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One button, big risk: recent experience of button battery ingestion in a pediatric emergency department

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ABSTRACT

Objective: Button battery ingestion causes serious health problems by corrosively damaging the mucous membrane. Early diagnosis and rapid intervention are very important. This study aimed to investigate the demographic and clinical characteristics of button battery ingestion.

Material and Methods: This retrospective cross-sectional study analyzed data from patients aged 1 month to 18 years admitted to a tertiary pediatric hospital's emergency department between January 2023 and December 2024 due to button battery ingestion.

Results: A total of 72 patients were included (69.4% male; median age 36 months [IQR; 22–59.5]). The median presentation time was 90 minutes (IQR; 56.25–180), and only 6 patients (8.3%) were symptomatic. All ingestions were accidental, with 22 (30.6%) witnessed. On direct radiography, the batteries were found in the esophagus (4.2%), stomach (48.6%), and intestine (47.2%). Endoscopic battery removal was performed in 11 patients (15.3%), with a median endoscopy duration of 12 hours (IQR; 6–19). Mucosal changes were observed in 7 (63.6%) of the 11 cases that underwent endoscopy. Batteries in the esophagus were removed within 6 hours. Of the 35 stomach batteries, 8 (22.9%) were removed endoscopically, while the others passed spontaneously. All patients were discharged in stable condition without mortality.

Conclusion: Button battery ingestion is a critical pediatric emergency that particularly affects young children. It must be removed endoscopically as soon as possible to prevent serious complications. However, preventive strategies that limit children's access to batteries or reduce their harmful effects are of great importance.

Keywords: Button battery, ingestion, endoscopy, pediatric

INTRODUCTION

Button batteries are widely used in household electronic devices and can cause serious health problems if accidentally ingested by children. Children under 5 years of age are especially at high risk as they tend to put such foreign bodies in their mouths (1, 2). The most dangerous feature of button batteries is their corrosive effect, causing alkaline burns to surrounding tissues. Complications such as mucosal damage, necrosis, and perforation can develop in a few hours. Patients may be asymptomatic to variably symptomatic (hypersalivation, dysphagia, chest pain, bloody vomiting, wheezing, cough, and tracheoesophageal fistula in the later stages) (3). In addition, various studies indicate that this problem has increased over the years (4, 5).

The appearance of a double ring or halo sign on a direct radiograph is characteristic of a button battery and is also useful in determining its location in the gastrointestinal tract. Foreign bodies are most lodged in the upper esophageal sphincter (cricopharyngeal stenosis), the narrowest part of the esophagus. Button batteries ingested into the esophagus start tissue damage within minutes. For this reason, it is recommended to perform endoscopy as soon as possible (<2 hours) in patients with esophageal button battery ingestion (6, 7). Endoscopy of the upper gastrointestinal tract is performed to evaluate the corrosive damage and to remove the button battery. Giving

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honey or sucralfate to patients reduces mucosal damage by creating a mechanical barrier around the battery and should be started as soon as possible (8, 9). Button batteries ingested in the stomach should be removed endoscopically if the patient is symptomatic, has co-ingested a magnet, or if the diagnosis is delayed (>12 hours) (10).

Button battery ingestions in children are critical cases that require rapid evaluation and early intervention in pediatric emergency services due to high morbidity and mortality. This study aimed to investigate the demographic and clinical characteristics of button battery ingestions.

MATERIALS and METHODS

This study is a retrospective, descriptive, and cross-sectional study. The patients aged between 1 month and 18 years who were admitted to Etlik City Hospital pediatric hospital emergency department due to foreign body ingestion between January 2023 and December 2024 were analyzed. Patients with a history of button battery ingestion were included in the study. Patients aged less than 1 month, those who ingested another foreign body, and those whose file data could not be accessed were excluded from the study.

Demographic characteristics of the patients (age, sex, race), history of chronic disease, history of additional foreign body ingestion, whether the event was witnessed or not, number, size, localization of the ingested button battery, signs and symptoms, duration of admission, whether endoscopy was performed or not, the time of endoscopy, hospitalization data, length of hospital stay, intensive care requirements and complications that developed during follow-up were evaluated.

Button batteries lodged in the esophagus are removed urgently by endoscopy, regardless of the time of ingestion, symptoms, or fasting compliance. Batteries located beyond the esophagus are removed as soon as possible if the patient is symptomatic. If the patient is not symptomatic, the final decision is made by the relevant departments, taking into account the individual circumstances of each case.

Statistical analysis

IBM SPSS for Windows, version 27 (IBM Corp., Armonk, N.Y., USA) software performed all statistical analyses. The Kolmogorov-Smirnov test was used to assess the suitability of numerical variables for normal distribution. Descriptive statistics (percentage, median, and interquartile range [IQR]) for demographic and clinical characteristics of all patients were used. For comparisons between groups, the $\chi 2$ or Fisher's Exact Test was used for categorical variables, and the Mann-Whitney U test was used for continuous variables that were not suitable for normal distribution (after reviewing for appropriateness). For all analyses, $p<0.050$ was determined as statistically significant.

RESULTS

Seventy-two patients admitted to the pediatric emergency department with button battery ingestion were included in the study. Median admission time was 90 min (IQR; 56.25-180). Fifty (69.4%) of the patients were male, and the median age was 36 months (IQR; 22-59.5 years). Four (5.6%) patients had known psychiatric disorders (3 with autism spectrum disorder and 1 with ADHD). All ingestions were accidental, and 22 (30.6%) were witnessed by parents. Only 6 (8.3%) patients were symptomatic at presentation (5 vomiting, 1 abdominal pain).

Direct radiography was performed in all patients to evaluate the presence and location of the button battery. Three (4.2%) of the button batteries were in the esophagus, 35 (48.6%) in the stomach, and 34 (47.2%) in the intestine. The diameter of the button battery was ≥20 mm in 58 (80.6%) patients and <20 mm in 14 (19.4%) patients. The number of ingested batteries was 1 battery in 60 (83.3%) patients, 2 batteries in 10 (13.9%) patients, and 3 batteries in 2 (2.8%) patients. None of the patients had a history of co-ingestion of another foreign body. 59 (81.9%) of the patients were hospitalized, and the median length of hospital stay was 24 hours (IQR; 21-46). Demographic and clinical characteristics of the patients are given in Table I.

Endoscopic battery removal was performed in 11 patients (15.3%), and the median duration of endoscopy was 12 hours (IQR; 6-19). Mucosal hyperemia, erosions, and ulcers were detected in 7/11 (63.6%) of the patients who underwent endoscopy. There were no anesthesia or endoscopy-related complications during the battery removal procedure. Clinical characteristics of the patients with endoscopic button battery removal are given in Table II.

Table I: Demographic and clinical characteristics of the patients

All features	Total (n=72)	Endoscopic removal (n=11)
Age, month*	36 (22-59.5)	37 (18-53)
Gender†		
Male	50 (69.4)	9 (81.8)
Witnessed event†	22 (30.6)	7 (63.6)
Button battery size†		
<20 mm	58 (80.6)	3 (27.3)
≥20 mm	14 (19.4)	8 (72.7)
Number of button batteries†		
1	60 (83.3)	11 (100)
2	10 (13.9)	-
3	2 (2.8)	-
Button battery location†		
Esophagus	3 (4.2)	3 (27.3)
Stomach	35 (48.6)	8 (72.7)
İntestine	34 (47.2)	-
LOS, hours*	24 (21-46)	51 (18-72)

: median (IQR), †: n(%), **LOS: length of hospital stay*

Table II: Details of patients with endoscopic button battery removal

Age (month)	Gender	Battery Size	Battery Location	Symptoms	Endoscopy time (hours)	Mucosal Lesion
13	M	≥20 mm	Esophagus	Vomiting	6	Hyperemia
17	M	≥20 mm	Stomach	Asymptomatic	28	Normal
18	M	≥20 mm	Stomach	Asymptomatic	12	Normal
21	M	≥20 mm	Stomach	Asymptomatic	19	Hyperemia
36	M	<20 mm	Stomach	Asymptomatic	10	Normal
37	M	≥20 mm	Stomach	Asymptomatic	14	Normal
37	F	≥20 mm	Esophagus	Asymptomatic	4	Erosion
45	F	≥20 mm	Esophagus	Vomiting	4	Erosion and necrosis
53	M	<20 mm	Stomach	Stomachache	24	Erosion
64	M	<20 mm	Stomach	Asymptomatic	11	Erosion
192	M	≥20 mm	Stomach	Asymptomatic	15	Ulcer

Endoscopic removal of the button batteries lodged in the esophagus was performed in the first 6 hours. All patients had a battery size ≥20mm, and two had vomiting. While 8/35 (22.9%) of the gastric button batteries were removed endoscopically, the rest passed through the passage spontaneously during the follow-up period. Five of the patients' button batteries were ≥20 mm in size, and all patients were asymptomatic. Patients with intestinal button batteries were observed until spontaneous excretion occurred, and fecal softeners were given to accelerate passage.

DISCUSSION

Button battery ingestions are an important cause of pediatric emergency admissions, and successful management prevents serious morbidity and mortality.

Important risk factors include age younger than 5 years, button battery size ≥20 mm, ingestion at the level of the aortic arch of the esophagus, and prolonged time after ingestion. Presenting with witnessed or suspected ingestion of a button battery, direct radiography should be performed to differentiate the presence and location (11, 12). In our study, button battery ingestion and its location were determined by direct radiography.

In our study, most of the patients were male, and the median age was 36 months. In the literature, button battery ingestions are more common in early childhood when children are more curious and in males (13). Most children who ingest a button battery are asymptomatic, or symptoms may be difficult to recognize in nonverbal children, where the event was not witnessed. If the patient is symptomatic at presentation, it is a warning for poor prognosis, as it may be associated with battery ingestion or complications (14). In our study, most patients were asymptomatic, and endoscopy revealed mucosal damage in 50% of patients who were symptomatic at presentation.

It has been reported that in 75% of children, ingested button batteries will pass through the gastrointestinal tract without any problems. Narrow esophagus in infants and ingested large diameter button batteries (≥20mm) in children increases the risk of gastrointestinal tract entrapment and mucosal injury and predisposes to complications (13, 15). In our study, endoscopic battery removal was performed in 15.3% of patients.

The time of removal of button batteries is the most important factor to prevent complications. The first 2 hours after ingestion of the button battery are critical for the development of mucosal damage. After 6 hours, serious complications develop, including esophageal stenosis, tracheoesophageal fistula, aorto-esophageal fistula, and death (16-18). The highest risk contacts for mucosal injury are batteries ingested into the esophagus, which international guidelines have reported as an indication for emergency endoscopy in children (10, 19). In our study, endoscopic battery removal was performed within the first 6 hours in all patients with esophageal battery ingestion, and no serious complications were found except mucosal damage.

Removal of post-esophageal button batteries allows evaluation of possible damage to the esophagus and prevention of damage to the stomach or intestine. There is no consensus among the guidelines for the endoscopic management of post-esophageal button batteries. However, endoscopy is recommended if the patient is symptomatic, younger than 5 years of age, the button battery is ≥20mm, delayed presentation (>12 hours), and co-ingestion with more than one battery or magnet (3, 10, 19). In our study, 22.9% of patients with gastric button battery implantation underwent endoscopic removal, and half of them had a variable degree of gastric mucosal damage without esophageal damage.

Administration of honey and sucralfate until the button battery is removed prevents mucosal damage by creating a mechanical barrier and neutralizing alkali. However, caution should be exercised in delayed diagnosis (>12 hours), suspicion of perforation, honey or sucralfate allergy, and in children younger than 1 year due to the risk of botulism (20). Except for one patient under 1 year of age, honey was given to prevent mucosal damage.

CONCLUSION

Button battery ingestion is an important cause of emergency admission that requires timely and qualified medical intervention and is more common in young children. Because of the risk of serious complications, button batteries lodged in the esophagus should be removed as soon as possible. There is

less consensus on the management of gastric button batteries. However, it is well known that they cause mucosal damage and may lead to serious complications. Prevention strategies, such as preventing access by children or reducing the damaging properties of the battery, should be developed.

Ethics committee approval

This study was conducted by the principles outlined in the Declaration of Helsinki. Approval was granted by the Medical Ethical Committee of the Etlik City Hospital (AESH-BADEK1-28.05.2025/2025-218).

Contribution of the authors

Study conception and design: ***ASO, OA,*** and ***CC***, Data collection: ***FSE, MDK***; analysis and interpre-tation of results: ***BO, BA***; Draft manuscript preparation: ***FOH, AG, NT***; All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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