



# Trans-cervical tracheal resection and repair of acquired tracheoesophageal fistula secondary to button battery ingestion



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## ABSTRACT

Injuries related to button battery ingestion have become increasingly common in children. Recognition of battery ingestion is often delayed and thus leads to serious esophageal injury. Resultant distal acquired tracheoesophageal fistulas are difficult to safely access and repair. Herein, we report the multidisciplinary repair of a distal tracheoesophageal injury, secondary to battery ingestion, via an innovative trans-cervical surgical approach.

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Pediatric button battery ingestions cause serious esophageal, tracheal, and even aortic injury. In as little as 2 h after ingestion, circumferential caustic corrosions and esophageal perforations can occur [1]. This rapid process, combined with an often delayed diagnosis, will likely lead to an acquired and life-threatening tracheoesophageal fistula (TEF). Distal TEFs that are close to the carina are often difficult to visualize and access. Surgical approaches employed for repair of TEFs include thoracotomy, thoracoscopy, and sternotomy with cardiopulmonary bypass. These may not be ideal for a difficult distal lesion that creates a challenge for both access and the ability to avoid significant surgical morbidity. In the following case, we discovered that a trans-cervical exposure, with tracheal resection of the involved segment, allowed excellent exposure and reduced the risk to major thoracic and mediastinal structures. Herein, we highlight a case of a missed button battery ingestion with the focus on the patient's presentation and hospital course along with the multidisciplinary management of a resultant large distal TEF that was repaired through a cervical approach.

## 1. Case report

### 1.1. Button battery ingestion

A 17-month-old female infant with a history of a respiratory illness and progressive dysphagia presented to the emergency department with a croupy cough, tachypnea, and tachycardia. The patient's primary care physician had conservatively treated croup-like symptoms a week prior to presentation. Because of poor symptom resolution, the parents brought the child to the emergency room. There was no hemoptysis or hematemesis at presentation. Upon further questioning, the parents noted a missing disc battery from an unspecified device prior to initial symptoms. Chest X-rays performed after presentation to the emergency department (Fig. 1a and b) revealed a disc shaped foreign body in the esophagus compressing the distal trachea, with a "halo" effect noted on the object on the anterior-posterior view (Fig. 1a). The patient was evaluated by the pediatric surgery service and taken to the operating room for endoscopic removal of a button battery. A flexible esophagoscope was used and a common disc battery was found, adjacent to necrotic and granulated tissue, in the mid to distal esophagus. A circumferential burn the length of the battery (20 mm) was present after removal, at the site of impaction. A gastrostomy tube was placed laparoscopically for enteral feeds due to the extent of esophageal

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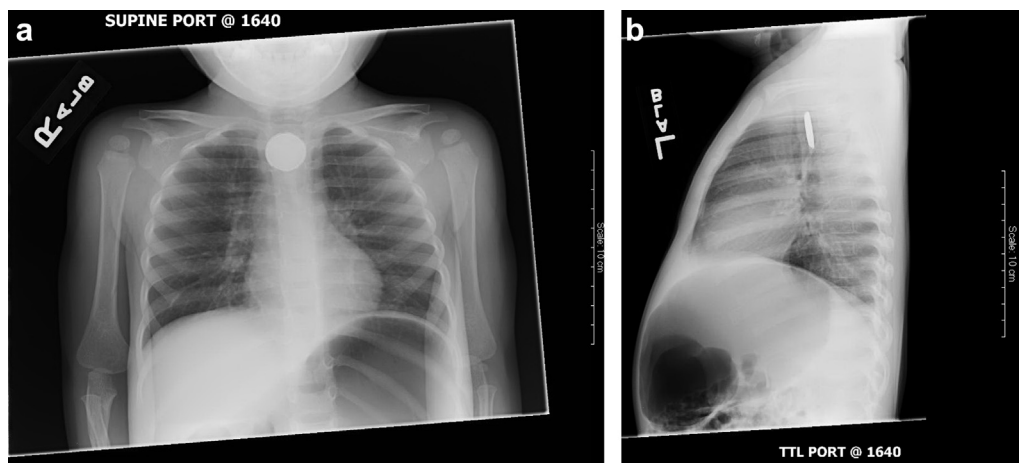


Fig. 1. Anterior chest X-ray (a) With lateral view (b) showing the site of button battery impaction.

tissue damage. The patient was left intubated and taken to the intensive care unit.

An esophageal (Fig. 2) was performed and confirmed the presence of a distal TEF approximately 2.5 cm above the carina. The radiologist placed a transpyloric feeding tube, and the pediatric otolaryngology team was consulted for bronchoscopic evaluation and coordinated repair. Rigid bronchoscopy revealed granulation tissue and a 2 cm curvilinear fistula at the distal trachealis approximately 2–3 cm proximal to the carina (Fig. 3) (Video 1). The patient was then re-intubated.

### 1.2. Trans-cervical repair

Due to the size and extent of injury, a short segment tracheal resection was necessary to repair the trachea. The pediatric surgery and otolaryngology teams decided that a trans-cervical approach was ideal to complete this procedure along with repair of the esophagus. Thoracic approaches were held in reserve if needed.

A low cervical horizontal incision was made 1 cm above the manubrium. Subplatysmal flaps were elevated to the level of the hyoid and down to the clavicle. The infrahyoid muscles were identified and divided to expose the laryngotracheal skeleton and thyroid gland. Dissection of the trachea continued inferiorly along the anterior and lateral tracheal walls with preservation of lateral vascular pedicles. The innominate artery was gently mobilized

anteriorly. The carina was identified and attachments of the anterior tracheal wall and both mainstem bronchi were mobilized. Bilateral traction sutures (3.0 prolene) were applied to the distal lateral tracheal walls to allow elevation of the trachea closer to the neck. The posterior fistula was thereby exposed.

The trachea and the esophagus were separated both proximal and distal to the TEF. A vessel loop was placed around the trachea distally. A horizontal tracheotomy was performed distal to the fistula, and an endotracheal tube was placed as the incision was carried through the trachealis to release the proximal trachea above the fistula. This allowed the TEF to be visualized along the anterior esophagus, which was debrided and repaired by the surgery team. Two esophageal fistula sites were repaired with primary anastomosis using interrupted 5.0 polydioxanone (PDS) absorbable sutures along the left lateral esophageal wall.

The otolaryngology team then resected the distal aspect of the proximal tracheal stump that contained the fistula. A tracheal segment 1.5 cm in length was removed, and primary anastomosis was performed with 4.0 monocryl along the trachealis and 4.0 PDS suture along the tracheal rings. Lateral tracheal suspension sutures were placed bilaterally to relieve tension as the anastomosis was completed. Before final closure anteriorly, the tracheostomy tube was removed and a nasotracheal tube was placed. A Valsalva maneuver performed by the anesthesia team did not demonstrate an air leak at the anastomosis. Evicel™ a fibrin (human) surgical

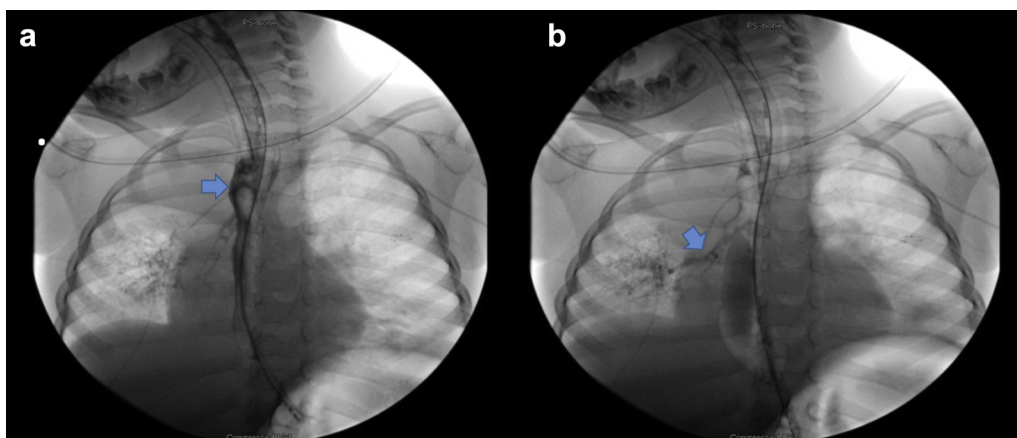


Fig. 2. Barium swallow X-ray showing swallowed contrast (a) Entering the right mainstem bronchus (b) as evidence of acquired TEF.

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