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Outcomes After Esophagectomy in Patients With Prior Antireflux or Hiatal Hernia Surgery

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Abstract

Background—Esophagectomy is indicated occasionally for the treatment of patients with refractory gastroesophageal reflux disease (GERD) or recurrent hiatus hernia. The purpose of this study was to evaluate the impact of previous gastroesophageal operations on outcomes after esophagectomy for recurrent GERD or hiatus hernia.

Methods—Using a prospectively accumulated database, a retrospective review was performed to identify patients undergoing esophagectomy for complicated GERD or hiatus hernia. Mortality, perioperative and functional outcomes, and need for reoperation were evaluated, assessing esophagectomy patients who had undergone prior operations for GERD or hiatus hernia.

Results—Of 258 patients with GERD or hiatus hernia undergoing esophagectomy, 104 had undergone a previous operation, with a median interval to esophagectomy of 28 months. Transhiatal resection was accomplished in fewer patients undergoing reoperation (87 of 104 versus 151 of 154; $p < 0.005$). A gastric conduit was used as an esophageal replacement in fewer patients with previous operation(s) (89 of 104 versus 150 of 154; $p < 0.005$). Esophagectomy patients with a history of prior gastroesophageal surgery, as compared with those without, sustained more blood loss and were more likely to require reoperation, and fewer reported good to excellent swallowing function ($p < 0.05$). There was no difference in the occurrence of anastomotic leak.

Conclusions—Esophagectomy in patients who have undergone prior operations for either GERD or hiatus hernia can be accomplished without thoracotomy and with satisfactory intermediate-term quality of life. Such patients should be evaluated and prepared for the use of alternative conduits should the remobilized stomach prove to be an unsatisfactory esophageal substitute at the time of esophagectomy.

Failure of antireflux operations or hiatal hernia repairs can be attributed to recurrent symptoms of gastroesophageal reflux, dysphagia, or anatomic recurrence of hiatal hernia [1]. Single-center reports of outcomes after fundoplication for gastroesophageal reflux demonstrate low rates of reoperation in short-term follow-up, but with longer-term follow-up, rates of reoperation vary from 1% to 14% [2]. Patients undergoing hiatal hernia operations, particularly of the paraesophageal or combined type, appear to have a higher rate of recurrence [3], with reoperation rates ranging from 5% to 15% [4–6].

For the majority of patients who undergo reoperation after prior antireflux surgery or hiatal hernia repair, an esophageal-preserving operation is feasible [7–10], although it is well recognized that reoperative antireflux surgery carries an increased risk for anatomic failure or

recurrent symptoms with worse patient satisfaction. Some patients who have had prior operations for gastroesophageal reflux or hiatus hernia and have experienced recurrent symptoms or esophageal obstruction refractory to medical management may be considered for esophageal resection and reconstruction. We reviewed our experience with esophagectomy for failed antireflux or hiatal hernia surgery at a single tertiary referral center. For comparison, we identified a separate cohort of patients undergoing esophagectomy for complications of gastroesophageal reflux but who had not undergone any previous gastroesophageal operation.

Patients and Methods

Patient Population

Permission for this retrospective study using both medical records and the Section of General Thoracic Surgery's prospective esophagectomy database was provided by the institutional review boards of the University of Michigan Medical School. Between 1975 and 2007, 570 patients have undergone esophagectomy on our service for benign disease. Of these, 271 (48%) patients required operation for complications of gastroesophageal reflux disease or hiatal hernia. The indications for resection were Barrett's mucosa with high-grade dysplasia, intractable reflux with associated undilatable or "hard" stricture, recurrent reflux or hiatal hernia, particularly after two or more antireflux operations, and obstructive symptoms caused by a severe stricture associated with reflux. Patients with gastroesophageal reflux disease related to connective tissue diseases such as scleroderma ($n = 13$) were excluded from analysis. Of the remaining 258 patients, a cohort of 104 patients had undergone at least one prior gastroesophageal operation. Table 1 lists the specific previous operations. In this cohort of 104 patients among patients with a history of one, two, or three prior operations, "first-time" open Nissen fundoplication had been performed 11, 22, and 3 times, respectively. Remedial Nissen fundoplication had been performed 15 times. Although we included other types of gastroesophageal operations in our enumeration of prior surgery, all patients in this cohort had undergone at least one operation for treatment of gastroesophageal reflux disease or hiatal hernia. Using as the reference group the 154 patients with gastroesophageal reflux or hiatus hernia undergoing esophagectomy but with no prior gastroesophageal operation, the outcomes and characteristics of those of the cohort of interest were compared.

Outcomes and Statistical Analysis

Perioperative mortality was defined as 30-day or in-hospital mortality. Complications included the need for splenectomy, hemorrhage requiring transfusion, airway injury, anastomotic leak, postoperative vocal cord palsy, renal insufficiency, infection, and chylothorax.

Functional quality of life was determined as an aggregate of self-reported measures of dysphagia, regurgitation, and dumping syndrome assessed during patient follow-up and categorized as excellent (completely asymptomatic), good (minimal symptoms requiring no treatment), fair (symptoms requiring occasional treatment such as dilatations or antidumping medication), and poor (symptoms requiring ongoing treatment), as has been reported elsewhere [11]. Patient satisfaction was assessed at the time of follow-up with the following three questions: "Are you generally pleased with your ability to eat?", "Are you better than you were before your operation?", and "Knowing what you know now about the procedure, would you have the operation again (if faced with the same circumstances)?"

The objective of the analysis was to evaluate the impact of a previous gastroesophageal operation on mortality, perioperative complications, functional outcome, and patient satisfaction after esophagectomy. Logistic regression and multiple linear regression analyses were used to assess outcomes. Esophagoenteric anastomotic dilatation was analyzed both as ever needed dilatation (yes/no) and as cumulative number of dilatations over time [12–14].

Functional quality-of-life outcomes were dichotomized into excellent–good and fair–poor categories. The primary covariate of interest, history of prior gastroesophageal surgery, was analyzed both as a dichotomous factor, ie, whether or not a patient had prior esophagogastric operation(s), and as the number of prior esophagogastric operation(s), while adjusting for demographic and surgical covariates.

In univariate analysis evaluating covariates between subjects with and without previous operation, Wilcoxon rank-sum test was used for continuous variables. The χ^2 statistic [15] and Fisher's exact test [16] were used for categorical variables. A two-tailed probability value of 0.05 or less was considered to be statistically significant. All statistical analyses were done using SAS v9.1 (SAS Institute Inc, Carey, NC).

Results

Patient Characteristics

Barrett's esophagus with high-grade dysplasia, arising in 121 of 154 patients, was the most common indication for esophagectomy among patients with gastroesophageal reflux or hiatus hernia without previous esophageal surgery. Other indications included gastroesophageal reflux disease (12.3%, 19 of 154) and reflux-related esophageal strictures (5.8%, 9 of 154). The 104 patients with previous gastroesophageal operation(s) presented with a variety of diagnoses. The majority of these patients required esophagectomy for recurrent or persistent gastroesophageal reflux (46.2%, 48 of 104) or recurrent hiatus hernia (28.8%, 30 of 104). A greater proportion of patients undergoing esophagectomy after a previous operation were younger, weighed less, and were women (Table 2).

Before esophagectomy, 184 previous gastroesophageal operations had been performed in this cohort of 104 patients (Table 1). Until March 1998, none of 55 patients undergoing reoperative esophagectomy in this cohort had previously undergone a laparoscopic antireflux operation. Thereafter, 19 of 49 patients had undergone at least one laparoscopic antireflux operation before esophagectomy. The median interval from most recent antireflux or gastroesophageal operation to esophagectomy was 27.5 months, and ranged from 0 months (9 days) to 30 years.

Operative Approach and Esophageal Substitute

Esophagectomy was accomplished by thoracotomy or thoracoabdominal approach in 17 (16.3%) patients with a prior history of a gastroesophageal operation, whereas transhiatal esophagectomy without thoracotomy was completed in 151 (98%) patients without a previous operation ($p < 0.005$). Fewer patients with a history of a prior gastroesophageal operation underwent esophageal replacement using the gastric conduit in the orthotopic (posterior mediastinal) location ($p < 0.005$; Table 3).

Mortality and Perioperative Complications

The overall in-hospital or 30-day mortality in these 258 patients was 2% (5 patients) and was not significantly different between the two comparison groups (Table 4). Intraoperative bleeding was greater in patients undergoing reoperation (mean, 864 ± 784 mL versus 417 ± 394 mL; $p < 0.0001$). In multivariate analysis, in addition to a history of prior operations, nonstandard conduit location and earlier year of operation also were significant risk factors for more intraoperative blood loss ($p < 0.005$). Among esophagectomy patients with a history of prior operation(s), earlier year of operation and use of a hand-sewn anastomosis were associated with more intraoperative blood loss ($p < .0001$), but the number of previous operations was not statistically significant as a risk factor. Conversely, among patients with a stapled cervical esophageal anastomosis, history of prior operation was not a statistically significant risk factor

for greater intra-operative blood loss after adjusting for subject demographics, year of operation, and operative techniques.

In multivariate analysis of risk factors associated with any complication, patients with an increasing number of previous gastroesophageal operations were at greater risk for any complication, adjusting for patient demographics and operative technique (odds ratio, 1.5; 95% confidence interval [CI], 1.1 to 2.2; $p < 0.02$). The number of prior operations was a risk factor only among subjects who had a hand-sewn anastomosis, whereas among subjects with stapled anastomosis, no associated risk factors were identified.

Consistent with our previous reports [17,18], patients who had a stapled cervical esophageal anastomosis were less likely to have an anastomotic leak, adjusting for patient sex, age, weight, operative year, surgical variables, and operative indications (odds ratio, 0.24; 95% CI, 0.08 to 0.76; $p = 0.02$). Although a history of prior gastroesophageal surgery was not associated with anastomotic leaks, among patients with such a history, increasing number of prior operation (s) was a risk factor for the occurrence of postoperative anastomotic leak (odds ratio, 2.66; 95% CI, 1.04 to 7.73; $p = 0.04$).

Reoperations After Esophagectomy

Significantly more patients who had undergone a prior esophagogastric operation required reoperation after esophagectomy (15 of 104 versus 5 of 154; $p = 0.002$; Table 4). Of the 15 (14%) esophagectomy patients with prior operations, subsequent reoperations included colon interposition for alimentary discontinuity (3 patients), esophagogastric (2 patients) or cologastric anastomotic revision (2 patients), diaphragmatic hernia repair (2 patients), Roux-en-Y gastrojejunostomy (2 patients), and in 1 patient each: completion gastrectomy with substernal jejunal interposition, repair of tracheoenteric (gastric) fistula, enterolysis, and open drainage for empyema.

Functional Assessment

Overall median follow-up for the entire cohort was 43 months (95% CI, 30 to 56 months). For esophagectomy patients with prior gastroesophageal surgery, median follow-up was 53 months (95% CI, 30 to 78 months) and for those without prior operation median follow-up was 37 months (95% CI, 25 to 52 months). Functional data were available at follow-up in 99 (95%) patients undergoing esophagectomy with prior gastroesophageal surgery and in 149 (97%) esophagectomy patients without such history.

Using a composite assessment of functional outcomes, 43 (50.6%) patients with a history of prior gastroesophageal surgery had a good-to-excellent functional outcome, compared with 92 (68.7%) patients without prior gastro-esophageal surgery ($p < 0.05$). When adjusting for patient demographics, year of operation, and operative technique, esophagectomy patients with prior gastroesophageal surgery were more likely to have a fair-to-poor composite functional outcome, indicating the need for regular treatment of dysphagia, regurgitation, or dumping syndrome (odds ratio, 2.84; 95% CI, 1.2 to 7.1; $p = 0.02$). Among these patients, those who had a longer operative interval between previous operation and esophagectomy were more likely to have a good or excellent functional outcome (odds ratio, 1.10; 95% CI, 1.02 to 1.21; $p = 0.02$).

At the time of most recent follow-up, 59 (60%) esophagectomy patients with a history of prior esophageal surgery were able to swallow comfortably without the need for anastomotic dilatation, compared with 120 (83%) patients without previous gastroesophageal surgery. Moderate-to-severe dysphagia occurred in 32 (32%) patients with previous operation, with only 2 patients having severe dysphagia requiring regular anastomotic dilatation. In

comparison, only 21 (14%) patients without previous gastroesophageal operation experienced moderate dysphagia, and none experienced severe symptoms ($p < 0.005$). Within 2 years of operation, patients with a history of prior gastroesophageal surgery were more likely ($p < 0.01$) to require anastomotic dilatation, 1.5 versus 0.9 dilatations per patient. In multivariate analysis, censoring at last follow-up, patients with a stapled cervical esophageal anastomosis undergoing esophagectomy without prior gastroesophageal surgery required the fewest anastomotic dilatations with time ($p = 0.02$), although a history of prior gastroesophageal surgery was not a statistically significant factor (Fig 1).

Overall, at most recent follow-up, 122 (50%) patients experienced no regurgitation, 77 (31.6%) patients experienced rare-to-mild symptoms of regurgitation, and pulmonary complications attributable to regurgitation and aspiration were noted in 5 patients, of whom 4 were esophagectomy patients with prior gastroesophageal surgery; there were no significant differences identified between the two patient groups. Similarly no significant difference was noted in postoperative dumping syndrome, as determined by assessment of cramping and diarrhea, between the two patient groups.

Patient Satisfaction

Patient satisfaction data were available at follow-up in 61 (59%) patients undergoing esophagectomy with prior gastroesophageal surgery and in 116 (75%) esophagectomy patients without such history. Among esophagectomy patients with available survey data, significantly more patients with a history of prior gastroesophageal operation responded that they felt better after operation. No significant differences were identified between groups regarding whether subjects were generally pleased with their ability to eat or would have the operation again if faced with the same decision (Table 5).

Comment

Much of the recent literature regarding reoperative anti-reflux surgery addresses the first-time “failure,” particularly after a laparoscopic operation. The rate of reoperation after initial laparoscopic antireflux operations can be as low as 2.5% to 5.1%, as reported in several large prospectively maintained series with median follow-up greater than 2 years [19–23]. For patients undergoing primary laparoscopic repair of large paraesophageal hiatal hernias, the rate of reoperation is likely higher [24].

After primary open antireflux surgery, the estimated rate of reoperation is estimated to be 4% to 10% [1,25]. In a series of 240 patients undergoing transthoracic hiatal hernia repairs at our institution, 5.8% (14 of 240) required reoperation [5]. Consistent with the treatment algorithms reported by others, esophageal-preserving reoperation remains our preferred approach in patients with one “failed” hiatal hernia or antireflux operation. The success rate of third-time or more hiatal hernia or antireflux operation is so low that we generally recommend an esophagectomy after two or more failed operations.

In the first two decades of our experience, from 1975 until 1997, no patients undergoing reoperative esophagectomy had undergone a previous laparoscopic antireflux operation. As laparoscopic techniques have become more pervasive [26], we also have observed that from 1998 onward a substantial number, 39% (19 of 49), of our patients with a history of prior gastroesophageal surgery had undergone at least one laparoscopic operation. Whether the initial indications or the type of prior gastroesophageal surgery, laparoscopic or open/transabdominal, influence the need for subsequent esophagectomy is beyond the scope of this study, given the nature of our referral-based practice. We have not been impressed that a laparoscopic fundoplication results in any less periesophageal or perihial fibrosis than an open fundoplication.

The surgical management of an unsuccessful antireflux operation is challenging. For the first remedial operation, laparoscopic approaches appear to be effective, although patients who have undergone open primary operations are more likely to require conversion to open operations [9,22]. It is well established that after open antireflux surgery both poor clinical results and perioperative morbidity increase with reoperation; unsatisfactory outcomes range from 20% to 60% [25,27–31]. Among patients with failed gastroesophageal procedures who require reoperation (but not an esophagectomy), reported early mortality (in-hospital or within 30 days of operation) is infrequent (0% to 1.5%) [8–10,28,32,33]. In our review, we observed that early mortality was 2%, comparable to other reports of patients undergoing esophagectomy for similar indications [34,35].

Complication rates after remedial operations after previous antireflux surgery typically range from 15% to 40% [8–10,28,32,33]. One large series of 307 reoperations, including 77 open procedures, reported that when laparoscopic reoperation was feasible, the perioperative complication rate of 13% was significantly lower than the 33% after open reoperation and 40% in those requiring conversion to open operations [9]. After reoperative esophagectomy or gastrectomy, complication rates, including need for anastomotic dilatation, appear to be greater, occurring in more than 24% to 50% of patients [34–36]. In our series, the complication rate of 31% among esophagectomy patients with a history of prior gastroesophageal surgery was not significantly different from that in our comparison group.

Rates of reoperation after the first remedial operation in selected series with greater than 1 year median or average follow-up range from 7% to 11% [9,10,28,32,33]. Among esophagectomy patients in our series with a history of prior gastroesophageal surgery, the rate of reoperation, 14%, was comparable to rates of reoperation after open esophageal-preserving reoperations, arguably in a cohort of patients with more deranged esophageal physiology and anatomy.

It is possible that relative conduit ischemia or fibrosis arising from remobilization of the stomach after previous operations can contribute to the need for more frequent anastomotic dilatation that we observed among esophagectomy patients with a history of prior gastroesophageal surgery. Despite this, the majority of patients (60%) did not require any anastomotic dilatation, and most patients were able to swallow comfortably with a relatively small number of postoperative dilatations.

Assessment of functional status after esophagectomy remains largely qualitative. A combined two-part survey consisting of a disease-specific functional assessment and a standardized questionnaire, the Medical Outcomes Study 36-Item Short-Form Health Survey, has been used [37]. Quality-of-life scores after esophagectomy in that study indicated that self-assessment of physical functioning, social functioning, and health perception were significantly lower when compared with national norms. We assessed functional status as a composite of the degree of dysphagia, regurgitation, and dumping syndrome (diarrhea and cramping). Compared with the cohort of patients without a history of prior gastroesophageal surgery, esophagectomy patients with such a history were less likely to have a good-to-excellent aggregate functional outcome, similar to that reported for patients undergoing esophageal reconstruction for benign disease [10,34]. Patient satisfaction was comparable between those undergoing esophagectomy with or without a history of prior gastroesophageal surgery, although any differences in patient-reported satisfaction might be obscured by the number of missing data in our analysis.

Even with prospective collection of data, such factors as changes in patient assessment and perioperative care cannot be accounted for adequately in this retrospective 30-year single institutional experience. In addition, although reports of functional outcome and quality of life are difficult to compare among institutions, validated instruments assessing both functional

status and patient satisfaction used in conjunction with disease-specific questionnaires may lead to improved analysis of surgical outcomes in this group of difficult-to-treat patients.

We approach an initial redo antireflux or hiatal hernia operation with the intent of revising the previous repair. If there is a recurrent hiatal hernia, our initial approach is a left posterolateral thoracotomy. If there is obstruction within the fundoplication but the wrap is below the diaphragm, the previous operation is assessed through an open transabdominal approach. Our first goal is to delineate the anatomy of the esophagogastric junction, taking down completely any previous fundoplication(s) and removing prosthetic material. If mesh has been used in the previous operation, the possible need for esophagectomy is discussed with the patient. The colon is evaluated and prepared in the event that after removal of the mesh and remobilization, the stomach is not adequate for use as an esophageal substitute. These steps are necessary whether considering redo fundoplication or esophageal resection. Devascularization of the gastric fundus, as might have arisen by skeletonization of the esophagogastric junction during prior operations, luminal erosion of synthetic prosthetic material, or excessive scarring and fibrosis at the esophagogastric junction mitigate for resection rather than redo fundoplication.

Careful assessment of symptoms, anatomy, and esophageal function should be pursued in the patient who presents with renewed or persistent symptoms after an antireflux operation or hiatus hernia repair. Recurrent but medically controlled reflux symptoms, a small anatomic hernia, or intermittent dysphagia do not mandate reoperation, as reflux or dysphagia may occur after a repeat fundoplication or esophageal resection. Appropriate patient selection, preoperative patient education, and clear definition of possible adverse outcomes are extremely important. Esophagectomy remains a suitable and safe alternative, particularly when previous attempts at esophageal preservation have failed. Continued postoperative follow-up with documentation of functional and physiologic outcomes is essential in establishing evidence-based guidelines.

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Fig 1. Average number of cumulative esophagoenteric anastomotic dilatations required after esophagectomy, stratified by history of prior operation and by anastomotic technique, hand-sewn or side-to-side stapled.

Table 1

Previous Operations in Patients Undergoing Esophagectomy

Operation	Initial or Reoperation	Number (%)	Operations per Patient			
			One	Two	Three	Four
Open Nissen fundoplication (NFP)	Initial	36 (19.6%)	11	22	3	3
	Reoperation	15 (8.2%)		13	2	2
Open antireflux (non-Nissen)	Initial	18 (9.8%)	10	5	3	3
	Reoperation	17 (9.2%)		10	7	7
Laparoscopic NFP/hiatus hernia	Initial	18 (9.8%)	5	10	3	3
	Reoperation	7 (3.8%)		2	5	5
Collis gastropasty, fundoplication	Initial	9 (5.0%)	8	1		
	Reoperation	9 (5.0%)		9		
Trans thoracic hiatus hernia repair, any	Initial	7 (3.8%)	2	5		
	Reoperation	7 (3.8%)		5	2	2
Esophagomyotomy ± Belsey		7 (3.8%)		2	2	3
Esophagogastrectomy		5 (2.7%)	2	1	2	2
Partial gastrectomy (eg, antrectomy)		5 (2.7%)		4	1	1
Antulcer/vagotomy/pyloroplasty		4 (2.2%)		4		
Angelchik band ± antireflux operation		3 (1.6%)		3		
Reversal of fundoplication		4 (2.2%)		3	1	
Previous esophageal atresia repair		2 (1.1%)	1	1		
Colon interposition		3 (1.6%)		1		2
Removal of Angelchik		2 (1.1%)		2		
Gastric stapling for obesity		6 (3.3%)		1	2	3
Total		184 (100.0%)	39	104	33	8

Table 2

Demographics of Patients Undergoing Esophagectomy for Gastroesophageal Reflux Disease or Hiatal Hernia

Variable	No Prior Operation (n = 154)	Prior Operation (n = 104)	p Value
Female (%)	39 (25%)	62 (60%)	<0.0001 ^a
Age (y), median (range)	61 (18–86)	54 (14–84)	<0.005 ^b
Weight (kg), mean ± SD	85.5 ± 21	73.6 ± 18	<0.001 ^b
Indication for esophagectomy			
High-grade dysplasia	121	13	
GERD/stricture	19	18	
Recurrent GERD	0	30	
Recurrent HH	0	30	
Stricture/GERD	9	5	
Other	5	7	
Neuromotor (spasm/dysmotility)	0	1	

^a χ^2 test.^b Wilcoxon rank-sum test.

GERD = gastroesophageal reflux disease; HH = hiatal hernia; SD = standard deviation.

Table 3

Operative Approach in Patients Undergoing Esophagectomy for Gastroesophageal Reflux Disease or Hiatal Hernia^a

Variable	No Prior Operation (n = 154)	Prior Operation (n = 104)	Total	p Value ^b
Resection				<0.005
Thoracoabdominal	0 (0%)	3 (2.9%)	3 (1.2%)	
Transhiatal	151 (98.0%)	87 (84.0%)	238 (92.5%)	
Transthoracic	3 (2.0%)	14 (13.5%)	17 (6.3%)	
Conduit location				<0.005
Gastric posterior mediastinum	150 (97.4%)	87 (83.7%)	237 (91.9%)	
Gastric retrosternal	0 (0%)	2 (1.9%)	2 (0.8%)	
Colon posterior mediastinum	1 (0.7%)	9 (8.7%)	10 (3.9%)	
Colon retrosternal	0 (0%)	2 (1.9%)	2 (0.8%)	
Delayed reconstruction	1 (0.7%)	3 (2.9%)	4 (1.6%)	
Other conduit	2 (1.3%)	1 (1.0%)	3 (1.2%)	

^aColumn percentages.

^bFisher's exact test.

Table 4

Operative Outcomes in Patients Undergoing Esophagectomy for Gastroesophageal Reflux Disease or Hiatal Hernia^a

Variable	No Prior Operation (n = 154)	Prior Operation (n = 104)	Total (n = 258)	<i>p</i> Value
Hospital or 30-day mortality	3 (2.0%)	2 (1.9%)	5 (1.9%)	1.0 ^b
Blood loss (mL), mean $\pm$ SD	416 $\pm$ 394	864 $\pm$ 784		<0.0001 ^b
Need for reoperation	5 (3.3%)	15 (14.4%)	20 (7.8%)	<0.001 ^c
Total complications (patients)	39 (25.3%)	32 (30.8%)	71 (27.5%)	0.35 ^c
Complications				
Anastomotic leak	22 (14.3%)	14 (13.5%)	36 (14.0%)	1.0 ^c
Splenectomy	2 (1.3%)	6 (5.8%)	8 (3.1%)	0.06 ^c
Vocal cord palsy	1 (1.0%)	4 (3.8%)	5 (2.0%)	0.16 ^c
Other	23 (15.0%)	13 (12.5%)	36 (14.0%)	
Pulmonary	6	5	11	0.76 ^c
Gastrointestinal	7	2	9	0.32 ^c
Airway injury		1	1	
Wound or mediastinal hematoma	2	0	2	
Infection, hematologic	7	5	12	1.0 ^c
Chylothorax	1	1	2	1.0 ^c

^a Column percentages.

^b Wilcoxon rank-sum test.

^c Fisher's exact test.

SD = standard deviation.

Table 5

Patient Satisfaction at Follow-up After Esophagectomy for Gastroesophageal Reflux Disease or Hiatal Hernia

Question	No Prior Operation	Prior Operation	Total	<i>p</i> Value ^a
Pleased?				
No	6 (5.2%)	3 (4.9%)	9 (5.1%)	1.0
Yes	110 (94.8%)	58 (95.1%)	168 (94.9%)	
Missing	38	43	81	
Total	154	104	258	
Better?				
No	34 (30.6%)	7 (11.7%)	41 (24.0%)	0.005
Yes	77 (69.4%)	53 (88.3%)	130 (76.0%)	
Missing	43	44	87	
Total	154	104	258	
Would do again?				
No	3 (2.8%)	3 (5.2%)	6 (3.6%)	0.42
Yes	105 (97.2%)	55 (94.8%)	160 (96.4%)	
Missing	46	46	92	
Total	154	104	258	

^a Fisher's exact test.