

# Foreign bodies in the gastrointestinal tract of children: A clinical analysis and guidelines for management

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## ABSTRACT

**Objective:** In this paper, we analyzed the outcomes of foreign bodies in the digestive tract of 42 children who were hospitalized in the pediatric department of a tertiary hospital in a medium-sized city in China. The focus is on discussing the indications for removal of foreign bodies via digestive endoscopy.

**Methods:** Forty-two children with foreign bodies in the digestive tract, hospitalized from June 2020 to October 2022 were selected.

**Results:** (1) The majority of the children (52.4%) who had coins in their digestive tracts were between the ages of 3 to 6 years. (2) Symptoms were most commonly observed in the esophagus (62.5%), and gastroscopy was used to remove all foreign bodies. (3) There were 13 cases with foreign bodies in the stomach, and only 4 required removal of the foreign bodies. (4) Among 4 cases where imaging was unable to detect the foreign bodies, gastroscopy revealed the foreign bodies in the esophagi of 2 symptomatic cases, and were removed; the other 2 asymptomatic cases excreted the foreign bodies in the stools.

**Conclusion:** The timing for foreign body removal via digestive endoscopy depends on factors such as location, nature, and symptoms. Single foreign bodies that migrate within the stomach and intestine may be observed without intervention if asymptomatic. Sharp foreign bodies usually pass spontaneously if beyond the esophagus. Emergency gastroscopy is recommended for symptomatic cases; otherwise, clinical observation is suggested.

**Keywords:** child; foreign bodies; gastrointestinal tract; watchful waiting; gastroscopy.

doi: <http://dx.doi.org/10.5546/aap.2024-10475.eng>

**To cite:** Chen Q, Song L, Yang Y. Foreign bodies in the gastrointestinal tract of children: a clinical analysis and guidelines for management. *Arch Argent Pediatr.* 2024;e202410475. Online ahead of print 19-DEC-2024.

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**Financing:** None.

**Conflict of interest:** None.

**Received:** 6-20-2024

**Accepted:** 10-29-2024



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## INTRODUCTION

A high proportion of children who visit the children's emergency department are those with foreign bodies in the digestive tract;<sup>1,2</sup> this may be attributable to their natural curiosity and lack of judgment in ingesting inedible objects. In most cases in China, children with foreign bodies in the digestive tract are brought to the doctor by their parents who discover the ingestion, with or without symptoms. Gastroduodenoscopy is an effective option in handling such emergency cases.<sup>3-5</sup> However, this method is risky and unnecessary if the indications are unclear. In this paper, we reviewed the excretion of foreign bodies by 42 children with foreign bodies in their digestive tract, who were hospitalized in Nantong First People's Hospital. The objective is to analyze the characteristics of these cases, summarize the necessary examinations, and determine when foreign bodies should be removed by immediate or elective gastroscopy. Additionally, the results were compared with the recommendations on removal of foreign bodies by endoscopy in the *Protocol for the development of guideline for the management of foreign bodies in the digestive tract of children in China (2022)*,<sup>6</sup> aiming to provide some reference for future clinical work.

## MATERIALS AND METHODS

A total of 42 children who were admitted to and hospitalized in the Children's Digestive System Department of Nantong First People's Hospital due to ingestion of foreign bodies in the digestive tract between June 2020 and October 2022 were consecutively recruited. Nantong First People's Hospital is a municipal public hospital primarily serving residents in Nantong, a city with a population of 7.744 million. Among them, 38 cases were detected by imaging and 4 cases were undetected (including 2 with plastic toys, 1 with half of a toothpick and 1 with a crab shell). Children who developed complications requiring surgical treatment on admission were excluded.<sup>7</sup> All 42 children admitted to the Nantong First People's Hospital met the admission criteria of the hospital and their parents or guardians signed the informed consent upon admission, meeting the ethical requirements. In this paper, we analyzed the factors influencing the ingestion of foreign bodies by the 42 children, including the types of foreign bodies, position, age, gender, removal by digestive endoscopy and natural excretion.

## Ethics approval

The study was conducted in accordance with the Declaration of Helsinki and was approved by Ethics Committee of the Nantong First People's Hospital.

## RESULTS

Gender: 27 (boys): 15 (girls), 1.8:1. Age: 9 cases under 3 years, 23 cases between 3-6 years, and 10 cases over 6 years.

Types of foreign bodies: coins in 22 cases, other metals in 6 cases, button batteries in 4 cases, chicken bones in 3 cases, game coins in 3 cases, plastics in 2 cases, a crab shell in 1 case, and half of a toothpick in 1 case.

Among the 42 cases, 12 cases (28.5%) had symptoms such as nausea, vomiting, sore throat, dysphagia, and abdominal pain.

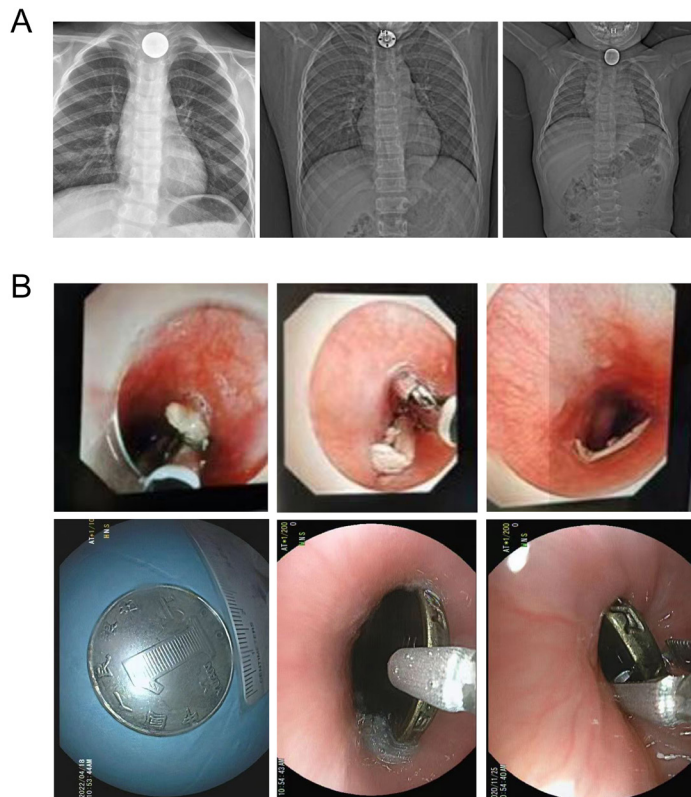
The 16 cases with foreign bodies in the esophagus, included 10 with symptoms and 6 without symptoms. Coins were the most frequently found foreign bodies, all of which were successfully removed using gastrointestinal endoscopy with forceps under general anesthesia. Additionally, three irregular and sharp foreign objects were removed using the same technique: two cases involved chicken bones lodged in the upper esophagus, and one case involved a crab shell at the esophageal entrance (*Figure 1A, Figure 1B*).

Out of the 13 cases with foreign bodies in the stomach, only 2 had mild symptoms of vomiting once or twice, and the other 11 were asymptomatic. Of the 9 cases that underwent gastroscopy, only 4 foreign bodies were removed, while the rest were naturally excreted, including blunt objects such as coins and sharp metals such as the metal tip of a necklace and a zipper puller (*Figure 2*).

Nine cases were identified as having foreign bodies in the intestine, including one case with periumbilical pain. In all cases, the foreign bodies were naturally excreted, including a sharp metal plate in one case and a round magnet in another case in addition to various blunt objects (*Figure 3*).

Since gastroscopy is required for removal of foreign bodies in the esophagus and stomach, a comparison was made between the number of foreign bodies in both the organs, the occurrence of symptoms, and the number of foreign bodies removed from both organs in order to summarize the indications and timing for gastroscopy.

**FIGURE 1. A: Imaging features of foreign bodies in the esophagus; B: Coins and chicken bones removed from the esophagus by endoscopy**



## DISCUSSION

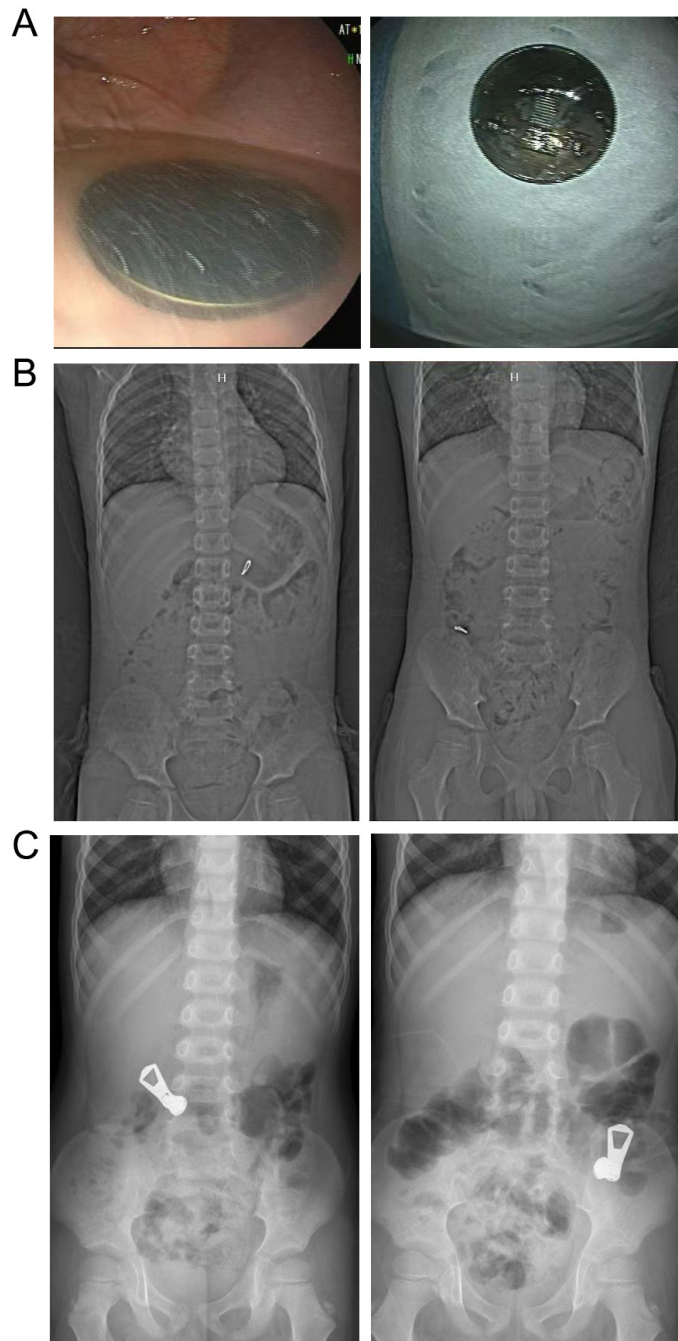
In this study, the incidence of symptoms of foreign bodies in the digestive tract was 28.5%, compared to 25.4% reported in some other studies, indicating that symptoms were not common.<sup>8</sup> Therefore, the diagnosis cannot rely solely on the occurrence of symptoms. In this study, the history of foreign body ingestion was considered the primary diagnostic criterion. The higher incidence (62.5%) and greater number of symptoms (vomiting, abdominal pain, chest pain, sore throat, and dyspnea) in case of foreign bodies in the esophagus than in other locations, were consistent with other studies.<sup>9,10</sup> For example, a 4 years and 6 months old child had a sore throat and a sense of nausea caused by ingestion of a crab shell. Subsequently a flaky crab shell was removed from the esophageal entrance by gastroscopy. Three cases were found to have the foreign bodies in the esophagus by imaging after developing symptoms such as nausea, vomiting, or chest pain after ingestion of coins. Among the 13 cases with foreign bodies in the stomach, only 2 cases developed the

symptom of vomiting, and only 1 of the cases with foreign bodies in the intestine had symptoms, namely abdominal pain.

In this study, the position of foreign bodies in the esophagus in 16 cases were determined by X-ray or computed tomography (CT), and they were removed by emergency endoscopy. This is consistent with the recommendation for gastroscopic removal of foreign bodies in the esophagus in the *Guidelines*, which suggest emergency endoscopy for symptomatic or sharp, corrosive, or magnetic foreign bodies in the esophagus, and elective endoscopy for those with no clinical manifestations. The foreign bodies in the esophagus in this study were all removed by emergency endoscopy, possibly due to urgent requests for emergency treatment from the parents.

However, regarding the necessity of endoscopy, it was recommended only in symptomatic cases. Additionally, button batteries are a common type of corrosive foreign body found in the digestive tracts of children. If a button battery was lodged in the esophagus, urgent

**FIGURE 2. A: Removal of coins from the stomach by endoscopy; B: A metal tip on the necklace in the stomach, which was excreted naturally; C: A zipper puller in the stomach, which was excreted naturally**

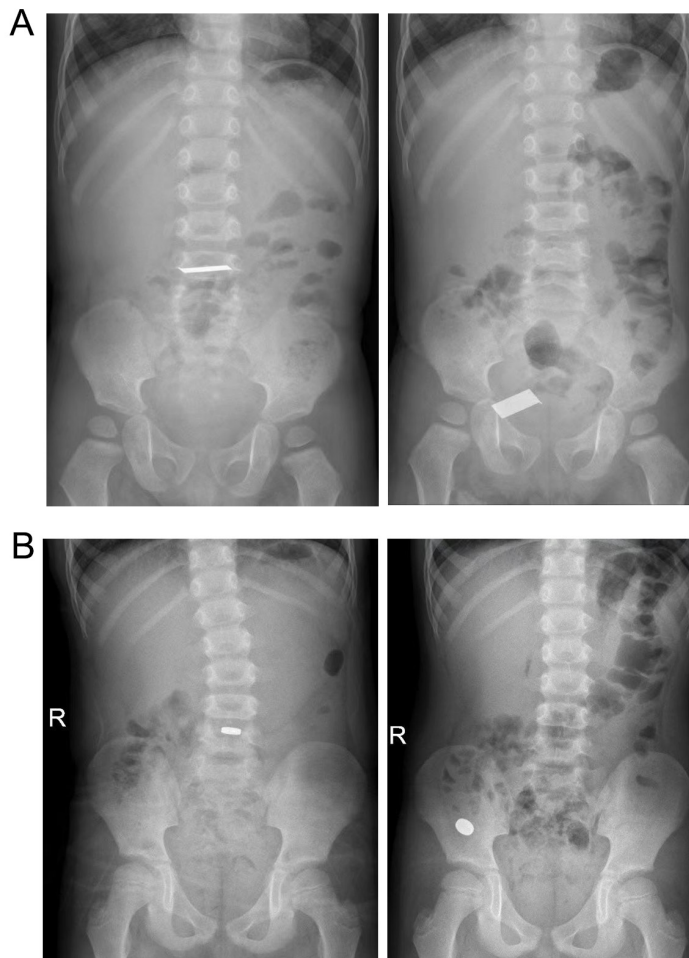


removal was applied due to the potential for rapid and severe injuries, regardless of whether the patient showed symptoms.

Nine of the 13 cases with foreign bodies in the stomach underwent gastroscopy, and only 4 cases succeeding in removing the objects. In

the other 5 cases, gastroscopy showed that the foreign bodies were no longer in the stomach, but migrated to the intestine, as confirmed by X-ray reexamination and were eventually excreted in stools. For example, a 4 years and 4 months old boy was detected to have a zipper puller in the

**FIGURE 3. A: A metal plate already in the intestine on admission, which was excreted naturally; B: A round magnet already in the intestine on admission, which was excreted naturally**



stomach by CT scan, upon admission. However, when he underwent gastroscopy 3 hours later; the foreign body was found no longer in the stomach, but had migrated to the middle abdomen, as shown in the X-ray film reexamination. The zipper puller was excreted in stools the next day. The *Guidelines* recommend observation for single blunt foreign bodies that can migrate within the stomach and intestine without causing obvious clinical symptoms (such as those caused by obstruction or injury), similar to the case with a round magnet in the stomach and intestine in this study. Therefore, out of the above 9 cases with foreign bodies in the stomach who underwent gastroscopy, 5 cases did not require gastroscopy as the foreign bodies had migrated; while the remaining 4 cases where the foreign bodies were

successfully removed via gastroscopy could have been excreted naturally during observation. It should be noted that the recommendation for observation is for single blunt foreign bodies that can migrate in the stomach and intestine without obvious clinical symptoms (such as those caused by obstruction or injury) as in the case of a single round magnet in the stomach or intestine. It does not cover multiple magnets.<sup>11,12</sup>

In terms of the shape of foreign bodies, 12 of the 42 cases had sharp foreign bodies. Among them, 1 case with a crab shell in the esophagus and 2 cases with chicken bones in the esophagus developed symptoms and underwent endoscopic removal. The remaining 9 cases with foreign bodies in the stomach and intestine had them excreted naturally without causing

gastrointestinal perforation or other complications. This confirms the tendency of sharp foreign bodies to cause symptoms in the esophagus,<sup>13</sup> and the need to immediately remove them after these symptoms. However, if they have passed through the esophagus, and can migrate within the stomach and intestine, they can usually be excreted spontaneously. This is consistent with a large-scale study on sharp foreign bodies.<sup>14</sup> As recommended in the *Guidelines*, sharp foreign bodies in the gastroduodenal part can be immediately removed by endoscopy. However, the same recommendation may need to be verified by large-sample studies on blunt foreign bodies in the stomach and intestine.

Coins were the most commonly found foreign bodies in 22 cases, representing 52.4% of all the cases in this study, in contrast with 41.2% in some other studies.<sup>15</sup> Among the 22 cases, 9, 7, and 6 cases had coins in the esophagus, stomach, and intestine, respectively, upon admission. Of the 9 cases with coins in the esophagus, all foreign bodies were successfully removed by gastroscopy; only 2 of the 7 cases with coins in the stomach were successfully removed by gastroscopy, 3 cases were under conservative observation at the request of their family and the coins were found to have migrated to the intestine during reexamination the next day. In the remaining 2 cases, the coins were not detected by elective gastroscopy, and were later found to have migrated to the intestine during the X-ray reexamination. These findings confirm the feasibility of the recommendation in the *Guidelines* to observe the blunt foreign bodies that can migrate to the stomach and intestine.

The *Guidelines* recommend prioritizing imaging for detecting foreign bodies in the digestive tract due to its high detection rate and ease of execution. Hand-held detectors can also be used, but they have a low detection rate for metals except for coins. They can be used for follow-up after the initial diagnosis, but are inferior to X-ray examination for the initial detection.<sup>16</sup> A barium swallow can be helpful, but in practice, children are often reluctant to swallow a barium meal after ingesting a foreign object. As a result, this diagnostic test is typically not used, and CT is performed instead. In this study, imaging was used to detect chicken bones, metals, game coins, and button batteries. Among the 4 undetected cases, 1 case with plastics developed chest pain and vomiting; another case with a crab shell had a sore throat, and the

crab shell was found in the upper esophagus by emergency gastroscopy and removed. The other two cases, one with plastics who had no symptoms and the other with half of a toothpick and periumbilical pain, underwent gastroscopy, but no foreign bodies were found and they were eventually excreted in stools. This suggests that the abdominal pain of the case with half of a toothpick could have been coincidental rather than caused by toothpick injury. Therefore, if there are symptoms, foreign bodies that cannot be detected by imaging are likely to be in the esophagus, and can be removed by emergency gastroscopy. If no symptoms occur, they may be in the stomach and intestine, and clinical observation is recommended. Due to the extended retention of foreign bodies in the esophagus, symptoms may develop, and a 24-hour observation period is recommended. For objects located in the stomach, a 1-2 week observation period is advised. If the foreign body has not been expelled naturally within that time, removal through gastroscopy is suggested. Button batteries, being corrosive, require immediate removal from both the esophagus and stomach. If the battery reaches the intestines, it cannot be removed endoscopically, necessitating X-rays every 1-2 days to monitor its movement until natural expulsion occurs. In cases where the foreign body remains in the intestines and complications arise, surgical intervention may be required. Asymptomatic patients should undergo clinical follow-up every three days. The risk of injury increases with larger foreign bodies, typically those exceeding 5 centimeters in size, or those that are more pointed and sharper, in contrast to a single, blunt, small foreign body. Medical professionals should be vigilant when dealing with such cases.<sup>17,18</sup> In addition, using laparoscopic techniques before open abdominal surgery allows for the safe removal of ingested foreign bodies, making laparoscopic minimally invasive surgery the preferred choice over open abdominal surgery due to its advantages.<sup>19</sup>

## CONCLUSION

Most foreign bodies ingested by children can be excreted naturally through the digestive tract. The most common foreign bodies such as coins, single blunt foreign bodies, sharp metal plate, and metal tips on necklaces in this study, can be passed through the esophagus and excreted in stools. Moreover, in cases where the foreign bodies cannot be located through

imaging, they may also be excreted naturally in case there are no serious symptoms. Therefore, understanding the indications for endoscopic removal of foreign bodies is crucial to prevent unnecessary procedures. ■

### Acknowledgements

We are particularly grateful to all the people who have given us help on our article.

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