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Button Battery Ingestion in Children: A Retrospective Study from a Tertiary Centre.

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BACKGROUND
Button battery ingestion has become an increasingly important pediatric emergency due to the widespread use of lithium and alkaline button batteries in household electronic devices and children's toys. Although the incidence of battery ingestion per million population has remained relatively stable over the past three decades, data from the National Electronic Injury Surveillance System (NEISS) showed that the absolute number of emergency department visits related to battery-associated injuries more than doubled between 1990 and 2009. (1)The majority of ingestions occur in children younger than six years of age. While many button batteries pass through the gastrointestinal tract uneventfully, severe morbidity and mortality can occur, particularly when the battery becomes impacted within the esophagus.
METHODS:
A retrospective study was done of all children presenting with button battery ingestion between January 2020 and June 2026. Demographic data, battery location, management strategy, time to passage, interventions, and outcomes were analyzed.
RESULTS:
A total of 30 children with confirmed button battery ingestion were included in the study. Twenty-eight patients (93.3%) were managed conservatively and passed the battery spontaneously per rectum without complications, while two patients (6.7%) required intervention. One child required emergency esophageal retrieval because of impacted battery and associated airway compromise, and another underwent upper gastrointestinal endoscopy for persistent gastric retention. Both patients recovered without complications.Among the patients with spontaneous passage, 26 of 28 (92.9%) passed the battery within 36 hours, whereas the remaining two (7.1%) passed the battery within 36–72 hours. No patient required surgical intervention, and there were no esophageal perforations, fistula or deaths. A rare event of spontaneous button battery fragmentation during gastrointestinal transit was observed in one child, in whom the separated inner and outer layers were subsequently passed separately without any evidence of bowel injury.

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CASE 1; A 4-year-old girl was referred to our institution with a history of button battery impaction in esophagus(fig:1). An attempt of endoscopic removal had been made at an outside hospital but was unsuccessful. On arrival, the child was critically ill, with stridor and respiratory distress secondary to severe upper airway edema. Emergency esophagoscopy was performed . The impacted button battery (20mm) was successfully retrieved using a balloon-assisted displacement technique. Extubation was initially unsuccessful because of persistent stridor resulting from airway edema. Consequently, ventilatory support was continued, and the child remained intubated for 28 hours.With continued medical management, including intensive airway monitoring and supportive care, the upper airway edema gradually resolved and the stridor resolved. The child was successfully extubated after 28 hours of ventilatory support and gradually showed progressive clinical recovery. No evidence of esophageal perforation, fistula formation, or other major complications was identified. She was discharged in stable condition after one week of hospitalization.

This case highlights the potentially life-threatening consequences of an impacted esophageal button battery and emphasizes the importance of early recognition, prompt referral, multidisciplinary management. Despite presenting with significant airway compromise, timely intervention resulted in a favorable outcome.

CASE 2: A 3-year-old boy presented with history button battery ingestion. Initial x ray showed a button battery located within the stomach(fig:2). The child was clinically stable and asymptomatic at presentation and was admitted for observation with serial radiographic monitoring. A repeat abdominal x-ray obtained 24 hours after admission showed no progression of the battery from its gastric location. In view of the persistent gastric retention, upper gastrointestinal endoscopy was done. and the button battery(20mm) was successfully retrieved(fig:3). Inspection of the gastric mucosa showed no evidence of erosions, ulceration, or other mucosal injury. The child remained clinically stable following the procedure and tolerated oral feeds without difficulty. He was discharged in stable condition after an uneventful recovery.

This case illustrates the importance of serial radiographic assessment in children with gastrointestinal button batteries. Although most batteries located beyond the esophagus pass spontaneously, persistent gastric retention may necessitate endoscopic retrieval to prevent potential mucosal injury and other complications.

CASE 3: A 2-year-old girl child was brought to our institution with a suspected button battery ingestion. At presentation, the child was clinically stable and asymptomatic, with no history of vomiting, abdominal pain, drooling, respiratory symptoms, or feeding difficulties.X ray revealed 2 radiopaque foreign bodies in lower gastrointestinal tract(fig:4). Initially, the finding was interpreted as possible multiple button battery ingestion. As the child remained asymptomatic and the foreign bodies had already progressed to the distal bowel, she was admitted for observation and serial clinical monitoring.During the hospital stay, the child passed two separate metallic components in the stool. Examination of the retrieved foreign bodies revealed that they represented the inner and outer layers of a single button battery rather than two independently ingested batteries. This finding confirmed spontaneous fragmentation of the button battery during gastrointestinal transit.Throughout her hospital stay, the child remained completely asymptomatic, with no evidence of gastrointestinal bleeding, abdominal pain, vomiting, or signs of mucosal injury. Oral intake was well tolerated, and no intervention was required. She was discharged after confirmation of complete passage of the battery components.

This case represents a rare instance of spontaneous button battery fragmentation within the gastrointestinal tract with subsequent uneventful passage of the separated components.

DISCUSSION

Button battery ingestion remains a significant challenge in pediatric practice because of the potential for rapid tissue injury and severe complications.These batteries can generate electrical current in the presence of mucosal fluid, leading to the production of hydroxide ions and causing alkaline liquefactive necrosis that may progress even after battery removal(2).Visible mucosal injury can develop within 15 minutes of button battery impaction, while more severe tissue damage and potentially life-threatening complications may begin to occur as early as 2 hours after ingestion(3)

The anatomical location of the battery is the most important predictor of clinical outcome. Esophageal button batteries are associated with the highest morbidity and mortality because prolonged mucosal contact can result in deep tissue injury and extension into adjacent structures. Reported complications include esophageal perforation, tracheoesophageal fistula, recurrent laryngeal nerve injury, mediastinitis, esophageal stricture, and catastrophic aorto-esophageal fistula(1). Therefore, current guidelines recommend immediate endoscopic removal of all esophageal button batteries regardless of symptom severity(4).

The management of button batteries that have progressed beyond the esophagus remains an area of ongoing debate. Guidelines from the National Battery Ingestion Hotline (NBIH) and the National Capital Poison Center conventionally recommended conservative management with observation in asymptomatic children with postesophageal button batteries, as the majority of these batteries pass spontaneously per rectum without causing significant injury(5). However, more recent expert opinion–based recommendations from the Endoscopy Committee of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) advocate consideration of endoscopic assessment and removal in high risk patients (age < 6yrs, BB size >20mm), even when the battery has passed beyond the esophagus (1). Our findings are consistent with this risk-based approach, as the majority of button batteries passed spontaneously in our series were small,with diameters of approximately 9-12mm, whereas the larger battery size (20mm) required interventions .

Importantly, the risk of complications does not end after removal of an esophageal button battery, as tissue necrosis may continue to progress due to ongoing alkaline injury(1). Delayed catastrophic hemorrhage secondary to aorto-esophageal fistula (AEF) has been reported days to weeks after ingestion, even in children who had mnormal esophagogram findings(1) . Therefore, meticulous post-removal surveillance is essential. NASPGHAN recommends CT angiography or chest MRI following button battery removal when esophageal injury is identified or suspected(5) . Additionally, proton pump inhibitor therapy for approximately one month may be considered to facilitate mucosal healing, due to the possibility of delayed progression of esophageal injury even after successful battery extraction.

In our series, the majority of children (93.3%) were successfully managed conservatively, consistent with previous reports demonstrating that batteries which have passed beyond the esophagus usually traverse the

gastrointestinal tract without complications. Furthermore, spontaneous passage occurred rapidly in most patients, with nearly 93% of batteries passing within 36 hours.

Only two children required intervention. The child with esophageal impaction represented the most severe presentation, with significant airway compromise manifested by stridor and respiratory failure requiring ventilatory support. Despite the severity of presentation, timely multidisciplinary intervention resulted in complete recovery without long-term sequelae.

The second intervention was done for persistent gastric retention. Although gastric batteries carry a lower risk of injury than esophageal batteries, prolonged retention may require endoscopic removal, when serial imaging demonstrates failure of progression beyond stomach.

Interestingly, both patients requiring intervention swallowed large sized batteries(size 20mm). Larger lithium batteries, particularly those measuring 20 mm or greater, have been associated with a higher incidence of impaction and significant complications(6) .In contrast the majority of the battery that passed spontaneously in our series were relatively small, with diameters of approximately 5-12mm.This observation may reflect the recognized association between larger-diameter batteries and increased risk of esophageal impaction .

The most unique aspect of our series was the occurrence of battery fragmentation within the gastrointestinal tract. To our knowledge spontaneous battery fragmentation during intestinal transit are not reported in the literature. The mechanism responsible for fragmentation remains uncertain but may involve degradation of the battery casing secondary to exposure to gastrointestinal secretions during transit.

The findings of our study reinforce the need for preventive strategies. Button battery ingestions are entirely preventable events.While a complete ban may not be practical due to the widespread industrial and medical use of these batteries, manufacturers should prioritize to use smaller sized button batteries(less than 10mm) in consumer devices. Smaller sized batteries may be less likely to become impacted in esophagus and facilitated uncomplicated passage in our series and in other published studies. Use of child resistant button battery compartments in electronic devices and child's toys may also reduce the incidence. In addition establishment of national surveillance system similar to the National Battery Ingestion Hotline (NBIH) in the USA may facilitate systemic monitoring and improve preventive strategies.

CONCLUSION

Button battery ingestion in children remains a medical emergency due to its rapid and severe complication , particularly when it becomes impacted in esophagus. Our study underscores that the anatomical location and size of the battery are the determinants of clinical outcome. The majority of post esophageal batteries (especially battery size less than 10 mm) can be managed conservatively with close monitoring and serial radiological surveillance. In contrast, larger batteries (around 20 mm) were associated with esophageal impaction and failure of gastric progression requiring interventions .Careful clinical assessment, serial radiological monitoring, adoption of established management guidelines, preventive measures may help to reduce the burden of this largely preventable pediatric emergencies.

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FIGURES:

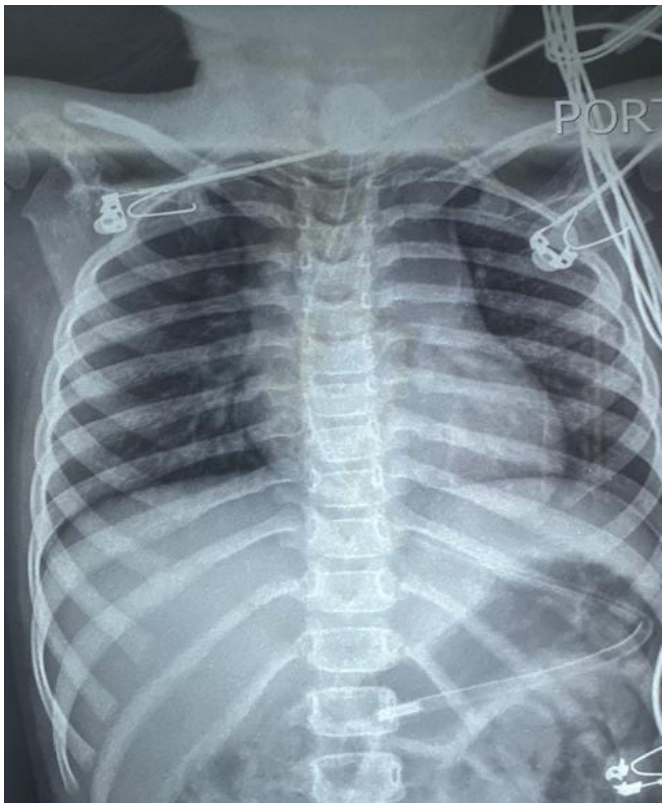

FIG 1: X ray shows Button battery in upper esophagus

FIG 2: :X ray shows button battery in stomach

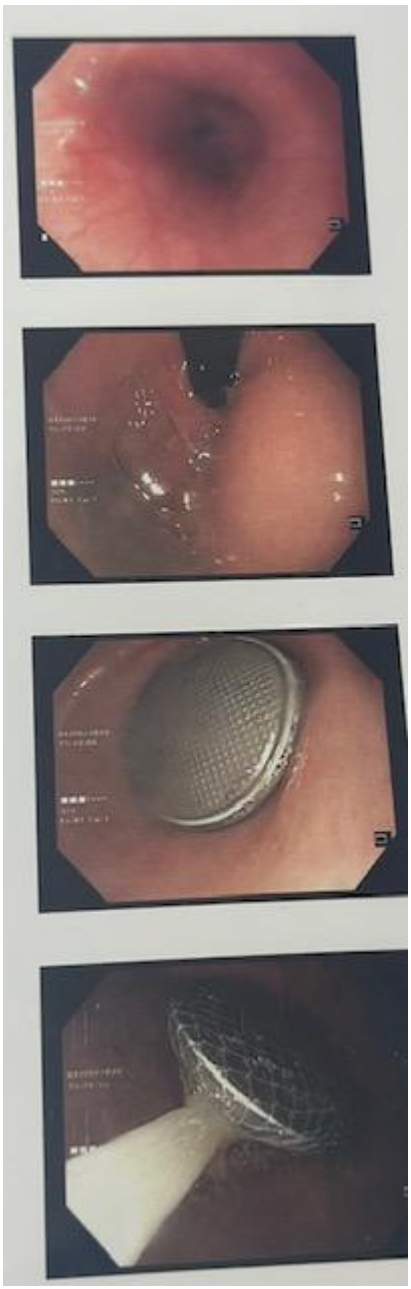

FIG 3 ; Endoscopic image shows foreign body in stomach

FIG 4: X ray shows fragmented button batteries in lower GI tract