Postoperative Gastrointestinal Complaints After Laparoscopic Nissen Fundoplication

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Purpose: To investigate the postoperative gastrointestinal complaints and their effects on the satisfaction level of patients after laparoscopic Nissen fundoplication (LNF).

Materials and Methods: Over a 7-year period, 553 patients who underwent "floppy" LNF were evaluated for preoperative and postoperative complaints. For this purpose, a set of questions derived from gastroesophageal reflux disease–health-related quality-of-life questionnaire (GERD-HRQL) was used. A *P*-value of <0.05 was considered to show a statistically significant result.

Results: The present study included 215 patients with a mean follow-up of 60 months. Reflux-related symptoms [regurgitation (17.7%), heartburn (17.2%), and vomiting (3.7%)] and nonspecific symptoms [bloating (50.2%), abdominal pain (15.3%), and belching (27%)] showed a significant decrease ($P < 0.001$) after the surgery. Inability to belch (25.1%) and early satiety (29.3%) were the newly emerged symptoms. The percentage of patients with flatulence increased from 23.3% to 38.1% after LNF. There was no significant difference for dysphagia (25.6%) and diarrhea (15.3%) in the postoperative period. Of the patients, 15.3% had recurrent preoperative complaints and 9.8% were using drugs for that condition. Satisfaction level and preference for surgery were 82.8% and 91.6%, respectively. There was no significant difference in GERD-HRQL score according to body mass index.

Conclusions: This is the first study in which postoperative reflux-related and nonspecific gastrointestinal complaints are analyzed together for a long follow-up period. We found a significant decrease in many reflux-related and nonspecific symptoms. Although some disturbing complaints like inability to belch, early satiety, and flatulence emerged, the preference for surgery did not change.

Key Words: long-term results of Nissen fundoplication, postoperative gastrointestinal complaints, laparoscopic Nissen fundoplication

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Nissen fundoplication was first described by Rudolf Nissen in 1956. The operation was performed laparoscopically by Dallemagne and colleagues in 1991.[1,2] Up today, many reports showed excellent outcomes. There are different results in the literature concerning gastrointestinal complaints, recurrent, or newly emerged.[3–14] In this study, we aimed to investigate the frequency, severity, and duration of gastrointestinal complaints and their effects on surgical satisfaction level.

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Written informed consent form was obtained from all patients.
This study was approved by the ethical committee.
The authors declare no conflicts of interest.
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MATERIALS AND METHODS

Over a 7-year period, 553 patients underwent laparoscopic Nissen fundoplication (LNF) with the standard technique by the senior surgeon in Ankara University, Faculty of Medicine Department of General Surgery. Patients were diagnosed by endoscopy. Reflux esophagitis was classified according to Los Angeles classification system in preoperative endoscopic evaluation. Some patients who cannot be diagnosed with endoscopy were evaluated with ambulatory pH study. Owing to the difficulty of patient compliance, it was not performed to every patient. Esophageal manometry was used only in preoperative assessment in patients with clinically suspected esophageal dysmotility disorders. These patients were not offered Nissen fundoplication and therefore were not included in this study. Postoperative endoscopic evaluation was not performed routinely to assess the state of reflux esophagitis. Patients who have failed medical management (inadequate symptom control, severe regurgitation not controlled with acid suppression, or medication side effects), or who prefer surgery despite successful medical management (due to quality of life considerations, lifelong need for medication intake, etc.), or who have complications of gastroesophageal reflux disease (eg, Barrett esophagus) or who have extra-esophageal manifestations (asthma, hoarseness, cough, chest pain, aspiration) underwent surgery. All procedures performed in the study were performed under the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Exclusion criteria were as follows: the first 50 patients in the learning period, patients who underwent surgery due to atypical symptoms of gastroesophageal reflux disease, patients demonstrated to have a short esophagus, patients with preoperative motility abnormality, and patients who did not complete the postoperative 12 months. As mentioned in the literature, LNF is only advised in selected patients with atypical symptoms.[15] So, patients with atypical symptoms were excluded in order not to disrupt homogeneity of the study group. Patients were asked a set of questions (Fig. 1). The questionnaire form used in the study was derived from gastroesophageal reflux disease–health-related quality-of-life (GERD-HRQL) questionnaire, developed by Velanovich et al.[16] It was translated and validated in 2006.[11] The form included reflux-related and nonspecific gastrointestinal complaints, their frequency, severity, and surgical satisfaction level. The questions in the form were asked to all patients preoperatively during routine physical examination. In the postoperative period, patients were called by phone and invited to the clinic. One patient had reoperation due to recurrence. Only 20 of them attended to the clinic. Some of the patients who cannot not be reached by phone or did not want to answer the questions or could not clearly comprehend a specific inquiry were excluded from that question analysis. The remaining patients attended to the questionnaire by phone (Fig. 2). The evaluation of patients was performed by a single observer. Demographic characteristics and clinical data of the patients

1. Do you have difficulty in swallowing?
   0: no
   1: with solid foods
   2: with soft foods
   3: with liquid foods
   4: with all
2. Do you have early satiety?
   0 (no) 1 (yes)
3. Do you have regurgitation?
   0 1 2 3 4
4. Do you have heartburn?
   0 1 2 3 4
5. Do you have gas-bloating?
   0 1 2 3 4
6. Do you have frequent belching?
   0 1 2 3 4
7. Do you have frequent diarrhea?
   0 1 2 3 4
8. Do you have abdominal pain?
   0 1 2 3 4
9. Do you have vomiting?
   0 1 2 3 4
10. Do you have inability to belch?
   0 1 2 3 4
11. Do you have frequent flatulence?
   0 1 2 3 4
12. How satisfied are you with your current situation?
   1: Very satisfied
   2: Satisfied
   3: Neutral
   4: Not satisfied
13. Do you have any recurrence of the complaints that caused you to have surgery?
   0 1
14. Do you take any medication for new complaints?
   Yes/No
15. If you had reflux, would you have this surgery again?
   Yes/No

Evaluation scale for questions 3-11
0: No complaint
1: Little (complaints but not every day)
2: Middle (complaints every day but not affecting daily life)
3: Frequent (complaints affecting daily life)
4: Very often (unable to do daily activities)

FIGURE 1. Questions administered to the patients.

were recorded. We added nonspecific gastrointestinal complaints that we often observe in clinical practice to GERD-HRQL questionnaire. Furthermore, the symptom scale was reduced to make it more understandable. Difficulty swallowing was rated between 0 and 4. Half bowl portion was used when questioning early satiety. Postoperative satisfaction was graded from 1 to 4. Patients with satisfaction levels 1 and 2 are collected under a single group called "satisfied" for statistical significance. Patients were interrogated in terms of drug use and perspective to surgery.

Operative Technique

A 360-degree floppy LNF was performed in all patients. Five trocars were placed in the upper abdomen with the direct trocar insertion technique as described before. The gastroesophageal junction was widely mobilized and both vagus nerves were preserved. The fundus was mobilized with the division of short gastric vessels by 5-mm laparoscopic ultrasonic cutting coagulation shears. The esophagus was mobilized posteriorly and the retroesophageal window was created. The fundus and mediastinal esophagus were aggressively mobilized so that 3 to 4 cm of esophagus was intra-abdominal without tension. Both crus and the crural commissures were dissected. After the insertion of 56-F bougie, crural repair was performed with nonabsorbable suture and U-shaped prolene mesh was placed to cover the diaphragmatic crura with the open end of the U pointing anteriorly. It was fixed using 6 to 8 titanium staples with a 5-mm EndoAnchor Mesh Fixing Stapler (EANCHR5; Ethicon). After hiatal closure 2 interrupted sutures (2-0 silk) were used to fashion a standard Nissen fundoplication. A short, loose fundic wrap 2 to 3 cm around the esophagus was created, and the esophagus was incorporated into the fundoplication sutures. The wrap was not anchored to the crus. The operation was completed without inserting drains or nasogastric catheters. Patients were allowed to drink fluids on the operation evening and were discharged from the hospital in the postoperative first day with the recommendation of a liquid diet for 1 week and a soft diet for the following 2 weeks.

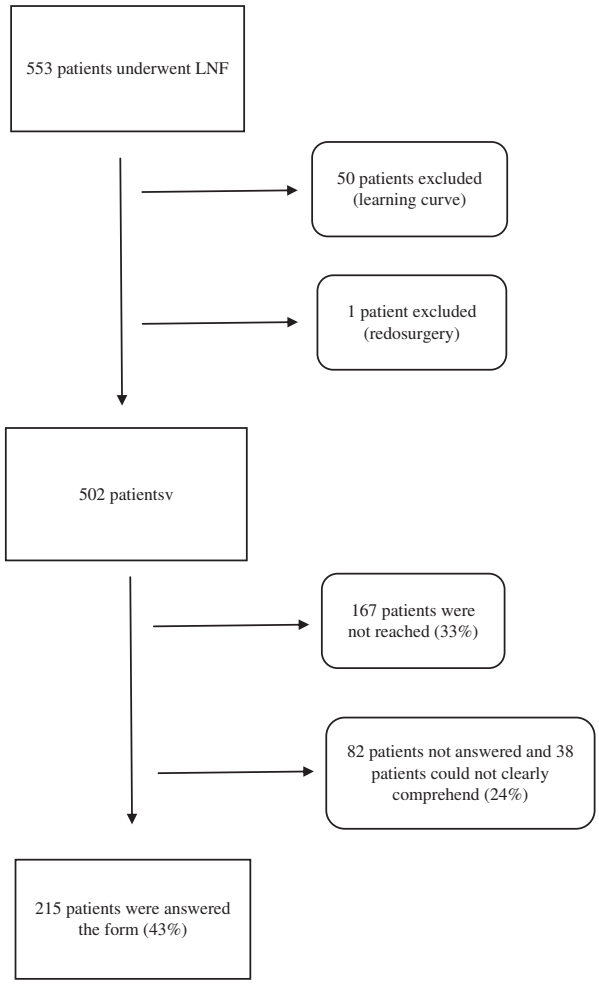

FIGURE 2. Flow chart of patients. LNF indicates laparoscopic Nissen fundoplication.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Sciences version 16.0 for Windows (SPSS Inc., Chicago, IL). The correlation between surgical satisfaction level, preoperative symptom duration, and frequency of postoperative complaints was evaluated by Kruskal-Wallis variance analysis. The significance of differences between preoperative and postoperative symptoms was analyzed by Wilcoxon test. The relationship between preoperative symptom duration and postoperative complaints, and the correlation of postoperative complaints with each other was evaluated with Spearman correlation coefficient. The difference between independent groups was evaluated by Mann-Whitney *U* test. A *P*-value of <0.05 was considered to show a statistically significant result.

RESULTS

Demographic characteristics and clinical data of 215 patients are given in Table 1. The mean age was 44 ± 10.06 years old. No complication was observed and only 1 patient had reoperation after 2 years due to recurrence. Population was divided into 4 groups based on the World Health Organization classification of body mass index (BMI). There was a significant difference in BMI according to sex (females had higher BMI; $P < 0.05$). There was no significant difference in GERD-HRQL score according to BMI ($P > 0.05$; Table 2). Surgical satisfaction level and preference for surgery were found as 82.8% and 91.6%, respectively. There was no relationship between preoperative symptom duration and surgical satisfaction level ($P > 0.05$). The frequencies of all preoperative and postoperative symptoms were compared. Reflux-related symptoms [regurgitation (17.7%), heartburn (17.2%), and vomiting (3.7%)] and nonspecific gastrointestinal symptoms [bloating (50.2%), abdominal pain (15.3%), and belching (27%)] showed a significant decrease after the surgery ($P < 0.001$; Fig. 3). Although the postoperative bloating rate seems to be high, it has decreased significantly compared with that at the preoperative period. Inability to belch and early satiety has emerged as new symptoms in the postoperative period, at a rate of 25.1% and 29.3%, respectively (Table 1). There was no significant difference for dysphagia and diarrhea between the preoperative and postoperative periods ($P > 0.005$). Dysphagia was mostly associated with solid foods and more importantly, none of the patients needed dilatation in the postoperative period. There was a relationship only between long preoperative symptom duration and frequency of postoperative regurgitation ($P < 0.001$ and $r = 0.236$), heartburn ($P < 0.01$ and $r = 0.232$), and bloating rate ($P > 0.05$ and $r = 0.159$). By contrast with bloating, regurgitation, heartburn, and abdominal pain ($P < 0.001$), we observed that the frequency

TABLE 1. Demographic Characteristics and Clinical Data of Patients

Patients (n)	215
Sex (F/M)	116/99
Age (mean)	44 ± 10.06
BMI (range) (kg/m^2)	24.4 (17-32)
Hospitalization (d)	1
Operation time (min)	55
Complication rate	0
Blood loss (mL)	80
Reoperation	1
Preoperative psychological treatment (n)	27
Preoperative symptom duration (mo)	60 (6-360)
Preoperative medical treatment duration (mo)	36 (3-120)
Follow-up period (mo)	60 (14-96)
Newly emerged symptom period (mo)	14.13 ± 20.73
Satisfaction rate (%)	82.8
Postoperative newly emerged symptoms (%)	
Early satiety	25.1
Inability to belching	29.3
Recurrence in preoperative complaints (%)	15.3
Postoperative medication (%)	9.8

BMI indicates body mass index (calculated as weight in kilogram divided by height in meters squared); F, female; M, male.

TABLE 2. Summary of GERD-HRQL Scores Measured in Various BMI Ranges

BMI	< 25	25-29.9	30-34.9	≥ 35
GERD-HRQL score, mean				
Male	6.5	3	5.2	
Female	5.2	3.4	5.6	11
All	6.2	3.1	5.7	11
Patient (n = 215)	17	186	11	1

BMI indicates body mass index; GERD-HRQL, gastroesophageal reflux disease–health-related quality-of-life questionnaire.

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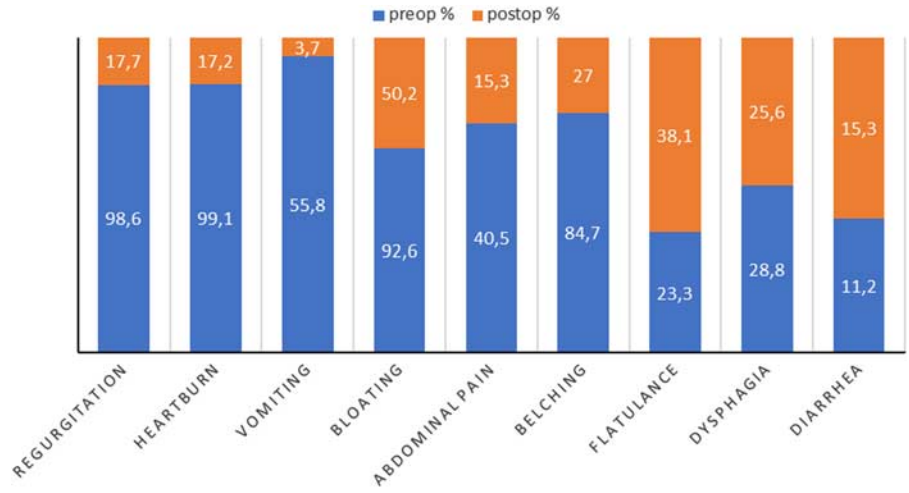

FIGURE 3. Comparison of preoperative and postoperative symptoms.

of flatulence and inability to belch did not influence the operative satisfaction ($P > 0.05$). There was no significant difference in the postoperative complaints according to sex ($P > 0.05$). Dysphagia was more seen in patients receiving psychological treatment ($P > 0.05$). There was a correlation between inability to belch and flatulence ($P < 0.001$ and $r = 0.332$) and diarrhea ($P < 0.001$ and $r = 0.272$), and between flatulence and diarrhea ($P < 0.001$ and $r = 0.243$) (Table 3). Of the 215 patients, 15.3% had recurrent preoperative complaints and 9.8% were using drugs for that condition. 84.7% had no recurrent preoperative complaints (Fig. 4). Although not recommended, the patients have used proton pump inhibitors.

DISCUSSION

The efficacy of LNF has been proven in the treatment of chronic reflux symptoms with <1% mortality and complication rate.[4,17–22] LNF provides 80% to 90% improvement in reflux symptoms.[9,23–26] Despite the excellent results, recurrent or newly emerged gastrointestinal complaints, which are shown to be at a rate of 10% to 20%, can affect the satisfaction rate.[25,27,28] In our study, the satisfaction rate was consistent with the literature. Our longer follow-up period (60 mo) compared with the previous studies allowed us to generate more accurate results in the evaluation of late symptoms. Various results have been reported in the literature about the late symptoms but most of them were temporary.[6,22] We found that the mean appearance time for late complaints was 14 months. Frantzides et al[6] observed that these temporarily complaints resolved within 3 months; however, the study was a multicenter study and the surgical procedures were performed by different surgeons. In our study, all operations were performed by the same surgeon with the same technique. Also, all patients were evaluated by a single observer. These complaints can affect the quality of life and create the perception of unsuccessful surgery in patients' minds. There are only a few studies about the quality of life of patients undergoing LNF.[4,6,10–12] The Turkish version of the GERD-HRQL questionnaire was validated and used previously in a study with a follow-up of 6 months, unlike our study.[11] We did not include the patients who did not complete the 12 months due to temporary symptoms. In contrast to many other studies, we used a more extensive form that interrogates reflux-related and nonspecific symptoms. This is the first study to examine all complaints together. We inquired belching, diarrhea, abdominal pain, vomiting, inability to belch, bloating, and flatulence. The reduction of the scale made it more understandable, as well.

In our study, there was a significant difference in BMI between male and female patients. But there was no difference in GERD-HRQL score according to BMI. This result is different from the study by Gee et al.[29] This may be due to the lower number of obese patients in our study.

TABLE 3. Correlation Between Inability to Belch, Diarrhea, and Flatulence

	Inability to Belch	Diarrhea	Flatulence
Inability to belch	1	0.272	0.332
Diarrhea	0.272	1	0.243
Flatulence	0.332	0.243	1

$P < 0.001$.

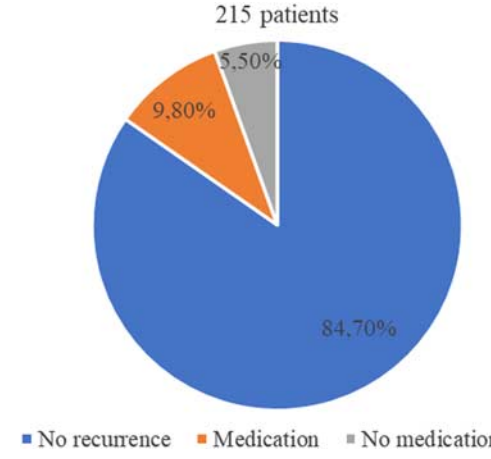

FIGURE 4. Satisfaction and medication rates.

Regurgitation and heartburn are the specific symptoms for gastroesophageal reflux disease. We know that heartburn after surgery can continue for several months due to previous esophageal irritation.[6] In case the symptoms persist for more than 3 months; advanced evaluation should be performed. The rates of these symptoms in our study were compatible with the literature data.[3,12]

Gas bloating is reported at various rates in many studies.[8,13,14] In our study, the severity and/or the frequency of bloating were low and did not change the satisfaction rate. There may be 2 mechanisms; fundoplication prevents the outflow of gas and delayed gastric emptying (caused by vagal damage).[7,30,31] Bloating can be reduced by chewing the food well and avoiding gas-producing foods, fast and/or irregular eating habits. Drugs such as simethicone can be prescribed as well.

Normally, swallowed air stimulates a reflex through the vagal nerve; lower esophageal sphincter relaxes, and belching arises. Some studies demonstrated a decrease in this reflex. Injury of afferent nerves while cutting short gastric vessels can be the responsible mechanism.[8,32,33] The inability to belch may cause dissatisfaction. Vomiting is another complaint that is seen in the preoperative period. In line with the literature, the rate of vomiting decreased from 55.8% to 3.7% in the postoperative period. Conversely, patients do not vomit easily due to fundoplication.

Postoperative dysphagia depends on many factors that can be seen in early or late period. It is an expected condition together with bloating in the early postoperative period due to mucosal edema.[3,34,35] If it continues for more than 3 months, it is called persistent dysphagia. It can be linked to narrowed hiatus, construction of a thick wrap, slipped fundoplication, or preoperatively undiagnosed esophageal dysmotility.[36,37] It is substantially seen with solid foods. In our study, 20% of patients had dysphagia and none of those patients required dilatation or reoperation, contrary to some studies.[4,21,38] There are different results in literature in a range of 2% to 24%.[6,39,40] In our study, no significant difference was observed in the rate of dysphagia in the postoperative period when compared with that in the preoperative period. Some studies associated esophageal dysmotility with the development of postoperative persistent dysphagia.[36,38] Toupet fundoplication was suggested to be performed instead of LNF in case of esophageal dysmotility in some studies.[35,38] In our center, we performed floppy LNF with a 1.5 to 2 cm, 360 degrees, tension-free, wide wrap and did not observe an increase in the rate of dysphagia. There are also conflicting results about the use of bougie, due to risk of esophageal injury.[41,42] We used a 56 F bougie and did not observe any complication.

Abdominal pain can be seen at different rates. Causes may be gas bloating, diarrhea, or heartburn.[9] We observed that abdominal pain, but not flatulence influences satisfaction, although its incidence rate increases after the operation. Diarrhea which can be seen at both periods is associated with vagal damage or previous irritable bowel syndrome.[39,43,44] In accordance with the literature, no significant difference was found in the rate of diarrhea between the preoperative and postoperative period.

Early satiety is another complaint with a rate of 29.3% which is thought to be a side effect of the operation. However, any obstruction and/or weight loss was not demonstrated. We also observed that it does not affect satisfaction.[6] Vagal injury, postoperative adhesions, and undiagnosed gastrointestinal diseases were blamed as the causes of early satiety in previous studies.[44]

Some studies have shown that mental status and stress affect gastric emptying and acid secretion.[45–47] Kammolz and colleagues found that atypical symptoms such as chest pain were more frequent in reflux patients with depression in comparison to the control group.[48] In our study, 12.6% of patients have been taking treatment for depression and dysphagia was seen more often in that group. Some reports found a correlation between psychiatric status and dissatisfaction.[5,49–51] Unlike them, we did not find any relation.

Beenen et al[5] reported that 87.2% of their patients were satisfied and of those, 13.6% had recurrent reflux symptoms. In our study, 15.3% of the patients had a recurrence and 82.8% of the patients were satisfied with their current status. Of the patients, 91.6% answered yes to the question about operative pleasure, that is indicating that they will undertake this operation once more if they experience reflux again. In addition, the medication rate due to newly emerged complaints was found as 9.8%. Most of them were simethicone-like medications. None of them was advised by a physician and no pathology was seen.

The main limitation of the present study is the low number of patients due to difficulties in accessing to some patients and unwillingness of some patients in replying to the questions at 12 months. Hence, studies with a larger number of patients are needed.

CONCLUSIONS

This is the first study in which postoperative reflux-related and nonspecific gastrointestinal complaints are analyzed together. Despite these gastrointestinal symptoms, patient satisfaction and preference rate of surgery is high in LNF. The main determinant factor is the frequency and degree of complaints. In this study, the frequency and degree of these complaints were found to be low and did not affect the satisfaction rate.

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