

Preoperative workup, patient selection, surgical technique and follow-up for a successful laparoscopic Nissen fundoplication

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ABSTRACT

Experienced surgeons have reported excellent results for laparoscopic Nissen fundoplication to treat gastroesophageal reflux disease (GERD). Others, however, associate this operation with unacceptable rates of morbidity, mortality and inferior outcomes. Results are certainly linked to an appropriate patient selection, work up, technical details and follow-up. This review focuses on the proper preoperative workup, patient selection, surgical technique, and follow-up for a successful laparoscopic Nissen fundoplication. Certainty of the diagnosis of GERD and the esophageal physiology is essential. An extensive dissection of the esophagus and crus in the abdomen and mediastinum, an adequate hiatoplasty, and a short-floppy fundoplication are important technical points. New onset or persistent symptoms after the operation must be carefully studied. Excellent outcomes may be reproducible if a proper preoperative workup, patient selection, surgical technique and follow-up are rigorously observed.

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INTRODUCTION

Some experienced surgeons have reported good and excellent results in more than 90% of patients submitted to laparoscopic Nissen fundoplication for gastroesophageal reflux disease (GERD).^[1-4] Others, however, associate this operation to unacceptable rates of morbidity, mortality and inferior outcomes.^[5] Results are certainly linked to an appropriate patient selection, work up,^[6] technical details^[7] and follow-up.^[8]

This paper focuses on the proper preoperative workup, patient selection, surgical technique and follow-up for a successful laparoscopic Nissen fundoplication.

WORKUP

An extensive esophageal work up with endoscopy, barium esophagography, manometry and pH monitoring is mandatory before an antireflux operation.^[9,10]

First of all, outcomes will be excellent if GERD is actually present. Thus, the certainty of the correct diagnosis is required. Although the diagnosis may be easy to perform in patients with typical symptoms and evident alterations in endoscopy as well as pH monitoring, this task may be more difficult in those with extra esophageal symptoms and normal tests. This is true due to the fact that these tests have a significant

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rate of false-negativity.

Many studies have shown that even typical symptoms such as heartburn and regurgitation have low accuracy leading to an incorrect diagnosis of GERD in 30-50% of patients.^[11,12] Likewise, the presence of reflux or hiatal hernia on esophagogram does not correlate well with reflux on pH monitoring, or esophagitis on endoscopy.^[10]

Extra esophageal symptoms may bring additional difficulty for the diagnosis. Other tests, such as laryngoscopy may be added to the armamentarium; however, a low positive predictive value for the diagnosis of GERD is anticipated.^[13] Other diseases may coexist with GERD, and symptoms may have other causes or may be multifactorial with GERD as only an adjuvant. The response to specific GERD treatment as a trial, and the association of the symptom with reflux episodes at the time of pH monitoring may help to determine the cause of the symptom.

Ambulatory 24-h pH monitoring should be routinely performed in the preoperative workup of patients suspect of having GERD.^[10] Either alone or in combination with multichannel intraluminal impedance (MII-pH) pH monitoring. This testing provides the best objective information on esophageal acid exposure, allowing diagnosing and quantifying GERD, and temporal correlation between symptoms and episodes of reflux.^[14]

Lastly, an adequate preoperative workup should bring several pieces of information in order to allow a clinical judgement for a better diagnosis since diagnostic tests individually (laryngoscopy, endoscopy, and even pH- or pH-impedance monitoring) may not be sufficient to make the definitive diagnosis of GERD.^[15]

PATIENT SELECTION

Following the example of any other elective surgical procedure, patients planned to undergo an antireflux operation should be carefully clinically evaluated. Patients under high anesthetic risk or those with uncontrolled co-morbidities should not be offered this kind of therapy.

Some predictors of worse outcomes after a fundoplication have been identified [Table 1]. Some are inherent to the patient, others to the disease, and some to technical difficulty during the operation.^[16-19] With the exception of obesity, these predictors cannot be changed in the majority of patients.

The certainty of the GERD diagnosis and attribution of

the symptoms to the disease increase the likelihood of excellent outcomes. Thus, a pathologic pH monitoring increases the chance of success by 5 times compared to a normal test,^[20] and clinical response to acid suppression therapy has been associated with a 3 times better response to surgical treatment.^[20] Esophageal symptoms are more prone to be caused by GERD, and also have a better prognosis compared to extra-esophageal symptoms.^[18,20]

“Illness behavior” may influence^[19-21] expectations, satisfaction and tolerance to post-operative side effects.

This fact may explain worse outcomes in females, patients with psychiatric disorders, and individuals of lower socioeconomic status.

Although not unanimously, some series show poorer outcomes for obese patients^[18,22] that undergo a fundoplication likely due to a more demanding operation with longer operative times^[23] and more complications.^[24]

One must consider the operation contraindicated in the presence of various predictors for unsuccessful outcomes, while older age and esophageal dysmotility (excluding achalasia) do not influence outcomes.^[25,26]

TECHNIQUE

Some technical points must be followed to ensure an adequate fundoplication.

An extensive esophageal dissection in the abdominal and lower thoracic segments to achieve a 2-4 cm segment of abdominal esophagus is helpful to prevent hernia recurrence. The presence of a long abdominal esophagus is *per se* an efficient antireflux mechanism [Figure 1],^[27] and careful attention should be taken to avoid damage to the vagal branches that are close to this portion of the esophagus.^[16,28]

Hiatal closure is an important part of this operation since the integrity of this muscle barrier exerts synergistic

Table 1: Predictors for bad outcomes after laparoscopic Nissen fundoplication

Patient	Disease	More difficult operation
Female gender	Extra-esophageal symptoms	Obesity
Psychiatric disorders	Lack of response to acid suppression therapy	Reoperation
Low socioeconomic status	Absence of hiatal hernia	

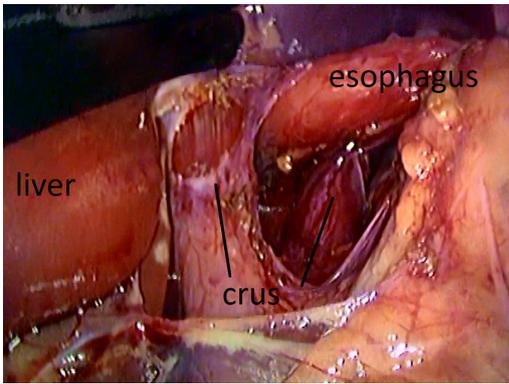


Figure 1: Extensive dissection of the esophagus including the lower mediastinum ensures a long segment of the abdominal esophagus (ideal > 2.5 cm)

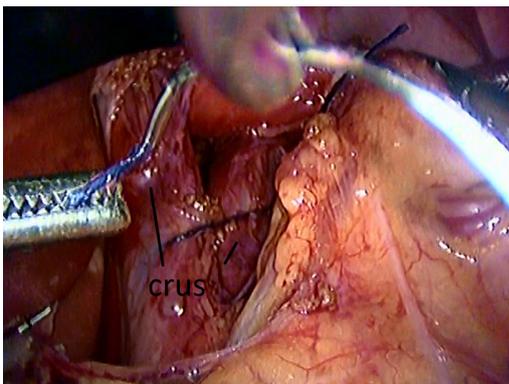


Figure 2: Hiatal closure must be performed with interrupted non-absorbable X-shaped stitches (e.g. 2-0 or 0, polypropylene, mersilene). Stitches must be well anchored in the crus

effect with the lower esophageal sphincter at the esophagogastric junction,^[29] and prevents herniation of the wrap to the chest [Figure 2]. This type of herniation of the stomach (wrap) through the diaphragmatic hiatus is one of the main causes of failure after antireflux surgery. Some propose the use of prosthetic material (mesh) to reinforce the closure of the esophageal hiatus. The use of mesh for this purpose is still the subject of much discussion.^[30] While many believe that the use of this material can reduce the failure rates of the hiatal closing,^[31] others oppose this practice due to the risks of erosion of abdominal viscera (especially esophageal and gastric). The indication for the hiatal mesh repair should be selective taking into account the tension during crural closure and weakness of hiatal tissue.^[29,32]

The fundoplication should be floppy, short, tension-free, and constructed with the fundus of the stomach around the esophagus. An extensive dissection of the posterior attachments of the gastric fundus and an ample retroesophageal window are essential to make a tension-free fundoplication. Short gastric vessels division may also help attain a floppy fundoplication,

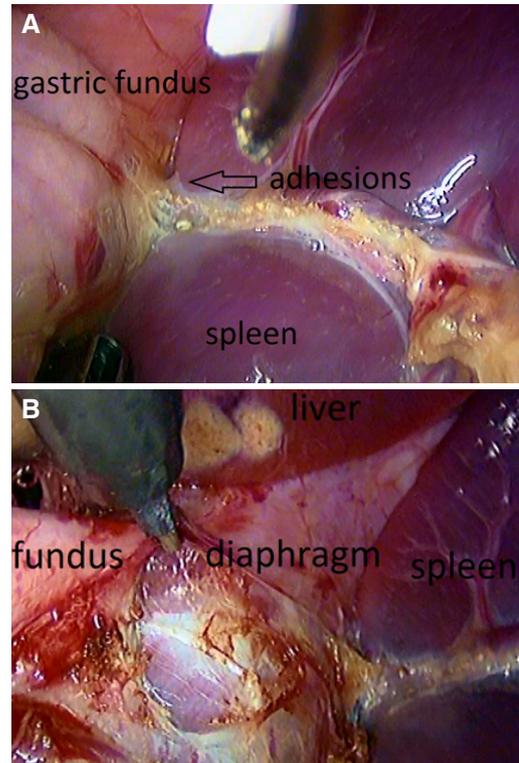


Figure 3: (A) A complete dissection of the gastric fundus ensures a tension-free fundoplication (arrow); (B) adhesiolysis of attachments of the gastric fundus to the spleen, diaphragm and retroperitoneum must be done even after division of the short gastric vessels

since it promotes the decrease of gastric fundus tension [Figure 3].^[33]

An intraluminal bougie is advocated by some to calibrate the fundoplication,^[34] although other different series do not show advantages.^[35] Another key step in this operation is the choice of the right place to create and position the wrap. Thus, gastro esophageal junction should be well identified, with the removal of the fat pad that is frequently located there. This is done to make sure that the gastric fundus is brought around the esophagus not the stomach. Also, the gastric fundus, not the gastric body should be used to create the fundoplication [Figure 4].

FOLLOW-UP

A good follow-up is important to achieve a satisfactory postoperative result. Patients who undergo this operation should be alerted about the common occurrence of transitory dysphagia in the first three months due to edema and esophageal ileus.^[36] Also, the improvement of extra esophageal symptoms may not be immediate and new symptoms, such as gas symptoms, may occur after surgery. These facts, however, do not decrease significantly quality of life and patient satisfaction with treatment.^[5]

Table 2: Current results for laparoscopic Nissen fundoplication in adults in series over 100 patients in the last 5 years

Author	n	Follow-up	Outcomes	Morbidity	Mortality
Andolfi et al. ^[6]	176	17 months	88% symptom relieve	Conversion rate 0.6% Abdominal wall complications 1.7%	0
van Rijn et al. ^[46]	125	14-25 years	62% satisfaction	NS	NS
SarÅ et al. ^[47]	162	18 months	75% symptom relieve 9% postoperative medication usage	NS	NS
Warren et al. ^[48]	185	Minimum 12 months	89% satisfaction 12% postoperative medication usage	2 cases of abscess linked to mesh hiatoplasty 1 case of precocious revision due to obstruction	0
Koetje et al. ^[49]	329	24 months	Significant improvements in symptom score and QOL measurements	Reoperation 7%	NS
Teixeira et al. ^[50]	399	14 months	98% symptom relieve	NS	NS
Rossetti et al. ^[51]	301	56 months	Significant improvement in QOL	NS	NS
Simorov et al. ^[52]	297	70 months	70% improvement in GERD symptoms	Reoperation 0.9% 5 bleeding 4 pneumothoraces requiring decompression 10 wound infections 3 prolonged ileus 8 urinary retention	NS
Kellokumpu et al. ^[53]	249	10 years	98% symptom relieve 83% satisfaction	Morbidity 7.6%	0
Qin et al. ^[54]	215	5.6 years	100% symptom relieve	NS	0
Schietroma et al. ^[55]	178	Minimum 11 years	94% symptom relieve	Conversion rate 6%	0
Beenen et al. ^[56]	222	11 years	87% satisfaction	NS	NS
Ross et al. ^[57]	510	Minimum 10 years	89% symptom relieve	NS	NS

NS: not stated; QOL: quality of life; GERD: gastroesophageal reflux disease

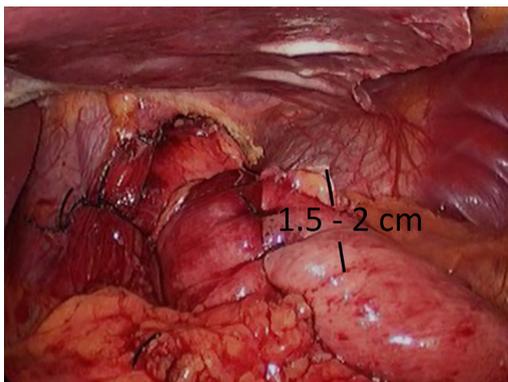


Figure 4: Fundoplication must be short-floppy and using gastric fundus only

CONCLUSION

New antireflux therapies are currently available. Novel acid suppressant drugs and other classes of medication are available or under development.^[37] However, up to now these medications have not shown clear advantages over current medication. Surgical therapy is aimed at the pathophysiology of the disease^[38] and can be more effective than current medical therapy.^[39] Surgical procedures other than a fundoplication; however, never gained acceptance for uncomplicated GERD cases. This is with the exception of bariatric procedures that control GERD and may be a good alternative to a fundoplication in obese individuals.^[40] Surgical technique has not changed expressively in the last several years; however, a

Nissen fundoplication may now be accomplished by endoscope.^[41] The technique is restricted to selected cases, lacks hiatal closure and results are inferior to a laparoscopic Nissen. Single port laparoscopy another option for performing a fundoplication;^[42] yet most believe it brings solely cosmetic improvement with a higher risk for complications.^[43] The aid of a robot in the operating room^[44] does not bring any advantage to the procedure and may add cost and time to the procedure. More recently, the fundoplication has been replaced by a magnetic chain of beads placed laparoscopically around the distal esophagus.^[45] Although good results are shown, the drawback of foreign material in the hiatus precludes dissemination of the technology.

Laparoscopic Nissen fundoplication continues to be safe and provides excellent outcomes [Table 2], not only in experienced hands, but also these results may be reproducible in community hospitals as well,^[58,59] if a proper preoperative workup, patient selection, surgical technique and follow-up are observed [Figure 5].

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Conflicts of interest

There are no conflicts of interest.

Patient consent

There is no patient involved.

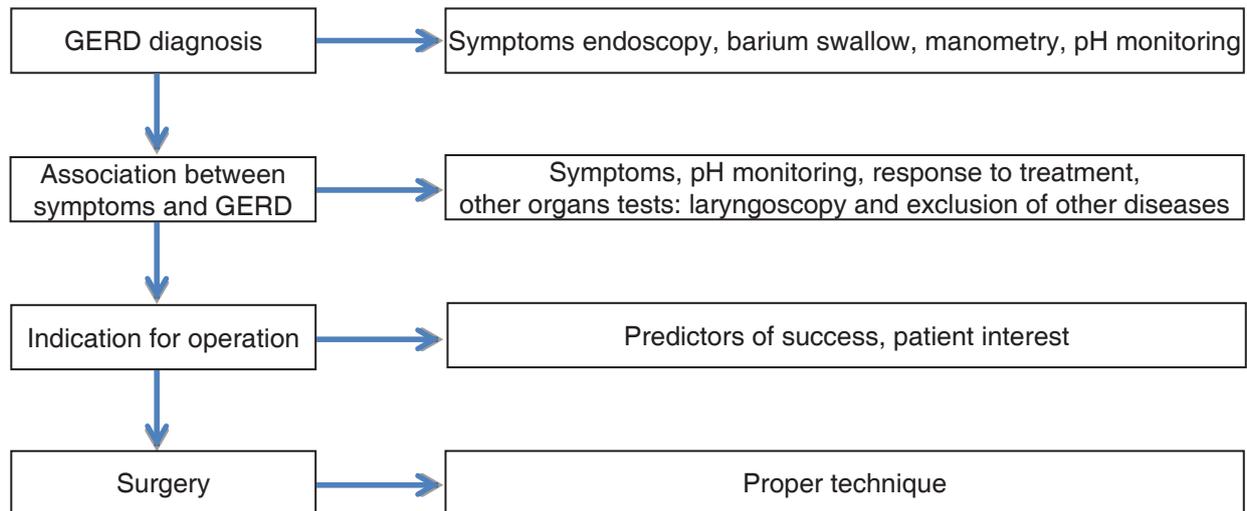


Figure 5: Road to a successful laparoscopic Nissen fundoplication. GERD: gastroesophageal reflux disease

Ethics approval

This review article is waived for ethical approval.

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