Al-Azhar International Medical Journal

Volume 5 | Issue 8 Article 11

8-31-2024

Section: Endemic diseases and tropical medicine

Evaluation the role of Esophagogastroduodenoscopy (EGD) in Bariatric Surgery

Raed Hamed Mansour
Gastroenterology, Hepatology and Infectious diseases, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Ayman Mohamed Abdelaziz
Department of Gastroenterology, Hepatology and Infectious diseases, Theodor Bilaharse Research Institute, Cairo, Egypt

Mohamed Zakaria Abu Amer
Gastroenterology, Hepatology and Infectious diseases, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Mohamed Ali Alnadar
Gastroenterology, Hepatology and Infectious diseases, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt, mohamedali1990529@gmail.com

How to Cite This Article

Mansour, Raed Hamed; Abdelaziz, Ayman Mohamed; Abu Amer, Mohamed Zakaria; and Alnadar, Mohamed Ali (2024) "Evaluation the role of Esophagogastroduodenoscopy (EGD) in Bariatric Surgery," *Al-Azhar International Medical Journal*: Vol. 5: Iss. 8, Article 11.
DOI: https://doi.org/10.58675/2682-339X.2587

ORIGINAL ARTICLE

Evaluation the role of Esophagogastroduodenoscopy (EGD) in Bariatric Surgery

Raed H. Mansour [a], Ayman M. Abdelaziz [b], Mohamed Z. Abu Amer [a], Mohamed A. Alnadar [a,*]

[a] Department of Gastroenterology, Hepatology and Infectious diseases, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt
[b] Department of Gastroenterology, Hepatology and Infectious diseases, Theodor Bilaharse Research Institute, Cairo, Egypt

Abstract

Background: ***Bariatric surgery (BS) is a therapeutic choice for severe obesity when non-surgical interventions have failed.***

Aim: ***To evaluate the value of esophagogastroduodenoscopy (EGD) before BS and its efficacy in fixing major surgical complications.***

Patients and method: ***Eight hundred individuals indicated for BS were included and classified into two groups: group A, with upper gastrointestinal (GI) symptoms, and group B, without upper GI symptoms. All of them were subjected to routine preoperative esophagogastroduodenoscopy (p-EGD) to identify pathologic findings that may change surgical planning. Cases that developed post-surgical complications were reviewed regarding the role of EGD in management.***

Results: ***p-EGD was found normal in 50.8% (47.1% of group A vs. 52.9% of group B) and abnormal in 49.2% (52.9% of group A vs. 47.1% of group B), with no significant correlation between GI symptoms and endoscopic findings. Endoscopic findings showed that altered surgical planning was 19.5% (37.6% in group A vs. 8.9% in group B). The clinical success of EGD in the management of postoperative leaks, strictures, and bleeding was nearly 91.1% (41/45), 100% (6/6) and 100% (3/3), respectively.***

Conclusion: ***p-EGD identified findings that had a clinical impact on surgical planning, especially in patients with GI symptoms. EGD proved to be effective in the management of BS complications.***

Keywords: Obesity, Bariatric, Endoscopy

1. Introduction

It has been demonstrated that bariatric surgery (BS) is the most durable and effective method of weight reduction.[1] Patients considered to have a small possibility of success with non-surgical approaches to weight loss and have a body mass index (BMI) exceeding 40 kilograms per square meter or with BMIs between 35 and 40 kg/m2 suffering from high-risk comorbid conditions associated with obesity may be suitable for surgical consideration.[2] Bariatric procedures have become safer due to a number of factors involving the near-universal fellowship training of bariatric surgeons, the pervasive adoption of minimally invasive/laparoscopic techniques & national quality improvement projects.[3] As the use of bariatric procedures becomes more prevalent, clinicians will encounter patients suffering complications with greater frequency.[4] Presently, numerous endoscopic interventions for these complications are carried out through the use of specialized instruments, including stents, suture systems, clips, and balloon dilators.[5] Also, numerous studies have shown that routine upper endoscopy prior to BS can detect cases with asymptomatic pathologic findings that may necessitate a modification of the surgical plan or delay it.[6] The aim of this work was to evaluate the value of esophagogastroduodenoscopy (EGD) before BS and its effectiveness in the management of major complications.

Accepted 21 August 2024.
Available online 31 August 2024

* Corresponding author at: Gastroenterology, Hepatology and Infectousdiseases, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt.
E-mail address: mohamedali1990529@gmail.com (M. A. Alnadar).

https://doi.org/10.58675/2682-339X.2587

2. Patients and methods

This multi-center cross-sectional study reviewed the database of 800 subject who underwent BS in the period between 2021 April and 2023 (Al-Azhar University hospitals & Theodor Bilharse Institute Endoscopy Units).

Inclusion criteria: patients between the ages of 18 and 65 with a BMI above forty or greater than thirty-five suffering from obesity-associated comorbidities after failure of dietetic regimens with acceptable surgical risk.

Exclusion criteria: Older than 65 years or younger than 18 years. Patients with a prohibitive operative risk, with contraindications to anaesthesia, with uncontrolled coagulopathy, with alcohol or drug abuse or with lack of family support to the planned surgery.

Ethical approval: All subjects had informed consent. This research complied with the Helsinki Declaration and was approved by the IRB at the Faculty of Medicine at Al-Azhar University.

All the subjects were subjected to: History taking, BMI measurements, blood tests and preoperative esophagogastroduodenoscopy (p-EGD).

The subjects were classified into two groups: One with upper gastrointestinal (GI) symptoms (group A) and one without (group B). The endoscopic findings were classified into four groups according to predetermined criteria proposed by Sharaf et al.[7]; Group 0 consisted of cases with a normal study, group 1 included abnormal findings that did not alter or delay the surgical approach, group 2 comprised abnormal findings that changed or delayed the surgical approach and group 3 that encompassed abnormal findings that were absolute contraindications to BS.

Postoperative data: Patients who developed leak, stricture or bleeding were reviewed to see what kind of surgery they had, how long it had been since the surgery, where was the anatomic site of leak, stricture or bleeding and how many endoscopic sessions they needed till management.

Statistical Analysis

Data was calculated using SPSS 21 software. Logistic regression analysis was used to identify predictors of abnormal endoscopic findings. The normal distribution-based variables were presented as mean and SD. A Student t-test was used to compare parametric data, while a Chi-square test was used to compare non-parametric data. A two-tailed $P < 0.05$ was considered statistically significant, while $P > 0.05$ was considered not significant.

3. Results

Eight hundred individuals were involved; most of them were women (62.2%), with a mean age of 32.05 ± 7.03. About 27.6% had a history of one or more co-morbidities, and about 17.4% were smokers. Routine p-EGD found normal in 50.75% (47.1% of group A vs 52.9% of group B) and abnormal in 49.25% (52.9% of group A vs 47.1% in group B). Of our patients, 653 (81.6%) underwent sleeve gastrectomy (SG), and about 147 (18.4%) underwent Roux-en-Y gastric bypass (RYGB) (Table 1).

Detailed distribution of P-EGD findings showed that gastritis was the commonest finding presented in 35.75% (52.2% of group A vs 26.1% of group B), followed by esophagitis in 20.9% (52.9% of group A vs 13.9% of group B), and hiatus hernia in 19% (36.6% of group A vs 8.7% of group B) (Table 2).

The results of univariate and multivariate regression analysis showed that age, BMI, and other health problems were all strong predictors of abnormal endoscopic findings ($P \leq 0.001$). However, GI symptoms were not among these predictors (Table 3).

As regard Sharaf grouping of p-EGD findings, 50.8% endorsed in Sharaf group 0 (47.1% of group A vs. 52.9% of group B), 29.8% endorsed in Sharaf group 1 (15.3% of group A vs. 38.2% of group B), and 19.5% endorsed in Sharaf group 2 (37.6% of group A vs. 8.9% of group B), this distribution of Sharaf grouping of p-EGD according to the prevalence of GI symptoms indicates a significantly higher prevalence of p-EGD findings that altered the surgical decision (Saraf group 2) in patients with upper GI symptoms (Group A) than in patients without upper GI symptoms (Group B) (Table 4).

Post-operatively, 36 leaks were diagnosed and referred early (less than 6 weeks from surgery), all were managed with endoscopic mega stent insertion for an average of 4 to 7 weeks with or without percutaneous drainage, with nearly 91.7% clinical success (Table 5).

It was more than 6 weeks after surgery when 9 leaks were found and reported. For an average of 8 to 10 weeks; endoscopic internal drainage (EID) with double-pigtail stents (7F–5 cm) was used, with nearly 88.9% clinical success (8/9) (Table 6).

Six patients (0.75%) had post-operative stricture, all were managed with endoscopic 18-mm controlled radial expansion (CRE) balloon in 2 to 4 sessions, with a 100% success rate (Table 7).

Three patients (0.4%) had postoperative bleeding, all were treated endoscopically with hemoclip insertion, with a 100% clinical success

rate (Table 8).

Table 1. Characteristics of studied patients.

		Total no = 800
Age	Mean±SD	32.05 ± 7.03
	Range	18 – 51
Gender	Female	498 (62.2%)
	Male	302 (37.8%)
BMI	Mean±SD	43.68 ± 1.91
	Range	36.9 - 47.9
Co-morbidities	DM	145 (18.1%)
	HTN	105 (13.1%)
	IHD	19 (2.4%)
	Asthma	12 (1.5%)
Routine p-EGD results	Normal	406 (50.75%)
	Abnormal	394 (49.25)
GI symptoms	Yes (Group A)	295 (36.9%)
	No (Group B)	505 (63.1%)
Type of surgery	SG	653 (81.6%)
	RYGB	147 (18.4%)

BMI, Body mass index; DM, Diabetes mellitus; HTN, Hypertension; IHD, Ischemic heart disease; p-EGD, preoperative esophagogastroduodenoscopy; GI symptoms, Gastrointestinal symptoms; SG, Sleeve gastrectomy; RYGB, Roux-en-Y gastric bypass.

Table 2. Detailed distribution of P-EGD findings among the studied groups A & B.

Total no = 800		GI symptoms		Test value	P-value	Sig.
		Group A (295)	Group B (505)			
Esophagitis	No [633 (79.1%)]	198 (67.1%)	435 (86.1%)	40.785	0.000	HS
	Yes [166 (20.9%)]	97 (32.9%)	70 (13.9%)			
	No [633 (79.1%)]	198 (67.1%)	435 (86.1%)	43.541	0.000	HS
	Mild [153 (19.1%)]	86 (29.2%)	67 (13.3%)			
	Severe [13 (1.8%)]	11 (3.7%)	3 (0.6%)			
Hiatus hernia	No [648 (81.0%)]	187 (63.4%)	461 (91.3%)	94.169	0.000	HS
	Yes [152 (19%)]	108 (36.6%)	44 (8.7%)			
	No [648 (81.0%)]	187 (63.4%)	461 (91.3%)	96.094	0.000	HS
	Small [132 (16.5%)]	91 (30.8%)	41 (8.1%)			
	Large [20 (2.5%)]	17 (5.8%)	3 (0.6%)			
Gastritis	No [514 (64.25%)]	141 (47.8%)	373 (73.9%)	55.079	0.000	HS
	Yes [286 (35.75%)]	154 (52.2%)	132 (26.1%)			
	No [514 (64.25%)]	141 (47.8%)	373 (73.9%)	60.618	0.000	HS
	Mild [273 (34.125%)]	143 (48.5%)	130 (25.7%)			
	Severe [13 (1.625%)]	11 (3.7%)	2 (0.4%)			
Gastric ulcer	No [794 (99.2%)]	290 (98.3%)	504 (99.8%)	5.606	0.018	S
	Yes [6 (0.8%)]	5 (1.7%)	1 (0.2%)			
Dudenitis	No [753 (94.1%)]	264 (89.5%)	489 (96.8%)	18.144	0.000	HS
	Yes [47 (5.9%)]	31 (10.5%)	16 (3.2%)			
Dudenal ulcer	No [799 (99.9%)]	294 (99.7%)	505 (100.0%)	1.714	0.190	NS
	Yes [1 (0.1%)]	1 (0.3%)	0 (0.0%)			
Gastric polyp	No [794 (99.2%)]	294 (99.7%)	500 (99.0%)	1.061	0.303	NS
	Yes [6 (0.8%)]	1 (0.3%)	5 (1.0%)			
Barrett	No [798 (99.8%)]	293 (99.3%)	505 (100.0%)	3.432	0.064	NS
	Yes [2 (0.2%)].	2 (0.7%)	0 (0.0%)			

GI symptoms, Gastrointestinal symptoms.

Table 3. Analyses by univariate & multivariate logistic regression showing predictors of abnormal endoscopic results.

	Univariate				Multivariate			
	P-value	Odds ratio (OR)	95% C.I. for OR		P-value	Odds ratio (OR)	95% C.I. for OR	
			Lower	Upper			Lower	Upper
Age > 28 yrs.	0.000	6.472	4.347	9.635	0.000	5.544	3.558	8.638
BMI > 43.1	0.000	3.511	2.531	4.870	0.000	4.023	2.790	5.801
DM	0.000	3.002	2.076	4.342	0.198	1.387	0.843	2.282
HTN	0.000	3.789	2.463	5.828	0.013	1.927	1.147	3.238
IHD	0.001	6.710	2.206	20.413	0.280	2.026	0.563	7.296
Smoking	0.000	2.713	1.868	3.939	0.000	2.422	1.562	3.756
Rural	0.024	1.463	1.052	2.036	0.009	1.675	1.136	2.471
HbA1c > 5.6	0.000	2.264	1.689	3.035	0.107	1.387	0.932	2.065

BMI, Body mass index; DM, Diabetes mellitus; HTN, Hypertension; IHD, Ischemic heart disease; Hb A1c, Hemoglobin A1c.

Table 4. Comparison between groups A &B regarding Sharaf grouping distribution of p-EGD findings.

Sharaf group	GI symptoms		Test value	P-value	Sig.
	Group A	Group B			
Group (0) [406 (50.8%)]	139 (47.1%)	267 (52.9%)	2.466	0.116	NS
Group (1) [238 (29.8%)]	45 (15.3%)	193 (38.2%)	46.986	0.000	HS
Group (2) [156 (19.5%)]	111 (37.6%)	45 (8.9%)	97.825	0.000	HS

GI symptoms, Gastrointestinal symptoms.

Table 5. Efficacy of endoscopic management of post-operative leak with mega stent.

		Mega stent for Leak No. = 36
Age	Mean ± SD	35.31 ± 7.32
	Range	21 – 47
Gender	Female	26 (72.2%)
	Male	10 (27.8%)
BMI	Mean ± SD	44.95 ± 1.48
	Range	41.2 – 46.9
Surgery	SG	36 (100.0%)
	RYGB	0 (0.0%)
Site	Angle of Hiss	36 (100.0%)
	GJ anastomotic line	0 (0.0%)
	Staple line	0 (0.0%)
Efficacy	Failure	3 (8.3%)
	Success	33 (91.7%)
Duration of stent (Wks.)		
	Range	4 – 6

BMI, Body mass index; GJ anastomotic line, Gastrojejunal anastomotic line; SG, Sleeve gastrectomy; RYGB, Roux-en-y gastric bypass.

Table 6. Efficacy of endoscopic management of post-operative leak with pig tail.

		Pig tail for leak No. = 9
Age	Mean ± SD	42.00 ± 3.64
	Range	36 – 49
Gender	Female	4 (44.4%)
	Male	5 (55.6%)
BMI	Mean ± SD	43.27 ± 1.97
	Range	40.1 – 46.2
Surgery	SG	7 (77.8%)
	RYGB	2 (22.2%)
Site	Angle of Hiss	7 (77.8%)
	GJ anastomotic line	2 (22.2%)
	Staple line	0 (0.0%)
Efficacy	Failure	1 (11.1%)
	Success	8 (88.9%)
Duration of peg tail	Mean ± SD	10.22 ± 1.56
	Range	8 – 12

BMI, Body mass index; GJ anastomotic line, Gastrojejunal anastomotic line; SG, Sleeve gastrectomy; RYGB, Roux-en-y gastric bypass.

Table 7. Efficacy of endoscopic management of post-operative stricture.

		Stricture No. = 6
Age	Mean±SD	38 ± 10.64
	Range	18 – 48
Gender	Female	3 (50.0%)
	Male	3 (50.0%)
BMI	Mean±SD	45.7 ± 0.56
	Range	44.9 - 46.3
	Large	6 (100.0%)
Operative details		
Surgery	SG	0 (0.0%)
	RYGB	6 (100.0%)
Site	GJ anastomotic line	6 (100.0%)
Management	18mm CRE balloon dilatation (3-4 sessions)	6 (100.0%)
Efficacy	Failure	0 (0.0%)
	Success	6 (100.0%)

BMI, Body mass index; GJ anastomotic line, Gastrojejunal anastomotic line; CRE, controlled radial expansion; SG, Sleeve gastrectomy; RYGB, Roux-en-y gastric bypass.

Table 8. Efficacy of endoscopic control of post-operative bleeding.

		Bleeding No. = 3
Age	Mean±SD	36.67 ± 4.93
	Range	31 – 40
Gender	Female	1 (33.3%)
	Male	2 (66.7%)
BMI	Mean±SD	44.87 ± 1.33
	Range	44 - 46.4
Operative details		
Surgery	SG	1 (33.3%)
	RYGB	2 (66.7%)
Site	Angle of Hiss	0 (0.0%)
	GJ anastomotic line	2 (66.7%)
	Staple line	1 (33.3%)
Management	Hemoclip insertion	3 (100.0%)
Efficacy	Failure	0 (0.0%)
	Success	3 (100.0%)

BMI, Body mass index; GJ anastomotic line, Gastrojejunal anastomotic line; SG, Sleeve gastrectomy; RYGB, Roux-en-y gastric bypass.

4. Discussion

Although remaining a controversial topic, numerous authors suggest routine EGD in all cases prior to bariatric procedures. 8 Endoscopic approaches are also considered if there's suspicion of postoperative complications regardless of the time interval from the surgery.[4] This study evaluated the role of pre-bariatric screening EGD and its efficacy in the management of major complications. Subjects were classified into; Group A (with upper digestive symptoms) included 295 patients (36.9%), and Group B (without upper digestive symptoms) included 505 patients (63.1%); likely, Abd Ellatif et al.[9] found that upper GI symptoms were referred by 28% of studied obese subjects, while 72% didn't give a history of significant upper GI symptoms, unlikely Frigg et al.[10] found that more than 50% of studied obese cases (59.6%) had one or more upper GI symptoms. However, the relatively small sample size in this study couldn't be realistic proof of the frequency of GI symptoms in obese cases. p-EGD was found normal in 50.8% (47.1% of group A vs 52.9% of group B) and abnormal in 49.2% (52.9% of group A vs 47.1% in group B), likely Schigt et al.[11] revealed that anomalous EGD presented in 51% of obese cases on average; however in previous research, the prevalence of anomalous EGD in obese cases varied considerably from 30% to 89.7%, as demonstrated in a systematic review & meta-analysis reported by Brown et al.[12] Mild gastritis was the commonest endoscopic finding (34.1%), followed by mild esophagitis (19.1%) and small

hiatus hernia (16.5%). Similarly, Wolter et al.[13] reported that gastritis was the most common endoscopic finding (31%). Univariate and multivariate regression analysis established that age, BMI, and comorbidities-comorbidities were predictive of abnormal endoscopic findings, while GI symptoms were not among these predictors. Likewise, Wolter et al.[13] and Abd Ellatif et al.[9] found no significant association between GI symptoms and the incidence of relevant endoscopic findings.To evaluate the utility of p-EGD screening in BS, we classified p-EGD findings according to the structure developed by Sharaf et al.[7]; group (0), where EGD results were normal; group (1) where surgical planning did not change due to findings like mild gastritis, esophagitis, and/or duodenitis, group (2) with findings that altered the surgical plan like ulcers, mass lesions, severe erosive esophagitis, gastritis and/or duodenitis, Barrett's esophagus and any sized hiatal hernia & group (3) where abnormal findings considered absolute contraindications to BS (GI cancer or varies). The majority of our patients (80.5% (644/800) endorsed in group 0 (50.8%) or group 1 (29.8%) proceeded directly to the planned surgery. The prevalence of EGD findings among group 2 is 19.5% (156/800), in whom the operation decision was either postponed till healing (patients with ulcers, severe gastritis or severe duodenitis) or changed from SG to RYGB (patients with any sized hiatus hernia, severe erosive esophagitis, or Barret's esophagus). None endorsed in group 3. The distribution of endoscopic findings to be significant or not among different studies is extremely variable, and different evaluations of endoscopic findings at varying degrees of significance with no clear definition of which are clinically significant may account for these variable results. The distribution of Sharaf grouping of p-EGD according to the prevalence of GI symptoms in our study indicated a significantly higher prevalence of p-EGD findings that altered the surgical decision (Saraf group 2) in patients with upper GI symptoms than in patients without upper GI symptoms. In our studied subjects, about 653 (81.6%) underwent SG, and about 147 (18.4%) underwent RYGB. Forty-five (5.6%) patients had leaks, 43 (95.6%) after sleeve, and 2 (4.4%) after LRYGB. Thirty-six leaks (36/45) were diagnosed in the early postoperative period (less than six weeks from surgery), and all of them were managed with endoscopic mega stent insertion for an average of 28 to 42 days with or without percutaneous drainage [The clinical success was nearly 91.7% (33/36)]. Nine leaks (9/45) were diagnosed in the late pot-operative period (more than six weeks from surgery), in which EID was achieved by the insertion of double-pigtail stents (7F–5 cm) for an average of 8 to 10 weeks [The clinical success was nearly 88.9 % (8/9)]. All cases that failed to heal were referred for re-operation. Rogalski et al.[14] systematic review and meta-analysis study showed similar results with successful leak closure, nearly at 89% (95% CI, 85–92%). Six cases (0.75%) had stricture; all were after RYGB and dilated using an 18-mm CRE balloon in 2 to 4 sessions with 100% clinical success; these results were in agreement with Parikh et al.[15] who showed 100% clinical success using CRE balloon dilatation for post-bariatric strictures. Three patients (0.4%) had postoperative bleeding (One after SG and two after RYGB); all were treated endoscopically with hemoclip insertion, with 100% clinical success.

4. Conclusion

There was no significant correlation between abnormal endoscopic findings and GI symptoms. However, significant endoscopic findings that had a clinical impact in delaying or changing the surgical planning were greater in cases with GI symptoms than in patients without GI symptoms, this suggests that EGD should be done routinely prior to BS, especially in patients with known GI symptoms.

This study had some limitations, such as the relatively small sample sizes, its limitation to Egyptian people and its non-available check for other less common post-bariatric complications.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

Funding

No Funds : Yes

Conflicts of interest

There are no conflicts of interest.

References

1. Aggarwal S., Priyadarshini P., & Agrawal S. Current concepts in bariatric surgery. GI Surgery Annual. 2015; Volume 22, 103-134.
2. DuCoin C., Moore R. L., & Provost D. A. Indications and contraindications for bariatric surgery. The ASMBS Textbook of Bariatric Surgery 2020; 77-81.
3. Ghiassi S., & Morton J. M. Safety and efficacy of bariatric and metabolic surgery. Current obesity reports. 2020; 9, 159-164.
4. Kumbhari V., Cummings D. E., Kalloo A. N., & Schauer P. R. AGA clinical practice update on evaluation and management of early complications after bariatric/metabolic surgery: expert review. Clinical Gastroenterology and Hepatology. 2021; 19(8), 1531-1537.

5. Cai J. X., Schweitzer M. A., & Kumbhari V. Endoscopic management of bariatric surgery complications. Surgical Laparoscopy, Endoscopy & Percutaneous Techniques. 2016; 26(2), 93-101.
6. Brown W. A., Johari Halim Shah Y., Balalis G., Bashir A., Ramos A., Kow L., et al. IFSO position statement on the role of esophago-gastro-duodenal endoscopy prior to and after bariatric and metabolic surgery procedures. Obesity Surgery. 2020; 30(8), 3135-3153.
7. Sharaf R. N., Weinshel E. H., Bini E. J., Rosenberg J., Sherman A., & Ren, C. J. Endoscopy plays an important preoperative role in bariatric surgery. Obesity surgery. 2004; 14.10: 1367-1372.
8. Bennett S., Gostimir M., Shorr R., Mallick R., Mamazza J., & Neville A. The role of routine preoperative upper endoscopy in bariatric surgery: a systematic review and meta-analysis. Surgery for Obesity and Related Diseases. 2016; 12(5), 1116-1125.
9. Abd Ellatif M. E., Alfalah H., Asker W. A., El Nakeeb A. E., Magdy A., Thabet W., et al. Place of upper endoscopy before and after bariatric surgery: a multicenter experience with 3219 patients. World Journal of Gastrointestinal Endoscopy. 2016; 8(10), 409.
10. Frigg A., Peterli R., Zynamon A., Lang C., & Tondelli P. Radiologic and endoscopic evaluation for laparoscopic adjustable gastric banding: preoperative and follow-up. Obesity Surgery. 2001; 11(5), 594-599.
11. Schigt A., Coblijn U., Lagarde S., Kuiken S., Scholten P., & van Wagensveld B. Is esophagogastroduodenoscopy before Roux-en-Y gastric bypass or sleeve gastrectomy mandatory?. Surgery for Obesity and Related Diseases. 2014; 10(3), 411-417.
12. Brown W. A., Johari Halim Shah Y., Balalis G., Bashir A., Ramos A., Kow L., et al. IFSO position statement on the role of esophago-gastro-duodenal endoscopy prior to and after bariatric and metabolic surgery procedures. Obesity Surgery. 2020; 30(8), 3135-3153.
13. Wolter S., Duprée A., Miro J., Schroeder C., Jansen M. I., Schulze-zur-Wiesch C., et al. Upper gastrointestinal endoscopy prior to bariatric surgery-mandatory or expendable? An analysis of 801 cases. Obesity Surgery. 2017; 27, 1938-1943.
14. Rogalski P., Swidnicka-Siergiejko A., Wasielica-Berger J., Zienkiewicz D., Wieckowska B., Wroblewski E., et al. Endoscopic management of leaks and fistulas after bariatric surgery: a systematic review and meta-analysis. Surgical Endoscopy.2021; 35, 1067-1087.
15. Parikh A., Alley J. B., Peterson R. M., Harnisch M. C., Pfluke J. M., Tapper D. M., & Fenton S. J. Management options for symptomatic stenosis after laparoscopic vertical sleeve gastrectomy in the morbidly obese. Surgical endoscopy, 2012; 26, 738-746.