

Management of a Pseudoaneurysm After Carotid-Esophageal Fistula Repair Secondary to Button Battery Ingestion in an Infant

Michal T. Ruprecht, BS¹, Vanesa Carlota Andreu Arasa, MD, PhD^{2,3}, Luisa Fernanda Atunes Ortega, MD⁴, and Alcy R. Torres, MD^{5,6}

¹Wayne State University School of Medicine, Detroit, MI

²Department of Radiology, VA Boston Healthcare System, Boston, MA

³Department of Radiology, Boston University Chobanian and Avedisian School of Medicine, Boston, MA

⁴Division of Epilepsy and Clinical Neurophysiology, Department of Neurology, Boston Children's Hospital and Harvard Medical School, Boston, MA

⁵Division of Pediatric Neurology, Department of Pediatrics, Boston Medical Center, Boston, MA

⁶Department of Pediatrics, Boston University Chobanian and Avedisian School of Medicine, Boston, MA

ABSTRACT

Button battery ingestion is a significant cause of pediatric foreign body emergencies, often leading to severe complications. We present the case of an infant who developed a left common carotid-esophageal fistula after button battery ingestion, which was further complicated by the formation of a pseudoaneurysm. The diagnosis was confirmed through follow-up imaging, and the pseudoaneurysm was successfully treated using a flow diversion stent. The patient remained clinically stable without neurological deficits. This case underscores the critical importance of early diagnosis and intervention to prevent life-threatening complications such as hemorrhage and stroke. In addition, it highlights the necessity of follow-up imaging studies, even in asymptomatic patients, to monitor for delayed complications and inform ongoing management.

KEYWORDS: Button battery; ingestion; carotid fistulae; pseudoaneurysm

INTRODUCTION

Button battery (BB) ingestion (BBI) represents a clinically significant portion of foreign body ingestion emergencies in children.¹ BBs pose a unique challenge several factors: their ubiquity, ease of removal from electronic devices, and size, which allows them to become lodged in the esophagus.² BBI outcomes can be further complicated by the electrolyte-rich esophageal environment, asymptomatic or nonspecific symptoms in children with ingestions that are unwitnessed, and the rapid progression of injury.³ Finally, it has been reported that certain cases of BBI are associated with morbidity and mortality even after BB removal.¹ Although most cases of BBI are benign, certain instances—namely those lodged in the esophagus—can present with serious injury and require removal.⁴ Damage can occur to the upper airways, nearby blood vessels, and mediastinal structures, resulting in arterio-esophageal fistulas (AEFs), tracheo-esophageal fistulas, esophageal perforation, and spondylodiscitis.⁵ The increased prevalence of household items requiring BBs and the use of larger-diameter BBs with higher voltage lithium cells have led to an increase in the proportion of BBIs with major or fatal outcomes.⁶ BBs are currently thought to induce tissue damage through an isothermic hydrolysis reaction that leads to a highly alkaline environment, resulting in liquefactive necrosis.⁷ Severe damage can occur within 2 hours of ingestion, resulting in a race against the clock.³ We describe the presentation and management of a carotid-esophageal fistula secondary to BBI.

CASE REPORT

A 13-month-old, previously healthy male patient, presented to the emergency department with cough, congestion, rhinorrhea, and poor oral intake lasting for several days. He had no medical or surgical history and did not take any home medications regularly. On

admission, the patient was tachycardic and febrile. A workup including complete blood count, basic metabolic panel, and hepatic function were unremarkable. During monitoring, the patient had a self-limited, 1-minute generalized tonic-clonic seizure with an episode of epistaxis and hematochezia. Two normal saline boluses and red blood transfusions were given, followed by a broad diagnostic workup with chest radiography and head computed tomography. Intravenous vancomycin was administered for empiric coverage of bacterial meningitis. Head computed tomography was unremarkable, and chest radiography showed a foreign body in the esophagus that appeared to be a button battery (Figure 1). After the discontinuation of vancomycin, a left common carotid-esophageal fistula was diagnosed (Figure 2); the diagnosis was delayed because of ingestion unwitnessed and the ambiguous initial symptoms. Emergent interventions were performed, including endoscopic removal of the battery and modified barium swallow procedure to evaluate aspiration/penetration of various consistencies, which showed no penetration or aspiration with a sippy cup. There was shallow penetration with an open cup. In addition, sternotomy to repair the fistula and carotid artery with a bovine graft were performed. Postoperative imaging revealed a pseudoaneurysm (1.4 cm × 1.8 cm) in the proximal left common carotid artery (Figure 3). Follow-up imaging 8 months later demonstrated expansion. The patient was treated for the pseudoaneurysm with a flow diversion stent. He was subsequently admitted to the medical-surgical

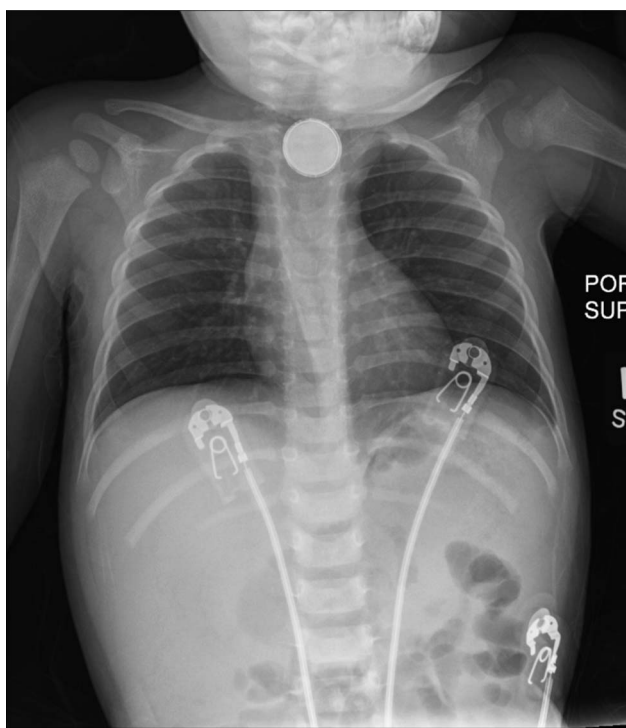


Figure 1. Chest radiograph. Ovoid radio-opaque foreign body lodged in the upper mediastinum, consistent with a button battery. Battery impaction in the upper esophagus carries a high risk of causing corrosive injuries, such as mucosal burns, perforation, stricture, fistula formation, and vocal cord paralysis.

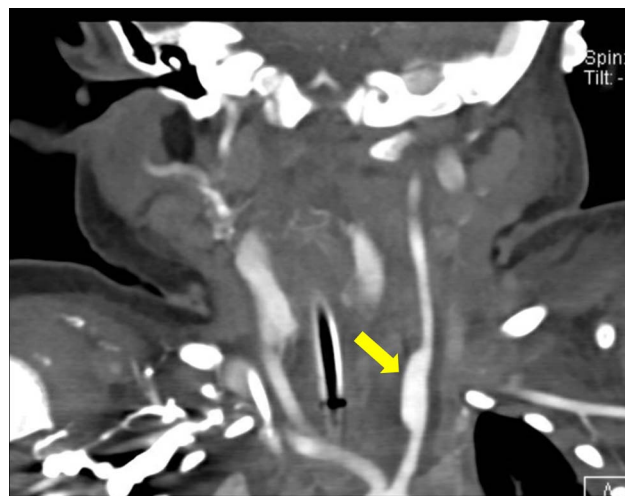


Figure 2. Coronal image of computed tomography angiography of the neck demonstrates a fusiform dilation of the left proximal common carotid artery, indicating a pseudoaneurysm (arrow), after the repair of the vascular wall injury with a bovine graft.

intensive care unit, where he was started on aspirin and clopidogrel for 6 months. The patient remained hemodynamically stable with no neurological deficits. Follow-up imaging with magnetic resonance imaging and magnetic resonance angiography 3 months showed a patent stent and 24 months later, he remains symptom-free.

DISCUSSION

Our case highlights the challenges posed by BBI in pediatric patients, especially when complications such as carotid-esophageal fistulas occur. The implications of this case include significant morbidity and potential mortality because of massive hemorrhage, infection, airway compromise, stroke, and seizures. AEFs can occur at any level of the esophagus, including fistula with the aorta, carotid, subclavian, and thyroid arteries. Although aorto-esophageal fistulas are more commonly reported, it is important to develop evidence-based approaches to carotid-esophageal fistulas. We hypothesize that several factors may have led to the BB lodging in the cervical esophagus rather than in the thoracic esophagus. Principally, the narrowing of the upper esophagus at the level of the cricopharyngeus muscle and decreased propulsive peristalsis in this region may have contributed to the location of the AEF.

The presentation of this case is uncommon and underscores the potential for life-threatening consequences even after surgery. In addition to the primary complication, delayed sequelae highlight the potential for delayed complications from BBI-induced vascular injury and the need for follow-up. These factors emphasize the need for early diagnosis and intervention to prevent life-threatening complications, aligning with previous studies that stress this importance.^{2,3,5} National Capital Poison Center guidelines recommend endoscopic removal



Figure 3. Coronal (A) and lateral (B) image of maximum intensity projection of magnetic resonance angiography shows the aneurysmal dilation of the left common carotid artery repaired with bovine graft.

of the BB rather than balloon catheter or magnet-assisted removal.⁸ Of significant importance is the immediate removal of the BB within 2 hours of diagnosis, as recommended by the North American Society of Pediatric Gastroenterology, Hepatology, and Nutrition.⁹ Before removal, anterior-posterior and lateral x-rays are important to evaluate the positioning of the BB because damage is more significant if tissue is adjacent to the negative pole.⁸ A multidisciplinary surgical intervention, such as in this case, involves the repair of the esophageal and vascular defect with graft placement, which often requires cardiopulmonary bypass for large vessel involvement.¹⁰ Although an endovascular approach with covered stent placement is a less invasive alternative to bovine graft repair, the technique is considered a temporizing measure because of the risk of stent failure and infection secondary to enteric contamination.¹¹ Although the patient's initial repair was successful, he later developed a pseudoaneurysm, which is a well-documented complication of vascular graft placement.¹² Pseudoaneurysms secondary to this intervention typically develop because of ongoing esophageal leakage, infection, or mechanical stress at the anastomotic site. Our patient's hemodynamic stability, imaging, and unremarkable labs suggest the complication arose because of mechanical stress. Therefore, long-term surveillance imaging with computed tomography angiography or magnetic resonance angiography is important to ensure early detection of progressive vascular changes. This is especially important among pediatric patients, whose vessels have greater plasticity and remodeling potential, which is helpful for long-term healing but can also lead to complications such as vascular stenosis or pseudoaneurysm formation. When evaluating a pediatric patient with BBI-induced carotid-esophageal fistula, we argue for postoperative follow-up imaging to assess for additional sequelae. Early intervention and surgical repair of the fistula may have prevented further complications. Future

studies should aim to establish guidelines for children with similar presentations.

DISCLOSURES

Author contributions: MT Ruprecht: data curation, literature review, and drafting the original manuscript; VC Andreu Arasa and LF Atunes Ortega: supervision, reviewing, and editing original draft; AR Torres: supervision, reviewing, editing original draft, and is the article guarantor.

Financial disclosure: None to report.

Informed consent was obtained for this case report.

Received March 29, 2025; Accepted July 15, 2025

REFERENCES

1. Leinwand K, Brumbaugh DE, Kramer RE. Button battery ingestion in children: A paradigm for management of severe pediatric foreign body ingestions. *Gastrointest Endosc Clin N Am*. 2016;26(1):99.
2. Litovitz T, Whitaker N, Clark L. Preventing battery ingestions: An analysis of 8648 cases. *Pediatrics*. 2010;125(6):1178–83.
3. 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;77(9):1392–9.
4. Litovitz T, Whitaker N, Clark L, White NC, Marsolek M. Emerging battery-ingestion hazard: Clinical implications. *Pediatrics* 2010;125(6):1168–77.
5. Gibbs H, Rhoades K, Jatana KR. Clinical guidelines and advocacy for the reduction of pediatric button battery injuries. *Clin Pediatr Emerg Med* 2020; 21(2):100775.
6. Ferrante J, O'Brien C, Osterhout C, Gilchrist J. Injuries from batteries among children aged <13 years--United States, 1995-2010. *MMWR Morb Mortal Wkly Rep*. 2012;61(34):661–6.
7. Jatana KR, Barron CL, Jacobs IN. Initial clinical application of tissue pH neutralization after esophageal button battery removal in children. *Laryngoscope* 2019;129(8):1772–6.

8. National Capital Poison Center. *Button Battery Ingestion Triage and Treatment Guideline*. Washington, DC: National Capital Poison Center; 2010.
9. Kramer RE, Lerner DG, Lin T, et al. Management of ingested foreign bodies in children: A clinical report of the NASPGHAN Endoscopy Committee. *J Pediatr Gastroenterol Nutr* 2015;60(4):562–74.
10. Saha A, Berg EA, Lerner D, et al. Management of vascular complications from button battery ingestions. *Curr Gastroenterol Rep* 2025;27(1):2.
11. Wilson WR, Bower TC, Creager MA, et al. Vascular graft infections, mycotic aneurysms, and endovascular infections: A scientific statement from the American Heart Association. *Circulation* 2016;134(20):e412–e460.
12. Reddy SM, Lander AD, Stumper O, Botha P, Khan N, Pacht M. Esophago-vascular fistulae in children: Five survivors, literature review, and proposal for management. *J Pediatr Surg* 2023;58(10):1969–75.

Copyright: © 2025 The Author(s). Published by Wolters Kluwer Health, Inc. on behalf of The American College of Gastroenterology. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.