Coc Cer Derg/Turkish J Ped Surg 2022;36(1): 62-66
doi: 10.29228/JTAPS. 53681

Case Report

Çocuk Cerrahisi Dergisi
Turkish Journal of Pediatric Surgery
Volume 36 Number 1 2022

A Case of Intestinal Perforation Due To Multiple Magnet Ingestion: Minimally invasive approach is possible

Beyza Kose Kusluk, Esra Ozcakir, Sefer Tolga Okay, Mete Kaya

University Of Health Sciences, Bursa Medical Faculty, Department Of Pediatric Surgery, Bursa, TURKEY

Abstract

Ingestion of foreign bodies is a common problem in children, most of which pass spontaneously through the gastrointestinal tract. A single magnet is like other foreign bodies, but it is an emergency situation when ingested more than one or with metallic objects together. They can bind by dragging the loops due to the strong attraction force, eventually leading to serious complications such as ulceration, necrosis, fistula formation, perforation, intestinal obstruction, and volvulus in the intestinal wall. In this report, we aim to present a case with acute abdominal symptoms caused by many magnets ingestion in the review of the literature.

Keywords: *Foreign body ingestion, magnet ingestion, minimally invasive approach*

Geliş/Received: 11.06.2021
Kabul/Accepted: 11.08.2021
Published online: 01.04.2022

Cite as: Kose Kusluk B, Ozcakir E, Okay ST, Kaya M. A case of intestinal perforation due to multiple magnet ingestion: Minimally invasive approach is possible. Coc Cer Derg/Turkish J Ped Surg 2022;36(1): 62-65. . doi: 10.29228/JTAPS. 53681

Mete Kaya
Çamlıca Mh. Ahmet Taner Kışlalı Cad. No 57 Park Evleri C-1,
Nilüfer 16110 Bursa - TÜRKİYE
✉ kayamete@yahoo.com
ORCID: 0000-0002-8877-5737

Beyza Kose Kusluk 0000-0002-5669-1432
Esra Ozcakir 0000-0002-0773-7430
Sefer Tolga Okay 0000-0002-2716-6006

Introduction

Foreign bodies ingested by children usually leave the gastrointestinal tract without any problems. Although a single ingested magnet has a similar process to other foreign bodies, when a child ingested multiple or with metallic objects, they can cause ulcers and pressure necrosis in the intestinal wall, and subsequently perforation, fistula formation, and intestinal obstruction[1]. Management of magnet ingestion ranges from observation spontaneously leaving of the magnet from the gastrointestinal system with serial graphics up to serious complications that require surgical intervention [1,2].

We aimed to present an 8-year-old male patient with intestinal perforations due to multiple magnets ingestion and to discuss the management by reviewing the literature.

Case report

An 8-year-old male patient was referred to our clinic with complaints of abdominal pain and bilious vomiting for 2 days. It was learned from history that the child ingested some magnets 3 days ago, when it was detailed, he was influenced by the games on the internet and he would have a special magnetic power if he ingests the magnets. Physical examination revealed abdominal tenderness, defense, and rebound in all quadrants and decreased bowel movements. Laboratory results were within normal limits except leucocyte count of 36 450/mm3 with 76% neutrophils. There was no free air in the abdominal X-ray examination but dilated bowel loops and multiple opaque foreign bodies in the left lower abdomen were seen (Figure 1).

When compared to the radiograph taken the day before in the referral center, it was understood that the foreign bodies did not move. Since the patient's vital signs were stable and there were signs of peritonitis, we opted to perform a minimally invasive approach by laparoscopy. Laparoscopy was performed by creating 12 mmHg pneumoperitoneum and placing a transumbilical 10 mm camera port and right lower quadrant 5 mm working port, it was observed that the omentum adhered to the intestines. When the omentum was retracted, perforations in the small intestine and magnets sticking together from the intestinal wall were observed (Figure 2a and 2b).

Figure 1. Plain abdominal X-ray shows multiple magnets arranged in a rosary in the lower left quadrant

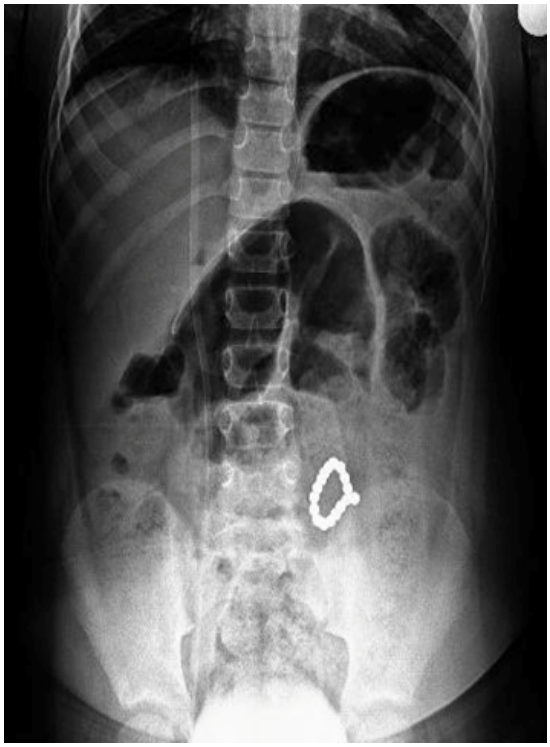
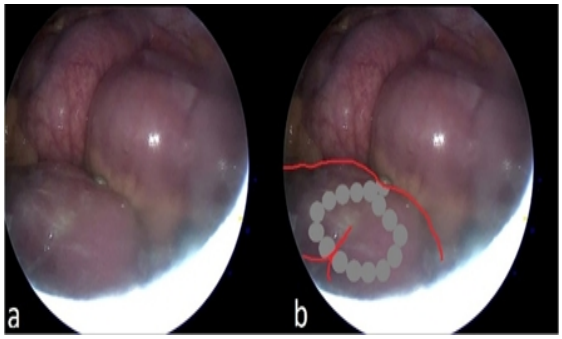


Figure 2. Laparoscopic photographs showing the small intestine perforated by a magnet (a); and the possible mechanism the other two perforations (b)



However, since it would be difficult to repair the perforation sites intracorporeally without escaping the magnets into the intestinal lumen, the umbilical port incision was extended and the perforated segment was taken out of the abdomen (Figure 3a). All of the magnets (17 spherical Buckyballs) were removed in the form of a rosary (Figure 3b). The perforation points were repaired primarily using with 4/0 polyglactin suture (Figure 3c and 3d). The postoperative treatment was uneventful; he was

Figure 3. Intraoperative photograph showing perforated bowel segment (a), removed magnets (b), perforation points (arrows) (c), and repair (d) after removal from the umbilical incision

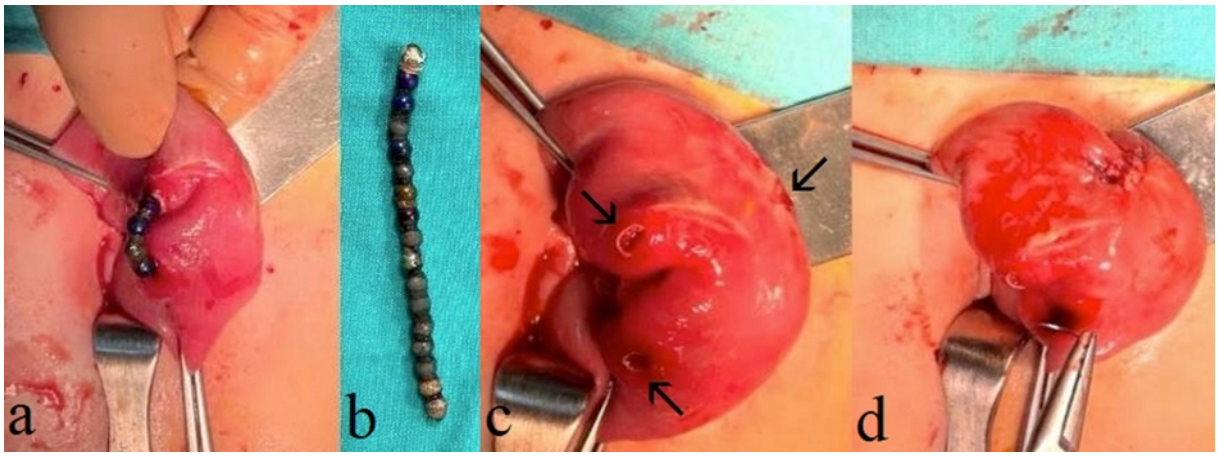


Figure 4. Postoperative cosmetic appearance of the umbilical incision

discharged on the 7th postoperative day without complications. The cosmetic appearance was satisfactory at postoperative 2nd month (Figure 4).

Discussion

Approximately 90% of ingested foreign bodies pass through the gastrointestinal tract without any problems, 10-20% require non-surgical intervention, and less than 1% surgical intervention [3,4]. Powerful rare-earth magnets, usually made of neodymium iron boron or samarium cobalt alloys, are found in toys. These different diameter magnets can attract each other across the intestinal wall up to 6 times and are strong enough to reposition the intestines to meet [1]. When the multiple magnets are aligned within reach of each other's magnetic force, they attract strongly each other, dragging the intestinal walls where they continue to apply pressure, causing perforation and pressure necrosis, and finally, fistula, bleeding, or intestinal obstruction [3]. This mechanism may explain fistulas between two intestinal loops for disc-shaped or flat-surface magnets, but not multiple perforations within the same loop. Naji et al. have suggested that for spherical magnets, the propulsive force of peristalsis may cause the magnets to separate from each other, and after a while, the attractive magnetic effect binds the objects together again, causing the entire thickness of the intestinal wall (one or two different intestinal sections) to be squeezed between the magnets [2]. This detachment and reattaching theory may valid for small round magnets. As in our case, it can be thought that the presence of three perforations only in the 3 cm intestinal segment, causing many perforations due to detaching and reattaching by the intestines with peristaltic movements.

Most foreign body ingestions typically occur in children younger than 3 years of age, but ingestion of rare-earth magnets appear to have an approximately bimodal age distribution with peaks at 2 to 4 years of age and 8 to 10 years of age, with intakes extending into the teenage years. The recent frequent use of magnets as fake piercings to mimic piercings predisposes teenagers, especially young girls, to rare earth magnet-related injuries. On the other hand, children cannot disclose magnet ingestion for fear of side effects, which puts them at risk of delay in treatment [(1)]. Neodymium magnets, often small spheres called Buckyballs, have been produced as educational toys, stress relief products, and as an artistic medium. Compared to conventional magnets, round, strong Buckyballs attract each other with a smaller area of stress, which often causes intestinal complications [(5)]. Our case ingested 17 Buckyballs in a row. Interestingly, it was learned from his history that he ingested because he was influenced by internet games and thought that if he ingested, he would have magnetic power.

Unless there is a symptom such as a choking attack, they are unlikely to show any initial symptoms and most children remain asymptomatic after magnet ingestion. Cases presenting with abdominal pain, discomfort or cramps, vomiting, and bloating are of concern as they may indicate intestinal obstruction. Other patients may have minimal complaints or the atypical clinical presentations of children ingesting magnets that may mimic viral gastroenteritis such as vomiting with or without fever and dull abdominal pain [(6-8)]. Our case presented with abdominal pain and bilious vomiting, and physical examination revealed the signs of peritonitis and defense. These findings indicated perforation.

The radiographic appearance of ingesting multiple magnets or of a single magnet with other metallic objects can be difficult to distinguish, depending on the angle at which it is imaged. In suspected cases, additional radiographs or fluoroscopy at oblique angles may be helpful. If it is not noticed at first, the absence of metallic foreign body movement on the follow-up radiograph should also increase the suspicion of a magnetic foreign body involving the intestines. Intestinal perforation may have occurred when there is free air and/or radiographic signs of small bowel obstruction [(9)]. Fluoroscopy is useful for identifying and confirming foreign body removal, but its use in children is controversial in terms of radiation exposure [(10)]. Serial radiographs were not taken in our case that was known to ingest magnets, because there were signs of perforation, and the surgical decision was made after two imaging studies.

Early surgical intervention is required in cases where the ingestion of multiple magnets or multiple metallic and magnetic foreign bodies is suspected [(11)]. Although significant pressure injury was reported in as little as 8 hours in those with a definite history of magnet ingestion, according to the informal NASPGHAN survey, perforations or fistulas were also reported when magnets were removed 12 hours after ingestion. In general, it is prudent to remove the magnet(s) endoscopically if possible, especially if more than one magnet is in an endoscopy-accessible location [(6)]. In cases where magnets are suspected to have passed through the stomach, if there is no evidence of obstruction and/or perforation, magnet migration can be monitored with serial plain radiographs. However, if magnet migration does not occur and symptoms are present, surgical intervention is required [(7,12)]. Besides endoscopy in magnet ingesting, laparoscopy, laparoscopic-assisted mini-laparotomy, or laparotomy can be warranted as surgical intervention [(2,12)]. Laparoscopy provides better visualization of the entire abdomen and pelvis, with better localization of foreign bodies, cosmetically favorable, and rapid postoperative recovery [(2)]. If there is a fistula between the intestinal loops,

limited enterotomy with removal of the foreign body followed by primary closure may be appropriate.Magnets localized in the intestinal lumen can be extracted from the appendix. Although the whole of the procedure can be performed laparoscopically, removing the magnets, bowel resection, and primary anastomosis can be difficult [13]. In this case, we localized the perforation site with laparoscopy, and then we extended the camera port incision and removed the perforated segment with mini-laparotomy, and repaired it primarily. Laparoscopy allowed us to visualize the entire abdomen and to perform intra-abdominal irrigation without difficulty and at the same time with a good cosmetic result. In fact, all procedures could be performed laparoscopically, but removing the magnets without dropping them into the intestinal lumen or abdominal cavity would be difficult. If the magnets fall into the intestine again, it can cause the same complications in other segments. On the other hand, multiple intracorporeal bowel anastomoses may not be as comfortable and safe as the open method, but this reason can be eliminated if performed in experienced hands.

Conclusion

The most important factor for children to ingest magnets is to take precautions and to make legal arrangements to prevent these objects from being used in toys or jewelry. Early endoscopy has been accepted in cases that do not exceed the stomach, but the surgical approach has been accepted for cases that persist in the same place and/or develop peritonitis findings in case of multiple magnets ingestion. We think that the laparoscopic approach, which is applied in limited today, would be the gold standard with its use in larger series.

Conflict of Interest: The authors declare that there is no conflict of interest for this case report.
Funding: None.
Informed Consent: Receipt.

References

1. De Roo AC, Thompson MC, Chounthirath T, et al. Rare-earth magnet ingestion-related injuries among children, 2000-2012. Clin Pediatr (Phila). 2013;52(11):1006-1013.
2. Naji H, Isacson D, Svensson JF, Wester T. Bowel injuries caused by ingestion of multiple magnets in children: a growing hazard. Pediatr Surg Int. 2012;28(4):367-374.
3. Hernández Anselmi E, Gutiérrez San Román C, Barrios Fontoba JE, et al. Intestinal perforation caused by magnetic toys. *J Pediatr Surg*. 2007;42(3):E13-6.
4. Chung JH, Kim JS, Song YT. Small bowel complication caused by magnetic foreign body ingestion of children: two case reports. J Pediatr Surg. 2003;38(10):1548-1550.
5. Zhang S, Zhang L, Chen Q, et al. Management of magnetic foreign body ingestion in children. Medicine 2021;100:2(e24055).
6. Hussain SZ, Bousvaros A, Gilger M, et al. Management of ingested magnets in children. J Pediatr Gastroenterol Nutr. 2012;55(3):239-242.
7. Han Y, Youn JK, Oh C, Lee S, Seo JM, Kim HY. Ingestion of multiple magnets in children. *J Pediatr Surg*. 2020;55(10):2201-5.
8. Sola R Jr, Rosenfeld EH, Yu YR, St Peter SD, Shah SR. Magnet foreign body ingestion: rare occurrence but big consequences. J Pediatr Surg. 2018 Sep;53(9):1815-9.
9. Kircher MF, Milla S, Callahan MJ. Ingestion of magnetic foreign bodies causing multiple bowel perforations. *Pediatr Radiol*. 2007;37(9):933-6.
10. Tsai J, Shaul DB, Sydorak RM, Lau ST, Akmal Y, Rodriguez K. Ingestion of magnetic toys: report of serious complications requiring surgical intervention and a proposed management algorithm. *Perm J*. 2013;17(1):11-4.
11. Cai DT, Shu Q, Zhang SH, Liu J, Gao ZG. Surgical treatment of multiple magnet ingestion in children: A single-center study. *World J Clin Cases*. 2020;8(23):5988-5998.
12. Bauman B, McEachron K, Goldman D, et al. Emergency Management of the Ingested Magnet: An Algorithmic Approach. *Pediatr Emerg Care*. 2019;35(8):e141-4.
13. Dutta S, Barzin A. Multiple magnet ingestion as a source of severe gastrointestinal complications requiring surgical intervention. Arch Pediatr Adolesc Med. 2008;162(2):123-5.