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A retrospective clinical study and management of ingested Indian currency coin found in the oesophagus among paediatric age group

Sudhakar Rao M. S., Deepak Karade*

Department of Otorhinolaryngology and Head and Neck Surgery, Vijayanagar Institute of Medical Sciences, Ballari, Karnataka, India

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***Correspondence:**
Dr. Deepak Karade,
E-mail: dkbims@gmail.com

ABSTRACT

Background: Foreign body ingestion is a common event in children and carries significant morbidity and mortality. Indian currency coins are found to be the common ingested foreign bodies hence, to be treated accordingly.
Methods: A 7 years retrospective review of 133 children diagnosed, admitted and managed for "ingested Indian currency coin" between January 2011 to December 2017 in the Department of Oto-rhino-laryngology and Head and Neck surgery, Vijayanagar Institute of Medical Sciences, Ballari, Karnataka, India. A plain radiograph of the relevant views of neck and chest were taken to identify the foreign body.
Results: There were 80 (60.2%) males and 53 (39.8%) females, ranging in age from 6 months to 15 years. Most of the patients 98 (73.7%) presented within 12 hours of the coin ingestion. 109 patients presented with one or more symptoms, common being vomiting 83 (62.4%). Coin was located mostly at the cricopharynx 111 (83.5%). Coin removal was possible using Macintosh laryngoscope and Magill's forceps in 106 (79.7%) patients, and 27 (20.3%) patient's required rigid oesophagoscope.
Conclusions: Indian currency coin ingestion is commonly found in cricopharyngeal area of the oesophagus among preschool age group. The duration of retention of the foreign body, procedural time, hospital stay of the patient, diameter of the coin in both the genders have no impact on clinical outcome on retrieval of them.

Keywords: Foreign body, Oesophagus, Indian currency coin, Magill's forceps, Macintosh laryngoscope

INTRODUCTION

Foreign body ingestion is a most common event in children and carries significant morbidity and mortality.[1] Most prevalent in age group from 6 months to 6 years, with peak in children older than 3 years.[2,3] The increased incidence of swallowing foreign bodies in children is due to their natural propensity to gain knowledge of taste, texture and configuration by putting things in their mouth, anatomical characteristics and physiological features such as immature swallowing coordination mechanism, development of chewing capacity, higher respiratory rates and tendency to cry, cough, or play during eating.[4,5]

Coins were found to be the common ingested foreign bodies.[6] A retrospective study conducted by Donald et al has shown that, out of 246 esophagoscopies 196 (80%) of the esophagoscopies were to remove coins.[6] Foreign bodies frequently found in the cricopharyngeal and oesophageal regions.[6,7] Most of the foreign bodies which have gone beyond lower oesophageal junction will pass uneventfully through the intestinal tract.[8] Foreign bodies in upper digestive tract irrespective of their size and shape should be considered as emergency and should be treated accordingly. If foreign bodies are not removed on time, there is a risk of intramural perforation, mediastinitis, aorto-oesophageal fistula, tracheo-oesophageal fistula and long-term residual injury to the oesophagus.[9]

There are several techniques to remove oesophageal foreign body, each technique carries certain benefits and risk to the patients and these techniques require experience and expertise. However, there is no universally accepted technique, the commonly preferred technique is rigid endoscopic removal under general anaesthesia and it can be used as diagnostic as well as therapeutic tool.[9] This technique is not devoid of risks especially oesophageal perforation which has got high morbidity and mortality, along with these the patient is also exposed to anaesthetic complications.[10]

Aim

The aim of the present study was to study the clinical presentation and management of ingested Indian currency coin found in the oesophagus among paediatric age groups.

METHODS

It is 7 years of retrospective review of all children diagnosed, admitted and managed for "ingested oesophageal Indian currency coin" between January 2011 to December 2017 in Department of Oto-rhino-laryngology and Head and Neck surgery, Vijayanagar Institute of Medical Sciences, Ballari, Karnataka, India.

After the institutional ethical committee approval data was collected by the review of medical records as patients demographics, clinical presentation, preoperative diagnosis, prior medical or surgical history, denomination and location of coin, duration of procedure, method of removal and need for conversion to a different type of instrumentation, success or failure of coin removal, length of hospitalisation and morbidity.

A retrospective analysis of 133 cases of foreign body coin ingestion was done. Children age group between 0 to 15 years was analysed. Exclusion criteria for this study are coin found below the level of lower oesophageal sphincter on radiological evaluation, patient age group more than 15 years, non-Indian currency coin foreign body, children with mental retardation and children with cerebral palsy. In all cases digital X-ray soft tissue neck antero-posterior and lateral view, chest X-ray postero-anterior view and X-ray erect abdomen were done along with other relevant preoperative investigations. The data is subjected for statistical analysis.

RESULTS

In this 7-years retrospective study, 133 cases of ingested Indian currency coins were studied and analysed. There were 80 (60.2%) males and 53 (39.8%) females, ranging in age group from 9 months to 15 years. Children from 2 to 5 years accounted for 84 (63.1%) of the patients. 5 (3.8%) were under the age of 1 year, 44 (33.1%) were between the age of 6 to 15 years (Figure 1).

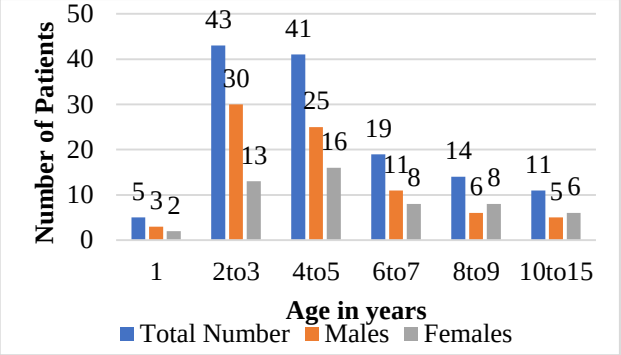

Figure 1: Age and gender distribution of study population.

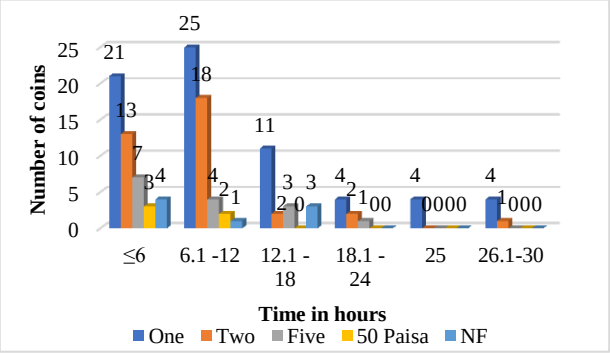

Figure 2: Presentation time duration for different coins.

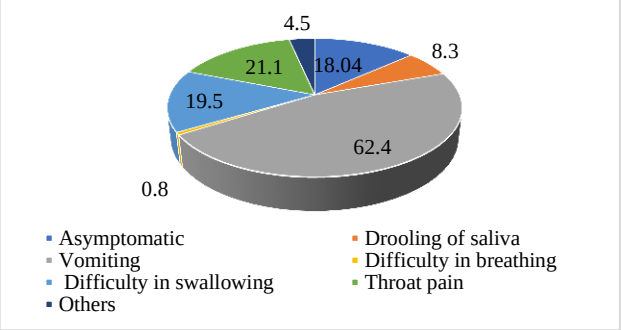

Figure 3: Presenting symptoms of children with Indian currency coin ingestion.

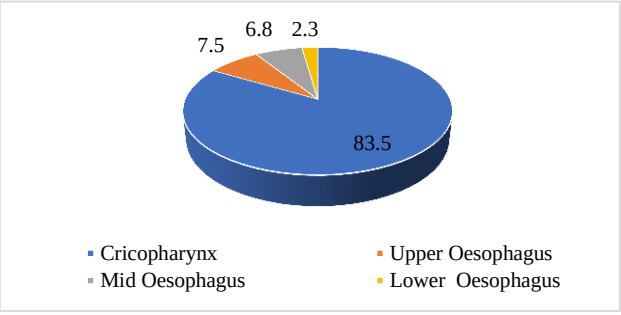

Figure 4: Location wise distribution of ingested Indian currency coin.

98 (73.7%) patients presented within 12 hours of the coin ingestion, 26 (19.6%) presented between 12 to 24 hours, 9 (6.8%) patients presented at 24 to 30 hours (Figure 2). 24 (18.04%) patients presented with history of ingestion of Indian currency coin without any symptoms, 109 patients presented with one or more symptoms, most common being vomiting 83 (62.4%), throat pain 28 (21.1%), difficulty in swallowing 26 (19.5%), drooling of saliva 11 (8.3%), one patient (0.8%) had difficulty in breathing and 6 (4.5%) had other symptoms like pain during swallowing, chest pain, nausea (Figure 3). Plain radiography of the soft tissue neck antero-posterior, lateral view and chest postero-anterior view were performed in all the patients and confirmed to have foreign body. Coin was located mostly at the cricopharynx 111 (83.5%), upper oesophagus 10 (7.5%), mid oesophagus 9 (6.8%), lower oesophagus 3 (2.3%) respectively (Figure 4).

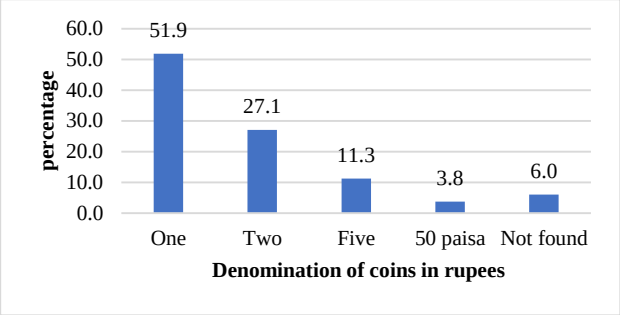

Figure 5: Percentage wise distribution of ingested Indian currency coin.

Coin retrieval was possible utilizing Macintosh laryngoscope and Magill's forceps under intravenous sedation in 106 (79.7%) patients, minimum time taken for this technique was 5 minutes and maximum time was 21 minutes and in 27 (20.3%) patients rigid oesophagoscope was used under general anaesthesia, minimum time taken for this technique was 21 minutes and maximum time was 45 minutes. Most common denomination of the coin was found to be 1-rupee coin 69 (51.9%), second most common denomination was of 2-rupee coin 36 (27.1%), in 15 (11.3%) patients 5-rupee coin in 5 (3.8%) patients 50 paisa coin and in 8 (6.0%) patients coin was found to have passed into the stomach (Figure 5).

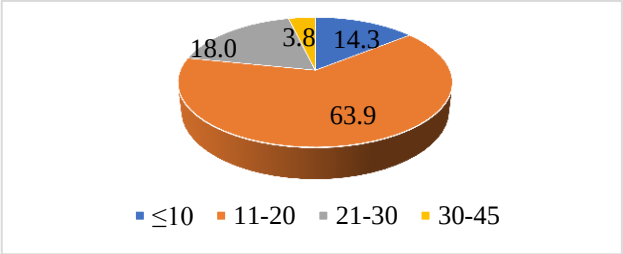

Figure 6: Percentage wise distribution of procedural time duration in minutes.

The time taken for removal of coin was 11-20 minutes in 85 (63.9%) patients, in 19 (14.3%) patients coin was removed within ten minutes, in 24 (18.0%) patients it took 21-30 minutes, in 3 patients coin was found to have passed into the stomach and in 5 (3.8%) patients, even after 30-45 minutes of diagnostic oesophageal procedure foreign body was not found (Figure 6).

Table 1: Statistical analysis of radiographic location of foreign body versus gender, age and denomination of coin.

		Radiographic location of foreign body				Total	Chi-square test
		Cricopharynx	Upper oesophagus	Mid Oesophagus	Lower oesophagus		
Gender	Male	70	5	3	2	80	3.57; p<0.311 (>0.05); Not significant
	Female	41	5	6	1	53	
Age (in years)	1-5	76	8	5	0	89	15.29; p<0.499 (>0.05); Not significant
	6-9	27	2	2	2	33	
	10-15	8	0	2	1	11	
Denomination (coins in rupees)	One	60	6	2	1	69	11.697; p<0.470(>0.05); Not significant
	Two	30	1	4	1	36	
	Five	12	1	2	0	15	
	50 paisa	4	1	0	0	5	
	Not found	5	1	1	1	8	

All the patients recovered within 15 minutes from anaesthesia. Overall 93 (69.9%) patients were discharged after two days and 12 (9.0%) patients were discharged after one day of procedure, 14 (10.6%) patients after 3-4 days of procedure, only 1 (0.8%) female child was hospitalised for seven days because of associated herpes labialis, 13 patients went against medical advice after the procedure.

The gender, age, denomination of the coin had no correlation with the radiographic location of the foreign body, i.e., p 0.311 (>0.05), p 0.499 (>0.05), p 0.470 (>0.05) respectively (Table 1).

Table 2: Statistical analysis of denomination of coin versus presenting symptoms.

Denomination (Coins in Rs.)	Frequency	Symptoms					
		Drooling of saliva	Vomiting	Difficulty in breathing	Difficulty in swallowing	Throat pain	Others
One	69	5	42	0	13	13	3
Two	36	3	23	0	8	10	2
Five	15	0	9	1	4	2	0
50 paisa	5	2	3	0	0	0	0
Not found	8	1	6	0	1	3	1
Total	133	11	83	1	26	28	6
Chi-square test		8.27, p<0.08 (>0.05)	0.693, p<0.952 (>0.05)	7.926, p<0.09 (>0.05)	2.136, p<0.711 (>0.05)	4.356, p<0.360 (>0.05)	2.225, p<0.694 (>0.05)

Table 3: Statistical analysis of denomination of coin versus post ingestion time duration (till hospital admission) in hours.

Post ingestion time duration (till hospital admission) in hours	Denomination (coins in Rs)					Total
	One	Two	Five	0.5	Not found	
≤6	21	13	7	3	4	48
6.1-12	25	18	4	2	1	50
12.1-18	11	2	3	0	3	19
18.1-24	4	2	1	0	0	7
25	4	0	0	0	0	4
26.1-30	4	1	0	0	0	5
Total	69	36	15	5	8	133

Chi square test=18.188; p<0.577 (>0.05); Not significant.

There was no association between denomination of coin and presenting symptoms p 4.26 (>0.05) (Table 2). We also found that there was no correlation between denomination/diameter of the coin and post ingestion time duration (till hospital admission) p 0.577 (>0.05) (Table 3).

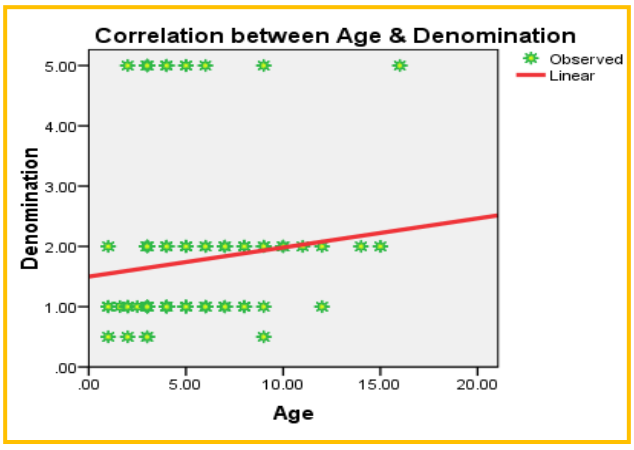

Figure 7: Statistical correlation between age and denomination of the Indian currency coin.

There is a positive correlation between age of the children with the denomination of the coin, Spearman's correlation r value 0.22 (Figure 7).

DISCUSSION

A foreign body ingestion is a common problem in paediatric age group with large variations in type of foreign body, most common among them is coin.[11] In children, 60% ingested foreign bodies are coins.[1,12] 80 to 90% of the foreign bodies can pass asymptomatically through the gastrointestinal tract and the impacted ones will cause symptoms and therefore should be managed accordingly.[4,13] These foreign bodies will get commonly impacted at the level or just below the cricopharynx or at the gastro-oesophageal junction.[4] The progress of the foreign bodies which passed through the gastro-oesophageal junction are impeded at the levels of pylorus, duodenum, duodenojejunal flexure, ileocecal junction but this is beyond the scope of our study.[4]

The length of the oesophagus at birth varies between 8 and 10 cm and measures about 19 cm at the age of 15 years.[14] The first constriction is at 15 cm from the upper incisor teeth, where the oesophagus commences at the cricopharyngeal sphincter; this is the narrowest portion of the oesophagus and second narrowest part of digestive tract after vermiform appendix and approximately corresponds to the sixth cervical vertebra.[15] The second constriction is at 23 cm from the upper incisor teeth, where it is crossed by the aortic arch and third constriction is by the left main bronchus 28 cm from the

upper incisor teeth.[15] The fourth constriction is at 40 cm from the upper incisor teeth, where it pierces the diaphragm; the lower oesophageal sphincter (LES) is situated at this level.[15]

A study conducted by Adhikari et al and Pokharel et al showed that foreign body ingestion is common in 0-4 years of age, another study conducted by Nandi et al showed that foreign body ingestion was common in age group from 6 months to 6 years.[1,2,11] In our study, the majority of cases are between 2 to 5 years of age which constituted 63.1% of the study population.

Our study showed that foreign bodies were more common in male children (60.2%) compared to female, it is similar to the study conducted by Pokharel et al.[11] A probable explanation for male predominance is that male children are by nature more curious than female children.[11]

It is important to determine the post ingestion time duration because foreign bodies lodged for more than 24 hours exposes a greater risk of erosion or other damages to the oesophagus and this will affect the choice of procedure for removing foreign bodies. In a study conducted by Balci et al they found that there is a higher risk of perforation in children who has swallowed coins for more than 36 hours prior to admission.[16] In our study, 124 cases presented within 24 hours of ingestion, in 8 cases foreign body was not found and in rest of the cases coin was retrieved successfully. 9 cases presented after 24 hours. A total of 24 cases were asymptomatic, rest all cases presented with one or two symptoms, most common being vomiting which is seen among 83 of total cases which is similar to a study conducted by Qudah et al.[17] In cases of logged oesophageal foreign bodies, vomiting is dangerous because the increase pressure may cause rupture of oesophageal thin wall.[18]

Removal of coin needs proper instruments and skill.[2] Irrespective of the techniques used to remove foreign bodies from the oesophagus there is a 95-100% success rate with less than 2% of complications.[16] The most common and gold standard technique is rigid esophagoscopy, other techniques used are flexible endoscopy, Foley's catheter extraction and the utilisation of a bougienage, temporization where foreign bodies lodged in the distal portion of the oesophagus get a chance to pass into the stomach.[16,18,19] Several articles have referred the use of Magill's forceps to retrieve foreign bodies like coins, marbles, rings and safety pins from upper end of the oesophagus. This is known as Magill forceps technique (MFT) and it is one of the extra anaesthetic use. In a study conducted by Singh et al, they have used MFT under inhalational anaesthesia using Macintosh laryngoscope to remove coin from upper end of oesophagus from 100 paediatric patients, they have concluded that this technique is better than rigid endoscopy in terms of efficacy, safety and complication rate with reduced hospital stay and cost of treatment.[20] In our study, we have used Magill's forceps technique (MFT) using Macintosh laryngoscope in 106 cases and rigid esophagoscopy in remaining 27 cases. In 8 cases we could not retrieve coin successfully by using above methods and these cases were referred to surgery for further management. The reason may be due to propulsive waves of oesophagus which appears during oesophagoscope insertion or from the muscle relaxation induced by the anaesthesia during the procedure may cause foreign bodies to move distally.[16,18] In our study most of the coins were impacted at the level of the cricopharynx accounting for 111 cases, similar to a study conducted by Adhikari et al.[1] 22 coins were found at different levels of oesophagus.

As the cricopharynx is the narrowest portion of oesophagus, diameter of it varies with the age 9 days to 4 weeks is 6 mm,1 month to 9 months is 7-8 mm,10 months to7 years is 8-11mm,7 years to 16 years is 9-13 mm.[21] Most of the ingested Indian currency coins are made up of ferratic stainless steel and cupro-nickel, the diameter of 1-rupee coin is 25 mm, 2-rupee coin is 26-27 mm, 5 rupee coin is 23 mm and 50 paisa coin is 22 mm.[22] In our study there is positive correlation between age of the children with the denomination of the coin. Foreign bodies having less than 2.5cm diameter and/or less than 5 cm in length will pass through the whole of the gastrointestinal tract.[4] As the age increases the diameter of the cricopharynx and oesophagus also increases so there are more chances of coin to pass through the oesophagus.

In our study the most common coin ingested is 1-rupee (51.9%) followed by 2-rupee coin (27.1%), reason for this may be the Indian parents will pacify the child by giving money more commonly by 1-rupee coin which is the most commonly circulated minimum currency coin. 69.9% stayed for 2 days in hospital after the retrieval of coin, 9.8% cases went against medical advice. In 78.2% cases, the procedure took less than 20 minutes, in 5 cases it took more than 30 minutes. In this study the hospital stays, and procedural time was not dependent on the location of FB. In this study no cases were found to have major complications except for the mucosal oedema and erosion. There was no mortality in our study.

CONCLUSION

Coin ingestion is common in children and its detection by using X-ray is a simple key in identifying it. Although morbidity with these foreign bodies is rare, it can happen with delay in presentation. Early removal of coin must be considered to reduce the morbidity. By using Magill forceps under Macintosh laryngoscopy vision foreign bodies from the upper part of the oesophagus can be removed without much complications. In this study Indian currency coin ingestion is commonly found in cricopharyngeal area of the oesophagus among preschool age group. The duration of retention of the foreign body, procedural time, hospital stay of the patient, diameter or

size of the coin among both the genders have no impact on clinical outcome and retrieval of these coins either by MFT or rigid oesophagoscopy procedure.

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