

Outcomes of Children Presenting with Button Battery in Esophagus: A Retrospective Review

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ABSTRACT

Introduction

Foreign body in esophagus is a common ENT emergency. Button batteries tend to have more grievous outcomes due to caustic mucosal injury to the esophagus. The objective of our study was to review the clinical profile and outcomes of the paediatric population in our center who presented with button battery in esophagus following accidental ingestion.

Methods

This was a retrospective study conducted in Tribhuvan University Teaching Hospital, Kathmandu, Nepal. Hospital records of all the patients who presented with button battery esophagus and underwent rigid oesophagoscopy removal from January 2013 to January 2019 were reviewed and analyzed for patient demographics, time interval between ingestion and presentation, site of impaction, status of oesophageal mucosa at the time of rigid oesophagoscopy removal of the battery, early post-operative complications, outcomes at the time of discharge and on follow-up.

Results

Our final sample size was 11 and all cases were <15 years. The average duration from time of ingestion to presentation to our hospital ranged from 1 day to 2 months. Variable oesophageal mucosal findings such as superficial mucosal erosion, superficial ulcer with slough and granulations with deep discrete ulcer were seen at the site of impaction of the button battery. One case was diagnosed with bilateral abductor palsy on 10th post-operative day following rigid oesophagoscopy removal of the battery. All other cases didn't develop any significant complications.

Conclusion

Button battery in esophagus results in oesophageal ulceration and thus warrants an early endoscopic removal. Delayed removal can also cause bilateral abductor palsy from the caustic damage to recurrent laryngeal nerve.

Keywords: Alkaline button battery, esophagus, rigid oesophagoscopy

INTRODUCTION

Foreign body in esophagus is one of the most common emergencies in otorhinolaryngology. Although it can occur in all age groups, it tends to be more prevalent in children due to their habit of exploring things with their mouth.¹ While majority of the foreign bodies in esophagus (80-90%) pass spontaneously into gastrointestinal tract, 10-20 % require surgical removal, mostly by endoscopic and rarely(1%) by open approach.²

A wide range of foreign bodies in esophagus have been reported such as coin, button battery, magnet, sharp pin, nail, meat bolus, bone, etc. Button battery tends to have most grievous outcome due mucosal injury it poses. It causes liquefactive necrosis and also a low voltage electrical burn to the mucosa.³ Moreover, close resemblance with metallic coins often leads to missed diagnosis and delay in treatment increasing the chances of complications.

The objective of our study was to review the clinical profile and outcomes of the paediatric population in a referral ENT center who presented with button battery in esophagus.

METHODS

This was a retrospective study conducted in Ganesh Man Singh Memorial Academy for ENT-Head and Neck Studies, Tribhuvan University Teaching Hospital, Kathmandu, Nepal. Hospital records of all the patients who presented with button battery esophagus and underwent rigid oesophagoscopy removal from January 2013 to January 2019 were analyzed. Patient demographics, time interval between ingestion and presentation, site of impaction, status of oesophageal mucosa at the time of rigid oesophagoscopy removal of the battery, early post-operative complications, outcomes at the time of discharge and on follow-up were noted. Outcomes on follow up were assessed from the follow-up records and complication records upto 1 month following surgery for symptomatic complaints of dysphagia, respiratory distress, aspiration and change in voice. Cases with incomplete documentation of the above mentioned findings were excluded. Zargar classification for

Table 1. Time interval between ingestion of button battery to presentation

Time interval	Number
≤1 day	4
>1-3 days	3
>3-7 days	2
>7-14 days	1
>14 days	1

caustic injuries to esophagus was used to define the depth of mucosal lesion.⁴

RESULTS

A total of 13 record files were assessed. Eleven had a complete documentation of patient profile, notes of surgical procedure, per-operative findings and post-operative outcomes. Two files didn't have the surgical notes and thus were excluded. Follow-up duration averaged from 2 weeks to one month post-operatively.

Of the total cases, six were male and five were female. All of the cases were <5 years with 9 out of 11 cases below 2 years. Majority of cases presented with symptoms of vomiting, excessive crying, difficulty in swallowing and refusal to feed. The time interval from the day of ingestion to presentation in our hospital ranged from 1 day to 2 months (Table 1).

All cases who presented in our hospital, underwent rigid oesophagoscopy removal of button battery within 8 hours of presentation. The diameter of the battery in all cases ranged from 15-20 mm. The site of impaction ranged from 10 cm to 25 cm from upper incisors. Majority of the cases had superficial ulcer covered with slough in the oesophageal wall. Perforation of the esophagus wasn't seen in any of the cases. The status of oesophageal mucosa at the site of impaction along with the duration of impaction is shown in Table 2.

Ten out of 11 cases were discharged without any documented complications and none of the cases on follow-up had complaints of dysphagia, change

Table 1. Duration of impaction and mucosal injury base on Zargar's classification

Duration of impaction	Mucosal injury	Number
≤1 week	Superficial mucosal erosion (Grade I)	1
	Superficial ulcer covered with slough (Grade 2a)	7
	Superficial ulcer covered with slough with minimal oozing (Grade 2a)	1
>1-2 weeks	Superficial ulcer covered with slough (Grade 2a)	1
>2 weeks	Granulations with deep discrete ulcer (Grade 2b)	1

in voice, aspiration or respiratory distress. One case developed respiratory distress on the 10th POD. Flexible endoscopic evaluation of larynx revealed bilateral abductor palsy for which emergency tracheostomy was done.

DISCUSSION

With increased use of electronic devices and easy availability of button batteries, incidence of these batteries presenting as foreign body in esophagus is increasing.⁵ A wide range of button batteries such as lithium, alkaline, zinc–air, silver oxide are available. These batteries tend to cause liquefactive necrosis of the oesophageal mucosa. In between the cathode and anode of these batteries, there is a rapid hydrolysis of water generating hydroxide ions which raises the pH and thus increasing the caustic injury.⁶ Also, a low voltage electrical burn is thought to occur at the site of impaction. Delay in diagnosis and management can lead to complications such as oesophageal perforation and stricture, tracheo-oesophageal fistula, vocal fold palsy and fistulization into major vessels.⁷ Button batteries should be removed as early as possible as the mucosal damage can occur within 2 hours at the earliest.⁸ Guidelines from National Capital Poison Center suggest administration of honey per oral in cases >12 month with a suspected history of battery ingestion within 12 hours. Honey is thought to coat the battery thus preventing generation of hydroxide ions. X-ray should be done in all cases including neck, chest and abdomen. After removal of the battery, a careful evaluation of the mucosal injury should be done. In the absence of perforation, a gentle wash with 0.25% sterile acetic acid (50-150 ml) can be done to neutralize the alkali burn. Early feeding with clear water is encouraged if there is no perforation in oesophagogram. The patient should be advised to have soft diet for at least 28 days.⁹

In our study, a total of 11 cases were included. The time interval from ingestion of button battery to hospital presentation ranged from <1 day to 2 months. Most of the children in our study presented with symptoms of vomiting, excessive crying, difficulty in swallowing and refusal to feed. In a multi-institutional review by Shaffer et al, of 48 cases presenting with button battery in esophagus, dysphagia, nausea, vomiting drooling, cough and fever were the commonest presenting symptoms. Their average time from ingestion to surgery was 8 hours.¹⁰ On reviewing the history, ignorance and unawareness of the parents was found as a major cause of delay in cases who were presented late i.e. >1 day in our study. Another factor for delayed presentation was lack of imaging facilities in the remote areas of the nation. One case in our study was presented with a delay of 2 months from the day of ingestion of the battery. The case was brought by the parents who were from remote

region of Terai. The only symptoms the child had was difficulty in feeding and vomiting. The child had a history of swallowing button battery 2 months back. The case was diagnosed after doing x-ray of soft tissue neck.

The button batteries were found to be impacted in esophagus between 10 cm to 25 cm from upper incisors. On removal of the battery variable mucosal lesions were found such as superficial mucosal erosions (Grade 1), superficial ulcer with slough (Grade 2a) and granulations with deep discrete ulcer (Grade 2b). The case, who presented after 2 months long history of ingestion had the latter finding. Anand et al. in their study, have classified the mucosal lesions in esophagus following caustic injury by button batteries in similar way. Of 39 cases, 23 had Grade 3 and 16 had Grade 2 mucosal injuries.¹¹ In their study, in cases who didn't develop complication, the median duration of exposure was 7.5 hours and in cases who developed complications, the median duration of exposure was 32 hours. In an experimental study by Jatana et al, 3-V Lithium batteries were found to cause significant injury compared to 1.5V batteries. In a study by Lee et al, amongst 12 children with button battery esophagus, no complications were seen in cases who ingested alkaline (LR57 and LR44) batteries smaller than 1.5 cm. Cases with lithium batteries (model CR1616, CR1620, and CR2032) larger than 1.5cm, showed moderate to major complications.¹³ None of the button batteries removed in our study were greater than 2 cm diameter. However, the voltage and type of battery were not mentioned in patient records, which was one of the drawbacks of our study.

The early complications such as oesophageal perforation, mediastinitis, bilateral abductor palsy and the late complications such as oesophageal stricture, tracheo-oesophageal fistula and fistulization into major vessels can occur as a consequence of button battery esophagus.^{9,12,14} The only major complication encountered in our series was bilateral abductor palsy. The patient developed respiratory distress on the 10th POD of removal of button battery. Rigid oesophagoscopy was done within 7 hours of ingestion and the button battery was found to be impacted just below the cricopharyngeal junction. Flexible endoscopic evaluation of larynx revealed bilateral abductor palsy for which emergency tracheostomy was done. Wallace et al. have reported a case of 11-month old boy with button battery in cervical esophagus developing left vocal fold palsy with subglottic stenosis.⁹ Similarly, Singh et al. also have reported a case developing bilateral abductor palsy which was detected 2 months after removal of Lithium battery from esophagus.¹⁵ Reported literatures describe that most of these cases present with respiratory distress ranging from 3 days to 2 months following removal of the battery.¹⁶⁻¹⁹

In our study, in all cases nasogastric tube was kept under direct laryngoscopic guidance following removal of the battery. In 9 cases, per oral feeding with clear sips of water was started from 1st post-operative day (POD) progressing to semisolid diet by 2nd POD and removal of NG tube. The decision to remove NG tube was guided by the absence of symptoms such as fever, chest pain, respiratory distress and normal post-operative chest X-ray. Although oesophagogram has to be done whenever possible prior to start oral feeding, presence of superficial mucosal lesions in majority of cases guided us to start oral feeding. Economic constrain was the another factor. Two cases had persistent fever upto 2nd POD and thus NG feeding was continued upto 5th POD. Delay in presentation in both cases were less than 1 week with mucosal lesion of Grade 2 (superficial mucosal ulcer with slough). All cases were kept under I/V antibiotics (Ceftriaxone) throughout the period of hospital admission. No significant complications were noted in the follow up except for one case who developed bilateral abductor palsy on 10th POD. On follow up we relied mostly on history of the patients to assess for complications. A flexible oesophagoscopy or contrast oesophagogram could have been helpful for us to detect oesophageal strictures. Oesophagogram is usually advised 1-7 days following removal of battery before starting oral feed and on 4th post-operative week to assess for oesophageal perforation and stricture respectively.^{5,9} Repeat endoscopic evaluation is advised if there is evidence of stricture in oesophagogram.⁵

There were various limitations in our study. Presence of superficial mucosal and submucosal lesions despite having history of >24 hours of ingestion of button battery in majority of cases is a very rare finding. A complete documentation of the type and voltage of the battery could have helped to us to figure out the reason. Also oesophagogram during follow up could have further helped us to detect complications such as oesophageal strictures.

CONCLUSION

Mucosal ulceration was the commonest complication resulting from button battery esophagus in our study. The severity of ulceration ranged from Zargar's Grade 1 to Grade 2b. Bilateral abductor palsy was also another cumbersome complication we encountered resulting from button battery esophagus. Thus, there should always be an attempt to remove the battery as early as possible.

CONFLICT OF INTEREST

None declared.

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