CHRONIC COUGH AND DENTAL EROSIONS IN A CHILD WITH GASTROESOPHAGEAL REFLUX EVALUATED BY PH-METRY ASSOCIATED WITH MULTICHANNEL INTRALUMINAL IMPEDANCE

Felicia GALOȘ¹,², T.P. IONESCU³, M. STOICESCU¹,², Gabriela NĂSTASE², Smaranda DIACONESCU⁴

1. “Carol Davila” University of Medicine and Pharmacy, Bucharest
2. “Marie Curie” Children Emergency Hospital, Bucharest
3. Faculty of Medical Dentistry, “TituMaiorescu” University, Bucharest
4. “Gr. T. Popa” University of Medicine and Pharmacy, Iasi
Contact person: Smaranda Diaconescu - turti23@yahoo.com

INTRODUCTION

The gastroesophageal reflux, defined as the passage of the gastric content in the esophagus, is a physiological event found in infants, children and healthy adults in the postprandial period. The physiological GER episodes are characterized by the absence of symptomatology, short duration and limited extension of the distal esophagus. The gastroesophageal reflux disease is present when the gastric content regurgitated in the esophagus determines clinical symptomatology or complications. GERD can manifest itself with recurrent regurgitations, chronic vomiting, heartburn, coughing, laryngitis or recurrent wheezing, asthma or relapsing pneumonia. Infants can show irritability, or arching of the upper body backwards during or immediately after feedings, food refusal, or poor growth. The esophageal GERD complications are reflux esophagitis, hemorrhages, stenosis, and Barrett’s esophagus [1]. (tab.1)

Chronic cough is a common symptom in pediatric practice, exhausting the child and its family, one of the most common reasons for which parents seek medical care [2]. The function of GER within cough etiology is well documented in adults but less in children [1,3].

Dental erosions, as an extraesophageal manifestation of GERD, has been recorded in several

Abstract

The clinical manifestations of the gastroesophageal reflux disease (GERD) are multiple and heterogeneous, differing according to age and individual susceptibility. The relationship between respiratory manifestations and the gastroesophageal reflux (GER) in children is a controversial topic on: proving or refuting either cause or effect, with special stress on the most important symptom – cough. Dental erosions can be GERD-related, especially in the case of infants or of neurologically-impaired children. The case of a 4 year and 8 month-old child with gastroesophageal reflux, with typical (chronic vomiting) and atypical (chronic cough, dental erosions) digestive manifestations, a diagnosis established by pH-metry associated with multichannel intraluminal impedance, will be discussed in the study.

Keywords: chronic cough, dental erosions, gastroesophageal reflux

Table 1. Main clinical signs of GERD according to age

<table>
<thead>
<tr>
<th></th>
<th>Infants</th>
<th>Infants</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vomiting</td>
<td>Common</td>
<td>Uncharacteristic</td>
<td>Rare</td>
</tr>
<tr>
<td>Regurgitation</td>
<td>Common</td>
<td>Common</td>
<td>Common</td>
</tr>
<tr>
<td>Pyrosis</td>
<td>Absent</td>
<td>Common</td>
<td>Common</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>Common</td>
<td>Uncharacteristic</td>
<td>Common</td>
</tr>
<tr>
<td>Refusal of food</td>
<td>Common</td>
<td>Common</td>
<td>Common</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Frequent</td>
<td>Relatively frequent</td>
<td>Rare</td>
</tr>
<tr>
<td>Others</td>
<td>Frequent</td>
<td>Very rare</td>
<td>Absent</td>
</tr>
<tr>
<td>Asthma</td>
<td>Common</td>
<td>Common</td>
<td>Common</td>
</tr>
</tbody>
</table>
studies, [4,5], although its connection with GER has been denied by other publications [6].

MATERIALS, METHOD AND RESULTS

Analyzed in the following is the case of a 4 year and 8 month-old child with chronic cough, presented for a check-up. The symptoms began approximately one month before hospitalization, with predominantly nocturnal, irritating, dry cough. Successive treatment with sedative cough, inhaled bronchodilator, inhaled corticosteroids, systemic antihistamines did not improve the symptoms. Vomiting is also mentioned, on the average as 1-2 episodes/week, yet not bothering the family.

No personal pathology.


Considering the association between dry cough and chronic vomiting, the gastroesophageal reflux was immediately taken into consideration. Another element in support of the diagnosis hypothesis is dental erosion, once knowing that the child does not and has not ingested sweet (tea, milk) or acid drinks (soft drinks) with a baby bottle or in high quantity. Furthermore, no records of vitamin C or iron extracts consumption were recorded.

As to the main symptom, cough, the most important causes determining it were taken into consideration. Chronic cough is defined as a daily cough lasting more than 4 weeks, in the absence of identifiable, especially respiratory, disease. Thus, according to the usual protocol, the most common respiratory or oropharyngeal diseases with cough symptoms were excluded. [7] Allergic evaluation, the lack of wheezing episodes, respectively, excluded bronchial asthma, whereas ENT assessment excluded adenoid vegetation, a frequent cause of irritating cough in children. The chest x-ray was negative and the inflammatory syndrome absent.

For GER suspicion, pH-metry in combination with multichannel intraluminal impedance was conducted, using a portable recording device (Digitrapper pH-Z Monitoring – Given Imaging).

The reflux index was 16.2%, the value reaching 23.9% in supine position. The number of acid reflux episodes was 92, and the number of those lasting more than 5 minutes was 8. (table 2)

### Table 2. pH-metry associated with multichannel intraluminal impedance parameter values

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflux index (RI) (%)</td>
<td>16.2</td>
</tr>
<tr>
<td>RI in supine position (%)</td>
<td>23.9</td>
</tr>
<tr>
<td>Number of acid reflux episodes</td>
<td>92</td>
</tr>
<tr>
<td>Number of acid reflux episodes &gt;5 min</td>
<td>8</td>
</tr>
<tr>
<td>Number of acid reflux episodes detected by impedance</td>
<td>51</td>
</tr>
<tr>
<td>Number of weakly acidic reflux episodes</td>
<td>11</td>
</tr>
<tr>
<td>Number of weakly alkaline reflux episodes</td>
<td>0</td>
</tr>
</tbody>
</table>

Regarding the composition of the reflux, most of them (42) were liquid, 15 were mixed and 29 were gas.

The correlation between reflux and the main symptom (cough) was positive. Therefore, SAP-SAP (symptom association probability), a parameter of statistical analysis, Fisher exact test in calculating the probability of associating the symptom with the reflux, was 99.8%.

Another important element analyzed was the height reached by the acid reflux episodes, an important element in ENT, mouth, and respiratory manifestations related lesions. The percentage of globally assessed reflux episodes reaching the level of the proximal esophagus was 71.9%, and of the acid ones, respectively, 80.9%.

It was concluded that the recording is positive for medium/severe acid gastroesophageal reflux (Fig 1).
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Fig 1. Trace of 24 hour pH-metry registration associated with multichannel intraluminal impedance

The parents denied completion of an upper gastrointestinal endoscopy which would have permitted highlighting possible erosions at the level of the esophageal mucous membrane.

Several recommendations were made as to the hygienic and dietetic treatment (avoidance of citrus juices, fat, chocolate, medicine that relaxes the lower esophageal sphincter, such as theophylline) and the medical treatment based on proton-pump inhibitors (esomeprazole, 20mg/day, in the morning, 30-45 minutes before eating). The duration of the treatment was estimated of minimum 3 months, with a clinical evaluation 14 days, 1 and 2 months after the beginning of the treatment.

The clinical evolution was excellent after 14 days, as to the main symptom, cough, whereas vomiting improved progressively. A month after the beginning of the antacid treatment, the child was asymptomatic.

DISCUSSION

Chronic cough is a common symptom in pediatric practice [2]. The function of GER within cough etiology is well documented in adults, less in children [1,3]. Several studies conducted on pediatric age had contradictory results, due to the fact that most of them used classical pH-metry for GER documentation, a method permitting only the acid GER – cough association, without being able to establish the correlations between cough and the non-acid GER, the last one being frequent in infants, especially in postprandial periods [9-11].

GER can trigger cough through several mechanisms, [12,13] the most important ones being:

> Reflux mechanism, through repeated microaspirations of the gastric content from the esophageal lumen in the airwaves, which causes inflammation at the level of the airwaves

> Reflex mechanism in which cough is vagally mediated, triggered by RGE

It is worth mentioning that, in the case of microaspirations, the reflux is high, reaching the level of the proximal esophagus, which subsequently allows aspirations from the digestive tract into the respiratory one. The cough triggered through the vagal mechanism may be also triggered by the reflux episodes reaching only the level of the distal esophagus.

Cough, as the only manifestation of GERD, is rare, whereas in adults it can reach 75% of the “silent” patients, without other digestive manifestations. In children, the percent varies between 15 and 45%. In a recently published study, cough has been documented in 27.5% of a selected group of children [10]. In our presentation, even if the reason for seeking medical care was cough, careful anamnesis and a complete clinical exam highlighted other signs, associated with a gastroesophageal reflux disease, such as dental erosions and chronic vomiting.

The advantage of using intraluminal impedance associated with pH-metry lies in the fact that it allows, along with GER documentation, to establish a correlation between reflux and cough and also the extent reached by the reflux episodes. Thus, SAP, the most important statistical analysis parameter, was positive, of 99.8% (>95%). Furthermore, we can partially certify acid GER involvement in dental erosion genesis, taking into consideration the fact that over 80% of the acid reflux episodes reach the level of the distal esophagus, without totally excluding other causes in their genesis.

The effects of exposing the oral cavity to the acid content of the stomach are numerous [14]. Less specific symptoms, such as a burning sensation or tooth sensitivity, have been already described. However, dental erosions, with progressive damaging of dental enamel and tooth composition, are common manifestations of
GERD and should be considered atypical manifestations of the disease [4]. It should be also observed that dental erosions are defined as destructions of the tooth substance through chemical processes, without involving an infectious, bacterial process [4].

A possibly lower salivary secretion rate could not be analyzed by objective methods. Stress (determined by video games, for example), viewed as a mechanism that reduces saliva, was denied by the family. The role of saliva is important in protecting the tooth through its lubricative function, as well as through its capacity of neutralizing or diluting acid substances. Furthermore, it has been demonstrated that the proteins from saliva form a protective layer, a film, at dental enamel level [15]. Saliva has a pH that varies between neutral and alkaline values, its deglutition contributing to neutralizing the refluxed acid material, having also an alimentary bolus effect that contributes to esophageal clearing. GERD patients have been documented as having a decreased salivary function [16].

CONCLUSIONS

In children with chronic cough, the gastroesophageal reflux is a potentially etiological factor, a reason for which they should be investigated in this direction. pH-metry associated with multichannel intraluminal impedance is recommended, for detecting all types of reflux (acid, weakly acidic and weakly alkaline) and for establishing the extension of the reflux episodes, an important element in evaluating children with extraesophageal manifestations. Evaluation of these children will be done by a team, formed of a pulmonologist, an ENT specialist and a dentist.

References


