

## CASE REPORT

### Pulmonary Alveolar Microlithiasis

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#### ABSTRACT:

Pulmonary alveolar microlithiasis (PAM) is a rare disease which is characterized by the presence of small calculi in the alveolar space in both lungs. We report a case of a 20-year-old man with a history of shortness of breath on exertion and dry cough. Physical examination was altered only for crackles at auscultation. Pulmonary function revealed a mild restrictive ventilatory defect and the chest radiograph demonstrated paracardiac confluence of dense micronodular infiltrate. High-resolution CT scan revealed diffuse ground glass attenuation and septal thickening, more pronounced in lower pulmonary regions, with calcifications along the interlobar septa and subpleural regions. Diagnosis of PAM was finally confirmed on transbronchial lung biopsy and histological examination.

**Keywords:** Microlithiasis, pulmonary, alveolar

#### INTRODUCTION:

Pulmonary alveolar microlithiasis (PAM) is a rare, chronic lung disease characterized by the presence of round little bodies containing concentric calcareous lamellas in pulmonary alveolus. There is paucity of symptoms in contrast to the imaging findings. The radiographic appearance of the disease is pathognomonic, chest radiographs show diffuse micronodular shadows. Earlier, the diagnosis was primarily made at autopsy, whereas nowadays diagnosis is made by transbronchial biopsy and bronchoalveolar lavage. Etiology and pathogenesis of pulmonary alveolar microlithiasis is not known. There are certain hypothesis for the etiology and pathogenesis of pulmonary alveolar microlithiasis but none of them are satisfactory. The incidence is similar in all continents, in both sexes and it is higher in age between 20 and 50 years. Familial incidence has also been reported by some authors. There is no known specific treatment to date.

We present one such case, a 20 year old serving soldier who was admitted and diagnosed for the first time to be suffering from Pulmonary Alveolar Microlithiasis.

#### CASE REPORT:

A 20 years old male, non-smoker, soldier by occupation reported in our hospital with three months history of progressive breathlessness on exertion, which was almost the same since its onset. Auscultation of lungs revealed random wheezes and coarse inspiratory crackles with vesicular breathing. He had no history of fever, chest pain, anorexia, weight loss or recent change in voice. Vitals were within normal range and no anomaly was detected on detailed examination of the chest and other systems. Blood complete picture, differential leucocyte count, RFTs, LFTs, ANA, c-ANCA, urinalysis, skin tests for tuberculosis, and studies for acid-fast bacilli, Serum calcium, phosphate and PTH were all within normal range. Chest radiograph revealed bilateral micronodular sand-like opacities more so in middle and lower zones. His family members were X rayed, but none of the family members showed any abnormal radiological feature. Pulmonary function tests revealed typical features of a restrictive defect with a reduced forced vital capacity of 71.69% predicted, FEV<sub>1</sub> of 74.94%, FEV<sub>1</sub>% of 104% and PEF OF 110.51%. CT scan [Figure II] revealed generalized fine nodular opacities along with interlobular and septal thickening forming confluent areas of lung calcification bilaterally. There was mild lymph node enlargement in subcarinal region.

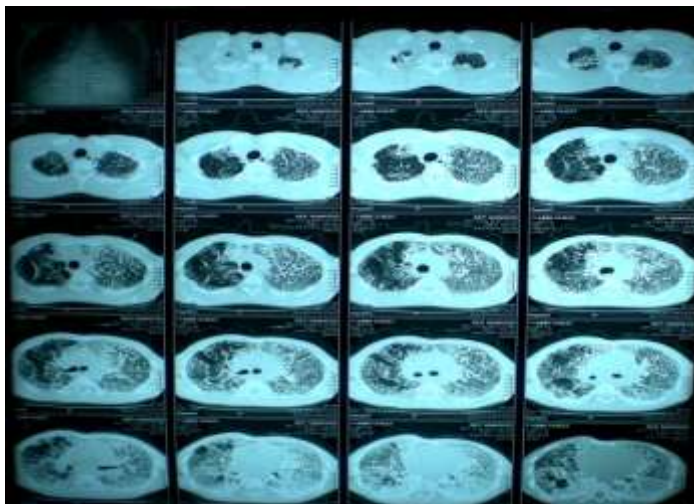
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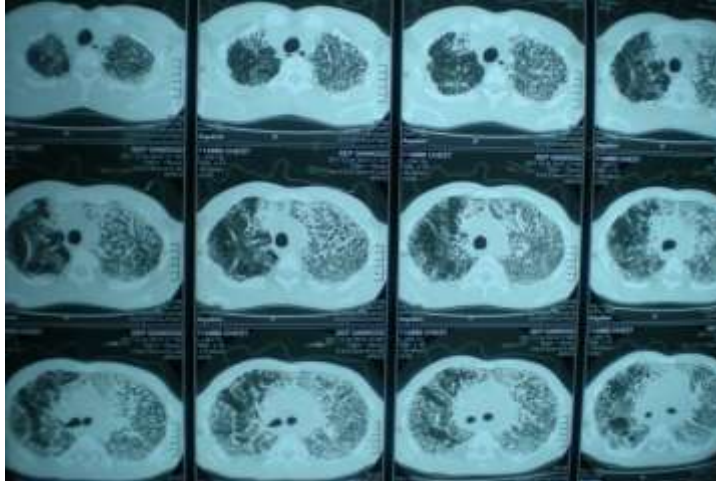
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Also there was evidence of multiple tiny calcified nodular opacities within the alveoli scattered in both the lung fields and multiple calcified plaques were seen along the costal pleura bilaterally, predominantly in the lower lobes. These features were consistent with the diagnosis of pulmonary alveolar microlithiasis. Transbronchial lung biopsy was done which showed the infiltration of interstitium with chronic inflammatory cells, mainly the lymphocytes, plasma cells and monocytes along with areas of fibrosis.



**Figure I:** X-Ray revealing diffuse bilateral calcified fine nodular pattern with extensive septal thickening.





**Figure II:** High-resolution CT scan reveals diffuse ground glass attenuation and septal thickening, more pronounced upper and middle pulmonary regions.

#### **DISCUSSION:**

PAM is a rare autosomal recessive disease with poorly defined etiology and pathogenesis affecting both genders equally. It is characterized by numerous small calculi (denominated calciferites, calcospherites or microliths) within air spaces<sup>1</sup>. Patients remain mostly asymptomatic for many years and do become symptomatic between the third and fourth decades<sup>2</sup>. Patients usually present with progressive deterioration of the pulmonary function of restrictive pattern. Respiratory failure and cor pulmonale are the impending lethal complications of this disease. The disease presents a high incidence of familial occurrence (approximately one-third of the cases)<sup>2-4</sup>. Mutation in the type IIb sodium-phosphate cotransporter gene (SCL34A2 gene) accepted responsible for the pathologic changes seen in the pulmonary parenchyma in PAM. It is involved in phosphate homeostasis in several organs, including the lung as proved by recent research evidence. SCLC34A2 expression is observed in type II alveolar cells. These cells use phospholipids to produce surfactant and are also responsible for recycling and degrading the outdated surfactant<sup>3, 6</sup>. This leads to reduced clearance of the phosphate released in this process and the formation of microliths. Disodium etidronate, inhibits microcrystal growth of hydroxyapatite and thus inhibits ectopic calcification, has been used to treat PAM. Although some reports show little or no benefit with the use of disodium etidronate, a recent study, regarding the long-term results of the treatment in two cases, demonstrated an improvement at the patients PFT and radiological changes<sup>4,7</sup>. Besides that, some authors demonstrated the usage of measuring the serum concentration of surfactant protein-A (SP-A) and surfactant protein-D (SP-D) in patients with PAM. Alveolar type II cells and Clara cells produce these two proteins in the lungs. The diffuse parenchyma fibrosis, consequent to PAM, causes an increase in permeability, leading to an increase in the levels of these two proteins in the blood. Therefore, SP-A and SP-D measurement may be an alternative to monitor the progression and activity of the disease<sup>4,6</sup>. These exams were not performed in our patient. Nevertheless, no effective treatment for end stage PAM currently exists, with the exception of lung transplantation. Until now, seven successful cases have been reported, with no recurrence of the disease. Transplantation should be considered in cases where either severe respiratory failure or right heart failure is present. Patients who undergone lung transplantation has shown increase in right ventricular ejection fraction and regression of right ventricular hypertrophy<sup>6-8</sup>

In the radiological diagnosis of PAM, chest radiographs usually reveal diffuse, bilateral areas of micronodular calcifications (“sand storm”) that predominate in the middle and lower lung areas<sup>3</sup>. The HRCT findings in patients with alveolar microlithiasis vary considerably. Ground-glass opacities are the most common finding described in literature. This pattern occurs probably due to small calculi in the air space. Subpleural linear calcification, confluent and diffuse calcified nodules and dense consolidations are also a common finding<sup>4,5</sup>. There is no known medical treatment to reduce or halt the progression of the disease. Palliative treatments with systemic corticosteroids, calcium-chelating agents and serial bronchopulmonary lavage have been shown to be ineffective. Attempts to reduce calcium phosphate precipitation in pulmonary alveoli have been tried with diphosphonate. Lung transplantation remains the only possible treatment for end-stage cases.<sup>1,6-8</sup>

Clinicians should have in mind that some findings seen in PAM, such as nodular calcifications, can be found in other diseases like tuberculosis, metastatic osteosarcoma, amyloidosis and silicoproteinosis. Besides that, dense consolidations can also be found in metastatic pulmonary calcification, talcosis and amiodarone lung toxicity. In this way, associated CT findings and clinical features should always be correlated, since these diseases have different kinds of presentation and evolution.<sup>3,5,9</sup>

In conclusion, PAM is a rare disease that can affect young patients, with chronic and deteriorating evolution. Clinicians should be aware of its existence and the radiological features associated. The micronodular pattern seen in chest radiography can sometimes be misdiagnosed as miliary tuberculosis or other diseases that present with this pattern. In this way, HRCT should always be performed since it can reveal characteristic patterns of alveolar microlithiasis, reserving lung biopsy for atypical and inconclusive cases.

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