Primary Surgical Repair of Acquired Tracheoesophageal Fistula Following Button Battery Ingestion: A Case Report

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Abstract:

***Background*:** Tracheoesophageal fistula (TEF) is a rare but potentially life-threatening complication of button battery ingestion in infants and young children. Prompt diagnosis and multidisciplinary team management are essential for favorable outcomes. TEF can occur within hours of ingestion, but in some cases, it can develop days or even weeks after successful battery removal. This necessitates close and prolonged clinical monitoring, as early symptoms may be subtle or non-specific. ***Case presentation*:** We report a case of a 2-year-old girl with a history of button battery ingestion who presented six weeks after removal of the battery from the upper esophagus, with a history of recurrent episodes of pneumonia, dysphagia, and failure to thrive. Imaging revealed a large tracheoesophageal fistula measuring approximately 12mm. She underwent successful primary surgical repair through a low cervical collar incision, a fistulous tract was identified between the posterior tracheal wall and anterior esophageal wall, which was carefully separated, and both defects were closed using interrupted 4-0 Vicryl sutures. Postoperatively the patient recovered fully and was discharged in good condition. At one-year follow-up, clinical evaluation demonstrated complete resolution of symptoms with no evidence of recurrence or other complications. ***Conclusion*:** This case highlights the importance of long-term follow-up after button battery ingestion and underscores the significance of early surgical management in patients with large fistula.

***Keywords*:** button battery, imaging, pediatric, surgical repair, tracheoesophageal fistulas.

إصلاح جراحي أولي لناسور رغامي مريئي ناتج بعد ابتلاع بطارية قرصية: تقرير حالة

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الملخص:

الخلفية: يُعد الناسور الرغامي المريئي (TEF) من المضاعفات النادرة والخطيرة الناتجة عن ابتلاع البطاريات القرصية لدى الرضع والأطفال الصغار. يُعد التشخيص المبكر والخطة العلاجية متعددة التخصصات أمرين حاسمين لتحقيق نتائج علاجية إيجابية. يمكن ان يحدث الناسور الرغامي المرئي خلال ساعات من ابتلاع البطارية، ولكن في بعض الحالات قد يحدث بع أيام او حتى أسابيع من إزالة البطارية بنجاح، وهذا يستلزم مراقبة سريرية دقيقة ومستمرة، حيث قد تكون الأعراض الأولية غير واضحة أو محددة. **عرض الحالة:** نحن هنا نقدم حالة لطفلة تبلغ من العمر عامين لديها تاريخ مريضي بابتلاع بطارية قرصية وظهرت عليها اعراض بعد ستة أسابيع من إزالة البطارية من الجزء العلوي للمريء شملت نوبات متكررة من الالتهاب الرئوي، صعوبة في البلع، وقصور في النمو. أظهرت الفحوصات التصويرية وجود ناسور رغامي مريئي كبير، وقد تم علاجه بنجاح من خلال إصلاح جراحي أولي عبر شق طوق الرقبة المنخفض. تعافت المريضة تماما وتم إخراجها من المستشفى بحالة مستقرة. وبعد متابعة دامة لمدة عام كامل، أظهرت الفحوصات السريرية تحسناً كاملاً دون وجود أي دلائل على تكرار الحالة أو حدوث مضاعفات أخرى. **الخلاصة:** تؤكد هذه الحالة على أهمية المتابعة طويلة الأمد بعد ابتلاع بطارية قرصية، كما تبرز أهمية التدخل الجراحي المبكر وخاصة في حالات النواسير كبيرة الحجم.

الكلمات المفتاحية: أطفال، الإصلاح الجراحي، البطارية القرصية، ناسور رغامي مريئي، التصوير الطبي.

1. Introduction:

Button battery ingestion has increased during the last years related to the availability of electronic devices using these battery and account for approximately 2% of pediatric esophageal foreign bodies (Chang et al., 2004; Sigalet & Lees, 1988). Recent epidemiological data underscore this trend; in the United States alone, the National Poison Data System recorded over 70,322 button battery ingestions in children under 18 years between 2010 and 2019 with highest rate in children under 5 years of age and annual rate of ingestion increasing by 91% during that period(Chandler et al., 2022). Even though more than 90% of swallowed batteries pass through the gastro-intestinal tract and do not cause a problem. The esophagus is the commonest site of foreign body impaction as it's the narrowest area within the gastrointestinal tract(Anand et al., 2002).

Impaction of the button battery in the esophagus can lead to potential life-threatening complication and early diagnosis and extraction of the battery is critical(Sigalet & Lees, 1988). Complete luminal disruption with perforation can occur within 5 h of exposure with reports of perforation in all disc batteries retained after 12 h(Szold et al., 1991). Tracheoesophageal fistula post button battery ingestion is a rare but a serious complication associated with significant morbidity including recurrent aspiration, pneumonia, dysphagia and failure to thrive, even eventually death (Petri et al., 2003). The exact incidence of TOF post button buttery ingestion is unknown in recent studies. However, a systematic review of 105 pediatric cases of TEF secondary to button battery ingestion found that TEF is a significant but relatively rare complication, with high morbidity and a mortality rate of 11.4% among reported cases(Poupore et al., 2022). Persistent TOF from acquired injuries are often managed surgically. However, immediate surgical intervention can be complicated by high mortality rates, recurrence and the need for multiple procedures. Thus, several authors have advocated the use of conservative management for acquired tef following reports of spontaneous closure by secondary intention(Poupore et al., 2022). We report a 2 -year -old child with tracheoesophageal fistula after ingestion of disc battery with successful primary repair through a low cervical incision.

2. Case presentation:

A 2-year-old Libyan girl with a known history of button battery ingestion was initially treated with endoscopic removal of the foreign body from the upper esophagus on the 8th of October 2022, more than six hours after the ingestion, she was discharged in good condition. Two weeks later following the endoscopic removal she was readmitted with symptoms of difficult swallowing, persistent cough and dyspnea, A contrast swallow (barium meal) study was conducted and revealed a large TEF at the upper esophagus (Figure 1). Since

then, she was managed with conservative treatment including antibiotic therapy, nasogastric tube feeding and respiratory support for four-week duration, after that, the patient was transferred to our center and admitted to pediatric surgery department where a computed tomography scan (CT scan) (Figure 2), and esophagogastroscopy (Figure 3) were performed, confirming the diagnosis of a 12-mm fistulous tract between the trachea and esophagus. Given the size of the defect and the failure of the conservative treatment, a decision was made to proceed with surgical repair.

Under general anesthesia, a low cervical collar incision with extension to the left was performed. The carotid sheath then identified and carefully retracted. Dissection proceeded to expose the trachea and esophagus. A tracheoesophageal fistula was identified between the posterior wall of the trachea and the anterior wall of the esophagus. The trachea and esophagus were carefully separated. The defect in the posterior tracheal wall and the anterior esophageal wall was closed primarily using 4-0 Vicryl sutures. No tissue flap was used. The surgical wound was closed in anatomical layers. Postoperatively, the patient transferred to pediatric ICU and kept sedated for one week to reduce tension on the repair site.

At one-year follow-up, the patient had gained weight appropriately and remained symptom-free, with no evidence of complications or fistula recurrence (Figure 4). Informed verbal and written consent were obtained from the parents for the publication of their child's clinical details and related images.

3. Discussion:

Button battery ingestion has become a significant public health concern due to its popularity in infants and young children and its serious and occasional fetal complications, including, but not limited to, tracheoesophageal fistula, vocal cord paralysis, and other potentially severe outcomes(Eyring et al., n.d.).

TEFs is a potentially life-threatening consequences of battery ingestion which can develop early within a few hours after ingestion(Alkan et al., 2004; Imamoğlu et al., 2004), the mechanism of this injury is multifactorial and related to button battery impaction, electrolysis and chemical released the chemical substance released leading to tissue damage, wall erosion and ultimately fistula formation(Tibballs et al., 2002; Völker et al., 2017). This serious complication can manifest even after the removal of the button battery, which can contribute to delayed diagnosis and management. The European Society for Pediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) highlights the importance of long-term follow-up in such cases, to detect potential late-onset complications, including TEF. This approach is crucial, as delayed diagnoses have been associated with increased morbidity. Therefore, Post removal evaluation and Follow-up is essential to promptly diagnosis and manage any occurring complications(Mubarak et al., 2021).

Nicolas S. et al., in their systematic review evaluating the management timeline of tracheoesophageal fistulas secondary to button battery ingestion, emphasized the complexities in choosing between conservative and surgical management. Surgical repair provides definitive resolution but carries significant perioperative risks, including recurrent laryngeal nerve damage, esophageal strictures, and recurrent fistula formation. On the other hand, conservative management (watchful waiting) can lead to spontaneous closure and avoid post operative complications, fistula less than 10 mm diameter demonstrated greater likelihood of spontaneous resolution, typically within 8 weeks. Thus, Nicolas S. et al. recommended a period of watchful waiting of at least 8 weeks prior to surgical intervention for most BB-induced TEFs(Poupore et al., 2022).

In our case, the patient was diagnosed with TOF approximately six weeks after button battery ingestion, confirmed by endoscopy and CT scan, revealing a fistula diameter exceeding 12 mm. This diagnosis was made following recurrent episodes of aspiration pneumonia and persistent dysphagia, highlighting the severe clinical implications associated with delayed diagnosis. Given the large size of the fistula and ongoing morbidity, a surgical intervention was planned. Through this case we strengthen that an individualized, multidisciplinary approach—encompassing pediatric surgery, pediatrician, radiology and otolaryngology is critical to ensuring prompt diagnosis, appropriate management, and improved patient outcomes. Furthermore, post removal follow is essential for early diagnosis and management of such life-threatening complications.

4. Conclusion:

Tracheoesophageal fistula secondary to button battery ingestion is a potentially life-threatening condition that may be presented after an initial period of apparent recovery. This case emphasizes the critical importance of early recognition, thorough follow-up after battery removal, and timely intervention. An individualized, multidisciplinary approach—combining pediatric surgery, radiology, pediatrics, and otolaryngology—plays a vital role in achieving favorable outcomes. Surgical management remains the mainstay in large or persistent fistulas, especially when conservative measures fail.

5. Authors' contributions:

Dr Mustafa AL-Ahmer managed the case, collected clinical data, drafted and reviewed the final version of the manuscript; Dr Sherfad M. administrated the project, designed the study, interpreted the radiological data and drafted the manuscript; Dr. Aniba A, prepared the figures and revised the final version. All authors approved the submitted version.

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Figures

Fig 1: upper GIT study reveals a large defect of trachea-oesophageal fistula at the low cervical leve

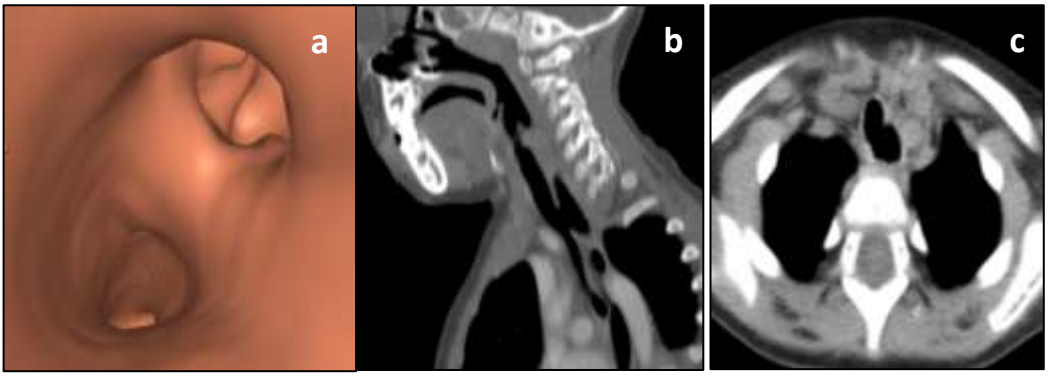

Fig (2): (a) virtual CT scan endoscopy (b) & (c) sagittal and axial CT scan reveal a 12mm trachea-oesophageal fistula

Fig (3): upper GIT endoscopy shows large trachea-oesophageal defect

Fig (4): One-year postoperative follow-up image shows a healthy and well-nourished child