



Laparoscopic antireflux surgery

Preoperative lower esophageal sphincter pressure does not affect outcome

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Abstract

Background: Concern has been raised about operating on patients with gastroesophageal reflux disease (GERD) and normal lower esophageal sphincter (LES) pressure for the fear that a fundoplication may fail to control reflux and result in a high rate of postoperative dysphagia. We hypothesized that fundoplication is effective in patients with GERD irrespective of the preoperative LES pressure, and that in patients with normal LES pressure, a total fundoplication does not result in a high incidence of dysphagia.

Methods: We studied 280 unselected patients with GERD who underwent laparoscopic fundoplication. They were divided in three groups based on the preoperative LES pressure (normal, 14–24 mmHg): group A (LES pressure, 0–6 mmHg; 61 patients; 22%); group B (LES pressure, 7–13 mmHg; 178 patients; 64%); group C (LES pressure, ≥ 14 mmHg; 41 patients; 14%). De novo dysphagia was defined as new onset of postoperative dysphagia lasting more than 10 weeks. The average follow-up period was 17 ± 22 months.

Results: There was no difference in resolution of symptoms among the three groups. Heartburn and regurgitation resolved or improved respectively in 96% of group A, 90% of group B, and 91% of group C patients. In addition, there was no difference in the incidence of de novo dysphagia, which occurred in 8% of group A, 7% of group B, and 2% of group C.

Conclusions: We conclude that fundoplication controlled GERD irrespective of preoperative LES pressure, and that a normal LES pressure before surgery was not associated with a higher rate of postoperative dysphagia.

Key words: Gastroesophageal reflux — Lower esophageal sphincter — Esophageal manometry — Dysphagia — Antireflux surgery

In most patients who undergo surgery for gastroesophageal reflux disease (GERD), esophageal manometry shows that the lower esophageal sphincter (LES) has a low resting pressure [15]. A fundoplication is thought to control reflux by increasing the resting LES pressure [11]. However, a minority of patients is found to have a normal LES pressure preoperatively, and in these patients, transient relaxations of the LES are assumed to be the cause of the abnormal reflux detected by pH monitoring [3, 7]. Concern has been raised about operating on patients with GERD and normal LES pressure for the fear that a fundoplication may fail to control reflux and result in a high rate of postoperative dysphagia [1]. On the basis of these thoughts, some have recommended a partial instead of a total fundoplication [10].

In this study we assessed in patients with GERD both the effectiveness of fundoplication in relation to the preoperative LES pressure and the incidence of postfundoplication dysphagia (de novo dysphagia) in patients with normal preoperative LES pressure after partial or total fundoplication.

Methods

Between July 1993 and December 2000, 520 patients underwent laparoscopic fundoplication for GERD at the University of California, San Francisco. Follow-up evaluation was complete for 280 (54%) of the 520 patients, so this group served as the study population. There were 154 men and 126 women, whose mean age was 50 years. Symptoms had been present in these patients for an average of 101 months. All the patients had been treated with acid-reducing medications: H₂-blocking agents (5%), proton pump inhibitors (45%), proton pump inhibitors and prokinetic agents (50%).

Table 1. Postoperative symptoms among the 280 patients who underwent laparoscopic fundoplication for GERD

Symptom	Groups					
	A1	A2	B1	B2	C1	C2
Heartburn (% of patients)						
Resolved	82	57	82	69	88	56
Improved	11	40	10	25	4	22
Regurgitation (% of patients)						
Resolved	95	62	89	61	91	67
Improved	5	34	1	23	9	11
De novo dysphagia (% of patients)	13	3	6	9	3	0

A1: LES pressure 0–6 mmHg, 30 patients, total fundoplication

A2: LES pressure 0–6 mmHg, 31 patients, partial fundoplication

B1: LES pressure 7–13 mmHg, 123 patients, total fundoplication

B2: LES pressure 7–13 mmHg, 55 patients, partial fundoplication

C1: LES pressure \geq 14 mmHg, 31 patients, total fundoplication

C2: LES pressure \geq 14 mmHg, 10 patients, partial fundoplication

Clinical findings

The severity of symptoms was scored by the patients before and after the operation using a 5-point scale ranging from 0 (no symptoms) to 4 (disabling symptoms) (Table 1). The preoperative disorders included heartburn (90%) and regurgitation (73%). De novo dysphagia was defined as new onset of postoperative dysphagia lasting more than 10 weeks.

X-ray findings

The results of barium esophagograms were normal in 39% of the patients, and showed a sliding hiatal hernia in 61% of the patients. No patients in this study had an esophageal stricture or a paraesophageal hiatal hernia.

Endoscopic findings

According to endoscopy, 3% of the patients had no visible signs of esophagitis, 67% had grade 1 or 2 esophagitis, and 30% had grade 3 or 4 esophagitis.

Esophageal manometry

The patients were studied after an overnight fast using a technique previously described [9]. Medications that might interfere with esophageal motor function (i.e., metoclopramide, nitrates, and calcium-channelblocking agents) were discontinued at least 48 h before the study. The following variables were assessed: resting pressure of the LES and amplitude of peristalsis in the distal esophagus.

On the basis of the preoperative LES pressure (normal, 14–24 mmHg), the patients were divided into three groups: group A (LES pressure, 0–6 mmHg; 61 patients; 22%); group B (LES pressure, 7–13 mmHg; 178 patients; 64%); group C (LES pressure, \geq 14 mmHg; 41 patients; 14%).

Ambulatory pH monitoring

Acid-suppressing medications were discontinued 3 days (H₂-blocking agents) to 14 days (proton pump inhibitors) before the study. During the test, the patients consumed an unrestricted diet and took no medications that could interfere with the results [9]. The reflux score (normal, <14.7) was 86 ± 55 for the group A patients, 60 ± 46 for the group B patients, and 49 ± 31 for the group C patients ($p < 0.05$ for A vs B, B vs C, and A vs C patients).

Surgical treatment

Laparoscopic fundoplication was performed according to techniques previously described [8]. Of the 280 study patients, 184 patients (66%) with normal esophageal peristalsis underwent a total fundoplication (360°) and 96 patients (34%) with abnormal esophageal peristalsis (amplitude in the distal esophagus, \leq 40 mmHg) underwent a partial (240°) fundoplication [5]. According to the type of operation performed, each group was further divided into two subgroups: A1 (total fundoplication) and A2 (partial fundoplication); B1 (total fundoplication) and B2 (partial fundoplication); C1 (total fundoplication) and C2. (partial fundoplication).

Follow-up evaluation

All the patients were seen in follow-up visits 2 and 8 weeks postoperatively. Subsequently, they were interviewed by phone at 3- to 4-month intervals. The mean follow-up period was 17 ± 22 months.

Statistical analysis

Student's *t*-test, Wilcoxon signed-rank test, and analysis of variance (ANOVA) were used for statistical evaluation of the data. All the results are expressed as mean \pm standard deviation. Differences were considered significant at *p* values less than 0.05.

Results

Postoperatively, pH monitoring was offered to all the patients to determine the effect of the operation. However, only a very few patients (~15%) had the test. Most asymptomatic patients did not have the test, either because they did not want to repeat it in the absence of symptoms or because their insurance denied authorization. Because of the low number of postoperative pH monitoring studies (resulting in no statistical power), we decided to assess the outcome of the operation on the basis of symptoms only. Table 1 and Figs. 1 and 2 show the effects of the operation on heartburn and regurgitation in the six subgroups. There was no difference ($p =$ not significant [NS]) in the resolution of symptoms and improvement of the symptom score among the groups that had undergone a total fundoplication (groups A1, B1, and C1), independent of the preopera-

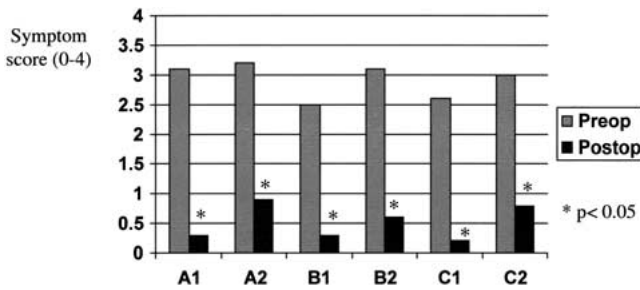


Fig. 1. Pre- and postoperative symptom scores for heartburn. Group A1: LES pressure 0–6 mmHg, 30 patients, total fundoplication; Group A2: LES pressure 0–6 mmHg, 31 patients, partial fundoplication; Group B1: LES pressure 7–13 mmHg, 123 patients, total fundoplication; Group B2: LES pressure 7–13 mmHg, 55 patients, partial fundoplication; Group C1: LES pressure \geq 14 mmHg, 31 patients, total fundoplication; Group C2: LES pressure \geq 14 mmHg, 10 patients, partial fundoplication.

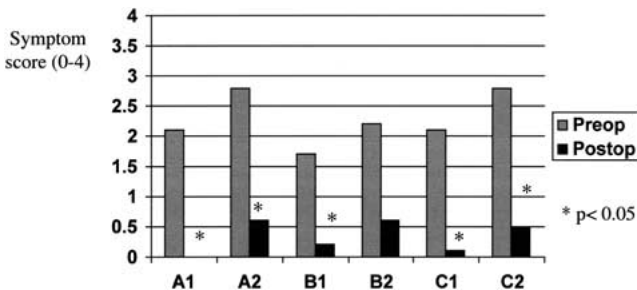


Fig. 2. Pre- and postoperative symptom scores for regurgitation. Group A1: LES pressure 0–6 mmHg, 30 patients, total fundoplication; Group A2: LES pressure 0–6 mmHg, 31 patients, partial fundoplication; Group B1: LES pressure 7–13 mmHg, 123 patients, total fundoplication; Group B2: LES pressure 7–13 mmHg, 55 patients, partial fundoplication; Group C1: LES pressure \geq 14 mmHg, 31 patients, total fundoplication; Group C2: LES pressure \geq 14 mmHg, 10 patients, partial fundoplication.

tive LES pressure. Similarly, the improvement was similar ($p = \text{NS}$) among groups A2, B2, and C2, which had undergone partial fundoplication. However, across the board, improvement was better after total than after partial fundoplication (A1 vs A2, $p < 0.05$; B1 vs B2, $p < 0.05$; C1 vs C2, $p < 0.05$).

De novo dysphagia developed in 19 patients (7%). There was no difference ($p = \text{NS}$) in the incidence of de novo dysphagia among the six groups based on preoperative LES pressure (Table 1). In addition, within each group there was no difference in the incidence of de novo dysphagia between patients who had partial and those who had total fundoplication. Dysphagia resolved spontaneously after an average of 4 months in 14 patients (74%), and after dilation (average, 1.2 patient range, 1–5) in 5 patients (1 patient in group A1 and 4 patients in group B1). No patient required a second operation because of dysphagia. Figure 3 shows the effect of the fundoplication (total or partial) on the LES resting pressure.

Discussion

The study data show that fundoplication was effective in patients with GERD irrespective of the preoperative

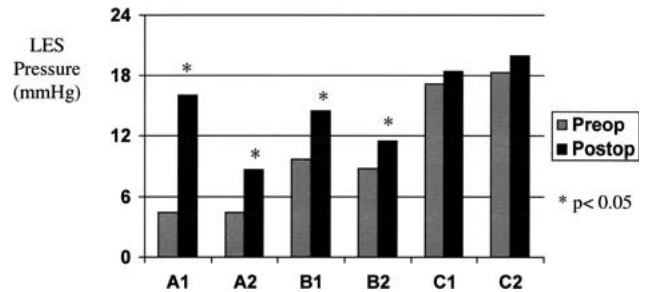


Fig. 3. Pre- and postoperative lower esophageal sphincter pressures. Group A1: LES pressure 0–6 mmHg, 30 patients, total fundoplication; Group A2: LES pressure 0–6 mmHg, 31 patients, partial fundoplication; Group B1: LES pressure 7–13 mmHg, 123 patients, total fundoplication; Group B2: LES pressure 7–13 mmHg, 55 patients, partial fundoplication; Group C1: LES pressure \geq 14 mmHg, 31 patients, total fundoplication; Group C2: LES pressure \geq 14 mmHg, 10 patients, partial fundoplication.

LES pressure, that fundoplication in patients with normal LES pressure did not result in more de novo dysphagia than in those with a hypotensive LES, and that a total fundoplication was not followed by more postoperative dysphagia than partial fundoplication, irrespective of the preoperative LES pressure.

GERD and LES pressure: effect of fundoplication

Among our 280 patients, a LES pressure of 6 mmHg or less was found preoperatively in only 22% of the patients. It was slightly decreased in 64% and normal in 14% of the patients. In another study of 324 patients with GERD (documented by prolonged pH monitoring), the LES was normal in 40% of the patients [15]. Dodds et al. [3] explained these contrasting findings in a landmark article on the mechanisms underlying gastroesophageal reflux. Using a solid-state sleeve catheter, which allowed prolonged recording at the level of the LES, these authors found that transient LES relaxations (sudden loss of sphincter tone not preceded by swallowing) were the most common mechanism of reflux among normal subjects and patients with GERD. In a more recent study, the same group of investigators found that whereas transient relaxation accounts for most reflux episodes, a hypotensive LES is more common in patients with more severe esophagitis [2].

For practical reasons, the dynamic behavior of the LES is not studied except for research purposes, so the clinical value of the standard manometry is limited to excluding primary esophageal motility disorders such as achalasia, and to locating the LES for proper placement of the pH probe. We found that a fundoplication corrected reflux irrespective of the resting LES pressure. Postoperative manometry showed that whereas a low preoperative LES pressure increased after surgery, it remained unchanged in patients who had a normal pressure preoperatively. This accords with reports indicating that the efficacy of fundoplication in this latter group stems from a decrease in the frequency of transient LES relaxation episodes [6]. Furthermore, others have noted that the results of a Nissen fundoplication were just as good in patients with a structurally defective

sphincter as in patients with a normal sphincter [12]. On the basis of these findings, a fundoplication should be considered an appropriate treatment of GERD regardless of resting LES pressure.

LES pressure and fundoplication: incidence of de novo dysphagia

The concerns have been centered around the possibility of dysphagia as a fundoplication side effect in the face of a normal LES pressure [1]. For instance, Blom et al. [1] reported that new-onset dysphagia was six times more common after Nissen fundoplication in patients with normal LES pressure. Others, however, have not replicated these findings [4, 13]. Our results show that the preoperative LES pressure did not affect the incidence of postoperative de novo dysphagia. Actually, only 2% of the patients with a normal preoperative LES pressure experienced dysphagia, as compared with 8% of the patients with a hypotensive LES. Dysphagia resolved spontaneously in most patients within 4 months. Dilatation was needed in only five patients, after which the dysphagia resolved permanently. Other groups have stressed the importance of postoperative dilatation before resort to a second operation [14]. Thus far, no patient in our series has required a second operation for dysphagia.

In conclusion, laparoscopic fundoplication is effective in patients with GERD regardless of preoperative LES pressure. Even in patients with normal LES pressure, it controls reflux and is not associated with an increased incidence of postoperative dysphagia. Therefore, the decision to perform a partial rather than a total fundoplication should be based only on the manometric characteristics of esophageal peristalsis.

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