Long-Term Satisfaction and Medication Dependence After Antireflux Surgery

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Background. **Antireflux surgery remains an important treatment for gastroesophageal reflux disease (GERD) refractory to medical management. However, there is a paucity of data on long-term surgical outcomes. The objectives of this study were to determine long-term patient satisfaction and medication dependence after antireflux surgery.**

Methods. **We identified all patients having antireflux surgery for GERD at our institution between 2000 and 2010. Medical records were reviewed and long-term outcomes were assessed using telephone surveys. Cox proportional hazards models were used to identify significant predictors of patient satisfaction and medication use 5 years and 10 years after surgery.**

Results. **We surveyed 195 patients receiving antireflux surgery with a median follow-up of 6.3 years; 191 of 195 operations (98%) were performed laparoscopically. Five years after surgery, 82% of patients were satisfied with their operation and 83% of patients were not taking any antireflux medication. At 10 years postoperatively, these rates drop to 59% and 38%, respectively. Of patients taking medication who received formal evaluation of their symptoms, only 38.5% (15 of 39) had evidence of reflux. Age, sex, year of operation, surgeon specialty, body mass index, and presenting symptom were not associated with long-term satisfaction or medication use.**

Conclusions. **Antireflux surgery dramatically improves symptoms and provides excellent 5-year patient satisfaction and freedom from medication use. However, both of these outcomes decrease with follow-up out to 10 years.**

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Gastroesophageal reflux disease (GERD) is a highly prevalent disease, affecting 25% of people in western populations with at least monthly symptoms [1]. Most patients are managed with long-term acid suppression pharmacotherapy. Surgical management by antireflux operations is an alternative treatment made more popular in the 1990s with the advent of laparoscopic fundoplication. Advantages of surgery include the potential avoidance of life-long medications, rapid relief from extraesophageal symptoms such as aspiration, and potential improvement for patients whose symptoms are refractory to medical therapy [2, 3].

A recent cost-effectiveness analysis demonstrated that antireflux surgery may offer improved health-related quality of life but at increased cost compared with medical management [4]. Clearly, the cost effectiveness of antireflux surgery for GERD is contingent upon accurate long-term outcomes data. Although a number of randomized controlled trials have been performed over the past 15 years studying outcomes of laparoscopic antireflux surgery, few have documented follow-up of greater than 5 years [5–9]. There is also a paucity of data that describes the use of antireflux medications beyond 5 years after surgery. The objectives of this study were to determine long-term patient satisfaction and freedom from medication usage after antireflux surgery.

Material and Methods

Between June 2000 and November 2010, adult patients treated at the University of Virginia with antireflux surgery for symptomatic GERD or type I hiatal hernia or both were identified from an institutional database. Only primary operations were included; patients requiring repeat operations were included based on their primary intervention as an intention-to-treat analysis. Patients with a known malignancy or a paraesophageal hernia other than a simple sliding hiatal hernia were excluded from the study. Patients with less than 1 year of follow-up were also excluded. The vast majority of procedures were laparoscopic Nissen fundoplications. Operative techniques were similar across thoracic and general surgery departments. Key technical points included division of the short gastric vessels, interrupted suture closure of the posterior diaphragmatic crura, and a floppy fundoplication over a 52F to 56F Maloney dilator. The study was approved by the Human Studies Committee at the University of Virginia.

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Preoperative demographics were obtained using electronic chart review and included age, sex, body mass index (BMI), presenting symptoms, and preoperative medications. Perioperative data included date of intervention and operative approach. Follow-up of long-term outcomes was performed by telephone interviews involving a standardized call script that assessed current symptoms, use of postoperative diagnostic or therapeutic interventions, current medication regimen, and level of satisfaction. At the time of survey, a standardized criterion for the levels of satisfaction was described for each patient (Fig 1). All interviews were conducted by a single medical student trained by the director of clinical research. Three initial survey attempts were made at different times of the day for each participant with an active telephone line. Voicemail including contact information was given for each unsuccessful attempt when an answering machine was available. One week after the initial set of attempts, all nonresponders were again surveyed with two more telephone calls before being recorded as lost to follow-up.

Primary endpoints for this study were postoperative patient satisfaction and freedom from medication usage at 5 years and 10 years. Patients were considered to be satisfied with surgery if they rated their level of satisfaction at the time of follow-up as either excellent or good. Cox proportional hazards models were used to analyze the relationship between these two primary outcomes and length of follow-up after surgery. The models included risk adjustment for variables designated a priori: age, sex, BMI, presenting symptom type, year of operation, and surgeon specialty (thoracic or general). Presenting symptoms were categorized into typical (heart burn, regurgitation, epigastric pain, dysphagia, nausea, belching) and atypical (wheezing, dyspnea, cough, hoarseness, other).

Telephone Script
Long Term Outcome of Antireflux Surgery

1. Did you have your antireflux surgery at the University of Virginia on _____ ?
2. What was the main thing bothering you when you had your surgery?

	Yes	NO
Can't remember	_____	_____
Heart burn	_____	_____
Regurgitation	_____	_____
Epigastric/chest pain	_____	_____
Dysphagia (trouble swallowing)	_____	_____
Nausea	_____	_____
Belching	_____	_____
Cough	_____	_____
Hoarseness	_____	_____

3. Based on the following definitions, how satisfied are you with your surgery?
   a. Excellent: you do not have symptoms
   b. Good: you have minor symptoms that don't require daily treatment
   c. Fair: you are improved, but continue to have symptoms needing treatment
   d. Poor: you have the same or worsened symptoms
4. If you are still experiencing symptoms, what is bothering you?
5. Have you seen your doctor or surgeon about these concerns and what was done?
6. What medications are you taking? If taking a PPI or H2 blocker, when did you start taking them? Did you have a repeat pH test, EGD or barium swallow?

Fig 1. Telephone survey script for long-term follow-up after antireflux surgery. Definitions of satisfaction were described to participants during the survey. (EGD = esophagogastroduodenoscopy; PPI = proton pump inhibitor.)

Secondary outcomes included freedom from GERD-related symptoms and evidence of documented recurrent reflux from objective testing. All data analyses were performed using SAS 9.1.3 software (SAS Institute, Cary, NC).

Results

We identified 318 patients who met the study criteria, of whom 195 completed postoperative follow-up in the form of telephone surveys (61.3%). Of the 113 patients lost to follow-up, 8 declined participation, 24 had no active phone line, and 81 were persistent nonresponders despite three telephone calls. Median time to follow-up was 6.4 years (interquartile range, 3.89 to 9.39). When comparing the study population with patients lost to follow-up, there were statistically significant, but clinically similar differences, including age (51.6 versus 48 years, $p = 0.02$), sex (62% versus 50% female, $p = 0.025$), and mean BMI (29.2 kg/m^2 versus 31 kg/m^2, p = 0.008). Demographics and surgical details for patients completing follow-up are listed in Table 1.

Cox proportional hazards regression demonstrated that 83% and 38% of patients were free from antireflux medication at 5 years and 10 years, respectively (Fig 2). None of the factors defined a priori was a significant predictor of long-term medication use. At the time of follow-up, 51.8% of patients (101 of 195) remained free of medical management, and 44.1% (86 of 195) were taking a proton pump inhibitor (PPI). Other medications included histamine antagonists (9.2%, 18 of 195), antacids (7.7%, 15 of 195), and promotility agents (3.1%, 6 of 195). Of patients requiring medical management, 86.1% (81 of 94) were maintained on a monotherapy regimen.

Cox proportional hazards regression demonstrated that 82% and 59% of patients were satisfied with their antireflux surgery at 5 years and 10 years, respectively (Fig 3). No variables selected a priori were found to be significant predictors of patient satisfaction. At the time of follow-up,

Table 1. Demographics and Surgical Details of Patients Completing Follow-Up

Variable	Mean or n (%)
Age at surgery, years	51.6
Body mass index, kg/m^2	29.3
Female	121 (62.1)
Presenting symptom	
Typical	157 (80.5)
Atypical	38 (19.5)
Surgeon specialty	
Thoracic	74 (38.0)
General	121 (62.1)
Surgical approach	
Laparoscopic	191 (98.0)
Open	4 (2.0)
Wrap	
Complete	187 (95.9)
Partial	8 (4.1)

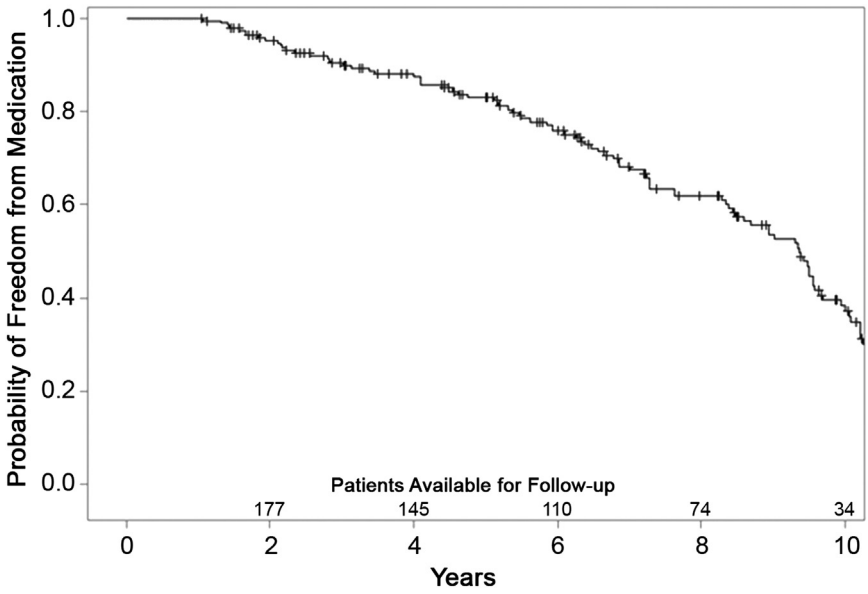

Fig 2. Cox proportional hazards model for freedom of antireflux medication: 83% and 38% of patients were free of antireflux medication use at 5 years and 10 years, respectively.

71.8% of patients (140 of 195) described their level of satisfaction as either excellent or good.

Improvements in the numbers of patients with typical and atypical symptoms after antireflux surgery are shown in Figure 4. At the time of follow-up, 39.5% (77 of 195) reported freedom from all GERD-related symptoms. Symptomatic patients most frequently endorsed heart burn (44.6%; 87 of 195), epigastric pain (11.3%; 22 of 195), and regurgitation (4.1%, 8 of 195). Dysphagia, defined as difficulty swallowing, was the most common postoperative complication (16.4%, 32 of 195 patients). Of patients complaining of postoperative dysphagia, 84.4% (27 of 32) sought no further intervention, 12.5% (4 of 32) underwent endoscopic dilation, and 1 patient (3.1%) required a redo operation.

Of note, only 33.1% of patients (39 of 118) with persistent GERD symptoms had formal postoperative testing. Of these patients, only 38.5% (15 of 39) had evidence of recurrent reflux based on endoscopy (10), barium swallow (4), or pH testing (1). Importantly, through these tests, 9 patients were found to have a recurrent hiatal hernia and 7 patients had evidence of an esophageal stricture. At the time of analysis, 9 patients (4.6%) had undergone a redo operation.

Comment

Laparoscopic fundoplication for the treatment of GERD rapidly became the surgical intervention of choice for symptomatic patients over the past two decades. This was

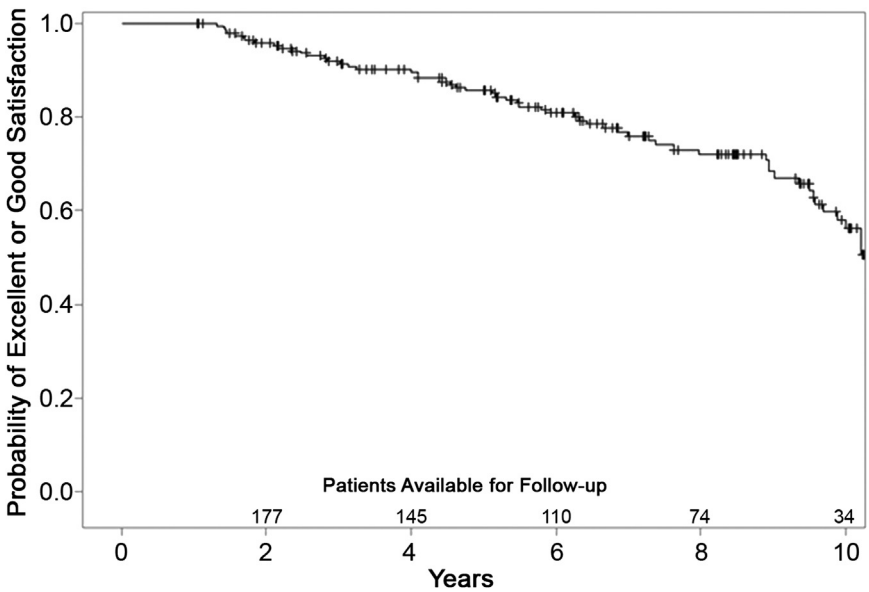

Fig 3. Cox proportional hazards model for patient satisfaction: 82% and 59% of patients rated their satisfaction with surgery as excellent or good at 5 years and 10 years, respectively.

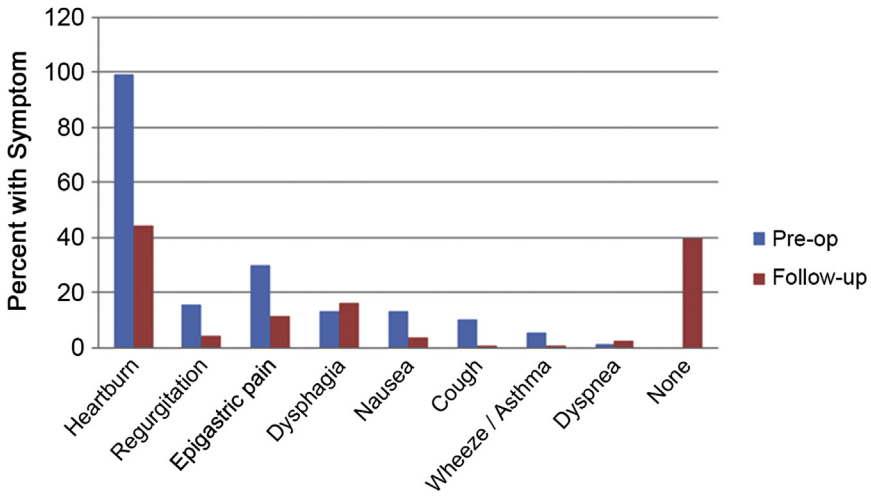

Fig 4. Comparison of preoperative symptoms (blue bars) and postoperative symptoms (red bars). At follow-up, 39.5% of patients were asymptomatic. Symptomatic patients endorsed heart burn (44.6%), epigastric pain (11.3%), and regurgitation (4.1%) most frequently. The most common complication was dysphagia (16.4%).

driven by optimistic results from a number of randomized control trials in the late 1990s showing reduced hospital length of stay and morbidity when compared with an open operation [10–12]. Short-term postoperative results were excellent as well, endorsing recurrence rates as low as 2% [13]. However, few studies have documented postoperative follow-up greater than 5 years.

This study has a median follow-up of 6.4-years and used a Cox proportional hazards model to account for varying lengths of follow-up. Our study population had follow-up times ranging between 1 and 10 years, and the Cox proportional hazards model adjusts each patient's contribution to the survival curve based on their length of follow-up. At the time of follow-up, our study's freedom from medication usage is superior to that reported by Spechler and colleagues [14] (48.2% versus 38% at a median of 6 years), and our 10-year data are similar to a more recent long-term follow-up study by Salminen, who cited a PPI usage rate of 46.5% at 15 years [15]. We believe that improvement in operative technique over time and a younger study population may both contribute to improved outcomes compared with the seminal study by Spechler and colleagues [14] based on a veteran population. Our 5-year rate of freedom from medication use is in agreement with a recent prospective, multi-center trial that demonstrated 85% remission rate with laparoscopic antireflux surgery at 5 years [16]. That study defined remission as less than two dilations for stricture and no additional medical therapy. These long-term data emphasize that despite excellent short term outcomes, the probability of freedom from medication use diminishes over time after antireflux surgery. Although 96% of our cohort underwent a complete fundoplication, our results are also in agreement with those from a recent review on laparoscopic partial fundoplications that compared various operative techniques [17].

This study utilized a four-category instrument to measure long-term patient satisfaction. This scale has been used in other retrospective studies focused on long-term follow-up of hiatal hernia surgery [18]. In our experience, 82% of patients were satisfied with their surgery at 5 years, and 59% were satisfied at 10 years. Owing to the retrospective nature of our study, it was not tailored to incorporate validated satisfaction surveys that emphasize the comparison of preoperative and postoperative quality of life measurements such as the Gastroesophageal Reflux Disease Health-Related Quality of Life scale [19].

Although 86 patients in our study were using regular PPI therapy at the time of follow-up, only 39 underwent additional diagnostic testing for postoperative symptoms including impedance. Of these patients, fewer than 40% had objective evidence of recurrent reflux. This emphasizes the fact that many patients who report GERD-like symptoms do not actually have reflux. Similar results have been reported by Broeders and associates [20] in a study that demonstrated that only 7 of 20 symptomatic, postfundoplication patients had demonstrable reflux on pH monitoring. That emphasizes the need for objective measurement of recurrent reflux before committing postfundoplication patients to the costs of life-long PPI therapy.

This study included the surgeon specialty as a predictive variable in a Cox proportional hazards model for antireflux surgery. Factors contributing to surgeon performance are complicated and may include operative experience, training, patient-physician interactions, postoperative care, and the referred patient population. Our findings that antireflux surgery outcomes were similar between general and thoracic surgeons for this population bring attention to the fact that postoperative management by ancillary staff and hospital infrastructure may be important contributors. We also found that outcomes from antireflux surgery have not significantly improved over time despite advancements in laparoscopic technology and instrumentation. This further argues in favor of routine postoperative testing for patients with persistent symptoms to better define recurrence through objective measures.

One of the weaknesses of our study is its retrospective nature, which lends to inherent selection and reporting

biases. The absence of comprehensive preoperative clinical data was secondary to incomplete records from referring practices and to the difficulty intrinsic to data collection from patients who received surgery before our university's institution of an electronic medical record system. Therefore, although nearly 40% of our patients report complete freedom from GERD-related symptoms at a median of 6.4 years of follow-up, we were unable to draw statistically significant conclusions about specific symptoms. Despite a detailed recruitment protocol and significant effort, our follow-up inclusion rate of 61.3% also raises questions of selection bias. Importantly, the statistical differences in age, sex, and BMI between our study cohort and patients lost to follow-up were not significant predictors of our primary outcomes. The major barrier to long-term follow-up of such a cohort is cost. Additionally, because our study is based on a retrospective experience at a single referral-based institution, the applicability of our outcomes to community-based practices will encounter confounding factors including surgeon experience and comorbidities of the patient population.

In conclusion, our study of patient satisfaction and medication usage after antireflux surgery emphasizes the importance of reporting long-term outcomes. When counseling patients, it is important to emphasize that, although antireflux surgery may significantly reduce medication dependence and provide excellent postoperative satisfaction, the probability of remaining medication-free decreases over time. For patients with GERD-like symptoms after fundoplication, the use of diagnostic testing to provide objective evidence of recurrent reflux is crucial before opting for resumption of long-term antireflux medical management.

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DISCUSSION

DR DANIEL L. MILLER (Atlanta, GA): Excellent presentation. I think it is very important that we get these data out in the literature to document the success at 5 and 10 years. I have two questions. First, did you look at the body mass index data at the time of the original operation and at last follow-up? I have had several patients who have said that when their reflux is taken care of, they will be able to get off of their "special diet" and eat more. I have seen those patients increase their baseline weight, which may decrease the long-term success of the procedure.

DR HU: We did not look at the body mass index at the time of the telephone survey, but that would definitely be interesting.

DR MILLER: That would be interesting data, because I would think that the ones who were not doing as well may have been related to increased weight. My second question is, you said that there was a difference in regard to the surgeon who performed the procedure, so was there any relationship in regard to overall results based on surgeon volume or technique at your institution?

DR HU: That's a great question. To that end, we only included surgeons who had more than 10 cases during the time period of the study, because if we included surgeons with only one or two cases, the variability becomes too high. Although we can't really make any conclusions regarding relationships between volume and satisfaction after surgery, they do all contribute to the Cox proportional hazards model.

DR STEPHEN R. HAZELRIGG (Springfield, IL): Was surgeon volume one of the things you actually looked at, though?

DR HU: We did not use that as a predictive variable.

DR BRIAN E. LOUIE (Seattle, WA): I enjoyed your presentation. I would echo Dr Miller's comments that it was very well done. I think the last point you made in your discussion, which is you did not have a lot of postoperative testing, really needs to be emphasized in your discussion, because the Spechler paper, which came out years ago and probably was responsible for a drop off in fundoplications because of recurrent medication use. Some of those people didn't really need those medications. And I think your medication-free number probably would be higher if you had actually tested more people, because a lot of those people probably don't need proton pump inhibitor therapy or they are on it for stomach-related issues, ulcers, dyspepsia, other things. That message needs to come out in your paper, because the gastrointestinal physicians will look at it and say, people are back on proton pump inhibitors. Why should I keep sending them over for surgery if over time they're going to fail?

Your outcomes probably are in the ballpark, though, because certainly in the randomized trial from Lars Lundell, over time, at 10 and 12 years, about 25% of people will fail in that randomized trial or have some symptoms.

DR HU: I think that is the more important thing to take away from this paper, honestly. We have not looked at cost effectiveness at our institution, but in order to have an accurate quality estimation, you really need to have a good model that determines timing of medication needs postoperatively. To improve this number, the first thing we can do is standardized testing for patients who continue to be symptomatic.

A study done in the United Kingdom had quality-adjusted life year of around $30,000, which is considered to be borderline cost ineffective, but they reported medication dependence rate of 38% at 1 year. So if we update those numbers, we can give much better predictions on when is anti-reflux surgery really cost effective.

DR MITCHELL MAGEE (Dallas, TX): I have two questions, and one is related to what Dan asked about that particular surgeon who was ferreted out as being better in terms of results. Was there anything that you can identify in terms of preoperative testing that was done by that surgeon compared with the other surgeons, and is there any preoperative testing, such as motility or formal reflux testing or pH testing, acid reflux testing, that would determine who gets operated on and what operation is done?

DR HU: That, again, is one of the limitations in this study. We did not have a formalized way of determining preoperative testing, because although we did review electronic medical records, a lot of our patients come from outside institutions, and we don't have that recorded in our data.

DR HAZELRIGG: Another criticism is going to be you lost a lot of patients to follow-up, and I understand that, but maybe you can tell us a little more. The cynics for this in gastrointestinal medicine are going to say, well, you lost follow-up in all the ones who did poorly. So even though these numbers look pretty good, I think losing a lot of those patients to follow-up is going to be a weakness for it.

DR HU: That's a point well taken. Absolutely.