A 55-year-old woman presented with intermittent palpitations. She received a diagnosis of paroxysmal atrial fibrillation and was treated accordingly. Her history was significant for lung disease, diagnosed with chest radiograph when she was in her teens. Her brother had also received a diagnosis of lung disease when he was in his late teens. She is an accountant who does not smoke. She was treated with several inhalers (albuterol, salmeterol, and fluticasone) and supplemental oxygen at night and as required during the day. She did not undergo lung biopsy and has been assessed for a possible lung transplantation.

Physical examination revealed a well-looking white female subject comfortable at rest while receiving 2 L of oxygen. She was afebrile and talking in full sentences. Her BP was 116/76 mm Hg, and her pulse was irregular at 115 beats/min. Her respiratory rate was 24 breaths/min, with oxygen saturation of 95%. She had early digital clubbing with no peripheral cyanosis or cervical/axillary lymphadenopathy. Chest expansion was symmetrical. She had several scars over the left chest consistent with previous tube thoracostomies. The percussion note was resonant, and auscultation revealed attenuated breath sounds with bilateral fine end-inspiratory crackles most pronounced over the lung bases.

Findings of initial WBC count, hemoglobin, platelet count, and electrolytes were normal. ECG revealed an irregular rhythm with absent P waves and a fast ventricular rate consistent with atrial fibrillation. Chest radiograph revealed almost complete “whiteout” of both lung fields, with diffuse modular opacities (Fig 1).

Pulmonary function testing revealed decreased lung volumes (vital and total lung capacity to 64% and 61% of predicted, respectively) and decreased diffusing capacity (diffusing capacity/alveolar volume of 70%).

What is the diagnosis?
Diagnosis: Pulmonary alveolar microlithiasis

Pulmonary alveolar microlithiasis (PAM) is a rare disease first described by Harbitz in 1918. It is so rare that by 1975, < 100 cases were described in the literature. It is a disease of unknown cause, where calcium phosphate microliths are deposited within the lung alveoli.

Theories of pathogenesis are based on acquired abnormalities of calcium and phosphate metabolism. Although the microliths are usually confined to the lungs, there are reports of microliths appearing in other tissues (e.g., kidneys, prostate, sympathetic chain, and gonads). They have even been found in the organs of other species (e.g., orangutans and binturongs).

More than half the cases occur in families, suggesting a genetic defect. However, since siblings are predominantly affected, it appears that environmental factors may be important as well.

Microliths are formed in the alveolar walls and are released into the alveolar space. They range from 0.01 to 3 mm in size; they are round, oval, or irregular in shape and have a concentric laminated appearance. Initially, the alveolar walls appear normal and, later on, thicken with fibrosis. Bullae often develop in the apices.

The radiographic features can be pathognomonic. The basic pattern is a fine sand-like opacification throughout the lungs, described as a "sandstorm." The individual microliths are well defined and usually < 1 mm in diameter. Due to greater depth of lung tissue, the number of microliths increases in the lower lung fields. Pneumothorax, pleural thickening, and pericardial calcifications can also occur.

The differential diagnosis includes hemosiderosis, histoplasmosis, stamnosis, metastatic carcinomatosis, pulmonary adenomatosis, miliary tuberculosis, pneumoconioses, sarcoidosis, amyloidosis and metastatic pulmonary calcification associated with chronic renal failure and hemodialysis.

Most patients are asymptomatic on presentation. There is a striking contrast between the paucity of signs and symptoms and the marked radiographic features. The initial symptoms are dyspnea on exertion and a nonproductive cough. Auscultation may reveal diminished breath sounds and fine inspiratory crackles. Subsequently, they may develop respiratory failure with cyanosis and signs of right ventricular failure.

In addition to the chest radiograph, other methods can be used to establish the diagnosis of PAM. Surprisingly, microliths in the sputum and BAL are not diagnostic, because patients with COPD and tuberculosis expectorate microliths as well. CT and the 99mTc diphosphonate scan have been used to confirm diffuse calcifications in PAM. CT scan of the chest reveals a diffuse infiltrative pattern, and the 99mTc diphosphonate scan reveals increased uptake of the isotope throughout both lungs.

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 capacity; normal residual volume/total lung capacity ratio, and decreased diffusing capacity.

There is no specific treatment for PAM. Broncho-pulmonary lavage and corticosteroids have no effect. Treatment is supportive with supplemental oxygen. Some patients may benefit from lung transplantation.

References