Observational Study of Children With Aerophagia

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Aerophagia involves excessive air swallowing. The clinical features common to all patients are abdominal distention that increases progressively during the day and gaseous distention of the stomach, small bowel, and large bowel on radiographs. Other symptoms, which may be present, are audible air swallowing, excessive burping (eructations), flatulence, and, sometimes, severe abdominal pain or vomiting. Aerophagia is a functional disorder that simulates pediatric gastrointestinal motility disorders. Often the diagnosis is delayed, especially when it occurs concomitantly with functional constipation. Aerophagia has been reported in children with mental retardation, after fundoplication, and in a small number of otherwise healthy children. It is a rarely observed behavior among healthy children and adults (0.14%) and has been diagnosed in 1.3% of 4- to 18-year-old children presenting to a pediatric gastroenterology clinic and in 8.8% of institutionalized mentally deficient adults.

An international committee, the Rome III committee, provided symptom-based criteria for aerophagia. These criteria define aerophagia as at least a 2-month history of 2 of the following signs and symptoms: air swallowing, abdominal distention due to intraluminal air, or repetitive belching or increased flatus. We report the results of a retrospective study of 9 constipated children with gaseous abdominal distention to increase awareness about aerophagia.

Patients and Methods

In this study, 9 constipated children with gaseous abdominal distention are reported. Eight of the children were seen by one of the authors in our general pediatric clinic, and their data were collected prospectively. One child was not seen by the authors but was retrospectively diagnosed with aerophagia; she was discovered during a review of medical records for a study on abdominal pain. Five of the subjects, including the one who was retrospectively diagnosed, received all their medical care at the Children’s Hospital of the University of Iowa, Iowa City, and 4 were referred for consultation due to persistent symptoms of functional constipation with or without fecal incontinence.
The data were collected through chart review using a structured form: age; sex; initial clinical symptoms and features; medical history; findings on the physical examination; results of the evaluations such as abdominal X-rays, anorectal manometry, and laboratory data; time to diagnosis; treatment; and outcome.

The study was approved by the institutional human research review committee.

**Statistical Analysis**

Descriptive data are expressed as the number of patients or percentage. Mean ± standard deviations are calculated.

**Results**

The patient characteristics of the 2 girls and 7 boys, 2 to 10.4 years of age, with aerophagia are presented in the Table. All 9 children had functional constipation defined by the Paris consensus on childhood constipation terminology criteria, and 3 children were also suffering from fecal incontinence (formerly called encopresis). In all, 7 of the 9 children were treated with osmotic laxatives—2 with milk of magnesia, and 5 with polyethylene glycol at the time of presentation with gaseous distention to the author. Seven children were healthy except for problems with defecation. One boy (no. 2), a 32-month-old child who had been previously reported in more detail, was later diagnosed with autism, and 1 boy had pervasive developmental disorder.

**Symptoms**

All children suffered from gaseous abdominal distention, which is the hallmark of this disorder. The increase in abdominal distention as the day progressed was not spontaneously reported in any children, was reported in 7 children only when they were questioned about it, and was documented in one child (no. 1) by measuring the abdominal girth on awakening and in the evening. Patient 9 was flat during one of his appointments, which occurred in the morning.

Audible swallowing, visible swallowing movements in the neck, or some funny noise was reported in 3 children after extensive and multiple questioning and was observed during the clinic visit in 1 child, even after the mother had denied it repeatedly.

Excessive burping was denied by 8 of 9 parents and children. Flatulence during the day was reported in only 3 of 9 children. Seven children had a history of stool withholding. Flatulence at night was often difficult to assess. Parents responded that they did not smell stool, flatulence, or a foul smell when entering the child’s bedroom at night.

Other symptoms were abdominal pain in 3 children and vomiting in 2 children.

**Physical Examination**

The physical examination was remarkable for findings during the abdominal and rectal examinations. The abdomen was visibly distended, nontender, and tympanitic, and bowel sounds were active in all children. No hepatomegaly or splenomegaly was noted. The rectal examination often revealed a dilated rectal ampulla filled with gas; in others, a large amount of stool and gas was present.

**Evaluation**

The hallmark of aerophagia on X-ray is the distended gas-filled loops of small and large bowels (Figures 1 and 2). In 1 child (no. 6), the rectosigmoid was so distended that no reference to stomach or small bowel could be made. Often the radiologist remarked on air-fluid levels suggesting ileus or an enormous amount of stool filling the rectosigmoid and/or colon. Follow-up X-rays still revealed the distended gas-filled loops of bowel when the constipation was adequately treated (Figures 1 and 2).

Laboratory evaluation included stool cultures and stool examinations in a few children to rule out organic disease, anorectal manometry to rule out Hirschsprung disease (nos. 1, 6, and 9), and tests for celiac disease (nos. 3, 4, 6, 8, and 9). One child (no. 6) received antibiotics to treat presumed bacterial overgrowth, with no improvement.

**Time to Diagnosis**

The time to diagnosis is shown in the Table. Excluding the child in whom the diagnosis of aerophagia was done in retrospect, the mean time to diagnosis was 6 months. Even the author needed a mean of 2.6 months to make the diagnosis of aerophagia.
<table>
<thead>
<tr>
<th>Age, y</th>
<th>Sex</th>
<th>Other Problems</th>
<th>Other Abdominal Symptoms</th>
<th>Diagnosis by the Author, mo</th>
<th>Time to Diagnosis, mo</th>
<th>Time to Swallowing Movements, mo</th>
<th>Duration of Aerophagia, mo</th>
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<tbody>
<tr>
<td>2.67</td>
<td>Male</td>
<td>Pain</td>
<td>No</td>
<td>Yes</td>
<td>5</td>
<td>6</td>
<td>6</td>
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<tr>
<td>3.1</td>
<td>Male</td>
<td>Vomiting</td>
<td>Never asked</td>
<td>Never asked</td>
<td>7</td>
<td>0</td>
<td>2</td>
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<tr>
<td>4.2</td>
<td>Female</td>
<td>Mild pain</td>
<td>Never asked</td>
<td>In retrospect</td>
<td>1</td>
<td>0</td>
<td>2</td>
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<tr>
<td>4.8</td>
<td>Male</td>
<td>Constipation and fecal incontinence</td>
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<td>10</td>
<td>2</td>
<td>0</td>
<td>12</td>
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<td>5.6</td>
<td>Male</td>
<td>Burping, flatulence</td>
<td>Yes</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>14</td>
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<td>Constipation and fecal incontinence</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
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<td>6.2</td>
<td>Male</td>
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<td>5</td>
<td>19</td>
<td>20</td>
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<td>10.4</td>
<td>Male</td>
<td>Constipation and fecal incontinence</td>
<td>Yes</td>
<td>19</td>
<td>5</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>
Treatment

Because inadequate laxative dosage was considered to be the cause of the gaseous abdominal distention in some children, the first treatment attempt was to increase the laxative dosage. We discontinued the osmotic laxative in 5 children and gave senna or bisacodyl suppositories before making the diagnosis of aerophagia. Reassurance and explanation of the excessive air swallowing were provided to the parents and the children. We encouraged the child to stop the air swallowing. In addition, we suggested eating slowly, not to use straws or sippy cups for drinking, and not to drink carbonated beverages or chew chewing gum.

Outcome

Follow-up occurred in the clinic or via telephone. As can be seen in the Table, the aerophagia resolved in all after 2 to 20 months (mean = 7.9 months).

Discussion

We report here the presentation of aerophagia in 9 constipated children. This clinical combination needs to be regarded as incidental; others have reported that 7% of the children with aerophagia in their study had constipation. The children who meet the Rome criteria for aerophagia should have at least 2 of the 3 following symptoms: air swallowing, abdominal distention due to intraluminal air, or repetitive belching or increase in flatus. For Rome II criteria, symptoms should persist for at least 12 weeks and for Rome III criteria, for 2 months. Chitkara et al and we doubt that symptom duration should be necessary for diagnosing aerophagia because early recognition and diagnosis of aerophagia is required to avoid unnecessary and expensive diagnostic investigations.

Usually, parents do not report the excessive air swallowing because they do not recognize it as such. When asked about gulping sounds or other frequent noises, 4 children (44%) made sounds or movements suggestive
of air swallowing, similar to reports by Chitkara et al\textsuperscript{10} and Hwang et al.\textsuperscript{1} Even though excessive burping is one criterion of aerophagia, it appears that only 11\% of our children were able to belch excessive swallowed air, similar to another study.\textsuperscript{1}

Only 33\% had excessive flatulence during the day. Flatulence may have been absent due to the comorbidity of fecal retention with retentive posturing in 7 children. Flatulence at night was often denied, similar to another report.\textsuperscript{10}

Gas is normally present throughout the lumen of the gut from the mouth to the anus. This gas is derived from 4 major sources: swallowed air, interaction of gastric acid with alkaline secretions of food, diffusion of gas from the blood stream into the gut lumen, and bacterial fermentation.\textsuperscript{17} It is estimated that 70\% of the gastrointestinal gas is swallowed, 20\% is caused by diffusion of gases from the blood, and 7\% to 10\% is the result of bacterial decomposition.

Under normal circumstances, swallowed air is the predominant source of gastric gas, with a minor contribution from gas refluxing through the pylorus.\textsuperscript{18} Malabsorption of lactose or other carbohydrates and bacterial fermentation of ingested carbohydrates and vegetables containing nonabsorbable carbohydrates result in increased gas production. However, most of the gas present in the intestine is absorbed through the mucosa. Increased gas production in the bowel is often seen in children having constipation, but not in the stomach. This may be due to inadequate treatment with osmotic laxatives, disordered motility, or withholding of stool and gas.

The diagnosis was missed in these children by family physicians, pediatricians, pediatric gastroenterologists, emergency room physicians, pediatric surgeons, and even by the author for a period of time, as outlined in the Table. Many were treated for constipation and developed gaseous distention of the bowel, which made the recognition of aerophagia more difficult.

Aerophagia represents a functional gastrointestinal disorder rather than a disease and is usually self-limited, lasting weeks to months, as in our children. A careful history, physical examination, and a minimal number of radiological studies should differentiate it from an organic disease, such as malabsorption, Hirschsprung disease, chronic intestinal pseudoobstruction, or intestinal obstruction. The key factor in all the children presenting with aerophagia and constipation was the late onset of the abdominal distention and the reduction of the distention at awakening each morning. The combination of abdominal distention of early onset with constipation must always alert the practitioner to the possibility of Hirschsprung disease.

Treatment usually consists of making the child and the parents aware of air swallowing, discouraging air swallowing, and recommending not to use straws or sippy cups for drinking and not to drink carbonated beverages or chew chewing gum.

The main feature of aerophagia common to all constipated children was the late-onset abdominal distention that increased progressively during the day, with resolution of the distention during the night due to excessive air swallowing. Early recognition and diagnosis will help to alleviate the anxiety of both the parents and the patient and prevent unnecessary testing, treatments, and hospital admissions.

References

3. van der Kolk MB, Bender MH, Goris RJ. Acute abdomen from an organic disease, such as malabsorption, Hirschsprung disease, chronic intestinal pseudoobstruction, or intestinal obstruction. The key factor in all the children presenting with aerophagia and constipation was the late onset of the abdominal distention and the reduction of the distention at awakening each morning. The combination of abdominal distention of early onset with constipation must always alert the practitioner to the possibility of Hirschsprung disease.

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