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# Gastroesophageal reflux rate after laparoscopic sleeve gastrectomy during 2 years

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## Abstract

**Background and Objective:** Studies have shown that sleeve gastrectomy surgery increases the symptoms of gastroesophageal reflux disease (GERD). The aim of this study was to evaluate the incidence of postoperative reflux.

**Materials and Methods:** Patients who underwent sleeve gastrectomy at Shahid Modarres Hospital and had preoperative endoscopy available were evaluated. Endoscopic findings were recorded according to the Los Angeles criteria and the endoscopic results one year after sleeve gastrectomy were compared with the preoperative findings.

**Results:** The present study was performed on 200 patients who underwent sleeve gastrectomy with a mean age of 31.2 ± 7.28 years and a mean weight of 121.98 ± 18.21 kg. Among patients, 153 (76.5%) were female and 47 (23.5%) were male. The results of the study showed that according to the endoscopic findings before the operation, 101 patients (50.5%) were normal. 52 patients (26%) had GERD A, 32 patients (16%) had GERD B, 15 patients (7.5%) had GERD C, that after the surgery 91 patients (45.5%) was normal. 53 patients (26.5%) had GERD A, 35 patients (17.5%) had GERD B and 21 patients (10.5%) had GERD C. In fact, 49.5% of patients had GERD before surgery and 54.4% of patients had GERD after surgery. However, 25.7% of normal preoperative patients had reflux, which can be said that the incidence of reflux after laparoscopic sleeve gastrectomy was 25.7%. Comparison of reflux grades before and after surgery did not show a significant difference.

**Conclusion:** It seems that the frequency of reflux changes before and after surgery was not significantly different.

**Keywords:** Obesity, Restrictive surgery, Sleeve gastrectomy, Esophageal reflux

## 1. Introduction

Obesity is a medical condition, sometimes considered a disease (1), in which abnormal or excess body fat has accumulated to such an extent that it may have a negative effect on health. People are classified as obese when their body mass index (BMI)—a measurement obtained by dividing a person's weight by the square of the person's height—is over 30 kg/m2; the range 25–30 kg/m2 is defined as overweight. Some East Asian countries use lower values to calculate obesity (2). Obesity is a major cause of disability and is correlated with various diseases and conditions, particularly cardiovascular diseases, type 2 diabetes, obstructive sleep apnea, certain types of cancer, and osteoarthritis (3). High BMI is a marker of risk for, but not a direct cause of, diseases caused by diet and physical activity (3).

Sleeve gastrectomy is a surgical weight-loss procedure in which the stomach is reduced to about 15% of its original size, by surgical removal of a large portion of the stomach along the greater curvature. The result is a sleeve or tube-like structure. The procedure permanently reduces the size of the stomach, although there could be some dilation of the stomach later on in life. The procedure is generally performed

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laparoscopically and is irreversible.
A meta-analysis of 174,772 participants published in The Lancet in 2021 found that bariatric surgery was associated with a 59% and 30% reduction in all-cause mortality among obese adults with or without type 2 diabetes respectively (4). This meta-analysis also found that median life expectancy was 9.3 years longer for obese adults with diabetes who received bariatric surgery as compared to routine (non-surgical) care, whereas the life expectancy gain was 5.1 years longer for obese adults without diabetes (4).
Gastroesophageal reflux disease (GERD) is a condition commonly seen in patients undergoing bariatric surgery. Although some procedures such as Roux-en-Y gastric bypass are associated with a reduced incidence of postoperative reflux, this is controversial for LSG. Therefore, the present study was conducted with the aim of investigating the incidence of reflux after laparoscopic sleeve gastrectomy and comparing it with before the surgery.

## 2. Materials and Methods

This study was a descriptive-analytical study that was conducted cross-sectionally. The research population included patients who had undergone sleeve gastrectomy surgery in Shahid Modares Hospital (2014-2016) and the results of endoscopic imaging performed before the surgery, were available. They were examined again after one year to check the incidence of reflux in them.

After the approval of the ethics committee of Shahid Beheshti University of Medical Sciences, the patients' information was extracted from their files. Patients whose preoperative endoscopy was not available were excluded from the study. Other patients were contacted to perform endoscopy again, and if they wished, they underwent endoscopy again.
Endoscopic findings were reported based on the Los Angeles criteria, and endoscopic results were compared one year after sleeve gastrectomy with preoperative findings. It should be noted that surgery and endoscopy were performed by a single surgeon and an internist.

## 3. Results

The present study was conducted on 200 patients who underwent sleeve gastrectomy, the average age of these patients was 31.2 ± 7.28 with a range of 19 to 55 years and their average weight was 121.98 ± 18.21 with a range of 94 to 170 kg.

Among the patients, 153 (76.5%) were women and 47 (23.5%) were men. According to the endoscopic findings before sleeve gastrectomy, 101 patients (50.5%) were normal in terms of reflux. 52 patients (26%) had GERD A, 32 patients (16%) had GERD B, and 15 patients (7.5%) had GERD C.

The results of endoscopy after sleeve gastrectomy showed that 91 patients (45.5%) were normal in terms of reflux. 53 patients (26.5%) had GERD A, 35 patients (17.5%) had GERD B, 21 patients (10.5%) had GERD C.

Before surgery, 49.5% of patients had reflux and after surgery, 54.5% had reflux. 26 of the normal patients had reflux after the surgery and 16 of the patients who had reflux before the surgery had recovered. The rest of the patients who had reflux also had reflux after the operation. Therefore, the incidence of new reflux after surgery was 25.7%.

74.3% of patients who were normal before the operation were also normal after the operation. 18.8% and 6.9% of them had GERD A and GERD B respectively after the operation. 26.9% of patients who had GERD A before the operation were normal in terms of reflux after the operation. 51.9%, 13.5%, and 7.7% of them had GERD A, GERD B, and GERD C, respectively, after the operation. Also, 6.3% and 15.6% of patients who had GERD B before the operation, were normal and GERD A after the operation, respectively, and 59.4% of them still had GERD B.
Among the patients who had GERD C before surgery, 13.3% and 13.3% had GERD A and GERD B after surgery, respectively, and 73.3% of them were still GERD C. Therefore, the comparison before and after surgery shows that there was no difference in the incidence of reflux compared to before surgery, and 25.7% of normal patients had reflux after surgery.

**Table 1. Determining and comparing the frequency distribution of reflux before and after sleeve gastrectomy**

| After surgery / Before surgery | Normal | GERD A | GERD B | GERD C | Total |
|---|---|---|---|---|---|
| Normal | 75 (74.3%) | 19 (18.8%) | 7 (6.9%) | 0 (0%) | 101 (100%) |
| GERD A | 14 (26.9%) | 27 (51.9%) | 7 (13.5%) | 4 (7.7%) | 52 (100%) |
| GERD B | 2 (6.3%) | 5 (15.6%) | 19 (59.4%) | 6 (18.8%) | 32 (100%) |
| GERD C | 0 (0%) | 2 (13.3%) | 2 (13.3%) | 11 (73.3%) | 15 (100%) |
| Total | 91 (45.5%) | 53 (26.5%) | 35 (17.5%) | 21 (10.5%) | 200 (100%) |

## 4. Discussion

Obesity is considered a major global health problem. In 2008, the World Health Organization (WHO) estimated that more than 500 million adults are clinically obese (BMI<30) (5). Obesity-related diseases such as type 2 diabetes, hypertension, dyslipidemia, coronary artery disease, some types of cancer, and reflux are observed in obese patients (6). Therefore, care must be taken in choosing a suitable treatment method for weight loss and also the effect on diseases associated with obesity. Various studies have shown that weight-loss surgeries, along with intensive lifestyle interventions and medical treatments, cause significant weight loss and improve many obesity-related diseases (7). Laparoscopic sleeve gastrectomy (LSG) is an effective method for reducing weight and improving type 2 diabetes in obese patients (8). However, the effect of SG in lowering or increasing GERD is contradictory (9).

The present study was conducted to investigate the incidence of reflux after sleeve gastrectomy surgery for 2 years. In this study, most patients who underwent sleeve gastrectomy were less than 30 years old (49%). The results of this study showed that before surgery 49.5% of patients had reflux and after surgery 54.4% of patients had reflux. Of course, 25.7% of normal patients had reflux after surgery, which can be said that the incidence of reflux after sleeve laparoscopic gastrectomy was 25.7%. Among the patients who had reflux before the surgery, 16.2% recovered completely after the surgery. A comparison of reflux grades before and after the surgery, did not show any significant difference.

The increase or decrease of reflux after sleeve gastrectomy is different in different studies, and some studies agree with its increase and others with its decrease after surgery, but the results of different studies do not agree with each other. As in a systematic study by Chiu et al., 15 articles related to sleeve gastrectomy and reflux were examined. The results of this systematic review showed that 4 studies reported an increase in GERD after sleeve surgery. 7 studies reported the reduction of GERD and 4 studies reported only the incidence of GERD after surgery (9).

In a study conducted on 213 patients between 2009 and 2015, similar to the present study, most of the patients were less than 30 years old. In their study, the new occurrence of heartburn was reported in 47% of patients, and the score of dysphagia, odynophagia, and regurgitation increased after surgery. Also, in patients with a higher BMI, the occurrence of new GERD symptoms or worsening of symptoms was higher (OR=0.97) (10). In a meta-analysis study, it was shown that 19% of patients experienced worsening GERD symptoms, and 23% new onset of GERD with an 8% prevalence of Barrett's esophagus after sleeve surgery. In this regard, a systematic multicenter study showed that the prevalence of Barrett's esophagus after 5 years of sleeve surgery was 18.8% and was associated with an increase in GERD symptoms from 22 to 76% (11-13). Therefore, due to the increased risk of developing Barrett's esophagus in these patients, it seems that performing endoscopy and annual follow-ups can be effective in the early detection of this finding.

In a systematic study published by Laffin et al. in 2013, 13 clinical studies investigated the prevalence of GERD after laparoscopic sleeve gastrectomy. In 8 studies, an increase in the prevalence of GERD was observed, and in 5 studies, a decrease in the prevalence of GERD was observed. In the studies where the increase in the prevalence of GERD was observed, its prevalence before surgery varied

between 0% and 34% and after surgery between 2.1% and 49%. In the studies that showed a reduction in the incidence of GERD after sleeve surgery, the reduction in GERD symptoms after surgery was around 0.3% to 20% (5). In this regard, the study of Nocca et al showed that the incidence of reflux after sleeve gastrectomy is 11.8% (14). Of course, the difference between the results obtained in different studies and the present study can be due to the patients' diet, different surgical techniques, post-operative care, follow-up period, time and method of evaluating reflux in these patients.

Similar to the present study, in a study conducted by Carter et al. with the aim of investigating the relationship between GERD and sleeve gastrectomy, 34.6% of patients had GERD before the operation, and after the operation, 49% complained of GERD symptoms during the first month, and 47.2% had stable symptoms of GERD after one month (15).

In the study by Arias et al., the incidence rate of GERD after surgery was 2.1% after 24 months of follow-up of patients, which was lower than in other studies. However, the method of evaluating reflux in this study was based on the report of clinical symptoms, and this is probably the reason for its low prevalence. Contrary to that, Tai et al. showed that 47% of patients have reflux after surgery, and in their study, the evaluation was based on the report of clinical symptoms by the patient, and it seems that the evaluation of reflux based on the patient's reports can give different results (16). But Braghetto et al. showed that similar to the present study, the incidence of new reflux is 27.5%, and the method of evaluating reflux was through pH meter and endoscopy, which was similar to the present study (17). In another study by Himpens et al., an evaluation of reflux after sleeve surgery was done based on response to treatment, and the incidence of reflux 1 and 3 years later was 21.8% and 3.1%, respectively (18). Similar to the Himpens study, in another study where the evaluation of reflux was based on response to treatment, 25% had reflux before surgery and 39% after surgery (19).

Stomach anatomy after sleeve surgery can be one of the predisposing factors to GERD. During surgery, His angle and anatomical features protecting against reflux are destroyed, and this destruction is partially responsible for the increase in the incidence of reflux during the first year after surgery (20). Yehoshua et al. showed that a decrease in gastric compliance and an increase in gastric pressure are observed after surgery, and this increase in gastric pressure leads to a decrease in LES pressure and can be effective in increasing the incidence of reflux. Also, inactivity of the digestive system can be effective in the occurrence of reflux. The reduction of plasma ghrelin can also make patients prone to reflux (21).

Unlike other studies that showed an increase in the incidence of reflux after sleeve gastrectomy, a limited number of studies reported improvement of reflux after surgery. In Logan et al.'s study, 30.6% of patients had GERD before surgery, and after surgery, reflux improved in 53% of patients and 11% of patients had new symptoms of reflux (22). Chopra et al. also reported a reduction in reflux from 13.7% before surgery to 13.2% in a period of 36 months (23). Weiner et al. also showed that the incidence of reflux symptoms after sleeve gastrectomy surgery is reduced by 20%, although all these studies evaluated the incidence of reflux symptoms using a patient report system and clinical symptoms, which is not reliable compared to endoscopy. There are reports about the possible mechanisms of reducing reflux after surgery (24). Considering that obesity increases reflux (25), therefore, any weight loss associated with gastric surgery should reduce the effects of obesity on reflux symptoms. Contrary to Himpens' study, which showed a decrease in gastric emptying rate after sleeve surgery, Melissas and Shah in their studies provided evidence that LSG increased gastric emptying rate (26, 27).

Finally, according to the evidence available in the studies, it is not possible to make a definite opinion on the increase or decrease in the incidence of reflux after sleeve gastrectomy surgery, and it seems that different studies do not have a consensus in this field due to the different evaluation methods. Therefore, according to this issue, the necessity of more extensive controlled studies is recommended, although one of the strengths of the study was the appropriate sample size compared to other studies and the evaluation of patients through endoscopy. However, the frequency of reflux before and after the surgery was not significantly different from each other.

## Conclusion

The present study was conducted on 200 patients who underwent sleeve gastrectomy, the average age of these patients was 31.2 ± 7.28 years and their average weight was 121.98 ± 18.21 kg. The majority of patients in this study were less than 30 years old. The results of the study showed that according to the endoscopic findings before sleeve gastrectomy, 101 patients (50.5%) were normal in terms of reflux. 52 patients (26%) had GERD A, 32 patients (16%) had GERD B and 15 patients (7.5%) had GERD C. While the endoscopy results after sleeve gastrectomy surgery showed that 91 patients (45.5%) were normal in terms of reflux. 54 patients (26.5%) had GERD A, 35 patients (17.5%) had GERD B, and 21 patients (10.5%) had GERD C. Therefore, before surgery, 49.5% of patients had reflux and after surgery, 54.5% had reflux. 26 patients (25.7%) of normal patients had

reflux after surgery and 16 patients (16.2%) of patients who had reflux before surgery had recovered. The rest of the patients who had reflux also had reflux after the surgery. Therefore, the incidence of new reflux after surgery was 25.7%. However, there was no significant difference in reflux grades before and after surgery.

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