

POISON PEARLS



Toxicology Topics for the Healthcare Team of a Poisoned Patient

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Button Battery Ingestion

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Background

Button batteries are small disc batteries typically ranging from 5-25 mm in diameter, most often used in toys, calculators, watches, hearing aids, and small electronic devices. Larger batteries (diameter of >20 mm) carry a heightened risk if ingested. If a battery becomes lodged in sites such as the esophagus, nasal cavity, or auditory canal, severe and potentially irreversible tissue damage can occur within as little as two hours. However, the majority of ingestion incidents typically follow a benign clinical trajectory.

Mechanisms of Injury

There are three interacting mechanisms of injury:

- 1. Electrolytic Current and Hydroxide Generation:** The primary mechanism of injury involves the generation of an external electrolytic current, which hydrolyzes tissue fluids, producing hydroxide at the battery's negative pole. Notably, higher voltage and larger diameter lithium cells produce hydroxide more rapidly.
- 2. Chemical Injury:** Tissue damage occurs due to leakage of alkaline electrolytes, particularly in the esophagus. Leakage can begin within as little as two hours in the gastric environment.
- 3. Pressure Necrosis:** The physical pressure exerted by the button battery can compress and damage adjacent tissue, resulting in localized necrosis ([Litovitz et al., 2010](#)).

Clinical Presentation Post Ingestion

Patients without airway involvement will likely be asymptomatic early on, but may later develop pain, drooling, vomiting, chest discomfort, difficulty swallowing, and refusal to eat or drink. Internal tissue damage via the above mechanisms is more likely the longer the battery is retained ([Tran, C. et al., 2024](#)).

Initial Treatment

At home, if the child is >12 months old and ingestion is within 12 hours, 10 mL of honey can be given every 10 minutes up to 6 doses which can slow the development of battery injury, but won't stop it from occurring (use commercial honey rather than specialized or artisanal honey). It is important to note that this should not delay immediate transport to the ED. At the hospital, honey can also be used, or 1 g sucralfate can be administered every 10 minutes up to 3 doses which could prevent battery-induced pH increase and could decrease the depth of the resulting esophageal injury ([Anfang, R. et al., 2019](#)).

Imaging and Removal

- Initial Assessment:** Patients should remain NPO until anteroposterior and lateral radiographs are obtained to determine the position and orientation of the battery's positive and negative poles. Do not administer activated charcoal. On imaging, a button battery typically displays a double-rim or "halo" effect, although this feature may diminish as the battery corrodes, potentially causing it to be mistaken for a coin.
- Management Based on Battery Location:**
 - In the Esophagus:** Button batteries lodged in the esophagus must be urgently removed via endoscopy.
 - Beyond the Esophagus:** If the battery has passed into the gastrointestinal tract beyond the esophagus and the patient is asymptomatic, they may be discharged home. Button batteries located from the stomach to the colon typically do not require emergent removal and can be allowed to pass naturally. If retained in the stomach, a follow-up x-ray 3-4 days post-ingestion may confirm its movement.
- Post-Removal Care:** Following esophageal removal, the area may be irrigated with 50-150 mL of 0.25% sterile acetic acid to neutralize residual alkali ([Jatana et al., 2017](#)). Patients with evidence of mucosal injury require monitoring for delayed complications post removal. Delayed tracheoesophageal fistula (9 days), aortic esophageal fistula (28 days), mediastinitis, vocal cord paralysis, tracheal stenosis, tracheomalacia, aspiration pneumonia, lung abscess and pneumothorax have been reported ([Litovitz et al., 2010](#)).



Key Points:

- Diameter ≥ 20 mm batteries pose the greatest risk of getting stuck when ingested
- There are three interacting mechanisms of injury
 - Electrolytic current
 - Chemical injury
 - Pressure necrosis
- Patients will likely be asymptomatic early on, but may show signs and symptoms later including:
 - Pain
 - Drooling
 - Vomiting
 - Chest discomfort
 - Difficulty swallowing
 - Refusal to eat
- A double rim of "halo" effect is an easily recognized feature of button batteries on an x-ray
- Honey may be given to slow the development of battery injury but it won't stop the injury from occurring

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