

Pediatric Foreign Body Ingestion/Aspiration/Removal

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Foreign Body Ingestion

Preface

Foreign body ingestion is common in pediatrics. Incidence is greatest in children <3 years old and in those with developmental delay but may occur in any age. In 80% to 90% of events, objects pass spontaneously through the GI system without complication. However, there are cases when foreign body ingestion requires prompt treatment and intervention based on object type, child's age, past medical history and GI anatomy. Types of foreign bodies that can result in serious complications are coins, button batteries, magnets, and sharp objects.

Coin Ingestion

Key Points

- Coins lodged in the esophagus account for most foreign body ingestions treated in the emergency department.
- Coins are most likely to get stuck at the thoracic inlet, distal esophageal sphincter, or mid-esophagus, where the aortic arch crosses over.
- Several removal methods ([Table 1](#)) are possible as guided by institution protocols.

Assessment and Diagnosis

- Child may be asymptomatic or have one or more of the following symptoms:
 - Drooling
 - Gagging

- Sensation of foreign body in throat/chest
- Vomiting
- Difficulty swallowing
- Abdominal pain
- Respiratory distress
- Usually diagnosed with x-ray (from nose to rectum, including lateral), but metal detectors may be used in known coin ingestions

Management and Treatment

Table 1. Management and Treatment of Coin Ingestion

Method/Setting	Advantages	Disadvantages
Endoscopy in operating room	Most common and reliable method	<ul style="list-style-type: none"> • Most costly, often requiring admission • Carries added risk of anesthesia • Results in longer stays because of NPO time and OR availability
Bougienage with esophageal dilator in emergency department to advance coin to stomach	<ul style="list-style-type: none"> • May be safe and effective if patient is low risk, defined as <ul style="list-style-type: none"> ○ Known, witnessed single coin ingestion <12 to 24 hours post-ingestion ○ Coin position in esophageal lumen confirmed by x-ray (including lateral) ○ No history of esophageal foreign body, GERD, esophageal surgery, strictures, or other esophageal diseases • Significantly decreases length of stay and total hospital charges as compared with endoscopy or watchful waiting 	<ul style="list-style-type: none"> • Not appropriate for all patients (ie, those who do not meet inclusion criteria) • Requires repeat x-ray • Still requires watching at home for object to pass • Potential risks include perforation of esophagus if strict inclusion criteria not met
Foley catheter in emergency department to remove coin	Significantly decreases length of stay and total hospital charges as compared with endoscopy or watchful waiting	<ul style="list-style-type: none"> • May require IV access, sedation and fluoroscopic guidance • Infrequently used due to potential risks, including rupture of the esophagus (reported in literature) and coin aspiration (never reported in literature)
Watchful waiting/PO fluid challenge* *Follow-up includes <ul style="list-style-type: none"> • Repeat visit with x-ray in 12 to 24 hours to confirm passage into stomach • Monitoring of stool • If child is symptomatic or coin is not noted in 2 weeks, return for repeat abdominal x-ray 	Reasonable approach if certain that foreign body is a coin, not a battery, or other potentially harmful object, and child is tolerating fluids	<ul style="list-style-type: none"> • Approximately 2/3 will still require delayed removal • Giving glucagon to induce passage into stomach provides no benefit • Once the coin passes into the stomach, it is unlikely to cause problems or require removal; however, entrapment can occur at the pylorus, the ligament of Treitz, or the ileocecal valve

Button Battery Ingestion

Key Points

- Severe complications from button battery ingestion are increasing as more devices contain button batteries and larger batteries are being used (batteries >20mm are most dangerous).

- Serious damage can occur quickly if battery lodges in esophagus.
 - Mucosal damage can occur within 2 hours.
 - Damage can result from electrical current, chemical irritation from leaking battery acid, and direct pressure of lodged battery.
- National Button Battery Hotline (202-625-3333) is available 24/7 to assist in decision-making.
- Education and preventative counseling are important because of difficulty in diagnosis without witnessed ingestion and possible severe consequences of delayed diagnosis.

Assessment and Diagnosis

- Maintain a high index of suspicion; child may have vague symptoms or no symptoms.
- Differentiate from coin by
 - History
 - Double ring or halo sign on posterior-anterior chest x-ray
 - Visualizing step-off on lateral x-ray
- May not require x-ray if child is asymptomatic, >12 years old, and ingested battery is <12mm diameter because battery unlikely to get stuck. Determine size of ingested battery by measuring replacement battery.

Management and Treatment

- If battery is in stomach and child asymptomatic
 - Must determine if battery is lithium, as it is higher voltage and more likely than alkaline batteries to cause mucosal damage. If lithium, likely needs to be removed, even if asymptomatic.
 - For most, may observe at home with option of adding laxative; monitor stool.
 - If not seen in stool, repeat x-ray in 4 days.
 - If battery has not moved past stomach, endoscopic retrieval is recommended.
- If battery is in esophagus
 - Perform emergent endoscopic removal in operating room for both diagnostic and therapeutic purposes; this allows for removal and visual inspection of mucosal damage.
 - Do not delay because of anesthesia NPO time.
 - Complications may include esophageal stricture, tracheo-esophageal fistula, bleeding from corrosion, and rupture into vessel.
 - If mucosal damage is seen, follow-up endoscopy is indicated. Observe for signs of bowel necrosis.

Magnet Ingestion

Key Points

- Incidence of rare earth magnet ingestion is increasing.
- Extremely high magnetic force increases risk of complications, such as bowel wall ischemia, bowel obstruction, and rupture.
- May cause significant damage if child ingests more than one magnet or one magnet and a metal object.

Assessment and Diagnosis

May be difficult to distinguish number of magnets on x-ray, so obtain lateral view once foreign body is identified.

Management and Treatment

- If confident that only 1 magnet was ingested and child is asymptomatic, give laxative and follow with serial x-rays.
- If child ingested >1 magnet or 1 magnet and a metal object, refer to a facility where pediatric gastroenterologist and pediatric surgeon are present for evaluation and/or removal.

Sharp Object Ingestion

Key Points

- Sharp, elongated objects, such as straight pins and toothpicks, pose an increased risk for perforation.
- Objects longer than 4 to 6 cm are not likely to pass through the small intestine.

Assessment and Diagnosis

Maintain a high index of suspicion, as toothpicks are not radiopaque.

Management and Treatment

- Consider removal, even if the object already has passed into the stomach.
- Manage in conjunction with a GI specialist or pediatric surgeon.

Foreign Body Aspiration

Preface

Foreign body aspiration is less common than ingestion but often more serious, requiring acute intervention. Choking is the fourth cause of accidental death in the U.S., claiming 4,700 lives in 2010. Death from choking occurs once every 5 days, and 17% of these deaths are caused by hot dogs.

Complete Foreign Body Airway Obstruction

Key Points

- Choking due to foreign body airway obstruction may be fatal or have high morbidity.
- Most aspirated foreign bodies are radiolucent, so providers must maintain a high index of suspicion. Delay in diagnosis may cause significant damage.
- Common causes of foreign body airway obstruction are high-risk foods, small toys, and balloons. (See "[Prevention](#)" below for more details.) A balloon is the most common object to result in death from aspiration because it can conform to the size of the airway and can't be cleared with abdominal thrusts.
- Prevention of foreign body aspiration and choking remains the focus because diagnosis is often difficult.

Assessment and Diagnosis

- Maintain a high degree of suspicion. In many cases aspiration is unwitnessed. Delay in diagnosis may cause significant morbidity.
- Acute onset of stridor and respiratory distress after a witnessed choking episode makes

diagnosis of a foreign body trapped in the larynx or trachea relatively straightforward.

- In 75% to 94% of cases, the foreign body migrates to bronchi, resulting in less specific symptoms and a more difficult diagnosis.
- Chest x-ray is the first study recommended although 80% to 96% of aspirated items are radiolucent.
- If x-ray is negative, but strong suspicion is present, get inspiratory and expiratory chest x-ray or lateral decubitus; if child is unable to comply, look for signs of air trapping.
- If these are negative, but strong suspicion is still present, refer child to a facility for multidetector CT virtual bronchoscopy, which is a non-invasive diagnostic tool that provides a three-dimensional view of the tracheobronchial airway.
- If negative, but still high suspicion, will need rigid bronchoscopy for definitive diagnosis and management.

Management and Treatment

The American Heart Association and American Red Cross recommend the following actions for the management and treatment of a choking child ([Table 2](#)).

Table 2. Recommendations for the Management and Treatment of a Choking Child

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	For Children	For Infants
American Heart Association	Abdominal thrusts* (previously called Heimlich maneuvers)	Back blows followed by chest thrusts*
American Red Cross	5 back blows followed by 5 abdominal thrusts*	5 back blows followed by 5 chest thrusts*

*Repeat until object is expelled or child becomes unresponsive. If child becomes unresponsive, begin CPR.

Prevention

Key Points

Prevention is key, including efforts by health care providers, national regulatory agencies, and professional organizations.

Choking Prevention Guidance to Parents and Caregivers

- Keep items that are choking hazards and high-risk foods away from babies and children younger than 4 years old ([Table 3](#)).

Table 3. Choking Hazards and High-Risk Foods

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Choking Hazards	Coins, buttons, toys with small parts, toys that can fit entirely in a child's mouth, small balls, marbles, balloons, small hair bows, barrettes, rubber bands, pen or marker caps, small button batteries, refrigerator magnets, pieces of dog food
High-Risk Foods	Hot dogs, sausages, nuts and seeds (eg, peanuts), chunks of meat or cheese, whole grapes, hard or sticky candy, popcorn, marshmallows, chunks of peanut butter, chunks of raw vegetables (eg, carrots), chewing gum

- Cut food for babies and young children into pieces no larger than one-half inch.
- Encourage children to chew food well. Supervise meal times.
- Insist that children sit down while eating. Children should never run, walk, play, or lie down with food or foreign bodies in their mouths.

National Prevention Efforts

- Because toy balls and marbles commonly result in aspiration, the Child Safety Protection Act of 1994 requires balls intended for use by children < 3 years to be at least 1.75 inches in diameter.
- In 2010 an AAP task force published the following recommendations:
- Foods should be labeled with choking risk warnings.
- Toys should have appropriate choking hazard warnings.
- Effectiveness of toy recalls should be improved.
- Food manufacturers should redesign high risk choking foods to decrease risk.

This guideline was developed to improve health care access in Arkansas and to aid health care providers in making decisions about appropriate patient care. The needs of the individual patient, resources available, and limitations unique to the institution or type of practice may warrant variations.

References

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