C-Arm Fluoroscopy-Guided Bronchoscopic Biopsy for Diagnosing Aspergilloma With Massive Hemoptysis After Pulmonary Tuberculosis: A Case Report

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Abstract
Background: Aspergilloma usually develops in the pulmonary cavity that already exists, including tuberculosis. The most frequent symptom is hemoptysis. Diagnosis of proven fungal infection requires a tissue sample obtained from a disease location to be subjected to histological examination or culture. A specimen taken using bronchoscopy alone is quite challenging because of its location. In this case, a C-arm fluoroscopy-guided bronchoscopic biopsy may be a solution to get specimens for a proven diagnosis.

Case: A 53-year-old male presented to the emergency department following a massive hemoptysis with a previous history of tuberculosis. Chest radiography revealed opacity and hilar restriction in the left upper lobe. A chest CT scan without contrast revealed suspected aspergilloma. The patient underwent a C-arm fluoroscopy-guided bronchoscopy for a biopsy sample. The biopsy sample referred to Aspergillus niger.

Discussion: Aspergillus sp. leads to parenchymal damage and causes several symptoms, mostly hemoptysis. Aspergilloma usually develops in the pulmonary cavity that already exists, including those from tuberculosis. The diagnostic effectiveness of bronchoscopy guided by C-arm fluoroscopy for peripheral lung lesions has consistently improved.

Conclusion: Aspergilloma usually develops in the pulmonary cavity that already exists, including tuberculosis. The patient came to the emergency department with massive hemoptysis and met all the criteria for diagnosis of proven fungal infection. The diagnosis was made by analyzing biopsy samples, which was taken by C-arm fluoroscopy-guided bronchoscopy.

Keywords: Aspergilloma, C-arm fluoroscopy-guided bronchoscopy, post-treatment tuberculosis, massive hemoptysis

INTRODUCTION

Aspergilloma usually develops in the pulmonary cavity that already exists, including those from tuberculosis (TB). Aspergilloma develops when Aspergillus sp. colonizes and grows inside pre-existing single or multiple lung cavities and forms a ball-like structure called a fungus ball. The fungus ball is composed of hyphae of Aspergillus, fibrin, mucus, inflammatory cells, blood, and epithelial cell components. More than 90% of aspergilloma is caused by Aspergillus fumigatus which is widely found in people with TB. Other species that can cause aspergilloma include Aspergillus niger, Aspergillus terreus, Aspergillus flavus, and Aspergillus nidulans.
Consistent radiographic findings, together with serological and microbiological evidence of Aspergillus species in a person with symptoms lasting more than three months, are required for a diagnosis. Furthermore, the diagnostic criteria can be divided into 3 levels, namely proven, probable, and possible (Figure 1).

![Figure 1. Diagnostic criteria for lung mycosis.](image)

A proven fungal infection needs a tissue sample taken from a disease location to be histologically analyzed or cultured to identify a fungus. A probable fungal infection requires a host factor, clinical features, and mycological proof. Possible fungal infections are defined as cases having the necessary host characteristics and clinical data supporting a fungus infection but without any mycological support. Histological analysis of a specimen taken from a site of aspergilloma by using bronchoscopy alone is a bit difficult because of its location. Diagnosis is important for the treatment that will be received.

Treatment for aspergilloma can be surgical or non-surgical. The most effective method of treating symptomatic aspergilloma, especially for massive hemoptysis, entails the surgical removal of infected lung lobes. Non-surgical treatment is an option for patients who have a variety of surgical contraindications, such as inadequate respiratory reserve, numerous or bilateral aspergillomas, or personal preference. For those patients, systemic administration of an antifungal drug, intracavitary instillation of an antifungal drug, or endobronchial instillation of an antifungal drug may be recommended.

CASE

A 53-year-old male presented to the emergency department on March 9, 2023, following a hemoptysis of about 400 ml of fresh blood. For more than 10 years, the patient had recurring episodes of blood-tinged sputum, along with fever and occasionally chest pain. He had previous two histories of TB and completed standard treatment in 2007 and 2015.

The patient was conscious, oriented, and hemodynamically stable when examined. Pallor was present. Low vesicular breathing was discovered during a respiratory system assessment in the left hemithorax region. Examinations of the nervous system, heart, and abdomen were all normal. Initial blood tests revealed severe anemia with a hemoglobin (Hb) level of 6.0 g/dL. Xpert MTB-RIF Assay G4 did not detect *Mycobacterium tuberculosis*. Chest radiography is shown in Figure 2.

![Figure 2. Chest radiography revealed opacity and hilar restriction in the left upper lobe](image)
The patient underwent a bronchoscopy after getting 4 units of packed red blood cells due to severe anemia. Under general anesthesia, the tube was put through LMA into the bronchus and bronchioles. We found stenosis at the left segmental bronchus of B1+2/Apicoposterior (Figure 4).

No active bleeding was found. A sample to be examined was taken by bronchial washing, brushing, and forceps biopsy (Figure 5). The sample is checked for histology, cytology, and KOH smear. The results can be seen in Figure 6.
The patient is treated with itraconazole 100 mg twice daily. The patient went home on March 11, 2023, with no more symptoms like hemoptysis, fever, or chest pain.

DISCUSSION

After breathing in its spores from the environment, Aspergillus species can colonize and thrive in the pulmonary cavity. By creating an intricate assemblage of Aspergillus hyphae, tissue fragments, inflammatory cells, and mucin known as a fungus ball (aspergilloma), it causes parenchymal injury. The cause of Aspergilloma in our case was Aspergillus niger. The most common Aspergillus sp. that causes Aspergilloma in post-TB disease, according to a comprehensive review and meta-analysis of cross-sectional studies in Asia and Africa, is Aspergillus fumigatus. Aspergillus niger is an uncommon cause of aspergilloma, especially invasive pulmonary aspergillosis, even though some authors report it.

Massive hemoptysis was the reason our patient came to the emergency department. He coughed around 400 ml of fresh blood. Aspergilloma can remain asymptomatic, but once the patient has hemoptysis, it can be life-threatening. Rarely, a rapidly growing cavity might encroach on the intercostal arteries and pleural surface, leading to a huge, usually fatal hemoptysis that is very challenging to control. The bleeding can be caused by some factors, such as erosion (local invasion) of vessels nearby, mechanical irritation of exposed vessels within the cavity, endotoxin and trypsin-like proteolytic enzyme release from the organism, direct penetration of the wall lining’s capillaries, or acute bacterial infection as comorbidity.

Younger age, blood-tinged sputum, and cavitary lesions with thick walls are some risk factors for severe hemoptysis in aspergilloma patients. The patient has had a blood-tinged sputum for more than 10 years, a risk factor that can develop into severe hemoptysis.

As seen in Figure 1, diagnostic criteria depend on three parameters, i.e., host factors, clinical features, and mycology examination. Host factors, including risk factors (long-term therapy of antibiotics, ongoing chemotherapy, long-term therapy of corticosteroid), and underlying chronic disease (diabetes mellitus, cancer, pulmonary chronic disease). Clinical features include clinical symptoms, radiology examination, and general laboratory results. Mycology examination includes culture or identification of fungus, serology, or molecular basic examination.

A diagnosis of proven fungal infection requires the detection of fungus by histological analysis or culture of a specimen of tissue taken from a site of disease. In this case, our patient met all the criteria for diagnosis of a proven fungal infection. A cytology sample of the patient was taken by washing and brushing techniques while the biopsy sample of the patient was taken using C-arm fluoroscopy-guided bronchoscopy (Figure 4). Without guidance from C-arm fluoroscopy, it will be difficult to biopsy because a bronchoscope alone is unable to reach peripheral lung parenchyma. A study revealed that the diagnostic effectiveness of bronchoscopy guided by C-arm fluoroscopy for peripheral lung lesions consistently improved and that biopsy was more effective than the other sampling methods.

According to several studies, surgical aspergilloma treatment has positive results and should be the first line of treatment. In terms of long-term survival and a low likelihood of recurrence, the long-term outcomes of aspergilloma surgery are favorable. However, some significant risks occurring after surgery should be considered. Those include postlobectomy empyema, excessive postoperative bleeding, prolonged air leaks, and residual pleural space.

Non-surgical treatment is an option for patients who have a variety of surgical contraindications. Systemic administration of antifungal medication, intracavitary instillation of antifungal medication, or endobronchial instillation of antifungal medication can be preferred for those patients. Itraconazole, the most widely used antifungal agent, is the medication best adapted to treating a persistent illness like aspergilloma. Nevertheless, due to possible poor
drug penetration, it acts slowly, especially for aspergilloma, and may not be helpful for patients with significant hemoptysis.11,13

A study revealed only 49% of patients with aspergilloma showed a radiological response to itraconazole 200 mg daily for 3 months.26 Another study discovered that a weight-based variable dose schedule of itraconazole is both an efficient and secure treatment option for aspergilloma and that treatment should be continued for longer than six months, particularly in individuals with simple aspergilloma. Moreover, patients with simple pulmonary aspergillosis who do not react to the medication should have access to surgical options.12 The patient in our case was given itraconazole 100 mg twice daily as treatment.

LIMITATIONS

Further investigation needs to be done to determine the effectiveness of itraconazole as a treatment for massive hemoptysis in aspergilloma because this case does not explain the long-term outcomes of patient after hospitalization.

CONCLUSION

Aspergilloma usually develops in the existing pulmonary cavity due to TB. C-arm fluoroscopy-guided bronchoscopy may be a good solution to get a biopsy sample of pulmonary aspergillosis in the peripheral site so the diagnosis can be established.

REFERENCES


