Laparoscopic Antireflux Surgery: Reoperations at the Hiatus

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Abhishek D. Parmar and Kyle A. Perry

Introduction and Epidemiology

Laparoscopic Nissen fundoplication is regarded as the gold standard operation for medically intractable gastroesophageal reflux disease. As surgeons have increasingly performed this operation over time, complications and the need for reoperation are also becoming increasingly common. While several studies have established the long-term efficacy of fundoplication for improving symptoms of reflux disease, it is still an operation that carries a significant risk for reoperation [1].

Rates of reoperation after initial antireflux surgery in the literature have been widely reported, from greater than 10% in the era of early adoption of laparoscopic fundoplication in the 1990s to as low as less than 3% in one systematic review [2]. Population-based studies estimate a reoperation rate of approximately 5%, usually within 1–2 years after fundoplication. In a nationwide Danish study of 2465 patients, 5% of patients required reoperation, with the risk highest in the first 2 years postoperatively [3]. Similarly, a population-based study of 13,000 Californians with uncomplicated GERD who underwent fundoplication from 1995 to 2010 identified a reoperation rate of 6.9% at 10 years [4]. In this study, younger, female patients were more likely to undergo reoperation, also more likely in the first 2 years postoperatively.

Causes for reoperation are most often due to recurrent reflux symptoms or dysphagia. Anatomic causes of fundoplication failure include transmediastinal

A. D. Parmar (✉)
Division of Gastrointestinal Surgery, Department of Surgery, University of Alabama School of Medicine, Birmingham, AL, USA
e-mail: aparmar@uabmc.edu

K. A. Perry
Division of General and Gastrointestinal Surgery, The Ohio State University, Columbus, OH, USA
e-mail: kyle.perry@osumc.edu

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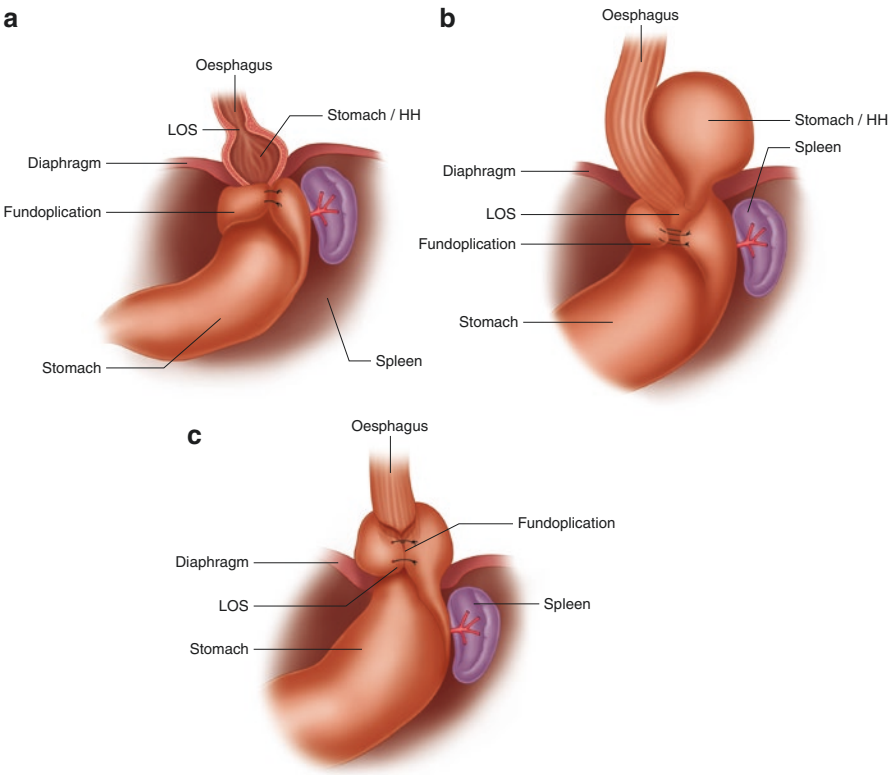


Fig. 17.1 Patterns of failure. (Suppiah et al. [9])

migration, fundoplication issues (tight wrap, slipped wrap), unrecognized shortened esophagus, or previously undiagnosed esophageal dysmotility, with transmediastinal migration being the most common [5–8]. An alternate classification has been proposed by Suppiah et al., in which (1) the wrap may have either "telescoped" or slipped, (2) a paraesophageal hernia may have developed, or (3) crural failure occurred with wrap herniation into the chest [9] (Fig. 17.1). Indications for surgery and etiologies of wrap failure as observed from the most recent systematic review of 930 redo antireflux operations by Symons et al. in 2011 are depicted in Table 17.1 [10].

Clinical Evaluation and Management

When considering reoperative surgery of the hiatus, it is essential to distinguish between radiographic recurrence and symptomatic recurrence. Studies have demonstrated that while radiographic hiatal hernia recurrence after Nissen fundoplication may be common, this may or may not be clinically relevant in the absence of

Table 17.1 Indications for reoperation and etiology of wrap failure after primary antireflux surgery

Indications for reoperation			Etiology of wrap failure		
Primary indication for reoperation	Number	Percentage	Etiology of wrap failure	Number	Percentage
Recurrent GERD	377	59.4	Hiatal hernia	336	44.1
Dysphagia	194	30.6	Disrupted	120	15.8
Gas bloat	29	4.6	Slipped	89	11.7
Hiatal hernia	14	2.2	Twisted	43	5.6
Other	21	3.2	Misplaced	30	3.9
			Other	144	19

Adapted from van Beek et al. [6]
GERD gastroesophageal reflux disease

significant symptoms that warrant repair. Oelschlager et al. [11] reviewed their experience in a multi-institutional cohort of 60 patients who underwent laparoscopic repair of large hiatal hernias. At a median of 58 months postoperatively, the group identified a radiographic recurrence on upper gastrointestinal series in 34 patients (57%). However, there was no difference in quality of life scores between patients with or without radiographic recurrence. As such, experts in foregut surgery recommend reoperation only be undertaken in the context of foregut symptomatology (recurrent or new reflux and/or dysphagia) *with* anatomic/radiographic findings that may be correctable surgically [7].

History and Physical Exam

A careful assessment of symptom severity and detail should be obtained prior to any intervention. Multiple standardized scoring systems are available, with the Visick score, dysphagia severity score, and GERD health-related quality of life surveys being developed specifically for symptoms of reflux [12, 13]. The patient's symptomatology should be used as a key determinant to guide preoperative testing and evaluation. Patient symptoms are generally classified into two groups: recurrent reflux-type symptoms and dysphagia. Eliciting the specific conditions in which these symptoms occur (solid versus liquid oral intake, presence and timing of regurgitation) can help differentiate primary or secondary esophageal dysmotility from an anatomic obstruction at a tight or herniated wrap. In addition, a focused assessment to identify symptoms of delayed gastric emptying would warrant additional imaging [14]. Care should be taken to ensure that patient symptoms are not expected side effects of fundoplication such as mild, early postoperative dysphagia, gas bloating, or an inability to belch. In this setting, dysphagia symptoms can often be successfully managed by endoscopic balloon dilation. Symptoms that persist beyond 6 months after surgery warrant evaluation and consideration for reoperation.

Finally, as with any reoperation, a thorough review of the patient's prior operative note and/or discussion with the operating surgeon should be undertaken to

identify specific operative details that might affect reoperation. These details might include technical details that could contribute to failure, such as failure to reduce and excise a hernia sac, inability to achieve adequate intra-abdominal length (and reasons for this), failure to adequately transect the short gastric vessels for an adequate distance, anatomic aberrations (such as a replaced or accessory left hepatic artery), or any other specific issues that may affect operative approach.

Surgeons undertaking redo fundoplications should take care to counsel patients about these risks and reasonable expectations for success and complications following surgery. Once reoperation is considered, rates of success are diminished, while rates of perioperative complications are increased compared to primary antireflux surgery [5, 6, 10]. Several systematic reviews have established that success, as defined by symptom improvement or resolution, is generally achieved in only 70–84% of patients following reoperative antireflux surgery, and this decreases with each successive reoperation [7]. In addition, the risk for complications can range from 14 to 21%, with most series citing gastrointestinal perforation as the most common complication. Finally, since rates of success diminish considerably with each successive reoperation, surgeons must balance the likelihood of success with repeat fundoplication with the benefit of conversion to Roux-en-Y gastric bypass as a definitive antireflux operation, particularly for obese patients.

Imaging and Interventions

Standard imaging and interventions prior to considering reoperative surgery of the hiatus include a repeat of the tests ordered prior to the primary antireflux operation. The evidence-based standards for preoperative imaging testing include an upper endoscopy, pH study with or without multichannel intraluminal impedance, barium upper gastrointestinal series, and esophageal manometry [15]. Upper endoscopy is an essential component to the evaluation in these patients to rule out pre-existing Barrett's dysplasia or underlying invasive malignancy as a potential cause for dysphagia. pH study is necessary to assess the presence or absence of objective reflux as a cause for patient symptoms, and correlation should be made with patient's symptoms as well as previous pH study. Barium esophagram demonstrates the patient's foregut anatomy and can help identify a herniated, slipped, or tight fundoplication as a cause of prolonged postoperative dysphagia. Finally, manometry will determine if the patient's cause for dysphagia may be due to underlying primary or secondary esophageal dysmotility. In addition, patients with severe dysmotility or esophageal aperistalsis might benefit from a partial redo fundoplication to reduce the risk of postoperative dysphagia. Patients with symptoms of delayed gastric emptying or with a history of known bilateral vagotomy during index operation should also undergo a technetium-labeled gastric emptying study. Objective evidence for delayed gastric emptying might prompt consideration for a gastric emptying procedure (i.e., pyloroplasty or pyloromyotomy) at the time of reoperation or prior to consideration of hiatal reconstruction.

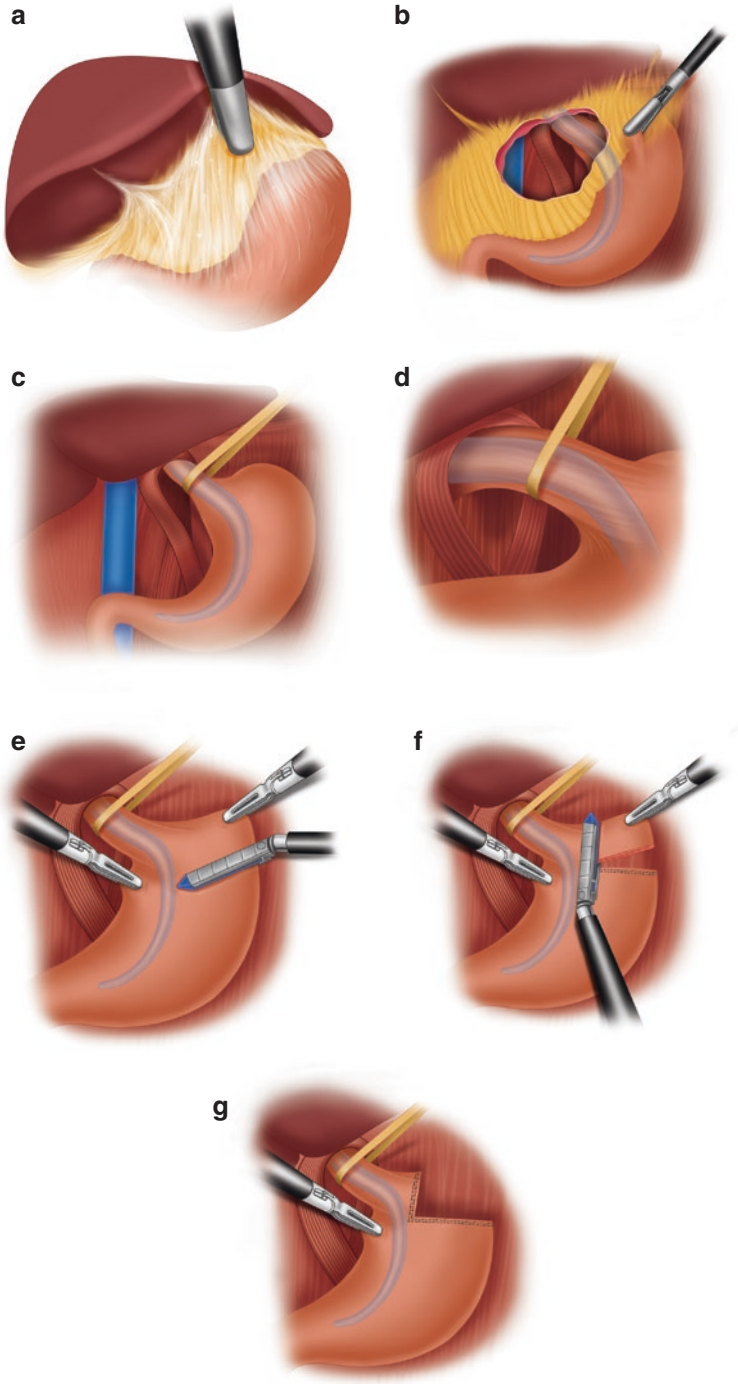
Technical Details

The choice of operative approach—open laparotomy, thoracotomy/thoracoscopy, or laparoscopy—should be left to the skill set of the surgeon. However, because the complication profile of reoperative laparoscopic surgery is improved compared to open surgery, and has documented safety and efficacy in the reoperative setting, we prefer the laparoscopic approach (Fig. 17.2) [1, 16].

While the technical components of laparoscopic reoperations of the hiatus are difficult to standardize given the variable patient presentations, there are several key steps during the dissection that are worth noting. The first is that adhesiolysis should be expected and should dictate peritoneal entry. The avoidance of prior open or laparoscopic incisions is essential to prevent iatrogenic injury. Intraperitoneal access can be achieved using open or closed approaches. Also, surgeons should be willing to place additional ports or modify port placement as needed if significant adhesions are present [16].

The next consideration is the approach to the initial hiatal dissection. Due to the extensive adhesions around the hiatus and the risk for iatrogenic esophageal or gastric injury, it is important to consider multiple possible approaches to the hiatus. One approach is to begin the dissection along the liver capsule in the region of the Pars flaccida (Fig. 17.2a). In this manner, the stomach can be mobilized to expose the caudate lobe of the liver and facilitate visualization of the right crus of the diaphragm (Fig. 17.2b). Alternatively, the lesser sac can be entered along the greater curvature of the stomach to expose the left diaphragmatic crus. Once the medial border of the crus can be clearly identified, careful sharp dissection can be used to achieve a circumferential dissection of the hiatus and the reduction of any herniated stomach and allow placement of a Penrose drain around the distal esophagus prior to beginning the mediastinal dissection (Fig. 17.2c).

Mediastinal dissection should proceed with caution as with any primary antireflux surgery, with care taken to avoid iatrogenic injury to the esophagus, vagus nerves, and stomach and to preserve the peritoneal lining of the crura if possible [8]. The gastroesophageal fat pat should be removed, and endoscopy may be utilized to accurately identify the gastroesophageal junction. Because the most common cause of failure is due to herniation of the wrap into the chest, care must be taken to first ensure adequate intra-abdominal esophageal length of at least 3 cm and then to perform adequate hiatal closure, which has been observed as a central cause for herniation (Fig. 17.2d) [16]. Calibrating the hiatal closure over a 44F Maloney dilator or bougie can assist in optimal hiatal closure, as can reducing the pneumoperitoneum setting to 8 mmHg. Finally, if hiatal closure proves difficult, a right-sided relaxing incision may also be performed [17], although this does have the theoretical risk for herniation. Consideration should also be given to reinforcing the hiatal closure with mesh, which likely reduces the risk of early hiatal hernia recurrence but with the potential for mesh-related complication and questionable long-term benefit [18, 19]. If intra-abdominal length cannot be obtained due to extensive mediastinal scarring or adhesions, an esophageal lengthening procedure should be performed. We prefer the wedge fundectomy approach as this can achieve adequate esophageal length using a totally laparoscopic approach (Fig. 17.2e, f) [20].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Finally, the previous fundoplication should be completely taken down, the stomach placed in the in situ position, and the wrap redone regardless of the gross appearance intraoperatively or on prior imaging tests (Fig. 17.2g). Techniques to perform wrap takedown can include the use of sharp dissection, energy devices, or a stapler at the fundoplication. A partial fundoplication should be considered in lieu of a floppy Nissen fundoplication in cases of severe dysphagia or established esophageal dysmotility on preoperative manometry. Key pitfalls and technical conduct of fundoplication creation have been discussed previously [21].

Repeat Reoperations of the Hiatus

Success rates are known to decrease with each successive reoperation, so we need to consider the approach to the patient with failure after a reoperation of the hiatus. These patients represent a complex group, and particular attention must be focused on the details of their symptoms in concert with repeat imaging and physiologic studies. Smith et al. published their experience in over 300 patients undergoing reoperative surgery [7]. The indications for redo-redo surgery in these patients were more likely to be due to wrap herniation and dysphagia than an inadequate wrap or recurrent reflux. In their high-volume experience, failure rates increased with successive repeat operation, from less than 3% after initial operation to over 7% with each successive procedure. In addition, they observed no increase in operative complications including gastric or esophageal perforation between a single reoperation and multiple reoperations. Despite lower success rates, the overwhelming majority of patients reported that they would recommend reoperation as a means to improve their quality of life, a finding that has been reproduced at other high-volume centers [22].

While these reports are reassuring, these reoperations were performed by experienced surgeons at high-volume centers for foregut surgery, and the outcomes may not be generalizable to all surgeons or practice models. Wilshire et al. published their experience with reoperative hiatal surgery in 2016 [23] and reported that patients who had undergone more than one reoperation had a significantly increased risk for intraoperative complications compared to a single reoperation (36% vs. 23%, $p = 0.002$) with worse quality of life outcomes. As historical failure rates may exceed 50% with a third reoperation [24], consideration in these cases should be made to convert the fundoplication to a Roux-en-Y gastric bypass, particularly for patients who are morbidly obese [25, 26].

Fig. 17.2 Technical details of operation. (**a**): Wrap/stomach is densely adhered to liver capsule, with Pars flaccida obliterated, (**b**): Wrap mobilized free from liver capsule, right crus, and IVC in view, (**c**): Penrose utilized for retraction and mediastinal mobilization, (**d**): Esophagus mobilized to obtain three centimeters of intra-abdominal length, (**e**): Wedge fundectomy, (**f**): Wedge fundectomy, (**g**): Fundoplication taken down

Key Points

- Reoperative antireflux surgery is a complex undertaking and should only be performed by experienced surgeons with specific expertise and/or training in foregut surgery.
- Laparoscopy has become the standard of care for reoperations of the hiatus and should be attempted initially.
- Optimal preoperative evaluation, including thorough history taking and testing, is essential in the selection of patients who would benefit from reoperative antireflux surgery.
- Preoperative testing should include at minimum upper endoscopy, pH study with or without multichannel intraluminal impedance, barium upper gastrointestinal series, and esophageal manometry.
- Technical points of the operation include safe peritoneal entry, use of the caudate lobe to guide initial hiatal dissection, obtaining adequate intra-abdominal esophageal length, and re-performance of the fundoplication.
- Multiple reoperations at the hiatus should be approached with caution, and strong consideration should be given to conversion to Roux-en-Y gastric bypass.

Summary

Reoperative antireflux surgery is a complex undertaking, with significant risk for complications and failure. Careful selection of patients who might benefit from reoperation, through informed history taking and preoperative evaluation, are vital components in the care of these patients. Reoperation should only be undertaken by surgeons with significant technical expertise in advanced laparoscopy and with an understanding of several key technical points. Finally, avoidance of multiple reoperations should be balanced with the risk for complications in conversion to Roux-en-Y gastric bypass. Only while employing all these considerations can outcomes be fully optimized for this patient population.

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