

Laparoscopic reoperations after failed and complicated antireflux operations

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Abstract. Nineteen patients underwent laparoscopic reoperations for failed or complicated antireflux operations from a total of 248 patients with gastroesophageal reflux disease who had been operated on by this approach. Sixteen had been submitted to open surgery and three to laparoscopic surgery over a period ranging from 5 days to 31 years before the study. Three patients had been submitted to two open antireflux surgeries previously. Seventeen patients had recurrent reflux esophagitis after different types of surgeries, and two patients presented with gastric strangulation after fundoplication. The causes of recurrence were: slipped total funduplications (3), disruption of total and partial funduplications (6), too-tight total fundoplication (1), too-low (gastric) partial fundoplication (1), Allison procedure (1), partial fundoplication and paraesophageal hernia (2), and unknown (3). The laparoscopic approach was used in 18 patients and a laparoscopic-thoracoscopic approach in 1. The procedures included laparoscopic total funduplications (11), partial funduplications (4), transhiatal esophagectomy (1), Collis-Nissen (1), Roux-en-Y gastrectomy and thoracoscopic vagotomy (1), and intrathoracic fundoplication (1). One patient was converted to open surgery. Intraoperative complications included 1 pneumothorax, 1 gastric perforation, and 1 esophageal perforation during the introduction of a Maloney dilator. Mean operative time was 210 min, ranging from 140 to 320 min. Mean hospital stay was 3.1 days after treatment of failed operations and 22 days after treatment of complications. Postoperative complications included subcutaneous infection (1), gastric fistula (1), and liver hematoma (1). The results have been excellent and good in 84.3% of the patients after a mean follow-up of 13 months. We concluded that laparoscopic reoperations are technically feasible with good preliminary re-

sults provided that the mandatory expertise is available.

Key words: Total and partial refundoplication — Laparoscopic transhiatal esophagectomy — Laparoscopic Collis-Nissen gastroplasty — Laparoscopic gastrectomy

Surgical treatment of gastroesophageal reflux disease has well-defined indications and successful control of reflux can be achieved in approximately 91% of patients followed up on a long-term basis [4]. Possible postoperative failures include complications, severe side effects, and recurrence of reflux symptoms [7–9, 11, 14]. Management of these patients represents a major clinical challenge, especially when reoperation is indicated. Particularly in patients who have had previous antireflux surgery, evaluation of symptoms and objective workup is essential. Reoperations for treatment of complications and recurrent reflux esophagitis require a number of different techniques, including resection, and present a reported morbidity of 4–40%, mortality of 0–4.9%, and excellent or good results in 60–85% of the patients [8, 10, 13–15].

Laparoscopic treatment of gastroesophageal reflux disease is a recent development, with advantages such as technical viability for most patients, short hospital stay, rapid return to previous activities, and satisfactory preliminary results [2, 3, 16]. Since the procedures performed by the laparoscopic approach are the same as those performed by open surgery, it is assumed that the results may eventually be the same, with, also, similar possibilities of complications, side effects, and recurrence of reflux esophagitis.

In the present report, we describe the preliminary results obtained for 19 patients with recurrent reflux esophagitis and complications after antireflux operations who were treated by laparoscopic surgery.

Materials and methods

From May 1991 to March 1994, 19 patients out of 248 were submitted to laparoscopic reoperation for the treatment of failed and complicated antireflux operations. There were 11 males and 8 females. Mean age was 55.2 years (range 48 to 72 years). Eight patients were excluded because the symptoms presented after antireflux surgery were not directly related to esophageal reflux disease. Objective evaluation excluded the possibility of GE reflux. The indications included two cases of gastric strangulations after fundoplication and 17 patients with recurrent reflux esophagitis after surgical treatment. Three patients had been submitted to laparoscopic surgery and 16 to open surgery over a period ranging from 5 days to 31 years. Three patients underwent two previous open antireflux operations. One patient had a gastrostomy tube in place.

Two patients with gastric strangulation reported solid-food dysphagia, retrosternal pain, nausea, and vomit. The diagnosis was made by chest x-ray and barium studies. One of the patients had been submitted to thoracic drainage and had an accidental stomach perforation. The two patients were reoperated 5 and 18 days after laparoscopic fundoplication.

The main symptoms of patients with recurrence of reflux esophagitis were heartburn and regurgitation. Five patients reported dysphagia. All of them were submitted to intensive medical therapy, with mean time of 4.2 years. Preoperative workup included upper digestive endoscopy with biopsy, barium meal, esophageal manometry, and 24-h pH monitoring. Patients with dysphagia were submitted to specific tests to rule out the possibility of achalasia (Chagas's disease).

Upper digestive endoscopy was performed in all patients in order to evaluate the severity of esophagitis, to ascertain the presence of Barrett's esophagus, and to determine the possible cause of recurrence. The patients were classified according to the Savary-Miller classification (1978): grade II (5), grade III (6), and grade IV (6). Six patients had Barrett's esophagus and multiple biopsies were taken in the metaplastic columnar epithelium of the distal esophagus. Patients with strictures also had biopsies in order to exclude a malignant etiology. Preoperative endoscopic dilation was done in five patients with strictures. They were progressively dilated up to a 54-Fr bougie in all but one of the patients, who had no significant improvement even after several sessions of esophageal dilatation. Evaluation of the hiatus and the integrity and position of the wrap were determined by a retroflexion maneuver.

Radiographic evaluation of the esophagus, stomach, and duodenum was also performed in all patients, demonstrating the presence of a paraesophageal hernia in 2, esophageal stenosis in 5, stenosis of the wrap in 1, and suspected slipped or disrupted fundoplication and sliding hiatal hernia in 9 patients.

Esophageal manometry was performed in 14 patients. Mean lower esophageal sphincter pressure was 8.1 mmHg, 2.1 cm of total length, and 0.7 cm of intraabdominal esophageal sphincter. Inadequate motility was demonstrated in 65% of the patients, including reduction in the amplitude of contractions, simultaneous contractions, and interrupted waves.

Twenty-four-hour esophageal pH monitoring was also performed in 14 patients. All of them presented abnormal results. Two patients had acid and alkaline reflux. However, due to technical reasons, it was not possible to determine whether it was due to bile content or to some other causes.

Technique

The patients were submitted to general anesthesia and prepared for possible selective intubation and thoracoscopic approach, and also for resection with colon interposition. They were initially positioned supine with legs abducted. The surgeon stood between the patient's legs with his first assistant placed on the patient's left. The second assistant held the camera on

the other side. The pneumoperitoneum was established by an open technique and more frequently in the left iliac fossa, although this position varied according to previous abdominal incisions. This was a step of great importance and difficult to perform in some patients. The second trocar (5 mm) was positioned along the left subcostal midclavicular line under visual control. A cutting device was introduced through this trocar, starting lysis of adhesions to allow placement of other trocars. This dissection represented a considerably difficult step and a long-lasting one in some patients. A 30° telescope was usually positioned on the midline at the junction of the middle and distal thirds, approximately 3–5 cm above the umbilical scar. As mentioned before, in most patients, positioning of the telescope at this site, as well as positioning of the other trocars, was only possible after lysis of adhesions. One 5-mm trocar was placed below the xiphoid, and another one adjacent to the right subcostal margin. The last 10-mm trocar was placed somewhere between the left subcostal trocar and the optics.

The esophagogastric junction was approached anteriorly to the stomach along both the lesser and greater curvatures. This dissection extended almost as far as the fundoplication area. The laparoscopic image provided an adequate and well-defined visualization of this dissection, which at times was done within a quite-reduced space between the liver and the anterior gastric wall. Bleeding from the liver was frequent. Extreme care was needed to avoid gastric perforation. Division of the short vessels was done routinely. In some cases, a posterior approach to the stomach was also used, especially for the handling and dissection of the posterior portion of the wrap.

Intraoperative upper digestive endoscopy was routinely used to facilitate the identification of the esophagus and the gastroesophageal junction in scarred tissue, the precise position of the previous fundoplication, and also to check the adequate placement of a new fundoplication or another technique.

The diaphragm was split anterior to the esophagus for a few centimeters in most patients. In order to avoid major subcutaneous emphysema, intraabdominal pressure was reduced at this time. Access to the posterior mediastinum was facilitated, and the esophagus in an area free from adhesions and scar tissue was more easily identified and dissected. The vagus nerves were identified and carefully isolated. The esophagus was extensively mobilized. For those patients with the stomach inside the thorax, mobilization was adequately performed starting from the borders of the hiatus.

The next step consisted of trying to identify the reason of the failure. After mobilization of the stomach and thoracic esophagus, dissection of the former fundoplication area and takedown of the wrap was performed with caution in an attempt to preserve the vagus nerves and also to avoid esophageal or gastric perforation. It was the most difficult step of the procedure, and mainly occurred at the posterior aspect of the wrap and esophagus. It was necessary to use great care in handling graspers and cutting devices.

Table 1. Cause of recurrence

Cause	No. of patients	%
Slipped total fundoplication	3	15.8
Disruption of total fundoplication	2	10.6
Too tight total fundoplication	1	5.3
Disruption of partial fundoplication	4	21.1
Too low partial fundoplication	1	5.3
Partial fundoplication/paraesophageal hernia	2	10.6
Allisson	1	5.3
Unknown	3	15.8
Gastric strangulation	2	10.6
Total	19	100

The esophageal hiatus was routinely closed with separate stitches using nonabsorbable sutures. In patients submitted to a new fundoplication, it was performed over a 58-Fr Maloney dilator using separate stitches of nonabsorbable sutures for an approximate extension of 2.0 cm in total funduplications and of 4–5 cm in partial funduplications.

Despite extensive mobilization of the thoracic esophagus, one patient continued to have his repair under tension in the abdomen. Extra care should be taken in this evaluation, as pneumoperitoneum compresses the diaphragm and a false relation can be established. A total intrathoracic fundoplication was performed. The stomach was sutured to the borders of the hiatus, which was partially closed. For the same reason, another patient was submitted to a laparoscopic Collis gastroplasty-Nissen fundoplication. A 58-Fr Maloney dilator was placed in the stomach. Straight clamps were introduced through the abdominal trocars and placed parallel to the lesser curvature in the fundus, which was sectioned for about 5 cm. The procedure was concluded with a two layers running suture and a total fundoplication.

Transhiatal esophagectomy was performed after mobilization of the lesser and greater curvature, ligation of the left gastric artery, pyloromyotomy, and posterior mediastinal mobilization of the esophagus. The mobilization of the thoracic esophagus through the hiatus was done up to 2–3 cm beyond the trachea bifurcation. The next step was a left cervicotomy, blunt dissection of the superior esophagus, and cervical esophagogastric anastomosis.

Antrectomy and Roux-en-Y anastomosis was performed when adequate access to the region of fundoplication was found to be impossible. Anastomosis of the stomach and jejunal loop was performed with staplers (endoGIA) and by hand sewing suture. Through left thoracoscopy, the right and left vagal nerves were identified and divided.

Results

The causes of failure of the first operation and recurrence of reflux esophagitis after pre- and intraopera-

Table 2. Laparoscopic procedures

Procedure	No. of patients	%
Total fundoplication	11	58
Partial fundoplication	4	21
Total intrathoracic fundoplication	1	5.3
Transhiatal esophagectomy	1	5.3
Collis-Nissen gastroplasty	1	5.3
Roux-en-Y gastrectomy	1	5.3
Total	19	100

tive evaluation are reported in Table 1 and the procedures used for their treatment in Table 2.

Three patients were diagnosed as slipped total fundoplication, with heartburn and a report of surgery reoperation. Two of these patients complained of dysphagia and had endoscopic diagnosis of esophageal stenosis and severe erosive-ulcerated esophagitis. They were submitted to preoperative dilatation, one of them unsuccessfully. Both presented important reduction in the amplitude of contraction on esophageal manometry and were managed by partial fundoplication and transhiatal esophagectomy, respectively. The third patient who had a laparoscopic approach on his first operation was submitted to laparoscopic total re-fundoplication.

Two patients had disruption of total fundoplication and were treated by total refundoplication.

One patient had a too-tight total fundoplication, with no significant improvement after several sessions of esophageal dilatation. He was treated by taking down the wrap, and a partial fundoplication was done 6 months after the primary operation.

Four patients underwent partial fundoplication with a mean interval of 3.4 years, ranging from 2 to 7 years. One of the patients, who presented dysphagia and a concomitant diagnosis of esophageal stenosis, was submitted to preoperative dilatation with good results. A new total fundoplication was done for these four patients.

Two patients submitted to partial fundoplication developed paraesophageal hernia. The sac was excised close to the diaphragmatic margin and the intrathoracic stomach dissected from its attachments and reduced to the abdomen. The right crus was sutured, partial fundoplication was redone, and the gastric wall was sutured to the peritoneum of the abdominal cavity.

One patient underwent partial fundoplication with the wrap misplaced in the stomach. The main complaints were heartburn and dysphagia. Endoscopy demonstrated severe esophagitis and stricture. He was submitted to several sessions of dilation with satisfactory results. During surgery performed 5 months later, a certain shortening of the esophagus was observed. Even after extensive esophageal mobilization, the esophagus positioned inside the abdomen was under tension. The procedure selected was lengthening of the esophagus and total fundoplication (Collis-Nissen gastroplasty).

The patient who underwent an Allison procedure 31 years before was treated by a new total fundoplication.

Two patients, for whom it was not possible to clearly define the cause of recurrence, were treated by total fundoplication. The third patient was submitted to antrectomy with Roux-en-Y anastomosis, left thoracoscopy, and bilateral trunk vagotomy, since access to the fundoplication area was not possible due to dense adhesions.

One of the patients with the diagnosis of gastric strangulation had a concomitant partial disruption of the wrap and the esophageal hiatus stitches. He was treated by intrathoracic fundoplication since even after extensive mobilization of the thoracic esophagus it was not possible to establish a segment of intraabdominal esophagus without tension. The other patient with gastric strangulation was treated by reduction of part of the stomach from inside the chest, new suture of the esophageal hiatus, and fixation of the stomach to the abdominal wall. This patient was converted to open surgery due to inadequate mobilization of the stomach and distal esophagus. There was no need to handle the wrap. Both of them had a laparoscopic approach as their first operation.

Although they were mentioned earlier, the three patients with two previous surgeries will be discussed separately because they presented characteristics of great severity. They had severe heartburn, dysphagia, and thoracic pain. Upper digestive endoscopy demonstrated severe esophagitis. All of them were submitted to preoperative and intraoperative dilation. One patient who did not respond to dilation and had inadequate motility underwent transhiatal esophagectomy. The other two patients were submitted to Collis-Nissen gastroplasty and partial fundoplication, respectively.

Intraoperative complications included pneumothorax in one patient, one gastric perforation, and one esophageal perforation during the introduction of the 58-Fr Maloney dilator. They were treated by laparoscopic suture techniques. No further morbidity was observed in any of the patients.

The postoperative complications included one subcutaneous infection at one of the trocar sites, one 5 × 5 cm hepatic hematoma, and one gastric-cutaneous fistula in the patient with gastric strangulation.

Mean operative time was 210 min, ranging from 140 to 320 min. Mean hospital stay for the patients with a preoperative diagnosis of recurrent reflux esophagitis was 3.1 days, ranging from 24 h to 9 days. For those patients with gastric strangulation after laparoscopic fundoplications, mean hospital stay was 22 days. Mean follow-up was 13 months (ranging from 1 to 26 months). Postoperative clinical evaluation demonstrated excellent and good results in 84.3% of the patients. The patient submitted to transhiatal esophagectomy had frequent episodes of nocturnal regurgitation and mild complaints of dumping. In another patient, moderate-to-severe gas-bloat symptoms were observed. All patients had endoscopic and radiologic

control ranging from 45 days to 5 months. Remission of previous esophagitis was noticed in all but one of the them, who still had mild erosive esophagitis, although asymptomatic. The one submitted to laparoscopic Collis-Nissen gastroplasty developed dysphagia, requiring two sessions of postoperative esophageal dilation. Eleven patients volunteered to have repeated esophageal manometry and 24-h esophageal pH studies. Mean postoperative LES pressure was 17.4 mmHg, and total and intraabdominal length were 4.2 cm and 2.1 cm respectively. The results of 24-h esophageal pH studies are shown in Fig. 1.

Discussion

Antireflux operations are primarily designed to correct a mechanically defective lower esophageal sphincter and can produce effective and lasting relief of reflux symptoms in 91% of the patients on a follow-up of more than 10 years [4]. However, management of 10–15% of patients with failed antireflux operations represents a major clinical challenge [15]. As emphasized by some investigators [13, 14], it is important to evaluate and classify the type of postfundoplication syndrome, as well as the previous number of antireflux operations, before making the decision about the indication of reoperation and type of procedure to be used.

Subjective evaluation is important even if it does not determine the cause of recurrence or whether reoperation is viable. However, patients with recurrence of reflux symptoms without dysphagia can be more easily treated than those with dysphagia [13].

Objective evaluation by barium meal, upper digestive endoscopy with biopsy, 24-h pH monitoring, esophageal manometry, and gastric emptying studies may determine the cause of failure. Assessment of esophageal motor function and of the type of reflux (acid or alkaline) may help select the type of surgery and eventually exclude patients.

The approach may be thoracic, abdominal, or combined according to the cause of recurrence and the preference or school of thought of the surgeon. The main advantage of the thoracic approach is that it allows easy access to the diseased and healthy esophagus, with extensive mobilization without direct handling of the fundoplication area [8, 15]. The abdominal approach, however, has permitted adequate treatment in some series, even when complex procedures were required [7, 10, 13]. Different types of procedures—such as total and partial fundoplication, posterior gastropexy, Collis gastroplasty, intrathoracic fundoplication, antrectomy with Roux-en-Y diversion, and resection—have been utilized to varying extents depending on the series analyzed [6, 8, 13, 15]. Similarly, the results depend on the type and number of previous surgeries, anatomical and functional conditions of the esophagus, and reoperation technique, with a wide range of morbidity and mortality depending on the series reported in the literature [6–11, 13–15].

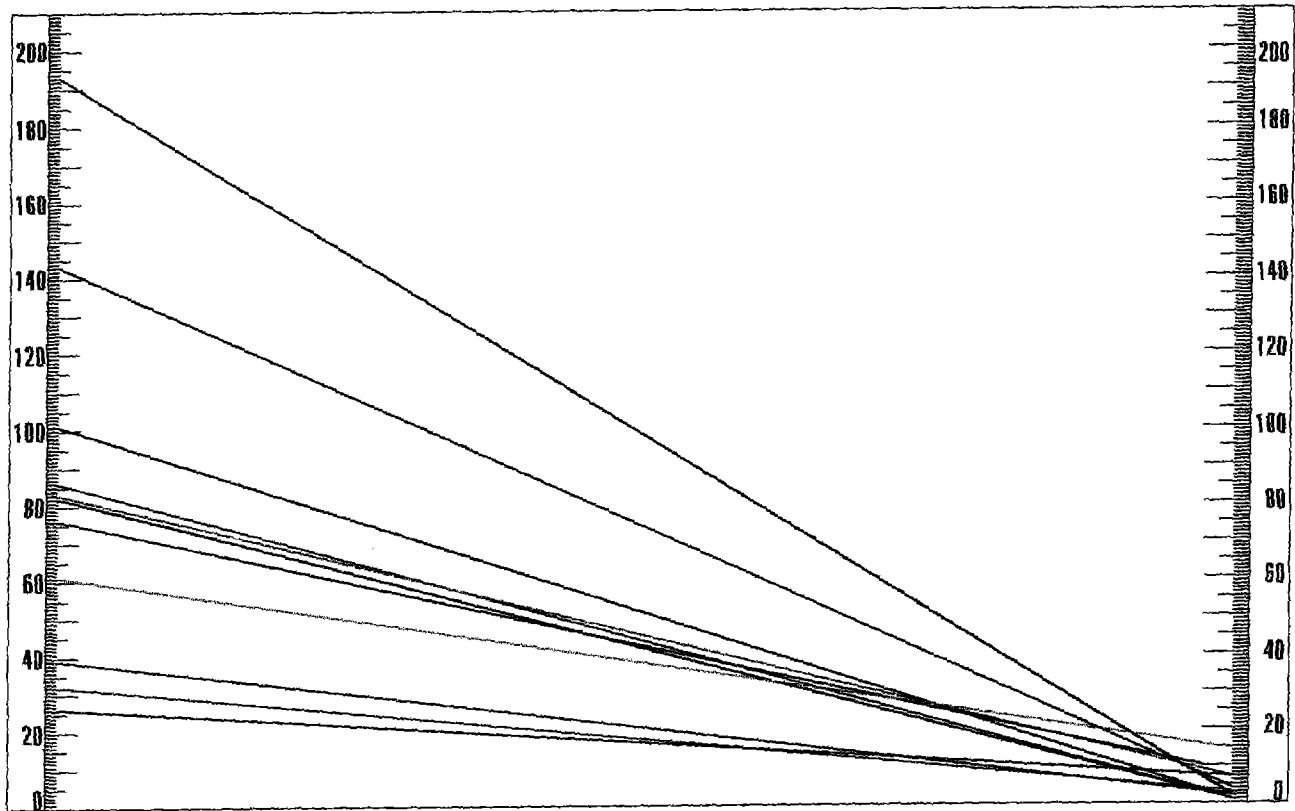


Fig. 1. DeMeester score. The 24-h esophageal pH composite score before and after antireflux surgery. Normal score <14.8. All patients had a normal score after surgery.

The laparoscopic approach to gastroesophageal reflux disease has the advantages of technical viability in most patients, short hospital stay, rapid return to previous activities, and satisfactory preliminary results; it represents a new option for the surgical treatment of this entity [2, 3, 16]. The indications for laparoscopic approach are a matter of debate. In principle, they should be the same as those for open surgery; however, in most cases, it depends rather on the surgeon's experience.

As for open surgery, the use of laparoscopic approach following failed and complicated antireflux operations represents a major challenge. The technical aspect deserves emphasis. The pneumoperitoneum was established by open technique, usually in the left iliac fossa, followed by lysis of adhesions and placement of other trocars under direct vision. Direct dissection of the fundoplication area was avoided from the beginning and was performed only after extensive mobilization of the thoracic esophagus. Splitting of the diaphragm was frequently performed for a few centimeters, providing a wide and adequate approach to the posterior mediastinum. As for primary antireflux operations, this technique allowed a better definition of the anatomy compared to open procedure. Visualization through the telescope allowed precise identification of the vagus nerves, extensive mobilization of the thoracic esophagus, and take-down of the fundoplication. Dissection and take-down of the wrap were performed safely, though with difficulty, especially with

respect to the posterior portion of the esophagus and wrap. As previously reported by some investigators [8, 13, 15], patients with a history of more than one antireflux operation and esophageal stenosis were usually more difficult to be operated on. The lesions were more severe and there were greater technical difficulties, which required more complex procedures for effective treatment. The choice for a laparoscopic approach in patients who underwent two or more open procedures was based on the same principles and therefore required more complex procedures, such as laparoscopic transhiatal esophagectomy and Collis gastroplasty. It is possible that the laparoscopic approach can cause less trauma to these already-damaged tissues.

Intraoperative endoscopy was very important in helping to identify the gastroesophageal junction and esophagus, in mobilization, in dissection of the wrap, and in characterizing the type of failure.

A number of different laparoscopic procedures were necessary according to appropriate subjective and objective preoperative evaluation, the cause of recurrence, clinical condition of the patient, and intraoperative evaluation. The first option was refundoplication. Partial fundoplications were mainly indicated for patients with impaired motor function and for those whose local inflammatory conditions permitted the procedure, since several stitches need to be applied in an inflamed and friable tissue. The option for a lengthening esophageal procedure was made for patients

whose repair continued to be under tension even after extensive mobilization. Intrathoracic fundoplication was done for the same reasons, although this procedure provides favorable results according to some investigators [1], and catastrophic ones according to others [12]. In one patient, technical difficulties related to the approach of the fundoplication area indicated antrectomy, Roux-en-Y diversion, and thoracoscopic vagotomy. This is an option in the treatment of complicated reflux esophagitis [6], especially for patients without esophageal obstruction [13]. Laparoscopic esophageal resection through the hiatus is a technically feasible procedure, both for benign and malignant diseases [5]. Visualization of the dissection of the posterior mediastinum was precise, allowing adequate identification and manipulation of intrathoracic structures.

Analysis of intraoperative complications demonstrated how dangerous the introduction of a dilator during laparoscopic fundoplications is when you do not have the hands to guide the dilator, the usefulness of nontraumatic devices and precise techniques to avoid perforation of the esophagus or stomach, and the current maturity of laparoscopic surgery, which can be used for the treatment of its own intraoperative complications.

Although there was a low incidence of postoperative complications, the small number of patients and of complex procedures, such as resection, does not allow us to draw definite conclusions about the risks of the laparoscopic approach. Clinical results demonstrated a high rate of excellent and good results despite short postoperative follow-up. Potential advantages would include those listed for primary antireflux laparoscopic operations, such as the feasibility to perform exactly the same procedure as for open surgery, less pain, short hospital stay, and rapid recovery.

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Discussion

Dr. DeMeester: Let me ask you, Dr. DePaula: Do you think if you had opened some of these patients you could have repaired them with a fundoplication as opposed to having to do a more extensive procedure?

Dr. DePaula: Should we open? I don't think so. I think it's even more—it's easier to do it laparoscopically, since we've got the direct approach to it. And if you use the division of the diaphragm to get access to the posterior mediastinum and define a healthy esophagus extensively dissected and bring everything down, I think you can also accomplish it. Or you can also do a laparoscopic Nissen after dividing the hiatus.

Dr. Loy: I have tried a couple of these operations, Aureo, on your encouragement, and I tried to follow. And what I have found is—and maybe you can comment on this—the most difficult part of the dissection in this, and as I recall from open cases, is when sutures have been placed between the posterior side of a wrap and the closed crus, and oftentimes the appearance there is such that the planes are obscured and the operation is actually even very difficult open. So I found that it's possible to accomplish all the other aspects of the dissection in a very small experience, but then on the back side, that's where it's most difficult. And I wonder whether that's generic and going to be a common feature so that that will be the Achilles heel, or the hardest part of this approach, or whether you have some tricks when encounter a patient who has adhesions in that particular area.

Dr. DePaula: I agree with you, Larry. And I can tell you that the patient that was submitted to a transhiatal esophagectomy had two previous open and reflux procedures. And what we found at that time is that there was a complete mix in that area in the patient, and I think that the surgeon started to suture everything to the crus to the diaphragm. And this specific patient we had to resect the esophagus. So I think that this is a major drawback, and one of the most difficult aspects is that to dissect the posterior aspect of the wrap, no doubt.