

Metallic Foreign Body Ingestion During Childhood; the Experience of a University Hospital in Turkey

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Abstract

Aim: Metallic foreign body (MFB) ingestion is a common problem in the pediatric population. Morbidity and mortality rates are low in foreign body ingestion during childhood, but it may lead to anxiety in parents.

Materials and Methods: We aimed to analyze the clinical presentation, etiology, and management of MFB ingestion. The records of children admitted with a history of MFB ingestion were retrospectively reviewed. Data regarding gender, age, type of foreign body, management, and outcome (outcomes) were recorded.

Results: Of the 151 children included, 67 (44.4%) were male and 84 (55.6%) female. The mean age was 49.3±39.2 months. Coins, in 108 patients (71.5%), were the most commonly ingested foreign bodies, followed by batteries in 19 patients (12.6%), and other metallic objects. The foreign bodies were located in the esophagus in 70 (46.4%) patients, the stomach in 29 (19.2%), and the small intestine in 52 (34.4%). Endoscopic interventions were performed in 69 patients (45.6%). One patient who swallowed a battery was operated because of acute abdomen.

Conclusion: MFB ingestion may appear as an emergency condition of a preventable cause in domestic accidents. It must not be forgotten that in addition to protective measures, early intervention in the emergency department is a significant factor in reducing mortality associated with this condition. (*JAEM 2015; 14: 79-82*)

Keywords: Children, metallic foreign body ingestion, endoscopy, emergency

Introduction

Metallic foreign body (MFB) ingestion is one of the causes of admission to the emergency room, and it results in anxiety in parents. MFB ingestion is sometimes fatal and is very common during childhood. In 2012, the Annual Report of the American Association of Poison Control Centers documented more than 107.000 incidents of foreign body ingestion in childhood (1). The most commonly ingested foreign bodies are coins, magnets, batteries, and other metallic objects (2). According to this report, the most commonly ingested MFB for children were batteries in 6698 patients and coins in 4295 (1).

Literature has only a limited number of publications on the ingestion of MFBs during childhood. These publications are either case reports based on developed complications or a listing of all foreign bodies (3-13). The ingestion of foreign bodies mostly occurs under the age of 5; during this period, children have the instinct of putting anything in the mouth, and incompletely developed functions of eating and chewing result in ingestion. The type of foreign bodies

varies depending on nutrition, geography, and socio-cultural characteristics (14-16). It is reported that the ingestion of MFBs is very common in the Western countries and North America, whereas ingestion incidents of non-MFBs are higher in the Eastern countries (14-16). Local studies report that metallic objects such as pins and coins are the most commonly ingested (15, 16).

Our aim in this study is to draw attention to the ingestion of MFBs that can cause serious complications during childhood and have various differences in their diagnosis and treatment.

Materials and Methods

The files of patients who were admitted to the pediatric emergency room for ingesting MFB between 2004 and 2011 were retrospectively reviewed to evaluate patient data, clinical findings, causes of MFB ingestion, date of admission to the hospital, location of MFB, radiological studies, discharge date, and diagnostic and treatment methods. The review also included the imaging methods the pa-

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tients underwent, number of radiographs, duration of hospital stay, and overall cost calculations of this data. All MFB ingestion located in the first curve of the esophagus and upper sections were removed by McGill clamps, whereas the others were removed by a flexible endoscope. The study was approved by the ethics committee of the Ondokuz Mayıs University Clinical Research Ethics Commission.

Statistical analysis

Statistical Package for Social Sciences 21.0 (SPSS Inc., Chicago, IL, USA) software program was used to analyze the collected data. In the evaluation of the data, continuous variables are presented as mean±standard deviation (SD), and the frequency data are presented as percentage (%).

Results

The mean age was 49.3±39.2 months (range: 1 month-17 years). There were 67 male patients (44.4%) and 84 female patients (55.6%) from the total of 151 patients who were included in this study. In total, 49 patients (32.5%) were in the infancy period (0-2 years), 67 (44.4%) were in the early childhood period (2-5 years), and 35 (23.2%) were in school age (5-18 years). Only four of the patients (2.6%) had no history of ingesting MFB.

The mean time of admission was 10.7±27.4 h (min-max 1-234). In the evaluation of the cases at the time of admission, 134 (88.7%) were admitted to the hospital within the first 24 h. Eleven patients (7.3%) were admitted within 24-48 h, three (2%) within 48-72 h, and three (2%) after 72 h.

When we evaluated the cases by clinical findings, 54 patients (35.8%) had no significant symptoms or signs. The most common complaint was vomiting, which occurred in 24 patients (15.9%). Other complaints and symptoms are presented in Table 1.

The most commonly ingested MFB was coins in 108 patients (71.5%) (Table 1). MFBs were mostly located in the esophagus in 70 patients (46.4%) (Table 1).

In cases where batteries and pins were detected in the esophagus with an immediate reaction on the same day, it was possible for the foreign body to leave the gastrointestinal system (GIS), whereas patients with the ingestion of other MFBs were kept under observation. MFB spontaneously left GIS in 82 patients (54.4%) without requiring any intervention. Sixty-nine (45.6%) patients underwent an endoscopic intervention. One patient underwent endoscopic intervention twice because the foreign body could not be found. Only one patient with MFB developed a complication. This 3.5-year-old patient ingested a battery and underwent a surgical procedure as the patient presented with acute abdominal manifestation.

Among the patients, 75 (49.6%) were discharged within the first 24 h, 58 (38.4%) within 24-48 h, and the others were discharged after >48 h. The mean duration of hospital stay was 20.8±31.2 h (0-288 h). In total, 55.6% of the patients received fluid therapy. The most common radiological study ordered for the patients was chest X-ray (Table 2). The mean cost for the patients was 105.9 dollars according to the cost analysis (Table 2).

Discussion

One of the most common pediatric emergencies is the ingestion of foreign bodies (11-15). Ingestion of MFBs can cause serious com-

Table 1. Clinical findings, causes of MFBs, time of admission to the hospital, location of MFB, radiological studies, discharge date, and diagnostic and treatment methods

	Number, n (%)
Mean age	49.3±39.2 months
Ratio of females to males	84/67
Complaints and symptoms	
Asymptomatic	54 (35.8)
Vomiting	24 (15.9)
Gag reflex	16 (10.6)
Ingestion difficulty	10 (6.6)
Cyanosis	6 (4)
Cough	5 (3.3)
Abdominal pain	4 (2.6)
Hematemesis	3 (2)
Dyspnea	3 (2)
Wheezing	1 (0.6)
Ingested material	
Coins	108 (71.5)
Batteries	19 (12.6)
Safety pins	7 (4.6)
Jewels (e.g., pendants, rings, ear rings, hair clips)	7 (4.5)
Pins	6 (3.9)
Other objects (part of a toy, push pins, wires)	4 (2.6)
Time of admission	
Within the first 24 h	134 (88.7)
Within 25-48 h	11 (7.3)
After >48 h	6 (4)
Location of MFB	
Esophagus	70 (46.4)
Other segments of the intestines	48 (31.8)
Stomach	29 (19.2)
Duodenum	4 (2.6)
Radiological studies	
Chest X-ray	227
Abdominal X-ray	183
Cervical graphy	16
Treatment	
No interventions	82 (54.4)
Endoscopic intervention	69 (45.6)
Outcomes	
Ambulatory discharge	75 (49.6)
Hospitalization	76 (50.4)
Duration of hospital stay	
24 h	75
One day	58
Two days	19
Total	151 (100)
MFB: metallic foreign body	

Table 2. Interventional procedures, radiological studies, treatment services, and costs

	Number of applications (n)	Cost (\$)
Interventional procedures		
Endoscopy	73	6838
Radiological studies	426	1759
Treatment services	151	8301
Total		16898

plications. These complications include hemopericardium associated with the ingestion of safety pins (3), gastric mucosal injury related to the ingestion of batteries (4), tracheoesophageal fistula (5), aspiration pneumonia (10), aorto-esophageal fistula (7); duodeno-sigmoid fistula (8), esophageal perforation (9), and hemorrhage of GID (10). Severe complications include ingestion difficulty, pain, zinc toxicity, bezoar formation, and intestinal perforation associated with ingestion of coins (11-13).

Aydođdu et al. (16) reported 176 cases of gastrointestinal MFB in three years, and evik et al. (15) presented 192 cases of laryngeal and gastrointestinal incidents. Studies have demonstrated that the type of MFBs varies by socio-cultural characteristics and that the ingestion of MFB mostly occurs in the Western countries (2-5). In our country, the study by Aydođdu et al. (16) revealed that the commonly ingested objects include evil eye talismans and their safety pin, followed by pins for a turban. It was reported that the ingestion of safety pins was mostly due to attaching an evil eye talisman to infants younger than 1 year. Our study largely involved the ingestion of coins; of the patients, 19 (12.6%) ingested batteries, 7 (4.6%) ingested safety pins, and 4 (2.6%) ingested pins.

The ingestion of MFB mostly occurs between the ages of 6 months and 4 years, especially in male children. The major risk factors include the behavioral inclination to put anything in the mouth during this period and incompletely developed functions of eating and chewing (11). Most of our patients (63.6%) were younger than 4-years and were mostly females as opposed to previous studies. Most cases of MFB ingestion occurred at home. The patients were admitted to the hospital within the first 24 h because most of them (97.4%) had a history of ingesting MFB. Four patients (2.6%) did not have a history of foreign body ingestion.

Symptoms vary depending on the location and type of MFBs, age, and complications (6-11). Feeding difficulty may be the only symptom in infants, whereas symptoms such as vomiting, dysphagia, and chest pain are seen in older age children(11). Most of our patients were asymptomatic (56%), and the most common symptom was vomiting. Four patients had mild cyanosis among other symptoms and findings, and none of the patients developed a serious symptom such as respiratory distress syndrome. One patient underwent a surgical operation because of acute abdominal manifestation. The rate of acute abdominal manifestation cases reported in literature is less than 1% (2-6).

The type of ingested MFB is one of the important factors affecting prognosis. Complications associated with batteries and penetrating (sharp) objects can occur. Metallic coins included in these objects may usually leave GIS with no symptoms; however, foreign bodies such as batteries and pins are of particular importance as

they can cause complications (4, 11, 16). Complications associated with ingesting batteries include mucosal burn, perforation, stenosis, tracheoesophageal fistula, and hemorrhage (2). It was reported in literature that a chemical burn occurs 2.5 h after ingesting a battery and a GIS perforation occurs after 5 h (2). Immediate diagnosis and treatment play an important role in these cases because complications can develop in a very short period. Similarly, the ingestion of penetrating objects and pins is important as they can cause direct erosion in the mucosa resulting in perforation (2-10). Batteries and pins were removed by an endoscope from our patients before they developed any complications.

The location of MFBs is an important factor to estimate the treatment approach and complications that may occur. Most of the ingested MFBs are caught by the esophagus, the narrowest section outside the appendix of GIS (6, 7). Consistent with previous studies, most MFBs were located in the esophagus in our cases (11-15). Most MFBs that entered the stomach can pass through the digestive tract without causing any problems; however, some patients may need surgical interventions because of total occlusion or perforation. In particular, long and sharp objects can be caught by the C-ring of the duodenum or the Treitz ligament. The objects that pass through these levels are expected to reach the anus. If the patient is asymptomatic, MFB in the esophagus should be removed in 8-16 hours (17). Extrinsic pressure from a foreign object is more common especially on the trachea of infants as they have a smaller trachea. The risk of aspiration pneumonia increases in patients who are unable to swallow the secretion. MFBs such as safety pins are first pushed from the esophagus to the stomach and are then removed. The patients immediately undergo an endoscopic procedure, particularly on ingesting batteries and pins. One of our patients who ingested a safety pin had to undergo a second intervention because MFB could not be removed. If MFB obstructs the intestines, it can cause abdominal pain, distention, and perforation (18, 19). One of our patients required surgical intervention because of acute abdominal manifestation. None of the other patients developed any complications.

Many MFBs (80-90%) spontaneously leave through the intestines without damaging GIS. In total, 10-20% of the patients require endoscopic removal, whereas 1% needs a surgical procedure (11-15). The location and type of MFB, history, and method of physical examination are also important. Seventy-three of our patients (48.3%) underwent endoscopy. The patients, who were admitted to our center after ingesting coins, were monitored at one week intervals by taking X-rays if the coin was inside the stomach and the patient was asymptomatic. If MFB was a battery or pin, it was immediately removed without waiting. Moreover, 44.4% of our patients had MFB in their intestine, and it left GIS spontaneously.

Of the patients who ingested MFB, 65 (43%) were discharged on the same day, 58 (38.4%) were discharged on day two, and the others were discharged on day three or the following days. The mean duration of hospital stay was 1 day (range: 0-12 days). Moreover, 55.6% of those who ingested MFB received fluid therapy, whereas 43.7% received antibiotic therapy. Most of the patients who underwent an endoscopic procedure to remove MFB at our center were discharged on the same day; however, this period was extended for those who ingested a battery, sharp object, or pin depending on the endoscopic findings. As reported in previous studies, endoscopic treatment was successfully administered to the patients ingesting MFB, and the patients were discharged after a short follow-up. The procedures

performed were PA chest X-ray in 227 patients, abdominal X-ray in 183 patients, cervical graphy in 16 patients, and cranial graphy in one patient. The total cost increased to 9270 dollars when the hospitalization duration of the patients was added.

Study limitations

This study has several limitations. First, this study was conducted on 151 patients; it would be beneficial to carry out a multicenter study on more patients. Second, this study was designed as a retrospective study.

Conclusion

The ingestion of MFB is an important health problem because of high costs and the fact that it causes complications and anxiety in families. We consider that it can be significantly reduced and/or prevented by taking several simple measures. We believe that families and children should be educated on this topic. Endoscopic treatment remains an effective method in those who ingest a foreign body detected in the upper gastrointestinal tract.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Ondokuz Mayıs University Clinical Research Ethics Commission.

Informed Consent: Due to the retrospective nature of this study, informed consent was waived.

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References

- Mowry JB, Spyker DA, Cantilena LR Jr, Bailey JE, Ford M. 2012 Annual Report of the American Association of Poison Control Centers' National Poison Data System. *Clin Toxicol* 2013; 5: 949-1229. [\[CrossRef\]](#)
- Chung S, Forte V, Campisi P. A review of Pediatric Foreign Body Ingestion and management. *Clin Pediatr Emerg Med* 2010; 1: 225-30. [\[CrossRef\]](#)
- Kalayci AG, Baysal K, Uysal S, Sarac A, Bernay F, Gebesoglu F. Hemopericardium caused by ingested safety pin. *Endoscopy* 2002; 34: 93. [\[CrossRef\]](#)
- Honda S, Shinkai M, Usui Y, Hirata Y, Kitagawa N, Take H, et al. Severe gastric damage caused by button battery ingestion in a 3-month-old infant. *J Pediatr Surg* 2010; 45: e23-6. [\[CrossRef\]](#)
- Harjai MM, Ramalingam W, Chitkara G, Katiyar A. Corrosive tracheo-esophageal fistula following button battery ingestion. *Indian Pediatr* 2012; 49: 145-6.
- LaFrance DR, Traylor JG Jr, Jin L. Aspiration pneumonia and esophago-tracheal fistula secondary to button battery ingestion. *Forensic Sci Med Pathol* 2011; 7: 283-6. [\[CrossRef\]](#)
- Mortensen A, Hansen NF, Schiødt OM. Fatal aortoesophageal fistula caused by button battery ingestion in a 1-year-old child. *Am J Emerg Med* 2010; 28: 984-6. [\[CrossRef\]](#)
- Yilmaz M, Isik B, Sogutlu G, Ara C, Yilmaz S, Kirimlioglu V. Duodeno-sigmoid fistula due to ingested metallic wire. *J Emerg Med* 2008; 34: 83-4. [\[CrossRef\]](#)
- Bertani A, Menguy P, Barnoux T, Gauthier J, Lamblin G, Massoure PL, et al. Esophageal perforation following ingestion of a coin battery by a 5-year-old child in Djibouti. *Med Trop (Mars)* 2011; 71: 438.
- Brumbaugh D, Kramer RE, Litovitz T. Hemorrhagic complications following esophageal button battery ingestion. *Arch Otolaryngol Head Neck Surg* 2011; 137: 416-7. [\[CrossRef\]](#)
- Wahbeh G, Wyllie R, Kay M. Foreign body ingestion in infants and children: location, location. *Clin Pediatr* 2002; 41: 633-40. [\[CrossRef\]](#)
- Márquez-Rojas J, Roldán-Baños S, López-Guerra D, Onieva-González FG, Jiménez-Redondo JL, Leal-Macho A. Bezoar after ingestion of metallic foreign bodies. *Cir Cir* 2011; 79: 464-7.
- Lee J, Chao HC, Ming YC, Wu CT. Ileal perforation induced by a wire from a metal scouring pad in an infant. *Pediatr Emerg Care* 2011; 27: 304-5. [\[CrossRef\]](#)
- Kay M, Wyllie R. Techniques of foreign body removal in infants and children. *Techniques in Gastrointestinal Endoscopy* 2002; 4: 188-95. [\[CrossRef\]](#)
- Cevik M, Gökdemir MT, Boleken ME, Sogut O, Kurkcuoglu C. The characteristics and outcomes of foreign body ingestion and aspiration in children due to lodged foreign body in the aerodigestive tract. *Pediatr Emerg Care* 2013; 29: 53-7. [\[CrossRef\]](#)
- Aydođdu S, Arıkan C, Cakir M, Baran M, Yükksekaya HA, Saz UE, et al. Foreign body ingestion in Turkish children. *Turk J Pediatr* 2009; 51: 127-32.
- Rajagopal A, Martin J, Matthai J. Ingested needles in a 3-month-old infant. *J Ped Surg* 2001; 36: 1450-51. [\[CrossRef\]](#)
- Kim JK, Kim SS, Kim JI, Kim SW, Yang YS, Cho SH, et al. Management of foreign bodies in the gastrointestinal tract: an analysis of 104 cases in children. *Endoscopy* 1999; 31: 302-4. [\[CrossRef\]](#)
- Akçalı Y, Yeşilkaya Y, Kahraman C, Elbeyli L, Öztürk A, Taşdemir K. Özafagus yabancı cisimleri. *Erciyes Tıp Dergisi* 1990; 12: 51-60.