

Case Report

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Parietal Pleural Lymphatic Blockage by Anthracotic Nodule Laden Macrophage, Leading Cause of Pleural Effusion in Anthracosis

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Anthracosis of lung is assumed to be a disease that causes parenchymal accumulation of macrophage-laden anthracotic nodules, which leads to bronchial obstruction, lung mass, and lymphadenopathy. Pleural surface anthracosis involvement as extra-parenchymal involvement has been rarely reported. Still, due to presentation with a transudate pattern, pleural effusion is considered to be a side effect of lung collapse. I represent two subjects with patches of anthracosis in the presumptive place of anatomical fenestra of lymphatic vessels in the parietal pleural. It may cause inhibition of reabsorption of pleural fluid and finally accumulation of transudate pleural effusion. Involvement of the pleura by anthracosis, and black discoloration of the parietal pleura have already been discovered by physicians who perform pleuroscopy. The pleural involvement by anthracosis is usually diffuse. In these two subjects, pleural involvement was in the early stage of anthracosis, which helped me to introduce a new mechanism for transudative pleural effusion due to blockage of the pleural lymphatic channels entrance.

Keywords: Anthracosis; Anthracofibrosis; Pleurisy; Pleural effusion; Pleuroscopy

INTRODUCTION

Anthracosis of the lung has been introduced as a bronchial lesion that starts from distal small airways (1) due to exposure to air pollution, mainly soot and other incompletely burned hydrocarbons (2). It is postulated that carbon particles are entrapped by macrophages, and deposited in their micro-vesicles called anthracotic nodules (3). Accumulation of these macrophages containing anthracotic nodules in bronchial mucosa may increase from just black discoloration of mucosa to severe deformity which occludes bronchial lumen called bronchial anthracofibrosis (BAF) (1). They may also aggregate together to make intra-parenchymal mass or migrate across lymphatic to make lymphadenopathy (4).

Pleural involvement especially pleural effusion, has been reported in a quarter of subjects (5), but earlier reports did not mention fluid analysis and pleuroscopy. Pantanowitz et al. reported pleural fluid analysis in two subjects, one exudative containing anthracotic nodule, and one transudate pleural effusion (6). Recently, pleuroscopical findings of anthracosis on the pleural surface were reported in two case reports. Amiseno et al. reported a subject who showed hyperpigmentation in both parietal and visceral pleura (7), and later Yadav et al. reported a subject who suffered from transudate pleural effusion, black discoloration of the pleura and typical histopathological finding of the anthracosis in the pleural surface (8). One year later, a case series was undergone on

the pleural effusion of subjects suffering from BAF. The results of this study showed that 93% of subjects suffered from transudative pleural effusion. The authors suggested that the cause of this type of pleural effusion is related to increased negative pleural pressure generated from lung collapse due to bronchial obstructions (9).

In this regard, I reviewed the results of my pleuroscopy during the last three years, and I found nine subjects who revealed anthracosis of the lung parenchyma, but pleural involvement by anthracosis was evident in only four subjects. Two subjects revealed widespread involvement of pleura, but two subjects showed less. However, a characteristic presentation that elucidates a mechanism other than the mechanism introduced by Shafahi et al. (9) Here is the history of these two subjects:

Case 1: A 56-year-old male presented with right pleural effusion. Thoracentesis showed straw-colored fluid with a pattern of transude. Pleuroscopy showed severe anthracotic lung along with a spot of anthracosis along the parietal pleura. It which was highly suggestive of being the entrance of pleural lymphatic vessels (Figure 1). Otherwise, the lung and pleural cavity did not show significant pathological findings.

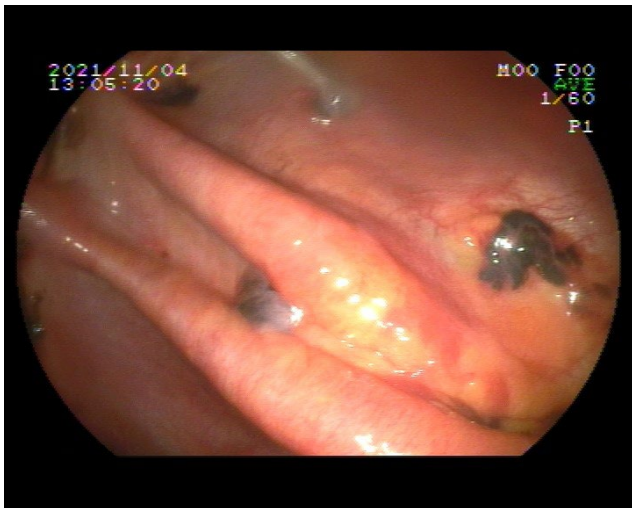


Figure 1. Patch of anthracotic nodule at the anatomical fenestra of lymphatic channel of parietal pleura

Case 2: A 67-year-old female presented with exertional dyspnea 2 years ago. A moderate amount of pleural effusion was seen in the left lung. The chemical analysis

showed transudative pleural effusion, but no possible etiology could be discovered. Pleuroscopy was undergone and a patch of anthracosis was seen in a regular and linear pattern suggestive of anatomical fenestra of lymphatic channels (Figure 2).

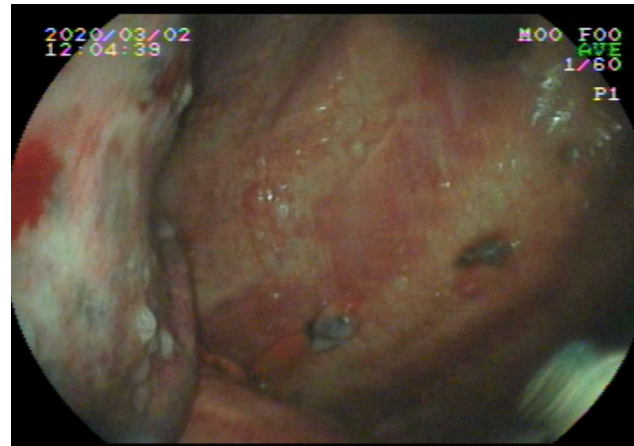


Figure 2. Sediment of anthracosis in parietal pleura in a patient suffering from transude pleural effusion

DISCUSSION

The representation of these two subjects showed that the mechanism of pleural effusion in these subjects is related to the obstruction of lymphatic channels by macrophages containing anthracotic nodules.

Macrophages play a major role in the pathogenesis of anthracosis (3). They clean the airways and alveolar surfaces by entrapping the air-borne particles including soot particles. Nevertheless, these materials contain silicate which the macrophages are unable to digest; thus, they keep storing them in the vesicles (10). Continuous exposure to air pollution will increase the number of these cells which occupy the mucosal membrane of bronchi and occlude them (11). Then, accumulation of them in parenchyma results in large visible mass (4). Finally, they migrate to lymph nodes and cause enlargement of the lymph nodes which may erode to the esophagus and large bronchi and result in anthracosis of esophagus and broncholithiasis (12). In this regard, I believe that the escape of macrophages containing anthracotic nodules to the pleural space may occur, and they naturally follow the

lymphatic route. Therefore, they go to the lymphatic channel of the parietal pleura. Stagnation of these cells at the anatomical fenestra of the lymphatic channel and possibly along the lymphatic vessels may result in inhibition of pleural fluid drainage and cause “transudative pleural effusion.”

In conclusion, in case of severe anthracosis of the lung, some macrophages containing anthracotic nodules may escape from the lung to the pleural space. Picture from the parietal pleural surface indicates the blocking of the anatomical fenestra of the lymphatic channel by these cells. It may lead to the accumulation of pleural fluid with a transudative pattern.

REFERENCES

1. Mirsadraee M. Anthracosis of the lungs: etiology, clinical manifestations and diagnosis: a review. *Tanaffos* 2014;13(4):1-13.
2. Gupta A, Shah A. Bronchial anthracofibrosis: an emerging pulmonary disease due to biomass fuel exposure. *Int J Tuberc Lung Dis* 2011;15(5):602-12.
3. Amoli K. Anthracotic airways disease: report of 102 cases. *Tanaffos* 2009; 8(10): 14-22.
4. Mirsadraee M, Asna-Ashari A, Attaran D, Naghibi S, Mirsadraee S. Bronchial anthracosis: a new diagnosis for benign mass lesions of the lung. *Tanaffos* 2013;12(4):10-8.
5. Kim YJ, Jung CY, Shin HW, Lee BK. Biomass smoke induced bronchial anthracofibrosis: presenting features and clinical course. *Respir Med* 2009;103(5):757-65.
6. Pantanowitz L, Warren M, and Goulart RA. 2009. Anthracotic pigment in pleural fluid: a case report. *Acta Cytol.* 53: 306-308.
7. Amiseno R, Ban AY, Masir N, Hamidi LR, Faisal Abdul Hamid M. Pleural anthracosis presenting with massive effusion: a rare entity. *Respirol Case Rep* 2018;7(2):e00390.
8. Yadav RK, Saini JK, Sethi P, Sarin R. A Rare Case of Bronchial Anthracofibrosis with Pleural Anthracosis Presented as Recurrent Pleural Effusion. *Case Rep Pulmonol* 2019;2019:2982763.
9. Shafahi A, Fekri MS, Hashemi Bajgani SM, Yazdani R, Shafiepour M, Touhidi MH, et al. Biochemical and cytological analyses of pleural effusion in patients with lung anthracosis and antracofibrosis. *Ann Med Surg (Lond)* 2021;69:102686.
10. Ohshima S. Studies on pulmonary anthracosis. With special reference to the mineral constitution of intrapulmonary particulate pollutants in the human lung. *Acta Pathol Jpn* 1990;40(1):41-9.
11. Ozcan K, Beytut E. Pathological investigations on anthracosis in cattle. *Vet Rec* 2001;149(3):90-2.
12. Mirsadraee M, Katebi M. Loose body in the main bronchus due to broncholithiasis. *Tanaffos* 2010, 9(1):63-6.