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ORIGINAL CONTRIBUTIONS

Prevalence of Barrett's Esophagus in Bariatric Patients Undergoing Sleeve Gastrectomy

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Abstract
Background The appearance and incidence of gastroesophageal reflux after sleeve gastrectomy is not yet resolved, and there is an important controversy in the literature. No publications regarding the appearance of Barrett's esophagus after sleeve gastrectomy are present in the current literature.
Purpose The purpose of this paper was to report the incidence of Barrett's esophagus in patients submitted to sleeve.
Material and Methods Two hundred thirty-one patients are included in this study who were submitted to sleeve gastrectomy for morbid obesity. None had Barrett's esophagus. Postoperative upper endoscopy control was routinely performed 1 month after surgery and 1 year after the operation, all completed the follow-up in the first year, 188 in the second year, 123 in the third year, 108 in the fifth year, and 66 patients over 5 years after surgery.
Results Among 231 patients operated on and followed clinically, reflux symptoms were detected in 57 (23.2 %). Erosive esophagitis was found in 38 patients (15.5 %), and histological examination confirmed Barrett's esophagus in 3/231 cases (1.2 %) with presence of intestinal metaplasia.
Conclusion Bariatric surgeons should be aware of the association of gastroesophageal reflux (GER) disease and obesity. Appropriate bariatric surgery should be indicated in order to prevent the occurrence of esophagitis and Barrett's esophagus.

Keywords Barrett's esophagus · Sleeve gastrectomy

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Introduction

The appearance and incidence of gastroesophageal reflux after sleeve gastrectomy is not yet resolved, and there is an important controversy in the literature. Chiu et al. [1] in a recent review article mention that four publications showed increased gastroesophageal reflux (GER), three mention only postoperative increase of GER while seven showed decreased GER after surgery. In addition, some mechanisms have been postulated for the improvement of reflux. On the contrary, others have suggested a high risk of reflux after sleeve gastrectomy (SG), and it is widely recognized that some patients report worsening of their gastroesophageal reflux disease after operation. Besides, others patients develop de novo reflux [2–10]. Howard [11], comparing the pre and post sleeve reflux symptoms, found by radiological evaluations evidences of gastroesophageal reflux (GER) before surgery in 3.6 % which increased to 39 % after operation and worsening of disease in 23 % of cases. In selected series (>100 patients), GER occurs in 7.8–20 % 12–24 months after surgery and GER "de novo" appears in 21 % after 6 years [11].

Among the mechanisms favoring reflux are the modifications of the anatomy of the esophagogastric junction (EGJ) which becomes a dilated tubular segment, the deleterious effect on the lower esophageal sphincter after sectioning the sling fibers during the performance of sleeve, cardial dilatation, mesogastric stenosis, and increased intragastric pressure which promotes appearance of gastroesophageal reflux [12–14]. In our experience in a previous publication, symptoms of gastroesophageal reflux were present in 27 % of the patients after sleeve gastrectomy and endoscopic presence of reflux esophagitis with GER confirmed with scintigraphic studies and 24-h pH monitoring was observed in 60 to

70 % of cases [2, 3]. In addition, more than 50 % of these patients were in treatment with PPIs for symptoms control.

No publications regarding the appearance of Barrett's esophagus after sleeve gastrectomy are present in the current literature.

The purpose of this paper was to report the incidence of Barrett's esophagus in patients submitted to sleeve gastrectomy.

Material and Methods

In this prospective study, we included 231 patients who were submitted to sleeve gastrectomy (SG) for morbid obesity with BMI between 35 and 45Kg/m^2 associated with other medical diseases. All of them underwent a study protocol which includes:

- Clinical evaluation regarding their symptomatology, eating habits, medical history of associated diseases, previous treatment, previous operations, and metabolic tests
- Endoscopy in order to evaluate presence of erosive esophagitis, dilated cardia, or hiatal hernia
- Abdominal ultrasonography in order to evaluate gallstones or fatty liver
- Nutritional and psychological evaluations

Patients with preoperative symptoms of reflux esophagitis, erosive esophagitis, or hiatal hernia confirmed during endoscopic evaluation were discarded to be candidates for sleeve gastrectomy. According to this protocol, no patients included in this study and submitted to SG had reflux symptoms, cardia dilation, hiatal hernia, and Barrett's esophagus. Therefore, all had normal preoperative endoscopy.

Sleeve gastrectomy was performed according to the technique previously published [2, 3, 15]. We routinely use a F34 bugie in order to avoid narrow tubulization, and in all patients, we perform radiological study with barium sulphate swallow before discharging from the hospital in order to exclude leaks, twisted sleeve, or stricture after the operation. None of the patients included in this study had these complications which could promote reflux.

As our patients did not have hiatal hernia, we never dissected the hiatus and it was not necessary to close it.

Follow-up

As a part of our protocol of follow-up, patients were monitored monthly during the first 6 months after surgery and then every 3 months with clinical and nutritional evaluations. Postoperative upper endoscopy control was routinely performed 1 month after surgery and 1 year after the operation. After that, it was annually selectively indicated depending on patient's symptoms. All patients (231) completed the follow-up in the first year, 188 in the second year, 123 in the third year, 108 in the fifth year, and 66 patients more than 5 years after surgery.

Results

In Table 1, we show the demographic characteristics of patients studied. In this group, female patients were predominant (n=168) (72.7 %) and the body mass index was 38.4+3.1Kg/m^2. Postoperative BMI was 25.3+3.8 kg/m^2 at 1 year after surgery, 27.3+4.2 after 3 years, and 29.9+4.8 kg/m^2 after 5 years with %EWL of 57.3+23.3 % at 5 years follow-up. Driving the follow-up, patients with reflux symptoms or esophagitis were treated with proton pump inhibitors in order to reduce symptoms and esophagitis.

Among 231 patients operated on and followed clinically, reflux symptoms were detected in 57 (23.2 %) mainly heartburn and regurgitation. None of them presented extra esophageal reflux symptoms, dysphagia, or chest pain. These patients were treated with proton pump inhibitors with good symptomatic response but became drug dependant. Endoscopic monitoring in order to demonstrate esophagitis or the appearance of columnar epithelium at the distal esophagus was performed. Erosive esophagitis was found in 38 patients (15.5 %), and histological examination confirmed Barrett's esophagus in 3/231 cases (1.2 %) with presence of intestinal metaplasia (Table 2). Barrett's esophagus occurred in three patients, 5 and 6 years post surgery. Endoscopic findings of these three patients showed erosive esophagitis, presence of esophageal ulcer, columnar epithelium, and bile reflux during examination (Fig. 1).

Additionally, they were studied with barium swallow showing the cardia or gastroesophageal junction dilated with loss of His angle and positive radiological reflux (Fig. 2). These three patients were converted to gastric bypass with resection of the distal remnant of the stomach.

Discussion

Obesity is associated with a high prevalence of GER, esophagitis, and hiatal hernia [16]. Also, Barrett's esophagus is three times more frequent in obese patients compared to normal subjects [17–20]. Therefore, presence of GER in obese patients must be taken in consideration at the moment of electing the best surgical option in order to treat GER and obesity. Although, reflux esophagitis post sleeve is even a controversial topic, we never offer sleeve gastrectomy in these patients due to the risk to worsening the GER after

Table 1 Demographic characteristics of patients and follow-up

	Preoperative		Postoperative	
	(*n*=231)	(*n*=231) 1 year	(*n*=123) 3 years	(*n*=66) >5 years
Gender				
Female (%)	168 (72.7)	168 (72.7)	86 (69.9)	45 (68.1)
Male (%)	63 (27.3)	63 (27.3)	37 (30.1)	21 (31.8)
Age				
BMI (kg/m^2)	38.4+3.1	25.3+3.8	27.2+3.7	29.9+4.8
%EWL		84.8+19.1	71.5+21.2	54.3+23.3
GER symptoms or esophagitis (%)	0	23.2	21.7	15.5[a]
Barrett's esophagus	0	0	1	2

[a] After PPi treatment or conversion to gastric bypass

surgery [20, 21]. An increased incidence of symptomatic reflux erosive esophagitis has been described after sleeve gastrectomy by us and others authors [3, 21], which correlates with persistent GER symptoms in patients with preoperative GER. Patients without preoperative symptoms have increased risk of postoperative GER [21]. Besides, a worsening of endoscopic esophagitis and GER have been demonstrated after sleeve [22]. Himpens [23] reported 21 % of new gastroesophageal reflux complaints 6 years after sleeve, and Miguel [24] reported 45 % of patients with erosive esophagitis after sleeve. In spite of this, some authors suggest that the improvement of GER after sleeve can be explained by the postoperative weight loss, but it could also be related to the increase of the gastric compliance and accelerated gastric emptying [22, 25]. However, we have seen a worsening of the disease and others as Weiner et al. [26] reported that 16 % patients had postoperative GERD who finally were solved by conversion to laparoscopic Roux-en-Y gastric bypass (LRYGBP). Lacy [27] in his paper of post sleeve revisional surgery mentioned persistent reflux as cause of reoperation between 5 and 36 % and 15 % had to be converted to Bypass due to intractable reflux. In the international literature (Medline, PubMed, Scielo) until now, there is no publication regarding the development of Barrett's esophagus post sleeve gastrectomy. Among the patients presenting reflux symptoms or esophagitis, we detected three cases of Barrett's esophagus during the follow-up after laparoscopic sleeve gastrectomy. We emphasize that we always perform preoperative objective studies in order to exclude erosive esophagitis and Barrett's esophagus before surgery. Therefore, all patients included in this study had normal endoscopy and no reflux symptoms. After the operation, "de novo" reflux symptoms, erosive esophagitis, and Barrett's esophagus were observed. In the literature reviewed, only a case of Barrett's esophagus, after laparoscopic adjustable gastric

Table 2 Occurrence of reflux symptoms, erosive esophagitis, and Barrett's esophagus along with the follow-up in the entire group of patients undergoing sleeve gastrectomy

	Sleeve gastrectomy (*n*=231) *n* (%)
Symptoms	
Heartburn or regurgitation	57 (23.2)
Endoscopy	
Erosive esophagitis	38 (15.5)
Distal columnar epithelium	3 (1.2)[a]
Histology	
Intestinal metaplasia	3 (1.2)[b]

[a] 3/38 Patients with erosive esophagitis (7.9 %)

[b] 3/57 Symptomatic patients (5.3 %)

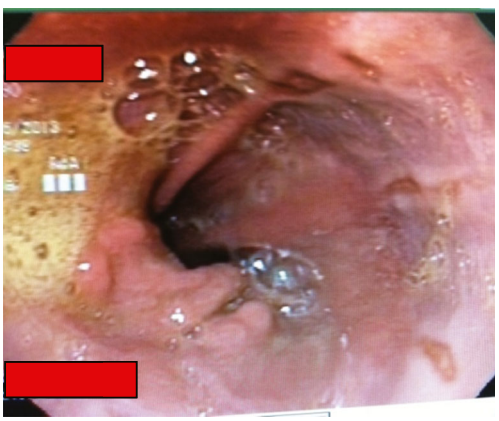

Fig. 1 Endoscopic findings demonstrating erosions, short-segment columnar epithelium, cardia dilatation, and bile reflux after sleeve gastrectomy

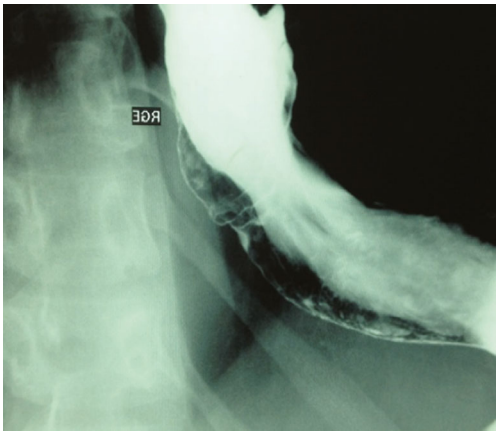

Fig. 2 Radiological aspect of cardia after sleeve gastrectomy showing a continuous tubular segment at the EGE junction, disappearance of His angle and cardia dilatation with reflux

banding placement, has been communicated, as a rare but not unexpected complication after gastric band placement ,but the precise incidence of Barrett's esophagus after adjustable gastric banding is not known [28]. Different esophagogastric operations are associated with gastroesophageal reflux either by resection of the lower esophageal sphincter or by increasing duodenoesophageal reflux by gastrointestinal anastomosis in which the development of intestinal metaplasia takes time to appear after surgery [29].

On the contrary, there are some publications reporting good clinical, endoscopic, and histological results after gastric bypass in obese patients [30, 31]. Csendes [30] suggested that gastric bypass in patients with morbid obesity should be an excellent antireflux procedure, because acid secretion is reduced and duodenal reflux is avoided, due to the long Roux-en-Y limb. Disappearance of symptoms and the healing of endoscopic esophagitis or peptic ulcer have been reported, which is followed by an important regression to cardiac mucosa [30, 31] Cobey [31] performed a laparoscopic Roux-en-Y gastric bypass on a patient with GERD and Barrett's esophagus. One year after the RYGBP, an upper endoscopy was performed as routine surveillance for Barrett's esophagus. Endoscopic and histological evaluation demonstrated complete regression of the Barrett's esophagus and resolution of her reflux symptoms. There are enough clinical evidences in the literature that gastric bypass is an excellent operation to treat Barrett's esophagus in obese patients. These are these arguments in order to indicate conversion to gastric bypass in patients with GER and Barrett's esophagus after sleeve gastrectomy [32–35].

In conclusion, Barrett's esophagus could be a late complication after sleeve gastrectomy and bariatric surgeons should be aware of the important association of GER disease and obesity. Based on these findings, surgeons should consider an appropriate bariatric surgery in order to prevent the occurrence of esophagitis and Barrett's esophagus.

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