

Foreign Body Ingestion in Child: Impaction of Lithium Battery in Gastrointestinal Tract for An Extended Period of Time

Carlos Augusto Leite de Barros Carvalho^{1*}, Camyla Lemos Budib², Augusto Aurélio de Carvalho¹

¹Department of Pediatric Surgery, Santa Casa de Misericordia de Cuiaba Hospital, Cuiaba, Mato Grosso, Brazil

²Medical Student at University Center of Varzea Grande, Varzea Grande, Mato Grosso, Brazil

***Corresponding author:** Carlos Augusto Leite de Barros Carvalho, Department of Pediatric Surgery, Santa Casa de Misericordia de Cuiaba Hospital, Seminary Square, 141, D Aquino, 78015-325, Cuiabá, Mato Grosso, Brazil. Tel: +556530511946; E-mail: cautocha@hotmail.com

Citation: Barros Carvalho CAL, Budib CL, Carvalho AA (2017) Foreign Body Ingestion in Child: Impaction of Lithium Battery in Gastrointestinal Tract for An Extended Period of Time. J Surg: JSUR-150. DOI: 10.29011/JSUR-150.000050

Received Date: 19 June, 2017; **Accepted Date:** 15 July, 2017; **Published Date:** 22 July, 2017

Abstract

More than 3,500 individuals ingest lithium batteries, used in watches, toys and remote controls, in the United States each year. Such ingestion is dangerous for children due to the severity of the complications. The time elapsed since ingestion is crucial to the degree of damage. The aim of this work is the description of a rare case of chronic permanence of intragastrical lithium battery in a poorly symptomatic 9-year-old male child who swallowed watch batteries, requiring laparotomy performed seven months after the ingestion. In the present case, the duodenal duplication cyst caused a delay in the gastric emptying due to a duodenal sub occlusion, which made diagnosis difficult because of the presence of food residues and also made impossible the identification of the foreign body. However, the food residues may have blocked the direct contact of the batteries with the gastric mucosa, preventing its serious injury.

Keywords: Child; Foreign Body; Gastrointestinal Tract; Lithium Battery

Introduction

Every year in the United States, more than 3,500 individuals of all ages ingest lithium batteries. They are used in hearing aids, watches, toys, video games, calculators, remote controls and many other objects. The intaking of this type of battery can cause significant morbidity and mortality, especially if lodged in the esophagus. These objects pose a risk to children due to the severity of the complications that may arise within a short period of time, as well as their availability in almost all home environments [1-3]. In order to collect data on the ingestion of batteries and provide recommendations for the management of these patients, the National Button Battery Ingestion Hotline (NBIH) was created in the USA in 1982 [4]. In 2010, a number of cases on the subject were published by this entity with the description of 8,648 cases, and 8,161 of them were related to the ingestion of lithium batteries [2]. Regarding the batteries ingested, 36.3% came from hearing aids,

22.1% from toys and 11.1% from watches. Based on the literature, the time elapsed is determinant for the degree of the injury [2,5,6]. In this regard, the case description to be discussed in this work is intriguing, since the patient described here remained for a long period of time with the foreign bodies within him. Therefore, the present study aims at describing a rare case of chronic permanence of intragastrical lithium battery in a poorly symptomatic child, requiring a laparotomy to remove the foreign bodies.

Case Report

A 9-year-old male child, with a history of ingestion of watch batteries, witnessed by his sister (a minor), the fact was not reported to those responsible. From the third day after swallowing the batteries, the child started to experience abdominal pain, nausea and vomiting, being taken to medical service where the presence of foreign bodies in gastrointestinal tract was evidenced and watchful waiting has been undertaken. The episodes of abdominal pain and intermittent vomiting remained the same and the child was transferred to the Santa Casa de Misericordia Hospital

in Cuiabá-MT about 7 months after the ingestion of the foreign bodies. At admission the child was asymptomatic, however, it was detected a slight abdominal distension at the time of the physical examination. Further examinations were requested and after analysis of the abdominal radiographs, the hypothesis of impaction of the foreign bodies in the stomach was raised. Thus, The Upper Gastrointestinal (UGI) endoscopy was requested, and it showed food residues in the stomach, due to intestinal obstruction. The presence of gastric stasis was noted, but the foreign bodies were not visualized (suitable fasting was carried out to perform the examination). Despite the further examinations, the condition remained unsolved, then an exploratory laparotomy was performed with the aid of fluoroscopy. The surgical procedure was performed through a median incision, and within the cavity, the gastric and duodenal dilation was evidenced, with the fluoroscopy suggesting two foreign bodies in an intraduodenal position.

It was decided to perform a transverse duodenotomy in second portion, and a cystic duplication of the duodenum was observed (Figure 1).

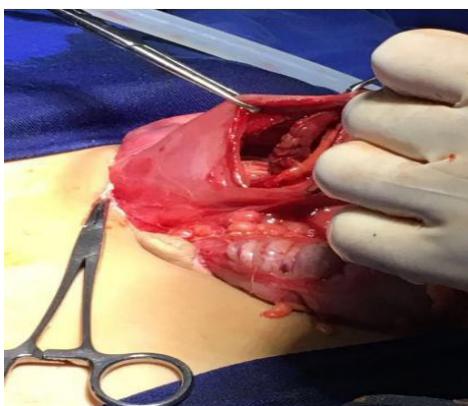


Figure 1: Duodenotomy showing duodenal duplication.

without identification of the batteries. Through palpation, the foreign bodies were identified in the stomach, which was full of food remains. Through duodenal incision, the removal of two lithium batteries attached to the gastric mucosa was performed (Figure 2).



Figure 2: Lithium batteries removed from the stomach.

Subsequently, the suture of the duodenum and the passage of the post duodenal nasogastric tube was conducted. The patient was kept in the ICU during the post-operative, Cephalotin, Amikacin and Metronidazole was used. The diet through the nasogastric tube began on the second day of the post-operative and orally on the seventh day after the surgery. The patient was discharged after 36 days of the hospital admission.

Discussion

Foreign body ingestion is a common problem in children, and more often in children younger than 3 years old, resulting in more than 100,000 proven cases a year in the United States and nearly 1,500 annual deaths on the entire American population [7]. The impaction of foreign bodies in children normally occurs in the esophagus in areas of physiologic narrowing, such as in the cricopharyngeal area, in the compression zone of the aortic arch and in the esophagogastric junction. Following the esophagus, the areas of greatest difficulty for these objects passing through are the pylorus, the duodenal arc and the ileocecal valve. After passing through the duodenum, 85% of these objects cross the entire digestive tract in 72 hours. The incidence of ingestion of lithium batteries is increasing, probably due to the growing access of children to toys with this type of devices [1,2,3,7]. Lithium batteries are composed of a steel receptacle, which is the positive charge (anode) and one capsule of the same material, which is the negative charge of the battery (cathode), separated by an insulating seal. The inner part of the battery is composed of pure lithium and manganese dioxide isolated by a polypropylene separator soaked of alkaline metals electrolytes. They have voltage of 3V, and half life longer than ordinary batteries. The mechanism of injury caused by the battery is probably multifactorial and includes leaking of electrolytes which are presented in its interior; electrolysis with alkali formation by the external current, mercury toxicity and pressure necrosis. When surrounded by secretions, its surface and the electrolytes form an "Electrolytic Cell", with changing of the polarity state of the battery and initiating chemical reactions on its surface. The current flows externally between the anode and cathode with oxidation (loss of electrons) in the first, plus the formation of hydrochloric acid and release of metals. At the cathode, occurs reduction (gain of electrons), with production of sodium hydroxide, which is capable to injure the esophagus and surrounding structures such as the trachea [7-9].

The most common symptoms, in view of lithium battery ingestion, are vomiting, salivation, dysphagia, odynophagia, digestive bleeding, cough, dyspnea and irritability [1]. Such symptoms usually appear when the battery impact the esophagus or cause erosions in the gastric mucosa, it depends on the location where the battery is housed. The batteries that lodge in the upper third of the esophagus tend to cause excessive salivation, nausea, vomiting and dysphagia [1,2,5]. The objects impacted in the middle and distal thirds of the esophagus cause less prominent salivation and pain

or retrosternal discomfort. If the battery impact was after the pylorus the child can present abdominal pain, vomiting, melena and hematemesis. In some cases, there is massive bleeding, culminating in death [6,10,11]. The doctor who treats a child who ingested a lithium battery must promptly request a chest x-ray in PA and profile, and abdomen x-ray, in order to determine the position of the object. Erroneous diagnoses may occur when the radiographic analysis identify the batteries as coins, for example. To avoid such confusion, it is necessary to emphasize the radiographic features of the lithium batteries and the coins. Batteries feature double edge, also called halo effect, which consists of a low-density aureole around the circumference of a battery, and can be seen on x-ray in AP. In the profile incidence, an image in slope can be observed. It should be noted that a battery lodged in the esophagus should be treated as a medical emergency. This is due to the fact that the duration of the impaction of the battery in the esophagus is of great influence on the degree of injury found after the removal of the object. Studies in animal models show lesions of the esophageal mucosa from 15 minutes after impaction [1,7].

Although patients with batteries housed in the esophagus initially present themselves asymptomatic, it is necessary to consider the speed in solving the clinical feature. The endoscopy allows the removal of the battery and the direct visualization of the adjacent tissue injury [8,10,11]. However, the handling of batteries that go beyond the esophagus has been less invasive, with intervention being indicated in cases of an outbreak of symptoms. The treatment recommended by the National Battery Ingestion Hotline (NBIH) for batteries housed in the stomach is initially conservative, awaiting the spontaneous elimination of the battery, with the patient remaining at home, eating normally, with radiographic follow-up and inspection of the feces [4]. Endoscopic removal is indicated in case of onset of symptoms. Patoulias, et al. described the case of an 18-month-old who ingested a 20 mm lithium battery which was removed by endoscopy 4 hours after ingestion, the patient had already featured multiple, superficial and deep, gastric erosions; because of that, this author suggests urgent endoscopic intervention in some cases of batteries lodged in the stomach, namely: battery diameter bigger than 15 mm, age less than 4 years old, presence of symptoms, ingestion of more than one battery and concomitant intake of magnet [12]. In the case reported in this study, the association of the ingestion of the batteries with the anatomical flaw of duodenal duplication cyst, which caused delayed of gastric emptying due to a duodenal sub occlusion, provided a diagnostic difficulty, since, due to the large amount of food remains, the identification and removal of batteries via endoscopy was not possible. However, these crystallized food remains may also have been responsible for an extremely favorable and unlikely result - by reducing the direct contact of the battery with the stomach, since no severe damage to the gastric mucosa was found after the removal of the objects, despite the long period in which they were lodged there.

Conclusion

Foreign body ingestion in children is a frequent occurrence and must be seen and accompanied by pediatricians and pediatric surgeons. The object ingested must be promptly and correctly identified and located. Those are the first steps to the definition of the conduct that may require urgent endoscopic intervention.

References

1. Toby Litovitz, Nicole Whitaker, Lynn Clark, Nicole C White, Melinda Marsolek (2010) Emerging battery-ingestion hazard: clinical implications. *Pediatrics* 125: 1168-1177.
2. Litovitz T, Whitaker N, Clark L (2010) Preventing Battery Ingestions: An Analysis of 8648 Cases. *Pediatrics* 125: 1178-1183.
3. Marom T, Goldfarb A, Russo E, Roth Y (2010) Battery ingestion in children. *International Journal of Pediatric Otorhinolaryngology* 74: 849-854.
4. Hamilton JM, Schraff SA, Notrica DM (2009) Severe injuries from coin cell battery ingestions: 2 case reports. *J Pediatr Surg* 44: 644-647.
5. Toby Litovitz, James S Reilly, Peter J Kolai, Gene Rider, Jatana KR, et al. (2013) Pediatric button battery injuries: 2013 task force update. *International Journal of Pediatric Otorhinolaryngology* 77: 1392-1399.
6. Thomson M and Sharma S (2015) The hazards of button battery ingestion. *Arch Dis Child* 100: 1010-1011.
7. McConnell MK (2016) When button batteries become breakfast: the hidden dangers of button battery Ingestion. *Journal of Pediatric Nursing* 28: e42-e49.
8. Kay M and Wyllie R (2013) Foreign body ingestions in the pediatric population and techniques of endoscopic removal. *Techniques in Gastrointestinal Endoscopy* 15: 9-17.
9. Sharpe SJ, Rochette LM, Smith GA (2012) Pediatric battery-related emergency department visits in the United States, 1990-2009. *Pediatrics* 129: 1111-1117.
10. Alrazzak BA, Al-Subu A, Elitsur Y (2013) Etiology and management of esophageal impaction in children: A review of 11 years. *Avicenna J Med* 3: 33-36.
11. Crockett SD, SLW Sperry, C Brock Miller, NJ Shaheen, ES Dellon (2013) Emergency care of esophageal foreign body impactions: timing, treatment modalities, and resource utilization. *Diseases of the Esophagus* 26: 105-112.
12. Patoulias I, Christos Kaselas, Dimitrios Patoulias, Konstantinos Farmakis, Eleni Papacrivou, et al. (2016) Multiple Gastric Erosion Early after a 3V Lithium Battery (CR2025) Ingestion in an 18-Month-Old Male Patient: Consideration about the Proper Time of Intervention. *Case Reports in Pediatrics* 2016: 3.