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**Background:** Pulmonary aspergilloma represents a potentially life-threatening disease caused by saprophytic growth of *Aspergillus fumigates* in pulmonary cavities. This is the first report of its operative treatment from Ethiopia. The aim of this study was to determine the clinical presentations, operative treatments and post operative outcome of patients with pulmonary aspergilloma.

**Methods:** This was a retrospective review of patients' record with post operative diagnosis of pulmonary aspergilloma treated over a period of three years between April 2005-March 2008 at The Tikur Anbessa hospital which is a teaching and referral hospital in Addis Ababa.

**Results:** Eleven patients were included, 81.8% of whom were males. Cough and hemoptysis were the two most common presenting symptoms, occurring in 11(100%) and 10(90.9%). The chest x-ray features typical for aspergilloma was seen in only 4(36.4%). The left lung was involved in 8(72.75%) and the upper lobes were the most commonly affected lobes occurring in 10 (90.9%). The most frequent clinical indication for surgery was severe hemoptysis in 8 (72.75%). Left upper lobectomy was the most frequently performed surgery in 4(36.4%) and left pneumonectomy in 3(27.3%). Four significant complications occurred in the postoperative period and one patient died, making the postoperative mortality 9.1%. Histopathologic confirmation of the fungal ball was possible in 10 patients and the most common underlying cavitory disease was tuberculosis in 9(90%).

**Conclusion:** Aspergilloma is not an uncommon disease in Ethiopia and the diagnosis should be considered in patients who present with hemoptysis or chronic non-resolving cough. Surgery for pulmonary aspergilloma accounted for 5.8% of all thoracotomies done at the hospital and we have adopted the policy of early surgical treatment for all cases. In our series, the commonest lung pathology behind the aspergillus lesions was cavitory pulmonary tuberculosis, similar to many reports. Since the typical x-ray finding is not present in all patients, we believe that a supportive x-ray finding is sufficient enough an investigation to decide on early surgery in patients who present with suggestive symptoms.

## Introduction

Pulmonary infections caused by the fungus *Aspergillus* can occur in varying clinical forms i.e. aspergilloma, allergic broncho-pulmonary aspergillosis or invasive/semi-invasive aspergillosis<sup>1</sup>. Aspergilloma represents a potentially life-threatening disease caused by saprophytic growth of *Aspergillus fumigates* in pulmonary cavities and is usually located in the upper lobes of the lungs to form a fungal ball or mycetoma<sup>2,3</sup>. The fungal ball is made up of a tangled mass of fungal hyphae, fibrin, epithelial cells, mucus, debris and blood cells<sup>4</sup>.

Fungal pulmonary colonization usually occurs after super-infection of pre-existing pulmonary cavities from previous chronic lung diseases such as tuberculosis, bronchiectasis, cavitating carcinoma, sarcoidosis, histoplasmosis bronchogenic cyst or chronic lung abscess<sup>5,6</sup>. In a study of 544 patients with pulmonary cavities secondary to tuberculosis, 11% had radiologic evidence of aspergilloma<sup>6</sup> and according to a large survey conducted by British Tuberculosis Association, it occurred in 12% of healed tuberculosis patients<sup>7</sup>. Patients with aspergilloma should undergo surgical treatment, because there is a risk of sudden life threatening hemoptysis and because there is no effective alternate medical therapy<sup>5</sup>. Surgery offers the only realistic chance of a permanent cure and it very effective in prevention of recurrence of hemoptysis. Some authorities

recommend early surgical resection of symptomatic aspergilloma and even in asymptomatic cases<sup>5,6,7</sup>. Pulmonary aspergilloma is not uncommon in Ethiopia. From 26 patients operated for complicated pulmonary tuberculosis at the same center over a period of 5 years, 27% of the surgeries were for pulmonary aspergilloma<sup>8</sup>. This is the first published report from Ethiopia that described the patterns of patients with pulmonary aspergilloma who were surgically treated surgically.

## Patients and Methods

During a three-year period (April 2005-March 2008), 11 patients were admitted and operated on at the Tikur Anbessa Hospital (TAH) in Addis Ababa, Ethiopia, Chest Surgery Unit for pulmonary aspergilloma. The patients' records were retrieved and data concerning their socio-demography, presenting symptoms and findings, imaging studies, intra-operative findings, operative procedures, post operative course and final out comes were collected. After data collection, analysis was done using computer based statistical software EP-INFO-2002.

Overall, 11 surgical procedures were carried out. Routinely, these patients were initially evaluated and treated by chest physicians and then referred for surgery. Decision to operate was reached after joint discussion between the chest surgeons and physicians. All patients were operated under general anesthesia and with double lumen endo-tracheal tubes in situ for adequate isolation and selective ventilation, through standard postero-lateral thoracotomy. Considerable adhesions were seen in all of the cases and significant bleeding occurred in most. Post-operative, patients were transferred to the Surgical ICU and then to their regular wards when their condition stabilized. Mechanical ventilation was employed for a limited period in patients who couldn't maintain their breathing on their own. All operative specimens were sent for histopathologic study. However, fungal culture was not done.

## Results

During the study period, 11 patients were admitted for surgical treatment of pulmonary aspergilloma, 81.8% of these patients were males. Their ages ranged from 24 to 56 years (Mean=38.9 and Median=35 years). Most were in their third and fourth decades (72.8%). They came from all over the different regions of the country (Table 1). The mean duration of illness before admission was 16.9 months (Lowest=6 months, highest=36 months). Cough and hemoptysis were the two most common presenting symptoms, occurring in 11(100%) and 10(90.9%). The constitutional symptoms of tuberculosis such as low-grade fever, weight loss and night sweats were reported by 5(45.5%). Eight patients completed standard short course anti-TB medications twice and three were still taking their first course. All received different courses of antibiotic therapy for variable duration before surgery. All patients were negative for HIV infection and none had evidence for immune-suppression. Ten (90.9%) were clinically malnourished.

The chest x-ray features revealed cavitary lung lesion in 5(45.5%), typical features of pulmonary aspergilloma in 4(36.4%) and a suspicious solid pulmonary mass lesion in 2(18.2%). Chest CT-Scan was done for three patients and it was diagnostic of aspergilloma in two and it was suspicious for pulmonary neoplasm in one. The left lung was involved in 8(72.75%) and the right side in 3(27.3%). The upper lobes were the most commonly affected lobes occurring in 10 (90.9%) and the lower lobe in 1(9.9%). All were solitary lesions (Table 2). The most frequent clinical indications for surgery were severe haemoptysis in 8 (72.75%), suspicious lung carcinoma in 2(18.2%) and severe cough with mild hemoptysis in 1(9.1%). Pre-operatively, all patients were put on anti-TB drugs, some were started on antibiotics and adequate chest physiotherapy delivered. No patient was put on any form of anti-fungal treatment.

The performed procedure were left upper lobectomy in 4(36.4%), left pneumonectomy in 3(27.3%), limited resection of the upper lobes in the right side 1(9.1%) and the left 1(9.1%),

right upper lobectomy in 1(9.1%) and right pneumonectomy in 1(9.1%). (Table 3). All surgeries were accompanied by bleeding of 750ml. of blood and three (27.3%) procedures were associated with bleeding of more than 2 liters. Intra-operative injury to major bronchus occurred during 1(9.1%) procedure. Four significant complications occurred in the postoperative period. These include prolonged air leak for more than 20 days (1), severe post operative bleeding that required reoperation (1), post operative pneumonia (1), and over flooding of the opposite lung during extubation (1).

**Table 1.** Socio-demographic characteristics of patients operated for Pulmonary Aspergilloma in TAH, Addis Ababa: 2005-2008

Socio-demographic variable	Frequency (N=11)	Percentage (100%)
<b>Age</b>		
Mean age= 38.9 ± 10. 34yrs		
24-30	1	9.1
31-40	6	54.6
41-50	2	18.2
51-56	2	18.2
<b>Sex</b>		
Male	2	18.2
Female	9	81.8
<b>Residence</b>		
Addis Ababa	3	27.2
Oromiya Region	2	18.2
Tigray Region	2	18.2
Somali Region	2	18.2
Gambella Region	1	9.1
Amhara Region	1	9.1

**Table 2.** Clinical presentations and findings of patients operated for Pulmonary Aspergilloma

Characteristics	Frequency (N=11)	Percentage (100%)
<b>Symptoms during presentation</b>		
Productive cough and hemoptysis	10	90.9
Productive cough without hemoptysis	1	9.1
Fever, weight loss and night sweats	5	45.5
Chest finding	7	63.6
<b>Site of the lesion</b>		
Left Lung	8	72.7
Right Lung	3	27.3
<b>Lobes affected</b>		
Upper lobes	10	90.9
Lower lobe	1	9.1

**Table 2.** Indications of surgery and types of surgery performed

Characteristics	Frequency (N=11)	Percentage (%)
<b>Indications of surgery</b>		
Severe hemoptysis	8	72.75
Severe cough with mild hemoptysis	1	9.1
Suspicious pulmonary mass lesions	2	18.2
<b>Type of Surgery performed</b>		
Left Upper lobectomy	4	36.4
Left pneumonectomy	3	27.3
Limited lung resection	2	27.3
Right upper lobectomy	1	9.1
Right pneumonectomy	1	9.1

**Table 4.** Complications witnessed in patients operated for Pulmonary Aspergilloma

Complications	Frequency (N=7) (Occurred in 3 patients)	Frequency (100%)
Significant intra operative bleeding	3	45.5
Prolonged air leak	1	27.3
Severe post operative bleeding that required reoperation	1	9.1
Post operative pneumonia	1	9.1
Over flooding if the opposite lung		9.1

The prolonged air leak after a right pneumonectomy responded to prolonged chest tube drainage, the patients with significant post operative bleeding had to be re-explored after 6 hours of surgery to control the bleeding from a major bleeding vessel and the post operative pneumonia responded to antibiotics and chest physiotherapy. However, the patient who developed severe contamination of the healthy lung during extubation died on the 4<sup>th</sup> post operative day due to severe respiratory failure, making the postoperative mortality 9.1%.

All the ten patients who were discharged improved were followed up for 6 months and all are symptom free. Histopathologic confirmation of the fungal ball was possible in all 10 patients, the underlying disease identified to be tuberculosis in 9(90%) and bronchiectasis in 1(10%).

## Discussion

During the three-year period, surgery for pulmonary aspergilloma accounted for 5.8% of all thoracotomies done at the hospital. Eleven cases seen over three years in a national referral hospital (average of 3.6 patients per year) in a country where tuberculosis is very rampant might give the impression that aspergilloma is a rare disease. However, we believe this is the tip of the ice berg and many asymptomatic and undiagnosed patients might be still out there.

Aspergilloma in Ethiopia doesn't seem to cluster in particular areas of the country since we have seen that the patients came from all over the country.

In our series, the commonest lung pathology behind the aspergillus lesions was cavitary pulmonary tuberculosis. This is reported from other African and Asian reports but different from a German report which states that bronchiectasis is the most common underlying pathology<sup>16</sup>. Aspergillomas predominantly occurs in the upper lobes, and on the left side. Literature review also shows that this is due to the fact that the upper lobes are prone for cavity formation at the relative imbalance in perfusion and ventilation in the apices, which provides an oxygen-rich environment for invading organisms<sup>3,4,5</sup>. Generally, reports state that patients present with significant hemoptysis and chronic productive cough, which can be life threatening<sup>7,9</sup>. This was also found to be true in our patients.

Radiologically, aspergilloma typically is evident as an upper-lobe, mobile, intra-cavitary mass with an air crescent in the periphery and the adjacent pleura may be thickened<sup>9,13</sup>. In our case, it was in only 4(36.4%) that this typical feature was present. However, at times, the mass might not be easily seen on routine chest radiograph. This occurred in 5(45.5%) of our patients where the cavitary lung lesion was predominantly visualized and two x/rays were suspicious for solid lung neoplasms. It is said that chest CT scan may be necessary to make an accurate diagnosis in such cases<sup>10,13</sup>. However, in developing countries like as Ethiopia, the affordability and routine availability of CT scan is a serious issue. It is worth remembering that aspergilloma usually complicates pulmonary tuberculosis, which intern predominantly occurs in the economically deprived societies. Therefore, we believe that chest x/ray is sufficient enough an investigation to decide on early surgery in patients who present with suggestive symptoms.

A definitive diagnosis of pulmonary aspergilloma can be made after histopathologic examination or culture of the resected specimen. We have found that histopathology is practical since the diagnosis in all our patients was confirmed the same way. However, we didn't routinely do fungal cultures. Isolation of the fungus from sputum is possible but its sensitivity is low given frequent non-pathologic airway colonization<sup>4</sup>. Serological diagnosis has reasonably good sensitivity and specificity but has limited clinical importance in a typical scenario. However, we haven't utilized serology in our patients and we believe that this is a room for improvement.

In our center, we have adopted the policy of early surgical treatment for all cases with aspergilloma. The literature also supports that surgery is the best option of treatment. According to some authors, successful treatment of complex aspergilloma needs both surgery and peri-operative anti-fungal chemotherapy. Amphotericin B, 5-flucytosine, Itraconazole and most recently caspofungin had been utilized and some degree of response has been reported<sup>4,11,12</sup>. Other therapies include intra-cavitary instillation of antifungal agents and embolization of bronchial arteries for hemorrhage. It has also been reported that approximately 10% of aspergillomas spontaneously resolve<sup>13</sup>.

Surgery for pulmonary aspergilloma has been the standard in many centers, but can be associated with high morbidity and mortality<sup>7,9</sup>. The underlying significant pulmonary pathology, the immune status of the patient, malnutrition, and the presence of significant adhesions that make the operative procedures difficult might be related to the complications such as bleeding, residual pleural space, broncho-pulmonary fistula, empyema, and respiratory failure. The mortality from surgery for aspergilloma is reported in the ranges between 7% and 23%<sup>7,8,9,10</sup>. In our series, the mortality was 9.1%, well in range with those reported by others<sup>10,14,15</sup>.

## Conclusion

- Aspergilloma of the lungs is not an uncommon disease in Ethiopia and the diagnosis should be considered in patients who present with hemoptysis or chronic non-resolving cough.
- Tuberculosis is the most common underlying cavitory lesion and aspergilloma of the lungs should be considered if the cough and the hemoptysis fail to respond to standard anti-tuberculosis treatment and the x/rays show cavitory lesions.
- Early surgical consultations should be sought in these cases.

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