

# Delayed Death of a Child Due to Ingestion of Button Battery

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## ABSTRACT

Foreign body ingestion is a frequent complaint in the pediatric emergency. Foreign body ingestions in children are mostly accidental and involve common objects found in the home environment, such as coins, toys, jewelry, magnets, and batteries. Children may present with symptoms like stridor, pain, drooling, fussiness, chest pain, abdominal pain, fever, refusal to feed, wheezing, and respiratory distress, or they may not have any symptoms that may lead to delayed diagnosis, thereby increasing the risk of severe complications.

**Keywords:** Aorta, Oesophagus, Endoscopy, Foreign body, hematemesis.

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## INTRODUCTION

Foreign body ingestion and foreign body aspiration commonly affect young children between 6 months and 6 years.<sup>1</sup> Ingestion of disc or button batteries may have devastating or even fatal consequences and is a growing problem. Injury can occur rapidly and children can be asymptomatic or demonstrate non-specific symptoms until catastrophic injuries develop over hours or days.<sup>2</sup>

Button batteries, also known as coin, or watch cells, are small, disposable single-cell batteries used to power small portable electronic devices. Further, many counterfeit batteries are also available. The safety of batteries has attracted much media and legal attention. Nearly all households have several button battery-powered devices and button batteries themselves, which are not surprisingly readily accessible to young children.<sup>2</sup>

The damage is caused not by the contents of the battery but by the electric current it creates, which causes alkali/acid to build up and burn through the esophagus and into major blood vessels, which can cause fatal bleeding. Central Manchester University Hospital Trust warns that a lot of doctors are unaware that this can cause harm. A significant number of children who ingest a battery suffer severe or fatal injuries.<sup>3</sup>

## Case Report

A three-year-old female child of a poor socio-economic background was brought dead to our institution. There was a history of button-battery ingestion 14 days back. After the ingestion of the button battery by the child at home, the parents gave the child fruits to eat, hoping the battery would be removed while defecating. But on the next day, they reported to a gastroenterologist with dysphagia, who, upon endoscopy, found a food bolus (grape) stuck in the esophagus just above a button battery (Figure 1). The gastroenterologist removed both the battery and the food bolus. No stricture, growth or

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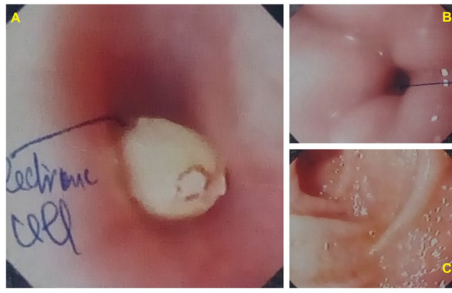
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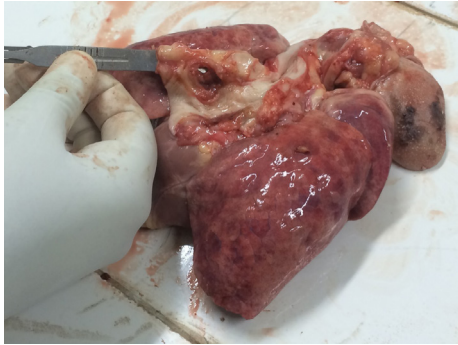
varices were found; the esophagus, stomach and duodenum were grossly normal. The vital signs were within normal limits and physical examination was unremarkable, revealing no sign of drooling, stridor, oral burns, wheezing, respiratory distress or cough. The child was sent home thereafter. Later the child complained of discomfort and frequent chest pain for a few days to the parents, for which no medical advice was taken. Then after 14 days of ingestion of button-battery, the child developed sudden hematemesis and was declared dead on arrival at the hospital.

On post-mortem examination, the body was pale, with blood-stained fluid coming out from the mouth and nostrils. The mouth, larynx and trachea contained blood-stained fluid. The stomach contained blood-stained fluid. Small and large intestines contained brownish to black altered blood and fecal matter. All the organs were pale, grossly. The lower part of the esophagus showed a circular discolored area 1.5cm above the gastro-oesophageal junction. On dissection, the well-circumscribed reddish circular ulcer was present with necrotic tissue on it, further adherent and communicating with descending aorta. (Figure 2) Large blood vessels showed air bubbles in them.

On histopathological examination, an ulcerative site was seen with a hemorrhagic border surrounded by numerous inflammatory cells. In the esophagus, there was an abrupt



**Figure 1:** Upper gastrointestinal endoscopy showing (A) food bolus (grape) seen stuck above a button battery, (B) stomach and (C) duodenum



**Figure 2:** Aorto-oesophageal fistula in gross

transition from the normal squamous epithelium to necrotic granulation tissue. There was a complete absence of the oesophageal wall at this site. Sections from the adherent vessel showed a florid acute inflammatory reaction with numerous neutrophils and eosinophils and with minimal lymphocytes in the adventitial layers.

## DISCUSSION

Modern disk batteries differ greatly in size and composition and may contain quantities of metal oxides, hydroxides, and varying concentrations of other salts. Although present in small amounts, the strongly corrosive effects of the concentrated alkalis in these batteries have been well documented.<sup>4,5</sup> Injuries to children caused by batteries have been documented in the medical literature and by poison control centres for decades. Of particular concern is the ingestion of button batteries, which can lodge in the esophagus, leading to serious complications or death.<sup>6</sup>

Three proposed mechanisms of battery-induced injury include 1) leakage of the caustic alkaline electrolyte; 2) ischemic necrosis caused by direct pressure; and 3) production of an external electrolytic current that hydrolyses tissue fluids, creating hydroxide at the negative pole. Medical experts have attributed severe injuries and death to the latter mechanism when button batteries get lodged in the esophagus rather than passing through the gastrointestinal tract.<sup>6,7</sup>

Typical symptoms associated with battery ingestion are relatively non-specific, making the diagnosis difficult, particularly when ingestions go unwitnessed. These include

vomiting, abdominal pain, fever, diarrhea, respiratory distress, and dysphagia. A battery lodged in the esophagus can cause serious burns in only 2 hours, and fatal hemorrhage has been reported even >2 weeks after endoscopic removal.<sup>6,7,8</sup>

Children with foreign body button cell ingestion are usually asymptomatic and without complications. Due to mucosal edema, dysphagia and odynophagia are very common in these patients. The non-specific symptoms might hinder diagnosis when battery ingestion was unnoticed. The diagnosis of oesophageal battery cell impaction is usually made based on medical history and clinical manifestations. As the management is removing the foreign body under anesthesia, parents should be advised to keep the patient nil per oral. Parents should be informed about the situation's seriousness and instructed not to feed their child anything by mouth. The key to properly managing button battery foreign bodies is rapidly diagnosing and removing any object lodged.<sup>6,9,10</sup>

Foreign bodies frequently lodge in the cricopharyngeal and oesophageal regions because of the point of natural narrowing at 15 and 25 cm, but impaction at this level may have more to do with motility patterns than anatomy. Removal of the battery should be accorded the highest priority to prevent complications.<sup>6,11</sup>

Long-time impaction of a foreign body in the esophagus causes edema of the mucosa, and the oesophageal wall becomes weakened. Retention leads to perforation, which is only a matter of time. Therefore, all foreign bodies retained in the esophagus should be removed as soon as diagnosed. Delay in the removal of lithium battery cells causes leaking of chemicals, mucosal injury due to liquefaction necrosis of mucosa, oesophageal perforation and chance of stricture. The presence of a perforation in association with a foreign body and a mediastinal inflammatory mass should be treated by extraction of the foreign body, enteric but no oral feeding, and antibiotics until healing has occurred as demonstrated by contrast esophagogram.<sup>9,10,12</sup>

Button battery ingestions are the most dangerous form of foreign body ingestion commonly encountered in pediatrics. A multidisciplinary approach is needed to most effectively manage these patients, including emergency medicine, anesthesia, pediatric gastroenterology, pediatric surgery/ cardiothoracic surgery, otolaryngology, interventional cardiology, and radiology. Even after the removal of the battery from the esophagus, there may be an ongoing evolution of the injury for up to several weeks thereafter, placing patients at risk for a catastrophic auto-oesophageal fistula or other severe sequelae. Endoscopic intervention for asymptomatic gastric button batteries remains controversial but may be considered in high-risk patients to evaluate for oesophageal injury.<sup>13</sup>

The Button Battery Task Force has emphasized the need for a collaborative effort of representatives from relevant organizations in industry, medicine, public health, and government to develop, coordinate and implement strategies to reduce the incidence of button battery injuries in children.<sup>2</sup>

## CONCLUSION

To prevent morbidity and mortality due to button batteries, a multi-pronged strategic approach needs to be followed, addressing the industry, public and the medical fraternity, including the various aspects like awareness, education, design, warning labels, packaging.

## REFERENCES

1. Kodituwakku R, Palmer S, Paul SP. Management of foreign body ingestions in children: button batteries and magnets. *Br J Nurs* Mark Allen Publ. 2017 Apr 27;26(8):456–61.
2. Jatana KR, Litovitz T, Reilly JS, Koltai PJ, Rider G, Jacobs IN. Pediatric button battery injuries: 2013 task force update. *Int J Pediatr Otorhinolaryngol*. 2013 Sep;77(9):1392–9.
3. Battery warning after child deaths. *BBC News* [Internet]. 2014 Oct 14 [cited 2018 Apr 9]; Available from: <http://www.bbc.com/news/uk-england-manchester-29610570>
4. Blatnik DS, Toohill RJ, Lehman RH. Fatal complication from an alkaline battery foreign body in the esophagus. *Ann Otol Rhinol Laryngol*. 1977 Oct;86(5 Pt 1):611–5.
5. Kulig K, Rumack CM, Rumack BH, Duffy JP. Disk battery ingestion. Elevated urine mercury levels and enema removal of battery fragments. *JAMA*. 1983 May 13;249(18):2502–4.
6. Centers for Disease Control and Prevention (CDC). Injuries from batteries among children aged <13 years--United States, 1995-2010. *MMWR Morb Mortal Wkly Rep*. 2012 Aug 31;61(34):661–6.
7. Hamilton JM, Schraff SA, Notrica DM. Severe injuries from coin cell battery ingestions: 2 case reports. *J Pediatr Surg*. 2009 Mar;44(3):644–7.
8. Litovitz T, Whitaker N, Clark L, White NC, Marsolek M. Emerging Battery-Ingestion Hazard: Clinical Implications. *Pediatrics*. 2010 May 18; peds.2009-3037.
9. Dawe N, Puvanendran M, Flood L. Unwitnessed lithium ion disc battery ingestion: case report and review of best practice management of an increasing clinical concern. *J Laryngol Otol*. 2013 Jan;127(1):84–7.
10. Sharma VK, Tailor MK, Rawat DS, Verma PC, Aseri Y, Singh BK. Button cell battery as foreign body ingestion in children: A retrospective analysis in a tertiary care center. *Int Multispecialty J Health*. 2017;3(8):286–90.
11. Nandi P, Ong GB. Foreign body in the oesophagus: review of 2394 cases. *Br J Surg*. 1978 Jan;65(1):5–9.
12. Akilov KA, Asadullaev DR, Yuldashev RZ, Shokhaydarov SI. Cylindrical and button battery ingestion in children: a single-center experience. *Pediatr Surg Int*. 2021 Oct;37(10):1461–6.
13. Leinwand K, Brumbaugh DE, Kramer RE. Button Battery Ingestion in Children. *Gastrointest Endosc Clin N Am*. 2016 Jan;26(1):99–118.

