

IPEG Guidelines for the Surgical Treatment of Pediatric Gastroesophageal Reflux Disease (GERD)

Preamble/Introduction

Gastroesophageal reflux (GER) is a common problem in infants and children. Physiologic vomiting is common in the first 6 months to 1 year of life. However, pathologic gastroesophageal reflux disease (GERD) can present in childhood. Pathologic GERD is the occurrence of reflux with associated complications that can include failure to thrive, aspiration, laryngospasm, and esophagitis.¹ Treatment of GERD is initially medical, with surgery employed for failure of medical management. The purpose of this document is to discuss the work-up and medical and surgical treatment of GERD.

Disclaimer

Clinical practice guidelines are intended to indicate the best available approach to medical conditions as established by systematic review of available data and expert opinion. The approach suggested may not necessarily be the only acceptable approach given the complexity of the health care environment. These guidelines are intended to be flexible, as the physician must always choose the approach best suited to the individual patient and variables in existence at the moment of decision. These guidelines are applicable to all physicians who are appropriately credentialed and address the clinical situation in question, regardless of specialty.

Guidelines are developed under the auspices of the International Pediatric Endosurgery Group (IPEG) Surgeons and its various committees, and approved by the Executive Committee. Each guideline is developed with a systematic approach, and includes review of the available literature and expert opinion when published data alone are insufficient to make recommendations. All guidelines undergo appropriate multidisciplinary review prior to publication, and recommendations are considered valid at the time of publication. Because new developments in medical research and practice can change recommendations, all guidelines undergo scheduled, periodic review to reflect any changes. The systematic development process of clinical practice guidelines began in 2007 and will be applied to all revisions as they come up for scheduled review, as well as all new guidelines.

Definition

Gastroesophageal reflux (GER) is the refluxing of gastric contents into the esophagus. This occurs in 50% of all infants from 0 to 3 months of age, with emesis at least once-daily.² Gastroesophageal reflux disease (GERD) is described as the clinical symptoms of GER and may be quite diverse and vary

according to the age of the child. The infant and younger child usually presents with regurgitation, vomiting, and irritability and the older child or adolescent with heartburn, epigastric/substernal pain, and dysphagia.³ The consequences of pathologic, as opposed to physiologic, GERD are complications including esophagitis, stricture, Barrett esophagus, and pulmonary symptoms.⁴

Fundoplication is the surgical treatment of GERD and consists of a partial (less than 360 degrees) or complete wrap or plication (i.e., folding) of the fundus of the stomach around the esophagus. The surgery can be accomplished by traditional open techniques or by minimally invasive techniques.

Diagnosis and Work-Up

Patients are initially evaluated by clinical history and examination. Infants with reflux commonly present with regurgitation or vomiting.^{1,3,4} Other symptoms in infants include irritability and failure to thrive. Older children present with heartburn, epigastric pain, and dysphagia.^{3,4} GERD has been implicated in sudden infant death syndrome (SIDS) or acute life-threatening events (ALTE).¹ Children presenting with pathologic reflux should be evaluated with objective diagnostic examinations. A barium swallow is typically performed to evaluate for other causes of emesis. While this study was sensitive, it lacked specificity for the determination of reflux.^{1,3}

Esophageal pH monitoring is considered the gold standard for the diagnosis of GER.^{1,3,5} pH monitoring is more helpful if the times of acid reflux correspond to symptoms, especially when symptoms are nongastrointestinal in nature.³ Esophageal pH monitoring gives information about the number of episodes of reflux with a pH less than 4, as well as total time exposure to a pH less than 4 and the length of the episodes.^{1,6,7}

Gastric emptying studies (radionuclide-labeled ^{99m}Tc sulfur colloid liquid or semisolid food) can assess for gastric emptying and has been used for the measurement of reflux. Scintigraphy can measure both acid and nonacid reflux.⁷ The persistence of tracer in the chest at 24 hours can be suggestive of aspiration. Esophagoscopy has been recommended to look at the esophageal mucosa to determine mucosal injury from GERD.^{1,7} Esophageal manometry measures the pressures in the esophageal body and lower esophageal sphincter directly. This type of study, however, is used infrequently in children with GER.¹

Intraluminal impedance monitoring (IMP) is a study using electrical impedance to record changes in the electrical impedance in the gastrointestinal lumen. The impedance devices use multiple channels, which can allow measurement of the direction of movement.⁸ Intraluminal impedance has

been compared with pH monitoring, with IMP being more sensitive, allowing the detection of both acid and nonacid reflux episodes.^{5,9-11}

Bronchoscopy with bronchoalveolar lavage can be performed in patients with reflux symptoms associated with presumed aspiration episodes. The bronchoalveolar lavage helps assess for the presence of neutrophils and lipid-laden macrophages in the aspirate, which would be consistent with aspiration from reflux.¹²

Patient selection

Selection of patients for surgery is reserved for patients with failure of medical management. Surgery is considered for the patient with esophagitis and stricture or Barrett esophagus.⁷ Other indications for selection of surgery are pulmonary symptoms, specifically asthma with persistent symptoms and reflux despite medical management and recurrent pneumonia associated with GER.^{7,12} Antireflux surgery is also considered with failure or inadequate response to medical therapy associated with neurologic handicaps.¹³ The most common indications for antireflux surgery in the United States were failure to thrive, feeding disorders associated with reflux, respiratory symptoms associated with GER, and esophagitis.¹⁴

Risks or potential hazards/benefits

Risks of medical management, which frequently include proton-pump inhibitors and histamine-2 receptor antagonists as well as prokinetics, are the side effects of the medications. For some patients, the medications may be short term, but for many patients, the length of medical treatment can be protracted.^{2,7} When using H-2 receptor antagonists, there is an escape from the acid-inhibitory mechanism after approximately 6 weeks.⁷ Metoclopramide efficacy is equivocal and has associated side effects, including tardive dyskinesia.⁷ Thickening of feedings can be helpful in decreasing the symptoms of reflux and decreasing the acid-reflux episodes. This treatment does not decrease the total number of reflux episodes when measured by impedance.^{2,5} Long-term effects of nonacid reflux are not available.

The risks of surgical procedures include both short- and long-term complications. These include wound infections, herniations through abdominal incisions, gas-bloat syndrome, persistent dysphagia, dumping syndrome, and recurrence of GERD.^{1,3,7} Other complications can include small-bowel obstruction, pneumonia, perforation, persistent esophageal stricture, and esophageal obstruction.⁷ Outcomes can differ, depending on the neurologic status of the child. Neurologically normal children tend to have fewer complications and remain free of symptoms, as opposed to neurologically impaired children.¹⁴

Indications

Medical treatment and, specifically, formula changes and thickening feeds can be performed with clinical suspicion of GERD. Response to this therapy is sometimes considered evidence of the presence of GER.⁷ The use of medications, including proton-pump inhibitors, generally require the confirmation of GER by an objective measure.^{2,7} Surgery is generally indicated when there is objective evidence of GER

by one or more of the methods described in the Diagnosis section, such as pH monitoring, impedance monitoring, esophagoscopy, and scintigraphy demonstrating reflux.^{1,2,7} In addition to the presence of GER and complications, the patients undergoing surgery have generally failed a trial of medical management, as described above.

Contraindications

Contraindications to medical management include persistent symptoms despite optimization of medication dosing and side effects of medication, such as metoclopramide.^{1,7,14} Contraindications to an operation are the lack of comorbidities and the lack of medical trials prior to surgery.^{7,14}

Treatment and Options

Thickened feedings have been shown to decrease the number of acid-reflux episodes and may relieve the symptoms of the infant with GERD.^{2,5,7} Lifestyle changes in older children, with the avoidance of caffeine, chocolate, and spicy foods, may be efficacious. In addition, weight loss may be helpful in obese children, and the avoidance of exposure to tobacco smoke may be helpful.⁷ Surgical options include both open and laparoscopic antireflux procedures. The antireflux operations may include partial or complete funduplications.

The Nissen fundoplication was first described in 1954. The operation can be performed either openly or laparoscopically with similar results and outcomes. The procedure is described as a repair of the esophageal hiatus after dissection with a plication of the fundus around the esophagus in a 360-degree fashion. Complications of the operation include dysphagia and gas bloat. Recurrent reflux can occur in 1.7–14%.^{1,15-19}

Toupet fundoplication is a partial posterior 270-degree wrap. It is performed by closing the posterior hiatal opening, then suturing the fundus to the right crus and the right side of the esophagus, and then suturing the left side of the fundus to the esophagophrenic ligament. The complications can include recurrence of reflux and, less commonly, dysphagia. Recurrence of reflux occurs in 2–6.1%.^{1,20}

Anterior partial wraps, which include the Boix-Ochoa and the Thal, can be performed openly or laparoscopically. The Boix-Ochoa wrap involves an approximation of the right crural fibers, followed by an anchoring of an anterior wrap to the anterior aspect of the esophagus and to the right crus and diaphragm. A Thal is performed by approximation of the hiatus posterior to the esophagus, followed by a suture to fix the esophagus at that level posteriorly. The fundus is then sutured anteriorly with fixation to the esophagus and the diaphragm. Recurrence rates for these operations range from 5 to 20%.²¹⁻²³

Endoscopic approaches to treating GERD have been recently described. Of these, the Stretta procedure, using radiofrequency therapy of the lower esophageal area, has been successfully used in adults and has been described in children. The treatment involves radiofrequency therapy of a 2–3-cm area of the lower esophagus and the cardia of the stomach. This creates a high-pressure zone in that area and reduces reflux. This therapy can be repeated and may be performed as an outpatient. It may also play a role in the setting of a failed fundoplication.^{24,25} Currently, the use of Stretta in children is based on type III evidence.

Recommendations

Initial treatment of children with thickening of feeds has efficacy in improving symptoms of infants with GER. This may lead to persistent nonacid reflux, but allows the child to be free of symptoms. This is supported by research done in the pediatric gastroenterology guidelines and in a placebo-controlled crossover trial.^{5,7} This evidence is a combination of types I and III.

Diagnostic studies are recommended, based on several types of evidence. The use of barium swallows, endoscopy, and scintiscans are based on type III evidence. The use of pH studies is based on types II-2 and III data. The use of impedance studies is based on type I data.

Use of medications is supported by the pediatric gastroenterology group and by expert opinions. This should be performed with H-2 receptor antagonists and proton-pump inhibitors. The data for these therapies is described as type I by the pediatric gastroenterology group.⁷

Surgical options are recommended only after failure of medical therapies. There are no randomized, controlled trials of fundoplication versus medical therapy.⁷ Studies evaluating surgical treatment usually do not have controls. Most studies of laparoscopic antireflux surgery versus open antireflux surgery are nonrandomized. There is no randomization of patients undergoing partial versus complete wraps, but most studies suggest that the efficacy and complications are similar despite the type of procedure. Use of antireflux surgery can be recommended by using type II-3 evidence. The randomized trial of open versus laparoscopic Nissen revealed no difference in outcome based on inflammatory response. Laparoscopic funduplications are safe and have similar outcomes, compared to open funduplications^{1,12} The evidence to support the use of laparoscopic funduplications is mostly types II-3 and III.

- Type I: Evidence obtained from at least one properly designed randomized controlled study
- Type II-1: Evidence obtained from well-designed cohort or case-controlled trials without randomization
- Type II-2: Evidence obtained from well-designed cohort or case-controlled analytic studies, preferably from more than one center or research group
- Type II-3: Evidence obtained from multiple time series with or without the intervention
- Type III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees

Expected Post-Treatment Course

Postoperatively, patients are expected to be relieved of their emesis and pain. The postoperative course varies, depending on whether the surgery is performed open or laparoscopically. Typically, children undergoing laparoscopic surgery are feeding by postoperative day 1 and spend 1–3 days in the hospital. The time is prolonged in the neurologically impaired children and those who undergo concomitant gastrostomy placement.^{1,16–17,20,26} In the patients undergoing open fundoplication, the time to oral feeding and discharge were usually 2–3 days postoperatively and 4–6 days for length of stay.^{16,17,26}

Post-Treatment Care

Post-treatment care involved analgesia in the immediate postoperative period. The patient was then started on a diet or tube feeding, and feeding was advanced until the child could be discharged. The child was then evaluated in the office after the procedure within the first few months of surgery. The evaluation was by clinical examination and history with testing reserved for patients with recurrence of symptoms.^{1,26–32}

Complications and Treatment of Complications

Complications of surgery in the initial postoperative period are uncommon, but include dysphagia and gas bloat. For dysphagia, the child is kept on liquid and semisolid foods until the dysphagia resolves. This generally occurs by 6 months after the operation.^{1,28} Bowel perforations can occur, and these are treated by laparoscopic or open repair of the defect.¹⁷ Pneumonia postoperatively has been reported and is treated with antibiotics. Small-bowel obstruction is treated with nasogastric decompression and with lysis of adhesions, if nonoperative management does not resolve the obstruction.¹³ Stricture of the wrap and recurrent reflux may occur. The problems can be related to the crural closure, the wrap being too tight or sutures becoming loose. These can be treated nonoperatively, at first. Tight wraps may be dilated, on occasion. Medications can be resumed, and if this fails, the wrap may be repeated either open or laparoscopically. When repeating the operation, the choice of type of fundoplication may be changed.^{13,16–20,30–32}

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