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Spontaneous Passage of Ingested Coin in Children

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ABSTRACT

Objective: To determine the factors related to spontaneous passage of ingested coins in children.

Methods:

Design: Retrospective study

Setting: Tertiary Government Hospital

Subjects: The records of 136 pediatric patients with a history of coin ingestion seen at the emergency room department of our institution between December 2012 and May 2014 were retrospectively reviewed. Demographic data such as age and gender of the patient were recorded, including the type of coin, location of coin in the esophagus, time of ingestion and time of spontaneous passage into the stomach (for those that passed spontaneously).

Results: Spontaneous passage in 27 out of 136 pediatric patients with radiographic evidence of a round radio-opaque foreign body initially located in the esophagus eventually passed into the stomach or intestines, accounting for 20% of the total number of cases. Coin ingestion was more common in patients aged 5 to 6 years (33% of cases), with slight male predominance (58%). One peso coins were the most common type of coin ingested, however only 24% of these spontaneously passed. The rate of spontaneous passage was highest in smaller sized coins (5 and 25 centavo coin) compared to larger sized coins (5 peso). Proximally located coins, albeit more common than middle and distally located coins, were the least likely to spontaneously pass (12%). Average time interval from ingestion to passage of the coin was 12 hours.

Conclusion: Many factors are related to spontaneous passage of foreign bodies in the esophagus. The age of the patient, type of coin ingested, and initial location of the coin in the esophagus should be considered. Older patients, smaller sized coins, and distally located coins have the highest probability of spontaneous passage beyond the esophagus. A 12-hour observation period may be considered in patients with single esophageal coin ingestion.

Keywords: *foreign body, esophagus, esophagoscopy*

In children, the most common foreign body ingested are coins, comprising 75% of all cases.[1] The decision whether to first observe or operate on pediatric patients has been discussed in several articles.[2-6]

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Several surgical procedures for the removal of esophageal foreign bodies have been proposed and are currently in use, ranging from the use of a Foley catheter, bougienage, and esophageal dilators to flexible esophagoscopy for retrieval of blunt foreign bodies. Careful endoscopic removal of foreign bodies under direct visualization by rigid esophagoscopy is the safest management for patients with foreign body ingestion.[1] However, complications from this "safe" intervention may also arise, the most common of which is respiratory distress occurring during the procedure.[1] This may result from accidental dislodging of the endotracheal tube.[1] Other possible complications such as esophageal perforation, retroesophageal abscess, mediastinitis and death can occur, but these are rare.[1]

Several studies show that there is a high rate of spontaneous passage of esophageal coins into the stomach.[1-6] Soprano *et al*. reported an incidence of spontaneous passage of esophageal coins as high as 28%.[2] They suggested that a 12- to 24-hour observation period should be given among children with single esophageal coin ingestion, with no history of esophageal disease and no respiratory compromise on presentation.[2] Waltzman *et al*. reported factors that may predict spontaneous passage of esophageal coins, including the initial location in the distal esophagus, male gender, and age older than 5-years-old.[3] They suggested that an observation period of 8 to 16 hours is appropriate in otherwise healthy children with asymptomatic esophageal coins.[3]

However, prolonged observation for spontaneous passage can also lead to several complications. Complications arise when there is prolonged obstruction leading to inflammation and edema of the surrounding tissue, resulting in ischemia and eventual erosion and esophageal perforation which may lead to several life-threatening complications.[1] These may present as hemoptysis, pneumonia, atelectasis, abscess formation, or fever.[1]

In order to avoid such complications, early detection and decision on whether to observe for spontaneous passage or initiate surgical intervention is required. In our institution, there are no guidelines on when to watchfully wait for spontaneous passage and when to proceed with surgery. This study aims to identify the factors affecting spontaneous passage of ingested coins in children.

METHODS

Study Design: Retrospective study

Setting: Tertiary Public Hospital

Subjects: With institutional ethical review board approval, the medical records of 136 pediatric patients less than 18-years of age with a history of coin ingestion seen at the emergency room department of our institution between December 2012 and May 2014, were retrospectively reviewed. Demographic factors of the patients such as age and gender were recorded. Similarly, the type of coin ingested, time of ingestion, time of spontaneous passage beyond the esophagus (for those that passed spontaneously), and initial location of the coin in the esophagus (proximal, middle, distal third) were tabulated. Initial diagnosis of the coin in the esophagus and spontaneous passage were confirmed through radiography.

Data and Statistical Analysis: The mean age, gender ratio, age distribution, mean time interval between coin ingestion and passage beyond the esophagus were computed from the data gathered. The percentage of cases that spontaneous passed into the esophagus per age group, gender, type of coin, and location in the esophagus, were likewise determined.

RESULTS

During the 18 month period, a total of 136 pediatric patients (79 or 58% male, 57 of 42% female) consulting at the Emergency Department with pertinent complaints were diagnosed with coin ingestion located in the esophagus at the time of consult. Spontaneous passage beyond the esophagus was observed in 27 children (20%). Of these, 16 were male (59%) and 11 were female (41%).

Coin ingestion was more common in the 5- to 6-year-old age group, comprising 45 out of the 136 patients (33.1%). The highest percentage of coin passage was seen in the older age group, in one patient 14 to 16 years of age-- a 100% spontaneous passage rate (1 out 1 patient). On the other hand, patients aged 0 to 2 years had the lowest percentage of spontaneous coin passage into the GI tract (2 of the 18 cases, 11%). *(Table 1)* For the cases in which spontaneous passage was observed, the youngest patient was 11 months old, and the oldest was 16 years old.

Table 2 shows the percentage of coins that spontaneously passed per type of coin ingested. One-peso coins were the most commonly ingested coins encountered (97 out of 136 cases), with a spontaneous passage rate of 24%. The highest percentage of spontaneous passage was seen in the case of 5 centavo and 25 centavo coins, having a 100% spontaneous passage rate. On the other hand, only 1 out of the 11 ingested 5 peso coins spontaneously passed beyond the esophagus (9%). No data regarding the type of coin swallowed was retrieved for 24 cases.

Proximally located coins comprised the majority of cases of coin ingested during the 18 month study period, accounting for 110 out of the total 136 cases (81%). However, the passage rate in this group was only 12%. On the other hand, despite having the lowest number of cases (8 of the 136 cases - 5.9%), coins located in the distal third of the esophagus had a 75% spontaneous passage rate (6 out of 8 patients with distally-located coins). Coins located in the middle third of the

esophagus had a passage rate of 44% (8 out of the 18 cases). *(Table 3)*

The mean average time from ingestion to passage of the coin lodged in any segment of the esophagus was 12.4 hours (range 2 – 72 hours).

Table 1. Spontaneous Passage of Coins per Age Group

Age (years)	Number of Cases of Esophageal Coin Ingestion (n = 136)	Number of Cases with Spontaneous Passage of Coin (n = 27)	Percentage of Cases that Spontaneously Passed (%)
Birth to 2	18	2	11
3 to 4	36	5	14
5 to 6	45	10	22
7 to 8	20	4	20
9 to 10	12	2	17
11 to 12	4	3	75
13 to 14	-	-	-
14 to 16	1	1	100
17 to 18	-	-	-

Table 2. Spontaneous Passage per Type of Coin

Type of Coin Ingested	Number of Cases of Esophageal Coin Ingestion (n = 136)	Number of Cases with Spontaneous Passage of Coin (n = 27)	Percentage of Cases that Spontaneously Passed (%)
5 centavo	1	1	100
10 centavo	2	1	50
25 centavo	1	1	100
50 centavo	0	0	-
1 Peso	97	23	24
5 Peso	11	1	9
Undetermined Type	24	0	0

Table 3. Spontaneous Passage of Coin per Initial Location in Esophagus

Location:	Number of Cases of Esophageal Coin Ingestion n = 136	Number of Cases with Spontaneous Passage of Coin n =27	Percentage of Cases that Spontaneously Passed (%)
Proximal third	110	13	12
Middle third	18	8	44
Distal third	8	6	75

DISCUSSION

Most cases of foreign body ingestion involve the pediatric age group, a majority occurring between the ages of 1 to 3 years.[1] Pediatric patients are susceptible to accidental foreign body ingestion at this age because they curiously tend to explore the environment by placing objects in their mouth, and they often run or play with objects in their mouth, causing accidental swallowing.[1] Of the 136 patients seen and diagnosed with coin ingestion in our study, the majority of cases belonged to the 5- to 6-year-old age group, comprising 33% of total cases, with male patients being more commonly involved than females (58% and 42% respectively). These results are similar to the other studies where most of the patients were toddlers and pre-schoolers.[2,3,5]

In terms of age, older patients had a higher chance of spontaneous coin passage into the stomach, with the highest percentage seen in the older age group of 14 – 16 years (100% passage rate), followed by those aged 11 to 12 years old (75% passage). On the other hand, the lowest percentage of coin passing was seen in patients younger than 3 years of age, having a passage rate of only 11%. These reflect the findings of Waltzmann *et al.,* who concluded that spontaneous passage of ingested coin tends to increase as the patient gets older, noting that incidence of spontaneous passage was higher in patients older than 5 years of age.[3]

In our study, larger sized 5 peso coins (diameter 27 mm) were less likely to spontaneously pass compared to smaller diameter, 5 centavo (15.5 mm) and 25 centavo (20 mm) coins. The size of the foreign body is inversely related to the probability of the coin passing through the esophageal constrictions and lumen.

We observed that the mean time interval from time of ingestion to time of passage beyond the esophagus was 12.4 hours, regardless of the segment where the coin was initially located. Similar studies such as that of Stringer and Capps showed spontaneous passage of the coin 12 hours post-ingestion in 33% of cases.[4] This was also observed by Soprano *et al*. who suggested an observation period of 12 – 24 hours from the time of coin ingestion in asymptomatic patients with a simple case of coin ingestion (i.e. no history of esophageal disease or surgery) prior to performing an invasive procedure.[2] Their study concluded that there is a 28% chance of spontaneous passage of the coin into the stomach.[2]

The most common area where foreign bodies lodge is the cervical esophagus, particularly the area just below the cricopharyngeus muscle.[1] This was likewise observed in our study wherein 110 out of the 136 coins lodged in the proximal third of the esophagus (81% of cases). On the other hand, coins that lodged in the middle and distal third was less commonly encountered in our study, occurring in 44% and 6% of the cases respectively. Obstruction in this part of the esophagus is often

caused by extra-luminal compression by the aortic arch or the left main stem bronchus.[1]

In terms of location, the area from where spontaneous passage of the coin most occurred was the distal third of the esophagus–with a passage rate of 75%. In contrast, the proximal third of the esophagus (which was the most common area where ingested foreign bodies lodged) had the lowest rate of spontaneous passage of coins (12%), while the middle third had a 44% spontaneous passage rate. The low passage rate of coins from the proximal third of the esophagus may be attributed to the area of the cricopharyngeal muscle, which corresponds to the first anatomic constriction of the esophagus.[7] In general, our study found a 20% spontaneous passage rate of coins beyond the esophagus regardless of initial location.

Treatment options in patients with foreign body ingestion are controversial. Performing outright surgery versus observation for spontaneous passage has been debated, giving rise to numerous studies on rates of spontaneous passage of ingested foreign bodies.[2-6] Conners *et al*., suggest that the decision whether to operate or observe first depends on the initial location of the coin in the esophagus.[5] They suggested that immediate surgical intervention is warranted in patients with esophageal coins lodged in the proximal and middle third.[5] According to their study, none of the coins lodged in these segments passed. On the other hand, coins situated in the distal part of the esophagus can be observed for a period of 24 hours for the possibility of the coin to pass on its own.[5] As much as 60% of cases of distal esophageal coin obstruction passed spontaneously after observation.[5]

Contrary to Conners *et al*., Soprano *et al*. suggested that a 12 to 24 hour observation period should still be implemented even for coins lodged in the proximal and middle third of the esophagus as spontaneous passage may still occur (22% and 33% of cases, respectively).[2] Similarly, Caravati *et al*. reported a high spontaneous passage rate of 77% of coins lodged in the esophagus.[6]

Complications from prolonged esophageal foreign body obstruction include formation of true / false esophageal fistulas, aorticoesophageal fistula, esophageal perforation leading to foreign body migration to surrounding structures, esophageal stricture formation, and respiratory distress.[8-10] However, recent studies reported that observation for < 24 hour periods have not led to any adverse complications.[2,3] Soprano *et al*. reported no adverse events during the observation periods, but noted adverse events during or after endoscopic procedures, including pharyngeal bleeding, bronchospasm, accidental extubation, stridor and hypoxia.[2] In our study, no adverse reactions or complications were encountered from time of ingestion to time of passage of the coin.

Withholding immediate surgical intervention and opting for more conservative management such as observation in an otherwise asymptomatic patient has been advocated in several studies.[2-4] However, initial observation for patients with asymptomatic coin ingestion has not been generally accepted, as most parents would opt for immediate removal of the foreign body.[11] This issue should be well-explained to the caregivers prior to deciding whether to observe first or perform surgery.

In summary, many factors affect spontaneous passage of an esophageal coin, and no single factor can predict whether a coin will pass beyond the esophagus or remain lodged in it. Factors associated with a greater possibility of spontaneous passage of esophageal coin include age older than 5 years (the older the patient, the higher the possibility for spontaneous passage), smaller sized coins (5 centavo and 25 centavo coins) and location in the distal third of the esophagus. In an otherwise asymptomatic and stable pediatric patient with a history of coin ingestion, an observation period of 12 hours from the time of ingestion may be recommended due to the possibility of spontaneous passage beyond the esophagus. Repeat radiography after the allotted observation period is generally recommended to identify the location and/or document passage of the coin. The parent/guardian's informed consent is important prior to recommending any plan of management for a patient with foreign body ingestion.

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