



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2019; 5(1): 203-205
www.allresearchjournal.com
Received: 11-11-2018
Accepted: 14-12-2018

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Acquired tracheo oesophageal fistula: A rare sequelae of button battery ingestion in a child

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Abstract

We report a rare case of acquired trachea-esophageal fistula in a 6 month infant secondary to accidental button battery ingestion.

Keywords: Tracheo-esophageal fistula, child, button battery, foreign body ingestion

Introduction

Coins are still the most common foreign bodies swallowed in children. Incidence of accidental ingestion of button batteries has increased in recent years, due to the increasing accessibility to electronic toys and devices by children^[1]. Ingestion of button batteries and its sequelae is infrequently published in Indian literature^[2].

Complications of button battery impacted in esophagus include trachea-esophageal fistula^[3-6] vocal cord paralysis, esophageal burns^[7, 8] perforation,^[4, 10, 11] stenosis^[9] and aorto-esophageal fistula. Amongst these trachea-esophageal fistula is rare in the paediatric population^[12].

We report a case of a 6 months old female child who underwent successful surgical management of acquired trachea-esophageal fistula secondary to impacted button battery in esophagus.

Case Report

A 6 month old female child presented with complaints of noisy breathing, cough with expectoration and difficulty in swallowing since 10 days. There was no history of any foreign body ingestion. Chest X-ray revealed a circular radio-opaque shadow in the upper esophagus. (Figure. 1)



Fig 1: Circular radio-opaque shadow in upper esophagus

Rigid esophagoscopy revealed an impacted button battery in the upper esophagus. The esophageal wall was severely edematous with severe inflammatory changes. Circumferential ulcerations were visualized just below the upper esophageal sphincter. The button battery could not be extracted and slipped onwards during rigid esophagoscopy.

Repeat x-ray revealed the battery to be in the stomach. The battery was passed per rectally within 48 hours. Patient had a persistent cough on oral feeds. Suspecting a fistula between the trachea and esophagus at the site of the long standing impacted battery, a contrast enhanced computed tomography (CECT) Neck and Thorax with virtual bronchoscopy was done. It revealed a 5 x 3 mm tracheo-esophageal fistula between trachea and esophagus at T2 level with aspiration pneumonitis in the right upper zone. (Figure. 2 and 3)

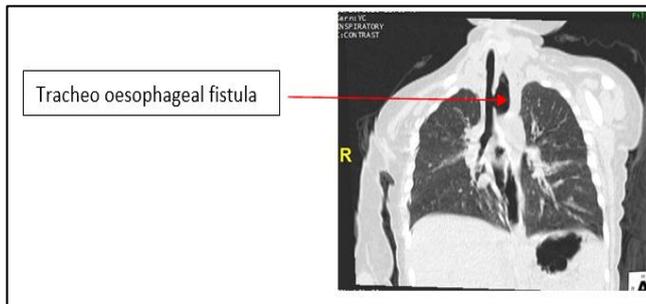


Fig 2: CECT Neck and Thorax

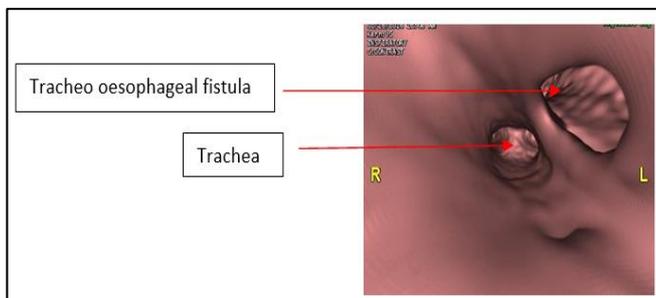


Fig 3: Virtual bronchoscopy showing fistula

Patient was started on nasogastric feeds and antibiotics. Symptoms persisted after 4 weeks necessitating surgical intervention. The oesophagus at the site of impaction was very friable with a strictured segment of approx 1.5cms. A fistulous communication to the trachea was seen from this site. The oesophagus was gently separated from friable surrounding tissues and adhesions and hooked proximally and distally. The short fistulous communication to the trachea was identified and disconnected. Fistula on tracheal side was closed. Strictured segment of the oesophagus was excised and primary esophago-esophagostomy was done. Parietal pleura patch was interposed between tracheal and esophageal suture lines. Feeding jejunostomy was done. Contrast esophagography done two weeks post operatively showed no fistula or anastomotic leak (Figure. 4).



Fig 4: Post-operative contrast esophagogram

Patient was started on oral feeds. However, in the initial few weeks she had severe difficulty in swallowing and bouts of cough. Repeat CECT thorax with virtual bronchoscopy confirmed no evidence of fistula (Figure. 5).

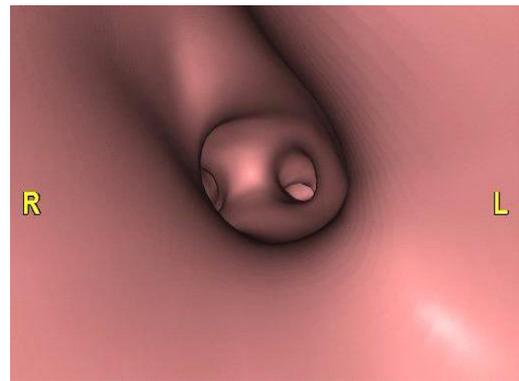


Fig 5: Post-operative virtual bronchoscopy

Jejunostomy feeds were continued during this period. The symptoms gradually improved and she accepted oral feeds and jejunostomy was removed. The symptoms were probably secondary to upper oesophageal sphincter dysfunction due to the long standing pressure of the impacted battery.

Discussion

The American National button-battery ingestion (NBBI) survey revealed that children less than five years of age were the most affected group accounting for 61.8% cases.¹³ The esophagus is especially susceptible to foreign body impaction due to its specific anatomic area of narrowing and weak peristalsis. Thoracic inlet has been reported to be the narrowest point and the most common site of foreign body impaction.¹⁴

The extent of damage caused depends on^[3, 4, 9]

- Diameter of battery: Larger diameter of battery (20 mm) resulted in esophageal impaction
- Chemical contents of the battery such as manganese, silver, mercury, lithium and zinc
- Position of anode side of battery against the esophageal wall and
- Time period for which the battery is present in the esophagus.
- The factors, which contribute to tissue injuries caused by batteries include^[4]
- Leakage of [OH] ions, which react with the mucosal proteins leading to liquefaction, necrosis and saponification of lipid membranes
- Absorption of toxic substances: Though rare, broken or fragmented batteries may lead to absorption of heavy metals. Mercury batteries are more likely to fragment than others. Mallon *et al.* reported a case of lithium battery ingestion in a 5-year-old boy in whom the serum lithium concentration was raised (0.7 mEq/L)^[15]
- Electrical discharge: The flow of electric current to the tissue occurs through the negative pole causing local hydrolysis, hydroxide accumulation and corrosive tissue injury. Lithium cells are associated with most severe outcomes as they contain higher voltage (3V) and capacitance compared with other button batteries.

Likewise charged batteries are associated with severe esophageal injuries.

- Pressure necrosis caused by the presence of battery in the esophagus.
- Challenges in the management of acquired tracheoesophageal fistula are due to the poor nutritional status of the patient, associated pulmonary consolidation and the timing of presentation and surgical intervention, friability of surrounding tissues and adhesions.
- Surgical procedure needs to be individualised for each patient depending on the site and size of fistula, surrounding inflammatory changes and adhesions to important structures.

The principles of repair of tracheo-esophageal fistula are:

- Treat pre-existing pulmonary infections
- Separate closure of the fistulous tracts on the tracheal and esophageal ends
- Interposition of viable muscle flap between the tracheal and esophageal suture lines.

The most common complication following repair of foreign body induced TEF is recurrence of the fistula. A repeat thoracotomy for management of a recurrent fistula increases risk in view of anaesthesia, poor nutritional status and pulmonary infections.

The management of children with button battery ingestion is a costly affair associated with unpredictability and high morbidity. It is certainly an avoidable prospect. There is increased need to educate parents about the dangers of battery ingestion and aim primary prevention. Health-care personnel should be aware of various modes of presentation of children with battery ingestion. High alert, especially in infants with nonspecific respiratory symptoms is essential, especially when the child fails to respond to treatment of respiratory infections. A plain radiograph of the chest is helpful in establishing the diagnosis. A multidisciplinary team approach and early referral with rapid and coordinated care are of paramount importance to minimize the risk of complications and negative outcome.

Education regarding hazards of button battery ingestion in the targeted population can greatly decrease the incidence. Stricter legislation on locally made toys can also be helpful.

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