Gas Reflux in Children with Normal Acid Exposure of the Oesofagus

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ABSTRACT

The clinical manifestations of non-erosive gastroesophageal reflux disease (NERD) are multiple and heterogeneous, and differ according to age and individual susceptibility. Weakly acidic reflux and the presence of gas in the refluxate could be relevant in the pathogenesis of symptoms. We present the case of a 3-year and 5-month-old child who came to the hospital with recurrent paroxysmal manifestations without fever assessed. The positive diagnosis was made using pH-metry associated with multichannel intraluminal impedance and glucose respiratory breath test, a new technique that allows positive diagnosis as well as establishes important connections regarding gas reflux and clinical symptomatology described by the patient.

Keywords: Gas reflux, child

INTRODUCTION

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 role and normal values of gaseous reflux are a debated issue (1-6).

It was demonstrated that the presence of gas in the refluxate enhances reflux perception in non-erosive patients with physiological acid exposure of the oesophagus (7). Whether lower esophageal sphincter (LES) motility could also be affected by exposure of the colon to malabsorbed carbohydrates or gas production of small intestinal bacterial overgrowth is presently unknown. Piche et al (8,9) shows that colonic fermentation, through the production of short-chain fatty acids (SCFAs), exerts a controlled feedback on LES motor function. SCFAs production may result in decreased gastric tone and delayed emptying, conditions known to be associate with GER disease. Whether the mechanism of this phenomenon are of hormonal nature, neural nature, or both remains to be determined. Their data suggest that hormonal pathways are involved in the observed changes in LES motility. Some regulatory peptides such as glucagon-like peptide 1 (GLP 1) and peptide YY (PYY), which are colocalized in the endocrine L cell of the distal intestine, have been proposed as ileocolonic mediators of upper gastrointestinal inhibition under several conditions (9).
By presenting this case, we wanted to point out the role of a multidisciplinary approach in children with chronic pathology, the importance of clinical practice guidelines and the contribution that cutting edge technology has regarding diagnosis.

CASE REPORT

We present a case of a 3-year and 5-month-old girl with recurrent manifestations who comes for a check-up. The first episode took place approximately three weeks before hospitalization in our clinical department with shortness of breath, agitation, anxiety, perioral cyanosis, succeeded by hypotonia. Consciousness was intact and the period of the manifestation lasted approximately 10 minutes. The family and the girl had not undergone medical evaluation after the first episode. The second paroxysmal manifestation took place 2 weeks after, having the same characteristics. No personal and nor familial pathology are remarkable.

The clinical exam shows a child with a generally normal condition, no fever, good nutritional status: weight 15 kg (50ºP), stature 104 cm (75ºP). Stethacoustic pulmonary physiologic vesicular murmur, without rales, cardiac normal evaluation, clear pharynx, lean abdomen, no sensitivity at palpation, normal stool, spontaneous urination, normal macroscopic urine, clear sensor, tonus, normal reaction.

Considering the symptoms, gastroesophageal reflux was immediately taken into consideration.

The neurologic evaluation, including electroencephalography and computer tomography, was negative. The cardiologic exam was negative, too.

For gastroesophageal reflux suspicion a pH-metrix in combination with multichannel intraluminal impedance was conducted (Figure 1), using a portable recording device (Digitrapper pH-Z Monitoring – Given Imaging).

The parameter values shown in the Table 1.

It was concluded that the recording was positive for gaseous gastroesophageal reflux.

At this point in the development of the patient evaluation the following questions were raised:

1. Does the presence of gas in the refluxate increase reflux perception in the oesophagus and determine the anxiety and suffocation sensation?
2. What is the source of excess gas?

Non-excessive air swallowing (aerophagia) was demonstrated using esophageal impedance monitoring.

Reviewing the background again, we discovered a constipated child, with bowel movements twice per week, painful defecation, poor appetite. The symptoms started 3 months before. No anal fissure, no encopresis, no treatment were noticed.

In order to check for small intestinal bacterial overgrowth (SIBO), glucose breath test was conducted (LactoFAN 2) and it was positive.

The medical treatment contained laxative agents and rifamixine. The duration of the treat-

### TABLE 1. pH-metrix associated with multichannel intraluminal impedance parameter values

<table>
<thead>
<tr>
<th>Parameters analyzed</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflux index (RI) (%)</td>
<td>0.13%</td>
</tr>
<tr>
<td>RI in supine position (%)</td>
<td>0.02%</td>
</tr>
<tr>
<td>Number of acid reflux episodes</td>
<td>7</td>
</tr>
<tr>
<td>Number of acid reflux episodes &gt;5 min</td>
<td>0</td>
</tr>
<tr>
<td>Total number of reflux detected by impedance</td>
<td>15</td>
</tr>
<tr>
<td>Number of weakly acid reflux episodes</td>
<td>10</td>
</tr>
<tr>
<td>Number of weakly alkaline reflux episodes</td>
<td>0</td>
</tr>
<tr>
<td>Gas reflux</td>
<td>100</td>
</tr>
<tr>
<td>Mixed reflux</td>
<td>3</td>
</tr>
<tr>
<td>Liquid reflux</td>
<td>10</td>
</tr>
</tbody>
</table>
ment was estimated for a period of 10 days for SIBO and a minimum of 2 months for constipation with a clinical evaluation after 30 days.

The clinical evolution was excellent. After a month of medical treatment, the child was asymptomatic, with good appetite, well-grown and presenting daily normal defecation with normal stool.

**DISCUSSION**

It was important in our case to use esophageal impedance monitoring, because we established that there was no air swallowing. Aerophagia in childhood is defined by the Rome IV criteria (10) as all of the following signs or symptoms: excessive air swallowing, abdominal distension due to intraluminal air increase during the day, repetitive belching and/or increase flatus occurring for at least 2 months. The symptoms cannot be fully explained by another medical condition, after appropriate evaluation (Table 2).

<table>
<thead>
<tr>
<th>Must include all of the following:</th>
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<tbody>
<tr>
<td>1. Excessive air swallowing</td>
</tr>
<tr>
<td>2. Abdominal distension due to intraluminal air which increase during the day</td>
</tr>
<tr>
<td>3. Repetitive belching and/or increased flatus</td>
</tr>
<tr>
<td>4. After appropriate evaluation, the symptoms cannot be fully explained by another medical condition</td>
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</tbody>
</table>

Criteria must be fulfilled for at least 2 months before diagnosis

**TABLE 2.** Rome IV diagnostic criteria for aerophagia

Multichannel intraesophageal impedance resulting in a specific pattern characterizes aerophagia. An air swallow is defined as a peak superior to 1000 ohms above baseline moving in the antegrade direction and measured in the most distal impedance segment. (11-13).

Air swallowing during eating and drinking is a normal physiological event. In healthy children each swallow transports a certain quantity of air to the stomach. The stomach protects itself against excessive distension through belching.Transient lower esophageal sphincter relaxation (TLESRs), triggered by gastric distension, is the main mechanism underlying reflux events. It has been shown that TLESRs are generated in response to gastric distension in both health and GERD and they occur more frequently after meals. The activation of mechano-sensitive receptors in the proximal stomach, by stimuli such as air, meal intake, starts a vago-vagal reflex arc that involves central processing and the circuit is completed via a short burst of inhibitory vagal input to the lower esophageal sphincter (LES) (14).

Aerophagia in children is the result of repetitive and excessive air swallows while awake and particularly in the upright position. Patients with aerophagia present supragastric belches more specifically, due to excessive air swallowing (11). With multichannel impedance recording we were able to demonstrate the two different types of belching. The first type is characterized by an increment of intraluminal impedance moving in oral direction, representing venting of gas from the stomach and can be referred to as gastric belching. The second type, characterized by a rapid antegrade impedance rise followed by a rapid retrograde return to baseline represents esophageal air ingestion followed by immediate expulsion. Whereas gastric belches were found both in patients and healthy children, supragastric belches were only seen in patients with excessive aerophagia (13).

It is important to realize that not all gas GER episodes (retrograde flow of gas from the stomach into esophagus) fall under the definition of a belch (a subjective perception, which is assumed to be the result of gas GER episodes and is often accompanied by airflow from the mouth (4).

Belching occurs occasionally and is regarded as normal behavior. In a patient with excessive belching, gastric and supragastric belches are distinguished and this distinction has consequences for therapy. Excessive belching is a behavioral disorder and should be treated as such.

**CONCLUSION**

The clinical manifestations of non erosive gastroesophageal reflux disease are multiple and heterogeneous, and differ according to age and individual susceptibility. The type of reflux and the presence of gas in the refluxate could be relevant in the pathogenesis of symptoms. In this sense, we recommend using pH-metry associated with multichannel intraluminal impedance when we suspect gastroesophageal reflux disease in order to detect all types of reflux and their composition: liquid, mixed or gaseous.

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REFERENCES


