

## SEVERE COMPLICATIONS OF A DISK BATTERY INGESTION (CASE REPORT)

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### ABSTRACT

Certain categories of foreign bodies ingestion in children can cause dangerous and severe complications leading to increased morbidity rates among them.

We report a case of disk battery ingestion in a 2 year old girl, with impaction in the upper cervical esophagus, extracted in otolaryngology service but complicated afterwards with tracheo-oesophageal fistula and aspiration pneumonia and by long-term effect with high esophageal stenosis that required endoscopic dilatation.

**Keywords:** battery, child, tracheo-esophageal fistula, esophageal stenosis

### INTRODUCTION

Infants and toddlers explore the environment by placing various objects in their mouth, so that foreign body ingestion is a quite common phenomenon in the pediatric population. The foreign bodies ingested include pins, coins, buttons, seeds, bones, pieces of toys, rocks, hair pins, keys, pencils but also toothpicks, magnets, nails, screws; the most notorious of all are disks batteries. (1,2). The battery is a special category of foreign body due to severe complications that can arise when it is retained during its passage through the gastrointestinal tract, particularly in the esophagus. (3) In pediatric pathology over 66% of cases of battery ingestion are described in children under 6 years (with a maximum peak incidence between the age of 1-2 years). (4) In the United States there are reported approximately 2,100 cases/year are reported. (4)

### CASE PRESENTATION

We report the case of a 2-year-old girl, normally developed and without medical history, who addressed to a pediatric service several days after the ingestion of a disk-battery from a toy. The exact moment of ingestion could not be established. Clinical examination and laboratory investigations performed at the presentation in pediatric service were within normal limits, the patient did not show signs of acute respiratory failure or haemodynamic deterioration. Thoraco-abdominal radiography revealed the presence of a foreign body (disk battery diameter of about 15 mm diameter in the cervical esophagus) that was removed in the otolaryngology service. Although informed about the increased risk of complications, the parents refused hospitalization. A week later the patient presented again to the emergency department for cough, anorexia and acute respiratory distress. Chest X-ray showed mild

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opacity in the right lower lung lobe. Clinical examination, laboratory investigation (WBC = 18.000/mmc, PMN = 89%, ESR = 65/mmh, Fg = 654 mg/dl, CRP = 84mg/dl) and chest X-ray suggested right inferior lobar pneumonia; intravenous antibiotics, oxygen and symptomatic supportive treatment was started. Prolonged and unfavorable evolution of disease (14 days hospitalization in intensive care unit) added to anamnestic elements required an upper gastrointestinal endoscopy, that revealed a fistula on the anterior wall of the cervical esophagus, 13 cm from the dental arch. Under these conditions the oral diet was replaced by nasogastric tube, the patient continued to receive broad-spectrum antibiotic and symptomatics. Clinical evolution was slowly favorable, but control endoscopy performed 14 days after the previous revealed spontaneous closure of the fistula. Oral intake was gradually introduced, the clinical, biological and radiological evolution was favorable and the patient was discharged after 21 days of hospitalization. About 2 months later the girl presented moderate dysphagia for solids and esophagoscopy showed a moderate esophageal stenosis in the upper third of the esophagus treated by endoscopic dilatation sessions. The patient is now in a good clinical condition with normal oral food intake.

## DISCUSSIONS

Round batteries are commonly used in digital watches, hearing aids, minicomputers, cameras, glucometers, some toys and other electronic devices. These batteries contain corrosive and toxic chemicals and heavy metals, including mercury, zinc, silver, nickel, cadmium, manganese, and lithium, together with a concentrated alkaline electrolyte solution of 26% to 45% potassium or sodium hydroxide. (6) These substances can leak if kept in contact with wet surfaces like mouth, oesophagus trachea or larynx. Prolonged contact with mucosa leads to extensive mucosal damage and inflammation. Exposure to the gastric acid in the lower oesophagus or the stomach increases the risk of leakage of the battery content (7). There are four main types of these batteries; mercury, silver, alkaline manganese, and lithium. Lithium disc batteries have a power of 3 Volts, while the other three have a power of 1.5 Volts. Lithium containing batteries have the highest potential to cause mucosal damage. Oesophageal injury from button battery impaction can be attributed to the combined effects of several mechanisms like: alkaline electrolytes leakage from the battery, „de novo“ alkali production

from external current, heavy metal toxicity, direct flow of current causing low voltage burn, and pressure necrosis. The corrosive contents of these batteries and the potential for metal poisoning are reasons for early and aggressive therapy like endoscopic or surgical retrieval in such patients. (8)

The highest number of such cases reported in the literature is the American National Survey on Intake Batteries (NBBI) where it has been analyzed 2382 cases of round battery ingestion. (3) Children younger than 5 years were most frequently affected representing 61.8% of cases and 10% of patients were symptomatic. In this series only 16 patients (0.7%) had oesophageal impaction and two of the children had late complications such as esophageal stenosis. Based on these findings there are authors who supported a non-invasive approach in most cases where oesophageal impaction were excluded, except for those patients with symptoms and signs of developing lesions of the gastrointestinal tract. (3) After radiological confirmation of the position, batteries impacted in the esophagus should be immediately removed, with a stone retrieval basket or a retrieval net. It can also be used an alternative method like a Foley catheter. (9) If the battery can not be recovered directly from the esophagus, it should be pushed into the stomach where it can often be successfully extracted with endoscopic accessories described above.

Batteries that have passed beyond the esophagus are not necessarily needed to be recovered unless the patient has damage of the gastrointestinal tract, except the large ones (> 20 mm in diameter) that are stationary in the stomach more than 48h. Once batteries pass in the duodenum, in 85% of cases they are naturally eliminated within 72 hours. (9)

The complications of battery impaction in the esophagus includes tracheo-esophageal fistula, vocal cord paralysis, ulcerative lesions with or without perforation, and aorto-esophageal fistula. (10)

Regarding tracheo-oesophageal fistula there are several surgical treatment options: segment tracheal resection, tracheal anastomosis and suture the esophageal defect, with or without interposition of muscle flaps. Other authors recommend the use of esophageal stents, which is linked to complications or death, but proved to be only temporary solutions. (11,12,13) There is also the possibility of spontaneous closure, as in our case, favored by fasting. (14,15) There are authors who suggest a non-surgical approach after removing the disk batteries, even when esophageal perforation was noted. (16)

We reported the consequences of prolonged impaction of a round battery in the esophagus, initial-

ly represented by undiagnosed tracheo-esophageal fistula and right inferior lobe aspiration pneumonia. Disease progression was prolonged and aggravated by the noncompliant parents who could not specify the exact time of ingestion and declined in the first phase medical supervision that could prevent the complications. Nasogastric feeding and maintaining oesophageal patency were effective in treating the fistula, with favorable evolution confirmed by a preoperative endoscopy but then we faced with a late complication, esophageal stenosis that required a long term endoscopic treatment. Early recognition of these clinical entities and appropriate management can significantly reduce morbidity due to complications. Essential is increasing awareness of parents and people involved in the process of institutionalization (nurseries, kindergartens, centers for children with neuromotor disabilities and child psychiatry services) to estab-

lish protective rules that avoid keeping hazardous materials out of the reach of children and their active surveillance during the game. At the same time avoiding in the age group 0-3 year the toys containing small parts that can be easily ingested or inhaled is the most effective method of prevention but unfortunately this recommendation is frequently ignored by parents.

## CONCLUSION

Ingestion of foreign bodies, common in young ages and children with mental disorders, can lead to serious complications such as tracheo-oesophageal fistula. Batteries extraction must be followed by a follow-up to early diagnosis and treatment of these complications. Education of parents and health professionals working with children is the most effective method of prevention.

## REFERENCES

1. **Conners G.P.** Esophageal coin ingestion: going low tech. *Ann Emerg Med* 2008; 51:373-374.
2. **Hamilton J.M., Schraff S.A., Notrica D.M.** Severe injuries from coin cell battery ingestions: 2 case reports. *J Pediatr Surg* 2009; 44:644-647
3. **Litovitz T., Schmitz B.F.** Ingestion of cylindrical and button batteries: an analysis of 2382 cases. *Pediatrics* 1992; 89:747-57.
4. American Association of Poison Control Centers. AAPCC Annual Data Reports. <http://www.aapcc.org/dnn/NPDS/AnnualReports/tabid/125/Default.aspx>.
5. **Bhat V.S., Al-Saadi K.A., Bessiouni I.E., Tuffaha A.S.** Embedded esophageal foreign body. A diagnostic challenge. *Saudi Med J* 2009; 30:433-435.
6. **Tander B., Yazici M., Rizalar R., Ariturk E., Ayyildiz S.H., Bernay F.** Coin ingestion in children: which size is more risky? *J Laparoendosc Adv Surg Tech* 2009; 19:241-243.
7. **Pokharel R., Adhikari P., Bhusal C.L., Guragain R.P.** Oesophageal foreign bodies in children. *JNMA J Nepal Med Assoc* 2008; 47:186-188.
8. **Abdulkareem I., Sabir O.M., Elamin A.** Button battery induced traumatic tracheoesophageal fistula: Case report and review of literature. *Sudan J Paediatr* 2011; 11(2):43-49.
9. Cominication from the ASGE Standards of Practice Committee. Management of ingested foreign bodies and food impactions, Volume 73, No. 6 : 2011 *Gastr. Endoscopy*, 1088-1089
10. **Mortensen A., Hansen N.F., Schia O.M.** Cardiac arrest in child caused by button battery in the oesophagus and complicated by aorto-oesophageal fistula. *Ugeskr Laeger* 2009; 171:3098-3099.
11. **Thomas A.N.** Management of tracheoesophageal fistula caused by cuffed tracheal tubes. *Am J Surg* 1972; 124:181-9.
12. **Eleftheriadis E., Kotzampassi K.** Temporary stenting of acquired benign tracheoesophageal fistulas in critically ill ventilated patients. *Surg Endosc* 2005; 19:811-5
13. **Freire J.P., Feijo S.M., Miranda L., Santos F., Castelo H.B.** Tracheoesophageal fistula: combined surgical and endoscopic approach. *Dis Esophagus* 2006; 19:36-9.
14. **Grisel J.J., Richter G.T., Casper K.A., Thompson D.M.** Acquired tracheoesophageal fistula following disc-battery ingestion: can we watch and wait? *Int J Pediatr Otorhinolaryngol* 2008; 72:699-706.
15. **Senthikumar G., Crankson S., Yousef M.** Spontaneous closure of acquired tracheoesophageal fistula. *J Laryngol Otol* 1996; 110:685-687
16. **Samad L., Ali M., Ramzi H.** Button battery ingestion: hazards of esophageal impaction. *J Pediatr Surg* 1999; 34:1527-1531