

Endoscopic management of foreign bodies in the upper gastrointestinal tract: A review

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ognize the current and most common types of upper gastrointestinal foreign bodies presented today. Knowledge regarding the modern advanced methods and techniques available when treating patients with foreign bodies will keep the success rate of recovery above 96%.

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Abstract

Foreign body ingestion is a common condition, especially among children who represent 80% of these emergencies. The most frequently ingested foreign bodies in children are coins, toys, magnets and batteries. Most foreign body ingestions in adults occur while eating, leading to either bone or meat bolus impaction. Flexible endoscopy is the therapeutic method of choice for relieving food impaction and removing true foreign bodies with a success rate of over 95% and with minimal complications. This review describes a comprehensive approach towards patients presenting with foreign body ingestion. Recommendations are based on a review of the literature and extensive personal experience.

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Key words: Foreign body; Endoscopic management; Esophageal stricture; Food bolus impaction; True foreign body

Core tip: It is vitally important for physicians to rec-

INTRODUCTION

An estimated 1500 people in the United States die annually from foreign bodies in the upper-gastrointestinal (GI) tract^[1]. Ingestion of foreign bodies is common, especially, among children who represent 80% of these emergencies. Most foreign body ingestions in children, are coins, toys, magnets and batteries^[2-4]. Most foreign body ingestions in adults are related to eating, leading to either bone or meat bolus impaction^[5]. Patients who purposely swallow a true foreign body (nonfood object) typically are younger and more often male; associated psychiatric illness and/or drug abuse are common^[1,6]. Most ingested foreign bodies (80%-90%) pass spontaneously. However, approximately 10%-20% of foreign bodies necessitate an endoscopic procedure, whereas, less than 1% require operation^[6-10]. This review emphasizes etiology, diagnosis, therapy and prognosis of upper GI foreign bodies based on a literature review and personal observations.

EPIDEMIOLOGY

The types of ingested objects vary with patient age^[2-4,11]. Coins accounted for 66% of the upper GI foreign bodies found in patients less than 10 years of age; in contrast,

food boluses account for 60% of upper GI foreign bodies in those over 11 years old^[5] (Table 1). A food bolus impaction, in the adult patients, is often due to an underlying structural abnormality, such as an esophageal web, ring, a benign or malignant stricture or eosinophilic esophagitis (Table 1)^[8,9,12,13]. Roura *et al.*^[5] noted that 99% of ingested foreign bodies, in their series of 242 patients, become lodged in the upper GI tract; these foreign bodies were found in the pharynx in 39 patients, in the esophagus in 181 patients, in the stomach in 19 patients and in the small intestine in 3 patients.

PATHOPHYSIOLOGY

The majority (80%-90%) of foreign bodies and food impactions will pass spontaneously. Ten to twenty percent of gastrointestinal foreign bodies will require endoscopic intervention. Few patients who ingest foreign bodies require surgery^[6-10]. Impaction, perforation, or obstruction most often occurs at areas of acute angulations or physiologic narrowing. Potential sites for blocking include the cricopharyngeus muscle or upper sphincter, aortic arch, left main stem bronchus, gastroesophageal junction or lower sphincter, pylorus, duodenal sweep, ileocecal valve, and anus. Foreign bodies and food impactions in the esophagus have the highest incidence of complications with the complication rate directly proportional to the dwell time in the esophagus^[14]. Perforation is most common with sharp objects, and ranges from 15%-35%^[6,15].

Materials retained in the upper GI tract generally fall into two categories, namely, a food bolus impaction and a true foreign body^[15,16]. Classifications for foreign bodies, which define anatomic region and shape, are important for defining optimal therapy (Table 1). Sharp-pointed objects, food bolus impaction, and button batteries may lead to upper GI tract perforation, obstruction or bleeding, thereby necessitating earlier intervention (Table 2).

DIAGNOSIS

The diagnosis is often apparent from the patient's history. The patient may report a sudden onset of dysphagia while eating, often accompanied by chest pain or odynophagia and an inability to handle secretions. When children are unable to provide a history, a sudden refusal to eat, drooling, or respiratory symptoms such as coughing or wheezing due to aspiration should alert the physician to suspect foreign body ingestion. A careful physical examination should assess for signs of perforation such as subcutaneous emphysema or peritoneal signs. Drooling suggests complete esophageal obstruction.

Plain radiography may show the foreign body; perforation is suggested by subcutaneous air, pneumomediastinum, or pleural effusion. Barium studies also have a very low yield; gastrografin is not recommended in the obstructed esophagus because it is hypertonic and can lead to pulmonary edema if aspirated^[14]. CT scanning is superior to plain radiography and identifies the foreign

Table 1 Classifications of foreign bodies

Blunt objects
Round objects: coin, button, toy
Battery
Sharp-pointed objects
Fine objects: needle, toothpick, bone, safety-pin
Sharp irregular objects: partial denture, razor blade
Long objects
Soft objects: string, cord
Hard objects: toothbrush, spoon, screwdriver, ballpoint pen
Food bolus impaction
Bezoar
Objects containing poisons
Button battery
Narcotic body packet

Table 2 Indications for foreign body removal

Emergent indications
Sharp-pointed objects
Needle, toothpick, bone, safety-pin, partial denture, razor blade, medication blister packs
Object inducing esophageal obstruction
Food bolus
Object including poisons
Button battery
Non Emergent Indications (blunt rounded objects)
Coin, button, small toy

bodies in 70%-100% of patients^[17-19].

Urgent endoscopy is indicated when there is respiratory distress, airway compromise, or when complete obstruction is suspected because a patient cannot handle internal secretions. Endoscopic diagnosis and therapeutic removal can be performed at the same time^[16].

TREATMENT

Timing

Once foreign body ingestion is diagnosed, the physician must decide whether intervention is necessary, what degree of urgency is merited, and what the optimal modality of intervention might be. The timing of endoscopic intervention is dictated by the perceived risks of aspiration and/or perforation. Patients with sharp objects and disk batteries lodged in the esophagus require urgent endoscopic intervention. Urgent intervention is likewise needed for foreign bodies, such as food impactions, causing obstruction and the inability to manage secretions (Table 2). Those without evidence of high-grade obstruction, or acute distress, can be handled less urgently as spontaneous passage may occur. However, no foreign object or food bolus impaction should be allowed to remain in the esophagus beyond 24-h after presentation^[20].

SEDATION

Conscious sedation is adequate for the majority of adult patients. General anesthesia with endotracheal intubation

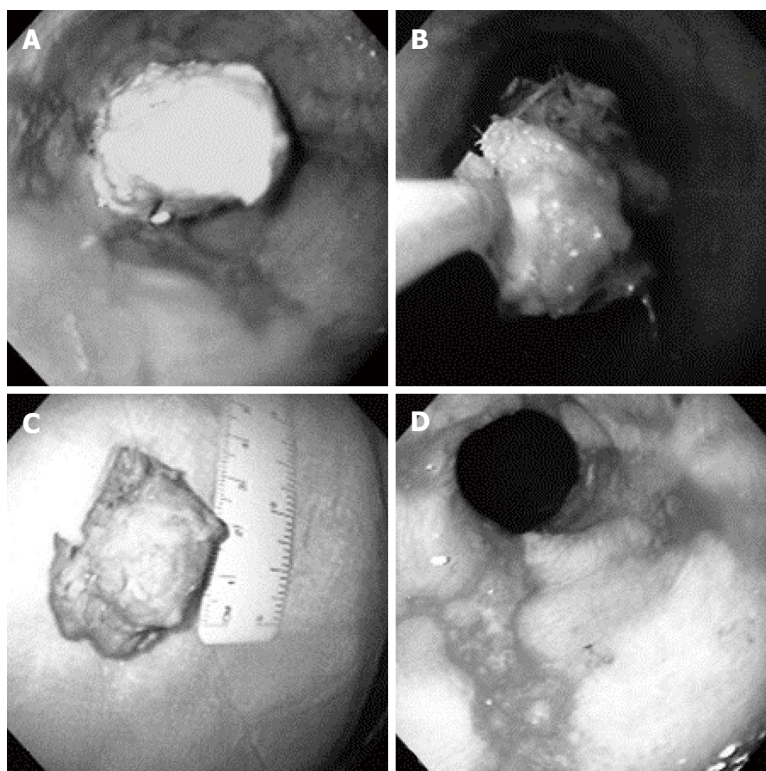


Figure 1 The photographs (A) show a piece of meat lodged at a narrowed gastroesophageal ring; the meat was removed with the snare (B and C). The photo (D) shows the ring after extraction with esophagitis; the narrowing was successfully dilated.

will give full protection of the airway and is ideal in most pediatric patients. Furthermore, general anesthesia with endotracheal intubation is best for the uncooperative psychotic patient and those who have ingested multiple objects, thereby, prolonging extrication time.

EQUIPMENT

Endoscopes

Endoscopists should be available and familiar with a wide range of tools for removing foreign bodies. A flexible endoscope is the diagnostic as well as therapeutic method of choice for food impaction and true foreign bodies with success rates of greater than 95% and complication rates of 0%-5%^[7,8,16]. The push-and-pull double-balloon enteroscopy may be successful for removal of entrapped capsules from the small intestine^[21-25].

Retrieval devices

Retrieval tools include grasping forceps, polypectomy snares, Dormier-type stone retrieval baskets, retrieval snare net, transparent cap-fitting device (used for endoscopic mucosal resection)^[26] and overtube^[27,28]. A retractable latex-rubber condom-typed hood is effective for delivering objects across the sphincter and for preventing mural injury from sharp or pointed edged objects^[29]. An overtube protects the airway and facilitates passage of the endoscope during removal of multiple objects or piecemeal removal of a food impaction^[27,28]. An overtube also protects the esophageal or gastroesophageal junction mu-

cosa from laceration during retrieval of sharp objects^[28].

Food bolus impaction

A food bolus impaction is usually the result of an underlying structural abnormality, such as a web, ring or stricture of the esophagus (Figure 1, Tables 1 and 2)^[30]. An esophageal food bolus impaction often contains chewed meat lodged at one of these narrowed sites. Adult patients who develop food impaction have underlying esophageal pathology in 88% to 97% of patients^[31]. Esophageal obstruction by a food bolus is the most common type of foreign-body ingestion complication in adults^[32]. The obstruction is often complete and may be associated with increased salivation, the inability to swallow liquids, substernal pain, and aspiration^[30]. Thus, successful endoscopic treatment of food impaction as well as the underlying pathologic lesion is essential.

Using a snare or snare basket, a food bolus can be retrieved in one piece or by piecemeal extraction (Figure 1) or reduced in volume allowing it to pass spontaneously. The food may be successfully pushed into the stomach after it is cut into small pieces by a snare^[31]. This technique involves bypassing the esophageal narrowing with the endoscope, while assessing the cause of the obstruction. After the endoscope is passed into the stomach, the food may be gently pushed distally. Forceful blind pushing with the endoscope is dangerous. Similarly, advancing retrieval devices or dilators blindly beyond the impaction invites complications. If food is extracted through the mouth either in one piece or piecemeal (Figure 1), use of

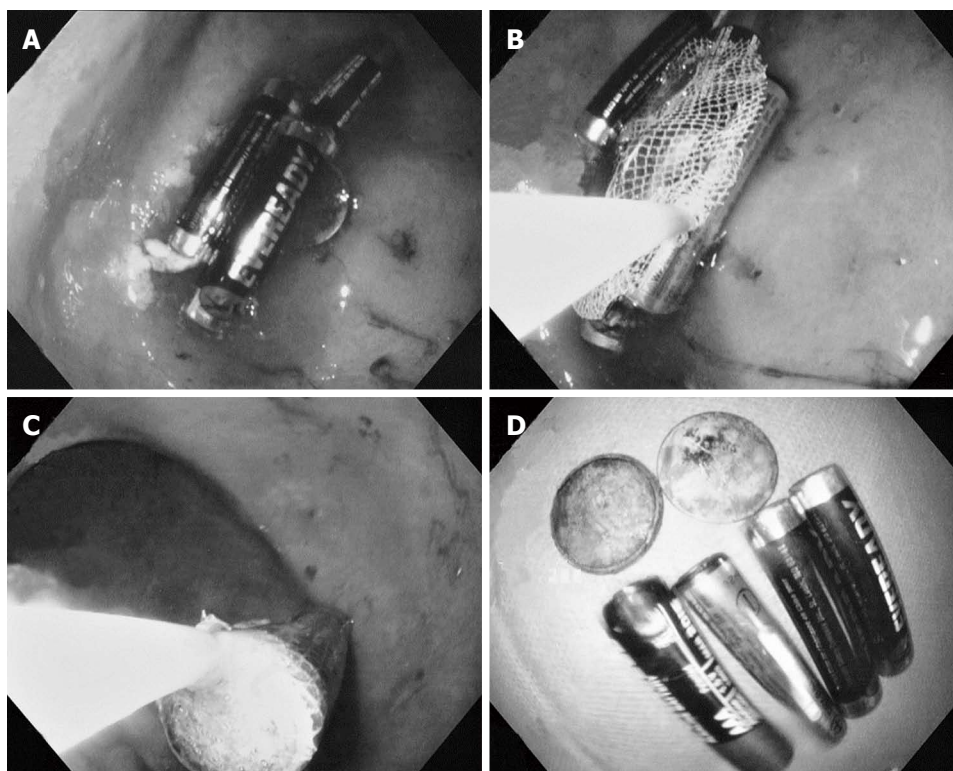


Figure 2 A 54-year-old woman with history of psychiatric illness swallowed four AA batteries and two button batteries (A). All these batteries in the stomach were removed using a snare net (B) one by one (C and D). Note the multiple erosions and shallow ulcers caused by button batteries (A, B and C).

an overtube to protect the airway against aspiration may be employed^[27,31]. A stricture can be treated with a balloon dilator after successful extraction or passage of an impacted food bolus distally.

Blunt object

The most common blunt foreign bodies are coins ingested by children (Tables 1 and 2). Approximately 30% of coins will pass from the esophagus into the stomach within 24 h^[33]. If the object has passed into the stomach and is less than 2 cm in size, it will usually pass through the entire gastrointestinal tract without difficulty. These can be retrieved using a retrieval snare net if objects fail to pass beyond the stomach by 3 to 4 wk^[7].

Button or small disk batteries

Button or small disk batteries are found in watches, hearing aids, calculators and other electronic devices. If both poles of the battery come into contact with the mucosa, electrical conduction may result in corrosive injury, necrosis and perforation (Tables 1 and 2, Figure 2). Furthermore, these agents contain either metallic salts (mercuric oxide, silver oxide, zinc oxide, or lithium oxide) or alkaline fluids (sodium or potassium hydroxide), which may leak into the gastrointestinal lumen and cause necrosis. After radiographic documentation, batteries lodged in the esophagus or stomach should be emergently removed. Use of a retrieval snare net or a stone retrieval basket is most often successful (Figure 2)^[26]. Surgical management is recommended if severe abdominal pain develops or if

the battery fails to pass in 72 h^[34,35].

Sharp-pointed object

Common sharp pointed foreign bodies include bones, toothpicks, needles, safety pins, nails, dental appliances and medication blister packs (Tables 1 and 2, Figure 3). They should be removed, if possible, before they pass through the stomach, as 15%-35% of these objects will perforate the intestine, usually, near the ileocecal valve^[6,15]. Budnick *et al.*^[36] reported 8176 toothpick-related injuries in the United States from 1979 to 1982; this is a rate of 3.6 per 100000 person-years. Patients often do not remember swallowing a toothpick and imaging studies demonstrate the presence of a toothpick in only 14% of patients^[36-40]. Sharp foreign body ingestion, such as bones and toothpicks, can be dangerous by causing airway compromise, bowel perforation or penetration^[41,42], aortic or tracheal fistulae^[43,44], or cardiac tamponade (Tables 1 and 2)^[45,46]. Ingested sharp-pointed objects have the highest rates of perforation, which may be 35%^[2,46]. Sharp objects within the esophagus should be urgently removed endoscopically. Surgical intervention is indicated if the patient develops symptoms of perforation or if the ingested sharp object fails to progress within 72 h after ingestion^[6]. Medication blister packs can cause bleeding or perforation of the esophagus^[47]. They can be removed by a snare net. For removal of sharp and pointed objects, use of an overtube or a retractable latex-rubber condom-type hood is recommended. One should always remember that advancing points puncture, whereas, trailing ones do not.

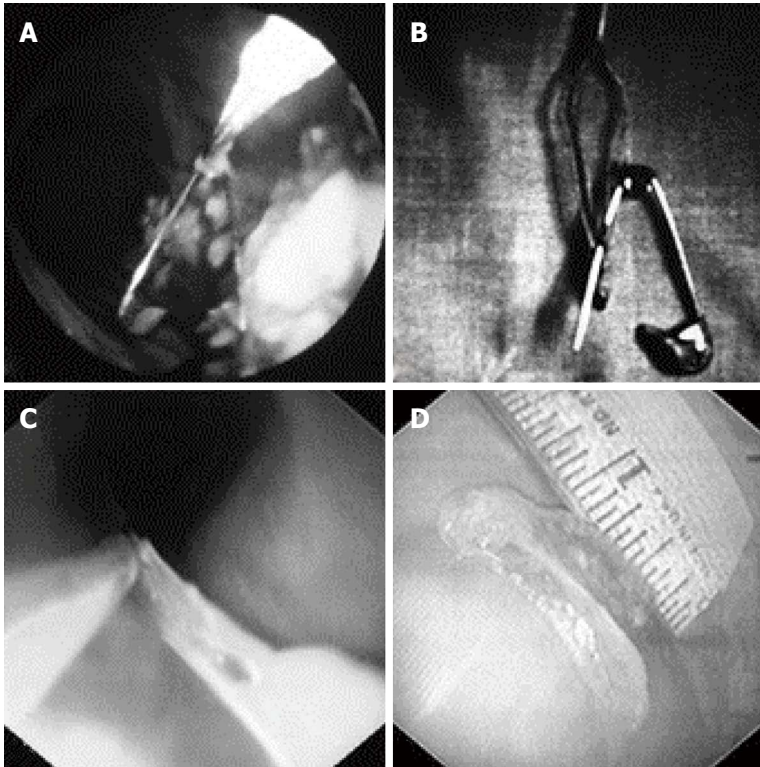


Figure 3 The top photos (A and B) show a swallowed safety-pin in the stomach, removed with the gallstone retrieval basket. The lower photos (C and D) show a swallowed cat fish bone stuck in the proximal esophagus. The sharper edge was dislodged from the esophageal wall with a snare (C), and removed (D).

Pointed objects should always be removed such that the pointed end is trailing as done in a safety pin (Figure 3A and B) or fish bone removal^[7,16]. These objects can also be retrieved using a polypectomy snare (Figure 3C and D). Surgical removal should be considered if endoscopic retrieval is impossible and the object has not moved in 72 h or if it is advancing with a pointed end^[6,14].

Long object

Objects greater than 5 cm in length, such as pens, toothbrushes, spoons and cutlery, usually become lodged in the duodenal sweep, requiring removal. This can generally be accomplished with a polypectomy snare (Figure 4A and B). An overtube may be required to protect the airway. Long objects like a large metal spoon lodged in the duodenum need surgical removal when endoscopic efforts fail (Figure 4C and D).

Bezoar

Bezoars are concretions of foreign material that become fixed in the stomach and occasionally the duodenum. They may be of vegetable origin (phytobezoar), or consist of ingested hair (trichobezoar). Patients will present with a chronic history of vomiting, dyspepsia, abdominal discomfort or weight loss. A barium upper gastrointestinal series may provide diagnosis, but diagnostic endoscopy may also be therapeutic.

Treatment of phytobezoars using enzymatic digestion has occasionally been effective. This has been particularly true with the use of cellulase, which will digest vegetable

matter. Large bezoars may be fixed to the gastric wall and difficult to manipulate endoscopically. Accessories such as snares and stone baskets or the lithotripter are useful for fragmenting and removing large portions of the bezoars^[16]. Some bezoars, particularly trichobezoars, may be so large and fixed that prompt laparotomy is the most efficacious therapy^[48].

Narcotic body packets

Cocaine may be smuggled by swallowing packets containing cocaine inside protective coverings, such as condoms (Table 1). The packets can usually be seen on plain abdominal films. Endoscopic retrieval of these packets is contraindicated for fear of puncture. The packets typically contain 3-5 gm of cocaine. Inpatient observation is recommended. Surgery is indicated for failure of the packets to progress, signs of intestinal obstruction, or clinical finding suggesting rupture^[49].

Small-bowel foreign bodies

Removal of retained endoscopy capsules, coins and migrated stents has been achieved using single- or double-balloon enteroscopy^[21-25]. Use of balloon enteroscopy for foreign body removal should be decided by the type of foreign body, availability of enteroscopy accessories, and duration of the procedure.

CONCLUSION

Most upper GI foreign bodies in adults are related to

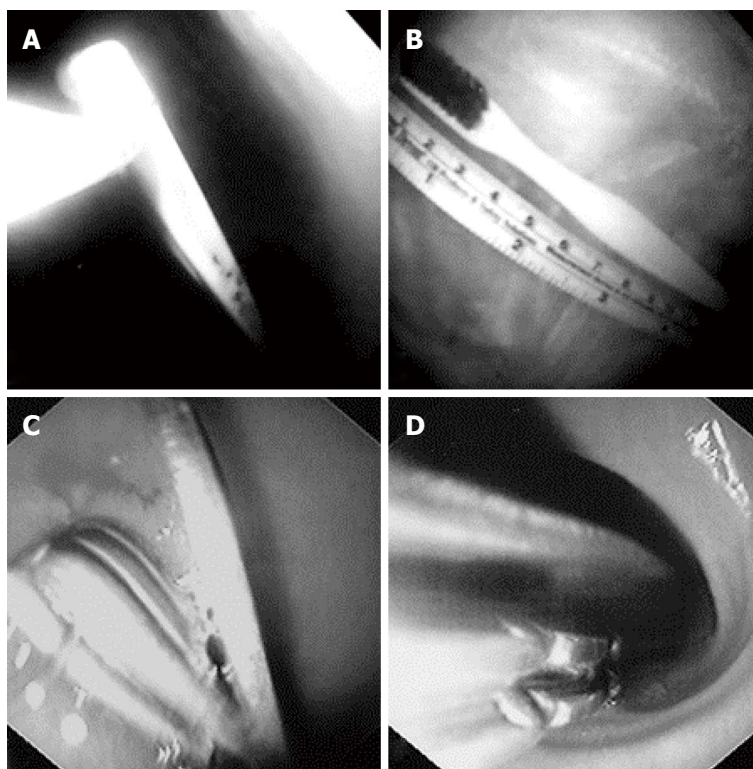


Figure 4 The top photo (A and B) shows a toothbrush being removed from the stomach with a snare. The lower photos (C and D) show several large metal spoons in the gastric antrum extending into the duodenal bulb; these could not be removed endoscopically. Successful laparoscopic surgery was performed.

food bolus impaction with meat. Patients who swallow a true foreign body typically are younger, more often male, and often have significant psychiatric illness and/or drug abuse. A variety of endoscopic techniques and instruments are indicated for different situations. Flexible endoscopic treatment is a safe and reliable procedure for a skilled endoscopist, with a high success rate, low morbidity, and no mortality^[6,16].

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