

Focus on Subspecialties: Concerns mount for catastrophic injury in children who ingest button batteries

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Jenifer R. Lightdale, M.D., M.P.H., FAAP; Kris R. Jatana, M.D., FAAP

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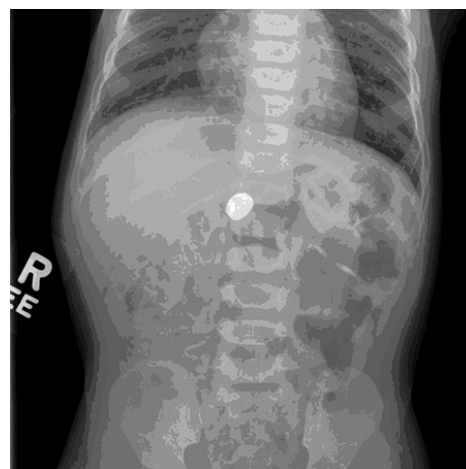
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Health care professionals should recognize that button batteries, such as those found in portable reading lights, car key remotes and MP3 players, represent a significant hazard if ingested by a child — with serious complications occurring even after the battery is removed.

Button battery ingestion can involve development of an aortoenteric fistula leading to catastrophic hemorrhage. Although this injury generally is associated with esophageal battery impaction, a recent report from Children's Hospital of Colorado highlights a growing experience with delayed development of fistula from the esophagus to the aorta that can occur more than two weeks after ingestion (Leinwand K, et al. *Gastrointest Endosc Clin N Am.* 2016;26:99-118).

Health care professionals should recognize that button batteries, such as those found in portable reading lights, car key remotes and MP3 players, represent a significant hazard if ingested by a child. Photo courtesy of Robert E. Kramer, M.D.

“Recognition of a button battery in the stomach, intestines or colon on X-ray does not give clinicians information about how long the battery may have been in the esophagus prior to passing through the lower esophageal sphincter,” said Robert Kramer, M.D., senior author of the paper.



Dr. Kramer also cites growing evidence that commonly available lithium button batteries are very powerful and can do significant damage in remarkably short periods of time, with persistence or progression of tissue damage even after removal.

Button batteries are particularly dangerous when they become entrapped in the digestive tract. The mucosa bridges the positive and negative terminals of the battery, allowing electrical current to flow, increasing mucosal pH and causing coagulative necrosis of surrounding tissues. This process has been demonstrated to start within 15 minutes of contact. If a battery is impacted in the esophagus, necrosis can extend through to adjacent tissue such as the trachea or great vessels.

While the rate of battery ingestion (per million population) has been stable in children over the past 30 years, data from the National Electronic Injury Surveillance System show the absolute number of emergency

department visits for battery-related injury has more than doubled from 1990 to 2009. In addition, the rate of significant complications and death resulting from button battery ingestion has increased almost seven-fold.

The dramatic rise in button battery injury over the past 15 years can be attributed to two factors: voltage and size. Lithium cells typically are 3 volts and 20-25 millimeters (mm) in diameter, compared to the 1.5 voltage and less than 15 mm size of traditional alkaline button batteries.

A review of the most serious outcomes between 2000-'09 suggests they most often were due to lithium cells with diameters greater than 20 mm and were more likely to occur in children younger than 5 years of age. In addition, 50% of the most serious events occurred after unwitnessed ingestions, which likely led to delay in recognition and diagnosis.

Button batteries with diameters less than 15 mm also have caused serious injuries in children; these have been lodged in the esophagus of children under 12 months of age and easily placed into the nose or ear canal.

The recent paper from Colorado provides a testament to tragedies that can ensue from button battery ingestion in pediatric populations. The authors describe 13 cases of button battery ingestion over four years with four resulting in esophageal perforation and three developing esophageal strictures. Four of the 13 patients died after ingestion. All four previously had been healthy, and two of the fatalities had presented with the button battery already passed beyond the esophagus.

Data from the National Capital Poison Center indicate that the great majority of fatalities are due to fistula into great vessels. Such injuries have proven extremely difficult to manage even when recognized, with almost no reports of successful rescue once an aortoenteric fistula has developed.

The Colorado report joins others in underscoring the importance of prompt recognition and multidisciplinary intervention to maximize potential for patient survival after button battery ingestion.

The Academy is participating in a Button Battery Task Force that has been bringing together medical, industry and patient advocacy groups on a biannual basis since 2014 to address the issue and to advocate for appropriate solutions (www.aap.org/buttonbattery). One goal is development of new battery technologies that should render them safe within the human digestive tract. Other efforts include ensuring that manufacturers provide safe compartments for products containing button batteries to reduce chances of access by children.

In the meantime, it is imperative that all who work in the clinical setting have an increased awareness of the complexity and potential severity of this type of ingestion and be familiar with [guidelines](#) from the National Battery Ingestion Hotline. Finally, all pediatricians can help in creating public awareness by educating families about the dangers of all button batteries and encouraging them to keep them out of children's reach.

Dr. Lightdale is chair of the AAP Section on Gastroenterology, Hepatology and Nutrition Executive Committee. Dr. Jatana is a member of the AAP Section on Otolaryngology-Head and Neck Surgery.

Resources

- [Simulation of full wall thickness esophageal damage caused by button battery-induced coagulative necrosis in roast beef](#)
- [AAP News Parent Plus article "Button batteries can cause injuries, death if swallowed"](#)