

SHORT REPORT

Children and mini-magnets: an almost fatal attraction

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Children imitating adults often appear to indulge in harmless fun, however at times these activities have more serious implications. The recent fashion of body piercing among adults has encouraged children to have similar procedures or imitate them by applying small magnets to sustain the jewellery used in piercing in position. This paper describes a series of 24 cases presented to the Sheffield Children's Hospital over a period of eight weeks. The children imitated body piercing by using small powerful magnets across parts of their body including nose, ears, penis, and tongue. Some swallowed the magnets while attempting to use them, resulting in one near fatal surgical complication. The paper describes the details of the patients, the procedures used to detect the magnets, and the management of the different complications encountered.

mm) magnets that were powerful enough to be self supporting when placed across parts of a child's body, thus allowing imitation of ear, nose, tongue, cheek, and genital piercing. Unfortunately this children's game resulted in a number of hospital attendances and one case requiring urgent surgery and intensive care.

Over a short period from 13 April to 20 April 2000 at the Sheffield Children's Hospital we had five children present with magnets adhering to their body. This was followed by another period from 8 May to 3 June when we had a further 19 children present with magnet related problems, 10 of these children presented over two consecutive days. The details of these cases are listed in table 1.

CASE PRESENTATIONS

We will now discuss in more detail three of the cases to illustrate the problems associated with each type of presentation.

Children have always tried to imitate adults, sometimes in an attempt to appear more grown up. The recent fashion for body piercing has already been recognised to cause problems in accident and emergency (A&E) departments¹ and we now present problems caused by the imitation of body piercing by children. In Sheffield a situation arose where children had obtained small (7 mm × 4 mm × 1

Patient 4

A 10 year old boy presented to the A&E department with one magnet in each nostril, the magnetic force causing them to adhere tightly to the nasal septum. Removal was attempted by the SHO in the A&E department but was unsuccessful. The patient required referral to the ENT department for removal of the magnets, following which he was discharged home.

Table 1 Details of the 24 children presenting to the Sheffield Children's Hospital with magnet related problems

Patient number	Date of presentation	Age (y)	Sex	Site of magnets	Outcome
1	13/4/00	13	M	Nose	Removed by ENT
2	15/4/00	7	M	Nose	Removed in A&E
3	15/4/00	10	M	Penis	Removed in A&E
4	19/4/00	10	M	Nose	Removed by ENT
5	20/4/00	10	M	Penis	Removed in A&E
6	8/5/00	11	M	Nose	Removed by ENT
7	8/5/00	10	M	Ingested	Discharged
8	10/5/00	15	M	Ingested	Discharged
9	10/5/00	8	M	Nose	Removed in A&E
10	10/5/00	10	F	Nose	Removed in A&E
11	10/5/00	9	M	Ingested	A&E Review Clinic > discharge
12	11/5/00	8	F	Nose	Removed by ENT under general anaesthetic
13	11/5/00	10	M	Penis	Removed in A&E
14	11/5/00	11	M	Nose	Removed in A&E
15	11/5/00	8	M	Ingested	Discharged
16	11/5/00	11	F	Ingested	Discharged
17	11/5/00	15	F	Nose	Removed by ENT
18	15/5/00	12	M	Nose	Removed by ENT under general anaesthetic
19	15/5/00	12	M	Nose > ingested	Discharged
20	18/5/00	9	F	Ingested	Laparotomy for multiple perforations
21	22/5/00	5	F	Ears	Removed in A&E
22	22/5/00	8	M	Ingested	Discharged
23	25/5/00	8	M	Ingested	Discharged
24	3/6/00	13	F	Ingested	Discharged

Involvement of the nose was the commonest presentation during our series and has been reported before with commercial magnetic jewellery.^{2,3} The magnetic attraction in our cases was so strong that even after only a few hours, an area of pressure necrosis could be seen developing around each magnet, increasing the patient's pain and making removal of the objects more difficult. Although some of the magnets were removed in A&E the majority needed ENT referral and in two cases a general anaesthetic was required to facilitate this. One of these cases showed necrosis of the nasal mucosa so severe that it left the septal cartilage exposed in both nostrils. Another problem that might be underestimated is the attraction of the magnets for the metallic instruments used. This made precise use of the instruments difficult and hindered the removal process further.

Patient 13

A 10 year old boy presented with two magnets stuck across his penis, saying that they had fallen down his trousers while he had been playing with them. They had grasped a fold of skin at the mid-shaft of the penis and were causing him significant pain. Removal was achieved easily in A&E with instruments and the boy was allowed home.

The three boys who presented with magnets across the penis were all in significant pain but this increased dramatically as removal was attempted. One child required sedation with midazolam before removal of the magnets could be achieved.

Patient 20

A 9 year old girl presented to the general surgeons via her general practitioner with constant central abdominal pain and bile stained vomiting. Two days previously she had attended the A&E department with a two day history of diarrhoea and vomiting and at that time she was discharged with a diagnosis of gastroenteritis. Since then her diarrhoea had begun to settle but the pain had increased and her vomiting had become bile stained. On examination she was afebrile with a pulse of 100 and a normal capillary refill time. Abdominal examination revealed some tenderness in the lower abdomen, no guarding but mild percussion tenderness. Bowel sounds were normal. The surgical registrar requested an abdominal film and this revealed a collection of small objects massed in the lower abdomen. On further inquiry the girl admitted to swallowing a number of small magnets over a period of time while imitating tongue piercing. She was rehydrated overnight and at laparotomy she was found to have five perforations in the small bowel and one in the caecum. The mass of magnets was resting extra-luminally. Peritoneal lavage was performed and the perforations closed. She was given antibiotics and transferred to the intensive care unit where she remained for one week before transfer to a general ward. After a further week as an inpatient she was discharged home.

It was recognised during this cluster of cases that there was the potential for these magnets to attract each other across loops of bowel.^{4,5} All the patients presenting through A&E had groups of magnets massed together in their stomach and it was felt that they were highly unlikely to separate and then rejoin while traversing the intestine. Patients were warned to reattend if they had any abdominal symptoms. One child was reviewed, as the magnets initially did not seem to be stuck together tightly on radiography. The concern was that a fold of stomach had been caught in between the magnets but a repeat film after 12 hours showed them to have moved further along the intestinal tract. The young girl who required surgery had been seen in A&E and discharged with a diagnosis of gastroenteritis. Had the history of magnet ingestion been available at that presentation an abdominal film would probably have been taken and treatment instigated sooner.

DISCUSSION

The easiest way to separate two magnets is to slide them apart and these magnets were no exception. Unfortunately this was impossible when a body part was trapped between them as it caused too much pain. The only other options were that they had to be either levered apart, again very painful, or pulled apart perpendicular to each other, which was directly against the magnetic force acting between them.

Why we had this cluster of cases is still unclear but it is probably because of the size and strength of the magnets involved. They are a neodymium magnet, a type that is considered to be one of the strongest currently available and are produced by mixing iron, boron and neodymium powders before pressing them in to the required shape. These blanks are then magnetised and are five to ten times as strong as plain iron magnets.

Where the children obtained these magnets is unclear but other children were selling them for a penny each in the schoolyard and this price is less than they are worth commercially. It is perhaps interesting to note that all but one of the first 17 cases lived in three adjoining postal districts and it took nearly four weeks for the craze to spread beyond this area. Such magnets are also to be found in many modern electrical appliances where their size and power aid in the ever increasing miniaturisation of products.

The ingestion of foreign material is a common paediatric occurrence but most objects will pass through the digestive tract uneventfully. Unfortunately, with the multiple ingestion of magnets there is the potential for the ingested objects to interact and cause a unique problem.^{4,5} The sequence of events involved in the case of perforation can be hypothesised but is most likely to have begun with two magnets in adjoining loops of bowel attracting each other and trapping the intestinal wall between them. The degree of obstruction created could cause the initial vomiting while the irritation to the mucosa could result in diarrhoea. As the mucosa thinned the bowel would perforate, allowing the magnets to join together extra-luminally and resulting in leakage of bowel contents into the peritoneal cavity.

It is now common practice in A&E departments to use a metal detector to locate ingested metallic objects, thus reducing the number of patients requiring radiographs.⁶⁻⁸ The size of these magnets was such that they could not be reliably located with a metal detector and so we had to revert to radiographing all the children to locate the magnets.

After the case of intestinal perforation occurred it was felt that this craze had become too dangerous to tolerate and further action was needed to prevent another series injury. A press release was issued and the local media cooperated in passing the concerns of medical staff on to the general public. Since then we have had only the four cases as shown.

CONCLUSION

We have had a unique experience of magnets as foreign bodies in children and discovered some problems specific to their properties. Clinicians should be aware of these problems and remember the potential for severe intestinal damage with ingested magnets. We suggest that any patient presenting with a history of multiple magnet ingestion should have an abdominal radiograph and if there are any abdominal symptoms be considered for further surgical intervention.

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