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# Clinical diagnosis and treatment of throat foreign bodies under video laryngoscopy

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## Abstract

**Objective:** This study was designed to explore the clinical application of video laryngoscopy in the diagnosis and treatment of throat foreign bodies (FBs).

**Method:** In total, 1572 patients diagnosed with throat FBs at the Department of Otolaryngology of Nanjing Drum Tower Hospital were retrospectively analysed. The covariables collected were the time from FB ingestion to admission, age, sex, duration of admission, and site of impaction.

**Result:** The most common FBs were fish bones, which accounted for 1446 (91.98%) of 1572 FBs. Among all 1572 FBs, 1004 (63.87%) were successfully removed by video laryngoscopy without complications. A shorter duration of admission was associated with a higher diagnostic rate under video laryngoscopy. The diagnostic rate of sharp FBs was significantly higher than that of non-sharp FBs. The most common sites of throat FBs were the tongue root (42.29%), epiglottic vallecula (19.40%), tonsil (18.21%), and piriform fossa (10.65%).

**Conclusion:** Video laryngoscopy is a powerful tool for the diagnosis and treatment of throat FBs, allowing for identification of rare locations of FBs as well as refractory FBs.

## Keywords

Video laryngoscope, throat foreign bodies, fish bone, diagnosis, foreign body impaction, otolaryngology

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## Introduction

Ingested foreign bodies (FBs) are a common problem encountered in otolaryngologic practice. In China, fish bones are the most frequently encountered FBs as reported by Gmeiner et al.[1]

In ear, nose, and throat clinics, video laryngoscopy has traditionally been used by otolaryngologists for the diagnosis and management of a variety of FBs affecting the throat. The procedure is low-risk and easy to perform. The clinical features of ingested FBs include the sensation of intermittent or persistent puncturing with throat pain. It is inappropriate to primarily use radiography or computed tomography for assessment of suspected throat FBs.[2] Instead, the oropharynx should be the first area to be examined, and this should be followed by indirect laryngoscopy if necessary. If the FB is still not found, then video laryngoscopy should be used. Other techniques that can be used for the removal of retained FBs in the upper digestive tract include endoscopy, rigid oesophagoscopy, and surgery because FBs may become lodged even deeper.[3] Video laryngoscopy under topical anaesthesia is commonly used. This study was performed to analyse and present our experience using video laryngoscopy for the extraction of throat FBs.

## Materials and Methods

This retrospective study involved patients with throat FBs who presented to the ear, nose, and throat clinic of Nanjing Drum Tower Hospital from December 2014 to November 2016. All outpatients were routinely examined by the first clinician. The first clinician either found no FB or found an FB but did not have the ability to remove it. These patients were advised to undergo examination by video laryngoscopy.

The following variables were obtained from the patients' medical records: age, sex, clinical presentation, duration of admission, and type of FB in the throat. The patients were divided into five groups according to the duration of time from FB ingestion to admission: group 1 (1 day), group 2 (2–3 days), group 3 (4–6 days), group 4 (7–14 days), and group 5 ($\geq$15 days). The FB was classified as a sharp or non-sharp FB according to its shape. Sharp FBs found in patients' throats mainly consisted of fish bones, melon seed shells, bamboo wood, iron wires, and similar objects. Other mass-like or irregularly shaped bones, plastic shells, tablets, and vegetables were categorized as non-sharp FBs. All patients were examined and underwent FB removal by video laryngoscopy under topical anaesthesia. Before video laryngoscopy, the patient's bilateral nasal mucosal surfaces were anaesthetized with 1% tetracaine and 1% ephedrine, and the oropharynx was then anaesthetized with 1% tetracaine. If an FB was found, we immediately removed it using auxiliary forceps. If not, the patients were observed for a few days. All patients were followed up for 2 weeks. The following equipment was used in the study: a video laryngoscope (type VT, VT2; Olympus, Tokyo, Japan) and FB forceps (type FB-19C-1, FB-21C-1; Olympus).

The statistical analysis was performed using the Statistical Program for the Social Sciences (SPSS version 19.0; IBM Corp., Armonk, NY, USA), chi-square tests were performed, and a P value of $<0.05$ or $<0.01$ was considered statistically significant.

Before the examination, the procedure and its risks, benefits, and associated complications were explained to the patients, and all patients provided written informed consent. This study was approved by the Nanjing Drum Tower Hospital Review Board (IRB 2019-193-03).

## Results

A total of 1572 patients (696 men, 876 women) presented with a complaint of a throat FB. The patients' mean age was $43.5 \pm 16.54$ years (range, 9–94 years), and nine patients were <14 years of age. The time from ingestion of the FB to admission ranged from 30 minutes to 3 months. In total, 1004 throat FBs were successfully removed under video laryngoscopy. No throat FBs were diagnosed in 567 patients. In the remaining patient, an FB in the oesophageal inlet was removed by oesophageal endoscopy under general anaesthesia.

The results are summarized in Table 1. Indirect laryngoscopy revealed impacted FBs in 316 (20.10%) of the 1572 patients, and 1005 (63.93%) were detected with video laryngoscopy; of these patients, 4 were children. As the time until admission increased, the diagnostic rate under video laryngoscopy significantly decreased ($P < 0.05$). We compared the diagnostic rate of FBs among different times until patient admission to the hospital and found no significant difference in the diagnostic rate between patients admitted within 7 to 14 days (group 4) and those admitted after 15 days (group 5). However, comparisons among the other groups showed significant differences in the diagnostic rate between groups 1 and 2 ($P < 0.01$), groups 2 and 3 ($P < 0.01$), and groups 3 and 4 ($P < 0.05$) (Table 2).

Of the 1572 patients who presented to the clinic, 1449 were admitted with the complaint of having ingested a sharp FB. Of these 1449 patients, 989 were diagnosed using video laryngoscopy; in the remaining 460 patients, no FBs were found in the throat. A total of 123 patients presented with the complaint of having ingested a non-sharp FB. Among these 123 patients, only 16 were diagnosed under video laryngoscopy; the remaining 107 patients were not diagnosed with a throat FB. The diagnostic rate of sharp FBs under video laryngoscopy was significantly higher than that of non-sharp FBs ($P < 0.01$) (Table 3).

The common and specific lodging sites of ingested FBs were also identified via video laryngoscopy (Figures 1 and 2). The most common sites were the lingual root in 425 (42.29%) patients, the epiglottic vallecula in 195 (19.40%), the tonsil in 183 (18.21%), and the piriform fossa in 107 (10.65%). The least common sites were the lateral and posterior pharyngeal walls in 48

**Table 1.** Comparison of tools for management of throat foreign bodies.

| | Diagnosis | No diagnosis | Diagnostic rate (%) |
|---|---|---|---|
| Video laryngoscopy | 1005 | 567 | 63.93 |
| Indirect laryngoscopy | 316 | 1256 | 20.10 |

**Table 2.** Time to admission and diagnostic rate of throat foreign bodies via video laryngoscopy.

| Group | Time from ingestion to admission (days) | Patients (n) | Foreign bodies (n) | No diagnosis | Diagnostic rate (%) |
|---|---|---|---|---|---|
| 1 | 1 | 1002 | 749 | 253 | 74.75 |
| 2 | 2–3 | 333 | 189 | 144 | 56.76 |
| 3 | 4–6 | 131 | 45 | 86 | 34.35 |
| 4 | 7–14 | 79 | 17 | 62 | 21.52 |
| 5 | ≥15 | 27 | 5 | 22 | 18.52 |

**Table 3.** Diagnostic rate of sharp and non-sharp foreign bodies.

| Foreign body shape | Patients (n) | Foreign bodies (n) | No diagnosis | Diagnostic rate (%) |
|---|---|---|---|---|
| Sharp | 1449 | 989 | 460 | 68.25 |
| Non-sharp | 123 | 16 | 107 | 13.01 |

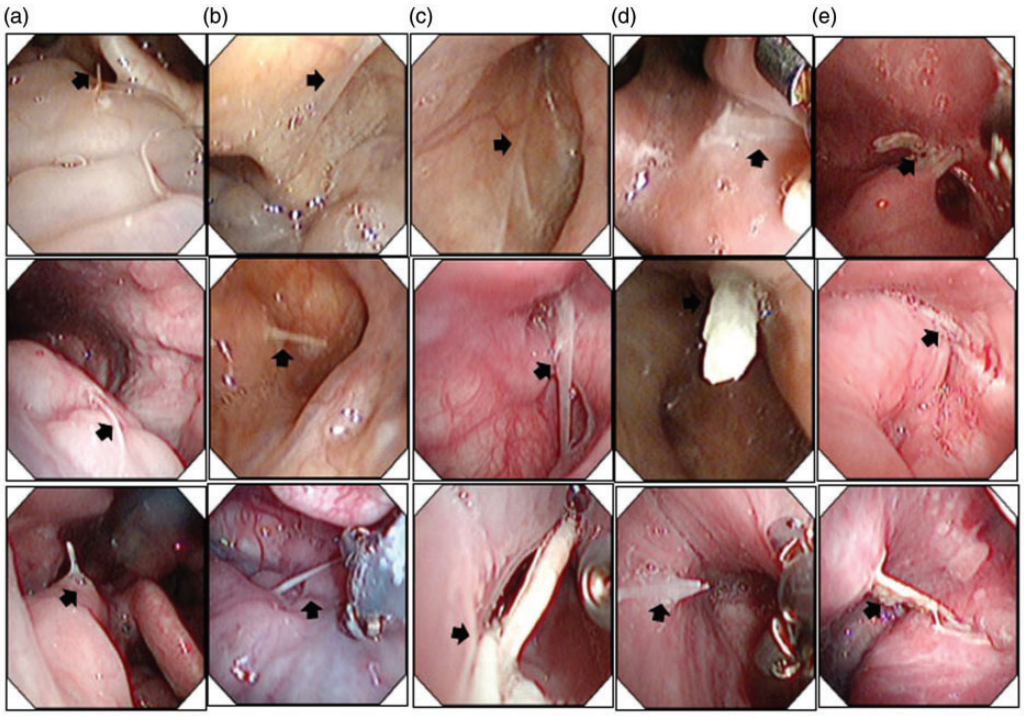


**Figure 1.** Distribution of most common lodging sites under video laryngoscopy. Endoscopic photographs showed five lodging sites. (a) Fish bone at tongue root. (b) Fish bone in epiglottic vallecula. (c) Fish bone in piriform fossa. (d) Fish bone in lateral pharyngeal wall. (e) Fish bone at entrance of oesophagus and posterior cricoid cartilage.

(4.78%) patients, the epiglottis in 15 (1.49%), the aryepiglottic fold in 10 (1.00%), the entrance to the oesophagus and the posterior cricoid cartilage in 8 (0.80%), the hypopharynx in 5 (0.50%), the nasopharynx in 4 (0.40%), the arytenoid region in 2 (0.20%), the tongue papillae in 2 (0.20%), and the glottis in 1 (0.10%) (Figure 4). The FB distribution in four children with a history of FB inhalation were the tongue root, piriform fossa, lateral wall of the pharynx, and tonsil. Tiny FBs in the throat were very difficult to find under indirect laryngoscopy; however, they could be clearly seen and diagnosed using video laryngoscopy (Figure 3, Table 3). Among the 1005 FBs diagnosed by video laryngoscopy, 437 (43.48%) occurred on the right side and 409 (40.70%) occurred on the left side. The remaining 159 occurred across both sides or in the middle.

## Discussion

This study was performed to describe the best clinical practice for the diagnosis and

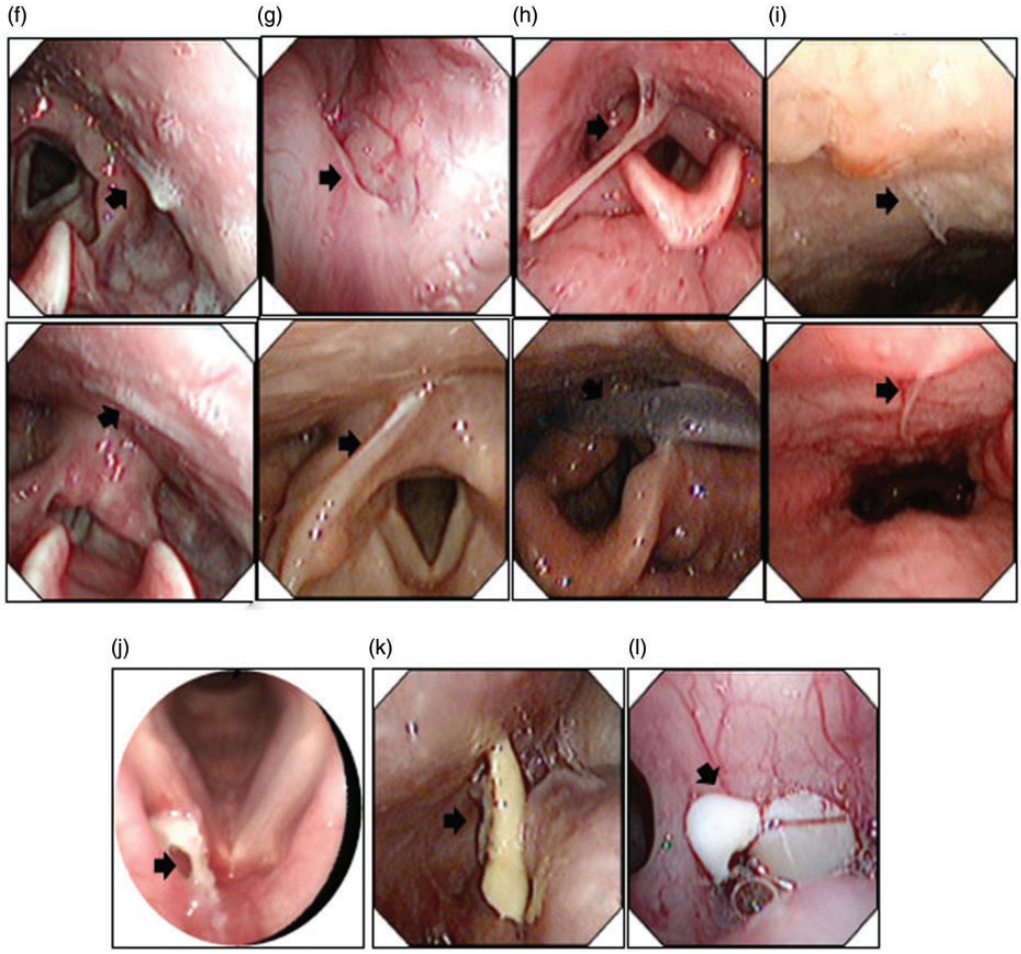


**Figure 2.** Distribution of specific lodging sites under video laryngoscopy. Endoscopic photographs showed seven lodging sites. (f) Fish bone in posterior hypopharyngeal wall. (g) Fish bone in aryepiglottic fold. (h) Fish bone (upper photograph) and ballpoint pen (lower photograph) in hypopharynx. (i) Fish bone in nasopharynx. (j) Fish bone in glottis. (k) Chicken bone in entrance of oesophagus. (l) Non-sharp foreign body in epiglottic vallecula.

treatment of throat FBs in children and adults. In Asia, few studies have focused on the management and treatment of throat FBs, particularly in children.[4–6] FB ingestion is one of the most common problems among children, and fish bones are frequently found.[7,8] Plain radiography and computed tomography have high sensitivity and specificity in cases of suspected impaction of fish bones in the oesophagus.[9] However, throat video laryngoscopy is the procedure of choice in our department. For the initial assessment of an FB in the throat, video laryngoscopy has higher sensitivity than indirect laryngoscopy for the extraction of FBs in the upper digestive tract.

The most common FBs in the laryngopharynx are fish bones.[10] In the upper alimentary tract, fish bones commonly lodge in the palatine tonsil, at the base of the

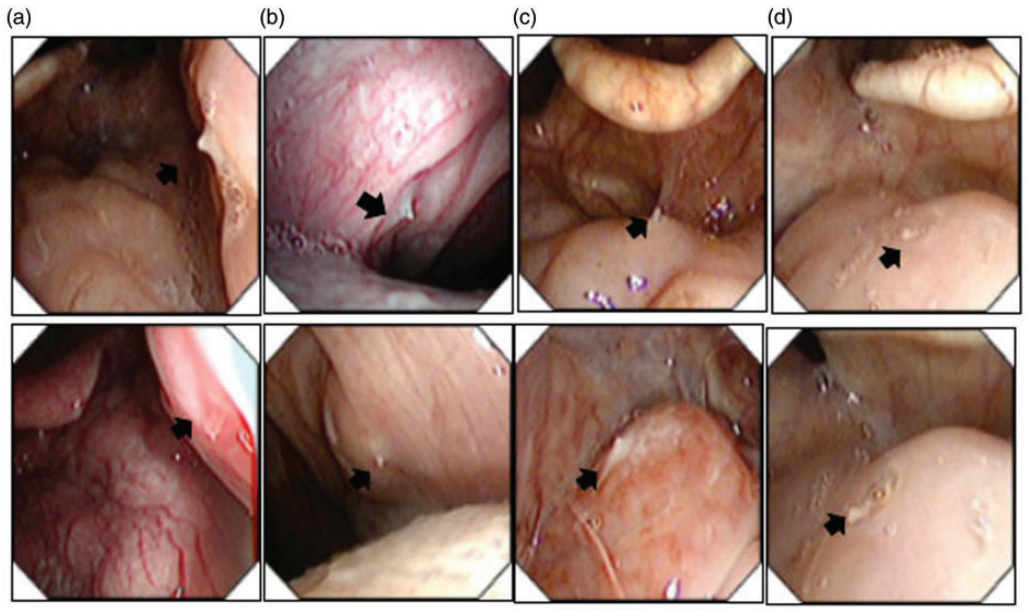


**Figure 3.** Distribution of lodging sites of tiny fish bones under video laryngoscopy. Endoscopic photographs showed three lodging sites. (a) Fish bone at superior pole of tonsil. (b) Fish bone at inferior pole of tonsil. (c) Fish bone at root of tongue.

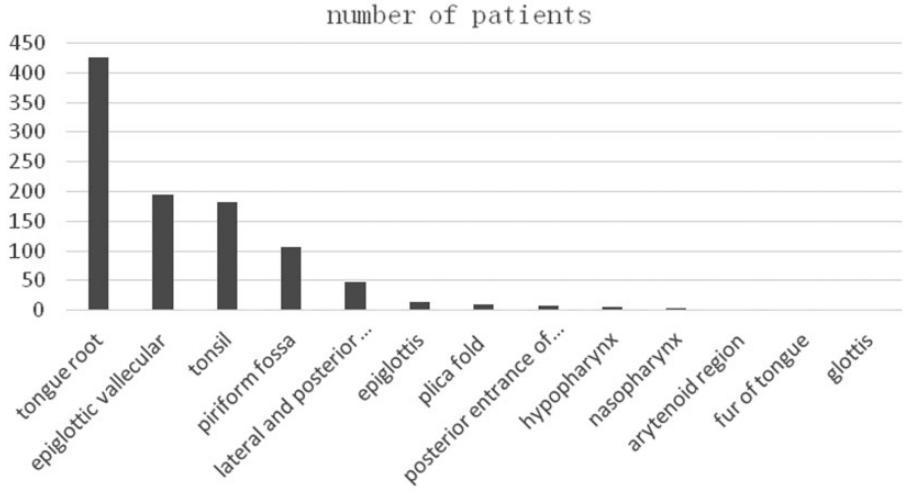


**Figure 4.** Graphical representation of lodging site distribution of throat foreign bodies.

tongue, and in the vallecula.[11] In the present study, the FBs found under video laryngoscopy were most commonly located at the tongue root, in the epiglottic vallecula, and in the tonsil. Assessment of the correlation between the time to first admission and the diagnostic rate of FBs under video laryngoscopy showed that a shorter time from ingestion to video laryngoscopy was associated with a higher rate of

diagnosis. The highest numbers of FB ingestion cases were reported within 1 day of ingestion, which significantly increased the diagnosis and treatment rates. Patients admitted after 3 days were not easily diagnosed, and most of the FBs were not found in the throat region. Moreover, the patients who presented after 1 week were rarely diagnosed and treated, and no significant difference was observed. Of all cases of diagnosis and successful removal of FBs, only three patients were admitted from 16 days to 1 month after ingestion. Two patients who presented beyond 1 month after ingestion underwent successful FB removal. The longest duration occurred in an elderly man who presented after 40 days because of sensory deterioration associated with ageing. These findings suggest that early detection and rapid removal of FBs by video laryngoscopy is crucial. A long duration from ingestion to endoscopy and the presence of mucosal injury are risk factors for complications of endoscopic FB removal.[12]

There are various reasons for an unsuccessful diagnosis, such as the fact that throat FBs might be slightly out of position or might have been swallowed. Additionally, FBs stuck in the oesophagus are difficult to diagnose under video laryngoscopy. In some cases, throat FBs may cause mucosal abrasion or throat inflammation with the development of related symptoms. Some patients are also psychologically affected. In some of our unsuccessfully diagnosed cases, we found that the patient's medical history was not clear; in particular, the feeling of stabbing pain was unclear, and the time to admission was longer than 3 days. Thus, a clear medical history of FB ingestion and assessment of the patient's psychological health are important for the diagnosis, and attention should be paid to both the medical history and mental health.

In the present study, fish bones were the most frequently encountered throat FBs, comprising 1446 (91.98%) of all 1572 cases. This finding is consistent with those of several previous studies conducted in Asian and Western countries.[13,14] We observed that sharp FBs were far more common than non-sharp FBs, and the diagnostic rate of sharp FBs was significantly higher than that of non-sharp FBs. We speculate that this is because sharp FBs can easily cause throat stenosis, lodge in hidden positions, or directly pierce mucous membranes.

Video laryngoscopy plays an important role in the treatment of uncommon and refractory FBs in the throat, especially tiny FBs in the tonsil and lingual root.[15,16] Smaller FBs and their tiny pieces may be hidden in the throat, and it is difficult to identify and remove these FBs. Moreover, uncommon and refractory FBs, such as those in the pharyngeal wall, aryepiglottic fold, oesophageal entrance, nasopharynx, arytenoid region, tongue papillae, and glottic area, are difficult to identify by traditional methods of indirect laryngoscopy. The advantage of video laryngoscopy is that flexible forceps can enter various regions of the throat with a direct and clear view.

Compared with traditional inspection, the application of video laryngoscopy is very effective in providing accurate information on the position of the FB. Therefore, we conclude that video laryngoscopy, with its advantages of full illumination, accurate positioning, and a precise operation, is convenient, fast, and effective for the treatment of ingested throat FBs.

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## Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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