Is Laparoscopic Reoperation for Failed Antireflux Surgery Feasible?

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Hypothesis: Laparoscopic techniques can be used to treat patients whose antireflux surgery has failed.

Design: Case series.

Setting: Two academic medical centers.

Patients: Forty-six consecutive patients, of whom 21 were male and 25 were female (mean age, 55.6 years; range, 15-80 years). Previous antireflux procedures were laparoscopic (21 patients), laparotomy (21 patients), thoracotomy (3 patients), and thoracoscopy (1 patient).

Main Outcome Measures: The cause of failure, operative and postoperative morbidity, and the level of follow-up satisfaction were determined for all patients.

Results: The causes of failure were hiatal herniation (31 patients [67%]), fundoplication breakdown (20 patients [43%]), fundoplication slippage (9 patients [20%]), tight fundoplication (5 patients [11%]), misdiagnosed achalasia (2 patients [4%]), and displaced Angelchik prosthesis (2 patients [4%]). Twenty-two patients (48%) had more than 1 cause. Laparoscopic reoperative procedures were Nissen fundoplication (n = 22), Toupet fundoplication (n = 13), paraesophageal hernia repair (n = 4), Dor procedure (n = 2), Angelchik prosthesis removal (n = 2), Heller myotomy (n = 2), and the takedown of a wrap (n = 1). In addition, 18 patients required crural repair and 13 required paraesophageal hernia repair. The mean ± SEM duration of surgery was 3.5 ± 1.1 hours. Operative complications were fundus tear (n = 8), significant bleeding (n = 4), bougie perforation (n = 1), small bowel enterotomy (n = 1), and tension pneumothorax (n = 1). The conversion rate (from laparoscopic to an open procedure) was 20% overall (9 patients) but 0% in the last 10 patients. Mortality was 0%. The mean ± SEM hospital stay was 2.3 ± 0.9 days for operations completed laparoscopically. Follow-up was possible in 35 patients (76%) at 17.2 ± 11.8 months. The well-being score (1 best; 10, worst) was 8.6 ± 2.1 before and 2.9 ± 2.4 after surgery (P < .001). Thirty-one (89%) of 35 patients were satisfied with their decision to have reoperation.

Conclusions: Antireflux surgery failures are most commonly associated with hiatal herniation, followed by the breakdown of the fundoplication. The laparoscopic approach may be used successfully to treat patients with failed antireflux operations. Good results were achieved despite the technical difficulty of the procedures.
PATIENTS AND METHODS

PATIENTS

Between March 1992 and May 1998, 46 patients were referred to either Creighton University Medical Center, Omaha, Neb, or Mayo Clinic Jacksonville, Jacksonville, Fla, for surgical treatment of a failed antireflux procedure. All patients underwent a prior laparotomy, thoracotomy, laparoscopy, or thoracoscopy as the initial procedure for the treatment of gastroesophageal reflux disease or its complications. The need for a reoperation was determined by the inability of prior symptoms to resolve, the recurrence of symptoms, or the development of new symptoms after an antireflux operation. The presence of a hiatal hernia was not the reason for a reoperation. There were 25 female and 21 male patients. The mean ± SEM age and weight were 55.6 ± 2.1 years and 79.4 ± 2.4 kg, respectively. The symptoms before the reoperation are listed in Table 1. The mean ± SE duration of these symptoms was 25.4 ± 3.2 months. The interval between the patients’ initial surgery and reoperation was 67.0 ± 9.5 months.

A barium esophagram was performed primarily in 43 patients (93%) and was most useful in developing a working diagnosis. Endoscopy was performed in 43 patients to define the esophagogastric anatomy and to identify esophagitis or other foregut disease. Twenty patients (47%) had esophagitis, 7 (16%) had a Barrett esophagus, and 5 (12%) had strictures. Manometry was used in all patients to measure the lower esophageal sphincter pressure and esophageal body motility. Twenty-four–hour pH monitoring was attempted in 14 patients to confirm the presence or absence of acid reflux. In 2 patients, the catheter could not be passed because of a large hiatal hernia. The mean ± SEM DeMeester score was 47.3 ± 7.0 and was abnormal in all patients tested. Gastric emptying was performed in 3 patients.

The initial procedures were laparoscopy in 21 patients, laparotomy in 21 patients, thoracotomy in 3 patients, laparotomy in 21 patients, thoracotomy in 3 patients, laparotomy in 21 patients, thoracotomy in 3 patients, and thoracoscopy in 1 patient. The types of prior procedures were laparoscopic Nissen fundoplication (n = 18), open Nissen fundoplication (n = 16), open Angelchik prosthesis removal (n = 2), and the following procedures in 1 patient each: open Toupet, open Nissen and highly selective vagotomy, open Nissen and Heller myotomy, thoracic Collis-Belsey, thoracic Collis-Nissen, thoracotomy and paraesophageal hernia repair, thoracoscopic Belsey, laparoscopic Toupet, laparoscopic Nissen and paraesophageal hernia repair, and thoracotomy with the Belsey. The preoperative and postoperative well-being scores were determined postoperatively by telephone interview, which was performed by one of us (N.R.F.). Statistical analysis of the well-being score was performed using the Student t test.

OPERATIVE TECHNIQUES

Exposure

The abdomen is entered using the Hassan or Veress needle techniques in the left upper quadrant. This area is most commonly free of adhesions. Carbon dioxide gas is insufflated, a 10-mm port is placed, and a camera is inserted. Blunt dissection is used to separate adhesions. The camera is switched to a second port after its placement 2 to 3 cm above the umbilicus in the midline. The remainder of the ports are placed in the usual manner for a laparoscopic Nissen fundoplication.1,3 The procedure then continues, depending on the situation.

Definition of Crura

In most patients, defining the diaphragmatic crura is the first step of the procedure. This allows for anatomic dissection at the hiatus. The right crus of the diaphragm is defined by retracting the liver and sharply dissecting the stomach off the liver bed. This plane is followed in the direction of the diaphragm until the vertical muscle fibers of the right crus are identified. The right crus is separated from...
the esophagus, followed up to the anterior portion of the right crus, and finally, to the left crus. Sometimes, it is more convenient to begin by dissecting the left crus. The gastroesophageal junction is located by repositioning the stomach into the abdomen and retracting the esophagus. In the presence of scarring, a suture or pledget may indicate the presence of the previous fundoplication. This dissection results in the identification of the hiatus with mobilization of the stomach and esophagus and with reduction of a hialtal hernia, which was the most commonly found abnormality.

**Correction of Failure**

The nature of a failed surgery is determined with a combination of preoperative and operative findings. Reoperations are tailored to correct the cause of the failure. If a sliding or paraesophageal herniation is present, then the fundoplication must be repositioned into the abdominal cavity and the crura reapproximated behind the esophagus. Mesh may be used to repair large defects in which the diaphragmatic tissues are considerably weakened. If a wrap is completely disrupted, a new fundoplication is created. If the leaves of a fundoplication are loosely adherent, then a suture is placed to tighten the wrap. If a slipped Nissen is present, the fundoplication must be taken down, the gastroesophageal junction located, and the wrap recreated to lie around the esophagus. A Heller myotomy is performed for misdiagnosed achalasia. In the presence of a tight wrap or misdiagnosed achalasia, the fundoplication is converted to a 270° Toupet fundoplication. A takedown procedure requires sharp dissection of fibrotic tissues and has an increased risk for perforating the esophagus or stomach. Should a gastric outlet obstruction be present, as defined preoperatively by a gastric emptying study, then a pyloroplasty may be necessary. A slipped Angelchik prosthesis can easily be removed laparoscopically. This is followed by a fundoplication.

There were 9 conversions (20%) to the open procedure, which were a result of adhesions (4 patients), bleeding (3 patients), perforation (1 patient), and tension pneumothorax (1 patient). The conversion rate was 29% for patients who had a previous open procedure and 9% for patients previously operated on either laparoscopically or thoracoscopically (*P* < .27).

**POSTOPERATIVE MORBIDITY**

The mean postoperative hospital stay was 4.7 days, with a median of 2 days (range, 1–68 days). The mean hospital stay was 2.3 ± 0.9 days for patients whose reoperation was completed laparoscopically. Mortality was 0%. Postoperative complications, which occurred in 7 patients, included a subphrenic abscess, sepsis, urinary tract infection, recurrent paraesophageal hernia, and small bowel fistula. Of 35 patients, postoperative symptoms occurred in 24 (69%), and 13 (37%) had more than 1 symptom. Nineteen (54%) were not receiving any medications at follow-up. Thirteen (37%) had occasional dysphagia to liquids, and 8 (23%) had occasional dysphagia to liquids and solids. Dilatation was required in 6 (17%) (Table 1).

For the patients whose procedure was converted to the open technique, 3 were asymptomatic. Of the remaining 3, 2 complained of heartburn and reflux, and the third complained of chest and respiratory tract symptoms. Three patients continued taking antacid medication, and 1 patient was receiving calcium channel blockers. No patient had further surgery.

**FOLLOW-UP**

Follow-up was possible in 35 (76%) of 46 patients at 17.2 ± 11.8 months. Follow-up was performed in 6 of 9 patients whose procedure was converted to the open technique. The well-being score (1 indicates best; 10, worst) for all patients was 8.6 ± 2.1 before and 2.9 ± 2.4 after sur-

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**Table 1. Symptoms Before and After Reoperation**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Before Surgery (n = 46)</th>
<th>After Surgery (n = 36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regurgitation</td>
<td>25 (57)</td>
<td>4 (11)</td>
</tr>
<tr>
<td>Heartburn</td>
<td>9 (20)</td>
<td>6 (17)*</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>8 (17)</td>
<td>0</td>
</tr>
<tr>
<td>Respiratory</td>
<td>7 (15)</td>
<td>2 (6)</td>
</tr>
<tr>
<td>Dysphagia needing dilatation</td>
<td>6 (13)</td>
<td>6 (17)</td>
</tr>
<tr>
<td>Chest pain</td>
<td>4 (9)</td>
<td>4 (11)</td>
</tr>
<tr>
<td>Reflux</td>
<td>4 (9)</td>
<td>6 (17)</td>
</tr>
<tr>
<td>Epigastric pain</td>
<td>2 (4)</td>
<td>0</td>
</tr>
<tr>
<td>Belching</td>
<td>2 (4)</td>
<td>0</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>0</td>
<td>5 (14)</td>
</tr>
<tr>
<td>Cough</td>
<td>0</td>
<td>3 (8)</td>
</tr>
<tr>
<td>Constipation</td>
<td>1 (2)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Flatulence</td>
<td>0</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Bloating</td>
<td>1 (2)</td>
<td>12 (34)</td>
</tr>
<tr>
<td>Patients with symptoms</td>
<td>46 (100)†</td>
<td>24 (67)</td>
</tr>
</tbody>
</table>

*This was less severe than before surgery and easily controlled with antacids.
†Also included are fullness, laryngospasm, bloating, weight loss, esophageal spasm, and hoarseness, each in one patient.

**Table 2. Major Reasons for Failure (n = 46)**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Patients, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrap breakdown and sliding hernia*</td>
<td>11 (24)</td>
</tr>
<tr>
<td>Paraesophageal hernia (PEH)</td>
<td>8 (17)</td>
</tr>
<tr>
<td>Slipped Nissen fundoplication and sliding hernia*</td>
<td>5 (11)</td>
</tr>
<tr>
<td>Wrap breakdown</td>
<td>4 (9)</td>
</tr>
<tr>
<td>Wrap breakdown and PEH</td>
<td>4 (9)</td>
</tr>
<tr>
<td>Tight wrap</td>
<td>4 (9)</td>
</tr>
<tr>
<td>Slipped Nissen fundoplication</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Sliding hernia*</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Missed diagnosis of achalasia</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Slipped Angelchik prosthesis</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Slipped Nissen fundoplication and PEH</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Slipped Nissen fundoplication and tight wrap</td>
<td>1 (2)</td>
</tr>
</tbody>
</table>

*Sliding hernia indicates that either the fundoplication or the gastroesophageal junction has herniated into the chest.
surgery (P<.001). The well-being score for patients whose reoperation was completed by the open technique was 7.8 ± 2.3 before and 3.6 ± 3.1 after surgery. Of all 35 patients interviewed, 31 (89%) were satisfied with their decision to have a reoperation.

This study demonstrates that a laparoscopic operation to correct previous antireflux surgery may be performed safely by surgeons with extensive experience in advanced laparoscopy. The incidence of complications and conversion to the open procedure was high compared with that of a primary procedure. This did not lead to significant morbidity, however. The long-term outcome in these patients is similar to that from open reoperation, with a 67% incidence of postoperative symptoms (24 of 36 patients). The high patient acceptance rate indicates that postoperative symptoms are more tolerable than preoperative symptoms. This study also shows the feasibility of laparoscopic antireflux surgery following a failed open procedure. Careful patient selection and preoperative evaluation are necessary to determine appropriate candidates for reoperation and the correct choice of operation to be performed.

Poor surgical technique, an incorrect choice of procedure, and poor patient selection were the cause of failure in 66% of cases reported by Stein et al.20 Absorbable sutures leave a tenuous wrap dependent on fibrosis alone. The use of pledgets and nonabsorbable sutures may prevent disruption of the fundoplication. Absorbable sutures leave a tenuous wrap dependent on fibrosis alone. The use of pledgets and nonabsorbable sutures may prevent disruption of the fundoplication. Seventy-nine percent of patients with a disruption of the fundoplication have either a sliding or paraesophageal herniation. A prosthetic patch repair may be performed. Future technical modifications should focus on the prevention of herniation because this was the most commonly encountered anatomic defect in our patients.

A slipped Nissen fundoplication may be the result of a technical error in which the fundoplication is incorrectly placed over the stomach or may be due to slippage of the stomach up through an intact wrap. A tight wrap occurs because of poor surgical technique or the misdiagnosis of achalasia. A tight fundoplication is usually caused by surgical inexperience. A tight wrap must be taken down. Fibrotic scars must also be released to resolve dysphagia. A bougie is considered helpful in preventing postoperative dysphagia, but the use of a bougie results in a higher incidence of esophageal perforations. A bougie was used in 19 of our patients, with 1 perforation. Because of this, we have now abandoned the use of bougies.

The laparoscopic Dor procedure is used when it is difficult to create a window posterior to the esophagus.

Antireflux reoperation with the open technique has a higher mortality than the initial procedure, with an average mortality of 2.8%. The success rate for open reoperative procedures is 79%, as calculated from 564 cases in the literature. Our rate of satisfaction was higher, indicating that patients tolerate the laparoscopic approach better than the open. Our 0% mortality attests to the safety of doing these procedures laparoscopically. The cause of most deaths is an unsuspected esophageal or gastric perforation with ensuing sepsis. The presence of severe fibrosis makes dissection difficult and dangerous. Our conversion rate was 20%, which is consistent with the results of other studies. A higher conversion rate occurs for patients initially operated on with the open technique than for those with the laparoscopic technique.

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REFERENCES


**DISCUSSION**

Donald L. Kaminski, MD, St Louis, Mo: The authors have described their experience with laparoscopic revision of previous antireflux operations. This represents an important presentation in the history of laparoscopic surgery because it describes reoperating laparoscopically on patients who had previous complex operations. This seems to be a process which has not been frequently pursued previously. This technological achievement certainly isn’t diminished by a significant complication rate in addition to a conversion rate of approximately 20%. It’s not entirely clear why these patients underwent reoperation. There are a large number of subjective symptoms present in these patients prior to reoperation. There is little evidence they were treated medically or that they failed to respond to medical therapy. One would assume that the original operations were performed for esophagitis or the complications of esophagitis. The characteristics of the information in the paper as well as the presentation are that the period of follow-up is brief; the average follow-up is about 17 months. It’s possible that many of these patients will have increased development of postoperative symptoms as time passes.

There is very little objective evidence of disease in these patients preoperatively, such as esophagitis, and no objective information postoperatively that esophagitis or hiatus hernias were corrected.

I also was dismayed by the large number of operations being performed. There probably are about 10 different operations performed on these patients during the original operation. Trying to sort through the number of operations performed when they were reoperated on revealed at least 6 or so different types of operations. The message that I derive from this paper involving patients undergoing repeated antireflux procedures is that if patients are unhappy with their original operative results, these results can be changed and hopefully improved by a laparoscopic procedure.

I have several questions for the authors. They indicate that selected patients can undergo laparoscopic reoperation for failed antireflux repairs. Obviously, the question is, how do you select those patients to undergo laparoscopic reoperation rather than open reoperation? It was interesting that a few of these patients’ original operations were performed through the chest, and I wonder if a previous thoracic operation makes a laparoscopic reoperation easier or more difficult.

Finally, because of the large number of operative procedures being performed in these patients at their original operations and at reoperation, I wonder if the authors would comment on whether the problems are related to the unsatisfactory characteristic of these operations themselves, or do they believe that they are being incorrectly performed?

Jorge L. Rodriguez, MD, Minneapolis, Minn: I have 2 questions. First, I think endoscopic findings are very important. I would like to know the association not only of esophagitis but also with metaplasia that was associated with the patients who were reoperated on, whether the indications were clinical, symptomatic, or was the decision based on endoscopic findings? Second, in the 20% conversion rate, what was the length of stay and what were the reasons—although I might have missed it—for their conversions to open?

Philip E. Donahue, MD, Chicago, Ill: I find the presentation very interesting, and most of these complications, Dr Hinder, were failures of fixation at the original operation—sliding up, sliding down, failure to stay in the right place, or failures of posterior fixation. The first question is, Were these Nissens done without any fundopexy component to the operation? Were all of these from the groups in Omaha and Florida? Finally, while this series shows that laparoscopic procedures can be done for reoperative issues, it doesn’t prove that it should be done. A 20% conversion rate, 30% major complication rate, and long operative times are really not convincing. The take-home message for some of us will be that reoperative procedures should be done the old-fashioned way.

Dr Hinder: Dr Kaminski asked about indications for reoperation in these patients. Our indications for reoperation are essentially the same as for first-time operations, that is, for unacceptable symptoms unresponsive to medical therapy. You and Dr Rodriguez asked about esophagitis. As we are seeing with first-time antireflux surgery, esophagitis is no longer a major deciding factor. We frequently see patients with severe symptoms of reflux, cough, chest pain, or heartburn who are on medical therapy and show very little in the way of esophagitis because of powerful antiacid medications. We endoscope all of these patients but don’t use esophagitis as a major criterion for our decision to carry out surgery. You asked about the short length of follow-up. More of the patients are going to fail as time goes by, but our experience suggests that we will see a steady but acceptably low recurrence rate equivalent to the open procedure. You asked about the large number of different operations. These are complex problems, and this leads to varied operations. There isn’t one operation to fix all situations. We often have to do a combination of different procedures to achieve a result. Careful planning is required preoperatively. You and Dr Donahue asked about the selection of patients for laparoscopy. Essentially, we offer the laparoscopic approach to all patients, with the option that we may have to convert.

Dr Rodriguez, you asked about the reasons for the conversions. These are shown in the manuscript. They were essentially failure to progress, perforation, or bleeding.

Dr Donahue asked for information about the first surgeries. Unfortunately, it was not clear to us exactly what happened in most of the first surgeries as they were done many years earlier at other institutions. We also have little data on the experience of these surgeons. Finally, Dr Donahue asked whether laparoscopic redo surgery should be performed. I feel we should do so, and I am supported by my results. A person who comes to us with severe recurrent symptoms requiring an operation faces an 80% chance of a successful laparoscopic repair with short hospitalization, which is quite reasonable. Surgeons who are qualified to do this type of surgery should continue to explore this evolving area.