Allergic bronchopulmonary aspergillosis presenting with a pulmonary mass mimicking lung cancer

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Abstract
A 48-year-old man with a history of asthma visited our hospital for the investigation of a high density mass at the right hilum. Laboratory data revealed elevated serum carcinoembryonic antigen. A bronchoscopy was performed to rule out lung cancer; however, mucoid impaction was found without malignant or bacterial cells. On the basis of peripheral blood eosinophilia, elevated total serum IgE, and immediate cutaneous reactivity to Aspergillus fumigatus, he was diagnosed with allergic bronchopulmonary aspergillosis. The radiographic findings and serum carcinoembryonic antigen levels improved with corticosteroids. Pulmonary masses are uncommon findings and serum carcinoembryonic antigen may be a useful marker of the disorder.

Introduction
Allergic bronchopulmonary aspergillosis (ABPA) is an immunological pulmonary disorder caused by hypersensitivity to Aspergillus fumigatus (A. fumigatus), presenting with asthma, recurrent pulmonary infiltrates, and bronchiectasis [1]. With the development of ABPA, asthma typically worsens and may manifest with a new or worsening cough or an increase in sputum production or wheezing; however, patients can occasionally be asymptomatic and the disorder is diagnosed on routine screening of asthmatic patients [2]. Chest radiographs that demonstrate fleeting parenchymal opacities or bronchiectasis trigger a consideration of ABPA. Findings noted on high-resolution CT include central bronchiectasis, mucoid impaction, mosaic attenuation, presence of centrilobular nodules, tree-in-bud opacities, and uncommon pulmonary masses [2]. In this communication, we describe a patient with ABPA whose asthma was controlled, but who presented with a pulmonary mass mimicking lung cancer with an elevation of serum carcinoembryonic antigen (CEA).

Case Report
A 48-year-old man visited our hospital for the investigation of abnormal shadows on a chest X-ray at his annual medical examination. He was a warehouse manager with a past history of smoking (12 pack-years), having quit for 10 years. He had a past history of allergic dermatitis and a 30-year history of bronchial asthma, which had been diagnosed at a primary care clinic based on recurrent wheezing episodes. Without controller medicines, he had been hospitalized twice due to asthmatic attacks, but his asthma had been clinically controlled for the previous 2 years with budesonide 400 mg/day. There was no history of fever, chills, weariness, or weight loss. The chest X-ray and CT scan showed a high density round mass (3 cm × 2 cm in diameter) at the right hilum with obstruction of the right upper lobe bronchus and infiltrative shadows reaching the peripheral area of the right upper lung field (Figure 1). Laboratory data on the first visit revealed a white blood cell count of 4900/μL with 21% eosinophils and serum CEA of 14.9 ng/mL. CEA is the most commonly used tumor marker in patients suspected of having lung cancer in our hospital. The radiographic findings and serum CEA elevation urged us to examine the presence of lung cancer; however, a bronchoscopy revealed mucoid impaction in the orifice of the right upper lobe bronchus. With the biopsy and bronchoalveolar lavage, there were neither malignant nor bacterial cells, including fungus. Additional laboratory data showed total serum IgE of 13,900 IU/mL and specific IgE was positive for A. fumigatus, Alternaria.
alternata, Candida albicans, Cladosporium herbarum, and Penicillium notatum (ImmunoCAP system; Phadia, Uppsala, Sweden), whereas serum precipitins to A. fumigatus (Cosmo Bio Co., Ltd., Tokyo, Japan) were negative. An immediate skin reaction was positive to A. fumigatus, Cladosporium cladosporioides, and Penicillium luteum (Torii Pharmaceutical Co., Ltd., Tokyo, Japan). Pulmonary function tests revealed a moderate obstructive impairment: a FEV1 of 1.96 L (62.2% of predicted), FVC of 3.15 L (80.8% of predicted), a FEV1/FVC of 62.2%, and the fraction of exhaled nitric oxide was 116.8 ppb. Thus, we diagnosed the patient clinically with ABPA on the basis of the criteria of Rosenberg (positive for 5 of 7 primary findings) [1], and initiated oral corticosteroid therapy (prednisolone 30 mg/day; 0.5 mg/kg body weight). One month later, laboratory data revealed a white blood cell count of 5500/μL with 6% eosinophils, total serum IgE of 7500 IU/mL, and serum CEA level of 5.2 ng/mL. The fraction of exhaled nitric oxide decreased to 76.1 ppb and CT findings improved markedly (Figure 2). Tapering of prednisolone was then started.

Discussion

Radiographic studies of patients with ABPA report high-resolution CT findings with a great wide spectrum. The common appearances are central brochiectasis, mucus plugging with bronchoceles, consolidation, centrilobular nodules with tree-in-bud opacities, bronchial wall thickening, atelectasis, and mosaic perfusion with air trapping on expiration [2]. A previous study reported that bronchiectasis and centrilobular nodules were highly suggestive of ABPA, which was found in more than 90% patients with ABPA [3]. The uncommon findings included high-attenuation mucus (the finding most helpful in differential diagnosis), pleural involvement, and pulmonary masses [3]. In the present case, the high density round mass at the right hilum mimicked lung cancer with obstruction of the right upper lobe bronchus. It is possible that the mass was mucus plugging the upper lobe bronchus.

CEA, a glycoprotein, is mainly used as a tumor marker for colorectal cancer, gastric cancer, pancreatic cancer, lung cancer, and breast cancer; however, serum CEA levels may also be raised under some non-neoplastic conditions, including ulcerative colitis, pancreatitis, cirrhosis, diffuse panbronchiolitis, asthma, idiopathic pulmonary fibrosis, and smokers [4, 5]. The detailed mechanisms of elevated serum CEA have not been proven; however, it is suggested by immunohistochemical studies that CEA is secreted from epithelial hypertrophic cells in destructive bronchi and spills over into the blood stream [5]. In the present case, the serum CEA level fell to a near normal level after one-month
treatment with prednisolone, suggesting that serum CEA may be a useful marker to assess disease conditions and whether treatment is effective.

Since the current recommendation is to consider an antifungal agent as a corticosteroid-sparing agent or if corticosteroids alone are ineffective [2], we did not use antifungal agents, such as itraconazole, in the present case.

Disclosure Statements
No conflict of interest declared.

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

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