Outcomes of laparoscopic one-anastomosis gastric bypass in treatment of morbid obesity: a retrospective analysis

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Background
Laparoscopic one-anastomosis gastric bypass (OAGB) is a promising bariatric procedure with multiple apparent benefits. However, concerns have been expressed about reported complication rates and the extent of follow-up, with recommendations to establish a registry of complications and revisional procedures.

Aim of study
To retrospectively analyze outcomes of OAGB performed for treatment of morbid obesity regarding weight loss, improvement in comorbid conditions, complications, and quality of life.

Patients and methods
OAGB was performed for the treatment of morbid obesity in 60 patients, and they completed at least 1 year of follow-up postoperatively at the Gastrointestinal Surgery Unit, General Surgery Department, Tanta University, Egypt.

Results
The study population included 60 patients, with a mean age of 33.52±8 years. The mean preoperative;Deg;BM;Deg;I was 53.29±6.91 kg/m^2. Early complications were encountered in eight (13.3%) patients. Late complications occurred in 21 (35%) patients: nutritional sequelae developed in eight (13.4%) patients, four (6.7%) patients developed gall stones, gastritis owing to biliary reflux occurred in eight (13.4%) patients, and severe malnutrition developed in one (1.7%) patient. Preoperative obesity-related comorbidities were hypertension in 11 cases and diabetes mellitus in seven cases. The mean;Deg;BM;Deg;I 24 months after surgery was 34.14±4.17 kg/m^2. Most of the comorbidities improved or resolved; 81.8% for hypertension and 85.6% for diabetes mellitus.

Conclusion
OAGB surgery is an easy, safe, and effective bariatric surgical technique for the treatment of morbidly obese patients producing significant weight loss, resolution or improvement of comorbidities, and improvement of patient quality of life. Strict postoperative follow-up with surveillance for vitamins, protein, and minerals deficiencies is essential, and endoscopic examination when indicated is recommended.

Keywords:
laparoscopic, mini-gastric bypass, obesity

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Introduction

Morbid obesity can lead to complications affecting nearly every organ system [1]. Because of their effect on the patients' quality of life (QOL), life expectancy, and healthcare finances, obesity, and its related comorbidities constitute a significant health problem worldwide [2].

Bariatric surgery is the most effective treatment of morbid obesity; not only is it a weight-reducing surgery but also a metabolic surgery. It results in excellent long-term sustained weight loss and hence in reduction of comorbidities [3].

Laparoscopic one-anastomosis gastric bypass (OAGB) is a promising bariatric procedure with multiple apparent benefits. In 1997, Rutledge with the purpose to carry out an ideal weight loss operation that should be effective, easy to perform, and safe introduced OAGB [4], which seems an attractive alternative to laparoscopic Roux-en-Y gastric bypass with less morbidity and easier to teach and to perform [5].

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Patients and methods

This retrospective study was carried out at the Gastrointestinal and Laparoscopic Surgery Unit, General Surgery Department, Tanta University, to analyze the outcomes of OAGB performed for the treatment of morbid obesity. All patients who had OAGB as a first procedure for treatment of morbid obesity and completed at least 1-year follow-up after surgery were included in the study starting December 2015. Patients who had other weight-reducing procedure and patients who had OAGB but did not complete at least 1-year follow-up after surgery were excluded.

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: anthropometric measurements in the form of weight, height, BMI, excess BMI, waist circumference, hip circumference, and waist/hip ratio; laboratory investigations; imaging investigations; evaluation of the associated comorbidities; and accurate assessment of the operative risks of the patient and prophylaxis against deep venous thrombosis.

Operative technique

The surgery was performed in the positioning of the patient with joined lower limbs. The operator stood on the right side of the patient. The surgery was performed using five trocars. Using a linear stapler, a stomach pouch was created with a capacity of 30–50 ml, and a length of ~7–10 cm. The diameter of the pouch produced was calibrated on a 38-Fr bougie. Then, using a harmonic scalpel, the greater omentum was cut slightly to the left of the midline. In the case of patients whose morbid obesity was the indication for the surgery, OAGB with a length of 150 cm was performed. Gastrojejunostomy was performed side to side using a linear stapler. The stapler defect was closed using vicryl 3–0 suture. A methylene blue leak test was performed intraoperative.

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

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

During regular follow-up visits, the included patients were assessed 1 year after surgery and then every 6 months as applicable. The following data were collected:

(1) Anthropometric measurements: weight loss, change in mean BMI, and change in mean excess weight loss (EWL).
(2) Improvement or resolution of obesity-associated morbidities. 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' [6]
(3) Development of complications and their management including any readmission or intervention.
(4) Endoscopic evaluation when indicated.
(5) Assessment of the patients' QOL using the Bariatric Analysis and Reporting Outcome System (BAROS) [6].

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 (percent). Metric data were expressed as range, median, mean, and SD.

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.

Results

Preoperative data

Table 1 shows the preoperative data. The study population included 60 patients, comprising 44 (73.3%) females and 16 (26.7%) males. Their ages ranged between 18 and 53 years, with a mean of 33.52±8 years. Overall, 31 patients attended 36 months of follow-up. Preoperative upper gastrointestinal endoscopy was done for all patients, and it revealed that 14 (23.3%) patients had small sliding hiatus hernia, six (10%) patients had gastroesophageal reflux disease (GERD) (grades II–III), 18 (30%) patients had gastritis (antral or pangastritis), five (8.3%) patients had duodenitis and received medical treatment before surgery, seven (11.6%) patients had incompetent cardia, and 10 patients had normal upper endoscopy with no *Helicobacter pylori* infection.

Table 1 Preoperative data

Preoperative results			*N*=60 [*n* (%)]
Sex			
Male			16 (26.7)
Female			44 (73.3)
Age			
Minimum–maximum			18.0–53.0
Mean			33.52±8.14
Median			34.5
Anthropometric measures	Minimum–maximum	Mean	Median
Weight	145.0	144.40±18.59	115.0–186.0
Height	165.0	164.82±7.13	145.0–182.0
BMI	52.0	53.29±6.91	41.80–68.70
Preoperative endoscopic finding			
Normal			10 (16.6)
Small sliding hiatus hernia			14 (23.3)
GERD			6 (10)
Incompetent cardia			7 (11.6)
Gastritis of different degrees			18 (30)
Duodenitis			5 (8.3)
Associated comorbidities			
Hypertension			11 (18.3)
Type 2 DM			7 (11.7)
OSA			19 (31.7)
Dyslipidemia			18 (30)
Skin			22 (34.9)
Musclo-skeletal			27 (45)
Urinary			22 (34.9)
Gall bladder stones			4 (6.7)

More than one comorbidity present in the same patient. DM, diabetes mellitus; GERD, gastroesophageal reflux disease; OSA, obstructive sleep apnea.

In this study, 11 (18.3%) patients were hypertensive on antihypertensive medications, seven (11.7%) patients had type 2 diabetes mellitus on insulin therapies, 18 (30%) patients had dyslipidemia on statins, 19 (31.7%) patients had obstructive sleep apnea, and 27 (45%) patients had arthritis, 22 (34.9%) patients had urinary symptoms, 22 (34.9%) patients had skin symptoms, and four (6.7%) patients had gall bladder stones.

Operative records

The operative time ranged between 60 and 180 min, with a mean of 126.83±29.43 min and 120 min as a median. The associated procedures were laparoscopic cholecystectomy in four (6.7%) patients.

Intraoperative complications

Intraoperative complications were recorded in 10 (16.8%) patients. Superficial liver tear caused by the liver retractor was encountered in seven (11.7%) patients, and the resulting bleeding was controlled by cautery and compression.

Minimal bleeding from splenic capsule occurred in one (1.7%) patient and was controlled by compression as well. Small jejunal perforation was recorded in one (1.7%) patient and was repaired laparoscopically.

We had one (1.7%) case of conversion to open surgery owing to short mesentery of small bowel with multiple intestinal perforations during trials to move the jejunum toward the created gastric pouch.

Postoperative results

The postoperative hospital stay ranged between 4 and 30 days, with a mean of 7.72±3.45 days and 4 days as a median. After exclusion of the patient who developed leakage and stayed in the hospital for 30 days, the postoperative hospital stay of the remaining 59 patients ranged between 4 and 7 days, with a mean 4.84±1.80 days.

All patients in this study were subjected to oral gastrografin contrast study on the second postoperative day, and no leakage were detected in any of them.

Early postoperative course and complications

One (1.7%) patient was admitted in the ICU for postoperative mechanical ventilation for respiratory

problems for 48 h. Early complications were encountered in eight (13.3%) patients. One (1.7%) male patient developed staple line leakage in the first postoperative day manifested by bilious effluent through the drain. This patient was explored laparoscopically where the site of the leakage was the lower medial angle of the gastric pouch that was repaired laparoscopically and the patient passed a smooth postoperative course thereafter.

In another patient (1.7%), leakage at gastroesophageal junction (GEJ) was detected by gastrografin study in the fifth day postoperatively. This patient was treated conservatively by maintained abdominal drainage, nothing per mouth, and total parenteral nutrition (TPN) with repeated abdominal ultrasound examination that revealed no intraabdominal collection.

Four (6.7%) patients experienced local wound complications (seroma and infection) managed successfully by conservative treatment in the form of antibiotics (according to culture and sensitivity test) and repeated daily dressing. Two patients with port-site hematoma were evacuated successfully.

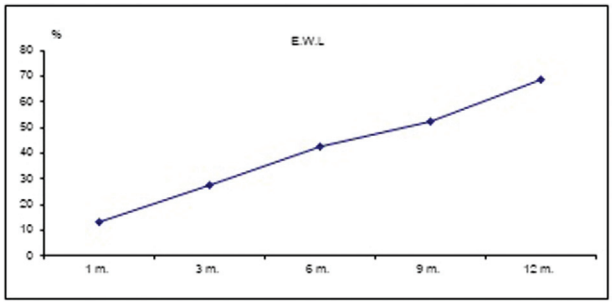
Weight loss and change in BMI

In this study, the preoperative weight ranged between 115 and 186 kg with a mean of 144.40±18.59 kg. At 12-month follow-up, the weight ranged between 80 and 129 kg, with a mean of 101.04±12.26 kg. At 18-month follow-up, the weight ranged between 75 and 120 kg, with a mean of 96.63±10.77 kg.

At 24-month follow-up, it ranged between 70 and 111 kg, with a mean 93.0±10.47 kg. At 36-month follow-up, the weight of the 31 attending patients ranged between 70 and 100 kg, with a mean of 86.42±7.94 kg (Fig. 1).

In this study, the preoperative BMI ranged between 41.8 and 68.7 kg/m^2, with a mean of 53.29±6.91 kg/m^2. At 12-month follow-up, BMI ranged between 28.70 and 49.90 kg/m^2, with a mean of 37.54 ±4.64 kg/m^2. At 18-month follow-up, the BMI ranged between 26.8 and 48 kg/m^2, with a mean of 35.40±4.47 kg/m^2. At 24-month follow-up, the BMI ranged between 26.7 and 42.9 kg/m^2, with a mean of 34.14±4.17 kg/m^2. The BMI of 31 attending patients at 36-month follow-up ranged between 25.4 and 39 kg/m^2, with a mean of 32.25±3.21 kg/m^2.

Figure 1



Preoperative weight and its change over 3 years of follow-up.

Effects of weight reduction on obesity-related morbidities

Postoperatively during the follow-up period till the end of the study, the achieved weight reduction produced beneficial effects on the associated comorbidities that showed either resolution of the comorbidity, which means total cessation of medication and normalization of symptoms and blood investigations specific to the comorbidity, or improvement of the comorbidity, which means a reduction in medication taken and improvement in the symptoms or blood investigation specific to the comorbidity. The distribution of the comorbidities and the effect of weight reduction on them (either reduction, improvement, or no change) are demonstrated in Table 2.

Bariatric Analysis and Recording Outcome System

The system defines five outcome groups (failure, fair, good, very good, and excellent), based on a scoring table that adds or subtracts points while evaluating three main areas: percentage of EWL, changes in medical conditions, and QOL.

To assess changes in QOL after treatment, this method incorporates a specifically designed patient questionnaire that addresses self-esteem and four daily activities. Complications and reoperative surgery deduct points, thus avoiding the controversy of considering reoperations as failures. Overall, 16.5% of patients were recorded as having fair outcome, 41.6% as good, 35% as very good, and one patient as excellent.

There were no cases of failure, where more than seven points represents an excellent result, five to seven points a very good result, three to five points a good result, and one to three points a fair result. A final score of one point or less signifies a failure of the treatment.

Late complications

Late complications were encountered in 21 (35%) patients. Severe malnutrition developed in one (1.7%) patient manifested by generalized weakness and generalized edema and was rehospitalized for

Table 2 Effects of weight reduction on obesity-related comorbidities

Obesity-related morbidities	*n* (%)
HTN	11 (100)
Resolved	5 (45.5)
Improved	4 (36.3)
No change	2 (18.1)
DM	7 (100)
Resolved	4 (57.1)
Improved	2 (28.5)
No change	1 (14.2)
Dyslipidemia	18 (100)
Resolved	8 (44.4)
Improved	7 (38.9)
No change	2 (11.1)
No follow-up	1 (6)
Musculoskeletal	27 (100)
Resolved	8 (29.6)
Improved	14 (52)
No change	4 (14.8)
No follow-up	1 (3.7)
Skin	22 (100)
Resolved	5 (22.7)
Improved	12 (54.4)
No change	4 (18.3)
No follow-up	1 (4.6)
Urinary	22 (100)
Resolved	8 (36.4)
Improved	13 (59)
No change	1 (4.6)
OSA	19 (100)
Resolved	8 (42.1)
Improved	10 (52.6)
No change	1 (5.3)

DM, diabetes mellitus; HTN, hypertension; OSA, obstructive sleep apnea.

severe hypoalbuminemia (2 mg/dl) and anemia (7.5 mg/dl). The patient was started on TPN after central line insertion and explored laparoscopically. Gastrojejunostomy was found 220 from duodenojejunal flexure. We proposed to fashion a Roux-en-Y limb leaving in place the preexisting gastrojejunal anastomosis. We divided the afferent limb next to the previous gastrojejunal anastomosis, and a jejunojejunal anastomosis was performed distally at 70 cm on the alimentary limb.

Four (6.7%) patients developed gall stones at the first year postoperatively; two of them presented with biliary pain and the others were discovered by ultrasound examination, and they were managed by laparoscopic cholecystectomy 1.5 year postoperatively.

Gastritis owing to biliary reflux occurred in eight (13.4%) patients who were diagnosed clinically and by endoscopic findings during follow-up and were managed by prokinetics, deoxycholic acid, and cholestyramine (as chelating agent).

Nutritional sequelae developed in eight (13.4%) patients in the form of anemia in four (6.7%) patients, and hypocalcaemia in four (6.7%) patients who were treated medically.

Discussion

The aim of this study was to analyze the outcomes of OAGB in treatment of morbidly obese patients regarding weight reduction, reduction of comorbidities, and change in patients' QOL. This study included 60 morbidly obese patients who accepted to participate and signed an informed consent.

In this study, the mean preoperative weight was 144.40 ±18.59 kg, and the EWL% at 12 months ranged between 35.7 and 82%, with a mean of 55.59±10.18 kg. At 24-month follow-up, the EWL% ranged between 43.1 and 92%, with a mean of 64.96±10.90. Lastly, at 36-month follow-up, the EWL% in the 30 patients who completed 36-month follow-up ranged between 53 and 92%, with a mean of 72.71±8.47.

Piazza *et al.* [6], reported the mean EWL% of 65% at 1 year and 80% at 2 years because the gastrojejunostomy was done 180–240 cm from the ligament of Treitz. Kular *et al.* [7], reported similar results at 2 years, with EWL% of 71.6%.

Rutledge and Walash, reported a higher mean EWL% after 1 year which was 80% because they used a 28-Fr bougie and performed a bypass limb of 180 cm distal to the duodenojejunal flexure. Iron-deficiency anemia was the most common nutritional deficiency syndrome. They reported anemia in 110 (5%) patients, and 12 of them required iron infusion. Moreover, 31 (1%) patients developed excessive weight loss and required revision to a gastroplasty [8].

During the follow-up period, the achieved weight reduction produced beneficial effects on the comorbidities, which showed either resolution or improvement. In this study, 11 (18.3%) patients were hypertensive on antihypertensive medications before the surgery. Resolution/improvement of hypertension in our study was 100%. Our results are higher than that reported by Jammu and Sharma [9], which was 85.4%.

In this study, seven (11.6%) patients were diabetic on subcutaneous insulin therapy, and resolution/

improvement of type 2 diabetes mellitus was reported in 100% of the diabetic patients included in the study, showing a better glycemic control and a higher rate of diabetes remission supported by Jammu and Sharma [9], with 95.1%.

Similarly, in this study, resolution/improvement of dyslipidemia was reported in 83% of patients, an outcome that is similar to that reported by Kular and colleagues who had resolution/improvement of dyslipidemia in 90%.

Resolution/improvement of degenerated joint diseases in our study was 85%. Our results did not match with Kansou *et al*. [10] who reported 66.1% and Musella and Milone [11] who reported 100% at 12 months. This may be explained by the higher numbers of super and super obese patients included in our study.

Resolution/improvement of obstructive sleep apnea occurred in 94.7% of patients in our study. Our results coincide with that reported by Kansou *et al*. [10], where resolution occurred in 92.5% and were much better than Madhok *et al*. [12], where resolution occurred in 66%, because their included patients were only super obese.

Intraoperative complications in this study were reported in 10 (16.8%) patients. These complications included superficial liver tear caused by the liver retractor in seven (11.7%) patients, and the resulting bleeding was controlled by cautery and compression. Minimal bleeding from splenic capsule occurred in one (1.7%) patient, and bleeding was controlled by compression as well. One (1.7%) patient had small intestinal perforation that was repaired laparoscopically. Miguel *et al.* [13] reported two cases, including one esophagogastric junction perforation by the calibration tube and one incorrect gastric transection in a patient with severe cardioesophageal inflammation; both required conversion to distal (Roux-en-Y gastric bypass) with esophagoileal anastomosis.

Conversion from laparoscopic to open surgery occurred in one (1.7%) of our patients. The cause of conversion was multiple small bowel perforations while preparing the bypass loop because of dense fibrous adhesions involving the small bowel at the site of previously repeated caesarian section. Compared with other series, the overall conversion rate was 0% reported by Kular *et al*. [7] and Plamper *et al*. [14].

The mortality rate in our study was zero. This matched with the results reported by Bruzzi *et al*. [15], and Noun *et al*. [16], where the mortality rate was zero. Jonathan *et al.* [17] reported mortality rate of 2% in their study, an incidence that is higher than ours.

In this study, early postoperative complications were reported in nine (15%) patients including one (1.7%) patient who developed staple line leakage on the first postoperative day. This patient was explored laparoscopically where the site of the leakage was the lower medial angle of the pouch that was repaired laparoscopically and the patient passed a smooth postoperative course thereafter. In another patient, leakage was confirmed by gastrografin study at the fifth day postoperative. This patient was treated conservatively by maintained abdominal drainage, nothing per mouth, and TPN, with repeated abdominal ultrasound examination that revealed no intraabdominal collection.

Etiologies of leaks have been divided into mechanical and ischemic causes, which include tension, ischemia, poor wound healing, technical errors, iatrogenic injury, and distal obstruction; a leak results when intraluminal pressure exceeds the strength of the tissue and the staple line. Because ischemic leaks are known to occur 5–7 days postoperatively, when wound healing is between the inflammatory and fibrotic phases, the most common causes of most leaks that occur within 48 h are mechanical [18].

Miguel *et al*. [13] reported that early complications developed in 16 (1.3%) patients, and these complications included intraabdominal bleeding in nine patients, leakage in three patients, early small bowel obstruction in two patients, necrosis of the excluded anterior gastric wall in one patient, and acute dilation of the excluded stomach in one patient. Moreover, Piazza *et al*. [6] reported that early postoperative complications were detected in eight (4%) patients, where two patients were diagnosed with pulmonary embolism and were treated with anticoagulant therapy in the ICU, and six patients developed melena, which was mostly owing to bleeding from the stapler line, and were treated conservatively.

Chakhtoura *et al*. [19] reported seven (7%) patients with major early postoperative complications: three reoperations for incarcerated herniation of small bowel in the port site, one peritonitis owing to a traumatic injury of the jejuna loop, one perianastomotic abscess, one hemoperitoneum requiring splenectomy, and one endoscopic hemostasis for anastomotic bleeding.

However, Rutledge [20], reported early postoperative complications in one (0.08%) patient diagnosed with deep venous thrombosis, two (1.6%) patients with pulmonary embolism who were treated with anticoagulant therapy in the ICU, and two (1.6%) patients with leaks. Rutledge and Walash [8], reported 1.08% with leakage controlled laparoscopically, 0.08% port site hernia, and 0.12% with port site infection.

Late postoperative complications were reported as follows: severe malnutrition developed in one (1.7%) patient manifested by generalized weakness and generalized edema and was rehospitalized for severe hypoalbuminemia (2 mg/dl) and anemia (7.5 mg/dl), explored laparoscopically and converted to Roux-en-Y gastric bypass.

Four (6.7%) patients developed gall stones. Gastritis owing to biliary reflux occurred in eight (13.4%) patients. Nutritional sequelae developed in eight (13.4%) patients in the form of anemia in four (6.7%) patients and hypocalcaemia in four (6.7%) patients who were treated medically.

Rutledge and Walash [8], reported 11.7% late postoperative complications in 2410 patients, where dyspepsia and ulcer occurred in 135 (5.6%) patients, with failed medical treatment in three patients who underwent revision, iron-deficiency anemia in 110 (5%) patients, and excessive weight loss with malnutrition in 31 (1.1%) patients who underwent revision to a gastroplasty.

Our results did not match with those reported by Piazza *et al.* [6] who recorded late postoperative complications in only five (2.5%) of 197 patients. Anastomotic ulcer occurred in three (1.5%) patients, and severe esophagitis occurred in two (0.1%) patients.

The QOL after surgery was also determined with BAROS questionnaire. No patient was assessed as failure; in 10 (16.6%) patients, the QOL was assessed as fair, and in 25 (41.6%) as good. The QOL was assessed as very good in 21 (35%) and in one (1.7%) patient as excellent.

It should be emphasized that for people with super obesity, surgical treatment results in significant improvement in their quality of life, regardless of how much it has been deteriorated by the disease. What is interesting and, at the same time, difficult to explain is the fact that the QOL of patients after surgery reaches the level exceeding the standard value for our population.

Al Harakeh *et al.* [21] presented similar results concerning improvement in the QOL after bariatric surgery, as estimated based on the BAROS questionnaire. Moreover, in the study by Sarwer *et al.* [22], no significant differences were observed for improvement on the QOL in relation to the degree of body mass reduction.

Women constituted most of our patients (44/60; 73.3%). This sex incidence was matched with that reported by El-Mahdimatch [26] (78.7%) and Carbajo *et al.* [23] (73%). The higher incidence of morbid obesity among women can be explained as female patients are more prone to psychosocial problems and stress conditions. Moreover, women may be more concerned about the cosmetic sequelae of obesity, worried about marriage in married patients, delayed marriage in nonmarried patients, and infertility in some patients [24].

The age in our study ranged between 18 and 53 years, with mean of 33.52±8 years. This recorded age is quite similar to most studies including that of Noun *et al.* [16], and El Shora [25], where the mean age was 33.2 ±10.2; and El-Mahdi, where the mean age was 33.67 ±8.22 years. This age incidence indicates the increased occurrence of obesity among early middle ages, which is the most productive age group and hence its detrimental social and economic consequences.

The operative time ranged between 60 and 180 min, with mean of 126.83±29.43 min. This outcome is quite similar to Chakhtoura *et al.* [19], who reported mean of 129±37 min (range, 80–240).

The mean hospital stay in this study was 6.20±7.0 days. It ranged between 4 and 30 days (after exclusion of the patient who developed leakage from GEJ with hospital stay of 30 days). The mean hospital stay in our study (4.8 days) was found to be quite similar to that of many authors including Kim and Hur [5], who reported mean of 4.5±1.0 days and range between 3 and 7 days.

Obesity and rapid weight loss are known risk factors for gall stones formation, and some centers routinely perform prophylactic cholecystectomy with bariatric procedures to prevent complications of cholelithiasis, whereas other centers prefer to do cholecystectomy only for those having gall stones [28]. Our center adopts the second policy. Hence, we do preoperative abdominal ultrasound examination routinely for all of

our patients to detect cases with asymptomatic gall stones. Laparoscopic cholecystectomy was done in four (6.7%) patients because of having gall stones whether symptomatic or not.

Postoperative endoscopic follow-up examination was done in 50 patients. Pathological findings were reported in 21 (42%) patients of examined patients and were gastritis of different degrees in 12 (24%) patients, stomal ulceration in four (8%) patients, peptic esophagitis in three (6%) patients, and atrophic antral mucosa in two (4%) patients.

A new-onset GERD or any increase in GERD is to be considered as a complication as it is one of the most distressing symptoms from both the patients' and the surgeon's perspective. Hence, one has to carefully evaluate any patient with GERD and may preferably avoid a sleeve gastrectomy in these patients, as the postsurgical motility changes need more research, and should better go ahead with gastric bypass, which is the gold standard in patients with GERD [29].

In our study, improvement of 6/14 (42.8%) patients with small sliding hiatal hernia, 3/7 (42.8%) patients with incompetent cardia, and 3/6 (50%) patients with GERD, despite no concomitant hiatal repair was done. Kular *et al*. [7], reported that there has been a significant observation in their study showing GERD remission in 72% of the patients.

Tolone *et al*. [30], performed studies showing that after 1 year, GEJ function was not compromised and GERD was not increased, demonstrated by statistically diminished intragastric pressure and gastroesophageal pressure gradient, using endoscopy, high-resolution impedance manometry, and 24-h pH-impedance monitoring.

Conclusion

OAGB surgery is an easy, safe, and effective bariatric surgical technique for the treatment of morbidly obese patients producing significant weight loss, resolution or improvement of comorbidities, and improvement of patient QOL. Strict postoperative follow-up with surveillance for vitamins, protein, and minerals deficiencies is essential, and endoscopic examination when indicated is recommended.

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Conflicts of interest
There are no conflicts of interest.

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