

## X-ray diagnosis with a bloating agent for foreign object ingestion

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### Abstract

The location of an ingested foreign object is often difficult to determine by X-ray if gastric air bubbles are not clear in the image. Methods that provide negative contrast can facilitate precise object localization, which is important for object retrieval and treatment of the patient. This case report describes a male child, 2 years and 2 mo of age, who accidentally swallowed a lithium battery while playing at home. A plain X-ray showed that the battery was in the abdomen, but it was unclear whether the object was still inside the stomach. A second X-ray examination performed after oral administration of a bloating agent to produce expansion of the stomach and provide negative contrast confirmed that the ingested battery was still in the stomach. The battery was then carefully removed using magnetic and balloon catheters under fluoroscopic guidance. This case report describes the successful use of an orally administered bloating agent without pain to the child in order

to determine the precise location of a foreign object in the abdomen.

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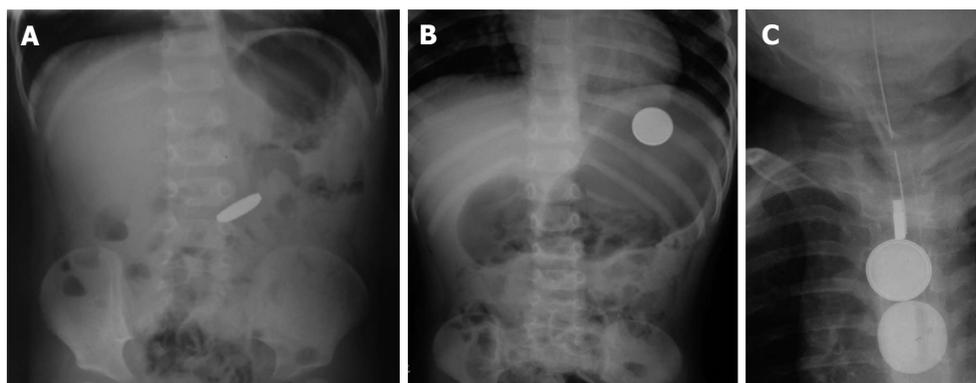
**Key words:** Accidental ingestion; Bloating agent; X-ray; Minimal invasion; Foreign object

**Core tip:** After ingestion of a foreign object, it is sometimes difficult to determine the object's exact location, which is important for successful retrieval and patient recovery. In the present case, an X-ray examination was performed after oral administration of a bloating agent to confirm that an ingested battery was still inside the stomach of a pediatric patient. This case demonstrates the successful and painless utilization of a bloating agent in a child for the diagnostic determination of an ingested foreign object location.

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### INTRODUCTION

It is often difficult to determine the precise location of a foreign ingested object in a plain X-ray if gastric air bubbles are not clear in the image. We experienced a case in which a child who had accidentally swallowed a lithium battery was brought to our emergency department. An initial X-ray examination was performed, and failed to reveal the precise location of the battery within the abdomen. A second X-ray examination performed after oral administration of a bloating agent to produce gastric carbon dioxide air bubbles resulted in sufficient exten-



**Figure 1 X-ray image.** A: Initial X-ray image showing the presence of a foreign object in the patient's abdomen; B: Abdominal X-ray image taken after oral administration of a bloating agent. Gastric air bubbles produced after administration of the bloating agent provided sufficient distension and negative contrast to confirm that the battery was inside the stomach; C: Chest X-ray image during removal of the foreign object. A magnetic catheter was used in combination with a balloon catheter to attract and remove the battery under fluoroscopic guidance.

sion of the stomach to indicate that the battery was still inside the stomach. Thus, we describe the successful use of a bloating agent that can be administered orally and without pain to a child, which is useful for determining the location of a foreign object in the stomach.

## CASE REPORT

A male child, 2 years and 2 mo of age, accidentally swallowed a battery while playing at home. He was first taken to a nearby hospital and then brought to our hospital approximately 4 h after the accident. The general condition of the patient was good without any symptoms. The foreign object was identified in abdominal plain X-ray images, but it was unclear whether the object was inside the stomach (Figure 1A). Therefore, a bloating agent (Baros Effervescent Granules-S 3.5 g, Horii Pharmaceutical Ind., Osaka, Japan) was orally administered to provide a negative contrast agent for X-ray imaging. The patient was provided with approximately one-fifth of one packet of the agent with a small amount of water by his mother. This produced gastric air bubbles that expanded the stomach. An abdominal plain X-ray examination then showed that the battery was inside the stomach (Figure 1B). A magnetic catheter was inserted from the mouth into the stomach without anesthesia. The battery was removed using the attraction of the magnet, with concomitant use of a 14 Fr. balloon catheter under fluoroscopic guidance (Figure 1C). The foreign object was confirmed to be a lithium battery, which was partially darkened due to stomach fluid. After removal of the battery, the general condition of the patient was good.

## DISCUSSION

Due to the possibility for serious complications, foreign objects such as button-type batteries require an emergency removal from the esophagus<sup>[1]</sup>, or the stomach. However, it is often difficult to determine whether the accidentally ingested foreign object is present in the

stomach based on plain X-ray images. In such instances, the site of the object is usually confirmed by instilling air through a nasogastric tube to induce stomach expansion. A bloating agent for contrast X-ray can also be used to confirm the site of a foreign object, as the agent can extend the stomach and duodenum wall by immediately producing carbon dioxide, which at the same time enhances the image contrast by increasing the difference in X-ray transmittance. The foaming ingredient within such bloating agents consists of sodium hydrogen carbonate and tartaric acid. Carbon dioxide produced in the stomach is excreted from the oral cavity by eructation, or absorbed into the digestive tract and excreted out of the body by gas exchange in the pulmonary alveoli<sup>[2]</sup>. Some reports have recommended the use of carbonated drinks such as cola and soda for stomach expansion<sup>[3]</sup>, however such drinks are not always appropriate for infants. Since the bloating agent used in our case was slightly sweet and sour, the child was able to take the agent without difficulty when given by his mother. Therefore, we suggest that a bloating agent for contrast X-ray is a suitable option to expand the stomach of a child who has swallowed a foreign object, since the approach is minimally invasive and does not require insertion of a nasogastric tube.

## COMMENTS

### Case characteristics

A two-year-old boy accidentally swallowed a lithium battery, which needed to be retrieved.

### Clinical diagnosis

The patient had swallowed a foreign object (a lithium battery), which was located in the stomach.

### Differential diagnosis

The foreign object (battery) may have been located in the intestine rather than the stomach.

### Imaging diagnosis

An X-ray performed after a bloating agent was administered allowed for stomach expansion and negative contrast to confirm that the foreign object (battery) was in the stomach and not the intestine.

### Treatment

A magnetic catheter and a 14 Fr. balloon catheter were used to remove the

magnet.

### **Experiences and lessons**

To treat a child who has swallowed a foreign object, we propose administration of boating agent prior to an X-ray, which expands the stomach and provides contrast while being minimally invasive and avoiding use of a nasogastric tube.

### **Peer review**

This paper describes a case in which an oral negative contrast media was used to localize a foreign body in the upper gastrointestinal tract. The diagnostic procedure presented in this case report is interesting and useful to other clinicians in need of a minimally invasive and painless technique to locate a swallowed foreign object.

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