



E-ISSN: 2706-9575

P-ISSN: 2706-9567

www.medicinpaper.net

IJARM 2021; 3(2): 333-340

Received: 07-05-2021

Accepted: 20-06-2021

**Dr. Senthil Kumar
Ramalingam**

Assistant Professor, Institute
of Medical Gastroenterology,
Madras Medical College,
Chennai, Tamil Nadu, India

Dr. Winston Thomas

Assistant Professor, Dept. of
Pediatric Gastroenterology,
Institute of Child Health and
Hospital for Children, Madras
Medical College, Chennai,
Tamil Nadu, India

Dr. Nirmala Dheivamani

Professor and HOD, Dept. of
Pediatric Gastroenterology,
Institute of Child Health and
Hospital for Children, Madras
Medical College, Chennai,
Tamil Nadu, India

Corresponding Author:

**Dr. Senthil Kumar
Ramalingam**

Assistant Professor, Institute
of Medical Gastroenterology,
Madras Medical College,
Chennai, Tamil Nadu, India

Original Research Article

Pediatric foreign body ingestion and outcomes of endoscopic management: Four year experience from a tertiary care centre in south India

Dr. Senthil Kumar Ramalingam, Dr. Winston Thomas and Dr. Nirmala Dheivamani

DOI: <https://doi.org/10.22271/27069567.2021.v3.i2f.264>

Abstract

Introduction: One of the common emergency paediatricians face in their daily practice is ingestion of foreign bodies. The clinical presentation, investigation and appropriate management vary for different foreign bodies. Advances in endoscopic techniques and accessories have enabled non-surgical removal in children with excellent outcome. Data are relatively few from this region of the world.

Method: We present our experience over four years in upper gastrointestinal endoscopic management of ingested foreign bodies from January 2017 to December 2020. In this retrospective study the type of foreign bodies, nature, and number of foreign bodies ingested and the success of endoscopic intervention in these children were collected and analyzed using SPSS 15.0 statistical software.

Result: A total of 137 children were subjected for upper gastrointestinal endoscopy during the study period. The majority of the foreign body ingested were coins followed by button battery. Most of the foreign body was located in the stomach. Endoscopic interventions were done using appropriate accessories and the procedures were successful with good outcome.

Conclusion: The spectrum of foreign body ingestion varies in different parts of the region due to the varied cultural and social factors. Endoscopic intervention is a timely and safe procedure in majority of foreign body ingestion with excellent outcome in a specialised gastroenterology unit.

Keywords: Foreign body ingestion, pediatric, gastrointestinal tract, endoscopy

Introduction

Foreign body (FB) ingestion in children is common and it is one of the main indication for emergency endoscopy in children^[1]. Most events occur in children between 6 months and 6 years of age^[2]. Nearly 80%–90% of ingested FB in the gastrointestinal tract (GIT) are passed spontaneously without complications, 10%–20% are removed endoscopically, and only 1% require surgical intervention^[3]. Children because of their nature of exploring and putting everything in their mouth are more prone to ingestion of household things and toys. Majority of FB ingestion in children are accidental in nature.

The exact incidence tends to be underestimated as most of the foreign body ingestions goes unnoticed and are managed without seeking medical attention. Coins are among the most common foreign bodies ingested in the pediatric age group. The clinical presentation and type of foreign body ingested depends on culture, lifestyle and play habits of children of that particular society^[4].

The advent of flexible endoscopy and accessories has revolutionised the management of foreign bodies especially in children thereby reducing the morbidity and mortality, the additional advantage being the identification of underlying anatomical abnormality and the complication of FB ingestion.

Parameters that need to be considered regarding the timing of endoscopy in children with ingested FBs are the child's age, body weight, the clinical presentation, time since the last meal, time lapse since ingestion, type, number, size and shape of the FB and its present location in the GI tract. Study reports on foreign body ingestion and its outcome are relatively few particularly in this part of our country. Hence, this study was conducted in order to assess the clinical presentation, etiology and outcome of children presenting with foreign body ingestion.

Materials and Method

We conducted a retrospective study over the period of four years (January 2017 to December 2020) in the Institute of Child Health and Hospital for children Chennai, which is a tertiary care centre in southern India. Children with history of foreign body ingestion were first assessed for emergency symptoms, type and number of foreign body ingestion and time of ingestion with relation to food. X-ray of chest and abdomen were taken to confirm the diagnosis, localisation and nature of foreign body and for the signs of complications. Endoscopic intervention was performed after obtaining informed consent from the parents. Flexible single channel endoscope was used to retrieve the foreign bodies (Olympus CV170). Various endoscopic accessories such as endoscopic removal basket, Roth net, rat tooth retrieval forceps and snare were used depending on the nature and location of the foreign body ingested.

Button batteries in oesophagus, sharp foreign bodies in upper gastro intestinal tract and foreign bodies with symptoms were taken up for immediate endoscopic removal. Button batteries in stomach were observed for 24 hours. If no transit was noted after the period of observation, patients were subjected to endoscopy. Asymptomatic coins in stomach were observed for 2 weeks duration. If no transit was noted they were subjected for removal. Light sedation with local lignocaine was given to children and vitals were monitored during and immediately following the procedure. Upper digestive endoscopy was performed by gastroenterologists.

During the procedure clear view of the foreign body was obtained. Nature, number and position of the foreign body were confirmed. Irrigation with water was done for some foreign bodies in stomach to dislodge the mucus for easy identification and securing. Screening was done upto duodenum to look for the presence of additional foreign bodies. Pins in oesophagus were pushed into stomach and they were removed with the sharp end trailing behind to avoid injury. Choice of the retrieval accessory was based on nature of foreign body and the endoscopist's expertise. Mostly basket was used to remove coin, battery and magnets. Roth net was used in some cases. These have the advantage of firm grip over the foreign body and avoid slippage during removal back into the stomach and in the airway while approaching the cricopharyngeal region. In some cases, multiple accessories were tried for a single foreign body before its final retrieval.

Scope was reintroduced in case of oesophageal button battery impaction after its removal to assess the damage to oesophageal mucosa and to rule out the presence of additional foreign bodies. After the procedure was over child was kept nil oral for a duration based on clinical scenario and any expected complications based on the type of foreign body (oesophageal mucosal injury due to button battery). Usually nil oral was kept for six hours and feeding initiated thereafter. If no complaints noted they were discharged the following day as per institutional protocol. Follow up endoscopy was done one month after removal of oesophageal button batteries for assessment of mucosal healing.

Data such as age, sex, type of ingested foreign body, presentation, investigations, type of intervention were collected and analyzed using SPSS 15.0 statistical software.

Results

Of the 137 cases, 62% (85/137) were male and 38% (52/137)

were female. The most common age group in this study was the 1 – 4 year group. However, coin ingestion was most commonly seen in the 5 – 8 years bracket (Table 1). In some very young children, the elder sibling had put the foreign body in the child's mouth unintentionally.

Majority of the children in the study were asymptomatic at presentation with history of foreign body ingestion except for the oesophageal foreign bodies who complained of refusal of feeds and vomiting. In the 137 subjected to endoscopy, foreign body was visualised and removed in 83.2% (114/137) children. In the remaining 16.8% (23/137) cases foreign body was not visualised. These cases were followed-up and all these children eventually passed the foreign body naturally without any complication (Table 2).

Coins

Of the total 64 endoscopies done for coin retrieval, 91% (58/64) were removed. In 6 children no coin was visualised. Post procedure radiograph showed coin in the distal bowel which was passed out during follow up. Among the 58 coins, 90% (52/58) were in stomach, 7% (4/58) in oesophagus and 3% (2/58) in duodenum. Majority of the coins (48%) were 5 rupee coins (Table 3). Basket was used predominantly (43 children) to remove coins in stomach. 8 were removed using Roth net while rat tooth retrieval forceps was used in 1 case. Of the 2 coins in duodenum, one was removed by basket and another by rat tooth retrieval forceps. All the oesophageal coins were removed by rat tooth retrieval forceps.

Button battery

A total of 32 endoscopies were done for button battery ingestion. In 26 children button battery was visualised and removed. Only one child had two button batteries in stomach which were removed one by one by Roth net. In the remaining six children no battery was visualised (Table 4). Post procedure radiograph showed battery in the distal bowel which passed out naturally during follow-up. Of the four oesophageal button batteries, all were lodged in distal oesophagus. Three were removed by rat tooth retrieval forceps and the remaining one by basket. In stomach, 16 batteries were removed by basket, four by Roth net and one by snare. Duodenal button battery was removed by basket.

Safety pins

Endoscopy was done in ten children for removal of ingested safety pin. Removal was done in nine of these children. Three each were removed from oesophagus, stomach and duodenum. One had passed beyond duodenum before the procedure which subsequently was passed spontaneously without any complications. Five of the safety pins removed were open and one was a broken safety pin. All the pins were removed by retrieval rat tooth forceps (Table 5).

Hair clip

A total of 12 endoscopies were done for hair clip ingestions. Seven were removed (i.e. one from lower oesophagus, four from stomach and two from duodenum). Retrieval rat tooth forceps was used for removal of oesophageal hair clip. Three of the four hairclips in stomach were removed using basket. Of the two hairclips in the duodenum one was removed by retrieval rat tooth forceps and the other was removed using basket. Five hairclips which had passed beyond duodenum passed out spontaneously (Table 6).

Other foreign bodies

Various other foreign bodies removed include metallic ring, chain, iron nail, magnet, pendant, belt buckle pin, AA and AAA batteries and gooseberry impacted above an oesophageal stricture. Except for the impacted goose berry above the oesophageal stricture all the other foreign bodies were removed from the stomach or the duodenum.

Oesophageal foreign bodies were relatively easy to retrieve than the stomach and duodenal foreign bodies. Safety pins were easy to remove holding the eye with rat tooth retrieval forceps.

In all but 4 of the 114 children in whom foreign bodies were removed they were done in the first attempt. The failed cases include a hair clip, a button battery and a 5 Rupee coin all in the stomach and an impacted goose berry just above the oesophageal stricture. In these patients, the foreign bodies were removed the next day. In all, multiple foreign bodies were seen in only one patient, who had ingested two button batteries which was removed from the stomach one after the other using Roth net.

All the children who underwent endoscopy had normal anatomy of the upper gastro intestinal tract except one who had an anastomotic oesophageal stricture following surgery for oesophageal atresia with tracheo oesophageal fistula. The impacted goose berry in this case was removed and oesophageal dilatation was done at the same time.

Most of the foreign bodies were in the stomach (91/114). Coins were the most common foreign body, with rupee 5 coin being the commonest. Mucosal injury was present in all the patients with oesophageal button batteries. After removal of button battery, scope was reintroduced to assess the extent of damage and for the presence of additional foreign bodies. As per our institutional protocol, oesophageal injuries due to button batteries were subjected to repeat endoscopy after 4

weeks to assess mucosal healing. None of our patients developed complications in the follow up period.

None of the patients in the 23 children where the foreign body had passed beyond the duodenum at the time of endoscopy had complications and all these reported to have passed the foreign bodies spontaneously. Surgical intervention was not required in any of our patients.

No psychiatric disorder was found in any child in whom endoscopy was done for foreign body ingestion.

Table 1: Age & sex distribution (n=137)

Age group	Male n (%)	Female n (%)	Total n (%)
< 1 year	5 (63)	3 (37)	8 (6)
1 – 4 years	49 (68)	23 (32)	72 (53)
5 – 8 years	22 (55)	18 (45)	40 (29)
9 – 12 years	9 (53)	8 (47)	17 (12)
Total	85 (62)	52 (38)	137

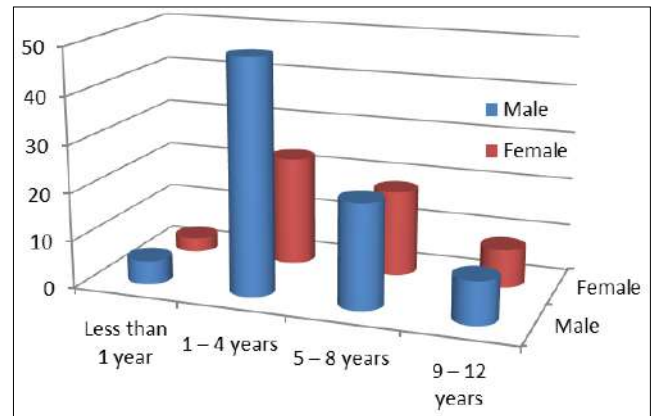


Fig 1: Age & sex distribution

Table 2: Types of foreign bodies encountered in children and endoscopic retrieval

Foreign Bodies	Foreign body visualised and removed by endoscopy	Foreign body not visualised
Coins	58	6
Button battery	26	6
Hair clip	7	5
Safety pin	9	1
Metal ring	3	1
Iron nail	2	1
Magnet	2	-
Broken metal blade	1	-
Pendant	1	1
Chain	1	-
Belt buckle pin	1	-
Goose berry	1	-
AA battery	1	-
AAA battery	1	-
Metal dice	-	1
Sharp wooden piece	-	1
Total	114	23

Table 3: Number and types of coins ingested

Coin types	No. of coins retrieved from cases
5 Rupees coin	28
2 Rupees coin	10
1 Rupee coin	14
10 Rupees coin	2
50 paise coin	1
Type not documented	3

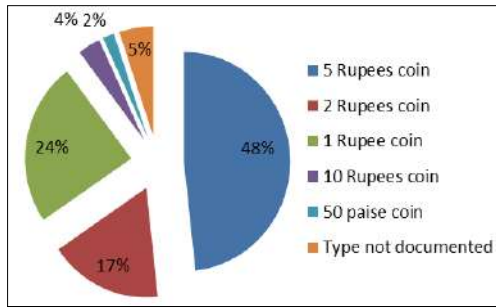


Fig 2: Stomach coins

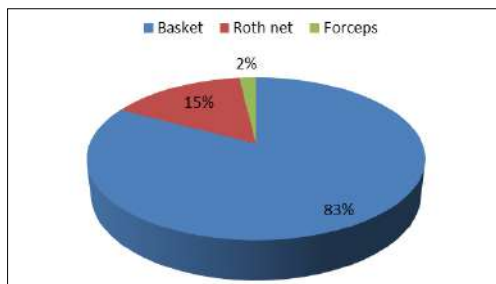


Fig 3: Accessories for coin in stomach

Table 4: Distribution of button batteries in anatomical site

Anatomical site	No. of batteries detected
Oesophagus	4
Stomach	21
Duodenum	1

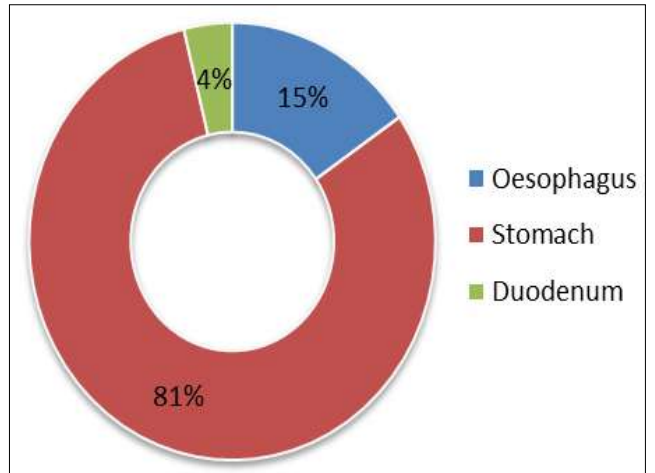


Fig 4: Button battery

Table 5: Safety pin location and retrieval from different anatomical sites

Site	Number	Nature of safety pin		Accessory used
		Open/broken type	Closed type	
Oesophagus	3	3	-	Retrieval rat tooth forceps
Stomach	3	2	1	Retrieval rat tooth forceps
Duodenum	3	1	2	Retrieval rat tooth forceps

Table 6: Anatomical site and accessories used for retrieval of hair clips

Site	Number	Accessory used
Oesophagus	1	Retrieval rat tooth forceps
Stomach	4	Retrieval rat tooth forceps - 1 Basket - 3
Duodenum	2	Retrieval rat tooth forceps - 1 Basket - 1

Table 7: Common foreign bodies - Age & sex distribution

Age	Coins		Button battery		Safety pin		Hair clip	
	Male	Female	Male	Female	Male	Female	Male	Female
Less than 1 year	0	0	1	0	1	0	2	1
1 – 4 years	16	5	19	7	4	4	4	4
5 – 8 years	18	16	1	1	0	1	0	0
9 – 12 years	5	4	2	1	0	0	0	1

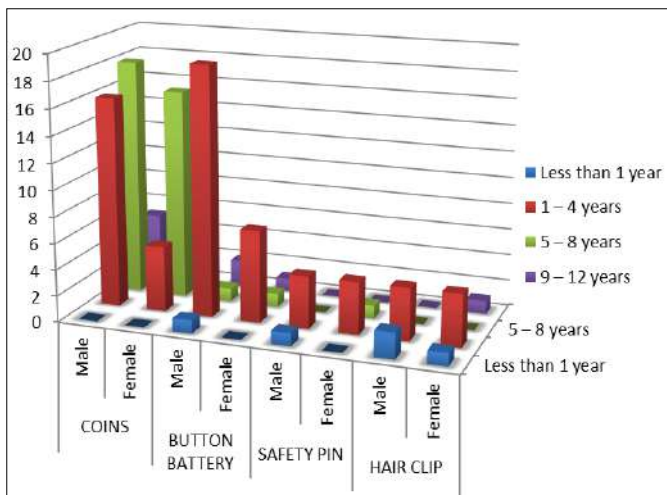


Fig 5: Common foreign bodies - Age & sex distribution



Fig 6: Photograph depicting the various foreign bodies removed in our study

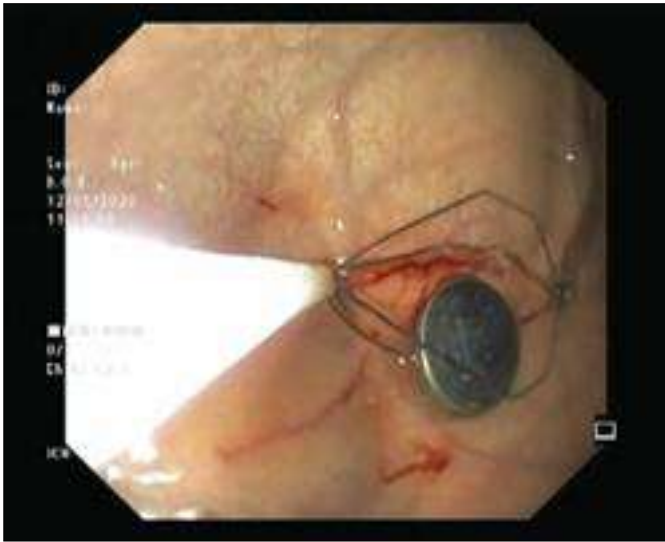


Fig 7: Endoscopic image of button battery removed by basket



Fig 10: Endoscopic image of goose berry above oesophageal stricture- removed by basket

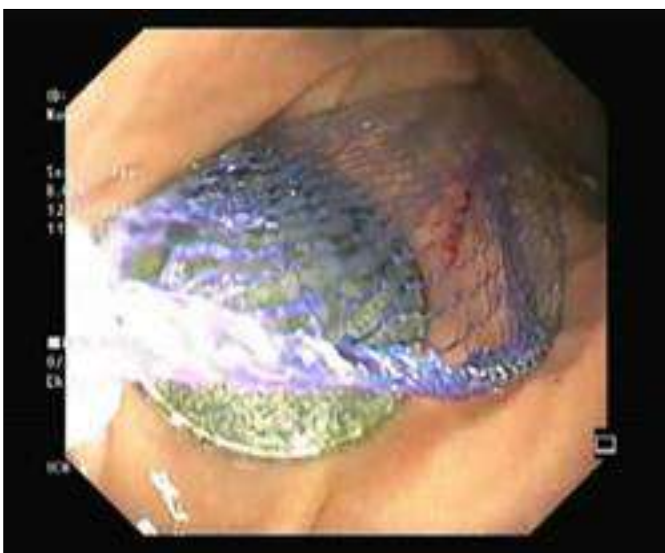


Fig 8: Endoscopic image of coin removed by net

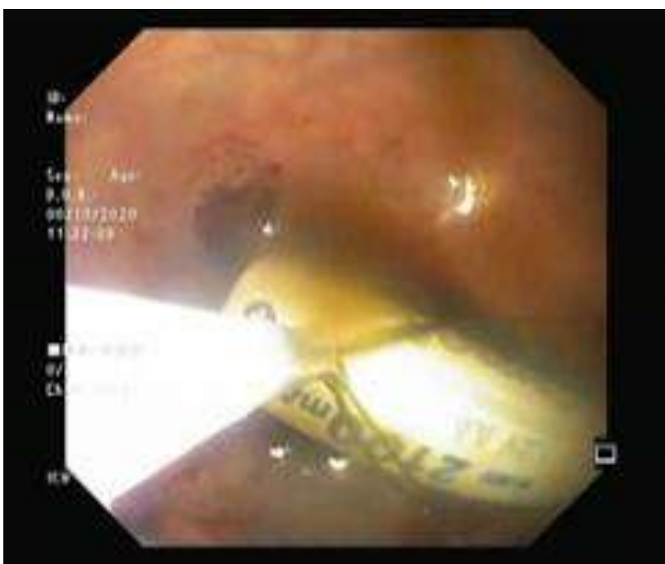


Fig 9: Endoscopic image of a battery removed by basket

Discussion

One of the challenging situations often faced by endoscopist is the ingestion of foreign bodies in children. Inadequate history of ingestion, high risk foreign bodies such as button batteries and magnets, patient size, inadequate guidelines on management place the pediatric age group at a higher risk of morbidity and mortality. In about 40% of cases the foreign body ingestions goes unnoticed and are managed without seeking medical attention. Hence the exact incidence tends to be underestimated^[5].

Foreign body ingestion is common in pediatric age group due to the vulnerability of children to explore objects followed by accidental ingestion. Before the advent of fibre optic flexible endoscopes rigid scopes were used to retrieve the foreign bodies, the disadvantage of rigid scopes being increased incidence of visceral injury. Once a foreign body is in the stomach, the majority will pass within 4–6 days⁶. Conservative management has been proven to be effective in the management of many asymptomatic gastric foreign bodies^[7].

Regarding symptoms most of the children were asymptomatic except for the oesophageal foreign bodies. This is in lieu of the literature noted^[8]. Upper digestive endoscopy is the most common method used to retrieve ingested foreign bodies, as discussed by Waltzman *et al.*^[9]. The modality of using endoscope to remove foreign bodies is increasingly used due to its success. In fact it is used in 25% in Belgium and 80 -90% in eastern part of the world^[8].

This study done in our institute describes the experience of upper gastro intestinal endoscopic management of ingested foreign bodies presented to us. Foreign bodies lodged in cricopharynx were removed by ENT surgeons in our institute. So cricopharyngeal foreign bodies were not included in our study group.

Foreign body ingestion has no sex predilection. Studies show an equal distribution between males and females¹⁰ where as in our study there was a male dominance (62%). Reports documented that 60% and 90% of ingested foreign bodies are found to be radio opaque¹¹. In our study except for the gooseberry and sharp wooden piece all other FBs were radio opaque due to which X-ray was the most reliable investigation in our study.

Table 8: Timing of the Endoscopic Removal of Foreign Bodies as given NASPGHAN endoscopic committee [12]

Type	Location	Symptom	Timing
Button battery	Oesophagus	Yes or No	Emergent
		Yes	Emergent
	Gastric/SB	No	Urgent (if age <5years and BB ≥20 mm) Elective (if not moving on serial x-ray)
Magnets	Oesophagus	Yes	Emergent
		No	Urgent
	Gastric/SB	Yes	Emergent
		No	Urgent
Sharp	Oesophagus	Yes	Emergent
		No	Urgent
	Gastric/SB	Yes	Emergent
		No	Urgent
Coin	Oesophagus	Yes	Emergent (if not managing secretions, otherwise urgent)
		No	Urgent
	Gastric/SB	Yes	Urgent
		No	Elective

Emergent – Less than 2 hrs from presentation regardless of Nil per oral status (NPO)

Urgent – Less 24 hours from presentation, following usual NPO guidelines.

Elective - Greater than 24 hours from presentation, following usual NPO guidelines.

Literature observes common foreign bodies retrieved in Children as coins, button batteries and hair clips in contrast to foreign bodies in adults where food bolus and denture impaction were more common [13].

In our study the common foreign body ingested were coins because of their easy availability. A waiting period of two weeks was given for asymptomatic coins in stomach but some were removed earlier due to parental concerns. This might explain the somewhat high number of coins in the study group.

In a study by Balekuduru AB *et al.* [14], coins formed 69% of the total foreign bodies removed. In another north Indian study by Shabir AS *et al.* [15] scarf pins were the common foreign bodies removed. One more observation in this study is the high incidence of ingestion of metallic hairclips. Seven hairclips were removed while the remaining five passed out. In a study from south India a total of four clips were removed [14]. This explains the difference in the spectrum of foreign bodies in a particular geographic region.

In our study, button batteries were the second most common foreign body that were removed. Fish bones were the common FB next to coins in a study by Cheng *et al.* [16]. In another study by Arana *et al.* [8], button batteries were the common FB to be removed next to coins. This may be explained by the widespread availability of imported toys with lithium button batteries.

Lithium cells are associated with worse prognosis because of their long shelf life and cold tolerance. Lithium cells are typically 3.0 V, as compared with the 1.5 V of traditional alkaline button batteries. The increased voltage is the main contributing factor in the type and degree of injury transmitted by these lithium batteries as, per Ohm’s law, higher voltage drives an increase in current [17]. When a lithium button battery becomes entrapped in the oesophagus, mucosa bridges the positive and negative poles of the battery thus completing a circuit and allowing current to flow.

Electrical current from the battery results in generation of hydroxide radicals in the oesophageal tissue. The presence of hydroxide radicals rapidly raises the pH of the tissue leading

to caustic injury and associated coagulative necrosis. A contact time of 15 minutes is sufficient to cause injury to mucosa [18]. Oesophageal impaction at the level of the aortic arch, age less than 5 years, battery size of 20 mm or greater, and multiple impaction of batteries are all factors that should prompt the greatest level of concern [19]. Even after removal of the battery from the esophagus, ongoing evolution of the injury for up to several weeks occur thereafter, placing patients at risk for a catastrophic aorto-oesophageal fistula and other severe sequelae.

In our study though there was mucosal injury in all the children with oesophageal button battery impaction, fortunately none of the children developed complications during follow-up.

Magnets seem to be interesting play objects with subsequent risk of accidental ingestion and their ensuing complications. New generation magnets are composed of iron, boron and neodymium which are 5 to 10 times more powerful than traditional magnets. The attractive force of these modern magnets is formidable. After swallowing greater than one magnet or a magnet with another piece of metal, the attractive force allows the objects in the intestine to find each other despite being in different regions of the bowel [20]. The magnets can therefore cause two segments of bowel to adhere together resulting in ischemia and pressure injuries and even leading to gangrene and resection. In a study by Zhang *et al.* [21], four magnets were removed by endoscopy out of the six contemplated. In our study only two children reported with ingestion of magnets and both of them were removed from stomach.

Sharp foreign bodies in GIT pose the risk of perforation while passage through oesophagus being the riskiest place. Risk of sharp foreign body for complications is as high as 30% and hence removal is advocated [22]. In the present study safety pins, hairclips, broken blade, belt pin, sharp wooden piece and iron nails formed the sharp foreign bodies that had to be removed, with safety pins and hairclips being particularly common. A total of 28 endoscopies were done for removal of these foreign bodies out of which 8 had already passed beyond the scope’s reach at the time of endoscopy. None of these patients developed complications.

Oesophageal foreign body may be associated with oesophageal stenosis, atresia and sometimes in children with mental retardation and psychosis [23]. In a study in Jordan two children had oesophageal strictures and seven children had

endoscopic features of eosinophilic oesophagitis [24]. In our study there was a single female child with gooseberry impaction at the site of anastomotic oesophageal stricture.

No mortality was reported in our study, which is consistent with the low mortality rates associated with foreign body ingestions worldwide reported by other studies [25]. Children should be taught about the danger of ingestion and aspiration effect of foreign bodies. Parental education is of utmost importance in this scenario. In fact in many cases in our study, foreign bodies especially coins were ingested by children in direct view of parents who assumed it is harmless. We agree with Palta *et al.* [26] that an increased awareness of the parents and people involved in the institutional care settings (nurseries, kindergartens, centers for children with neuromotor disabilities, and child psychiatry services) along with an active surveillance during daily activities is essential in order to establish protective rules that help to keep hazardous materials out of the children's reach.

Children especially infants and toddlers should be given to play with large wooden toys which effectively minimises risk of ingestion and toxic ingestion. In fact our elder generation used to give their children to play with these type of toys which were safe and the parents were able to take care even if their children were left with grandparents as baby sitters. Plastic toys with small loose attachments such as screws, wheels are a potential danger along with button battery device. Care giver should have a constant look over these children for avoiding these situations.

One aspect we learnt in our study is abdominal radiograph should be planned just before the procedure to confirm the position of foreign body within the reach of endoscope. By this unnecessary need of scopy can be reduced. Adequate sedation with back up of emergency team is a prerequisite. Availability of the proper endoscopic accessory, skill, experience, patience, endurance, expertise of the endoscopist and skilled technical endoscopic assistant play an important role in the management of the endoscopic retrieval of foreign bodies in children.

During the retrieval one of the difficult site to negotiate is the cricopharyngeal region where the foreign body usually slips. This is reduced by holding the foreign body snugly near to the scope end and also getting hold of the accessory in the other hand which holds the scope. This ensures both scope and accessory with foreign body is removed at the same time simultaneously without slippage. At any point of time the foreign body should be in direct vision so that it can be negotiated as the need arises.

According to guidelines, all foreign bodies in children ideally should be removed with general anaesthesia. But due to logistic considerations in our institute we removed foreign bodies with children under light sedation with local lignocaine. But we had help of anaesthetists and pediatric surgeons as back up. In case of sharp foreign bodies like pin ideally overtube should be used. But due to non-availability it was not used in our setting. The authors encourage complying with the NASPGHAN recommendation to do such procedures under general anaesthesia, while the patient is intubated to protect the airway. This study does not recommend endoscopic retrieval of foreign bodies under sedation.

In conclusion, foreign body ingestion is common in children between 1 to 4 years of age with coins being the predominant FB. Endoscopy remains the cornerstone and effective tool for successful management of ingested foreign bodies. Timely

intervention, fully equipped endoscopic suite with skilled technicians are the pivotal needs in the FB management. Parental education is of utmost importance in this preventable stress.

References

1. Pfau P. Ingested foreign objects and food bolus impactions. In: Ginsberg GG, Kochman ML, Norton I, *et al.*, (Eds.), *Clinical Gastrointestinal Endoscopy*, Saunders: Elsevier 2005, 291-304.
2. Hachimi-Idrissi S, Corne L, Vandenplas Y. Management of ingested foreign bodies in childhood: our experience and review of the literature. *Eur J Emerg Med* 1998;5(3):319-323.
3. Louie MC, Bradin S. Foreign body ingestion and aspiration, *Pediatrics in Review* 2009;30(8):295-301.
4. Kay M, Wyllie R. Pediatric foreign bodies and their management. *Curr Gastroenterol Rep* 2005;7(3):212-21.
5. Wright CC, Closson FT. Updates in pediatric gastrointestinal foreign bodies. *Pediatr Clin North Am* 2013;60:1221-39.
6. Ikenberry SO, Jue TL, Anderson MA *et al.* Management of ingested foreign bodies and food impactions, *Gastrointestinal Endoscopy* 2011;73(6):1085-1091.
7. Panieri E, Bass DH. The management of ingested foreign bodies in children—a review of 663 cases, *European Journal of Emergency Medicine* 1995;2(2):83-87.
8. Arana A, Hauser B, Hachimi-Idrissi S, Vandenplas Y. Management of ingested foreign bodies in childhood and review of the literature. *Eur J Pediatr* 2001;160:468-72.
9. Waltzman ML, Baskin M, Wypij D, Mooney D, Jones D, Fleisher GA. Randomized clinical trial of the management of esophageal coins in children, *Pediatrics* 2005;116(3):614-619.
10. Timmers M, Snoek KG, Gregori D *et al.* Foreign bodies in a pediatric emergency department in South Africa. *Pediatr Emerg Care* 2012;28:1348-52.
11. Macpherson RI, Hill JG, Othersen HB, Tagge EP, Smith CD *et al.* Esophageal foreign bodies in children: diagnosis, treatment, and complications. *AJR Am J Roentgenol* 1996;166:919-924.
12. Kramer RE, Lerner DG, Lin T, Manfredi M, Shah M *et al.* (2015) Management of ingested foreign bodies in children: A clinical report of the NASPGHAN Endoscopy Committee. *J Pediatric Gastroenterol Nutr* 1996;60(4):562-574.
13. Endoscopic Management of Foreign Bodies in the Gastrointestinal Tract: A Review of the Literature, Mikhael Bekkerman *et al.*, *Gastroenterology Research and Practice* 2016. Article ID 852076.
14. Balekuduru AB, Shetty B, Dutta A, Subbaraj SB. Profile of foreign body ingestion and outcomes of endoscopic management in pediatric population. *J Dig Endosc* 2017;8(1):17-23.
15. Shabir AS *et al.* Emergency Endoscopic Management of Pediatric Upper Gastrointestinal Tract Foreign Bodies: A North Indian Study. *Gastroenterol Hepatol Int J* 2020;5(1):000172.
16. Cheng W, Tam PK. Foreign-body ingestion in children: experience with 1265 cases. *J Pediatr Surg* 1999;34:1472-6.
17. *Gastrointest Endosc Clin N Am*. PMC 2017.

18. Tanaka J, Yamashita M, Kajigaya H. Esophageal electrochemical burns due to button type lithium batteries in dogs. *Vet Hum Toxicol* 1998;40(4):193-6.
19. Litovitz T, Whitaker N, Clark L. Preventing battery ingestions: an analysis of 8648 cases. *Pediatrics* 2010;125:1178-83.
20. Oestreich AE. Danger of multiple magnets beyond the stomach in children. *J Natl Med Assoc* 2006;98:277-9.
21. Zhang *et al.* *Medicine* 2021;100:2.
22. ASGE Standards of Practice Committee, Ikenberry SO, Jue TL, Anderson MA, Appalaneni V, Banerjee S, *et al.* Management of ingested foreign bodies and food impactions. *Gastrointest Endosc* 2011;73:1085-91.
23. Lin MT, Yeung CY, Lee HC *et al.* Management of foreign body ingestion in children: experience with 42 cases. *Acta Paediatr Tw* 2003;44:269-73.
24. EyadAltamimi, DawoodYusef, NaifRawabdeh *Gastroenterology Rev* 2020;15(4):349-353.
25. Bronstein AC, Spyker DA, Cantilena LR, Green JL, Rumack BH, Heard SE. Annual report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 25th annual report, *Clinical Toxicology* 2007, 2008;46(10):927-1057.
26. Palta R, Sahota A, Bemarki A, Salama P, Simpson N, Laine L. Foreign-body ingestion: characteristics and outcomes in a lower socioeconomic population with predominantly intentional ingestion, *Gastrointestinal Endoscopy* 2009;69(3):426-433.