Laparoscopic Heller Myotomy With Toupet Fundoplication

Outcomes Predictors in 121 Consecutive Patients

Yashodhan S. Khajanchee, MD; Shalini Kanneganti, MD; Amy E. B. Leatherwood, NP; Paul D. Hansen, MD; Lee L. Swanström, MD

Hypothesis: This study was performed to assess the intermediate-term outcomes after laparoscopic Heller myotomy and posterior Toupet fundoplication in a single-surgeon series with the expectation of identifying patient and disease factors associated with poor outcomes.

Design: Retrospective analysis of prospectively collected data.

Setting: Tertiary care teaching hospital with a comprehensive esophageal physiology laboratory.

Patients: A total of 121 patients undergoing laparoscopic Heller myotomy with Toupet fundoplication (between December 1, 1996, and December 31, 2004) for achalasia were included.

Interventions: All patients had preoperative objective documentation of achalasia. A 5- to 6-cm-long myotomy was performed on the distal esophagus. The myotomy incision was extended 2 cm onto the stomach. A partial (270°) posterior Toupet fundoplication was performed as an antireflux mechanism in all patients.

Main Outcome Measures: Data on preoperative and postoperative symptoms, manometry, and 24-hour ambulatory pH were prospectively collected. Symptoms were recorded with a standardized assessment tool. Patients with postoperative dysphagia scores of 2 or greater were considered treatment failure. Logistic regression modeling was performed to identify variables significant for poor outcomes.

Results: Preoperatively, 89 patients (73.6%) had severe dysphagia (dysphagia score, 3 or 4) and 32 patients (26.4%) had mild or moderate dysphagia (dysphagia score, 1 or 2). After a median follow-up period of 9 months, 102 patients (84.3%) (P < .001) had excellent relief of dysphagia (dysphagia score, 0 or 1). Eight additional patients (6.6%) demonstrated a significant (25%-75% [P = .01]) improvement in dysphagia scores. Only 11 patients (9.0%) had either no change or worse dysphagia. Postoperatively, all patients with manometry had a normal lower esophageal sphincter pressure (mean ± SD, 14.7 ± 6.6 mm Hg; P < .001) and good lower esophageal sphincter relaxation. Odds of failure were greatest for patients with severe preoperative dysphagia, male patients, and patients with classic amotile achalasia. Of the 60 patients having heartburnlike symptoms preoperatively (mean ± SD score, 2.52 ± 1.00), 19 (31.7%) continued to have similar symptoms after surgery. Sixteen (33.3%) of the 48 patients having postoperative pH studies demonstrated objective reflux (DeMeester score, > 14.7). Five (31.2%) of these patients had symptoms of their reflux.

Conclusions: Dysphagia improves in most patients after laparoscopic Heller myotomy with partial fundoplication. Patients with severe preoperative dysphagia, esophageal dilation, or amotile achalasia may have greater chances of a poor outcome.

Arch Surg. 2005;140:827-834

Achalasia is an idiopathic primary motility disorder characterized manometrically by a poorly relaxing lower esophageal sphincter (LES) and complete loss of primary peristalsis, which leads to a compromise of the primary function of the esophagus. Untreated, it leads to an extremely poor quality of life because of progressive dysphagia, esophageal dilation, and stasis. All current treatments are palliative, as they are directed toward relieving dysphagia and preventing stasis-related complications, but do not restore normal esophageal motility. Surgical myotomy, endoscopic pneumatic dilation, and botulinum toxin injections of the LES are the most commonly used techniques for the treatment of achalasia at present, all of which seem to provide excellent symptomatic relief at least initially. Although most studies indicate that surgical myotomy is superior to endoscopic approaches in providing long-term...
Many physicians still favor endoscopic treatment because of the relative higher morbidity associated with laparotomy or thoracotomy. Surgical myotomy, however, has regained primacy since the introduction of a minimally invasive laparoscopic approach in 1991. This is because of the obvious advantages associated with this approach, including less postoperative pain, a shorter hospital stay, and an earlier return to work. Current data suggest that, in experienced hands, results of laparoscopic Heller myotomy (LHM) are excellent and are comparable with those of open surgery. Even so, the symptoms of achalasia may recur in 6% to 23% of patients, and little is known about the factors that may lead to failure after myotomy. The aim of this study was to evaluate intermediate-term outcomes after LHM with a posterior 270° Toupet fundoplication and identify patient, technical, and disease factors associated with or predictive of poor outcomes.

OUTCOME MEASURES

Baseline demographics and data on preoperative and postoperative symptoms, upper gastrointestinal tract studies, manometric and data were prospectively collected on standardized data collection forms, which were maintained in an electronic database system (Microsoft Access 97; Microsoft Corp, Redmond, Wash). Symptoms were recorded with a symptom assessment tool using a scale of 0 to 4, with higher ordinal values representing greater frequency of symptoms. Baseline demographics and preoperative clinical data were obtained at the time of the first office visit. Achalasia was defined manometrically by the complete absence of primary peristalsis of the esophageal body. Other manometric characteristics of achalasia, such as failure of the LES to relax to gastric baseline with swallowing or the presence of a hypertensive LES, were also recorded. Esophageal dilation was determined by the maximum esophageal diameter on review of upright barium swallow radiographs. Minimal dilation was described as less than 2.5 cm, moderate as 2.5 to 5 cm, and severe as greater than 5 cm. Data on operative time and intraoperative complications were acquired at the time of surgery. The primary symptom outcomes for this study were dysphagia and sensation of gastroesophageal reflux.

All surgical procedures were performed under the supervision of 1 of us (L.L.S.). Surgery residents or fellows were involved in most of the cases. A posterior 270° wrap (Toupet fundoplication) was the primary antireflux surgery used after an LHM. Dor fundoplications or no wrap were used occasionally for specific anatomic reasons or because of a failed Toupet procedure; these patients were excluded from the present study to achieve uniform data.

Five trocars were placed in the upper part of the abdomen. The gastroesophageal junction and lower mediastinal esophagus were widely mobilized while both vagus nerves were preserved. The short gastric vessels were routinely divided. A 54F to 56F bougie was used in all cases. A myotomy to the level of submucosa was started on the anterior gastric cardia, 2 cm below the gastroesophageal junction, and was extended 5 to 6 cm proximal to it on the anterior esophageal wall. Adequacy of the myotomy was assessed by noting mucosal bulging without any visible crossing fibers and by performing endoscopy if indicated. Both crura were loosely approximated posterior to the esophagus, and a 270° posterior Toupet fundoplication was completed by suturing the wrapped fundus to the edges of the myotomy as well as to the right and left crura. A closed suction drain was placed adjacent to the myotomy, and a watersoluble contrast study was performed before the drain was removed and oral feeding was started the following day.

Manometry was performed with an 8-channel water-perfused catheter. The LES was located by means of the stationary pull-through technique, and the resting LES pressure (LESP), LES relaxation, and esophageal body contractility were determined for a minimum of 10 wet swallows. A commercial software program (Medtronic, Inc, Stockholm, Sweden) was used for the interpretation of manometry tracings and data analysis.

<table>
<thead>
<tr>
<th>Table 1. Scale for Assessment of GER and Dysphagia Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

Abbreviation: GER, gastroesophageal reflux.

INTERVENTIONS

Patients were selected from a prospective database of patients undergoing esophageal procedures at our institution. Patients were included only if they had a preoperative diagnosis of achalasia, underwent LHM with 270° posterior Toupet fundoplication, and had a postoperative follow-up of at least 6 months’ duration. Patients undergoing LHM with no antireflux procedure and those undergoing Dor fundoplication were excluded from the study, as were patients who had surgery before 1996, when a different symptom assessment tool was in use. A total of 158 LHMs were performed by one of us (L.L.S.) between December 1, 1996, and December 31, 2004. One hundred forty patients with achalasia satisfied the selection criteria for this study. Nineteen of these patients were eliminated because of incomplete follow-up, resulting in a study population of 121 patients. Forty-five of the patients had had previous endoscopic interventions (bougienage, 35; balloon dilation, 10; and/or botulinum toxin injections, 8), and 7 patients had a previous myotomy.

METHODS

Patients were followed up at 1 to 2 weeks after surgery, and again at 6 weeks if indicated. At 3 months, patients were asked to complete a symptom assessment form. After a postoperative period of 6 months, all of the patients were recalled and encouraged to undergo esophageal manometry and 24-hour ambulatory pH testing at no charge. Symptom assessment forms were administered at each visit. Long-term follow-up of all patients was done by telephone interview every year, and symptomatic patients were brought back for further testing. Patients with a postoperative dysphagia score of 2 or higher were considered to represent treatment failures.

©2005 American Medical Association. All rights reserved.
STATISTICAL ANALYSIS

The means of all continuous variables were compared by appropriate parametric or nonparametric tests. Categorical variables and proportions were compared with the χ² test or the Fisher exact test. Logistic regression modeling was performed to identify variables significant for the prediction of a poor outcome. Factors included in the model were age, sex, weight, severity of preoperative dysphagia (mild to moderate [grade 1 or 2] vs severe [grade 3 or 4]), amiotile vs vigorous achalasia, resting LESP (hypertensive vs normotensive), preoperative endoscopic interventions, previous myotomy, preoperative esophageal dilation, and postoperative resting LESP (>20 mm Hg vs ≤20 mm Hg). P≤.05 was considered to be significant. All data are reported as proportions, mean±SD, or median (range).

RESULTS

Of the 121 patients, 48 (39.7%) were male and 73 (60.3%) were female. The mean age of the patients was 46.4±14.1 years; mean weight was 76.9±20.0 kg. Preoperatively, 89 patients (73.6%) had severe dysphagia (dysphagia score, 3 or 4) and 32 patients (26.4%) had mild or moderate dysphagia (dysphagia score, 1 or 2). Sixty patients (49.6%) had heartburnlike symptoms preoperatively. The mean preoperative score for these reflux symptoms was 2.52±1.00.

All patients included in this study had preoperative documentation of complete absence of primary peristalsis on manometry. In 51 patients who underwent preoperative manometry outside of our facility, either the original tracings were obtained or the physician who performed the study was contacted to ensure the diagnosis of achalasia; otherwise, the study was repeated in our laboratory. Immediate preoperative manometry was performed in our esophageal laboratory in 70 of the 121 patients. All manometry and radiographic studies were interpreted by one of us (L.L.S.). The diagnosis of achalasia was based on manometric criteria (completely aperistaltic esophageal body and a poorly relaxing LES [<50% relaxation, or relaxation pressure >6 mm Hg]) and barium swallow study findings showing delayed transit and/or dilation of the esophageal body. Sixty-five patients (53.7%) demonstrated an amiotile variety of achalasia. Mean preoperative resting LESP was 38.3±23.9 mm Hg and mean LES relaxation was 62.9%±28.7%. Sixteen patients (13.2%) demonstrated nearly normal LES relaxation (>90%) but had radiographs typical of achalasia and classic symptoms, and 46 (38.0%) had a hypertensive LES (mean resting LESP, 58.6±24.2 mm Hg).

After a median postoperative 9-month follow-up (range, 6-48 months), 102 patients (84.3%; P<.001) had relief of dysphagia after surgery (dysphagia score, 0 or 1); 8 patients (6.6%) demonstrated a 25% to 50% improvement in their dysphagia (P=.01), and 11 patients (9.0%) had either no change or a worsening of their dysphagia (Figure 1).

Eighteen (94.7%) of 19 patients with postoperative failure had severe preoperative dysphagia, while 71 (69.7%) of 102 patients with a favorable outcome had grade 3 or 4 dysphagia before surgery (odds ratio, 11.31; 95% confidence interval, 1.45-88.22; P=.01).

A total of 43 patients underwent postoperative manometry. Mean postoperative resting LESP was 14.7±6.6 mm Hg. This was significantly (P<.001) lower than preoperative values (Figure 2). All patients had improved apparent LES relaxation after LHM (average nadir, 90.2%±27.6%; interquartile range, 70.1%-108.8%), and/or with a relaxation pressure less than 6 mm Hg. There was, however, no restoration of primary esophageal peristalsis in any patient.

Preoperative upper gastrointestinal tract studies with contrast were available for 94 patients (77.7%). Of 15 patients who continued to have postoperative dysphagia, 8 (53.4%) had severe (maximum diameter, >5 cm) esophageal dilation as compared with 26 (32.9%) of the 79 patients who had a favorable outcome. Odds of having postoperative esophageal dilation were 2.3 (95% confidence interval, 0.7-7.1; F=.22) in patients having postoperative failure as compared with patients with no postoperative dysphagia.

Of the 60 patients who had heartburnlike symptoms preoperatively, 19 (31.7%) continued to complain of heartburn after surgery (mean score, 2.2±1.0). Twelve patients (19.7%) demonstrated new-onset reflux symptoms after surgery (mean score, 2.0±0.9). A total of 48 patients had postoperative pH studies; of these, 12 (25.0%) were complaining of reflux symptoms. Of the 73 patients who did not undergo postoperative objective testing, 18 (24.7%) complained of heartburn (P=.86). Sixteen (33.3%) of the 48 patients having postoperative pH studies demonstrated objective reflux (DeMeester score >14.7). Only 5 (31.2%) of these 16 patients, however, had any symptoms of reflux.

Results of regression modeling are summarized in Table 2. None of the factors included in the regression modeling was identified as being a statistically significant predictor of a poor outcome. However, the odds of failure were higher among patients with severe preoperative dysphagia, in male patients, in patients with the amiotile variety of achalasia, and in patients having preoperative esophageal dilation.

Intraoperatively there were no conversions to open procedures in the series. Mean±SD operative time was 2 hours 18 minutes±2 hours. Mean blood loss was 65.0±54.5 mL. Intraoperative and immediate postoperative complications are summarized in Table 3. Of the 8 esophageal mucosal tears that occurred, 7 were identified and repaired at the time of surgery and patients had no sequelae. In 1 patient an esophageal leak was identified at the time of routine postoperative upper gastrointestinal tract study. The perforation was successfully repaired thoracoscopically; however, the patient had an extended hospital stay of 3 weeks because of a postoperative myocardial infarction. An additional patient had a postoperative myocardial infarction and was discharged on postoperative day 12. Mean hospital stay for the remaining patients was 1.7±1.3 days. One patient (0.8%) in this series died on postoperative day 11 of aspiration pneumonia.

COMMENT

Laparoscopic Heller myotomy has become the standard surgical treatment for patients with achalasia during the
past decade. Most patients have good to excellent relief of dysphagia with this treatment; however, about 6% to 23% of patients may continue to have dysphagia.8,16-20

Patients who fail to have good outcomes after cardiomyotomy generally have a poor quality of life10 and may require invasive endoscopic interventions,21 revision of myotomy,22 or even esophagectomy23 to relieve their symptoms. In addition to determining the outcomes of LHM with 270° posterior Toupet fundoplication, one of the primary goals of the present study was to analyze the influence of various preoperative and postoperative factors on outcomes, particularly dysphagia and reflux symptoms. Technical factors such as inadequate myotomy and tight fundoplication are thought to be the most important cause of persistent dysphagia after myotomy.24,25 In a review of 100 consecutive Heller myotomies without fundoplication, Sharp et al17 reported that an inadequate myotomy, as judged by a residual LESP greater than 18 mm Hg, was associated with a significantly higher incidence of postoperative dysphagia. In the present series, we had 11 patients with postoperative LESPs greater than 20 mm Hg but less than 30 mm Hg. None of these patients had postoperative dysphagia. This is most likely because of the interesting phenomenon we noted of an apparent return of receptive relaxation after myotomy. All patients undergoing postoperative manometry and no dysphagia had a decrease in resting pressure to less than 6 mm Hg in response to an induced swallow. It is not clear whether this

Figure 1. Improvement in dysphagia score after surgery in individual patients. Positive values represent improvement; negative values demonstrate worsening dysphagia.

Figure 2. Mean±SD preoperative and postoperative resting lower esophageal sphincter pressure (LESP).
response is a true neurologically mediated one or merely a physiologic reaction to the presence of a swallowed bolus. Regardless, this basal pressure may be a very important factor in minimizing postoperative dysphagia. One patient did have a high postoperative LESP of 33.4 mm Hg and also had grade 2 dysphagia.

Among the various preoperative factors, LESP\(^{16}\) and esophageal dilation\(^{26,27}\) have been shown to have some correlation with postoperative outcomes. Arain et al\(^{16}\) reported that a higher preoperative resting LESP was a strong predictor of resolution of dysphagia; however, in another study, preoperative LESP was not found to have any influence on outcomes.\(^{28}\) Our data seem to support the findings of the latter study, as results of both univariate and multiple regression modeling did not find increased odds of failure for patients having normotensive preoperative LES. We did find higher odds of failure in patients with marked preoperative dilation of the esophagus; however, it was not statistically significant.

In the present study we also analyzed the influence of several other important preoperative factors, including the severity of dysphagia, amotile vs vigorous forms of achalasia, a history of endoscopic intervention, and previous myotomy. Univariate analysis of these factors showed that severe preoperative dysphagia is the only factor that is significantly associated with poor outcomes (odds ratio, 11.3; \( P = .01\)). Patients with preoperative esophageal dilation, previous myotomy, or endoscopic intervention had marginally higher odds of failure after surgery. When adjustment for confounding variables was performed by multiple logistic regression, none of the factors included in our model was found to be a statistically significant predictor of poor outcome. The odds of failure were still greatest among patients with severe preoperative dysphagia and those with the amotile variety of achalasia (Table 2). Interestingly, the predictors male patients and a postoperative LESP greater than 20 mm Hg were found to have marginally increased odds of poor outcome.

A possible criticism of the current report is the relative shortness of the follow-up (9 months). Our routine follow-up includes office visits at 1 to 2 weeks, 6 weeks (if indicated), and 6 months. Symptom assessment forms are completed at each visit. Between 6 months and 1 year, patients are also urged to return for a pH and motility study at no charge as part of routine follow-up. Patients with normal study results are asked to return if they develop recurrent symptoms or heartburn. Patients with abnormal study results are seen more regularly, and 5 patients in this series eventually had revision of their surgery during follow-up. It has been our experience that the vast majority of failures are apparent at 1 year, and, after a year, it is almost impossible to get asymptomatic patients back for studies.

The need for an antireflux procedure after myotomy remains one of the most controversial issues surrounding LHM. It is widely accepted that a complete 360° wrap should not be used in achalasia, but even the use of a partial wrap is controversial. Opponents of using an antireflux procedure argue that a good postoperative LESP (14 mm Hg) with low incidence of reflux symptoms can be achieved without partial fundoplication by avoiding excessive posterior dissection and any closure of the crura.\(^{17}\)

---

**Table 2. Results of Regression Modeling**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Adjusted Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>( \beta ) Coefficient</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative dysphagia severity</td>
<td>3.54</td>
<td>0.26-46.82</td>
<td>1.266</td>
<td>.33</td>
</tr>
<tr>
<td>Sex</td>
<td>2.90</td>
<td>0.16-51.88</td>
<td>1.065</td>
<td>.46</td>
</tr>
<tr>
<td>Preoperative distal esophageal amplitude</td>
<td>2.24</td>
<td>0.23-21.67</td>
<td>0.808</td>
<td>.48</td>
</tr>
<tr>
<td>Preoperative esophageal dilation</td>
<td>1.79</td>
<td>0.06-45.41</td>
<td>0.347</td>
<td>.76</td>
</tr>
<tr>
<td>Postoperative resting LES pressure</td>
<td>1.18</td>
<td>0.08-17.85</td>
<td>0.030</td>
<td>.86</td>
</tr>
<tr>
<td>Weight</td>
<td>1.00</td>
<td>0.06-1.03</td>
<td>0.002</td>
<td>.93</td>
</tr>
<tr>
<td>Age</td>
<td>0.99</td>
<td>0.62-1.60</td>
<td>-0.007</td>
<td>.86</td>
</tr>
<tr>
<td>Preoperative hypertensive LES</td>
<td>0.72</td>
<td>0.06-7.60</td>
<td>-0.325</td>
<td>.78</td>
</tr>
<tr>
<td>Preoperative endoscopic intervention</td>
<td>0.65</td>
<td>0.21-2.05</td>
<td>-0.041</td>
<td>.47</td>
</tr>
<tr>
<td>Previous myotomy</td>
<td>0.25</td>
<td>0.20-3.32</td>
<td>-1.36</td>
<td>.29</td>
</tr>
</tbody>
</table>

*Abbreviation: LES, lower esophageal sphincter.*

**Table 3. Intraoperative and In-Hospital Complications**

<table>
<thead>
<tr>
<th>Complication</th>
<th>No. of Patients</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoperative esophageal mucosal tears</td>
<td>7</td>
<td>All identified and repaired during surgery with no sequelae; 2 in reoperative cases, 2 in patients with previous endoscopic treatments</td>
</tr>
<tr>
<td>Intraoperative esophageal serosal tears</td>
<td>2</td>
<td>Both identified and repaired during surgery with no sequelae</td>
</tr>
<tr>
<td>Blood loss &gt; 300 mL</td>
<td>2</td>
<td>One had liver retraction injury; other was reoperative case</td>
</tr>
<tr>
<td>Postoperative gastric leak</td>
<td>1</td>
<td>None</td>
</tr>
<tr>
<td>Postoperative esophageal leak</td>
<td>1</td>
<td>Also had myocardial infarction after repair of esophageal leak</td>
</tr>
<tr>
<td>Cardiac complications</td>
<td>2</td>
<td>None</td>
</tr>
<tr>
<td>Aspiration pneumonia</td>
<td>1</td>
<td>Died of aspiration pneumonia on postoperative day 11</td>
</tr>
<tr>
<td>Urinary retention</td>
<td>1</td>
<td>None</td>
</tr>
<tr>
<td>Cellulitis around trocar site</td>
<td>1</td>
<td>None</td>
</tr>
</tbody>
</table>

*There were 18 complications in 15 patients (12%).
Such techniques, however, need careful long-term evaluation for potential paraesophageal herniation or other problems.

In our series, the mean postoperative resting LESP of 14.7 mm Hg (Figure 2) was similar to that observed by previous authors. Only a small proportion (20.1%) of patients had postoperative LESPs greater than 20 mm Hg, and this did not increase the chances of a poor outcome. Our observations suggest that a modest postoperative LESP can be achieved by performing a carefully fashioned Toupet repair in combination with an adequate extension of the myotomy onto the anterior gastric wall, and that this also achieves a secure closure of the hiatus. Most important, it does not lead to an increased barrier to the passage of food. Oelschläger et al.18 also demonstrated that, with adequate extension of the myotomy onto the gastric cardia and with a Toupet fundoplication, a low LESP can be achieved without increasing the incidence of postoperative reflux.

The postoperative rate of reflux detected by pH testing was 33.3% in our study, which is somewhat higher than is frequently reported by other authors. This may be owing to our aggressive myotomy technique or an artifact from the aggressive use of postoperative pH studies. We advocate postoperative pH studies for all patients with achalasia irrespective of their symptom status. If a patient is found to have significant acid reflux after achalasia surgery, we prescribe acid suppression therapy regardless of whether the patient has heartburn symptoms. We do this in the hope of preventing recurrent dysphagia secondary to peptic stricture. In the current study, one might suspect that more patients would follow through with postoperative testing if they were having problems, which might negatively bias our results. However, the proportions of symptomatic patients among those undertaking pH studies and those who did not undergo postoperative pH studies were the same (25%). This would seem to reduce any sampling bias with regard to pH outcome. We showed as well that postoperative symptoms are an unreliable indicator of objective reflux, as only 6 of the 12 patients who developed new-onset reflux symptoms had an abnormal pH study. On the basis of these data and our previous experience with the poor correlation between postoperative symptoms and objective reflux in patients with gastroesophageal reflux disease,21 we believe that routine 24-hour pH monitoring is optimally performed to detect reflux in all patients undergoing Heller myotomy. Similar observations have been made by other authors.20

CONCLUSIONS

Our results indicate that in most patients with achalasia, LHM with 270° posterior Toupet fundoplication provides excellent relief of dysphagia with low intraoperative and perioperative morbidity and mortality. Postoperative reflux remains a problem in 33.3% of patients, and these patients should be closely monitored for esophageal mucosal damage and should probably be treated with antipptic medications. Nonetheless, we prefer good dysphagia relief to low reflux rates, as there is no medication for dysphagia, and progressive dysphagia and esophageal dilation often culminate in esophagectomy. Patients with severe preoperative dysphagia, the amotile variety of achalasia, and severe esophageal dilation should be warned that there may be a greater likelihood of a poor outcome.

Accepted for Publication: May 19, 2005.
Correspondence: Lee L. Swanstrom, MD, 1040 NW 22nd Ave, Suite 560, Portland, OR 97210 (lswanstrom@aol.com).
Previous Presentation: This paper was presented at the 76th Annual Meeting of the Pacific Coast Surgical Association; February 19, 2005; Dana Point, Calif; and is published after peer review and revision. The discussions that follow this article are based on the originally submitted manuscript and not the revised manuscript.

REFERENCES

Carlos A. Pellegrini, MD, Seattle, Wash: What the authors have shown today is that in a selective group of patients with achalasia, Heller myotomy when combined with a Toupet fundoplication completely reverses dysphagia in 85% of the patients and alleviates it in an additional 8%. They have also shown that, in those who underwent postoperative studies (about one third of the population), the operation reduced the lower esophageal sphincter (LES) pressure to approximately 15 mm Hg and that abnormal reflux occurs in 30% of those individuals. Furthermore, they suggested (although I don’t think the numbers prove it) that among those patients who have severe dysphagia or a dilated esophagus preoperatively, the outcome of the operation tends to be worse than among those who don’t have those features preoperatively.

We have performed this operation in a manner similar to that reported, except that we prefer to extend our myotomy further into the stomach, which presumably accounts for our lower LES pressure postoperatively. Using the Toupet procedure we have seen the same incidence of abnormal reflux but have noted that this reflux is rarely symptomatic. Unlike the authors, however, we have not been able to achieve complete relief of dysphagia in 85% of the patients long-term. Unlike the authors, we have not noticed a difference among the patients with dilated and nondilated esophagi. Our different results may be accounted in part by the follow-up period, which is longer in our series. I noted with surprise that your follow-up is only 9 months.

Dr. Pellegrini, thanks so much for your comments; you are the ideal discussant and certainly somebody whom we all look up to as a leader in minimally invasive treatments of achalasia. You asked us about the complete relief of dysphagia, and as we all know from our experience in antireflux surgery, the answer always depends on how you ask the patient and what you are asking. We use a numeric scoring system for dysphagia. For this study, any patient who scored grade 1 or 0 we put down as “complete relief” of dysphagia because we have found when establishing our “norms” for this that many asymptomatic volunteers will say on occasion that they have some dysphagia. Since achalasia patients will remain without motility after surgery, it would be very rare to find one who didn’t on rare occasions have some dysphagia. I ascribe our good results to a very aggressive approach with our myotomies, extending them well onto the stomach, as you have advocated, and always making a point of aggressively separating the fibers, peeling the myotomized walls back a long way to really open up the distal esophagus, and perhaps that partly explains our low dysphagia rates.

A question about the 9-month follow-up in what is essentially a 14-year experience: we did exclude patients from our early experience, 1996 and earlier. At that time we used a different symptom-scoring tool and probably were in our learn-
The definition of achalasia is an aperistaltic esophagus that is progressively dilating. The shorter follow-up is also due to our desire to correlate our objective data, which we routinely obtain between 6 and 12 months, with symptoms. We do have late outcomes data, which is symptomatic only. The objective data that we have more than a year out is for patients who are falling and who come back years later and are retested.

There was a question about the dilated esophagus. We used a simple measurement of the maximum diameter and didn’t really look at sigmoidization as there is no real way to quantify it. Anything less than 5 cm we called minimal dilation; anything over 5 cm we listed as a large degree of dilation; and I think our results support the intuitive sense that greater dilation represents more end-stage organ failure and therefore worse outcomes.

You question the use of the Toupet with perforations. You are correct to assume that many of the Dor repairs that were excluded from this study group were done to reinforce mucosal perforations. On the other hand, I have not found a small plastic closure of the mucosa to be especially threatening; in this series, none of the patients with postoperative problems were those who had a repaired mucosal perforation. If I feel that the Toupet repair is a better “fit” for a patient, I will simply do a nice repair, perhaps place some fibrin glue on it, and watch the patient closely.

Now about the role of the Dor? I personally favor the Toupet, mostly because it holds the myotomy open. Once again, our philosophy is to attempt to minimize dysphagia. I am not that concerned about reflux. Almost everyone in the world is on Prilosec or Nexium anyway. Our goal is a more aggressive opening of the lower esophageal sphincter and a little better antireflux repair, and I feel that the Toupet achieves this. That being said, for the last 2½ years we have been involved with a randomized prospective study comparing the Dor and Toupet repairs, and those patients, of course, were excluded from this study as well.

Dr Patti, thank you very much for your comments. Failed myotomies are a fascinating clinical puzzle. What do you do with these unfortunate patients? It’s a tough problem, especially patients who actually get worse with a myotomy, of which we had 2 in this series. It’s been our philosophy to go ahead and try a second myotomy, 180° from the first, and to take down the fundoplication. I strongly advise not adding another fundoplication on these patients or, at most, adding a little 90° re-creation of the angle of His. Results for reoperative myotomies are not great. There is a 50% success rate, at the most. We don’t try a third myotomy. We would instead proceed to a vagal-sparing laparoscopic esophagectomy in that group.

Dr Smith, it is great to see you, although you are a long way from home. Duration of symptoms: no, we didn’t specifically look at that. Achalasia patients come with so many odd symptoms. Some of them present with chest pain; a lot of them present as reflux patients. Because it was difficult to pinpoint, we didn’t record duration of symptoms. We use, and I think it is a fair surrogate, dilation of the esophagus as an indicator of disease progression, and perhaps our results also support the progression of achalasia from vigorous (early) to amotile (late); a long-standing theory.

Our 30% reflux rate: I think that it is a little bit higher than most in the literature. I think we are very aggressive, once again, at relieving dysphagia and will not compromise that in an effort to stop reflux. I think some more recent data have shown reflux rates much higher if you don’t do a fundoplication, up to 60%, so I think we are doing something to control it. You also refer to the growing awareness, supported again by our data, that patients who complain of heartburn symptoms after surgery most often don’t have reflux as measured by 24-hour pH testing. Should we then put all patients on PPIs after surgery? It’s a valid question because recurrent dysphagia following treatment because of peptic stricture is almost an automatic esophagectomy. Perhaps we should be treating all postoperative achalasia patients with prophylactic medications.

Then, finally, you made a comment on the traditional definition of achalasia as an amotile esophagus. I think we all agree with this as the key criteria. Of course, the definition used to also require a hypertensive LES and then a nonrelaxing LES. Dr Patti has produced data from his Swallowing Center that the LES criteria is no longer necessary, finding as we did that the LES can be hypertensive, normotensive, or even hyprotensive. It can also show a wide spectrum of relaxation, ranging from no relaxation to complete. When we looked very carefully, however, at that group of patients with normal LES pressures and what appeared to be relaxation, we noted that the relaxation often is transient or poorly timed, and I believe Dr Patti has found the same thing. I believe that the actual 2005 definition of achalasia is an aperistaltic esophagus that is progressively dilating.