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Case Report

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Anesthetic Management of Pediatric Ingestion of Multiple Magnetic Beads: A Case Report

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Abstract

The incidence of magnet ingestion among children is increasing, though it remains rare. This case describes a 3-year-old child who ingested multiple magnetic beads and was planned to have the foreign bodies removed by endoscopy under sedation. However, perioperative hypoxemia occurred because gastric perforation had not been detected beforehand. An exploratory laparotomy was performed immediately, all magnetic beads were extracted, and the stomach perforation was closed. This report emphasizes the importance of anesthesia evaluation, anesthesia preparation, airway management, and intraoperative circulation maintenance.

Keywords

Magnet Ingestion, Foreign Body, General Anesthesia, Gastric Perforation

Introduction

The incidence of magnet ingestion among children is very low but is increasing over time [1]. Multiple magnets can lead to serious adverse events [2]. Objects that reach the stomach are typically asymptomatic unless they are large enough to cause gastric outlet obstruction, which may present with vomiting and/or feeding refusal [3]. Therefore, magnets in the esophagus or stomach should be promptly removed via endoscopy. Endoscopic removal of magnets is feasible and safe in children. This report discusses the challenges and strategies of anesthesia management in pediatric patients with magnet ingestion, providing insights and references for handling similar cases in the future.

Case Presentation

A 3-year-old male patient was referred to our hospital emergency department with a 10-day history of abdominal pain, reduced appetite, and vomiting, with no fever or peritoneal signs. The parents confirmed that the patient had been playing with a toy containing magnetic beads but did not witness the ingestion. An X-ray of the abdomen was performed at another hospital, which showed long strips of high-density shadows in the mid-upper quadrant. There was no relevant past medical history.

All laboratory investigations were normal. Radiographs were repeated, revealing an inverse "L"-shaped metal foreign body in the upper abdomen, approximately 8 cm and 7.3 cm in length on both sides. No free gas was found in the abdominal cavity (**Fig-1**).

Case Report

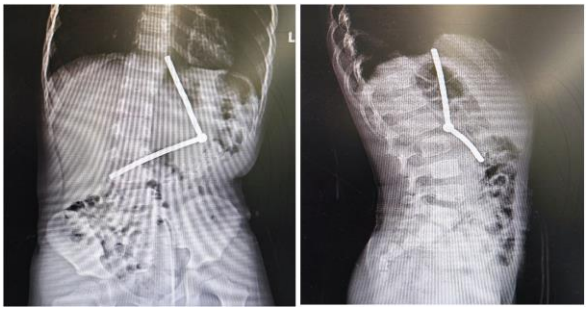

Fig-1: An abdominal X-ray showing the foreign body

Based on the history, examination, and X-ray findings, a diagnosis of foreign body ingestion was made. The child was urgently scheduled for esophagogastroduodenoscopy (EGD) to remove the foreign body on the same day. The case was discussed with the parents, and they consented to proceed.

Anesthesia Procedure

The child was admitted to the room, crying and irritable. Cardiac monitoring showed a heart rate of 112 beats per minute, blood pressure of 93/56 mmHg, and SpO_2 of 100%. The child underwent EGD under propofol sedation in a left lateral position. Oxygen was administered through a nasal cannula at a flow rate of 3 liters per minute, and intravenous midazolam 0.5 mg, fentanyl 30 μg, and propofol 20 mg were administered. The child became quiet, and breathing was effortless.

EGD revealed a magnetic strip-like foreign body near the posterior wall of the upper middle portion of

Fig-2: EGD showed that a magnetic strip-like foreign body

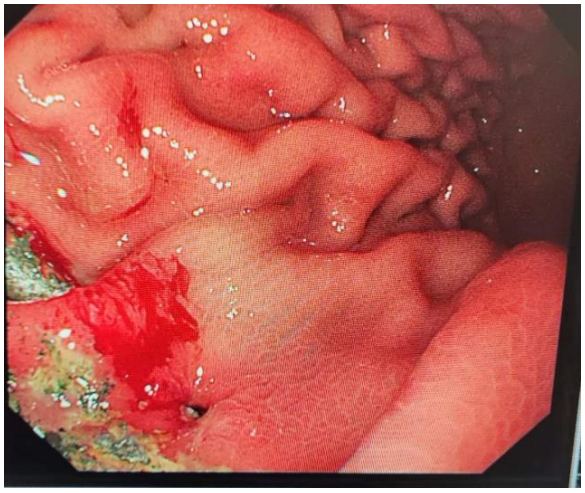

Fig-3: A perforation could be seen on the original surface

the gastric body. The outer wall was corroded, and movement of the magnetic strip was visible upon close observation (**Fig-2**). A perforation, approximately 0.6 cm in diameter, was observed on the original surface after the foreign body was clamped (**Fig-3**). The foreign body was composed of six small magnetic strips, with a total length of about 6.6 cm. No remaining magnetic strips were found in the stomach or duodenum.

The gastroscopist decided to continue the operation and attempted to remove the remaining magnetic strips through the perforation. An additional 10 mg of propofol was administered, and after two minutes, the child developed respiratory depression, with SpO_2 dropping to 92%. The operator stopped the procedure immediately.

The child's respiratory movement was inhibited, respiratory mobility was poor, and abdominal distension was evident. A large amount of gas injected by the endoscopist entered the abdominal cavity through the perforation, causing the diaphragm to rise and diminishing tidal volume. Before decompressing

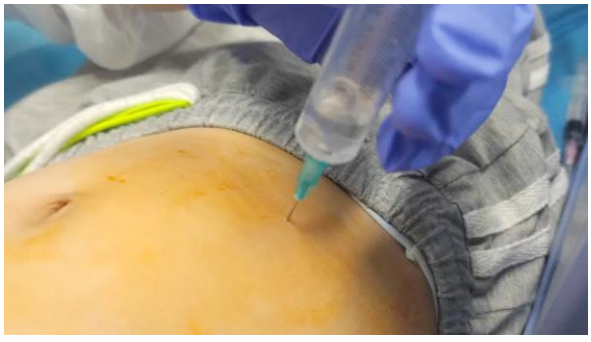

Fig-4: Abdominal decompression is performed using a needle

the abdomen, the operator first deflated the stomach endoscopically. Abdominal decompression was performed using a needle (**Fig-4**). After treatment, oxygen saturation rose to 100%.

Radiographs were repeated, revealing an inverse "L"-shaped metal foreign body in the left middle and upper abdomen, with lengths of 5.7 cm and 2.7 cm on both sides, respectively. Lateral radiographs showed free gas shadows in the subphrenic and prehepatic spaces, indicating perforation of the cavity organs (**Fig-5**).

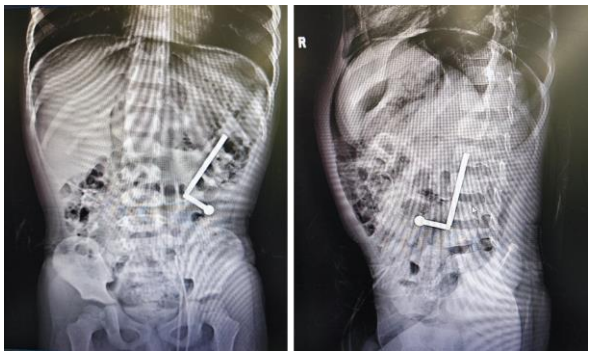

Fig-5: Radiographs were repeated, an inverse "L" shaped metal foreign body was found in the left middle and upper abdomen

A diagnosis of foreign body ingestion causing gastric perforation was made. The child underwent exploratory laparotomy, gastric perforation repair, jejunal perforation repair, and removal of intra-abdominal gastrointestinal foreign bodies. Post-procedure, the patient was stable and was discharged from the hospital 8 days after the operation.

Discussion

The majority of foreign body ingestions occur in children between the ages of six months and three years [4]. The location and type of foreign body are key factors in determining the appropriate management. Multiple magnet ingestions can lead to life-threatening adverse events such as perforation, intestinal obstruction, or volvulus by attracting to each other across different segments of the gastrointestinal wall. Guidelines recommend the urgent removal of multiple magnets when the location is amenable to endoscopic retrieval via either EGD or colonoscopy [5].

In pediatric digestive endoscopy, the role of anesthesiologists is irreplaceable. It is recommended to perform digestive endoscopy in children under sedation/anesthesia to ensure their safety and prevent the occurrence of related complications.

Pre-anesthesia history collection is crucial for children with gastrointestinal foreign bodies. The evaluation should include medical history, physical examination, and auxiliary tests. Special attention should be given to identifying possible increased risks of anesthesia during the perioperative period, including difficult airway, respiratory diseases, allergic conditions, pathological obesity, congenital heart disease, blood disorders, malnutrition, and water and electrolyte imbalances, especially gastric retention or delayed gastric emptying.

For children who have ingested high-risk foreign bodies (such as batteries, magnets, sharp objects, etc.), the choice of anesthesia method and medication should be based on the child's general condition, the nature of the foreign body, the time since ingestion, the location of incarceration, and the operator's proficiency. Non-intubation intravenous (or intravenous-inhalation combined) general anesthesia can be used if the foreign body is non-corrosive, round, blunt, and has been swallowed for a short time. If the foreign body is sharp, corrosive, likely to cause perforation, or if the child is younger than 1-year-old, general anesthesia with tracheal intubation should be selected, with perioperative management tailored to the child's specific needs. Rapid sequential intravenous induction is the preferred method for children with a full stomach. The tracheal intubation model should avoid being excessively thin, and the tracheal cuff should be inflated appropriately to reduce micro-aspiration caused by the procedure. After the operation, the tracheal catheter should be removed only after the child is awake and muscle strength has fully recovered.

During sedation/anesthesia, the patient should be continuously observed and monitored, including observation of skin and lip color, respiratory rate and depth, and routine monitoring of vital signs such as heart rate, respiration, blood pressure, and SpO_2. The abdomen should be palpated periodically throughout the procedure to exclude severe pneumoperitoneum. If

the abdomen becomes excessively distended, especially if tidal volume begins to diminish or peak and plateau airway pressures start to rise, abdominal decompression should be performed using a Veress needle or an angiocatheter.

In recent years, with the rapid development of digestive endoscopy technology, the diagnosis and treatment techniques of pediatric digestive endoscopy have also advanced significantly. The combination of pediatric endoscopic treatment and surgical endoscopy is becoming increasingly widespread. Anesthesiologists strive to ensure the safety of children while maintaining hemodynamic stability and airway patency.

Conflict of Interest

The author has read and approved the final version of the manuscript. The author has no conflicts of interest to declare.

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