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Predictors of nature of ingested foreign bodies in children & assessment of operative outcomes

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ABSTRACT

Objective: To examine sensitivity/specificity of history & radiology to identify ingested foreign body (FB) and develop a protocol for management of ingested FBs in paediatric patients; to assess outcomes of removal of lithium button battery foreign body (LBBFB).

Methods: Retrospective review. Children presenting to ENT emergency with suspected FB ingestion underwent rigid esophagoscopy and FB removal. Average age, number of attempts, duration of ingestion, success rate, and complications were analysed.

Results: Cases of coin/LBBFB ingestion: 916/70. Mean age: 5.8/2.03 years ($p < 0.001$). Average duration of ingestion: 37/9.5 h ($p < 0.001$). Patients below 3: 31.3/62.8% ($p < 0.001$). Suggestive history/radiological signs: 100%/100%, 75.7%/98.6% ($p < 0.0001$). Site of impaction cricopharynx: 60.3%/74.3% ($p = 0.02$). LBBFB group: Successful removal in 1st attempt: 66 (94.3%). Cases requiring multiple attempts due to impaction: 4 (5.7%). Parenteral steroids were administered before successful reattempt. No relation was found between duration of ingestion/impaction. Five (7.1%) cases developed complications. Average follow-up duration: 13.59 months.

Conclusions: Children < 3 years with vague history of FB ingestion and suggestive chest x-ray should be sent urgently for FB removal. Parenteral pre-and postoperative short course steroid use may be considered to improve outcomes.

1. Introduction

Children have an inherent tendency to put small objects in their mouth and other orifices. Any small object may be picked up and invariably put in the mouth (ingestion), nose or ears (insertion). A wide variety of ingested or inserted foreign bodies has been reported in the medical literature, including batteries [1], bones, toy parts, marbles and pieces of jewellery [2]. Coins comprise 70% of ingested foreign bodies in children [1,2]. Ingested and inserted foreign bodies constitute a major paediatric emergency problem worldwide.

Lithium button batteries as foreign bodies continue to pose a major health hazard, especially in paediatric age group. These comprise 2% of total ingested/inserted foreign bodies [3]. Button batteries are being increasingly used in watches, remotes, toys, hearing aids and other digital devices. Their smooth and shiny appearance makes them particularly appealing to children [4]. Foreign bodies usually get impacted at the sites of anatomical narrowing in the oesophagus, most commonly at the cricopharyngeal junction.

Patients with lithium button batteries have a higher chance of developing complications. Major complications of lithium button batteries include oesophageal mucosal erosions with consequent perforation, mediastinitis and oesophageal strictures [5]. Other rare complications reported in medical literature include tracheo-oesophageal fistula, erosion of major blood vessels with consequent haemorrhage, and bilateral vocal cord palsy [6]. Thereby it is important to expedite the diagnosis and management of button battery foreign body. The present study was carried out with the aim of comparing the characteristics of LBBFB with coin FBs and proposes a protocol for management of these ingested foreign bodies. Ours was a retrospective study including all cases of coin and LBBFB ingestions over a six-year period.

2. Materials & methods

2.1. The case series

Approval for the study was obtained from Lady Hardinge Medical College Ethics Committee. All cases of suspected coin/LBBFB foreign

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Table 1
Comparison of demographics of foreign body coin vs. LBBFB ingestion cases.

Parameter	FB coin	LBBFB	P-value
Avg. Age	5.8 yrs	2.03 yrs	**P < 0.0001, S**
Avg. Duration	37 h	9.5 h (54 pts)	**P < 0.0001, S**
Suggestive History	916 (100%)	53 (75.7%)	**P < 0.0001, S**
Radiological Signs	916 (100%)	69 (98.6%)	**P = 0.0003, S**
Impaction at cricopharynx	553 (60.3%)	52 (74.3%)	**P = 0.02, S**
% Females	440 (48%)	33 (47.1%)	P = 0.88
% below 3 yrs	287 (31.3%)	44 (62.8%)	**P < 0.0001, S**
% complications	Nil	5 (7.1%)	–
% death	Nil	66 (94.3%)	–
Avg. duration of follow-up	3.5 months	13.59 months	–
Avg. Length of stay	11.7 h	3.5 days	**P < 0.0001, S**
TOTAL CASES	**916**	**70**	

Bold values signify that the P values are statistically significant.

Table 2
Summary of cases of button battery ingestion requiring more than one attempt at retrieval.

Age	Location	Duration	Outcome
2 y	14 cm	4 d	2 attempts, U/E
15 m	15 cm	20 d	Removed at 3rd attempt, RT removed at 10 days, discharged U/E
2 y	18 cm	7 h	Impacted, 1st attempt failed, i.v. antibiotics, steroids 2 days: U/E removal
2.5 y	15 cm	2 d	1st attempt failed, i.v. antibiotics &steroids 2 days, removed, U/E
TOTAL			4

Legend: Y = years. M = months.Location = distance from upper incisors. Cm = centimeters. Hrs = hours. D = days. U/E = uneventful.

body ingestion which presented to the emergency department over a six-year period from January 2011 to January 2017 were included. Average age at presentation, duration of ingestion, success rate, number of attempts for removal, characteristics of removed battery and complications were analysed. Role of pre- and postoperative parenteral steroids in LBBFB cases was analysed. A total of 986 cases-916 cases of coin ingestion and 70 cases of LBBFB ingestion-were included in the study. All other FBs were excluded. Demographic profile of all cases is summarized in Tables 1 and 2.

In all cases chest X-ray postero-anterior view and lateral view were obtained; presence of battery was diagnosed accurately by the "double-ring sign" [7]. This is a sign in which a disk battery shows a double-ring or halo sign due to the metallic cap (Fig. 1). On lateral view of chest X-ray a 'step-off' sign can be seen (Fig. 2) [7]. A coin is seen as a continuous round opaque shadow and these features were used to make a preoperative diagnosis of the ingested FB.

3. Observations/results

3.1. Coin ingestion

Average age of the children at presentation was 5.8 years (1–12 years). Two eighty seven patients (31.3%) were less than 3 years of age; 48% were females. History of the duration of ingestion varied from few hours to a number of days with an average of 37 h. Average duration of follow-up was 3.5 months (1–4 months).

3.2. Ingestion of lithium button battery

The average age of the children at presentation was 2.03 years (7 months–8 years). Forty-four patients (62.8%) were less than 3 years of age. Thirty-three out of 70 patients (47.1%) were females. History of the duration of battery ingestion varied from few hours to a number of days with an average of 9.5 h for 54 patients and 4.8 days for 16 patients. Average duration of follow-up was 13.59 months (12–24 months). All findings are summarized in Tables 1 and 2.

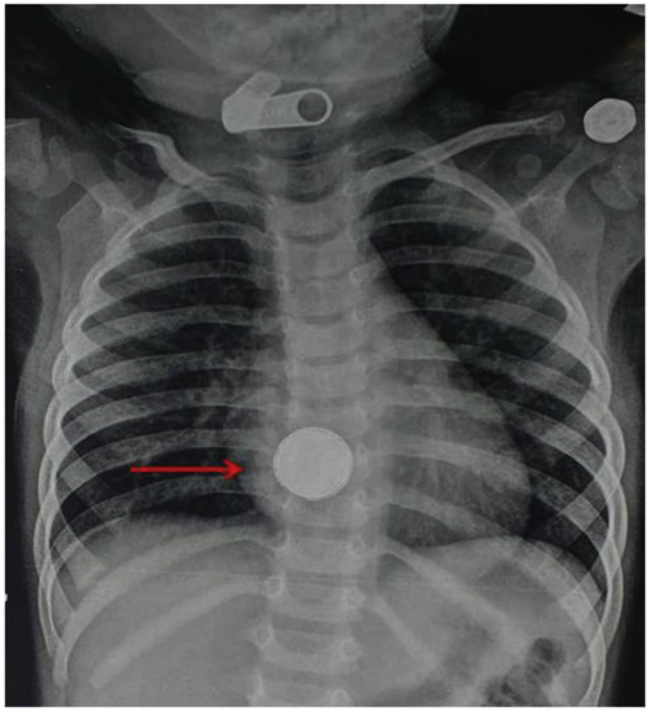

Fig. 1. Chest X-ray postero-anterior view showing the classical "double-ring sign".

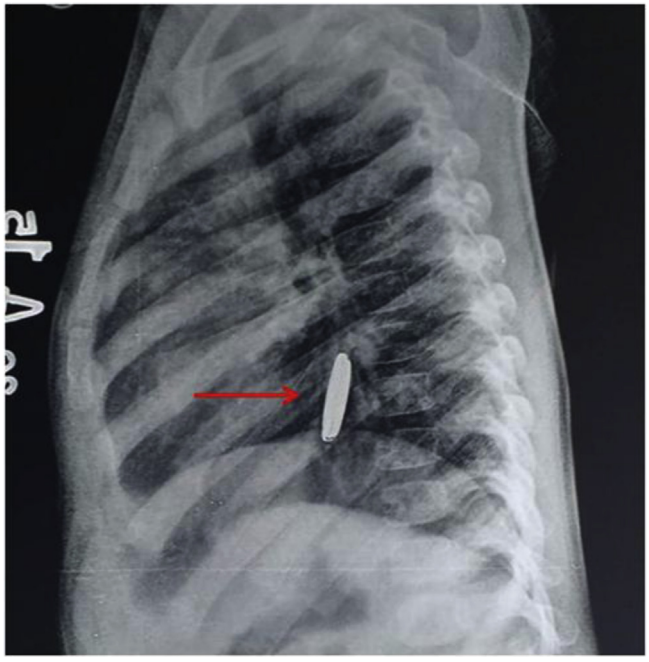

Fig. 2. Chest X-ray lateral view showing the "step-off" sign.

3.3. Management

All patients were posted for emergency rigid oesophagoscopy under general anaesthesia within 4 h of presentation. All 916 of our cases with foreign body coin had an uneventful removal and all were discharged within 6–12 h of removal.

Sixty-six cases out of 70 (94.3%) had successful removal of battery