

Image Diagnosis: Bronchioloalveolar Carcinoma Presenting as Unilateral “Crazy-Paving” Pattern on High-Resolution Computed Tomography

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CASE REPORT

A 70-year-old man presented to our hospital with 18 months of cough and breathlessness. He was tachypneic and had decreased breath sounds and coarse crackles over his left chest. He was human immunodeficiency virus-negative and had never smoked. The 6-minute walk test revealed blood oxygen desaturation from 94% to 86%. The patient was admitted to the hospital for further tests and monitoring to establish a diagnosis.

A radiograph of the patient's chest showed inhomogeneous opacity in left mid and left lower zones (Figure 1). A high-resolution computed tomography (HRCT) scan done one year before presentation highlighted a classic “crazy-paving” pattern, where thickened interlobular septa and intralobular lines, with distinct geographic margins on a background of ground-glass opacification, could be seen in the left upper lobe (Figure 2A). HRCT performed on presentation showed that in the intervening year the lesion had increased dramatically along with minimal left-side pleural effusion (Figure 2B). Sputum stains and cultures for *Mycobacterium tuberculosis*, fungi, and other aerobic organisms were negative. Fiberoptic bronchoscopy showed no gross abnormality. Bronchial aspirate was negative for all organisms, as was the GeneXpert test for *M tuberculosis*. Transbronchial biopsy confirmed bronchioloalveolar carcinoma (BAC) (Figures 3A and 3B).

These investigations were carried out during the patient's five-day stay in our institution. After confirmation of the diagnosis, he was referred to a tertiary oncology center for further management and was lost to follow-up.



Figure 1. Radiograph of the chest showing inhomogeneous opacity in left mid and left lower zones obscuring the left heart border and the left diaphragm.

DISCUSSION

The first-ever portrayal of crazy-paving on HRCT was recorded in a patient with pulmonary alveolar proteinosis and is still considered a hallmark of the disease.¹ Since then, a number of clinical conditions have been associated with this radiologic pattern visible on HRCT.² This pattern has also been reported in viral/opportunistic infections, *Pneumocystis carinii* pneumonia, exogenous lipid pneumonia, diffuse alveolar haemorrhage, and sarcoidosis.³ The crazy-paving pattern appears on HRCT as diffuse ground-glass opacification

superimposed with interlobular septal thickening and intralobular lines in a geographic distribution resembling irregularly laid cobblestones. These areas are usually bilateral and feature distinct margins, which sharply demarcate these areas from the normal lung parenchyma.^{3,4} It has been postulated that the crazy-paving pattern occurs because of processes that cause alveolar filling, because of interstitial fibrosis, or because of a combination of both of these elements.²

BAC, a term coined by Liebow in 1960,⁵ accounts for approximately 4%

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of all primary lung malignancies. It is more common in females and never-smokers.⁶ The radiologic presentations of BAC are diverse and range from solitary or multiple pulmonary nodules to cystic disease, cavitation, and consolidation. Most consolidations in BAC are peripheral in location, can persist for a long duration, and can be difficult to differentiate from consolidation of an infective origin.⁷

The revised World Health Organization lung tumor classification⁸ recognized this infrequently seen clinical entity as a subtype of adenocarcinoma with three distinct histologic forms:

mucinous, nonmucinous, and mixed or indeterminate.⁸ In 2011, the International Association for the Study of Lung Cancer/American Thoracic Society/European Respiratory Society⁹ proposed that BAC be categorized under four new subtypes: adenocarcinoma in situ; minimally invasive adenocarcinoma; lepidic predominant nonmucinous adenocarcinoma; and invasive mucinous adenocarcinoma. The preinvasive lesion subtypes included adenocarcinoma in situ and minimally invasive adenocarcinoma. The invasive subtypes were lepidic predominant nonmucinous adenocarcinoma and invasive

mucinous adenocarcinoma. The main purpose of this newer classification was to delineate categories having distinct clinical, radiologic, and histologic characteristics.⁹ However, the term BAC is still widely used.

BAC presenting radiologically as a crazy-paving pattern is a distinct rarity.¹⁰ BAC should always be considered in the differential diagnosis of this singularly unusual HRCT imaging pattern. ❖

Disclosure Statement

The authors have no conflicts of interest to disclose.

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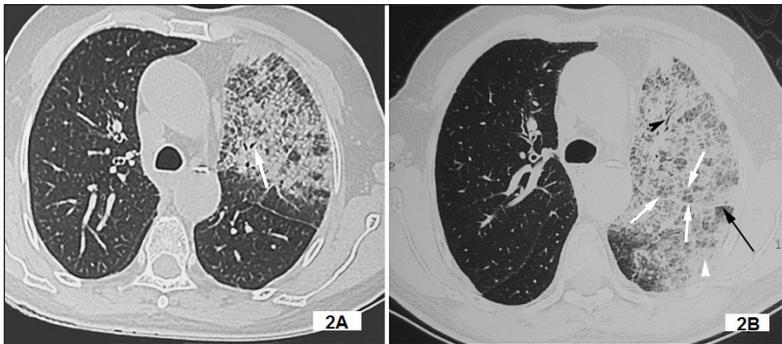


Figure 2A. High-resolution computed tomography scan of the thorax (specifically the lung window), performed one year before presentation. The white arrow indicates evidence of air bronchograms amid consolidation in the left upper lobe, which suggests a unilateral "crazy-paving" pattern involving the left upper lobe.

Figure 2B. High-resolution computed tomography scan of the thorax (specifically the lung window), performed at presentation, shows the progression of the disease process in the left lobe of the lung. The white arrowhead indicates features of consolidation, the black arrowhead indicates an air bronchogram, the white arrows indicate the distinct "crazy-paving" pattern, and the black arrow indicates interlobular septal thickening.

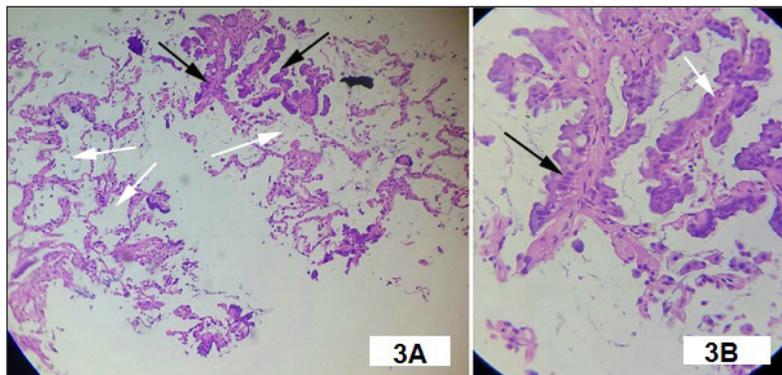


Figure 3A. Low-power view of the patient's biopsy specimen on hematoxylin and eosin stain; original magnification, x10. The white arrows indicate dilated alveolar spaces showing a prominent lining of atypical epithelial cells. The black arrows indicate moderate atypia and occasional secretory vacuoles in the columnar tumor cells.

Figure 3B. High-power view of the patient's biopsy specimen on hematoxylin and eosin stain; original magnification, x40. The white arrow indicates an example of the tumor cell details. The black arrow indicates moderate atypia and occasional secretory vacuoles in the columnar tumor cells.