

Bronchial Anthracosis - Anthracofibrosis: Potential Causes and Clinical Characteristics

Elif Yılmazel Uçar, Ömer Araz, Metin Akgün, Mehmet Meral, Leyla Sağlam, Hasan Kaynar, Ali Metin Görgüner

Department of Pulmonary Diseases, Atatürk University Faculty of Medicine, Erzurum

Abstract

Objective: Anthracosis is characterized by accumulation of black pigment in the bronchial mucosa. It may cause anthracofibrosis by leading to mucosal destruction and deformity. In the present study, we aimed to investigate the underlying reasons and clinical characteristics of cases, in which anthracosis-anthracofibrosis was detected via bronchoscopy.

Methods: The study comprised of 109 patients, in whom anthracosis –anthracofibrosis was detected by bronchoscopy between 2002 and 2012. Underlying reasons and clinical characteristics of the patients were analysed by reviewing medical records. The study was designed as a retrospective cohort study.

Results: The present study included 52 males (47.7%) and 57 females (52.3%) with a mean age of 67.8 ± 9.8 (34-85) years. Of the patients, 66 (60.6%) had exposure to biomass smoke, 38 (34.9%) had a history of smoking and 5 (4.5%) had occupational exposure. In bronchoscopy, 34 patients were shown to have anthracosis and 75 patients had anthracofibrosis. The right upper lobe (76 patients, 69.7%) and the left upper lobe (74 patients, 67.9%) were the most commonly involved sites; cough (58.7%) and dyspnoea (49.5%) were the most common symptoms, followed by chest pain (36.7%). The most common radiological findings were atelectasis (65.1%) and consolidation (55%). Of the patients, 46.8% had chronic obstructive pulmonary disease (COPD), 24.8% had pneumonia, 18.3% had tuberculosis and 10.1% had malignancy.

Conclusion: Biomass smoke exposure is the most important risk factor for patients with anthracosis-anthracofibrosis. Such patients should be evaluated and followed-up for various pulmonary diseases including COPD, pneumonia, tuberculosis and malignancy.

Keywords: Anthracosis, anthracofibrosis, bronchoscopy



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Address for correspondence
Elif Yılmazel Uçar, Department of Pulmonary
Diseases, Atatürk University Faculty of Medicine,
Erzurum, Turkey
E-mail: eucar1979@yahoo.com

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INTRODUCTION

The term bronchial anthracosis (BA) is defined as black pigmentation of the bronchial mucosa (1). Bronchial anthracofibrosis (BAF) is defined as anthracotic pigmentation accompanied by bronchial stenosis or obliteration (2).

Diagnosis of bronchial anthracosis and/or anthracofibrosis can be made by bronchoscopic evaluation. Although, in general, BA occurs due to the accumulation of carbon particles, also iron, lead, cadmium and other inorganic or organic materials may cause BA. It is usually detected in patients with obstructive pulmonary disease, who do not completely respond to treatment and had radiological abnormalities (3). It is more prevalent among advanced age females living in the rural areas. However, there is no clear clinical approach concerning the underlying reasons and clinical characteristics of patients, in whom anthracosis or BAF is detected.

In the present study, we aimed to investigate the underlying reasons and clinical characteristics of patients, in whom anthracosis-anthracofibrosis was detected via bronchoscopy.

Table 1. Epidemiological and clinical characteristics of the patients

Characteristics	Values
Age (years) (mean±SD)	67.8±9.8 (34-85)
Male/Female n (%)	52/57 (47.7/52.3)
Risk Factors n (%)	
Smoking	38 (35)
Biomass	66 (61)
Occupational	5 (4)
Symptoms n (%)	
Cough	64 (59)
Dyspnoea	54 (50)
Chest pain	40 (37)
Weight loss	15 (13.8)
Fatigue-weakness	16 (15)
Blood in sputum	5 (5)
PFT (n=89) (mean±SD)	
FVC expected %	90.6±20.1
FEV ₁ expected %	70.2±30.5
FEV ₁ /FVC	67.8±10.6

n: Patient number; SD: standard deviation; PFT: pulmonary function test

METHODS

Patient Population

In the present study, the reports of 2536 patients, of whom bronchoscopy records were available between 2002 and 2012, were reviewed. Medical records of 109 out of 200 patients, in whom anthracosis or BAF had been detected, were available. Patients, whose medical records were unavailable, were not included in the study.

Study Design

The study was planned as a retrospective cohort study. Medical files of the patients, in whom BA and/or BAF was detected via bronchoscopy, were reviewed. Clinical and radiological characteristics of the patients were recorded. Consents of all patients were obtained prior to bronchoscopy. The study protocol was approved by the Local Ethics Committee.

Interventions

Patients that underwent bronchoscopy were included in the study. Prior to bronchoscopy, routinely, 0.07-0.67 mg/kg midazolam (Dormicum; Cenexi Sas Fontenay, France) was used for sedation and 2% lidocaine (Aritmal; Osel Pharm. Co., Istanbul, Turkey) was used for local anaesthesia (5 cc for gargling and 4 puffs of spray on the vocal cords).

Methods for Measurement

Pulmonary function tests of the patients that were performed prior to bronchoscopy were examined. According to the American Thoracic Society (ATS) criteria, patients whose post-bronchodilator forced expiratory volume in one second (FEV₁)/forced vital capacity (FVC) ratio <70 were considered to have chronic obstructive pulmonary disease (COPD) (4). Postero-anterior chest x-ray and tho-

Table 2. Bronchoscopic findings

Localization	Bronchial Anthracosis (n=34)	Bronchial Anthracofibrosis (n=75)
Right upper lobe	10	15
Left upper lobe	10	10
Right middle-lower lobe	10	50
Left lower lobe	5	10
Right main bronchus	4	-
Left main bronchus	2	-

n: Patient number

racic computed tomography of the patients were examined and radiological features were recorded.

Statistical Analysis

Statistical analysis was done using SPSS Windows version 17.0 (SPSS Inc. Chicago, IL., USA). Mean and standard deviation of data were calculated and descriptive analysis was done.

RESULTS

Of the 109 patients included in the study, 52 (47.7%) were male and 57 (52.3%) were female. The mean age of the patients was 67.8±9.8 (34-85) years. While 38 (35%) of the patients were smokers, 66 (61%) had exposure to biomass smoke, and 5 (4%), of which, 3 were coal miners and 2 were jean sandblasting workers, had occupational lung disease. These patients were diagnosed with pneumoconiosis and silicosis, respectively. All females with biomass smoke exposure were homemakers and all males with biomass smoke exposure were farmers, with a mean exposure period of 30±7 years. The most common presenting symptoms of the patients were cough (58.7%) and dyspnoea (49.5%) followed by chest pain (36.7%) and weight loss (13.8%). Pulmonary function tests revealed a post-bronchodilator FEV₁/FVC ratio <70 in 50 patients. General characteristics of the patients are presented in Table 1.

The most common radiological signs on PA chest x-ray and computed tomography of the thorax were atelectasis (n=71), consolidation (n=60), mass (n=18) and calcified or non-calcified hilar lymphadenopathy (n=13). BAF was present in 51 of the patients with atelectasis (p=0,003), and COPD and pneumonia were the comorbidities in these patients.

Bronchoscopy revealed pigmented lesions and/or bronchial stenosis in many areas (Figure 1,2). Thirty four patients had BA and 75 patients had BA and BAF. Particularly the right upper lobe (n=76) and the left upper lobe (n=74) were the most commonly involved sites. Bronchial anthracofibrosis was most frequently detected in the middle lobe (n=50) (Table 2).

The most common comorbidities were COPD (n=50) and pneumonia (n=38). Tuberculosis was identified in 20 patients, of whom 10 had pulmonary tuberculosis and 2 had endobronchial tuberculosis. Eleven patients had lung cancer; with regard to the subtypes, 6 had squamous cell cancer and 5 had adenocancer. While BA was found together with BAF in 7 of these patients, BA or BAF was detected in separate segments in 4 patients.



Figure 1. Bronchial anthracosis in the main carina and left main bronchus.



Figure 2. Bronchial anthracofibrosis in the entrance of the right middle lobe.

DISCUSSION

The present study revealed that biomass smoke exposure is the most important risk factor in BAF patients. COPD was the most common co-morbidity followed by pneumonia, tuberculosis and malignancy in patients with bronchial anthracofibrosis.

Biomass is being used as an energy source in 90% of rural areas in the developing countries (5). Homemakers in particular are exposed to biomass smoke during cooking and warming in poor environmental conditions (6). As the consequence of exposure, organic and inorganic particles of various diameters and carbon particles are accumulated in the bronchial mucosa (7). This accumulation may result in bronchial hypertrophy and stenosis. Studies (3,8-13) demonstrated that biomass smoke exposure is a significant risk factor for the development of COPD particularly in rural areas. Likewise, in the present study, it was observed that biomass smoke exposure was the leading risk factor accompanied frequently by COPD, in patients with BAF.

In previous studies (8-14), the most frequent presenting symptoms of BAF patients were reported to be cough and dyspnoea. In the present study as well, 59% of the patients presented with cough and 50% presented with dyspnoea. In these patients, bronchoscopy was performed due to either unresponsiveness to conventional treatment or the presence of an accompanying radiological pathology. Atelectasis was the most common radiological pathology. This was deemed significant in terms of considering BAF in particularly female patients, who are at an advanced age, have biomass exposure and are unsuitable for bronchoscopy.

In addition to biomass smoke exposure, history of previous tuberculosis is also important in patients with bronchial anthracofibrosis. In

the present study, half of the BAF patients with tuberculosis were the patients with a history of tuberculosis in the past. Based on these results, no decision could be made whether BAF facilitates tuberculosis or tuberculosis facilitates BAF or both of them are comorbid conditions developing as a consequence of similar conditions. In addition to tuberculosis, pneumonia or malignancy may also accompany BAF. Of the patients, 35% had pneumonia and 10% had lung cancer.

CONCLUSION

Patients with bronchial anthracofibrosis must be evaluated in terms of risk factors, particularly for biomass smoke exposure. These patients should be evaluated and followed-up for various pulmonary diseases mainly for COPD, as well as for pneumonia, tuberculosis and malignancy.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Atatürk University.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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