

# Does digestive symptoms require esophago gastroscopy prior to bariatric procedure?

## Assessment of 6 years' experience



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### Does digestive symptoms require esophago gastroscopy prior to bariatric procedure? Assessment of 6 years' experience

**AIM:** Performance of routine preoperative esophagogastroduodenal endoscopy (EGE) in patients undergoing bariatric surgery is still a controversial subject. The purpose of our study was to evaluate the benefits of performing preoperative EGE in a cohort of bariatric patients.

**MATERIAL AND METHODS:** The present retrospective study was performed between March 2010 and June 2016. We divided the study participants into two groups: group A comprised subjects without disturbing upper digestive signs, while group B comprised patients with disturbing upper digestive signs. Logistic regression analysis was used to identify the predictors that might be associated with abnormal outcomes.

**RESULTS:** Our study included 232 patients (who had undergone sleeve gastrectomy, gastric bypass, ileal interposition, or transit bipartition). The average age was  $41.4 \pm 10.3$  years, and the average body mass index (BMI) was  $43.6 \pm 5.1$  kg/m<sup>2</sup>. Of all the observed gastroscopic abnormalities, the prevalence for gastritis (17.3%), followed by esophagitis (10.2%), hiatus hernia (9.4%), and bulbitis (8.7%). In multivariate regression analysis, the Gastrointestinal Symptom Rating Scale (GSRS) score and upper gastric symptoms were found to be the only independent predictive markers (OR = 2.822, 95% CI: 1.674-3.456 and OR = 2.735, 95% CI: 1.827-3.946, respectively). We identified a positive correlation between abnormal EGE findings and postoperative complications.

**CONCLUSION:** Preoperative EGE had a high rate of detection for the possible abnormalities prior to bariatric surgery. Upper gastric symptoms are significant predictive factors of postoperative complications. Performing preoperative EGE for symptomatic patients could help reduce the morbidity and mortality rates in these patients.

**KEY WORDS:** Bariatric surgery, Preoperative endoscopy, Upper digestive symptoms

### Introduction

Gastrointestinal tract disorders are common and exhibit various symptoms in morbidly obese patients.

Furthermore, obesity is an important risk factor for gastroesophageal reflux disease (GERD).

Therefore, patients are willing to undergo bariatric surgery as a solution for obesity<sup>1</sup>. Bariatric surgery is the most effective method for ensuring substantial weight loss and decreasing the comorbidities by up to 70%<sup>2</sup>. Moreover, the prevalence of gastric disorders in morbidly obese individuals is twice of that in normal weight individuals; these disorders include GERD, esophagitis, hiatal hernia, and Barrett's esophagus.

Preoperative esophagogastroduodenal endoscopy (EGE) is currently a debated issue for bariatric patients. Bariatric surgeons recommend preoperative EGE because of its ability to identify gastroscopic issues that may cause substantial complications in the early postsurgical period. Furthermore, these findings may require the surgeons to

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revise the method of the procedure. On the other hand, serious pathologies (such as malignancy) may be overlooked if EGE is not performed<sup>3</sup>.

In addition, it is recommended that EGE also be performed in the preoperative period for timely detection of the possible complications, facilitating early detection and treatment of postoperative complications such as bleeding, leaks, and fistulae.

The current guidelines suggest that EGE should be performed for all bariatric candidates in the preoperative period so that the pathologies causing complications in the preoperative period are identified<sup>4</sup>.

This study aimed to identify and evaluate the presence and prevalence of gastric disorders, including *Helicobacter pylori* (*H. pylori*) infection, using preoperative EGE in morbidly obese participants scheduled to undergo bariatric surgery and evaluate the effects on postoperative complications and their management.

## Material and Methods

### STUDY DESIGN AND PATIENTS

We retrospectively evaluated the prospectively obtained data of 232 consecutive morbidly obese patients who underwent preoperative EGE before undergoing bariatric surgery (laparoscopic sleeve gastrectomy [LSG], Roux N-Y Gastric bypass [LRYGB], ileal interposition with diverted sleeve gastrectomy [LII-DSG], and transit bipartition with sleeve gastrectomy [TB-SG]) in a tertiary bariatric surgery center between March 2010 and June 2016. All these obese patients had a body mass index (BMI) score above 40 kg/m<sup>2</sup>, had obesity-related comorbidities, and were > 30 years old, which are indications for bariatric surgery.

Subjects were informed and explained about the study objectives as well as the EGE procedure, surgery type, possible side effects, and complications; those who then consented to participate in the study were enrolled. The preoperative EGE and the surgical procedure were performed for all participants who fulfilled the eligibility criteria of the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO)<sup>5,6</sup>. Every patient was assessed by experienced surgeons, gastrointestinal process staff, and dieticians. EGE was performed for the participants as part of the study, irrespective of the presence of symptoms. Furthermore, patients who had previously undergone EGE in other clinics were excluded.

### GASTROINTESTINAL SYMPTOM RATING SCALE (GSRS)

Participants of groups assessed by Gastrointestinal Symptom Rating Scale (GSRS) scoring system. The GSRS is a disease-specific scale that includes 15 items joined with following five symptoms: indigestion,

TABLE I - Sharaf's criteria

Group 0:	– No findings – Normal study
Group 1:	– Abnormal findings that do not change surgical approach/postpone surgery – Mild esophagitis, gastritis, hiatal hernia (<2 cm), 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 – Hiatal hernia (>2 cm)
Group 3:	– Absolute contraindications to surgery – Upper GI cancer – Varices

abdominal pain, reflux, constipation, and diarrhea. The GSRS is a seven-point scale; 1 point indicates the absence of disturbance, while 7 points indicate intense disturbance<sup>6</sup>.

### PREOPERATIVE KNOWLEDGE

All participants were questioned about their clinical knowledge regarding esophagogastrointestinal symptoms such as esophageal heartburn, gastroesophageal reflux, regurgitation, vomiting, and abdominal pain before the EGE. We divided the patients in the following two groups, according to their EGE findings: group A comprised subjects without disturbing upper digestive signs, while group B comprised patients with disturbing upper digestive signs. The EGE outcomes were separated to four groups based on Sharaf et al. suggested criteria<sup>7</sup> (Table I).

### ESOPHAGOGASTRODUODENAL ENDOSCOPY

All patients underwent standard EGE, irrespective of gastric symptoms or complaints before the surgery. Intravenous anesthesia was induced in all patients. EGE applied by the same gastroscopist for preventing the dilemma. No complications were observed during the EGE procedures. Biopsies were taken from the antrum, corpus, and any suspicious areas in the stomach as per the guidelines of the American College of Gastroenterology<sup>8</sup>. The data of patients undergoing revisional bariatric surgeries and of those who had undergone EGE in other clinics were excluded from the research.

Hiatal hernia was identified by 2 cm disconnection from the esophageal junction, also esophagitis was classified with the Los Angeles classification, and gastritis and ulcers were identified by mucosal change coated by mild necrotic material of smaller than 5 mm and ulcer with a mucosal fracture of 5 mm or more. Helicobacter pylori infection results were conducted using the campyobakter like organisms (CLO) test and histopathological analyses.

According to the results of these tests, eradication treatments were administered, and the operation delayed until H. pylori, gastritis, ulcer, esophagitis or any detected pathology however crosschecking of eradication was not performed. The frequency of H. pylori infection was assessed using the histologic rapid test; however, no abnormal outcomes were determined.

#### POSTOPERATIVE KNOWLEDGE

The postoperative clinical data of the participants were collected from their follow-up charts. Postoperative complications, such as bleeding (presented with hematemesis and/or melena with substantial hemodynamic changes including elevated heart rate [ $> 20$  pulse/min]), fistulas, and leaks detected by endoscopic management, as well as surgical treatment methods were assessed.

#### STATISTICAL ANALYSES

We used the Student *t* test for comparing variables, as appropriate. Patient characteristics and endoscopic findings were compared using the chi-square test. All data are presented as mean (standard deviation [SD]). Statistical analyses were performed using PASW Statistics for Windows (SPSS version 20.0 for Windows; SPSS Inc., New York, IL). Logistic regression analyses were used for defining the preoperative predictive factors that may be related to the GSRS and abnormal endoscopy results. Multivariate logistic regression analysis was used to assess the predictive markers that may be related to the GSRS and upper gastric symptoms. Values were considered statistically significant when  $p < 0.05$ .

#### Results

The EGE procedure was performed for 253 consecutive, morbidly obese patients who underwent bariatric surgery. Fourteen participants who did not consent to participate and 7 who underwent EGE in another diagnostic center were excluded from the study. Consequently, 232 participants (LSG 168 [75%], LRYGB 32 [10%], II-DSG 19 [8.1%], and TB-SG 13 [5.6%]) were enrolled; 152 (65.5%) of them were women and 80 (34.5%) were men. Their average age was  $41.4 \pm 10.3$  years, and the average

TABLE II - Patient's characteristics

Patients	(n = 232)
Age, average $\pm$ SD (year)	41.4 $\pm$ 10.3
Weight, mean $\pm$ SD (kg)	151.3 $\pm$ 35,3
BMI, mean $\pm$ SD (kg/m <sup>2</sup> )	43.6 $\pm$ 5.1
Upper Gastric signs (%)a	36.2%
Heartburn	23.2%
Acid regurgitation	11.2%
Abdominal pain	5.4 %
Nausea /vomiting	3.2 %
Comorbidities: (%)b	35.6%
Hypertension	25.8%
Hyperlipidaemia	28.7 %
Asthma/COPD	15.0%
Coronary artery disease	4.9 %
Type II diabetes, n (%)	13.7%
Type of bariatric procedure	100%
LSG	168 (75%)
LRYGB	32 (10%)
LII-DSG	19 (8,1%)
TB-SG	13 (5.6%)

n; (%) number and percentage, SD; standard deviation, BMI; body mass index, GERD; gastroesophageal reflux disease, LSG; Laparoscopic sleeve gastrectomy, LRYGB; Roux N-Y Gastric bypass, LII-DSG; Ileal interposition with diverted sleeve gastrectomy and TB-SG; transit bipartition with sleeve gastrectomy, a :Some patients have more than one symptoms; b: Some patients have more than one comorbidity.

BMI was  $43.6 \pm 5.1$  kg/m<sup>2</sup>. Gastric symptoms were present in 36.2%, and comorbidities in 35.6% subjects. None of the patients undergoing revisional surgery or second-step bariatric surgery was included in this study. Patient characteristics, comorbidities, upper gastric symptoms, and types of surgical procedures are shown in Table II.

#### EGE FINDINGS AND TREATMENT METHODS

EGE findings were normal in 72.4% patients, while abnormal EGE findings (single or multiple) were observed in 27.6 % patients. Of all the observed gastroscopic abnormalities, the highest prevalence was for gastritis (n = 39), followed by that for esophagitis (n = 23), hiatus hernia (n = 22; the majority were small [ $< 2$  cm]), and bulbitis (n = 20). H. Pylori infection was detected in 14 (6.08%) of the 232 participants evaluated histopathologically, and curative therapy was prescribed. No carcinoma or tract pathology that could cause mortality was detected (Table III). Of the 22 patients had hiatal hernias; however, most of these patients (n = 12) had small hiatus hernias ( $< 2$  cm). Of the 23 patients with esophagitis who used PPIs, 12 also had hiatus hernias and 8 also had ulcers; only 3 of these patients had only esophagitis.

TABLE III - Endoscopic findings during routine upper gastrointestinal endoscopy and their prevalence

EGD findings			Group A (n = 134)	Group B (n = 98)	P value
Normal	72.4%	(n:168)	42.5 %	29.9%	<0.05
Abnormal	27.6% <sup>a</sup>	(n:64)	8.4%	19.2%	<0.05
Esophagus					
Hiatus hernia		(n:22)	4.2%	5.2%	
Esophagitis		(n:23)	4.6%	5.6%	
Esophagus polyp			0	0	
Stomach and Duodenum					
Gastritis		(n:39)	7.7%	9.6%	
Gastric polyps		(n:3)	0.5%	0.9%	
Gastric Ulcer		(n:5)	0.8%	1.5%	
GIST /gastric cancer			0	0	
+ biopsy <i>H. pylori</i> ,		(n: 14 )	2.6%	3.48%	>0.05
Bulbitis		( n:20)	3.3%	5.4%	
Duodenal Ulcer		( n:3)	0.7%	0.6%	
Neuroendocrine tumor			0	0	

EGD esophagogastroduodenal endoscopy, GERD gastroesophageal reflux disease, NERD non-erosive reflux disease, GIST gastrointestinal stromal tumor, a Some patients have more than one finding in other sites of upper gastric anatomy.

TABLE IV - Detected findings on EGE and efficacy to surgical process

Lesion	Group A	Group B	followed path		
Hiatus hernia	4.2%	5.2%	≤ 2 cm	n:12	not intervened (underwent planned process)
			> 2cm	n:4	change the procedure to LRYGB
			LSG + hiatal repair	n:2	LSG + no crural repair + anticipate treatment
Esophagitis	4.6%	5.6%			Medical therapy RYGB LSG II-DSG / TB-SG
Gastritis	7.7%	9.6%		n:39	Medical therapy, control gastroscopy
Gastric ulcer	0.8%	1.5%		n:5	Medical therapy control gastroscopy
Duodenal ulcer	0.7%	0.6%		n:3	Medical therapy , control gastroscopy
Bulbitis	3.3%	5.4%		n:20	Medical therapy , control gastroscopy

Four participants with both, esophagitis and hiatal hernias, who were scheduled for II-DSG, TB-SG, and LSG were converted to LRYGB because of the possible risk of reflux esophagitis. Four of them consented to undergo synchronize hiatus repair, two agreed to undergo only LSG without any crural repair and anticipate treatment for postoperative reflux disease. The remaining 12 patients with small hiatus hernias underwent the planned surgery. Three participants with only esophagitis underwent metabolic surgery (2 underwent II-DSG and 1 underwent TB-SG), as planned.

The 39 patients diagnosed with gastritis, 5 with gastric ulcers, of 3 with duodenal ulcers, of 20 with bulbitis were lead to postpone the process and need treatment until recovery of the tissue with control gastroscopy

(Table IV). The detected polyps (n = 3) and ulcers (gastric and duodenal, n = 8) were biopsied/removed from their location; all of them were found to have a benign histology.

### Association of gastric symptoms and EGE findings of the groups

Upper gastric symptoms were predict of possible abnormal outcomes by EGE process. Univariate analyses showed no substantial distinctions between the parameters of sex, age, BMI, and comorbidities of the groups. However, univariate and multivariate regression analyses showed that the GSRS scores and upper gastric symp-

TABLE V - Analysis of variables related with detected gastroscopic abnormalities

Variables	Group A	Group B	Univariate analysis p value
	n:134	n:98	
Age (years)	40.6 ±8.3	42.2 ±9.2	0.489
BMI (kg/m <sup>2</sup> )	42.9 ± 3.2	44.1 ± 4.1	0.829
Sex (f/m) 152/80	82/42	70/38	0.634
Comorbidities			
T2DM	36.6 %	38.2%	0.821
Hypertension	53.4 %	47.2%	0.658
Hyperlipidemia	32.6 %	34.1%	0.645
Smoker	21.7 %	26.8%	0.237
History of myocardial infarction	0.2%	1.1%	0.347
History of pulmonary embolism	0.3%	0.4%	0.183
History of DVT	2.3%	2.5%	0.456
COPD	6.2%	9.1%	0.593
Upper gastric symptoms	48.2%	53.6%	0.023*
Reflux symptoms	5.8 %	12.9%	0.017*
Dyspepsia symptoms	6.3%	14.2%	0.027*
GSRS	3,8±2,3	5,6±2.1	0.033*
Abdominal pain	3,6±1,5	8,8±4,3	0.034*
Reflux	3,8±1,9	8,5±3.2	0.021*
Indigestion	4,3±2.6	7.6±2.9	0.026*
Diarrhea	2.7± 1.3	6.5±2.3	0.045*
Constipation	2.4±2.1	7.2±3.7	0.039*

F: Female; M: Male; EGE: Esophagogastroduodenoscopy; Statistically significant differences between group A and group B in EGE outcomes BMI: body mass index, COPD: chronic obstructive pulmonary disease, DVT: deep vein thrombosis, GSRS: Gastrointestinal Symptom Rating Scale \* Statistical significance set at p value<0.05.

TABLE VI - Univariate and Multivariate regression analysis in clinical predictors for abnormal EGE outcomes.

Variables	UV OR	UV 95% CI	P Value	MV OR	MV 95% CI	P Value
Age (years)	1.024	0.934–1.256	0.489	1,562	0.892-2.84	0.276
BMI (kg/m <sup>2</sup> )	0.907	0.402–2.064	0.829	1.358	1.047-2.624	0.612
Sex (f/m)	1.145	0.590–2.221	0.634	0.435	0.216-2.175	0.273
Comorbidities	1.016	0.537-2.269	0.423	0.741	0.546-1.694	0.315
Upper gastric symptoms	2.311	1.768-2.823	0.023*	2.735	1.827-3.946	0.026*
GSRS	2.027	1.317–2.542	0.031*	2.822	1.674-3.456	0.042*

OR: Odds ratio; BMI: Body mass index. Univariate: UV, Multivariate: MV, Statistical significance set at p value < 0.05, GSRS: Gastrointestinal Symptom Rating Scale, \*Statistical significance set at p value<0.05

TABLE VII - Clinical and endoscopic characteristics of complications

Findings	N. 9	%
Presentation bleeding	9	3.87
Hematemesis	5	
melena	3	
hypotension	2	
Postoperative Bleeding	9	3.87
Observation	4	
Gastroscopic application	3	
Blood transfusion	3	
Presentation leak	5	2.15
Treatment leak		
TTS stent	3 (1 LRYGB,2 LSG)	1.29
Fibrin sealant	1 (LSG)	0.43
Second look		
Re-anastomosis	1 (LII-DSG)	0.43

toms were associated with abnormal EGE findings and these are unique parameters for variables (OR = 2.822; 95% CI: 1.674-3.456, OR = 2.735; 95% CI: 1.827-3.946 respectively) with p < 0.05 (Table V and VI).

#### POSTOPERATIVE OUTCOMES

No strictures or stenoses were detected after the LSG, II-DSG, and TB-SG among the participants. However, only stomal stenosis was detected in 1 patient after the LRYGB procedure.

These pathologies were identified using oral contrast gastrography. For the treatment of stenoses, dilatation was performed twice a month using 18-mm balloon catheters that were recovered at the end of 2 months. No revi-

sional procedure was performed for stenosis. Of the 9 participants with postoperative bleeding after the bariatric process, 2 were diagnosed using the evident signs of hemorrhage, such as melena and hypotension. Of 4 participants were cured spontaneously by observation, of 3 were treated by gastroscopic application by aid of some drugs such as adrenalin and only one patients has underwent second look.

Gastric leak was detected preoperatively in 5 participants; in 3 patients, it was detected after the LSG process, in 1 after the LRYGB, and in 1 after the LII-DSG. The common leak site was the fundus of the stomach; however in LII-DSG it was found in gastro-ileal anastomosis and laparoscopically resected and re-anastomosed. Other detected leaks were cured by performing gastroscopic TTS (through the scope) wall stent using tisseel (fibrin sealant, Baxter Healthcare Corporation, NY, USA) (Table VII)

## Discussion

Performance of preoperative EGE as a standard procedure before bariatric surgery is still a controversial subject. The common consensus is that EGE should be performed for patients based on the procedure they are scheduled to undergo. While some researchers recommend performing EGE prior to bariatric surgery for detecting the glancing pathologies, others suggest routine postoperative endoscopy<sup>9,10</sup>. On the other hand, opponents noting this application is an unpleasant process and not cost effective<sup>11</sup>.

The GSRS is one of the most widely utilized scales for patients with disturbing upper gastric symptoms; it is used for evaluating the gastrointestinal symptoms and their effects on the participants' daily activities. Scores on individual scale calculated by taking the average of the materials and increase in scoring indicates the severity of the symptoms. Furthermore, the scores of patients in the symptomatic group differed significantly from those of subjects in the asymptomatic group. Bariatric patients are more likely to have accompanying co-morbidities such as diabetes mellitus, hypertension, and chronic obstructive pulmonary disease (COPD)<sup>10,12</sup>.

Preoperative EGE is recommended to improve the postoperative outcomes of bariatric surgery by identifying the undetected pathologies present in the patients that may necessitate revising the method of the surgery (because of conditions such as hiatus hernia and reflux disease) or cancelling the surgery (such as cancer). In the present study, no malignant pathology was detected preoperatively; however, some pathologies were detected that necessitated the postponement of the surgical process. Like the present study, previous studies have also reported the presence of abnormal EGE findings in 31% to 76% of the participants<sup>13</sup>.

Furthermore, a prevalence of up to 80% has been report-

ed for upper gastric symptoms in bariatric populations. Praveenraj et al. reported finding gastroscopic abnormalities in asymptomatic patients. Moreover, Loewen et al. found that EGE should be performed preoperatively because they determined a significant relationship between gastritis and postoperative anastomotic ulcerations in asymptomatic patients in their medium-sized study. On the other hand, Schigt et al. found that preoperative EGE is an unnecessary process because they did not determine any significant abnormalities in their study. The results of the present study correlated with those of the studies that recommend the performance of preoperative EGE based on the detection of abnormalities in both, the asymptomatic and especially symptomatic subjects<sup>13,14</sup>.

Furthermore, some of the EGE findings of the present study may contraindicate the surgery or necessitate a change in the type of surgery. Participants with hiatus hernia ( $\leq 2$  cm) did not generally need crural fixing due to the small defect; however, the process type was changed or hiatal repair was performed for the hiatal defects ( $> 2$  cm) for subjects with/without esophagitis.

The surgery was postponed for patients with gastritis, gastric ulcers, and duodenal ulcers who needed treatment before the surgery; treatment results controlled by successive gastroscopy. The common outcomes of EGE application were benign and/or moderate and also abnormal outcomes of gastroscopy were detected substantially in symptomatic patients. Present study showed the prevalence of abnormal outcomes of EGE with substantially 27.6%. Opponents were not suggesting to postpone or change surgery type in existence of gastric symptoms. Munoz et al. recommend that the surgery should not be postponed despite the abnormal endoscopic findings<sup>15</sup>. However, there is an inconsistency between the risk factors and planned surgery type. The current guidelines recommend that EGE should be performed for all symptomatic patients; by contrast, many researchers have reported no relationship between symptoms and abnormal EGE findings<sup>16,17</sup>.

Schigt et al. reported abnormal EGE findings in 0.2% to 17.6% of patients; the most commonly detected abnormalities were gastritis, esophagitis, and hiatus hernia. On the other hand, Delahay et al. found that untreated H. pylori infection accompanied by gastric ulcers leads to perforation, bleeding, or malignancy during the postoperative period<sup>11,18</sup>.

In the present study, we found that the rate of leak and bleeding were increased in preoperatively identified symptomatic patients. Especially, postoperative bleeding was detected commonly in patients with gastritis; however, leaks were also detected in patients with gastric ulcer. In summary, we found that preoperative findings are related to postoperative complications; therefore, preoperative EGE should be performed for all symptomatic patients. According to recent researches, some authors found that LSG may increase the rate of GERD due to residual

fundus, also elevated stomach pressure. With novel reports about the occurrence of GERD after LSG, some procedures such as narrowing the resection margin to the pylorus by increasing the stomach emptying rate, increasing the amount of weight loss, and sufficient fundal resection that can release the lower esophageal sphincter may help reduce the rate of these diseases<sup>19,20</sup>.

The retrospective research by DuPree et al., which included 4832 patients who had undergone LSG (44.5% with preoperative GERD), found that 84% of GERD cases progress in the postoperative period and that it was resolved in only 16% of the participants<sup>21</sup>.

In the assessment of the LRYGB procedure, EGE is a required standard method for detecting the overlooked pathology in latent stomach. Therefore, preoperative EGE helps prevent delayed diagnosis of gastric cancer, particularly if it is located in the residual stomach<sup>22</sup>.

The early determination of possible pathologies such as malignancies is primarily indicative of the LSG procedure; furthermore, the eradication of unnoticed lesions can be easier detected after the LSG procedure by gastroscopy however we lose this chance in LRYGB process. Tashiro et al. found that the prevalence of gastric malignancies changes according to ethnicity and eating habits. Furthermore, morbid obesity is a risk factor for malignancies because a higher BMI stimulates greater release of inflammatory markers, which in turn leads to adverse pathologies. Therefore, preoperative EGE needs to be performed to ensure that these kinds of pathologies do not remain undetected<sup>23</sup>.

However, our research showed that 27.6% of patients had abnormal EGE findings, the surgical procedure was altered in 1.7% (n = 4) of the cases, hiatal repair was additionally performed in 1.7% (n = 4) cases, and the hiatal defects were small (not significant enough to warrant a change in the planned surgery) in 5.1% (n = 12) of the cases. However, preoperative EGE helped us detect the pathologies in symptomatic participants.

The present study suggests that symptoms are predictive factors for important abnormal findings. Mong et al. demonstrated this relationship of symptoms with abnormal EGE findings. In this study, regression analysis showed that the prevalence of upper gastric symptoms was significantly higher in group B patients (symptomatic patients). The current guidelines of the American Society for Gastrointestinal Endoscopy (ASGE) do not recommend the use of gastroscopy as a standard method for the detection and treatment of *H. pylori* infection<sup>24</sup>.

The prevalence of *H. pylori* infection in bariatric patients reported in the literature ranges from 12% to 61%; the prevalence in our study cohort was 6.08%. Papavramidis et al. and Ramaswamy et al. found a significant correlation of *H. pylori* infection with abnormal EGE findings; however our study did not find this correlation<sup>25-27</sup>.

On the other hand, LSG causes some esophageal abnormalities (such as Barrett's esophagus), and this may not be avoidable. Therefore, we may need to alter the sur-

gical process. However, in bypass procedures, we could never reach the part of the residual stomach postoperatively.

When we analyzed the complications in the postoperative period, we observed stenosis only in one patient after the LRYGB procedure that was treated by gastroscopic dilatation performed twice a week with no complications for 2 months postoperatively.

Moreover, we did not detect any stenosis in patients who underwent other types of surgery such as LSG, II-DSG, and TB-SG.

Postoperative leaks were detected in 5 patients (3 who underwent LSG, 1 who underwent LRYGB, 1 who underwent LII-DSG, and none of those who underwent TB-SG consecutively). We were unable to identify a cause for the postoperative leaks; however, in the LSG procedure, avoiding the residual fundus to prevent the risk of splenic trauma can lead to this complication.

We performed stenting or used fibrin sealants to treat the pathology without complications. However, a second look was necessary in one patient. The majority of patients who experienced postoperative bleeding had upper gastric symptoms and abnormal findings preoperatively.

Some researchers suggest that preoperative EGE should only be performed for symptomatic patients. At the same time, we found a positive relationship between upper gastric symptoms, GSRS scores, abnormal EGE (especially ulcers) findings, and postoperative complications in the study subjects. Some pathologies have also been detected in symptomatic patients<sup>11</sup>.

Furthermore, we found a relationship between the preoperative abnormal findings and the postoperative complications. In contrast, Fernandes et al. found that abnormal EGE findings were related to postoperative complications<sup>28</sup>.

In general, abnormal gastroscopic results are not common; however, postoperative complications were detected especially in these participants. Therefore, we recommend that preoperative EGE should be performed for symptomatic subjects to rule out these risks.

The present research also has some limitations, first of all this is a retrospective cohort study which the data obtained from follow up cards. Second, the diagnosis of hiatal hernia may change according to the gastroscopist's foresight. The EGE procedures in our study were performed by a single experienced surgeon. Furthermore, the length of study may lead not to reach the follow up cards precisely. Finally, the sample size of the present cohort study was not large. Multi-specialty bariatric surgery centers can facilitate a larger study population for research.

## Conclusion

The present study showed that upper gastrointestinal symptoms may be predictors of abnormal gastroscopic

outcomes, which may lead to postoperative complications. Postoperative complications can be reduced by early detection, treatment, and eradication of the abnormal gastric findings detected using EGE. Therefore, we recommend the performance of preoperative EGE for symptomatic patients scheduled to undergo bariatric surgery.

### Riassunto

**PREMESSA:** È argomento controverso se l'esofago-gastroscopia deve precedere di regola una procedura di chirurgia bariatrica, e lo scopo di questo studio è quello di valutare i vantaggi della sua esecuzione in un gruppo di pazienti baritrici.

**METODO:** Si tratta di uno studio retrospettivo effettuato tra marzo 2010 e giugno 2016, suddividendo i pazienti in due gruppi: nel gruppo A quelli senza disturbi dell'apparato digerente, e nel gruppo B quelli con sintomi riferibili all'apparato digerente superiore. L'analisi della regressione logistica è stata utilizzata per identificare elementi che potrebbero far prevedere risultati anormali.

**RISULTATI:** Nello studio sono stati compresi 232 pazienti (sottoposti a gastrectomia tubulare, bypass gastrico, interposizione dell'ileo, o bipartizione di transito). L'età media era  $41,4 \pm 10,3$  anni e l'indice di massa corporea (BMI) è stato in media di  $43,6 \pm 5,1$  kg / m<sup>2</sup>. Di tutte le anomalie gastroscopiche osservate, era prevalente la gastrite (17,3%), seguita da esofagite (10,2%), ernia hiatale (9,4%) e duodenite (8,7%). Nell'analisi di regressione multivariata, il punteggio della scala dei sintomi gastrointestinali (GSRS) e i sintomi dell'apparato gastrico superiori sono stati i soli indici indipendenti di previsione (OR = 2.822, 95% CI: 1.674-3.456 e OR = 2.735, 95% CI: 1.827- 3.946, rispettivamente). Abbiamo identificato una correlazione positiva tra i risultati anormali della esofagogastroscopia e le complicazioni postoperatorie.

**CONCLUSIONE:** L'esofagogastroscopia preoperatoria ha offerto una rilevante incidenza di rilevamento di possibili anomalie prima della chirurgia bariatrica. I sintomi dell'apparato digerente superiore superiori sono significativi indicatori di previsione di complicanze postoperatorie. L'esecuzione di EGE preoperatorio per i pazienti sintomatici potrebbe contribuire a ridurre la morbilità e la mortalità in questi pazienti.

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