

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

185,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



Foreign Bodies Ingestion

Leen Jamel Doya and Ali Ibrahim

Abstract

Foreign body ingestion is a common problem among children especially under psychological stress. More than 110.000 ingested foreign bodies were reported in the United States, of which more than 85% occurred in the pediatric population. Ingested foreign bodies usually pass through the alimentary tract without any problem. However, they can occasionally be trapped and require endoscopic or surgical management. In the asymptomatic patient, a series of abdominal X-rays are recommended to follow up on the progress of the foreign body. When a foreign body becomes immobile in the distal bowels a high suspicion that the foreign body has become trapped must be considered and surgical management is recommended with or without signs of inflammation. Here we describe the cases scenarios of foreign bodies trapped in the gastrointestinal tract and the management options.

Keywords: Foreign bodies, surgical cases, gastrointestinal tract

1. Introduction

Foreign bodies (FBs) ingestion is a very common worldwide health problem in children between 6 months and 3 years of age (25% of them younger than 1 year) [1]. FBs ingestion affects up to 75% of children especially that infants evaluate objects by tasting and swallowing [2]. Frequent cases of FBs ingestion often occur in children with intellectual disability or those with behavioral disorders [3]. FBs ingestion generally does not cause complications and passes through the gastrointestinal tract spontaneously [4]. About 80–90% of FBs pass through the gastrointestinal (GI) tract spontaneously without complications, whereas 10–20% of them are removed endoscopically. Few children (1%) require open surgical removal secondary to complications [5]. The initial diagnosis is based on sudden onset of symptom coupled by seeing the child putting an item in his/her mouth while playing [6]. The assessment and management of FBs ingestion depends on the patient's presentation and physical examination (patient status, vital signs and airway evaluation) [7]. FBs ingestion morbidity is dependent on the type of FBs ingested; disc batteries lead to esophageal perforation and tracheoesophageal fistula formation with significant morbidity and mortality [8]. Coins and multiple magnet ingestion can require surgery to prevent secondary perforation-related attraction and necrosis of the bowel [9].

2. FBs ingestion

The risk of FBs ingestion increases in children with congenital or acquired abnormalities of the gastrointestinal tract (atresia, history of surgery) [10]. The most

important issue when a foreign body enters the digestive tract is its passage through the esophagus. The esophagus has 3 physiological areas of narrowing that can potentially trap the swallowed body. 50–80% of cases of impaction of the esophagus occur at the level of the cricopharyngeal muscle above the esophagus, then the lower sphincter, and finally the site of intersection of the aorta with the esophagus [8]. FBs often pass through the digestive tract without significant problems; the estimated time of the passage through the anus is seven days [9].

3. Epidemiology and etiology of FBs ingestion

FBs ingestion is relatively serious common problem. Annually, more than 100000 cases of FBs ingestion reported each year in the United States (US); 85% occurred in pediatric population [11]. It is responsible for about (1500–3000) deaths per year in the US. There is equal incidence among boys and girls (1: 1) [12]. FBs ingestion may be accidental or deliberate. Majority of the children with FBs ingestion are healthy. Some of them have disease as strictures, achalasia, eosinophilic esophagitis, or rings [6]. The most common children FBs ingestion in US is coins, while it is different in other countries (the fish bones is most common in Asian countries). In Adolescents and adults, the most common type is food impaction [8].

4. Initial assessment

Initial assessment includes a thorough medical history should be obtained immediately to determine any medical problem and prompt physical examination should be performed [7]. FBs ingestion may be asymptomatic (10–50)% of all cases or symptomatic, depending on the location of the FBs.

In the esophagus, it may present as dysphagia, refusal of food intake, salivation, pain behind the sternum or respiratory symptoms (wheezing, stridor, frequent pneumonia, weight loss) [8].

In the stomach, it is usually asymptomatic except large FBs causes obstruction in the outlet of the stomach and appears as non-bilious vomiting and/or refusal to feed [10].

FBs in the distal parts of the gastrointestinal tract can cause right lower quadrant pain due to impaction at the level of the terminal ileum and hence mimicking acute appendicitis [11]. Neck swelling, erythema, or skin crepitus may be present on physical examination and may indicate the need for surgical consultation / intervention [8]. When the FBs is pressing on the trachea, inspiratory stridor or expiratory wheezing can be detected on the chest auscultation [9]. The most common clinical symptoms include dysphagia (37%), drooling (31%), choking (17%). Other symptoms included: cough, abdominal pain, chest pain, stridor, vomiting, and refusal to eat [1]. FBs may lead to intestinal obstruction or perforation and present with distention or guarding on abdominal examination [10].

4.1 Radiology evaluation

Diagnosis of FBs confirmed using X-ray, barium swallow, Echography, computed tomography (CT) scan or magnetic resonance imaging (MRI). 64% of patient ingested a radiopaque object. 25–30% of FBs are not visible through X-ray, but in all cases it should be performed to look for signs of obstruction as indicated by air-fluid levels or free air indicating perforation. CT scan may be necessary to characterize the size, shape and anatomic location of the swallowed body [5].

5. Types of FBs ingestion

5.1 Coins

The most commonly ingested FBs in children are coins (80% of FBs). Approximately 30% of them, spontaneously pass through the digestive system without complications depending on its location, age of the child, and the size of the coin [7]. Coins measuring more than 23.5 mm in size are more likely to become impacted, particularly in children aged under 5 years, and coins measuring more than 25 mm in diameter are unlikely to pass through the pylorus [13]. Children with an ingested coin without any history of esophageal disease or surgery and no respiratory symptoms can be observed over 12–24 hours before performing an invasive procedure (endoscopic or surgical removal) [14].

5.2 Button batteries (BBs)

The frequency of button batteries (BBs) ingestion has increased due to their widespread use as power sources in electronic devices. Lithium batteries hold enough charge to cause harm even after they are used up [15]. The pathogenesis of BBs ingestion is dependent on the production of hydroxyl radical (OH^-) in the esophageal mucosa, causing caustic damage due to an elevated PH value in addition to thermal electrical damage [16]. PH value increases from 7 to 13 at the negative electrode of the battery 30 minutes after ingestion. Necrosis of the basal plate of the esophagus within 15 minutes of ingestion extends to the outer muscle layer within 30 minutes. The damage can last for days or weeks after the battery is removed, which can lead to death as a result of the formation of an aortic esophageal fistula after about 19 days [17]. The risk of BBs ingestion is greater in children Less than 5 years old who swallow more than 20 mm battery or multiple batteries [15]. The most important complications of BBs ingestion are necrosis, perforation, esophagotracheal fistula, cervical abscess, and stenosis of the esophagus [17]. An anterior, posterior, and lateral x-ray of the neck, chest, and abdomen should be performed which shows a double-ring sign or double halo signs in an anterior–posterior imaging (circle-within-a-circle appearance) and step-off mark in lateral appearance (characteristic two-layer appearance) [18].

5.3 Sharp or pointed foreign bodies

Sharp or pointed foreign bodies (FBs) ingestion (such as Pins, needles, bones, etc.....) is associated with high morbidity and mortality [19]. It can cause serious complications such as perforation (15–35)%, abscess formation, trachea-esophageal fistula, aortic esophageal fistula, peritonitis, and even death [20]. Less than 0.0005% of them get trapped in the appendix and require surgical management. Therefore, it is preferable to remove pointed and sharp bodies from the esophagus or stomach whenever possible to reduce the incidence of adverse events [19]. X-ray examination is necessary to diagnose radiopaque objects (as needles, pins, etc....), while radiolucent FBs such as plastic, glass, or wood cannot be identified. Therefore, an emergency endoscopy is recommended when high index of suspicion exists for ingestion of sharp FBs even with a negative X-ray [21].

5.4 Magnets

Magnet ingestion is a serious health risk associated with significant mortality and mobility. In recent years, children's ingestion of magnets has increased. The greatest risk of its ingestion when multiple magnets or a single magnet with a

metallic FB has been ingested. Children may be asymptomatic or present with vomiting, cough, gagging and drooling. They may present as a result of magnet related complications [1]. It may lead to mucosal pressure necrosis, intestinal obstruction, fistula, perforation, and many other complications that necessitates surgical intervention. In addition, magnet may lead to bowel obstruction and volvulus [22]. That can lead to peritonitis, sepsis, and death.

5.5 Bezoars

A bezoar is a large ball like collections of material within the gastrointestinal system. It may be associated with pica, especially in developmentally delayed children or having psychosocial problem. Rarely, it may occur in normal children with no psychosocial issues [23]. The risk factors for the formation of a bezoar include excessive fiber consumption, chronic antacid treatment, psychiatric or developmental disorders, previous gastric surgery including vagotomy or pyloroplasty, and gastrointestinal dysmotility [24]. Bezoars are classified to phytobezoars, pharmacobezoars, trichobezoars, lactobezoars, and foreign body bezoars [25].

5.5.1 Trichobezoars or phytobezoars

It composed of bubble gum, seeds and vegetable matter. Majority in older children particularly those with psychiatric problems and young female [23].

5.5.2 Medication bezoars

It may occur in the infants treated for upper gastrointestinal bleeding or esophagitis with intragastric or frequent oral administration of aluminum hydroxide [25].

It has usually nonspecific clinical manifestations that mimic many gastrointestinal diseases [23]. Patients may present with abdominal pain, nausea, vomiting, anorexia, weight loss, intestinal bleeding from pressure ulcer necrosis, or intestinal obstruction. The most common site of bezoar is the stomach; however, It may be found in the esophagus or any site along the gastrointestinal system [24].

6. Management

There are many factors to consider when determining how to decrease the foreign bodies ingestion, especially in the extremely young. Certain object characteristics such as size, shape, and material must keep away from children. Education for parents should continue to be prioritized when possible. This can be through positions such as pediatricians, and school teachers as well as media advertisements and printed materials.

6.1 Coins

Esophageal coins must be removed within 24 hours to reduce the incidence of complications [7]. Asymptomatic children with ingested coins in the stomach should be monitored closely and the stool examined to check for the passage of the coin, and serial X-rays should be obtained every 1 or 2 weeks until the passage of the coin has been confirmed. The coin that remains in the stomach after 2–4 weeks should be endoscopically removed [11]. Patient with asymptomatic small bowel coins should be clinically observed. While children with symptoms of bowel obstruction or perforation require, surgical removal (**Figure 1**) [13].

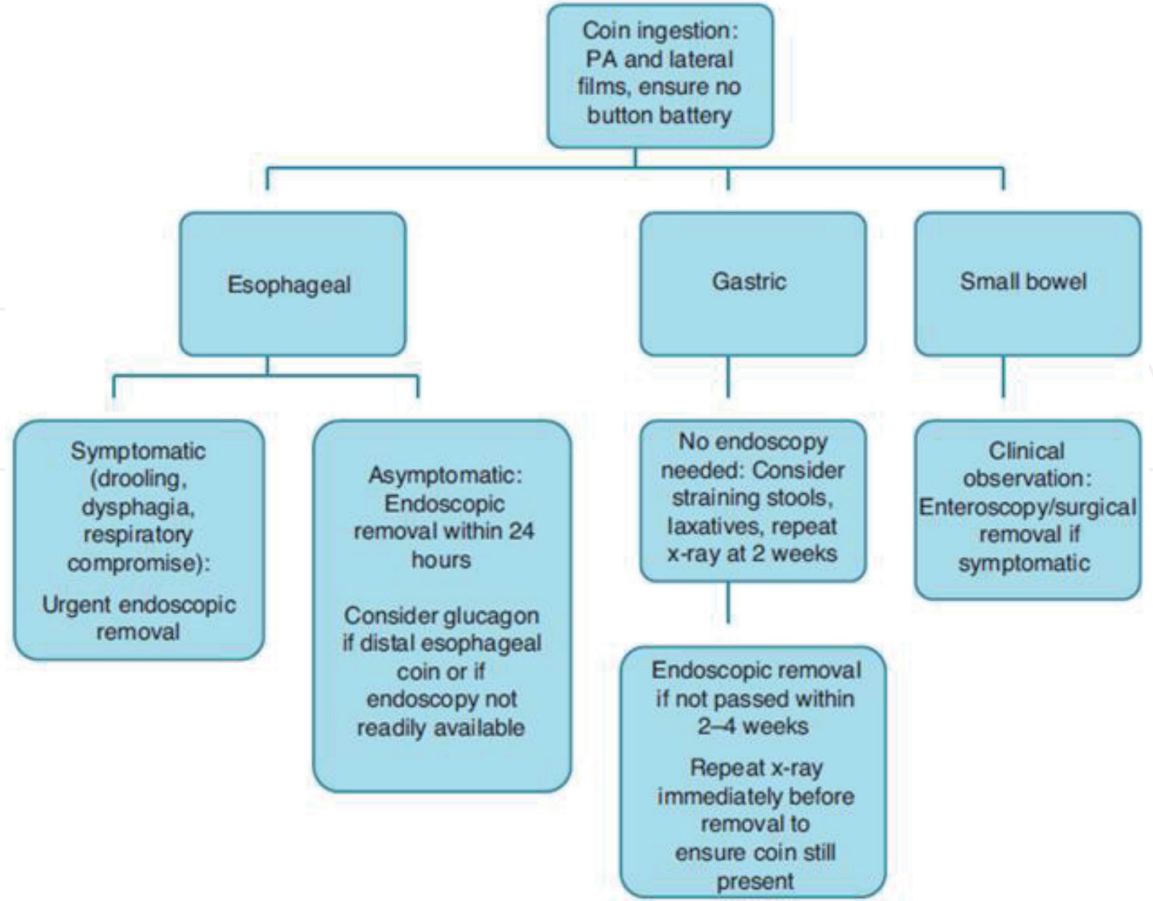


Figure 1.
Kramer's algorithm of coin ingestion.

6.2 Button batteries (BBs)

Batteries in the stomach often passed without complications. The American Society for Gastrointestinal Endoscopy (ACGE) recommendations is to extract the BBs in the stomach if the diameter is greater than 20 mm and has remained for more than 48 hours after radiological investigation [23]. The probability of the battery being expelled out of the body is 85% when it passes the duodenum within 72 hours [16]. Recent research recommends performing esophageal endoscopy in all BBs ingestion, even if they are in the stomach to evaluate the esophageal mucosa before the battery is transferred to the stomach (**Figure 2**) [26].

6.3 Sharp or pointed foreign bodies

Gastrointestinal endoscopic removal is necessary for sharp or pointed FBs, large and wide objects (more than 2.5 cm diameter in older children, more than 2 cm diameter in infants and young children), or long objects (more than 6–10 cm diameter in older children, more than 4–5 cm diameter in infants and young children) that are located in the stomach [20]. Surgical removal can be considered in symptomatic children if the FBs does not show the expected passage after 4 days or passed into the small bowel (distal to the ligament of Treitz). While asymptomatic patients should be clinically and radiographically followed-up with serial X-rays (**Figure 3**) [21].

6.4 Magnets

In asymptomatic children, an X-ray is necessary to detect whether the ingested magnets are single or multiple magnets or have a metallic part. If multiple magnets

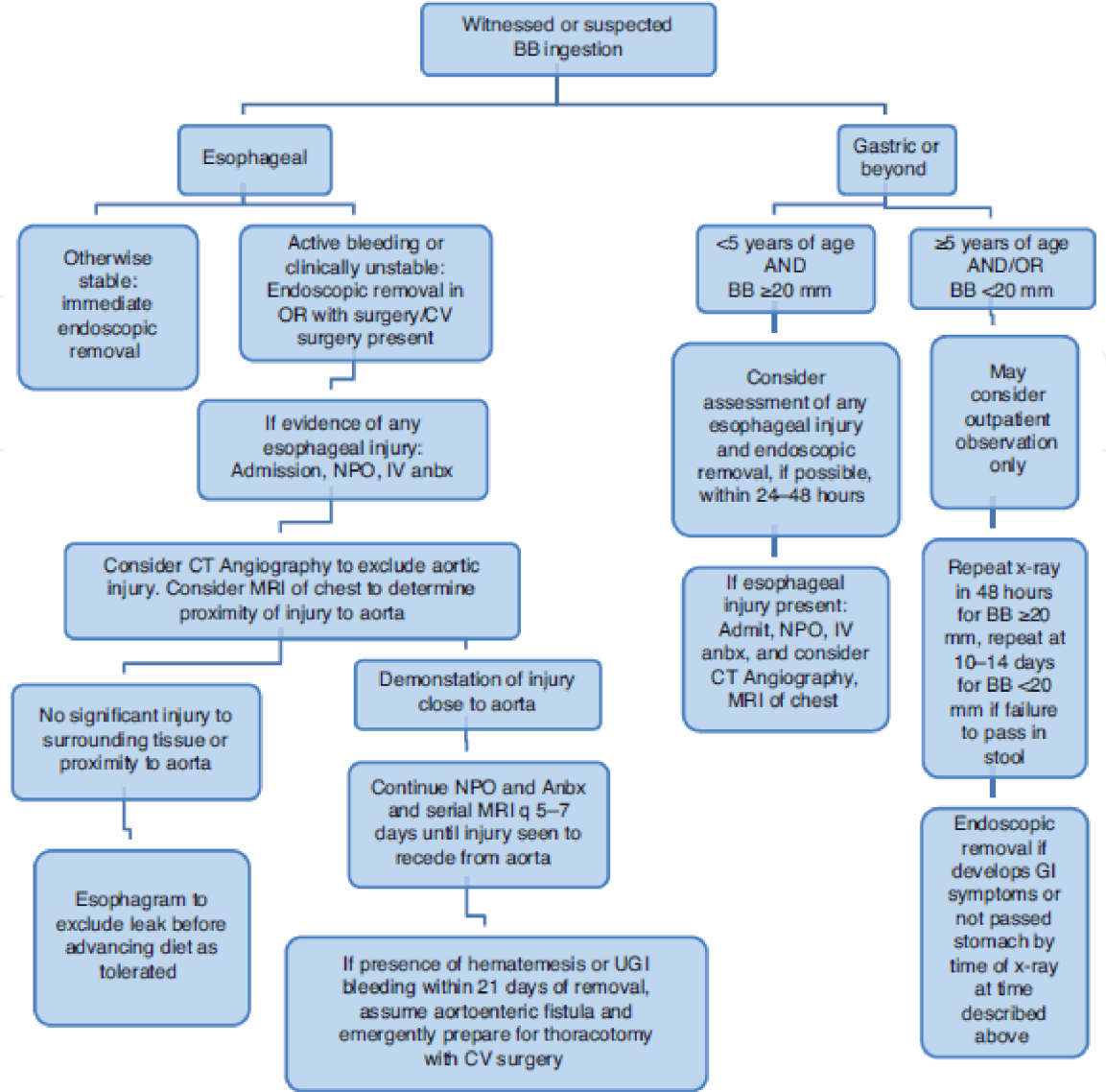


Figure 2.
Kramer’s algorithm of BB ingestion.

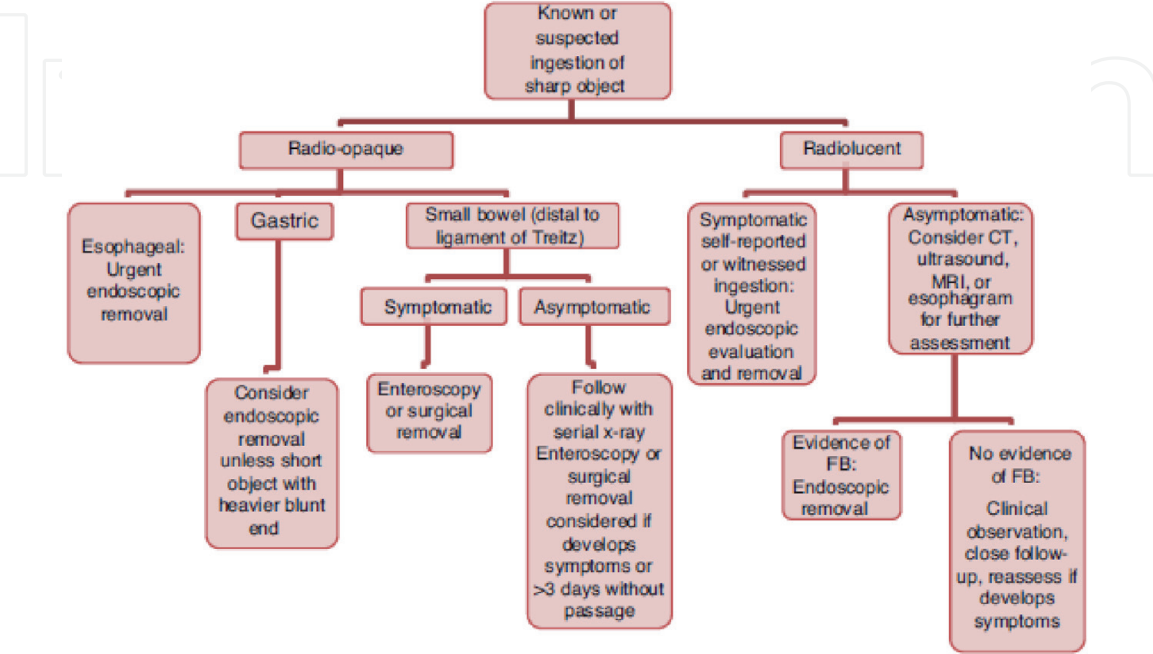


Figure 3.
Kramer’s algorithm of sharp object ingestion.

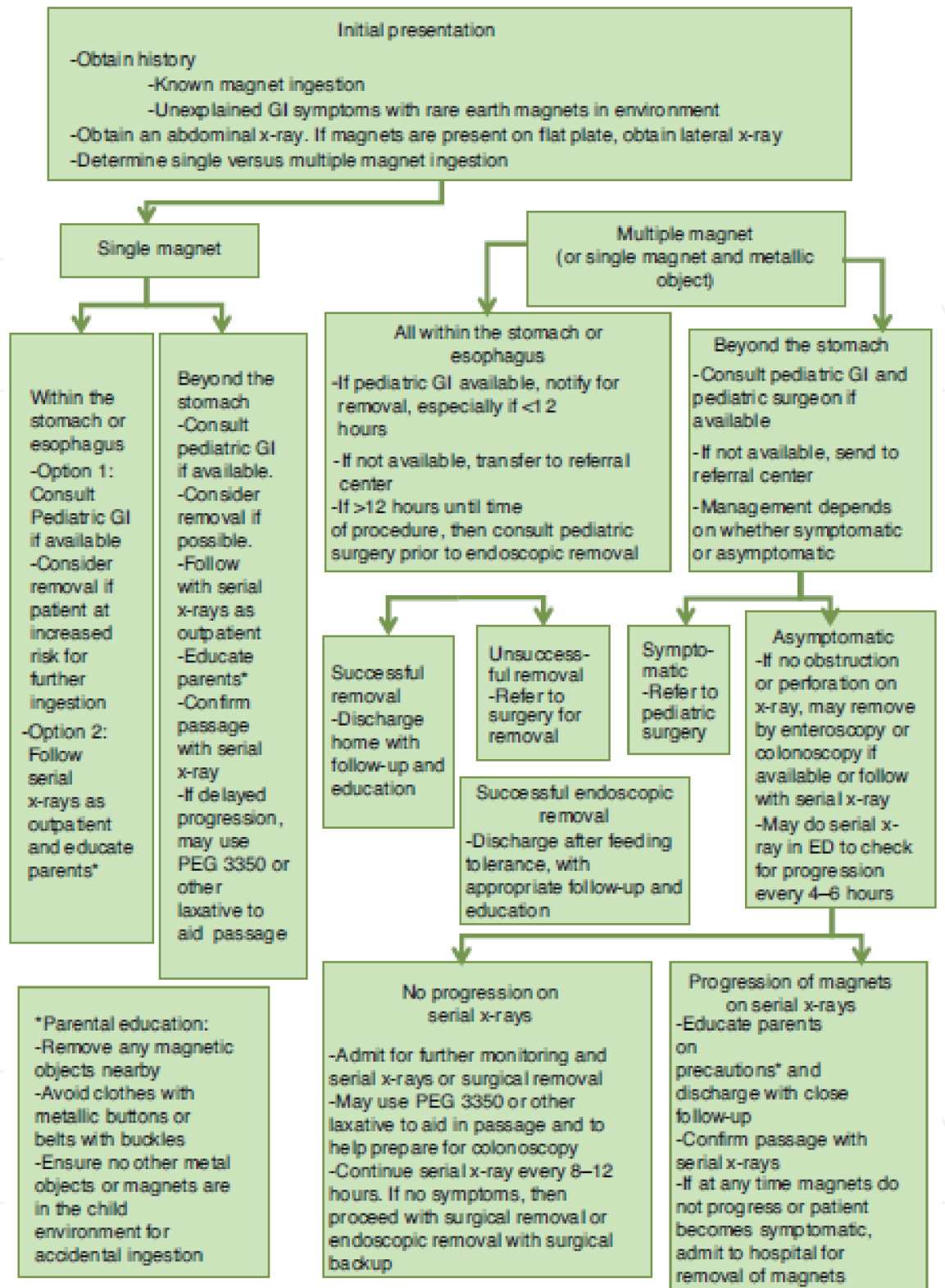


Figure 4.
Kramer's algorithm of magnet ingestion.

or magnet with a metallic FB are located within the esophagus or the stomach, these FBs must be endoscopically removed [27]. Symptomatic children with either multiple magnets or a single magnet with a metallic FB in any site of the digestive system need to consult a pediatric surgeon (Figure 4) [22].

6.5 Bezoars

Management of Phytobezoar may resolve spontaneously over weeks to months. Small feedings containing digestive or mucolytic enzymes (several types of

chemical dissolution or prokinetic agents as cotazym, viokase, or mucomyst) may use if there is no outlet obstruction. If the bezoar is symptomatic in large objects or does not dissolve, extraction by endoscopic or surgical removal is recommended. In medication Bezoars, Gastric lavage with saline is usually effective in dissolving the bezoar within ten days [24, 25].

7. Conclusion

Although some cases of ingestion of FBs are dangerous and require surgical intervention, educating parents about the risk of swallowing FBs remains the most important procedure in the prevention.

Acknowledgements

We wish to thank the medical officer, and the doctors in the Pediatrics department.

Conflict of interest

None declared.

Author details

Leen Jamel Doya^{1*} and Ali Ibrahim²

¹ Department of Pediatrics, Tishreen University Hospital, Latakia, Syria

² Department of Pediatrics, Professor of Gastroenterology and Hepatology, Tishreen University Hospital, Latakia, Syria

*Address all correspondence to: dr.leen.doya@gmail.com

IntechOpen

© 2021 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

References

- [1] Lee, M., and S. C. Kim. Appendiceal foreign body in an infant. *Medicine* 2017;96(17): e6717. DOI: <http://dx.doi.org/10.1097/MD.00000000000006717>
- [2] Lee JH. Foreign body ingestion in children. *Clinical endoscopy* 2018;51(2):129-136. DOI: <http://dx.doi.org/10.5946/ce.2018.039>.
- [3] Seo, J. K. Endoscopic management of gastrointestinal foreign bodies in children. *Indian journal of pediatrics*. 1999; 66(1):S75-80. PMID: 11132474
- [4] Orsagh-Yentis D, McAdams RJ, Roberts KJ, LB MK. Foreign-body ingestions of young children treated in US emergency departments: 1995-2015. *Pediatrics*. 2019;143(5):e20181988. DOI: <https://doi.org/10.1542/peds.2018-1988>
- [5] Hesham AKH. Foreign body ingestion: children like to put objects in their mouth. *World J Pediatr*. 2010;6(4):301-310. Doi:10.1007/s12519-010-0231-y
- [6] Jayachandra S, Eslick GD. A systematic review of paediatric foreign body ingestion: presentation, complications, and management. *Int J Pediatr Otorhinolaryngol*. 2013;77(3):311-317. Doi:10.1016/j.ijporl.2012.11.025
- [7] Ikenberry S.O, Jue T.L, Anderson M.A, Appalaneni V, Banerjee S, Ben-Menachem T, et al. Management of ingested foreign bodies and food impactions. *Gastrointestinal endoscopy*. 2011; 73(6):1085-1091. DOI: 10.1016/j.gie.2010.11.010
- [8] Gregori D, Scarinzi C, Morra B, Salerni L, Berchialla P, Snidero S, et al. Ingested foreign bodies causing complications and requiring hospitalization in European children: Results from the ESFBI study. *Pediatr Int*. 2010;52(1):26-32. Doi:10.1111/j.1442-200X.2009.02862.x
- [9] Lee BK, Ryu HH, Moon JM, Jeung KW. Bowel perforations induced by multiple magnet ingestion. *Emerg Med Australas* 2010;22(2):189-191. Doi:10.1111/j.1742-6723.2010.01276.x
- [10] Sola Jr R, Rosenfeld E.H, Yangyang R.Y, Peter S.D.S, Shah S.R. Magnet foreign body ingestion: rare occurrence but big consequences. *Journal of pediatric surgery*. 2018; 53(9):1815-1819. Doi:10.1016/j.jpedsurg.2017.08.013.
- [11] Khorana J, Tantivit Y, Phiuphong C, Pattapong S, Siripan S. Foreign body ingestion in pediatrics: distribution, management and complications. *Medicina*. 2019; 55(10):686-690. doi:10.3390/medicina55100686
- [12] Gurevich Y, Sahn B, Weinstein T. Foreign body ingestion in pediatric patients. *Current opinion in pediatrics*. 2018; 30(5): 677-682. doi: 10.5946/ce.2018.039
- [13] Waltzman M.L, Baskin M, Wypij D, Mooney D, Jones D, Fleisher G. A randomized clinical trial of the management of esophageal coins in children. *Pediatrics*. 2005; 116(3): 614-619. Doi:10.1542/peds.2004-2555
- [14] Singh N, Chong J, Ho J, Jayachandra S, Cope D, Azimi F, Wong E. Predictive factors associated with spontaneous passage of coins: A ten-year analysis of paediatric coin ingestion in Australia. *International journal of pediatric otorhinolaryngology*. 2018; 113(1): 266-271. doi:10.1016/j.ijporl.2018.08.010
- [15] Litovitz T, Whitaker N, Clark L, White N.C, Marsolek M. Emerging battery-ingestion hazard: clinical implications. *Pediatrics*. 2010; 125(6): 1168-1177. DOI: 10.1542/peds.2009-3037
- [16] Krom H, Visser M, Hulst J.M, Wolters V.M, Van den Neucker A.M,

- de Meij T Kindermann A. Serious complications after button battery ingestion in children. *European journal of pediatrics*. 2018;177(7): 1063-1070. Doi:10.1007/s00431-018-3154-6
- [17] Eliason M.J, Ricca R.L, Gallagher T.Q. Button battery ingestion in children. *Current opinion in otolaryngology & head and neck surgery*. 2017; 25(6): 520-526. Doi:10.1097/MOO.00000000000000410
- [18] Jatana K.R, Litovitz T, Reilly J.S, Koltai P.J, Rider G, Jacobs I.N. Pediatric button battery injuries: 2013 task force update. *International journal of pediatric otorhinolaryngology*. 2013; 77(9):1392-1399. Doi:10.1016/j.ijporl.2013.06.006
- [19] Alzahem A.M, Soundappan S.S, Jefferies H, Cass D.T. Ingested magnets and gastrointestinal complications. *Journal of paediatrics and child health*. 2007; 43(6): 497-498. Doi:10.1111/j.1440-1754.2007.01121.x
- [20] Diaz R, Davalos G, Welsh L.K, Portenier D, Guerron A.D. Use of magnets in gastrointestinal surgery. *Surgical endoscopy*. 2019; 33(6): 1721-1730. doi:10.1007/s00464-019-06718-w
- [21] 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. doi:10.1016/j.gie.2008.05.072
- [22] Lee J.H, Lee J.S, Kim M.J, Choe Y.H. Initial location determines spontaneous passage of foreign bodies from the gastrointestinal tract in children. *Pediatric emergency care*. 2011; 27(4): 284-289. doi: 10.1097/PEC.0b013e318213131a
- [23] Campos R.R, Paricio P.P, Albasini J.A, Riquelme J.R, Tebar J.C, Mompeán, J.L, Ayllón J.G. Gastrointestinal Bezoars. *Digestive surgery*. 1990; 7(1): 39-44. doi:10.1159/000171939.
- [24] AlMuhsin A.M., Alsalman F, Bubshait A, Hajar R.O.A. Surgical Management of Massive Metal Bezoar. *Cureus*. 2021; 13(1): 1-5. doi: 10.7759/cureus.12597
- [25] Andrus C.H, Ponsky J.L. Bezoars: classification, pathophysiology, and treatment. *American Journal of Gastroenterology*. 1988;83(5):476-478. PMID: 3284334
- [26] Leinwand K, Brumbaugh D.E, Kramer R.E. Button Battery Ingestion in Children: A Paradigm for Management of Severe Pediatric Foreign Body Ingestions. *Gastrointestinal endoscopy clinics of North America*. 2016; 26(1): 99-118. Doi:10.1016/j.giec.2015.08.003
- [27] Hussain S.Z, Bousvaros A, Gilger M, Mamula P, Gupta S, Kramer R, Noel R.A. Management of ingested magnets in children. *Journal of pediatric gastroenterology and nutrition*. 2012; 55(3): 239-242. doi: 10.1097/MPG.0b013e3182687be0