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Research Article

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Esophageal Foreign Bodies in Children

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ABSTRACT

Introduction: Esophageal foreign body (EFB) is one of the most common causes of emergency admission in children and is a public health problem. 75% of EFBs are seen in children younger than 5 years old. We aimed to present the demographic and clinical characteristics of patients treated for EFBs in our department.

Material and Methods: The files of 113 patients who were treated for EFB in our clinic between April 2018 and April 2022 were reviewed retrospectively. The patients were divided into 3 groups as 0-5 years old, 5-10 years old and 10-17 years old. The age, gender, type of foreign body, level of the esophagus, the procedure performed, complications and additional diseases of the patients were evaluated.

Results: The mean age of the patients was 4.28±3.05 (min:3 months, max:17 years) and the male-female ratio was 1.4. Of the patients, 62.8% were aged under 5 years. Although most of the patients were asymptomatic, the most common symptom was hypersalivation. Ingested foreign body was a metallic coin in 76 patients. There was a significant difference between the types of swallowed foreign bodies among the groups (p=0.009). Of the esophageal foreign bodies, 67.2% were detected in the first constriction of the esophagus, and 99.12% of the EFBs were successfully removed.

Conclusion: If EFB in children is not diagnosed and treated on time, it can be life-threatening clinical condition. Most EFBs in esophageal first anatomical narrowing can be removed with Magill forceps, and foreign bodies that are lodged more distally can safely be removed via rigid esophagoscopy. Especially those families whose children have esophageal diseases such as esophageal atresia repair or a corrosive esophagitis sequelae, should be warned against a foreign body ingestion.

Keywords: Esophagus, foreign body, rigid esophagoscopy, child

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Introduction

Foreign body ingestion is one of the reasons for admission to the emergency department in children, and more than half of the patients are younger than 5 years old. Unlike adults, 98% of foreign body ingestions in children develop as a result of an accidental ingestion [(1)]. Eighty percent of ingested foreign bodies leave the gastrointestinal tract without any intervention, but up to 20% require surgical management [(2)].

The esophagus is the narrowest part of the gastrointestinal tract; there are 3 anatomical stricture sites, the first one is at the cricoid cartilage level, the second one is in the area where esophagus crosses the left main bronchus and third one is where it crosses the diaphragm in which foreign bodies are generally stuck in these narrows. If esophageal foreign body (EFB) is not recognized on time, it can cause serious morbidity and mortality.

Most EFBs are coins, small toy pieces, magnets, disc batteries, food scraps[(3-5)]. Rigid esophagoscopy is the most reliable intervention method both for diagnosis and treatment. However, in some cases, complicated surgical procedures such as thoracotomy and esophagotomy may be required.

In this study, we examined the cases who applied to the emergency department with the suspicion and history of foreign body ingestion, who underwent esophagoscopy or another interventional according to the clinical and/or radiological decision, both clinically and radiologically, as well as the results and complications of the procedure.

Materials and Methods

After obtaining the ethics committee approval (decision number 22.08.20) for clinical studies, the files of 113 patients, who were treated for esophageal foreign body in our department between April 2018 and April 2022 were reviewed retrospectively.

The patients were divided into 3 groups as 0-5 years, 5-10 years and 10-17 years, respectively, as reported by Dereci et al (6). The age, gender, type of foreign body, level of the esophagus, the procedure performed, complications and additional diseases of the patients were evaluated. Inclusion criteria were patients aged 0 to 18 years, of both sexes, who presented to our department with a foreign body in the esophagus during the study period. Exclusion criteria were patients with foreign bodies elsewhere in the gastrointestinal tract other than the esophagus, patients who refused treatment or requested voluntary discharge, and incomplete clinical case files.

Anteroposterior and lateral chest X-ray combined with abdominal X-ray were taken for each patient who presented with the complaint of an EFB. If the history of the patient and symptoms were compatible with an EFB no additional imaging was performed for radiolucent bodies, which could not be detected on direct X-ray, but if the symptoms or history was not consistent with an EFB, esophageal passage X-ray with a dilute water-soluble contrast material was taken. If severe respiratory distress or a sharp/pointy foreign body was suspected, then a thoracic computed tomography (CT) of chest was performed to exclude esophageal perforation.

SPSS 22 statistical program was used in the analysis of the data. Kolmogorov-Smirnov test was used to evaluate the distribution. Continuous variables were defined as median (interquartile range 25-75) or mean ± standard deviation, and categorical variables were presented as numbers and percentages. The student's t test and Mann-Whitney U were used to compare continuous variables, and chi-square test was used to compare categorical variables. p value <0.05 was considered statistically significant.

Results

A total of 113 patients, consisting of 66 males and 47 females, were included in the study, and the male female ratio was 1.4. The mean age of the patients was 4.28±3.05 (min: 3 months, max: 17 years). Of the patients, 62.8% were aged under 5 years, 31,9% were aged 5-10 years and only 5.3% patients were older than 10 years of age. The diagnosis of esophageal perforation was established in a patient with severe respiratory distress who swallowed a razor blade by thoracic CT (Figure 1).

Figure 1. Foreign body in the esophagus with pneumomediastinum in thorax CT

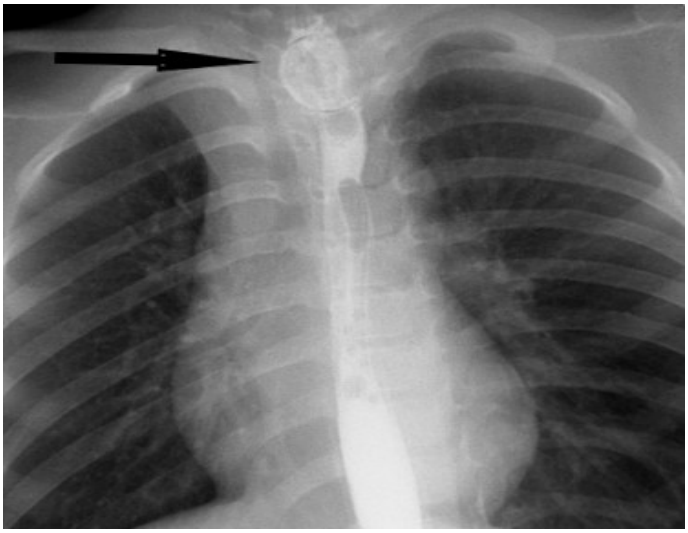

Figure 2. A radiolucent foreign body is visualized with a filling defect on the esophageal passage radiograph

A foreign body was detected in the esophageal passage X-ray of another patient whose history did not match but symptoms were compatible with an EFB (Figure 2).

The mean diameter of swallowed foreign bodies was 22.82±4.24 mm, and coin was the most common EFB in 76 patients. There was a history of congenital heart disease surgery in 4 patients who swallowed coin. The mean time to rigid esophagoscopy in patients who swallowed a disc battery after swallowing the foreign body was 4.2 hours; 60% of these patients had grade 2b esophageal burns and 20% had grade 2a esophageal burns. Patients with esophageal burns were given enteral nutrition after 5 days of parenteral nutrition. No esophageal stricture was found in any patients on the third week follow-ups. In children who swallowed jewelry, pendants were found in 5 patients and earrings were found in 2 patients. There were safety pins in 3 children, a pin in 1 child, and a razor in 1 child who swallowed a penetrating object. While all objects except the razor blade were removed by rigid esophagoscopy, razor blade was removed by thoracotomy and esophagotomy with the preliminary diagnosis of esophageal perforation. Of the 13 patients who swallowed food particles, 8 had previous esophageal atresia repair and 1 had stricture of esophagus because of a previously managed corrosive esophagitis. Lung X-ray of 3 patients with a history of esophageal atresia repair showed a distention in the esophagus above the obstruction site (Figure 3). Esophageal dilatation was performed in the same session in patients with a history of esophageal atresia repair and corrosive esophagitis.

In the esophagoscopy of 4 patients who have no additional or prior disease, large or poorly chewed chunk of foods such as apricot kernels and plums were present. Toys and or others group comprised of two children who swallowed plastic toys of plastic material, one child who swallowed a marble toy, one child who swallowed a piece of stone, and one child who swallowed a plastic bottle cover. There was a significant difference between the swallowed foreign bodies and the groups (p=0.009). Demographic and clinical characteristics of the patients are shown in Table 1.

Figure 3. Dilatation and air-fluid level are seen in the proximal esophagus

Of the patients with EFB, 50.4% were asymptomatic, and the most common symptom being hypersalivation with 19.5%. Ninety percent of foreign bodies in the first narrowing was removed with a Magill forceps. Of all foreign bodies, 46.8% were removed with rigid esophagoscopy. In only 1 patient, the round foreign body (stone fragment) was pushed into the stomach because it could not be grasped with forceps. In 4 patients, no foreign body could be detected by rigid esophagoscopic exploration, and it was then checked with the fluoroscopy device during the procedure and the foreign body was visualized in the stomach location. In these 4 patients, the foreign body left the gastrointestinal tract in an average of 5 days without any complications.

Table 1: Demographic and clinical characteristics of the patients

			0-5 age	5-10 age	10-17 age	*p value*
Gender	Male	58.4%	42	21	3	0,909
	Female	41.6%	29	15	3	
Foreign body	Metallic coin	67.3%	46	28	2	0,009*
	Chunk of food	12.4%	8	5	1	
	Jewel	7%	7	0	1	
	Toys and others	5.3%	4	2	0	
	Disc battery	4.4%	4	1	0	
	Sharp-penetrating objects	3.5%	2	0	2	
Localization	1.narrowing	67.3%	49	25	2	0,277
	2.narrowing	23%	17	6	3	
	3.narrowing	9.7%	2	5	1	
Symptoms	Asymptomatic	50.4%	35	18	4	0,57
	Hypersalivation	19.5%	17	5	0	
	Unable to feed	16.8%	15	4	0	
	Dyspnea	5.3%	2	3	1	
	Retrosternal pain	4.4%	2	3	0	
	Painful swallowing	3.5%	0	3	1	

Discussion

Although pediatric EFB presents itself in various admission forms over the years, it still requires early intervention due to its possible complications. Especially young children whose chewing skills are not fully developed and who tend to get familiarized with new objects they explore, and older children just with the aim of playing, swallow foreign objects which are too large to be going anywhere more distally than esophagus[7]. A study conducted by the American Association of Poison Control Centers reported that more than 75% of EFB ingestion occurred in children under the age of 5[8]. In our study, this rate was found to be 62.8%. It has been emphasized in previous publications that males are significantly more affected[9,10]. In our series, 58.4% of the patients were male and 41.6% were female.

EFB is usually seen in anatomical strictures of the esophagus. The first narrowing is the part behind the cricoid cartilage at the level of the cricopharyngeal muscle, the second narrowing is at the level of the aortic arch, and the third is where the esophagus passes through its own hiatus through the diaphragm[2]. Seventy percent of EFB is seen in the first narrowing, the tightest part of the esophagus[11]. In our study, foreign body was detected in esophageal first narrowing in 67.2% of the patients, which is consistent with the literature.

Guidelines suggest that cases should be evaluated together with anteroposterior and lateral radiograph in patients presenting with EFB[12]. An anteroposterior X-ray should be performed even when the foreign body is not radiopaque, an air-fluid level proximal to the esophagus due to a foreign body could be visualized this way. We diagnosed esophageal obstruction by anteroposterior direct X-ray in 50% of our patients with a history of esophageal atresia repair. Esophageal passage radiographs can be taken with water-soluble contrast agents in patients with a suspicious history of EFB. We identified EFB in the esophageal passage X-ray of our 1 patient with a suspicious history but symptoms consistent with FB, and then removed it by esophagoscopy. Thoracic CT is recommended in patients with EFB if there is severe respiratory distress, or if the suspected foreign body is larger than 2 cm, long or sharp, or if the foreign body type is unknown[13,14]. In our study, the pneumomediastinum was determined in one case with a subsequent severe respiratory distress who swallowed a razor by thorax CT.

Children who swallowed an esophageal foreign body are usually asymptomatic or may show nonspecific symptoms[15]. The most common symptoms observed in children with esophageal foreign body are hypersalivation (15%), nausea or vomiting (15-30%), feeding difficulties (23%), and painful swallowing[16]. Foreign bodies that are lodged in the first narrowing of esophagus may cause coughing, wheezing or respiratory distress by mechanical compression of the trachea or larynx. While nearly half of the patients in our study were asymptomatic, the most common symptoms encountered were hyper-salivation (19.5%), difficulty in feeding or refusal to eat

(16.8%), respiratory distress (5.3%), retrosternal pain (4.4%), and painful swallowing (3.5%).

Although the majority of young children presenting with EFB are healthy individuals, some diseases or previous surgeries have been identified as risk factors in children with previously diagnosed esophageal conditions. These include swallowing disorders, congenital stenosis of the esophagus, motility disorders, achalasia, esophagitis, and congenital diseases of the esophagus that require surgical repair such as esophageal atresia and tracheoesophageal fistula[16]. In older children and adults, deliberate swallowing may be the result of a psychiatric disease like non-suicidal self-injury, suicidal ideation or neuro-motor retardation of any kind[3]. In our patient population, 8.85% of patients had an underlying disease. The most common comorbid disease was previous esophageal atresia repair. A 17-year-old male patient, also the eldest patient in the study population, had a psychiatric illness with narcotics abuse and was the only patient in our series who required conventional surgery. Although we did not find a relationship in the literature study we conducted, 3.54% of our patients had a history of surgery for congenital heart disease.

In a number of studies in the past, it was reported that the most frequent swallowed foreign object in children was coin[17,18]. However, there are studies in different studies stating that the foreign body swallowed by the child is related to the environment in which he lives in. For example, fish bone is more common in East Asia (18). Coins were the most common EFB (67.3%) in our patient population, while sharp-penetrating objects were the least common (3.5%).

Disk batteries that are in use nowadays are generally alkaline batteries, and in vitro studies have shown that they open spontaneously in humid environments and release their contents[19,20]. For this reason, both the North American and European Society of Gastroenterology, Hepatology and Nutrition (NASPGHAN and ESGHAN) stated that the flat batteries in the esophagus should urgently be removed within 2 hours due to the risk of corrosion, necrosis, and future perforation, whether it is symptomatic or not[21]. Thus, we removed disc batteries by emergent rigid esophagoscopy, even if they were asymptomatic, regardless of the duration of pre-operative fasting. In our patients who swallowed a disc battery, the mean time to rigid esophagoscopy after swallowing the foreign body was 4.2 hours.

Rigid esophagoscopy is the most preferred treatment method which enables controlled removal of 90-99% of EFBs[22]. In our study, the success rate of rigid esophagoscopy was found to be 98.11%. Surgical treatment may be required in 1-18% of cases, especially in patients who swallow sharp-edged objects[23]. Therefore, conversion to open surgical treatment might be considered during esophagoscopy, particularly in patients whose esophagoscopic examination reveals a sharp or penetrating object lodged in the narrowing of the esophagus and therefore cannot be removed without an inevitable complete laceration of the esophageal wall. Since one of our patients was diagnosed with pre-operative esophageal perforation, the foreign body was removed via thoracotomy and esophagotomy.

It has been reported that 7-62% of round shaped EFBs spontaneously progress to the stomach due to relaxation of the esophageal sphincters following the induction of general anesthesia[24,25]. According to Çelik et al., this rate was 4.45% [22] similar to our study, which was 3.54%. There is a 0.1-1.9% risk of esophageal rupture in rigid esophagoscopy performed during the whole procedure[26]. However, no perforation cases were observed in our study.

This study has limitations such as being retrospective and single-center study. Since our hospital is a third level health center, complicated patients such as those whose foreign bodies are lodged more distally than the first narrowing of the esophagus are referred to us. Most foreign bodies in first narrowing of esophagus can be removed with a Magill forceps in a second level health center. We think that a more detailed planning of a multicenter prospective study with a larger number of patients would be beneficial.

Until children give up putting foreign objects in their mouth as a method of discovering new things or for the sole purpose of playful activities, we can conclude that foreign body ingestion will continue to be a problem handled by pediatric surgeons. When EFB is not diagnosed and treated on time, it can turn into a complicated clinical condition. Many factors should be taken into account such as type of the swallowed object, duration of patient admission after swallowing, and the clinical condition of the patient in children presenting with EFB. Most of them are lodged in the first anatomical narrowing of esophagus and can be removed with a Magill forceps under sedation anesthesia, and foreign bodies located more distally can safely be extracted by esophagoscopy under general anesthesia. Although most of EFB can be removed with a Magill forceps in a second level health institution, patients with underlying esophageal disease and patients who swallow sharp-penetrating objects should be treated in centers experienced in thoracic and esophageal

surgery. Especially families of children with a previous history of esophageal diseases, should be warned against foreign body ingestion.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could affect the work reported in this article.

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