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Removal of a fish bone endangering the common carotid artery under general anesthesia with video laryngoscope: A case report

Yang Lu [a,b], Hua Zhang [b], Jurong Xia [b], Haibo Xu [c], Jinglei Wang [c], Jie He [b,*]

[a] Zhejiang Chinese Medicine University, Hangzhou, 310053, Zhejiang, China
[b] Department of Anesthesiology and Pain Management, The Third People's Hospital of Hangzhou, Hangzhou, 310009, Zhejiang, China
[c] Otolaryngological Department, The Third People's Hospital of Hangzhou, Hangzhou, 310009, Zhejiang, China

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ABSTRACT

A fish bone penetrating the digestive tract is a common emergency, and its removal often requires endoscopy. We report herein a case in which a fish bone punctured the throat; its front end was close to the common carotid artery, but its back end could not be visualized. Subsequently, we compared the pharyngeal CT and carotid CTA of the patient and found that the fishbone had shifted. So we considered that the end of the fish bone could be rediscovered and successfully removed by a video laryngoscope. Finally, with the patient under deep sedation with maintained spontaneous breathing, the fish bone was removed using video laryngoscopy. This case highlights the importance of rechecking CT scans and the use of laryngoscopy when determining the location of a shifted foreign body at different times and when selecting the removal method.

1. Introduction

A fish bone is one of the most common foreign bodies found penetrating the esophagus, often due to careless eating. A fish bone puncturing the esophagus may cause pain as well as throat, esophagus, and gastrointestinal injury. In addition to puncturing the esophagus, the bone may damage the trachea and great vessels. All esophageal foreign bodies require urgent treatment within 24 h. However, fish bones require urgent treatment, preferably within 2 h and absolutely within 6 h. Approximately 10%–20% of cases involving foreign body ingestion require endoscopic removal, while less than 1% require surgery for foreign body extraction or to treat complications [1]. We report herein a case in which the patient accidently swallowed a bream bone. The bone pierced from the pharynx, and its front end reached the vicinity of the common carotid artery. At first, the other end of the bone could not be visualized using laryngoscopy. Later, under general anesthesia with retained spontaneous breathing and without endotracheal intubation, the end of the fish bone was found and successfully removed without complications.

2. Case report

A 45-year-old woman visited the otolaryngology department of our hospital due to a "feeling discomfort in the throat more than 1 h ago." At that time, the patient had a sore throat and hoarse voice, but no cough or expectoration, chest tightness, shortness of breath, chills, fever, or other discomfort. Height 160 cm, weight 60 kg, no history of alcoholism, hypertension, diabetes, cardiovascular,

* Corresponding author.
E-mail address: anesthesiame@163.com (J. He).

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cerebrovascular, central nervous system and other chronic diseases. Laryngoscopy showed no obvious abnormalities (Fig. 1a). The plain film indicated that the fish bone spanned across the throat and the tip appeared to be approaching the carotid artery. Therefore, CT scan of the throat was performed. Throat computed tomography (CT) showed a transverse high-density shadow in the horizontal esophagus at the level of the sixth cervical vertebra with a length of about 3.3 cm; a foreign body was considered (Fig. 1b). After repeated questioning, we found that the patient's symptoms occurred while eating bream 11 h prior. We therefore concluded the patient had a foreign body in her esophagus and prepared to remove it under emergency endoscopy.

After careful observation of the throat CT scans, we found that the tip of the fish bone was close (approximately 0.29 cm) to the left common carotid artery (Fig. 2a and b). A few hours later, carotid computed tomography angiography (CTA) revealed the left end of the fish bone was about 0.45 cm away from the left common carotid artery. The fish bone moved slightly, and no obvious abnormal signs were found in the carotid CTA (Fig. 2c and d; Fig. 3). In view of the fact that the back end of the fish bone was not found under the laryngoscope, the front end of the fish bone was too close to the common carotid artery, and reports of insertion of fish bones or other foreign bodies into the carotid artery are not uncommon, we organized a multidisciplinary discussion with the departments of otolaryngology, head and neck surgery, vascular surgery, stomatology, gastroenterology, and anesthesiology.

We considered the serious possible outcomes of this case, including uncontrollable bleeding caused by the bone's sharp tip piercing into the common carotid artery during continuous swallowing. After our discussion, we formulated the following surgical plan. First, after sufficient surface anesthesia with 2% lidocaine in the pharynx and larynx, the patient was given dexmedetomidine 0.5 μg/h combined with propofol target-controlled infusion (TCI) 2 μg/ml and alfentanil 20 μg/kg to implement general anesthesia with spontaneous breathing. Under deep sedation anesthesia, inhibit the discomfort caused by laryngoscopy, and prevent the patient from swallowing frequently and causing further displacement of fish bone. When the laryngoscope was inserted, the patient's vital signs were stable, the single orifice nasal catheter was used for 2 L/min oxygen inhalation, the oxygen saturation was 95–99%, the heart rate was 60–65 bpm, the respiratory rate was 8–12 bpm, the non-invasive blood pressure was 100–115/50-60 mmHg, there was no cough, and there was no body movement reflex. The pharyngolaryngeal cavity was visualized using a video laryngoscope. Fortunately, the back end of the fish bone was located (Fig. 4a). The otolaryngologist gently clamped the back end of the fish bone with a foreign body clamp and successfully pulled it out (Fig. 4b and c). The patient's vital signs were stable during the operation, and her hoarseness gradually improved to complete recovery after the operation. No other discomfort was reported, and the patient was discharged after 3 days.

3. Discussion

Fish bones penetrating the esophagus are common emergencies requiring urgent treatment and are often caused by careless ingestion, drunkenness, or mental disorders [2]. The swallowing of fish bones may lead to digestive tract perforation and bleeding and may lead to mediastinal abscess, esophagotracheal fistula, and other serious complications [3,4] that usually require emergency digestive endoscopy or laryngoscopy. The fish bone perforation reported in this case was caused by accidental ingestion. This may be related to her eating habits, such as fast eating and speaking or laughing during meals. The tip of the fish bone was close to the common carotid artery and, if not removed in time, may have caused serious complications such as carotid artery rupture and bleeding. W Rivington reported for the first time in 1886 that a fish bone penetrated a patient's left carotid artery, causing massive bleeding [5]. Until 2008, Damon reported the second case of a fish bone penetrating the carotid artery [6]. Fortunately, the outcome of this case was favorable. The main interesting aspects of this case are as follows: 1) The special position of the fish bone, where the tip of the fish bone threatens the carotid artery; And at first, no trace of the fish bone was found under ordinary laryngoscopy, but the X-ray examination

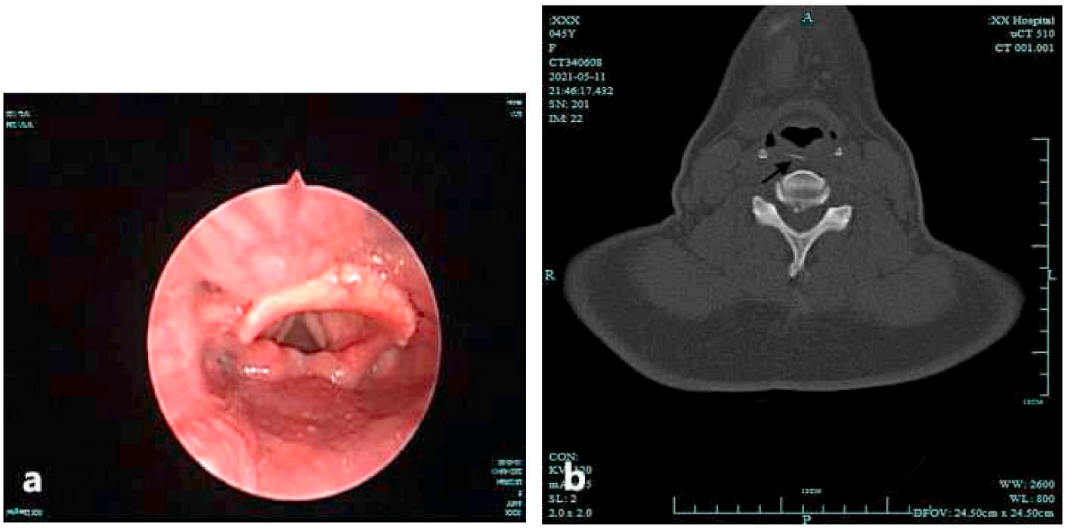

Fig. 1. a. No fish bone found; b. Throat computed tomography (CT) shows a fish bone (black arrow).

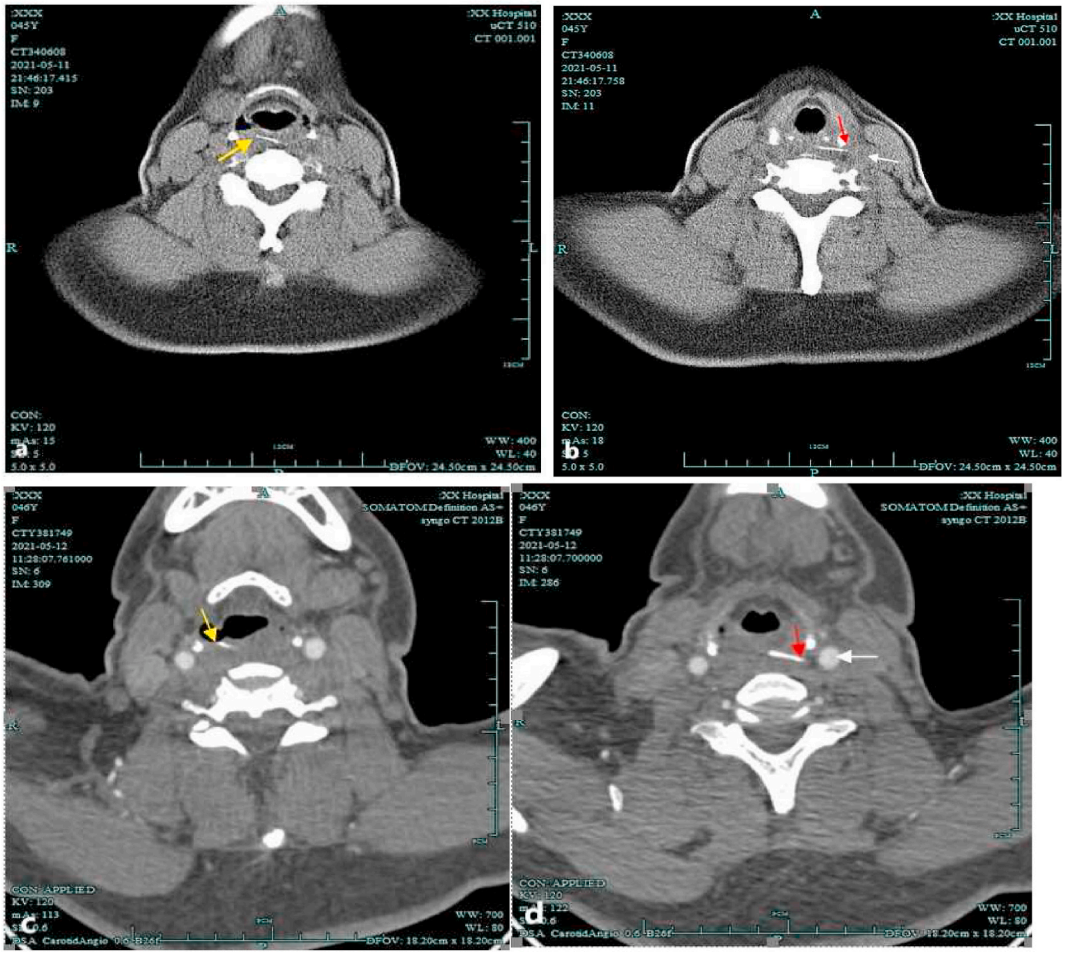

Fig. 2. a. The end of the fish bone (yellow arrow); b. The tip of the fish bone (red arrow) is close to the left common carotid artery (white arrow); c-d. Displaced fish bone and common carotid artery.

showed that the fish bones seemed to be in the throat; 2) We performed carotid artery CTA examination because we were worried that the fish bone had damaged the carotid artery. However, after comparing the CTA examination results with previous CT examination results, it was found that the fish bone had shifted away from the artery. This is also an important basis for us to try using video laryngoscopy to remove the fish bone through the pharyngeal cavity. So we believe that re-examination of CT is of great significance for the diagnosis and treatment of high-risk and easily displaced fish bones; 3) We implemented deep sedation to preserve autonomous breathing, and with the assistance of a video laryngoscope, we were fortunate to discover its "disappeared" tail end, which not only improved patient comfort but also avoided the related complications caused by tracheal intubation.

The diagnosis of oropharyngeal and intra-esophageal fish bone is made with the combination of the history of swallowing, clinical symptoms, and imaging or laryngoscopy findings [7,8]. Radiological examination, such as CT and X-ray, is of great significance in the diagnosis of foreign bodies in the digestive tract [9]. In addition, laryngoscopy and digestive endoscopy offer advantages in diagnosis and treatment of oropharynx and digestive tract fish bone [10]. In addition, they allow providers to evaluate the shape and size of a foreign body and determine its relationship with important tissues and structures such as surrounding organs and blood vessels [11]. They can also be used to identify complications such as bleeding and subcutaneous emphysema. In the present case, no foreign body was found under laryngoscopy, but CT findings allowed us to determine the exact location of the foreign body and its relationship with the surrounding tissues. The successful implementation of anesthesia and the surgical plan in this case was inseparable from the comparison of CT and CTA results at different times before operation; therefore, the importance of CT re-examination for such patients is self-evident. However, the necessity of CT re-examination is worth exploring and requires confirmation in future studies with large samples.

Treatment for a fish bone in the digestive tract often involves surface anesthesia to remove the foreign body via endoscopy, but in an emergency situation with a foreign body in the digestive tract that may cause serious complications or even endanger the patient's life [2], the patient's cooperation and the operator's skills and technology are required to remove the foreign body quickly and accurately. Therefore, such therapeutic endoscopic operations must often be performed under deep sedation, and general anesthesia

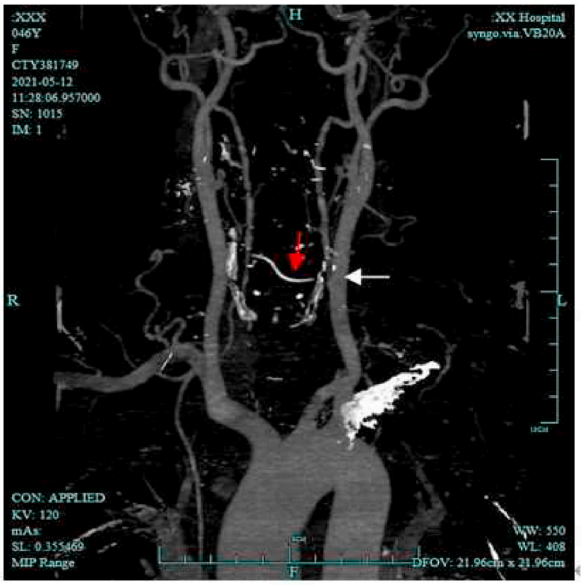

Fig. 3. Three-dimensional computed tomography (CT) reconstruction (red arrow indicates the fish bone, the white arrow the left common carotid artery). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

through endotracheal intubation is necessary [12]. The European Society of Gastrointestinal Endoscopy (ESGE) suggests endotracheal intubation should be considered when the risk of aspiration is high to ensure patient safety and improve the treatment success rate and patient satisfaction [2]. In this case, common laryngoscopy in the outpatient department did not reveal the end of the fish bone, which increased the difficulty of removal; moreover, CT examination showed that the front end of the fish bone was close to the common carotid artery. Surface anesthesia would not have effectively inhibited the swallowing reflex or the discomfort caused by endoscopic treatment. The muscle movement of the patient's throat and implementation of the digestive endoscope and tracheal intubation could also lead to displacement of the fish bone and puncturing of the common carotid artery. Therefore, this patient was treated with deep sedation combined with analgesics, then underwent laryngoscopy again [13,14]. The fish bone was successfully located and removed. This scheme not only effectively suppressed the swallowing reflex and the discomfort of laryngoscopy but also preserved the patient's spontaneous breathing and avoided the risks associated with tracheal intubation. The second laryngoscopic examination revealed the fish bone displacement may have been due to reduction of the throat mucosa edema and swallowing movement. Fortunately, the fish bone did not move toward the common carotid artery. If the common carotid artery had been torn or ruptured, it would have required intervention via vascular surgery and head and neck surgery. If we still had not found the fish bone in the second laryngoscopic examination, Or there might have been carotid artery bleeding during the process of removing fish bone, we would have deepened the anesthesia and used muscle relaxants to complete the incision under tracheal intubation to remove the fish bone. Of course, we also had an alternative treatment plan. If the carotid artery bled, our vascular surgery would repair the carotid artery under general anesthesia with tracheal intubation. If the bleeding was more serious, the carotid artery could even be ligated, which was the significance of multidisciplinary discussion before surgery. Therefore, for cases in which sharp foreign bodies perforate the throat, laryngoscopy is important. Its importance should be further examined in future studies. Of course, this plan had limitations: 1) We considered that when carotid artery was injured, the first choice for examination was carotid artery CTA, carotid arteriography might be more appropriate; 2) During deep sedation we could use anesthesia depth monitoring as an objective reference indicator, which was safer and more reliable, such as bispectral index, entropy index, etc.

4. Conclusion

Gastrointestinal foreign body is a common emergency in clinical practice. Endoscopic intervention is required for cases of high-risk gastrointestinal foreign body that may involve serious complications or even endanger life. In this case, we show that it is necessary to perform painless laryngoscopy before treatment of gastrointestinal foreign body in the throat. Because it is used to inhibit the discomfort of laryngoscopy, reduce the excessive swallowing reflex, and avoid foreign body displacement; besides, laryngoscopy improves the power of endoscopic intervention and patient satisfaction. Additionally, laryngoscopy intervention allows us to simply and quickly evaluate whether follow-up tracheal intubation is needed to complete the treatment and avoid injury and complications caused by unnecessary tracheal intubation. Certainly, preoperative re-examination of CT scans, laryngoscopy can help determine the immediate location of the migratory foreign body and the best surgical method for removal. This case provides a new idea for doctors to diagnose and deal with sharp-migratory foreign bodies in the pharyngolarynx.

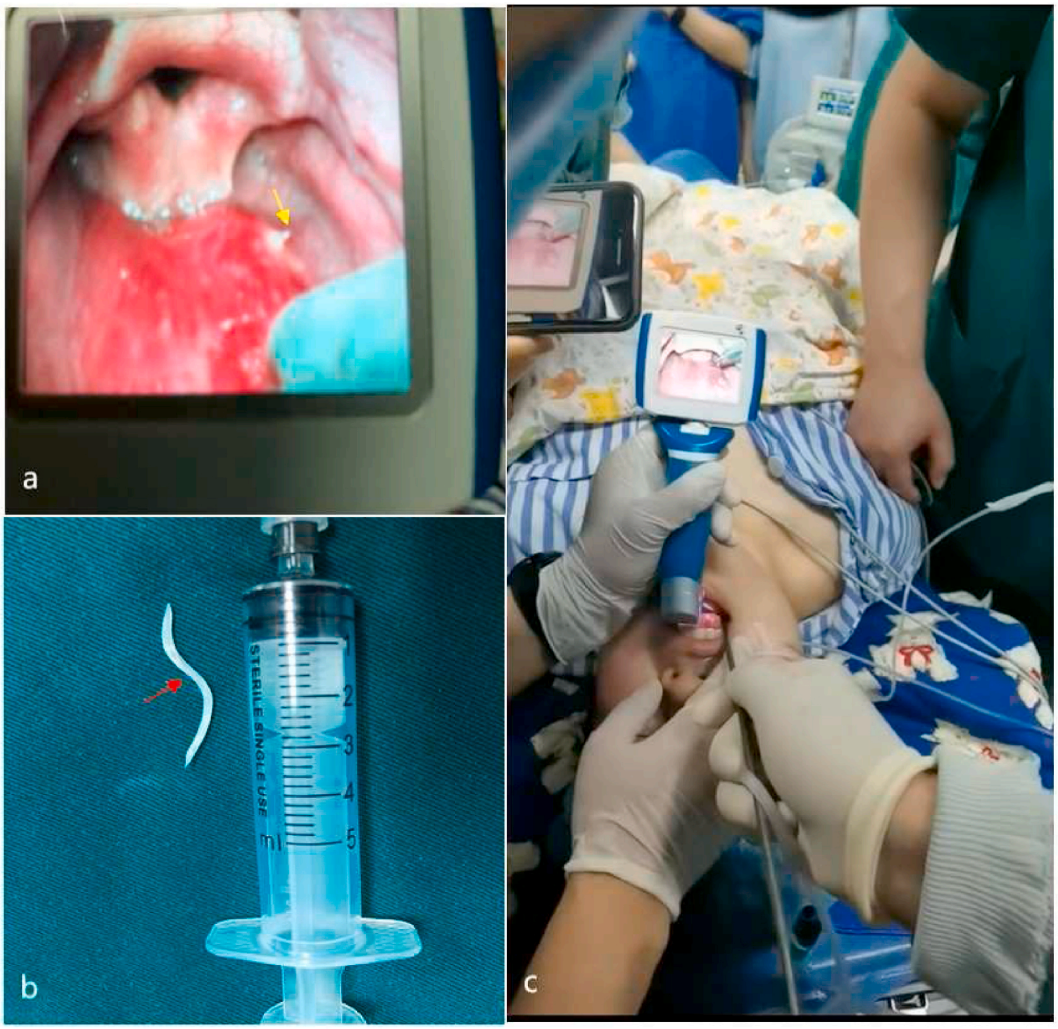

Fig. 4. a. The back end of the fish bone (yellow arrow); b. The fish bone (red arrow); c. Fish bone removal. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

Patient consent

We obtained the informed consent of the patient and she agreed to use the clinical data and image details in the manuscript for publication.

Data availability statement

Data included in article/supp. material/referenced in article.

Additional information

No additional information is available for this paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to

influence the work reported in this paper

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