

Case Reports

Button Battery (BB) Ingestion in Children: A Case Report

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Abstract

Over the last few years, there is a rise in the use of button batteries (BB) in children's toys and home appliances. Easy availability and small size of these batteries pose a significant risk of ingestion by small children which is exceedingly dangerous. After ingestion, the BB may lodge in the esophagus or enters easily into the stomach due to its variable sizes. If lodged in the esophagus, BB can cause injury due to their caustic and electric properties, as well as by direct pressure. In our case, the 16 months old boy had accidentally ingested a BB, removed approximately after 30 hours from the esophagus, had developed esophageal perforation followed by trachea-esophageal fistula, complications related to aspiration and finally expired due to bronchopneumonia with septicemia and respiratory failure. So, Prompt removal is mandatory to reduce devastating outcome if it is a button battery

Keywords: Button-battery (BB), Children, Tracheoesophageal fistula.

Introduction

Button batteries (BB) are small, coin-shaped batteries that are used frequently in a variety of electronic items, including children's toys and common home appliances. BB are small, single cell battery typically 5-25 mm in diameter and 1-6 mm in high resembling a button. A metallic can forms the button body to which polarity is usually stamped on and an insulated top cap indicate the negative terminal. Pediatric foreign body ingestion is a problem encountered by many physicians including pediatricians, otolaryngologists and emergency physicians. Approximately, 80% cases of foreign body ingestions occur in children between the ages of six months and three years.¹ Button battery ingestion occurs at an estimate rate of ten in

one million people per year, a small group of which are retained in the esophagus and later become complicated, and the annual incidence is greater than 3500 cases in the United States.^{2,3} Esophageal foreign body is a rare presenting pediatric complaint due to the fact that not all are present immediately following ingestion. The majority of ingested foreign bodies pass through the GI tract with no sequelae; however, those that do cause impaction do so in the upper esophagus, the most common site accounting for more than 75% of all cases.^{4, 5}

Previously injury was believed to occur secondary to leakage of alkaline material; however, recent studies have proved that the cause is the passage of current through the tissue causing hydrolysis of tissue fluids. Usually, current generates hydroxide at the negative battery pole and as a result, when it comes in contact with the tissue surface, release electron. Esophageal injury can be predicted by the anatomic location and the orientation of the battery. Moreover, lithium cells have been associated with worse outcomes. This is due to lithium being 3 V cells instead of 1.5 V cells and since they generate more current, more hydroxide is produced rapidly than other cells.^{1,6}

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Fig.-1: Button batteries of different sizes

Case

Nubaid, a 16 months old, healthy, playful child, 2nd issue of his parents suddenly developed vomiting & refusal to take food. Mother took him to a paediatrician who advised her to do a chest x-ray & x-ray nasopharynx with the diagnosis of enlarged bilateral tonsils with suspected upper airway obstruction. During X- ray, technician saw a large coin shaped foreign body in the upper airway and referred him for immediate removal. Foreign body was removed by the department of Otolaryngology under local anaesthesia about 30 hours after ingestion and it was a lithium battery and sent back to home with oral antibiotic and analgesic. Following removal of FB, he again developed cough with

swallowing difficulty, profuse secretion from mouth & respiratory distress. With the complaints of non-productive cough for 15 days, difficulty in swallowing for same duration & profuse secretion from mouth, he was diagnosed as a case of pneumonia & was treated with parenteral antibiotics without improvement and referred to Dhaka Shishu Hospital for intensive care.

O/E, Nubaid was conscious, irritable, dyspnic, afebrile, R/R- 62/min, H/R- 136/min, CRT<3 sec, SpO₂ 96% with 3L/min O₂. Anthropometrically, he was age appropriate. Breath sound was vesicular with bilateral fine crepitations over both lung fields. Abdomen was soft, non-tender. Other systems revealed no abnormality. He was managed with nothing per oral, I/V fluid, frequent oropharyngeal suction & parenteral antibiotics. Endoscopy of upper GIT was done which revealed a large tracheo-oesophageal fistula about 10 cm from the incisor teeth with gastritis probably due to chemical injury. A medical board was formed by the department of pediatric surgery, thoracic surgery, gastroenterology, pulmonology & they advised to start NG tube feeding & keep the baby in propped up position with OP suction 2 hourly. In spite of all available measures, there was no improvement in baby’s condition rather deterioration. At 10th day of ICU stay, he underwent mechanical ventilation and at 3rd day of ventilator stay, he died in spite of all efforts.

Table-I
Showing change in Complete Blood Count

	Hb gm/dl	WBC/mm ³	Platelet/mm ³	N%	L%	E%	M%	B%
Initially	12.5	19310	635000	71	24	2	2	1
After 7 days	11.2	9500	80000	85	7	5	3	0

Table-II
Showing Serial ABG findings of the child

pH	PCO ₂	PO ₂	HCO ₃	BE	Interpretation
7.26	10.7	166.9	4.7	-22.3	Uncompensated metabolic acidosis
7.51	33.4	49.1	26.3	3.8	Respiratory alkalosis
7.30	43.0	200.3	21.2	-4.8	Respiratory acidosis

Serial X-rays



Discussion

One of the commonly ingested new era foreign bodies, button batteries range in size, but the larger diameter batteries cause the most severe problems.⁴ Esophageal battery impaction is a rare presenting pediatric complaint due to the fact that not all are present immediately following ingestion. So any history of button battery ingestion should be taken seriously and investigated.⁷ Chest radiograph should be done in suspicious cases to rule out when ingestion is not observed. The esophageal coins or button batteries classically appears enface appearance on anterior-posterior view and lateral view will show edge of the coin. The coin will be viewed in opposite position if it is lodged in trachea.

Recent data have shown a growing incidence of button battery ingestion with 7-fold increase in incidence of ingestion associated with fatal outcome in children younger than 4 years old.^{3,8-10}

The presenting symptoms of button battery ingestion can range from being completely asymptomatic to being fatal. In between these ends of the spectrum, symptoms can include GI complaints including vomiting, drooling, dysphagia, odynophagia, and respiratory complaints such as cough, stridor, and

choking.¹¹⁻¹⁴ However, neither the symptoms upon presentation nor the location of impaction within the esophagus is predictive of the presence of esophageal injury.¹⁵ The complications resulting from ingestion are mainly related to the duration of impaction.¹⁶

These objects lodged within the esophagus of a child may lead to esophageal perforation, tracheo-esophageal fistulas, and hemorrhage from arterial fistulization.^{9,10} Many studies have displayed findings that support this theories. Denny et al. showed that foreign bodies in situ for more than 24 hours were more likely to cause esophageal ulceration (46%) as compared to those in situ for less than 24 hours (23%).¹⁵ Similarly Miller et al. concluded that a higher rate of esophageal injury is seen in foreign body ingestion of over one week.¹⁷ Elie et al., Kalyenshetter SS et al. and Banarjee et al. have reported that there was evidence of esophageal mucosal ulceration within 48h of ingestion of button battery.^{12,17,18} Button battery ingestion can cause injury in three primary ways: leakage of caustic alkaline electrolyte; ischemic necrosis caused by direct pressure; and production of external electrolytic current that hydrolyzes tissue fluids creating hydroxide at the negative pole.¹⁹

Significant esophageal damage has been reported as early as two hours post ingestion.³ While both coins and button batteries present as round radiolucent objects on chest radiograph, button batteries are easily distinguished by their characteristic double-rimmed appearance, as seen in the radiographs attached from these cases.²⁰ The children described above have already developed esophageal perforation and acquired tracheo-esophageal fistula as the batteries were removed approximately after 30 hours of ingestion. Studies have demonstrated that the worst anatomic area of impaction is in the esophagus and there is less chance to have an injury from an esophageal battery, if removed within 2 hours of ingestion. The children described above would not have developed such serious complications and would not have died had the button battery been identified within 2 hours and removed early on. This particular case highlights the necessity of having high clinical suspicion and intervention early on.

Conclusion

Button battery ingestions that remain in the esophagus can result in severe complications and death within hours to days. So it is important for physicians to keep ingestion of button batteries in their differential for children presenting with sudden onset of refusal to eat or drink, vomiting, choking, coughing, gagging, retrosternal pain, stridor or respiratory distress. Treatment includes prompt gastrointestinal or ENT consultation for immediate removal by endoscopy to prevent further complications.

Recommendation

Parents of young children should take extra caution in storing small items especially ones that have chemical composition such as batteries which could be ingested by children around the house.

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