

ENT manifestations of gastro-oesophageal reflux in children

Manifestazioni ORL del reflusso gastroesofageo nel bambino

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Key words

Gastro-oesophageal reflux • Children

Parole chiave

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Summary

Gastro-oesophageal reflux is common in children and is associated with morbidity rates that justify increasing interest in early diagnosis and appropriate medical or surgical treatment. In children ENT manifestations of gastro-oesophageal reflux mainly affect the larynx, ears, nose, paranasal sinuses and oral cavity. Main manifestations are laryngo-tracheal stenosis, laryngomalacia, otitis media with effusion, rhinosinusitis.

Riassunto

Il reflusso gastroesofageo è una patologia comune nel bambino, dal momento che la ricorrenza delle sue manifestazioni risulta rilevante, richiede un'adeguata diagnosi e trattamento. Ogni distretto ORL può essere coinvolto. Le principali manifestazioni descritte sono: la stenosi laringotracheale, la laringomalacia, l'otite media e la rinosinusite.

Introduction and historical notes

Gastro-oesophageal reflux (GER) is common in children and is associated with morbidity and mortality¹. In the first few months of life (0-3 months), post-prandial reflux is a physiological event which gradually decreases, disappearing by one year of age. Onset is generally between 2-4 months of age, peaks around 4-5 months and disappears, nearly always spontaneously, by 10-12 months². The progressive decrease in episodes is due to maturation of the lower oesophageal sphincter (LES) and to acquisition of sitting and standing. After the age of one year, persistent regurgitation or reflux, not only post-prandial, associated with backwardness and behavioural disorders, such as irritability, unjustified crying and sudden waking, suggests persistent pathological GER³. Timely diagnosis of paediatric GER is often difficult. In adults, symptoms such as regurgitation and/or reflux, dysphagia, burning, belching, oro-pharyngeal foreign-body sensation and retro-sternal pain indicate GER⁴⁻⁶, whereas children rarely present these typical symptoms. Moreover, vomiting and regurgitation are aspecific symptoms in many paediatric diseases but are highly specific in adults. Recurrence at short intervals and the duration of single episodes of reflux are more indicative of GER than persistence of vomiting or regurgitation.

Fearon and Brama⁷ were the first to see reflux in children as a possible cause of inflammatory disease of the

lower respiratory tract. Their studies together with that of Cherry and Margulies⁸ in the late sixties, helped to define GER as a complex pathological condition, in which extra-oesophageal or atypical symptoms of the upper and lower respiratory tract coexist with oesophageal or typical symptoms (vomiting, regurgitation). Since 1970, many studies have focused on the relationship between gastro-oesophageal reflux and respiratory disease. The link between oesophageal or gastric GER and paediatric pathologies has been studied relatively little in the last 20 years, and interest has shifted to lower and mostly upper respiratory tract disease. Since the introduction of prolonged monitoring of oesophageal pH with double, distal oesophageal and proximal hypopharyngeal probes by Koufman⁹ and Wiener et al.¹⁰ in 1986 there have been more studies on GER in children. Research has focused on the noxious effects of stomach acid in the laryngeal and tracheo-bronchial tracts. Oesophageal pH monitoring with double probe confirmed that acid may pass the anatomical barrier of the upper oesophageal sphincter and come into contact with the laryngeal and hypopharyngeal mucosa. Work then focused on laryngeal disorders secondary to GER, neglecting those of the oesophageal and/or gastric district in which reflux is the typical manifestation¹¹⁻¹³. In the nineties, research workers, such as Contencin and Narcy¹⁴ postulated that reflux material could also reach the naso-pharyngeal and nasal district, causing acute and, above all, chronic rhino-sinusitis.

Clinical features

In children, extra-oesophageal ENT manifestations of GER mainly affect the larynx, ears, nose, paranasal sinuses and oral cavity.

LARYNGEAL MANIFESTATIONS

Cherry and Margulies⁸ were the first to recognise that GER could cause posterior laryngeal inflammation, contact ulcer and granuloma that improved with anti-reflux therapy. The principal sets of laryngeal symptoms of GER in children are:

- laryngo-tracheal stenosis, developing at the posterior commissure and the sub-glottic area and causing typical relapsing paroxysmal laryngospasm, mostly nocturnal and typical of children;
- supra-glottic stenosis, typical of the neonatal period and due to reflux in a large percentage of cases; in most cases, there is vestibular involvement;
- laryngomalacia, typical of the neonatal period and characterized by prolapse of the supra-glottic tissue into the glottal space; it is worse in prone, and better in supine, position and during crying; due to GER in 50% of cases.

Koufman⁹ produced evidence of a significant link between reflux and laryngeal stenosis: 72% of children had anomalous pH, monitored over 24 h. GER was presumed to trigger episodes of apnoea by acid stimulation of laryngeal, pharyngeal and oesophageal chemoreceptors, causing laryngo-spasm. However, since these episodes did not show a clear temporal relation with GER, a clear cause-effect relationship could not be demonstrated¹⁵. Although the incidence of GER in children with subglottal stenosis is three times greater than in the normal paediatric population, there is no direct evidence that reflux causes or favours subglottic stenosis. Nor is it clear whether GER is caused by increased respiratory effort or whether it plays a role in causing it.

Laryngitis may also be due to GER. The posterior larynx is the most affected area. Hyperaemia of the mucosa of the posterior commissure may be a normal or non-specific finding. Mucosal oedema seems to be a more direct expression of a cause-effect relationship with reflux.

EAR MANIFESTATIONS

Ear manifestations, especially *otitis media* with effusion (OME), are nearly always exclusive to neonatal and infantile periods. This is because Eustachian tube dysfunction is more frequent in children than adults. GER was recently included among the risk factors for tube dysfunction due to the large number of episodes of reflux in babies with respect to adults and due to prolonged lying in the supine position. The pathogenic mechanism would appear to be linked to

contact of the rhino-pharyngeal region with reflux material: repeated exposure of the ciliate respiratory epithelium to pH 4 or less blocks ciliary movement and mucous clearance. Hydrochloric acid and pepsin cause local inflammation, oedema and ulceration of the respiratory mucosa leading to loss of tube ventilatory function.

Tasker et al.¹⁶ using enzyme-linked immunosorbent assay (ELISA) to analyse middle ear secretions, obtained by tympanocentesis, in 54 children with middle ear infection, found concentrations of pepsin and pepsinogen, about three orders of magnitude greater than in serum. Albumin concentrations were the same, indicating that the origin of pepsin, in middle ear secretions, was GER and not transudation. However, an epidemiological review of the international literature did not bring any differences to light in the incidence of middle ear infection between newborns and children with a history of GER and controls. Currently available data¹⁷ only makes it possible to establish grade C evidence of a negative association between GER and middle ear infection. There could even be a “protective” relationship between the two. In other words, GER may be associated with a major confounding factor in reducing the incidence of middle ear infection: during diagnostic screening, children with GER may be assessed and treated for allergy, resulting in a lower frequency of otitis.

NOSE AND SINUS MANIFESTATIONS

Like ear manifestations, those affecting the nose and sinuses are also frequent in children and are due to chronic inflammatory processes in the nasal and para-nasal cavities. Considering the multi-factorial aetiology of rhino-sinusitis, GER can be regarded as a cause of chronic paediatric rhino-sinusitis¹⁸. The pathogenic mechanism by which acid reflux may affect the nose and sinuses is unclear. One possibility is its direct action on the nasal respiratory mucosa as occurs in the hypo-pharyngo-laryngeal district¹⁹. Excluding the hypothesis that reflux could reach the paranasal sinus directly through the ostia, it may reach the rhino-pharynx and posterior part of the nasal cavities where the only ostium communicating with the sphenoidal sinus is located. In this way, acid reflux could lead to nasal mucosal inflammation, oedema and obstruction of the osteomeatal complex¹⁴. Another mechanism is hyper-reactivity of the autonomic nervous system induced by reflux and leading to nasal oedema and ostial obstruction²⁰. The studies did not satisfactorily demonstrate these correlations. A relationship between GER and enlarged adenoids seems less likely. The question is whether reflux promotes an inflammatory process of adenoid tissue or whether the adenoids facilitate reflux by modifying intra-thoracic inspiratory and expiratory pressures, thus

favouring retrograde movement of gastric content in the oesophagus.

A review of the international literature¹⁷ shows grade C evidence of a positive association between GER and sinusitis. However, despite the lack of studies on large samples of paediatric patients with chronic rhino-sinusitis, and despite the relative lack of continuous pH monitoring studies in this district to demonstrate reflux, GER should still always be considered as a concausal or primary factor in all children with recurrent rhinitis or chronic rhino-sinusitis when all other aetiological agents of disease have been excluded and when there is no response to aggressive antibiotic treatment.

We analysed pH values in 150 subjects, aged between 1 month and 16 years, coming to the Paediatric Surgery Department of Siena University between January 1994 and December 2002. This series included 30 symptomatic patients under, and 60 symptomatic patients over one year of age (mean: 6.7), 30 controls under, and 30 over one year of age (mean: 7). Symptoms included: vomiting, regurgitation, belching, dyspepsia, lack of appetite and abdominal swelling. Patients were examined by an ENT specialist and paediatric surgeon. In our study, limited to patients with confirmed GER, recurrent (non allergic) rhinitis and chronic rhino-sinusitis were atypical manifestations with an incidence of 20.7% and 5.2%, respectively. In children with recurrent rhinitis and chronic rhino-sinusitis resistant to common treatments, GER is a possibility²¹.

ORAL MANIFESTATIONS

Clinical manifestations of the mouth may affect soft or hard tissue. The former include burning, changes in tongue sensitivity, aspecific irritation of the mouth

and tongue, and mouth ulcers. Hard tissue lesions only concern the teeth and include dental grinding, abrasion and erosion leading to minor or major damage. Erosion consists in loss of dental substance by a chemical process involving hydrochloric acid and pepsin, without bacterial action. The absence of the latter is the only distinguishing feature with respect to caries. There have been only two clinical control studies postulating a relationship between dental erosion with loss of enamel in children and adolescents and GER^{22,23}. However, O'Sullivan et al.²⁴ did not show any increase in the incidence of dental erosion in adolescents with high oral pH. As yet, no evaluation has been made of the efficacy of anti-reflux therapy in preventing or arresting the progression of dental erosion in children.

Conclusions

According to recent literature, oesophageal-laryngeal-pharyngeal reflux in children involves all ENT districts: larynx, nose, sinuses, ears, mouth and teeth. The current clinical practice of treating children with ENT symptoms for GER is increasing, but there is little data to support it. In our opinion, there is still a lack of accurate means for diagnosing GER. 24-hour pH monitoring with double/triple probes (distal and proximal oesophageal and/or naso-pharyngeal probe) is the "gold standard" for diagnosing ENT manifestations. Despite its high sensitivity, specificity and accuracy, it is invasive and not always suitable for children. According to our studies, the area under the curve H+[AUH+] has high specificity and sensitivity and is the best parameter for evaluating erosive and non-erosive GER.

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