

## Pediatric Foreign Bodies

**Urgent message:** A variety of objects find their way into the ears, noses, and throats of children. Some can be lethal and require ED or specialist referral. Others can be safely removed in an urgent care setting.

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### Introduction

In children who are brought to an urgent care for treatment, foreign bodies are common. Especially if they are between the ages of 18 months and four years, children will insert objects into their ears or nostrils as well as swallow sometimes very surprising things.

Commonly inserted foreign bodies include beads, food, toy parts, and paper. Common ingested foreign bodies include coins and toy parts. Magnets and button batteries can be ingested or inserted. The presence of either object requires special attention, as we shall see. Insects are a common accidental foreign body found in the ear.

The placement or ingestion of a foreign body can be obvious. It can be witnessed by a parent or caregiver. Sometimes a child will notify the parent after the event occurs. Or a well-meaning sibling may witness the event and notify an adult.

However, the presence of a foreign body can also be subtle. The timing of the placement or ingestion can be unknown. A child may present with purulent rhinorrhea or epistaxis and have a nasal foreign body as the cause.

As such, with pediatric patients—especially young children—a high index of suspicion for a foreign body should be maintained even when the presenting symptoms seem to suggest an illness. Not all purulent rhinorrhea, for example, is sinusitis, especially if it is unilateral. While nose picking is a common cause of acute nosebleed, it may also be that a button battery or magnet is lodged in the nasal cavity and causing necrosis.

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Difficulty breathing or a chronic cough is not always due to a respiratory infection. A foreign body can be a surprise finding on a routine ear exam.

For any clinician caring for children, knowledge of pediatric foreign bodies, including how to perform an evaluation to rule them out and how to remove them if discovered, is therefore essential.

### Preparation for Removal

Even if an ear or nose foreign body is identified and can be removed without difficulty, some preparation is still needed to best facilitate the procedure. Educating the child and caregiver about what is going to occur is of great importance. Explaining the procedure to the older child will often lead to better success. In the younger child, distraction with a book or toy may be helpful. A less-cooperative child may require immobilization. A papoose board, if available, can help immobilize the child's arms and legs. If a papoose board is not available,

wrapping the child in a bed sheet to secure the arms and legs can accomplish the same goal.

Sedation for the removal of an ear or nose foreign body is often not necessary. The experienced provider with the appropriate staff and resources may use oral midazolam for light sedation and anxiety. A dose 0.25 mg/kg-0.5 mg/kg may be given 30 minutes prior to the procedure. In some settings, intranasal midazolam is available. The dose is 0.2mg/kg and can be administered 10-30 minutes prior to the procedure. Any patient receiving any level of sedation should be observed until he or she is back to baseline.

### Foreign Bodies in the Ear

The external ear canal is divided into two regions: the lateral third and the medial two-thirds. The medial two-thirds of the canal is narrow, very vascular, and quite sensitive. Foreign bodies in the medial two-thirds are often more difficult to remove, especially if the foreign body is close to the eardrum.

Spherical-shaped foreign bodies such as beads or BBs are often difficult to remove. It can be challenging trying to grasp a spherical foreign body. Irregular-shaped and/or soft foreign bodies such as paper, tissue, or cotton are easier to remove. If a button battery has been inserted in the ear, it should be removed as soon as possible. A battery lodged in the ear can cause tympanic membrane perforation or stenosis of the external auditory canal.<sup>1</sup>

Various tools are available for foreign-body removal. Alligator forceps are the most common tool used for removal by non-ENT physicians. However, alligator forceps are not ideal for spherical-shaped foreign bodies. They are most useful when the foreign body can be directly visualized in the external canal.

Curettes are readily available in urgent care settings. They come in many shapes and sizes and can be metal or plastic. A curette can be carefully manipulated past the foreign body and then slowly withdrawn to remove the object.

Irrigation can be performed with a 20 mL-50 mL syringe and a flexible IV catheter tip. Inject a constant stream of water to flush the external ear canal. It is preferable to use water at body temperature to avoid discomfort to the child. Irrigation is not recommended for foreign bodies that are spongy or expansile when wet,

*“A battery lodged in the nose can cause epistaxis or septal necrosis with perforation.”*

such as vegetable matter.

An insect in the ear can cause great discomfort to a child, especially if the insect is still alive. Viscous lidocaine can be applied to the ear canal both to anesthetize the canal and “drown” the insect. The non-moving insect can then be removed with forceps or irrigation.

Cyanoacrylate is not recommended to facilitate the removal of foreign bodies. It is commonly thought that a fast-acting adhesive applied to a swab or curette can adhere to the foreign body and make it easier to remove. The likely result, however, is that instead of having one foreign body in the ear canal, you will now have two: the initial foreign body and cyanoacrylate!<sup>2</sup>

Earrings can get embedded in the earlobe. This is often because the earring back is too tight. The earring can become posteriorly displaced. Cellulitis may be associated as well. To remove the earring, provide local anesthesia with lidocaine (no epinephrine). Sometimes the earring can be pushed through; at other times a small incision is required to facilitate removal. If cellulitis is present, a course of oral antibiotics is indicated.<sup>3</sup>

### Foreign Bodies in the Nose

The same types of objects placed in the ear can be inserted into the nose—and often are. If a button battery has been inserted into nose, it should be removed immediately. A battery lodged in the nose can cause epistaxis or septal necrosis with perforation.<sup>1</sup>

Magnets inserted into the nose also require prompt removal. Magnets can adhere to each other across the nasal septum, causing septal hematoma or septal necrosis. Often forceps are not strong enough to break the magnetic force. There are case reports of using a household magnetic pickup device, generally a wand-like tool, to separate the magnets.<sup>4</sup>

There are various techniques to extract a nasal foreign body. The simplest method this is to have the child to blow his or her nose while compressing the non-occluded nostril. Administering positive pressure is another means of removal.

“Parent’s Kiss” has been described in the literature.<sup>5,6</sup> Position the child in the parent’s lap in a semi-recumbent position. Then have the parent deliver a sharp mouth-to-mouth breath while compressing the non-occluded nostril. The same technique can be accomplished with

a bag valve mask, also known as an Ambu bag.

Another option is mechanical extraction. Forceps and curettes, described in the section on removing ear foreign bodies, can be used in the same fashion for nasal foreign bodies. In addition, a Foley catheter can be used to remove a posteriorly placed foreign body. Manipulate the Foley past the foreign body, inflate the balloon, and gently pull to remove.<sup>2,7,8</sup>

Lastly, saline washout, similar to the technique used to collect mucus for viral studies, can be performed with about 7 mL of saline injected at high pressure into the non-occluded nostril.

### Ingested Foreign Bodies

Objects impacted in the esophagus are the most common and potentially the most problematic consequence of a gastrointestinal foreign body. Coins account for 50%-75% of swallowed foreign bodies. Foreign bodies in the esophagus tend to lodge in three sites: the thoracic inlet, the aortic arch, and the gastroesophageal junction. The majority of foreign bodies lodge at the thoracic inlet. Objects that pass safely into the stomach are likely to pass through the remainder of the GI tract without complications. This includes pointed objects such as screws and staples. While it is commonly thought that objects greater than 5 cm are less likely to pass, there are no definitive length guidelines. However, sewing needles appear to pose a higher risk for causing perforations.<sup>9,10</sup>

#### Coin Ingestion

Patients presenting with airway symptoms—cough, stridor, or respiratory distress—are likely to have a foreign body in the proximal esophagus. Patients presenting with pain, drooling, and/or dysphagia often have the foreign body lodged in the middle to distal esophagus. The precise location of an ingested coin is often determined by radiograph.

A prospective study looked at the spontaneous passage of esophageal coins in asymptomatic patients. The investigators found that coin location was important in predicting spontaneous passage, whereas coin type and size were not. Coins in the distal esophagus had up to a 67% spontaneous passage rate in study subjects, whereas coins in the proximal and middle esophagus had 14% and 43% spontaneous passage rates, respectively. The results suggested that an asymptomatic

*“Coins account for 50%-75% of swallowed foreign bodies.”*

patient could be observed for 8-16 hours to determine if the coin would pass.<sup>11</sup>

For coins needing removal, endoscopy is the mainstay of management. Other modalities have been tried as well. Glucagon, for example, produces relaxation of the smooth muscle of the esophagus

and has been used to promote passage of esophageal foreign bodies. However, one study failed to corroborate the effectiveness of glucagon for this use in children.<sup>12</sup>

Several studies in children have investigated the use of the bougienage procedure to advance an esophageal foreign body into the stomach with documented success. In the appropriately screened child and in the appropriate setting, this may be an option, provided the physician has the required skill set to perform this procedure.<sup>13,14</sup>

#### Battery Ingestion

With the proliferation of battery-powered toys and electronic devices of every sort, disk batteries have become common foreign body ingestions in children, most likely due to their increased use. A review of three national databases revealed a 6.7-fold increase in button battery ingestions from 1985-2009 with major or fatal outcomes.<sup>15</sup> The size of the battery and its composition play a role in the outcome. Thirty-one of 33 cases with major outcomes or fatalities involved batteries greater than 20mm. Lithium batteries have more clinically significant outcomes than other battery types, with severe burns with sequelae occurring in just 2-2.5 hours. Almost all batteries greater than 20mm were of lithium composition in this analysis.

Batteries can cause injury in three ways. First, batteries can generate an external electrolytic current at the negative pole that can hydrolyze tissue fluids and produce hydroxide. Second, batteries can leak alkaline electrolyte, which is poisonous. Third, a battery can exert physical pressure on adjacent tissues, creating a choking hazard.

Ingested lithium batteries are particularly worrisome. While they do not tend to leak an irritating chemical or produce local damage, lithium batteries have a higher capacitance than other batteries, thus generating more current. This means that more hydroxide is generated more rapidly than with other batteries. Hydroxide burns and causes ulcers in adjacent tissue. As it burns through the walls of the esophagus or gastrointestinal canal, hydroxide can cause catastrophic internal bleeding.<sup>15</sup>

When evaluating a child with known or suspected battery ingestion, in most situations, an initial radiograph is required. An older child (>12 years) with a known small battery (<12 mm) ingestion may not necessarily need an x-ray, as significant complications are unlikely.

If there is a battery present in the esophagus, it must be removed emergently, ideally within two hours. If a battery is in the stomach or intestine, and the patient is asymptomatic, the battery may be left to pass spontaneously. In a smaller child who ingests a larger battery, a follow-up radiograph in four days is suggested to ensure that it has passed.<sup>15,16</sup>

Consult with an ENT specialist or gastroenterologist sooner rather than later when a child has ingested or inserted a button battery. Phoning the National Battery Ingestion Hotline (202-625-3333) can help determine the course of treatment a child needs. In addition, the National Capital Poison Center offers a useful algorithm for button battery ingestion triage and treatment ([www.poisson.org/battery/guideline.asp](http://www.poisson.org/battery/guideline.asp)).

### *Magnet Ingestion*

Magnets can be used in toys, crafts, or jewelry. A single ingested magnet poses complications no different from any other solitary ingested foreign body. However, multiple magnets ingested, or a magnet ingested with other metallic objects, can cause many severe gastrointestinal complications.

When a magnet becomes aligned with another magnet or metallic object, the bowel wall can be dragged along. A section of bowel wall trapped between magnets can develop pressure necrosis leading to perforation, peritonitis, or obstruction. If a blood vessel gets trapped between magnets, hemorrhage can occur. If a large loop of bowel is involved in the magnetic attraction, volvulus can occur.

Much like any other ingested foreign body, a plain radiograph is often obtained to determine the location of the magnet. It may be hard to differentiate one magnet from two or more magnets on imaging, even with a CT scan. Maintaining a high index of suspicion for multiple magnet ingestion is therefore advised.

If a magnet is beyond the reach of an endoscope and the patient is asymptomatic, hospital admission for observation, serial abdominal exams, and serial radiographs is recommended. If at any point during the evaluation or hospital course, the patient develops worsening abdominal pain or signs of obstruction, surgical intervention is indicated.<sup>17-19</sup>

As with battery ingestion, involve an ENT specialist or gastroenterologist early in the patient's care. As is always recommended when deep sedation or anesthesia may be required, keep the patient NPO.

### **Aspirated Foreign Bodies**

Foreign bodies lodged in the upper airway can be immediately life-threatening. If the airway is partially occluded, respiratory distress, stridor, and labored breathing will likely be present. If the airway is completely occluded, basic life support should be performed. In the awake patient, the Heimlich maneuver can be performed if the child is older. Back blows with chest compressions can be used even in a child less than one year of age. In the unconscious child, chest compressions should be performed. Such children need to see an ENT specialist emergently.

Foreign bodies lodged in the lower airway have a much more subtle presentation. These most commonly present in the child less than three years of age. Food accounts for most aspirations, with peanuts being the most common.

If a child presents with a witnessed choking episode, the diagnosis is often made more quickly. Focal lung findings on physical exam and focal hyperinflation on chest radiograph are often—but not always—present. If there is a good history of choking or any focality on evaluation, the patient should be referred to an ENT specialist or pulmonologist for further evaluation and possible bronchoscopy.

The child with an unwitnessed choking episode is more problematic. Symptoms seen with lower-airway foreign bodies are similar to some common childhood illnesses, including asthma, bronchiolitis, and pneumonia. In evaluating the child presenting with chronic cough or new-onset wheezing, a history for possible foreign-body aspiration should be explored.

The type of radiograph to obtain is often the subject of debate. A plain chest radiograph may have focal findings but can often appear normal. Inspiratory and expiratory films are often recommended, but given the age group that commonly presents with aspirated foreign bodies, these may be difficult to obtain. Right and left lateral decubitus films can also be obtained in the less-cooperative younger child as another way to evaluate for air trapping. If an abnormality is present on any type of imaging, the patient should be referred for further evaluation.

In the child presenting with chronic cough or new-onset wheezing, if there is no history of possible aspiration and imaging is normal, follow-up with the primary

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care provider should be arranged, keeping in mind that unwitnessed aspiration of a foreign body often takes longer to correctly diagnose.<sup>20-22</sup>

## Conclusion

Many foreign bodies inserted into the pediatric ear or nose can be evaluated and removed in the office or urgent care setting. Knowing the size and makeup of an ingested foreign body is important. A radiograph can help determine its presence, size, and location. Objects lodged in the esophagus, as well as magnets or button batteries lodged in any location, should be referred to the ED for further evaluation by the appropriate subspecialist. Foreign bodies that are aspirated can have very obvious or very subtle presentations. Always maintain a high index of suspicion for the presence of a foreign body in a child presenting for evaluation. When a foreign body is recognized, prompt referral to the ED or an appropriate subspecialist will ensure appropriate care. ■

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