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Secondary spontaneous pneumothorax- An unusual clinical presentation of Allergic Bronchopulmonary Aspergillosis

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Abstract

Allergic bronchopulmonary aspergillosis (ABPA) is a Th2 hypersensitivity lung disease in response to Aspergillus fumigatus that affects asthmatic and cystic fibrosis patients. Sensitization to A. fumigatus is common in both atopic asthmatic and CF patients, yet only 1-2% of asthmatic and 7–9% of CF patients develop ABPA. We present a case of ABPA in a young female that presented with secondary spontaneous pneumothorax.

Keywords: Allergic bronchopulmonary aspergillosis (ABPA); Asthma; Cystic fibrosis

Introduction

Aspergillus are ubiquitous spore-forming fungi with about 150-250 species known worldwide. Humans are commonly affected by Aspergillus fumigates (AF), Aspergillus flavus and Aspergillus niger [1,2]. Depending on the virulence of the organism and integrity of host immunity a variety of clinical manifestations are encountered. The clinical manifestations include Aspergilloma (fungal ball), allergic conditions including Allergic Aspergillus Sinusitis, Allergic Bronchopulmonary Aspergillosis [ABPA], chronic necrotizing pulmonary aspergillosis and invasive aspergillosis [3]. Allergic Bronchopulmonary Aspergillosis (ABPA) is a hypersensitivity reaction mounted by the host in response to Aspergillus mycelia that colonize the bronchi. This condition is commonly seen in asthmatics and cystic fibrosis patients.

Case Report

A 21 years old college student presented to the emergency medical services with a history of sudden onset right sided chest pain and chest tightness. On enquiring there was no history of preceding trauma. She had frequent episodes of cough with expectoration and breathlessness in the last five years with seasonal aggravation. There was no past history of tuberculosis or a family history of asthma or allergy. Upon presentation, she was dyspneic, tachypneic but maintained oxygen saturation at room air. On auscultation of chest there was absent breath sounds in the right mammary and basal areas with occasional coarse crepitations in the right infra-axillary area. Scattered polyphonic wheeze and crepitations were heard on the left side. Chest X-ray (CXR) showed right partial pneumothorax with mediastinal shift to left and fibrosis and bronchiectatic changes involving the left upper and middle zone (Fig. 1). A diagnosis of right sided secondary spontaneous pneumothorax was made and an intercostal chest tube drainage (ICTD) was performed. Her hemogram showed peripheral eosinophilia. High resolution computed tomography (HRCT) of chest showed bilateral central and peripheral bronchiectasis and right upper lobe paraseptal emphysematous changes (Fig. 2). In view of central bronchiectasis and peripheral eosinophilia a possibility of ABPA was considered. On further evaluation, skin prick test for aspergillus fumigatus was positive, Serum total IgE was elevated , serum specific IgE for aspergillus was raised and serum precipitins (IgG) for aspergillus was positive. Considering the history, radiological and serological parameters a diagnosis of ABPA was made. Post ICTD the patient symptomatically improved (Fig. 3). Pleurodesis with tetracycline was performed to prevent recurrence. A diagnosis of stage V ABPA (fibrosis stage) with right sided secondary spontaneous pneumothorax was made. Patient is currently on inhaled bronchodilators and corticosteroids. She was symptomatically better till the last contact.

Discussion

ABPA was first described in 1952 by Hinson and colleagues [4]. Though more than half a century has passed the complete pathogenesis of ABPA is still not completely understood. ABPA is predominantly an immunoglobulin E (IgE) mediated type1 hypersensitivity disease. However a recent review has suggested possible immunoglobulin G (IgG) mediated type III and cell mediated type IV hypersensitivity reactions are in the pathogenesis [3]. The prevalence of ABPA is believed to be about 1-2% in asthmatics and 2-15% in cystic fibrosis patients [5]. However in a recent study from north India the prevalence of ABPA was about 27% [6]. It clinically manifests as chronic asthma, recurrent pulmonary infiltrates, and bronchiectasis.

A genetic predisposition seems to be essential in the pathogenesis. In genetically susceptible person, inhaled spores of Aspergillus fumigatus germinate into hyphae with subsequent release of sensitizing antigens. These antigens affect the mucociliary clearance and breach the airway epithelial barrier resulting in activation of innate

and adaptive immunity of the lung leading to an exaggerated immune response [1,3]. In addition to antigen mediated immune response, proteases derived from Aspergillus fumigatus also cause epithelial cell injury and protective barrier disruption triggering immune hypersensitivity by inducing inflammation. Further these proteases also stimulate cytokines like IL8 and release of growth factors resulting in tissue damage and bronchiectasis [7,8] Genetic risks identified in the development of ABPA include HLA-DR and HLA-DQ, IL-4 receptor alpha chain (IL-4RA) polymorphisms, IL-10-1082GA promoter polymorphisms, surfactant protein A2 (SP-A2) polymorphisms, and cystic fibrosis transmembrane conductance regulator gene (CFTR) mutations [9].

ABPA frequently presents in the third or fourth decade with no gender predilection although childhood presentation has been reported [10]. The most common clinical presentation is uncontrolled asthma despite appropriate asthma treatment. Majority of these patients present with low-grade fever, myalgia, cough, that is usually productive, wheezing episodes and hemoptysis. More than 1/3rd of patients also complain of expectoration of brownish black mucus plug in sputum. This symptom when present along with hemoptysis and pulmonary opacities in asthmatics is highly suggestive of ABPA [3].

ABPA is diagnosed based on a combination of clinical, radiological and serological parameters. Radiological findings also have a prognostic value [3]. CXR findings in ABPA may be transient or permanent. Transient findings include consolidation, nodular shadows, non-homogenous opacities, tram lines, toothpaste shadows, finger-in-glove opacities and fleeting opacities. Permanent findings are parallel-line and ring shadows, bronchiectasis and extensive fibrosis [11]. High resolution computed tomography (HRCT) of the chest has more diagnostic utility than to in the diagnosis of ABPA.

HRCT findings in ABPA include central bronchiectasis that is extensive and involving three or more lobes, hypodense mucus plugging, High-attenuation mucus (HAM), centrilobular nodules with or without tree in bud opacities, mosaic attenuation, areas of collapse and consolidation [11]. HAM is seen in up to 20% of patients [11].

There is no single test to diagnose ABPA. Diagnostic criteria's have been proposed and debated. Rosenberg and Patterson proposed diagnostic criteria in 1977 [12]. The criteria were further modified by Greenberg to include minimal disease criteria [13]. Rosenberg- Patterson criteria has been widely used in establishing the diagnosis of ABPA. The criteria have major and minor components. The components of the criteria are given below:

Major criteria

- Asthma
- Fleeting pulmonary opacities on chest x ray
- Skin prick test positive for Aspergillus
- Eosinophilia
- Precipitating antibodies (IgG) in serum
- Elevated serum IgE (1,000 IU/mL)
- Central bronchiectasis
- Aspergillus fumigatus-specific IgG and IgE (more than twice the value of pooled serum samples from patients with asthma who have Aspergillus hypersensitivity)

Minor criteria

- Presence of Aspergillus in sputum
- Expectoration of brownish black mucus plugs
- Delayed skin reaction to Aspergillus antigen (type III reaction)

The presence of six out of eight major criteria makes the diagnosis almost certain. This criteria is debated as it includes bronchiectasis which occurs in the advanced stage of the disease. To detect patients at a early stage, a minimal disease criteria proposed by Greenberger [13] can be applied. This minimal disease criteria includes: 1) asthma, 2) immediate cutaneous reactivity to A. fumigatus, 3) total serum IgE >1000 ng•mL−1 4) elevated serum specific aspergillus fumigatus IgE /IgG-A and 5) central bronchiectasis in the absence of distal bronchiectasis. In the absence of central bronchiectasis but with the presence of other minimal disease criteria, the disease can be classified as serological ABPA (ABPA-S). Serological ABPA is the early phase of the disease. With the presence of central bronchiectasis the disease can be termed as ABPA-CB.

Five pathological stages of ABPA has been identified and described [14]. These stages include 1. acute stage 2. stage of remission 3. stage of exacerbation,4. stage of steroid dependent asthma and 5. fibrotic stage. A person with ABPA does not necessarily pass through all the stages.

ABPA presenting with spontaneous pneumothorax is a less common event. In ABPA, though central bronchiectasis is more common, upto 40% of patients can have peripheral bronchiectasis [11]. The rupture of these subpleural cystic spaces can result in pneumothorax [15]. Judson and colleagues reported a case of secondary spontaneous pneumothorax in an ABPA patient and postulated that in ABPA a ball valve obstruction of small airways by thick mucus dislodgement from adjacent bronchiectatic segments. This obstruction can lead to distal air trapping and subsequent rupture and pneumothorax [16].

Systemic corticosteroids form the main stay of treatment of ABPA. Long duration of steroids is required to attain remission and prevent relapse. The recommended dose is 0.5 mg/kg/day for the first 2 weeks, followed by a progressive decrease in dose over the next 6–8 weeks.[17] Treatment of underlying asthma should be continued. Role of antifungals like Itraconazole are not well established. Studies have

shown a 16 week course of Itraconazole that improved clinical outcome in stage V ABPA [17]. Serial monitoring of IgE is required to look for remission or relapse. Treatment of pneumothorax secondary to ABPA requires intercostal tube drainage and pleurodesis [15].

Conflicts of interest: None declared

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