



Gastroesophageal reflux



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ABSTRACT

Gastroesophageal reflux disease (GERD) is a very common condition and affects approximately 7–20% of the pediatric population. Symptoms from pathological GERD include regurgitation, irritability when feeding, respiratory problems, and substernal pain. Treatment typically starts with dietary modifications and postural changes. Antireflux medications may then be added. Indications for operative management in the pediatric population include failure of medical therapy with poor weight gain or failure to thrive, continued respiratory symptoms, and complications such as esophagitis. Laparoscopic Nissen fundoplication has become the standard of care for surgical treatment of children with GERD. The key technical aspects of laparoscopic Nissen fundoplication include creation of an adequate intra-abdominal esophagus, minimal dissection of the hiatus with exposure of the right crus to identify the gastroesophageal junction, crural repair, and creation of floppy, 360° wrap that is oriented at the 11 o'clock position.

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Introduction

Gastroesophageal reflux is defined as the passage of gastric contents into the esophagus. Gastroesophageal reflux disease (GERD) refers to the pathological symptoms and complications that result from reflux. GERD is a very common condition and affects approximately 7–20% of the pediatric population.¹ A number of physiologic barriers exist to prevent reflux from the stomach into the lower esophagus, such as the lower esophageal sphincter, the angle of HIS, and the length of the intra-abdominal esophagus. In addition, mechanisms are present to both minimize the amount of reflux in the esophagus, such as esophageal peristalsis, and to limit esophageal injury, such as saliva and other enzymes.² The adverse effects of GERD occur from the failure of one or more of these factors. Transient lower esophageal sphincter relaxation is the most important pathophysiologic mechanism leading to GERD.³ A number of congenital anomalies also increase the risk of GERD, including esophageal atresia and congenital diaphragmatic hernia.

Clinical presentation

The symptoms of GERD are variable and depend on the age and medical condition of the child. Regurgitation is a common

presentation for infants and children with GERD. Pulmonary symptoms such as coughing, wheezing, choking, apnea, and apparent life-threatening events (ALTE) can also be the presenting symptoms of GERD. Older children may complain of more typical heartburn symptoms including retrosternal and epigastric pain. Finally, complications of reflux such as esophagitis, stricture formation, and ulcers can lead to pain, dysphagia, and hemorrhage.

Diagnosis

Several diagnostic tests may be used both to detect the presence or absence of reflux and to rule out other pathologies. Upper gastrointestinal radiography (UGI) can identify reflux in approximately half of the patients and delineates the anatomy of esophagus and upper GI tract. The level of reflux, presence of a hiatal hernia, and esophageal peristalsis can all be evaluated on a UGI. However, the most useful aspect of this test is to rule out other anatomic abnormalities of the upper gastrointestinal tract, such as malrotation. A 24-h PH probe testing has been considered the gold standard for diagnosing GERD. A score is calculated from the time the pH is less than 4, total number of reflux episodes, number of episodes greater than 5 min, and the longest reflux episode. However, impedance studies, in which multichannel electrode pairs are placed in the esophagus and stomach, are being used more frequently since they measure nonacidic reflux and can be performed while children are on antireflux medications.⁴ Other diagnostic evaluations such as upper endoscopy with

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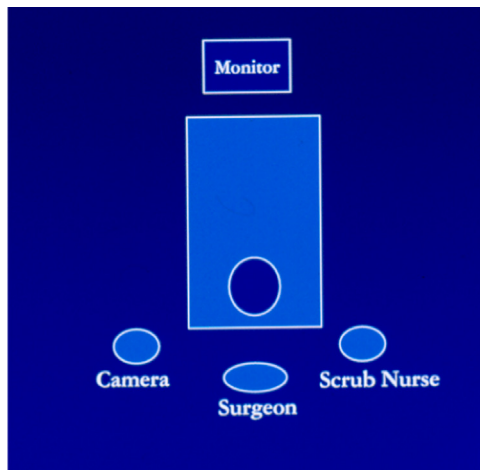


Fig. 1. Schematic of patient positioning.

biopsies, bronchoscopy with bronchial washings, and gastric emptying studies may also be used to add further confirmatory information or when the diagnosis is unclear. Additionally, some of these studies may be helpful to evaluate for complications of GERD and in patients who have already undergone antireflux surgery.

Treatment

The treatment of pathological GERD typically starts with dietary modifications and postural changes. For infants, elevation of the head of the bed and frequent small volume meals with thickened formulas or agents are generally recommended. Next, pharmacologic agents may be added consisting of antireflux medication and prokinetic agents. The main acid suppressant agents used for GERD are H₂-receptor antagonists and proton pump inhibitors. Motility medications such as metoclopramide have been widely used although studies demonstrating their efficacy have been limited.⁵

Indications for operative management in the pediatric population include failure of medical therapy with poor weight gain or failure to thrive, continued respiratory symptoms, and complications attributable to GERD. Situations in which a trial of medical treatment may not be necessary include infants who present with ALTEs and no other identifiable etiology. In addition, neurologically impaired infants who require a gastrostomy for feeding and concerns for aspiration may also benefit from a fundoplication at the same time. Finally, initial operative intervention may be indicated for patients found to have Barrett esophagitis, in which

squamous epithelium is replaced by columnar epithelium, or other GERD-related complications.

Several different surgical procedures have been described for the treatment of GERD. However, the most commonly performed operation is the Nissen fundoplication in which the fundus is posteriorly wrapped 360° around the lower esophagus. There has not been any literature demonstrating significant benefits of one procedure.⁶

Technique

For the laparoscopic Nissen fundoplication, the patient is placed at the end of the table with the surgeon at the foot of the table (Figure 1). For infants, the legs are placed in a frog-leg position and for older children, stirrups with appropriate padding are used to place them in lithotomy position. A monitor is placed over the patient's head. Five trocars are then inserted with the camera port at the umbilicus, working ports in the right and left mid-quadrants, a liver retractor port in the right mid-quadrant in the mid clavicular line to the patient's right of the falciform, and a stomach retractor in the left upper quadrant. The left upper quadrant trocar position should be the gastrostomy tube site if one is to be performed and may be marked before the insufflation to assure that the button is far enough from the costal margin (Figure 2). Otherwise, the port should be placed at the costal margin in the mid clavicular line. It should be noted that some authors have tried to limit the number of ports, or even perform the operation using a single-site technique. However, because the geometry and formation of the fundoplication is so important to the success of the operation as well as the risk of recurrence, we choose to continue to use five ports to insure adequate exposure and proper formation of the wrap. We have moved to mini-laparoscopy (3 mm incisions) in larger patients to limit incision sites.

This technique has been developed over the past 2 decades with minor revisions to improve outcome.^{7–9} The left lobe of the liver is retracted superiorly to expose the gastroesophageal junction through the right upper quadrant port. Although a self-retaining retractor may be used, a babcock retractor with a locking in-line handle can be placed on the diaphragm to expose the hiatus. With the stomach retracted toward the left by an assistant through the left upper quadrant port, the gastrohepatic ligament is divided. The stomach is then retracted to the right, and the short gastric vessels are divided either with electrocautery or a sealer device in older children (Figure 3). Short gastric mobilization is necessary to achieve a tension-free wrap. A retrosophageal window is then created bluntly from the right side with care not to injure the posterior vagus nerve (Figure 4). The right crus should be dissected so that the gastroesophageal junction can be clearly

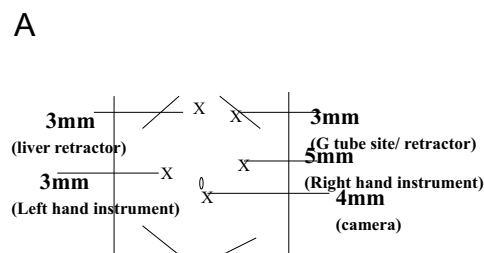


Fig. 2. (A) Schematic of trocar placement and (B) picture of trocar placement.

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