SECTION EDITOR: BEVERLY P. WOOD, MD

Radiological Case of the Month

Michael A. Gittelman, MD; John Racadio, MD; Javier Gonzalez del Rey, MD

A 1-MONTH-OLD MALE was brought to the emergency department with a 3-day history of vomiting. The parents stated that the infant had been feeding on a 1:1 ratio of water mixed with formula (Similac with iron; Abbott Laboratories, Abbott Park, Ill) (2.9 J/mL [20 cal/oz]), 120 mL every 4 hours, and he had been gaining weight appropriately. Three days prior to the visit, the child began to regurgitate more frequently than he had in the past. His emesis was nonbilious, nonbloody, and composed mainly of formula. His mother stated that the emesis had become more forceful and frequent during the previous 2 days. He also developed frequent, watery stools that were nonbloody in appearance. The pediatrician had recommended an oral electrolyte maintenance solution (Pedialyte; Abbott Laboratories) in small amounts for 24 hours in response to the symptoms; however, the child continued to have persistent and occasionally projectile vomiting. There were no contacts with ill people and no history of fever, nasal congestion, difficulty breathing, cyanosis, or pain. He was taking no medications or other formulas. His birth history was unremarkable, with a birth weight of 3.3 kg.

The initial examination revealed an awake, active, 1-month-old infant in no apparent distress. Vital signs were a rectal temperature of 37.5°C (99.4°F); heart rate, 150 beats/min; respiratory rate, 36/min; blood pressure, 97/62 mm Hg; and weight, 3.8 kg (500 g more than the birth weight). His anterior fontanelle was flat, open, and not depressed. His mucous membranes were pink and slightly dry, with several adherent white plaques on the buccal and gingival mucosa. The lungs were clear to auscultation. The results of cardiac examination revealed a sinus tachycardia with no murmurs, gallops, or rubs. His abdomen was slightly distended yet soft. No abdominal masses were palpated, and normal, active bowel sounds were heard. Capillary refill was less than 2 seconds, and palpated peripheral pulses were strong. The testes were palpated bilaterally in the scrotum. In a rectal examination, normal tone was appreciated and the stool specimen tested negative for blood. The results of a neurologic examination were normal.

Laboratory studies disclosed the following values: hemoglobin, 119 g/L; hematocrit, 0.33; white blood cell count, 1.4×10^9/L, with neutrophils, 0.29; lymphocytes, 0.37; and monocytes, 0.26; platelet count, 4.2×10^9/L; serum sodium, 136 mmol/L; potassium, 5.6 mmol/L; chloride, 99 mmol/L; bicarbonate, 29 mmol/L; serum urea nitrogen, 2.9 mmol/L (8 mg/dL); and creatinine, 30.5 µmol/L (0.4 mg/dL). A radiograph of the abdomen was obtained (**Figure 1**) followed by an upper gastrointestinal series, which was performed to rule out pyloric stenosis (**Figure 2** and **Figure 3**).

From the Division of Emergency Medicine (Drs Gittelman and Gonzalez del Rey) and the Department of Radiology (Dr Racadio), Children's Hospital Medical Center, University of Cincinnati, Cincinnati, Ohio.

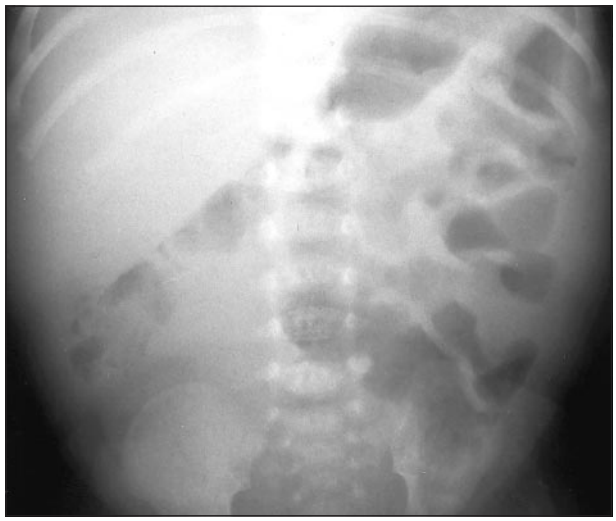

Figure 1.

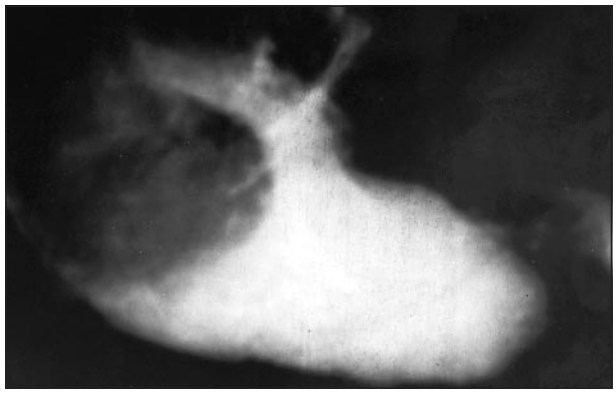

Figure 2.

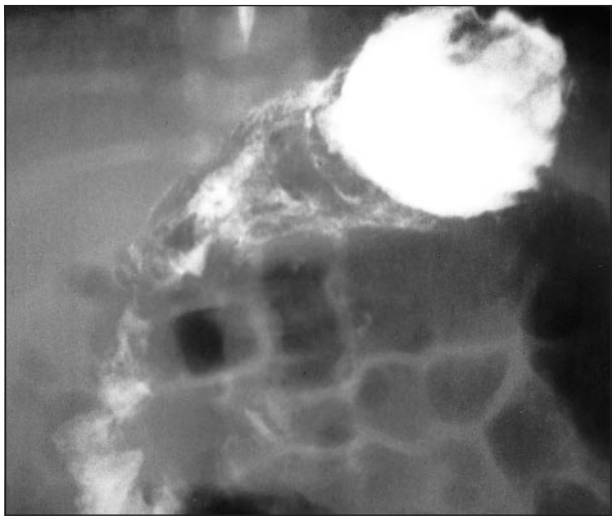

Figure 3.

Denouement and Discussion

Lactobezoar

Figure 1. *Anteroposterior abdominal radiograph of the patient in the supine position demonstrates a normal bowel-gas pattern including a normal-appearing stomach.*

Figure 2. *Oblique spot film from an upper gastrointestinal series shows a rounded filling defect in the gastric body.*

Figure 3. *In a radiograph of the patient in the supine position, the gastric mass has moved dependently into the gastric fundus and appears irregular and partially obscured by barium. These characteristics are typical of a lactobezoar. The pylorus was normal. In the results of fluoroscopy, the barium progressed through the normal small bowel.*

Bezoars are defined as "a calculus or concretion found in the stomach or intestine of certain animals."[1] Infants and children were believed to acquire bezoars as a result of habitually swallowing hair from dolls, wool from blankets, or proteinaceous material, such as persimmon seeds or various tar products, which form a shellaclike substance after mixing with gastric acids.[2] Hairballs (trichobezoars) and vegetable matter concretions (phytobezoars) are more common in developmentally disabled or emotionally disturbed children, who may habitually ingest these indigestible materials.[2] Since 1980, reports in the literature[3] have suggested the presence of other types of bezoars, such as undigested milk curds (lactobezoars) or bezoars from specific medicines, including antacids.

In infants, lactobezoars are the most commonly encountered type of bezoar. Although the underlying mechanism that causes lactobezoars remains unclear, many studies have shown associated factors that contribute to their formation. The majority of these infants were born preterm (<33 weeks estimated gestational age), had a low birth weight (<1.5 kg), and received formulas containing 3.3 J/mL (24 cal/oz).[3-6] All these formulas had high casein-whey ratios, high calcium-phosphate ratios, and a fat source of medium- and long-chain triglycerides. More recent studies show that lactobezoars occur in full-term infants,[7] infants receiving human milk (2.9 J/mL [20 cal/oz]),[6,8] and infants receiving soy formula with a low casein-whey ratio.[5] Some researchers postulate that physiologic mechanisms, including insufficient gastric secretions or abnormal gastric emptying, cause bezoar formation.[9]

Patients with a lactobezoar may have abdominal distension, a palpable mass in the left upper quadrant of the abdomen, or nonbilious emesis, which was a symptom of the patient described herein.[3] Other patients may not have symptoms, but a masslike foreign body may be seen on a radiograph. Abdominal radiographs may show a normal stomach, bowel, and gas pattern or an intraluminal, mottled gastric mass that is outlined by air. In our patient, the results of an upper gastrointestinal tract examination showed that the mass was intraluminal and separate from the gastric wall. Using abdominal ultrasonography, Naik et al[10] showed a hyperechoic intraluminal gastric mass with a heterogeneous echo texture.

Significant morbidity, including gastric obstruction with consequent perforation and metabolic or hemodynamic changes secondary to persistent emesis, has been associated with lactobezoars.[5] Appropriate treatment should include early recognition, bowel rest, and formula change to a predigested elemental diet. Medical treatment alone often results in a favorable outcome. Surgery should be reserved for lactobezoars in which complications, such as gastric perforation, have occurred.

REFERENCES

1. Stein J, ed. *The Random House Dictionary of the English Language.* New York, NY: Random House Inc; 1971:144.
2. Behrman R, ed. *Nelson Textbook of Pediatrics.* 14th ed. Philadelphia, Pa: WB Saunders Co; 1992:960.
3. Grosfeld JL, Schreiner RL, Franken EA, et al. The changing pattern of gastrointestinal bezoars in infants and children. *Surgery.* 1980;88:425-432.
4. Green D, Mimouni F. Neonatal radiology casebook. *J Perinatol.* 1993;13:235-236.
5. Bakken D, Abramo T. Gastric lactobezoar: a rare cause of gastric outlet obstruction. *Pediatr Emerg Care.* 1997;13:264-267.
6. Yoss BS. Human milk lactobezoar. *J Pediatr.* 1984;105:819-822.
7. Usmani SS, Levenbrown J. Lactobezoar in a full-term breast-fed infant. *Am J Gastroenterol.* 1989;84:647-649.
8. Singer JL. Lactobezoar causing an abdominal triad of colicky pain, emesis, and mass. *Pediatr Emerg Care.* 1988;4:194-196.
9. Schreiner RL, Brady MS, Franken EA, et al. Increased incidence of lactobezoars in low birth weight infants. *AJDC.* 1979;133:936-940.
10. Naik DR, Bolia A, Boon AW. Demonstration of lactobezoar by ultrasound. *Br J Radiol.* 1987;60:506-508.