

[CASE REPORT]

Massive Hemoptysis with a Fungus Ball-like Shadow in an Old Tuberculosis Cavity That Was Shown to Be a Clot by Bronchoscopy

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Abstract:

Development of aspergilloma is common in cases with a fungus ball-like shadow in cavities due to old tuberculosis. Some reports have shown that blood clots tend to appear as a fungus ball-like shadow. A 71-year-old man with a history of pulmonary tuberculosis presented with a fungus ball-like shadow in an old cavity and hemoptysis. There was no evidence of aspergillus infection on various examinations. We confirmed a blood clot and aneurysm of an artery under direct vision by bronchoscopy. A lateral thoracic artery aneurysm was detected by angiography. Transcatheter arterial embolization was performed. After treatment, the artery aneurysm disappeared.

Key words: Hemoptysis, fungus ball-like shadow, aspergilloma, lateral thoracic artery aneurysm, blood clot

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Introduction

Massive hemoptysis is a life-threatening medical emergency with a mortality of 50-80% if untreated (1). Destructive lung diseases from many causes, such as neoplasms, tuberculosis, bronchiectasis, and cystic fibrosis, lead to massive hemoptysis (2). Generally, pulmonary aspergilloma develops as secondary colonization in preexisting lung cavities. Aspergilloma clinically appears as mild to severe hemoptysis but may be life-threatening (3). Some reports have shown that blood clots may appear as a fungus ball-like shadow in an old tuberculosis cavity, and hemoptysis is known to occur due to Rasmussen's aneurysm in old tuberculosis cavities (4).

To our knowledge, this is the first report of a fungus ball-like shadow that was confirmed to be a blood clot with massive hemoptysis caused by an aneurysm of an artery under direct vision by bronchoscopy.

Case Report

A 71-year-old man was admitted to our hospital with acute respiratory failure due to massive hemoptysis. He had a medical history of pulmonary tuberculosis, chronic obstructive pulmonary disease (COPD), cerebral infarction, and alcohol abuse. He was a current smoker of approximately 40 pack-years, despite having COPD.

On an examination, his height was 167 cm, and his body weight was only 45 kg with a body mass index of 16 kg/m². His blood pressure was 188/82 mmHg and body temperature 37°C. He had tachycardia with tachypnea and a pulse oximetry saturation of 96% on 4 L/min oxygen with a mask. His respiratory sounds were decreased in the right upper field. Cardiac auscultation showed no abnormalities, and neither leg edema nor skin lesions were noted. Arterial blood gas analyses showed hypercapnia of 60 mmHg and oxygen partial pressure (PaO₂) of 96 mmHg with a 4-L

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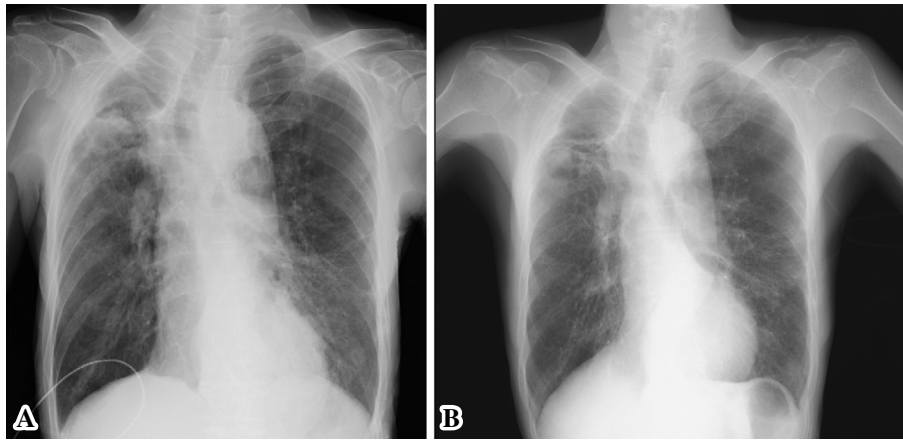


Figure 1. (A) A chest radiograph on admission shows ground-glass opacity in the bilateral lower lung fields and a cavity with a fungus ball-like shadow in the right upper field. (B) A chest radiograph shows that the fungus ball-like shadow has disappeared.

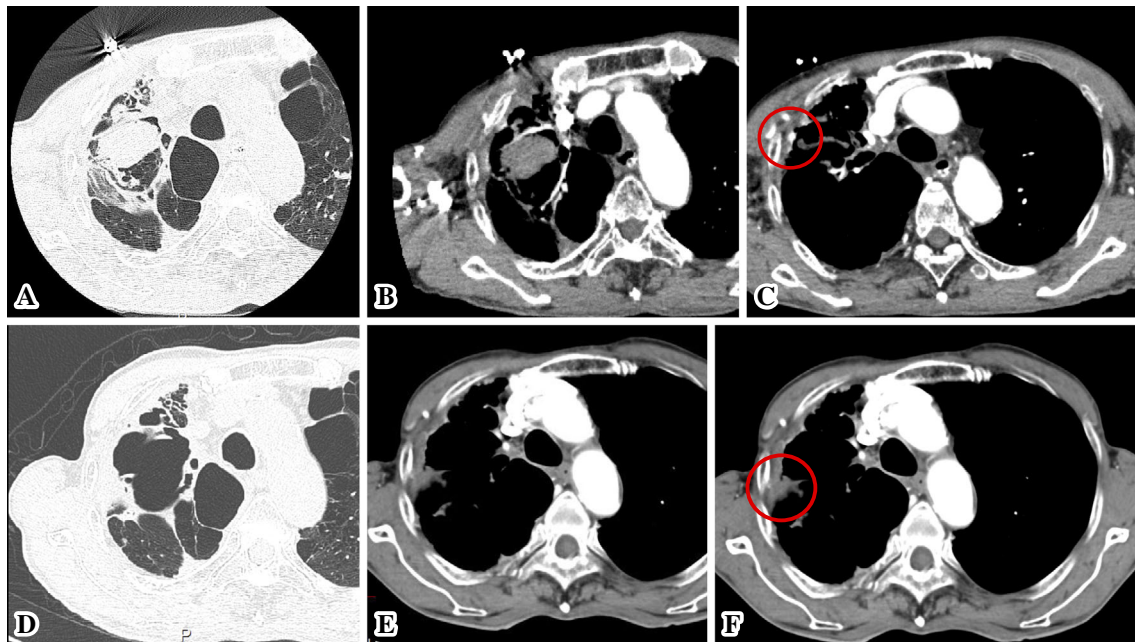


Figure 2. (A, B) Chest computed tomography shows a cavity with a fungus ball-like shadow in the right upper lobe and emphysema. (C) Chest computed tomography shows an expanded vessel with contrast enhancement deep inside the right wall of the cavity (arrow). (D, E) Chest computed tomography shows that with transcatheter arterial embolization after 2 months, the fungus ball-like shadow in the cavity has disappeared in the right upper field. (F) Chest computed tomography shows disappearance of the lateral thoracic artery aneurysm with contrast enhancement (circle).

mask. The laboratory findings were as follows: elevated levels of lactic dehydrogenation enzyme (LDH) at 249 U/L and brain natriuretic peptide (BNP) at 125.2 pg/mL and slightly decreased levels of hemoglobin at 13.2 g/dL. All other laboratory data were relatively normal.

An anterior-posterior chest radiograph showed slight cardiomegaly, hyperinflation of the lungs, mediastinal excursion of the right side, right lung upper lobe cavitation, and bilateral lower lobe infiltration (Fig. 1A). Chest computed tomography (CT) revealed an approximately 30-mm fungus ball-like shadow in an old tuberculosis cavity

(Fig. 2A and B).

Initially, we treated the patient by supplying supplemental oxygen, administering a hemostatic agent, controlling high blood pressure, and providing antibiotics. We initially suspected pulmonary aspergilloma because of the presence of the old tuberculosis cavity and the patient's medical history of tuberculosis. After treatment, his condition gradually improved. Therefore, we attempted to assess the site of bleeding and cause of massive hemoptysis in this situation. On the 6th day, we performed bronchoscopy to assess the cause of bleeding and to confirm the presence of aspergillus. We

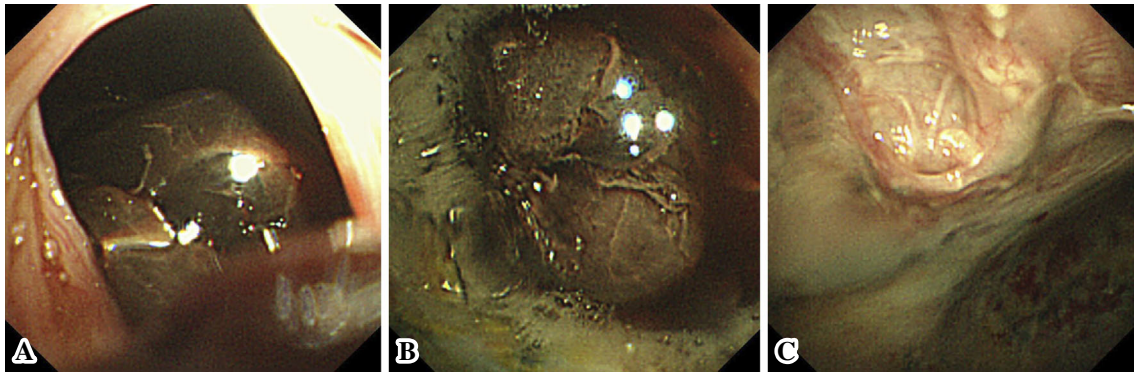


Figure 3. (A) Bronchoscopic findings of the right B2b, showing blood clots, which consist of a smooth surface and dark reddish brown lesions, in the cavity. (B) Bronchoscopic findings of the cavity in the right upper lobe also show a blood clot. (C) Bronchoscopic findings of the cavity in the right upper lobe show a raised mass lesion deep inside the right wall of the cavity.



Figure 4. (A) Selective angiography from the right axillary artery leading to the lateral thoracic artery shows an aneurysm (circle). After enhancement of the lateral thoracic artery, the contrast medium flows in the pulmonary artery. Angiography shows a lateral thoracic artery-to-pulmonary artery shunt with a lateral thoracic artery aneurysm. (B) After embolization treatment of the lateral thoracic artery aneurysm, the lateral thoracic artery and pulmonary artery shunt disappeared.

found a large amount of clotted blood and hemoptum in the bilateral lower lobes and aspirated almost all of the endotracheal contents. The bleeding lesion was suspected to be in the cavity, which was located in front of the right B2b bronchus. A number of rust-colored clots were seen in these areas (Fig. 3A and B). We aspirated the rust-colored clots and tested them for the presence of aspergilloma. The laboratory findings were as follows: aspergillus antigen and aspergillus precipitating antibody were negative; the cytology of sputum and bronchoalveolar lavage fluid showed no mycelium on grocott staining; and culture of the sputum and bronchoalveolar lavage fluid were negative. There was no evidence of aspergilloma. A pulsatile mass located deep inside the cavity wall was observed. We considered this mass to be associated with a lateral thoracic artery aneurysm caused by old tuberculosis (Fig. 3C). After the procedure with bronchoscopy, the fungus ball-like shadow disappeared, according to X-ray findings of the chest (Fig. 1B).

The patient experienced massive hemoptysis (300 mL of blood) the following evening. We performed emergency bronchoscopy and sprayed the bleeding lesion with liquid thrombin. The next day, we performed additional transcatheter arterial embolization. Enhanced chest CT showed an aneurysm at the right upper cavity, and the branches of the subclavian artery were suspected to be the culprit vessels (Fig. 2C). Angiography of the right subclavian artery showed peripheral vascularization around the right upper cavity. An aneurysm was observed in the lateral thoracic artery and pulmonary artery shunt (Fig. 4A). Therefore, the lateral thoracic artery and internal thoracic artery were thought to be the feeder vessels. We performed embolization treatment on this aneurysm using an absorbable gelatin sponge. At the end of embolization, enhancement of the aneurysm in the lateral thoracic artery and pulmonary artery shunt had disappeared (Fig. 4B).

Because there was no evidence of an aspergillus infection,

we considered that the fungus ball-like shadow had been formed by a blood clot from a lateral thoracic artery aneurysm rupture associated with an old tuberculosis cavity.

A few days after transcatheter arterial embolization, the fungus ball-like shadow disappeared in radiological imaging findings. Two months later, follow-up CT after discharge showed that the fungus ball-like shadow in the cavity had disappeared from the right upper field (Fig. 2D and E). The aneurysm also vanished after treatment (Fig. 2F).

Discussion

We experienced a case of blood clots and a pulsing aneurysm due to old tuberculosis that was induced by a lateral thoracic artery aneurysm. These findings were directly observed by bronchoscopy. Most cases of a fungus ball-like shadow in an old tuberculosis cavity are caused by aspergilloma. Aspergilloma is a fungus ball composed of *Aspergillus* hyphae, fibrin, mucus, and cellular debris in a pulmonary cavity (5). Aspergilloma arises in preexisting pulmonary cavities that have become colonized with *Aspergillus* spp. (6). Patients who have cavities of ≥ 2 cm due to classical pulmonary tuberculosis have an approximately 20% chance of subsequently developing aspergilloma and/or chronic pulmonary aspergillosis (7-9). However, a fungus ball-like shadow has also been reported in association with other diseases, such as lung cancer, in some other mycosis infections, and with bloody clots (4, 10, 11).

A fungus ball confirmed under direct vision by bronchoscopy typically shows various colors, such as reddish brown, milky white, and yellow-white (12-15). Our case showed dark reddish brown contents in a cavity, and culture tests and serum aspergillus precipitating antibody testing were negative. Therefore, the present patient did not have aspergilloma.

A previous report showed that CT values of $>2,000$ Hounsfield units (HU) were observed in cases showing a fungus ball in paranasal aspergillosis (16). In another report, CT values of 45 to 75 HU were observed in cases of blood clots as a result of intraperitoneal hemorrhaging (17). These reports suggest that differences in HU may be useful for distinguishing between aspergilloma and blood clots when evaluating a fungus ball-like shadow on chest CT. To the best of our knowledge, there are no reports on differences in aspergilloma and blood clots as shown by CT images. However, in the present case, identifying the cause of the fungus ball-like shadow using CT images alone was too difficult because the CT values vary greatly, from 50 to 1,000 HU, depending on the part of the blood clot.

The sensitivity of a fungal culture by sputum or a specimen with bronchoscopy is as low as 44.3% (18). The serum precipitating antibody test is useful for a diagnosis because of its relatively high sensitivity of 88% to 100% (19, 20), but the diagnosis of aspergilloma is not perfect. Therefore, proving the presence of blood clots or directly detecting an aneurysm by bronchoscopy would be useful.

The present case showed massive hemoptysis. Almost all cases of hemorrhaging originate from bleeding of hypertrophied bronchial arteries, which can usually be occluded using endovascular techniques (21). However, in our case, we did not observe any enlargement of the bronchial arteries, although we did observe a lateral thoracic artery aneurysm in an old pulmonary tuberculosis cavity wall. Bleeding from cavities that occurs after tuberculosis is more common when caused by bronchial artery-to-pulmonary artery shunting than by non-bronchial artery-to-pulmonary artery shunting. This bleeding is caused by pseudoaneurysms of the pulmonary artery where the artery is focally weakened by inflammatory infiltrate. However, massive hemoptysis due to this cause is rare. In our case, we directly observed a lateral thoracic artery aneurysm pulsing in an old pulmonary tuberculosis cavity wall. Massive hemoptysis then occurred because of a ruptured aneurysm. The massive hemoptysis comprised approximately 300 mL of blood. Therefore, we performed transcatheter arterial embolization. Since performing this procedure, there has been no recurrence of hemoptysis.

In conclusion, we experienced a case of blood clots and a pulsing aneurysm due to old tuberculosis that was induced by a lateral thoracic artery aneurysm, as shown directly by bronchoscopy. When we treat a patient with hemoptysis, bronchoscopy may provide useful information not only for identifying the site of hemoptysis but also for making a differential diagnosis regarding the cause of hemoptysis itself. Therefore, bronchoscopy should be strongly considered when making a diagnosis in such cases.

The authors state that they have no Conflict of Interest (COI).

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