

Analysis of the management and risk factors for complications of esophageal foreign body impaction of jujube pits in adults

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Abstract

Introduction: Foreign body impaction is a common emergency in the field of otolaryngology. The prevalence of a jujube pit as an esophageal foreign body has increased in the Jiaodong Peninsula. However, reports on this are scarce.

Aim: To investigate the methods for diagnosing and treating esophageal foreign body impaction of a jujube pit and to determine the risk factors for complications.

Material and methods: We conducted a retrospective review of the medical records of patients who were diagnosed with esophageal impaction of a jujube pit. Demographic, clinical, radiological, and endoscopic data were collected and analyzed.

Results: Neither plain radiography nor esophagogram provided enough information on the surrounding issues and complications. The rate of secondary radiological examination was 51.61% for the patients who did not undergo prior computed tomography. The success rate of rigid esophagoscopy was 95.45%; 18 of these patients (27.27%) had previously undergone flexible esophagoscopy without foreign body removal. Logistic regression showed that the time from ingestion to presentation and the jujube pit size were independent risk factors for complications.

Conclusions: Computed tomography without contrast material is the preferred diagnostic method for adults with esophageal jujube pit impaction, and rigid esophagoscopy can be used for therapy even though the first flexible esophagoscopy failed. Large diameter of the jujube pit constituting the esophageal foreign body (≥ 25 mm) and long duration between pit ingestion and presentation (> 12 h) were associated with increased complications in the patients in this study.

Key words: complications, computed tomography, esophageal diseases, esophagoscopy, foreign body.

Introduction

Foreign body impaction is a common emergency in the field of otolaryngology. Fortunately, most foreign bodies pass through the gastrointestinal tract spontaneously without any serious incidents; however, 10–20% of cases require nonsurgical intervention, and 1% or less require surgery [1, 2]. Gastrointestinal foreign body ingestion tends to be accidental in adults, and bones, fish bones, and dental prostheses

are the most common esophageal foreign bodies found in adults [3–6]. The types of foreign bodies ingested may differ in different countries and regions according to the feeding habits, cultural features, and sociocultural characteristics of the population, and they mainly depend on the food culture [7–9]. For example, fish bones are the most common foreign bodies ingested by adults residing in South China, as it is adjacent to the ocean, and the inhabitants often eat fish soup [3]. We found that the prevalence of a ju-

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jube pit as an esophageal foreign body increased in the Jiaodong Peninsula [9]. However, reports on this are scarce.

Aim

The aim of the present study was to investigate the clinical characteristics of esophageal foreign body impaction of a jujube pit and to report our experiences with diagnostic and therapeutic methods.

Material and methods

Study populations

We conducted a retrospective review of the medical records of patients who were diagnosed with esophageal foreign body impaction of a jujube pit, as confirmed by rigid or flexible esophagoscopy, and whose foreign bodies were removed successfully after being hospitalized in the otorhinolaryngology department of the Affiliated Hospital of Qingdao University between January 2010 and June 2016. The exclusion criteria were as follows: pediatric patients, patients younger than 18 years of age, those with insufficient data, and those who were transferred to another hospital or abandoned treatment. In total, 66 patients were enrolled in this study. The study protocol was approved by the Institutional Review Board of the hospital.

Methods

All of the patients underwent radiological examinations, including esophagogram with barium, computed tomography (CT) without contrast material and plain radiography. If a foreign body was identified in the radiological images, an attempt was made to remove it. Most of the patients who stuck to rigid esophagoscopy or experienced failed flexible esophagoscopy underwent rigid esophagoscopy, which was performed by otorhinolaryngologists, to remove the foreign body. In addition, flexible esophagoscopy was performed by gastroenterologists for extraction of the foreign body from patients who could not lie down because of a hunchback and from those who could not endure a strong extraneous stimulus. All patients gave their informed consent for the procedure.

Data collection

Demographic, clinical, radiological, and endoscopic data were collected and analyzed, including

the patients' age and sex, size of the foreign body, time from ingestion to presentation, location of the foreign body, symptoms, imaging manifestations, method used to remove the foreign body, and complications.

Statistical analysis

The data were analyzed using SPSS software (version 20.0, SPSS, Inc., Chicago, IL, United States). The χ^2 test was used for categorical variables, and logistic regression analysis was used to calculate the risk factors for complications. A *p*-value of less than 0.05 was considered to indicate statistical significance.

Results

A total of 66 adults diagnosed with esophageal foreign body impaction of a jujube pit were included in this study. These patients consisted of 17 males and 49 females, with a male:female ratio of 1 : 2.88. The patients' ages ranged from 24 to 92 years, with a mean age of 65.18 ± 15.16 years. The majority of the patients (65.15%, 43/66) were older (≥ 60 years old).

The incident was self-reported as accidental by all patients. Six (9.10%) patients had facilitating risk factors; 3 had dentures, 1 had dementia, 1 had amnesia, and 1 had depression. With regard to underlying diseases, 16 patients had hypertension, 5 had coronary heart disease, 2 had cerebral thrombosis, 2 had diabetes, and 2 had asthma.

The jujube pits were located in the upper esophagus in the great majority of the patients (96.97%, 64/66); only 2 (3.03%) were located in the mid-esophagus. The jujube pit size (largest diameter) ranged from 20 to 35 mm, with a mean size of 23.50 ± 3.70 mm; 33 pits had a diameter < 25 mm, and 33 had a diameter ≥ 25 mm. The time from ingestion to presentation ranged from 0.25 h to 192 h; the mean time was 33.17 ± 43.91 h, and the median time was 9.5 h. Most of the patients (72.73%, 48/66) presented within 24 h, and more than half of the patients (53.03%, 35/66) presented within 12 h. All of the patients suffered from odynophagia, 39 had dysphagia, 3 had fever, 2 had a foreign body sensation, 2 had coughing attacks, and 2 had chest pain.

Among the 66 patients, 3 underwent plain radiography; 1 of these 3 patients also underwent esophagogram with barium, and 1 also underwent CT because the foreign body could not be detected

in prior examinations. The detection rate for plain radiography was 33.33%. Twenty-eight patients underwent esophagogram with barium, and 14 of these 28 patients also underwent CT to determine the correlation between the foreign body and the surrounding issues and to identify complications. Thirty-five patients only underwent CT without contrast material. The detection rates for the esophagogram with barium and CT were both 100%. However, neither plain radiography nor the esophagogram provided enough information on the surrounding issues and complications. The rate of secondary radiological examination was 51.61% (14 + 2/28 + 3) for the patients who did not undergo CT first.

All of the patients underwent endoscopy, including 63 (95.45%) who underwent rigid esophagoscopy and 3 (4.55%) who underwent flexible esophagoscopy, and all of the foreign bodies were removed successfully. Eighteen (27.27%) patients who underwent rigid esophagoscopy had previously undergone flexible esophagoscopy without foreign body removal at lower-level hospitals or at the endoscopy department of our hospital or another equivalent hospital. Flexible esophagoscopy was successfully performed for 3 patients, including 1 with a hunchback who could not lie down and 2 with asthma, dementia or cerebral thrombosis who could not endure a strong extraneous stimulus.

Significant complications related to foreign body impaction were observed in 20 (30.30%) patients, including ulcer or laceration with minor bleeding in 11 (16.67%) patients, perforation in 5 (7.58%), and mediastinitis, pneumomediastinum, pneumothorax or cervical abscess in 4 (6.06%). Logistic regression showed that time from ingestion to presentation

and jujube pit size were independent risk factors for complications (Table I). The distributions of complications according to differences in the time from ingestion to presentation and pit size are shown in Table II. The rate of complications among the patients with a time from ingestion to presentation of 12 h or less (14.29%, 5/35) was lower than that among the patients with a time of more than 12 h (48.39%, 15/31; $p < 0.05$); additionally, the rate of complications among the patients with a time from ingestion to presentation of 24 h or less (18.75%, 9/48) was lower than that among the patients with a time of more than 24 h (61.11%, 11/18; $p < 0.05$). Further, the rate of complications (9.10%, 3/33) was lower when the foreign body diameter was < 25 mm than when it was ≥ 25 mm (51.52%, 17/33). All the patients with complications were cured by receiving a nasogastric tube and other medication, such as proton pump inhibitor or antibiotic. The patients with ulcer or laceration with minor bleeding were given the above treatment for 3–5 days. Esophagogram with iodipin was given for the patients with esophageal perforation after 7-day treatment to identify the recovery and CT for the ones with other complications. Most patients recovered within 7 days. Only 3 patients with thoracic complications recovered within 14 days with the above treatment without thoracic surgery.

Discussion

Esophageal foreign body ingestion is a commonly encountered incident in otorhinolaryngology departments. The increasing number of patients in the Jiaodong Peninsula who present with a jujube

Table I. Results of logistic regression analysis of risk factors for complications

Variables	P-value
Age [years]	0.923
Gender (male/female)	0.828
Time from ingestion to presentation [h]	0.006*
Symptoms (dysphagia/no dysphagia)	0.210
Size [mm]	0.027*
Previous flexible esophagoscopy (yes/no)	0.637
Location (upper esophagus/mid-esophagus)	0.999

*Significance value.

Table II. Distributions of complications according to different times from ingestion to presentation and different foreign body sizes

Variables	Ulcer, laceration	Perforation	Mediastinitis
Time ≤ 12 h	4	1	0
12 h $<$ time ≤ 24 h	3	1	0
Time > 24 h	4	3	4
Size < 25 mm	1	1	1
Size ≥ 25 mm	10	4	3

pit lodged in the esophagus may be related to the abundance of jujubes in Shandong Province and the tradition of eating Chinese rice pudding with jujubes. The gender distribution in this study showed a significant female predominance in contrast with reports in the literature indicating that foreign body ingestion is more common among males [10, 11]. There are two possible causes for this discrepancy in results. First, the jujube is served as a sweetmeat, and females are fonder of it than males. Second, it is known that women are prone to developing anemia, and jujubes can help to enrich the blood because they contain an abundance of vitamins and microelements. Additionally, they can reduce blood pressure and enhance immune function.

The characteristics of jujube pits explain their tendency to become lodged in the esophagus. Jujube pits have double pointed ends, which contribute to their impaction. Furthermore, they are tightly enclosed in the surrounding pulp. The pulp and pit cannot be easily separated, which results in accidental deglutition. In our study, risk factors for facilitating foreign body impaction, such as psychiatric disorders, mental retardation and dentures, were present in some of the patients (9.10%), and these results are similar to those of a study reporting accidental intake [5]. However, the majority of the patients had no apparent risk factors for unintentional foreign body ingestion. Some scholars believe that foreign body impaction occurs primarily in patients with a pre-existing pathology [12]. However, none of the patients in this study had an underlying pathological disease of the esophagus.

Most of the patients with suspected jujube pit impaction underwent physical examination, and few of the pits were found to be lodged in the oropharynx or laryngopharynx. In fact, the overwhelming majority of the pits were located in the upper esophagus, which is consistent with the findings of a previous study [13]. Many types of symptoms are caused by foreign bodies, such as foreign body sensation, vomiting, odynophagia, dysphagia, drooling and food refusal, stridor and cough, neck swelling, chest pain, and so on. Odynophagia was the most common symptom among the patients in this study, followed by dysphagia. The severity of symptoms is influenced by many factors, including the size, shape, and location of the foreign body, its relationship with the surrounding issues, the associated complications, and the patient's tolerance of the foreign

body. However, the area of discomfort is often not correlated with the site of impaction [2]. If a foreign body inducing pharyngalgia is not detected in the oropharynx or laryngopharynx, then the esophagus should be checked or the patient should be followed to avoid a missed diagnosis.

Generally, identification and radiographic localization are the following steps in the management of foreign body impaction [14]. Plain radiography and esophagram with barium are the traditional methods for detecting sharp foreign bodies; however, it is difficult to detect radiopaque foreign bodies by plain radiography, which has gained popularity because of its simplicity, convenience and cost effectiveness. The low rate of diagnosis associated with the use of plain radiography has resulted in its decreased clinical application [9, 15]. The European Society of Gastrointestinal Endoscopy (ESGE) recommends the use of plain radiography to assess the presence, location, size, configuration, and number of ingested foreign bodies if the ingestion of radiopaque objects is suspected or the type of ingested object is unknown [16]. In our study, only 3 patients underwent plain radiography at the primary hospital before presentation. Jujube pits can be difficult to detect because they usually have varying radiodensity. Some authors have recommended the use of barium to locate foreign bodies, which reduces the duration of the endoscopic procedure, in patients who are afraid of this procedure [3]. However, we found that an esophagram could not be used to assess the correlation between the foreign body and the surrounding issues or to detect complications; furthermore, the barium coating the foreign body interfered with endoscopic visualization, as described in a previous report [17]. In addition, barium use has been reported to contribute to the risk of aspiration, delay emergency endoscopic procedures and complicate foreign body removal [13]. Moreover, the barium could enter the chest through an unknown perforation, thereby increasing the chance of infection. Consequently, the ESGE and ASGE Standards of Practice Committee do not recommend a barium swallow [2, 16]. In our study, 15 patients underwent secondary CT to detect the foreign body or complications, which might have caused an increased economic burden and exposure to radioactivity.

With the rapid development and spread of CT technology, increasing numbers of studies have reported the successful use of CT in patients with

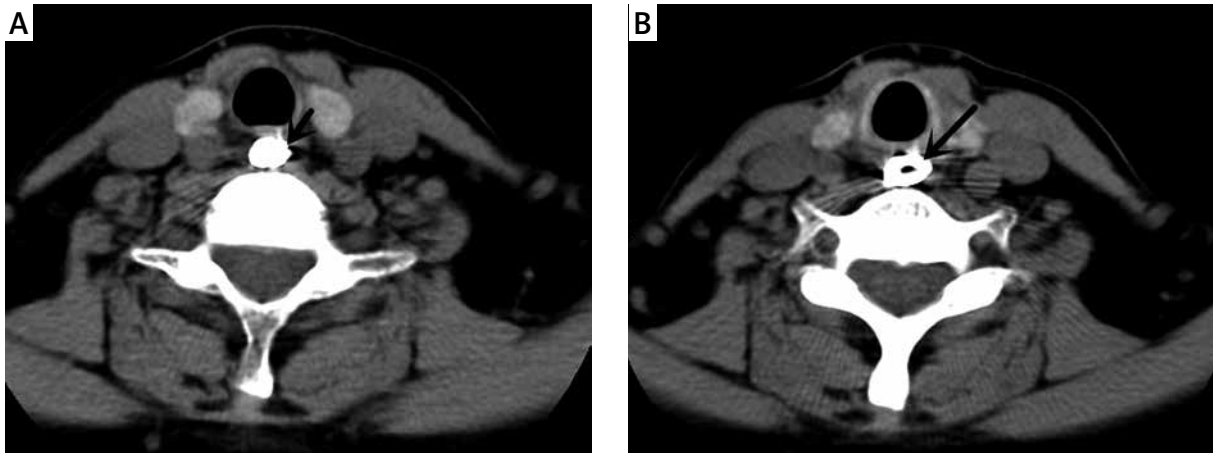


Photo 1. Computed tomography (CT) scan revealed hyperdensity of the jujube pit (A). In some cases, the CT scan showed a hollow area in the middle of the jujube pit (B)

an impacted foreign body, and its advantages have gradually become recognized in recent years [18]. Noncontrast CT has been reported to be very effective for detecting esophageal foreign body impaction, with a sensitivity of 90% to 100% and specificity of 93.7% to 100% [16–19]. Computed tomography can provide valuable information, not only about the presence of an impacted foreign body but also about its precise location, shape, size, and depth, the conditions of surrounding structures and soft tissues and the complications, which are important for determining treatment options and evaluating the risks of endoscopic management [16, 20]. In this study, patients who underwent CT as the first examination did not need to undergo a second radiolog-

ical examination. The typical CT imaging finding for a jujube pit is hyperdensity (Photo 1 A), and a hollow area in the center of the pit is also observed in some cases (Photo 1 B).

The choice of flexible versus rigid esophagoscopy depends on many factors, including the age and physical condition of the patient, the size, shape and anatomical location of the ingested foreign body, the skills of the physician, the instruments available, and surgeon preference. The best modality for foreign body removal has been the subject of much controversy [2–4, 11]. Flexible esophagoscopy has been increasingly used due to its many advantages, such as avoiding the need for general anesthesia in the majority of adults, reducing the costs, technical facility, excellent visualization, incidental diagnosis of other diseases [3]. However, 18 patients in our study underwent flexible esophagoscopy without removal of the foreign body. The high failure rate observed in our study may be attributed to the unique characteristics of the jujube pit. The two pointed ends of the pit were lodged in the submucosa in most of the patients (Photo 2). The portion that was visible by esophagoscopy was curved outwards without a concave or hollow surface, which made it difficult to grasp with small forceps. Additionally, foreign bodies located at the entrance of the esophagus presented great difficulty for the flexible esophagoscope because of the limited working space and restricted visual field. In contrast, rigid esophagoscopy can enlarge the space, and larger forceps can pass through the rigid esophagoscope to reach the foreign bodies [11]. Some authors have suggested that patients for whom the foreign body cannot be removed by en-



Photo 2. Photograph of a jujube pit obtained using flexible esophagoscopy. The two pointed ends of the pit were lodged in the submucosa

doscopy should be referred to the surgical department. However, rigid esophagoscopy was performed successfully for 18 patients in our study who had previously undergone unsuccessful flexible esophagoscopy.

Much attention has been consistently focused on the complications in these patients. In our study, the rate of complications associated with foreign body impaction of a jujube pit was high (30.30%). This high rate may be due to the following unique characteristics of jujube pits as hazardous foreign bodies: (1) they are sharp and can easily penetrate through the esophageal wall, leading to deep cervical infection and mediastinitis, or cause damage to the great vessels, leading to lethal massive hemorrhage; (2) they are large and can compress the esophageal wall, causing ischemia, edema, erosion, ulcer, and even perforation [21, 22]. Furthermore, we found that the jujube pit size and the time from ingestion to presentation were independent risk factors for complications. The risk factors for complications have been the focus of recent studies and a source of controversy. Hong *et al.* reported that the risk factors for endoscopic complications and failure are sharpness of the foreign body and a duration of impaction of greater than 12 h [23]. However, Wu *et al.* reported that there was no significant difference in complications after foreign body removal between the two groups beyond 24 h and within 24 h after ingestion [24]. Most authors believe that the long-term impaction of a foreign body in the esophagus causes pressure changes in the esophageal wall and perforation [4, 21, 22].

Conclusions

Computed tomography without contrast material is the preferred diagnostic method for adults with esophageal jujube pit impaction, and rigid esophagoscopy can be used for therapy even if the first flexible esophagoscopy failed. The rate of complications caused by jujube pit impaction was high and was correlated with the pit size and the time from ingestion to presentation. Awareness of this issue should be increased to encourage patients who have ingested a jujube pit to see a doctor as soon as possible.

There are some limitations to our study. First, the extent of complications was not defined objectively because of the retrospective nature of the study. Second, the statistical results may have been biased due to the small sample size. Further prospective

studies with large samples are needed to confirm these results.

Conflict of interest

The authors declare no conflict of interest.

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