Respir Case Rep 2023;12(3):114-118 DOI: 10.5505/respircase.2023.27676

A Case of Endobronchial Tuberculosis Mimicking Lung Cancer Developing on the Background of Anthracosis

Antrakozis Zemininde Gelişen Akciğer Kanserini Taklit Eden Endobronşiyal Tüberküloz Olgusu

Sümeyra Kaplan, Ceyda Anar, Muzaffer Onur Turan, Bunyamin Sertogullarindan

Abstract

Anthracite pigment accumulation in the bronchial mucosa can lead to bronchial hypertrophy and narrowing in the future. A patient pre-diagnosed with community-acquired pneumonia underwent fiberoptic bronchoscopy (FOB) and was subsequently treated with antibiotics, however no clinical or radiological response could be obtained. Fiberoptic bronchoscopy (FOB) revealed the mucosa of the lower basal segments of the right lung to be covered with black pigment, while the bronchi segments were found to be narrowed with mucosal infiltration. Based on these findings, a biopsy was performed with pre-diagnosis of malignancy developing on the basis of anthracosis. The pathological examination revealed granulomatous inflammation with caseified necrosis and acid-resistant bacilli in the bronchoalveolar lavage. The patient was diagnosed with tuberculosis on the basis of anthracosis and was thus started on quadruple anti-tuberculosis treatment, and clinical, microbiological and radiological improvement was observed in the 4th month of follow-up.

Keywords: *Anthracosis, tuberculosis, bronchoscopy.*

Öz

Bronşial mukozada antrakotik pigment birikimi ileri dönemde bronşial hipertrofi ve daralma ile sonuçlanmaktadır. Bu olgumuzda, toplum kökenli pnömoni ön tanısı ile antibiyotik tedavisi uygulanan ve klinik, radyolojik yanıt alınamayan hastaya fiberoptik bronkoskopi uygulandı. Bronkoskopide sağ akciğer alt lob bazal segmentlerinin mukozasının siyah renkli pigmentle kaplı olduğu ve segment bronşlarının mukozal infiltrasyon ile daraldığı ve infiltre olduğu izlendi. Bu bulgularla biyopsi ve BAL yapıldı. Patoloji sonucunda kazeifiye nekroz içeren granulomatoz inflamasyon saptandı. Ayni zamanda bronkoalveoler lavajda asido rezistans basil tespit edildi. Antrakotik zemininde tüberküloz tanısı konan hastaya dörtlü antitüberküloz tedavisi başlandı. Takibinin 4. ayında klinik, mikrobiyolojik ve radyolojik olarak düzelme izlendi.

Anahtar Kelimeler: *Antrakozis, Tuberkuloz, Bronkoskopi.*

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Submitted (Başvuru tarihi): 10.05.2023 ***Accepted (Kabul tarihi):*** 24.06.2023

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Anthracosis is a type of pneumoconiosis that can result from an accumulation of carbon particles, but also iron, lead, cadmium, organic or inorganic materials. Exposure to organic/inorganic particles and carbon particles can lead to their accumulation in the bronchial mucosa, resulting in bronchial hypertrophy and narrowing (1). The term "bronchial anthracosis" refers to the appearance of a black pigmentation in the bronchial mucosa (2), while "bronchial antracofibrosis (BAF)" is an accompanying anthracotic pigmentation, bronchial narrowing or obliteration (3). Bronchial anthracosis (BA) and/or anthracofibrosis can be diagnosed bronchoscopically. Although biomass exposure is the leading risk factor in patients with bronchial anthracosis, a history of tuberculosis is also important. It is not clear, however, whether anthracosis causes tuberculosis or tuberculosis causes bronchial anthracosis. Uçar et al. reported the most common comorbid disease to be COPD, followed by pneumonia, tuberculosis and malignancy (4).

Endobronchial tuberculosis (EBTB) can be confused clinically and radiologically with asthma, foreign body aspiration, pneumonia and bronchial cancer, especially in those of advanced age. Another feature of EBTB is the relatively limited bacteriological diagnosis possibilities in normal sputum examinations, which can be seen in 10–40% of patients with active pulmonary tuberculosis. We present here a case who was diagnosed with endobronchial tuberculosis based on bronchoscopic material. The disease developed on the basis of anthracosis and mimicked lung cancer clinically and radiologically, and was treated successfully with anti-tuberculosis therapies.

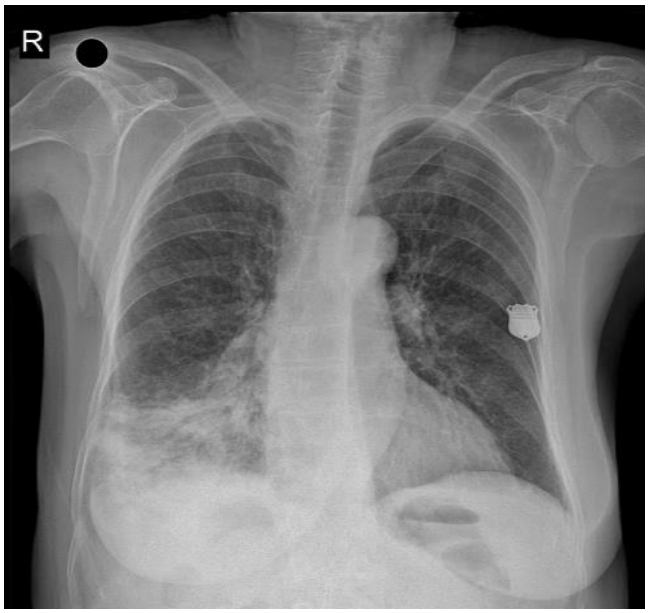

Figure 1: A homogeneous density observed in the lower zone of the right lung on Chest X-ray

CASE

A 77-year-old female patient presenting with cough, anorexia, weakness and weight loss had been diagnosed with pneumonia in an external center, but saw no improvement in her condition after 10 days of empirical antibiotic treatment. Upon applying to our hospital for further investigation she was subjected to a physical examination with the following findings: blood pressure: 110/70 mmHg, Pulse: 80/min and Fever: 37°C. A respiratory system examination revealed decreased respiratory sounds in the lower right lung but no pathology in an examination of other systems. The laboratory examination findings were as follows: White Sphere be 11000/µL, Hb: 13g/dL, Hct: 33%, PLT: 250/µL, sedimentation rate: 33mm/h and C-reactive protein: 30mg/L, while biochemistry parameters were normal. The patient had no comorbidities other than a known skin basal cell carcinoma and hypertension. A homogeneous density was identified in the lower zone of the right lung on chest X-ray (Figure 1), while thorax CT revealed a consolidated area containing air bronchograms in the anterobasal right lung lower lobe (Figure 2a and b). Bronchoscopy revealed the mucosa was infiltrated with white and black anthracosis changes in the right lung lower lobe basal segment, especially in the anterior and lateral segments (Figure 3a and b), and the areas were subjected to bronchus biopsy, transbronchial fine needle biopsy and bronchoalveolar lavage.

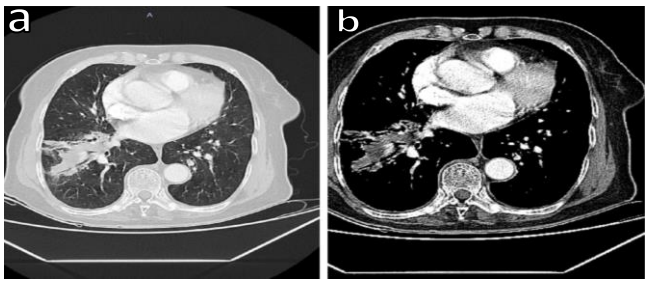

Figure 2a, and b: A consolidated area containing air bronchograms observed in the anterobasal right lung lower lobe on thorax CT

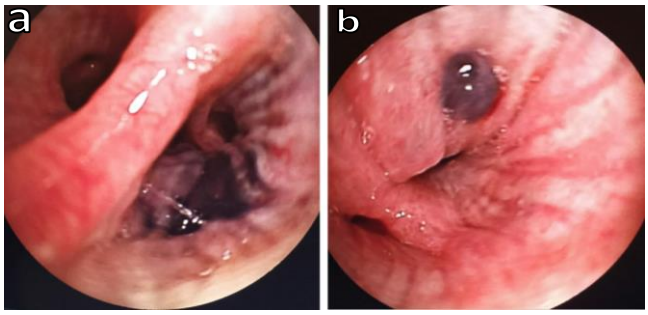

Figure 3a, and b: The mucosa was infiltrated with white and black anthracotic changes in the right lung lower lobe basal segment on bronchoscopy

Based on the bronchoscopic findings, lung carcinoma developing on the basis of anthracosis was suspected, and so a Positron Emission Tomography (PET-CT) was conducted revealing intense FDG accumulation in the consolidation area containing air bronchograms defined in the right lung lower lobe anterolateral basal, and multiple hypermetabolic lymph nodes in the mediastinum, right upper-lower paratracheal, left lower paratarecal, prevascular, aorticopulmonary, subcarinal, bilateral epiphrenic and bilateral hilar (Figure 4a and b). The pathology results revealed granuloma structures in the bronchial mucosa in intense lymphoplasmocytic inflammation (necrosis in the central section that could indicate caseification), and fragments of hyalinized, fibrotic, anthracotic and partially necrobiotic acellular connective tissue. Mycobacterium tuberculosis PCR sent in BAL material was found to be low positive. The patient was diagnosed with pulmonary tuberculosis, developing on the basis of anthracosis, and was started on quadruple therapy (INH, RIF, EMB, PRZ). A mycobacterium tuberculosis complex grew in the tuberculosis culture of the BAL material approximately 2 weeks after the patient was started on treatment. At the 2nd month control, the sputum ARB smear was negative and there was no growth in the culture, and so the patient was switched to double anti-tuberculosis treatment (INH, RIF). A postero-anterior (PA) chest X-ray taken at the 4th-month follow-up revealed a marked regression of the infiltration area observed in the lower zone of the right lung (Figure 5). The antituberculosis treatment was planned to be completed in 6 months.

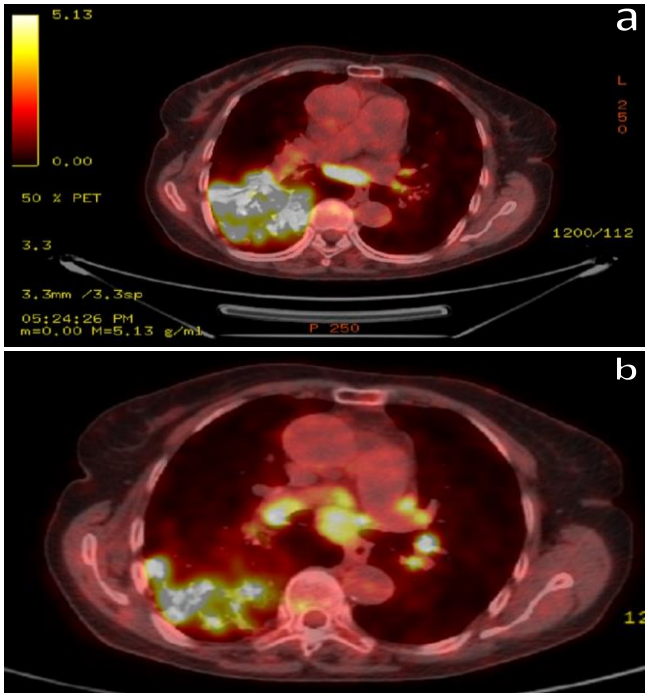

Figure 4a, and b: PET-CT revealed an intense FDG accumulation in the consolidation area containing air bronchograms defined in the right lung lower lobe, and hypermetabolic multiple lymph nodes

DISCUSSION

Endobronchial tuberculosis (EBTB) is detected in approximately 58% of patients with anthracosis, which strongly suggests that bronchial anthracosis is attributable to active or previous tuberculosis infection. Endobronchial tuberculosis continues to be a significant health problem as the diagnosis is often delayed (5,6). The presence of TB in BAF was first demonstrated by Chung et al. (3) 30 years ago. In a meta-analysis of studies investigating the relationship between TB and anthracosis, the frequency of tuberculosis in all anthracosis patients was 22.5 % (32.3 % for anthracofibrosis and 16.6 % for anthracosis), which was significantly higher than the control group (7).

It has been shown that a wheezing symptom has led EBTB to be mistakenly diagnosed as bronchial asthma, with around 24% of patients with this finding inadvertently undergoing long-term bronchial asthma treatment before a correct diagnosis (8,9). Thoracic mass lesions were observed on CT scans in 15% of patients with EBTB, but no invasive procedures were performed until active pulmonary tuberculosis was ruled out. Previous studies have revealed that bronchial anthracosis can be misdiagnosed as lung cancer based on radiological studies alone (10,11).

Singh et al. (12) reported the most common symptoms in patients with anthracosis to be dyspnea (90%) and cough (76.65%), while Chung et al. (3) reported cough (71.42%) and exertional dyspnea (60.71%) to be the predominant symptoms. Likewise, Mirsadree et al. (7) reported that 95% of the anthracosis cases in their study complained of shortness of breath while 86% had a cough. Our case had persistent cough and fatigue. The disease can increase the existing symptoms in infectious conditions such as pneumonia and tuberculosis, which may occur on the background of anthracosis.

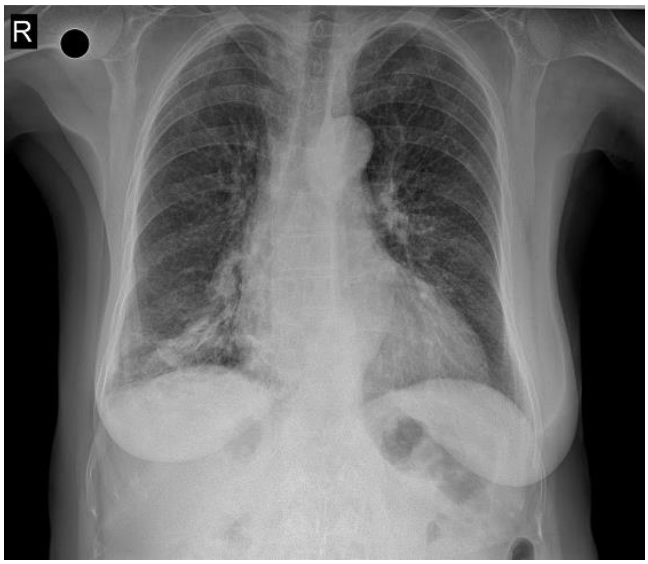

Figure 5: The infiltration in the lower zone of the right lung was seen to have regressed on chest X-ray following 4 months of treatment

Anthracosis has been previously documented in patients with chronic exposure to biomass fuel fumes (3,4,7). Grobbelaar et al. (13) found anthracosis to be prominent in patients chronically exposed to biomass fumes, and coined the term "Hut Lung" to describe the condition. In the study by Singh et al. (12), it showed that biomass exposure was not significantly associated with anthracosis. Our case was exposed to biomass due to the situation of burning a tandoor and a hearth. In the same study, a significant association was identified between stone mining and anthracosis, which may be attributed to the association of stone mining with silicosis, and subsequently, tuberculosis. Silica alters the macrophage function and thus prevents the clearance of inhaled particles, leading to an accumulation of pigments and changes in the immune mechanisms in the lungs, leading to Mycobacterium tuberculosis infection (14). Another hypothesis proposes that carbon and silica accumulate in the lymph nodes of people who are heavily exposed to air pollutants, cigarette smoke and biomass fuel smoke (15). When these lymph nodes become infected with M. tuberculosis, they rupture into the adjacent tracheobronchial tree, causing black pigmentation and subsequent inflammation and fibrosis.

Chest X-ray findings have been reported to be normal in only 7% of cases with anthracosis. The most common abnormalities reported on chest X-rays are inhomogeneous pulmonary infiltrations. Subsegmental atelectasis and mass lesions were found less frequently (20% and 16%, respectively, in patients) (16). Chest X-rays may be normal in 10–20% of patients with EBTB, and so the diagnosis of these patients can often be delayed or incorrectly identified as bronchial asthma or malignancy. In our case, a heterogeneous increase in density in the lower zone of the right lung was observed on chest X-ray.

CT can be considered a good diagnostic method for the differentiation of such bronchial conditions as bronchial stenosis or obstruction, with more sensitive and more specific radiological findings related to both anthracosis and EBTB. The initial reports suggested mediastinal or hilar lymphadenopathy in 94% of cases, of which 57% were calcified, and the conditions were followed by bronchial narrowing with or without atelectasis at a rate of 94% (17). In one study, the frequencies of lymph node, bronchial stenosis, atelectasis and mass lesions in BAF were significantly higher in patients with anthracosis than in non-anthracotic cases (16). Bronchial wall thickening has also been reported in 20% of BAF patients (17). Involvement may be unilateral or bilateral, although the right middle lobe has been reported as the most frequently involved lobe location, followed by the upper lobes, (16,17). In another study, mediastinal lymphadenopathy (53.3%), fibrosis (43.3%), nodules (46.67%), consolidation (33.3%) and collapse (23.3%) were detected on CT (12). In a study by Bekçi et al. (18), consolidation and atelectasis were observed at the level of the right middle lobe on CT, as in our case, and the final diagnosis was reached by bronchoscopy. Our case, on the other hand, was presented with a complaint of cough, and after no significant regression was noted on chest X-ray after 10 days of antibiotherapy treatment, an area of consolidation was observed on CT.

Bronchoscopy is the optimum approach to the diagnosis of anthracosis and EBTB. Lesion size, which has an endobronchial effect, is among the side effects of EBTB, and it is a very important point to perform a bronchoscopic examination in this direction. Anthracosis can be localized, widespread, and unilateral or bilateral. It is most often seen in the right middle lobe, followed by the upper lobe in the second order, and tracheal involvement is rare (17). Seven subtypes of EBTB have been defined based on their bronchoscopic features, being active caseous, edematous-hyperemic, fibrostenotic, tumoral, granular, ulcerative and non-specific bronchitic (19). In the study by Lee et al. (20), the most common bronchoscopic finding was lumen narrowing due to hypertrophy, and the most frequently involved areas were the right upper lobe bronchus and the right main bronchus. Our case had involvement in the lower lobe bronchus of the right lung, as well as anthracotic changes in the middle lobe and bronchus of the right lung, and bronchial narrowing and mucosal infiltration on an anthracotic background in the lower lobe. In another case who presented with hoarseness, FOB was performed to investigate the etiology of the identified mediastinal lymphadenopathy, and diffuse anthracotic pigmentation was observed in the bronchial mucosa, in addition to vocal cord paralysis. There was no finding in favor of tuberculosis or malignancy in the bronchial lavage. The pathology of the materials taken from the patient who underwent diagnostic thoracotomy revealed parenchymal anthracosis and granulomatous inflammation with caseification in the lymph nodes (21). In our case, diagnosis was based on the identification of ARB in the bronchoalveolar lavage obtained by bronchoscopy, as well as granulomatous inflammation showing caseification on biopsy, and early treatment was initiated.

In conclusion, patients with anthracosis should be investigated and followed up for tuberculosis and malignancy. Our case of pulmonary tuberculosis mimicking anthracosis-based lung carcinoma was identified with computed tomography and bronchoscopic findings and received clinical and radiological improvement with anti-tuberculosis drug therapy. In such cases, bronchoscopic and bronchoscopic material examinations for the investigation of tuberculosis are of great importance in terms of both establishing the correct diagnosis and preventing the

development of bronchostenosis through the early initiation of treatment.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - S.K., C.A., B.S., M.O.T.; Planning and Design - S.K., C.A., M.O.T., B.S.; Supervision - S.K., C.A., M.O.T., B.S.; Funding - S.K., C.A., B.S.; Materials - S.K., C.A.; Data Collection and/or Processing - S.K., C.A.; Analysis and/or Interpretation - S.K., C.A.; Literature Review - S.K., C.A.; Writing - S.K., C.A.; Critical Review - S.K., C.A.

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