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CASE REPORT

Pneumonia, Multiple Pulmonary Infarction and Abscess Caused by a Bamboo Stick Accidentally Piercing into Chest: a Case Misdiagnosed as Pulmonary Tuberculosis

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Key words: foreign body; pneumonia; pulmonary abscess; pulmonary tuberculosis; misdiagnosis

Abstract Computed tomography (CT) examination is the major measure for detecting and diagnosis of foreign bodies in human body. Although CT has high sensitivity in diagnosis of foreign body, some interference factors may still lead to missed diagnosis or misdiagnosis. Here we report a rare case that a bamboo stick accidentally pierced into the left chest of a young man who was drunk and unware of this hurt. The patient experienced cough, chest pain, fever, hemoptysis, and was misdiagnosed as primary and secondary tuberculosis based on chest CT examinations at a local hospital, although no tubercular bacillus detected by sputum smear. He subsequently received anti-tuberculous treatments in the following three years, but no improvement of his symptoms was observed. Until one month before his death, the bamboo stick was detected by spiral CT examination as well as three-dimensional image reconstruction at another hospital. Postmortem examination revealed pneumonia, pulmonary infarction, and abscess as the causes of his death. We analyze the potential reasons of misdiagnosis in this case, aiming to provide reference for the diagnosis and treatment of pulmonary inflammation associated with foreign body in the future.

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PNEUMONIA is one of lethal respiratory diseases, and it usually includes primary and secondary etiologies. Foreign bodies which lead to pneumonia are often aspirated into bronchi by accident. If foreign bodies are detected and removed in time, secondary infection could be prevented or better controlled. The shape, texture, and location of foreign bodies may affect the timeliness and accuracy of diagnosis.[1, 2] In this case, a bamboo stick pierced into lung accidentally and caused a serious lethal pneumonia, pulmonary infarction, and abscess, but was misdiagnosed and treated as primary and secondary tuberculosis for three years.

CASE DESCRIPTION

Case history

In June 2015, during several people fighting each other after excessive alcohol drinking at midnight, a bamboo stick for grill was stabbed into the back of a 21-year-old young man by accident. The victim did not recognize this hurt and never told others, even when he went to see doctors for cough, chest pain, fever, hemoptysis afterwards. The victim was hospitalized for several times in a local hospital. CT examinations were performed, and the victim was diagnosed as primary tuberculosis and secondary tuberculosis of lungs, although no tubercular bacillus detected by sputum smear examination then. Subsequently, he took antituberculosis therapy for about three years. During this period, he went to see doctors at another two hospitals. In June 2018, advanced spiral CT scan and three-dimensional image reconstruction at a provincial hospital revealed a straight, string-like shadow in his left chest (**Figure 1**). In addition, plenty citrate bacillus were detected by bacterial culture of blood, indicating the diagnosis of foreign body of bamboo stick instead of pulmonary tuberculosis. Although the patient suffered from repeated pneumonia and progressive heart failure, he concerned about the expenses of hospitalization and declined to take further treatments. He died at home one month later after being unable to eat for days.

Postmortem examination

As the death of the victim was suspected for intentional injury, and the time period from injury to death was long, during which medical interventions were involved, systematic autopsy was carried out to establish the causes of death.

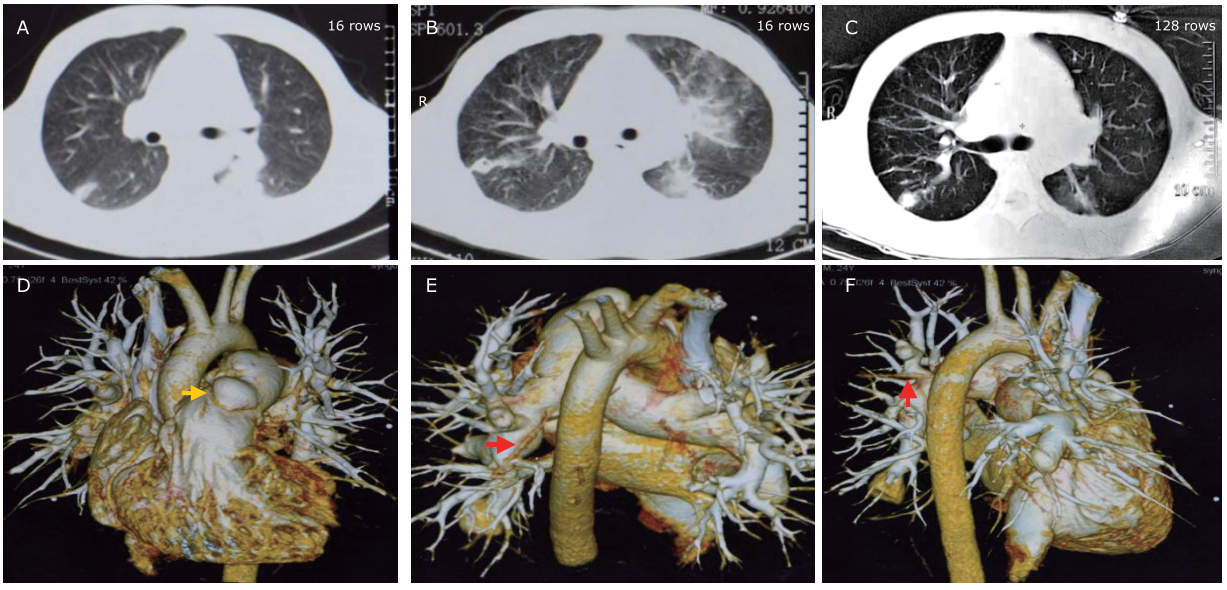


Figure 1. Imaging findings of series chest CT examinations of a young man with a bamboo stick in the left chest
(A) CT image at a local hospital 14 months after the hurt, and primary complex of lung was diagnosed. (B) CT image at the second hospital 35 months after the hurt shows a straight string-like shadow which was suspected for foreign body in chest. (C-F) CT images and 3D reconstructed images at a provincial hospital 3 days after the second CT examination. The yellow arrow indicates a pulmonary artery aneurysm caused by the tip of bamboo stick piercing into the pulmonary artery intima. The red arrows indicate the bamboo stick.

The body looked very thin and in malnutrition. There was no obvious scar on the skin of left back where the bamboo stick was pierced. Partial fibrous adhesion with a scope of 7.0 cm × 6.0 cm was found between left lung and chest wall beside spine, and there was a circle inward concave in center of adhesion area of the lung surface. In transections of left lung, a broken bamboo stick, with a diameter of 0.3 cm, was observed. The stick was inserted from the superior segment of left inferior lobe S6 (near interlobular fissure) and passed through the apical-posterior segment left superior lobe S1-2(**Figure 2A**). The stick then pierced through the wall of left pulmonary artery and entered pulmonary artery cavity. The stick tip arrived at 1.5 cm away from pulmonary artery valve, where endarterium was ruptured in a scope of 1.5 cm × 1.0 cm, with 0.7 cm diameter arterial wall bulging outward. The total length of the broken bamboo stick in chest was 10.3 cm, of which 4.8 cm in left lung and left pulmonary artery wall, and 5.5 cm in pulmonary artery lumen. Consolidation of lungs was observed bilaterally. There were multiple different sized abscess cavities in the apex and the posterior segments of bilateral lungs, of which the largest diameter was 1.5 cm. The abscesses were completely fibrous enveloped, with yellow necrotic pus inside (**Figure 2B**). The lymph nodes at bilateral hilus pulmonis enlarged remarkably. Multiple cauliflower-like neoplasms in different sizes were observed on the surface of pulmonary artery valves, valve edge and pulmonary artery intima. The right ventricle was obviously dilated. The thickness of right ventricular muscle was 0.5 cm, and the thickness of ventricular septum was 1.2 cm.

Histopathological findings: pulmonary abscesses with fibrous envelope scattered. Some sporadic pulmonary infarction focuses were accompanied with thrombosis in branches of pulmonary artery. Some infarction focuses were coagulation necrosis (**Figure 2C**). Pneumonia was recognized primarily based on extensive fiber and inflammatory cell infiltration in pulmonary alveoli. Pulmonary interstitial fibrosis and congestion were observed widely in both lungs. Thrombi accompanied with colonies and pus were observed on the surface of pulmonary artery and pulmonary valve. The pleura were thickened with infiltration of a large number of inflammatory cells.

Analysis of cause of death

Based on the findings of postmortem examination, we suspect that the thrombosis on pulmonary valve, thrombi in pulmonary artery branches, pulmonary infarction, and abscesses could be the consequences of the bamboo stick, a foreign body, piercing into the pulmonary artery repeatedly. The formation of vegetation-like neoplasm (thrombus, pus and infection) on pulmonary valve led to incomplete closure of pulmonary artery valves, which could result in increased post load of right ventricle, right heart expansion, and even right heart failure. The chronic right heart failure might lead to gastrointestinal congestion, apositia, and malnutrition. In conclusion, the victim died of multiple organ dysfunctions caused by pulmonary thrombosis, infarction, infection, right heart failure, and malnutrition.

DISCUSSION

Although the bamboo stick in the current reported

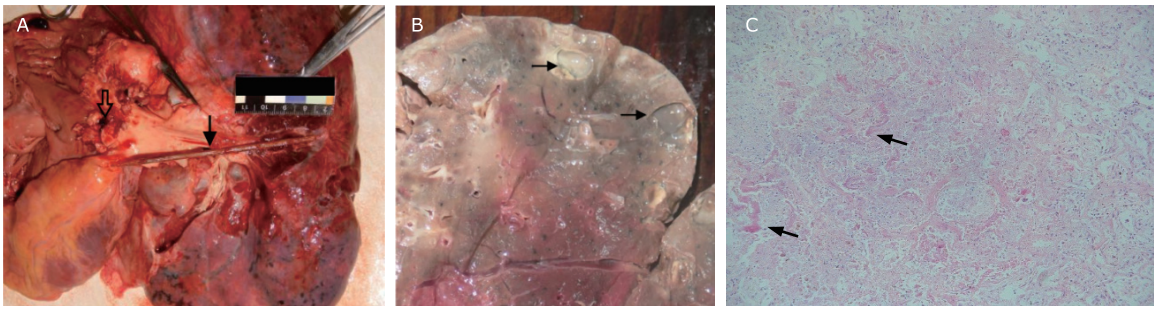


Figure 2. Gross anatomic and histopathological photographs of a 24-year-old man with a bamboo stick perciing into left chest (A) Pulmonary artery and right ventricle. Broken bamboo stick (solid arrow) and cauliflower-like neoplasms (hollow arrow) on the surface of pulmonary valves. (B) Pulmonary abscesses (solid arrows) scattered in pulmonary tissues of bilateral superior lobes. (C) Pulmonary infarction. Coagulation necrosis of pulmonary tissues (solid arrow), and the necrosis of fiber and inflammatory cell were extensively seen in pulmonary alveoli (HE staining, ×100).

case inserted into left chest of the victim did not directly have lethal impact on pulmonary function, ultimately the death was caused by secondary diseases, of which the pathophysiological progresses might lie in the following aspects.

First, pneumonic pathogens could colonize in the wound track or hide in the bamboo stick, and evade the functions of immune and antibiotics killing, causing repetitive bacterial infections. Second, the bamboo stick led to incomplete closure of pulmonary artery valves, resulting in right ventricular heart failure and malnutrition. Besides, the victim's pneumonia was mainly caused by citrobacter, a opportunistic pathogen, of which the infection often happened in malnutritional patients. Third, the long-term use of antibiotics led to drug resistance and dysbacteriosis, which could be also a cause of opportunistic infection.[3] Forth, the thrombosis on pulmonary valves and thrombi in pulmonary artery branches repeatedly caused pulmonary infarction and abscess. Although the bamboo stick inserted into lung did not have direct lethal impact on pulmonary function, the secondary pulmonary thrombosis, infarction, infection, right heart failure, and malnutrition ultimately caused the death.

There are some reasons for the misdiagnosis of the victim as pulmonary tuberculosis in this case.

Firstly, the bamboo stick was not timely detected as a foreign body soon after the injury. It was reported that CT examination is more useful in the early stage of bamboo foreign body injury.[4, 6] In the current case, the victim took CT examination 14 months after the injury, when pulmonary inflammation around the bamboo stick might have similar density to the bamboo itself. Besides, the slice thickness of the CT imaging acquisition protocol used at local hospital was 20 mm. The partial volume effects probably had concealed the density contrast and thus the contour of the bamboo stick.

On the other hand, the CT findings of the chronic inflammation beside fissure of entrance, the pulmonary fibrous hyperplasia around the bamboo stick, and the enlargment of hilar lymph nodes mimicked the characteristic CT findings of primary complex (primary pulmonary tuberculosis). The CT findings of pulmonary infarction were similar to miliary tuberculosis, and that of pulmonary abscesses in lung apex were similar to cavitary pulmonary tuberculosis. The pathologies caused by the bamboo stick in this case as well as that of the primary and secondary pulmonary tuberculosis are illustrated and compared in **Figure 3**.

In addition, some coincident events also contributed to the misdiagnosis. Firstly, the victim didn't recognize the hurt by bamboo stick for being drunk too much and did not know the bamboo stick was stuck in his body. Secondly, due to irregular use of anti-tuberculosis drugs, the symptoms of pulmonary infarction

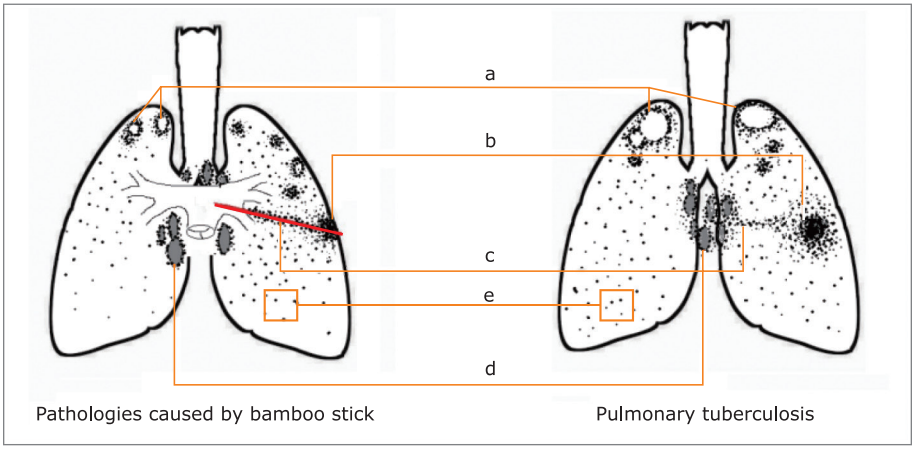


Figure 3. Illustration of the pathologies of the current case and pulmonary tuberculosis in terms of the similarities in CT manifestations

(a) The cavity of lung abscesses is similar to the cavitary pulmonary tuberculosis; (b) the fibrous hyperplasia on the lung surface punctured with the bamboo stick is similar to the tuberculous lesion on the lung surface; (c) the bamboo stick (shown in red) formed a wound track, being similar to the inflamed lymphatic vessels of tuberculosis; (d) enlarged lymph nodes at bilateral hilus pulmonis are similar to hilar lymphadenopathy of tuberculosis; (e) multiple pulmonary infarcts resemble miliary lesions of tuberculosis.

happened many times, which were easily misinterpreted as relapsing of tuberculosis.

When a foreign body is inhaled or punctured into the lungs, and develops a local inflammation, the CT imaging finding of inflammation may blur the foreign body, resulting in misdiagnosis. Clinically, the imaging diagnosis of pulmonary foreign body may largely depend on the reported medical history to doctors, which helps to select suitable imaging methods and to interpret some special imaging signs correctly. It has to be noted that doctors' professional abilities at the local hospital were not strong enough for differential diagnosis in the rare condition. By the current case report, we hope to throw some insight into the diagnosis and treatment of pulmonary inflammation associated with foreign bodies. It is necessary to carry out training on optimizing CT scan protocol based on patient's history of present illness, as well as to improve competences of local care service providers in radiological diagnosis.

Ethical Statement

This article was reviewed and approved for publication by the Medical Ethics Committee of Kunming Medical University. The informed consent for publication signed by the immediate family member was acquired.

Conflict of interests

None.

REFERENCES

1. Peterson JJ, Bancroft LW, Kransdorf MJ. Wooden foreign bodies: imaging appearance. AJR Am J Roentgenol 2002; 178(3): 557-62. doi: 10.2214/ajr.178.3.1780557.
2. Bodene D, Quinn SF, Cochran CF. Imaging foreign glass and wooden bodies of the extremities with CT and MR. J Comput Assist Tomogr 1988; 12(4): 608-11. doi: 10.1097/00004728-198807000-00013.
3. Samonis G, Anaissie E, Elting L, et al. Review of citrobacter bacteremia in cancer patients over a sixteen-year period. Eur J Clin Microbiol Infect Dis 1991; 10(6): 479-85. doi: 10.1007/BF01963933.
4. Hajime N, Kanji E, Katsumi N, et al. Bamboo foreign bodies in lung parenchyma: CT features. Clin Imaging 1992; 16(2): 117-20. doi: 10.1016/0899-7071(92)90124-r.
5. Liu WK, Ma L, Mao BY. A delayed frontorbital abscess caused by a penetrating nonmissile foreign body (a bamboo stick). Neurol India 2009; 57(2): 208-10. doi: 10.4103/0028-3886.51299.
6. Kitajiri S, Tabuchi K, Hiraumi H. Transnasal bamboo foreign body lodged in the sphenoid sinus. Auris Nasus Larynx 2001; 28(4): 365-7. doi: 10.1016/s0385-8146(01)00096-7.
7. Kantarci M, Ogul H, Karasen RM. Detection of a giant wooden foreign body with multidetector computed tomography and multiplanar reconstruction imaging. Am J Emerg Med 2007; 25(2): 211–3. doi: 10.1016/j.ajem.2006.08.006.
8. Wang B, Li M, Ma H, et al. Computed tomography-based predictive nomogram for differentiating primary progressive pulmonary tuberculosis from community-acquired pneumonia in children. BMC Med Imaging 2019; 19(1):63. doi: 10.1186/s12880-019-0355-z.
9. Knopf A, Dobritz M, Fauser C. The "invisible" foreign body. HNO 2009; 57(11): 1133-5. German. doi: 10.1007/s00106-009-1940-1.
10. Yang I, Hayes CW, Jacobson JA, et al. Unique foreign body injury: bamboo penetration of thigh and pelvis while skiing. Emerg Radiol 2002; 9(4): 243-6. doi: 10.1007/s10140-002-0234-7.
11. Kabayashi F, Saiki M, Nakamura Y, et al. Aortogastric fistula caused by a foreign body in a hiatal hernia. Ann Thorac Surg 2016; 101(5):1976-8. doi: 10.1016/j.athoracsur.2015.06.107.