

# Gastro-oesophageal reflux in infants and children

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## Abstract

Gastro-oesophageal reflux is a normal physiological phenomenon that is frequently associated with regurgitation in infants. In general, it resolves by the age of one year. Some children are more likely to have persistent symptoms and develop complications, e.g. children with congenital abnormalities of the oesophagus, neurological impairment, and a family history of gastro-oesophageal reflux disease (GORD). Preliminary evidence suggests that GORD in infancy and childhood may be a precursor to adult GORD. GORD is reflux that is associated with troublesome symptoms or complications. These complications are categorised into oesophageal and extra-oesophageal difficulties. Diagnosis in most patients relies on a thorough history and physical examination. However, the symptoms in infants and young children are often atypical. Patients with significant symptoms require more extensive diagnostic assessment, such as contrast radiography, oesophagoscopy and oesophageal pH-metry. In most cases, parental reassurance and advice on feeding are sufficient. Thickened feeds reduce the frequency of regurgitation. Patients with complications require potent acid inhibition and occasionally anti-reflux surgery.

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## Introduction

Regurgitation is a common complaint in infancy and frequently causes parental concern. The family practitioner needs to distinguish between infants whose regurgitation is benign, and those who require further diagnostic assessment and treatment. This requires an understanding of the physiology of gastro-oesophageal reflux, the natural history, potential complications and the appropriate diagnostic and therapeutic approach.

## What is gastro-oesophageal reflux?

Reflux is the passage of gastric contents into the oesophagus. This normal phenomenon occurs several times daily in infants and children. Reflux material is rapidly cleared by the oesophagus and does not lead to difficulties. However, occasionally troublesome symptoms or complications may develop. This is called gastro-oesophageal reflux disease (GORD).<sup>1</sup>

During infancy, regurgitation frequently follows an episode of gastro-oesophageal reflux, whereas this is unusual in older children and adults. Approximately two thirds of four-month-old infants regurgitate at least once daily.<sup>2</sup> As they get older, the frequency of regurgitation decreases. Usually,

it resolves by one year in most infants. In the majority, episodes of reflux and regurgitation are uncomplicated. However, a small proportion of children develop GORD. They need to be identified and treated by the attending clinician. Some children have an increased risk of persistent regurgitation and GORD (Table I). In addition, several lines of evidence suggest that GORD in infancy and childhood may be a precursor to adult GORD.<sup>3,4</sup>

## What is gastro-oesophageal reflux disease?

Older children and adolescents with GORD have typical symptoms, such as heartburn and regurgitation. On the other hand, young children and infants experience less typical symptoms, which tend to be non-specific. GORD complications are consequently grouped into these two age

Table I: Children with an increased risk of GORD

- Anatomical abnormalities include oesophageal atresia or other congenital abnormalities of the oesophagus, congenital diaphragmatic hernia and hiatal hernia
- Neurological impairment
- Cystic fibrosis
- Family history of GORD

**Table II:** Troublesome symptoms and complications due to oesophageal disease<sup>1</sup>

Unable to reliably report symptoms, or younger than eight years	Cognitive ability to reliably report symptoms	Oesophageal injury and complications
Excessive regurgitation Feeding refusal or anorexia Unexplained crying Choking, gagging or coughing Sleep disturbance Abdominal pain	Typical reflux syndrome	Reflux oesophagitis Reflux stricture Barrett's oesophagus Adenocarcinoma

**Table III:** Troublesome symptoms or complications due to extra-oesophageal disease<sup>1</sup>

Definite associations	Possible associations
Sandifer syndrome Dental erosions Malnutrition	<i>Bronchopulmonary:</i> Asthma and pulmonary fibrosis <i>Laryngotracheal and pharyngeal:</i> Chronic cough and hoarseness <i>Rhinological and ontological:</i> Sinusitis and serous otitis media <i>Infants:</i> Apparent life-threatening events

**Table IV:** Differential diagnosis of gastro-oesophageal reflux

Anatomical or motility disorders Gastrointestinal infections Food allergy Eosinophilic oesophagitis Raised intracranial pressure Inherited metabolic diseases Urinary tract infections or abnormalities Infections Toxins and drugs Cardiac abnormalities Cyclic vomiting Neglect or abuse
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categories and are further divided into oesophageal and extra-oesophageal difficulties (Tables II and III).

The association between gastro-oesophageal reflux and oesophageal complications, such as reflux oesophagitis and Barrett's oesophagus, is well established. The association is not clear for complaints such as recurrent wheezing, acute life-threatening episodes and excessive crying.<sup>5</sup>

## Differential diagnosis

Before the diagnosis of GORD can be made, other conditions that may have a similar presentation should be considered (Table IV). Cow's milk-protein allergy may be indistinguishable from GORD and should be considered in infants who are not thriving. A two-week trial of extensive or completely hydrolysed formula is indicated in these infants. Surgical conditions, such as pyloric stenosis and mid-gut malrotation, also need to be considered. Inherited metabolic disorders are rare causes of vomiting. They should be contemplated in infants with dysmorphic or other suggestive features, such as developmental delay.

## Making the diagnosis of GORD

### History

The diagnosis of GORD relies on a thorough history and physical examination. Eliciting the history is complicated by a number of factors. The clinician relies on caregivers for the history of the infant. Young children are very suggestible when a history is provided. There is also an age-dependent variation of symptoms. Validated questionnaires are

available. However, the sensitivity and specificity of these questionnaires are still inadequate to make a confident diagnosis of individual patients.

The history also provides the clinician with an indication of the severity of the complaints, whether complications are present and whether other conditions need to be considered. For example, bile-stained vomiting indicates a serious underlying anatomical abnormality. Erosive oesophagitis may cause haematemesis in rare instances.

### Side room and special investigations

Other causes for the symptoms should be excluded and the severity of symptoms assessed. Urine is routinely tested at the first visit to exclude a urinary tract infection. Additional investigations that may be indicated include serum electrolytes, a full blood count and the serum-acid base.

### Contrast radiography

The barium swallow is not a sensitive or specific test for the diagnosis of GORD.<sup>6</sup> However, it is useful to detect anatomic abnormalities of the oesophagus and proximal bowel that may account for the vomiting. If a swallowing disorder is suspected, a modified barium study, also called a videofluoroscopic study, should be performed. This assesses the oral and pharyngeal phases of swallowing, in addition to the oesophageal phase.

### Oesophageal scintigraphy

Oesophageal scintigraphy is thought to be more sensitive than a barium swallow. Lack of standardisation and normal values limit widespread application of this investigation.<sup>6</sup>

## Endoscopy

Oesophagoscopy allows direct visualisation of the oesophagus and biopsy for histological assessment. Although GORD can be diagnosed without oesophagoscopy, it is the investigation of choice when assessing complications, such as Barrett's oesophagus, and to exclude other conditions, such as eosinophilic oesophagitis.

## Ambulatory oesophageal pH-metry

Oesophageal pH-metry provides an objective measure of distal oesophageal acid exposure. Normal values for infants and children differ from those of adults. This test is useful to determine if acid reflux is responsible for the atypical presentations of GORD, such as coughing or excessive crying, and to assess the effectiveness of acid inhibition. However, it does not detect non-acid or weak-acid reflux. Patients with GORD may have normal 24-hour oesophageal pH study results.

## Combined multichannel intraluminal impedance<sup>7</sup>

Combined multichannel intraluminal impedance and pH monitoring detects acid, weak-acid and non-acid reflux. Although this investigation has improved understanding of paediatric GORD in the last decade, it is expensive and requires considerable experience to interpret.

## Treating GORD<sup>6</sup>

In most cases, reassurance of the infant's parents and provision of information regarding the natural history of reflux and on the generally benign outcome are adequate. Advice regarding feeding may reduce the frequency of regurgitation and alleviate parental anxiety. Children with GORD require additional treatment.

### Feeds

Incorrect feeding technique often contributes to frequent regurgitation. It should be ensured that the infant is not overfed and that an inappropriate feeding technique is not the cause of vomiting. Some infants may have an exaggerated gag reflex that is elicited by being fed solids or use of large bottle teats.

Thickened feeds reduces the frequency of regurgitation and provides some symptomatic control. Thickeners, such as infant cereals or commercial thickeners, may be added to the formula. However, giving these feeds is often difficult. Some commercially available infant formulas have thickening agents that are activated in the acidic stomach. These formulas are easier to administer, but are more expensive. Thickening is not advised for patients with reflux oesophagitis.

A trial of extensively hydrolysed infant formula is indicated where there is suspicion of cow's milk-protein allergy.

Infants with poor weight gain require careful assessment of volumes of offered feeds, formula preparation, feeding technique, suck and swallow development and associated symptoms and signs. Non-GORD causes of poor growth should be considered. If the modification of feeds and technique does not improve weight gain, a trial of a hydrolysed formula is indicated. Occasionally, temporary administration of feeds through a nasogastric or nasojejunal tube is required. If this option is exercised, oral motor skills should be maintained by allowing the infant to continue to have small feeds orally.

### Positional therapy

Reflux is less frequent in the prone position. However, this is associated with an increased risk of sudden infant death syndrome and is not recommended for infants who are at risk. After feeds, the prone position may be useful, providing that the infant remains under direct supervision.

### Prokinetic agents

Currently, no effective prokinetic drugs are available. Accessible agents have limited efficacy and often have unacceptable side-effects.

### Acid inhibition

Proton-pump inhibitors (PPIs) provide superior acid inhibition, are usually well tolerated and have few severe side-effects. They effectively reduce oesophageal acid exposure, but do not control regurgitation. They are administered once daily before breakfast. However, a few patients require a twice-daily dose. The maximum acid suppression effect is achieved after four days.

Young children, between one and 10 years old, often require higher doses per body weight than older children and adults, while young infants, under six months, may require lower doses. Available clinical and dosing studies, paediatric registration and appropriate formulation should be considered when selecting a PPI.

Although PPIs are well tolerated by most infants and children, a number of side-effects have been reported. These include complaints such as headaches and increased rates of pneumonia and diarrhoea.

Histamine-2 receptor antagonists are often still used. Suitable formulations are available, both oral and intravenous, but are less effective than PPIs.

### Surgery

Anti-reflux surgery is indicated for children with significant GORD that does not respond to optimal medical treatment.

Postoperative complications include dysphagia, bloating, dumping syndrome and increased retching. Many infants and children experience recurrence of GORD after a period of temporary improvement.

Neurologically impaired children are a particularly difficult group of patients to treat. They have increased operative mortality and postoperative complications. The decision to perform anti-reflux surgery on these patients should be made in consultation with a paediatric gastroenterologist and surgeon.

## Conclusion

The majority of infants and young children with regurgitation will experience a benign course of gastro-oesophageal reflux and require no more than parental reassurance. When the symptoms are severe or cause complications, further investigation and treatment is required. The family practitioner should refer infants and children whose symptoms persist beyond the age of 12 months, who do not respond to conservative treatment measures such as

thickened milk feeds and who have associated oesophageal or extra-oesophageal complications to a specialist who is familiar with caring for children with GORD.

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