Original Article

Factors Associated with Development of Complications After Endoscopic Foreign Body Removal

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ABSTRACT

Background/Aims: We analyzed the clinical characteristics of patients who underwent endoscopic foreign body removal and the risk factors of complications. **Patients and Methods:** The medical records of 415 patients treated from January 2000 to August 2011 for suspected foreign bodies were retrospectively reviewed. Patient characteristics, endoscopic findings, clinical outcomes, and risk factors of complications were analyzed. **Results:** Foreign bodies were detected endoscopically in 315 patients. Fish bone fragment (36.9%) and coins (15.3%) were the most common type of foreign bodies in adults and children, respectively. Complications associated with endoscopic procedure occurred in 26 patients (8.3%); 20 of the patients were treated conservatively and the other six patients underwent surgical treatment. Perforation (14%) was the most common complication. By univariate and multivariate analysis, the risk factors associated with complication after endoscopic foreign body removal were long duration from ingestion to endoscopy ($P = 0.009$) and existence of initial mucosal injury ($P = 0.018$). **Conclusions:** Most foreign bodies were successfully removed by endoscopy without complication, but long duration from ingestion to endoscopy and mucosal injury were risk factors of complications of endoscopic foreign body removal. Patients with these risk factors could require more careful treatment.

Key Words: Complications, foreign body, risk factors

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Foreign body ingestion and food bolus impaction are well-recognized and relatively common problems in the emergency department.[1] Diagnosis is typically made when there is a history of ingestion coupled with corresponding radiographic verification. Foreign body ingestions are a common feature of many patients who are young, alcoholic, or have psychiatric conditions, and it is a common scenario for gastroenterologists.

The majority of foreign bodies that reach the gastrointestinal (GI) tract will pass spontaneously. However, 10-20% of cases will require nonoperative intervention, and 1% or less will require surgical procedures.[2]

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The aim of this retrospective study was to analyze the type of foreign objects according to age, outcome, and risk factors of complication after endoscopic foreign body removal.

PATIENTS AND METHODS

The medical records and endoscopic findings of 415 patients who were referred to our hospital for suspected foreign body ingestion or food bolus impaction between January 2000 and June 2011 were reviewed retrospectively. Three hundred fifteen cases of foreign body ingestion or food bolus impaction in the upper GI tract detected during endoscopic examination were included. One hundred cases in which no foreign body was detected during endoscopy were excluded from the analysis. The 315 cases comprised 67 (21.3%) children (defined as < 15 years of age) and 248 (78.7%) adults. Patients with previous esophageal surgery or apparent esophageal disease, and respiratory compromise on presentation were also included in our analysis.

The information recorded in the medical files of the patients included the methods of object removal associated

with the material and the location of the foreign bodies or food boluses, the success rate, underlying disease, and the complications. Complication was defined as any event with a negative impact on the subsequent course of the patient, mucosal injury such as ulcer, laceration, bleeding, perforation, and infection.

Before endoscopy, ear/nose/throat evaluation and plain radiographs were routinely performed in the initial investigation of all patients with suspected foreign body ingestion. In most cases, the plain film radiography was performed in two projections in the region of the neck, thorax, or abdomen, as required.

Flexible endoscopes (GIF Q160, GIF Q180, GIF H260; Olympus Optical, Tokyo, Japan) were used for the removal of foreign objects. Each patient underwent an upper endoscopy while under local pharyngeal anesthesia or sedation. Accessories used to remove the foreign bodies included foreign body forceps (FB-25K-1; Olympus), biopsy forceps (FG-42L-1, FG-47L-1; Olympus), retrieval basket (US Endoscopy, Mentor, OH, USA) and snares (MD-48709; Sumitomo Bakelite, Tokyo, Japan). A latex protector hood or an overtube (MD-48518; Sumitomo Bakelite) was used to protect the GI tract during removal.

Data were analyzed using SPSS computer software version 18 (SPSS Inc., Chicago, IL, USA) and descriptive statistics were performed using a frequency analysis. Univariate analysis was performed using Chi-square or Fisher's exact test for comparing two groups of factors. For analysis of independent predictive factors of complications, multivariate analysis was performed using logistic regression analysis. Statistical significance was indicated at a $P < 0.05$.

This study was approved by our institutional review board.

RESULTS

Of the 415 patients reviewed, foreign bodies were detected endoscopically in 315 patients. Foreign bodies were not found in 100 patients (24%), either on plain radiographic film or on endoscopic examination. The percentage of children (<15 years old), adults (15-60 years old), and the elderly (>60 years old) were 21.3%, 44.1%, and 34.6%, respectively. One hundred seventy-five patients (55.6%) were male and 140 were female (44.4%). The majority of the patients (n = 290, 92.1%) ingested foreign body incidentally, with ingestion being intentional in 23 (7.3%) patients. Psychiatric problems were noted in seven patients and two ingested foreign body due to hallucinations. Forty-one (13%) patients also had GI diseases. Benign stricture (6%) and esophageal cancer (4.4%) were the most common pathologies. Esophageal diverticulum (1.9%), gastrectomy state (0.3%), and esophageal web (0.3%) were also frequently found in patients with foreign body ingestion [Table 1].

The median time interval from ingestion to visiting the clinic was 5 hours (h) and 75% of patients underwent an endoscopy within 5 h of ingestion.

The types of foreign bodies found in the upper GI tract varied greatly, mainly including fish bones (36.8%), coins (15.2%), food-bolus impactions (13.3%), chicken bones (5.7%), drug packages (3.8%), springs (2.5%), and dental prostheses (1.9%). Other objects included chopsticks, tooth brushes, and needles. The mean size of the foreign body was 2.7 cm and the most common size of foreign bodies was between 2 and 3 cm (n = 167, 53%). The majority (61.3%) of foreign bodies were sharp and smaller than 5 cm (n = 261, 82.8%). Coins and fish bones were the most common foreign bodies in children and adults, respectively [Table 2]. Foreign bodies were detected in 125 patients (29.7%) by radiographic examination and in 16 patients (5.1%) by ear/nose/throat evaluation. The foreign bodies were located in the pharynx (n = 38), esophagus (n = 253), and stomach (n = 14). The upper esophageal sphincter (n = 90, 28.6%) was the most common site within the esophagus. The most common foreign bodies in the pharynx, esophagus, and stomach were coins, fish bones, and springs, respectively [Table 3].

The frequently used accessory devices were foreign body forceps (80.6%), snare (7.9%), and basket (1.9%). Most

Table 1: Characteristics of patients and foreign bodies

Patients characteristics	Number of patients	Percentage
Age (years)		
<15	67	21.3
15-60	139	44.1
>60	109	34.6
Gender		
Males	175	55.6
Females	140	44.4
Reason of ingestion		
Incidentally	290	92.1
Intentionally	23	7.3
Hallucinations	2	0.6
Underlying gastrointestinal diseases		
None	274	87
Benign stricture	19	6
Esophageal cancer	14	4.4
Esophageal diverticulum	6	1.9
Others[a]	2	0.6
Shape of foreign bodies		
Round	121	38.5
Sharp	194	61.6

[a]Others: Stomach cancer operation, one case; web, one case

Table 2: Type of foreign bodies according to the age groups

Age (years)	Total	Foreign bodies	Number	Percentage
<15	67	Coins	47	70.1
		Bezoar	2	2.9
		Others	18	26.8
15-60	139	Fish bones	64	46
		Chicken bones	14	10
		Food bolus	11	7.9
		Springs	8	5.7
		Others	42	30.2
>60	109	Fish bones	51	46.7
		Food bolus	30	27.5
		Drug packages	8	7.3
		Others	20	18.3
Total	315			

Table 3: Most common type of foreign bodies according to anatomic location

Location	Foreignbodies (number/total)	Percentage
Pharynx	Coins (24/38)	63
Esophagus	Fish bones (104/253)	41
Stomach	Springs (2/14)	14
	Ball point pen (2/14)	14
	Battery (2/14)	14

of the foreign bodies were removed successfully (92.5%). However, in 23 (7.5%) patients, endoscopic procedures failed. The most common foreign bodies of the failure cases were fish bones (34%), dental prosthesis (8%), springs (8%), and others (50%). Although there was no statistical significance in the size ($P = 0.20$), the size of the foreign body in failed cases was generally bigger (mean size, 3.6 cm) than that of the successful cases (mean size, 2.7 cm). The major causes of endoscopic failure were patient intolerance or noncompliance, and severe underlying disease conditions. Some of these patients required a second endoscopic procedure under general anesthesia or further surgery. All these foreign bodies were successfully removed without complications.

During endoscopic foreign body removal, mucosal injury was observed in 176 patients. The most common mucosal injury was erosion ($n = 116$, 36.8%), followed by deep ulcer ($n = 55$, 17.5%). Five patients (1.6%) had hemorrhagic bullae during endoscopy.

There was no mortality associated with the endoscopic procedures. The complications associated with foreign body removal included perforation ($n = 14$, 4.4%), mucosal laceration ($n = 9$, 2.9%), infection ($n = 2$, 0.6%), and bleeding ($n = 1$, 0.3%). Twenty patients with complications were treated medically and six patients needed surgery. By univariate analysis, age, symptoms, time interval of symptom to endoscopy, foreign body type, mucosal injury, and presence of ulcer were significantly different between complicated and noncomplicated cases.

By multivariate analysis, the risk factors of complication after endoscopic foreign body removal were long duration from ingestion to endoscopy ($P = 0.009$) and existence of initial mucosal injury ($P = 0.018$). Among mucosal injury, ulcer was the only risk factor of complication [Table 4].

DISCUSSION

Foreign body ingestion is a common clinical problem and most foreign bodies of the upper GI are successfully removed by endoscopy without complications. However, the complication sometimes can be a serious problem and sometimes it is life threatening. The aim of the present study was to identify the risk factors of complication after foreign body removal.

Among all the patients suspected of having foreign body impaction in the present study, foreign bodies were found in 76% (315/415) of the patients. The majority of the patients presented to the emergency department within 24 h of ingestion of foreign body, similar to other reports.[3,4]

The common types of ingested foreign bodies were fish bones, coins, and chicken bones. The types of ingested foreign bodies were significantly age related. Children ingested coins most frequently, whereas adults tended to have fish bones and food boluses. Moreover, the types of foreign bodies varied regarding the impacted locations. Fish bones were frequently impacted in the esophagus, and coins were most often found in the pharynx. The size and nature of foreign bodies may have been the causes of this difference, because coins are usually bigger than fish bones and fish bones tend to be sharper than coins. But, the types and location of foreign bodies were not related to the risk of complications associated with removal of foreign bodies.

In this study, 41 patients (13%) had some underlying GI disease. The most common pathologies were benign stricture and esophageal cancer. Because patients with these diseases frequently had food-bolus impact, we suggest that in case of food bolus impaction, a repeat endoscopy should be carried out after extraction of the foreign bodies to find an underlying disease.

Foreign bodies were successfully removed in 92.5% of cases and the outcome of endoscopic removal was similar to that reported elsewhere.[5,6] Upper GI endoscopy was a useful and effective method for making the diagnosis and treatment

Table 4: Risk factors associated with complications after foreign body removal

Factor	Odds ratio	*P* value	95% CI
Age	1.043	0.827	0.712-1.528
Time from ingestion to endoscopy	1.008	0.009	1.002-1.015
Ulcer	10.01	0.018	1.47-71.4
Erosion	0.732	0.756	0.103-5.202
Type of foreign body	0.977	0.657	0.881-1.083

of foreign body removal in most cases. Foreign bodies were discovered in 16 (5.1%) patients based on ear/nose/throat evaluation. All these cases required an endoscopic procedure because laryngoscopic removal was impossible. Upper GI endoscopy could approach distal lesion compared with laryngoscopy.

According to the American Society for Gastrointestinal Endoscopy, only 10-20% of foreign bodies may need to be removed endoscopically.[2] However, most patients in our hospital were treated endoscopically. Most of the foreign bodies ingested by patients include fish bone and chicken bone, and the percentage of these foreign bodies is higher in Korean populations than in Western populations.[7-9] These foreign bodies always result in painful symptoms and potentially severe complications, and so are potentially dangerous. Similar to our study, other studies reported that higher percentages of patients with foreign bodies were treated endoscopically.[10,11]

In the present study, the failure rate of endoscopic removal was 7.5%. Because patient's intolerance or noncompliance was the main cause, some cases were removed under general anesthesia in the operation room. The muscle of pharynx and upper esophagus could be completely relaxed under anesthesia, the foreign body could also be removed easily even though large in size.

In our hospital, the endoscopic procedure was performed in most of the patients within 24 h of foreign body ingestion, because the foreign bodies had not passed through the upper-GI tract. The mean time of visit to the endoscopy unit was 5 h. A long duration from ingestion to endoscopy is a significant risk factor of complication. If a fish bone was impacted for a long time, serious complications can develop including deep mucosal ulceration, inflammation of surrounding tissues, and abscess formation. Therefore, endoscopic foreign body removal must not be delayed. A complication rate of up to 5% has been reported to be associated with endoscopic treatment; these complications can be severe.[12-14] In the present study, the complications included perforation, mucosal laceration, and infection, and the rate was 8.6% (27/315). There was no mortality associated with the endoscopic procedures in our hospital. The present complication rate was slightly higher compared with that in other studies, because cases of deliberate ingestion of foreign bodies by high-risk individuals (eg., prisoners) were included. Another study involving prisoners who ingested foreign body reported an even higher complication rate of 11.5%.[15]

In domestic research, sharp foreign bodies, long diameter, and severe symptoms are risk factors predicting complications related to removal of foreign bodies.[16] However, in the present study, the risk factors associated with complications after endoscopic foreign body removal were long duration from ingestion to endoscopy and existence of initial mucosal injury. Because the foreign body size was not significantly different between complicated cases and noncomplicated cases, the diameter was not a significant risk factor. However, the size of the foreign body tended to be bigger in complicated cases. Considering that the mean size was smaller than the domestic study, size might be associated with the development of complications.

In conclusion, early detection of foreign body ingestion and rapid endoscopic removal is important. More careful observation in patients with an ulcer at the time of endoscopic treatment is recommended, due to the possible high risk of complications.

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