The diagnosis of unsuspected foreign body ingestion is a common problem in children. We describe a toddler who presented with persistent vomiting and dehydration. A plain radiograph of the abdomen did not reveal a foreign body. However, abdominal ultrasonography promptly identified a funnel-shaped foreign body obstructing the gastric outlet. This was extracted by upper endoscopy. A recent review of the literature shows increasing evidence that abdominal ultrasonography is an equally complementary diagnostic modality for ingested foreign bodies in children.

Key Words: Gastrointestinal foreign body, Sonographic diagnosis, Gastric outlet obstruction, Abdominal ultrasonography.

INTRODUCTION

Foreign bodies are frequently ingested by young children, mostly by ambulatory toddlers who explore their surroundings orally. Almost 40 percent of the ingestion of the foreign bodies are unwitnessed and 50 percent are asymptomatic. Depending on the size, shape, content and nature, most ingested small objects on reaching the gastrointestinal tract pass through spontaneously within 2-6 days, but may take up to four weeks. While serious complications such as bowel obstruction or perforation can occur, gastric outlet obstruction by the ingestion of a foreign body is uncommon.

We report a case of a toddler presenting with persistent vomiting caused by an ingested foreign body obstructing the gastric outlet. A plain radiograph of the abdomen did not reveal the presence of a foreign body; however, abdominal ultrasonography detected the obstructing foreign object which was extracted by upper gastroscopy.

CASE PRESENTATION

A 19-month old toddler presented with a one-week history of persistent non-bilious vomiting and intolerance of oral fluids and solids. The vomiting was associated with abdominal distention and a low-grade fever. There was no history of diarrhea, choking or the witnessing of the ingestion of a foreign body. Physical examination revealed a distended abdomen with increased bowel sounds, but no tenderness and no organomegaly. The patient was hospitalized with the clinical diagnosis of gastritis with moderate dehydration. The vomiting ceased with intravenous hydration and keeping the patient on nil by mouth. As he was restarted on clear oral fluids, the vomiting recurred. Flat film of
the abdomen showed paucity of gas in the gut which was reported as normal. The suspicion of a faint radio-density projecting over the stomach was seen retrospectively following the results of the abdominal sonography (Figure 1).

An abdominal ultrasound done showed a small echogenic structure localized to the region of the pyloris. The structure was obstructing the gastric outlet (Figure 2) as evidenced by a distended fluid filled stomach.

Figure 1: Abdominal radiograph showed a relative paucity of gas in the gut. The faint radio-density (arrow) which represented the foreign body was noted retrospectively.

Figure 2: Abdominal sonogram demonstrated the presence of a small echogenic structure casting an acoustic shadow localized to the region of the pylorus. The structure appeared to be creating a gastric outlet obstruction as evidenced by a massively distended fluid filled stomach.

An urgent upper gastroscopy was performed under general anaesthesia. The procedure revealed a normal but hugely dilated stomach with a funnel-shaped plastic foreign body impacting and completely obstructing the pylorus (Figure 3). The foreign body was extracted (Figure 4) with a snare and forceps. The patient was discharged home 24 hours following gastroscopy on a regular diet and ranitidine for mild esophageal erosions. The specimen was examined by the pathologist who confirmed a pink funnel-shaped structure measuring 2.3x2x2 centimeters. Similar plastic objects are typically fixed to balloons as handles and are readily available to children.

DISCUSSION
Foreign body ingestion occurs commonly in children, especially toddlers. Small colorful toys are attractive ingestion hazards for toddlers. Once
past the lower esophageal sphincter (LES), the majority of regularly-shaped smooth foreign bodies usually pass spontaneously through the gastrointestinal tract within 4-6 days, but may take up to 4 weeks. Gastric outlet obstruction as seen in our patient, causes persistent vomiting with dehydration.

While 80% of ingested foreign bodies pass through spontaneously, 10-20% require intervention and 1% need surgical removal. Conventional radiography will identify most radio-opaque metallic objects, but may not detect radiolucent objects such as plastic objects, wood, glass, fish or chicken bones. Hence, the diagnosis of radiolucent foreign bodies in the gastrointestinal tract can be challenging.

Oral contrast studies have been utilized to locate ingested non-opaque foreign bodies which appear as filling defects. However, oral contrast studies have the potential risk of aspiration in cases of a high grade obstruction or poor control of secretions. They are to be avoided if esophageal perforation is suspected. If perforation is suspected and a study is necessary, an isotonic contrast agent may be used, whereas Gastrograffin and Barium are contraindicated. Moreover, the coating of the foreign object may compromise the endoscopic findings.

Sonography, unlike conventional radiography, is not dependent on radiographic density and does not involve ionizing radiation. Despite its ease of use and relative low cost, sonography has been considered a poor imaging modality to detect abdominal foreign bodies as an air-filled bowel is difficult to visualize.

The sonographic diagnosis of a foreign body depends on primary and secondary signs. The foreign object elicits its own primary signs by casting an echogenic mass with a dense acoustic shadow. The secondary signs due to tissue edema or hemorrhage result in a hypoechoic area surrounding the foreign body. Distension of the stomach or the bowel segments is a further important secondary sign of an obstructing foreign body. Fluid-filled bowel loops allow sonographic demonstration of the foreign body. Multiple studies have shown the effectiveness of sonography in detecting soft tissue foreign bodies. Ginsburg et al demonstrated that sonography is the most reliable method of detecting non-opaque soft tissue foreign bodies. Caspi et al revealed that sonography is effective in detecting foreign bodies in vaginal orifices.

Several cases of abdominal foreign bodies detected by ultrasonography have been reported. Isaac reported the detection of a ball point pen by abdominal ultrasonography in a 4-year-old female. It appeared as a hyperechoic linear mass with a strong acoustic shadow. Asad et al diagnosed a case of appendicitis due to an accidentally ingested endodontal file which lodged in the appendix. The graded compression technique was used in abdominal sonography to detect the precise location of the missing object. In a 5-year-old boy, ileal perforation occurring secondary to an ingested fragment of a skewer was identified by Rathaus et al by using abdominal sonography. The abdominal sonogram revealed the presence of a hyperechoic straight-line foreign body embedded within a hypoechoic inflammatory mass. An earlier case of gastrointestinal perforation due to a swallowed toothpick was recognized sonographically by Chau et al.

In a review of 23 cases of abdominal foreign bodies diagnosed sonographically, Kuznetsov et al concluded that ultrasonic examination provided the maximal information about sizes, structure, location of foreign abdominal bodies, their depth of location and relationship with abdominal organs. This case report adds to the increasing evidence that the skilled use of ultrasonography, a noninvasive painless diagnostic modality, can detect abdominal foreign bodies.

Ingestion of foreign bodies should be considered in the evaluation of persistent vomiting in a toddler. Some objects may not be radio-opaque and may be difficult to find by plain radiographic views. This report, along with the literature review, shows that abdominal ultrasonography is preferred to plain film and oral contrast studies in the diagnosis of suspected foreign body ingestion.

REFERENCES
1. Chen MK, Beierle EA. Gastrointestinal foreign bodies. Pediatr Ann. 2001; 30:736-42.
2. Dahshan A. Management of ingested foreign bodies in children. J Okla State Med Assoc 2001; 94:183-6.
3. Arana A, Hauser B, Hachimi-Idrissi S, Vandenplas Y. Management of ingested foreign bodies in childhood and review of the literature. Eur J Pediatr 2001; 160:468-72.
4. Panieri E, Bass DH. The management of ingested foreign bodies in children – a review of 663 cases. Eur J Emerg Med 1995; 2(2):83-7.
5. Yalcin S, Karnak I, Ciftci AO, Senocak ME, Tanyel FC, Buyukpanmucu N. Foreign body ingestion in children: an analysis of pediatric surgical practice. Pediatr Surg Int 2007; 23(8):755-61.
6. American Society For Gastrointestinal Endoscopy: Guidelines for the management of ingested foreign bodies. Gastrointestinal Endoscopy 2002; 55(7):802-6.
7. Davae KC, Sofka CM, DiCarlo E, et al. Value of Power Doppler Imaging and the Hypoechoic Halo in the Sonographic Detection of Foreign Bodies: Correlation with Histopathologic Findings. J Ultrasound Med 2003; 22:1309-13.
8. Lyon M, Braham L, Johnson D, et al. Detection of Soft Tissue Foreign Bodies in the Presence of Soft Tissue Gas. J Ultrasound Med 2004; 23: 677-81.
9. Gooding GA, Hardiman T, Sumers M, et al. Sonography of the Hand and Foot in foreign body detection. J Ultrasound Med 1987; 6: 441-7.
10. Soudack M, Nachtigal A, Gaitini D. Clinically Unsuspected Foreign Bodies: The Importance of Sonography. J Ultrasound Med 2003; 22: 1381-5.
11. Romero M, Bargallo X, Lopez-Quillones MT, et al. Sonography of a Mercury Foreign Body in the Hand. J Ultrasound Med 2004; 23: 711-14.
12. Ginsberg MJ, Ellis GL, Flom LL. Detection of soft tissue foreign bodies by plain radiography, xerography, computerized tomography, and ultrasonography. Ann Emerg Med 1990; 6:701–3.
13. Caspi B, Zalel Y, Elchalal U, Katz Z. Sonographic detection of vaginal foreign bodies. J Ultrasound Med 1994; 13: 236-7.
14. Isaac DL. Detection of a Ballpoint Pen in a Patient’s Abdomen by Sonography. J Ultrasound Med 2006; 25: 1095-8.
15. Asad S, Bae K, Jeon K, et al. Appendicitis Caused by a Foreign Body of Dental Origin: Diagnosis with Ultrasonography. J Ultrasound Med 2007; 26:967-70.
16. Rathaus V, Ilan E, Zissin R. Ileal Perforation due to an ingested fragment of a skewer. J of Ultrasound Med 2006; 25:389-91
17. Chau W, Wu SS, Wang JY. Ultrasonic detection of an intra abdominal foreign body. J Clin Ultrasound 1985; 13:130-1.
18. Kuznetsov NA, Ziniakova MV, Kharitonov SV, et al. Ultrasonic diagnosis of abdominal foreign bodies. Khirurgija (Mosk) 2001; 10:21-3.
19. Boyse TD, Fessell DP, Jacobson JA, Lin J, Holsbeeck MT, Hayes CW. US of soft-tissue foreign bodies and associated complications with surgical correlation. Radio Graphics 2001; 21:1251-6.