

# A Battery in the Stenotic Esophagus of a Child with a Congenital Tracheoesophageal Fistula

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## ABSTRACT

*A case of a three-year-old male child who was admitted to our hospital with the suspicion that he had swallowed a battery approximately one hour before admittance. The parents believed that it was a button-shaped lithium battery approximately 12 mm in diameter. A chest X-ray was taken immediately, and a battery was identified in the esophagus at the fifth thoracic vertebra. By reviewing the child's medical history, we found that the child had had surgery the day after birth due to congenital atresia of the esophagus and a tracheoesophageal fistula type III b. An esophagoscopy was performed one hour after admittance, and the battery was found to be partially past the scar from the first surgery. Because of that, the battery was pushed further toward the stomach, out of fear that retrieving the battery through the scarred section of the child's esophagus could damage the stenotic wall. Upon the next X-ray of the abdomen, the battery was observed in the stomach. The child was monitored, and X-rays were taken over the next several days. The battery was evacuated in stool eight days after it had been ingested.*

**Key words:** foreign body, battery, stenotic esophagus, congenital tracheoesophageal fistula, esophagoscopy

## Introduction

Children who have swallowed batteries are an increasingly common problem<sup>1,2</sup>. Although batteries currently account for only 2% of all foreign bodies swallowed by children, the frequency of these incidents has been rising over the last two decades<sup>3,4</sup>.

Disc-type electric batteries are used in more and more household devices, electronic games and calculators; therefore, they are becoming more accessible to small children<sup>5,6</sup>.

If the battery does not pass through the digestive system, it most likely becomes lodged in the esophagus, and there is little probability that it would stop in any other section of the digestive tract (such as the pylorus, appendix or Merkel's diverticulum). When a battery becomes lodged in the esophagus, emergency esophagoscopy is mandatory to remove the battery<sup>8</sup>. The follow-up therapy depends on the condition of the esophagus wall<sup>3</sup>. It is important to emphasize that damage from the battery to the esophagus wall can appear within four hours after ingestion and that the battery can perforate the wall within six hours<sup>4,9</sup>.

Therefore, extracting or retrieving the battery from the esophagus is an emergency procedure<sup>4,10</sup>.

Batteries cause four types of damage: toxic effects due to the absorption of battery material by the body, burns of the esophagus wall from electrical discharge, necrosis as a consequence of constant pressure on the wall, and caustic burns caused by chemicals leaking from the battery<sup>3</sup>.

The burns are classified into three levels. The first level is characterized by superficial edema, hyperemia and sloughing. The second and third levels involve the total wall of the esophagus, while the third level also involves periesophageal tissue<sup>7</sup>.

In cases of battery ingestion, the following protocol is recommended: initial X-rays, esophagoscopy, and retrieval of the battery from the esophagus. If the battery has already passed into the digestive system, it becomes necessary to take X-rays of the abdomen every four to seven days until the battery leaves the body via stool<sup>11</sup>.

## Case Report

A three-year-old male child was admitted to the emergency room of a pediatric clinic with a foreign body suspected of being stuck in their esophagus. The child's medical history indicated that the child was born at full term. Immediately after the child was born, the child was diagnosed with esophageal atresia with a tracheoesophageal fistula (type III b), and surgery was immediately performed on the first day after birth. The child was currently suffering from obstructive bronchitis, bronchiectasis, severe GERD, and grade three esophagitis. One hour prior to being admitted to the emergency room, the child had swallowed a button-shaped lithium battery (1.5 V, 12 mm in diameter) that was previously being used in an electric toy. The parents were present when the child swallowed the battery. Immediately upon swallowing the battery, the child started to hypersalivate, could not swallow, and felt pain when attempting to swallow. During the clinical diagnosis, a secretion was found that filled both the mouth and the visible portion of the hypopharynx.

A round shadow of metallic foreign body at the fifth thoracic vertebra was visible in the chest X-ray, measuring approximately 12 mm in diameter, impacted in the esophagus (Figure 1). Because an esophagoscopy was required, the child was moved to an ENT department. Esophagoscopy with rigidoscope was done one hour after admittance (two hours after the battery was swallowed) under endotracheal anesthesia. During the esophagoscopy, a battery was found 20 cm down the esophagus (measured from the child's upper front teeth) with 2/3 of its diameter past the postoperative scar.

Due to the risk of damaging the scar tissue by extracting the battery, we decided to push the battery toward the healthy part of the esophagus and stomach.



Fig. 1. Battery in the esophagus (supine position).

At the location where the battery was stuck for almost two hours, a grey-black impression was visible. There was no bleeding or damage to the mucus wall.

In a follow up X-ray of the abdomen, the battery was seen to be moving in the direction of the stomach.

After consultation with the pediatric surgeon, we decided to “wait and watch” and hope for spontaneous elimination of the battery. To minimize the chances of battery corrosion, diet was adjusted (parenteral feeding), and a preventive antibiotic was administered (Ceftriaxone, 50 mg/kg i.v. twice a day).

A nasogastric tube was not applied. The third X-ray of the abdomen, 24 hours after admission, displayed the foreign body in the pyloric channel; after 48 hours, the battery was in the cecum.

On the third day, liquid food was administered. By the fourth day, the foreign body was in the transverse colon, and, by the sixth day, it was in the colon sigmoideum (Figure 2).

The food was then changed to semi-solid. The battery was finally eliminated eight days after ingestion. On the twelfth day, or four days after spontaneous elimination, a passage of the esophagus was done using Gastrografin (MFG & brand). The results showed a clean mucosal surface with no negative indications, and ordinary food was administered.



Fig. 2. Battery in the colon sigmoideum (up-right position).

## Discussion and Conclusion

Batteries account for less than 2% of the foreign bodies ingested by children, but this proportion has been rising over the last two decades<sup>4</sup>.

The clinical process selected depends on the location of the battery, the duration of mucous wall exposure, the remaining battery charge, and the battery's chemical composition<sup>3</sup>. Only 9.9% of patients who swallowed batteries developed symptoms, and these were mostly patients who ingested larger batteries (20–23 mm)<sup>4</sup>. Batteries less than 15 mm in size very seldom get stuck in the esophagus.<sup>3</sup>

Although ingested batteries do not usually cause problems, batteries lodged in the esophagus can lead to serious complications, including death<sup>3</sup>.

Serious complications with risk of death include bleeding, choking, fistulation (tracheoesophageal fistula, aorto-esophageal fistula), perforation and mediastinitis<sup>5,12–14</sup>. Immediate esophagoscopy is necessary if the battery gets stuck in the esophagus<sup>4,11</sup>.

Retrieval and extraction using an endoscope is recommended in cases when batteries are constrained in the esophagus, in patients with strong gastrointestinal symptoms, such as vomiting, blood in the stool, abdominal pain, and in cases where multiple cylindrical batteries are ingested<sup>4</sup>.

Some authors suggest that bronchoscopy should be performed along with esophagoscopy in cases where the battery has been stuck in the esophagus for more than four hours<sup>2</sup>. Removing the batteries by surgery is seldom required<sup>4</sup>.

In the case of our patient, in whom the battery had been lodged for two hours, esophagoscopy was performed

that lasted 30 minutes. Similar procedures described in the literature lasted from 30–60 minutes<sup>15</sup>. In our case, the battery was not retrieved but pushed in the direction of the stomach. The movement of the battery was slow, but it was monitored by X-ray until it was evacuated in stool eight days later, consistent with previously reported results<sup>4,11</sup>.

According to research by Litovitz and Schmitz, batteries pass through the intestinal tract at the following rates: 22.6% within 24 hours, 61.3% within 48 hours, 78% within 72 hours, and 86.4% within 96 hours. In 4.5% of cases, it took more than one week, and it took more than two weeks (up to 73 days) in 1.1% of cases<sup>4</sup>. Most of the batteries were evacuated spontaneously<sup>8,11</sup>. It is unnecessary to monitor the passage by X-ray for the entire time<sup>4,11</sup>. In the case of batteries containing mercury, it is necessary to monitor the patient's blood and urine for mercury<sup>4</sup>.

This case history brings to light how even a small 12-mm battery can create a problem when the patient has postoperative scars from the treatment of a congenital tracheoesophageal fistula type III b.

In such cases, if it is too risky to extract the battery the alternative is to pass the battery into the digestive tract because batteries are eliminated spontaneously with stool in most cases. It is important to regularly monitor the passage of the battery by X-ray<sup>4,11</sup>.

We believe that this case history will aid decision-making during esophagoscopy when extracting the battery poses a significant risk of damaging the esophagus.

In a literature review, we did not find a case of a child with a stenotic esophagus after surgery for congenital tracheoesophageal fistula with a battery lodged in their esophagus.

## REFERENCES

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## **BATERIJA U STENOTIČNOM JEDNJAKU DJETETA SA KONGENITALNOM TRAHEOEZOFAGEALNOM FISTULOM**

### **S A Ž E T A K**

Prikazujemo slučaj trogodišnjeg muškog djeteta, koje je zaprimljeno u našu bolnicu pod sumnjom da je sat vremena pred prijem progutalo bateriju. Roditelji vjeruju da se radi o litijskoj dugmastoju bateriji promjera približno 12 milimetara. Hitno urađena RTG snimka grudnog koša ukazuje na bateriju u jednjaku, u visini petog torakalnog kralješka. Uvidom u medicinsku dokumentaciju doznali smo da je dječak operiran dan nakon poroda zbog kongenitalne atrezije jednjaka i traheozofagealne fistule tip III b. Jedan sat po prijemu uradi se ezofagoskopija i nađe baterija, koja je najvećim dijelom prošla postoperacijski ožiljak nastao nakon prethodne operacije na stijenci stenotičnog jednjaka. S obzirom na to, pasirali smo bateriju distalno prema želudcu, poradi bojazni da bi izvlačenjem baterije kroz ožiljkasti i stenotični dio jednjaka mogli ozlijediti stjenku istog. Na kontrolnoj nativnoj RTG snimci abdomena baterija se nalazila u želudcu. Dijete je monitorirano radiološki narednih dana. Baterija je spontano evakuirana stolicom osmi dan nakon ingestije.