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Pulmonary Alveolar Microlithiasis

A 40-year-old male patient was referred with a history of exertional shortness of breath since a few years ago. Spirometric findings were consistent with a restrictive ventilatory defect. Plain chest radiographs showed sand-like opacities throughout both lungs predominantly in the lower zones. Computerized tomographic scan revealed diffuse bilateral calcified fine nodular pattern. The diagnosis of pulmonary alveolar microlithiasis was confirmed by transbronchial biopsy.

Keywords: computerized tomography, bronchoscopy, biopsy, needle

Introduction

Pulmonary alveolar microlithiasis is a rare disease of unknown etiology is characterized by deposition of calcium phosphate microliths within the pulmonary alveoli.[1] Harbitz first reported the disease in 1918; since then over 400 individuals with this condition have been reported.[2, 3] The pathogenesis of the disease remains obscure; however, isolated inborn errors of calcium metabolism have been proposed as a probable etiology.[3] An autosomal recessive mode of inheritance is suspected.[3] This disease is especially prevalent in Turkey, which consistutes 33% of the literature in the field.[4]

Case Report

A 40-year-old man presented with exertional shortness of breath since a few years ago. There was no history of expectoration, hemoptysis, chest pain, cough or tuberculosis. On chest auscultation, there were bilateral end-inspiratory crackles at the lung bases. He was a nonsmoker and had no history of significant exposure to any noxious dust. No familial history of similar pulmonary problems was found. Resting arterial blood gas values in room air were as follows: PaO2 = 68 mmHg, PaCo2=40 mmHg, pH= 7.38 and O2 saturation= 92%. Pulmonary function test showed vital capacity= 2.32 lit (71% pred.), forced expiratory volume in one second= 1.92 lit (81% pred.).

On chest radiograph PA (Figure 1), there was diffuse fine micronodulation involving both lungs with sharply defined nodules measuring less than 1 mm in diameter. The overall density was greater over the lower zone than the upper. Computerized tomographic scan (mediastinal window) findings consisted of calcific nodules measuring 1 mm or less in diameter with area of confluence that distributed predominantly along the mediastinal border and dorsal portion of the lungs (Figure 2).

Calcific interlobular septal thickening could be seen in the anterior portion of the lungs. These findings produce a sandstorm appearance in the lungs. Calcific nodules are less in periphery of the lungs. Transbronchial lung biopsy was performed through fiberoptic bronchoscopy. The histologic appearance (Figure 3) revealed concentrically laminated intra-alveolar calcium phosphate microliths, which confirmed the diagnosis of pulmonary alveolar microlithiasis.

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Discussion

Pulmonary alveolar microlithiasis has no predilection for either of genders. As the disease progresses the patient often develops exertional dyspnea. The pathogenesis of the disease remains unknown, but inborn errors of calcium metabolism are implicated by the high rate of familial association (>50%).[5, 6] The total number of reported cases is about 400 most of which have been from Turkey.[4]

Most cases are diagnosed at the third to fifth decades of life. Most patients are asymptomatic on presentation. There is a striking contrast between the paucity of clinical signs and symptoms and the marked radiographic features. The presenting symptoms are dyspnea on exertion and a nonproductive cough. Our patient presented with gradually progressive dyspnea on exertion. Auscultation may reveal diminished respiratory sounds and fine inspiratory crackles. Cough and dyspnea are usually reported late in the disease course and are associated with restrictive lung disease and gas exchange impairment.[7] With the development of interestitial fibrosis, signs of cor pulmonale appear.[5, 8] Although a positive family history is observed in more than half of the reported cases, the family history of our patient was negative for the disease.[9]

Pulmonary function studies are initially normal. About 30% of patients with PAM eventually develop abnormal pulmonary function studies. In most patients, a mild restrictive defect evolves. The most common findings are decreased vital and total lung capacities, normal residual volume/total lung capacity ratio, and a decreased diffusing capacity.[7,10] Chest radiography characteristically shows diffuse bilateral calcific micronodules with a predilection for the lower zones forming a pattern of fine sand-like opacification throughout the lungs, described as a "sandstorm". The individual microliths are well defined and usually less than 1 mm in diameter. The micronodules are alveolar that produce air bronchograms and radiographically obliterate the heart borders, pulmonary vessels, and the diaphragm.[11] In the later stages, radiographic signs of pulmonary hypertension, pulmonary fibrosis, and a restrictive pulmonary defect appears. Reduced diffusing capacity for carbon monoxide and severe gas exchange eventually

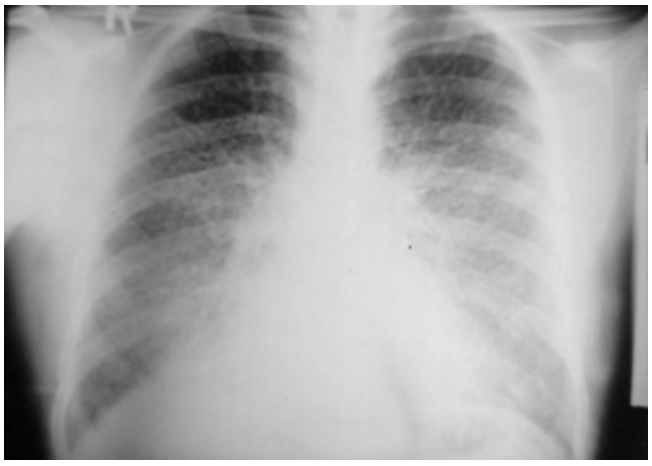

Fig 1. Chest radiograph showing diffuse nodulation with fine sand-like micronodular pattern involving both lungs with greater involvement at the lung bases.

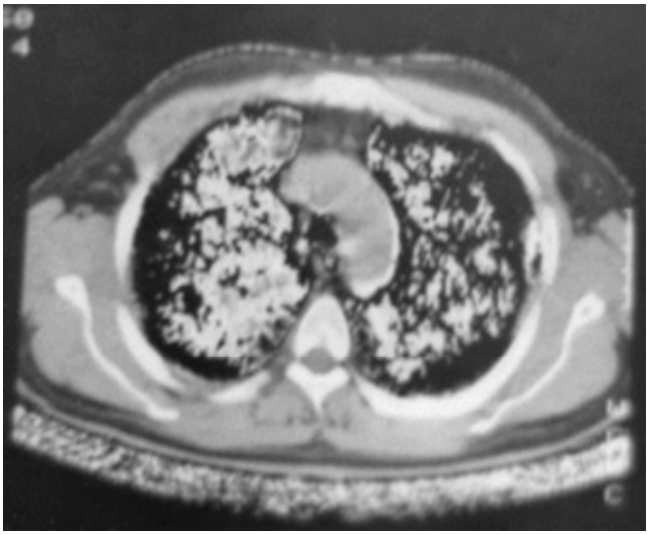

Fig 2. A computed tomographic scan shows bilateral diffuse calcific densities on both lungs.

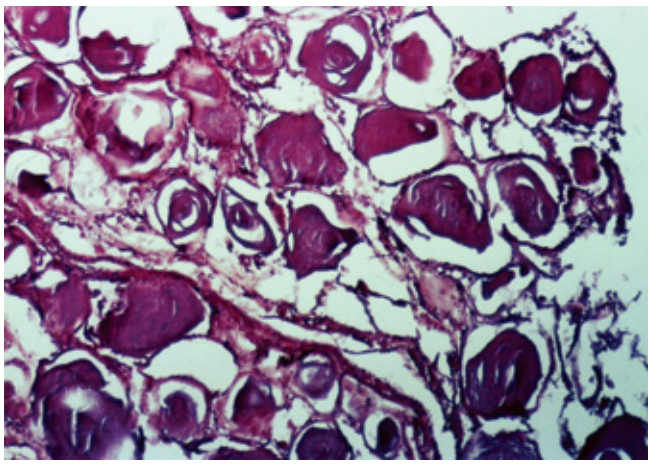

Fig 3. Histopathologic findings of transbronchial biopsy (hematoxylin-eosin stain) show intraalveolar microliths with concentric lamellar structures.

results in respiratory failure.

Several reports have characterized pulmonary alveolar microlithiasis on conventional CT and HRCT.[12,13] The predominant CT findings consist predominantly of micronodular calcifications primarily found along the bronchovascular bundles and subpleural regions with a perilobular distribution.[12] Ggroundglass opacities interspersed with microcysts and calcispherytes.[12] Felson described the "black pleural line", a zone of increased translucency between the lung parenchyma and the ribs.[14] On HRCT, the "black pleural line" are confused to be due to thin-walled subpleural cysts.[12,13] In addition to the fine nodulation, CT may show polygonal-shaped calcified densities caused by the accumulation of microliths in the periphery of the lobule.[15]

The differential diagnoses of this disease are clinical entities associated with pulmonary calcification, including: metastatic pulmonary calcification, pulmonary alveolar proteinosis, amyloidosis, hyperparathyroidism, previous DNA virus infection, chronic renal failure, and pulmonary vascular diseases.[16] Technetium (99m Tc) bone scintigraphy or transbronchial lung biopsy can provide confirmation.[17, 18]

There is no known therapy for pulmonary alveolar microlithiasis. Corticosteroids, chelating agents and bronchoalveolar lavage have demonstrated no benefit, and the role for the use of bisphosphonates remains to be proven.[19, 20] Bilateral lung transplantation is a viable option for far-advanced cases.[21, 22]

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