Combination of gastroscopy and fibro-bronchoscopy facilitates removal of incarcerated fish bone in the esophagus: A case report

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Abstract. Esophageal foreign body impaction is a notable clinical emergency. If the high-risk esophageal foreign bodies are not removed in time, life-threatening complications, such as perforation, infection and injury to the vessels, may occur. In the present study, the case of a patient experiencing a foreign body sensation in the throat after ingesting a fish bone by mistake is presented. A high risk of impending arterial puncture was confirmed using thoracic CT and thoracic aorta CT angiography scanning. The ends of the fish bone were first confirmed using a fibro-bronchoscopy light source passing through the bronchial and esophageal walls, before biopsy forceps were used to successively free the thoracic aorta and bronchial ends under gastroscopy. Finally, the fish bone was safely removed using a combination of gastroscopy and the rarely used fibro-bronchoscopy, and the patient recovered well after standard care. In certain cases of foreign bodies, it is necessary to use multiple strategies in a timely manner according to the type and location of the ingested foreign body.

Introduction

Esophageal foreign body impaction is a common emergency of the digestive system, with >150,000 reports to American Poison Centers every year (1). The condition most frequently occurs at three physiological strictures (including the level of the cricopharyngeus muscle, the aortic arch/left mainstem bronchus and the esophageal hiatus of the diaphragm) (2) due to the ingestion of fish bones, toys and missing dentures by mistake. The main clinical manifestations are esophageal foreign body sensation, difficulty swallowing and pain behind the sternum (3). In severe cases, patients may experience perforation, obstruction, formation of an aorto-esophageal and/or tracheoesophageal fistula (4). The foreign body may also pierce large blood vessels and lead to mortality (5).

Vascular damage adjacent to the foreign object is one of the most serious complications reported. In 2019, Zhao *et al* (6) reported that a 53-year-old female patient succumbed to hemorrhagic shock due to a fish bone penetrating the left subclavian artery. In another case in 2021, a 40-year-old male patient experienced hemorrhagic shock, aortoesophageal fistula and thoracic aorta pseudoneurysm (7). It was caused by a fish bone that was 2.5-cm long near the sixth thoracic vertebra (7). Therefore, esophageal foreign body objects can present a danger to the lives of patients. It is important to find suitable methods for removing fish bones as soon as possible.

To the best of our knowledge, in the previous reports (8-10) on the removal of esophageal foreign bodies, fibro-bronchoscopy was not used in conjunction with gastroscopy, as it is mainly used in the airways. The aim of the present case was to document a case of a patient with a fish bone trapped in the esophagus, which lied adjacent to the thoracic aorta and was at high-risk of puncturing it. It was finally removed using the combination of gastroscopy and fibro-bronchoscopy.

Case report

A 22-year-old female patient was admitted to Chengdu First People's Hospital (Chengdu, China) in January 2023 due to a foreign body sensation in the throat 6 h after eating fish. Discomfort in the pharynx and sternum were the main symptoms, without other obvious symptoms. There were no significant findings from the physical examination. The patient did not receive any other treatments before being admitted to the hospital.

No significant abnormalities were revealed from the results of the laboratory tests, including routine blood, liver function, kidney function, electrolytes and coagulation tests (Table I). Thoracic CT and thoracic-aorta CT angiography scanning indicated a foreign body in the middle third of the esophagus. The length of esophageal foreign body was ~3.0 cm. The right end of the foreign body had pierced the esophageal wall and reached the tracheal carina, where the distance between the left end of the foreign body and the aortic wall was <0.1 cm (Fig. 1). Therefore, the patient was diagnosed with esophageal foreign body impaction.

Specifically, one end of the esophageal foreign body was close to the thoracic aorta and there was high risk of it puncturing the aorta. After multidisciplinary consultation, it was

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Table I. Main indicators from routine blood, liver function, renal function, electrolyte and coagulation laboratory tests.

Indicators	Results	Sign	Normal range
Red blood cell, $x10^{12}$/l	4.62	-	3.80-5.10
White blood cell, $x10^{9}$/l	8.88	-	3.50-9.50
Neutrophil, %	80.80	Up	50.00-70.00
Platelets, $x10^{9}$/l	189.00	-	100.00-300.00
High-sensitivity C-reactive protein, mg/l	0	-	0-10.00
Total bilirubin, μmol/l	10.30	-	1.70-28.00
Albumin, g/l	43.20	-	35.00-55.00
Alanine aminotransferase, U/l	10.00	-	0-50.00
Aspartate aminotransferase, U/l	19.00	-	0-50.00
Creatinine, μmol/l	52.00	-	45.00-84.00
Ca^{2+}, mmol/l	2.19	-	2.09-2.54
K^{+}, mmol/l	3.70	-	3.50-5.30
Na^{+}, mmol/l	134.00	Down	135.00-145.00
Prothrombin time, sec	10.40	-	9.00-14.00
Activated partial thromboplastin time, sec	27.90	-	20.00-40.00

-, within normal range.

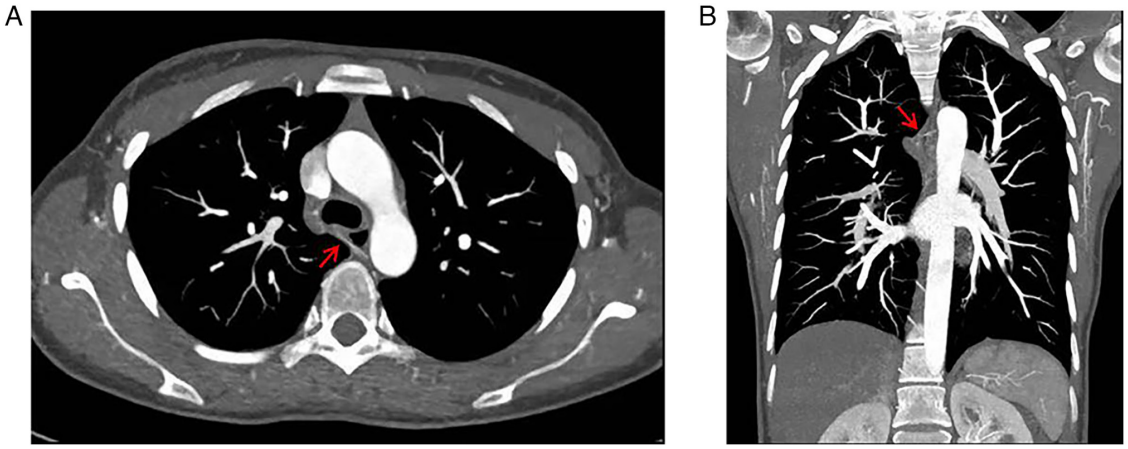

Figure 1. CT images. (A) Horizontal and (B) frontal images. A thin 'strip-shaped' high-density shadow, indicated by a red arrow, with a length of ~3.0 cm, was observed in the middle of the esophagus (~T5 vertebral body level) from the upper left rear to the lower right rear.

considered that the first step was to perform endoscopic foreign body removal; if this failed, thoracoscopy or thoracotomy would be required. To ensure the right of the patient to life and health, the patient and their family was informed regarding the treatment plan and the risks involved, before subsequently consent was obtained. After completing preoperative preparation, the surgery to remove the foreign body was performed under general anesthesia and gastroscopy. During the operation, a white strip of fish bone was revealed to be embedded on both sides of the esophageal wall ~25 cm from the incisor teeth under gastroscopy (Fig. 2A). One end of the fish bone had become fan-shaped with burrs, whilst the other end penetrated the esophageal wall in a complete strip shape.

To maximize the safety of the patient and verify the locations of the two ends of the fish bone under gastroscopy, fibro-bronchoscopy was performed during the operation. Under fibro-bronchoscopy, it was revealed that the fish bone had pierced the bronchus. In addition, when the light source of the gastroscope was turned off, the light source of the fiber-optic-bronchoscope could be observed through the bronchial and esophageal walls (Fig. 2B). Subsequently, the fiberoptic bronchoscope was removed and the light source of gastroscope was turned on. Due to limitations in available tools, the fish bone could not be cut in half. Biopsy forceps were used to clamp the left end of the fish bone under gastroscopy, repeatedly pulling it towards the right end to free the left end of the fish bone. During this process, the left end was fixed as much as possible to reduce movement and risk. Immediately, biopsy forceps were used to keep clamping the left free end of the fish bone, and successfully remove the right end of the fish bone outside the body.

It was observed that the mucosa of the left esophageal wall in contact with the foreign body was congested and eroded under the endoscope, but no exact fistula formation was observed. By contrast, the mucosa of the right esophageal

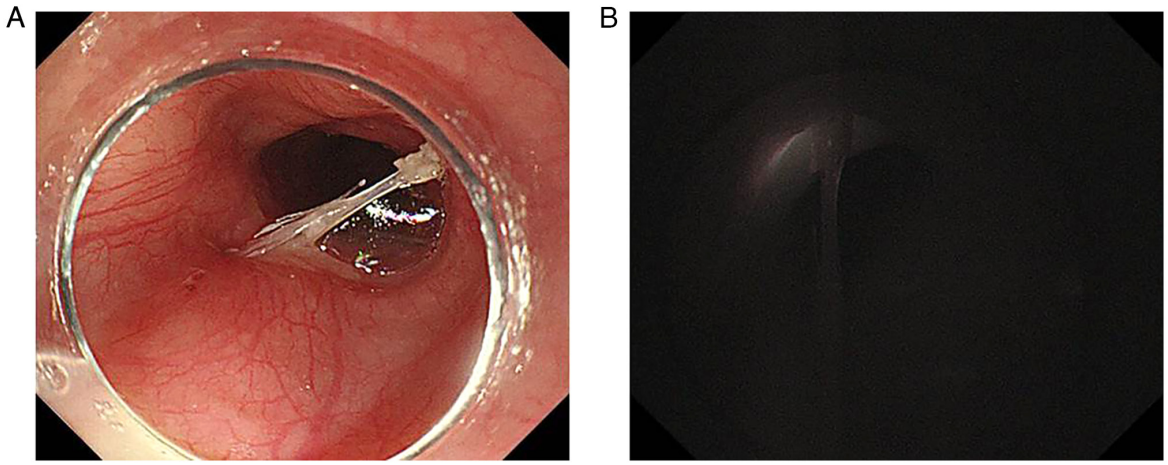

Figure 2. Fish bone observed under gastroscopy. (A) Visual angle under the gastroscope light source. (B) Gastroscopic angle assisted by the fiberoptic bronchoscope light source.

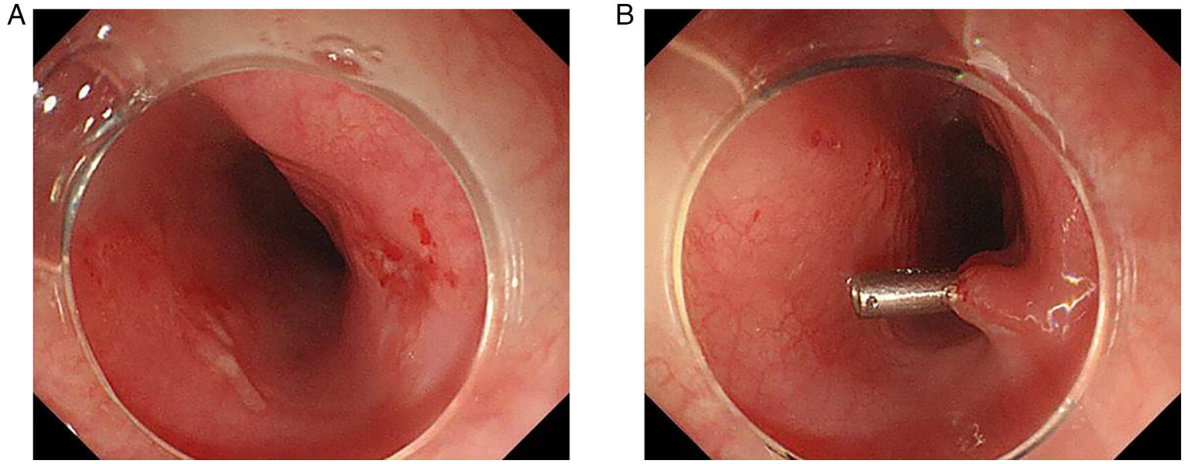

Figure 3. Gastroscopic view after fish bone removal. (A) Esophageal mucosa was damaged by the two ends of the fish bone. (B) Esophageal mucosa occluded by titanium clips.

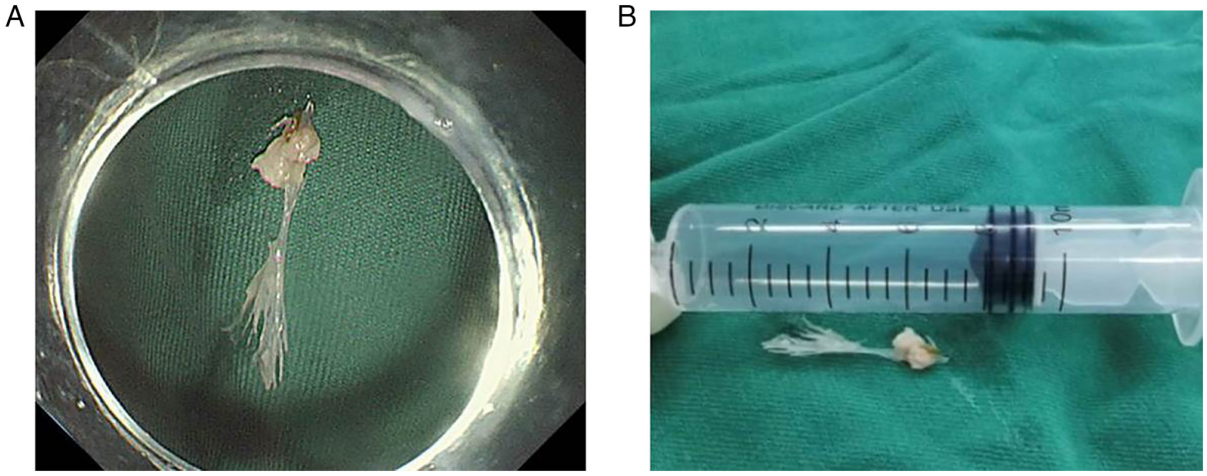

Figure 4. Fish bone once removed. (A) Intact fish bone. (B) Comparison of the fish bone with a 10-ml syringe.

wall in contact with the foreign body was more eroded and congested with edematous compared with that of the left wall, but no obvious fistula opening could be observed either (Fig. 3). Finally, the right wound was closed with a titanium clip. The ~2.7 cm foreign body was completely removed (Fig. 4) and the injury of thoracic aorta was avoided.

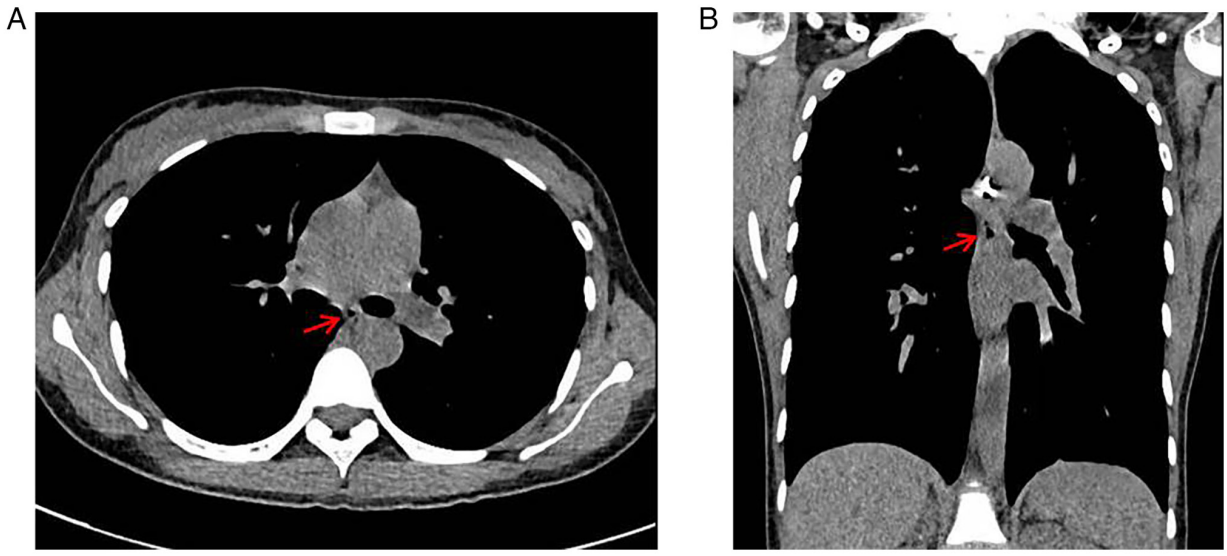

Figure 5. CT images after 5 days of fish bone removal. (A) Horizontal and (B) frontal images showing a 2.3x5.6-mm bubble shadow (arrows) in the posterior mediastinum.

Postoperative gastrointestinal decompression was performed, followed by prohibition of food and drink for 48 h. However, the patient received a 250-ml compound amino acid injection (18AA) via an intravenous drip twice a day, a 250-ml medium/long chain fat emulsion injection via an intravenous drip once a day, fluid infusion (400 ml 10% glucose injection, 100 ml 50% glucose injection and 15 ml 10% potassium chloride injection) via an intravenous drip once a day, acid-suppression (250 ml 5% glucose injection and Famotidine 20 mg) via an intravenous drip twice a day and anti-infection (Ceftazidime 1 g and 100 ml 0.9% sodium chloride) injection via an intravenous drip three times a day. Subsequently, the patient had a fluid diet without any signs of discomfort, such as difficulty swallowing, swallowing obstruction, chest pain or fever. After a total of 5 days of standard care, the thoracic CT showed that there was a 2.3x5.6-mm bubble shadow in the posterior mediastinum (Fig. 5). This was a normal postoperative phenomenon that is usually absorbed in a short period of time. The patient was discharged with no obvious discomfort. All of the treatments followed the standardized management procedures (Management of foreign bodies in the airway and oesophagus) for removing esophageal foreign bodies under endoscopy (11,12). Through four telephone follow-up surveys conducted at 1 week, 1 month, 3 months and 5 months after discharge, the condition of the patient was recorded as stable.

Discussion

Ingestion of foreign bodies by mistake is a common clinical issue worldwide. Children make up ~80% of patients, and the annual incidence for adults reaches 13.0 per 100,000 individuals (13). The majority of ingested foreign bodies will pass through the digestive system spontaneously (14). However, 10-20% cases of ingested foreign bodies do require endoscopy-assisted removal and 1% will require surgery for foreign body extraction or treatment of complications (15). In the majority of cases, endoscopy-assisted removal of foreign bodies is safe and has risk of minor complications when performed by an experienced endoscopist (14,16). However, there is a risk of fatality if foreign bodies are not removed in a prompt and correct manner. A previous study (17) reported the case of a 3-year-old child who had a prolonged presence of disc batteries in the esophagus, resulting in an aorto-esophageal fistula and subsequently fatal hemorrhage.

The European Society of Gastrointestinal Endoscopy clinical guidelines (14) recommend emergency endoscopy for sharp-pointed objects in the esophagus within 24 h. The previous study by Zhang *et al* (18) demonstrated that the incidence of complications, including ulcers, laceration, perforation and perforation with mediastinitis or mediastinal abscesses, were more frequent in the >24 h compared with that in the ≤24 h group. Effective treatment within 24 h resulted in less complications and shorter postoperative hospitalization stays (18). In the present case, the patient came to the hospital in a timely manner, 6 h after ingesting the fish bone. Even with the addition of preoperative preparation and operating time, the fish bone was successfully removed within a total of 12 h. This most likely aided the recovery of the patient.

The present case was a high-risk esophageal foreign body due to its proximity to the thoracic aorta. It is important to conduct a meticulous anamnesis, adequate imaging and urgent gastroscopy for patients with esophageal fish bone impaction before treatment (19). Due to several factors, such as changes in the position of the patient and endoscopic techniques, it was necessary to reposition the two ends of the fish bone. Since one end was inserted into the bronchus, it was not only a foreign body in the esophagus, but also seemed to be a part of the airway. The present case revealed that the light source of the fiberoptic bronchoscope could serve an auxiliary role. During the operation, the combination of fibro-bronchoscopy and gastroscopy was used to eliminate the possibility of misjudgment and reduce the severity of organ injury, where the foreign body was safely removed.

Endoscopic removal remains to be the gold standard of treatment and surgical removal is the last resort (11,12). Bae and Cho (20) previously reported the case of a 57-year-old male patient complaining of a sore throat, odynophagia pain and chest

pain behind the sternum after eating a fish. It was then revealed using a chest CT scan that a sharp fish bone was located between the aortic arch and the right subclavian artery. Considering the difficulties and dangers, thoracotomy was adopted to remove the esophageal foreign body. Despite its success, the majority of patients may not be as willing to experience such an invasive surgical procedure due to the advantages of endoscopy, which is minimally invasive, more economical and convenient (21,22). In the present case, the successful removal of the foreign object using endoscopy was performed, avoiding further trauma.

The present case reports a rare occasion of foreign body removal using upper gastrointestinal endoscopy and fibro-bronchoscopy. Without the assistance of fibro-bronchoscopy, it may have resulted in an incorrect direction of dissociation and endangered the patient's life. This suggested that fibro-bronchoscopy may exhibit a good auxiliary effect on the removal of esophageal foreign bodies in special cases. It may improve the success rate of one endoscopic procedure whilst avoiding further surgical procedures for patients. In such cases, they not only need to be diagnosed and treated in a timely manner, but it is also necessary to apply multiple strategies according to the type and location of the foreign body.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

YM and XX contributed to the conception of the study. YM and YT wrote the manuscript. YM, YT and XX analyzed and interpreted the imaging findings. YC, TP and HR obtained and analyzed the endoscopic images. TP and XX edited and reviewed the prepublication version of the manuscript. YM, YT and XX confirm the authenticity of all the raw data. All authors read and approved the final version of the manuscript.

Ethics approval and consent to participate

The Ethics Committee of Chengdu First People's Hospital exempted this case study from the ethical review approval due to the management mode of emergency procedures.

Patient consent for publication

Written informed consent for the publication of the patient's clinical information and images was obtained from the patient.

Competing interests

The authors declare that they have no competing interests.

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