

## Aspergillomas in the lung cavities

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**Objective** Pulmonary aspergilloma usually arise from colonization of aspergillus in preexisting lung cavities. In this study, we aimed to evaluate computed tomography (CT) findings in patients with pulmonary aspergilloma.

**Method** We have reviewed 9 patients with aspergilloma, who referred to the hospital between 1991 and 1996, on their tomographic findings.

**Results** The most common involvement site was upper lobe, which suggested the etiology of tuberculosis.

All patients showed cavitory lesions due to healed tuberculosis except one. Hemoptysis was the most common complaint. Six patients underwent thoracotomy. One patient developed empyema after the operation.

**Conclusion** CT of the chest in the patients with aspergilloma is an important diagnostic tool in the diagnosis of pulmonary aspergilloma.

**Key words** Pulmonary aspergilloma, computed tomography.

### Introduction

The first description of aspergillosis in man was made by Bennett in 1842. The term aspergilloma was first used by Dave almost a century later to describe a discrete lesion that classically colonizes the cavities of healed pulmonary tuberculosis and other fibrotic lung diseases (1). Pulmonary involvement with *Aspergillus fumigatus* is varied and largely dependent on the patient's underlying pulmonary and immune status. Hypersensitivity reactions from inhalation of spores can cause acute allergic bronchopulmonary aspergillosis. Aspergilloma develops from secondary colonization of preexisting lung cavities. Invasive and semiinvasive aspergillosis affect mostly patients with altered immune status (2,3). The diagnosis of pulmonary aspergillosis may be difficult because the disease is uncommon, and aspergillosis produces a wide spectrum of chest radiography findings (4).

We present our experience in the diagnosis of aspergilloma and describe their appearances on computed tomographic (CT) scans.

### Material and Method

Nine patients were referred to the Hospital during the years 1991-1996 with the suspected or confirmed diagnosis of aspergilloma suggested by an abnormal radiograph. Four patients were women and five were men, with an age range of 23-56 years (mean 41.8).

CT scanning was performed with a Toshiba 600 S and Hitachi W450 scanner. Two or five millimeter-thick sections were obtained with a scanning time of 1.8 or 3 seconds with the patient in full inspiration and in the supine position and, when indicated, in the prone position as well. Each scan was then examined with particular reference to the characteristics, number, and position of the aspergillomas. Six patients underwent surgery and histologic specimens were obtained. In three patient, the diagnosis was

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strongly suggested by a positive precipitin test. CT clearly demonstrated pulmonary aspergilloma findings.

### Results

The most common underlying disease was healed pulmonary tuberculosis. The CT appearance in all was consistent with a diagnosis of aspergilloma.

In two patients with aspergilloma (22%) the lesions were bilateral; in two patients, there were multiple aspergillomas. In all cases the aspergilloma occupied the upper lobe. CT and histologic findings correlated well.

All patients complained of hemoptysis, 5 of cough and sputum. All had pleural thickening in CT and fibrotic bands around the cavity, 8 mobile fungus balls, 4 air spaces in fungus balls. The list of the patients and CT findings are illustrated in Table I. Six patients underwent surgery, and one died subsequently due to postoperative empyema resultant sepsis. That patient had also had diabetes mellitus.

### Discussion

Aspergilloma represents a saprophytic growth of *Aspergillus* that colonizes in the pulmonary cavities and is usually located in the upper lobes. Preexisting cavities, cysts, and other air-containing spaces predispose the subject to this superinfection. Cavities of prior tuberculous infections are the most common spaces. Other causes in decreasing frequency include cysts and cavities from sarcoidosis, chronic fungal infections, bronchiectasis, bullae, sites of prior surgery such as lobectomy, pneumonectomy, pulmonary abscesses and bronchial cysts (3).

Table I. Demographic data, symptoms, underlying abnormalities, and CT findings.

No	Age	Sex	Symptoms	Underlying abnormality	CT findings
1	38	M	Hemoptysis, cough , sputum	Pulmonary tuberculosis	Left upper lobe, one aspergilloma, pleural thickening, ball mobile within cavity,air crescent sign
2	56	M	Hemoptysis, cough , sputum	Pulmonary tuberculosis	Left upper lobe, one aspergilloma, pleural thickening, ball mobile within cavity,air crescent sign, air spaces in ball
3	44	M	Hemoptysis	Pulmonary tuberculosis	Bilateral upper lobes, two aspergillomas, pleural thickening, ball mobile within cavity,air crescent sign, air spaces in ball
4	32	F	Hemoptysis	Pulmonary tuberculosis	Right upper lobe, one aspergilloma, pleural thickening, immobile ball filling cavity
5	50	M	Hemoptysis	Pulmonary tuberculosis	Left upper lobe, one aspergilloma, pleural thickening, ball mobile within cavity,air crescent sign, air spaces in ball
6	56	F	Hemoptysis	Sarcoidosis	Right upper lobe, one aspergilloma, pleural thickening, ball mobile within cavity,air crescent sign
7	27	F	Hemoptysis, cough , sputum	Pulmonary tuberculosis	Left upper lobe, one aspergilloma, pleural thickening, ball mobile within cavity,air crescent sign
8	50	M	Hemoptysis, cough , sputum	Pulmonary tuberculosis	Bilateral upper lobes, two aspergillomas, pleural thickening, ball mobile within cavity,air crescent sign, air spaces in ball
9	23	F	Hemoptysis, cough , sputum	Pulmonary tuberculosis	Left upper lobe, one aspergilloma, pleural thickening, ball mobile within cavity,air crescent sign

The most common underlying disease was also healed pulmonary tuberculosis in our cases. We have also demonstrated that aspergillomas lie predominantly in the upper lobes, probably reflecting the predilection for cavity formation at this site and the relative imbalance in perfusion and ventilation in the apices, which provides an oxygen-rich environment for invading organisms.

Generally, patients have chronic productive cough or hemoptysis, which can be life threatening. Pleural thickening may be the earliest sign on chest radiographs before any visible changes in the involved cavity of cyst (2). In our study, all patients complained of hemoptysis, and 5 of chronic productive cough. Pleural thickening was seen on chest radiographs and CT scannings in all cases. Classically the cavities contained mobile rounded masses or fungus balls (Figure 1a, 1b).

Other findings of *Aspergillus* superinfection include thickening of the wall of the cyst or cavity (Figure 2), opacification, or formation of an air - fluid level within the cyst. These masses may exist for years and can calcify. Pathologically, the walls consist of fibrous tissue, inflammatory cells, and abundant vessels that may be the source of hemorrhage (3).

The characteristic appearance of an aspergilloma is one or more rounded masses within a round or ovoid cavity (Figure 3); classically, the mass is demarcated on one aspect from the wall of the cavity by a crescent - shaped collection of air. In some patients, the mycelial ball moves when the patient shifts position. Most of the cavities are in the upper lobes, reflecting the association with tuberculosis and sarcoidosis. In our cases, all patients had upper lobe cavities related to tuberculosis in 8 patients and sarcoidosis in 1 patient.

Their average diameter was 3 to 6 cm. The wall thickness varied. Adjacent pleural thickening was common and often preceded the characteristic radiologic appearance of a fungus ball. Unless hemorrhage, concomitant bacterial infection, or liquefaction of the fungal mass develop air- fluid levels are absent.

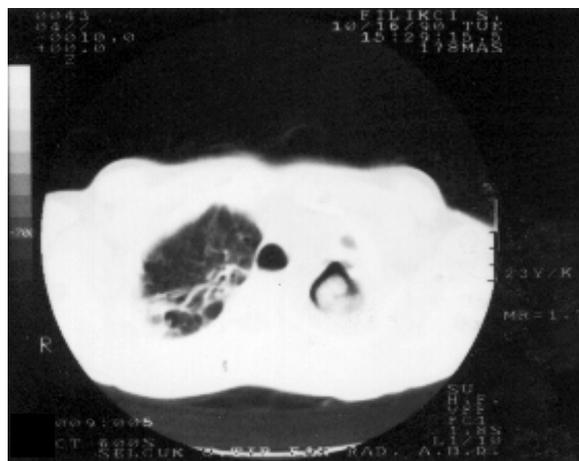




Figure 1. Supine (A) and prone (B) CT scans of 27 years old female patient. Aspergilloma, pleural thickening, ball mobile within cavity in the left upper lobe.



Figure 2. Prone position of CT scans of 23 years old female patient with tuberculosis and Diabetes Mellitus. Aspergilloma, pleural thickening, ball mobile within cavity and air crescent sign in the left upper lobe.



Figure 3. Prone position of CT scans of 50 years old male patient. Aspergilloma, pleural thickening, air crescent sign in both side, and air space in ball on the left side.

On occasion, despite good-quality conventional chest radiographs, pathologic processes involving the lung parenchyma may be detectable on CT when findings on the former study are negative. These

include small, otherwise occult cavitory lung lesions, emphysema, and interstitial disease due to a variety of causes (5). In addition CT is more sensitive for detecting subtle (early) cavitation within a known nodule, and it can provide thorough assessment of the thickness and nodularity of the cavity wall. Early in the development of an aspergilloma, CT may demonstrate an irregular sponge-like network filling the cavity, before a mobile mass later becomes demonstrable (6).

Surgery is the primary choice for treating pulmonary aspergillomas, but it is associated with high morbidity and mortality (7,8). Six patients underwent thoracotomy. The underlying lung disease, diabetes mellitus, chronic bronchitis and emphysema, were related to the poor outcome observed in one patient. Systemic antifungals and steroids have shown limited results in treating aspergillomas. Other therapies include intracavitary instillation of antifungal agents, embolizations of bronchial arteries for hemorrhage, and surgical resection for cases of recurrent hemoptysis. Approximately 10% of aspergillomas spontaneously resolve (2,3). The major clinical concern in patients with pulmonary aspergillomas is massive hemoptysis. Hemoptysis is common, occasionally it is massive and life-threatening. Massive hemoptysis is the cause of death in 5 - 14 % of patients with pulmonary aspergillomas (7,9). In our study massive and / or chronic hemoptysis was the main indication for surgical treatment. Since there is no effective medical therapy for aspergilloma, some clinics recommend surgical removal of all lesions. Indeed, surgical resection of an aspergilloma is the only certain method of cure. Unfortunately, only 20 to 40 per cent of patients with mycetomas are candidates for surgical excision of the lesion. The remainder are disqualified on different grounds: bilateral or multiple aspergillomas, severe pulmonary fibrosis, chronic bronchitis and emphysema, or cor pulmonale (10).

As a conclusion, we would like to point out that the CT is an important diagnostic tool in the diagnosis of pulmonary aspergilloma.

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