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Review

Overview of the Management of Swallowed Gastrointestinal Tract Foreign Body

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Foreign bodies' ingestion is a potentially serious problem. The majority of ingested foreign bodies pass spontaneously, but serious complications, such as bowel perforation and obstruction, can occur. It is a commonly seen problem in accident and emergency units, commonly in children in about (80%) also seen in the elderly, mentally impaired, or alcoholic individuals, and may occur intentionally in prisoners or psychiatric patients. According to the literature 90% of ingested foreign bodies pass through the gastrointestinal tract without complications, 10% to 20% necessitate endoscopic removal, whereas only 1% of them will finally need surgical intervention. Foreign bodies with smooth edges usually do not pose significant problems, but a sharp foreign object that is not retrieved at the earliest time may penetrate the wall of the viscus and cause complications. Ingestion of metallic foreign bodies such as large coins or button-type batteries because of peculiar problems posed by them may require an aggressive approach. In clinical practice, we often face the dilemma of choosing the appropriate treatment modality, instead of the usual a "waiting and close observation" policy.
The aim of this article is to share the personal experience of about 22 years of a single surgeon in the management of various types of ingested foreign bodies.

Keywords: Foreign body; Swallow; Gastrointestinal tract**.**

INTRODUCTION

In general, foreign bodies in the air and food passages are the sixth most common cause of accidental death in the U.S (Kaushal et al., 2011).

Foreign body ingestion is a commonly seen problem in accident and emergency departments, occurring mostly in children (80%), especially young children aged 6 months to 5 years, but can affect children of all ages

Toddlers aged 2-3 years are most commonly affected, as children in this age group are ambulatory and more orally explorative (Hesham 2010; Rabie et al., 2008). Those younger than 6 months can occasionally ingest materials with the aid of older siblings and the event may even be witnessed by parents.

However, no child is immune to swallowing a foreign body and it is not unheard of for infants to ingest foreign body with the assistance of another sibling but ingestion can also result from deliberate ingestion (Gasparella et al., 2009; Murtagh and Yuen 1986; Stack and Munter 1996; Louie et al., 2005).

Elderly, mentally impaired, or alcoholic individuals can ingest accidentally, but it may occur intentionally in prisoners, psychiatric patients (Gitlin et al., 2007), prisoners or drug-mules.

Even though majority of ingested foreign bodies pass smoothly, some of the ingested foreign body can lead to major catastrophe (O' Flynn et al., 1993; Daneshbod et al., 2011).

According to the literature, 90% of ingested foreign bodies pass through the gastrointestinal tract without complications (Conners et al., 1996).

Foreign body that enter the oropharynx can exit through the route they entered, be hidden in the mouth of the child, or more worrisome travel down either the trachea or the esophagus (Webb 1988; Antoniou et al., 2011).

Foreign bodies in the airway are less common than gastrointestinal foreign body.

Foreign bodies with smooth edges usually do not pose significant problems, but a sharp foreign object that is not retrieved at the earliest possible time may penetrate the wall of a viscus and cause complications and the same goes for button-type batteries (Vijaysadan et al., 2006 15; Gordon and Gough 1993).

Body-packers those involved in the smuggling of illicit drugs concealed in the gastrointestinal tract are prone to problems caused by purposeful ingestion of these foreign bodies (Silverberg et al., 2006).

10% to 20% of ingested foreign body necessitate endoscopic removal, whereas only 1% of them will finally need surgical intervention (Deeba et al., 2009).

In clinical practice, we often face the dilemma of choosing the appropriate treatment modality (Conners et al., 1996).

Frequency and Aetiology

Although exact incidence of foreign body ingestion is not readily available, but nearly 75,000 foreign body ingestion of patients 19 years and below were reported in 1996 in U.S.A (Kaushal et al., 2011).

Virtually any object small enough to pass through the pharynx may be swallowed. Items commonly ingested by children include coins, small toys, pencils, pens and their tops, batteries, safety pins, needles and hairpins - they are mainly radio-opaque.

Food-related items, such as fish and chicken bones, are more often ingested by older children and adults and tend to be radiolucent. In adults, dentures or parts from dentures can be swallowed accidentally; however the swallowing of foreign bodies during dental procedures does not occur very often (Deeba et al., 2009); Webster et al., 2011).

Trichobezoar is a rare condition where hair ingestion leads to formation of a hair ball in the stomach. Sometimes teens with emotional disturbances or with mental retardation are more common victims of bezoar formation and gastrointestinal obstruction (Kumar 2011; Sumskiene et al., 2009).

Usually toddlers aged 2-3 years are most commonly affected, as children in this age group are ambulatory and more orally explorative. However, no child is immune to swallowing a foreign body and it is not unheard of for infants to ingest foreign body with the assistance of another sibling.

Of course many children who swallow foreign body go undiagnosed and suffer no untoward consequences.

Any child with congenital or anastomotic narrowing of the gastrointestinal tract is more susceptible to foreign body impactions.

Most parents will allude to the fact that toddlers put whatever they lay their hands on in their mouths; but in addition infants may swallow objects with the assistance of other curious siblings.

In children with swallowed foreign body male to female ratio is the same but more men accidentally swallow foreign body than women and the incidence of intentional swallowed foreign body is much higher in men.

Body packers, or individuals who purposefully ingest or insert unwrapped packets of drugs, such as heroin or cocaine, into the gastrointestinal tract, are often adults, though teenagers have been perpetrators of this crime (Silverberg et al., 2006). These patients require special management, as rupture of the packets can lead to devastating consequences.

Rectal foreign bodies such as rectal thermometers or enema tips are usually inserted in children, but majority become impacted in the rectum (Anderson and Dean 2011), after swallowing. Sometimes rectal foreign bodies are likely to be the result of sexual abuse, homo-sexualism or teens experimenting with autoeroticism (Busch and Starlong 1968; Cohen and Sackier 1996; (Kouraklis et al., 1997).

Swallowed objects are usually characterized based on size, shape, radiolucency etc. However additionally swallowed objects could be classified as either radio-opaque (metallic objects) or radiolucent (plastic objects, bones).

The most common, regularly shaped smooth foreign body is a coin (Conners et al., 1996), other commonly ingested foreign bodies include screws, chains, keys, buttons, tooth picks, safety pins opened or closed, forks, spoons, bottle caps, rubber or plastic materials, marbles seeds keys; toys, tools and jewelry as shown on figures 1, 2 and 3 below.

Regularly, smooth objects like coin cause least difficulty and pass through the gastrointestinal with little concern once it has passed through the lower oesophageal sphincter.Conners et al (1996).

Although children commonly aspirate food items, it is unusual for small children to present with impacted food.

Figure 1 Ingested Iraqi coin

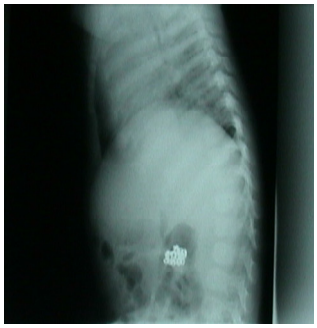


Figure 2 Ingested jewelry

Figure 3 Ingested nail

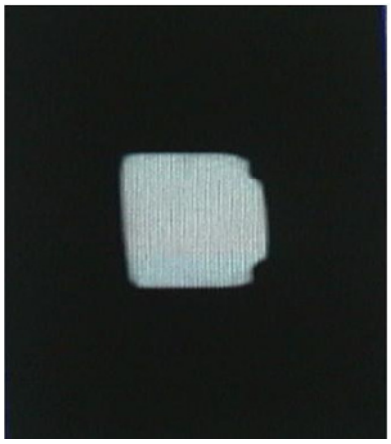


Figure 4 Ingested battery

Figure 5 Same as figure 4 side view

Sharp objects such as pins, needles, bones, screws, razor blades, open safety pins are of special concern given their propensity for perforation.

The ingestion of batteries used in watches, calculator, hearing aids, all present a special problem. Disk batteries usually do not cause problems unless they become lodged in the gastrointestinal tract. Oesophageal damage can occur in a relatively short period of time and perforation has occurred in as little as six (6) hours after ingestion (Marom et al., 2010; Amanatidou et al., 2011).

In the past, button batteries accounted for less than 2% of the foreign bodies ingested by small children, but in the last two decades, they show a rapidly increased frequency (Litovitz 1985; Litovitz and Schmitz 1992; Kuhns 1989).

Pathophysiology

The entire gastrointestinal tract can be involved. The oesophagus is a tubular structure approximately 20-25 cm length with three (3) areas of narrowing i.e. upper oesopghgeal sphincter which consists of cricopharyngeus muscle; crossover of the aorta and lower oesophageal sphincter. These areas are where the majority of oesophageal foreign body becomes entrapped.

However structural abnormalities of the oesophagus such as strictures, webs, diverticulae, malignancies and motor disturbances such as occurs in scleroedema, achalasia or diffuse oesophageal spasm can increase the risk of foreign body entrapment.

Once a foreign body has reached the stomach, it has 80-90% chance of passage, even though it could become entrapped either at the pylorus or the duodenal curves.

When a foreign body reaches the small bowel the only structural impediment to its passage is the ileocaecal valve and rarely a foreign body may become entrapped in a Meckel's Diverticulum.

The corrosive nature of a battery also can lead to gastrointestinal erosion and or perforation.

When a disk battery is in an acid environment, an electrochemical reaction occurs that leads to dissolution of the cathode, primarily in its crimp area.

Therefore, batteries (figures 4 and 5) that become lodged in the stomach corrode and fragment more frequently.

Figure 6 Patient in left lateral position for extraction of foreign body from the rectum

Figure 7 Extracted anal plastic

Figure 8 Plastic after washing

Mercuric oxide cells are substantially more likely to fragment than other batteries of other chemical compositions.

Clinical Presentation

Up to 35% of paediatric patients with oesophageal foreign bodies are asymptomatic, therefore a witnessed event by a patient, guardian or sibling offers the best hope of early intervention; therefore one should note the exact nature of the object and the time of ingestion.

If the event is unwitnessed, one should establish the nature, onset and progress of symptoms such as choking, gagging, drooling, coughing, wheezing, dysphagia, dyspnoea, fever, neck, chest or abdominal pain or haematemesis. One should also note previous surgeries or congenital anomalies of the gastrointestinal tract.

For older children or adults specific questioning regarding bizarre eating habits and psychological behaviour may help to diagnose a bezoar, i.e. a conglomeration of hair or vegetable matter.

Majority of children who have ingested a disk battery remain asymptomatic unless they become lodged in the gastrointestinal tract.

It has been shown that 23% of disk batteries pass through the gastrointestinal tract within 24 hours, 61% within 48 hours, 78% within 72 hours and 86% within 96 hours. Only 1% takes more than 2 weeks to pass.

Heavy metal poisoning is also a consideration after disintegration of the battering casing. This only occurs with mercury containing cells. Toxic serum concentration of mercury may arise and chelation treatment may be required.

Rashes following disk battery ingestion have been reported and may be a manifestation of nickel hypersensitivity.

Patients with a rectal foreign body may present with abdominal or rectal pain, pruritis or bleeding (see figures 6-8 Above).

For cases of suspected sexual assault appropriate legal authority should be contacted.

Investigations

Laboratory studies are usually not necessary for diagnostic and treatment purposes.
However obtain blood and urine, Mercury levels in case of fragmented disk-battery or broken rectal thermometer.

A complete blood count (CBC) is indicated for patients who present with signs and symptoms consistent with infection and anemia.

Imaging

Where there is a history of a swallowed radio-opaque object that may be located within the upper gastrointestinal (GI) tract, plain X-ray should be carried out to confirm or refute the possibility of oesophageal entrapment.

This need not be done urgently if occurring out-of-hours and the patient is well, but should be performed at the earliest opportunity when radiology services are available.

If there is a suspicion of swallowing a button battery, then X-rays and further treatment should be performed urgently.

Very small children can be imaged using a mouth-to-anus radiograph.

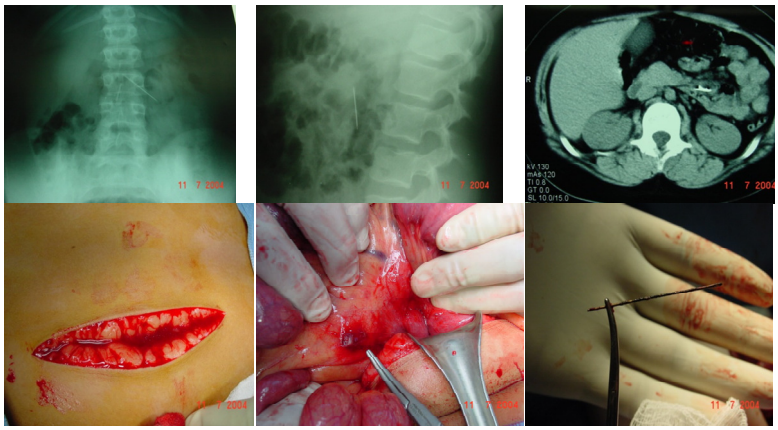
In adults, a PA and lateral chest radiograph and/or plain abdominal X-ray are more useful.

Only about 20-50% of food bones will be visible on X-rays. (Louie et al., 2005).

Figure 9 (Mini enterotomy)

Figure 10 (Extracted Iraqi coin)

Figure 11 (Enterotomy closed)



Figures 12 to17

Coins in the oesophagus usually appear in a coronal alignment on frontal radiographs (i.e. seen as a disc).

Coins in the trachea are more usually seen in a saggital orientation on frontal radiographs, due to the incompleteness of tracheal cartilage rings posteriorly (i.e. seen 'edge-on').

Plan films of abdomen including pelvis and chest are mandatory for all patients. Radiopaque objects are rarely seen and localized on the films.

Radiopaque droplets in the gut may be found on x-ray in patients with fragmented cells.

Barium or gastrografin swallow is helpful if the foreign body in question such as toothpicks or aluminum is radiolucent, but barium is contraindicated in cases where oesophageal or bowel perforation is suspected.

CT scans

CT scanning of the thorax/abdomen is highly useful for locating entrapped objects of various types and considered superior by many to plain X-ray imaging.

CT scanning is the investigation of choice if there is reason to suspect perforation or abscess formation.

Not all cases of acute dysphagia/odynophagia due to food bones should have CT scanning, as only a minority (17-25%) of those who have the sensation of a trapped foreign body after eating will actually have one present, the remainder having the sensation due to mucosal injury.

Computerized (CT) Scan of the neck/chest is highly reliable in localizing foreign bodies; but because of its cost, CT is rarely used unless the patient presents with

complications such as in suspected perforation or abscess formation.

Treatment

For children who have swallowed a coin that has passed the gastroesophageal junction, reassurance that the foreign body will pass without consequence is all that is required (Rebhandl et al., 2007).

Other objects like small toys, button seeds will also pass.

These patients can be sent home with instructions to return if abdominal pain, vomiting occurs; or if the object has not been found in the stool within five to seven (5-7) days.

Objects with sharp edges or points such as pins, needles, razor blades, open safety pins present special problem because of high incidence of intestinal perforation (Macpherson et al., 1996).

Even though a large number of them will also pass through the gastrointestinal tract once past the gastroesophageal junction; nevertheless it is preferable to observe them in the hospital for possible need for immediate abdominal exploration should bleeding (Sumskiene et al., 2009), or features of perforation occurs (Losanoff and Kjossev 2001).

Obtain daily radiographs and examine stools for the foreign body to monitor progress. Gastrointestinal hemorrhage or sign of bowel perforation require immediate surgical exploration and removal of the object.

Body packers are at risk of death if the packets of the illicit substance rupture. Such patients should be hospitalized and bowel irrigation considered.

Narcotic 'body packers'/'drug mules' should be followed up and monitored as inpatients due to the risk of drug toxicity; they may need bowel irrigation and/or surgical intervention if there is any evidence of systemic effects of leaking narcotics (endoscopy is not recommended, as it tends to release drugs from the packages) (Silverberg et al., 2006).

Ingested batteries stuck in the oesophagus should be removed immediately because of the increased risk of corrosion and perforation.

Batteries that have passed the lower sphincter should be followed up with radiographs taken 12 hourly and removed surgically if no progress is observed.

Specific Procedures

Endoscopy

Although a variety of methods have been described for removal of foreign bodies from the oesophagus, rigid oesophagoscopy is the standard against which other treatments are compared.

Endoscopy is the most commonly used technique for active management and removal of oesophageal foreign bodies. It has been used and both have high incidence of complications.

Where the ingested object is not radio-opaque, X-ray investigations are unlikely to help and will probably only delay more relevant investigations such as upper GI endoscopy (Macpherson et al., 1996).

Endoscopy is the most commonly used technique for active management and removal of oesophageal foreign bodies. It has been used traditionally for visualization and removal of foreign bodies in the oesophagus.

It is also indicated for patients who may have swallowed aluminum can tablets or toothpicks, since neither object is visualized with plain films and both have incidence of complications.

It is safe and effective but relatively expensive; unfortunately the expertise may not be available easily in some centers in the developing world.

Urgent endoscopy is mandatory in cases where there is airway obstruction or evidence of other severe complications.

Where there is a clear history of swallowing of objects, such as toothpicks and/or aluminium bottle. Caps/can rings, endoscopy is the investigation/procedure of choice, as there is a high rate of complications with such objects.

Where the history of ingestion of such objects is not so clear-cut, consider CT first to detect the object.

Definite indications for endoscopy are objects that are sharp, non-radio-opaque, elongated, or where there are multiple swallowed objects or a high risk of oesophageal injury (e.g. button batteries).

Endoscopy is also indicated for gastric or proximal-duodenal foreign bodies that have a diameter of >2 cm, a length of >5-7 cm or are eccentrically-shaped and prone to enlodgement/perforation, such as open safety pins.

Endoscopy is a relatively safe procedure in experienced hands, but costly, and should therefore be avoided as a routine intervention if possible.

Metal detector

The use of a metal detector to locate intra thoracic and intra abdominal metal objects is a useful non-invasive procedure for diagnosis.

A metal detector such as those employed in airports and embassies can be used to discover the whereabouts of an object and to monitor its progress down the gastrointestinal tract.

Use of Fogarty catheter

When an object is difficult to grasp with the forceps such as

a marble or round toy, a Fogarty catheter can be advanced through the scope past the object and inflated.

The Fogarty can then be pulled behind the object and the endoscope is withdrawn to retrieve the foreign body.

Following this procedure, a postoperative chest x-ray is undertaken to assess the mediastinum. Patients are admitted, observed, start on clear liquids and discharged when able to tolerate oral intake.

Foley Catheter Removal

This is another widely used technique for removal of single, smooth blunt foreign bodies. (Bowa et al., 2009; Dunlap 1981). It is contraindicated in patients with foreign bodies present in for more than 72 hours and a history of oesophageal disease or surgery.

Foleys catheter removal of foreign body should only be attempted by those familiar with its use. It is performed under fluoroscopy with the patient placed in a head-down position and appropriate Foley catheter passed orally past the foreign body. Its balloon then inflated and both with the foreign body pulled out. The success rate for this procedure has been reported to be about 85-100%.

This method is particularly cheap and easily available at any health delivery centre around the world where the services of an endoscopist is not easily available.

Complications from it include epistaxis, dislodgement of the foreign body into the nose, hypoxia and aspiration.

Oesophageal Bougienage

Used mainly for foreign bodies lodged at the oesophago-gastric junction and could be pushed into the stomach by an appropriately selected esophageal dilator.

Children selected must have swallowed a single coin and symptoms less than 24 hours duration with no previous esophageal abnormalities on surgery. Success rate is about 83-100%.

Medical Treatment

Smooth muscle relaxant agents such as glucagon and benzodiazepines could be useful in adults (Trenkner et al., 1983; Anderson and Lee 2007), but are not usually successful in children and are not recommended.

Hyoscine may be useful in cases of food bolus obstruction (Trenkner et al., 1983).

Gastrostomy

Gastro intestinal foreign bodies may require laparotomy for definitive removal in some cases as most are stuck in the stomach (see figures 9-17 below) (Deeba et al., 2009).

Under general anaethesia, mini laparotomy is made and a small enterostomy made either proximal or distal to the foreign body and then extracted (Deeba et al., 2009).

Once removed, the enterostomy is closed in two layers and abdomen closed in the same standard way (Selivanonov et al., 1984).

Proctosigmoidoscopy

Usually done especially in children under general anaethesia.

Under visualization the object is grasped with forceps and extracted. In the case of thermometers all mercury pellets should be removed when feasible.

Laparoscopy

This is done under general anaethesia and depending on the skill of the surgeon, an enterotomy is created and the appropriate foreign body removed. This allows for smaller abdominal wound.

CONCLUSION

A conservative approach is recommended for most ingested foreign bodies in the abdomen except disk batteries, which should be removed surgically if they remain in any one position for more than 24 hours.

A few selected other types of ingested foreign bodies especially those with sharp edges that are producing signs and symptoms of peritoneal irritation should be surgically removed promptly.

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