

Retrospective Cohort Study

Place of upper endoscopy before and after bariatric surgery: A multicenter experience with 3219 patients

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Abstract

AIM: To study the preoperative and postoperative role of upper esophagogastrroduodenoscopy (EGD) in morbidly obese patients.

METHODS: This is a multicenter retrospective study by reviewing the database of patients who underwent bariatric surgery (laparoscopic sleeve gastrectomy, laparoscopic Roux en Y gastric bypass, or laparoscopic minigastric bypass) in the period between 2001 June and 2015 August (Jahra Hospital-Kuwait, Hafr Elbatin Hospital and King Saud Medical City-KSA, and Mansoura

University Hospital - Egypt). Patients with age 18-65 years, body mass index (BMI) > 40, or > 35 with comorbidities after failure of many dietetic regimen and acceptable levels of surgical risk were included in the study after having an informed signed consent. We retrospectively reviewed the medical charts of all morbidly obese patients. The patients' preoperative data included clinical history including upper digestive symptoms and preoperative full workup including EGD. Only patients whose charts revealed whether they were symptomatic or not were studied. We categorized patients accordingly into two groups; with (group A) or without (group B) upper digestive symptoms. The endoscopic findings were categorized into 4 groups based on predetermined criteria. The medical record of patients who developed stricture, leak or bleeding after bariatric surgery was reviewed. Logistic regression analysis was used to identify preoperative predictors that might be associated with abnormal endoscopic findings.

RESULTS: Three thousand, two hundred and nineteen patients in the study period underwent bariatric surgery (75% LSG, 10% LRYDB, and 15% MGB). Mean BMI was 43 ± 13 , mean age 37 ± 9 years, 79% were female. Twenty eight percent had presented with upper digestive symptoms (group A). EGD was considered normal in 2414 (75%) patients (9% group A *vs* 66% group B, $P = 0.001$). The abnormal endoscopic findings were found high in those patients with upper digestive symptoms. Abnormal findings (one or more) were found in 805 (25%) patients (19% group A *vs* 6% group B, $P = 0.001$). Seven patients had critical events during conscious sedation due to severe hypoxemia (< 60%). Rate of stricture in our study was 2.6%. Success rate of endoscopic dilation was 100%. One point nine percent patients with gastric leak were identified with 75% success rate of endoscopic therapy. Three point seven percent patients developed acute upper bleeding. Seventy-eight point two percent patients were treated by conservative therapy and EGD was performed in 21.8% with 100% success and 0% complications.

CONCLUSION: Our results support the performance of EGD only in patients with upper gastrointestinal symptoms. Endoscopy also offers safe effective tool for anastomotic complications after bariatric surgery.

Key words: Morbid obesity; Obesity surgery; Endoscopy; Complications; Dilation; Stenting

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Core tip: It is still a major controversial point to do routine screening endoscopy for obese patients before surgery. Many authors suggest doing upper esophagogastrroduodenoscopy (EGD) for all patients before bariatric procedures because of the lack of correlation between patient symptoms and EGD findings. On the contrary, many other investigators advocate selective approach for asymptomatic patients because of the

relatively weak clinical relevance of the majority of the lesions discovered on routine EGD along with the cost and invasiveness of the EGD. The upper endoscopy is commonly indicated in the postoperative bariatric patient to evaluate post-bariatric symptoms, to detect and manage complications, as well as evaluation of failure of weight loss. Post-bariatric complications prompting upper endoscopy include bleeding, anastomotic or staple line leaks or fistulae, sleeve stricture in laparoscopic sleeve gastrectomy or stomal stenosis in laparoscopic Roux en Y gastric bypass, or laparoscopic minigastric bypass. We aimed in this retrospective study to answer if it is still necessary to do pre-bariatric screening endoscopy and to evaluate the efficacy and safety of the endoscopic therapy for management of post-bariatric complications.

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INTRODUCTION

Obesity represents a serious health problem in nearly the whole world^[1-5]. Obesity surgery is the most effective treatment due to the sustainable and significant weight loss results in addition to the resolution of the comorbidities in up to 80%^[6-8]. Upper digestive diseases are 2-3 times more common in obese then normal weight individuals, including erosive esophagitis, gastroesophageal reflux, hiatal hernia, Barrett's esophagus and *Helicobacter pylori* (*H. pylori*) infection^[9].

It is still a major controversial point to do routine screening endoscopy for those patients before surgery^[10]. There is evidence that some pathologic esophagogastrroduodenoscopy (EGD) findings change the chosen procedure such as a large hiatal hernia or Barrett's esophagus. Many authors suggest doing EGD for all patients before bariatric procedures because of the lack of correlation between patient symptoms and EGD findings^[11-15]. On the contrary, many other investigators advocate selective approach for asymptomatic patients because of the relatively weak clinical relevance of the majority of the lesions discovered on routine EGD along with the cost and invasiveness of the EGD^[16,17]. One of the outmost important points is the risk of conscious sedation at the time of EGD due to hypertension and obstructive sleep apnea^[18].

The upper endoscopy is commonly indicated in the postoperative bariatric patient to evaluate post-bariatric symptoms, to detect and manage complications, as well as evaluation of failure of weight loss. Post-bariatric

complications prompting upper endoscopy include bleeding, anastomotic or staple line leaks or fistulae, sleeve stricture in laparoscopic sleeve gastrectomy (LSG) or stomal stenosis in laparoscopic Roux en Y gastric bypass (LRYGB), or laparoscopic minigastric bypass (MGB). We aimed in this retrospective study to answer if it is still necessary to do pre-bariatric screening endoscopy and to evaluate the efficacy and safety of the endoscopic therapy for management of post-bariatric complications.

MATERIALS AND METHODS

Patients studied

This is a multicenter retrospective study by reviewing the database of 3219 patients who underwent bariatric surgery (LSG, LRYGB, or MGB) in the period between 2001 June and 2015 August (Jahra Hospital-Kuwait, Hafr Elbatin Hospital and King Saud Medical City-KSA, and Mansoura University Hospital - Egypt). The study was reviewed and approved by Mansoura Institutional Review Board. Local ethical committee approval for data base management was obtained at each hospital. Patients with age 18-65 years, body mass index (BMI) > 40, or > 35 with comorbidities after failure of many dietetic regimen and acceptable levels of surgical risk were included in the study after having an informed signed consent. Those patients who underwent routine EGD pre-bariatric and patients' charts revealed whether these patients were actually symptomatic before surgery. We excluded patients with prohibitive surgical risk, indications of lack of compliance with perioperative regimen, uncontrolled alcohol or drug abuse, uncontrolled depression or other mental disorders, and lack of family support or significant discord within the family about the planned surgery.

Preoperative data

All patients underwent detailed clinical history including upper gastrointestinal tract (GIT) symptoms, physical examination, and diagnostic work up including routine upper endoscopy. Only patients whose charts revealed whether they were symptomatic or not were studied. Upper digestive symptoms recorded included heartburn, reflux, acid regurgitation, nausea, vomiting and abdominal pain. We categorized patients accordingly into two groups; with (group A) or without (group B) upper digestive symptoms. The endoscopic findings were categorized into 4 groups based on predetermined criteria suggested by Sharaf *et al*^[11]: (1) group 0: With normal EGD study; (2) group 1: If there were abnormal findings that neither changed the surgical approach nor postponed it; (3) group 2: Abnormal EGD findings that changed or postponed the surgical approach; (4) group 3: The abnormal findings that were absolute contra-indications to surgery. In case if there was more than one endoscopic finding, we considered the most significant lesion was the diagnosis (Table 1).

Table 1 Classification system for endoscopic findings

Group 0: No findings
Normal study
Group 1: Abnormal findings that do not change surgical approach/postpone surgery
Mild esophagitis, gastritis, and/or duodenitis
Esophageal webs
Group 2: Findings that change the surgical approach/postpone surgery
Mass lesions (mucosal/submucosal)
Ulcers (any location)
Severe erosive esophagitis, gastritis, and/or duodenitis
Barrett's esophagus
Bezoar
Hiatal hernia (any size)
Peptic stricture
Zenker's diverticula
Esophageal diverticula
Arteriovenous malformations
Group 3: Absolute contraindications to surgery
Upper GI cancer
Varices

GI: Gastrointestinal.

Preoperative endoscopy was done routinely for all patients. Endoscopy was done by our experienced gastroenterology doctors using local throat anesthesia spray. Conscious sedation was done in some cases (if requested by the patient) with nasal oxygen supply and careful monitoring in presence of an anesthetist. Propofol was the standard sedation used which was extended to midazolam if needed. Esophagitis was graded according to the Savary-Miller classification^[19]. Tissue biopsies for *H. pylori* were taken from the corpus and the antrum of patients following the American College of Gastroenterology guideline^[20] and additional biopsies were taken if other abnormalities were seen. If *H. Pylori* was detected, eradication therapy was given for 1 wk (amoxicillin 750 mg *bid*, clarithromycin 500 mg *bid*, and omeprazole 40 mg once daily); the success of HP eradication was not assessed.

Postoperative data

The medical record of patients who developed stricture after bariatric surgery were reviewed for imaging results, time from surgery until symptoms onset, site of stricture, way of treatment, types gastrointestinal anastomosis in case of LRYGB or MGB (end or linear stapler or hand sewn). If endoscopic management was used; number of dilation sessions, diameter of the balloon used for dilation and duration till patient tolerate soft diet. Sleeves narrowing or stomas less than 10 mm in diameter, or if the scope failed to pass through were considered significant strictures and were treated with balloon dilations.

Data from patients who developed leak included: Methods used to detect and manage leaks, interval between surgery and leak, interval between detection and closure and type of stents used. Acute leaks were defined as those occurring within 7 d of the primary procedure, early leak from 1 to 6 wk of the

Table 2 Patient characteristics

Variable	Summary = 3219
Age	37 ± 9 yr
Female: male	79%:21%
BMI	43 ± 13
Haemoglobin	13 ± 4 g/dL
Upper GI symptoms: 902 (28%) ¹	
Heartburn	19.2%
Acid regurgitation	17.6%
Abdominal pain	7.3%
Nausea with or without vomiting	5.7%
Comorbidities: 1159 (36%) ²	
Obstructive sleep apnea	4.9%
Hypertension	57.8%
Arthritis	56.9%
Diabetes mellitus	40.5%
Hypothyroidism	36.6%
Asthma/COPD	15.1%
Coronary artery disease	9.9%
Type of endoscopy	
Conscious sedation	354 (11%)
Local anesthesia spray	2865 (89%)
Type of bariatric procedure	
Vertical sleeve gastrectomy	2415 (75%)
Roux-en-Y gastric bypass	322 (10%)
Laparoscopic minigastric bypass	482 (15%)

¹Some patients have more than one symptoms; ²Some patients have more than one comorbidity. GI: Gastrointestinal.

primary procedure, late leak after 6 wk of the primary procedure. Post-bariatric hemorrhage was defined as patients who presented with hematemesis and/or melena with significant hemodynamic changes including one or more of increase in heart rate > 20 beat/min, decrease in systolic blood pressure > 20 mmHg, significant drop in hemoglobin > 2 g/dL or endoscopic signs of active or recent bleeding.

Statistical analysis

Continuous variables were compared using a Student *t* test or a nonparametric test, as appropriate. Categorical variables were compared using the χ^2 or Fisher's exact test. A two-tailed *P* < 0.05 was considered statistically significant. All data are expressed as mean (SD). Statistical analysis was performed using a commercially available software package (SPSS version 11.5 for Windows; SPSS Inc, Chicago, IL). Logistic regression analysis was used to identify preoperative predictors that might be associated with abnormal endoscopic findings.

The primary outcome of this study was to compare prevalence of clinically significant lesions found on upper endoscopy before bariatric surgery in patients who have (group A) or do not have (group B) upper digestive symptoms. Secondary outcome was to evaluate the safety and efficacy of upper endoscopy to diagnose and treat post-bariatric surgery complications such as bleeding, leakage and stenosis.

RESULTS

During the study period, 3219 patients underwent

Table 3 Endoscopic findings during routine upper gastrointestinal endoscopy and their prevalence

EGD findings	Group A (n = 902)	Group B (n = 2317)	P value
Esophagus			
Normal = 65%	19%	46%	0.001
Abnormal = 35%	25%	10%	0.001
Hiatal hernia	21.9%	7.9%	
Esophagitis	19%	6%	
Barrett's esophagus	1.1%	0.1%	
Stomach			
Normal = 77%	24%	53%	0.001
Abnormal = 23%	17%	6%	0.001
Spotty gastropathy	4%	1.3%	
Erythematous gastropathy	7%	2.5%	
Erosive gastropathy	8%	1.2%	
Atrophic gastropathy	1%	0.48%	
Multiple polyps	0.1%	0.02%	
Ulcer	2.4%	0.5%	
Duodenum			
Normal = 87%	23%	64%	0.001
Abnormal = 13%	9%	4%	0.001
Erythematous bulbopathy	6%	2.2%	
Erosive bulbopathy	2.6%	1%	
Ulcer	1.4%	0.8%	
+ve biopsy for <i>H. pylori</i> , 407 (14.6%)	10.7%	3.9%	0.001

EGD: Esophagogastroduodenoscopy; *H. pylori*: *Helicobacter pylori*.

bariatric surgery [2415 (75%) LSG, 322 (10%) LRYDB, and 482 (15%) MGB]. Mean BMI was 43 ± 13, mean age 37 ± 9 years, 79% were female and 36% had comorbid diseases (Table 2). Nine hundred and two (28%) had presented with upper digestive symptoms, with the most common symptoms being heartburn (19.2%), acid regurgitation (17.6%), abdominal pain (7.3%), and nausea with or without vomiting (5.7%).

EGD was considered normal in 2414 (75%) patients [9% (group A) vs 66% (group B), *P* = 0.001]. Abnormal findings (one or more) were found in 805 (25%) patients [19% (group A) vs 6% (group B), *P* = 0.001]. Small hiatal hernia was the most common findings (29.7%) followed by gastritis (23%), esophagitis (15%) and Barrett's esophagus (1.2%). Benign polyps and ulcers were detected in (0.12%) and 2.9%, respectively (Table 3). The prevalence of endoscopic findings using Sharaf *et al.*^[11] classification system was as follows: Group 0 (65%), group 1 (18.2%) [9.2% (group A) vs 8.9% (group B), *P* = 0.43], group 2 (6.8%) [5.2% (group A) vs 1.6% (group B), *P* = 0.001], and group 3 (0.0%). In no patients were upper GIT cancers or esophageal varices identified. Thirteen percent underwent EGD in supine position instead of standard left lateral position due to their body weight.

Findings of endoscopy had clinical consequences in 219 (6.8%) patients as showed in (Table 4): Patients with hiatus hernia required crural repair and reduction of the hernia, gastric ulcers, duodenal ulcer operation postponed and medications prescribed till full healing was checked by follow up endoscopy. *H. pylori* was assessed at histopathological examination in 493 (15.3%) patients, and was positive in 407

Table 4 Lesions identified on upper endoscopy and impact on bariatric surgery, $n = 219$ (6.8%)

Lesion	Group A	Group B	Result
Hiatal hernia	25%	10%	Crural repair/reduction of hernia
Gastritis	17%	6%	Medical treatment, postpone surgery
Esophagitis	19%	6%	Medical treatment, postpone surgery
Gastric ulcer	2.4%	0.5%	Await biopsy results, medical treatment, repeat endoscopy
Barrett's esophagus	1.1%	0.1%	Await biopsy results, medical treatment, repeat endoscopy
Duodenal ulcer	1.4%	0.8%	Await <i>Helicobacter pylori</i> results, medical treatment

[14.6% (10.7% in group A vs 3.9% in group B, $P = 0.001$)] of them. Polyps removed from stomach came histopathologically to be hyperplastic polyps. Conscious sedation was used in 354 (11%) on patient request. Those patients were observed for a minimum of 12 h after the endoscopy. Seven (1.97%) patients had critical events during conscious sedation due to severe hypoxemia ($< 60\%$). They received oxygen insufflation via ambu bag, endo-tracheal intubation was necessary in no one. No other critical events, such as aspiration or severe hypotension, occurred. Six hundred and twelve (19%) of our patients, EGD showed presence of esophagitis with GERD symptoms. Of those patients, 307 (9.7%) underwent LSG whose GERD symptoms improved in 217 (70.7%) and worsen in 90 (29.3%). Total number who developed *de novo* GERD was 197 (8.2%) during the 1st year which declined significantly to 48 (2%) after 3 years of their follow up.

Multivariate logistic regression analysis was used to identify clinical predictors that might be associated with abnormal EGD. Univariate analysis demonstrated that 6 independent variables were associated with abnormal endoscopic findings: Age, gender, preoperative BMI, comorbidities, anaemia and GIT symptoms. The upper digestive symptoms were predictive for presence of abnormal endoscopic finding ($P \leq 0.001$). No significant differences were observed in age, gender, preoperative BMI, co-morbidities or anaemia. Univariate (Table 5) and multivariate regression analysis (Table 6) established that presence of GIT symptoms was the only clinical variable associated with abnormal endoscopic findings (OR = 2.649; 95%CI: 1.904-3.684) with $P \leq 0.05$.

Fifty-four (2.2%) patients after sleeve had stricture at the site of incisura (47/54) or at the gastro-esophageal junction (7/54). Stomal stenosis developed in 16 (4.7%) patients after LRYGB and 15 (3.2%) after MGB. They have been diagnosed by contrast study and confirmed and treated by EGD. The Endoscopic dilation was done via through the scope balloon dilation. The mean time from surgery to initial endoscopic dilation was 59 ± 9 d. The mean number of dilations was 1.7, and the median balloon size was 15 mm. The mean

Table 5 Univariate analysis of clinical predictors of abnormal upper endoscopy

Variables	Total population	Normal EGD (65%)	Abnormal EGD (35%)	P value
Age (yr)	37 ± 9	31 ± 9	43 ± 10	0.26
BMI	43 ± 13	43 ± 11	47 ± 16	0.09
Gender (F:M)	79%:21%	64%:36%	69%:31%	0.17
GIT symptoms	13.80%	72%	28%	0.001
Haemoglobin (g/dL)	13 ± 4	13 ± 3.4	11 ± 3.2	0.07
Comorbidities	36%	52%	48%	0.18

F: Female; M: Male; EGD: Esophagogastroduodenoscopy; BMI: Body mass index; GIT: Gastrointestinal tract.

time from the first dilation to toleration of a soft diet was 31 ± 7 d. Success rate for endoscopic intervention was 100% with no complications. None of our patients required operative revision to correct the symptomatic stenosis. One hundred and ninety (3.7%) patients had postoperative GIT bleeding in form of drop of hemoglobin or overt melena and hypotension. Seventy-eight point two percent patients were just treated conservatively. Twenty-one point eight percent patients required endoscopic management in form of adrenaline injection, no one required surgical treatment.

Sixty-one (1.9%) patients had leak; 49 (2.02%) after sleeve (all of them had leakage from gastro-esophageal junction), 5 (1.55%) after LRYGB and 7 (1.45%) after MGB. Twenty-six patients had acute leak; leak site suture was successful in 19/26 patients and gastrostomy tube was placed in 7 patients. All of them were treated by laparoscopic reoperation, thorough washout and drainage. Fourteen cases with early leak were managed successfully with endoscopic wallstent and percutaneous drainage. The other 21 patients had late leak; 11 patients were managed by endoscopic wallstent and percutaneous drainage. One of those patients, gastrograffin study on the 5th day showed leakage which was unsuccessfully treated by one more stent at the same day. His problem has been finished by gastrectomy and oesophagojejunostomy. Ten patients without signs of uncontrolled sepsis were treated non-operatively. Four of these patients required only maintenance of the operatively placed suction tube. Percutaneous drainage was done in 43 patients. Endoscopic clips in 14 patients for chronic leak. A total of 74 stents were placed in our patients (some patients required more than one stent). Success rate was 75%. Forty-three of these were polyester based (Polyflex) and 31 were nitinol based (Alveolus). Migration occurred in 27% stent placements.

One hundred and nineteen (3.7%) patients developed post-operative hemorrhage out of total 3219. Seventy-nine patients had one episode of bleeding, 29 had two episodes and 11 had three episodes, for a total 170 episodes of bleeding. Hematemesis was the predominant manifestation. Table 7 shows the clinical and endoscopic findings of these bleeding episodes. All

Table 6 Multivariate regression analysis of clinical predictors of abnormal esophagogastroduodenoscopy

Variables	OR	95%CI	P value
Age	1.414	0.772-2.59	0.26
BMI	1.092	0.923-1.723	0.38
Gender	0.225	0.028-1.826	0.162
GIT symptoms	2.649	1.904-3.684	0.001
Comorbidities	0.68	0.335-1.381	0.286
Anaemia	0.945	1.241-2.093	0.274

OR: Odds ratio; GIT: Gastrointestinal tract symptoms; BMI: Body mass index.

of these endoscopic procedures have been performed in operative rooms with the patients intubated.

DISCUSSION

The role of routine EGD before bariatric surgery still remains unclear. So far, this study is the largest series trying to find answer for this question. Many authors suggest doing EGD for all patients before bariatric procedures because of the lack of correlation between patient symptoms and EGD findings^[11-15]. On the contrary, many other investigators advocate selective approach for asymptomatic patients because of the relatively weak clinical relevance of the majority of the lesions discovered on routine EGD along with the cost and invasiveness of the EGD^[16,17].

Only patients whose medical charts revealed if upper gastrointestinal (GI) symptoms recorded were enrolled in the study. Prevalence of upper GI symptoms in morbidly obese patients ranges from 10% to 87%^[21-24]. Upper GI symptoms were present in 28% of our patients. We have found, opposite to others^[25,26], strong correlations between patients symptoms and endoscopic findings. EGD was considered normal in 75% patients (9% group A vs 66% group B, $P = 0.001$). Abnormal findings (one or more) were found in 25% patients (19% group A vs 6% group B, $P = 0.001$). Küper *et al*^[14] found that 80% of the patients with pathological findings are asymptomatic.

Our study showed that no EGD findings were absolute contraindications to surgery or changed the decision plans and findings of endoscopy had clinical consequences in 6.8% (5.2% group A vs 1.6%, $P = 0.001$) patients as showed in Table 4: Patients with hiatus hernia required crural repair and reduction of the hernia, gastric ulcers, duodenal ulcer operation postponed and medications prescribed until full healing was checked by follow-up endoscopy. The majority of preoperative EGD findings were benign or mild and of little clinical consequence and the abnormal EGD findings were found to be high in those patients who had upper GIT symptoms. In 93.2% of patients, the EGD findings were either entirely negative or had no effect on the preoperative management or choice of surgery. We found in this study that it might not be wise to expose those morbidly obese patients to

Table 7 Clinical and endoscopic characteristics of bleeding episodes

	1 st episode <i>n</i> = 119	2 nd episode <i>n</i> = 40	3 rd episode <i>n</i> = 11
Presentation			
Hematemesis	93	33	5
Melena	39	19	9
Hypotension	17	3	-
Management			
EGD	28	7	-
Observation	91	33	11
Blood transfusion	43	19	3
Prominent findings on EGD			
Active blood oozing	17/28	7/3	
Bleeding vessel	28/6	7/4	
Adherent clot	28/4	-	
Other findings (visible vessel, red streaks, etc.)	28/4	-	
Endoscopic therapy			
Epinephrine injection	10	5	
Heater probe	9	4	
Clip	7	3	

EGD: Esophagogastroduodenoscopy

routine invasive uncomfortable procedure which carries potential risk although it is minimal. We do not screen the general population for those minor EGD findings; so why should we do it on people planned for bariatric surgery?

EGD was indicated if LSG is planned because of the idea that LSG increases prevalence of GERD. Some showed an increase in prevalence^[27-29] and on opposite, some found reduced prevalence of GERD after sleeve^[30-32]. LSG may promote GERD by reducing LES pressure, reduced gastric compliance and distensibility and increased gastric pressure^[33]. Factors that thought to reduce GERD after LSG include; accelerated gastric emptying, weight loss, reduced acid production and fundal resection which is considered the source of relaxation waves to the lower esophageal sphincter^[32]. Scott *et al*^[34] found that overall GERD symptoms are not more common in patients who have had LSG vs LRYGB. Six hundred and twelve (19%) of our patients, EGD showed presence of esophagitis with GERD symptoms. Of those patients, 307 (9.7%) underwent LSG whose GERD symptoms improved in 217 (70.7%) and worsen in 90 (29.3%). Total number who developed *de novo* GERD was 197 (8.2%) during the 1st year which declined significantly to 48 (2%) after 3 years of their follow up. These data in addition to others^[30-32] confirm that presence of GERD could not be considered as a contraindication for LSG.

In gastric bypass surgery, the EGD was routinely done because the rest of the stomach will be out of reach of endoscopy, for our countries risk of gastric cancer is low and there is no regular screening program for gastric cancer in the normal population; so why would we screen bariatric patients for gastric cancer? Moreover, only the gastric remnant is excluded in gastric bypass, but access to esophagus and possibility

of controlling esophageal abnormalities still remains. We have 1% Barrett's esophagus without dysplasia. Barrett's esophagus can be diagnosed, followed up and even treated after all types of bariatric surgery because for all types the access to the esophagus still remains.

Incidence of gastrointestinal stomal anastomotic stenosis occurs in 5.1%-6.8% of patients following laparoscopic R-Y gastric bypass and most commonly presents within the first year after surgery^[35]. The incidence of this anastomotic stenosis has been found to be technique dependent. The circular stapled anastomoses have been reported to have higher rate anastomotic strictures more than the linear stapled anastomoses^[36]. Hand sewn technique yield the lowest rate of anastomotic stricture^[35]. Endoscopic balloon dilation is the mainstay of treatment of these anastomotic strictures. In our study, rate of success endoscopic dilation of stomal stricture was 100% with no complications. We found stenosis rate after LSG is 1.6% comparable to the previously reported in other studies^[37,38]. We have found, as have others^[37] that the incisura angularis is the place with the greatest potential place for stricture development. The possible reason for this organic stricture could be if stapling has been accidentally performed too close to the incisura creating too tight sleeve in spite of the bougie is in place. Functional stenosis occurs if the gastric tube got twisted due to asymmetrical traction. Symmetrical lateral traction while stapling is of the utmost importance.

Leaks after LSG are reported to occur in 1.4%-5.3% of cases^[38-41] and 1%-5% after LRYGP^[42,43]. In a previous study over 1395 patients who had LSG, we found that neither the distance of the first stapler from the pylorus nor the caliber of the bougie was related to postoperative leak, the same finding we noticed also regarding reinforcement of the suture line^[44]. Management options are varied and dependent on the timing and clinical presentation of the leak. Immediate re-operation is the preferred course of action for the unstable patient, usually with washout, irrigation of the abdominal cavity, wide drainage, and an attempt at suturing of the leak if the tissue condition allows it^[9]. Sound surgical judgment is imperative in deciding whether the tissues are amenable to suturing or whether further intervention will only impose further damage. Endoscopic stent treatment could have a major impact on managing anastomotic complications after bariatric surgery. Standard treatments are time-consuming and can result in substantial morbidity, including patient discomfort and decreased quality of life. It is our impression that stents will shorten hospital stays and reduce complications of specialized feeding. Care will likely be improved as stent manufacturers customize stents for use in bariatric surgery. Our data suggest that the use of covered stents after bariatric surgery can be safe and effective in the treatment of acute leaks, chronic fistulas, and strictures. These stents effectively seal any leak while allowing secretions and food to pass, without compromising healing. We believe

the use of endoscopically placed stents will become the preferred treatment for bariatric patients with staple line complications.

Upper GI hemorrhage occurs in approximately 1%-4% patients after LRYGP^[45]. This hemorrhage usually arises from staple line. We have 3.7% incidence of upper GI hemorrhage. All patients were successfully controlled with observation or endoscopic management, no patient required re-operation for control of bleeding, thus avoiding exposure of these morbidly obese patients for another major surgery with its potential morbidity. Conservative treatment with fluid and blood transfusion is usually effective. Patients who will not respond to conservative therapy will require either endoscopic or surgical management. Some recommend against endoscopy for fear of perforation at the immature anastomotic sites^[46]. The availability of standard hemostatic endoscopic measures, such as epinephrine injection, heater probe, and endoscopic clips, either alone or in combinations, made the success of endoscopic management available in all our patients. The majority of our patients manifested with hematemesis, which may place these patients at a high risk of aspiration. All our patients were managed in the operative room with pre-endoscopy intubation to avoid possibility of aspiration. We have reported, as others have, that endoscopy could be used in controlling postoperative bleeding with good experienced hands and enough precautions^[47-49]. Despite the relatively big number of patients we enrolled in this study, this study is not without limitations. While it is a review of prospectively collected data, it is still retrospective in nature. Additionally, there was no randomization in allocating the patients into either group. We recommend another study to be conducted on a prospective randomized way.

In conclusion, the upper digestive symptoms were predictive for presence of abnormal endoscopic finding. These endoscopic findings were found to be benign and mild. No findings were absolute contraindications to surgery or changed the decision plans. Our results support the performance of EGD only in patients with upper gastrointestinal symptoms. Endoscopy also offer safe effective tool for anastomotic complications after bariatric surgery. Endoscopic dilation of stricture is safe and effective with high success rate. Endoscopic therapy for gastric leak using covered stent is also a good option and should be considered an appropriate intervention. Most post-bariatric bleeding occurs within the first 4 h after the operation and is most commonly arising from the staple line. With experienced hands, EDG is a safe and successful tool in controlling significant post-operative hemorrhage which is best done in operative room with intubation to avoid aspiration.

COMMENTS

Background

Obesity surgery is the most effective treatment due to the sustainable and

significant weight loss results in addition to the resolution of the comorbidities in up to 80%. It is still a major controversial point to do routine screening endoscopy for those patients before surgery. Many authors suggest doing esophagogastroduodenoscopy (EGD) for all patients before bariatric procedures because of the lack of correlation between patient symptoms and EGD findings. Upper endoscopy in those patients is not without risk, one of the outmost important points is the risk of conscious sedation at the time of EGD due to hypertension and obstructive sleep apnea.

Research frontiers

The authors supposed that the upper digestive symptoms were predictive for presence of abnormal endoscopic finding and they provide support to their hypothesis with this paper.

Innovations and breakthroughs

Upper endoscopy was routinely done as a routine preoperative preparation of every obese patient before bariatric operation.

Applications

The upper digestive symptoms were predictive for presence of abnormal endoscopic finding. These endoscopic findings were found to be benign and mild. No findings were absolute contraindications to surgery or changed the decision plans. The results support the performance of EGD only in patients with upper gastrointestinal symptoms. Endoscopy also offer safe effective tool for anastomotic complications after bariatric surgery. Endoscopic dilation of stricture is safe and effective with high success rate. Endoscopic therapy for gastric leak using covered stent is also a good option and should be considered an appropriate intervention. Most post-bariatric bleeding occurs within the first 4 h after the operation and is most commonly arising from the staple line. With experienced hands, EGD is a safe and successful tool in controlling significant post-operative hemorrhage which is best done in operative room with intubation to avoid aspiration.

Terminology

Upper digestive symptoms recorded included heartburn, reflux, acid regurgitation, nausea, vomiting and abdominal pain. Esophagogastroduodenoscopy is a test to examine the lining of the esophagus, stomach and upper part of the duodenum. Laparoscopic sleeve gastrectomy is a safe and effective surgery that can help obese people lose weight. Patients may undergo sleeve gastrectomy as a single surgery or the first stage before a gastric bypass. Laparoscopic R in Y gastric bypass surgery makes the stomach smaller and causes food to bypass part of the small intestine. Mini gastric bypass surgery is a short and relatively simple procedure that has been shown by the available research to have low risk and result in good short and long-term weight loss.

Peer-review

The article is aimed to study the preoperative and postoperative role of upper endoscopy in morbidly obese patients. The clinical application of the study is very important.

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