

- Facebook
- Twitter
- LinkedIn
- Favorites
- Permissions
- More
  - Cite
  - Permissions
  - Image Gallery

Toxicology Rounds

# Toxicology Rounds: Lessons from the Courtroom: Pediatric Button Battery Ingestions

Gussow, Leon MD

Emergency Medicine News: November 2010 - Volume 32 - Issue 11 - p 6

doi: 10.1097/01.EEM.0000390644.48203.b1

Metrics



Image:

Image

*This is the second in a series about medical malpractice cases related to issues in toxicology.*

A 2-year-old boy was brought to the emergency department because of apparent discomfort and difficulty swallowing. The mother thought he might have swallowed something, although she did not actually witness the ingestion.

On initial evaluation, the child's vital signs were unremarkable. He exhibited occasional gagging and coughing, but the airway was intact, and breathing did not appear to be compromised. An AP chest radiograph demonstrated a round seemingly metallic object in the esophagus approximately the size of a nickel. A pediatric gastroenterologist was called to perform endoscopic removal of a coin from the esophagus. After consultation over the phone, it was decided that the child should be admitted to hospital and that the procedure would be done the next morning (16 hours later).

The next morning the gastroenterologist performed the endoscopy, and removed a lithium cell battery. The child subsequently developed a tracheoesophageal fistula that was treated with surgery and multiple dilatations. The child's parents filed a medical malpractice case, claiming that the physician should have known that the round structure on the x-ray could have been a battery, that material leaking from the battery caused the esophageal damage, and that the endoscopy to remove it should have been done earlier.

The defendants claimed the mother stated that the object was most likely a coin, and assuming that was the case was not unreasonable. They denied negligence or breaching the standard of care, and argued that the damage was not caused by acid but by electric current emitted from the battery.

The jury ruled for the defense.

Ingestion of button batteries by young children is not uncommon, and has the potential to turn into real medical disasters, especially if the battery gets lodged in the esophagus. The physician faces a number of challenges in these cases, beginning with the difficulty of actually making the diagnosis. Often, as in this case, the ingestion was not witnessed, and the child may present with nonspecific gastrointestinal or respiratory symptoms, such as coughing, dyspnea, vomiting, dysphagia, reluctance to eat, diarrhea, and abdominal pain. When a chest radiograph is obtained, the battery is easily mistaken for a coin, especially if the object is not carefully inspected on at least two views.

Object	Diameter
Pencil eraser	6-7 mm
Dime	18 mm
Penny	19 mm
Lithium cell battery	20 mm
Nickel	21 mm
Quarter	24 mm

Source: Pediatrics 2010;125(6):1168.

Diameter of Commonly Swallowed Objects:

Diameter of Commonly Swallowed Objects

An excellent recently published review of button battery ingestions notes an almost sevenfold increase in the percentage of these cases resulting in a major clinical outcome or fatality from 1985 to 2009. (*Pediatrics* 2010; 125[6]:1168.)

Several factors account for this. With the proliferation of portable electric devices of all sorts, button batteries have become ubiquitous, and the very common and dangerous 20 mm lithium cell has a voltage (3V) twice that of many of its predecessors. Many physicians are still not aware that a button battery stuck in the esophagus is a true medical emergency, where time is of the essence.

These batteries can injure the esophagus in several ways. Pressure from the foreign object causes physical trauma, although this seems to be a relatively minor consideration. Although leakage of alkaline material from the battery can contribute to esophageal damage, this seems not to be a major factor when dealing with lithium cells. By far the most important mechanism of injury is production of an electric current at the *negative* pole of the battery. This produces hydroxyl ions (OH), which cause most of the damage. Even spent batteries can produce enough current to result in catastrophic injury.

A disc battery has a step-off, with one surface being slightly wider than the other. (See picture.) It is easy to determine which surface is negative by remembering the "Rule of the 3-Ns." The **n**arrow surface is **n**egative and causes **n**ecrosis. Because of this step-off, an x-ray view lateral to the object can help distinguish a battery from a coin. In a straight-on view, a double-density or halo effect may be apparent. Objects larger than a penny are of special concern. (See table.)

Complications of disc battery ingestion include perforation or stenosis of the esophagus, tracheoesophageal fistula, and vocal cord paralysis (from damage to the recurrent laryngeal nerves). The most devastating injury is erosion into the aorta, which can cause sudden hemorrhage and exsanguination that has been reported to occur as long as 18 days after battery removal. Because tissue damage can continue even after extraction of an impacted battery, these children have to be observed carefully for days or weeks after the procedure.

Treatment involves endoscopic removal of the battery as rapidly as possible. During the procedure, the esophageal mucosa can be inspected to determine extent of injury. Early removal is crucial because major sequelae have been reported after only two hours of impaction. Although blind removal using a balloon catheter or magnet is not recommended, no studies have been done evaluating whether this may improve outcome if there will be an unavoidable delay before endoscopy can be performed.

In the past, these cases were occasionally associated with heavy metal toxicity because batteries formerly contained mercuric oxide. Since passage of the U.S. Mercury-Containing and Rechargeable Battery Management Act of 1996, this is not a major concern. A case of clinically significant lithium toxicity caused by battery ingestion has never been reported.



Dr. Gussow:

is a voluntary attending physician at the John H. Stroger Hospital of Cook County in Chicago (formerly Cook County Hospital), an assistant professor of emergency medicine at Rush Medical College, and a consultant to the Illinois Poison Center. He is also the editor of his own blog, The Poison Review ([www.thepoisonreview.com](http://www.thepoisonreview.com)).

Guidelines on triaging and treating button battery ingestions are available from the National Battery Ingestion Hotline of the National Capital Poison Center at [www.poison.org/battery/guideline.asp](http://www.poison.org/battery/guideline.asp).

*Comments about this article? Write to EMN [atemn@lww.com](mailto:atemn@lww.com).*

**Click and Connect!** Access the links in this article by reading it on [www.EM-News.com](http://www.EM-News.com).

Copyright © 2010 Wolters Kluwer Health, Inc. All rights reserved.

[View full article text](#)

[Comment](#)

No comments yet. Be first to comment.

[^Back to Top](#)



Never Miss an Issue