The Laryngoscope

Proposal for Methods of Diagnosis of Fish Bone Foreign Body in the Esophagus

Seung Hoon Woo, MD, PhD; Kyung Hee Kim, MS

Objective: To investigate the methods of diagnosis of fish bone foreign body in the esophagus and suggest a diagnostic protocol.

Study Design: Prospective cohort study.

Methods: A prospective study was performed on 286 patients with a history of fish bone foreign body impaction. Among them, 88 patients had negative findings in the oral cavity and laryngopharynx. Subsequent radiologic assessment of these patients included plain radiography and computed tomography (CT). Sixty-six patients showed positive findings in the esophagus, and an attempt was made to remove the obstruction using transnasal esophagoscopy.

Results: In 66 patients, a fish bone foreign body was detected in the esophagus by CT. In contrast, plain radiography detected a foreign body in only 30 patients. The overall detection rate of plain radiography compared with CT for fish bones was 45.5%. Plain radiography detected 35.9% of the simple type fish bones and 54.5% of the gill bone detected by CT. However, jaw bones had a detection rate of 100% with both methods. The fish bone foreign bodies were most commonly located in the upper esophagus (n = 65, 98.5%), followed by the lower esophagus (n = 1, 1.5%).

Conclusion: CT is a useful method for identification of esophageal fish bone foreign bodies. Therefore, CT should be considered as the first-choice technique for the diagnosis of esophageal fish bone foreign body.

Key Words: Esophagus, fish bone, computed tomography, foreign body.

Level of Evidence: 4.

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INTRODUCTION

A fish bone in the upper gastrointestinal tract is commonly encountered in the field of otolaryngology.[1,2] Among gastrointestinal foreign bodies, 80% to 90% pass spontaneously. Among those, fewer than 1% require surgery.[2,3] However, when the foreign body is in the esophagus, diagnosis and treatment are not easy.

Ingestion of fish bone is a frequent complaint. In the hospital, physical examinations and radiographic tests (cervical plain films) are usually performed. The palatine tonsils are known as *common impaction sites*, and when the foreign body is in the oral cavity or laryngopharynx, it can be easily discovered and removed.[2,4] When the foreign body is located in the esophagus or embedded in the esophageal wall, however, it is not easy to detect and remove. The foreign body could lead to esophageal perforation and result in catastrophic consequences such as deep neck infection, mediastinitis, or even aortoesophageal fistula.[2,5]

Plain radiography is the most common investigative study performed in patients presenting with suspected fish-bone foreign body impaction. However, 48% of fish bones are radiolucent, and diagnostic accuracy is low because fish bones are consistent with the varying radiodensity of cartilage and bones.[2,6] Indeed, fish bones represent a special type of food foreign body because most fish bones are very sharp and thin. Thus, the detection of fish bones requires high x-, y-, and z-axis resolution.

The purpose of this study was to investigate the methods of diagnosis of fish bone foreign bodies in the esophagus and suggest a diagnostic protocol.

MATERIALS AND METHODS

The study was conducted on fish bone ingestion patients who visited Gyeongsang National University Hospital, Jinju, Republic of Korea, complaining of discomfort and foreign body sensation after eating fish between December 2010 and August 2012. For the study, a total 286 patients were enrolled: These patients were visited our clinic or emergency room because fish bone foreign body impaction was suspected (Fig 1). When a fish bone was identified in the oral cavity and laryngopharynx, it was removed using forceps. However, when a foreign body was not found in the oral cavity and laryngopharynx and the patient complaint continued, we suspected a foreign body in the esophagus. We then checked cervical plain radiography and computed tomography (CT) in all patients.

Plain radiographs were taken with lateral and anterior–posterior projections. Computed tomography was performed in spiral mode without contrast material using a 64-slice CT

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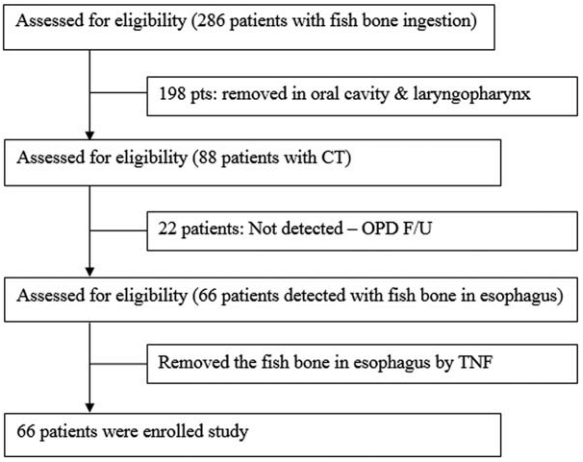

Fig. 1. The enrollment of patients. CT = computed tomography; F/U = follow-up; OPD = outpatient department; TNE = transnasal esophagoscopy.

system (Light Speed VCT; GE Healthcare, Milwaukee, WI), and the scan range was from the skull base to the diaphragm. The studies were interpreted as pathological if a hyperdense body was detected in the cervical esophageal walls. All studies were interpreted by a staff radiologist. If a fish bone was identified on CT or plain radiography, an attempt was made to remove it using transnasal esophagoscopy (TNE). When a fish bone was not identified on CT and plain radiography, clinical follow-up of the patients was performed.

When a fish bone was identified, we evaluated the bone's type, size, and lying position. The type was classified as simple fish bone (spine type), gill bone, or jaw bone; and the position was classified as horizontal, vertical, or oblique into the esophagus. The length of the fish bone was also measured.

This study was performed after obtaining approval from the Institutional Review Board of Gyeongsang National University Hospital (GNUH-2010-09-013-001).

RESULTS

There were a total of 286 patients with fish bone foreign body ingestion. Out of this group, an oral or laryngopharyngeal fish bone foreign body was diagnosed and removed in 198 patients, including 122 men and 76 women. The mean age was 31.0 years (standard deviation [SD] ± 20.8), and the median age was 32.0 years (interquartile range [IQR] 10.8–44.0).

For the remaining 88 patients in whom the ingested foreign body was not discovered in the oral cavity or laryngopharynx, plain radiography and CT were performed. A fish bone was newly discovered in the esophagus in 66 of these patients. The fish bone foreign bodies were most commonly located in the upper esophagus (n = 65, 98.5%), followed by the lower esophagus (n = 1, 1.5%). Of the 66 patients with an esophageal foreign body, 26 were men and 40 were women. The mean age was 60.4 years (SD ± 10.0) and the median age was 60.0 years (IQR 53.0–68.3).

Regarding the type of fish bone, 40 (60.6%) were simple fish bones, 22 (33.3%) were gill bones, and four (6%) were jaw bones (Table I). The lying position of the simple fish bones in relation to the long axis of the esophagus was horizontal in 20 cases (50%), vertical in 13 (33%), and oblique in seven (17%) (Table I). The bones' longest length was 3.1 ± 2.49 cm. In the case of gill bones and jaw bones, the lying position could not be defined because the shape of the bones varied greatly.

When a foreign body was detected with CT or plain radiography, an attempt was made to remove it using TNE. Of the 66 fish bones detected on CT, 55 were successfully removed with TNE under local anesthesia; 10 passed into the stomach during the TNE procedure; and in one case, the fish bone could not be found (Fig. 2). The 22 patients in whom no fish bone foreign body was identified on CT or plain radiography were followed up clinically.

Among the 66 patients with a foreign body identified on CT and confirmed by TNE, the simple type of fish bone was detected by plain radiography in 14 cases and by CT in 39 cases (Fig. 3). Plain radiography detected 35.9% of the simple type fish bones detected by CT. Gill bones were detected in 12 cases by plain radiography and in 22 cases by CT. Plain radiography detected 54.5% of the gill bone detected by CT. However, jaw bones had a detection rate of 100% with both CT and plain radiography (Table I).

Regarding the lying position of simple fish bones in relation to the long axis of the esophagus, it was horizontal in four cases, vertical in five, and oblique in five (Table I). The overall detection rate of plain radiography compared with CT for fish bones was 45.5%, and the detection rate for simple fish bones, in particular, was just 35.9%.

DISCUSSION

Impaction of a foreign body in the upper gastrointestinal tract usually occurs during daily meals. The main impaction sites for fish bones discovered in the upper gastrointestinal tract are the palatine tonsils, base of the tongue, vallecula, and pyriform sinus.[4,7] In this study, the impacted foreign body was discovered in the oral cavity or laryngopharynx in 198 cases out of 286 (69.23%).

Patients suspected of fish bone impaction usually undergo physical and laryngoscopic examination.[2,8] Foreign bodies in the oral cavity and laryngopharynx are easily detected and removed it. However, it can sometimes be difficult to detect fish bones because they are

TABLE I.
The Detection of Fish Bones in the Esophagus.

Type	Plain Radiography	CT	Total
Simple bone	1	39	40
Horizontal	4	19	20
Oblique	5	7	7
Vertical	5	13	13
Gill bone	12	22	22
Jaw bone	4	4	4
Total	30	65	66

CT = computed tomography.

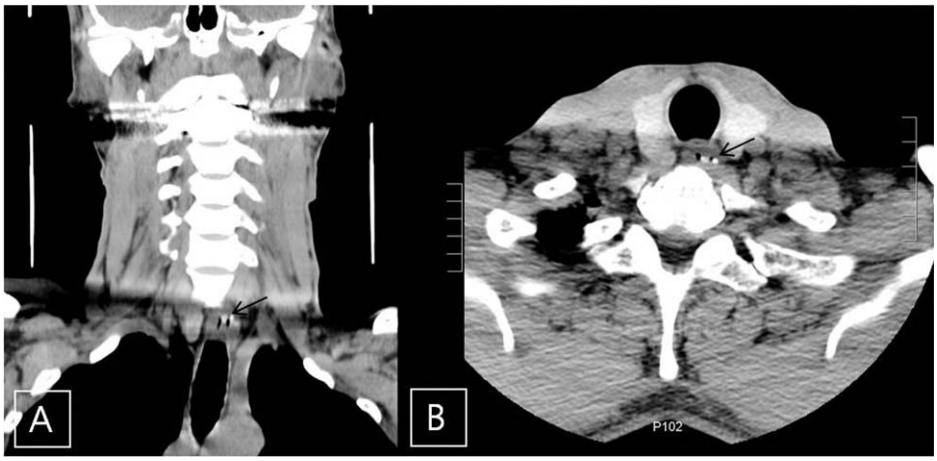

Fig. 2. This is a false positive case, in which computed tomography showed a linear horizontal fish bone in the upper esophagus (black arrow). However, there was no fish bone on transnasal esophagoscopy examination.

usually of varying radiodensity and may invade the wall of the digestive tract. Furthermore, fish bones placed in the esophagus are not able to be identified with physical examinations.[2]

Plain radiography used to be included in the traditional detection methods for impacted fish bone foreign bodies. However, the clinical utility of this method is questionable.[2] According to previous reports, the detection rate of plain radiography for fish bone foreign bodies ranged from 23.5% to 54.8%.[1,2,4,9] A plain radiograph should only be performed when searching for more radiodense fish bones. Fish bones are often small and thin, characteristics that make their adequate detection by plain radiography difficult.

In contrast, CT shows a very high detection rate. According to previous reports, noncontrast CT was found to be very effective in detecting esophageal foreign body impaction, with a sensitivity of 100% and a specificity of 93.7%.[10,11] The advantages of CT scan consist of detection of the foreign body and its accurate location as well as its relation to adjacent structures, and its use could thus prevent many unnecessary esophagoscopies.[11] In

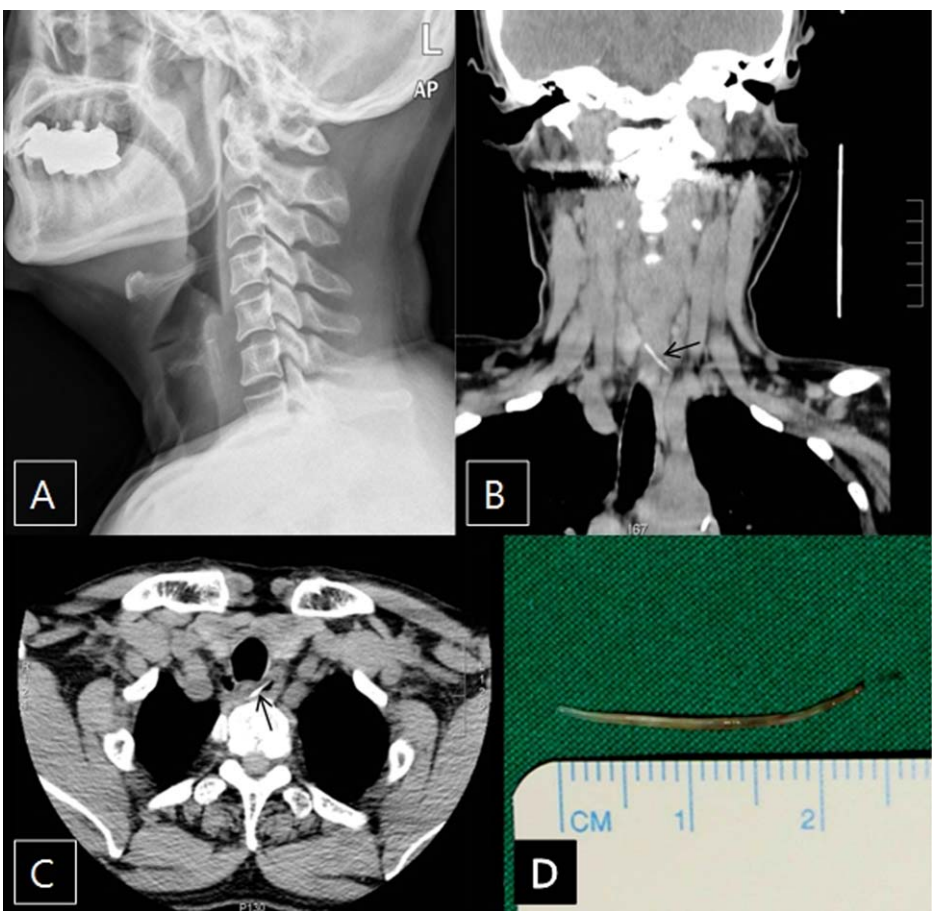

Fig. 3. (A) There was no remarkable finding on plain radiography (lateral projection). (B–C) Computed tomography showed a high-density and linear-like foreign body in the esophagus (black arrow). (D) Simple type fish bone removed from the esophagus. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

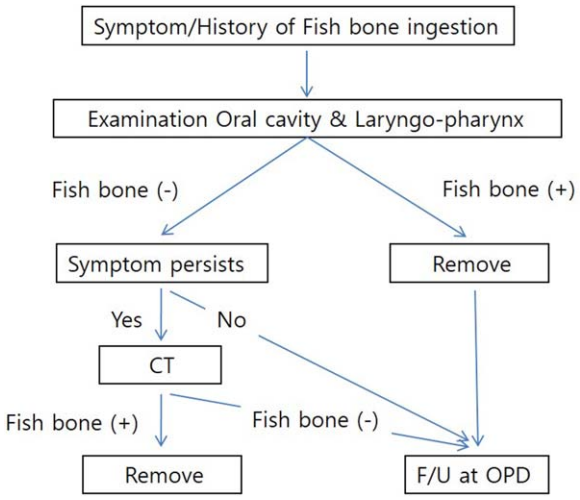

Fig. 4. Proposal for methods of diagnosis and treatment of fish bone foreign body is presented. CT = computed tomography; F/U = follow-up; OPD = outpatient department. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

our series of 66 cases, the detection rate of CT for fish bone foreign bodies was 98.5%. There was only one case in which the fish bone could not be found on TNE examination, in which CT identified a vertical fish bone in the upper esophagus. The identified fish bone on CT was probably confused with other food materials, or the fish bone might have passed into the gastrointestinal tract prior to the TNE examination (Fig. 2).

For the evaluation of upper gastrointestinal tract foreign bodies, not only their presence but their accurate location and relation to adjacent structures are also important.[2,12,13] Computed tomography offers the additional advantages of sagittal and coronal reconstruction images and short examination time. In the esophagus, fish bones are most frequently discovered mainly in the first narrow area among three narrow areas. In the current study, similar to existing reports, 65 cases (98%) of fish bone were discovered in the upper esophagus.

Almost all previous studies of fish bone foreign bodies were only focused on the ability to detect them. However, knowledge of the fish bone's accurate shape, size, location, and lying position is also important for appropriate treatment planning. In our study, the majority of the fish bones (60.6%) were simple fish bones. Regarding the lying position of the simple fish bones in the esophagus, the fish bones displayed horizontal (50.0%), vertical (32.5%), and oblique positions (17.5%).

Although the simple type fish bone was very easily removed by TNE, gill bones and jaw bones were more difficult to remove with TNE. Thus, providers should know the type (shape, size, location, and lying position) of the fish bones before treatment.

Fish bone foreign body ingestion in the esophagus appeared to be more common in older patients in the current study. According to previous studies, dysphagia can occur as swallowing movement deteriorates with increasing age.[7] In this respect, the reason for the increase in fish bones in the esophagus in older people compared to younger people is thought to be related to the physiological characteristics of the esophagus and the deterioration in swallowing movement that occurs as individual age.

This study has some limitations. First, CT delivers a high radiation dose and has a high cost compared to plain radiography.[11,14] However, when the modality's detection rate, as well as the discomfort experienced and the cost-effectiveness in patient management are taken into consideration,[15] CT must be recommended for patients with fish bone impaction. Second, TNE was not performed in all patients in whom no fish bone was detected on CT. However, TNE is an invasive procedure with potential risks, and a fish bone embedded in the esophageal wall usually cannot be found by TNE.

Our proposal for the methods of diagnosis and treatment of fish bone foreign body is presented in Figure 4.

CONCLUSION

Computed tomography has a high detection rate for fish bone foreign bodies in the esophagus. Computed tomography should be the first-line radiological evaluation procedure in the case of upper gastrointestinal tract fish-bone foreign bodies.

Acknowledgments

Seung Hoon Woo, MD, and Kyung Hee Kim contributed equally to this article.

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