

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Pulmonary artery penetration due to fish bone ingestion: A rare case report ☆☆☆

Ho Xuan Tuan, MD, PhD^a, Nguyen Duy Hung, MD, PhD^{b,c}, Nguyen Nhat Quang, MD^c,
 Nguyen-Thi Tam, MD^b, Nguyen-Thi Hai Anh, MD^d, Tran Hoa, MD, PhD^e,
 Bui The Dung, MD, PhD^f, Nguyen Minh Duc, MD^{g,*}

^aDepartment of Medical Imaging, Da Nang University of Medical Technology and Pharmacy, Danang, Vietnam

^bDepartment of Radiology, Hanoi Medical University, Hanoi, Vietnam

^cDepartment of Radiology, Viet Duc Hospital, Hanoi, Vietnam

^dDepartment of Radiology, Alexandra Lepève Hospital, Dunkirk, France

^eDepartment of Internal Medicine, Faculty of Medicine, University of Medicine and Pharmacy at Ho Chi Minh City, Ho Chi Minh City, Viet Nam

^fDepartment of Cardiology, University Medical Center HCMC, Ho Chi Minh City, Vietnam

^gDepartment of Radiology, Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam

ARTICLE INFO

Article history:

Received 8 January 2024

Revised 1 February 2024

Accepted 3 February 2024

Keyword:

Fishbone

Pulmonary artery penetration

Esophageal foreign body

Lung infection

Hemoptysis

Case report

ABSTRACT

Accidental fish bone ingestion is a common manifestation at emergency departments. In most cases, ingested foreign bodies usually pass uneventfully through the gastrointestinal tract and complications only present in less than 5% of all patients. In this report, we present the first documented case of pulmonary artery injury due to a fish bone in a 63-year-old male patient hospitalized with hemoptysis after accidentally swallowing a fish bone 30 days ago. This patient subsequently had surgery and endoscopy to safely remove the foreign body and then recovered well on a follow-up examination. For cases of fish bone ingestion, contrast-enhanced chest computed tomography is one of the most essential tools to assess vascular problems and associated mediastinal infections-risk factors for life-threatening and long-term recurrent inflammation. Reconstructing planes along the foreign body axis and changing windows when analyzing CT scans is necessary to avoid missing lesions and dilemmas.

© 2024 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

☆ Acknowledgments: None to declare.

☆☆ Competing Interests: 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.

* Corresponding author.

E-mail address: bsnguyenminhduduc@pnt.edu.vn (N.M. Duc).

<https://doi.org/10.1016/j.radcr.2024.02.003>

1930-0433/© 2024 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Background

Unintentionally fishbone swallowing is not an uncommon situation which accounts for about 84% of foreign body cases [1]. However, the rate of complications due to this entity just represents only about 1%-4%, encompassing esophageal perforation, mediastinal or neck abscess, and vascular or lung injuries [2,3]. Nonmetallic foreign bodies like fish bones are rarely detected on radiographs. Hence, CT may be helpful in accurately diagnosing preoperative complications [4]. We report a rare case of a normal mental status man with esophageal and pulmonary artery perforation due to fishbone swallowing. This patient subsequently had surgery and endoscopy to safely remove the foreign body.

Case presentation

A 63-year-old man without any underlying medical conditions was presented to the emergency department because of hemoptysis. About 30 days before, the patient accidentally swallowed a fishbone but did not go to the hospital at that time. He complained of multiple intermittent episodes of blood-streaked sputum for a month. This symptom worsened several days before hospitalization with 3 times episodes of coughing up over 150 mL of blood. At the time of admission, he was noted to be breathing normally on his own. Vital signs revealed a temperature of 38.50 C, blood pressure of 140/80 mmHg, heart rate of 100 beats/min. The complete blood count

showed red blood cells: 2.76 T/L, hemoglobin: 89 g/L, hematocrit: 0.251. Other laboratory results were normal. Contrast-enhanced thoracic, esophagoscopy, and bronchoscopy were performed.

Chest radiography revealed no abnormal findings, including supposedly fishbone in the esophagus (Fig. 1A). Echocardiographic showed a mild pericardial fluid, and the pulmonary arterial pressure was systemic. The CT of the chest revealed a foreign body in the thoracic esophagus at level T7, measured 40 mm in length and 2 mm thick, partly located in the lumen of the thoracic esophagus close to the level of the right pulmonary artery. This structure was determined to penetrate through the anterior margin of the esophagus to the inferior-posterior wall of the right pulmonary artery (Fig. 2). No active extravasation of intravenous contrast was seen on the post-contrast images. In addition, there is a unilateral paraseptal emphysema, cystic bronchiectasis of the right upper lobe, focal consolidation in the subpleural area of the right lower lobe, and mild fluid in the bronchus lingual segment of the left lobe (Fig. 3).

Bronchoscopy detected a small ulcer on the posterior wall of the left mainstem bronchus, and old blood clots in the lingual and inferior segment of the left bronchus. The esophagoscopy showed a foreign body that punctured up to the muscle layer, the interval from this position to the upper incisor was 28 cm (Fig. 4A, B).

The patient was diagnosed with a pulmonary artery perforation due to a fishbone injury. An emergent combined surgical and intraoperative endoscopic was indicated because high-risk intractable bleeding on endoscopy would require emergent cardiovascular surgery. After opening the peri-

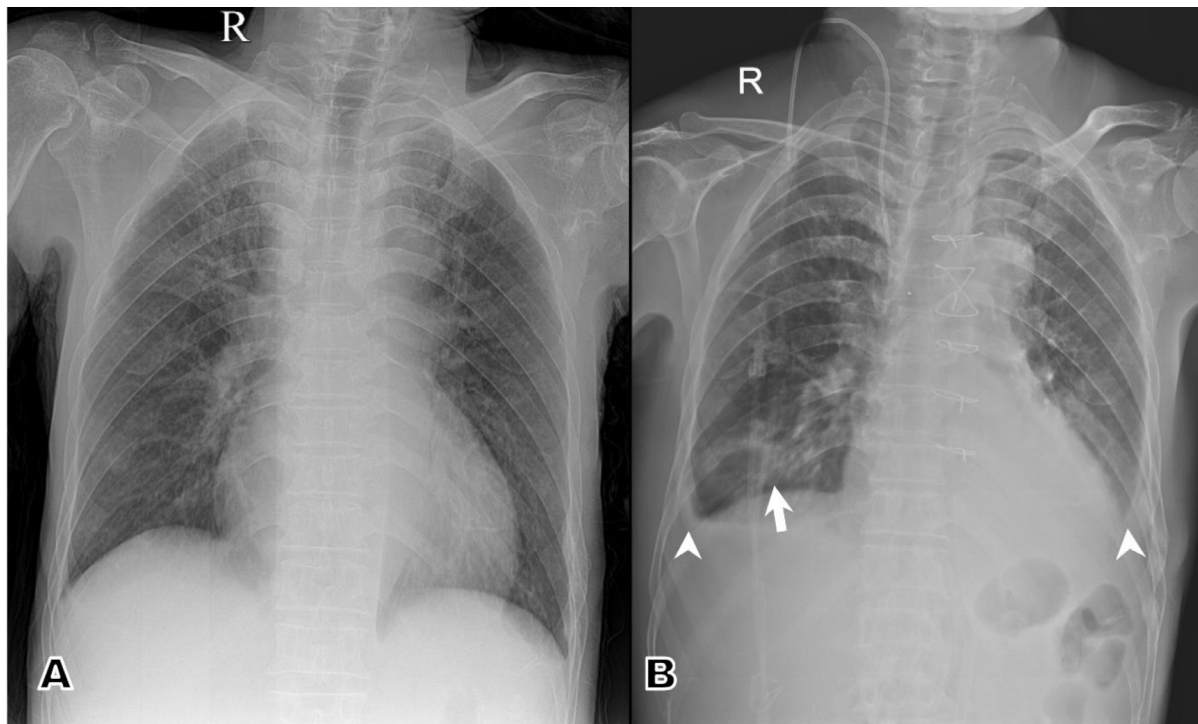


Fig. 1 – Chest X-ray image: (A) On admission: chest X-ray revealed no abnormal findings, including supposedly fish bone in the esophagus. (B) Fifth postoperative day: chest X-ray show bilateral pleural effusion (white arrowhead), and focal consolidation with air bronchograms in the right lower lobe (white arrow).

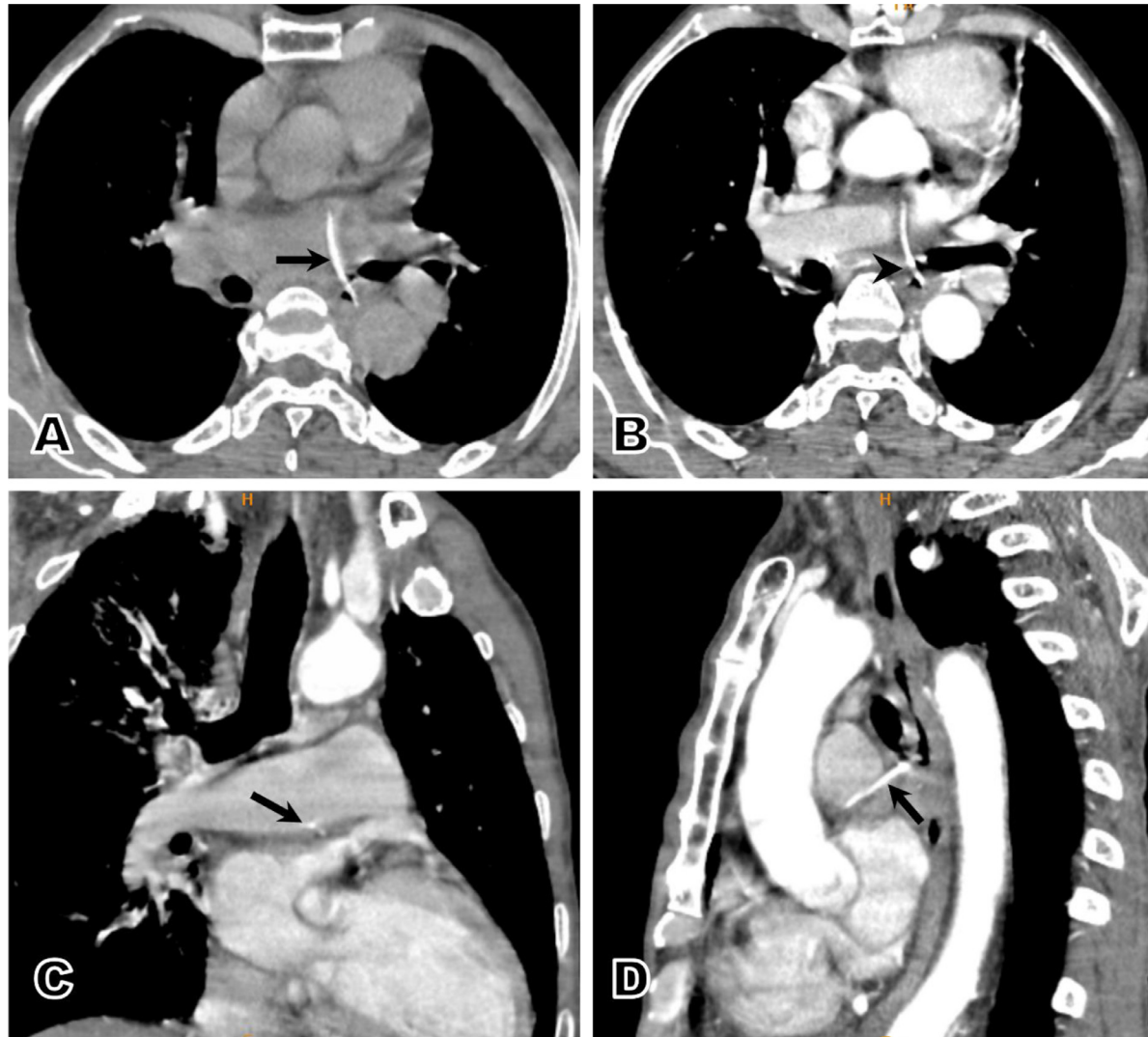


Fig. 2 – Contrast-enhanced computed tomography chest. The non-enhanced axial view (A) and the contrast-enhanced axial view (B), coronal view (C), and sagittal view (D): (A) the CT chest revealed a foreign body (black arrow) presented in the middle esophagus, penetrated the esophageal wall into the surrounding mediastinal structures. (B-C-D) This structure penetrated from the anterior margin of the middle intrathoracic esophagus (black arrowhead) into the right pulmonary artery (black arrow).

cardium, the surgeon detected a long sharp fishbone that penetrated the anterior esophageal wall and pierced the right pulmonary artery. The foreign body was successfully removed endoscopically without massive bleeding (Fig. 4C). The injured pulmonary artery and the perforated esophagus were repaired with sutures. Five days later, the bedside chest radiography showed bilateral pleural effusion and focal consolidation with air bronchograms in the right lower lobe (Fig. 1B). The patient was discharged well 10 days postoperatively.

Discussion

The esophageal foreign body is a relatively typical emergency condition that is often caused by the ingestion of fishbone. The entity is popular in Asian countries due to the routine

of using unfileted fish [5–7]. This habit can be hazardous in children especially ranges from 6 months to 6 years old. In adults, cases of real foreign bodies (not food) are often found in patients with psychological disorders, mental disorders, alcoholism, and prisoners in detention. According to research by Ruan and colleagues, among a total of 427 cases, up to 46.3% were caused by fishbone, 26% were caused by poultry bones, and 4.9% were caused by pork bones [2]. Types of foreign bodies often differ among countries based on eating habits, culinary culture, and socio-cultural characteristics [8,9]. The mean duration of impaction is 27 hours but some cases come to the hospital on the 4th–10th day [2,10]. In our case, the patient was hospitalized for treatment after 30 days. The delay of hospitalization can be explained by the patient often first trying to remove the foreign bodies by swallowing rice or vinegar or being tolerant of the foreign body, those are all leading to more severe and worsening damage.

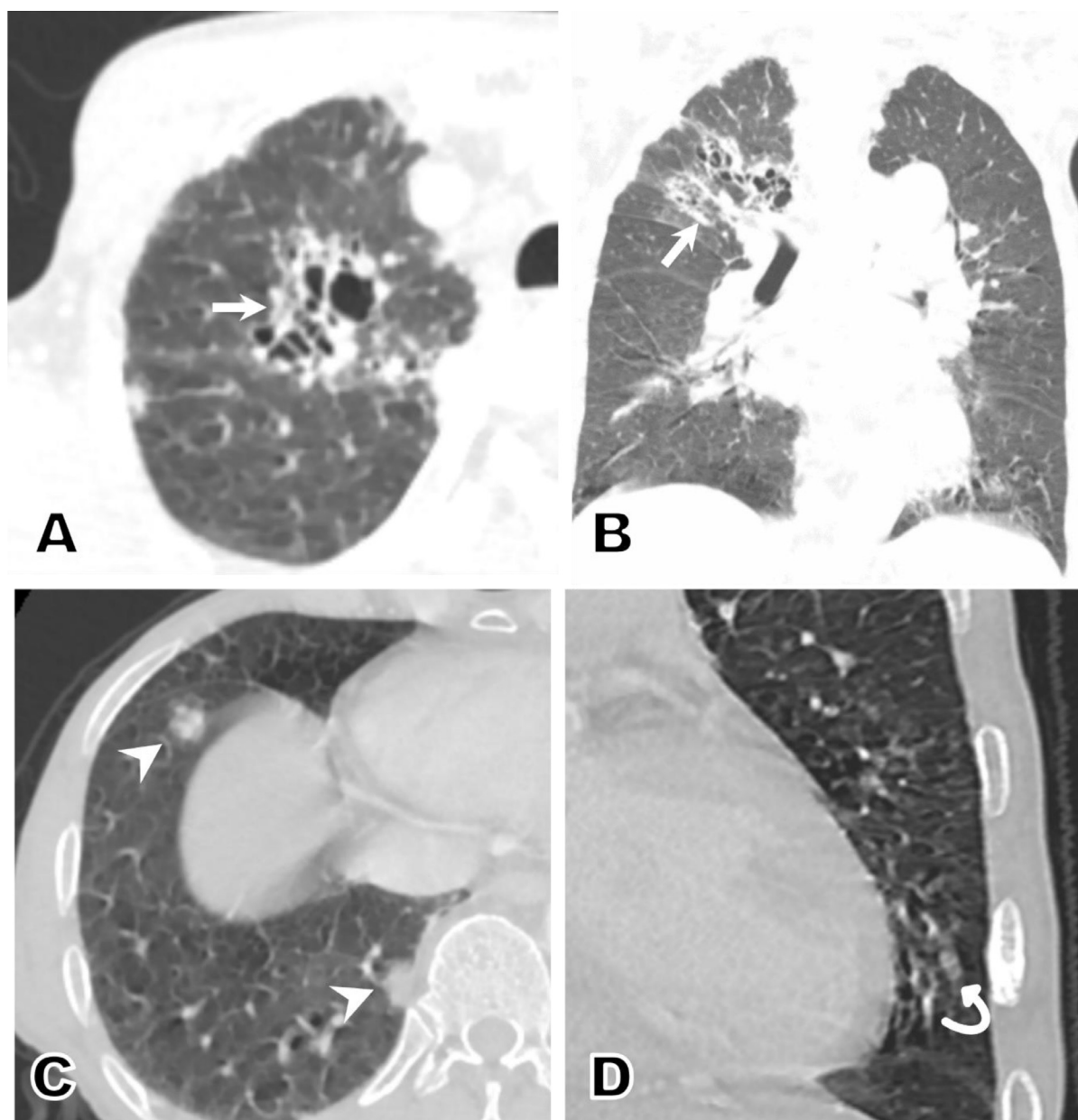


Fig. 3 – Contrast-enhanced computed tomography chest (lung window): (A, C) axial view, (B, D) coronal view: (A, B) The chest CT scan revealed unilateral para-septal emphysema and cystic bronchiectasis of the right upper lobe (white arrow) (C) Focal consolidation in the subpleural area of the right lower lobe (white arrowhead) (D) Mild fluid in the bronchus lingual segment of the left lobe (curved arrow).

Having said that foreign bodies will pass through the gastrointestinal tract uneventfully in 80% of cases, 10%-20% of cases need intervention to remove [11]. Fragmented diamond-shaped foreign bodies have the highest risk of perforation, such as bones, needles, etc. [2,3]. Esophageal perforation rarely occurs, estimated to account for 1%-4%. Typical complications include mediastinitis, vascular injuries such as pseudoaneurysm, aorto-esophageal tracheo-esophageal fistula, pneumomediastinum, pneumothorax, pericarditis, and some other one [12,13]. In rare cases, fish bones may migrate to the cervical cavities and adjacent thyroid structures [10]. Several locations of vascular injury due to fish

bones have been reported including the aorta, subclavian artery, common carotid artery, and superior vena cava [5,14–16]. The presentation of the foreign body inside vessels is believed to relate to 2 main mechanisms: the foreign body directly penetrates the vessel wall and the inflammatory process causes erosion of the adjacent vessel wall. Pulmonary artery injury resulting from foreign body ingestion routinely followed vascular intervention. There was only 1 case of a patient who swallowed a needle tip foreign object [17]. In our search of the literature, this is the first case of fishbone causing pulmonary artery injury.

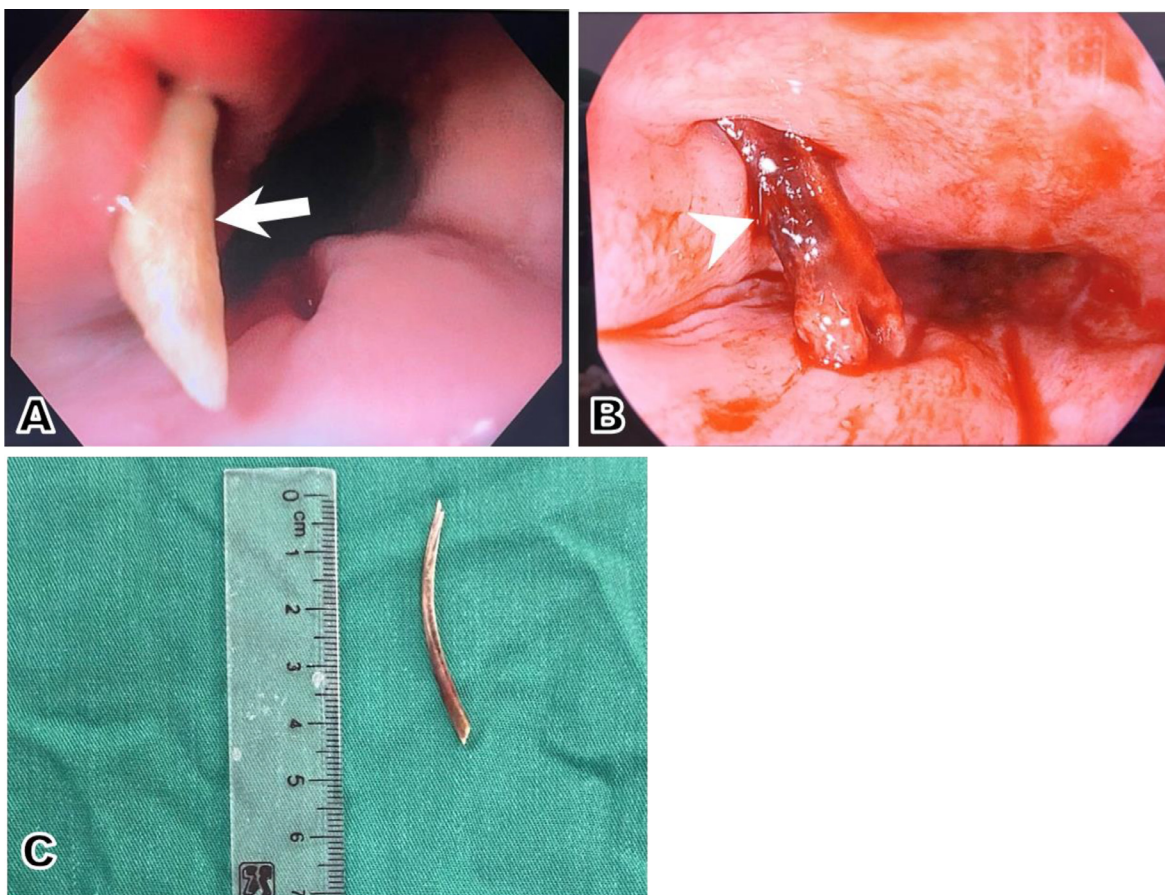


Fig. 4 – Esophageal endoscopic images (A, B) and postoperative image (C): (A-B) A typical picture of gastroscopy demonstrates the fishbone (white arrow) piercing into the esophagus wall with mild blood around the fishbone (white arrowhead). (C) Fishbone after removal with 42 mm in length.

Fishbone is not a metallic material, so it can rarely be detected on chest X-ray. Some studies reported that chest X-ray has a low sensitivity (about 32%) and a high false-positive rate (47%) [4,18]. On the contrary, CT has high sensitivity and specificity with rates of 90%-100% and 93.7%-100% [19]. It is important to note many hyperdense structures can be confused with foreign bodies: calcification of the tonsils, hyoid bone, calcification of the cricoid cartilage, and motion artifact. In addition, there are some artifacts due to high contrast agent concentration, barite, and slice thickness [19,20]. Oral contrast media is not necessary because it can cause difficulty in identifying the foreign body. To avoid a diagnostic dilemma, slice thickness should be 1.5 mm or less to facilitate multiplane reconstruction [20]. In our case, the Coronal and Sagittal Oblique reconstruction image (Fig. 2C and D) showed that the foreign body is located in the right pulmonary artery, inside the vessel lumen, which could easily be missed if only observed on the Axial image. And changing the window also helps us to reduce foreign body artifacts. From there, we can evaluate the foreign body's characteristics: shape, size, location, and direction. Inject intravenous contrast to evaluate the enhancement of the esophageal wall, vascular structures (pseudoaneurysm, aortotracheal fistula), and abscesses in the mediastinum. In addition, CT can detect and evaluate associated

diseases such as pneumonia, bronchiectasis, alveoli, lung tumors, mediastinal tumors, and esophageal tumors. Furthermore, it is necessary to combine other diagnostic methods for comprehensive assessment and detection of associated lesions. In our case, the patient had to be hospitalized because of symptoms of hemoptysis, caused by a small bleeding ulcer in the left main bronchus wall discovered through bronchoscopy.

According to the American Society for Gastrointestinal Endoscopy, fish bone foreign body is an emergency that needs to be removed within 24 hours [11]. Thoracotomy is performed in cases of esophageal perforation or complications that cannot be performed on endoscopy or endoscopy failure. Thoracotomy is performed in cases of esophageal perforation or complications that cannot be performed on endoscopy or endoscopy failure. In our case, there was the coordination of 2 teams: cardiothoracic surgery to control pulmonary artery injury and gastrointestinal endoscopy to perform endoscopic foreign body removal. In some cases, foreign bodies move to the stomach or gastrointestinal tract and should be monitored.

When a foreign body penetrates the wall of the pulmonary artery, bacteria circulate through the bloodstream, creating foci of infection in the lung parenchyma [12]. Like this patient,

the patient's preoperative CT scan showed several small air space opacifications in the lower lobe of the right lung (Fig. 3C), possibly inflammatory lesions caused by the foreign body. After surgery, the infection worsened and a larger consolidation in the right lower lobe could be seen on X-ray (Fig. 1B), which was different from the X-ray at the time of admission (Fig. 1A). Therefore, in cases with complications of vascular injury, there was a higher risk of infection than the other groups.

Conclusion

Fishbone foreign body is a common emergency condition, especially in Asian countries. It is necessary to carefully assess the clinical history to navigate the diagnosis. Our clinical case is one of the rare cases in which a fish bone foreign body penetrated the esophagus and penetrated the pulmonary artery wall and the patient was hospitalized late after 30 days with the main symptom of hemoptysis. Along with esophagoscopy, CT plays an important role in identifying foreign bodies. Intravenous contrast chest computed tomography is necessary to assess serious vascular complications and mediastinal infections in combination to plan appropriate and timely treatment. Vascular injuries caused by foreign bodies not only put the victim under a series of life-threatening conditions but also at a high risk of long-term recurrent inflammation. Reconstructing planes along the foreign body axis and changing windows when analyzing CT scans is necessary to avoid missing lesions and complications.

Patient consent

Informed consent for patient information to be published in this article was obtained.

Author's contributions

Ho XT and Nguyen MD: Case file retrieval and case summary preparation. Ho XT and Nguyen MD: preparation of manuscript and editing. All authors read and approved the final manuscript.

Availability of data and materials

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

Ethics approval and consent to participate

Our institution does not require ethical approval for reporting individual cases or case series. Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

REFERENCES

- [1] Shivakumar AM, Naik AS, Prashanth KB, Hongal GF, Chaturvedy G. Foreign bodies in upper digestive tract. *Indian J Otolaryngol Head Neck Surg* 2006;58(1):63–8. doi:10.1007/BF02907744.
- [2] Ruan WS, Li YN, Feng MX, Lu YQ. Retrospective observational analysis of esophageal foreign bodies: a novel characterization based on shape. *Sci Rep* 2020;10(1):4273. doi:10.1038/s41598-020-61207-8.
- [3] Scher RL, Tegtmeyer CJ, McLean WC. Vascular injury following foreign body perforation of the esophagus. Review of the literature and report of a case. *Ann Otol Rhinol Laryngol* 1990;99(9 Pt 1):698–702. doi:10.1177/000348949009900906.
- [4] Ngan JH, Fok PJ, Lai EC, Branicki FJ, Wong J. A prospective study on fish bone ingestion. Experience of 358 patients. *Ann Surg* 1990;211(4):459–62. doi:10.1097/0000658-199004000-00012.
- [5] Mathew RP, Jayaram V, Toms A, Joshi M. Fish bone induced bronchial artery pseudoaneurysm in a patient with underlying bronchiectasis—a case report. *Egyptian J Radiol Nucl Med* 2020;51(1):128. doi:10.1186/s43055-020-00253-8.
- [6] Dagan E, Yakirevich A, Migirov L, Wolf M. The role of economics and weekend meals in impacted fish bone occurrence in central Israel. *Isr Med Assoc J* 2011;13(1):48–50.
- [7] Arulanandam S, De SD, Kanagalingam J. A prospective study of epidemiological risk factors for ingestion of fish bones in Singapore. *Singapore Med J* 2015;56(6):329–33. doi:10.11622/smedj.2015091.
- [8] Eroglu A, Can Kürkçüoğlu I, Karaoganoğlu N, Tekinbaş C, Yılmaz O, Başoğlu M. Esophageal perforation: the importance of early diagnosis and primary repair. *Dis Esophagus* 2004;17(1):91–4. doi:10.1111/j.1442-2050.2004.00382.x.
- [9] Zhang X, Jiang Y, Fu T, Zhang X, Li N, Tu C. Esophageal foreign bodies in adults with different durations of time from ingestion to effective treatment. *J Int Med Res* 2017;45(4):1386–93. doi:10.1177/0300060517706827.
- [10] Johari HH, Khaw BL, Yusof Z, Mohamad I. Migrating fish bone piercing the common carotid artery, thyroid gland and causing deep neck abscess. *World J Clin Cases* 2016;4(11):375–9. doi:10.12998/wjcc.v4.i11.375.
- [11] Ikenberry SO, Jue TL, Anderson MA, Appalaneni V, Banerjee S, Ben-Menachem T, et al., ASGE Standards of Practice Committee Management of ingested foreign bodies and food impactions. *Gastrointest Endosc* 2011;73(6):1085–91. doi:10.1016/j.gie.2010.11.010.
- [12] Zuluaga CP, Aluja Jaramillo F, Velásquez Castaño SA, Rivera Bernal AL, Granada JC, Carrillo Bayona JA. Aortic pseudoaneurysm secondary to mediastinitis due to esophageal perforation. *Case Rep Radiol* 2016;2016:7982641. doi:10.1155/2016/7982641.
- [13] Jiang D, Lu Y, Zhang Y, Hu Z, Cheng H. Aortic penetration due to a fish bone: a case report. *J Cardiothorac Surg* 2020;15(1):292. doi:10.1186/s13019-020-01325-6.
- [14] Zhao S, Tinzin L, Deng W, Tong F, Shi Q, Zhou Y. Sudden unexpected death due to left subclavian artery-esophageal

- fistula caused by fish bone. *J Forensic Sci* 2019;64(6):1926–8. doi:[10.1111/1556-4029.14092](https://doi.org/10.1111/1556-4029.14092).
- [15] Lu Y, Zhang H, Xia J, Xu H, Wang J, He J. Removal of a fish bone endangering the common carotid artery under general anesthesia with video laryngoscope: a case report. *Heliyon* 2023;9(6):e17198. doi:[10.1016/j.heliyon.2023.e17198](https://doi.org/10.1016/j.heliyon.2023.e17198).
- [16] Wang QQ, Hu Y, Zhu LF, Zhu WJ, Shen P. Fish bone-induced myocardial injury leading to a misdiagnosis of acute myocardial infarction: a case report. *World J Clin Cases* 2019;7(20):3335–40. doi:[10.12998/wjcc.v7.i20.3335](https://doi.org/10.12998/wjcc.v7.i20.3335).
- [17] Dai X, Wu S. Inadvertently swallowed needle pierced the pulmonary artery in an adult. *Ann Thorac Cardiovasc Surg* 2023;29(1):40–3. doi:[10.5761/atcs.cr.21-00161](https://doi.org/10.5761/atcs.cr.21-00161).
- [18] Klein A, Ovnat-Tamir S, Marom T, Gluck O, Rabinovics N, Shemesh S. fish bone foreign body: the role of imaging. *Int Arch Otorhinolaryngol* 2019;23(1):110–15. doi:[10.1055/s-0038-1673631](https://doi.org/10.1055/s-0038-1673631).
- [19] Liew CJY, Poh ACC, Tan TY. Finding nemo: imaging findings, pitfalls, and complications of ingested fish bones in the alimentary canal. *Emerg Radiol* 2013;20(4):311–22. doi:[10.1007/s10140-012-1101-9](https://doi.org/10.1007/s10140-012-1101-9).
- [20] Goh BK, Tan YM, Lin SE, Chow PK, Cheah FK, Ooi LL, et al. CT in the preoperative diagnosis of fish bone perforation of the gastrointestinal tract. *AJR Am J Roentgenol* 2006;187(3):710–14. doi:[10.2214/AJR.05.0178](https://doi.org/10.2214/AJR.05.0178).