

# After the hiatal hernia repair: fundoplication, yes or no? Partial or complete?

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**Abstract:** Hiatal hernia repair and the performance of a fundoplication are separate propositions in the management of the patient with a paraesophageal hernia. Except under certain circumstances, such as gastric necrosis or the patient in extremis, a fundoplication should be performed. A 360, Nissen fundoplication or magnetic sphincter augmentation is recommended in patients with good esophageal motility. A 270, Toupet fundoplication is recommended in patients with poor motility and dysphagia, or in whom esophageal motility could not be determined.

**Keywords:** Hiatal hernia repair; paraesophageal hernia repair; fundoplication; Nissen fundoplication; Toupet fundoplication

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## Introduction

A hiatal hernia occurs when the esophageal hiatus enlarges and the phrenoesophageal ligament anchoring the gastroesophageal junction just inferior to the esophageal hiatus attenuates allowing for the gastroesophageal junction, stomach and, rarely, other intra-abdominal organs to migrate superior to the esophageal hiatus into the posterior mediastinum (1). Hiatal hernias are very common, especially in Western countries. The most common hiatal hernia is type I, accounting for up to 95% of all hiatal hernias (2). Paraesophageal hernias may account for up to 14% of all hiatal hernias, and the majority of paraesophageal hernias are of the type III variety (3). Their clinical manifestations can be completely asymptomatic to life-threatening incarceration and necrosis of the stomach or other organs (4). Therefore, a wide variety of treatment options may be appropriate, which will be addressed by other authors in this issue.

A basic question, nonetheless, is when a hiatal hernia is repaired, do they require a fundoplication? If the answer to

this question is yes, then this answer begs the next question: Should we employ a complete, 360-degree fundoplication or a partial 270- or 180-degree fundoplication? If the answer to that question is a complete fundoplication, the next relevant question is should we employ a Nissen fundoplication using the native fundus, or should we use magnetic sphincter augmentation with the Linx™ device?

We believe the answers to these questions will be based on each individual patient's presentation and knowledge of their physiology. The following sections will address these decision points.

## Do all patients require a fundoplication after hiatal hernia repair?

Allison's original approach to hiatal hernia was reduction of the stomach and gastroesophageal junction into the abdomen below the esophageal hiatus and repair of the hiatal defect by suture approximation of the diaphragmatic crura (5). His belief was that restoration of the

gastroesophageal junction back into the abdomen and re-establishing the normal hiatal anatomy would lead to the reversal of gastroesophageal reflux. He famously presented his 20-year experience with this approach reporting that only 50% of patients achieved long-term symptomatic relief (6). This established the principle that for the management of gastroesophageal reflux disease (GERD), repairing the hiatal hernia alone is not adequate.

However, larger hiatal hernias and, especially, paraesophageal hernias (PEH) were considered to be a different entity and presenting a higher risk to patients. This was based on a publication by Skinner and Belys in 1967 (7) describing PEH as having a high risk of incarceration, volvulus and strangulation, with a nearly 30% mortality rate. Therefore, the recommendation for decades was that PEH's needed to be repaired when discovered, irrespective of their association with symptomatic GERD. Of course if one were repairing the hiatal hernia to prevent catastrophic gastric necrosis, reflux is not a concern. However, outcomes with this approach mimicked Allison's with a significant number of patients developing GERD symptoms postoperatively and subsequent recommendations were to routinely add a fundoplication to PEH repair (8,9).

Nevertheless, it must be acknowledged that although fundoplication are desirable, the clinical condition of the patient may make them impractical. For example, the patient who presents with gastric necrosis requiring gastrectomy completely eliminates even the possibility of a fundoplication. The hemodynamically unstable patient who requires an expedited repair is clearly inappropriate for prolonging anesthesia time to add a fundoplication. The figure presents our decision flow chart in the overall management of hiatal hernia (*Figure 1*). On the other hand, it should be emphasized that in over 30 years of our combined surgical experience, we have encountered such circumstances only a handful of times. Therefore, in general, fundoplication should be used following all hiatal hernia repair.

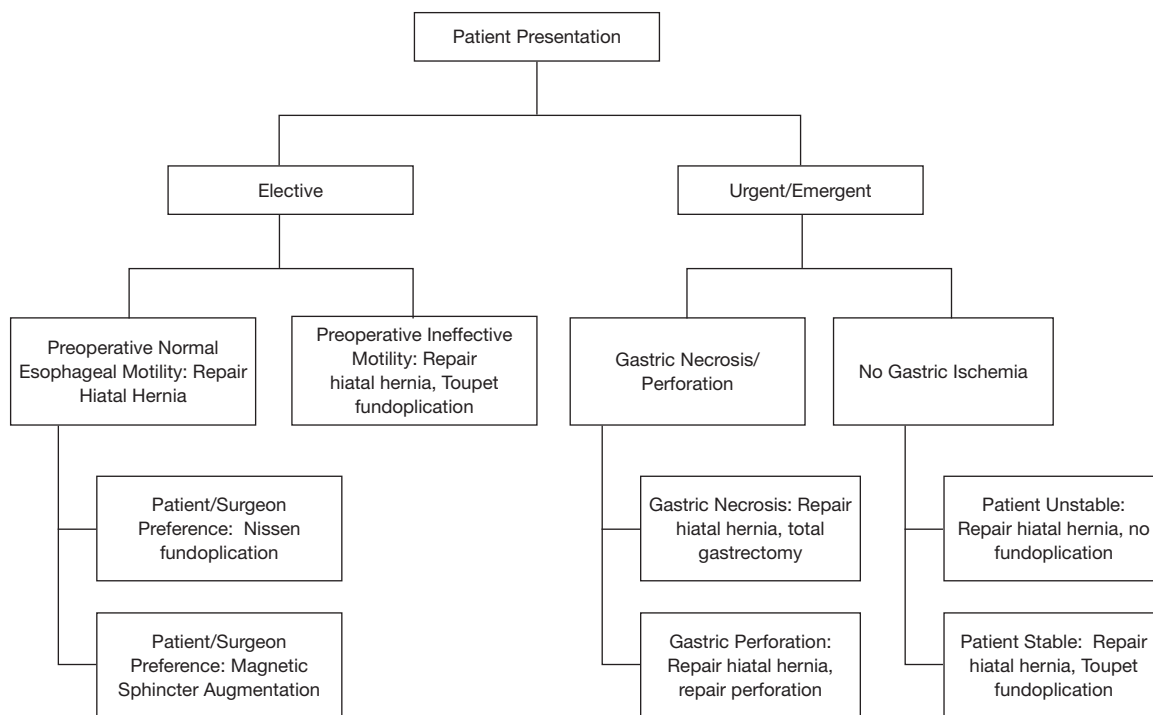
### **If a fundoplication is done, should it be partial or complete?**

Now that its established that a fundoplication should be a routine part of hiatal hernia repair, with few exceptions, the next question to answer is what type of fundoplication. There is general consensus that the Nissen fundoplication is the fundoplication of choice for most patients with hiatal

hernia and GERD symptoms (1). However, there is opinion among many surgeons that a partial fundoplication should be used to reduce the risk of postoperative dysphagia, especially in the presence of preoperative dysphagia or ineffective esophageal motility. Siegal *et al.* (10) studied the development of dysphagia in patients who underwent a fundoplication and found that high resolution manometry (HRM) does not always predict development of dysphagia; moreover, in patients with preoperative dysphagia and strong esophageal motility, the dysphagia would frequently improve. Further, they found that in patients with preoperative dysphagia and poor esophageal motility on HRM, dysphagia will persist. They reported that a distal contractile integral (DCI) greater than 1,000 was associated with dysphagia improvement in patients who underwent a Nissen and concluded that patients with weak esophageal contractility would be better served with a Toupet fundoplication (10). When one has the luxury of an elective case, the preoperative evaluation will help in the decision as to which fundoplication to use (11). The figure shows our decision factors in choosing between a complete or partial fundoplication (*Figure 1*). It is important to get this decision right. There have been several studies comparing partial and complete fundoplication. The type of fundoplication performed should be decided preoperatively and this decision should be linked to symptoms and the HRM findings.

There is consistent evidence that a Toupet fundoplication provides the same symptomatic relief as a Nissen fundoplication, at least initially. DeHaan *et al.* (12) used Endoflip™ impedance measurements to study the distensibility of the GE junction after Toupet and Nissen fundoplications. They found that the distensibility of the GE junction was greater with Toupet fundoplication and that this likely contributes to the increased gas bloat seen with Nissen as compared to Toupet fundoplications. Moreover, a recent meta-analysis compared dysphagia after fundoplication and found that the dysphagia rate following a Nissen was 12.5% as compared to 4.8% after a Toupet (12).

Although antireflux operations are widely performed with the same basic surgical principles as previously described, there are surgeon-specific differences in technique that may account for symptoms of dysphagia and gas bloat after fundoplication. When the fundoplication is described as “floppy”, there is significant imprecision and subjective surgical judgement that allows for wide variability in the actual fundoplication. Variable use and size of a bougie is another factor that can create variations in the quality of the



**Figure 1** Flow diagram of keys decision points in hiatal hernia repair and use and choice of fundoplication.

fundoplication and resulting in variations of post-operative symptoms. Division of the short gastric vessels to allow for better mobilization of the fundus is another factor that creates large variations in practices and outcomes. Kinsey-Trotman *et al.* (13) found less gas bloating and a better preservation of the ability to vent the stomach in patients when the short gastric vessels were left intact.

Initially, partial and complete fundoplication have similar results in controlling GERD both subjectively and objectively. The potential problem of performing a partial fundoplication on a patient that otherwise by HRM findings would be a good candidate for a complete fundoplication is long-term recurrence of GERD. Several studies have shown that patients who undergo a partial fundoplication when compared to a complete fundoplication are at higher risk for developing recurrence of GERD over time (14). Horvath *et al.* (14) compared the recurrence of symptoms between Nissen and Toupet fundoplication. They found symptomatic failure rates of 20% and abnormal DeMeester scores on 59% of the patients after undergoing a partial fundoplication at a mean follow up time of 22 months. On the other hand, the symptomatic failure rate on long term follow up after a complete fundoplication was 4.5% (14). There is also correlation between the severity of reflux

and the failure rates of a partial posterior fundoplication. Patients with a DeMeester score of 50 or higher also have an increased risk of failure if they undergo a Toupet compared to a Nissen Fundoplication (14).

With the advent of the magnetic sphincter augmentation (MSA) device, there now exists a choice between a fundoplication and MSA. In the elective setting in patients meeting physiological criteria for MSA, placement of the Linx™ instead of a fundoplication may be appropriate (15). Our purpose here is not to adjudicate the superiority of one approach over the other, but merely to acknowledge that both are viable options depending on the surgeon's and patient's preference in the elective setting.

MSA with the Linx™ device has become a widely-used alternative to fundoplication for GERD patients. There have been several studies that compare MSA to laparoscopic Nissen fundoplication. Skubleny *et al.* (16) performed a systematic review and meta-analysis and concluded that MSA is a good alternative with similar results in controlling reflux symptoms. It is also a less technically demanding procedure to perform with limited esophageal dissection and preservation of the short gastric vessels. Another perceived advantage is standardization of the MSA placement technique, whereby success rate with the

fundoplication are correlated with surgeon expertise and experience performing these procedures.

There are patient factors that limit the use of MSA. It is currently not indicated in patients with esophageal dysmotility and severe erosive esophageal disease where fundoplication remains the standard of care. Additionally, some studies report increased early dysphagia with Linx™ as compared to Nissen fundoplication (16). Thus, dysphagia may require additional esophageal dilations to “stretch” the capsule that encases the device. Some studies report better results with bloating and ability to emesis compared to Nissen fundoplication (16). Although rare, there have been reports of the Linx™ device erosions into the esophagus. These erosions have generally occurred in the smaller devices (e.g., the 12 bead device), which is no longer on the market. Lastly, patients with some metal allergies, such as nickel and titanium, are not candidates for Linx™ as these metals are in the casings of the magnets.

### Conclusions and recommendations

Under normal circumstances, most patients after hiatal hernia repair should have a fundoplication. The exceptions being the emergent cases associated the gastric necrosis or the patient in extremis. In patients with good motility, a complete fundoplication is preferable and MSA a viable alternative. Patients with preoperative symptoms of dysphagia and poor motility, should undergo a partial fundoplication, accepting the higher GERD recurrence rates.

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