

## Surgical Treatment of Pulmonary Aspergilloma

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### ABSTRACT

**Introduction:** Surgical approaches for the management of pulmonary aspergilloma have been accompanied with high levels of morbidity and mortality. However, these therapeutic options are still favored over other approaches for the treatment of pulmonary aspergilloma. The present study was conducted to describe the characteristics of 30 patients with aspergilloma who referred to Ghaem Hospital in Mashhad, Iran, during 2017-2018.

**Material and Methods:** This retrospective study was conducted on 30 patients (i.e., 21 males and 9 females) with pulmonary aspergilloma who were treated via surgery. The patients were examined based on their age, gender, clinical symptoms prior to surgery, affected pulmonary lobe, surgical method, and postoperative complications.

**Results:** The mean age of the patients was 48.13±5.2 years. Hemoptysis (90%) was the most common symptom of pulmonary aspergilloma, followed by productive cough and drug-resistant pneumonia. The most common problematic lobes included left upper lobe and right upper lobe. Regarding the surgical method, 21 and 9 patients underwent lobectomy and segmentectomy, respectively. After the surgery, residual space, wound infection, and bronchopleural fistula were observed in 5 (16.7%), 3 (10%), and 2 (6.7%) cases, respectively. Furthermore, only one patient passed away.

**Conclusion:** As the findings indicated, the methods of surgery (i.e., lobectomy and segmentectomy) were effective in the treatment of pulmonary aspergilloma.

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## Introduction

*Aspergillus* is a common fungus that is responsible for a range of immune system diseases, such as allergic bronchopulmonary aspergilloma in atopic people, chronic cavitary pulmonary aspergillosis, chronic pulmonary

aspergillosis, and invasive pulmonary aspergillosis (1). *Aspergillus* is a saprophyte, which is widely spread across the world. Accordingly, *Aspergillus* species account for a majority of human infections (95%) (2)

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Aspergilloma is comprised of *Aspergillus* hyphae, fibrin, mucus, inflammatory cells, blood, and pieces of the epithelial cells (2). Aspergilloma is formed inside the cavitory lung lesions and leads to the erosion of the wall of the cavity and development of hemoptysis as a result of the bronchial artery erosion (3). Dyspnea and cough are among the symptoms of this disease (4). This condition also causes numerous clinical symptoms and a range of other diseases (5). Aspergilloma can be created in each cavitory lesion in the lung. There are many factors that cause pulmonary cavity, such as tuberculosis, sarcoidosis, pneumoconiosis, histoplasmosis, and bulla (6)

The applied treatments for pulmonary aspergilloma include radiotherapy, instillation of antifungal agent into the cavity or bronchus, inhalation of antifungal agents, use of systemic antifungals, and surgery. Even though the surgery is accompanied by morbidity and mortality, the surgical resection of pulmonary aspergilloma is urged for the patients with severe hemoptysis to preserve the pulmonary function. The surgery is also considered for the patients with underlying sarcoidosis or those with the immunodeficiency and increased *Aspergillus*-specific IgG titre (7,8).

This study aimed to describe the characteristics of 30 patients with aspergilloma who referred to Ghaem Hospital in Mashhad, Iran, during 2017-2018.

## Materials and Methods

This descriptive retrospective study was conducted on 30 patients undergoing surgery due to pulmonary aspergilloma in Ghaem Hospital between 2017 and 2018. The patients were evaluated through reviewing their medical records based on their age, gender, clinical symptoms prior to the surgery, affected pulmonary lobe, surgical method, and postsurgical complications after 3 years of follow-up. The patients who had a history of an associated advanced cancer, limited respiratory function, and extensive bilateral disease were excluded from the study.

### Statistical analysis

All data were entered in SPSS software (version16) using descriptive statistics (e.g., frequency and mean).

## Results

The study population consisted of 21 (70%) males and 9 (30%) females. The mean age of the patients was 48.13 (5.2) years (age range: 4-76 years). With regard to the symptoms, 27 (90%), 12 (40%), and 23 (76.7%) patients suffered from hemoptysis, drug-resistant pneumonia, and

productive cough, respectively. In terms of the involved pulmonary lobe, the left lower, left upper, right lower, and right upper lobes were affected in 1 (3.3 %), 20 (66.7%), 1 (3.3%), and 8 (26.7%) subjects, respectively.

Out of the 30 patients, 21 (70%) and 9 (30%) cases underwent lobectomy and segmentectomy, respectively. Regarding the postoperative complications, 5 (16.7%), 3 (10%), and 2 (6.7%) patients had residual space, wound infection, and bronchopleural fistula, respectively. Furthermore, one of the patients, who was a 76-year-old man, died after the operation due to sepsis. As the findings indicated, the methods of surgery (i.e., lobectomy and segmentectomy) were effective in the treatment of pulmonary aspergilloma.

## Discussion

This study involved the investigation of 21 (70%) males and 9 (30%) females with the mean age of 48.13±5.2 years. Based on the results, the surgical methods showed no significant association with hemoptysis ( $P=0.207$ ), drug-resistant pneumonia ( $P=0.704$ ), productive cough ( $P=0.640$ ), affected pulmonary lobe ( $P=0.624$ ), postoperative complications ( $P=0.644$ ), and mortality ( $P>0.999$ ). As a result, these methods of surgery have been successful in the treatment of these patients.

Sagan assumed that the combined use of surgery and pharmacotherapy would be accompanied with more advantages than the exclusive utilization of surgery. In order to investigate this assumption, he carried out a retrospective study, in which different groups of patients suffering from pulmonary aspergilloma were compared. To this end, he employed two groups, one of which was subjected to surgery and pharmacotherapy, and the other one was treated with surgery alone. The findings of the mentioned study showed that the rate of the common 10-year survival of the patients who were only managed with surgery was higher than that in the other group. Furthermore, the antifungal treatment was reported to have no remarkable effect on the postoperative complications or survival (9).

In a study carried out on 14 adult patients suffering from pulmonary aspergilloma, hemoptysis was reported as the most common symptom, and tuberculosis was the most common underlying disease. In the mentioned study, no patients died during the surgery; however, half of the patients showed some postsurgical complications, the most common of which were prolonged air leak and empyema (4).

Another study involved the evaluation of the surgical outcome through examining 42 patients suffering from pulmonary aspergilloma (i.e., 12

patients with simple pulmonary aspergilloma and 30 cases with complex pulmonary aspergilloma). In the mentioned study, hemoptysis was identified as the most common symptom for surgery, and the common diseases included tuberculosis, bronchiectasis, and lung abscess. Furthermore, lobectomy was the most frequently used surgical method.

In the mentioned study, death (3.3 %) occurred just among the patients suffering from complex pulmonary aspergilloma. They observed a number of non-lethal postsurgical side effects in 12 patients, some of which included empyema, bleeding, prolonged air leak, and wound infection. The rates of the 5-year survival were reported as 91.6% and 83.3% for patients with simple and complex pulmonary aspergilloma, respectively. In the mentioned study, none of the patients showed the recurrence of the disease or hemoptysis (10, 11).

In a longitudinal study performed on 72 and 16 patients suffering from complex and simple pulmonary aspergilloma, respectively, the old age and complex pulmonary aspergilloma were the important risk factors for postsurgical complications. Out of the 14 deaths, only one patient was suffering from simple pulmonary aspergilloma. It was also demonstrated that the long-term outcomes of the pulmonary aspergilloma depend on the underlying lung diseases. Although the patients with complex pulmonary aspergilloma had a higher rate of postsurgical morbidity, surgical treatment resulted in satisfactory outcomes in both groups (12, 13).

Moapatra et al. examined 15 males (62.5%) and 9 females (37.5%) suffering from complex pulmonary aspergilloma with a mean age of 34.54 years. They reported tuberculosis as the underlying disease and hemoptysis as the main symptom in 91% and 79.16% of the patients, respectively. In the mentioned study, X-ray was the method of choice for the diagnosis of the disease. Furthermore, 16 (66.67%) patients were subjected to lobectomy. Mortality and side effects were reported in 1% and 33.33% of the subjects, respectively. Furthermore, the mean follow-up period was 21.65 months during which there were no cases of mortality or hemoptysis recurrence (3).

In a retrospective study, Makin et al. investigated 22 patients with pulmonary aspergilloma (including 18 males with the mean age of 51.0+17.4 years), who had been operated in a 10-year period. In the mentioned study, 46% and 41% of the patients were smokers and alcoholics, respectively. In addition, 50%, 73%, and 17% of the subjects had tuberculosis history, complex pulmonary aspergilloma, and simple pulmonary

aspergilloma, respectively. Hemoptysis was reported as the most common symptom (50%).

The surgical methods applied in the mentioned study included nonclassic lung removal, lobectomy, penectomy, and thoracoplasty conducted on 55%, 27%, 4%, and 2 % of the patients, respectively. There was only one case of death (5%) during the surgery, and 36% of the patients had postsurgical complications, the most common of which were pneumothorax (18%) and empyema (18%). Moreover, a total of 7 deaths were reported due to the associated reasons (n=4) and immunosuppression (n=3). In this regard, the patients with complex pulmonary aspergilloma and simple pulmonary aspergilloma had the mortality rates of 40% and 33%, respectively (14).

In a study performed by Chen et al, the clinical characteristics of pulmonary aspergilloma and its surgical outcomes were evaluated through examining 256 patients suffering from pulmonary aspergilloma managed with surgery during 1975-2010. These patients were divided into two groups of simple pulmonary aspergilloma (group A; n=96) and complex pulmonary aspergilloma (group B; n=160). The main underlying disease was reported as tuberculosis (71.1%).

In the mentioned study, lobectomy was performed in both groups. Furthermore, there were 8, 6, 10, and 16 cases of thoracoplasty, cavernoplasty, bilobectomy, and pneumonectomy in group B, respectively. Regarding group A, 4 and 6 cases of segmentectomy and wedge resection were implemented, respectively. Additionally, 40 (15.6%) patients had postsurgical complications, including residual space (3.9%), prolonged air leak (3.1%), bronchopleural fistula (1.6%), severe bleeding (1.6%), breathing failure (1.9%), and empyema (1.2%). They reported no death during the surgery; however, the total mortality rate was 1.2% during the 30 days after the surgery, and it only occurred in group B. Furthermore, no significant difference was observed between the two groups in terms of the postsurgical complications (P=0.27) (14, 15).

Another study involved a retrospective examination of 208 pulmonary aspergilloma patients between 1979 and 2010. Group 1, including 111 patients, was older than group 2, containing 97 patients. Group 1 had higher number of hospitalization, length of hospital stay, and follow-up duration. In the mentioned study, hemoptysis was the most common presurgical symptom in group 1; furthermore, breathing defect was more severe before the surgery in this group.

Additionally, group 1 had a higher rate of bleeding, while infection and residual pleural space were more common in group 2. Regarding the postsurgical complications, dyspnea was

more common in group 2. However, the disease progression was comparable between the two groups (16, 17).

### Conclusion

As the findings of the present study indicated, the surgical method for pulmonary aspergilloma (i.e., lobectomy and segmentectomy) showed no significant association with gender, clinical symptoms, postsurgical complications, and mortality. Accordingly, these methods can be concluded to be successful in the treatment of this disease.

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This study was approved by the Lung Disease Research Center of Mashhad University of Medical Sciences, Mashhad, Iran.

### Conflict of Interest

None declared.

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