

# Comparison of Patients with and Without Hiatal Hernia Repair during Laparoscopic Sleeve Gastrectomy: Single-centre Experience

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## ABSTRACT

**Objective:** To evaluate whether the concomitant repair of hiatal hernias during laparoscopic sleeve gastrectomy has an effect on the outcome of the surgery in patients with hiatal laxity and gastroesophageal reflux disease (GERD) symptoms during preoperative preparations.

**Study Design:** Descriptive study.

**Place and Duration of Study:** Department of General Surgery, Kayseri City Training and Research Hospital, Health Science University, Kayseri, Turkey, from 2016 to 2020.

**Methodology:** Reflux symptom index questionnaire (RSI) is used in patients with GERD symptoms and in cases where hiatal hernia is detected in routine endoscopy. Preoperative and postoperative periods can be compared with this non-invasive and short-term test.

**Results:** Thirty-five patients were included in the study. The mean age of the included patients was  $36.0 \pm 9.8$  (range, 21- 54) years, 80% of them were female. The preoperative median BMI was  $43.9$  (IQR, 41-50.7), and the postoperative mean BMI was  $31.3 \pm 5.1$  (range, 23.2-40.6)  $\text{Kg/m}^2$ . The median calculated RSI of the patients in the preoperative period was 8 (IQR, 2-13), and the postoperative median was 5.1 (IQR, 0-8) ( $p = 0.028$ ). It was observed that 24 (68.6%) of the patients had improvement in their symptoms, 7 (20%) patients had worsening, 3 (8.6%) patients did not experience a change, and only one (2.9%) patient developed *de novo* GERD symptoms.

**Conclusion:** No statistically significant difference was observed in individuals undergoing LSG and known to have GERD, hiatal hernia repair and cruroraphy in addition to LSG regarding reduction of GERD symptoms.

**Key Words:** Sleeve gastrectomy, Reflux symptom index score, Gastroesophageal reflux disease.

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## INTRODUCTION

Obesity is a health problem, which has been increasing in recent years. It is the trigger of many diseases such as heart disease, hypertension, type-2 diabetes, obstructive sleep apnea syndrome (OSAS), and osteoarthritis. In addition to these, another disease associated with obesity is gastroesophageal reflux disease (GERD). In the fight against obesity, first diet, then medical treatment, and finally surgical treatment are recommended. Regaining the weight is more common in methods other than surgical treatment.<sup>1</sup> Surgical treatments include malabsorptive and restrictive procedures.

Laparoscopic sleeve gastrectomy (LSG), which is being used with increasing frequency today, is a first-step of biliopancreatic diversion-duodenal switch surgery, but it has been accepted as a stand-alone surgical option because patients have sufficient weight loss and do not need second-step surgery.<sup>2</sup>

GERD is the name given to symptoms that develop with the escape of the acid content of the stomach into the esophagus and even the larynx, for various reasons. Reflux can be seen due to increased intra-abdominal pressure in obese patients, as well as *de novo* GERD in patients operated for obesity.<sup>3</sup> Various laboratory tests and questionnaires have been applied to detect reflux. Non-invasive techniques have also been used in practice due to the higher workload of invasive procedures and their rejection by patients. One of these is the reflux symptom index (RSI) score. In this scoring, a score of 13 and above was considered significant. The Turkish validation of the RSI questionnaire was performed by Akbulut *et al.*<sup>4</sup>

In obese patients with a hiatal hernia, the hiatal defect was noticed and repaired intraoperatively and sleeve gastrectomy

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was also performed. In patients with GERD symptoms, repair and LSG have been recommended when a hiatal looseness that may cause this reflux is detected. In some studies, *Roux-en-y* gastric bypass (RYGB) has been recommended for people with GERD, since LSG will reveal or increase *de novo* reflux.<sup>5</sup> Centres applying both procedures shared their own results and emphasised the need to decide which procedure to apply, with an increase in the number of studies.<sup>6</sup>

The aim of this study was to compare the postoperation improvement in GERD symptoms in patients who were operated for obesity, among those who did not undergo cruroraphy.

## METHODOLOGY

Between 2016 and 2020, 375 patients were operated at Department of General Surgery, Kayseri City Training and Research Hospital, Health Science University, Kayseri, Turkey, due to obesity. All patients were those who had an indication for bariatric surgery in accordance with current guidelines and were evaluated by the Department of Endocrinology and Metabolism and deemed suitable for surgical treatment. Preoperative routine upper gastrointestinal system endoscopy was performed in all patients before surgery. It was investigated whether there was a lesion in the stomach (malignant / benign) in routine endoscopy, and patients with *H. pylori* positivity were given eradication treatment. In addition, whether patients had a hiatal hernia or not were among the points recorded.

Preoperative reflux symptoms are questioned in patients with GERD and hiatal hernia. In the postoperative controls, it was questioned whether reflux symptoms were regressed or increased in patients who had reflux and were operated due to obesity, and these were scored with the RSI. Patients whose postoperative scores could not be reached, were excluded from the study. For this retrospective study, permission was obtained from the Ethics Committee of the Hospital, (No. 47, dated 08.09.2020).

For each patient, a decrease in postoperative score (score lower than preoperative value) was considered an improvement; whereas, a higher postoperative score was considered a worsening of symptoms. *De novo* GERD was defined as patients with a preoperative RSI score of 0 and a postoperative RSI score of  $\geq 1$ . When the preoperative and postoperative questionnaire scores were the same, they were defined as unchanged GERD symptoms. Weight loss assessment was evaluated using % EBML (excess body mass index loss) as previously described in the literature.<sup>7</sup>

The statistical programme SPSS version 24 was used for the analysis. Descriptive statistics were given as mean  $\pm$  standard deviation, median and interquartile range (IQR) depending on the distribution of the continuous variables, while categorical variables were summarised as numbers and percentages. The normality test of the numerical variables was controlled by visual (histogram and probability graphs) and analytical methods (Shapiro-Wilk test). While independent student's t-

test was used for the groups that conform to the normal distribution, Mann-Whitney U-tests were used in the groups that did not fit normal distribution. In a comparison of more than two independent groups, the Kruskal-Wallis H-test was used for the numerical variables without normal distribution. Wilcoxon Signed Ranks test was used to compare dependent continuous variables. The statistical significance level was taken as 0.05 in all tests.

## RESULTS

The total number of patients included in the study was 35. Of them, 80% were females and the mean age was  $36 \pm 9.8$  (range, 21- 54) years. The preoperative median BMI was 43.9 (IQR, 41-50.7), the mean BMI of the patients was  $31.3 \pm 5.1$  (range, 23.2-40.6) Kg/m<sup>2</sup> as of the time when the questionnaire was filled. The median calculated RSI of the patients in the preoperative period was 8 (IQR, 2-13), and the postoperative median was 5 (IQR, 0-8) ( $p=0.028$ ). It was observed that 24 (68.6%) of the patients had improvement in their symptoms, 7 (20%) patients had worsening, 3 (8.6%) patients did not experience change, and only 1 (2.9%) patient developed *de novo* GERD symptoms. The differences in the scores of the patients whose symptoms worsened, improved and who developed *de novo* GERD, were statistically significant ( $p=0.036$ ). The postoperative score of the patient who developed *de novo* GERD was 6. In total, 10 patients with a preoperative median RSI score of 9 (IQR, 2-14.5) had no symptoms in the postoperative period (RSI score: 0). The distribution of the patients by symptom score categories is summarised in Table I.

**Table I: Degree of gastroesophageal reflux symptoms, before and after surgery.**

	Preoperative (n)	Postoperative (n)
None, 0	4 (11.4%)	12 (34.3%)
Mild symptoms, score <13	22 (62.9%)	18 (51.4%)
Severe symptoms, score $\geq 13$	9 (25.7%)	5 (14.3%)

**Table II: Gastroesophageal reflux symptom scores according to postoperative weight loss rates.**

	Postoperative % EBML <50 (7 patients)	Postoperative % EBML $\geq 50$ (28 patients)	p
Preoperative RSI score, median (IQR)	5 (4-10)	8.5 (2-15.2)	0.456
Postoperative RSI score, median (IQR)	4 (0- 14)	5 (0- 8)	0.611
Preoperative BMI, median (IQR)	45 (43.5-52)	43.2 (40.7-48.8)	0.302
Postoperative BMI, mean $\pm$ SD	$37.9 \pm 2.7$	$29.7 \pm 4.1$	<0.001

IQR: 25th%- 75th%, SD: Standard deviation.

In the preoperative period, 30 patients had a symptom score of 1 and above, while 4 of 5 patients with a symptom score of 0 remained unchanged, and *de novo* GERD was observed in one patient. When the patients were grouped as 35-40, 40-50, and 50 and above, according to the preoperative BMI, it was observed that there was no statistically significant difference between obesity level and RSI scores ( $p = 0.335$ ). Likewise,

when the patients were grouped as below 30 and over 30 according to postoperative BMI, there was no statistical significance in RSI differences and postoperative scores ( $p = 0.178$  and  $0.385$ , respectively). Median follow-up time was 14 (IQR, 12-21.5) and 12 (IQR, 9-16) months, respectively. Mean % EBML values were  $72.7 \pm 22.9$  (range, 18.4-114.2). When patients were divided into two groups, according to % EBML values as "below 50" (7 patients), and "50 and above" (28 patients), it was observed that there was no statistically significant difference in postoperative RSI values and RSI change differences ( $p = 0.611$  and  $0.443$ , respectively). The median follow-up time was 9 (IQR, 7-16) and 14 (IQR, 11.2-21.5) months, respectively. Preoperative and postoperative RSI scores and BMI values of patients with an EBML value below and above 50, are summarised in Table II. However, in the group with postoperative % EBML over 50%, it was observed that 83.3% of the patients had a decrease in their symptoms.

**Table III: Gastroesophageal reflux symptom degree and body mass index of those with and without cruroraphy, before and after surgery.**

	Cruroraphy performed (n:16)	Cruroraphy not performed (n:19)	p
Preoperative RSI score, median (IQR)	6.5 (2-15.5)	8 (3-12)	0.973
Postoperative RSI score, median (IQR)	6 (0-8.75)	4 (0-8)	0.905
Preoperative BMI, median (IQR)	45.4 (40.9-52.1)	43.5 (41.3-49)	0.791
Postoperative BMI, mean $\pm$ SD	$32.2 \pm 5.5$	$30.5 \pm 4.7$	0.341

IQR: 25th%- 75th%, SD: Standard deviation.

There was no statistically significant difference between preoperative and postoperative RSI values between those with and without cruroraphy ( $p = 0.973$  and  $p = 0.905$ , respectively, Table III). The median follow-up period of the patients was 10 (IQR, 9-19) and 13 (IQR, 10.5-25.5) months, respectively. There was also no statistically significant difference between preoperative and postoperative BMI values ( $p = 0.791$  and  $p = 0.341$ , respectively). In the postoperative period, five patients, whose RSI value is still above 13, are being followed up under PPI treatment. Postoperative PPI use [median 6 (IQR, 2-12)] was statistically significantly higher than preoperative PPI use [median 0 (IQR, 0-0)],  $p = 0.004$ . The reason for this is that for postoperative patients, PPI were routinely prescribed.

## DISCUSSION

GERD is the name given to conditions in which the esophagus is exposed to stomach acid. Diet, smoking, alcohol consumption and weight gain are among the conditions that cause increased GERD. Surgical procedures are also among the treatments of obesity. LSG is performed with increasing frequency in bariatric surgical procedures. It is possible to see the good and bad aspects of such frequent surgeries over time. There are studies stating that *de novo* GERD develops in patients who underwent LSG. Moreover, the studies showing that reflux symptoms improve in patients who lose weight.<sup>8</sup> Increased intra-abdominal pressure, decrease in lower esophageal sphincter pres-

sure, and anatomical deterioration may increase the symptoms of reflux.<sup>9</sup> In previous studies, GERD was detected in 70% of patients undergoing bariatric surgery.<sup>10</sup> In a study conducted on 39,872 patients in Norway, an increase in BMI was found to be associated with the increase in the incidence of GERD.<sup>11</sup> Heartburn and acid regurgitation are important symptoms in the diagnosis of GERD. If these symptoms are present, there is no need for additional tests.<sup>12</sup> In the present series, 9 (25%) patients had severe reflux symptoms and the mean symptom score was 8. The rate of patients whose symptoms improved were higher than most studies in the literature (7-36%), 20% recovery rates were similar to the literature (12.6-39.6%), but *de novo* GERD rates of 0.2% were considerably lower than in the literature (8.6-17.7). These wide variations may be related to the use of objective criteria (pH meters) for GERD or the underestimation of patients' scoring. In a study using Ph manometry by Coupaye *et al.*, it was found that *de novo* GERD was present at a rate of 52%.<sup>13</sup>

In practice, it is not feasible to perform invasive procedures on every patient. Tests are preferred that are inexpensive, do not require special equipment, are easy to use and have high sensitivity.<sup>14</sup> Reflux symptom index is also a test that does not require invasive procedures, can be applied in outpatient clinic conditions, where the increase and decrease in reflux symptoms can be monitored.

While performing sleeve gastrectomy, the fundus should be released and the left crus should be seen. At the same time, it is evaluated whether there is a defect or hernia in the hiatus. In some studies, repair of hiatal hernia or repair of the crus in the looseness of the crus showed that the symptoms decreased in patients with gastroesophageal reflux, who underwent sleeve gastrectomy.<sup>15,16</sup> In one series, when a careful crus repair was performed in patients who underwent LSG operation, GERD was in remission at a rate of 73%, while a decrease in the development of *de novo* GERD from 23% to 0% was shown. In a study in which 174 patients were evaluated, postoperative GERD symptoms developed in only one (0.5%) patient without a hiatal hernia and esophagitis. In this study, although there was no significant change in the postoperative RSI scores of those who underwent and did not undergo cruroraphy, it was observed that 6 out of 16 patients, who underwent cruroraphy, had a symptom score of 13 and above, and only one had a postoperative symptom score of 13.

The size of the gastric sleeve is also important in the development of reflux symptoms that can be seen in the postoperative period. When a large and dilated stomach remains, acid production capacity may increase and cause reflux. A small volume of gastric sleeve increases the pressure in the stomach and increases the tendency for acid content to escape into the esophagus.<sup>17</sup> Petersen *et al.* demonstrated that the pressure in the lower esophagus was reduced in sleeve gastrectomy. They also showed that this decrease in pressure was not associated with weight loss.<sup>18</sup> The authors routinely use 36 F tube in all patients.

Hiatal hernia can be detected preoperatively. The defect is closed by making a posterior repair. While it is thought that the frequency of heartburn and regurgitation will decrease in patients who undergo hiatal repair during sleeve gastrectomy, it has been shown to increase in the study conducted by Santanikola *et al.* In hiatal repairs, biological mesh can also be used.<sup>19</sup> In a study by Gibson *et al.*, improvement was observed in patients who underwent anterior repair and preoperatively described their symptoms as GERD.<sup>20</sup> Those who continue to have postoperative GERD are also kept under control with PPI. Posterior repair has been shown to be superior to anterior repair. Various materials can be used in this repair. For example, materials such as ethibond, silk, prolene, ticon can be used and biological meshes can be used for large defects.<sup>6</sup> Posterior repair was performed in all patients who underwent cruroraphy, and it was not necessary to use synthetic material in any of the patients.

In another study conducted by Mizrahi *et al.*,<sup>21</sup> advanced age was found to be associated with hiatal hernia development. It has been emphasised that patients over 60 years of age have hiatal laxity and may require repair. The presence of Barrett esophagus is a contra-indication for sleeve gastrectomy. The development of *de novo* Barrett esophagus requires a transition to gastric bypass or other modalities.<sup>22</sup> There are also studies arguing that the most effective method in controlling GERD is Roux-en-Y gastric bypass ((RYGB)).<sup>23</sup> While performing LSG, carefully checking the crus and performing hiatus repair, if necessary, also greatly reduces GERD symptoms.<sup>24</sup> Morbidities such as the risk of anastomotic leakage in laparoscopic RYGB are also avoided.

One of the limitations of this study is that it is retrospective, the follow-up period is short, and a test such as pH monitoring, which includes objective criteria for the diagnosis of GERD before and after surgery, was not used. Although pH monitoring was used in the De Meester test, it was observed that it did not correlate with clinical symptoms and the De Meester score was normal in patients with GERD symptoms.<sup>25</sup>

## CONCLUSION

Although it is said in individuals, who are undergoing LSG and known to have GERD, that hiatal hernia repair and crus repair in addition to LSG reduce GERD symptoms: although no statistically significant difference was observed in this study. However, it was observed that 68.6% of the patients had a decrease in their symptoms. The patients did not require redo surgery or had any complaints that required another surgical procedure such as Roux-en-Y bypass. If during LSG, hiatal defect is found in those with GERD, repair can be done, it is not contra-indicated.

## ETHICAL APPROVAL:

Ethics Committee approval was obtained from the Ethics Committee of the University of Health Sciences, Kayseri City Training and Research Hospital (No. 47, date: 08.09.2020).

## PATIENTS' CONSENT:

The study was planned as a retrospective file scan; hence, consent was not obtained from the patients, except for surgical consent. (Not applicable).

## CONFLICT OF INTEREST:

The authors declared no conflict of interest.

## AUTHORS' CONTRIBUTION:

YD: Literature review and writer.

SKE: Fundings, analysis and interpretation.

T: Conception and design.

TE: Supervision and critical review.

EK: Data collection and processing.

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