

Black Pleura Sign in Silicosis

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Black pleura sign is a radiological sign seen on chest skiagram or high-resolution computed tomography (HRCT) of chest where a strip of peripheral black line all around the lung periphery is seen just beneath the pleura separating the bony rib cage and the high-density calcified lesions in the lung parenchyma. This sign is a classic feature in patients with pulmonary alveolar microlithiasis (PAM), appearing as a strip of peripheral lucency (darker area) that runs tangentially beneath the ribs, contrasting sharply with the adjacent dense, calcified lung tissue.¹ Despite its designation, the “black pleura” sign actually represents the subpleural sparing of underlying diffuse pulmonary calcification that occurs centrally within the alveoli of the secondary pulmonary lobules. First described on plain radiographs as a means of identifying alveolar microlithiasis, the sign is also demonstrable on chest HRCT.

Pulmonary alveolar microlithiasis is a rare, chronic disease of unknown or poorly understood origin, characterized by a

discrepancy between clinical symptoms and radiological findings. The condition involves the intra-alveolar accumulation of innumerable diffuse calcium phosphate microliths (calcospherites) throughout the lung parenchyma, with a predilection for the lower and mid zones, manifesting radiologically as dense micronodular opacities with a characteristic “sandstorm” appearance. The “black pleura sign” manifests as a vertical linear radiolucency between the ribs and lung parenchyma, typically indicating subpleural cystic changes identifiable on HRCT or pathological assessment.²

A 23-year-old unmarried female was admitted with complaints of shortness of breath and cough for the last 6 months and low-grade fever for last 15 days. These symptoms were gradual in onset and progressively increasing over time. For the last 3 years, she worked in a stone-grinding factory where white stone was processed, with her daily shift lasting 8 hours. On physical examination, she had anemia, but no clubbing, lymphadenopathy. Respiratory system examination revealed increased respiratory rate (22 per minute) and normal breath sounds. Her chest X-ray revealed bilateral diffuse nodular shadows. Her induced sputum was negative for acid-fast bacilli. Routine investigations of blood

and urine were also normal. CT scan of the chest revealed bilateral nodular lesions at both lung fields along with areas of ground-glass haziness (Fig. 1). A thin black rim at the peripheral lung fields was clearly evident suggesting “black pleura sign” (Fig. 2). Based on above features, she was diagnosed with acute silicosis based on occupational history and suggestive radiological findings. She received symptomatic treatment with partial improvement in symptoms.

Occupational exposure to silica dust leads to silicosis, an incurable chronic lung disease characterized by widespread small, calcifying fibrous nodules, predominantly found in the upper lung zones. Eggshell calcification and pleural plaques are other findings. Development of emphysema and bullae is also described in silicosis patients, which is independent of smoking and increases the risk of pneumothorax. Para-septal emphysema is classically subpleural in location and has also been demonstrated in silicosis.³

Subpleural sparing in HRCT chest is described as pathological lesions affecting lung that spares the extreme peripheral margins abutting the pleura or chest wall on cross-sectional imaging. This finding has a variety of causes, including idiopathic, inflammatory, infectious, inhalational, cardiac,

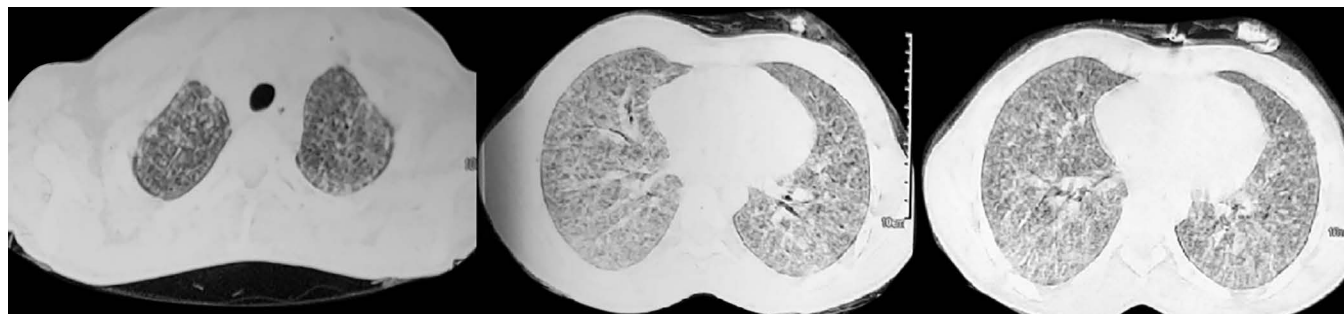


Fig. 1: CT scan chest showing bilateral nodular lesions with areas of ground-glass haziness

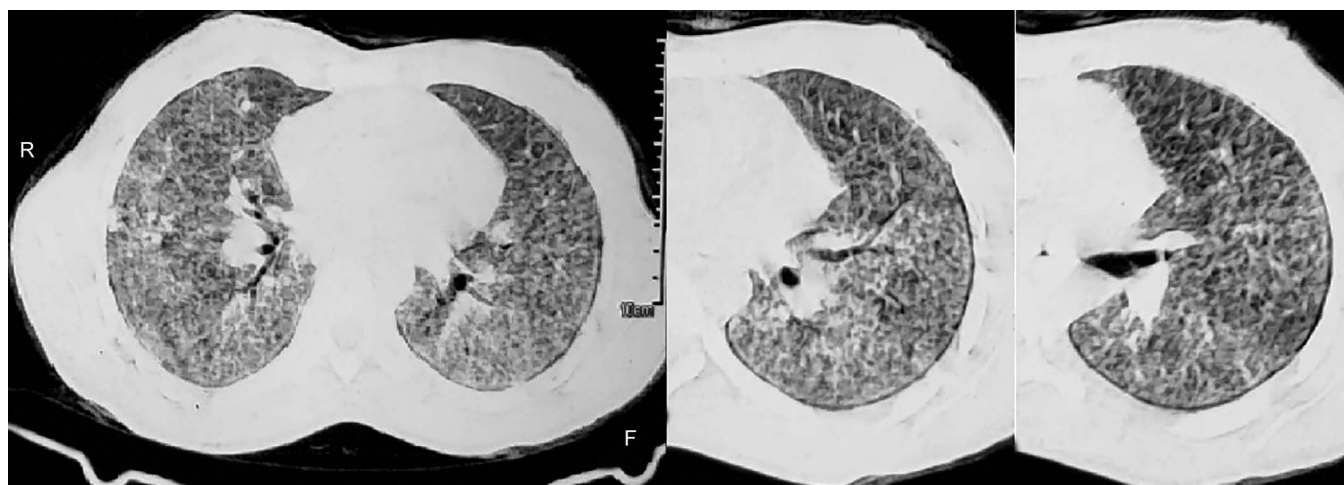


Fig. 2: CT scan chest showing peripheral subpleural linear sparing of lesions producing “black pleura sign”

traumatic, and bleeding disorders. Among the specific conditions, subpleural sparing (peripheral sparing) may be seen in nonspecific interstitial pneumonia, organizing pneumonia, pulmonary alveolar proteinosis, diffuse alveolar hemorrhage, vaping-associated lung injury, cracked lung, pulmonary edema, *Pneumocystis jirovecii* pneumonia, pulmonary contusion, and COVID-19 pneumonia.⁴

Subpleural sparing in PAM is notable to cause black pleura sign because of innumerable calcified nodules, making a striking density difference at the lung periphery. Since silicosis is also characterized by high-density pulmonary nodules and emphysematous changes, subpleural sparing in this condition may also produce “black pleura sign” as seen in the present case. Clinical history, including occupation, clinical presentation, radiological pattern, and distribution of lesions and other findings, usually helps to suggest the appropriate diagnosis.

REFERENCES

1. Enemark A, Jönsson ÅLM, Kronborg-White S, et al. Pulmonary alveolar microlithiasis: a review. *Yale J Biol Med* 2021;94(4):637–644.
2. Khaladkar SM, Kondapavuluri SK, Kamal A, et al. Pulmonary alveolar microlithiasis - clinico-radiological dissociation - a case report with radiological review. *J Radiol Case Rep* 2016;10(1):14–21.
3. Mohebbi I, Hassani E, Salarilak S, et al. Do bullae and emphysema increase risk of pneumothorax in silicosis? *Indian J Occup Environ Med* 2007;11(3):108–112.
4. Chong WH, Saha BK, Austin A, et al. The significance of subpleural sparing in CT chest: a state-of-the-art review. *Am J Med Sci* 2021;361(4):427–435.