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Button battery ingestion in the upper third of the esophagus Case report and review of literature

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Abstract
Button batteries represent about 2% of all foreign bodies, although this percentage seems to be increasing. Those batteries that lodge in the esophagus can result in serious complications and even death. We report a child aged 3 years, presented fever cough dysphagia and hypersialorrhea. A chest X-ray showed the presence of a foreign body at the upper third of the esophagus with halo effect. Esophageal endoscopy noted the absence of individualization of the foreign body in the oesophageal lumen, with inflammatory congestive appearance of the esophageal mucosa, without stenosis removal of the button cell by endoscopy failed. after several attempts, the surgical indication was put, the patient benefited from an oesophagotomy with extraction of the button battery. Esophageal corrosive injury and burn can occur a while esophageal perforation, tracheoesophageal fistula, mediastinitis, and perforation of the aorta.,Esophageal stenosis may be detected few months after removal of the button battery. Prevention is the best management of all. Parents and caretakers should be aware of the potential danger of button battery ingestion.

Keywords: button battery, complications, management

Introduction
Button batteries represent about 2% of all foreign bodies, although this percentage seems to be increasing. [1].
Button batteries that are located in esophagus can cause damage mainly by different and independent mechanisms. , they might cause damage in surrounding tissue because of direct pressure, as any other foreign body, although this mechanism alone should not cause severe injuries [2].
Epidemiology of button battery ingestion seems to be changing trends in the last years and there are more cases of severe complications related to them, which were reported recently.They seldom remain in the esophagus; however, these few cases are prone to develop severe injury even after some hours [1].

Case report
This is a child aged 3 years, no particular antecedents with good psychomotor development, admitted to medical emergencies, for fever, cough, hypersialorrhea and dysphagia.
A chest X-ray showed the presence of a foreign body at the upper third of the esophagus with halo effect. (Figure 1 and 2)

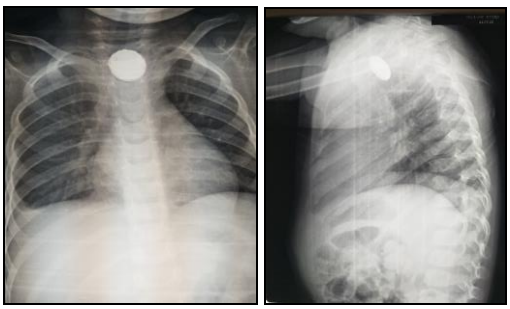

Fig 1 and 2: A foreign body at the upper third of the esophagus with halo effect.

Faced with the presence of fever and the discovery of a foreign body, mediastinitis secondary to the ingestion of a button cell was raised.
Thoracic CT scan: showed the presence of metallic density material in the intraparietal thoracic esophagus .absence of pneumomediastinum .on the other hand, he noted the presence of a pleural effusion with atelectasis opposite.
Absence of vascular complications. (Figure 3)

Fig 3: Presence of intraparietal metallic density material in the thoracic esophagus. Absence of pneumomediastinum

Esophageal endoscopy noted the absence of individualization of the foreign body in the oesophageal lumen, with inflammatory congestive appearance of the esophageal mucosa, without stenosis
Esophageal transit confirmed the absence of oesophageal stenosis, no visible oesopatracheal fistula. (Figure 4)

Fig 4: Absence of oesophageal stenosis, no visible oesopatracheal fistula .

Antibiotic therapy was started and removal of the button battery by endoscopy failed.
After several attempts, the surgical indication was put, the patient benefited from an oesophagotomy with extraction of the button battery: (figure 5 and 6)

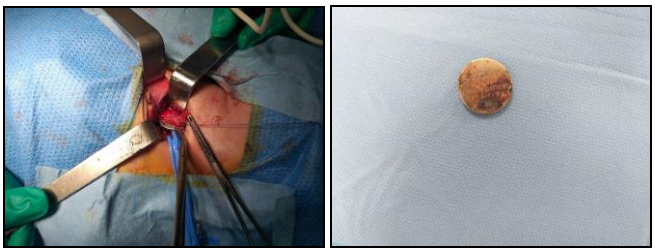

Fig 5 and 6: Oesophagotomy with extraction of the button battery

The patient was put under cephalosporin 3 rd generation for 10 days, with stopping feeding for 5 days, operative follow-ups were simple.
The patient was discharged, and summoned in 15 days to consultation with esophageal transit.
Provide an endoscopy in a month.

Discussion

1. introduction

The use of small button batteries can be attributed to the advent as well as the reduction in size of many technological devices. Button batteries are increasingly used in devices such as hearing aids, electronic games, watches, digital planners, and newelectronic gadgets.Their smooth and shiny appearance makes them quite attractive and interesting to children who eagerly handle them when they are accessible [3].
Button battery foreign bodies may have a fatal outcome. Conversely, they may result in little to no ill effect onthe child [3].

2. Epidemiology

Over the last two decades, the ingestion of button batteries is, unfortunately, becoming an increasingly common problem faced in the pediatric practice. It is mainly seen in the young children, with a peak incidence between six months and three years [3].
The annual incidence of battery ingestions reported to United States poison centers from 1985 to 2009 fluctuated up and down between 6.3 and 15.1 cases per million population. Thirteen deaths related to tissue damage in the esophagus or airway, and 73 major outcomes were described [4].

3. Physiopathology

The clinical course of a child with a button battery depends on several factors, including the location, duration of mucosal or skin exposure, remaining voltage in the battery, and chemical composition of the battery [3].
In the literature, four mechanisms of injury have been suggested:

1. leakage of the battery contents with direct corrosive damage,
2. direct electrical current effects on the mucosa and resultant mucosal burns,
3. pressure necrosis resulting from prolonged local pressure on the tissue, and
4. local toxic effect due to absorption of substances: this can be the case in mercuric oxide batteries [5, 6,7].

4. Diagnostic

The ingestion or placement of the battery is witnessed, and the child is promptly brought to the hospital for treatment. However, the exact nature of the foreign body is often unknown or mistaken. Symptoms are variable. Some children may present with no signs or symptoms while others can have nonspecific signs like pain, cough, vomiting, irritability, fever, and tachycardia. More specific symptoms include drooling, poor oral intake, epistaxis, rhinorrhea, and foul otorrhea [3].
An urgent initial radiography is required. Radiologists must be aware of its danger and be trained to differentiate the button batteries from the coins. Radiographs should be examined for the battery's double-rim or halo effect on the anteroposterior viewor step-off on the lateral view. Physicians must recognize the hazardous potential and serious implications of such an accident and must consider the diagnosis (particularly in unwitnessed ingestion). Button batteries that are lodged in the esophagus pose the greatest risk, requiring prompt removal.
Endoscopic removal of esophageal batteries is essential to determine the extent of injury and anticipate for patients with batteries lodged in the esophagus, removal is urgently needed within two hours while batteries that are in the stomach or beyond in an asymptomatic patient should be left to pass spontaneously with inspection of the stool or possible repeat radiography in10to14days to confirm passage [3].
Despite assurances from the parents that button batteries were not available and lack of symptoms, it is essential to rule out the possibility of any foreign body being a button battery [8].
Delayed diagnosis of an impacted battery is not uncommon and may occasionally present as a long term serious complication [9].

5. Radiology

The standard radiologic workup for a suspected battery foreign body was immediate nose, neck, chest, and abdominal plain X-ray films, in anteroposterior and lateral

views. Plain X-ray films have high availability, low costs, and high accuracy in outlining radio opaque objects [9].
Button batteries should always be diagnosed if a proper X-ray with adequate exposure is taken. They have a distinctive appearance on radiography as they have a bilaminar structure, making them appear as a double ring or halo (double density) on anteroposterior view and a step-off at the separation between the anode and cathode on lateral view. Small batteries have amore subtle contourwhich is hard to detect. When in doubt, repeated X-ray films in different angles are advised to achieve a correct diagnosis [9-10].
Occasionally, coins may mimic the shape, size, and contour of batteries, which make them undistinguishable If a battery is diagnosed as a coin on plain film, it may delay its removal unnecessarily [9].

6. Complications

those batteries that lodge in the esophagus can result in serious complications and even death . Patients lodged in the esophagus have a greater potential who have batteries that pass into the distal gastrointestinal tract.This is because batteries the esophagus exert a cumulative effect in a localized area without the benefit of dilution of chemical and electrical effects provided by the gastrointestinal secretions in more distal segments [3].
Impaction in the esophagus has been noted to most frequently occur in patients younger than 5 years old, with smaller esophageal diameter, and often occur with battery diameter larger than 20 mm. The larger the diameter of the battery, the more likely it is to lodge in the esophagus [9, 10].
Severe esophageal damage may occur in a very short period of time. Esophageal corrosive injury and burn can
occur as early as 2.5 hours after ingestion, while esophageal perforation can occur after as short a time as of five hours [10, 11]. Other complications include tracheoesophageal fistula, mediastinitis, and perforation of the aorta. Furthermore, airway compromise from esophageal edema has been reported. Esophageal stenosis may be detected few months after removal of the foreign body [10, 12, 13].
None of these late complications were found in our case.

7. Management

Successful management of ingestion of button battery demands a multidisciplinary approach and coordinated care across the ED, anesthesia, pediatric gastroenterology, pediatric surgery, otolaryngology, cardiothoracic surgery, and radiology physicians [14].
The key proper management of button battery foreign bodies is rapid diagnosis and removal of any object lodged in the ear, nose, and upper aerodigestive tract that is suspicious for a button battery [3].
Once the diagnosis of an esophageal BBI is confirmed, rapid assessment of the risk level must be performed in order to mobilize the appropriate resources. This initial assessment should minimally include the age of the patient, size of the battery, timing of ingestion, and current location of the battery, whenever possible. These factors encompass the most important risk factors for predicting severe injury [15].

a. Endoscopic removal

After the decision of where to perform the removal and the assembly of the appropriate personnel for the procedure, the specifics of the removal itself should be determined. in high-risk cases whereby esophageal impaction has injury to vascular structures is suspected, localization of the battery in relation to the aorta and other large vessels through may be performed may further delay actual removal by up to 30 minutes,
In terms of actual endoscopic removal, use of the smallest gastroscope available that still has a 2.8-mm biopsy channel is advised to allow the use of the full complement of foreign body retrieval devices. In the authors' institution, this is the GIF-160 (Olympus America, Center Valley, PA, USA), with an outer diameter of 8.6 mm. Although newer endoscopes have better optics and field of view, the narrower diameter may provide some additional measure of safety in preventing perforation, younger than 4 years of age. In larger patients, the additional 0.5 to 1.0 mm in diameter may be negligible terms of increased risk. Once the battery is visualized within the esophageal lumen, the depth (in centimeters) and orientation of the impaction should be noted as best as possible. Examination of the surrounding tissue for eschar formation and fusion to the surface the battery may help indicate how difficult removal will be.

b. Surgical management

The impossibility to withdraw the EC by endoscopy, after one or more attempts, especially if it is landlocked for several days or weeks. It will then be necessary to know to resort to a surgical treatment. [16]; which was our case.

c. post removal evaluation

Despite minimal findings of edema and ulceration on initial esophagoscopy at removal of the BB, esophageal necrosis and surrounding inflammation progresses despite no further exposure, making timing of associated morbidity from BB exposure somewhat unpredictable.
Stricturing of the esophagus can be a common complication after button battery exposure but does not often present before 4 weeks after initial ingestion [14].
Respiratory symptoms after battery removal should prompt emergent evaluation for vocal cord and tracheal complications, including tracheoesophageal fistula [14].
Even after an uneventful recovery, these patients should undergo a close follow-up. We strongly recommend a contrast study or an endoscopy within the first 4 weeks to rule out stenosis. Esophageal stenosis is probably the most common complication after EB due to button battery ingestion, even if it is seems to Endoscopic balloon dilatation seems to be a safe and effective solution in these cases in our experience. We perform balloon dilatation in a number of different pathologies with satisfactory results [1].

8. Recommendations

Prevention of button battery foreign bodies, especially ingestion, is essential.
The parents and child care providers should be educated about the potential hazards associated with battery exposure so they will be aware of its dangerous nature. The products containing button batteries are either kept away fromchildren or the batteries are secured safely in the product. The public education for this serious problem is necessary as increased public awareness through the public health and health care providers could reduce exposure to and injuries from these batteries. Industry changes,

including improved packaging and button battery markings, will also contribute to reduce morbidity in children. The primary prevention of battery foreign bodieswould bemore effective than improved [3].

9. Conclusion

Finally, prevention is the best management of all. Parents and caretakers should be aware of the potential danger of button battery ingestion and the importance of providing immediate care. Security of devices containing button batteries should be reviewed in order to find the way they cannot be released by children. In addition, as some other authors have underlined, the permanence of the battery in esophagus determines the risk of severe injuries; and therefore, the establishment of a maximum size by manufactures will diminish the probability they become lodged there. None of the more severe consequences of battery ingestion were reported to happen in small batteries.

Summing up, incidence of button battery ingestion is increasing in the last years and the early diagnosis when they become lodged in esophagus, is of capital importance to diminish the risk of potential fatal complications. Endoscopic removal and a close follow-up by a multi-disciplinary group of physicians are essential to deal with both early and late complications [17, 18, 19].

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