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Post extubation stridor due to bilateral vocal cord palsy following button battery ingestion – A rare and forgotten complication of button battery ingestion in children

***PAN Lochanie*[1*], *S Weerakoon*[2]**
Senior Registrar in Anaesthesiology[1], *National Hospital of Sri Lanka, Consultant Anaesthetist*[2],*Lady Ridgeway Hospital for Children, Colombo, Sri Lanka.*

****Corresponding author*:** lochanie1981@yahoo.co.uk

We report a patient who developed bilateral vocal cord palsy following button battery ingestion.
A two and half year old girl presented with a history of button battery ingestion. Rigid oesophagoscopy was performed within 3 hours. Patient developed post extubation stridor with respiratory distress.

Bilateral vocal cord palsy is a rare complication of button battery ingestion which can lead to an airway catastrophe. Decision on timing of extubation is crucial to avoid immediate post-operative respiratory distress.

Expedited removal of lodged button battery, increased vigilance for possible complications and long term follow up is of utmost importance.

Key words: Stridor; button battery ingestion; bilateral vocal cord palsy

Case report

A 2 1/2year previously healthy girl presented with a history of witnessed button battery ingestion. On admission she remained asymptomatic. Urgent antero-posterior chest and neck x-ray revealed a round opacification in mid oesophagus. Rigid oesophagoscopy was performed under general anaesthesia within 3 hours of incident. Intra venous propofol 30mg, fentanyl 10µg, suxamethonium 20mg, dexamethasone 1mg was given at induction and intubated with a 4.5mm endotracheal tube. Anaesthesia was maintained with oxygen, nitrous oxide 50:50 and isoflurane. Spontaneous respiration was maintained.

A 20mm Lithium button battery was removed. Oesophageal erosions were noted. A nasogastric tube was inserted. Patient was extubated in left lateral position on full recovery.

Immediately following extubation, child developed inspiratory stridor not responding to continuous positive airway pressure, i.v. propofol 20mg and 5mg adrenalin nebulization. Urgent direct laryngoscopy revealed bilateral vocal cord palsy. Patient was reintubated and ventilated on SIMV–volume targeted pressure control mode with $FiO_2$0.4, volume target 80ml, control pressure 15cmH_2O, PEEP 3cmH_2O, respiratory rate 20/ minute, I:E–1:2.

Intensive care unit management included keeping nil orally, i.v. N/2 saline 40ml.hour^{-1}, 30º head up tilt, i.v. dexamethasone 1mg 8 hourly, adrenalin nebulization tds, i.v. ranitidine 10mg 8 hourly, i.v. metoclopramide 2.5mg 8 hourly, i.v. co-amoxyclav 300mg 8 hourly and i.v. midazolam 20µg/kg/hour infusion.

Twenty four hours later, she was extubated after confirming presence of air leak. Immediately after extubation, child developed stridor. However, SpO_2 was 98% on room air with no features of respiratory distress. Consent was obtained for tracheostomy if the condition deteriorates.
Fortunately, child did not develop respiratory distress and was haemodynamically stable. Thus, a team decision was made to manage her conservatively. Three days later, fibreoptic laryngoscopy confirmed previous results.
Upper gastro intestinal contrast study did not reveal any significant leakage. Oral feeds were started gradually after confirming normal swallowing. She

was discharged to ward on 4th post- operative day and discharged home on 10th post-operative day with a plan to review in 1 month.

Discussion

Over past few decades there is a rise in incidence of button battery ingestion due to their use in toys and other electronic devices.[1] Majority pass through gastro intestinal tract without causing significant damage. The few which remain in upper oesophagus are more prone to cause severe injury within few hours.[2]

Predictors associated with poor outcome are longer duration of exposure, higher voltage, larger size and younger age.[3]

Alarmingly 12.6% of children younger than 6 years who ingested 20mm diameter lithium button batteries experienced major adverse effects such as perforation, tracheo-oesophageal fistula, fistulation to a major vessel etc.[1]

Button battery ingestion poses a significant challenge to the anaesthetists, intensivists and primary care physicians due to need of emergency interventions and associated fatal complications.

Button batteries are formed by compacting metals and metal oxides on either side of an electrolyte soaked separator.[1] Lithium containing batteries are more commonly associated with clinically significant complications due to larger diameter and greater voltage.[4] Most significant mechanism of injury is generation of hydroxide ions at negative pole caused by the current created through adjacent tissue. Hydroxide accumulation leads to tissue liquefaction and necrosis.

Our patient presented with a history of witnessed button battery ingestion. If there is wheezing, drooling, vomiting, dysphagia, coughing, choking in any child one should always consider the possibility of a button battery ingestion.[1] An algorithm for button battery ingestion triage and treatment designed by the National Poison Centre is available for reference when such a patient is encountered, which was followed for this patient.[3]Antero-posterior chest and neck radiograph was helpful to locate the battery. It often reveals a peripheral halo of reduced density which is useful to distinguish it from a coin. Unfortunately, a lateral chest radiograph was not performed which would have demonstrated the step off on negative side of the battery. Complications are generally more severe adjacent to negative pole[3] which would have been of predictive value. Once the diagnosis is established, endoscopy should be performed as early as possible.[1]Though this child was asymptomatic on presentation, she developed symptoms of vocal cord palsy immediately after extubation. This can be multifactorial. Firstly, as highlighted above, since this is a time sensitive injury mechanism, existing injury may have worsened even during the period of surgery up to removal of the battery. Secondly, airway manipulation during intubation might have caused airway oedema which may contribute to exacerbation of stridor.

Had bronchoscopy or micro laryngoscopy been performed during initial surgery per se, immediate post-operative catastrophe of upper airway obstruction would have been prevented by delaying extubation. However, as vocal cord palsy is a very rare complication of button battery ingestion, this was missed by our team. We hope that this case report would be an eye opener to all surgical teams involved in managing such patients to combine oesophagoscopy with bronchoscopy and direct laryngoscopy to exclude associated airway injuries.

Only 5 case reports were available in the literature survey for bilateral vocal cord palsy following button battery ingestion in paediatric population. (Table 1)

Patient number	Age	Diameter of battery	Chemistry	Time from ingestion to removal	Battery location	Signs and symptoms	Procedures performed
1[5]	15 months	20 mm	3V Li battery	5 hours	Oesophageal inlet	Biphasic stridor	Tracheostomy several weeks later when presented with severe respiratory distress. Gastrostomy for feeding
2[6]	16 months	Not mentioned	Li	Not mentioned	Oesophagus		Unilateral posterior cordotomy
3[7]	11 months	Not mentioned	Not mentioned	5 hours	Hypopharynx	Stridor	Intubated and ventilated for 6 days
4[8]		Not mentioned	Li	Not mentioned	Oesophagus	Not mentioned	Tracheostomy
5[9]	8 years	Not mentioned	Li	2 hours	Upper oesophagus	Wheezing, retractive respiration	Intubated and ventilated for 12 days

Table 1: Summary of data from previous case reports citing vocal cord palsy following button battery ingestion

Post-operatively, one should be vigilant to detect delayed complications. Furthermore, risk of aspiration is high due to vocal cord palsy. Place for gastrostomy or parenteral nutrition should be considered. Enteral feeds were started gradually for our patient after performing a swallowing assessment.

In conclusion, early recognition and expedited removal is the main step to minimize rare but devastating complications. High index of suspicion of possible complications would prevent undue critical incidents in recovery room and intensive care unit. A close follow up is essential to deal with both early and late complications.

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