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Holtz, Trine Kirkegaard; Greisen, Pernille Wied; Qvist, Niels; Bjørn, Niels

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Unexpected finding of ingested magnetic toys in a child undergoing cerebral MRI

Trine Kirkegaard Holtz a, *, Pernille Wied Greisen b, Niels Qvist a, Niels Bjørn a

a Department of Surgery A, Section of Pediatric Surgery, Odense University Hospital, Denmark
b Department of Radiology, Section of Pediatric Radiology, Odense University Hospital, Denmark

1. Introduction

Magnetic toys have become popular and widespread. Unfortunately, they can cause severe harm to the children if ingested. The ingestion of two or more magnets may cause entrapment of intestinal loops causing tissue necrosis with intestinal perforation or fistula formation [1]. Foreign body ingestion is most frequent in children at the age of 6 months to 3 years but also common in older children with developmental disabilities [1,2]. Symptoms vary widely from acute abdominal catastrophe due to perforation or malnutrition with diarrhea from fistula formation to more vague symptoms, which may be unrecognized in especially the mentally disabled child.

We present a case of an unexpected ingestion of multiple magnetic foreign bodies with no adverse events after a cerebral magnetic resonance imaging (MRI) for diagnostic evaluation.

2. Case

A 4 years and 8 months old boy with infantile autism and mental retardation was referred with a history of 4 months of intermittent vomiting and abdominal discomfort. The vomiting was observed during daytime only, varying from 3 times a week up to 4–5 times a day. There was no history of blood in either vomit or stool. Episodes with abdominal discomfort were observed up to several times a day by caretakers and parents, but no severe pain incidents or episode with fever were reported.

2.1. A general physical examination revealed no abnormal findings

On the suspicion of hydrocephalus, the patient was referred to a cerebral MRI under general anesthesia. No organ specific pathology was found, but severe artefacts at the skull base, with no obvious cause was observed. At the follow up 3 days later the parents reported, that the child had a habit of swallowing objects and was very fond of playing with magnetic toys. Based on this information a plain X-ray of the abdomen was performed and showed 15 foreign bodies attached to each other forming in a row of 11 sticks and 4 balls (Picture 1).

Laparotomy revealed two ileal-ileal fistulas, two ileal-jejunal fistulas, and one ileal-colonic fistula caused by entrapment of intestinal loops between the magnets. No free air or other signs of perforation were found, and all fistulas were consolidated. Fistulas were divided by stapling (EndoGIA®, Medtronic, USA) and seromuscular suturing (4/0 Monocryl®, Ethicon, USA).

The child recovered uneventfully and was discharged on the fourth postoperative day. The next day the child was admitted with abdomi-
nal pain and vomiting. A re-laparotomy was performed and a missed fistula from the caecum to the posterior part of the stomach causing a mechanical obstruction on the transverse colon was found. The fistula was divided and bowel and stomach wall was sutured (4-0 Monocryl®, Ethicon, USA). After an uneventful postoperative course, the child was discharged on the second postoperative day and was doing well at a follow-up three months later.

3. Discussion

The literature on MRI performed in patients with ingested foreign metal bodies including magnetic toys are sparsely and only in case reports [3]. Most cases are on small metal foreign bodies in the eye. In one case hyphema occurred after a MRI of the cervical and lumbar spine [4], whereas another showed no adverse events after MRI of the brain [5].

There is one case report on magnetic foreign bodies in the gastrointestinal tract [3]. Laparotomy was performed, the following day after MRI, and revealed perforation of the intestines. It was uncertain if this was caused by the MRI or a complication related to the ingestion of magnetic foreign bodies.

Almost 50% of children, who have ingested foreign bodies with no specification on which material, reveals no symptoms when admitted to the emergency department [6]. Therefore, the diagnosis can be difficult to confirm, if the ingestion of foreign bodies is unknown, and can result in severe complications, when missed [1].

Collected data from the National Electronic Injury Surveillance System database in USA have shown an 8.5-fold increase of in the incidence of magnetic ingestions in children in the period from 2002 to 2011 [7]. Another survey showed that 41% of patients admitted with ingestions of magnetic foreign bodies needed repair of a perforation or fistula and 22% needed bowel resection [8].

Surprisingly, in our case there were no signs of intestinal damage or perforation that could be ascribed to the performed MRI. Pain or discomfort from movements of the magnets during the scan may be expected but in our case the MRI was performed under general anesthesia. The child revealed no changes in abdominal symptoms after the MRI.

Studies have found a 100% sensitivity and 92.4% specificity for handheld metal detector in cases with suspected ingestion of metal foreign bodies [9]. The method has been adopted as a new initiative at the department of the aforementioned case of the unwitnessed ingestion of magnetic foreign bodies in a five year-old boy [3]. The children's Hospital of Michigan also examined the possibility of using metal detector prior to MRI on few patients, but unfortunately with no success of detecting ingested metallic foreign bodies [10].

If the ingestion of metallic foreign bodies cannot be excluded with certainty, especially when it comes to children with developmental disabilities or children with abdominal symptoms, a plain X-ray of the abdomen prior to MRI could be advocated.

The only screening method used for metallic objects prior to MRI in the Department of Radiology at Odense University Hospital is a questionnaire answered by the patient. The questionnaire involves implanted devices due to prior surgery but also any other metallic objects in the body to the patient's knowledge.

If magnetic foreign bodies are detected, the treatment depends on the localization and the number of ingested objects. Some authors are opposed to immediately surgical intervention, and others suggest waiting until symptoms of complications may occur [11]. In our department, surgery or endoscopy is mandatory when more than one magnetic object is present at abdominal plain X-ray irrespective of the symptoms present. A meticulous examination of the entire gastrointestinal tract at laparotomy is mandatory to avoid unexpected complications.

4. Conclusion

In children with uncharacteristic vomiting and unexplained abdominal pain, unwitnessed foreign body ingestion should be considered, and a plain abdominal X-ray should be performed prior to MRI to exclude the presence of metallic foreign bodies.

Consent

Consent to use information was obtained and signed by the parents.

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Declaration of competing interest

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