Case Report

Retrieving multiple magnetic foreign bodies from the glottic entrance and stomach: A case report

ABSTRACT

Aspiration and ingestion of foreign bodies present a frequent challenge in pediatric anesthesia practice that requires careful planning of the time and the method of retrieval. We discuss the management of a 20-month-old boy who had ingested multiple small magnetic beads and presented emergently to the operating room with two beads lodged in the vallecula and eighteen more forming a chain in the stomach. Benefitting from their magnetic properties, the beads located close to the glottic entrance could be removed by placing a steel Magill forceps close to the objects and using magnetic pull rather than grasping. The beads in the stomach were removed en bloc due to their magnetic properties using an endoscopic retrieval basket. Small beads can be difficult to remove, however, in this case it was possible to utilize their magnetic properties during the removal process.

Key words: Foreign body, magnet, pediatric airway

Introduction

Foreign body ingestion and aspiration occur frequently in young children. A recent review summarized nearly 20,000 cases of foreign body aspiration in pediatric patients between 1950 and 2009.[1] More than 30,000 ingestions of toys and non-food items were described in the annual report of the National Poison Data System for 2017 alone, mostly in children under 5 years of age.[2]

Witnessed foreign body aspiration with respiratory symptoms is an indication for emergent bronchoscopy.[3,4] Similarly, ingestion of sharp objects, batteries and multiple magnets poses a risk for bowel perforation or ileus and is an indication for emergent endoscopic or surgical removal.[5] Smooth, round objects like peanuts or beads can be very difficult to grasp and pose—if their diameter is similar to the tracheal diameter—a risk for complete airway occlusion and asphyxia. The optimal anesthesia technique for foreign body retrieval continues to be under debate with some authors advocating deep inhalational anesthesia with maintained spontaneous ventilation while others describe successful use of paralysis and positive pressure ventilation.[1,6] We believe that the anesthetic technique should depend on the type and location of the foreign body. We present a unique case where magnetic beads were removed from just ouside the glottic entrance using magnetic attraction to the Magill forceps. This is the first reported case of a concomitant aspiration and ingestions of small magnetic foreign bodies and first reported case of magnetically attracting these foreign bodies with a McGiels forceps.

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Stylianos Voulgarelis, Astrid Stucke

Department of Anesthesiology, Medical College of Wisconsin, Children's Hospital of Wisconsin, Milwaukee, Wisconsin, USA

Address for correspondence: Dr. Stylianos Voulgarelis, Department of Anesthesiology, Medical College of Wisconsin, 9200 W Wisconsin Ave, Milwaukee, WI 53226, USA. E-mail: svoulgarelis@mcw.edu

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Case History

Written consent for publication was obtained from the patient's parents. A 20-month-old previously healthy boy presented to the emergency department with a history of holding several small magnetic beads in his hands. On physical exam he had minimal drooling and was in no respiratory distress. Radiographic surveillance revealed 18 small radiopaque objects in the distal stomach and proximal duodenum and two that were precariously placed in the oropharynx [Figure 1a and 1b]. From the radiographic image it was obvious that the foreign objects had very strong magnetic properties as they formed a chain in the stomach. The case was classified as an emergency due to the high risk for aspiration and the possibility of the foreign bodies in the stomach to advance further into the small bowel. The patient was scheduled for a rigid bronchoscopy and gastroduodenoscopy and arrived in the operating suite within 60 minutes.

In the preoperative area, the patient was very anxious even after oral premedication with midazolam (0.5 mg/kg). We decided to avoid awake intravenous line (IV) placement to reduce the risk of crying and choking and performed a very gentle mask induction with a lot of distraction, which proceeded smoothly. The patient was kept breathing spontaneously on FiO2 1.0 and 4–5% end-tidal Sevoflurane concentration. After IV placement and sufficient preoxygenation we administered 1.2 mg/kg rocuronium. When the patient became apnoeic, we avoided positive pressure ventilation and immediately performed direct laryngoscopy to prevent dislodgement of the foreign bodies into the trachea. During the direct laryngoscopy we visualized the two magnetic beads anterior to the epiglottis and on the right arytenoid. Knowing that the beads had strong magnetic properties we held off intubation and advanced a Magill forceps towards the bead resting on the epiglottis.

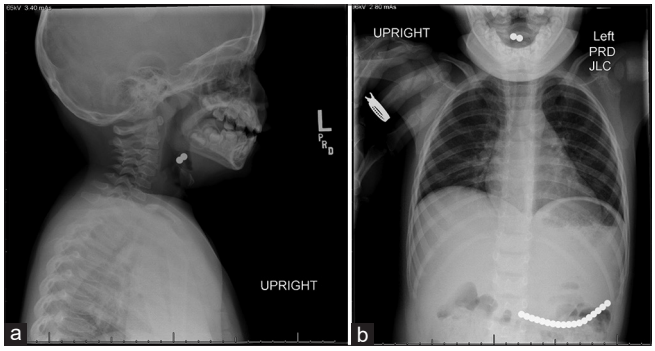

Figure 1: (a) Radiography of the lateral neck (a) and the antero-posterior view of the chest and upper abdomen (b) show two small radio-opaque beads next to the glottic opening and a string of 18 beads in the stomach and proximal duodenum

There was no intent to grasp the object due to the high risk of dislodging the bead into the trachea. The bead attached itself to the forceps and could be removed from the mouth [Figure 2]. We subsequently secured the airway with a 3.5 cuffed ETT and removed the second bead in a similar fashion. Rigid bronchoscopy was immediately available as backup in case a bead was dislodged into the trachea. The ingested beads were removed "en bloc" using an endoscopic retrieval basket. At this point, half of the beads had already advanced into the duodenum. Any delays would have made the endoscopic approach more challenging and may have mandated surgical treatment.

Discussion

The use of magnetic probes to extract ferromagnetic objects from the airway has been described before.[7] This is the first case report where the ferromagnetic properties of the Magill forceps, a tool readily available to every anesthesiologist, were used to remove magnetic objects from the upper airway.

Figure 1 reflects the information available to the anesthesiologist before anesthesia induction and highlights the precarious situation where two beads were lodged in close proximity to the glottic entrance. The diameter of the beads was later measured as 5 mm [Figure 2], confirming that aspiration would likely have resulted in complete tracheal occlusion. The primary treatment goal was to secure the airway with an endotracheal tube before aspiration could occur. When oral midazolam failed to achieve significant sedation, we chose to proceed to the operating room so as not to delay the case further. IV placement was deferred until after mask induction to reduce the risk of crying and struggling, which could have dislodged the beads. There is ongoing debate whether spontaneous ventilation with its inherent risk of coughing and bucking or positive pressure ventilation are the safer choice to avoid moving the foreign body deeper into the airway and causing complete airway obstruction.[1] We chose to preoxygenate the patient well during mask induction and not ventilate the patient at all until full muscle relaxation was achieved. After direct laryngoscopy

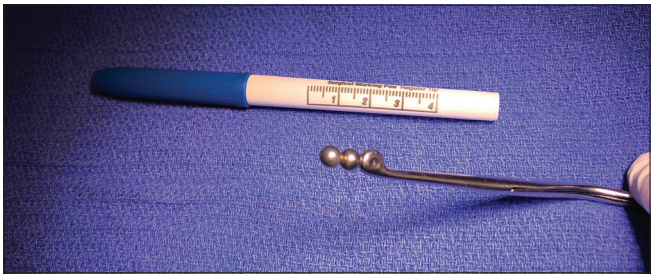

Figure 2: Two beads easily attached to the Magill forceps through magnetic pull

visualized both as foreign bodies, we only aimed to remove the bead that was resting on the epiglottis, because placement of the endotracheal tube could have advanced it into the trachea. As we had hoped, the bead strongly attached itself to the Magill forceps through magnetic pull [Figure 2]. The second bead had enough distance from the glottic entrance to allow intubation before removing it with the Magill forceps. This sequence allowed intubating the patient without desaturation. Most aspirated foreign bodies are of organic material (81%) and are found in the bronchial tree (88%). The standard approach to removal is rigid bronchoscopy.[8,9] Supraglottic foreign bodies are more rare and the manner of removal must be adjusted to material, size, and location.

The gastroenterologist performed the endoscopy using as little insufflation as possible. Still, the chain of the magnetic beads had already progressed halfway through the pyloric sphincter, which proved that the emergent endoscopy was warranted. Once in the small intestine the beads would have most likely required removal via laparotomy.[5]

In summary, radiographic evidence of the strong magnetic properties suggested that magnetic pull would be a suitable method for extracting the beads from the glottic entrance. The case also confirms the speed with which small beads can move from the stomach into the small intestines, justifying treating these cases as true emergencies.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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