

## Management of ingested foreign bodies and food impactions

*This is one of a series of statements discussing the use of GI endoscopy in common clinical situations. The Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy (ASGE) prepared this text. In preparing this guideline, a search of the medical literature was performed by using PubMed. Studies or reports that described fewer than 10 patients were excluded from analysis if multiple series with more than 10 patients addressing the same issue were available. Additional references were obtained from the bibliographies of the identified articles and from recommendations of expert consultants. Guidelines for appropriate use of endoscopy are based on a critical review of the available data and expert consensus at the time that the guidelines are drafted. Further controlled clinical studies may be needed to clarify aspects of this guideline. This guideline may be revised as necessary to account for changes in technology, new data, or other aspects of clinical practice. The original guideline was published in 1995 and last updated in 2002. The recommendations are based on reviewed studies and are graded on the strength of the supporting evidence (Table 1).<sup>1</sup> The strength of individual recommendations is based both on the aggregate evidence quality and an assessment of the anticipated benefits and harms. Weaker recommendations are indicated by phrases such as “we suggest,” whereas stronger recommendations are typically stated as “we recommend.”*

*This guideline is intended to be an educational device to provide information that may assist endoscopists in providing care to patients. This guideline is not a rule and should not be construed as establishing a legal standard of care or as encouraging, advocating, requiring, or discouraging any particular treatment. Clinical decisions in any particular case involve a complex analysis of the patient's condition and available courses of action. Therefore, clinical considerations may lead an endoscopist to take a course of action that varies from these guidelines.*

### INTRODUCTION

Foreign body ingestion and food bolus impaction occur commonly. The majority of ingested foreign bodies will pass spontaneously. Pre-endoscopic series have shown

that 80% or more of foreign objects will likely pass without the need for intervention.<sup>2,3</sup> However, 2 recent studies have shown that in the setting of intentional ingestion, the rate of endoscopic intervention may be much higher (63%-76%) and the need for surgical intervention ranges from 12% to 16%.<sup>4,5</sup> Mortality rates have been extremely low; a compilation of multiple studies including 2 large series report no deaths in 852 adults and 1 death in 2206 children.<sup>6-14</sup>

The majority of foreign body ingestions occur in the pediatric population, with a peak incidence between the ages of 6 months and 6 years.<sup>8,11,13,14</sup> In adults, true foreign body ingestion (ie, nonfood objects) occurs more commonly in those with psychiatric disorders, developmental delay, alcohol intoxication, and in incarcerated individuals seeking secondary gain via release to a medical facility.<sup>4,5,8,15,16</sup> Ingestion of multiple foreign objects and repeated episodes of ingestion are common. Edentulous adults are also at greater risk of ingesting foreign bodies, including an obstructing food bolus or their dental prosthesis.<sup>17</sup> Patients presenting with food bolus impaction often have underlying esophageal pathology directly causing the impaction.<sup>8-18</sup>

Impaction, perforation, or obstruction often occurs at GI angulations or narrowing.<sup>19</sup> Hence, patients with previous GI tract surgery or congenital gut malformations are at increased risk.<sup>20,21</sup> Once through the esophagus, most foreign bodies, including sharp objects, pass uneventfully.<sup>2,3,8</sup> However, ingestion of sharp and pointed objects, animal or fish bones, bread bag clips, magnets, and medication blister packs increase the risk of perforation.<sup>2,4,5,6,18,22-25</sup>

### DIAGNOSIS

Older children and nonimpaired adults may identify the ingestion and localize discomfort. However, the area of discomfort often does not correlate with the site of impaction.<sup>26</sup> Frequently, symptoms occur well after the patient ingests the foreign body.<sup>27-30</sup> Young children, mentally impaired adults, and those with psychiatric illness may thus present with choking, refusal to eat, vomiting, drooling, wheezing, blood-stained saliva, or respiratory distress.<sup>13,16,31</sup> Oropharyngeal or proximal esophageal perforation can cause neck swelling, erythema, tenderness, or crepitus. Clinicians must also evaluate for peritonitis or small-bowel obstruction. These conditions require

**TABLE 1. GRADE system for rating the quality of evidence for guidelines**

Quality of evidence	Definition	Symbol
High quality	Further research is very unlikely to change our confidence in the estimate of effect	⊕⊕⊕⊕
Moderate quality	Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate	⊕⊕⊕○
Low quality	Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate	⊕⊕○○
Very low quality	Any estimate of effect is very uncertain	⊕○○○

Adapted from Guyatt et al.<sup>1</sup>

surgery, and endoscopy should not delay surgical consultation.

Biplane radiographs identify most true foreign objects, steak bones, and free mediastinal or peritoneal air. Radiographs can confirm the location, size, shape, and number of ingested foreign bodies and help exclude aspirated objects. However, fish or chicken bones, wood, plastic, glass, and thin metal objects are not readily seen. A contrast examination generally should not be performed because of aspiration risk, and contrast coating of the foreign body and esophageal mucosa can compromise subsequent endoscopy. CT scanning may be useful, although it may not detect radiolucent objects. The sensitivity of CT may be improved with 3-dimensional reconstruction.<sup>32-34</sup> Metal detectors localize most swallowed metal objects and may be especially helpful in pediatric patients.<sup>35</sup> With suspected foreign body ingestion, persistent esophageal symptoms should be evaluated by endoscopy, even in the setting of a negative radiographic evaluation.<sup>19</sup> For patients with suspected nonbony food bolus impaction without complications (eg, no evidence of perforation or respiratory distress), endoscopy may be performed without obtaining radiographs.

**MANAGEMENT**

**Airway**

Initial management includes assessment of the patient’s ventilatory status and an airway evaluation. Patients unable to manage their secretions are at high aspiration risk and require urgent management. In some cases of proximal esophageal foreign body ingestion, endotracheal intubation is appropriate for airway protection. Endotracheal intubation, typically performed with the patient under general anesthesia, may also be required for patients with objects that are difficult to remove, for those with multiple objects, and when rigid esophagoscopy is needed. Pediatric endoscopy also often uses general anesthesia and endotracheal intubation because smaller and more compliant airways, among other risk factors, can lead to a higher risk of airway obstruction during endos-

**TABLE 2. Timing of endoscopy for ingested foreign bodies**

<p><b>Emergent endoscopy</b>                      Patients with esophageal obstruction (ie, unable to manage secretions)                      Disk batteries in the esophagus                      Sharp-pointed objects in the esophagus</p>
<p><b>Urgent endoscopy</b>                      Esophageal foreign objects that are not sharp-pointed                      Esophageal food impaction in patients without complete obstruction                      Sharp-pointed objects in the stomach or duodenum                      Objects &gt;6 cm in length at or above the proximal duodenum                      Magnets within endoscopic reach</p>
<p><b>Nonurgent endoscopy</b>                      Coins in the esophagus may be observed for 12-24 hours before endoscopic removal in an asymptomatic patient                      Objects in the stomach with diameter &gt;2.5 cm                      Disk batteries and cylindrical batteries that are in the stomach of patients without signs of GI injury may be observed for as long as 48 hours. Batteries remaining in the stomach longer than 48 hours should be removed.</p>

copy.<sup>36</sup> However, most adult cases of foreign body ingestion may be managed with conscious sedation. Overtubes may be used to provide airway protection and are discussed below.

**Timing**

The need for and timing of an intervention for foreign body ingestion depend on the patient age and clinical condition; the size, shape, content, anatomic location of the ingested object(s), and the time since ingestion (Table 2). Judgment of the risks of aspiration, obstruction, or perforation determines the timing of endoscopy. As stated previously, patients unable to manage their secretions require emergent endoscopic intervention to avoid aspiration. Ingestion of disk batteries and sharp and long

objects increase the risk of perforation and are discussed below. Most patients who are clinically stable without symptoms of high-grade GI obstruction do not require urgent endoscopy because the object will commonly pass spontaneously.<sup>2,3,37</sup> However, esophageal foreign objects and food impactions should be removed within 24 hours because delay decreases the likelihood of successful removal and increases the risk of complications including risk of perforation.<sup>38,39</sup> It is recognized that issues with consent among mentally incompetent patients can delay endoscopic removal beyond 24 hours, but an attempt to adhere to this standard should be made whenever possible.<sup>4</sup> In children, the duration of the foreign body in the esophagus may be unknown. Some advocate urgent removal in this population because transmural erosion, fistula formation, and other complications can occur. Once the foreign body has entered the stomach, most objects pass in 4 to 6 days. Conservative outpatient management is appropriate for most asymptomatic gastric foreign bodies,<sup>11,13,14,40</sup> although some recommend early endoscopic removal.<sup>12,41</sup> If endoscopy is deferred, patients should continue a regular diet and observe their stools for evidence of passing the object. In the absence of symptoms, weekly radiographs are sufficient to follow the progression of small blunt objects that have yet to pass because this may take as long as 4 weeks.<sup>2,13</sup> Special circumstances are discussed below.

## Equipment

**Endoscopes.** Most ingested foreign bodies are best treated with flexible endoscopes. Removal with flexible endoscopes has a high success rate and can be performed with conscious sedation in most adults. In a retrospective study of consecutive patients undergoing endoscopy for removal of impacted esophageal foreign bodies, no perforations occurred in 76 cases in which flexible endoscopy was performed compared with 2 of 63 cases (3.2%,  $P < .002$ ) in which rigid esophagoscopy was performed.<sup>42</sup> However, rigid esophagoscopy may be helpful for proximal foreign bodies impacted at the level of the upper esophageal sphincter or hypopharyngeal region and may allow protection of the airway without an overtube.<sup>11,42-44</sup> Standard or therapeutic endoscopes are preferred, although successful management of foreign body ingestion has been reported with use of small-caliber endoscopes via a transnasal approach.<sup>45</sup>

**Retrieval devices.** Various retrieval devices have been used, including rat-tooth and alligator forceps, polypectomy snares, polyp graspers, Dormier baskets, retrieval nets, magnetic probes, and friction-fit adaptors or banding caps.<sup>46-51</sup> Before endoscopy, practicing grasping a similar object to the ingested foreign body may help determine the most appropriate available retrieval device and in what fashion to grasp the object.

**Overtubes.** An overtube protects the airway and facilitates passage of the endoscope during removal of multi-

ple objects or during piecemeal clearance of a food impaction. An overtube also protects the esophageal mucosa from lacerations during retrieval of sharp objects.<sup>52,53</sup> Longer overtubes that cross the gastroesophageal junction should be used, when available, during removal of sharp or pointed objects distal to the esophagus. Because of the risk of esophageal injury during insertion, overtube use is less common in pediatric patients, although newer, softer tubes may help to mitigate this risk in older children. In the absence of an overtube, a foreign body protector hood is recommended to protect the esophagus during removal of sharp or pointed objects.<sup>8,48</sup>

## Food bolus impaction

The most common esophageal foreign body in adults in the Western world is impacted meat or other food.<sup>8</sup> Endoscopic treatment options include food extraction and advancement of the bolus into the stomach. Extraction may involve en bloc removal by using various grasping devices (eg, polypectomy snare, retrieval net, friction-fit adaptor or banding cap) or removal by a piecemeal approach. Many authorities, including the ASGE, have previously advocated against pushing the bolus into the stomach without first examining the esophagus distal to the obstruction by passing the endoscope around the bolus.<sup>18,19,54</sup> A high incidence of esophageal pathology is associated with food impactions, creating the notion that the push technique increases the high risk of perforation.<sup>18</sup> However, 2 large published series using the push technique reported no perforations in a total of 375 patients.<sup>55,56</sup> These series describe gentle pressure applied to the center of the food bolus. When advancement is unsuccessful, reduction of bolus size by piecemeal removal was performed, followed again by gentle pressure. Perforation may still be a risk if excessive force is applied with this technique. In most circumstances, it is considered safe to perform dilation after food bolus extraction when an esophageal stricture is present to reduce the risk of recurrence.<sup>55,56</sup> However, caution is warranted after prolonged impaction or if eosinophilic esophagitis is suspected. Eosinophilic esophagitis has been reported in as many as 33% of patients with food bolus impaction.<sup>57</sup> If eosinophilic esophagitis is suspected, then biopsies of the mid and distal esophagus should be obtained, and dilation may be deferred pending pathology results. A proteolytic enzyme, like papain, should never be used because hypernatremia, mucosal erosion, and esophageal perforation can result.<sup>58,59</sup>

**Glucagon.** In the setting of an impacted esophageal food bolus, the administration of glucagon 1.0 mg intravenously has been advocated to induce relaxation of the distal esophagus, thereby allowing spontaneous bolus passage while endoscopic therapy is coordinated.<sup>60,61</sup> However, other studies question the effectiveness of glucagon, including a single, small randomized study showing no significant improvement over placebo.<sup>62,63</sup> Gluca-

gon is relatively safe and thus remains an acceptable option. Its use, however, should not delay definitive endoscopic removal of a food impaction.

### True foreign bodies

**Short-blunt objects.** Coins can be removed with a foreign body forceps (eg, rat-tooth or alligator), snare, or retrieval net.<sup>8,48</sup> Smooth, round objects are best secured with a retrieval net or basket, although the retrieval net was superior in a prospective *in vivo* study.<sup>46</sup> With adequate visualization, objects not easily grasped in the esophagus may be advanced into the stomach where retrieval may be facilitated. Many nonendoscopic techniques to remove blunt, radiopaque esophageal foreign objects or push them into the stomach have been described, including fluoroscopically guided use of forceps, Foley catheter balloons, and nasogastric tubes outfitted with magnetic devices. This approach, however, provides no airway protection, does not directly visualize the esophagus for underlying pathology or complications (eg, mucosal injury), and lacks control over the object as it is removed or advanced into the stomach.<sup>64,65</sup> Therefore, endoscopic approaches are recommended. Many experts have recommended endoscopic removal of objects wider than 2.5 cm because they may be less likely to pass the pylorus, although limited data exist to support this recommendation.<sup>8,19,48,66</sup> Objects that fail to pass beyond the stomach by 3 to 4 weeks should be removed endoscopically. Clinical signs of peritonitis are indications for immediate surgical evaluation. Surgical removal should also be considered for objects located distal to the duodenum but in the same location longer than 1 week if they cannot be reached endoscopically.<sup>8,19</sup>

**Long objects.** Objects longer than 6 cm, such as toothbrushes and eating utensils, are likely to have difficulty passing the duodenum and should be removed. One study showed that 112 of 139 objects larger than 6 cm remained proximal to the pylorus at endoscopy. Sixty-four percent of the endoscopic procedures were performed more than 48 hours after presentation, suggesting that these objects will likely have difficulty passing beyond the stomach.<sup>4</sup> The use of a longer (>45 cm) overtube that extends beyond the gastroesophageal junction is helpful. The object can be grasped with a snare or basket and maneuvered into the overtube. The entire apparatus (ie, foreign body, overtube, and endoscope) can then be withdrawn in 1 motion to avoid losing grasp of the object within the overtube.<sup>67</sup>

**Sharp-pointed objects.** A myriad of ingested sharp-pointed objects have been described. Chicken and fish bones, straightened paperclips, toothpicks, needles, bread bag clips, and dental bridgework ingestions have been associated with complications. Patients suspected of swallowing sharp-pointed objects must be evaluated to define the location of the object. Many sharp-pointed objects are not radiographically visible, so endoscopy should still fol-

low a radiologic examination with negative findings. Sharp-pointed objects lodged in the esophagus are a medical emergency. Direct laryngoscopy is an option to remove objects lodged at or above the cricopharynx. Otherwise, rigid or flexible endoscopy may be performed when laryngoscopy is unsuccessful or for treatment of objects lodged below this area. Although the majority of sharp-pointed objects in the stomach will pass without incident, the risk of a complication caused by a sharp-pointed object is as high as 35%.<sup>2,68</sup> Therefore, a sharp-pointed object that has passed into the stomach or proximal duodenum should be retrieved endoscopically if this can be accomplished safely.<sup>8,18,48</sup> Otherwise, sharp-pointed objects may be followed with daily radiographs to document their passage, and surgical intervention should be considered for objects that fail to progress after 3 days.<sup>8,48</sup> Patients should be instructed to immediately report abdominal pain, vomiting, persistent temperature elevations, hematemesis, or melena. Endoscopic retrieval of sharp objects may be accomplished with retrieval forceps, a retrieval net, or a polypectomy snare.<sup>46</sup> The risk of mucosal injury during retrieval can be minimized by orienting the object with its point trailing during extraction, by using an overtube, or by fitting the endoscope with a protector hood.<sup>19,48,69</sup>

**Disk batteries.** Special considerations apply to small disk or button battery ingestions.<sup>70,71</sup> Children younger than 5 years of age are the most likely to ingest a button battery, and most ingested batteries are from hearing aids, watches, games, toys, and calculators.<sup>70</sup> Liquefaction necrosis and perforation can occur rapidly when a disk battery is lodged in the esophagus, leading to severe and potentially fatal complications. After radiographic documentation, batteries lodged in the esophagus should be emergently removed. Use of a stone retrieval basket or a retrieval net is most often successful.<sup>46</sup> An alternative method uses a through-the-scope balloon. The balloon is passed through the working channel of the endoscope, distal to the foreign body, where it is inflated and withdrawn to engage the battery. The balloon, battery, and endoscope are then removed as a unit.<sup>8</sup> The use of an overtube or endotracheal tube is essential to protect the airway during this procedure.

If the battery cannot be directly retrieved from the esophagus, it should be pushed into the stomach where it can often be successfully retrieved with a basket or net. However, once in the stomach, most disk batteries pass without complications. Batteries that have passed beyond the esophagus need not be retrieved unless the patient has signs of injury to the GI tract. A large-diameter battery (>20 mm in diameter) remaining in the stomach longer than 48 hours, as determined by a repeat radiograph, should be removed.<sup>70</sup> Once past the duodenum, 85% pass out of the body within 72 hours.<sup>72</sup> A radiograph every 3 to 4 days is adequate to assess the progress through the GI tract. Emetics are not beneficial in the management of disk

battery ingestions and have led to retrograde migration of batteries from the stomach into the esophagus.<sup>70</sup> Cathartics and acid suppression have no proven role in battery ingestion, although GI lavage may expedite passage.<sup>73</sup>

Cylindrical battery ingestions are less common, and data on the outcomes of these ingestions are limited. A single retrospective analysis identified a small number of patients who ingested cylindrical batteries.<sup>70</sup> No major life-threatening symptoms developed, and only 18% experienced minor or moderate symptoms. However, batteries remaining within the stomach longer than 48 hours should be retrieved. Signs of injury to the GI tract are an indication for removal, and history should determine whether the battery had an encasement defect before ingestion.

**Magnets.** Ingestion of magnets can cause severe GI injury and death. The attractive force between magnets or between a magnet and an ingested metal object can occur, trapping a portion of bowel wall between the 2 objects. Consequently, the pressure between the 2 objects can lead to bowel wall necrosis with fistula formation, perforation, obstruction, volvulus, or peritonitis.<sup>74</sup> Some advocate removal, when possible, of all magnets even if only 1 magnet is evident on radiograph or if the patient history suggests ingestion of only 1 magnet.<sup>75</sup> Additional, undetected magnets or the ingestion of pieces of metal together with a magnet can lead to injury.<sup>75</sup>

**Coins.** Ingestion of coins occurs most commonly in young children. If coins become lodged within the esophagus, they can be observed for 12 to 24 hours if the patient is asymptomatic because they will commonly pass spontaneously.<sup>76</sup> Patients with marked symptoms including drooling, chest pain, and stridor should have emergent intervention to remove the coin. Coins in the distal esophagus are more likely to pass spontaneously than those in the proximal esophagus, with 1 randomized, prospective trial showing passage in 56% of coins in the distal esophagus compared with 27% for coins in the proximal esophagus.<sup>77</sup> Most coins will eventually leave the stomach and pass through the GI tract without obstruction. Serial radiographs should be obtained as with other objects undergoing conservative management. Zinc toxicity has been reported with massive ingestion of pennies minted after 1982.<sup>7,78</sup>

**Narcotic packets.** Internal concealment of illegal drugs wrapped in plastic or contained in balloons or latex condoms, referred to as “body packing,” is seen in regions of high drug trafficking<sup>79</sup> and has been reported in both children and adults.<sup>80</sup> The packets can usually be seen radiographically, and CT scanning may be helpful, although false-negative scan results have been reported.<sup>32,33</sup> Rupture and leakage of the contents can be fatal, so endoscopic removal should not be attempted. Surgical intervention is indicated when packets fail to progress or if signs of intestinal obstruction are present. If packet rupture is suspected, surgery and urgent medical consultations for drug toxicity are indicated.

**Small-bowel foreign objects.** Single- and double-balloon enteroscopy can access the small intestine and may have a role in the treatment of foreign body ingestions. Case reports have described the successful use of balloon enteroscopy to retrieve retained video capsules.<sup>81-83</sup> Reports have also described the retrieval of retained objects with the potential to cause obstruction or perforation.<sup>84,85</sup> Accessories for the treatment of foreign bodies, including hoods, baskets, and forceps, have been designed for enteroscopes. At this time, data are limited on the use of balloon enteroscopy for extraction of foreign bodies. Decisions regarding the use of balloon enteroscopy in the management of foreign body ingestions should consider patient stability, availability of accessories, potential length of the procedure, and whether an initial antegrade or retrograde approach is preferred.

## RECOMMENDATIONS

1. We suggest avoiding contrast radiographic examinations with before removal of foreign objects. ⊕○○○
2. We suggest an otorhinolaryngology consultation for foreign bodies at or above the level of the cricopharyngeus. ⊕○○○
3. We recommend emergent removal of esophageal food bolus impactions and foreign bodies in patients with evidence of complete esophageal obstruction. ⊕⊕○○
4. We suggest that acceptable methods for the management of esophageal food impactions include en bloc removal, piecemeal removal, and the gentle push technique. ⊕⊕○○
5. We suggest endoscopic removal of all objects with a diameter larger than 2.5 cm from the stomach. ⊕○○○
6. We suggest endoscopic removal of sharp-pointed objects or objects longer 6 cm in the proximal duodenum or above. ⊕⊕○○
7. We recommend emergent removal of disk batteries in the esophagus. ⊕⊕○○
8. We recommend urgent removal of all magnets within endoscopic reach. ⊕⊕○○ For those beyond endoscopic reach, close observation and surgical consultation for nonprogression through the GI tract is advised.
9. We suggest that coins within the esophagus may be observed in asymptomatic patients but should be removed within 24 hours of ingestion if spontaneous passage does not occur. ⊕⊕○○
10. We recommend against endoscopic removal of drug-containing packets. ⊕⊕○○

## DISCLOSURE

*The following authors disclosed financial relationships relevant to this publication: Dr. Ben-Menachem: consultant to Boston Scientific; Dr. Decker: consultant to Facet*

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