
Laparoscopic Nissen Fundoplication

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Jessica K. Smith

Indications

- Reflux esophagitis unresponsive to maximal medical treatment and confirmed with 24-h pH probe
- History of aspiration and/or recurrent pneumonias
- Complications of longstanding reflux: erosive esophagitis, vocal cord changes, esophageal stricture, and Barrett's esophagus
- Unwillingness or inability to remain on life-long acid suppression therapy
- Symptomatic paraesophageal hernia with reflux
- Children with severe esophagitis, recurrent pneumonia, or failure to thrive

Essential Steps

1. Supine or modified lithotomy with a steep reverse Trendelenburg position.
2. Foley catheter and nasogastric or orogastric tube.
3. Induce pneumoperitoneum.
4. Mark xiphoid and bilateral costal margins.
5. Place the first 5- or 12-mm trocar just to the left of midline 12–15 cm below the xiphoid depending on the height of the patient.
6. Inspect the abdomen with a 30° or 45° 5- or 10-mm laparoscope.
7. Place four additional trocars:
 - Operating ports: Two 12-mm trocars are placed in the bilateral subcostal margins in the midclavicular line. A 5-mm trocar can be used on the right side depending on instrumentation and preferences.
 - Assistant port: One 5- or 12-mm trocar is placed in the left anterior axillary line at the same level as the camera port.
 - Liver retractor: Depending on the retractor to be used, one 5- or 10-mm trocar is placed in the right midaxillary line at the same level as the camera port. (Note: If a Nathanson retractor is used, a 5 mm incision is made just below the xiphoid to accommodate the instrument).
8. Elevate and retract the left lobe of the liver to expose the hiatus.
9. Downward traction on the stomach to reduce hernia if present, held in place by the assistant. If a hiatal hernia is present, the hernia sac should be circumferentially incised to reduce the hernia contents below the diaphragm and mobilize the esophagus to obtain at least 2 cm of intra-abdominal length (Chap. 12).

J.K. Smith, MD
Department of Surgery, University of Iowa Hospitals
and Clinics, Iowa City, IA, USA
e-mail: jessica-k-smith@uiowa.edu

10. Open the gastrohepatic ligament at the pars flaccida to expose the caudate lobe and right crus.
11. Develop the medial plane between the right crus and the esophagus.
12. Continue peritoneal incision over the hiatus.
13. Expose the left crus and decussation.
14. Complete atraumatic circumferential dissection of the esophagus.
15. Create a large enough retroesophageal window such that there is excellent visualization of the left upper quadrant looking from the right side.
16. Identify and preserve both vagus nerves.
17. Close the crura such that a small amount of space remains between the topmost stitch and the esophagus.
18. Divide the short gastric vessels to mobilize the fundus.
19. Pass an esophageal bougie under direct visualization with the laparoscope. Use 56–60-Fr bougie.
20. Create a loose floppy wrap by passing the fundus behind the esophagus and performing the “shoeshine” maneuver.
21. Suture the fundus to itself with the first stitch to size the wrap with the bougie in place.
22. Withdraw the bougie under direct visualization with the laparoscope.
23. Place two additional sutures in the fundoplication which include the anterior esophageal wall and create a wrap length of 2 cm just below the GE junction.
24. May perform the following gastropexy stitches: A stitch at the 3 o’clock position of the wrap which includes the wrap, esophagus, and left crus. A posterior stitch which includes the wrap and the crural repair. A third stitch at the 9 o’clock position which includes the wrap, esophagus, and the right crus.
25. Ensure hemostasis.
26. Remove the liver retractor under direct visualization and inspect for bleeding.
27. Remove ports under direct visualization, closing any dilated fascial defects.
28. Release pneumoperitoneum.
29. Proceed with skin closure.

Variations

- Position of the patient
- Size of the esophageal bougie
- Type of liver retractor
- Type of suture
- Suturing device and intra- or extracorporeal knot tying
- Gastropexy sutures
- 30° or 45° laparoscope

Complications

- Trocar injuries to the vessels or viscera
- Injury to the esophagus
- Injury to the spleen or stomach
- Wrap too loose or too tight causing recurrent reflux or dysphagia
- Hiatal closure too tight, causing esophageal obstruction
- Hiatal closure too loose, permitting paraesophageal herniation or wrap slippage
- Injury to the vagus nerves
- Pneumothorax or tension pneumothorax

Template Operative Dictation

Preoperative Diagnosis *Reflux esophagitis/Barrett’s esophagus/aspiration due to reflux/other*

Procedure Laparoscopic Nissen fundoplication

Postoperative Diagnosis Same

Indications This ___-year-old *male/female* had *biopsy-proven reflux esophagitis/Barrett’s esophagus/aspiration due to reflux/other*. *This had been refractory to medical management/the patient did not want to remain on lifelong acid suppression therapy/other*. The decision was made to proceed with laparoscopic Nissen fundoplication.

Description of Procedure The patient was placed on the operating table on a secured vacuum beanbag/split-leg table in the supine

position. Time-outs were performed using both preinduction and pre-incision safety checklists to verify correct patient, procedure, site, and additional critical information prior to beginning the procedure. General anesthesia was induced. A *Foley catheter and nasogastric/orogastric tubes were placed. The legs were placed in stirrups with appropriate padding.* The right arm was tucked to accommodate the liver retractor. *The beanbag was placed to suction to secure the patient.* The abdomen was prepped and draped in the usual sterile fashion. The xiphoid and costal margins were marked with a marking pen. A point 12 cm from the xiphoid just to the left of midline was chosen for the camera port. A transverse incision was made to accommodate a 5/12-mm trocar.

[Choose One:]

For Veress needle: *The Veress needle was inserted in the left upper quadrant at Palmer's point. Proper position was confirmed by aspiration and saline meniscus test. A 5-/12-mm trocar was then inserted.*

For Hasson cannula: *The fascia was elevated and incised. Entry into the peritoneum was confirmed visually and no bowel was noted in the vicinity of the incision. Two figure-of-eight sutures of 2-0 Vicryl were placed and the Hassan cannula inserted under direct vision. The sutures were anchored around the cannula.*

The abdomen was insufflated with carbon dioxide to a pressure of 15 mmHg. The patient tolerated the pneumoperitoneum well. The 30°, 5-/10-mm laparoscope was inserted and the abdomen inspected. No injuries from Veress needle or initial trocar placement were noted. Additional trocars were then inserted under direct vision in the following locations: Two 5-/12-mm trocars were placed in the bilateral subcostal margins in the midclavicular line. An assistant port using a 5-/12-mm trocar was placed in the left anterior axillary line at the same level as the camera port. The final fifth 5-/12-mm trocar was placed in the right midaxillary line at the same level as the camera port for the liver retractor. No injuries were noted during port placement.

The patient was placed in reverse Trendelenburg position. A liver retractor was introduced in the right subcostal port to elevate the left lobe of the liver and expose the hiatus. A 10-mm endoscopic Babcock clamp was introduced through the left assistant port and used to grasp the stomach and gently pull it toward the left lower quadrant.

The gastrohepatic ligament was opened with the *ultrasonic shears/electrocautery* beginning at the pars flaccida. The peritoneum was incised anteriorly over the hiatus to the left crus. The right crus was identified and cleared of investing tissue and the medial plane between the right crus and esophagus was developed and the crural decussation visualized. The dissection was then carried over the arch of the crura. The left crus was similarly dissected and the phrenoesophageal ligament divided. The vagus nerves were identified and protected. The esophagus was gently elevated with a closed grasper, and dissection progressed underneath the esophagus until the esophagus was fully mobilized and a large retroesophageal window had been created.

An *esophageal retractor/Penrose drain* was then passed under the esophagus. The esophagus was encircled to include the vagus nerves and the Penrose secured with *large endoscopic clips/Endoloop tie*. The assistant then released the stomach and grasped the Penrose to maneuver the esophagus.

The superior most short gastric vessels were divided with ultrasonic shears and the fundus of the stomach was completely mobilized. The nasogastric/orogastric tube was removed. With the esophagus and stomach in a neutral position, a 56-Fr bougie was slowly passed under direct visualization with the laparoscope.

Attention was then directed to the hiatus. ___ simple interrupted sutures of *0 Ethibond/Silk/Tycron* were placed to approximate the hiatus behind the esophagus, and the ___-Fr bougie was inserted to ensure that the hiatal closure is appropriately tight. At least 2 cm of intra-abdominal esophagus was observed.

With the esophagus gently retracted anteriorly, a grasper was passed behind the esophagus and the fundus grasped and pulled over to the

right side behind the esophagus. It passed easily and the proper orientation was ensured by performing the “shoeshine” maneuver. The wrap was approximated to itself without tension using a 2-0 silk suture, creating a 360° floppy wrap around the distal esophagus. The esophageal bougie was then removed. Two additional sutures were placed in the wrap which included a partial-thickness bite of esophagus to anchor the wrap. A wrap length of 2 cm was formed just below the GE junction.

[Optional]: Three additional gastropexy sutures were placed using 2-0 silk suture. The first stitch was placed at the 3 o'clock position of the wrap which included the wrap, esophagus, and left crus. A posterior stitch which included the wrap and the crural repair was placed. A third stitch was placed at the 9 o'clock position

which included the wrap, the esophagus, and the right crus.

Hemostasis was achieved. The liver retractor was removed under direct visualization and the liver inspected for any bleeding. The trocars were removed one at a time and the fascial openings carefully inspected. Any dilated defects were re-approximated with a transfascial suture. Pneumoperitoneum was released, the laparoscope was withdrawn, and the umbilical trocar was removed. The skin was closed with subcuticular sutures of ___ and Steri-Strips/skin adhesive.

A debriefing checklist was completed to share information critical to postoperative care of the patient. The patient tolerated the procedure well and was taken to the postanesthesia care unit in satisfactory condition.