

Multiple Magnets Ingestion Followed by Intestinal Fistula With Mild Symptoms

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Abstract

A healthy 3-year-old boy visited our hospital because of abdominal pain and vomiting, and abdominal X-ray revealed a 10 mm non-sharp foreign body in the lower abdomen. No one had witnessed accidental ingestion. Abdominal symptoms were mild. We followed-up with abdominal X-rays, but the foreign matter did not move. His grandfather remembered that he was playing with a posting magnet. Thus, the foreign matter was considered to be multiple magnets. No foreign body was excreted by laxative administration. There was no foreign matter revealed even by the colonoscopy. Because a fistula was found in the ileum, it was diagnosed as gastrointestinal perforation. Three magnets adhered from inside the fistula were removed by emergency laparotomy surgery. The final diagnosis was ileal sigmoid fistula due to damage of the mucous membrane sandwiched between the magnets. Multiple magnet ingestion often causes gastrointestinal injury. Even if the symptoms are mild, it should be removed promptly.

Keywords

magnet ingestion, intestinal fistula, surgery, children

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Case Presentation

A previously healthy 3-year-old boy visited our hospital because of abdominal pain and vomiting. On presentation, he was afebrile and vigorous. Physical examination revealed weakened peristalsis, but his abdomen was soft and flat with no tenderness. He did not have any rash, cough, and chest pain. Laboratory examinations showed mild leukocytosis ($12.5 \times 10^3/\mu\text{L}$, 89.4% neutrophils and 8.6% lymphocytes) and C-reactive protein elevation (0.59 mg/dL), whereas no other abnormal findings were observed. An abdominal X-ray examination was performed to assess the presence or absence of ileus and revealed a 10 mm large non-sharp object in the lower abdomen (Figure 1). No one had witnessed foreign body (FB) ingestion or knew what he ingested. Because his abdominal pain was not severe only with mild tenderness, we decided to follow him carefully and waited for spontaneous discharge of FB. Follow-up abdominal X-ray 5 days after the first visit revealed that the FB stayed at the same site, although he was well and had meals as usual. He defecated every 1 to 2 days and received an enema, whereas no FB was discharged. Abdominal pain, vomiting, and other gastrointestinal symptoms were not

observed after the first visit. He was admitted to our hospital in order to remove FB.

Clinical Course

By expanding X-ray (Figure 2a), the FB was presumed to be multiple magnets. Then, his grandfather remembered that he had been playing with the magnets attached to a refrigerator. Although he was treated with a sufficient amount of laxative, FB was not discharged. Then, we tried to remove FB by colonoscopy under general anesthesia. Nothing was found at the end of ileum. However, in the near-end of the ileum, there was an indentation, which seemed a diverticulum with redness and ulcer (Figure 2b). We considered that FB had stuck into Meckel's diverticulum. We injected a contrast agent to depict the diverticulum. Contrast agent was injected to the

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Figure 1. Abdominal X-ray at first visit. A radiopaque foreign body is present in the lower abdomen.

indentation and leaked into the abdominal cavity. Because gastrointestinal perforation was suspected, an emergency laparotomy was performed. A puncture was found at 10 cm from the ileocecal valve. There were 3 magnets stuck in the fistula and sigmoid colon was adhered penetrating through the mesentery. The periphery of the perforated portion was trimmed, and the entire layer was sutured (Figure 2c). Magnets were removed, and he recovered well and was discharged 6 days later with no complications. After surgery, we reviewed the endoscopic image, but we could not find the fistula of the sigmoid colon.

Final Diagnosis

Ileal sigmoid fistula caused by multiple magnets ingestion.

Discussion

Foreign body ingestion is common in pediatric practice. In 2000, the American Association of Poison Control Centers reported that 75% of more than 116 000 accidental drinking incidents occurred in children 5 years of age or younger. Compared with adults, 98% of children's FB ingestion is accidental and involves common things found in the home environment such as coins, toys, jewelry, magnets, and batteries.¹ Most of FB will be passed in the stool within a few days without serious complications. However, ingestion of button batteries or multiple magnets is hazardous and can be life-threatening. In the United States, the number of accidental magnet ingestion has increased 8.5-fold during the 10-year period. Abbas et al reported that a majority of patients who had ingested magnets were younger than 5 years of age.²

Magnets are widely used in daily life. There are numerous toys and pasting tools using magnets, which are close to children. Accidental ingestion of magnets has occurred since long ago, and the risk of tissue damage due to ingestion of multiple magnets or single magnet with metallic objects has also been recognized for many years. However, attention of the guardians may not be sufficient, since they do not always recognize their danger sufficiently. When ingested alone, the magnet goes through the gastrointestinal tract without difficulty. In contrast, multiple magnets ingestion can cause serious complications. Although FB rarely get into the appendix and diverticulum, complications including gastrointestinal mucosal erosion, ulceration, perforation, and fistula formation can arise when multiple magnets or magnets and metallic objects are ingested. Complications associated with multiple magnets ingestion occur with a probability of about 50%.² They often enter separately into the gastrointestinal tract, and then attach together, pinching the intestine. The sandwiched intestinal tract will suffer from pressure necrosis resulting in fistula formation and/or perforation followed by peritonitis. Toys using strong magnetic force such as neodymium magnets are widely available. Such toys are particularly at high risk of gastrointestinal damage, and even death cases have been reported worldwide.³ The magnets removed in our patient had strong magnetic force.

It is noteworthy that intestinal damage due to multiple magnets can be completely or almost asymptomatic like our patient.⁴ Children with multiple magnets ingestion can be asymptomatic for several days, even if they were complicated by a perforation of the gastrointestinal tract.⁵ Yamanouchi and colleagues reported noninvasive anastomosis using rare earth magnets. Thereafter, magnets have been used since the 2000s to enable intestinal anastomosis by noninvasive surgical techniques. The advantage of magnetic compression anastomosis includes avoidance of general anesthesia, abdominal surgery, and conventional surgical complications such as anastomotic leaks. It is presumed that the cause of mild abdominal pain and vomiting in our patient may not be due to fistula formation but transient obstruction of intestinal tract. Some patients with multiple magnets ingestion may have nonspecific gastrointestinal symptoms including abdominal pain and vomiting, which may mimic viral gastroenteritis. These facts indicate that unwitnessed multiple magnets ingestion is quite difficult to diagnose early.

Another reason for the late diagnosis in our patient was that magnets tightly attached together and looked

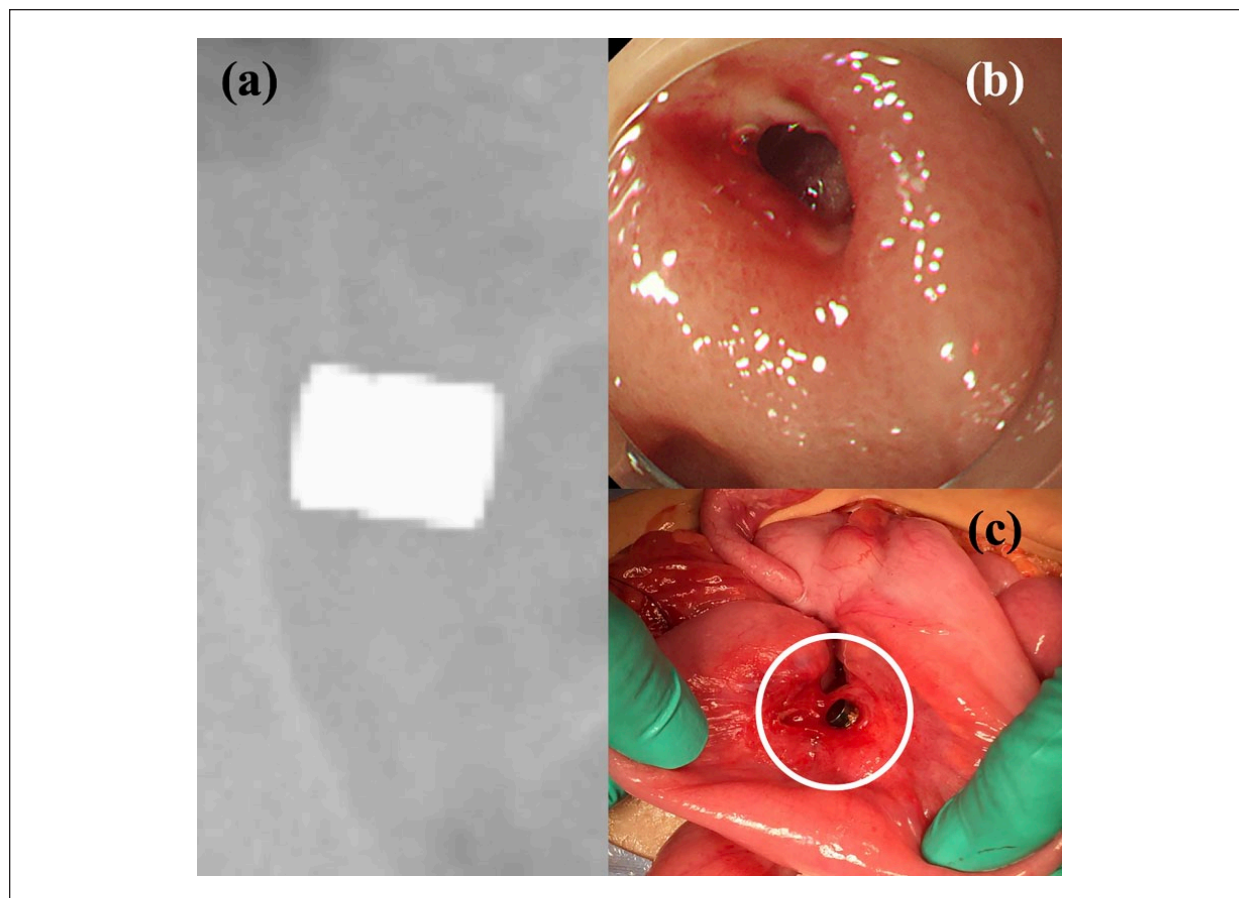


Figure 2. (a) Enlarged image of foreign body. It seems that 3 objects stuck together. (b) Indentation at the end of ileum. (c) Three strongly stuck magnets existed in the ileal peritoneum (within white circle).

like a single object. It is very important to differentiate ingestion of multiple magnets from that of a single magnet. For this purpose, multiple radiographic views are recommended. Expansion of abdominal X-ray was useful to diagnose multiple magnets ingestion in our patient. At present, an expansion of radiogram is easy by the application of digital imaging techniques. When an ingestion of multiple magnets is suspected, an expansion of radiogram may be useful for diagnosis.

Conclusion

Accidental ingestion of multiple magnets has been increasing and may be difficult to diagnose, especially unwitnessed cases. Multiple magnets accidental ingestion can easily cause serious gastrointestinal injury and require invasive treatment to remove the magnets. For the prevention of such accidents, appropriate regulation and safety standards should be established. In addition, parents need to keep in mind to use magnets outside the reach of children.

Author Contributions

RM, MO, KK and SN managed and/or treated the patient. RM and MO wrote the manuscript and AO advised the treatment and reviewed the manuscript. All authors read and approved the final manuscript.

Declaration of Conflicting Interests


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