

Case Report

Successful treatment of mycotic thoracic aortic aneurysm in collaboration with cardiovascular and general thoracic surgeons

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We report a rare case of ruptured mycotic thoracic aortic aneurysm that required almost one month for correct diagnosis. A 71-year-old woman who had hemoptysis for several weeks was initially suspected to have lung cancer based on several examinations, including fluorine-18 fluorodeoxyglucose-positron emission tomography. However, contrast-enhanced computed tomography revealed a ruptured mycotic thoracic aortic aneurysm in the lower lobe of the left lung. She underwent emergency surgery carried out collaboratively by cardiovascular and general thoracic surgeons. En bloc resection of the aneurysm with the left lower lobe and in situ graft replacement of the descending aorta were performed successfully, although left lower lobectomy was difficult due to the insufficient segmentation of the upper and lower lobes and strong adherence of the aneurysm to the left lung. The clinical course was uneventful. The reason for survival for one month was thought to be that the rupture was covered by the lung. Because the resection of the lung is often difficult in cases in which the aneurysmal rupture shows extensive lung invasion, collaboration with cardiovascular and general thoracic surgeons is important.

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Introduction

Mycotic thoracic aortic aneurysms are rare but life-threatening because they grow rapidly and tend to rupture, and most require emergency surgery¹. Mycotic thoracic aortic aneurysm rupture into lung is rare². And treatment strategy for such cases varies whether the lung invaded by aneurysm should be resected completely, or preserved. On the other hand, resection of lung invaded by aneurysm is often difficult because of strong adhesion³. We report a rare case of ruptured mycotic thoracic aortic aneurysm that required almost one month for correct diagnosis, and the emergency

surgery was successfully performed in collaboration with cardiovascular and general thoracic surgeons.

Case

A 71-year-old woman presented to a local hospital with hemoptysis that had persisted for several weeks. Chest radiogram showed a mass shadow around the left hilum. She received antibiotics and underwent a noncontrast-enhanced chest computed tomography (CT) scan, which revealed a mass shadow of 3 cm in size in the left lower lobe of the lung

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(Fig. 1A, B). Fluorine-18-fluorodeoxyglucose positron emission tomography (^{18}F -FDG PET)-CT showed high uptake of the mass shadow in the left lower lobe (Fig. 1C). Lung cancer was initially suspected, but a bronchoscopic examinations including biopsy, brushing cytology and bronchoalveolar lavage showed no evidence of malignancy.

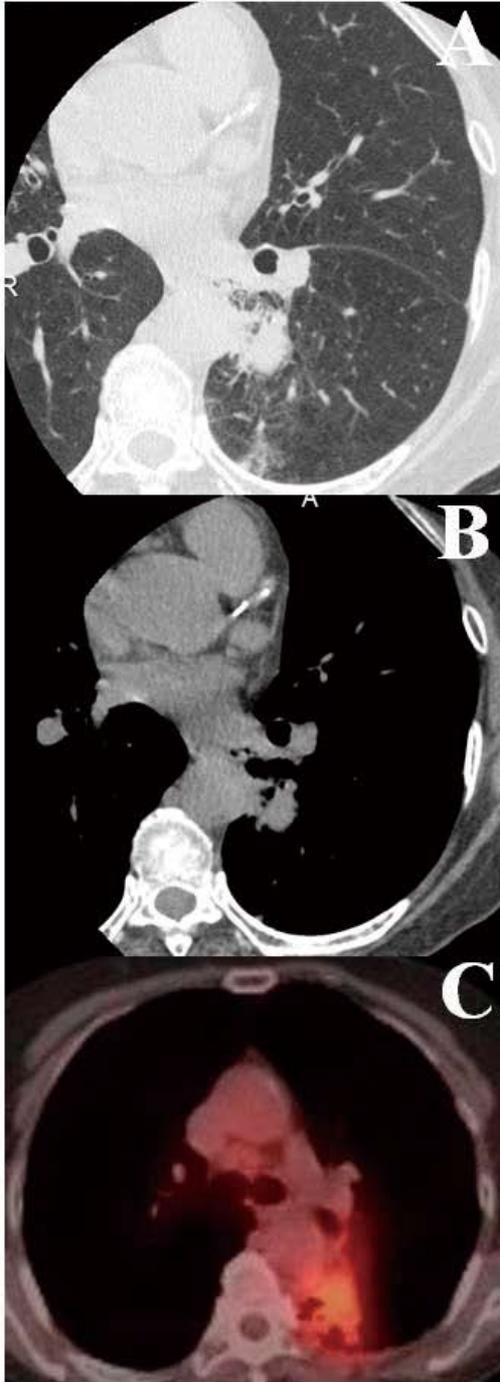


Figure 1 A, B. noncontrast-enhanced chest CT scan showed a mass shadow in the left lower lobe of the lung. C. ^{18}F -FDG PET-CT showed high uptake of the mass shadow in the left lower lobe.

Contrast-enhanced chest CT (CE-CT) performed one month after symptom onset showed an aortic saccular aneurysm surrounded by the left lower lobe of the lung. Fluid collection and consolidation around the aneurysm led to a suspicion of lung abscess and pneumonia (Fig. 2A, B). Laboratory examinations showed an elevated C-reactive protein level of 6.29 mg/dL and a white blood cell count of $10,820/\text{mm}^3$. Therefore, the patient was diagnosed with rupture of a mycotic thoracic aortic aneurysm into the left lung.

The patient was transferred to our hospital for emergency surgery, which was performed collaboratively by cardiovascular and general thoracic surgeons. Initially, the aortic arch just below the left subclavian artery and the descending aorta directly above the diaphragm were clamped by the cardio-

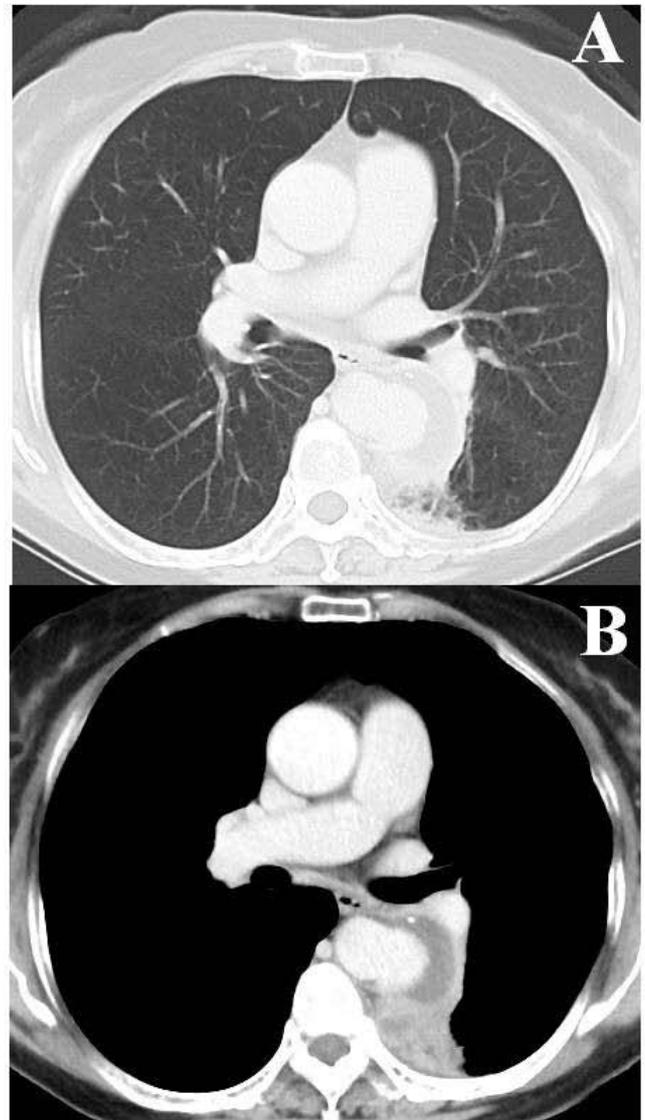


Figure 2 A. CE-CT showed an aortic saccular aneurysm. B. Fluid collection and consolidation were observed around the aneurysm.

vascular surgeons and partial cardiopulmonary bypass was instituted via the left femoral artery. Next, the general thoracic surgeons resected the inferior pulmonary vein, pulmonary artery, and lower bronchus. However, the lower lobe of the lung could not be removed because of insufficient segmentation of the upper and lower lobes and strong adherence of the aneurysm to the left lung. The cardiovascular surgeons then excised the aneurysm and performed in situ graft replacement using a J graft prosthesis (Japan LifeLine, Tokyo, Japan). Subsequently, the upper and lower lobes of the posterior aspect were separated and en bloc resection of the aneurysm with the left lower lobe was completed.

The resected specimen had a fistula between the lower lobe and aortic wall (Fig. 3A). Pathological examination revealed atherosclerotic changes and rupture of the aortic wall, with inflammation in the aortic wall and the resected lung. Bronchopneumonia-like changes were also observed in the lung (Fig. 3B).

The postoperative course was uneventful, with no infectious complications. Histological specimens and blood culture obtained before surgery revealed no bacteria, but the patient was treated prophylactically with ciprofloxacin. She was discharged 17 days after the operation.

Discussion

For a diagnosis of mycotic thoracic aortic aneurysm, the aneurysm must be associated with a positive culture from the aneurysmal wall, its content, or the surrounding tissue; and the patient must display signs of an associated infection. An aneurysm with a sterile culture is considered to be *mycotic* only if it has typical features of an eccentric and perforated or penetrated aneurysm intraoperatively, the patient has signs of infection, and the patient has been treated with antibiotics before surgery⁴). In our case, various cultures including blood culture yielded no microorganisms, but this may have been because antibiotics were administered before surgery. The pathological findings revealed atherosclerotic changes in the aortic wall. It suggests that the possibilities remain whether the diagnosis is penetrating atherosclerotic ulcer with pneumonia or mycotic thoracic aortic aneurysm. Our diagnosis of mycotic thoracic aortic aneurysm was based on the criteria above.

In a study of 22 cases of mycotic aneurysm, Chan et al. found that most required emergency operations because of the tendency to rupture⁵). In our case, infection and rupture might have occurred one month prior to surgery, at the onset of hemoptysis. Fortunately, the rupture was contained within

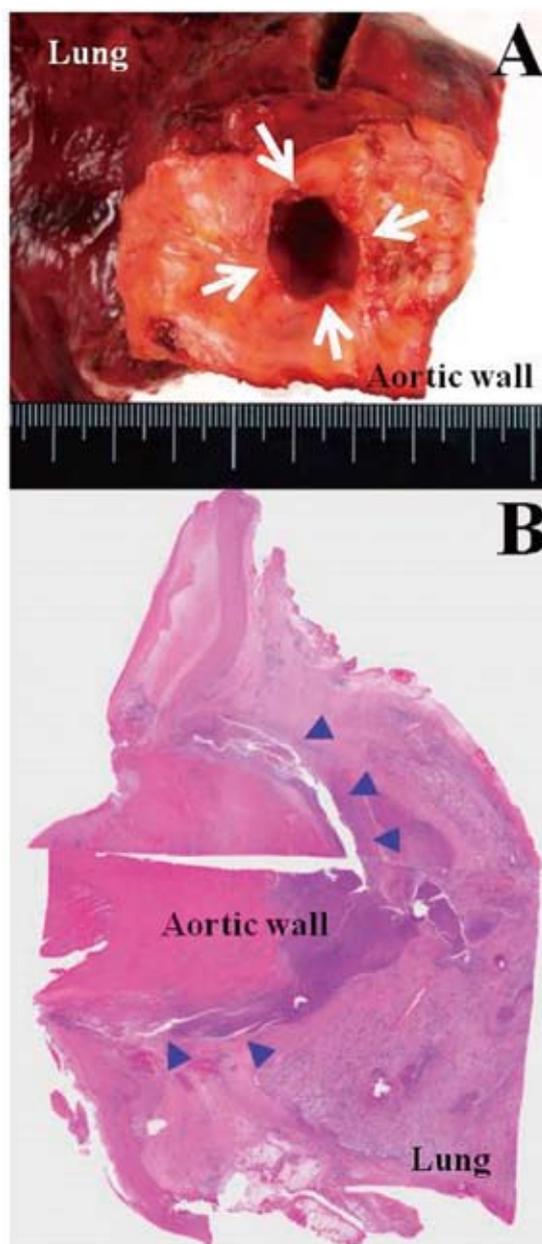


Figure 3 A. The resected specimen had a fistula between the lower lobe and aortic wall (arrows).

B. The rupture of the aortic wall (arrow heads) and the bleeding into the lung were observed. The inflammation around the aortic wall was continuous to the lung.

the lower lobe of the lung, which may explain the patient's survival for one month from the onset of symptoms.

Images of lung cancer and thoracic aortic aneurysm are sometimes similar and discrimination may be difficult^{6,7}). Thus, if a mass is detected around the hilum, the two possibilities of lung cancer and thoracic aortic aneurysm should be considered and discriminated by various modalities. Application of ¹⁸F-FDG PET-CT for diagnosis of mycotic aneurysm has increased⁸), but in the present case a diagnosis of

aneurysm could not be obtained from ^{18}F -FDG PET-CT. Thus, although ^{18}F -FDG PET is useful in diagnosis of infection, prior application of CE-CT is recommended for discrimination of lung cancer and thoracic aortic aneurysm.

Rupture of a thoracic aortic aneurysm into the lung is comparatively rare, with a frequency of about 1% to 4.5% of all rupture cases². One treatment strategy is to spare as much lung as possible, resecting only the aneurysm. This can preserve lung function, but the risk of infection or bleeding remains. Endovascular repair of mycotic thoracic aortic aneurysm has recently been reported^{1,9,10}. The long term durability after this procedure is unclear, but less invasive, endovascular management of thoracic aortic aneurysm is safer, especially for high-risk surgical candidates, and use of this approach for mycotic thoracic aortic aneurysms has acceptable rates of perioperative mortality, morbidity, and midterm survival^{1,9,10}. However, a major disadvantage is that infected tissue is not resected, which may facilitate recurrent sepsis or require long-term antibiotic therapy^{9,10}. Additionally, Sedivy et al. found high mortality in endovascular repaired cases with ongoing septic and ruptured infected aneurysms¹⁰.

Another treatment strategy is to remove the aneurysm en bloc with the lung. This procedure can resect an obvious focus of infection, but has a risk of poor pulmonary function. In the present case, the lung abscess and hematoma were massive, leading to the choice of resection of the ruptured aneurysm en bloc with lung tissue, and the patient healed without any morbidity.

On the other hand, lung resection is difficult and has the risk of massive bleeding in the case in which the adhesion between the aneurysm and lung is strong³. In addition, if a segmentation of an each lobe is insufficient like our case, the resection will become more difficult and require proficient procedure of general thoracic surgeons. Thus, the therapeutic strategy for mycotic aneurysms must be chosen carefully,

and collaboration with cardiovascular and general thoracic surgeons is recommended in cases in which the aneurysmal rupture shows extensive lung invasion.

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