomy at distant of 150 cm from duodenojejunal flexure. Methylene blue test was done routinely. We found that long gastric pouch was successfully created which enabled us to convert open VBG into LOAGB in our patients.

Operative data included operative time, any operative complications, or other surgical procedures performed together with bariatric surgery.

Early postoperative data included postoperative course, results of contrast study, length of hospital stay, any complications, readmission, or intervention.

During the study period, included patients were recalled for assessment annually after surgery. The following data were collected:

- (1) Anthropometric measurements: weight loss, change in mean BMI, and change in mean EBWL%.
- (2) Improvement or resolution of obesity-associated comorbidities. Resolution of comorbidities will be defined as 'normalization of clinical and laboratory parameters without medications' and improvement as 'normalization of clinical and laboratory parameters with reduced dose of medication'.
- (3) Development of complications and their management including any readmission or intervention.

Statistical analysis

The results were collected, tabulated, and statistically analyzed using the SPSS statistical package, version 20 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics were prepared. Categorical data were expressed as number and frequency (percentage). Metric data were expressed as range, mean, and SD.

Results

The study population included 17 females and three males, with a mean age of 38.25 ± 5.36 years. Preoperative upper gastrointestinal endoscopy (Fig. 1) and barium study (Figs. 2 and 3) were done routinely for all patients, and it revealed that 16 (80%) patients had disruption of four rows staple line between the already created gastric pouch and the excluded stomach in which a lesser curvature vertical pouch stapled in continuity with the excluded stomach and four (20%) patients had wide pouch without disruption. In this study, two (10%) patients were hypertensive, one (5%) patient had type 2 diabetes mellitus, one (5%) patient had dyslipidemia, three (15%) patients had arthritis, and only 2 patients of 20 (10%) had OSA (Table 1).

Operative records

The mean operative time was 145.36 ± 25.19 min. Neither conversion to open technique nor conversion to other bariatric procedures occurred.

Intraoperative complications

Intraoperative complications were recorded in three (15%) patients. Superficial liver tear caused by the liver

Figure 1



Endoscopic view.

Figure 2



Barium study with staple line disruption.

retractor was encountered in two (10%) patients; the resulting bleeding was controlled only by compression by a gauze for 3 min, and intestinal perforations occurred in one (5%) patient, which were repaired laparoscopically with no need for conversion.

Postoperative results

The mean postoperative hospital stay was 3.12 days. All patients in this study were subjected to oral gastrograffin contrast study on the first postoperative

Figure 3



Barium study e out disruption.

Table 1 Preoperative results

Preoperative results	N=20 [n (%)]
Sex	
Male	3 (15)
Female	17 (85)
Age	
Minimum–maximum	32–45
Mean	38.25±5.36
Preoperative endoscopic finding	
Disruption of staple line	16 (80)
Wide pouch without disruption	4 (20)
Associated comorbidities	
Hypertension	2 (10)
Type 2 DM	1 (5)
Dyslipidemia	1 (5)
Musculoskeletal	3 (15)
OSA	2 (10)

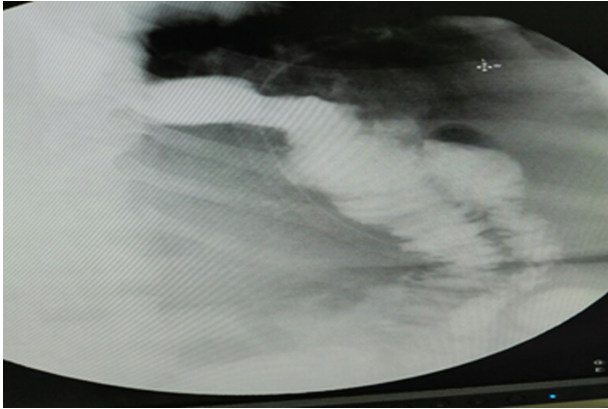
Three patients had combined comorbidities (hypertension and type 2 DM in one patient, hypertension and dyslipidemia in one patient, and arthritis and OSA in one patient). DM, diabetes mellitus.

day, and no leakage was detected in any of them (Fig. 4). In our study, oral intake was allowed in the form of clear fluids only after routinely gastrograffin contrast study.

Early postoperative complications

Early complications were encountered in three (15%) patients: small left subphrenic collection occurred in one (5%) patient, who was successfully managed conservatively by antibiotics, close observation, and repeated follow-up only by pelviabdominal

Figure 4



Gastrograffin study.

ultrasound, and the patient passed a smooth postoperative course thereafter. The other two (10%) patients experienced local wound complications (seroma and infection) at the right 5–12 working port, who were managed successfully by conservative treatment in the form of antibiotics (according to culture and sensitivity test) and repeated daily dressing.

Change in %EBWL and BMI

In this study, the mean preoperative weight was 136.25 ± 19.54 kg. The mean postoperative weight achieved was 95.86 ± 17.12 kg at 1 year and 85.34 ± 11.27 kg at 2 years

In this study, the mean postoperative excess body weight loss percent (EBWL%) achieved was 47.14 ± 15.24 at 1 year and 60.85 ± 12.17 at 2 years. The mean BMI achieved was 32.72 ± 5.46 at 1 year and 28.14 ± 4.45 at 2 years (Table 2).

Late postoperative complications

Late complications occurred in four (20%) patients. Severe biliary gastritis occurred in one (5%) patients 7 months postoperatively, who was diagnosed clinically and by endoscopic findings during follow-up and was managed by side-to-side jejunojejunostomy 12 months postoperatively after failure of medical treatment, and nutritional sequelae developed in three (15%) patients in the form of anemia in one (5%) patients and hypocalcemia in two (10%) patients, who were treated medically.

Discussion

The aim of this study was to evaluate LOAGB as a revisional bariatric procedure for failed VBG regarding technical feasibility, weight loss, improvement in comorbidities, and complications. This study

Table 2 Effects of weight reduction on obesity related comorbidities

Obesity related morbidities	N (%)
HTN	2 (100)
Resolved	1 (50)
Improved	1 (50)
No change	0
DM	1 (100)
Resolved	1 (100)
Improved	0
No change	0
Dyslipidemia	1 (100)
Resolved	0
Improved	0
No change	1 (100)
Musculoskeletal	3 (100)
Resolved	1 (33.3)
Improved	1 (33.3)
No change	1 (33.3)
OSA	2 (100)
Resolved	0
Improved	1 (50)
No change	1 (50)

DM, diabetes mellitus; HTN, hypertension.

included 20 morbidly obese patients who accepted to participate and signed an informed consent.

In our study, the cause of secondary operation is insufficient weight loss or weight gain, which matched with Meydan *et al.* [6]. So conversion of a failed restrictive procedure to gastric bypass is recommended to avoid risks of further redo surgery and high failure rate [7].

The age in our study ranged between 32 and 45 years, with a mean of 38.25 ± 5.36 years. This recorded age is quite similar to Musella *et al.* [8] and Bairdain *et al.* [9].

Regarding sex distribution in our study, females constituted the majority of our patients [17/20 (85%)]. This sex incidence is matched with that reported by Aboul Naga and Magdy [10] (92%), and Iannelli *et al.* [11] (16 women and two men).

Laparoscopic reoperation requires significantly longer operative time and is considered technically challenging [12]. The mean operative time in our study was 145.36 ± 25.19 min, which is similar to LOAGB group (145 min) and shorter than LRYGB group (185 min) reported by Salama and Sabry [13].

Intraoperative complications were recorded in three (15%) patients. Superficial liver tear caused by the liver retractor was encountered in two (10%) patients; the resulting bleeding was controlled only by compression,

and intestinal perforations occurred in one (5%) patient, which were repaired laparoscopically, with no need for conversion.

Regarding technical feasibility in our study, neither conversion to open technique nor conversion to other bariatric procedures occurred. We found that long gastric pouch was successfully created using 3–4 cartridges of size 6 cm, which enabled us to convert open VBG into LOAGB in our patients, whereas if long gastric pouch could not be created and the vertical length of the pouch was less than three cartridges of size 6 cm, the decision should be changed, and therefore VBG should be converted into LRYGB to avoid biliary reflux esophagitis, which is similar to that reported by Salama and Sabry [13], which convert VBG into LOAGB in 65% of their patients, whereas in 35% of the patients, VBG was converted into LRYGB owing to long pouch could not be created to avoid reflux esophagitis. This indicates that not all cases with failed open VBG can be converted into LOAGB and sometimes it is better to convert into LRYGB. So, the decision to convert open VBG to LOAGB or LRYGB should be taken intraoperatively depending mainly on the length of gastric pouch.

Conversion rate from laparoscopic to open surgery was zero, which coincided with that reported by Frantzides *et al.* [14], and was better than reported by Khewater *et al.* [15], for revisional LRYGB, which occurred in three (2.86%) patients with open VBG.

Early complications were encountered in three (15%) patients. Small left subphrenic collection occurred in one (5%) patient, who was successfully managed conservatively by antibiotics, close observation, and repeated follow-up only by pelviabdominal ultrasound, and the patient passed a smooth postoperative course thereafter. The other two (10%) patients experienced local wound complications (seroma and infection) at the right 5–12 working port, who were managed successfully by conservative treatment in the form of antibiotics (according to culture and sensitivity test) and repeated daily dressing.

The mortality rate in our study was 0. This matched with the results reported by Gentileschi *et al.* [1].

The mean postoperative hospital stay was 3.12 days, which is quite similar with those reported by Bairdain *et al.* [9], 3 days, ranged between 2 and 5 days, and is similar to revisional LRYGB reported by Khewater *et al.* [15], which was 3.20±1.20 days.

Late complications occurred in four (20%) patients. Severe biliary gastritis occurred in one (5%) patient 7 months postoperatively who was diagnosed clinically and by endoscopic findings during follow-up and was managed by side-to-side jejunojejunostomy 12 months postoperatively after failure of medical treatment, and nutritional sequelae developed in three (15%) patients in the form of anemia in one (5%) patient and hypocalcemia in two (10%) patients, who were treated medically.

Overall, four (0.4%) patients presented with severe bile reflux, all with revisional LOAGB, and were cured by a laterolateral jejunojejunostomy [16].

Surgical intervention for internal herniation was more prevalent in the LRYGB group (0.0 vs 4.9%), whereas surgical intervention for biliary reflux was prevalent in the LOAGB group (5.4 vs 0.3%), as reported Poublon *et al.* [17].

In this study, the mean preoperative weight was 136.25±19.54 kg. The mean postoperative weight achieved was 95.86±17.12 kg (29.6%) at 1 year and 85.34±11.27 kg (37.3%) at 2 years which matched with that reported by Frantzides *et al.* [14], which was 33.2±3.1%.

In our study, the mean postoperative EBWL% achieved was 47.14±15.24 at 1 year and 60.85±12.17 at 2 years, which matched with that reported by Spyropoulos *et al.* [18], 68.9%.

Regarding the mean preoperative BMI in our study, it was 48.15±4.35 kg/m², which is similar with that reported by Ibrahim *et al.* [19] (47.9 kg/m²) and Bruzzi *et al.* [5] (45.5±7 kg/m²).

In our study, the mean BMI achieved was 32.72±5.46 at 1 year and 28.14±4.45 at 2 years, which is similar to that reported by Ibrahim *et al.* [19], which was 29.2 after 1 year, and Gentileschi *et al.* [1] and Cohen *et al.* [20], which was 28 and 25.3 kg/m², respectively, after 24 months.

During the follow-up period, the achieved weight reduction produced beneficial effects on the comorbidities that showed either resolution or improvement. In this study, resolution/improvement of type 2 diabetes mellitus was reported in 100%. Our results were in agreement with van Wezenbeek *et al.* [21] (90%) and of revisional LRYGB reported by Zakaria and Elhoofy [22] (100%).

In this study, resolution/improvement of hypertension in our study was 100%. Our results coincided with that

of primary LOAGB as reported by Rutledge [23] (90%) and more than of revisional LRYGB, as reported by Zakaria and Elhoof [22] (71.4%).

Resolution/improvement of OSA in our study was 50%. Our results are coincided with that reported by Bruzzi *et al.* [5] (50%) and Bairdain *et al.* [8] (46.7%).

Resolution/improvement of degenerated joint diseases in our study was 66.6%. Our results matched with that reported by van Wezenbeek *et al.* [21] (57.1%).

LRYGB is the revisional surgery of choice after failed open VBG, as it can achieve better weight loss and comorbidities improvement [24]. However, strictures are common complications after revisional LRYGB, and it occurs because of distal pouch ischemia owing to chronic inflammation or proximal gastric pouch mucosal thickening [25].

Both LOAGB and LRYGB are acceptable options for restrictive procedures revision, although LOAGB is simple with better weight reduction than LRYGB except for nutritional sequelae such as anemia [26]. Moreover, Ibrahim *et al.* [19] and Aboul Naga and Magdy [10], concluded that LOAGB is an option for failed open VBG revision regarding safety, weight loss, and comorbidity improvement.

LOAGB is much better than LRYGB for weight regain and insufficient weight loss after failed restrictive surgery with a lower early complication rate and more weight loss, as concluded by Poublon *et al.* [17]. Moreover, Khewater *et al.* [14] concluded that LRYGB following open VBG revision is time-consuming, technically challenging and with a higher risk of conversion to open. They support the use of such revisional bariatric surgery in specialized, high-volume bariatric centers.

Further high-level studies such as prospective randomized studies comparing the long-term results between revisional LOAGB and revisional LRYGB on large numbers are required to confirm these findings.

Conclusion

Laparoscopic revisional bariatric surgery is technically demanding involving the addition of malabsorption result in a greater weight loss than gastric restriction, so LOAGB surgery as a revisional procedure for failed VBG is an effective bariatric surgical procedure producing significant weight loss, and resolution or improvement of comorbidities with low perioperative complications.

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Conflicts of interest

There are no conflicts of interest.

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