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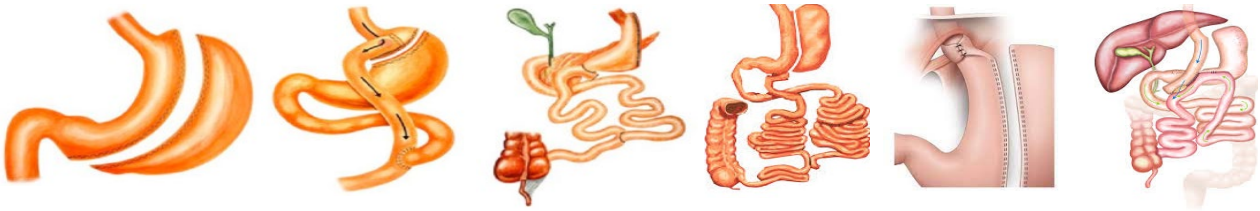
REVIEW ARTICLE

Gastroesophageal reflux disease and the phantom of Barrett's esophagus after most-often-used bariatric procedures: are future investigations necessary?

VISUAL ABSTRACT



Gastroesophageal reflux

↓

Follow-up: clinical and objective investigation

↓

Barrett's esophagus: Regression? Development?

AUTHORS
Italo BRAGHETTO, Barbara CARREÑO, Ramón HERMOSILLA, Rafael ZANABRIA

CORRESPONDENCE
Italo Braghetto.
Email: italobraghetto@gmail.com

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ARTICLE HIGHLIGHTS
- It is well established that obese patients experience more severe esophagitis and Barrett's esophagus (BE) than individuals of normal weight;
- Bariatric procedures, designed to reduce excess weight, are expected to positively impact the prevention of gastroesophageal reflux disease and BE;
- Current evidence suggests that the incidence of BE is higher following laparoscopic sleeve gastrectomy compared to the general population. This review provides compelling evidence that LSG may indeed lead to an increased risk of BE;
- Numerous studies suggest that Roux-en-Y gastric bypass protects against BE.

CENTRAL MESSAGE
Literature on Barrett's esophagus (BE) after bariatric procedure presents wide variation, and many studies have bias and limitations. In all reported cases, sleeve gastrectomy appears to promote gastroesophageal reflux disease and the potential development of BE, in contrast to Roux-en-Y gastric bypass (RYGB). Scarce and low-quality information is available regarding the other bariatric procedures.

PERSPECTIVES
Current evidence suggests that the incidence of Barrett's esophagus (BE) is higher following laparoscopic sleeve gastrectomy (LSG) compared to the general population. This review provides compelling evidence that LSG may indeed lead to an increased risk of BE. Numerous studies suggest that Roux-en-Y gastric bypass (RYGB) protects against BE. To fully understand the effect of bariatric surgery on BE, other bariatric procedures must be extensively assessed in well-controlled prospective studies with long-term follow-up (FU).

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REVIEW ARTICLE

Gastroesophageal reflux disease and the phantom of Barrett's esophagus after most-often-used bariatric procedures: are future investigations necessary?

Doença do refluxo gastroesofágico e o fantasma do esôfago de Barrett após procedimentos bariátricos mais utilizados: investigações futuras são necessárias?

Italo BRAGHETTO[1], Barbara CARREÑO[1], Ramón HERMOSILLA[1], Rafael ZANABRIA[1]

ABSTRACT

Background: Studies have investigated the incidence of gastroesophageal reflux disease (GERD) and Barrett's esophagus (BE) after common bariatric surgeries. However, many of these studies have bias or limitations. Therefore, it is crucial to determine the true incidence of GERD in long-term follow-ups (FUs) post-surgery. **Aims:** The aim of this study was to review and summarize long-term data regarding the incidence of post-surgical GERD and BE after various bariatric procedures, discuss the characteristics of current information available, and establish the need for future studies to determine objective functional outcomes that have not yet been reported. **Methods:** A narrative review was conducted using multiple electronic databases, including the review of 15 meta-analyses and over 200 articles. **Results:** The quality of studies analyzing GERD and BE following bariatric surgery varies widely. Some papers provide detailed outcomes, while others offer limited information. The reported rate of *de novo* postoperative GERD development after sleeve gastrectomy varies from 4.06 to 74.7% (mean=33.8±19.1), and the incidence of BE ranges from 0.2 to 27% (mean=8.2±7.5). After Roux-en-Y gastric bypass (RYGB), similar variability is observed, with BE incidence ranging from 1.6 to 17.5% (mean=7.5±5.9). In the case of one-anastomosis gastric bypass (OAGB), scarce information is available and most reports are incomplete. The incidence of erosive esophagitis ranges from 15 to 70%, with BE incidence reported in only two papers (1–9.5%). For procedures such as single-anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S), fundoplication-sleeve, or sleeve bipartition, few specific data are available, with most reports limited to symptoms and lacking findings such as esophagitis, hiatal hernia, or BE. **Conclusion:** This revision provides evidence that SG may indeed lead to an increased risk of BE. Numerous studies suggest that RYGB protects against BE. Other bariatric procedures must be extensively evaluated. Relatively low quality of available literature on this topic was observed; therefore, well-controlled prospective studies with long-term FUs are necessary to fully understand the effect of bariatric surgery on BE.

Keywords: Bariatric Surgery. Esophagitis. Barrett Esophagus. Incidence.

RESUMO

Racional: Estudos têm investigado a incidência de doença do refluxo gastroesofágico (DRGE) e esôfago de Barrett (EB) após cirurgias bariátricas habituais, mas muitos deles apresentam vieses ou limitações. Portanto, é crucial determinar a verdadeira incidência de DRGE em acompanhamentos de longo prazo após a cirurgia. **Objetivos:** Revisar e resumir dados de longo prazo sobre a incidência de DRGE e EB no pós-operatório tardio, após vários procedimentos bariátricos, discutir as características das informações atuais disponíveis e estabelecer a necessidade de estudos futuros para determinar desfechos funcionais objetivos que ainda não foram relatados. **Métodos:** Foi realizada uma revisão narrativa utilizando múltiplas bases de dados eletrônicas. Foram incluídos 15 meta-análises e mais de 200 artigos revisados. **Resultados:** A qualidade dos artigos que analisam DRGE e EB após cirurgia bariátrica varia amplamente, alguns fornecendo desfechos detalhados, enquanto outros oferecem informações limitadas. A porcentagem de ocorrência de DRGE pós-operatória *de novo* após gastrectomia vertical varia de 4,06 a 74,7% (média de 33,8±19,1%), e o esôfago de Barrett varia de 0,2 a 27% (média de 8,2±7,5%). Após bypass gástrico em Y-Roux também apresenta ampla variação, e a incidência de EB foi confirmada em taxas de 1,6 a 17,5% (média de 7,5±5,9). Após bypass gástrico com uma anastomose (OAGB), há poucas informações disponíveis e a maioria dos relatos é incompleta. A incidência de esofagite erosiva varia de 15 a 70%, com incidência de EB relatada em apenas dois artigos (1–9,5%). Poucos dados específicos estão disponíveis após procedimentos de *bypass* duodeno-ileal com anastomose única e gastrectomia vertical (SADI-S), fundoplicatura com *sleeve* ou bipartição com *sleeve*, relatando apenas sintomas, sem dados sobre esofagite, hérnia de hiato ou esôfago de Barrett. **Conclusões:** Esta revisão fornece evidências de que a cirurgia bariátrica, de fato, pode levar a um risco aumentado de EB. Numerosos estudos sugerem que o *bypass* gástrico em Y de Roux (RYGB) protege contra EB. Outros procedimentos bariátricos devem ser extensivamente avaliados. Foi observado uma qualidade relativamente baixa da literatura disponível sobre este tópico. Portanto, estudos prospectivos bem controlados com acompanhamento de longo prazo são necessários para compreender completamente o efeito da cirurgia bariátrica no EB.

Palavras-chave: Cirurgia Bariátrica. Esofagite. Esôfago de Barrett. Incidência.

INTRODUCTION

It is well established that obese patients experience more severe esophagitis and Barrett's esophagus (BE) than individuals of normal weight[80]. Bariatric procedures, designed to reduce excess weight, are expected to positively impact the prevention of gastroesophageal reflux disease (GERD) and BE. Studies have investigated the incidence of GERD and BE after common bariatric surgeries, such as sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB), but there is a need to evaluate other less common procedures such as one-anastomosis gastric bypass (OAGB), single-anastomosis duodenal ileostomy (SADI), fundoplication (FP)-sleeve (Nissen or Rosetti) (N-SG, R-SG), and sleeve with bipartition (SG-Bip)[1,15,31,33,34,36,120].

Evidence suggests that the weight loss induced by these procedures could be a significant factor in reducing the risk of

[1]University of Chile, Faculty of Medicine, Hospital Clínico Dr. José J. Aguirre, Department of Surgery – Santiago, Chile.
Correspondence: Italo Braghetto. Email: italobraghetto@gmail.com
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BE[54,99]. However, this conclusion is not entirely valid due to several biases and limitations in many studies. Conversely, the anatomical and mechanical changes resulting from these procedures could potentially contribute to the development of GERD and BE[7,23]. Therefore, it is crucial to determine the true incidence of GERD in long-term FUs post-surgery and identify which anatomical or pathophysiological factors must be investigated more deeply. The objectives are:

- To review and summarize long-term data (5–10 years) regarding the incidence of post-surgical GERD and BE after various bariatric procedures;
- To discuss the characteristics of current information available;
- To discuss whether development or regression of BE occurs following bariatric surgery;
- To establish the need for future studies to determine objective functional outcomes that have not yet been reported.

METHODS

A narrative review was conducted using multiple electronic databases (PubMed, MEDLINE, Google Scholar, and Scopus) with search terms such as "gastroesophageal reflux," "obesity," "Barrett's esophagus," "bariatric surgery," "sleeve gastrectomy," "gastric bypass," and variations including "Roux-en-Y," "one anastomosis," "single anastomosis duodenal interposition," "gastric bipartition," and "Nissen-sleeve." We reviewed 15 meta-analyses and over 200 articles, but only those with long-term FU data and written in English were included. Studies were selected based on pre- or postoperative occurrence of BE in patients undergoing bariatric surgery, excluding those with unavailable full texts, early postoperative data, or written in other languages.

RESULTS

Numerous papers have examined GERD and BE following bariatric surgery. The quality of these studies varies widely, with some providing detailed clinical and functional outcomes, while others offer limited information. Symptoms of GERD show a broad range, with SG alone or combined with other procedures generally associated with more frequent symptoms. The same trend is observed in the use of proton pump inhibitors (PPIs) and the presence of varying grades of esophagitis post-surgery. BE is most commonly observed after SG, also reported following RYGB, especially when the surgical technique was not properly executed. Data on other bariatric procedures are scarce, and cancer development post-surgery is rare and difficult to assess[2,10,38,42,60,72,76,77,112] (Table 1).

Table 2 presents data reported over the past decade following long-term FU after SG. Most authors agree on the high percentage of symptoms (affecting nearly 80% of patients), the presence of esophagitis, and the use of PPIs. The rate of de novo postoperative GERD development varies from 4.06 to 74.7% (mean=33.8±19.1) and that of BE ranges from 0.2 to 27% (mean: 8.2±7.5). Notably, only seven out of 32 papers (21.9%) reported more than 10% incidence of BE. In contrast, several studies reported hiatal hernia (HH) incidence rates exceeding 20%.

Genco et al.[51] recently reported three cases of adenocarcinoma after SG. Although the rate and probability of progression from BE to esophageal adenocarcinoma (EAC) are not well defined, the increasing popularity and execution of SG may lead to a rise in BE incidence. Clinical and endoscopic FUs are essential for prevention, early diagnosis, and epidemiologic data collection. Gastric reflux worsened more often after SG (31.8%) than after RYGB (6.3%)[8,9,14,17,19,20,24,26,32,37,41,43,44,48,50,51,59,61,62,67,77,78,80,83,84,88,93,94,104,110,113,115,117,125,128].

Papers reporting data on GERD and BE after RYGB also show wide variation in incidence (Table 3), with some focused solely on postoperative symptoms, while others included objective results from endoscopic studies[12,80,100,112]. These papers reported incidences of various grades of esophagitis, ranging from 0.4 to 26.7%, with most being grade A, and some authors noting grade C or D esophagitis. BE incidence was confirmed at rates from 1.6 to 17.5% (mean: 7.5±5.9). Adil et al.[3], in their meta-analysis, reported the percentage of BE and response to RYGB but warned about the quality of reports (low or intermediate). Only two papers described BE rates over 10%, likely

Table 1. Summary of GERD consequences after different bariatric procedures[2,10,38,42,60,72,76,77,112].

	SG (%)	RYGB (%)	OAGB (%)	SADI (%)	N-SG (%)	SG-Bip (%)
GERD symptoms	15.2–74.7	2–22	1.6–52.1	6.3–7.5	36.6	1–22
PPI use	13–61	7.4–64	19.3–27.1	No data	No data	2–7
Esophagitis (%)	33.1–44.4	5.8–17.6	15–29.1	No data	No data	
A	19–92	5.1–57.1				10
B	19.4–32.7	6.2				16
C	11.8–18					4
D	9.1					
Barrett´s esophagus	2.2–27.2	0–17.6	1–9.5	No data	No data	No data
Hiatal hernia	1.2–45	20–53.2	29.2	No data	No data	No data
Esophageal carcinoma	0.05% of cases reported	0.003%	5 cases reported	No data	No data	No data

GERD: gastroesophageal reflux disease; PPIs: proton pump inhibitors; SG: sleeve gastrectomy; RYGB: Roux-en-Y gastric bypass; OAGB: one-anastomosis gastric bypass; SADI: single-anastomosis duodenal ileostomy; N-SG: Nissen fundoplication-sleeve, and SG-Bip: sleeve with bipartition.

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Table 2. Results of the reported incidence of GERD and Barrett´s esophagus after SG.

Author	Year	Follow-up (months)	PPI use (%)	Esophagitis A-B-C (%)	Barrett´s esophagus (%)	Hiatal hernia (%)	Cancer (%)	GERD symptoms (%)	Incompetent LES (%)
Catheline et al.[31]	2013	60	33.3						
Qumseya et al.[93]	2021	60	7.4		11.6				
Kular et al.[61]	2014	60	21					21	
Rawlins et al.[94]	2012	60						11	
Sebastianelli et al.[104]	2019	78±15	52	41	18.8			76	
Felsenreich et al.[43]	2022	120	70	44	13	50		55	
Soricelli et al.[110]	2018	66	63.9	60.1 A=22.2 B=19.4 C=18.5	13.1			70.2	
Csendes et al.[36]	2019	126	120	58.5	4	18.9			
Braghetto et al.[24,26]	2016	36		15.5		1.2			
	2019	60				4.8			
Dimbezel et al.[41]	2020			35.6				27.1	
Genco et al.[50,51]	2021	58	68.1	74.7 A=46.3 B=32.7 C=11.8 D=9.1	17.2		3 cases	58.9	
Alexandrou et al.[9]	2015	60						16	
Angrisani et al.[14]	2016	60						8–15	
Ferrer et al.[48]	2022	60		31.4	0.9	30.5		76	
Arman et al.[17]	2016	140.7	11.1					21.4	
Al Sabah et al.[7]	2021	60		15.2	2.2	4.4			
Tai et al.[115]	2012	12		66.7 A=36.4 B=24.2 C=6.1		27.3		47	
Braghetto et al.[24]	2016	60		15.5	4.8	5.7		15.5	85.1 77.5
Yeung et al. [125]		3–132							
Benvenga et al.[19]	2020	66–85.2		19.2	1.3	23.1			
Bevilacqua et al.[20]	2020			4.06	0.84		0.08		
Salminen et al.[99]	2022	120	64	31	4	63			
Lallemand et al.[62]	2020	60		27.1	8.5	42.4		50.8	
Migaczewski et al.[78]	2021	60		30	27			56.7	
Swei et al.[113]	2023			14	6			54	
Kermansaravi et al.[59]	2023	60		29.5 A=15.2 B=11.4 C=2.9	5.7				
Moulla et al. [80]	2023			30					
Thereaux et al.[117]	2017	48	21						
Navarini et al.[83]	2020	12		51.4				60	40
Matar et al.[77]	2020	60	73.6	37.9	1.1				16.9
Leslie et al.[67]	2021	124	4.7	12.1	0.7			60.2	39.3
Mean±SD		68.7±32.8	44.3±34	33.8±19.1	8.2±7.5	26.4±20.4		44.9±22.6	51.8±28.6

PPIs: proton pump inhibitors; GERD: gastroesophageal reflux disease; SD: standard deviation; LES: lower esophageal sphincter.

Table 3. Results of the reported incidence of GERD and Barrett´s esophagus after RYGB.

Author	Year	Follow-up (months)	PPI use (%)	Esophagitis A-B-C-D (%)	Barrett´s esophagus (%)	Hiatal hernia (%)	Cancer (%)	GERD symptoms (%)
Borbély et al.[22]	2018	45.6	57.4	51.1 A=23.4 B=17 C=4.3 D=6.4	14.9	53.2		
Braghetto et al.[24]	2022	60		28.9 A=18.9 B=5 C=2.5 D=2.5	5.7	40		
Santonicola et al.[100]	2022	60–130						24.4
Wölnerhanssen et al.[123]	2023	84±12	19.8	27	1.6	18.6		26.7
Felsenreich et al.[44]	2020		14.6	12.9	12.9	0		24.4
Salminen et al.[99]	2022	120	28	7	4			
Boerlage et al.[21]	2020	7		2				
Huang et al.[53]	2003	49		0.4				
Braghetto et al.[24]	2016	60			3			
Genco et al.[50]	2021	120	24.4	22	17.5			
Navarini et al.[83]	2020			15		17		10
Matar et al.[77]	2020	60	62.5	17.6	5.1			16.6
Csendes et al.[35]	2022	120		5.4	3.2	2.2		6.5
Andrew et al.[12]	2018							4.7
Leslie et al.[67]	2021					1.1		35.3
Mean±SD		72.6±37.9	34.5±20.3	17.2±14.7	7.5±5.9	18.9±20.7		18.6±10.2

PPIs: proton pump inhibitors; GERD: gastroesophageal reflux disease; SD: standard deviation.

due to technical errors[50]. Conversely, Csendes et al. demonstrated a very low rate of symptoms, erosive esophagitis, BE, and HH after 10 years of FU, probably due to a very small gastric pouch (4.46 cm)[3,21-23,25,35,45,50,53,77,99,100,117,123]. Data regarding manometry and pH monitoring are scarce.

The literature on GERD data after OAGB is scarce compared to the extensive reports after SG or RYGB. Most reports are incomplete, confusing, and of poor quality due to incomplete data and inconclusive findings. Reflux symptoms after OAGB vary widely, ranging from 0 to 55%, and PPI use is as high as 51.1%. The incidence of erosive esophagitis ranges from 15 to 70%, with BE incidence reported in only two papers (1–9.5%), indicating unreliable data (Table 4)[8,16,42,46,47,50,58,60,63,68,69,75,82,89,90,92,95,98,103,105,106,108,109,114,117,121].

Deffain et al.[39] conducted a retrospective study on 179 patients regarding GERD after single-anastomosis duodenoileal bypass with sleeve gastrectomy (SADI-S). Four years of FU showed that 33% had GERD and 25% used PPIs postoperatively to control their symptoms, though the method of reporting these findings was not described. Yashkov et al.[124] reported GERD symptoms in 7.5% of patients, Surve et al.[111] in 12.5%, and Admella et al.[4], in a prospective study of 246 patients, noted a progressive increase in GERD after SADI-S, rising from 18.8 to 30.2% over 3 years. These papers did not report on esophagitis, HH, or BE postoperatively[111,124] (Table 5).

Few specific data are available on outcomes after SG plus FP or HH repair (Table 6). These papers focus mainly on the presence or remission of GERD symptoms, with few reporting on esophagitis, BE, or HH post-surgery. The overall quality of evidence is low due to the observational study design, heterogeneity, lack of blinded outcome assessment, short FU periods, and evidence of publication bias. However, the combination of antireflux maneuvers with SG appears to improve preoperative symptoms. The reported rate of GERD symptoms varies depending on the FU period, with BE mentioned in only one paper. Regarding the incidence of BE post N-SG or R-SG, the rate of de novo BE after 2 years is nil, though one paper reported one case of adenocarcinoma after 5 years of FU [5,6,11,13,18,27,29,30,34,65,71,73,79,81,86,87,118,119].

For GERD post-SG with Bipart, 32 papers were reviewed. Only four included data on GERD after the procedure, with one paper reporting a 12% incidence of GERD symptoms. There was no mention of esophagitis, HH, or BE[102,105].

Data regarding esophagitis or BE regression or progression after other antireflux procedures such as Hill gastropexy, use of the ligament of Teres, and sphincter augmentation with the Linx device are not available.

Table 4. Results of the reported incidence of GERD and Barrett´s esophagus after OAGB.

Author	Year	Follow-up (months)	PPI use (%)	Esophagitis A-B-C (%)	Barrett´s esophagus (%)	Hiatal hernia (%)	Cancer (%)	GERD symptoms (%)
Landreneau et al.[63]	2019	36						18.8
Antonopulos et al.[16]	2020	34						60.9
Sargsyan et al.[103]	2024							47.8
Felsenreich et al.[43,47]	2022 2023	48 60		28.3 33.3	9.5 11.1	0 0		28.3
Esparham et al.[42]	2023			15	1			6
Kermansaravi et al.[60]	2020			19.3		29.2		
Nehmeh et al.[84]	2021			11.6	4.6			
Davarpanah et al.[38]	2023							0–55
Genco et al.[50]	2021		27.1					52.1
Soprani et al.[109]	2020	60		74				
Szymański et al.[114]	2022	24		48	8			6
Sohrabi et al.[108]	2020	60		10.6		6.6		
Slagter et al.[106]	2021	36		3	2			57
Shenouda et al.[105]	2018	6		45				55
Salama and Hassan[98]	2017	12		4				
Robert et al.[95]	2019	24		10.1	1.7			7.7
Plamper et al.[90]	2023	25		8.3				
Pizza et al.[89]	2020	24	5.7	2.9				5
Mustafa et al.[82]	2020	24		8.5	0.5			13.5
Mahdy et al.[75]	2023	12		11				10.8
Katayama et al.[58]	2021	6		70				
Mean±SD		27.36±17.01	16.40±15.13	23.70±22.79	4.80±4.18	7.90±15.98		28.38±22.59

PPIs: proton pump inhibitors; GERD: gastroesophageal reflux disease; SD: standard deviation.

Table 5. Reported results of GERD after SADI´s procedures.

Author	Year	Follow-up (months)	PPI use (%)	GERD symptoms (%)	Barrett´s esophagus (%)	Hiatal hernia (%)
Deffain et al.[39]	2024	48	25	33	NR	NR
Yashkov et al.[124]	2021	60		7.5	NR	NR
Surve et al.[111]	2020	9		12.5	NR	NR
Admella et al.[4]	2023	36		30.2	NR	NR
Mean±SD		38.25±21.82		20.8±12.67		

PPIs: proton pump inhibitors; GERD: gastroesophageal reflux disease; SD: standard deviation; NR: not reported.

Table 6. Summary of reported data regarding GERD and Barrett´s esophagus after sleeve gastrectomy combined with anti-reflux procedures.

Surgery	Years	Follow-up (months)	GERD postop (%)	*de novo* GERD (%)	Esophagitis (%)	Hiatal hernia (%)	Barrett´s esophagus (%)
SG+HH repair[18,30,73,81]	2013 2024	12–48	20.4±17.5	12–30.6	30.2–55	11–55	1.1
SG+FP[29,65,79,88,118] Nissen SG[11,27] Rossetti SG[86,87,119] Toupet SG[118] DOR SG[70] Posterior[18] Dor-SG-Bipart[126]	2017 2022	22–60	5±8.1 4.8 1.6 6% 4.1±5.8 13.6% 15%	11–13.6	2–20	NR	0 0

GERD: gastroesophageal reflux disease; SG: sleeve gastrectomy; HH: hiatal hernia; FP: fundoplication; Bipart: bipartition; DOR: Dor fundoplication.

DISCUSSION

This study focused on BE development after bariatric procedures, as GERD symptoms, esophagitis, and other GERD-related issues have been sufficiently analyzed previously. A key observation is the lack of updated information on less common bariatric surgeries regarding BE. There is significant variability in the focus of published papers: some discuss results in terms of symptoms but do not detail the specific characteristics of patient evaluations. Most current studies are conducted on SG, followed by RYGB. Data on OAGB are scarce because it is relatively newer, and no long-term studies have been reported. The situation is worse for SADI-S or SG combined with anti-reflux procedures, as the literature is insufficient to analyze the rate of BE development.

It has been shown that BE development is associated with obesity, making it reasonable to suggest that bariatric surgery would protect against its development. The reduced risk of BE diagnosis in bariatric surgery patients could potentially be attributed to improvements in metabolic factors such as weight and body mass index (BMI). While weight loss is likely the primary driver of BE risk reduction, other mechanisms may also be at play, including mechanical, anatomic, and hormonal changes. The current data on de novo BE may not be very accurate due to many factors, such as missing anatomic and pathophysiologic considerations that play a role in BE development or improvement after different bariatric procedures, and mainly due to unsuitable FU.

Reflux may be assessed both subjectively (clinical symptoms) and objectively (upper endoscopy, monitoring, esophageal manometry, and histologic findings in biopsy). However, these parameters are missing in most studies, making the results of this meta-analysis heterogeneous. Few papers provide complete postoperative evaluations. Additionally, many studies have short and incomplete FUs, which are insufficient for the correct diagnosis of BE. BE results from chronic acid and bile reflux over more than 5–10 years of reflux disease evolution.

Despite the lack of periodic endoscopic or histological evaluations throughout the FU, we must consider the current reported data on the postoperative incidence of BE after bariatric procedures.

The mechanisms involved in the development of GERD and BE after SG are well described in the literature, supporting the high incidence of BE, as confirmed in this review. This is very similar to the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) report in 2018 which is as high as 4.6–6% within 5 years after surgery[24,26,37,41,43,44,49,62,78,104,110,113,115,125]. This finding is concerning, as the risk of BE in the general population is only 1–2%. If the estimates from current and other studies are correct, performing LSG could create a true "at-risk" population, with up to a six-fold higher risk of BE development[106]. Conversely, two papers reported no significant difference in BE risk between SG and RYGB cohorts (36% versus 5%; OR (odds ratio)=5.73; 95%CI (confidence interval) 5–5.11) and even suggested that bariatric surgery might protect against BE[5,6]. However, this study had many biases and limitations[23].

In two European studies, a 5-year FU showed that 17–19% of patients who underwent SG developed de novo BE[50,61]. The Swiss Multicenter Bypass or Sleeve Study (SM-BOSS) randomized clinical trial indicated that gastric reflux worsened more often after SG (31.8%) than after RYGB (6.3%)[88]. BE after RYGB has been established as the procedure of choice for patients with GERD due to its protective action against disease progression. Interestingly, some recent studies have also found that RYGB may be associated with BE, dysplasia, and EAC development at variable periods following surgery[49,108,109]. Although gastric refluxate after RYGB is less acidic, it might still prove harmful to the esophagus, warranting further study[25,35].

Many authors have demonstrated BE regression after RYGB, a parameter not included in Table 3. According to Gorodner et al.[52], laparoscopic RYGB (LRYGB) is a suitable treatment for obese patients with BE, demonstrated by a 36% regression rate of this premalignant disease. Although BE persisted in the remaining patients, no progression to dysplasia was observed. More patients and longer FUs are needed for definitive conclusions. In a review including 28 articles, no cases of BE progression were reported. Postoperative BE regression rates varied from 36 to 62%. Another meta-analysis showed GERD resolution in 74.2% of the LRYGB group versus 28.0% in the LSG group. Based on our results, we recommend LRYGB for patients with severe reflux symptoms[20,52,70].

Regarding BE after OAGB, the rates of esophagitis and BE were 15 and 1–6%, respectively. Many studies did not specify how they diagnosed GERD, with some relying solely on clinical symptoms or upper endoscopy, and fewer evaluating manometry or pH monitoring. These few papers demonstrated acidic reflux in few patients, with bile reflux noted during endoscopy. Transformation from reflux esophagitis to Barrett's metaplasia, likely caused by bile reflux after OAGB, has been reported[42,64].

Although OAGB can theoretically induce chronic biliary reflux, the incidence of biliary reflux and cancer risk has not been prospectively evaluated. Gastroesophageal reflux is a clear cause of BE metaplasia and adenocarcinoma of the esophagogastric junction (AEG). Although rare, five gastric cancers and two cases of AEG have been published. Clarification of this issue is urgently needed[28,38,40,46,47,57,60,66,92,96,97,107,116,126,127]. Unfortunately, our review confirmed the lack of long-term studies on de novo BE appearance or regression.

Regarding the SADI-S procedures reported by Deffain et al.[39], Admella et al.[4], Yashkov et al.[124], and Surve et al.[111], involving more than 500 patients, only GERD symptoms were reported. None of these studies provided objective mention of esophagitis, HH, or BE, nor did they include manometry or pH monitoring.

Studies have shown that SG with concomitant FP and HH repair is effective for reflux resolution and should be considered as an alternative to conventional SG in patients with obesity and HH and/or GERD. High-resolution impedance manometry (HRiM) showed increased lower esophageal sphincter (LES) function, and multichannel intraluminal impedance-pH (MII-pH) showed excellent control of both acid exposure and reflux events.

For patients unwilling or unable to undergo RYGB, SG may offer a safe and effective option to avoid BE development, even for those with pre-existing BE. However, NSG remains under evaluation. Aiolfi et al.[6] estimated an 11% postoperative GERD prevalence, and Castagneto-Gissey et al.[30] reported a 5% postoperative GERD rate. Further studies with extended FU and direct comparisons to conventional SG are warranted[40,65].

However, definitive and complete evaluations after long-term FU are missing.

Santoro et al.[102] and Zhao et al.[126] presented SG with transit bipartition (TB) as a surgical alternative effective in weight loss and GERD remission. SG+TB is potent for treating

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metabolic syndrome and obesity, addressing both obesity and GERD without mechanical restriction and significant malabsorption[101,102,126]. An experimental study showed that the TB procedure might protect the distal esophagus from histological changes associated with esophagitis, although clinical studies are needed to confirm these anti-reflux effects[122].

Regarding cancer appearance after bariatric surgery, the incidence of esophageal cancer has not been well determined in large longitudinal cohort studies. Current evidence is limited, showing no difference in incidence between bariatric surgery patients and non-surgical obese patients[20,57]. Lazzati et al.[66] reported a significant reduction in esophageal and gastric cancer incidence following bariatric surgery in a nationwide cohort. However, their multivariate analysis showed no significant difference between SG and RYGB regarding cancer incidence (hazard ratio [HR]=1.6, 95%CI 0.9–2.7, p=0.09 for SG versus RYGB). Conversely, other authors suggest that SG may increase the risk of BE development (0.02%) due to mechanisms that increase clinical GERD and progression to BE and potentially adenocarcinoma. Conversely, RYGB appears to be protective against disease progression to neoplastic BE during endoscopic surveillance (0.003%). Although acid/bile reflux decreases after RYGB, disease progression has still been observed, warranting continued endoscopic surveillance. The effect of RYGB on the development or progression of BE or EAC remains unclear[8,16,55,56,63,74,85,91,98].

A significant limitation of this article is the consequence of the relatively low quality of the available literature on this topic. This is due to the low rate of BE detection before bariatric surgery and the lack of routine endoscopic screening before and after bariatric surgery in most studies. Additionally, there is often a lack of adherence to protocols such as the Prague classification or Seattle protocols for biopsies, small patient numbers, considerable heterogeneity, non-prospective studies, and short-term FUs. These factors introduce biases that could confound the results. Furthermore, inter-observer variation in the diagnosis of BE across the included studies may lead to observer bias. The postoperative use of PPIs, although clearly mentioned in many reports, could also potentially confound the results of the various meta-analyses.

The strengths of this investigation include an extensive data search encompassing reviews, meta-analyses, cohort series, and prospective studies. This critical analysis of the obtained data determines the current results, identifies deficiencies in the consulted articles, and highlights the need for prospective studies with comprehensive objective evaluations of patients. The IFSO supports further high-quality studies in this field, mainly prospective and/or population-based studies, to elucidate the exact magnitude of the issue and provide further guidance to the community as necessary. Researchers should particularly focus on identifying potentially confounding factors when assessing the impact of certain procedures on the development and/or progression of BE[49].

CONCLUSIONS

Current evidence suggests that the incidence of BE is higher following LSG compared to the general population. This review provides compelling evidence that LSG may indeed lead to an increased risk of BE. Numerous studies suggest that RYGB protects against BE. To fully understand the effect of bariatric surgery on BE, other bariatric procedures must be extensively evaluated with well-controlled prospective studies with long-term FU.

AUTHORS' CONTRIBUTIONS

Braghetto I: Conceptualization, Investigation, Methodology, Data analysis, Writing—original draft, Literature review. Carreño B: Conceptualization, Investigation, Methodology, Data analysis, Writing—original draft, Literature review. Hermosilla R: Conceptualization, Investigation, Methodology, Data analysis, Writing—original draft, Literature review. Zanabria R: Conceptualization, Investigation, Methodology, Data analysis, Writing—original draft, Literature review.

DATA AVAILABILITY STATEMENT

The Informations regarding the investigation, methodology and data analysis of the article are archived under the responsibility of the authors.

REFERENCES

1. Aarts EO, Mahawar K. From the knife to the endoscope-a history of bariatric surgery. Curr Obes Rep. 2020;9(3):348-63. https://doi.org/10.1007/s13679-020-00382-1
2. Abdulkhaleq MM, Alshugaig RS, Farhan DA, Balubaid IT, Alkhaldi RA, Shoaib FM, et al. Prevalence and associated factors of gastroesophageal reflux disease after laparoscopic sleeve gastrectomy. Cureus. 2024;16(4):e57921. https://doi.org/10.7759/cureus.57921
3. Adil MT, Al-Taan O, Rashid F, Munasinghe A, Jain V, Whitelaw D, et al. A systematic review and meta-analysis of the effect of Roux-en-Y gastric bypass on Barrett's esophagus. Obes Surg. 2019;29(11):3712-21. https://doi.org/10.1007/s11695-019-04083-0
4. Admella V, Lazzara C, Sobrino L, Acrich E, Biondo S, Pujol-Gebellí J, et al. Patient-Reported Outcomes and Quality of Life After Single-Anastomosis Duodeno-ileal Bypass with Sleeve Gastrectomy (SADI-S): a cross-sectional study with 283 patients from a single institution. Obes Surg. 2023;33(6):1754-63. https://doi.org/10.1007/s11695-023-06554-x
5. Aili A, Maimaitiming M, Maimaitiyusufu P, Tusuntuoheti Y, Li X, Cui J, et al. Gastroesophageal reflux related changes after sleeve gastrectomy and sleeve gastrectomy with fundoplication: A retrospective single center study. Front Endocrinol (Lausanne). 2022;13:1041889. https://doi.org/10.3389/fendo.2022.1041889
6. Aiolfi A, Micheletto G, Marin J, Rausa E, Bonitta G, Bona D. Laparoscopic sleeve-fundoplication for morbidly obese patients with gastroesophageal reflux: systematic review and meta-analysis. Obes Surg. 2021;31:1714-21. https://doi.org/10.1007/s11695-020-05189-6
7. Al Sabah S, AlWazzan A, AlGhanim K, AlAbdulrazzaq HA, Al Haddad E. Does laparoscopic sleeve gastrectomy lead to Barrett's esophagus, 5-year esophagogastroduodenoscopy findings: A retrospective cohort study. Ann Med Surg (Lond). 2021;62:446-9. https://doi.org/10.1016/j.amsu.2021.01.096
8. Alaber O, Mansoor E, Perez LKM, Dumot J, Bhatt A, Chak A. High grade dysplasia or esophageal adenocarcinoma in patients with a history of Roux-en-Y gastric bypass surgery: a case series. Endoscopy. 2021;53(2):147-51. https://doi.org/10.1055/a-1203-5832

9. Alexandrou A, Athanasiou A, Michalinos A, Felekouras E, Tsigris C, Diamantis T. Laparoscopic sleeve gastrectomy for morbid obesity: 5-year results. Am J Surg. 2015;209(2):230-4. https://doi.org/10.1016/j.amjsurg.2014.04.006
10. Almutairi BF, Aldulami AB, Yamani NM. Gastroesophageal reflux disease and hiatal hernia after laparoscopic sleeve gastrectomy: a retrospective cohort study. Cureus. 2022;14(3):e23024. https://doi.org/10.7759/cureus.23024
11. Amor IB, Casanova V, Vanbiervliet G, Bereder JM, Habitan R, Kassir R, et al. The Nissen-Sleeve (N-Sleeve): results of a cohort study. Obes Surg. 2020;30(9):3267-72. https://doi.org/10.1007/s11695-020-04469-5
12. Andrew B, Alley JB, Aguilar CE, Fanelli RD. Barrett's esophagus before and after Roux-en-Y gastric bypass for severe obesity. Surg Endosc. 2018;32(2):930-6. https://doi.org/10.1007/s00464-017-5768-6
13. Angrisani L, Santonicola A, Borrelli V, Iovino P. Sleeve gastrectomy with concomitant hiatal hernia repair in obese patients: long-term results on gastroesophageal reflux disease. Surg Obes Relat Dis. 2020;16(9):1171-7. https://doi.org/10.1016/j.soard.2020.04.049
14. Angrisani L, Santonicola A, Hasani A, Nosso G, Capaldo B, Iovino P. Five-year results of laparoscopic sleeve gastrectomy: effects on gastroesophageal reflux disease symptoms and co-morbidities. Surg Obes Relat Dis. 2016;12(5):960-8. https://doi.org/10.1016/j.soard.2015.09.014
15. Angrisani L, Santonicola A, Iovino P, Palma R, Kow L, Prager G, et al. IFSO Worldwide Survey 2020-2021: current trends for bariatric and metabolic procedures. Obes Surg. 2024;34(4):1075-85. https://doi.org/10.1007/s11695-024-07118-3
16. Antonopulos C, Rebibo L, Calabrese D, Coupaye M, Ledoux S, Msika S. Conversion of one anastomosis gastric bypass to Roux-en-Y gastric bypass: results of a retrospective multicenter study. Obes Surg. 2022;32(6):1842-8. https://doi.org/10.1007/s11695-022-05963-8
17. Arman GA, Himpens J, Dhaenens J, Ballet T, Vilallonga R, Leman G. Long-term (11+years) outcomes in weight, patient satisfaction, comorbidities, and gastroesophageal reflux treatment after laparoscopic sleeve gastrectomy. Surg Obes Relat Dis. 2016;12(10):1778-86. https://doi.org/10.1016/j.soard.2016.01.013
18. Bège T, Lasbleiz A, Boullu S, Gaborit B, Berdah SV, Dutour A, et al. Two-year results of sleeve gastrectomy combined with posterior fundoplication for obesity patients with gastroesophageal reflux disease. Obes Surg. 2024;34(7):2508-14. https://doi.org/10.1007/s11695-024-07299-x
19. Benvenga R, Roussel J, Cohen R, Bouchoucha M, Bendacha Y, Catheline JM. Long-term endoscopic follow-up after sleeve gastrectomy. J Visc Surg. 2022;159(1):39-42. https://doi.org/10.1016/j.jviscsurg.2020.11.003
20. Bevilacqua LA, Obeid NR, Yang J, Zhu C, Altieri MS, Spaniolas K, et al. Incidence of GERD, esophagitis, Barrett's esophagus, and esophageal adenocarcinoma after bariatric surgery. Surg Obes Relat Dis. 2020;16(11):1828-36. https://doi.org/10.1016/j.soard.2020.06.016
21. Boerlage TCC, Wolvers PJD, Bruin SC, Huibregtse IL, Voermans RP, Fockens P, et al. Upper endoscopy after Roux-en-Y gastric bypass: diagnostic yield and factors associated with relevant findings. Surg Obes Relat Dis. 2020;16(7):868-76. https://doi.org/10.1016/j.soard.2020.03.001
22. Borbély Y, Kröll D, Nett PC, Moreno P, Tutuian R, Lenglinger J. Radiologic, endoscopic, and functional patterns in patients with symptomatic gastroesophageal reflux disease after Roux-en-Y gastric bypass. Surg Obes Relat Dis. 2018;14(6):764-8. https://doi.org/10.1016/j.soard.2018.02.028
23. Braghetto I, Csendes A. Prevalence of Barrett's esophagus in bariatric patients undergoing sleeve gastrectomy. Obes Surg. 2016;26(4):710-4. https://doi.org/10.1007/s11695-015-1574-1
24. Braghetto I, Korn O, Gutiérrez L, Torrealba A, Rojas J. Gastroesophageal symptoms after laparoscopic gastric bypass: mistakes in performing the procedure? Arq Bras Cir Dig. 2022;35:e1657. https://doi.org/10.1590/0102-672020210002e1657
25. Braghetto I, Korn O. Late esophagogastric anatomic and functional changes after sleeve gastrectomy and its clinical consequences with regards to gastroesophageal reflux disease. Dis Esophagus. 2019;32(6):doz020. https://doi.org/10.1093/dote/doz020
26. Braghetto I. Comment on: Bariatric surgery protects against Barrett's esophagus and esophageal adenocarcinoma: a national database study. Surg Obes Relat Dis. 2024;20(1):45-6. https://doi.org/10.1016/j.soard.2023.09.015
27. Brinas P, Joumaa S, Currie A, Boixière M, Valat JC, Nedelcu M, et al. Efficacy of nissen sleeve gastrectomy on mid-term Barrett's esophagus regression. Obes Surg. 2024;34(2):382-8. https://doi.org/10.1007/s11695-023-07034-y
28. Bruzzi M, Chevallier JM, Czernichow S. One-anastomosis gastric bypass: why biliary reflux remains controversial? Obes Surg. 2017;27(2):545-7. https://doi.org/10.1007/s11695-016-2480-x
29. Carandina S, Zulian V, Nedelcu A, Danan M, Vilallonga R, Nocca D, et al. Is it safe to combine a fundoplication to sleeve gastrectomy? Review of literature. Medicina (Kaunas). 2021;57(4):392.https://doi.org/10.3390/medicina57040392
30. Castagneto-Gissey L, Russo MF, D'Andrea V, Genco A, Casella G. Efficacy of sleeve gastrectomy with concomitant hiatal hernia repair versus sleeve-fundoplication on gastroesophageal reflux disease resolution: systematic review and meta-analysis. J Clin Med. 2023;12(9):3323. https://doi.org/10.3390/jcm12093323
31. Catheline JM, Fysekidis M, Bachner I, Bihan H, Kassem A, Dbouk R, et al. Five-year results of sleeve gastrectomy. J Visc Surg. 2013;150(5):307-12. https://doi.org/10.1016/j.jviscsurg.2013.08.008
32. Chen W, Feng J, Wang C, Wang Y, Yang W, Dong Z, et al. Effect of concomitant laparoscopic sleeve gastrectomy and hiatal hernia repair on gastroesophageal reflux disease in patients with obesity: a systematic review and meta-analysis. Obes Surg. 2021;31(9):3905-18. https://doi.org/10.1007/s11695-021-05545-0
33. Concon Filho A, Damous SHB, Otoch JP, Coronado MB, Zotarelli Filho IJ, Galvão Neto MP, et al. Retrospective longitudinal and comparative observational study between gastric bypass surgery and sleeve gastrectomy: 5-year postoperative follow-up. Arq Bras Cir Dig. 2025;38:e1885. https://doi.org/10.1590/0102-672020250000016e1885
34. Corrêa EL, Cotian LFP, Lourenço JW, Lopes CM, Carvalho DR, Strobel R, et al. Overview of the last 71 years of metabolic and bariatric surgery: content analysis and meta-analysis to investigate the topic and scientific evolution. Obes Surg. 2024;34(5):1885-908. https://doi.org/10.1007/s11695-024-07165-w

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35. Csendes A, L Gaete D, M Carreño B, Panza B. Clinical endoscopic and histologic findings of a long-term follow-up (10.7 years) after Roux-en-Y laparoscopic gastric bypass: a prospective study. Obes Surg. 2022;32(9):2930-7. https://doi.org/10.1007/s11695-022-06172-z
36. Csendes A, Orellana O, Martínez G, Burgos AM, Figueroa M, Lanzarini E. Clinical, endoscopic, and histologic findings at the distal esophagus and stomach before and late (10.5 years) after laparoscopic sleeve gastrectomy: results of a prospective study with 93% follow-up. Obes Surg. 2019;29(12):3809-17. https://doi.org/10.1007/s11695-019-04054-5
37. Csendes A, Smok G, Burgos AM, Canobra M. Prospective sequential endoscopic and histologic studies of the gastric pouch in 130 morbidly obese patients submitted to Roux-en-Y gastric bypass. Arq Bras Cir Dig. 2012;25(4):245-9. https://doi.org/10.1590/s0102-67202012000400007
38. Davarpanah Jazi AH, Shahabi S, Sheikhbahaei E, Tolone S, Skalli ME, Kabir A, et al. A systematic review and meta-analysis on GERD after OAGB: rate, treatments, and success. Expert Rev Gastroenterol Hepatol. 2023;17(12):1321-32. https://doi.org/10.1080/17474124.2023.2296992
39. Deffain A, Denis R, Pescarus R, Garneau PY, Atlas H, Studer AS. Single anastomosis duodeno-ileal bypass (SADI-S) as primary or two-stage surgery: mid-term outcomes of a single canadian bariatric center. Obes Surg. 2024;34(4):1207-16. https://doi.org/10.1007/s11695-024-07095-7
40. Del Genio G, Tolone S, Gambardella C, Brusciano L, Volpe ML, Gualtieri G. Sleeve gastrectomy and anterior fundoplication (D-SLEEVE) prevents gastroesophageal reflux in symptomatic GERD. Obes Surg. 2020;30(5):1642-52. https://doi.org/10.1007/s11695-020-04427-1
41. Dimbezel V, Nedelcu A, Danan M, Carandina S, Collet D, Gronnier C, et al. Endoscopic findings 5 years following sleeve gastrectomy. Obes Surg. 2020;30(10):3847-51. https://doi.org/10.1007/s11695-020-04757-0
42. Esparham A, Ahmadyar S, Zandbaf T, Dalili A, Rezapanah A, Rutledge R, et al. Does one-anastomosis gastric bypass expose patients to gastroesophageal reflux: a systematic review and meta-analysis. Obes Surg. 2023;33(12):4080-102. https://doi.org/10.1007/s11695-023-06866-y
43. Felsenreich DM, Artemiou E, Wintersteller L, Jedamzik J, Eichelter J, Gensthaler L, et al. Fifteen years after sleeve gastrectomy: gastroscopies, manometries, and 24-h pH-Metries in a long-term follow-up: a multicenter study. Obes Facts. 2022;15(5):666-73. https://doi.org/10.1159/000526170
44. Felsenreich DM, Kefurt R, Schermann M, Beckerhinn P, Kristo I, Krebs M, et al. Reflux, sleeve dilation, and barrett's esophagus after laparoscopic sleeve gastrectomy: long-term follow-up. Obes Surg. 2017;27(12):3092-101. https://doi.org/10.1007/s11695-017-2748-9
45. Felsenreich DM, Langer FB, Bichler C, Eilenberg M, Jedamzik J, Kristo I, et al. Roux-en-Y gastric bypass as a treatment for Barrett's esophagus after sleeve gastrectomy. Obes Surg. 2020;30(4):1273-9. https://doi.org/10.1007/s11695-019-04292-7
46. Felsenreich DM, Steinlechner K, Langer FB, Vock N, Eichelter J, Bichler C, et al. Outcome of sleeve gastrectomy converted to Roux-en-Y gastric bypass and one-anastomosis gastric bypass. Obes Surg. 2022;32(3):643-51. https://doi.org/10.1007/s11695-021-05866-0
47. Felsenreich DM, Zach ML, Vock N, Jedamzik J, Eichelter J, Mairinger M, et al. Esophageal function and non-acid reflux evaluated by impedance-24 h-pH-metry, high-resolution manometry, and gastroscopy after one-anastomosis gastric bypass-outcomes of a prospective mid-term study. Surg Endosc. 2023;37(5):3832-41. https://doi.org/10.1007/s00464-022-09857-9
48. Ferrer JV, Acosta A, García-Alementa EM, García AT, Del Castillo D, Espelta MV, et al. High rate of de novo esophagitis 5 years after sleeve gastrectomy: a prospective multicenter study in Spain. Surg Obes Relat Dis. 2022;18(4):546-54. https://doi.org/10.1016/j.soard.2021.11.011
49. Fisher OM, Chan DL, Talbot ML, Ramos A, Bashir A, Herrera MF, et al. Barrett's Oesophagus and Bariatric/Metabolic Surgery-IFSO 2020 Position Statement. Obes Surg. 2021;31(3):915-34. https://doi.org/10.1007/s11695-020-05143-6
50. Genco A, Castagneto-Gissey L, Gualtieri L, Lucchese M, Leuratti L, Soricelli E, et al. GORD and Barrett's oesophagus after bariatric procedures: multicentre prospective study. Br J Surg. 2021;108(12):1498-505. https://doi.org/10.1093/bjs/znab330
51. Genco A, Castagneto-Gissey L, Lorenzo M, Ernesti I, Soricelli E, Casella G. Esophageal adenocarcinoma after sleeve gastrectomy: actual or potential threat? Italian series and literature review. Surg Obes Relat Dis. 2021;17(5):848-54. https://doi.org/10.1016/j.soard.2020.11.023
52. Gorodner V, Buxhoeveden R, Clemente G, Sánchez C, Caro L, Grigaites A. Barrett's esophagus after Roux-en-Y gastric bypass: does regression occur? Surg Endosc. 2017;31(4):1849-54. https://doi.org/10.1007/s00464-016-5184-3
53. Huang CS, Forse RA, Jacobson BC, Farraye FA. Endoscopic findings and their clinical correlations in patients with symptoms after gastric bypass surgery. Gastrointest Endosc. 2003;58(6):859-66. https://doi.org/10.1016/s0016-5107(03)02310-1
54. Hurtado A, Chandar AK, Perez JA, Casselberry R, Martin SA, DeLano K, et al. Reduced risk of de novo Barrett esophagus after bariatric surgery: a national database study. Surg Obes Relat Dis. 2024;20(1):40-5. https://doi.org/10.1016/j.soard.2023.08.009
55. Jaruvongvanich V, Matar R, Ravi K, Murad MH, Vantanasiri K, Wongjarupong N, et al. Esophageal pathophysiologic changes and adenocarcinoma after bariatric surgery: a systematic review and meta-analysis. Clin Transl Gastroenterol. 2020;11(8):e00225. https://doi.org/10.14309/ctg.0000000000000225
56. Jaruvongvanich V, Osman K, Matar R, Baroud S, Hanada Y, Chesta FNU, et al. Impact of bariatric surgery on surveillance and treatment outcomes of Barrett's esophagus: A stage-matched cohort study. Surg Obes Relat Dis. 2021;17(8):1457-64. https://doi.org/10.1016/j.soard.2021.04.018
57. Kassab P, Ferraz ÁAB, Mitidieri ACH, Berti LV, Santo MA, Szego T, et al. The growing evidence of the relationship between obesity and cancer and the role of bariatric surgery. Arq Bras Cir Dig. 2024;37:e1838. https://doi.org/10.1590/0102-6720202400044e1838
58. Katayama RC, Arasaki CH, Herbella FAM, Neto RA, Lopes Filho GJ. One-anastomosis and Roux-en-Y gastric bypass promote similar weight loss, patient satisfaction, quality of life, inflammation grade, and cellular damage in the esophagus and gastric pouch in a short-term follow-up. J Obes Metab Syndr. 2021;30(4):396-402. https://doi.org/10.7570/jomes21040

59. Kermansaravi M, Amr B, Kabir A, Zare A, Tabaeian SP, Eghbali F, et al. Endoscopic evaluation of De Novo esophagitis and Barrett's Esophagus, 5 years after sleeve gastrectomy. Obes Surg. 2023;33(1):256-62. https://doi.org/10.1007/s11695-022-06403-3
60. Kermansaravi M, Kabir A, Mousavimaleki A, Pazouki A. Association between hiatal hernia and gastroesophageal reflux symptoms after one-anastomosis/mini gastric bypass. Surg Obes Relat Dis. 2020;16(7):863-7. https://doi.org/10.1016/j.soard.2020.03.011
61. Kular KS, Manchanda N, Rutledge R. A 6-year experience with 1,054 mini-gastric bypasses-first study from Indian subcontinent. Obes Surg. 2014;24(9):1430-5. https://doi.org/10.1007/s11695-014-1220-3
62. Lallemand L, Duchalais E, Musquer N, Jacobi D, Coron E, des Varannes SB, et al. Does sleeve gastrectomy increase the risk of Barret's esophagus? Obes Surg. 2021;31(1):101-10. https://doi.org/10.1007/s11695-020-04875-9
63. Landreneau JP, Barajas-Gamboa JS, Strong AT, Corcelles R, Kroh MD. Conversion of one-anastomosis gastric bypass to Roux-en-Y gastric bypass: short-term results from a tertiary referral center. Surg Obes Relat Dis. 2019;15(11):1896-902. https://doi.org/10.1016/j.soard.2019.09.059
64. Lange UG, Moulla Y, Mehdorn M, Tuennemann J, Zabel-Langhennig A, Ouaid A, et al. Laparoscopic conversion of omega loop gastric bypass to Roux-en-Y gastric bypass for Barrett's esophagus: case report. BMC Surg. 2022;22(1):273. https://doi.org/10.1186/s12893-022-01695-9
65. Lasnibat JP, Braghetto I, Gutierrez L, Sanchez F. Sleeve gastrectomy and fundoplication as a single procedure in patients with obesity and gastroesophageal reflux. Arq Bras Cir Dig. 2017;30(3):216-21. https://doi.org/10.1590/0102-6720201700030012
66. Lazzati A, Poghosyan T, Touati M, Collet D, Gronnier C. Risk of esophageal and gastric cancer after bariatric surgery. JAMA Surg. 2023;158(3):264-71. https://doi.org/10.1001/jamasurg.2022.6998
67. Leslie D, Wise E, Sheka A, Abdelwahab H, Irey R, Benner A, et al. Gastroesophageal reflux disease outcomes after vertical sleeve gastrectomy and gastric bypass. Ann Surg. 2021;274(4):646-53. https://doi.org/10.1097/SLA.0000000000005061
68. Level L, Rojas A, Piñango S, Avariano Y. One anastomosis gastric bypass vs. Roux-en-Y gastric bypass: a 5-year follow-up prospective randomized trial. Langenbecks Arch Surg. 2021;406(1):171-9. https://doi.org/10.1007/s00423-020-01949-1
69. Li J, Lai D, Wu D. Laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy to treat morbid obesity-related comorbidities: a systematic review and meta-analysis. Obes Surg. 2016;26(2):429-42. https://doi.org/10.1007/s11695-015-1996-9
70. Li R, Eskander W, Teixeira AF, Zorron R. Sleeve-Dor Fundoplication - an innovative surgical technique to avoid the epidemic long term de Novo gastroesophageal reflux and Barrett's esophagus after sleeve gastrectomy for obesity. Surg Innov. 2023;30(4):526-8. https://doi.org/10.1177/15533506221139967
71. Liagre A, Martini F, Kassir R, Juglard G, Hamid C, Boudrie H, et al. Is one anastomosis gastric bypass with a biliopancreatic limb of 150 cm effective in the treatment of people with severe obesity with BMI > 50? Obes Surg. 2021;31(9):3966-74. https://doi.org/10.1007/s11695-021-05499-3
72. Lim CH, Lee PC, Lim E, Tan J, Chan WH, Tan HC, et al. Correlation between symptomatic gastro-esophageal reflux disease (GERD) and erosive esophagitis (EE) post-vertical sleeve gastrectomy (VSG). Obes Surg. 2019;29(1):207-14. https://doi.org/10.1007/s11695-018-3509-0
73. Loo JH, Chue KM, Lim CH, Toh BC, Kariyawasam GMD, Ong LWL, et al. Effectiveness of sleeve gastrectomy plus fundoplication versus sleeve gastrectomy alone for treatment of patients with severe obesity: a systematic review and meta-analysis. Surg Obes Relat Dis. 2024;20(6):532-43. https://doi.org/10.1016/j.soard.2023.12.007
74. Luna Aufroy A, Rebasa Cladera P, Montmany Vioque S. Barrett's esophagus and esophageal cancer after sleeve gastrectomy. Myth or reality? Cir Esp (Engl Ed). 2023;101(Suppl. 4):S39-S42. https://doi.org/10.1016/j.cireng.2023.02.015
75. Mahdy T, Gado W, Alwahidi A, Schou C, Emile SH. Sleeve gastrectomy, one-anastomosis gastric bypass (OAGB), and single anastomosis sleeve ileal (SASI) bypass in treatment of morbid obesity: a retrospective cohort study. Obes Surg. 2021;31(4):1579-89. https://doi.org/10.1007/s11695-020-05159-y
76. Masood M, Low D, Deal SB, Kozarek RA. Gastroesophageal reflux disease in obesity: bariatric surgery as both the cause and the cure in the morbidly obese population. J Clin Med. 2023;12(17):5543. https://doi.org/10.3390/jcm12175543
77. Matar R, Maselli D, Vargas E, Veeravich J, Bazerbachi F, Beran A, et al. Esophagitis after bariatric surgery: large cross-sectional assessment of an endoscopic database. Obes Surg. 2020;30(1):161-8. https://doi.org/10.1007/s11695-019-04164-0
78. Migaczewski M, Czerwińska A, Rubinkiewicz M, Zarzycki P, Pisarska M, Rymarowicz J, et al. The prevalence of, and risk factors for, Barrett's oesophagus after sleeve gastrectomy. Wideochir Inne Tech Maloinwazyjne. 2021;16(4):710-4. https://doi.org/10.5114/wiitm.2021.107776
79. Moon RC, Teixeira AF, Jawad MA. Safety and effectiveness of anterior fundoplication sleeve gastrectomy in patients with severe reflux. Surg Obes Relat Dis. 2017;13(4):547-52. https://doi.org/10.1016/j.soard.2016.10.008
80. Moulla Y, Hamadeh H, Seidemann L, Mehdorn M, Blüher M, Feisthammel J, et al. Barrett's esophagus in bariatric surgery: regression or progression? Obes Surg. 2023;33(11):3391-401. https://doi.org/10.1007/s11695-023-06829-3
81. Mu SZ, Saber AA. Gastroesophageal reflux disease and weight loss after fundoplication sleeve gastrectomy: a systematic review and meta-analysis. Obes Surg. 2024;34(2):318-29. https://doi.org/10.1007/s11695-023-06927-2
82. Mustafa A, Rizkallah NNH, Samuel N, Balupuri S. Laparoscopic Roux-En-Y gastric bypass versus one anastomosis (loop) gastric bypass for obesity: A prospective comparative study of weight loss and complications. Ann Med Surg. 2020;55:143-7. https://doi.org/10.1016/j.amsu.2020.04.040
83. Navarini D, Madalosso CAS, Tognon AP, Fornari F, Barão FR, Gurski RR. Predictive factors of gastroesophageal reflux disease in bariatric surgery: a controlled trial comparing sleeve gastrectomy with gastric bypass. Obes Surg. 2020;30(4):1360-7. https://doi.org/10.1007/s11695-019-04286-5

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84. Nehmeh WA, Baratte C, Rives-Lange C, Martineau C, Boullenois H, Krivan S, et al. Acid reflux is common in patients with gastroesophageal reflux disease after one-anastomosis gastric bypass. Obes Surg. 2021;31(11):4717-23. https://doi.org/10.1007/s11695-021-05542-3
85. Nobel T, Sewell M, Boerner T, Bains MS, Bott MJ, Gerdes H, et al. Treatment of esophageal adenocarcinoma in patients with a history of bariatric surgery. J Gastrointest Surg. 2024;28(4):337-42. https://doi.org/10.1016/j.gassur.2024.01.028
86. Olmi S, Cesana G, D'Angiolella L, Bonaldi M, Uccelli M, Mantovani L. Sleeve gastrectomy with tailored 360° fundoplication according to Rossetti in patients affected by obesity and gastroesophageal reflux: a prospective observational study. Surg Obes Relat Dis. 2021;17(6):1057-65. https://doi.org/10.1016/j.soard.2021.01.007
87. Olmi S, Uccelli M, Cesana GC, Ciccarese F, Oldani A, Giorgi R, et al. Modified laparoscopic sleeve gastrectomy with Rossetti antireflux fundoplication: results after 220 procedures with 24-month follow-up. Surg Obes Relat Dis. 2020;16(9):1202-11. https://doi.org/10.1016/j.soard.2020.03.029
88. Peterli R, Wölnerhanssen BK, Peters T, Vetter D, Kröll D, Borbély Y, et al. Effect of laparoscopic sleeve gastrectomy vs laparoscopic roux-en-y gastric bypass on weight loss in patients with morbid obesity: the SM-BOSS randomized clinical trial. JAMA. 2018;319(3):255-65. https://doi.org/10.1001/jama.2017.20897
89. Pizza F, Lucido FS, D'Antonio D, Tolone S, Gambardella C, Dell'Isola C, et al. Biliopancreatic limb length in one anastomosis gastric bypass: which is the best? Obes Surg. 2020;30(10):3685-94. https://doi.org/10.1007/s11695-020-04687-x
90. Plamper A, Lingohr P, Nadal J, Trebicka J, Brol MJ, Woestemeier A, et al. A long-term comparative study between one anastomosis gastric bypass and sleeve gastrectomy. J Gastrointest Surg. 2023;27(1):47-55. https://doi.org/10.1007/s11605-022-05515-6
91. Plat VD, Kasteleijn A, Greve JWM, Luyer MDP, Gisbertz SS, Demirkiran A, et al. Esophageal cancer after bariatric surgery: increasing prevalence and treatment strategies. Obes Surg. 2021;31(11):4954-62. https://doi.org/10.1007/s11695-021-05679-1
92. Pletch A, Lidor A. GERD after bariatric surgery: a review of the underlying causes and recommendations for management. Curr Gastroenterol Rep. 2024;26(4):99-106. https://doi.org/10.1007/s11894-024-00919-7
93. Qumseya BJ, Qumsiyeh Y, Ponniah SA, Estores D, Yang D, Johnson-Mann CN, et al. Barrett's esophagus after sleeve gastrectomy: A systematic review and meta-analysis. Gastrointest Endosc. 2021;93(2):343-52.e2. https://doi.org/10.1016/j.gie.2020.08.008
94. Rawlins L, Rawlins MP, Brown CC, Schumacher DL. Sleeve gastrectomy: 5-year outcomes of a single institution. Surg Obes Relat Dis. 2013;9(1):21-5. https://doi.org/10.1016/j.soard.2012.08.014
95. Robert M, Espalieu P, Pelascini E, Caiazzo R, Sterkers A, Khamphommala L, et al. Efficacy and safety of one anastomosis gastric bypass versus Roux-en-Y gastric bypass for obesity (YOMEGA): a multicentre, randomised, open-label, non-inferiority trial. The Lancet. 2019;393(10178):1299-309. https://doi.org/10.1016/s0140-6736(19)30475-1
96. Runkel M, Runkel N. Esophago-gastric cancer after one anastomosis gastric bypass (OAGB). Chirurgia (Bucur). 2019;114(6):686-92. https://doi.org/10.21614/chirurgia.114.6.686
97. Saarinen T, Räsänen J, Salo J, Loimaala A, Pitkonen M, Leivonen M, et al. Bile reflux scintigraphy after mini-gastric bypass. Obes Surg. 2017;27(8):2083-9. https://doi.org/10.1007/s11695-017-2608-7
98. Salama TMS, Hassan MI. Incidence of biliary reflux esophagitis after laparoscopic omega loop gastric bypass in morbidly obese patients. J Laparoendosc Adv Surg Tech A. 2017;27(6):618-22. https://doi.org/10.1089/lap.2016.0401
99. Salminen P, Grönroos S, Helmiö M, Hurme S, Juuti A, Juusela R, et al. Effect of laparoscopic sleeve gastrectomy vs roux-en-y gastric bypass on weight loss, comorbidities, and reflux at 10 years in adult patients with obesity: the SLEEVEPASS randomized clinical trial. JAMA Surg. 2022;157(8):656-66. https://doi.org/10.1001/jamasurg.2022.2229
100. Santonicola A, Ruggiero L, Palma R, Angrisani L, Iovino P. Gerd symptoms after laparoscopic Roux-en-Y gastric bypass: an emerging scenario. Int J Obes (Lond). 2022;46(5):1076-8. https://doi.org/10.1038/s41366-022-01072-9
101. Santoro S, Lacombe A, Aquino CG, Malzoni CE. Sleeve gastrectomy with anti-reflux procedures. Einstein (Sao Paulo). 2014;12(3):287-94. https://doi.org/10.1590/s1679-45082014ao2885
102. Santoro S, Mota FC, Aquino CG. Treating severe GERD and obesity with a sleeve gastrectomy with cardioplication and a transit bipartition. Obes Surg. 2019;29(4):1439-41. https://doi.org/10.1007/s11695-019-03752-4
103. Sargsyan N, Das B, Robb H, Namgoong C, Ali I, Ashrafian H, et al. Outcomes of one-anastomosis gastric bypass conversion to roux-en-y gastric bypass for severe obesity: a systematic review and meta-analysis. Obes Surg. 2024;34(3):976-84. https://doi.org/10.1007/s11695-023-07050-y
104. Sebastianelli L, Benois M, Vanbiervliet G, Bailly L, Robert M, Turrin N, et al. Systematic endoscopy 5 years after sleeve gastrectomy results in a high rate of barrett's esophagus: results of a multicenter study. Obes Surg. 2019;29(5):1462-9. https://doi.org/10.1007/s11695-019-03704-y
105. Shenouda MM, Harb SE, Mikhail SAA, Mokhtar SM, Osman AMA, Wassef ATS, et al. Bile gastritis following laparoscopic single anastomosis gastric bypass: pilot study to assess significance of bilirubin level in gastric aspirate. Obes Surg. 2018;28(2):389-95. https://doi.org/10.1007/s11695-017-2885-1
106. Slagter N, Hopman J, Altenburg AG, de Heide LJM, Jutte EH, Kaijser MA, et al. Applying an anti-reflux suture in the one anastomosis gastric bypass to prevent biliary reflux: a long-term observational study. Obes Surg. 2021;31(5):2144-52. https://doi.org/10.1007/s11695-021-05238-8
107. Sneineh MA, Strypstein S, Dillemans B. Sometimes the best solution is transit bipartition: video case report. Obes Surg. 2021;31(4):1893-6. https://doi.org/10.1007/s11695-020-05218-4
108. Sohrabi Maralani M, Azadnajafabad S, Elyasinia F, Abolhasani M, Bagheri M, Kor F, et al. Postoperative outcomes and advantages of hand-sewn laparoscopic one-anastomosis gastric bypass: experience on 805 patients. Obes Surg. 2021;31(2):627-33. https://doi.org/10.1007/s11695-020-04981-8

109. Soprani A, Zulian V, Nedelcu M, Carandina S. One-stage conversion of laparoscopic adjustable gastric banding to laparoscopic 1-anastomosis gastric bypass: a single-center experience on 1,000 patients at 5 years of follow-up. Surg Obes Relat Dis. 2022;18(5):650-7. https://doi.org/10.1016/j.soard.2022.02.001
110. Soricelli E, Casella G, Baglio G, Maselli R, Ernesti I, Genco A. Lack of correlation between gastroesophageal reflux disease symptoms and esophageal lesions after sleeve gastrectomy. Surg Obes Relat Dis. 2018;14(6):751-6. https://doi.org/10.1016/j.soard.2018.02.008
111. Surve A, Rao R, Cottam D, Rao A, Ide L, Cottam S, et al. Early outcomes of primary SADI-S: an Australian experience. Obes Surg. 2020;30(4):1429-36. https://doi.org/10.1007/s11695-019-04312-6
112. Suter M. Gastroesophageal reflux disease, obesity, and Roux-en-Y gastric bypass: complex relationship-a narrative review. Obes Surg. 2020;30(8):3178-87. https://doi.org/10.1007/s11695-020-04690-2
113. Swei E, Helmkamp L, Samuels J, Schoen J, Scott FI, Wani S, et al. Reflux and Barrett's esophagus after sleeve gastrectomy: analysis of a statewide database. Surg Obes Relat Dis. 2023;19(9):1023-9. https://doi.org/10.1016/j.soard.2023.02.008
114. Szymański M, Marek I, Wilczyński M, Janczy A, Bigda J, Kaska Ł, et al. Evaluation of esophageal pathology in a group of patients 2 years after one-anastomosis gastric bypass (OAGB) - Cohort study. Obes Res Clin Pract. 2022;16(1):82-6. https://doi.org/10.1016/j.orcp.2021.12.001
115. Tai CM, Huang CK, Lee YC, Chang CY, Lee CT, Lin JT. Increase in gastroesophageal reflux disease symptoms and erosive esophagitis 1 year after laparoscopic sleeve gastrectomy among obese adults. Surg Endosc. 2013;27(4):1260-6. https://doi.org/10.1007/s00464-012-2593-9
116. Tarhini A, Rives-Lange C, Jannot AS, Baratte C, Beaupel N, Guillet V, et al. One-anastomosis gastric bypass revision for gastroesophageal reflux disease: long versus short biliopancreatic limb Roux-en-Y gastric bypass. Obes Surg. 2022;32(4):970-8. https://doi.org/10.1007/s11695-022-05892-6
117. Thereaux J, Lesuffleur T, Czernichow S, Basdevant A, Msika S, Nocca D, et al. Do sleeve gastrectomy and gastric bypass influence treatment with proton pump inhibitors 4 years after surgery? A nationwide cohort. Surg Obes Relat Dis. 2017;13(6):951-9. https://doi.org/10.1016/j.soard.2016.12.013
118. Türkçapar AG, Şen O. Combined partial Toupet Fundoplication with laparoscopic sleeve gastrectomy for patients with morbid obesity and symptomatic GERD: preliminary results of the T-sleeve technique. Surg Laparosc Endosc Percutan Tech. 2022;32(3):324-8. https://doi.org/10.1097/SLE.0000000000001042
119. Uccelli M, Cesana GC, Ciccarese F, Oldani A, Giorgi R, De Carli SM, et al. Laparoscopic sleeve gastrectomy with Rossetti fundoplication: long-term (5-year) follow-up. Surg Obes Relat Dis. 2022;18(10):1199-205. https://doi.org/10.1016/j.soard.2022.05.012
120. Vilallonga R, Sanchez-Cordero S, Umpiérrez Mayor N, Molina A, Cirera de Tudela A, Ruiz-Úcar E, et al. GERD after bariatric surgery. Can we expect endoscopic findings? Medicina (Kaunas). 2021;57(5):506. https://doi.org/10.3390/medicina57050506
121. Vitiello A, Berardi G, Peltrini R, Calabrese P, Pilone V. One-anastomosis gastric bypass (OAGB) versus Roux-en-Y gastric bypass (RYGB) as revisional procedures after failed laparoscopic sleeve gastrectomy (LSG): systematic review and meta-analysis of comparative studies. Langenbecks Arch Surg. 2023;408(1):440. https://doi.org/10.1007/s00423-023-03175-x
122. Wang M, Widjaja J, Dolo PR, Yao L, Hong J, Zhu X. The protective effect of transit bipartition and its modification against sleeve gastrectomy-related esophagitis in a rodent model. Obes Surg. 2022;32(4):1149-56. https://doi.org/10.1007/s11695-022-05907-2
123. Wölnerhanssen BK, Meyer-Gerspach AC, Nussbaumer R, Sauter M, Thumshirn M, Bueter M, et al. Prospective clinical cohort study: low incidence of Barrett esophagus but high rate of reflux disease at 5-year follow-up after sleeve gastrectomy versus Roux-en-Y gastric bypass. Surg Obes Relat Dis. 2023;19(7):707-15. https://doi.org/10.1016/j.soard.2023.02.012
124. Yashkov Y, Bordan N, Torres A, Malykhina A, Bekuzarov D. SADI-S 250 vs. Roux-en-Y Duodenal Switch (RY-DS): results of 5-year observational study. Obes Surg. 2021;31(2):570-9. https://doi.org/10.1007/s11695-020-05031-z
125. Yeung KTD, Penney N, Ashrafian L, Darzi A, Ashrafian H. Does sleeve gastrectomy expose the distal esophagus to severe reflux?: a systematic review and meta-analysis. Ann Surg. 2020;271(2):257-65. https://doi.org/10.1097/SLA.0000000000003275
126. Zhao S, Li R, Zhou J, Sun Q, Wang W, Wang D. Sleeve gastrectomy with transit bipartition: a review of the literature. Expert Rev Gastroenterol Hepatol. 2023;17(5):451-9. https://doi.org/10.1080/17474124.2023.2206563
127. Zhu C, Liu W, Hu D, Peng L. Risk of esophageal adenocarcinoma after bariatric surgery: a meta-analysis of retrospective studies. Obes Surg. 2024;34(5):1726-36. https://doi.org/10.1007/s11695-024-07190-9
128. Znamirowski P, Bryk P, Lewitowicz P, Kozieł D, Głuszek S. GERD-A burning problem after sleeve gastrectomy? Int J Environ Res Public Health. 2021;18(20):10829. https://doi.org/10.3390/ijerph182010829

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