CASE REPORT

FIRST CASE REPORT OF ANCA-ASSOCIATED VASCULITIS AND ANTHRACOSIS COEXISTENCE

Emrah Doğan[1], Ozan Kandemir[2], Özge Oral Tapan[3], Utku Tapan[3], Sabri Serhan Olcay[3], Özgür İlhan Çelik[4], Marwa Mouline Doğan[5]

[1]Department of Radiology, [2]Department of Nuclear Medicine, [3]Department of Pulmonology, [4]Department of Pathology, [5]Cardiolog (Fellow), Faculty of Medicine, Muğla Sıtkı Koçman University-Türkiye

Anthracosis is a type of mild *pneumoconiosis* secondary to harmless carbon dust deposits. Although *anthracosis* was previously associated with inhaled coal particles, such as *coal workers' pneumoconiosis*, this hypothesis was later abandoned; pathology has been associated with inhaled dust particles. Our paper is the first case report of ANCA-associated vasculitis and anthracosis coexistence. In addition, it aims to highlight that histopathologically proven anthracotic granulomatous nodules can show high FDG uptake in PET/CT contrary to expectation. We present a case of a 73-year-old male with p-ANCA-associated vasculitis and anthracotic lung nodules accompanied by radiological and clinical findings. The patient got diagnosis with p-ANCA-associated vasculitis with serological and rheumatological tests. Atypically, the clinical findings of the patient were weak (No dyspnoea, cough or additional pulmonary complaints). Nodules were present on X-ray graphics and nodules' contours were irregular on CT. On PET/CT, SUV values of the nodules were high [12 kBq/mL]. Histopathological specimens showed multiple lung granulomas including anthracosis particles. Until performing the biopsy, we could not exclude the possibility of malignancy. Conclusion: When lung involvement of vasculitis is superimposed by anthracosis, it can create granulomas with high SUV values. The relationship between anthracosis and parenchymal lung diseases is a current topic and many recently published papers are present on this subject. To the best of our knowledge, our paper is the first paper showing the relationship between parenchymal involvement of vasculitis and anthracosis in the literature. Environmental pollution and dust particles are the known reasons for anthracosis particles in the nodules. It is open to future research on whether air pollution triggers new atypical cases or not.

Keywords: Anthracosis; Vasculitis; Computed tomography; PET CT

Citation: Doğan E, Kandemir O, Tapan OO, Tapan U, Olcay SS, Çelik Öİ, *et al*. First case report of ANCA-associated vasculitis and anthracosis coexistence. J Ayub Med Coll Abbottabad 2023;35(3):473–7.

DOI: 10.55519/JAMC-03-11529

INTRODUCTION

Anthracosis is a type of mild *pneumoconiosis* secondary to harmless carbon dust deposits. Although anthracosis was previously associated with inhaled coal particles, such as coal workers' *pneumoconiosis*, this hypothesis was later abandoned; pathology has been associated with inhaled dust particles. It is strongly associated with air pollution and is very common among non-smokers. The bronchi are primarily affected. Dust particles including carbon accumulate in the bronchial mucosa. This disease is called bronchial arthrofibrosis (BAF). The prevalence of BAF is between 3.4 and 21%.

Non-BAF parenchymal carbon accumulation corresponding to anthracosis is a completely different entity and was rarely mentioned in the literature until last year. These dust particles can accumulate in fibrotic or destructive areas in chronic diseases.[1] The most known of this combination is Caplan's disease, which expresses the coexistence of RA/anthracosis.[2] Similarly; tuberculosis[3] and interstitial lung diseases (ILD)[4] can be complicated by anthracosis. Since BAF is now a known entity, interest in this subject has decreased over time. However, the findings related to the facilitation of the biopsy option in parenchymal diseases and the accumulation of anthracosis particles accompanying parenchymal disease in pathological specimens have raised interest in this subject again. There are many published case reports in the last 5 years showing different diseases that may be associated with anthracosis. Herein, as a supplement to other case reports, we present a case of p-ANCA-associated vasculitis characterized by atypically irregular nodules including anthracosis particles. To the best of our knowledge, our case is the first case report of p-ANCA-associated vasculitis with anthracosis.

In addition to the difference detected in the histopathological specimens of our patient, it is

also important in terms of radiological and clinical presentation. Our case presented with multiple irregularly circumscribed dense non-cavitary nodules and the nodules had high SUV values on PET-CT. There were both p-ANCA and rheumatoid factor (RF) positivity. Distinguishing between lesions related to vasculitis and metastatic malignancy had not been done until the biopsy. Furthermore, the mild clinical presentation discordant with the general picture of the patient is atypical for the disease.

Our paper aims to demonstrate ANCA-associated vasculitis with pulmonary involvement superimposed with anthracosis. We present a case of a 73-year-old male with p-ANCA-associated vasculitis and lung nodules related to anthracosis accompanied by radiological and clinical findings.

CASE REPORT

A 73 years old male patient was admitted to our hospital for the first time in December 2017 due to an increased cough at night. He had worked as a highway maintenance worker for 40 years and is currently retired. The patient had no history of smoking. There was no additional finding in the patient's history.

In the examination, the general condition of the patient was good, oriented and cooperative. There was a complaint of increasing dyspnoea at night. Dry eye, dry skin, photosensitivity, and Raynaud's phenomenon were not described. No morning stiffness.

In the pulmonary and cardiac examination, respiratory sounds were bilaterally normal. No rales, rhonchus or pathological cardiac sounds (S1 + S2 + additional sound or murmur) were detected in the auscultation. The abdominal examination was also normal. The joint range of motion was normal.

In laboratory tests; CRP:2,56 mg/L WBC:7,10 109/L. Total IGE:263 UI/ml ppd:5 mm+, Serum ACE:49.7 nmol/mL/min normal. Ds-dna borderline, Mpo ANCA: 7,68 negative, P-ANCA was positive. RF: 1/128-1/256 232 units/ml was moderately seropositive. The level of anti-CCP antibodies was within the normal range (12EU/ml).

Water's sinus X-ray graph were normal. Also, the pulmonary function test was normal. In the radiological examination of the chest; There were multiple nodular lesions in both lungs on the PA chest X-ray. CT was requested [Figure-1]. On thorax CT, nodules with irregular borders, the largest 1.5 cm, were detected in both lungs. [Figure-2].

PET-CT was requested to exclude malignancy. In PET-CT, SUV values of Nodules were high [12 kBq/mL] [Figure-3]. In addition, there was high *FDG* uptake in the left kidney. Therefore, malignancy wasn't excluded.

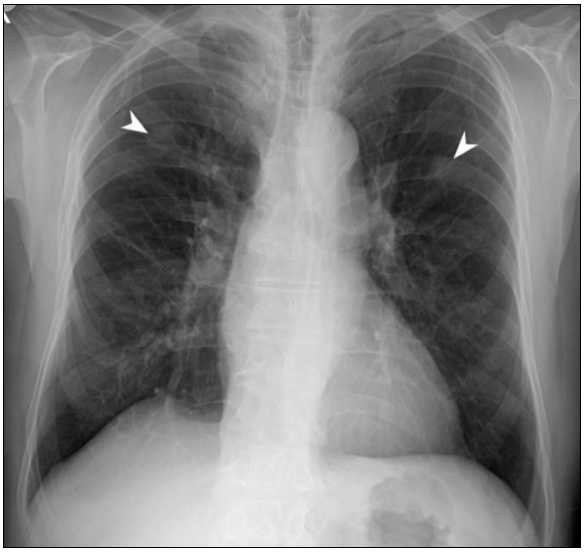

Figure-1: Nodular opacities with blurred borders are observed in the bilateral upper zones

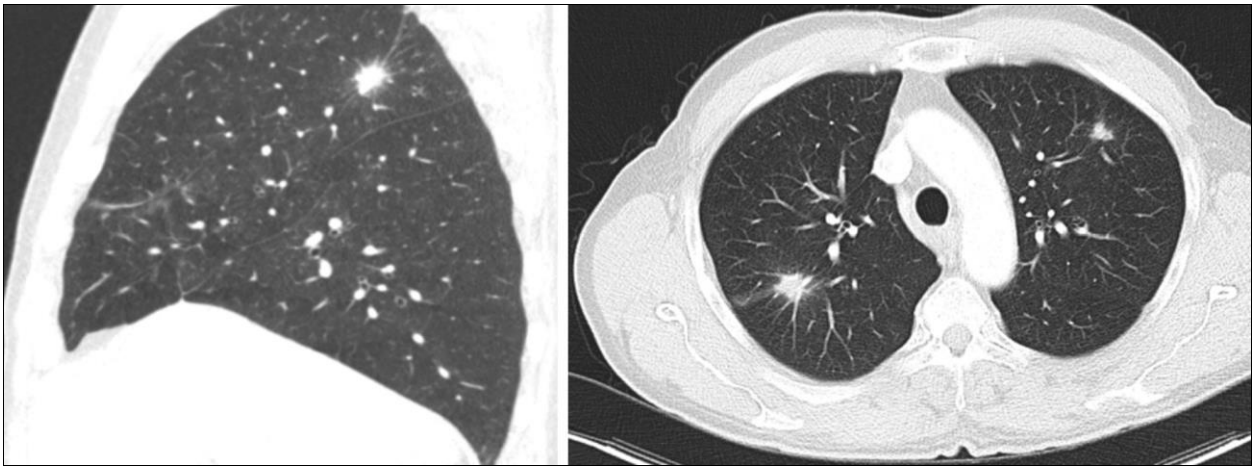

Figure-2: In the axial and sagittal CT planes, irregularly circumscribed nodular lesions are observed in both lungs that have evidence of corona radiata. Other lung parenchyma areas appear to be normal.

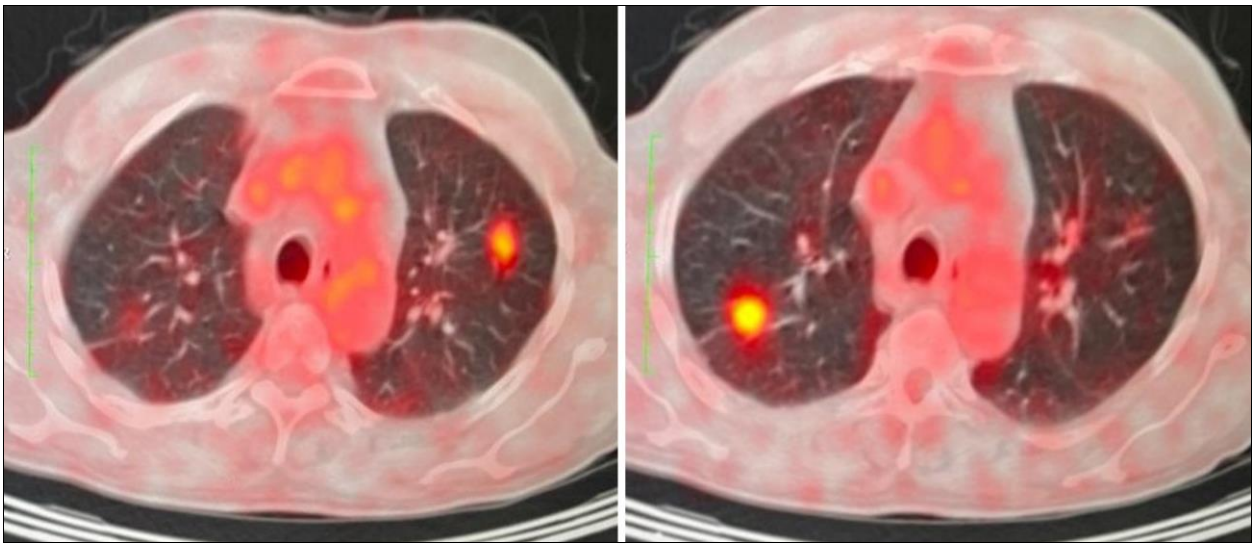

Figure-3: In the axial images, it was determined that the nodules in the bilateral lung showed FDG uptake. SUV values were high.

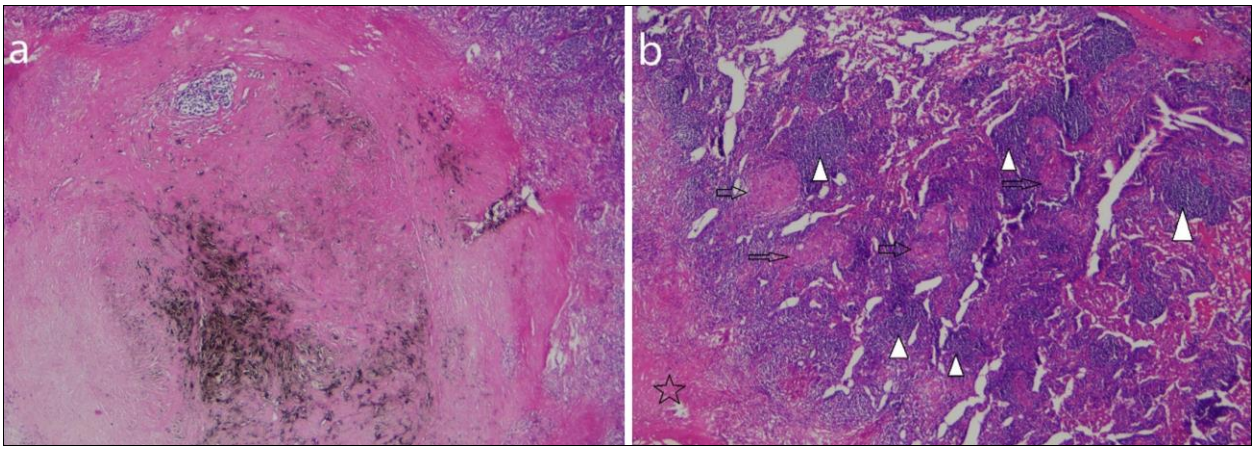

Figure-4: (a). Fibrotic focus including anthracosis particles (Haematoxylin & eosin, x40). (b). Inflammation (white arrowheads) and granuloma formations (arrows) around the fibrotic focus including anthracosis particles (star) (Haematoxylin & eosin, x100).

As a result, the diagnosis was compatible with vasculitis pulmonary involvement superimposed with anthracosis.

Renal sonography was performed because of the kidney's SUV uptakes value. The dimensions of the right kidney were 109x46 mm and the parenchyma thickness was 11 mm. Left kidney dimensions were 104×42 mm and parenchyma thickness was altered between 0 and 11 mm. A 4 cm cystic lesion was detected in the upper part of the right kidney. The lesion had multiple thin septa and was considered type 2 F according to the Bosniak classification. Also, a 2 cm hyperechoic stone was observed in the ureteropelvic junction. Grade 3 hydronephrosis was present due to mechanical obstruction. Kidney contours were smooth. Parenchyma echoes were homogeneous. PET-CT positivity was associated with inflammation in this area. A surgical biopsy of the nodules and *bronchoscopy* were planned.

No endobronchial lesion was observed in the bronchoscopy. BAL was performed from the middle lobe of the right lung. Bronchial lavage was taken from the upper lobe of the left lung. AFB test (acid-fast bacillus) was negative. The culture was negative.

Right anterior thoracotomy was performed and wedge resection was applied to the 1.5 cm mass. In the histopathological examination of the lung wedge resection material under the light microscope; a focus of fibrosis mixed with anthracosis with a diameter of 6mm was seen in the centre [Figure 4a]. Severe inflammation composed of predominantly lymphocytes, neutrophils and histiocytes composing a few granuloma formations was observed around these anthracosis particles, fibrotic focus [Figure 4b].

DISCUSSION

Anthracosis initially attracted attention in 19th-century biopsy studies because of the change in lung colour with age.[5] The term "anthracose" was first coined by Pearson in 1813. Pearson believed that anthracosis was a complication of coal workers' *pneumoconiosis*. However, it was later found that this relationship was weak. Today, it is known that inhaled dust particles cause anthracosis.[1] The relationships of anthracosis with many diseases such as RA[2], COPD[1], ILD[4] and tuberculosis[6] have been proven. As far as we know, it is the first case report showing the association between vasculitis and anthracosis. Most of the studies published in recent years concern the coexistence of anthracosis with other lung diseases. It is not known whether the incidence is increased in pathological specimens or not.[1,2,4] The effect of environmental pollution can be emphasized as a preliminary hypothesis in the re-emergence of anthracosis. This topic is open to future research. Our paper is a radiological and clinical-based case report.

Multiple lesions with spiculated contours were detected on CT. vasculitis, organizing pneumonia, chronic *eosinophilic pneumonia*, *Alveolar sarcoidosis*, tuberculosis as well as metastasis and malignancy were in the differential diagnosis. Other rare differential diagnosis titles were *Bacterial granulomatous* infections such as fungi, mycobacterial, Nocardia, parasitic, Langerhans cell histiocytosis and pulmonary embolism with infarction.[7–9] High degree of SUV uptake of the lesions in PET-CT fuelled the suspicion of *metastatic malignancy* according to atypical irregular spiculated contours of lesions. Minimally invasive adenocarcinoma was also a differential diagnosis. In addition, because of high SUV uptake in the kidney, metastasis of primary renal cancer was considered until performing renal sonography.[10] *Alveolar sarcoidosis* is characterized by multiple granulomatous nodules rather than a true alveolar pattern.[11] However, the patient's ACE values are normal and there is no Garland triad-type lymph node involvement in the mediastinal area. AFB tests were negative multiple times. There was no finding that could be evidence of tuberculosis. There was no evidence of infection. Many pathologies were excluded.

The clinical and laboratory findings of our case are very subtle for *vasculitis.* The patient has p-ANCA positivity but eosinophil values, paranasal evaluation was completely normal and there was no symptom in favour of microscopic polyangiitis (Microscopic PAN*)* or *Eosinophilic granulomatosis* with *polyangiitis (EGPA/Churg-Strauss syndrome).* P-ANCA can be positive for granulomatosis with polyangiitis (GPA) in the rate of 10–20%. *C*-ANCA is more sensitive to GPA. It is highly sensitive (90–95%) in active, systemic GPA, with a specificity of approximately 90%, and is usually, but not always, associated with the disease.[12]

Multiple irregularly circumscribed nodules, which tend to become cavitary later, may be seen in GPA. Its pathological basis is focal inflammatory necrosis. In EGPA, bilateral peripheral or *GGO* and consolidation are demonstrative in CT.[13] The pulmonary manifestation in microscopic PAN is Idiopathic pauci immune pulmonary capillaritis (IPIPC). It progresses with diffuse alveolar haemorrhage.[14]

In addition, the patient's *RF* was positive. Antibodies to the altered γ-globulin, called RF, occur in approximately 70% of patients with rheumatoid arthritis (RA). A high *RF* level helps confirm the diagnosis of *RA.* In addition, the *RF* serum level may be affected by treatment and often falls as inflammatory activity decreases. *RF* is not specific to RA and is found in many diseases (eg, chronic infections, hepatitis, sarcoidosis, granulomatous diseases, and subacute bacterial endocarditis).[15] Noritake *et al.*[16] reported that an elevated RF was observed in about half of GPA cases. Anti-CCP antibodies were negative in our case.

CONCLUSION

When lung involvement of vasculitis is superimposed by anthracosis, it can create granulomas with high SUV values on PET/CT. The relationship between anthracosis and parenchymal lung diseases is a current topic and many recently published papers are present on this subject. To the best of our knowledge, our paper is the first paper showing the relationship between parenchymal involvement of vasculitis and anthracosis in the literature. Environmental pollution and dust particles are the known reasons for anthracosis particles in the nodules. It is open to future research on whether air pollution triggers new atypical cases or not.

Patient consent: The patient consent form was signed by the patient on 24.2.2022.

REFERENCES

1. Mirsadraee M. Anthracosis of the lungs: aetiology, clinical manifestations and diagnosis: a review. Tanaffos 2014;13(4):1–13.
2. Deepak J, Kenaa B. Caplan's Syndrome with a twist. Int J Clin Case Rep Rev 2020;2(1):10.
3. Mirsadraee MH, Asnashari AK, Attaran DM. Tuberculosis in patients with anthracosis of lung underlying mechanism or superimposed disease. Iran Red Crescent Med J 2011;13(9):670–73.

4. Zhai L, Yu W. The co-occurrence of anthracosis with interstitial lung disease. Sarcoidosis Vasc Diffuse Lung Dis 2022;39(2):e2022012.
5. Donaldson K, Wallace WA, Elliot TA, Henry C. James Craufurd Gregory. 19th century Scottish physicians, and the link between occupation as a coal miner and lung disease. J R Coll Physicians Edinb 2017;47(3):296–302.
6. Takır HB, Tokyay DA, Güven AAÖ, Öztaş S, Yıldız T, Hacıömeroğlu O, *et al*. A Case of Pulmonary Tuberculosis with Anthracosis Presenting as Recurrent Pneumonia. Turk Toraks Derg 2019;20:406.
7. Rozenberg D, Shapera S. What to do with all of these lung nodules? Can Respir J 2014;21(3):e52–4.
8. Shinagare AB, Cunto-Amesty G, Fennessy FM. Multiple inflammatory nodules: a differential diagnosis of new pulmonary nodules in oncology patients. Cancer Imaging 2011;10(1):205–8.
9. Das J, Layton B, Lamb H, Sinnott N, Leahy BC. A case of pulmonary Serratia marcescens granuloma radiologically mimicking metastatic malignancy and tuberculosis infection. Scott Med J 2015;60(4):254–8.
10. Raju S, Ghosh S, Mehta AC. Chest CT Signs in Pulmonary Disease: A Pictorial Review. Chest 2017;151(6):1356–74.
11. Belperio JA, Shaikh F, Abtin FG, Fishbein MC, Weigt SS, Saggar R, *et al*. Diagnosis and Treatment of Pulmonary Sarcoidosis: A Review. JAMA 2022;327(9):856–67.
12. Radice A, Sinico RA. Antineutrophil cytoplasmic antibodies (ANCA). Autoimmunity 2005;38(1):93–103.
13. Venade G, Figueiredo C, Almeida C, Oliveira N, Matos LC. Eosinophilic granulomatosis with polyangiitis (Churg-Strauss syndrome). Rev Assoc Med Bras (1992) 2020;66(7):904–7.
14. Suzuki A, Sakamoto S, Kurosaki, Kurihara Y, Satoh K, Usui Y, *et al*. Chest High-Resolution CT Findings of Microscopic Polyangiitis: A Japanese First Nationwide Prospective Cohort Study. AJR Am J Roentgenol 2019;213(1):104–14.
15. Oshita H, Matsumoto H, Hoshino T, Omori K, Okamoto N, Awaya Y. Wegener's granulomatosis in which rheumatoid factor was useful for evaluating the disease status: a case report. Cases J 2009;2:6323.
16. Noritake DT, Weiner SR, Bassett LW, Paulus HE, Weisbart R. Rheumatic manifestations of
17. Wegener's granulomatosis. J Rheumatol 1987;14(5):949–51.

Submitted: November 15, 2022	*Revised: March 5, 2023*	*Accepted: March 6, 2023*

Address for Correspondence:

Dr. Emrah Doğan, Assistant Professor M.D., Muğla Sıtkı Koçman University, Faculty of Medicine, Department of Radiology, Mugla/Turkiye
Phone: +90 5066619794
Email: emrahdogan@mu.edu.tr