

PRACTICE GUIDELINE

Foreign body ingestions in children and adolescents: A position paper of the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) endoscopy special interest group



Oren Ledder¹ | Raoul Furlano² | Alexandra Papadopoulou³ | Dominique Schluckebier⁴ | Andreia Nita⁵ | Christos Tzivinikos⁶ | Salvatore Oliva⁷ | Simona Faraci⁸ | Luigi Dall'oglio⁸ | Marco Deganello Saccomani⁹ | Priya Narula⁴ | Iva Hojsak¹⁰ | Jorge Amil Dias¹¹ | Vasiliki Spyropoulou¹² | Lorenzo Norsa¹³ | Gokhan Baysoy¹⁴ | Claudio Romano¹⁵ | Matjaž Homan¹⁶ | Mike Thomson⁴

Abstract

Foreign body (FB) ingestion is a relatively frequent occurrence in the pediatric population with multiple potential sequelae. Appropriate intervention may range from urgent endoscopic retrieval to watchful waiting, with multiple variables influencing the decision. The four key variables include the type of object ingested, the anatomical location of the FB, the presence and severity of symptoms, and the time since ingestion. In this position paper, we provide an evidence-based approach to the management of ingested foreign bodies, incorporating expert opinion where existent evidence alone is insufficient to guide clinical judgement. We offer a clear, clinically relevant guide, with user-friendly algorithms, to assist in real-time decision making. We also include practical tips from experts on how to safely and effectively perform endoscopic removal of an ingested FB.

KEYWORDS

gastrointestinal emergencies, management algorithms, pediatric

¹Juliet Keidan Institute of Paediatric Gastroenterology and Nutrition, The Eisenberg R&D Authority, Shaare Zedek Medical Center, The Hebrew University of Jerusalem, Jerusalem, Israel

²University Children's Hospital Basel (UKBB), University of Basel, Basel, Switzerland

³Gastroenterology Department, Children's Hospital Agia Sofia, Athens, Greece

⁴Department of Paediatric Gastroenterology, Sheffield Children's Hospital NHS Foundation Trust, Sheffield, UK

⁵Paediatric Gastroenterology Department, Great Ormond Street Hospital, London, UK

⁶Paediatric Gastroenterology Department, Al Jalila Children's Specialty Hospital, Mohammed Bin Rashid University of Medicine and Health Sciences, Dubai, UAE

⁷Paediatric Gastroenterology and Liver Unit, Maternal and Child Health Department, Sapienza, University of Rome, University Hospital Umberto I, Rome, Italy

⁸Pediatric Gastroenterology, Nutrition, and Endoscopy Unit, Bambino Gesù Children Hospital, Rome, Italy

⁹Department of Paediatrics, Woman's & Child's University Hospital of Verona, Verona, Italy

¹⁰Children's Hospital Zagreb, University of Zagreb Medical School, Zagreb, Croatia

¹¹Paediatric Gastroenterology, Hospital Lusíadas, Porto, Portugal

¹²Division of Gastroenterology, Hepatology and Nutrition, University Children's Hospital Zurich, Zurich, Switzerland

¹³Vittore Buzzi Children's Hospital, University of Milan, Milan, Italy

¹⁴Department of Pediatric Gastroenterology, Hepatology and Nutrition, Istanbul Medipol University, Istanbul, Turkey

¹⁵Pediatric Gastroenterology and Cystic Fibrosis Unit, Department of Human Pathology in Adulthood and Childhood "G. Barresi", University of Messina, Messina, Italy

¹⁶Faculty of Medicine, University Children's Hospital, University of Ljubljana, Ljubljana, Slovenia

Correspondence: Oren Ledder, Pediatric Gastroenterology and Nutrition Unit, Shaare Zedek Medical Center, P.O. 3235, Jerusalem 91031, Israel. Email: oren@szmc.org.il

Funding information: None

CME module may be found at <https://learnonline.naspgghan.org/jpgn2>

Disclaimer: Although this paper is produced by the ESPGHAN Endoscopy SIG it does not necessarily represent ESPGHAN policy and is not endorsed by ESPGHAN.

[Correction added on 3 July 2026, after first online publication: Article title has been updated.]

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](#) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2026 The Author(s). *Journal of Pediatric Gastroenterology and Nutrition* published by Wiley Periodicals LLC on behalf of European Society for Pediatric Gastroenterology, Hepatology, and Nutrition and North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition.

1 | INTRODUCTION

Foreign body (FB) ingestion is a relatively frequent occurrence in the pediatric population, particularly among children 2–5 years old, with reports indicating an increasing frequency in recent years, accounting for up to 1% of emergency department presentations.¹ FB ingestion may result in serious morbidity and even mortality, therefore, appropriate management is critical. Despite the frequency of presentation, high-quality evidence on which to base management guidelines is relatively sparse. The lack of evidence is a factor of the multiple potential permutations influencing management (nature of the FB, location, patient age, and symptoms) and the ethical and practical limitations in generating high-level evidence such as randomized controlled trials. As such, most of the evidence is based on case series, observational studies and animal models, at times sufficient to formulate recommendations well supported by the evidence, but often clinical judgement, and expert opinion must fill in the gaps where evidence is lacking.

To address these limitations, the Endoscopy Special Interest Group of European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) formed a taskforce of international experts, divided the subject matter into six subsections, each assigned to three or four experts. Each team conducted extensive literature reviews (current to June 2025) and drafted the text for their subsection based on available evidence and expert opinion. The entire taskforce reviewed each subsection until consensus was reached, after which the manuscript was extensively edited to incorporate all important data and practice points in a user-friendly, practical position paper, which was then reviewed and approved by all taskforce members.

In most cases, FBs pass spontaneously through the gastrointestinal tract without causing complications. However, in certain instances, endoscopic removal is required to prevent potential injuries or complications.^{2,3} A FB can become impacted at various sites along the gastrointestinal tract due to physiological narrowing. These sites include the hypopharynx, mid-esophagus (due to the aortic arch and left bronchus), lower esophageal sphincter, pylorus, duodenal C-loop, and the ileocecal valve. Additionally, predisposing

What is Known

- Foreign body (FB) ingestion is a common presentation in children.
- Depending on the location and type of FB, the potential for complications may be significant.
- Decision-making regarding endoscopic removal depends on multiple factors.

What is New

- We provide an updated approach, based on available evidence and expert opinion, to guide decision making in managing children who present with an ingested FB.
- We provide user-friendly algorithms for quick reference, covering almost all potential scenarios.
- We included practical tips to assist the endoscopist with the often complicated and potentially dangerous endoscopic removal.

factors such as congenital defects or prior gastrointestinal surgery may increase the risk of FB retention.^{2,3}

The clinical presentation primarily depends on the type of ingested FB and its location within the gastrointestinal tract. Patients with impacted FBs in the hypopharynx or esophagus may present with cough, dysphagia, drooling, odynophagia, retrosternal discomfort, or pain. If the object is retained in the stomach, the patient is often asymptomatic or may present with mild, non-specific symptoms (Table 1—clinical presentation by anatomical location). In most cases, ingestion of a FB is reported by the caregiver who witnessed the event, or by the child itself, however, ingestion may sometimes occur entirely unnoticed. Since FB ingestions are often asymptomatic, or may present with only mild or non-specific symptoms that may be mistaken for other conditions such as pharyngitis, or respiratory tract infections, FB ingestion should be considered in the differential diagnosis in pediatric emergency presentations, including stridor, acute dysphagia, hematemesis, and small bowel obstruction.^{2,4}

TABLE 1 Symptoms and potential clinical sequelae by foreign body location.

Anatomical location	Common symptoms	Clinical notes
Oropharynx/Hypopharynx	Drooling, gagging, inability to swallow, stridor	Risk of aspiration; ENT input likely needed
Upper esophagus	Dysphagia, odynophagia, drooling, gag reflex, retrosternal pain	Urgent or emergent endoscopy often required. ENT input may be more appropriate
Mid esophagus (aortic arch level)	Chest pain, vomiting, cough, respiratory symptoms	Risk of vascular fistula; especially high-risk with button batteries
Lower esophagus	Often asymptomatic or mild dysphagia	Some blunt objects may pass spontaneously; endoscopy ideally within 24 h
Stomach	Typically asymptomatic; possible vomiting or discomfort	Observation is usually possible if the object is small and non-hazardous
Beyond stomach (duodenum and below)	Usually asymptomatic; possible signs of obstruction	Sharp, long, or magnetic objects may require endoscopic removal or monitoring with surgical input

Abbreviation: ENT, ear, nose, and throat.

1.1 | Acute management of FB ingestion in children

The acute management of FB ingestion in children requires a timely, structured, and multidisciplinary approach, guided by the characteristics of the object, its anatomical location, the presence of symptoms and the time elapsed since ingestion.^{2,4} Initial management should begin with a thorough clinical history, including whether the ingestion was witnessed, the type and size of the object, the time of ingestion, and any associated symptoms. Physical examination helps assess the severity of the situation, although it is often normal.

Imaging, particularly biplanar radiographs (anteroposterior and lateral views of the neck, chest, and abdomen), is usually indicated, especially when the type or location of the object is unclear. Lateral imaging may often assist in distinguishing between esophagus and trachea, and between stomach and more distal intestine, which may prevent an unnecessary procedure, or delay the correct intervention.^{2,4} Imaging is likely to contribute little if the ingested item is radiolucent. More advanced imaging, such as computed tomography (CT) scan, may be indicated in certain challenging scenarios to better ascertain the location of the FB, and assess regional damage or potential local vascular involvement. This may occur in the case of a sharp FB in the esophagus, or any esophageal FB with delayed presentation, where local erosion, perforation, or even local vascular damage as identified on CT may warrant coordinated removal with surgical back-up.

Management decisions are tailored based on four key variables^{4,5}:

1. Type of object (e.g., blunt, sharp, magnet, battery, toxic)
2. Anatomical location
3. Presence and severity of symptoms
4. Time since ingestion

A brief outline of these considerations will be presented here with more specific information in the sections below (Table 1).

1.2 | Type of object

- **Blunt objects:** Most will pass spontaneously, particularly if they are in the stomach and the child is asymptomatic. However, if located in the esophagus, especially in the proximal portion, removal should occur within 24 h, or sooner if symptomatic (e.g., drooling, inability to swallow). Objects longer than 5–6 cm or wider than 2.5 cm may not pass through the pylorus or duodenal C-loop and may require elective removal, yet these dimensions may be less relevant in younger children.
- **Sharp or pointed objects:** These should be removed urgently if in the esophagus due to the risk of perforation, however consideration of the length and orientation of the FB must be given to facilitate safe removal. In the stomach, the risk of removal should be considered alongside the risk of conservative management (see below for further details).

- **Magnets:** Ingestion of *multiple magnets* or a *magnet with another metallic object* represents an emergency, even in asymptomatic children, due to the risk of bowel wall entrapment and necrosis. A single magnet may be managed as a benign blunt object.⁶
- **Toxic objects** (e.g., lead-containing items, drug packets): Require individualized assessment. Removal is usually indicated if the risk of leakage or absorption is high, but this must be balanced against the potential risk of removal.
- **Button battery (BB):** Esophageal location is an endoscopic emergency because of the risk of severe local damage with potentially catastrophic consequences. Gastric location requires consideration of several factors, as outlined below, regarding the need for endoscopic assessment of the esophagus and removal of the BB.

1.3 | Anatomical location

Esophageal FBs are more likely to be symptomatic and prone to complications. Therefore, they should be managed with a certain degree of urgency, depending on the type of FB and the presence of symptoms. In contrast, gastric FB are usually considered “safer,” with a more “forgiving” neighborhood of surrounding organs, thicker viscus wall and more robust mucosa, allowing easier accommodation of the FB than the esophagus. However, depending on the type of FB, the presence of symptoms, or the duration without FB progression, elective removal is often indicated. Once past the pylorus, the FB may rapidly become out of reach of the endoscope; however, depending on the type of object (such as magnets) or the lack of progression, endoscopic removal may still be attempted (Figure 1).

1.4 | Symptoms

The presence or absence of symptoms is often a critical factor in determining the need for endoscopic removal, and its timing. Symptoms frequently influence the decision-making process regarding whether endoscopic removal should be attempted, except in cases such as button batteries, magnets, and esophageal sharp FB, where removal is indicated regardless of symptoms.

1.5 | Time since ingestion

While some FB must be removed emergently, others may be managed conservatively initially, yet as time passes, depending on the nature and location of the FB, the risk of complications increase. One study demonstrated that after 24 h the relative risk of a complication of an esophageal FB is 1.88, yet after 72 h the relative risk increases to 6.83.⁷ Hence, the timing of the ingestion may be a factor in considering the most appropriate management.

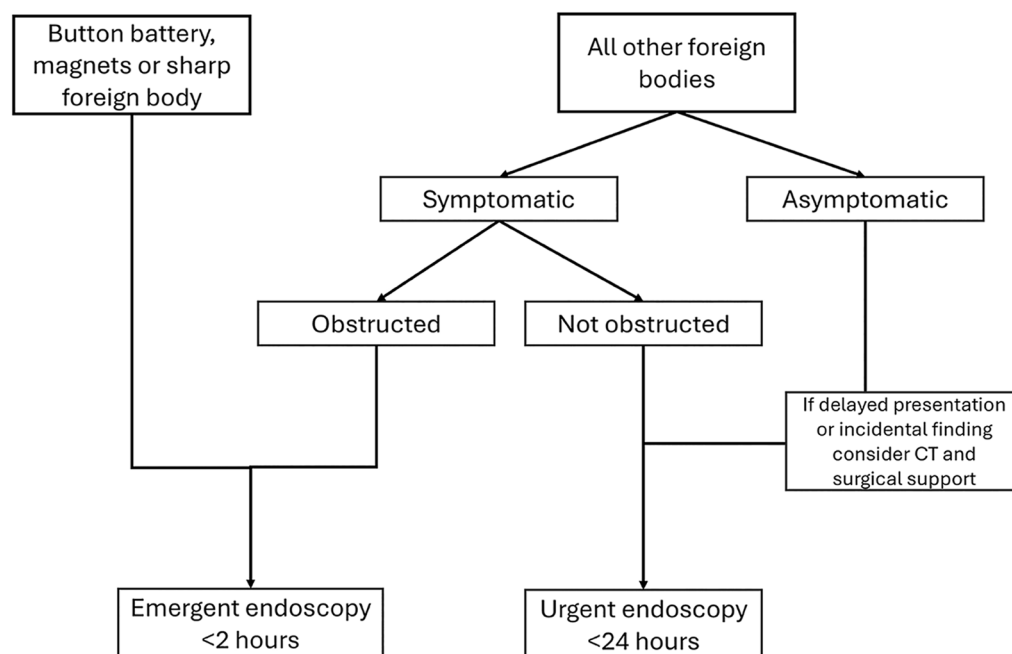
For the sake of consistency, timing of endoscopic intervention will be classified as emergent (<2 h from presentation), urgent (<24 h from presentation), and elective (>24 h from presentation).⁴ Strictly speaking this should be calculated from the time of ingestion, however practicalities may limit the ability to meet these criteria if the presentation is somewhat delayed. Therefore, timing recommendations are typically considered from the time of presentation.

1.6 | Adolescents

The management of adolescents with FB ingestion can be challenging for multiple reasons. When the ingestion is intentional and/or repeated, the patient is often engaging in self-destructive/psychiatric behavior, and invasive procedures to

remove the object may provide additional motivation for the ingestion. Perpetuating the cycle of behavior when urgent endoscopy is required may be an unfortunate consequence; however, it should not affect the decision regarding appropriate management of the FB. Joint management with adolescent medicine and psychology/psychiatry services is warranted.⁸

(A) Esophagus



(B) Stomach

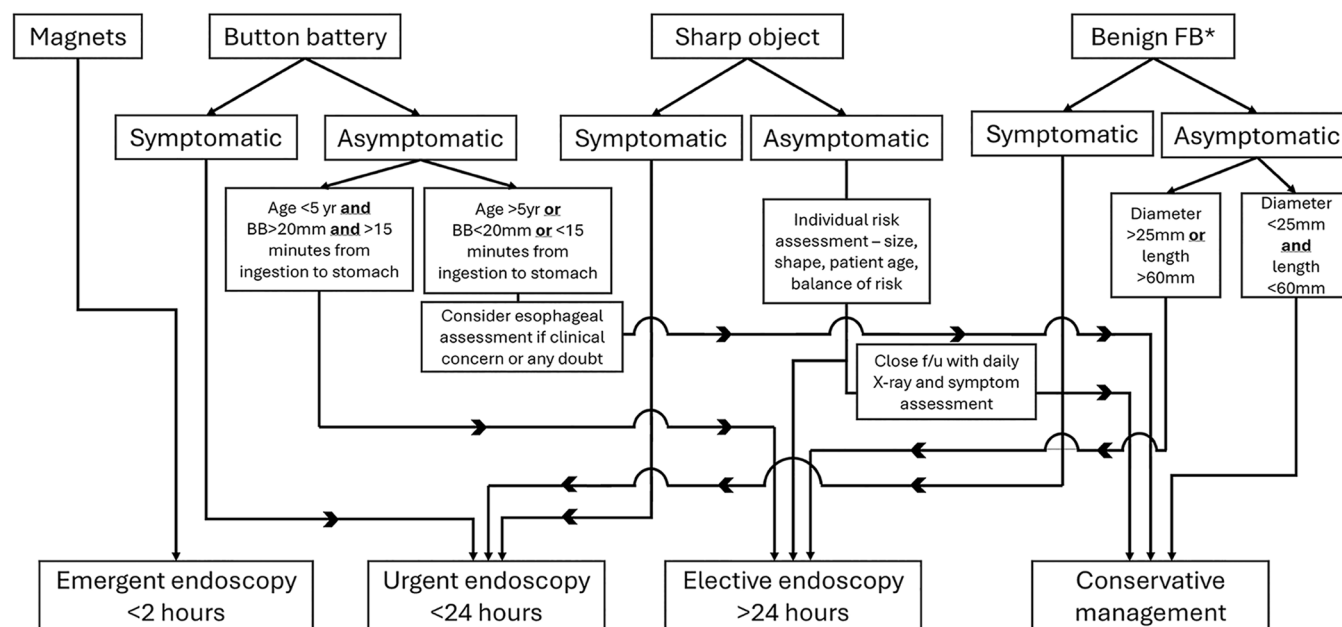


FIGURE 1 Approach to ingested foreign body by location: (A) esophagus, (B) stomach, (C) post-pylorus (*for potentially toxic objects or super absorbent polymers, refer to article text). BB, button battery; CT, computed tomography; FB, foreign body; f/u, follow up.

(C) Post-pylorus

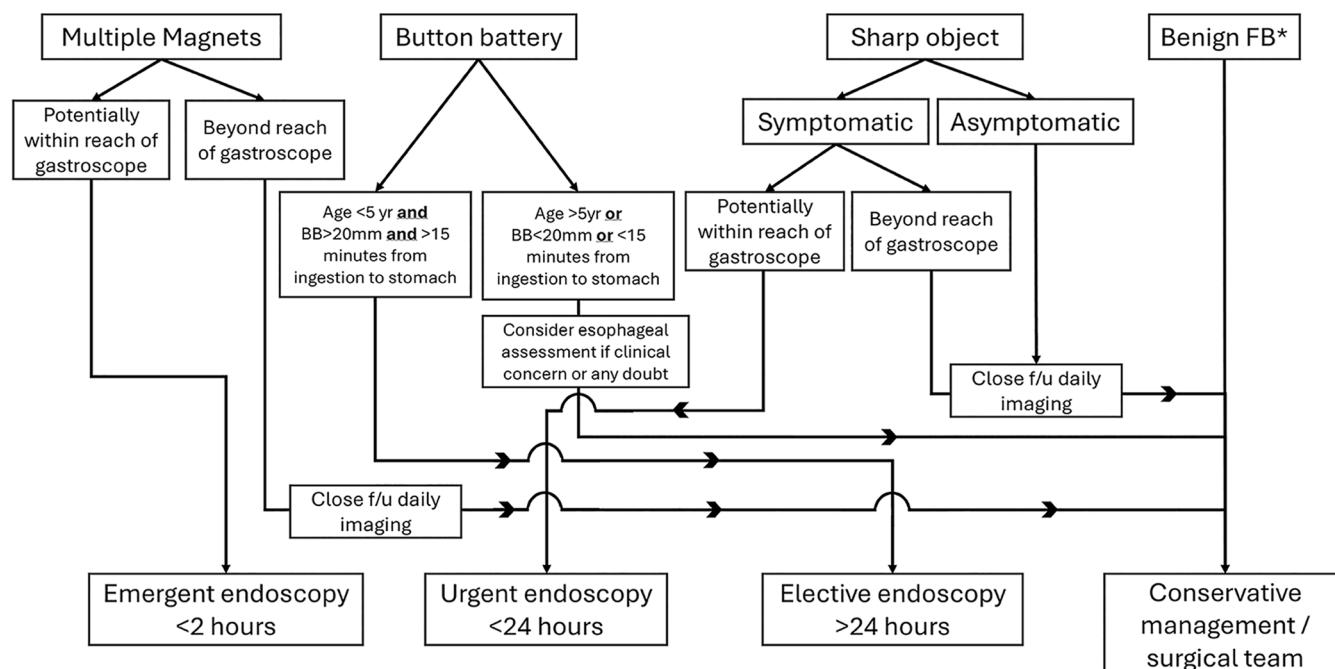


FIGURE 1 (Continued)

In conclusion, the acute management of FB ingestion in children is guided by a combination of object-related, anatomic, and clinical factors. Button batteries, magnets, and sharp objects require heightened vigilance and often emergent intervention. Symptomatic esophageal FBs usually require emergent intervention. Optimal outcomes depend on multidisciplinary coordination between emergency, pediatric, gastroenterology, ear, nose and throat (ENT), surgical, and anesthesiology teams.

1.7 | Recommendations

- The decision whether to remove an ingested FB, and the urgency of removal, depends on
 - the type of FB—benign, sharp, high-risk (button battery, magnet) or toxic
 - location of the FB
 - symptoms of obstruction or local damage (pain, vomiting etc)
 - timing since ingestion
- Based on these factors and available resources for managing the patient, a patient-specific plan needs to be implemented.

2 | BENIGN FOREIGN BODIES

2.1 | Endoscopic removal versus conservative management—Rationalization of conflicting risks

Defining a FB as benign does not mean these items are without risk. Benign FBs include objects which do not pose an

immediate risk of complications due to their nature, unlike sharp objects, button batteries, and magnets. Some benign FBs may have toxic potential, but they are still included in this section because, although these items may carry some variable risk that must be considered, they are not necessarily regarded with the same urgency as other, more dangerous FBs.

Blunt objects are the most common FB ingestion in children.⁹ As with all FB ingestions, the risk of conservative management needs to be balanced against the potential risk of endoscopic removal, however minimal. The risk of a complication from endoscopic removal of a benign FB is considered low, provided the endoscopist has adequate skills and the patient has a protected airway, with a reported complication rate of 2%–8%, predominantly referring to minor mucosal abrasions.^{1,10,11} Conversely, the risk of leaving a benign FB in the stomach to pass spontaneously in an asymptomatic child is also very low, therefore, the decision not to intervene is often appropriate. Esophageal FBs carry a higher potential risk, particularly in symptomatic patients with partial or complete obstruction, due to the risk of aspiration and, in more delayed removal, potential pressure necrosis of the esophageal wall. However, even asymptomatic patients have an aspiration risk, either of oral secretions or the FB, which increases over time.⁷ The risk of damage to the esophageal wall, and potentially also to surrounding vital organs, may also increase over time.

As a general rule, esophageal FBs causing acute symptoms, such as inability to manage secretions, respiratory or other concerns, should be removed emergently. Otherwise, endoscopic removal can be delayed up to 12–24 h.⁴ Indeed, a recent retrospective study of 273 children with an esophageal benign FB who did not meet criteria for emergent

removal, demonstrated no significant difference in risk of complications between removal within the first 4 h compared with waiting up to 12 h since presentation.¹² Hence, in the absence of an emergent indication otherwise, overnight endoscopic removal, requiring activation of limited after-hours resources, may not necessarily be justified.

Considering that the narrowest parts of the gastrointestinal tract are the cricopharyngeal muscle (upper esophageal sphincter) and the lower esophageal sphincter, benign gastric FBs usually pass spontaneously. Passage through the pylorus may be delayed due to the size of the FB and hence, despite the low risk of direct harm from most benign FBs in the stomach, it has been recommended to electively remove objects with a diameter >25 mm or objects longer than 6 cm.^{4,13} These dimensions are based on expert opinion in adults with limited data to support these recommendations,¹⁴ therefore, the decision to remove the FB should take into account the specific nature of the object, the size of the child and the expertise of the treating team. Due to the lack of urgency in most cases, and the often-challenging nature of removing such large objects, these are best removed electively under optimal conditions, including the availability of more experienced staff. Smaller benign non-toxic FBs in the stomach of an asymptomatic child, such as coins, can be managed conservatively with repeat X-ray after a month, and if still retained in the stomach, can be removed electively. This, too, is based on expert opinion, and while some practitioners repeat the X-ray after a shorter time period, there is no evidence to suggest harm from leaving the FB for a longer period.

2.2 | Esophageal food bolus impaction

Esophageal food bolus impaction is often due to an underlying esophageal pathology, most commonly eosinophilic esophagitis (EoE), but also occurs with esophageal strictures (post-tracheo-esophageal fistula repair, congenital, reflux), or more rarely, in motility disorders such as achalasia.^{15–17} Indeed, food bolus obstruction has been described as the first sign of EoE in both adults¹⁸ and children¹⁹ with 55%–74% of children presenting with food bolus obstruction subsequently diagnosed with EoE.^{20,21}

The decision regarding removal is essentially the same as with other benign esophageal FBs, with emergency removal if acutely symptomatic or obstructed (drooling, inability to drink, retrosternal pain), while asymptomatic, or minimally symptomatic children should undergo removal within 24 h.^{4,13}

The food bolus can be removed by manual extraction, suction, or gentle pushing into the stomach with the help of the endoscope.¹³ Pushing the food bolus should be performed with caution since excessive force may cause perforation, particularly if there is a suspected esophageal stricture distal to the impacted food bolus. Manual removal can be achieved in total by using a net retrieval device or snare device, however due to the impacted nature of the food bolus, full expansion of the net and encapsulation of the food bolus is often very challenging, and snare devices are likely to cut the food bolus due to the extraction force required. Usually, piecemeal debulking of the food bolus with graspers or snares is required until it is fully removed or small enough to advance into the stomach—this is often a somewhat time-consuming process. Other more novel

approaches include passing a through-the-scope balloon beyond the bolus, inflating it and withdrawing the bolus into the mouth, where it may be removed with Magill forceps,²² or placing a cap on the endoscopic tip and removing the bolus by suction.²³ More recently, an over-the-scope grasper, which can be attached to any standard gastroscope, was specifically designed for endoscopic removal of larger objects, and was shown to successfully remove food bolus from an adult patient with no procedure-associated complications.²⁴

Following removal, biopsies should be taken from the proximal and distal esophagus (avoiding the site where the food was impacted due to potential local damage from pressure effect) to assess for EoE.¹⁹ If an esophageal stricture or ring is identified after food bolus removal, dilation can be considered during the same session, although this is best deferred if there is evidence of local inflammation or overt EoE.²⁵

2.3 | Glucagon for esophageal FB?

Glucagon has been used to facilitate the passage of an esophageal FB in an effort to avoid endoscopy. Glucagon 1 mg IV has a relaxing effect on smooth muscle and significantly reduces lower esophageal sphincter (LES) resting pressure^{26–28} allowing the passage of the food bolus.²⁹ A large case series of 106 patients with food impaction who received glucagon demonstrated success in 10 (9.4%),³⁰ while another series demonstrated success in 7/19 (37%).³¹ A recent systematic review and meta-analysis of 1185 patients with esophageal impactions demonstrated no difference in resolution rates between glucagon and control patients (30% vs. 33%, $p=0.42$), yet vomiting events occurred more frequently in the glucagon group although this was not statistically significant (11% vs. 0%, $p=0.07$).³² Therefore, glucagon is not currently recommended in this setting.¹³

2.4 | Special cases

2.4.1 | Toxic substances

Several FB may consist of toxic materials, with the risk of harm depending on the nature of the substance and the potential for toxin absorption. There is limited literature describing the wide range of potential scenarios and the treating physician may need to decide on the appropriate course of action, balancing the risks of removal against conservative management, after discussion with the local poisons information service or a toxicologist.

Occasionally ingested lead objects, such as fishing sinkers, curtain weights, or lead shot may be encountered. Lead is poorly soluble in most physiological solutions yet it is soluble in the acid environment of the stomach.^{33,34} Acute lead toxicity can include non-specific gastrointestinal (GI) symptoms, anemia and central nervous symptoms including lethargy, coma, and even death. Symptoms may occur with blood lead levels >30 µg/dL however, encephalopathy should not occur with levels below 100 µg/dL, and it is recommended to commence chelation therapy for levels above 55 µg/dL.³⁵ There are only a few reported cases of lead toxicity from ingested lead FB, including two fatalities, however these

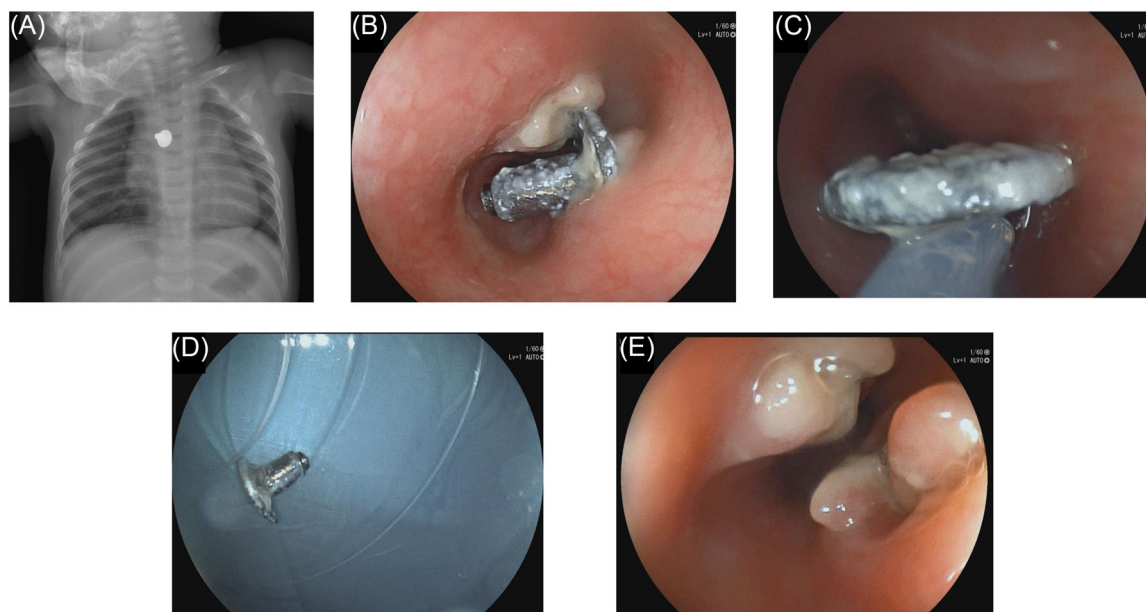


FIGURE 2 Delayed diagnosis of impacted foreign body in esophagus. Six-month old presented with mild symptoms of respiratory distress, chest X-ray (A) demonstrated unidentified foreign body in mid-esophagus with no recollection of ingestion. Gastroscopy revealed impacted stud partially buried in esophageal wall (B), removed utilizing a snare device (C). Foreign body post removal (D), deep ulcerations of esophageal wall (E).

cases involved retained lead FB in the stomach for at least 10 days in one case and 4 weeks in the other.³⁵ Overall the risk is considered very low, and management with acid suppression and close observation with repeat imaging after 48 h has been recommended. Endoscopic removal is advised only if the object does not pass, the child becomes symptomatic, or if blood lead levels exceed 55 µg/dL.^{35,36}

2.4.2 | Superabsorbent polymers (SAP)

SAP can retain up to 100 times their weight in water, therefore their use has increased in various fields. They are currently used in children's toys but are also widely found in diapers, agriculture and many other products. Due to the nature of SAP, ingestion of even a small ball or bead can lead to bowel obstruction, pressure necrosis on bowel wall if impacted, and even death.³⁷ Since these items are translucent, imaging is useful only for identifying the sequelae of the ingestion, but not the SAP itself, and diagnosis relies on parental reporting or a witnessed ingestion, where possible. In cases of witnessed or suspected ingestion of SAP, emergency endoscopy should be performed to attempt retrieval of the material. If this is unsuccessful, or not completely retrieved, the child should be admitted for close observation with surgical support.⁴

2.4.3 | Prolonged esophageal impaction

In the absence of a witnessed ingestion, obstructive symptoms, an impacted esophageal FB may only be identified after some time has passed, such as on imaging for non-

specific symptoms or suspected chest infection.^{38,39} Due to the mass effect, there is potential for pressure necrosis of the esophageal wall and possible damage to surrounding mediastinal organs (Figure 2). Accordingly, additional assessment should be considered before endoscopic removal, including CT, and removal should preferably be performed with surgical support and other contingencies available in case of perforation or bleeding.

2.5 | Recommendations

- Benign FBs should be removed emergently if causing obstruction, and urgently if otherwise symptomatic (individual risk assessment is critical).
- Large FBs (diameter >25 mm and/or length >6 cm) should be removed electively even if asymptomatic. However, the decision should take into account the nature of the object, the size of the child and the expertise of the treating team.
- Glucagon has not been shown to be effective in treating esophageal obstruction.
- Special consideration must be given to potentially toxic FBs such as lead, potentially dangerous FBs such as SAP, and in cases of prolonged esophageal impaction.

3 | BUTTON BATTERIES

3.1 | Background

This section of the position paper should be read in conjunction with the recently published ESPGHAN position

paper on button battery ingestion.⁴⁰ Button batteries (BBs) can cause noticeable initial injuries within just 15 min of esophageal impaction, with more severe injuries in as little as 2 h.⁴¹ The main mechanism of tissue damage is electrolysis and the formation of hydroxide ions at the negative pole, which rapidly increases the pH and leads to tissue liquefaction and necrosis, similar to the injury caused by ingestion of alkaline liquids.⁴² Even after the removal of the BB, tissue damage may progress, with the potential for delayed complications days, or even weeks, following removal.

Symptoms of BB ingestions are similar to those of other FBs, patients can be completely asymptomatic, or present with non-specific symptoms, which can vary with age.^{43,44} Ultimately, the most severe outcomes arise from unwitnessed ingestions, due to prolonged impaction time, with patients potentially remaining asymptomatic until a complication develops.

The extent of the injury depends on the size of the BB (diameter and voltage), the size of the child, and the duration the BB remained lodged in the esophagus. Specifically, BB >20 mm, age of the child <6 years, and unwitnessed ingestions (with associated delayed diagnosis), are all considered risk factors for esophageal impaction and significant injuries.^{40,45} Time from ingestion to removal significantly increases the risk of complications; odds ratio (OR) 3.71 (95% confidence interval [CI] 1.11–12.42) for ≥ 10 h, rising to 5.12 (95% CI 1.79–14.67) for ≥ 12 h.⁴⁶ Prolonged impaction time is more frequently associated with vascular complications than non-vascular complications, which predominated in cases with shorter exposure time (96 h [interquartile range, IQR: 24–240] vs. 36 h [IQR 8–144], $p < 0.05$). Among children with vascular complications, fatal cases had a more prolonged impaction time than survivors (144 h [IQR 33.5–240] vs. 11 h [IQR 7.5–14.5], $p < 0.05$).⁴⁷ Additionally, the location of the battery and the surrounding tissue can help predict the likelihood of complications, for example, proximity to vascular structures in the neck or mediastinum predict the risk of a vascular complication.

A recent systematic review of 44 articles (3125 children) found that mucosal damage (46%) and esophageal stricture (10%) were the most common complications.⁴⁶ Severe complications reported include esophageal stenosis, hemorrhage, tracheoesophageal fistula, vocal cord paralysis, spondylodiscitis, intestinal perforation with peritonitis, pneumothorax, pneumoperitoneum, mediastinitis, and anterior spinal artery syndrome with subsequent paralysis.^{48,49} Fatalities most often occurred due to massive hemorrhage resulting from arterial fistulation (such as aortic, subclavian, or inferior thyroid), aspiration of blood, or bronchopneumonia.^{47,50}

3.2 | Immediate management

Following BB ingestion, or in suspected unwitnessed BB ingestion, in a child >12 months, parents, medical and paramedical staff should be instructed to administer 2 teaspoons of honey every 10 min. Although honey has been demonstrated to protect against deep ulceration and bleeding,⁵¹ transport to hospital should not be delayed by any more than a few minutes in the search of honey. Honey or sucralfate should also be given

during transport and in the emergency department until removal occurs. More recent studies have shown that jam can be as effective as honey,⁵² however until the supporting data become more robust this should remain a secondary preference, used only if honey or sucralfate are not available. Due to the increasing risk of esophageal perforation over time, it has been suggested that honey should not be administered if ingestion occurred more than 12 h prior to presentation.⁴⁰

3.3 | Esophageal button batteries

Esophageal BBs need immediate removal regardless of fasting status, ideally within 2 h of ingestion.⁴⁰ Removal should be performed under general anesthesia with endotracheal intubation. If the BB is located at, or above, the level of the clavicles on x-ray, removal should be carried out by ENT with direct laryngoscopy or rigid esophagoscopy.⁵³ When removed endoscopically, BBs are best extracted by graspers, as net retrieval devices often cannot open sufficiently to enclose the BB around the impacted edges. Endoscopic examination following BB removal should assess the extent, depth, and location of mucosal injury, particularly at the negative pole. In cases of severe mucosal injury, observational evidence suggests placing a nasogastric tube under endoscopic guidance, with bridle fixation, and patients should remain NPO until perforation is ruled out. For delayed diagnosis (>12 h) or severe symptoms like bleeding, a (cardiothoracic) surgeon and/or an interventional radiologist or cardiologist should be involved, and urgent CT scan should be considered before removing the battery.⁴⁰ In such cases, removal should be undertaken with preparedness to deal with massive bleeding, including double large-bore IV access, availability of blood (O negative if there is insufficient time for crossmatching) and active involvement of surgical and interventional radiology or cardiology teams.

Following BB removal, if there are no signs of perforation, irrigation with 50–150 mL of 0.25% sterile acetic acid has been shown to reduce subsequent damage by neutralizing the local pH.^{41,54} While this has not been universally endorsed, it is a strategy that has become widely accepted and may be considered where local protocols allow.

Standardized protocols with dedicated response teams can reduce removal times and minimize delays at every stage, including transfer to specialized centers, emergency department evaluation, and perioperative, intraoperative, and postoperative care of children with esophageal BBs.^{55,56} Various risk mitigation practices can be applied at all three stages and are summarized in Table 2.

3.4 | Gastric button batteries

The appropriate management strategy for gastric BBs remains a subject of ongoing debate. Symptomatic patients or those with co-ingestion of BBs with magnets should undergo urgent endoscopy.^{4,40,50} Asymptomatic patients with unwitnessed ingestion or ingestion >12 h prior should be considered for endoscopy if the patient is younger than 5 years and battery size is ≥ 20 mm, since these factors are more likely associated with esophageal injury.^{4,50,57} If ingestion was witnessed and imaging confirmed gastric

TABLE 2 Mitigation risk of button battery ingestion a practice points before, during and after endoscopic removal.⁵⁰

Before removal	• 10 mL (two teaspoons) honey or sucralfate every 10 min in children >12 months of age and if <12 h post-ingestion (at home, during transport and in hospital) (max 6 doses).^{40,51} • Plan emergency endoscopic removal (<2 h) if esophageal location. • CT imaging if delayed presentation >12 h post ingestion. • Prepare catheter lab/surgery if presenting with bleeding.
During removal	• Rapid sequence induction regardless of fasting time. • Document level/extend of the caustic damage as well as the orientation of the negative pole.⁴⁰ • Anticipate potential acute complications such as esophageal perforation, tracheoesophageal fistula, vocal cord paralysis or frank hemorrhage. • Irrigate with 50–150 mL 0.25% sterile acetic acid if no signs of perforation.^{41,54} • Strongly consider placement of nasogastric tube under endoscopic guidance.
After removal	• Perform contrast imaging of chest (CT/MRI) within 24–48 h if severe mucosal injury was identified. If esophageal wall damage is in proximity to major vascular structures, repeated imaging should be considered every 48–72 h to assess for progression. • If repeat imaging reveals progression of damage impinging on a vascular structure, involve cardiothoracic team to consider prophylactic flap surgery to protect vessels. • Monitor for potential delayed complications: perforation, tracheoesophageal fistula, aorto-esophageal fistula (up to day 28), vocal cord paralysis, mediastinitis, spondylodiscitis. • Consider repeat esophagogram after 3–4 weeks if symptoms or high risk of stricture • Clear discharge instructions in written form to parents especially if they request earlier discharge.

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging.

location within 15 min of ingestion, the risk of esophageal injury is considered low, even in smaller children with large batteries. Endoscopy should be considered for patients with a history of intestinal surgery or known GI anatomical abnormalities.⁵⁸ Asymptomatic patients who do not meet these criteria can be managed as outpatients as these batteries usually pass spontaneously.⁴⁵ In such patients, abdominal X-ray should be repeated within 7–14 days (or sooner if symptoms develop) and endoscopic removal should be performed if there is no passage.⁴⁰ One multicenter retrospective study, demonstrated some level of gastric injury from gastric BBs, particularly when removal time was over 12 h,⁵⁸ however, the clinical relevance of this finding is unclear, and likely insignificant. This position is supported by a recent systematic review and meta-analysis which showed gastric BBs had minimal clinical sequelae.⁵⁹

Patients with small intestinal or colonic BBs or magnet co-ingestion should be managed with surgical support, and surgery should be performed if there is lack of passage of the BB or evidence of local complications.⁴⁰ Asymptomatic patients should have repeat imaging to confirm passage, and if the BB has not passed, surgery should be considered.

3.5 | Post-removal follow-up

The potential for development of complications can persist for several weeks following BB removal. A risk assessment is critical to plan post-removal follow-up. Cross-sectional imaging within 24–48 h after removal enables assessment of the structures near the BB impaction site, particularly vascular structures, as well as evaluation of esophageal wall ulceration and mediastinal edema or inflammation. Although both CT and MRI are valid options, concerns have been raised about retained metallic debris from the corroded BB, with a theoretical risk of thermal damage during MRI,⁶⁰ and therefore CT may be the preferred initial study. If there is any concern about

proximity of the damage to vascular structures, the patient should be admitted for close observation⁴ with repeat imaging after 48–72 h to assess for progression of the injury.⁴⁰ This should be repeated until the injury, particularly in relation to the vascular structures, begins to show signs of improvement, after which the child may be discharged. If there is evidence of progression of esophageal wall ulceration impinging on vascular structures, especially if there is evidence of damage to the vascular wall, consideration should be given to prophylactic surgical management with thoracotomy and placement of a flap or other separation of the vascular structure from the inflamed region.^{4,61,62} These children should be managed with close co-ordination between the GI team, experienced radiologist and the surgical team.

Other potential post-removal complications include perforation, mediastinitis, tracheoesophageal fistula, vocal cord paralysis, and esophageal stricture. These should all be assessed during follow-up and managed accordingly with conservative, medical and/or surgical measures as appropriate. Following discharge, consider an esophagogram or repeat endoscopy if the child has any dysphagia or other symptoms, or if the initial damage suggested a high risk for stricture.

3.6 | Recommendations

- Esophageal BB impaction is a medical emergency and requires immediate removal.
- Children older than 1 year should be given honey or sucralfate immediately if BB ingestion is suspected.
- If a BB is located in the stomach, gastroscopy should be considered to assess the esophagus (and removal of the BB) based on factors such as the child's age, battery size and estimated time from ingestion until its presence in the stomach.

- Post-removal management depends on risk assessment of actual or potential damage and may require close follow-up with cross-sectional imaging.

4 | MAGNET INGESTIONS

4.1 | Background

This portion of the position paper should be read in conjunction with the recently published ESPGHAN position paper on magnet ingestion.⁶ High-powered magnets pose the second-highest risk, after button battery ingestion, for morbidity and mortality among ingested FBs in children. High-powered neodymium magnets (PNMs) are composed of rare earth elements like $\text{Nd}_2\text{Fe}_{14}\text{B}$. Their strength-to-size ratio is at least 5–20 times greater than traditional (“refrigerator”) magnets, making them particularly dangerous if ingested.⁶³ Initially developed for industrial applications in the 1980s, PNMs are now found in household items such as toys, jewelry, and clasps.^{63–68} The popularity of desktop toys containing PNMs since 2009 has led to an increase in accidental ingestions, especially amongst toddlers, due to their small, colorful, and attractive design. Adolescents are also at risk of magnet ingestion, often using PNMs as faux piercings for noses, lips, or tongues, which can result in severe outcomes.

The incidence of PNMs ingestion in children has increased significantly over the past two decades. Despite under-reporting, a 444% rise in cases has been noted in the United States since 2018, following the lifting of sales restrictions.⁶⁹ Studies report an annual global increase of 6.1%, with severe outcomes associated with multiple PNMs.⁷⁰ In Japan, 104 cases were documented between 2015 and 2017, while UK pediatric data show a 56% rise in admissions due to FB ingestion (2016–2020), with 21% attributed to magnet ingestion.^{71,72} In the United States

(2002–2011), over 50% of magnet ingestions occurred in boys under 5 years.⁷³ Faux piercing-related injuries predominated in adolescents aged 10–15 years (2000–2012), while other causes included mistaking magnets for sweets (6.9%) or carrying them in the mouth (4.2%).⁷⁴

4.2 | Possible complications

A single magnet ingestion can be managed as a benign FB, however, ingestion of multiple PNMs, or a strong magnet together with another ferromagnetic swallowed FB (such as button battery or other metal object), can cause severe complications. Strong magnetic forces enable magnets to attach across layers of the gastrointestinal wall, compressing blood vessels and causing ischemia, necrosis, and finally perforation. This can lead to fistulas (entero-enteric, gastrointestinal, or tracheoesophageal), peritonitis, or even death, if untreated.⁷⁵ High numbers of powerful magnets can form chains or loops, resulting in bowel obstruction or volvulus.^{74–79}

4.3 | Management

Timely consultation with a pediatric surgeon and gastroenterologist is crucial for the treatment of magnetic ingestion and minimizing mortality. If magnets are in the upper airway, involvement of ENT specialists and pulmonologists may also be required.^{4,13,80} Evaluation begins with a detailed history, including the time of ingestion and number of magnets. A thorough physical examination and chest/abdominal X-rays are mandatory to locate the magnets and assess potential complications, such as obstruction or perforation. At least two views should be obtained to identify the number of magnets

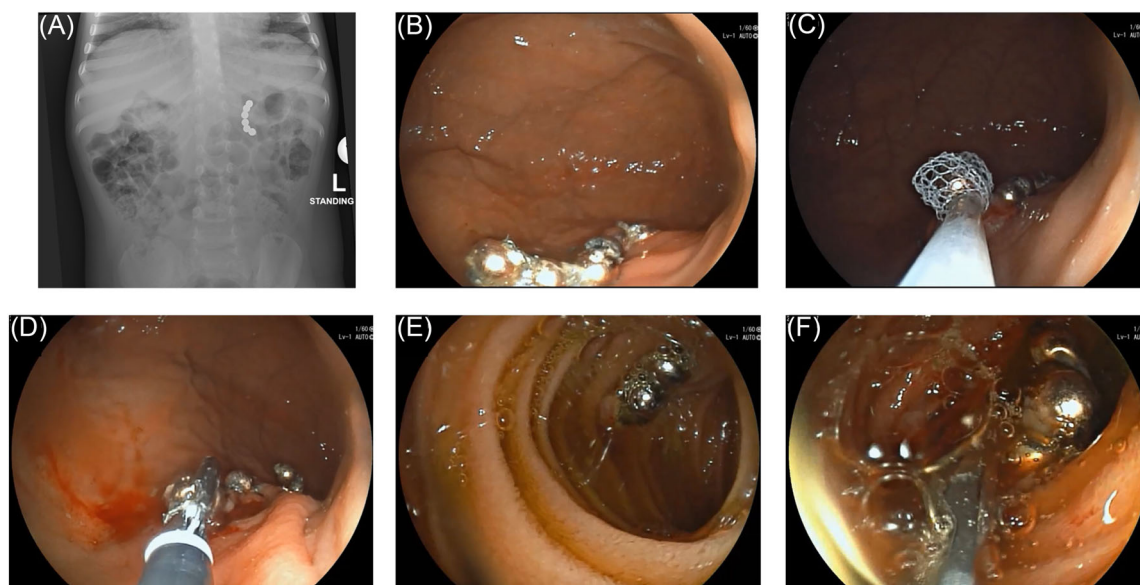


FIGURE 3 One year old swallowed multiple magnets, X-ray revealed six magnets presumably in stomach (A). Gastroscopy revealed chain of six magnets adherent to stomach wall (B). Magnets removed using net retrieval device (C) and graspers (D) with last remaining magnet still apparently adherent to unseen magnet. Two further magnets identified deep in duodenum (E) and on removal, two further magnets appeared from an unidentified perforation, presumably in the peritoneum (F). Overall, 10 magnets were removed despite only six being identified on X-ray.

ingested. CT imaging may help clarify the location if this is uncertain from x-ray, however MRI is obviously contraindicated due to the metallic nature of the FB.

Confirmed single magnet ingestions can be managed as for regular benign FB, however, if there is any doubt about the presence of a second magnet or an additional metallic FB, management should follow the protocol for multiple magnets. Multiple PNMs require emergency endoscopic removal to retrieve the magnet while it remains within endoscopic reach.⁶ If the magnet is impacted or has re-magnetized with gut wall trapped between them, removal as a single unit may be impossible, and piecemeal removal is often challenging. An attempt must be made to separate the magnets at either side, using graspers or net retrieval devices to entrap and pull the magnets apart. Separation of magnets may be challenging, particularly in the absence of an opposing force to fixate the other magnets. Significant force may be necessary, and surgical involvement, including laparoscopic assistance, may be required if separation and removal are unsuccessful. Often, removal needs to be approached from both sides (Figure 3). On table fluoroscopy has been suggested to confirm removal of all magnets if there is doubt whether all have been retrieved.

Mural perforations can be managed with immediate therapeutic endoscopic procedures, such as clip devices, yet may also be managed conservatively with surgical input and antibiotics. If endoscopy fails to remove the magnets, or if major perforation is suspected, surgical involvement is mandatory. Broad-spectrum antibiotics, including piperacillin/tazobactam or meropenem, are commonly used in cases of perforation to prevent sepsis and manage infection.⁸¹

4.4 | Recommendations

- Ingestion of more than one magnet (or one magnet with an additional metallic FB) requires emergent endoscopic retrieval if within reach.
- If retrieval is not possible or unsuccessful, patients require close surgical follow-up with repeat cross-sectional imaging.

5 | SHARP OBJECTS

5.1 | Potential complication

Common sharp or pointed FBs include pins, nails, screws, fish bones, broken glass, pine needles, thumbtacks, and dental accessories although many other, more unusual presentations are possible. The management of sharp or pointed FB has been debated in literature due to its potentially high morbidity and even mortality in children.⁸² While blunt FBs can cause viscus perforations in <1% of patients, sharp or pointed FBs can cause perforation in up to 15% of patients. Therefore, the benefit of removing sharp FBs from the esophagus or stomach is usually greater than that with benign FBs in order to reduce this serious complication.⁸³

Besides viscus perforation, other complications include impaction of the sharp FB, bleeding, or obstruction. These

complications are more likely to occur at areas of physiological narrowing or angulations, including the upper, mid and lower esophagus, the pylorus, the ileocecal valve, and anus.⁸⁴ More delayed complications include ulceration, perforation, tracheoesophageal fistula, abscess formation, peritonitis, aorto-esophageal fistula, and even death.^{84–86}

Symptoms of sharp FB ingestions are more common if the FB is lodged in the upper-mid esophagus, with pain and dysphagia being the most frequent symptoms. However, up to 50% of cases may remain asymptomatic for weeks, even in instances of intestinal perforation.⁸⁵

Early diagnosis depends on witnessed ingestion or a high index of clinical suspicion for the ingestion of a sharp FB, and an urgent X-ray is required. Certain sharp FBs, such as plastic, glass, fish bones and wood, are radiolucent and will likely be missed on X-ray. Hence, in symptomatic children with suspected ingestion of sharp FBs, even if X-ray does not reveal a FB, an emergency endoscopy is indicated.⁸⁷

5.2 | Likelihood of uneventful passage

Literature on the likelihood of passage of blunt FBs is more robust than for sharp FB's, with reports about sharp FB mainly limited to case series and case reports.^{9,88,89} A large retrospective analysis by Zmary et al., including 169 patients with sharp FB ingestions (mean age 31 years, including 16% of the patients under 15), found that in 79% of patients the FB passed uneventfully, 33% underwent endoscopy, of which only 55% had successful retrieval of the sharp FB, and 4% underwent surgical removal. The mean size of the FB was 2.8 cm, with the size of the FB predictive of the subsequent intervention, being significantly larger in patients requiring surgery (6 ± 3 cm) compared to those who had an endoscopy performed (3 ± 2 cm, $p = 0.007$) or no procedure (2 ± 1 cm, $p < 0.001$).⁸⁸ This suggests that the majority of sharp FBs will pass through the GI tract without complications, but that longer/larger FB may cause mucosal injury or even perforation requiring intervention.

Quitadamo et al. reviewed 580 FB ingestions in children aged 0 and 14 years, of which 270 were considered sharp.⁸⁹ No cases of prolonged retention or intestinal perforation were observed in this study cohort. However, in 3 of the 65 endoscopic retrievals (4.6%) the endoscopist encountered difficulties during removal related to the shape and the size of the FB, and its passage through the esophageal sphincter. This should be taken into consideration when planning potential retrieval, especially in younger children.

A not infrequent presentation in some communities is ingestion of hijab pins, sharp metallic pins ~3.5 cm in length. Yogeve et al. retrospectively reviewed 208 patients, with a mean age of 14.7 (± 4.1) years, who had ingested a total of 225 pins.⁹⁰ Forty-two (19%) of the pins were impacted and were removed endoscopically. Three were located in the esophagus of which two subsequently passed through the GIT with no complications. Of the 97 patients with a pin in the stomach, 35 (36%) underwent endoscopic removal after follow-up imaging showed no spontaneous progression. Of the 71 patients who presented with the pin in the small bowel, six underwent endoscopic removal and one surgical removal (10% overall) after lack of progression. The vast majority

passed, importantly, with no complications noted during observation.

5.3 | Risk of removing versus risk of not removing

European Society of Gastrointestinal Endoscopy (ESGE)/ESPGHAN endoscopy guidelines from 2017 recommend emergent (<2 h) removal of sharp-pointed objects located in the esophagus, stomach and proximal duodenum even in asymptomatic children.⁹¹ North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) guidelines recommend urgent endoscopic removal of sharp FBs in the esophagus, and urgent removal if in the stomach, but advise considering observation for short objects with a heavier blunt end if located in the stomach.

As noted in some case series, removal of certain sharp FBs can be complicated due to the size and the sharp ends, which may damage the viscus. Appropriately sized overtubes are not available for most patients in most centers, and although some protective mechanisms exist, the risk of removing the sharp FB, based on local expertise, must be weight against the risk of conservative management. The best described cases to date involve straight pins and other sharp objects weighted at one end, such as screws and hair pins, where it is likely that the blunt end passes first, with an assumed reduced risk of perforation.^{4,90} Management recommendations are very broad and range from observation with serial X-rays to laparotomy.^{4,92–95} Based on the nature, shape, and location of the sharp FB and the absence of symptoms, it is often reasonable to discuss the relative risks with the child's parents/carers, with joint decision-making being the preferred approach.

5.4 | Endoscopic removal

Once endoscopic management has been decided, optimal management depends on the location and type of the FB. As with benign FBs, if located above the clavicles, the case should be managed by ENT, with involvement of the pediatric gastroenterologist as necessary. The success of endoscopic removal depends on the endoscopist's level of experience and the devices available. The endoscopic equipment used must be appropriate for the size of the patient, which may limit the available accessories. Retrieval devices such as forceps, retrieval net, and polypectomy snare are available for both 2.8 and 2.3 operative channels, yet the range and size of devices are greater in endoscopes with larger working channels.⁹⁶

Success rates of 96% have been reported for the removal of sharp objects from the upper GI tract using rat tooth forceps. If the sharp end of the FB in the esophagus is observed to be facing proximally, it may be safest to push it into the stomach and rotate its sharp end distally before removal.⁴ Alternatively, it may be possible to capture the sharp end within the forceps, ensuring that the esophageal wall is not damaged during extraction.

Overtubes may be used when removing sharp FBs in adults, although their use is much more restricted in children due to the smaller esophageal diameter. Removal of sharp FBs using an endoscopic cap can prevent esophageal injury

in children, but they may also reduce visibility. Transparent distal caps, such as those used in variceal banding devices or endoscopic submucosal dissection, have been used as protective devices but require a standard-sized endoscope.⁹² When a sharp FB has passed the ligament of Treitz, enteroscopy or surgery can be considered for removal, although clinical risks and benefits must be assessed.⁴ Conservative management with serial imaging is usually more appropriate in such cases.

5.5 | Conservative management

Conservative management by means of clinical observation and serial imaging is appropriate when the sharp FB is in the small intestine, or in selected cases where the FB is located in the stomach. Special attention is required for patients with previous abdominal surgery or those at risk of intestinal lumen narrowing (e.g., Crohn's disease).⁹⁴ To ensure adequate follow-up and recognition of potential complications, conservative management is usually more appropriate as an inpatient. In select cases, depending on the child, social circumstances, and accessibility, these patients can be carefully managed in an outpatient setting. There is no evidence to suggest an appropriate timing plan for repeating imaging, and while daily imaging may be appropriate and convenient, timing should be assessed on a case-by-case basis.

Radiolucent objects pose an additional challenge, as identifying their anatomic location is not possible with standard X-ray. As such, endoscopic removal is common practice in such FBs. Different imaging studies in asymptomatic patients with radiolucent objects, such as contrast studies or CT, could be considered if the ingestion is unclear.⁹³

5.6 | Special situations

5.6.1 | Heated tobacco sticks

There has been a recent increase in reports of accidental ingestion of metal-containing heated tobacco sticks in the literature, which contain a sharp metal susceptor. Available evidence from published case reports indicates that susceptor ingestion poses no greater risk than ingestion of other sharp metal objects. This conclusion is based on both the lightness of the susceptor and its location within the sticks, which provides some protection. No severe injuries to the esophageal and gastrointestinal tract have been reported in hundreds of ingestion cases.^{97,98}

Regardless, in case of suspected susceptor ingestion, the child should be carefully managed, with imaging to confirm the location of the FB. If located in the esophagus, endoscopic removal should be undertaken as per all sharp esophageal FBs. If in the stomach or more distal, serial imaging should be performed to confirm passage.^{99,100}

5.7 | Recommendations

- Sharp FB impacted in the esophagus, or sharp FB anywhere causing symptoms need emergent removal.

- There should be a very low threshold for removing even asymptomatic sharp FBs in the stomach and duodenum due to the higher risk of complications, although conservative management may be appropriate in some cases. Individual risk assessment should consider the size and shape of the FB, the patient's age and the risks associated with removal.

6 | TIPS AND TRICKS

6.1 | Primum non nocere

Removing certain ingested FBs is often critically important to prevent potentially serious complications. However, removal of FBs may be a complex, and sometimes high-risk procedure, particularly in infants and young children. Therefore, a balanced approach is required when deciding whether to remove an ingested FB. While some FB must always be removed, and some should almost always be left, many cases require individual assessment, sometimes involving joint decision-making with parents. In addition to the factors listed above, such as the type and location of the FB, the age and size of the child, and the presence of symptoms, an honest assessment of the treating team's experience is important.

When removing the FB, certain precautions should be taken to reduce risk of complications from endoscopic removal:

6.1.1 | Airway protection

Due to the risk of aspiration of the FB during removal, airway protection with an endotracheal tube (with or without a cuff) should be standard practice in all but exceptional cases. Possible exceptions may include complicated airway with high-risk intubation, or easily removed FBs which are adequately secured in net retrieval devices, however, the default should be to protect the airway.

6.1.2 | Preventing damage from the FB

Sharp FBs may cause damage to the GI tract during removal. While endoscopic overtubes are very useful in adults, they may not be available or appropriate in younger patients. Bell-shaped endoscopic hoods can help prevent damage from the sharp end of the FB, however, at times the FB may be longer than the hood, hence providing a false sense of security. As much as possible, the sharp end should be contained and protected by the removal device, either by enclosing it in the graspers or angling it towards and keeping it in very close proximity to the working channel of the endoscope. When such positioning is not possible, holding the blunt end and allowing the sharp end to trail is an option, permitting as much free movement as possible of the FB during removal, rather than maintaining a rigid grip, to prevent damage when navigating acute anatomical angles. When removing sharp FB, care should be taken to keep the FB close to the tip of the endoscope while continuously insufflating during removal. It is also important to avoid repositioning or

reinserting the endoscope as much as possible, especially if the sharp end is angled caudally.

Large FBs may also be challenging to pass through the lower and upper esophageal sphincters. To assist removal, it is helpful to keep the contained FB close to the tip of the endoscope and insufflate during passage through these narrowed areas. At times, relatively firm, constant force may be required to encourage relaxation of the sphincter, yet this requires considerable experience to determine what is sufficiently firm, yet not too forceful and potentially damaging. Sometimes repositioning the patient with the head slightly elevated or in the left lateral decubitus position, may facilitate FB passage through the sphincters.

6.1.3 | Anticipation that underlying damage may worsen with removal

This is a common issue with BB, where underlying luminal damage, particularly in the esophagus, may be revealed and lead to unanticipated complications during removal, such as deep esophageal mural damage including vascular injury. Underlying damage can also occur with sharp FBs, magnets, or even benign FBs in the esophagus that are discovered and removed only after extended delays. Surgical or cardiothoracic backup and prior CT scan to assess for potential vascular damage or perforation should be considered in this scenario.

6.2 | Clean views and thoroughness are critical

The urgency of endoscopic removal of some gastric FBs, such as ingested magnets, sharp FB with bleeding or significant symptoms, does not allow for adequate pre-procedure fasting. In such cases, even small amounts of residual gastric contents can obscure large FBs. Unless the stomach is thoroughly cleaned with aspiration of all but the most minimal of gastric contents, it cannot be certain that the FB has exited the stomach. This may be challenging due to solid and semi-solid residue which cannot be aspirated through the endoscope. In these situations, irrigation and suction may need to be supplemented with removal of gastric contents using net retrieval devices. Only when the stomach is thoroughly cleaned and carefully inspected in its entirety, including retroflexion, can it be certain that a FB is not present. Adequate insufflation, and occasionally changing the patient's position, may uncover FBs previously hidden from endoscopic view.

6.3 | Choice of retrieval device depends on the endoscopist experience, type of FB and location

An endoscopist should be familiar with all types of retrieval devices. Some FBs are best removed with various graspers, others with snares and some with net devices. Often, the initial choice of device is insufficient to adequately grasp the FB and a different device may be needed. Hence, availability and familiarity of multiple options is crucial.

While net devices or snares may theoretically be ideal for removal of certain FBs in the esophagus, due to the relatively small luminal diameter, often further limited by the impacted FB, these devices may not completely deploy. Hence, other options, including graspers or endoscopic balloon devices may be required.

6.4 | Specific practical tips

- In non-urgent removal of FBs in which imaging has not been performed recently, it is recommended to repeat an X-ray shortly before the planned removal to confirm that the FB is still within reach of the endoscope and avoid an unnecessary procedure.
- Net devices and snares are often best advanced slightly distal to the FB, aiming to entrap it using the endoscopic wheels when withdrawing the device proximally, allowing the FB to “fall in.”
- If the FB is less familiar to the endoscopist, and accessing a similar FB is possible, it may be beneficial to test ex vivo which retrieval device provides a more secure grip.
- Some areas of the stomach, particularly the fundus, may be challenging to manipulate the scope or the retrieval device. Repositioning the patient by raising the bed or rotating the patient can move the FB to an “easier” location. The FB can also be carefully moved to a more appropriate position with a grasper or snare, or even with the endoscope itself.
- Manipulation of the endoscope and the retrieval device is always easier with a straight endoscope. While not always possible, try to remove loops and maintain a straight endoscope as much as possible.
- Magnets may be strongly adherent to one another, and if they entrap bowel wall between them, significant dexterity and manipulation may be required to separate them when removing. This may be achieved with graspers or by entrapping some of the magnets in a net device to provide sufficient traction to separate them.
- Distal balloon inflation with subsequent “trawling” proximally through the lumen, may be a feasible option to remove FBs, especially in the esophagus.
- If available, a dual-channel endoscope with a manipulatable distal tip may offer greater options in difficult FB removal.

7 | CONCLUSION

Ingested FBs in children present a wide range of scenarios, with multiple factors and permutations to consider when determining the optimal approach. Sufficient familiarity with retrieval devices and adequate experience, including advanced endoscopy training, are beneficial. However, a thorough understanding of the potential risks, and a healthy dose of common sense are also critical when planning management.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

ORCID

Oren Ledder  <https://orcid.org/0000-0001-8109-814X>

REFERENCES

- Speidel AJ, Wölfl L, Mayer B, Posovszky C. Increase in foreign body and harmful substance ingestion and associated complications in children: a retrospective study of 1199 cases from 2005 to 2017. *BMC Pediatr*. 2020;20(1):560. doi:10.1186/s12887-020-02444-8
- Oliva S, Romano C, De Angelis P, et al. Foreign body and caustic ingestions in children: a clinical practice guideline. *Dig Liver Dis*. 2020; 52(11):1266-1281. doi:10.1016/j.dld.2020.07.016
- Mantegazza C, Destro F, Ferraro S, et al. Recent trends in foreign body ingestion (FBI) epidemiology: a national cohort study. *Dig Liver Dis*. 2025;57(2):595-602. doi:10.1016/j.dld.2024.10.002
- Kramer RE, Lerner DG, Lin T, et al. Management of ingested foreign bodies in children: a clinical report of the NASPGHAN Endoscopy Committee. *J Pediatr Gastroenterol Nutr*. 2015;60(4):562-574. doi:10.1097/MPG.0000000000000729
- Dereci S, Koca T, Serdaroglu F, Akcam M. Foreign body ingestion in children. *Türk Pediatri Arsivi*. 2015;50(4):234-240. doi:10.5152/TurkPediatriArs.2015.3164
- Nugud AA, Tzivinikos C, Assa A, et al. Pediatric magnet ingestion, diagnosis, management, and prevention: a European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) position paper. *J Pediatr Gastroenterol Nutr*. 2023;76(4):523-532. doi:10.1097/MPG.0000000000003702
- Tokar B, Cevik AA, Ilhan H. Ingested gastrointestinal foreign bodies: predisposing factors for complications in children having surgical or endoscopic removal. *Pediatr Surg Int*. 2007;23(2):135-139. doi:10.1007/s00383-006-1819-0
- Sahn B, Mamula P, Ford CA. Review of foreign body ingestion and esophageal food impaction management in adolescents. *J Adolesc Health*. 2014;55(2):260-266. doi:10.1016/j.jadohealth.2014.01.022
- Mantegazza C, Ferraro S, Biganzoli D, et al. Foreign body ingestion in children: definition of a nomogram to predict surgical or endoscopic intervention. *Dig Liver Dis*. 2024;56(2):312-321. doi:10.1016/j.dld.2023.07.017
- Blanco-Rodríguez G, Teyssier-Morales G, Penchyna-Grub J, et al. Characteristics and outcomes of foreign body ingestion in children. *Arch Argent Pediatr*. 2018;116(4):256-261. doi:10.5546/aap.2018.eng.256
- Khorana J, Tantivit Y, Phiuphong C, Pattapong S, Siripan S. Foreign body ingestion in pediatrics: distribution, management and complications. *Medicina (Kaunas)*. 2019;55(10). doi:10.3390/medicina55100686
- Esparaz JR, Carter SR, Mathis MS, Chen MK, Russell RT. Esophageal foreign body management in children: can it wait? *J Laparoendosc Adv Surg Techn*. 2020;30(12):1286-1288. doi:10.1089/lap.2020.0636
- Thomson M, Tringali A, Dumonceau JM, et al. Paediatric Gastrointestinal Endoscopy: European Society for Paediatric Gastroenterology Hepatology and Nutrition and European Society of Gastrointestinal Endoscopy Guidelines. *J Pediatr Gastroenterol Nutr*. 2017;64(1):133-153. doi:10.1097/MPG.0000000000001408
- Committee ASOP, Jue TL, Anderson MA, et al. Management of ingested foreign bodies and food impactions. *Gastrointest Endosc*. 2011;73(6):1085-1091. doi:10.1016/j.gie.2010.11.010
- Longstreth GF, Longstreth KJ, Yao JF. Esophageal food impaction: epidemiology and therapy. A retrospective, observational study. *Gastrointest Endosc*. 2001;53(2):193-198. doi:10.1067/mge.2001.112709
- Byrne KR, Panagiotakis PH, Hilden K, Thomas KL, Peterson KA, Fang JC. Retrospective analysis of esophageal food impaction: differences in etiology by age and gender. *Dig Dis Sci*. 2007;52(3):717-721. doi:10.1007/s10620-006-9499-0
- Cheung KM, Oliver MR, Cameron DJ, Catto-Smith AG, Chow CW. Esophageal eosinophilia in children with dysphagia. *J Pediatr Gastroenterol Nutr*. 2003;37(4):498-503. doi:10.1097/00005176-200310000-00018
- Cook D, Zala A, Bollipo S, Potter MDE, Walker MM, Talley NJ. Esophageal food bolus obstruction and eosinophilic esophagitis. *Intern Med J*. 2019;49(8):1032-1034. doi:10.1111/imj.14389
- Amil-Dias J, Oliva S, Papadopoulou A, et al. Diagnosis and management of eosinophilic esophagitis in children: an update from the

- European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN). *J Pediatr Gastroenterol Nutr.* 2024;79(2):394-437. doi:10.1002/jpn3.12188
20. Hiremath GS, Hameed F, Pacheco A, Olive A, Davis CM, Shulman RJ. Esophageal food impaction and eosinophilic esophagitis: a retrospective study, systematic review, and meta-analysis. *Dig Dis Sci.* 2015; 60(11):3181-3193. doi:10.1007/s10620-015-3723-8
21. Etttyreddy AR, Sink JR, Georg MW, Kitsko DJ, Simons JP. Association between eosinophilic esophagitis and esophageal food impaction in the pediatric population. *Otolaryngol Head Neck Surg.* 2018;159(4):750-754. doi:10.1177/0194599818779049
22. Anand R, Garg S, Dubin E, Dutta S. A novel endoscopic method to relieve food impaction using an inflatable balloon. *Case Rep Gastrointest Med.* 2015;2015:357253. doi:10.1155/2015/357253
23. Ooi M, Duong T, Holman R, et al. Comparison of cap-assisted vs conventional endoscopic technique for management of food bolus impaction in the esophagus: results of a multicenter randomized controlled trial. *Am J Gastroenterol.* 2021;116(11):2235-2240. doi:10.14309/ajg.0000000000001484
24. Brand M, Hofmann N, Ho CN, Meining A. The over-the-scope grasper (OTSG). *Endoscopy.* 2021;53(2):152-155. doi:10.1055/a-1187-0178
25. Rajagopalan J, Triadafilopoulos G. Ring(s)-related esophageal meat bolus impaction: biopsy first, dilate later. *Dis Esophagus.* 2009;22(5):E14-E16. doi:10.1111/j.1442-2050.2008.00894.x
26. Jaffer SS, Makhlouf GM, Schorr BA, Zfass AM. Nature and kinetics of inhibition of lower esophageal sphincter pressure by glucagon. *Gastroenterology.* 1974;67(1):42-46.
27. Feczko PJ, Haggard AM, Halpert RD. A reappraisal of upper gastrointestinal response to low-dose glucagon. *Crit Rev Diagn Imaging.* 1985;23(4):377-412.
28. Necheles H, Sporn J, Walker L. Effect of glucagon on gastrointestinal motility. *Am J Gastroenterol.* 1966;45(1):34-39.
29. Wong E, Cheng AT, Aggarwala S, et al. Acute food bolus ingestion: ten-year experience at a tertiary pediatric hospital. *Austr J Otolaryngol.* 2020;3.
30. Sodeman TC, Harewood GC, Baron TH. Assessment of the predictors of response to glucagon in the setting of acute esophageal food bolus impaction. *Dysphagia.* 2004;19(1):18-21. doi:10.1007/s00455-003-0019-5
31. Trenkner SW, Maglinte DD, Lehman GA, Chernish SM, Miller RE, Johnson CW. Esophageal food impaction: treatment with glucagon. *Radiology.* 1983;149(2):401-403. doi:10.1148/radiology.149.2.6622682
32. Peksa GD, DeMott JM, Slocum GW, Burkins J, Gottlieb M. Glucagon for relief of acute esophageal foreign bodies and food impactions: a systematic review and meta-analysis. *Pharmacother J Hum Pharmacol Drug Ther.* 2019;39(4):463-472. doi:10.1002/phar.2236
33. Conrad ME, Barton JC. Factors affecting the absorption and excretion of lead in the rat. *Gastroenterology.* 1978;74(4):731-740.
34. Sartorelli E, Loi F, Gori R. Lead silicate toxicity: a comparison among different compounds. *Environ Res.* 1985;36(2):420-425. doi:10.1016/0013-9351(85)90035-0
35. Fergusson J, Malecky G, Simpson E. Lead foreign body ingestion in children. *J Paediatr Child Health.* 1997;33(6):542-544. doi:10.1111/j.1440-1754.1997.tb01668.x
36. Durback LF, Wedin GP, Seidler DE. Management of lead foreign body ingestion. *J Toxicol Clin Toxicol.* 1989;27(3):173-182. doi:10.3109/15563658909038581
37. Caré W, Dufayet L, Paret N, et al. Bowel obstruction following ingestion of superabsorbent polymers beads: literature review. *Clin Toxicol.* 2022; 60(2):159-167. doi:10.1080/15563650.2021.1987452
38. Baddouh N, Arjail L, Raji A, Bourrous M. Unsuspected cause of respiratory distress: unrecognized esophageal foreign body. *Case Rep Pediatr.* 2018;2018:6283053. doi:10.1155/2018/6283053
39. Yahyaoui S, Jahaouat I, Brini I, Sammoud A. Delayed diagnosis of esophageal foreign body: a case report. *Int J Surg Case Rep.* 2017;36:179-181. doi:10.1016/j.ijscr.2017.05.028
40. Mubarak A, Benninga MA, Broekaert I, et al. Diagnosis, management, and prevention of button battery ingestion in childhood: a European Society for Paediatric Gastroenterology Hepatology and Nutrition Position Paper. *J Pediatr Gastroenterol Nutr.* 2021;73(1):129-136. doi:10.1097/MPG.0000000000003048
41. Jatana KR, Rhoades K, Milkovich S, Jacobs IN. Basic mechanism of button battery ingestion injuries and novel mitigation strategies after diagnosis and removal. *Laryngoscope.* 2017;127(6):1276-1282. doi:10.1002/lary.26362
42. Varga Á, Kovács T, Saxena AK. Analysis of complications after button battery ingestion in children. *Pediatr Emerg Care.* 2018;34(6):443-446. doi:10.1097/PEC.0000000000001413
43. Buttazzoni E, Gregori D, Paoli B, et al. Symptoms associated with button batteries injuries in children: an epidemiological review. *Int J Pediatr Otorhinolaryngol.* 2015;79(12):2200-2207. doi:10.1016/j.ijporl.2015.10.003
44. Etttyreddy AR, Georg MW, Chi DH, Gaines BA, Simons JP. Button battery injuries in the pediatric aerodigestive tract. *Ear Nose Throat J.* 2015;94(12):486-493.
45. Litovitz T, Whitaker N, Clark L, White NC, Marsolek M. Emerging battery-ingestion hazard: clinical implications. *Pediatrics.* 2010;125(6):1168-1177. doi:10.1542/peds.2009-3037
46. Tran C, Nunez C, Eslick GD, Barker R, Elliott EJ. Button battery exposure in children: a systematic review and meta-analysis. *Inj Prev.* 2025;31(4):265-271. doi:10.1136/ip-2024-045339
47. Akinkugbe O, James AL, Ostrow O, Everett T, Wolter NE, McKinnon NK. Vascular complications in children following button battery ingestions: a systematic review. *Pediatrics.* 2022;150(3). doi:10.1542/peds.2022-057477
48. Labadie M, O'Mahony E, Capaldo L, et al. Severity of button batteries ingestions: data from French poison control centres between 1999 and 2015. *Eur J Emerg Med.* 2018;25(4):e1-e8. doi:10.1097/MEJ.0000000000000528
49. Krom H, Visser M, Hulst JM, et al. Serious complications after button battery ingestion in children. *Eur J Pediatr.* 2018;177(7):1063-1070. doi:10.1007/s00431-018-3154-6
50. Lerner DG, Brumbaugh D, Lightdale JR, Jatana KR, Jacobs IN, Mamula P. Mitigating risks of swallowed button batteries: new strategies before and after removal. *J Pediatr Gastroenterol Nutr.* 2020;70(5):542-546. doi:10.1097/MPG.0000000000002649
51. Anfang RR, Jatana KR, Linn RL, Rhoades K, Fry J, Jacobs IN. pH-neutralizing esophageal irrigations as a novel mitigation strategy for button battery injury. *Laryngoscope.* 2019;129(1):49-57. doi:10.1002/lary.27312
52. Chiew AL, Lin CS, Nguyen DT, Sinclair FAW, Chan BS, Solinas A. Home therapies to neutralize button battery injury in a porcine esophageal model. *Ann Emerg Med.* 2024;83(4):351-359. doi:10.1016/j.annemergmed.2023.08.018
53. Sethia R, Gibbs H, Jacobs IN, Reilly JS, Rhoades K, Jatana KR. Current management of button battery injuries. *Laryngosc Invest Otolaryngol.* 2021;6(3):549-563. doi:10.1002/lio2.535
54. Jatana KR, Barron CL, Jacobs IN. Initial clinical application of tissue pH neutralization after esophageal button battery removal in children. *Laryngoscope.* 2019;129(8):1772-1776. doi:10.1002/lary.27904
55. Goh S, Siu JM, Philteos J, et al. Pediatric esophageal button battery protocol reduces time from presentation to removal. *Laryngoscope.* 2024;134(12):5170-5177. doi:10.1002/lary.31607
56. Brandt K, Dukleska K, McKeown M, et al. Utilizing a critical airway response team expedites esophageal button battery removal. *J Pediatr Surg.* 2023;58(5):810-813. doi:10.1016/j.jpedsurg.2023.01.037
57. Vaucel JA, Recher M, Paradis C, et al. Severe post-pyloric injury after button battery ingestion: systematic literature review and case report. *Archives de Pédiatrie.* 2023;30(7):501-504. doi:10.1016/j.arcped.2023.05.007
58. Khalaf RT, Ruan W, Orkin S, et al. Gastric injury secondary to button battery ingestions: a retrospective multicenter review. *Gastrointest Endosc.* 2020;92(2):276-283. doi:10.1016/j.gie.2020.04.037
59. Tran C, Nunez C, Eslick GD, Barker R, Elliott EJ. Complications of button battery ingestion or insertion in children: a systematic review and pooled analysis of individual patient-level data. *World J Pediatr.* 2024; 20(10):1017-1028. doi:10.1007/s12519-024-00833-y
60. Yogev D, Lev-Tzion R, Ledder O, Orlanski-Meyer E, Zharkov E, Cyttar-Kuint R. Retained metal fragments following esophageal button battery impaction. *Eur J Pediatr.* 2022;181(1):143-147. doi:10.1007/s00431-021-04184-y
61. Raffi, Lev-Tzion EE, Bass R, et al. Preemptive surgery for impending aortoesophageal fistula after button battery ingestion. *J Pediatr Gastroenterol Nutr.* 2017;64.
62. Lohmann J, Klein T, Stenzel M, et al. Impending esophago-arterial fistula after battery ingestion-first preventive operation on a toddler worldwide. *Die Anaesthesiologie.* 2025. doi:10.1007/s00101-024-01487-1
63. Hodges NL, Denny SA, Smith GA. Rare-earth magnet ingestion-related injuries in the pediatric population: a review. *Am J Lifestyle Med.* 2017; 11(3):259-263. doi:10.1177/1559827615594336

64. Commission USCPs. Safety standard for magnets. <https://www.federalregister.gov/documents/2022/09/21/2022-20200/safety-standard-for-magnets>
65. CPSC U. CPSC warns consumers to immediately stop using reflections high-powered neodymium magnetic bracelets and heart-shaped magnets due to ingestion hazard. <https://www.cpsc.gov/Warnings/2024/CPSC-Warns-Consumers-to-Immediately-Stop-Using-Reflections-High-Powered-Neodymium-Magnetic-Bracelets-and-Heart-Shaped-Magnets-Due-to-Ingestion-Hazard-Violation-of-the-Federal-Regulation-for-Magnets-Sold-Exclusively-on-Photomagnets-com>
66. CPSC U. High-powered magnetic ball sets recalled due to ingestion hazard. <https://www.cpsc.gov/Recalls/2024/High-Powered-Magnetic-Ball-Sets-Recalled-Due-to-Ingestion-Hazard-Violation-of-the-Federal-Safety-Regulation-for-Toy-Magnet-Sets-Sold-Exclusively-on-Walmart-com-through-Joybuy>
67. CPSC U. XpressGoods recalls high-powered magnetic balls due to ingestion hazard. <https://www.cpsc.gov/Recalls/2024/XpressGoods-Recalls-High-Powered-Magnetic-Balls-Due-to-Ingestion-Hazard-Failure-to-Meet-Federal-Safety-Regulation-for-Toy-Magnet-Sets>
68. CPSC U. Zen magnets and neoballs magnets recalled due to ingestion hazard. <https://www.cpsc.gov/Recalls/2021/Zen-Magnets-and-Neoballs-Magnets-Recalled-Due-to-Ingestion-Hazard>
69. Middelberg LK, Funk AR, Hays HL, McKenzie LB, Rudolph B, Spiller HA. Magnet injuries in children: an analysis of the national poison data system from 2008 to 2019. *J Pediatr*. 2021;232:251-256.e2. doi:10.1016/j.jpeds.2021.01.052
70. Reeves PT, Rudolph B, Nylund CM. Magnet ingestions in children presenting to emergency departments in the United States 2009-2019: a problem in flux. *J Pediatr Gastroenterol Nutr*. 2020;71(6):699-703. doi:10.1097/MPG.0000000000002955
71. Miyamoto R, Okuda M, Kikuchi S, Iwayama H, Hataya H, Okumura A. A nationwide questionnaire survey on accidental magnet ingestion in children in Japan. *Acta Paediatr*. 2021;110(1):314-325. doi:10.1111/apa.15428
72. Thakkar H, Burnand KM, Healy C, et al. Foreign body ingestion in children: a magnet epidemic within a pandemic. *Arch Dis Child*. 2021;106(12):1240-1241. doi:10.1136/archdischild-2021-322106
73. Abbas MI, Oliva-Hemker M, Choi J, et al. Magnet ingestions in children presenting to US emergency departments, 2002-2011. *J Pediatr Gastroenterol Nutr*. 2013;57(1):18-22. doi:10.1097/MPG.0b013e3182952ee5
74. De Roo AC, Thompson MC, Chounthirath T, et al. Rare-earth magnet ingestion-related injuries among children, 2000-2012. *Clin Pediatr*. 2013;52(11):1006-1013. doi:10.1177/0009922813507129
75. Peyron PA, Villard C, Baccino E. Fatal bowel perforation caused by ingestion of high-powered magnets in a 6-year-old boy. *Int J Legal Med*. 2024;138(4):1659-1662. doi:10.1007/s00414-024-03188-1
76. Han Y, Youn JK, Oh C, Lee S, Seo JM, Kim HY. Ingestion of multiple magnets in children. *J Pediatr Surg*. 2020;55(10):2201-2205. doi:10.1016/j.jpedsurg.2019.11.021
77. Bolton SM, Saker M, Bass LM. Button battery and magnet ingestions in the pediatric patient. *Curr Opin Pediatr*. 2018;30(5):653-659. doi:10.1097/MOP.0000000000000665
78. Nui A, Hirama T, Katsuramaki T, et al. An intestinal volvulus caused by multiple magnet ingestion: an unexpected risk in children. *J Pediatr Surg*. 2005;40(9):e9-e11. doi:10.1016/j.jpedsurg.2005.05.065
79. Montaruli E. Volvulus and intestinal perforation following magnet toy ingestion. *J Pediatr Gastroenterol Nutr*. 2013;57(1):e1. doi:10.1097/MPG.0b013e3182990a82
80. RCoE Medicine. Best practice guideline: ingestion of super strong magnets in children. RCoE Medicine; 2021.
81. Zhang S, Zhang L, Chen Q, et al. Management of magnetic foreign body ingestion in children. *Medicine*. 2021;100(2):e24055. doi:10.1097/MD.00000000000024055
82. Bal A, Mahalik SK. Case report of a sharp-pointed foreign body ingested by a child: how long to wait before surgical intervention? *Cureus*. 2024;16(10):e72780. doi:10.7759/cureus.72780
83. Powers K, Baldassari C, Lucas J. Pediatric esophageal foreign bodies and caustic ingestions. *Otolaryngol Clin North Am*. 2024;57(4):623-633. doi:10.1016/j.otc.2024.02.016
84. Birk M, Bauerfeind P, Deprez P, et al. Removal of foreign bodies in the upper gastrointestinal tract in adults: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. *Endoscopy*. 2016;48(5):489-496. doi:10.1055/s-0042-100456
85. Lee JH. Foreign body ingestion in children. *Clin Endosc*. 2018;51(2):129-136. doi:10.5946/ce.2018.039
86. Hernot S, Kalra V, Wadhwa R, Kaintura M. Sharp 3-ended metallic foreign body in an infant hypopharynx. *Indian J Otolaryngol Head Neck Surg*. 2019;71(suppl 1):14-17. doi:10.1007/s12070-015-0908-6
87. Ang CX, Mun WK, Aw MM, et al. Gastrointestinal transit time of radiopaque ingested foreign bodies in children: experience of two paediatric tertiary centres. *Singapore Med J*. 2025;66(1):24-27. doi:10.4103/singaporemedj.SMJ-2021-408
88. Zarny KR, Davis JW, Ament EE, Dirks RC, Garry JE. This too shall pass: a study of ingested sharp foreign bodies. *J Trauma Acute Care Surg*. 2017;82(1):150-155. doi:10.1097/TA.0000000000001265
89. Quitadamo P, Battagliere I, Del Bene M, et al. Sharp-pointed foreign body ingestion in pediatric age. *J Pediatr Gastroenterol Nutr*. 2023;76(2):213-217. doi:10.1097/MPG.0000000000003655
90. Yogeve D, Mahameed F, Gileles-Hillel A, et al. Hijab pin ingestions. *Pediatrics*. 2020;145(6). doi:10.1542/peds.2019-3472
91. Tringali A, Thomson M, Dumonceau JM, et al. Pediatric gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) and European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) guideline executive summary. *Endoscopy*. 2017;49(1):83-91. doi:10.1055/s-0042-111002
92. Ofosu A, Ramai D, Reddy M. Overtube-assisted foreign body removal: a review of endoscopic management and case illustration. *Cureus*. 2017;9(9):e1730. doi:10.7759/cureus.1730
93. Kramer RE. The refinement of radiographic protocols in assessment of pediatric foreign body ingestions: location, location, Location. *J Pediatr Gastroenterol Nutr*. 2020;71(4):e135-e136. doi:10.1097/MPG.0000000000002878
94. Fung BM, Sweetser S, Song LMWK, Tabibian JH. Foreign object ingestion and esophageal food impaction: an update and review on endoscopic management. *World J Gastrointest Endosc*. 2019;11(3):174-192. doi:10.4253/wjge.v11.i3.174
95. Silva Júnior DS, Markus JR, Lopes AB, et al. Protocol of care for foreign-body ingestion in children: a qualitative study. *Rev Assoc Med Bras*. 2022;68(9):1270-1275. doi:10.1590/1806-9282.20220368
96. Sugawa C. Endoscopic management of foreign bodies in the upper gastrointestinal tract: a review. *World J Gastrointest Endosc*. 2014;6(10):475-481. doi:10.4253/wjge.v6.i10.475
97. Higashi K, Koike Y, Sato Y, et al. Extraction of a metallic susceptor after accidental ingestion of the heated tobacco stick TERA: a case report. *BMC Pediatr*. 2023;23(1):452. doi:10.1186/s12887-023-04285-7
98. Doi H, Kakiuchi T, Nishino M, Yoshiura M. Natural excretion of a metallic susceptor originating from an ingested heated tobacco stick. *Clin Case Rep*. 2024;12(4):e8756. doi:10.1002/ccr3.8756
99. Uchida K, Yokoyama H, Yamamoto A, Hashimoto K, Koike Y, Mohri Y. Safe extraction technique of a metallic blade after heated tobacco ingestion. *Pediatr Int*. 2024;66(1):e15763. doi:10.1111/ped.15763
100. Moro PA, Maida F, Solimini R, et al. Urgent health concerns: clinical issues associated with accidental ingestion of new metal-blade-containing sticks for heated tobacco products. *Tobacco Prevent Cessat*. 2024;10:1-7. doi:10.18332/tpc/190634

How to cite this article: Ledder O, Furlano R, Papadopoulou A, et al. Foreign body ingestions in children and adolescents: A position paper of the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) endoscopy special interest group. *J Pediatr Gastroenterol Nutr*. 2026;83:539-554. doi:10.1002/jpn3.70485