

Gastro-oesophageal reflux in children: surgical management

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Abstract

Gastro-oesophageal reflux disease is symptomatic reflux of gastric contents into the oesophagus. Factors predisposing to GORD are loss of the physiological antireflux barrier and anatomic abnormalities of the oesophagus or diaphragm. Conservative measures and medical management results in resolution of symptoms in a majority of children. Surgery is indicated in the event of failure of medical management or severe complications. Surgical procedures include open or laparoscopic fundoplication in children with normal neurology; fundoplication with or without vagotomy and pyloroplasty; surgical feeding jejunostomy and oesophago-gastric dissociation in the severely neurologically impaired children.

Keywords Antireflux procedure; fundoplication; gastro-oesophageal reflux; non-bilious vomiting

Definition and epidemiology

Gastro-oesophageal reflux (GOR) is passage of gastric contents into the oesophagus associated with or without regurgitation or vomiting. Gastro-oesophageal reflux disease is defined as the presence of GOR with symptoms or complications. A recent Italian population study reported a prevalence of 12% for GOR in infants.

Aetiology

The process of swallowing involves the onset of oesophageal peristaltic waves and associated relaxation of upper and lower oesophageal sphincter. This is regulated by the vagus and sympathetic nerves through the intrinsic neural network on oesophagus. In GOR, non-deglutatory peristaltic waves are triggered to achieve clearance. The factors promoting GOR are increased intra-abdominal pressure, strong stomach contractions, negative pressure in oesophagus during inspiration and lying down position.

The physiological antireflux barrier (Figure 1) is mainly constituted by the following:

- The lower oesophageal sphincter (LOS) composed of
 - the inner circular smooth muscle layer of oesophagus,

- high normal resting tone of lower oesophagus which relaxes only during swallowing.
- The flutter valve formed by the mucosal fold below the LOS.
- The diaphragmatic crural sling composed of the striated muscle which contracts rhythmically during the respiratory cycle and displaces gastro-oesophageal junction downwards, closing it tightly during inspiration and forming an external pinchcock mechanism.

There are several other minor components protecting against GOR, including increased intra-abdominal oesophageal pressure, angle of His, and alkaline saliva in oesophagus buffering gastric acid.

Anatomical disruption (e.g. hiatus hernia, congenital diaphragmatic hernia, oesophageal atresia) or functional abolition (neurological disorders) of one or more of the protective mechanisms result in GOR. The occurrence of non-deglutatory transient lower oesophageal sphincteric relaxation accounts for most episodes of GOR.

Clinical presentation

Most infants with GORD present with varying degrees of non-bilious vomiting or discomfort following feeds. ENT symptoms including recurrent tonsillitis, otitis and laryngeal polyps are less commonly reported. Infants with severe GORD can present with complications including apparent life-threatening events (ALTE), aspiration pneumonia, chronic cough or recurrent wheeze. Severe GORD also results in nutritional deficiencies and failure to thrive. Older children tend to present with heartburn and dysphagia especially when the GORD has resulted in a stricture.

Continuing reflux of acid contents into the oesophagus results in ulceration of oesophageal wall causing pain. Older children can present with complications of oesophagitis including iron deficiency anaemia and stricture causing dysphagia. Sandifer syndrome has also been reported as a result of chronic reflux, and is characterized by dystonic body movements or spastic torticollis.

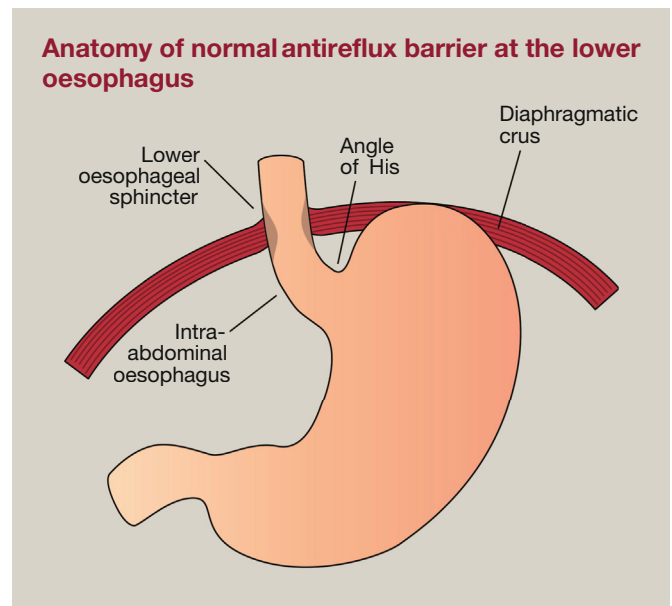


Figure 1

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Aspiration of gastric contents into the respiratory tract can result in bronchospasm, recurrent lower respiratory infections and atelectasis. Cases of sudden death have also been reported. Long-term risks of GORD include oesophageal strictures, Barrett's oesophagus and increased risk of oesophageal carcinoma.

Investigations

In a recent survey of American paediatric surgeons, most surgeons reported that their decision to proceed to an antireflux procedure was based mainly on the clinical history from parents than on investigations demonstrating GORD. There is no single investigation which predicts response to medical or surgical therapy.

Upper gastrointestinal contrast studies may be used to delineate the anatomy of LOS and rule out a hiatus hernia. GOR can be classified on contrast swallow examination as follows: grade 1 (reflux into distal oesophagus); grade 2 (reflux into proximal thoracic oesophagus); grade 3 (reflux into cervical oesophagus); grade 4 (continuous reflux); and grade 5 (aspiration into respiratory tract). [Figure 2](#) shows upper GI contrast swallow demonstrating severe gastro-oesophageal reflux. However, routine performance is not recommended due to the high false positivity and negativity rates and also the associated risk of radiation. Contrast meal radiograph can rule out other causes of vomiting such as malrotation and gastric or bowel obstruction.

pH studies have long been the best available method to quantify the duration and severity of reflux. A reflux index (defined as the percentage of time the measured oesophageal pH is less than 4) above 5% is considered positive for GOR. This has not been shown to correlate accurately with symptom severity in infants and is believed to be due to the acid buffering by milk feeds in this population. Both the North American and European Societies for Paediatric Gastroenterology and Nutrition have made specific recommendations for the indications for use of oesophageal pH monitoring in children.

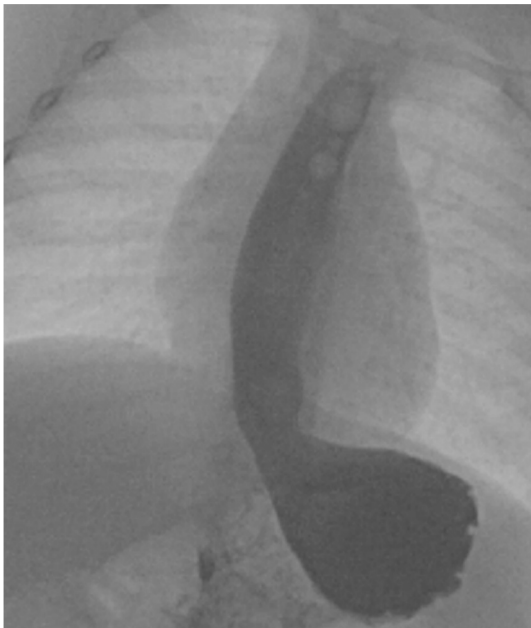


Figure 2 Contrast swallow demonstrating severe gastro-oesophageal reflux.

Multichannel intraluminal impedance (MII) measures changes in electrical resistance between multiple electrodes placed along the oesophagus and can be used to calculate the direction and velocity of bolus in the oesophagus. This has the advantage of being able to detect not only oesophageal acid exposure, but also neutral or even alkaline reflux events that are more common in newborns. MII with pH motoring has been shown to double the probability of documenting an association between symptoms and reflux compared to pH monitoring alone in infants.

Although useful in diagnosing GORD, studies in adult and paediatric populations report no association between pH studies or MII with surgical outcomes of resolution of symptoms of reflux.

Upper GI endoscopy is used by many to assess the oesophagitis secondary to reflux. Using endoscopy, oesophagitis is classified by Savary Miller scoring system as grade 1 (erythema of mucosa), grade 2 (linear non-circular ulceration), grade 3 (confluent ulceration) and grade 4 (stricture). A negative endoscopic examination however does not exclude GORD in infants or patients on H₂ blocker or PPI treatment. Endoscopic biopsy helps to rule out other causes of oesophagitis and to diagnose and monitor Barrett's oesophagus.

Oesophageal manometry is sometimes used in older children to assess the function of LES. However non-deglutatory relaxations are difficult to record accurately.

It is worth noting that in many (or even most) neuro-disabled patients, objective evidence of GORD can be difficult to obtain, even in the presence of extreme symptom severity. This suggests that, in these patients, the condition is more than mere 'acid reflux', and that it is compounded by an inappropriate neurological response to the presence of nutrients in the stomach and proximal bowel. This disordered physiological response has been demonstrated by electro-gastrographic and gastric emptying studies, but despite considerable research it remains ill-understood.

Management

Most neonates have a physiological level of GOR that resolve spontaneously by the age of 12–18 months when they take up an upright position. Infants with GORD are initially managed using conservative measures. Use of thickened feeds reduces visible regurgitation but does not decrease in the frequency of measurable oesophageal reflux episodes. Head end elevation has not been shown to have a beneficial effect in infants with GOR. Prone or left-sided sleeping position with elevation of the bed has been shown to benefit in adults with GOR.

H₂-receptor antagonists help in symptomatic improvement of GORD, but has the problems of tachyphylaxis and tolerance. Proton pump inhibitors (PPI) inactivate the H⁺K⁺ATPase pump and are currently the medical treatment of choice for symptoms of GORD and oesophagitis. Complications of PPI include increased risk of community-acquired pneumonias especially in children with immunocompromise. However, evidence does not support the use of PPIs in infants. Recent studies suggest a potential role for baclofen in inhibiting the lower oesophageal sphincter relaxation. Motility agents such as domperidone are widely used although not supported by evidence from randomized controlled trials.

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