

Journal of International Medical Research 2017, Vol. 45(4) 1386–1393 © The Author(s) 2017 Reprints and permissions: sagepub.co.uk/journalsPermissions.nav DOI: 10.1177/0300060517706827 journals.sagepub.com/home/imr

Esophageal foreign bodies in adults with different durations of time from ingestion to effective treatment

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Abstract

Objective: This study was performed to identify the differences in clinical characteristics, operative methods, complications, and postoperative hospitalization stays for adults with esophageal foreign bodies with different durations of time from ingestion to effective treatment. **Methods:** We retrospectively reviewed the medical records of 221 patients with a diagnosis of a foreign body in the esophagus, confirmed by rigid esophagoscopy, flexible esophagoscopy, or surgery. The differences between the two groups (Group A, \leq 24 hours from ingestion to effective treatment; Group B, >24 hours from ingestion to effective treatment) were analyzed.

Results: Sharp foreign bodies comprised the majority of objects in the two groups, including jujube pits, bones (excluding fish bones), fish bones, dentures, and seafood shells. Foreign bodies located in the upper esophagus were more commonly observed in Group A than B. Significant differences were observed in the complication rate and length of postoperative hospitalization stays. Adults with esophageal foreign bodies had a high complication rate.

Conclusions: Rigid esophagoscopy can be used to remove sharp and bulky foreign bodies if more effective methods are unavailable. Effective treatment within 24 hours resulted in fewer complications and shorter postoperative hospitalization stays.

Keywords

Esophageal, foreign body, esophagoscopy, adult, 24 hours

Date received: 15 December 2016; accepted: 3 April 2017

Introduction

Ingestion of foreign bodies is a relatively common emergency encountered in the field of otorhinolaryngology. Upper gastrointestinal foreign bodies are mainly located in ¹Department of Otorhinolaryngology, The Affiliated Hospital of Qingdao University, Qingdao, China ²Department of Otorhinolaryngology, First People's Hospital of Jinan, Jinan, China

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the esophagus.¹ They are commonly observed in the pediatric population; ingestion of foreign bodies by adults is generally accidental, and such foreign bodies are commonly food items, especially sharp objects.^{2–5} Foreign body ingestion is usually considered a serious medical condition because of possible complications such as the development of mucosal ulceration, esophageal perforation, mediastinitis, vascular trauma, aortoesophageal fistula, pseudoaneurysm, paraesophageal abscess, tracheoesophageal fistula, pneumothorax, pericarditis, and other conditions.⁶⁻⁹ The complications induced by esophageal foreign bodies in adults are associated with a high mortality rate and are more common and serious than complications in children. However, some patients with impacted foreign bodies do not go to the hospital for help but stay home for observation. They ingest food to dislodge the foreign body, which prolongs the time from ingestion to effective treatment and causes greater harm and a larger economic burden for the patients. Increasing attention has been focused on complications, mortality, and hospitalization stays; however, the influence of the duration of time from ingestion to effective treatment remains unclear. This study was conducted to review our experience in managing esophageal foreign bodies in adults with different durations of time from ingestion to effective treatment with respect to the patients' clinical information, methods to remove the foreign bodies, complications, and postoperative hospitalization stays.

Materials and methods

Study population

We conducted a retrospective review of the medical records of patients with a diagnosis of a foreign body in the esophagus confirmed by rigid esophagoscopy, flexible esophagoscopy, or surgery. The foreign bodies that were successfully removed at the Affiliated Hospital of Qingdao University from January 2005 to May 2016 were recorded. The exclusion criteria were as follows: age of <18 years, insufficient data, and transfer to another hospital or discontinuation of treatment. In total, 221 patients were enrolled in this study. The study protocol was approved by the institutional review board of the hospital.

Methods

Radiological examinations were performed on all patients, including plain film radiography for radiopaque objects, computed tomography (CT) for radioparent objects or suspected complications, and esophagography with barium and/or cotton for sharp and thin objects. For all patients, the presence of a foreign body was either suspected or could not be ruled out, and effective treatment was administered as soon as possible after fasting for 8 hours. Rigid esophagoscopy was performed for most patients to remove the foreign bodies. Massive food boluses that were too large to remove were pushed through the esophagus into the stomach. The operations were performed by otorhinolaryngologists. Flexible esophagoscopy was performed by gastroenterologists for extraction of foreign bodies in patients who could not lie down due to a humpback condition or could not endure general anesthesia because of cardiopulmonary insufficiency. A lateral cervical incision was performed to remove foreign bodies located in the submucosal area. Thoracic surgeons performed procedures for patients with foreign bodyinduced esophageal perforation and complications such as mediastinal abscesses and for patients in whom the foreign body was close to the aortic arch and might induce hemorrhage after extraction. All patients gave informed consent to undergo the procedure.

Data collection

All patients were divided into two groups. Group A comprised patients who were treated ≤24 hours after ingestion, and Group B comprised patients who were treated >24 hours after ingestion in our department. Differences in age, sex, type of ingested object, location, method of removing the foreign body, complications, and postoperative hospitalization stay were assessed between the two groups.

Statistical analysis

Data were analyzed using SPSS software (version 20.0; IBM Corp., Armonk, NY, USA). A chi-square test was used to analyze categorical variables, and a t-test was used to analyze continuous variables. Statistical significance was designated by a *P*-value of <0.05.

Results

In total, 221 adult patients with a diagnosis of an esophageal foreign body were included in this study. Group A included 114 patients, and Group B included 107 patients. The overall sex distribution was 111 men and 110 women. The sex distributions in Groups A and B are shown in Table 1; no significant difference was found between the two groups. The patients' ages ranged from 18 to 92 years (mean, 59.02 ± 17.81 years), and the majority were older people (≥ 60 years) (Table 1).

The most common foreign bodies that were swallowed were jujube pits and bones (excluding fish bones), which accounted for more than half (126/221, 57.01%) of all patients' foreign bodies. The next most commonly swallowed items were fish bones and dentures. Food boluses, metal, fruits, seafood shells, and other objects accounted for the minority of foreign objects. This distribution was similar in Groups A

Table 1. Sex and age distributions.

	Group A		Group B		Total	
	n	%	n	%	n	%
Sex						
Male	51	23.08	60	27.15	111	50.23
Female	63	28.51	47	21.27	110	49.77
Total	114	51.58	107	48.42	221	100.00
Age, y						
18–39	18	8.14	14	6.33	32	14.48
40-59	42	35.59	29	13.12	71	32.13
≥60	54	24.43	64	28.96	118	53.39

Table 2. Types of foreign bodies.

	Gro	oup A	лр A Group B		Total	
Object	n	%	n	%	n	%
Jujube pit	37	16.74	26	11.76	63	28.51
Bone	30	13.57	33	14.93	63	28.51
Fish bone	18	8.14	25	11.31	43	19.46
Dentures	П	4.98	7	3.17	18	8.14
Food bolus	5	2.26	6	2.71	11	4.98
Metal	8	3.66	2	0.90	10	4.52
Fruit	2	0.90	- 1	0.45	3	1.36
Seafood shell	I	0.45	2	0.90	3	1.36
Unidentified	2	0.90	5	2.26	7	3.17

and B (Table 2). The majority of objects included sharp foreign bodies such as jujube pits, bones, fish bones, dentures, and seafood shells. No significant difference in the frequency of these objects was observed between the two groups (97 cases in Group A and 93 cases in Group B).

The majority of objects (189/221, 85.52%) were located in the upper esophagus followed by the mid-esophagus, and only 4 cases involved the lower esophagus, which was the least frequent location. The distributions of locations in Groups A and B were not consistent (Table 3). The number of objects in the upper esophagus in Group A was obviously higher than that in

Table 3. Locations of foreign bodies.

	Group A		Group B		Total	
Location	n	%	n	%	n	%
Upper esophagus	104	47.06	85	38.46	189	85.52
Mid- esophagus	9	4.07	19	8.60	28	12.67
Lower esophagus	1	0.45	3	1.36	4	1.81

Group B, while the number of objects in the mid- and lower esophagus in Group A was lower. Foreign bodies located in the upper esophagus were more commonly found in Group A than B (P < 0.05).

Rigid esophagoscopy was performed in 208 patients (208/221, 94.12%), including 111 in Group A and 97 in Group B, resulting in successful removal of the foreign bodies. In three patients (two in Group A and one in Group B), a large food bolus was pushed into the stomach. Rigid esophagoscopy was performed twice in two patients in whom the foreign bodies were located at the entrance of the esophagus (one patient in Group A and one in Group B). In the first examination, the mucosa was severely swollen, and least two skilled otolaryngologists checked the area carefully but did not find a foreign body. Postoperative CT showed that the foreign bodies were still lodged in place. Both patients were given antibiotics, a proton pump inhibitor, and intravenous nutrition. After 3 days, a second rigid esophagoscopy procedure was successfully performed.

Flexible esophagoscopy was performed in 10 patients (10/221, 4.52%), including 3 in Group A and 7 in Group B, resulting in successful extraction of the foreign bodies by skilled physicians. Of the 10 patients, 1 had developed an anastomotic stenosis after an operation for esophageal cancer, 1 had a mental disorder, 1 had a hunched back and

Table 4. Complications in the two groups.

Variable (n)	Group A	Group B	Total	P-value
Ulcer, laceration	12	27	39	<0.01*
Perforation	3	10	13	<0.05*
Perforation with abscess	0	5	5	<0.05*

^{*}Statistically significant (Group A vs. B).

could not lie down, and 3 had asthma, dementia, or cerebral thrombosis and therefore could not endure general anesthesia. The remaining four patients individually insisted on flexible esophagoscopy.

Surgical procedures were performed on three patients (3/221, 1.36%); all were in Group B. A lateral cervical incision was performed in one patient (1/221, 0.45%), and a thoracotomy was performed in two patients (2/221, 0.90%). Flexible esophagoscopy was performed in one patient with a lateral cervical incision without detecting the object (a fish bone) located at the level of the esophageal entrance; however, CT showed the bone under the mucosa. Flexible esophagoscopy without removal of the foreign bodies (a bone and denture) had also been previously performed for the two patients who underwent a thoracotomy, and CT showed that the foreign bodies were located at the level of the aortic arch and pointed toward the artery; these patients developed esophageal perforation and mediastinitis or a mediastinal abscess. No significant difference in surgical procedures was found between the two groups.

The frequency of complications was high (57/221, 25.79%). Ulceration or laceration with or without minor bleeding were the most common complications, followed by perforation and perforation with mediastinitis or a mediastinal abscess. Complications were less frequent in Group A than B, resulting in a significant difference between the two groups (P < 0.05) (Table 4). The mean postoperative hospitalization stay in

Postoperative stay	Group A		Group B		Total	
	n	%	n	%	n	%
I-3 days	101	45.71	81	36.65	182	82.35
4–6 days	7	3.17	13	5.88	20	9.05
≥7 days	6	2.71	13	5.88	19	8.60

Table 5. Postoperative hospitalization stays.

Group A $(1.79 \pm 2.01 \text{ days})$ was shorter than that in Group B $(2.89 \pm 2.83 \text{ days})$, resulting in a significant difference between the two groups (P < 0.05). Most patients were discharged within 3 days after the operation (Table 5). All patients were cured without mortality.

Discussion

In adults, 80% of foreign bodies pass spontaneously.^{5,6} If the foreign body is too large to pass the physiological or pathological stricture, it is often blocked by the stenosis. Food, bones, and dental-related foreign bodies are the most common types observed in adults. The types of foreign bodies may differ among different countries and regions and vary according to dietary habits, cultural features, and sociocultural factors. 10-12 In South China, fish bones are the most common foreign bodies found in the upper gastrointestinal tract.4 The most common esophageal foreign body in adults in the Western hemisphere is impacted meat or other food. In the present study, jujube pits and bones (excluding fish bones) were the most common objects, followed by fish bones and dentures, possibly because of the abundance of jujube in Shandong Province and the preference for meat that contains bones. Consistent with the literature, sharp objects comprised the majority of foreign bodies in the present study. These objects can easily penetrate through the esophageal wall, leading to deep cervical infection and mediastinitis, or damage the large vessels, leading to lethal massive hemorrhage.^{7,13} Therefore, foreign bodies in adults can result in high complication rates.

In our series, most of the foreign bodies were detected in the upper esophageal tract, which is consistent with earlier reports.¹⁴ Foreign bodies commonly block the upper esophageal tract because it is the narrowest part of the esophagus, especially at the cricopharyngeal muscle. In the present study, foreign bodies located in the upper esophagus that were effectively treated within 24 hours of ingestion were significantly more frequent than those treated >24 hours after ingestion. In contrast, foreign bodies in the mid- and lower esophagus that were effectively treated after 24 hours were relatively more frequent. Wu et al.15 also reported that the >24-hour group showed a higher incidence of foreign bodies in the lower esophagus. The reason for this may be that patients with upper esophageal foreign bodies have more difficulty with feeding and swallowing than those with mid- and lower esophageal foreign bodies. Patients with dysphagia presented to the hospital earlier, or the early symptoms of mid- and lower esophageal foreign bodies might have been hidden.

The choice of treatment is influenced by many factors, including the patient's age and clinical condition, the size and the shape of the ingested foreign body, the anatomical location of the foreign body, the physician's skill level, the instruments available, and the surgeon's preference. 10,16 Early endoscopic management of impacted esophageal foreign bodies is generally safe and effective; endoscopy is also the first choice for perforating esophageal foreign bodies when the duration of impaction is <24 hours and no peri-esophageal abscess is present on CT images. 17 Whether rigid esophagoscopy or flexible esophagoscopy is the best choice for treatment remains controversial. Both flexible esophagoscopy and rigid esophagoscopy have been suggested because of

their high success rates, low complication rates, and high detection rates.¹⁸ Gastroenterologists advocate flexible esophagoscopy; however, otorhinolaryngologists prefer rigid esophagoscopy.² The use of flexible esophagoscopy has increased due to several advantages, such as no need for general anesthesia in most adults, low procedural costs, technical feasibility, excellent visualization, the ability to remove foreign bodies even from the duodenum, incidental diagnosis of other diseases, and a low morbidity rate.⁴ Although extracting a foreign body under local anesthesia in adults is less time-consuming, rigid esophagoscopy under general anesthesia may be preferable for children and can serve as an alternative for foreign body removal. Additionally, foreign bodies located at the entrance of the esophagus impose great difficulty in flexible esophagoscopy because of the limited working space and restricted visual field. We prefer rigid esophagoscopy under general anesthesia to remove foreign bodies. Esophageal foreign bodies in adults are usually large and sharp and tend to become firmly engaged in the mucosa or adhere to the surrounding tissues. Larger forceps can pass through the rigid esophagoscope to reach the foreign bodies. Nadir et al.² stated that the instruments used in rigid esophagoscopy were larger and more powerful. They can easily grasp foreign bodies. The forceps used with flexible esophagoscopy are commonly small, thin, and weak, and it is difficult to grasp larger foreign bodies such as jujube pits, bones, and dentures. In the present study, flexible esophagoscopy was performed for patients who could not lie down due to a hunchback condition, could not endure general anesthesia because of cardiopulmonary insufficiency, or individually chose flexible esophagoscopy.

A lateral cervical incision should be performed to remove the foreign body if it is not detected by esophagoscopy and is located under the mucosa as shown by CT. If an

fistula, paraesophageal aortoesophageal abscess, or other high-risk complications are present, or if the extraction is dangerous or impossible for the physician, thoracotomy is considered inevitable.¹⁹ Triadafilopoulos et al. 17 suggested that surgical removal should be considered if the object remains in the same location for more than 1 week. Surgery was performed in three patients who presented >24 hours after ingestion and in none of the patients who presented within 24 hours; however, no significant difference was present between the two groups. This result may be due to the small sample size and is consistent with a previous report. In a study by Kim and Song, ²⁰ only two patients underwent surgery due to abscess formation. In those cases, the durations of time between ingestion and hospital arrival were 3 and 5 days. Patients who present later may have a greater chance of undergoing surgery.

The high complication rate in adults with esophageal foreign bodies may reflect the high incidence of ingestion of sharp foreign bodies. The relationship between complications and the time from ingestion to effective treatment is controversial. The esophageal wall is thin with no serosal membrane encasing the outer layer. Long-term lodging of foreign bodies in the esophagus causes pressure changes in the wall and resultant perforation.⁷ Some researchers have suggested that the duration of impaction is a significant independent risk factor for the development of complications in patients with esophageal foreign bodies.^{1,21} Long delays from ingestion to presentation and intervention may account for the relatively high rates of surgery, perforation, and mortality.^{22,23} However, Wu et al.¹⁵ found no significant differences in complications after foreign body removal between patients who presented <24 versus >24 hours after ingestion. A higher proportion of patients developed odynophagia and esophageal ulcers in the >24-hour group, and no significant differences in severe complications such as esophageal perforation or bleeding were found between the two groups of patients. In the present study, complications including ulcers, laceration, perforation, and perforation with mediastinitis or mediastinal abscesses were more frequent in the >24 than ≤24-hour group. Retained or impacted esophageal foreign bodies should be promptly removed to avoid esophageal perforation or other subsequent complications, and under no circumstances should the objects be allowed to remain in the esophagus beyond 24 hours after ingestion.¹⁷

The length of postoperative hospitalization is partly associated with the duration of the patient's recovery. Little emphasis was placed on postoperative hospitalization in previous studies. Patients without complications were usually discharged the day after esophagoscopy, while patients with complications stayed in the hospital and underwent placement of a nasogastric tube and administration of other medication or treatment. Lengthening of the postoperative stay may place a significant burden on the healthcare system and bed utilization and add to the patient's economic burden and anxiety.²⁴ In the present study, the length of postoperative hospitalization in the >24-hour group was longer than that in the <24-hour group. Postoperative hospitalization was shortened when patients with swallowed foreign bodies presented at an early stage.

From the above information, we can conclude that rigid esophagoscopy can be used for removal of sharp and bulky foreign bodies if more effective methods are unavailable. Such patients tend to develop more complications and have longer postoperative hospitalization stays, and complications tend to occur in patients presenting more than 24 hours after ingestion. Attention should be focused on public education, and patients should be encouraged to see a doctor promptly after they swallow a foreign body.

This study has some limitations. First, bias existed in treatment selection. Some patients chose rigid esophagoscopy after being informed of possible failure due to the characteristics of their foreign body, the physician's skill level, or other reasons. Second, treatment selection was also based on the otorhinolaryngologists' preference. In future studies, we will select the primary data from the patients, first seeking medical service to solve the problem.

Author contributions

Xiaowen Zhang: Study design, data acquisition, chart abstraction, data analysis/interpretation, manuscript drafting

Yan Jiang: Chart abstraction, data analysis/interpretation, manuscript revision

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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