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Case Study

High Grade Esophageal Stricture Following Disk Battery Ingestion: A Novel Approach to Re-Establishing the Esophageal Lumen

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Abstract

Foreign body ingestions are a common pediatric problem. Among foreign body ingestions, button battery ingestions are becoming increasingly more prevalent as small electronic consumerism continues to grow. Unfortunately, many button battery ingestions are unwitnessed by parents and delayed presentation may lead to severe outcomes including esophageal perforation, esophageal stricture formation, and the creation of tracheo-esophageal fistulas. Here, we present the case of a 32-month old patient who presented for evaluation after an unwitnessed button battery ingestion. The patient developed a high grade inflammatory esophageal structuring requiring lateral neck dissection for battery removal and stricture management. Her hospital course was further complicated by re-stricturing of the esophagus requiring a novel retrograde endoscopic approach to reestablish her esophageal lumen.

Keywords: Pediatric; Foreign Body; Ingestions; Button Battery

Introduction

Foreign body ingestion is a common pediatric complaint. Button battery ingestions are increasingly common due to small electronics consumerism, and ingestion of button batteries now exceeds 2% of all foreign body ingestions at >8600 cases per year [1,2]. Complication rates associated with the ingestion of these foreign bodies similarly increase.1,2 Button battery ingestion poses a risk for serious complications such as esophageal perforation, stricture and the formation of tracheo-esophageal fistulas [3]. Often these ingestions are not witnessed by parents resulting in delayed diagnosis producing severe outcomes. We present the case of a 32-month-old African American female's unobserved button battery ingestion, resulting in a high-grade esophageal stricture. Though esophageal structuring secondary to delayed diagnosis has been reported previously in literature, this patient's course was complicated by postoperative restricturing requiring a novel retrograde endoscopic approach to reestablish her esophageal lumen. The described technique was completed successfully and without complications.

Case Report

A 32-month-old African American female presented to her primary care physician with a one-month history of intermittent wheezing and non-productive cough. According to her mother, the child began experiencing a "rattle in her chest" with a nighttime cough. The patient had no prior history of asthma, vomiting, diarrhea, bloody stools, rhinorrhea, ear pain, or foreign body ingestion. Her pediatrician prescribed Budesonide for presumed asthma as well as Ranitidine for suspected reflux.

The child was lost to follow-up over the subsequent four weeks but continued to experience intermittent wheezing and coughing despite adhering to medication. During this interval, the patient also developed progressive dysphagia to solids and liquids, intermittent vomiting, and a four-pound weight loss, which were new

symptoms not present at the time of initial presentation. Upon return visit, a chest radiograph revealed the presence of a radiopaque foreign body lodged in the proximal thoracic esophagus (Figures 1,2). CT confirmed what appeared to be a small, round, metal object located in the esophagus with marked narrowing of the airway and significant edema. Upper endoscopy further revealed a high-grade inflammatory proximal esophageal stricture that appeared to completely encompass the foreign body, preventing identification and removal (Figure 3).

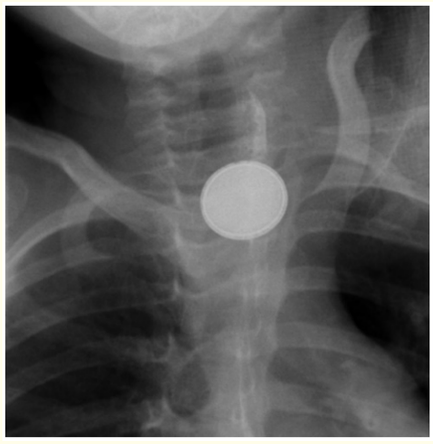

Figure 1: Chest radiograph of the foreign body in thoracic esophagus.

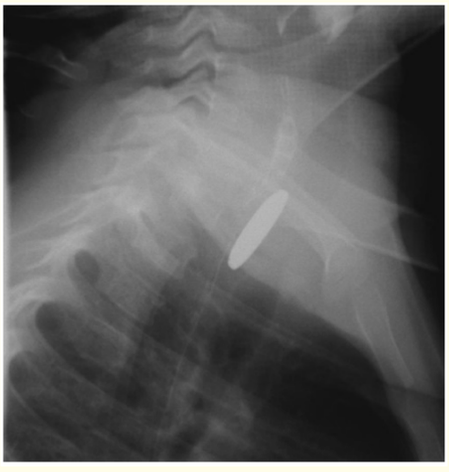

Figure 2: Lateral view of the foreign body.

Figure 3: Initial Endoscopic view of eroded foreign body (two o'clock) with overlying.

After a failed attempt at foreign body removal via antegrade endoscopy, Pediatric Surgery was consulted, and the patient was brought to the operating room for retrograde esophagoscopy via surgical gastrostomy incision. A neonatal gastroscope was inserted into the gastric lumen via surgical incision in the anterior abdominal wall and then advanced in a retrograde fashion through the lower esophageal sphincter into the proximal esophagus where the object was identified. Object visibility improved with a retrograde approach and the foreign body was grasped with forceps but could not be detached endoscopically despite multiple attempts with intermittent use of minimal forceps dissection to loosen the object. A high grade inflammatory stricture fully encompassed the button battery. Surgical lateral neck dissection by ENT was therefore necessary. A 1.5 cm button battery was discovered strongly adhered within the anterior esophageal mucosa and was successfully removed. A central line and surgical gastrostomy tube were also placed to allowed for empiric IV antibiotic therapy and future nutritional needs during recovery.

After a two-week hospital course, the patient was discharged home on a soft diet supplemented with gastrostomy feedings. However, 2 weeks later (4 weeks postoperatively) the patient presented with complaints of vomiting and progressive dysphagia. Follow-up esophagram revealed the reformation of a complete esophageal stricture (Figure 4). Multiple attempts were made during repeat EGD to pass a guidewire through the stenosed esophagus, how-

ever, these attempts were unsuccessful. A retrograde endoscope was inserted using the existing gastrostomy tube and a combination of antegrade and retrograde endoscopy was used under fluoroscopy. Preparations were made to penetrate the stricture inferiorly (Figure 5) with a sclerotherapy needle. However, gentle retrograde probing successfully advanced a guidewire. This wire was then guided out through the oral cavity, secured, and used for subsequent progressive esophageal balloon dilation, which were performed up to a size 42 French over a nine-month period (Figure 6). The patient's gastrostomy tube was later removed after her dysphagia fully resolved.

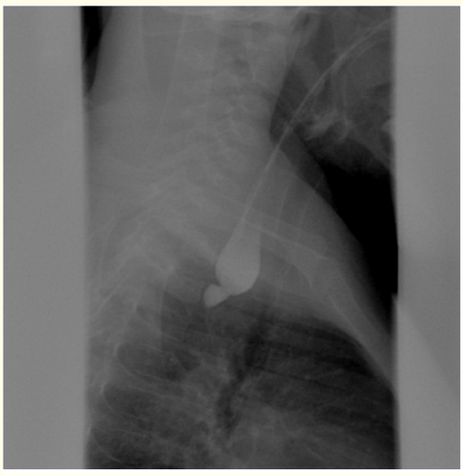

Figure 4: Follow-up esophagram with complete esophageal stricture.

Figure 5: Translucent fibrous scar following complete esophageal stricture.

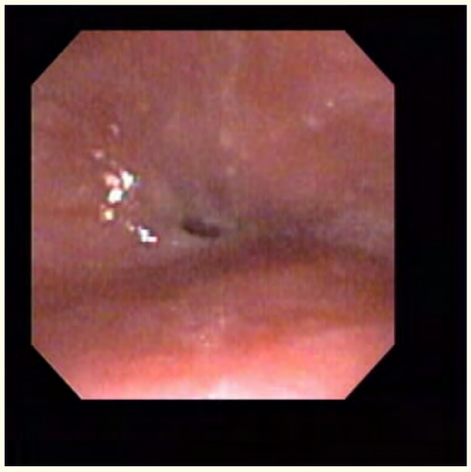

Figure 6: Endoscopy showing re-establishment of esophageal lumen.

Discussion

Button batteries are found with increasing frequency in household devices such as hearing aids, video games, watches, and calculators. According to the National Button Battery Ingestion Study, young children between the ages of 0-5 years are the most likely to swallow these small discs.4 Furthermore, recent evidence shows the relative risk of developing major complications after button batter ingestion has increased 7-fold since 1992 [5]. As a result, physicians now consider button battery ingestion to be the greatest factor leading to emergent management of ingested foreign bodies [6].

Complications of button battery ingestion are multi-modal and include liquefaction necrosis caused by leakage of alkali, mucosal injury from discharge of current, and pressure necrosis caused by the physical effects of the battery canister [7]. In animal studies, the time between ingestion and mucosal damage is seen as early as one hour with progression to transmural necrosis by four hours [8]. Because of these findings, the urgency of diagnosing and removing ingested batteries is crucial to the prevention of severe outcomes.

Unfortunately, button battery ingestion is frequently an unwitnessed occurrence, and this can lead to a delay in diagnosis, as with our patient. Our patient presented with nonspecific symptoms of wheezing and a non-productive cough. Becasue there was a very low clinical suspicion for foreign body ingestion, a trial of Budesonide and Ranitidine was appropriate. It is not the standard of care to obtain a chest x-ray for patients with new onset wheezing and cough, as this would expose the patient to unnecessary radiation and cost. After the patient returned with persistent symptoms

and the development of progressive dysphagia, radiography was used. In our case, the culmination of factors contributed to a delay in the diagnosis of button battery ingestion and resulted in erosion of the disc into the esophageal mucosa causing a high-grade inflammatory stricture.

After radiographic identification of a foreign body and failure of antegrade endoscopic removal, a retrograde approach esophagoscopy via gastrostomy incision was attempted. This technique has had documented successful in prior cases of coin ingestion but has not been described for button battery removal [9]. After discussing the need for a postoperative gastrostomy with the patient's family, the decision was made to use a retrograde endoscopic technique via gastrostomy before undergoing lateral neck dissection. However, in our case, retrograde esophagoscopy was also unsuccessful and surgical removal was required.

Postoperatively, the patient was discharged home when tolerating a soft diet with supplemental nutrition via her gastrostomy tube but returned several weeks later with a recurrence of her symptoms due to redevelopment of her esophageal stricture. Recurrence of strictures is a common complication of adult peptic stricture dilation, especially among patients with tight strictures at the time of presentation or with post-procedural dysphagia [10]. This not yet described among children, however, several reports describe varying approaches to surgical reapir of primary, high-grade esophageal strictures in children including esophagectomy, colon interposition, gastric transposition, and repair of cervical strictures with platysma myocutaneous flap [11,12]. The primary mechanism for managing restructuring remains esophageal dilatation [12].

The decision to proceed with a novel retrograde endoscopic approach was made after a failed antegrade attempt and after discussing options with the patient's family. The goal was to avoid a second esophageal surgery. Because a gastrostomy tube was already in place to support enteral nutrition during recovery from repair of the primary stricture, a retrograde attempt via gastrostomy seemed a reasonable, feasible, and low-risk option for this patient. Ultimately, using simultaneous antegrade and retrograde endoscopic approaches under fluoroscopy we successfully passed a guidewire through the stricture with soft pressure in a retrograde fashion and retrieved the wire for serial dilation using the antegrade endoscope. This is a new and novel technique that has not been described in the context of a secondary inflammatory esophageal stricture caused by button battery ingestion.

Conclusion

In this case report of button battery ingestion by a 32-month African American female, we review the severe complications associated with delayed diagnosis of button battery ingestion and describe a novel technique successfully employed in the management of this patient. Unwitnessed battery ingestions can pose diagnostic challenges. Medical management of this patient was appropriate given her initial presentation and evolving symptoms. Unfortunately, the foreign body ingestion was unwitnessed, presenting symptoms were non-specific, and these factors contributed to a delay in the diagnosis of button battery ingestion. Though sever outcomes were unavoidable, this case serves as a strong reminder of the potentially severe outcomes following delayed treatment of button battery ingestion. Furthermore, retrograde endoscopic stricturotomy is a new and novel technique that allowed for successful dilation in the context of secondary inflammatory stricture formation with failed antegrade attempts, preexisting gastrostomy, and a parental desire to avoid additional surgery.

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Conflicts of Interest

None

Contributor ship

Both authors contributed to the creation of this manuscript

Competing Interests

The authors have no competing interests to declare.

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