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Observational Study of Children With Aerophagia

Vera Loening-Baucke, MD, and Alexander Swidsinski, MD, PhD

Aerophagia is a rare disorder in children. The diagnosis is often delayed, especially when it occurs concomitantly with constipation. The aim of this report is to increase awareness about aerophagia. This study describes 2 girls and 7 boys, 2 to 10.4 years of age, with functional constipation and gaseous abdominal distention. The abdomen was visibly distended, nontender, and tympanitic in all. Documenting less distention on awakening helped to make the diagnosis. Air swallowing, belching, and flatulence were infrequently reported. The rectal examination often revealed a dilated rectal ampulla filled with gas or

stool and gas. The abdominal X-ray showed gaseous distention of the colon in all and of the stomach and small bowel in 8 children. Treatment consisted of educating parents and children about air sucking and swallowing, encouraging the children to stop the excessive air swallowing, and suggesting to them not to use drinking straws and not to drink carbonated beverages. The aerophagia resolved in all in 2 to 20 months (mean = 8 months).

Keywords: gaseous distention of the bowel; constipation; children; aerophagia

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.¹ 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,²⁻⁴ after fundoplication,⁵ and in a small number of otherwise healthy children.⁶⁻¹⁰ 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 clinic¹¹ and in 8.8% of institutionalized mentally deficient adults.¹²

An international committee, the Rome III committee, provided symptom-based criteria for aerophagia.¹³ 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.¹³

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.¹⁴ 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.

From the Division of General Pediatrics (VL-B), University of Iowa, Iowa City, Iowa; and Department of Gastroenterology, Hepatology, and Endocrinology (AS), Charité Hospital, the Humboldt University, Berlin, Germany.

Address correspondence to: Vera Loening-Baucke, University of Iowa Children's Hospital, 2605 JCP, 200 Hawkins Dr, Iowa City, IA 52242; e-mail: vera-loening-baucke@uiowa.edu.

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 \pm 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,¹⁵ 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,⁹ 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. Data of 9 Children With Visible Abdominal Distention Due to Aerophagia

	Sex	Age, y	Other Diseases	Other Problems	Other Abdominal Symptoms	Swallowing Movements	Time to Diagnosis, mo	Time to Diagnosis by the Author, mo	Duration of Aerophagia, mo
1	Female	2	Constipation		Pain	No	5	5	6
2	Male	2.67	Constipation	Autism	Vomiting	Yes	7	0	9
3	Male	3.1	Constipation	Disruptive behavior	Pain, vomiting	Never asked	1	0	2
4	Female	4.2	Constipation		Mild pain	Never asked	In retrospect	In retrospect	2
5	Male	4.8	Constipation and fecal incontinence	Day and night wetting		No	10	9	12
6	Male	5.6	Constipation			Yes	2	0	2
7	Male	6	Constipation and fecal incontinence	Day and night wetting	Burping, flatulence	Yes	1	1	14
8	Male	6.2	Constipation	Pervasive developmental disorder	Flatulence	No	1	1	4
9	Male	10.4	Constipation and fecal incontinence		Flatulence	Yes	19	5	20



Figure 1. Patient 1, the supine abdominal view of a 2-year-old girl with loose bowel movements on a daily dose of 8.5 g polyethylene glycol shows gaseous distention of small and large bowel loops.

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).



Figure 2. Patient 9, supine view of a 10-year-old boy on a daily dose of 51 g polyethylene glycol. Small and large loops of bowel are filled with air; no stool is seen.

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.¹ 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,¹⁶ symptoms should persist for at least 12 weeks and for Rome III¹³ criteria, for 2 months. Chitkara et al¹⁰ 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 al¹⁰ and Hwang et al.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.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.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.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.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

1. Hwang JB, Choi WJ, Kim JS, et al. Clinical features of pathologic childhood aerophagia: early recognition and essential diagnostic criteria. *J Pediatr Gastroenterol Nutr.* 2005;41:612-616.
2. Holburn CS, Dougher MJ. Behavioral attempts to eliminate air-swallowing in two profoundly mentally retarded clients. *Am J Ment Defic.* 1985;89:524-536.
3. van der Kolk MB, Bender MH, Goris RJ. Acute abdomen in mentally retarded patients: role of aerophagia: report of nine cases. *Eur J Surg.* 1999;165:507-511.
4. Morton RE, Pinnington L, Ellis RE. Air swallowing in Rett syndrome. *Dev Med Child Neurol.* 2000;42:271-275.
5. Kamolz T, Bammer T, Granderath FA, Pointer R. Comorbidity of aerophagia in GERD patients: outcome of laparoscopic antireflux surgery. *Scand J Gastroenterol.* 2002;31:204-207.
6. Stone RT, Morgan MC. Aerophagia in children. *Am Fam Physician.* 1971;3:94-95.
7. Rosenbach Y, Zahavi I, Nitzan M, Dinari G. Pathologic childhood aerophagy: an under-diagnosed entity. *Eur J Pediatr.* 1988;147:422-423.
8. Gauderer MW, Halpin TC Jr, Izant RJ Jr. Pathologic childhood aerophagia: a recognizable clinical entity. *J Pediatr Surg.* 1981;16:301-305.
9. Loening-Baucke V. Aerophagia as cause of gaseous abdominal distention in a toddler. *Pediatr Gastroenterol Nutr.* 2000;31:204-207.
10. Chitkara DK, Bredenoord AJ, Wang M, Rucker MJ, Talley NJ. Aerophagia in children: characterization of a functional gastrointestinal disorder. *Neurogastroenterol Motil.* 2005;17:518-522.

11. Caplan A, Walker L, Rasquin A. Validation of the pediatric Rome II criteria for functional gastrointestinal disorders using the questionnaire on pediatric gastrointestinal symptoms. *J Pediatr Gastroenterol Nutr.* 2005;41:305-316.
12. Lekkas CN, Lentino W. Symptom-producing interposition of the colon: clinical syndrome in mentally deficient adults. *JAMA.* 1978;240:747-750.
13. Rasquin A, Di Lorenzo C, Forbes D, et al. Childhood functional gastrointestinal disorders: child/adolescent. *Gastroenterology.* 2006;130:1527-1537.
14. Loening-Baucke V, Swidsinski A. Constipation as cause of acute abdominal pain in children. *J Pediatr.* 2007; 151:666-669.
15. Benninga MA, Candy DCA, Catto-Smith AG, et al. The Paris consensus on childhood constipation terminology (PACCT) group. *J Pediatr Gastroenterol Nutr.* 2005;40: 273-275.
16. Rasquin-Weber A, Hyman PE, Cucchiara S, et al. Childhood functional gastrointestinal disorders. *Gut.* 1999;45(suppl 2):II60-II68.
17. Sferra TJ, Heitlinger LA. Gastrointestinal gas formation and infantile colic. *Pediatr Clin N Am.* 1996; 43: 489-510.
18. Lasser RB, Bond JH, Levitt MD. The role of intestinal gas in functional abdominal pain. *N Engl J Med.* 1976;293:524-526.