Case Report

Button Cell Battery Ingestion in Children and their Outcome

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ABSTRACT

Button batteries are the second most frequently ingested foreign bodies and can lead to serious clinical complications within hours of ingestion. Over the past two decades, the prevalence and mortality of button battery ingestion have been on the rise with an extensive application of smaller, more technologically advanced toys in the household. We present a series of nine children with button batteries lodged in upper gastrointestinal tract. The diagnosis was made primarily by the history of button battery ingestion, radio imaging. The most common site of impaction was lower esophagus. Mucosal injuries were common in esophagus as compared to stomach. Endoscopic retrieval was done in all. One patient had esophageal stricture on follow-up and was subjected to endoscopic dilatation. Early detection, prompt treatment, and regular follow-up after discharge may help to decrease the incidence of complications and improve the outcomes.

Key words: Button battery, ingestion, esophagus

INTRODUCTION

Ingestion of foreign bodies is common in young children, especially in the children <5 years old.[1,2] Button batteries are the second most frequently ingested foreign bodies, secondary to the coins.[3] Over the past two decades, the prevalence and mortality of button battery ingestion have been on the rise with an extensive application of smaller, more technologically advanced toys in the household.[4]

Incidence of ingestion of button cell battery is around 4000 reported each year in United States.[5] About 70% events occur in children <6 years of age and 21% occur in children between 6 and 19 years.[5] There is inadequate data from India regarding button cell battery ingestion in children and its possible complications. Hence, we are presenting a case series of button cell battery ingestion and their outcome in children at our center.

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CASE REPORT

This is a case series of button cell batteries ingestion in toddlers. In a period of 7 months (November 2016–June 2017), total nine patients presented at our center. Main reason of presentation was suspicion by parents. Patients were in between age groups of 2 and 6 years of age with mean of 3.5. Male:female ratio was 1:2. All were subjected to X-ray for identifying the site of lodgment/impaction [Figures 1 and 2]. The most common site of lodgment of foreign body was lower esophagus. Other sites of lodgments were cricopharynx, upper esophagus, and stomach. All patients were followed up for the period of 6 months after endoscopic removal. Size of battery was approximately 20 mm [Figure 3]. Most commonly observed battery was lithium button cell battery. Time of presentation was different in all children ranging from 2 h to 72 h and did not relate to extent and severity of injury assessed on endoscopy.

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For endoscopic retrieval [Figure 3], we induced with general anesthesia with uncuffed intubation tubes. Instruments used for retrieval were rat tooth forceps, dormia basket, snare, etc. After inserting endoscope, local examination is done at the site of impaction for ulceration or perforation [Figure 4]. Then, button cell batteries were removed [Figure 5]. It was observed that chewed and leaked batteries were associated with more injury than the time of contact. Impacted batteries were first dislodged from impaction site and then retrieved.

Lodgment of battery in two patients was in stomach, four in lower esophagus, two in upper esophagus, and one in cricopharynx. Mucosal injury in esophagus was seen in four children with variable times of presentation from 2 h to 3 days. Two were presented with deep esophageal wall injury, one of them presented with stricture in upper esophagus at 2 months of follow-up. She presented with crying spells while feeding and regurge. Repeat endoscopy revealed stricture and was dilated subsequently. She was followed up for total 6 months and was asymptomatic. No injuries were observed in patients with batteries lodged in stomach [Table 1].

DISCUSSION

Children make 80% of patients that seek medical care after ingestion of foreign body with peak incidence of occurrence between 6 months and 3 years of age.[6] At least 30% of children with esophageal foreign body will be asymptomatic, so any history of foreign body ingestion should be taken seriously and investigated.[7] The esophageal coins/foreign bodies are commonly lodged in one of three locations: Upper esophageal sphincter (60–70%), mid esophagus at the level of aortic notch (10–20%), and above lower esophageal sphincter (20%).[8] In our study, the most common site of lodgment was in lower esophagus (44%).

Recent data indicate growing incidence of button battery ingestion with 7-fold increase in incidence of ingestion associated with major or fatal outcome occurring in children <4 years of age.[9] If the patient is symptomatic, but there is no ingestion history then consider battery (foreign body) ingestion if there is airway obstruction or wheezing, drooling, vomiting, chest discomfort, difficulty in swallowing, decreased appetite, refusal to eat, coughing chocking, and gagging with eating or drinking.[10]

A radiograph should be obtained in every case of acute onset of chest pain in children to rule out suspected radio-opaque foreign body ingestion particularly when ingestion is not observed. The esophageal coins or button batteries classically assume enface appearance on anteroposterior view, whereas lateral view will show edge of the coin. The coin will be viewed in opposite position if it is lodged in trachea. When looking at any round, opaque foreign body on anterior-posterior X-ray, it is useful to zoom in and look for "double ring or halo sign" to distinguish it from a coin. Close inspection of imaging is important to quickly make the correct diagnosis. The negative or narrower part of the battery can help guide clinician to where the most severe tissue injury may occur and what potential complications should be considered in the patient.[10]

The increased use of lithium coin cells, especially the 20 mm diameter cell without proper packaging in toys, is responsible for increased incidence of button battery ingestion. At present, all severe button battery ingestion cases involve lithium cells. In a study, an alarming 12.6% of children, younger than 6 years, who ingested 20 mm diameter lithium coin cell experienced a major effect such as perforation, tracheoesophageal fistula, fistulization into major vessel, esophageal stricture, vocal cord paralysis.[11]

In our study, one patient developed esophageal stricture out of 9. No major complications observed

Table 1: Patients with site of battery and nature of injury

Case no.	Age	Sex	Time of presentation to hospital	Site of battery	Nature of injury on endoscopy	Follow-up up to 2 months
1	2	F	2 h	Upper esophagus	Wall injury up to muscularis mucosa	Stricture
2	6	M	4 days	Stomach	No injury	Normal
3	4	F	6 h	Stomach	No injury	Normal
4	4	F	7 h	Lower end of esophagus	No injury	Normal
5	3	M	3 days	Lower end of esophagus	Wall injury up to muscularis mucosa	Normal
6	2	F	3 h	Upper end esophagus	Mucosal injury	Normal
7	3	F	8 h	Lower esophagus	Mucosal injury	Normal
8	3.5	M	5 h	Stomach	No injury	Normal
9	4	F	24 h	Lower end of esophagus	Mucosal injury	Normal

Figure 1: Xray abdomen erect showing foreign body; xray lateral skull and neck

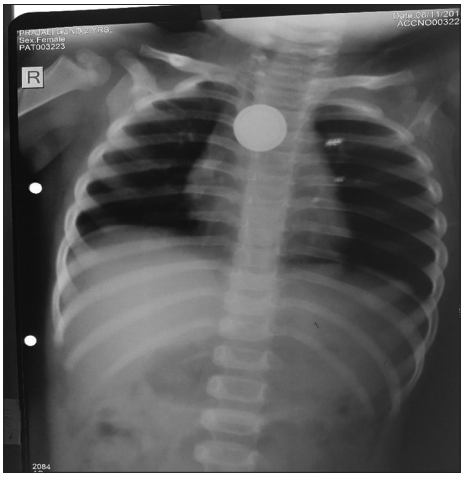

Figure 2: Xray showing button battery ingestion

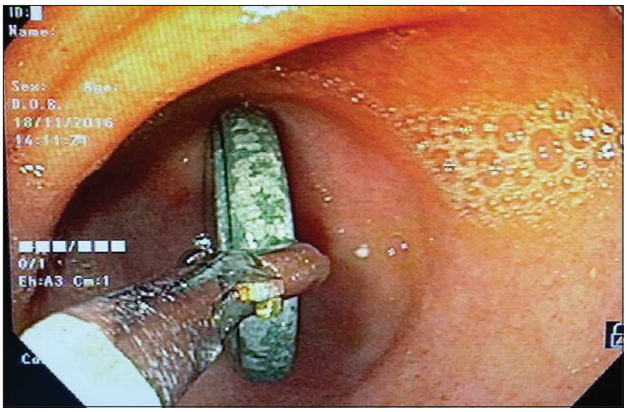

Figure 3: Endoscopic image of captured button cell battery

Figure 4: Endoscopic image showing ulceration at site of impaction

Figure 5: Removed button cell battery

Figure 6: Button cell battery after cleaning

even in rest on late presentation. Hence, time of contact was not observed to be related to the extent of injury. Chewed and leaked batteries were associated with severe mucosal injury.

Complications of button battery lodged in esophagus include mucosal burns, perforations, stricture, vocal cord paralysis, formation of tracheoesophageal fistula, major hemorrhage, and death.[12] Button batteries in particular can induce mucosal injury in as little as 1 h of contact time and involve all esophageal layers in 4 h,[7] hence, need expedient removal by endoscopy. Symptomatology depends on the type and shape of batteries and duration of presentation with a high degree of clinical suspicion.[13]

Risk Factors for More Severe Outcome Are[13]

- Size of the battery more than 20 mm
- Age <4 years
- Injuries are more severe with lithium batteries
- New cells produce 3.2 times more severe injury compared to spent cells.

Challenges in Endoscopic Retrieval were as Follows

- Chewed and impacted batteries
- Leaked material and debris
- Possible complications due to batteries and instrumentation
- Anesthesia in children
- Delicate accessories
- Pediatric size gastroscope
- Adult size gastroscope of 9 mm size can be used for children above 1 year of age.

CONCLUSION

- An alarming surge in cases of button cell battery ingestion in recent years among children because of easy accessibility to devices with button cell batteries
- Prompt medical attention after early suspicion by parents followed by endoscopic intervention for esophageal and gastric locations can prevent possible complications
- Parent education and awareness about button cell battery ingestion and subsequent complications will help in prevention of such incidences
- Manufacturers should ensure secure packaging of these cells along with a due consideration to reduce the size of cell.

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