

## Is Button Battery More Dangerous than a Bullet?

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### Abstract

**Objective:** Button battery in digestive tract has unpredictable outcome ranging from harmless to death around the globe. Despite public awareness campaigns its incidence is increasing with the passage of time. The purpose of this study is to highlight the severe complications associated with it and to sensitize the community to participate in its prevention to avoid catastrophic outcomes.

**Patients and Methods:** This study included 47 patients. Protocol includes patient's age, time of presentation, signs and symptoms and relevant radiographic investigations. Button batteries were urgently removed under general anesthesia.

**Results:** The average follow up period is 3 months. Total 47 patients are included in this study. Three patients has BB in stomach and below, twenty six had BB in cricopharynx and eighteen in hypopharynx. Two patients developed esophageal perforation. One patient developed aorto-esophageal fistula and died.

**Conclusion:** The mainstay of treatment is the early detection of button batteries. It should be urgently extracted out to avoid lethal complications. Physician and parental education can significantly reduce the morbidity and mortality associated with its ingestion. Electronic and print media should be utilized to develop awareness in the community.

**Keywords:** Digestive Tract; Button Battery; Oesophagoscopy

### Introduction

Button batteries are common causes of morbidity and mortality in infants and children worldwide. It is difficult to eradicate the problem, as children, by nature, are curious and exploratory. Approximately 3000 cases of button battery ingestions happens in a year placing children at risk and leads to severe complications including death [1]. It is estimated that of all the foreign bodies ingestions in children 80% occur in age group between 6 months and 3 years of age [4-7]. Batteries account for less than 2% of the foreign bodies ingested in children [12-14]. Every case is different from the other due to the age, time of ingestion, size of button battery, lithium strength, individual health, post removal complications etc. so the horizon is vast. Mostly children below 5 years have propensity to ingest button battery and mostly unwitnessed or delayed presentation due to lack of awareness or not taking it seriously by the parents is one reason of many complications even fatality. Button batteries are small readily available menace in nearly every home where little children and toddlers are present. They are mostly in cheap electronic toys, torches, remote controls, watches, Calculators and other small and handy equipment which are never hidden from the little ones rather given by the elders to them [10,11]. BBI is on increasing pattern in last 2 decades due to cheaper toys made in bulk, less safety quality measures, long life powerful batteries, lack of public safety awareness and media priorities. Most of the ingested foreign bodies in esophagus pass thru the GI tract uneventfully but as far as button battery is concerned it causes quick damage due to coagulative Necrosis due to the pH and strength of battery in less than 15 minutes of ingestion and later liquefactive

Necrosis across all the walls of the esophagus. Odynophagia, drooling, spitting and vomiting are the main signs and symptoms. However, it could lead to more severe complications including death [8,9].

The outcome depends on certain variables like age of the patient, duration of skin or mucosal contact, location, voltage of the battery, size of battery and chemical composition of the battery [1].

**Purpose of the Study**

The purpose of this study is to highlight the severe complications associated with it and to sensitize the community to participate in its prevention to avoid catastrophic outcomes.

**Materials and Methods**

47 cases of button battery ingestion presented to the Department of Neonatal and Pediatric Surgery, Children hospital, PIMS, Islamabad, Pakistan from August 2016 to August 2018 and were reviewed prospectively. The children who were included in this study were between 6 months to 12 years of age. Patients were diagnosed on the basis of history, physical examination and relevant radiological investigations. The variables including in this study were patient’s age, gender, site of lodgment, signs and symptoms, time of presentation, imaging and endoscopic findings. We performed X- ray of neck and chest in antero posterior and lateral views to determine the position of BB and to confirm our diagnosis. X- ray abdomen were reserved for those patients where BB was not found in neck and chest. We used Magill’s forceps and rigid esophagoscopy for BB removal from esophagus.

**Results**

Of all the 47 patients who present with the history of BB ingestion, there is slight male predominance that is 26 (55.31%) and 21 (46.68%) cases respectively (Table 1).

		Digestive	Tract
S. No.	Gender	Frequency	Percentage
1.	Male	26	55.31
2.	Female	21	46.68

*Table 1: Gender distribution of the cases.*

The total age range of all the cases was between 6 months to 12 years. Most of the cases belong to age group 6m to 3 years (Table 2).

		Digestive	Tract
S. No.	Age	Frequency	Percentage
1.	6m - 3 yrs	25	53.19
2.	3 - 5 yrs	15	31.91
3.	5 - 12 yrs	7	14.89

*Table 2: Age distribution of the cases.*

The time of presentation varies from within first 6 hours to more than 24 hours. Of 47 patients 18 (38.29%) cases presented within first 24 hours, 22 (46.80%) cases presented between 6 hour to 24 hour and 7 (14.89%) cases presented after 24 hour. In all cases of BB ingestion, the most common symptoms were dysphagia (68%) followed by vomiting (55.31%), foreign body sensation (29.78%) and odynophagia (27.65%). The most common site of lodgment is cricopharynx in 26 (55.31%) cases, hypopharynx 18 (38.29%) cases and in 3 (6.38%) cases BB was below stomach (Table 3).

Digestive tract			
S. No.	Site	Number	Percentage
1.	Cricopharynx	26	55.31
2.	Hypopharynx	18	38.29
3.	Stomach and below	3	6.38

Table 3: Distribution of cases by site of lodgment.

The management of all the patients with BB below stomach was conservative, for all the BB in cricopharynx were direct laryngoscopy and Magill’s forcep removal and for BB in hypopharynx were extracted out by rigid esophagoscopy with forceps removal.

Two patients presented after 24 hour with esophageal perforation secondary to BB. Left thoracotomies were done and BB removed as well as primary repair of esophageal perforation and pleuropexy was done (Figure 1a and 1b). Later on these patients developed esophageal stricture and they are on regular esophageal dilatation program. One patient developed dysphagia to solids secondary to BB ingestion 2 months back which was removed by rigid esophagoscopy. Barium swallow reveals esophageal stricture in lower 1/3 of esophagus. One patient developed aorto-esophageal fistula and died.



Figure 1a: An extracted button battery from the esophagus (20 mm).



Figure 1b: Endoscopic findings of esophageal perforation.

### Discussion

Button batteries are common causes of morbidity and mortality in infants and children worldwide. It is difficult to eradicate the problem, as children, by nature, are curious and exploratory. Button battery in digestive tract has unpredictable outcome ranging from harmless to death around the globe. They are the 3<sup>rd</sup> leading cause of death under 1 yr of age and 4<sup>th</sup> leading cause in the age group 1 - 6 years [1,7,11]. The maximum prevalence is seen between the age 1 and 2 years [1,4,12]. Button batteries represent about 2% of all foreign bodies, although this percentage seems to be increasing [12]. Button batteries are small readily available menace in nearly every home where little children and toddlers are present. They are mostly in cheap electronic toys, torches, remote controls, watches, Calculators and other small and handy equipments which are never hidden from the little ones rather given by the elders to them. BBI is on increasing pattern in last 2 decades due to cheaper toys made in bulk, less safety quality measures, longlife powerful batteries, lack of public safety awareness and media priorities. BB causes damage to esophagus by four mechanisms of injury. Leakage of the battery contents with direct corrosive damage. Direct electrical current effects on the mucosa and resultant mucosal burns. Pressure necrosis resulting from prolonged local pressure on the tissue. Local toxic effect due to absorption of substances [9,15-18]. BB contains toxic and corrosive chemicals, heavy metals such as mercury, nickel, silver, cadmium, zinc, manganese, and lithium and sodium or potassium hydroxide [2]. The HCL in the stomach also increases the risk of leakage of the contents of the battery when swallowed [3]. Mostly button batteries which are commonly used are 20 mm or greater in diameter so there are high chances of obstruction in esophagus. In most the patients button batteries stuck in upper part of esophagus because of anatomical strictures i.e. cricopharyngeal sling, aortic arch and where left bronchus crosses the esophagus. This justifies 26 patients with BB stuck in cricopharyngeus. The time of presentation is also very important as delay can cause serious complications. In our study two patients developed esophageal perforations with delay of more than 24 hours. These patients underwent thoracotomies and primary repair of esophagus was done along with pleuropexy. Later on these patients develop esophageal stricture and are on regular esophageal dilatation program. One patient died secondary to aortoesophageal fistula. The most common signs and symptoms of BB ingestion were dysphagia followed by vomiting, foreign body sensation and odynophagia.

Button battery ingestion is a surgical emergency so management should be prompt without any delay. After careful history and physical examination, X ray neck and chest anteroposterior and lateral views should be taken. Button battery has a characteristic halo sign or double ring appearance on x ray [1]. As soon as the diagnosis of BB ingestion is made, it should be extracted as early as possible to avoid serious complications. In our study BB in cricopharyngeus are removed by Magill's forcep and in hypopharynx by rigid esophagoscopy with forcep. All those button batteries which has descended down to stomach or below at the time of presentation were managed conservatively and these patients were followed to have no complications as they have passed it out in stool in 2 to 3 days.

Prevention is better than cure. Of all the ingested foreign bodies, BB is the dangerous of all. Serious complications are associated with it including death. So, the need of the hour is to sensitize our society regarding its complications and prevention. Electronic and print media should be utilized to develop awareness in the community. Pamphlets should be distributed in outdoor and indoor patients departments to educate the public as parental vigilance can then reduce child exposure to dangerous objects. There should be a proper legislation in order to avoid this lethal problem. Toy companies should redesign there products or otherwise banned who are making these cheap toys and exposing children to button batteries [19].

### Conclusion

The mainstay of treatment is the early detection of button batteries. It should be urgently extracted out to avoid lethal complications. Physician and parental education can significantly reduce the morbidity and mortality associated with its ingestion. Electronic and print media should be utilized to develop awareness in the community.

### Conflict of Interest

The author finds no conflict of interest.

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