



# Successful Lobectomy for Lung Aspergilloma Post-Tuberculosis Infection with Recurrent Hemoptysis

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## Abstract

**Background:** Aspergilloma is a colonization of a lung cavity by the fungus *Aspergillus*, which often occurs as a result of a prior tuberculous lesion. Thus, a multimodal approach is needed to be more effective at reducing recurrence and mortality.

**Case:** A 45-year-old male smoker came with complaints of recurrent hemoptysis for one year, followed by shortness of breath. The patient was diagnosed with tuberculosis twice, both diagnoses confirmed bacteriologically and declared cured. The CT scan of the thorax with contrast concluded that the pulmonary tuberculosis was inactive, displaying a fungus ball at the apex of the left lung accompanied by multiple subpleural blebs. Lobectomy was performed to remove the fungus ball. The results of the biopsy showed pieces of aspergillois fungal tissue with a fungus ball appearance accompanied by necrosis. Oral voriconazole was given as postoperative treatment for 7 days and continued with itraconazole for 6 months. The patient experienced clinical improvement and was able to return to activities during follow-up.

**Discussion:** Lobectomy is often optimal despite its morbidity risks. The X-ray that reveals a residual space or hydropneumothorax also mandates prolonged water-seal drainage and strict observation according to protocol. Additionally, postoperative triazoles completely eradicated the disease.

**Conclusion:** Surgery is a fairly effective treatment in cases of aspergilloma with recurrent hemoptysis. Surgical intervention allows for the complete removal of the fungal ball, its enclosing cavity, and the adjacent unhealthy lung tissue. Multidisciplinary and comprehensive treatment needs to be carried out to increase life expectancy and reduce the recurring symptoms.

**Keywords:** Aspergilloma, hemoptysis, lobectomy, tuberculosis infection

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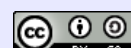
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## INTRODUCTION

Aspergilloma is a form of mycetoma, defined in the Fleischner 2024 glossary as an aggregation of fungal hyphae mixed with mucus, fibrin, and cellular debris, located within a pre-existing cavity.<sup>1</sup> The walls of this cavity consist of vascular granulation tissue. This condition is caused by an infection with the fungus *Aspergillus* and typically remains localized without spreading to surrounding tissues. Aspergilloma is often an incidental finding during radiological examinations.<sup>1,2</sup>

The manifestation of diseases induced by *Aspergillus* infection arises when the host's immune

response to *Aspergillus* antigens is either excessively strong or insufficiently robust. *Aspergillus fumigatus*, in particular, poses significant pathological challenges, especially in immunocompromised individuals. Conditions such as aspergilloma and chronic cavitary pulmonary aspergillosis (CCPA) are more frequently observed in immunocompetent individuals with pre-existing structural lung diseases.<sup>2</sup>

Globally, the highest prevalence is found among individuals with residual lung cavities caused by tuberculosis (TB), with approximately 10% of such cavities progressing to aspergilloma. Beyond TB,

other high-risk groups include individuals with non-tuberculous mycobacterial infections, chronic obstructive pulmonary disease (COPD), and lung cancer. Isolated aspergilloma without pre-existing lung disease is exceedingly rare, with an incidence reported at approximately 0.13%. Interestingly, while invasive aspergillosis is more commonly observed in patients with primary or acquired immunodeficiency, its occurrence remains uncommon among individuals infected with HIV.<sup>2</sup>

Diagnosis of aspergilloma presents major challenges due to limitations in the sensitivity and specificity of various diagnostic modalities, making a definitive diagnosis difficult to establish. Serological tests and cultures often yield false-negative results or have limited sensitivity.<sup>3</sup> Pharmacologic management with systemic antifungals is frequently suboptimal due to poor drug penetration into cavitary lesions, azole resistance, and side effects that complicate long-term therapy. Therefore, a multimodal approach combining antifungal therapy, bronchoscopic/debulking procedures, and pulmonary artery embolization becomes highly necessary to reduce recurrence and mortality. This combined strategy is more effective in lowering relapse and serious complications compared with single-therapy approaches.<sup>4</sup>

## CASE

In this case report, a 45-year-old male smoker presented with complaints of hemoptysis occurring in more than 12 episodes, with a volume of approximately 2 mL per episode, within 24 hours (Purcell Criteria, Grade II), persisting for one month. This was not the first time it happened, because the patient had hemoptysis about a year ago and was diagnosed with pulmonary aspergilloma. The patient also had a history of tuberculosis, diagnosed twice—10 years ago and one year ago—both of which were declared cured.

Alongside hemoptysis, the patient reported shortness of breath coinciding with the onset of symptoms. The patient has already sought treatment at a private hospital in Malang Regency, but there

was no improvement, and he was referred to Dr. Saiful Anwar Hospital as the primary referral hospital.



Figure 1. Chest X-ray (November 30<sup>th</sup>, 2023)

Physical examination revealed diminished breath sounds in the left lung, and pulmonary function tests indicated mild restriction. A chest X-ray in Figure 1 demonstrated fibro-infiltrates in the upper, middle, and lower lung fields and multiple cavities with opacities within them in the upper left lung, leading to the conclusion of active pulmonary tuberculosis with secondary infection (aspergilloma).

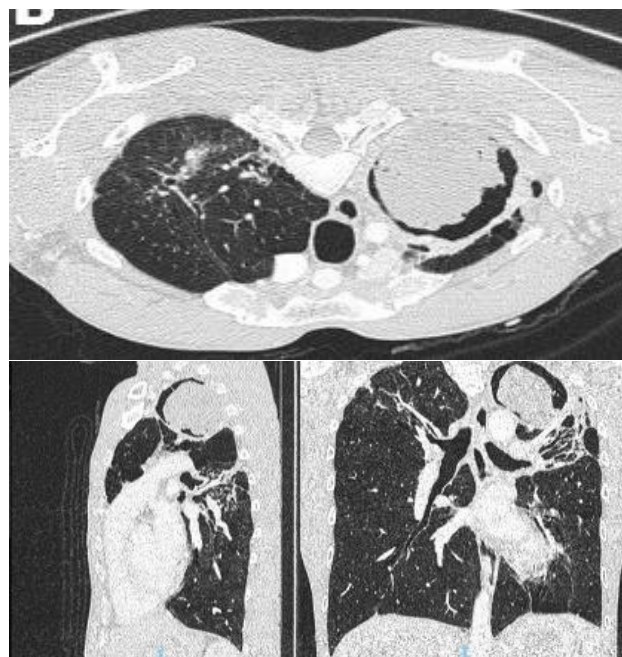


Figure 2. Contrast-enhanced chest CT scan, suggestive of inactive pulmonary TB with a fungus ball in the left lung (November 2<sup>nd</sup>, 2023)

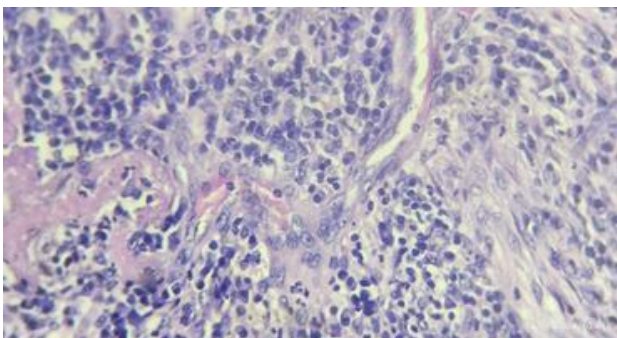
A chest CT scan in Figure 2 suggested inactive pulmonary TB with a fungus ball in the left

lung. Sputum cytology revealed Class II findings, showing epithelial cells with inflammatory changes and a background of inflammatory cells, including polymorphonuclear leukocytes (PMNs), mononuclear cells (MNs), and histiocytes. Non-invasive mycological evaluations, including *Aspergillus* culture and serological assays, were unavailable at our center. Therefore, preoperative diagnosis was based on clinical and radiological features, while definitive diagnosis was confirmed through postoperative histopathology.



Figure 3. Lobectomy performed by a thoracic surgeon

Following a multidisciplinary discussion, the patient underwent thoracotomy with lobectomy on the left lung by a thoracic surgeon, including excision of the fungal ball (Figure 3).



Pulmonary biopsy reveals *Aspergillus* fungal elements with the appearance of a fungal ball (aspergilloma) and associated necrosis (December 15<sup>th</sup>, 2023)

Biopsy results, as Figure 4, confirmed the presence of suppurative granulomatous inflammation accompanied by septate hyphae consistent with aspergillosis. Based on these findings, postoperative treatment consisted of oral

voriconazole (150 mg) for 7 days, followed by oral itraconazole (200 mg) for 6 months, which were prescribed to our patient.

The post-lobectomy chest X-ray in Figure 5 revealed fibro-infiltrates with partial consolidation in the upper lung zones, with no signs of cavitation. Specifically, fibro-infiltrates were observed in the upper and middle lung zones, accompanied by clear airspaces and a distinct pleural line, alongside opacity in the left upper lung zone. Based on these findings, the patient was diagnosed with a localized left-sided hydropneumothorax and active pulmonary tuberculosis with relatively stable infiltrates.



Figure 5. Post-lobectomy chest X-ray (December 21<sup>st</sup>, 2023)

To rule out high-risk post-tuberculosis complications—such as bronchopleural fistula or empyema—the loculated hydropneumothorax was closely evaluated. The patient was continuously monitored for air leaks and infection signs, ultimately demonstrating significant clinical improvement through conservative management before being safely discharged.

The patient experienced clinical improvement and was able to return to normal activities during the follow-up period. A chest CT scan performed two years after the lobectomy indicated no evidence of aspergilloma (Figure 6). Instead, it revealed inactive pulmonary TB with bronchiectasis in the right lung and bilateral pulmonary emphysema.

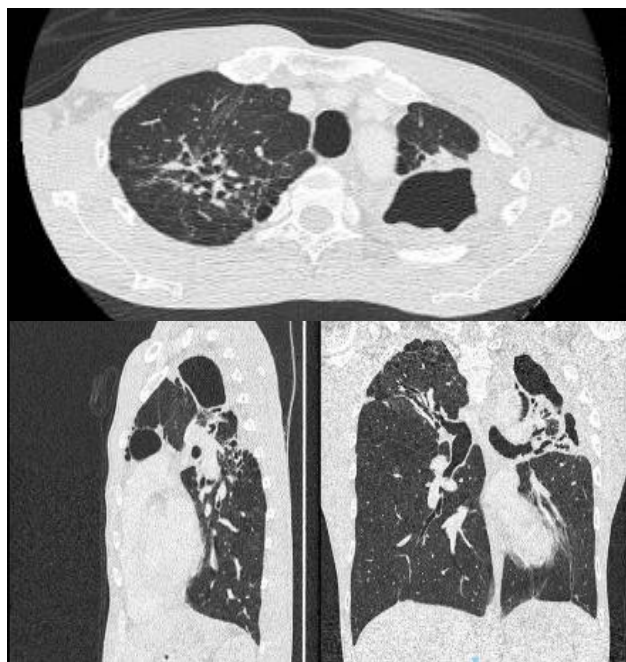


Figure 6. Contrast-enhanced chest CT scan (April 29<sup>th</sup>, 2025)

## DISCUSSION

Recurrent post-TB hemoptysis is generally caused by bronchiectasis, aspergilloma, Rasmussen's aneurysm, and lung carcinoma, arising as complications of tissue damage and chronic inflammatory processes following TB infection. Pulmonary malignancy, such as bronchogenic carcinoma, must be anticipated in post-TB patients because the risk of neoplasia increases due to long-standing changes in the lung tissue.<sup>5-7</sup>

Hemoptysis is reported in 55-83% of individuals with aspergilloma, ranging from blood-streaked sputum to massive hemoptysis, which poses a life-threatening risk in approximately 30% of cases. It remains the primary complication and a significant concern in patients with aspergilloma.<sup>8,9</sup>

Research indicates that CCPA tends to occur more frequently in men compared to women. For instance, a study focusing on the incidence of CCPA among patients with multidrug-resistant tuberculosis (MDR-TB) found that the majority of affected individuals were male, reflecting a broader trend observed in other CCPA studies conducted in Indonesia. This male predominance may be attributed to several factors, including occupational exposure, smoking habits, and gender differences in healthcare-seeking behavior. The age range of

individuals affected by CCPA in Indonesia spans from 18 to 80 years, with an average age of approximately 51 years.<sup>10,11</sup>

In diagnosing systemic mycoses such as pulmonary aspergillosis, there are several diagnostic categories: proven, probable, or possible. These categories are determined based on three parameters: host factors, clinical manifestations, and mycological examination. Mycological examinations—comprising direct microscopy, culture, serology, and molecular-based techniques—play a crucial role because it is difficult to distinguish pulmonary aspergillosis from other diseases based solely on clinical symptoms and radiological findings.<sup>12</sup>

A chest X-ray revealed fibro-infiltrates in the upper, middle, and lower lung fields, along with multiple cavities containing opacities in the upper field of the left lung, leading to a diagnosis of active pulmonary tuberculosis with secondary infection (aspergilloma). A chest CT scan further identified findings consistent with inactive pulmonary TB and the presence of a fungus ball in the left lung.<sup>2</sup>

Chest X-rays are often the initial diagnostic test for patients presenting with symptoms, typically showing cavitations more prominent in the upper lobes, thickening, scarring, and occasionally a rounded opacity within a cavity. CT imaging provides greater detail and demonstrates characteristic features such as a dense, round lesion within a cavitary space, a halo sign indicating an inflammatory reaction at the cavity wall, and an air crescent sign separating the fungal ball from the inner cavity wall circumferentially or partially. The Monod sign, characterized by positional changes of the fungal ball within the cavity based on patient positioning during imaging, may also be observed. These radiological signs are not exclusive to aspergillomas and can also be seen in conditions such as lung abscesses, hydatid cysts, and granulomatosis with polyangiitis.<sup>13,14</sup>

Sputum examination revealed Class II findings, with epithelial cells showing inflammatory changes and a background of inflammatory cells, including PMNs, MNs, and histiocytes.<sup>12</sup> Biopsy

results indicated suppurative granulomatous inflammation with septate hyphae characteristic of aspergillosis. These diagnostic procedures are not easy and are very difficult in rural areas, so the patient must be referred to a comprehensive hospital.<sup>1,2</sup>

Several less invasive approaches have been attempted to manage hemoptysis. Bronchial artery embolization can temporarily stop hemoptysis. However, recurrence is common, likely due to the extensive collateral arteries supplying the aspergilloma. Intracavitary instillation of N-acetylcysteine, aminocaproic acid, and amphotericin B has shown efficacy in controlling acute episodes of bleeding, but recurrent hemorrhages remain a significant issue for most patients.<sup>9</sup>

Surgical intervention, such as lobar resection or wedge resection, is indicated in patients with massive hemoptysis, a localized resectable lesion, or failure of medical management, provided that lung function is adequate and the patient is clinically stable. Surgery is not recommended if there are severe comorbidities, limited lung function, or high perioperative risk.<sup>3,15,16</sup>

Surgery, including lobectomy, decortication, and adhesiolysis, is crucial for life-threatening hemoptysis or refractory cases.<sup>17,18</sup> The primary objectives of surgery are to prevent life-threatening hemoptysis, mitigate the risk of invasive clinical forms, and avoid complications such as pulmonary fibrosis or renal amyloidosis caused by chronic inflammation.<sup>3,19</sup>

Also, operations in post-TB lungs face immense challenges, such as dense pleural adhesions and distorted anatomy, which significantly increase the risk of postoperative prolonged air leaks.<sup>17</sup> Surgical techniques for managing aspergilloma include partial lobectomy, lobectomy, pneumonectomy, thoracotomy, and debridement/curettage.<sup>2,4,11</sup>

The choice of surgical intervention also depends on the size, location, and characteristics of the aspergilloma and patient condition. Extensive adhesions or limited pulmonary reserve may render lobectomy unfeasible. Lobectomy is often optimal

despite its high mortality and morbidity rates, while pneumonectomy is reserved for severely destroyed lungs.<sup>20</sup>

Due to this inflammatory nature, which frequently results in significant adhesions to the chest wall, loss of pleural space, and challenges in dissection around the hilum due to collateral circulation and adhesions, posterolateral thoracotomy is typically required. Whereas video-assisted thoracic surgery (VATS) is safe only for localized lesions lacking parenchymal scarring or lymphadenopathy.<sup>18,21</sup>

After a multidisciplinary approach had been performed, this patient underwent thoracotomy with left lung lobectomy and fungal ball excision, as surgical intervention was strongly preferred over conservative medical treatment for several compelling reasons. First, the patient presented with recurrent hemoptysis persisting for a month, coupled with a history of a similar episode a year prior. This recurrent bleeding poses a continuous and unpredictable threat of life-threatening massive hemorrhage.<sup>8,9</sup>

Second, conservative management using systemic antifungals is frequently suboptimal for definitive cure because the drugs cannot achieve adequate minimum inhibitory concentrations (MIC) within the avascular cavity harboring the fungal ball.<sup>3,4</sup> Finally, diagnostic imaging confirmed a localized, resectable lesion in the left lung, and preoperative evaluations indicated adequate pulmonary reserve. Consequently, definitive surgical resection via lobectomy was the most rational approach to eradicate the source of bleeding, remove the fungal burden entirely, and prevent future fatal complications.<sup>15,16</sup>

Additionally, the presence of postoperative loculated hydropneumothorax requires immediate clinical attention. Because post-resection pleural spaces in post-TB lungs are prone to empyema and bronchopleural fistulas, comprehensive monitoring of air leaks, drainage characteristics, and infection signs is mandatory for a safe recovery.<sup>19,20</sup>

Postoperative loculated hydropneumothorax is a known complication following major lung

resections, particularly lobectomy and pneumonectomy, with a reported global incidence ranging from 1% to 5%.<sup>20</sup> This condition frequently results from intraoperative injury, surgical stump air leaks, or bronchopleural fistulas, thereby requiring immediate clinical attention and drainage.<sup>19,20</sup> In Indonesia, the high TB burden makes chronic pulmonary aspergillosis (CPA) and secondary hydropneumothorax major respiratory morbidities, although national surgical registries remain limited.<sup>17,22</sup>

According to standard postoperative management protocols, serial chest X-rays following a lobectomy directly dictate chest tube management. If the radiograph demonstrates optimal lung re-expansion with no significant air or fluid leakage, the chest tube is safely removed.<sup>19</sup> Conversely, if the X-ray reveals a residual space or hydropneumothorax—as seen in the patient—the protocol mandates prolonged water-seal drainage and strict observation.<sup>20</sup> Under this protocol, negative pressure suction may be applied to facilitate lung expansion. At the same time, surgical re-exploration is strictly reserved for massive hemorrhage or refractory air leaks indicating a severe bronchopleural fistula.<sup>19,20</sup>

This case highlights the efficacy of multimodal management for aspergilloma. Pathophysiologically, fungal colonization within an avascular post-TB cavity triggered reactive angiogenesis, causing recurrent hemoptysis.<sup>5,8</sup> While specific mycological tests were unavailable, characteristic HRCT findings reliably guided the diagnosis. Unlike isolated medical therapy, which demonstrates high relapse rates in the literature,<sup>4,15</sup> combining definitive lobectomy with postoperative triazoles completely eradicated the disease. Clinically, resectable aspergilloma presenting with recurrent hemoptysis requires prompt multidisciplinary surgical and medical intervention to prevent fatal outcomes.<sup>4,16</sup>

## CONCLUSION

The management of aspergilloma requires a multidisciplinary approach that integrates expertise

from various specialties, encompassing both operative and non-operative strategies. For patients ineligible for surgery, several non-operative therapeutic options are available, such as oral triazole therapy, which has become the standard treatment for patients with symptomatic CCPA. Current guidelines recommend initiating oral triazole therapy for a duration of 4 to 6 months, with the possibility of extending the treatment period in cases of slow or minimal response. Additionally, management should focus on alleviating symptoms, preventing and minimizing episodes of hemoptysis, and halting progression to pulmonary fibrosis. Surgery remains the most effective treatment option, especially in cases of aspergilloma with recurrent hemoptysis, while it carries significant risks of morbidity and mortality. Surgical intervention allows for the complete removal of the fungal ball, the containing cavity, and the surrounding unhealthy lung tissue. Therefore, multidisciplinary and comprehensive treatment needs to be carried out to increase life expectancy and reduce recurring symptoms.

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