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Bronchial Anthracosis: A New Diagnosis for Benign Mass Lesions of the Lung

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Background: This study aimed to identify the most important new radiological presentations of anthracosis and anthracofibrosis and evaluate the risk ratio for accurate diagnosis of these conditions using computed tomography instead of bronchoscopy.

Materials and Methods: This prospective, case-control study evaluated three groups of 70 patients with a bronchoscopic diagnosis of simple anthracosis and anthracofibrosis and 40 patients with a non-anthracotic diagnosis (control group). Bronchoscopy, chest radiographs and computed tomography (CT) (parenchymal and mediastinal windows) were reviewed. Special attention was given to mass lesions, calcified lymph nodes, bronchi and bronchial stenosis.

Results: Abnormal chest x-rays were observed in 93% of patients with bronchial anthracofibrosis; patchy consolidation was the most prevalent finding. The most significant CT finding was lymph node calcification (80%, odds ratio = 22.9), followed by bronchial calcification and bronchial stenosis (odds ratio = 6 and 2.91, respectively). Other significant findings were mass-like lesions (14%) and collapse (20%). CT findings were unremarkable in less than 1/6 of subjects.

Conclusion: Lymph node and bronchial calcification can serve as accurate signs in diagnosing anthracosis of the lung. In addition, mass lesions, collapse and infiltration may be associated with a benign course.

Key words: Anthracosis, Anthracofibrosis, Computed tomography, Radiology, Calcification

INTRODUCTION

Anthracosis of the lung is a black discoloration of the mucosal surface of bronchi (1). When anthracosis is associated with mucosal proliferation resulting in luminal obliteration/obstruction, the condition is called anthracofibrosis (2) (Figure 1). Although anthracosis is an ancient disease reported in mummies (3), medical reports show that this disease is currently prevalent in Asia (4).

Simple non-obstructing anthracosis (simple anthracosis) is an incidental finding during bronchoscopy; however, anthracofibrosis may indicate chronic lung disease with clinical symptoms namely cough, dyspnea, phlegm and wheezing (4). The course of disease is chronic and it is usually misdiagnosed as chronic bronchitis; although most patients have no history of cigarette smoking (4). Anthracosis is not localized to bronchi and may spread to the parenchyma and present as a large mass lesion. It can also invade the regional lymph nodes (5,6). Histopathological findings include anthracotic granules inside and outside of macrophages, edema and scattered inflammatory cells (5).

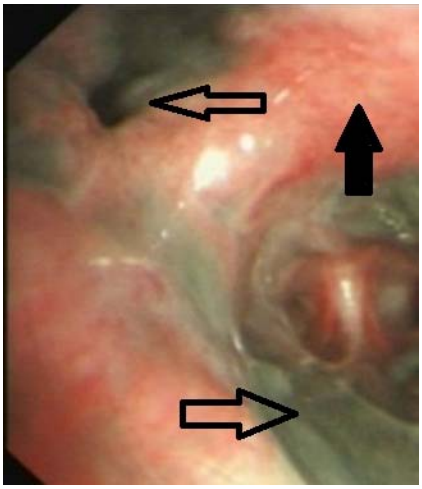

Figure 1. Bronchoscopic picture of anthracofibrosis obliterating the bronchial lumen (open arrow) and edema and erythema in the surrounding mucosa (filled arrow).

Currently, the diagnosis of anthracosis is made by bronchoscopy because other non-invasive diagnostic procedures are not very accurate in identifying this disease. However, bronchoscopy specimens are not usually helpful in detecting additional findings (e.g., gross morphology of bronchi) (1, 2,4). Therefore, an easy and non-invasive diagnostic method for a comprehensive and accurate diagnosing of anthracosis and anthracofibrosis is needed in endemic areas. Recently, a few comprehensive reports have shown that atelectasis along with mediastinal lymph node calcification is a radiological sign of anthracofibrosis (7). However, these studies were mainly descriptive and did not use a control group for statistical analysis and the risk ratio for radiological findings was not calculated.

The objective of this study was to identify the most important radiological presentations of anthracosis and anthracofibrosis using computed tomography (CT) and evaluate the risk ratio in order to introduce an accurate radiological sign that can indicate the presence of these conditions.

MATERIALS AND METHODS

Patients

This prospective, case-control study was carried out in university hospitals during 2006-2008 in Mashhad, Iran. The study was approved by the ethics committee of our university and all patients in our study provided written informed consent.

All patients who had undergone flexible bronchoscopy for various reasons were included in this study and divided into three groups: 1) simple anthracosis, 2) anthracofibrosis, and 3) the non-anthracotic control group. Indications for bronchoscopy in control group patients were related to significant lung lesions. Demographic data, history of exposure to smoke and important clinical findings were recorded. During bronchoscopy, patients with superficial non-deforming black discolorations were classified as having simple anthracosis and patients with black discolorations that caused deformity or stenosis of bronchi were classified as having anthracofibrosis. The control group consisted of patients without any black discoloration in the tracheal-bronchial mucosa. Biopsies were taken for a histopathology examination when malignancy or granulomatous disease was suspected during bronchoscopy. In all cases, bronchoalveolar lavage fluid was examined for acid-fast bacilli (AFB); cytology and mycobacterial culture were also performed. CT-guided transthoracic lung biopsy was also performed for evaluation of lung mass lesions.

Radiological examinations

Standard chest x-ray (CXR) and computed tomography (CT) were carried out in all patients prior to bronchoscopy. Unenhanced thin-section CT scans with 1mm collimation at 10 mm intervals were taken. Images were reconstructed using high-resolution (lung) and soft (mediastinal) algorithms.

A cross-sectional interventional radiologist reviewed the images. Localizations of radiographic lesions on CT scan and bronchoscopic lesions were correlated. All positive findings were recorded and special attention was given to bronchial stenosis, lymphadenopathy and calcification. Bronchial stenosis was diagnosed if focal or diffuse bronchial narrowing was present relative to proximal and distal bronchi for vertically-oriented bronchi, or with the adjacent same-order bronchus for horizontally

or obliquely-oriented bronchi. When the imaged planes were not centered on the bronchus, bronchial stenosis was not considered.

Bronchial calcification was recorded if it was apparent and in the direction of the bronchial wall. Lobar localization of lung changes was recorded and correlated.

Statistical analysis

A sample size of 35 for each group was calculated as sufficient for 0.05 alpha error and 80% potency on the basis of prevalence of anthracosis (22%) (4). Normal distribution of data was checked using the Kolmogorov–Smirnov test. Chi square test was used to evaluate the correlation of radiological findings (CT scan and CXR) with bronchoscopic findings and estimation of likelihood ratio (LR) and odds ratio (OR). The effect of tuberculosis on radiological imaging in anthracotic subjects was controlled by logistic regression. Bronchoscopy was used as a gold standard for measuring the sensitivity, specificity, negative predictive value and positive predictive value of new radiological parameters. EPI INFO 2003 and SPSS 16 software were used for statistical analyses. Significance was accepted at P<0.05.

RESULTS

Seventy anthracotic patients (n=35 in each group of anthracosis and anthracofibrosis) and 40 patients in the control group were entered the study. Females in both anthracosis groups were significantly more than in the control group; moreover, in these groups, the mean age was significantly higher than in the control group (Table 1). The prevalence of cigarette smoking in both anthracosis groups was less than in the control group, but the difference was not significant. History of traditional wood fired hearth bread baking was present in 40% of anthracotic patients (26/65; missing value = 5; 92% females), which was significantly higher than in the control group (X^2 = 8.07, P = 0.004, odds ratio = 4.8, CL = 1.39-18.11). In the anthracosis groups, 93% (54/58) of female patients were homemakers; however, patients held other occupations as well, such as farming (40%) and manual jobs (17%), which were the most prevalent jobs in anthracotic male patients.

Table 1. Demographic and clinical findings of subjects with simple anthracosis and anthracofibrosis compared to the control group.

	Simple anthracosis (35)	Anthracofibrosis (35)	Control (40)
Female/male ratio	1.7/1*	1.5/1*	0.6/1
Age (year)	68.1 ± 17.2*	69.3 ± 9,4*	54.5 ± 19.2
Cigarette smoking	15%	21%	34%
Baking	40%*	38%*	11%
Cough	85%	74%	85%
Dyspnea	70%	74%	62.5%
Sputum	40%	40%	35%
Hemoptysis	21%	18%	20%

* P<0.05

Clinical findings

The main presenting complaints of patients, who had undergone bronchoscopy, were cough (81%), dyspnea (68%), sputum (37%) and hemoptysis (20%). None of these symptoms were significantly more prevalent in anthracotic patients than in the control group (Table 1).

Chest x-ray findings

Chest x-ray findings are displayed in Table 2. Normal CXR was observed in 7% (5/70; 2/35 simple anthracosis and 3/35 of anthracofibrosis), which was significantly lower than in the control group (8/40, 20%) (X^2 = 4.04, P = 0.04). The most prevalent CXR finding was patchy consolidation (29/70; 45%). The frequency of consolidation was not significantly different between the two groups. Confluent consolidation was bilateral in 2 (6%) simple anthracotic patients and 7 (20%) anthracofibrosis patients. This difference was marginally insignificant (P = 0.06) (Table 2).

Table 2. Frequency of different pathological findings in chest X ray of simple anthracosis, anthracofibrosis and control groups.

	Simple anthracosis (33)	Anthracofibrosis (32)	Control (33)
Non-homogenous Infiltration	16 (49%)	13 (40%)	15 (45%)
Consolidation	2 (6%)	4 (12.5%)	1 (3%)
Collapse	1 (3%)	4 (12.5%)	4 (12.5%)
Mass*	6 (18%)	5 (16%)	15 (45%)
Lymphadenopathy	1 (3%)	0	1 (3%)
Honey comb like	1 (3%)	1 (3%)	4 (12.5%)
Reticular	0	2 (6%)	3 (9%)
Nodular	5 (15%)	2 (6%)	1 (3%)

* P<0.05

Lung collapse was present in four patients (12.5%) from the anthracofibrosis group compared to one patient (3%) in the simple anthracosis group (Figure 2). Mass lesions were observed in 11 anthracotic patients (17%). Cavitating lesion was not observed (Figure 3-6).

Computed tomography findings

CT scan findings were unremarkable in 6 (17%) simple anthracotic patients and in 2 (6%) anthracofibrosis patients; this frequency did not show significant differences with the control group. Abnormal CT findings are presented in Table 3.

Table 3. Frequency of different pathological findings in CT scan of simple anthracosis, anthracofibrosis and control groups.

	Simple anthracosis (35)	Anthracofibrosis (35)	Control (40)
Non-homogenous Infiltration	9 (25%)	9 (25%)	7 (22%)
Consolidation	3 (8.6%)	2 (6%)	4 (10%)
Collapse	3 (8.6%)	7 (20%)*	2 (5%)
Mass	6 (17%)	5 (14%)	10 (24%)
Lymph node calcification	25 (71%)*	30 (88%)*	6 (14%)
Bronchial stenosis	12 (35%)	15 (48%)*	10 (24%)
Bronchial calcification	14 (40%)*	21 (62%)*	6 (14%)
Bronchiectasis	1 (3%)	0	4 (10%)
Cavity	2 (5.7%)	1 (3%)	5 (12%)
Nodular	3 (8.6%)	5 (14.7%)	3 (7.3%)
Ground glass	1 (3%)	1 (3%)	0
Pleural effusion	1 (3%)	2 (6%)	0

* P<0.05

Lymph node calcification (high attenuation) was the most common CT finding, as seen in 55 (80%) patients (Figures 3 to 6). Frequency of lymph node calcification in anthracotic patients was significantly more than in the control group (X^2=46, P=0.0001, LR 50.5, OR=22.9 [95% CL=7.31< OR<75]). Lymph node calcification was also significantly more remarkable in the anthracofibrosis group (X^2=37.4, P<0.0001, OR 34 [95% CL=8.17<OR<157]) than in the simple anthracosis group (X^2=24, P<0.0001, OR=14.17 [95% CL=4.03<OR<52]) (Table 2). Although the prevalence of lymph node calcification was significantly high in both sexes, it was significantly higher in male patients in anthracofibrosis group (X^2=16.7, P=0.00001, LR=19.8, OR = 6.8 [95% CL=2.87<OR<21.4])

Figure 2. Plate-like atelectasis in chest X ray of a patient suffering from anthracofibrosis.

Figure 3. Hilar and carinal lymph node calcification (open arrow) and an extending mass to the left lung (filled arrow) in an anthracofibrosis patient.

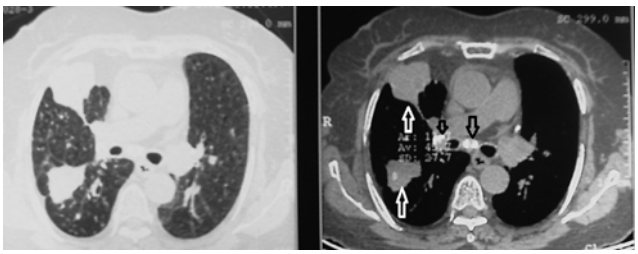

Figure 4. Benign masses (white arrow) in addition to lymph node calcification (black arrow) in an anthracofibrosis patient.

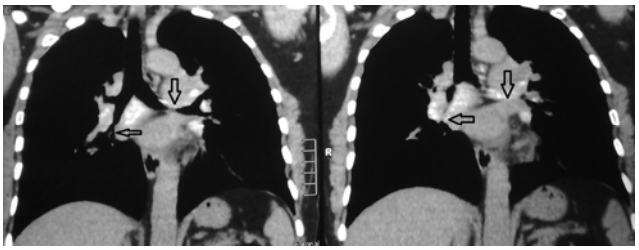

Figure 5. Bronchial narrowing (arrow) due to an enlarged calcified lymph node in an anthracofibrosis patient.

Figure 6. Calcified mass (white arrow) and lymph nodes (Black arrow) in an anthracofibrosis patient.

Bronchial calcification (high attenuation) was the second common finding (Figure 7) observed in anthracosis patients group and it was significantly more than in the control (X^2=14.3, P=0.0001, LR=18.8, OR=6 [95% CL=2.07<OR<18.3]) (Table 2). The difference was significant for male gender (X^2 = 15.5, P = 0.0001) and not significant for female subjects (X^2 = 2.9, P = 0.23). The difference in bronchial calcification between the simple anthracosis (X^2=6.27, P=0.01, OR=3.89, 95% [CL=1.16<OR<13.5]) and anthracofibrosis (X^2=18, P=0.00012, OR=9.4, 95% [CL=2.77<OR<33.7]) groups was also significant (Table 2). Overall, the accuracy of lymph node and bronchial calcification for diagnosing simple anthracosis and anthracofibrosis was more than 80% and 70%, respectively (Table 4).

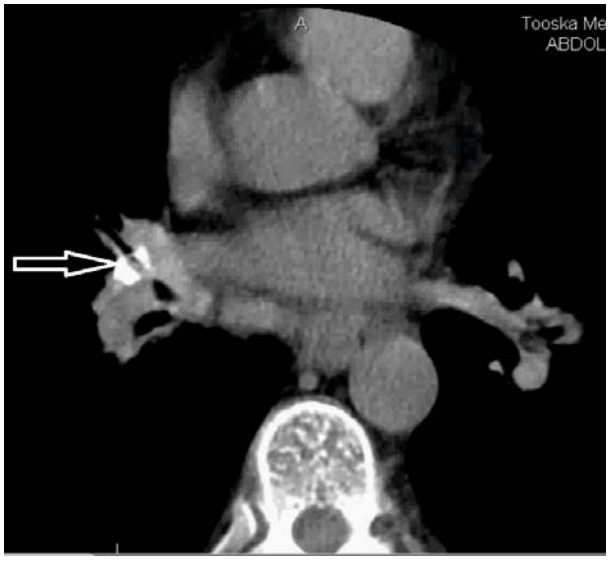

Figure 7. Calcification in the bronchial wall of the right middle lobe (arrow) in an anthracofibrosis patient.

Table 4. Accuracy of lymph node and bronchial calcification for diagnosis of anthracosis of the lung.

		Sensitivity	Specificity	PPV	NPV
Lymph node calcification	Simple anthracosis	80%	77%	71%	85%
	Anthracofibrosis	83%	89%	88%	85%
Bronchial calcification	Simple anthracosis	70%	62%	40%	85%
	Anthracofibrosis	77%	72%	61%	85%

NPV= Negative predictive value, PPV= Positive predictive value

Bronchial stenosis could not be determined in four patients with anthracofibrosis, as image planes were not centered over the bronchus. Of the remaining 31 patients, bronchial stenosis was observed in 48% (15/31) of patients with anthracofibrosis (Figures 5 and 8). Bronchial stenosis was observed in CT images in 34% (12/35) of patients with simple anthracosis with no significant difference when compared with the anthracofibrosis group (X^2=1.07, P= 0.3). Bronchial stenosis was significantly more frequent in anthracosis and anthracofibrosis groups than in the control group (X^2=4.48, P=0.03, OR=2.91[95% CL=1.02<OR<8.99]). Comparison of male and female gender showed no significant difference (X^2 = 1.14, P = 0.56).

In addition to the bronchial findings mentioned above, parenchymal lesion was seen in 94% (31/33) of simple anthracotic patients, 97% (31/32) of anthracofibrosis patients and 93% (38/40) of patients in the control group (Table 2). Collapse in any part of the lung was detected in 20% (7) of anthracofibrosis patients, which was significantly higher than in the control group ($X^2 = 3.98$, P = 0.04, OR = 4.75, [CL 95% 0.8<OR<386.8]). Anthracotic mass lesions (Fig. 3, 4 and 6), which were proven to be free from pathological lesions, such as malignancy or tuberculosis (TB) by trans-thoracic needle biopsy, were observed in 14-17% of patients depending on the type of anthracosis (Tables 2 and 3). Other CT scan findings that were mentioned in Table 3 were not significantly different between the simple anthracosis and anthracofibrosis groups and the control group.

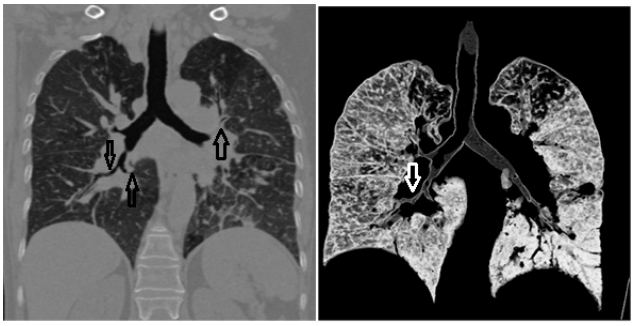

Figure 8. Bronchial stenosis due to infiltration or huge inter-lobar lymphadenopathy (arrow) in the bronchus intermedius, right middle and lower lobes of the right lung and left upper lobe in a patient suffering from anthracosis.

Right-sided lesions were more predominant than left-sided and bilateral lesions in all radiological lesions (X^2=107, P<0.0001, LR=76), except for bronchiectasis, which was more frequent on the left side. Also, the region of lung involvement did not reveal a significant correlation with any of the three groups.

Correlation of CT scan with bronchoscopic findings

Locations of common changes (lymph node and bronchial calcifications) in CT imaging were correlated with bronchoscopic findings. In 45.5% (15/33; missing data = 2) of simple anthracosis and 74% (23/31; missing data = 4) of anthracofibrosis patients, black discoloration of bronchi correlated well with the location of changes on the CT images. Anthracofibrosis correlated significantly more with CT scan findings than simple anthracosis (X^2=5.47, P=0.01). Involvement of upper lobes diagnosed during bronchoscopy was seen in 80% of anthracotic subjects; which was significantly higher than in the control group (X^2=28, P=0.0001).

Positive microbiologic and histopathological evaluation result for Mycobacterium TB was observed in one third of simple anthracosis and anthracofibrosis patients ($X^2 = 7.32$, P = 0.006, OR = 8 [CL 95%: 1.3<OR<62]), which was significantly higher than in the control group ($X^2 = 7.2$, P = 0.006, OR = 7.5 [CL 95%: 1.31<OR<55]). Upper lobe localization for anthracosis was not correlated with a final diagnosis of TB ($X^2 = 4.4$, P = 0.1). Lymph node calcification and collapse/atelectasis were the only CT scan findings that were significantly more prevalent in TB patients than in the anthracosis group ($X^2 = 12.9$, P = 0.002; $X^2 = 6.29$, P=0.01, respectively), but lymph node calcification was still more frequent in patients suffering from both TB and anthracosis in comparison to TB patients without anthracosis (19/21, $X^2 = 27$, LR=13.9, risk ratio = 4, P = 0.0001). On the contrary, bronchial calcification was significantly more frequent in non- TB anthracofibrosis patients (16/19 patients with bronchial calcification were not proven to suffer from TB) (X^2=7.8, P=0.007, OR = 0.11 [CL 95%: 0.01<OR<0.79]).

No malignancy was found in anthracotic patients. Histopathology showed malignant lesions in 6 patients (20%) in the control group, which was significantly higher than in anthracotic patients (Fisher's exact test = 0.007). Other histopathological diagnoses included sarcoidosis, bronchiolitis obliterans with organizing pneumonia and idiopathic pulmonary fibrosis (all of them in one subject) that presented only in the control group.

Clinical follow up of anthracotic patients (ranging from 6-15 months) showed two deaths, one due to secondary heart failure and the other related to complications of cirrhosis. In addition, all anthracosis and anthracofibrosis patients tolerated their chronic disease without significant disabilities. Confirmed TB patients were treated and after

which, significant clinical improvement was observed. Follow up CT scans in 16 patients (including those with mass lesions) did not show changes in the appearance of their mass lesions, bronchial stenosis or new lesions.

DISCUSSION

In this prospective study the radiological findings of simple anthracosis and anthracofibrosis were evaluated and compared to the control group. The results of this study show that most of the simple anthracosis and almost all of the anthracofibrosis patients had radiological abnormalities in their CXR and CT scans. Two-thirds of anthracotic subjects had not suffered from any other disease. Lymph node and bronchial calcifications were the most important radiological findings in support of simple anthracosis or anthracofibrosis. As mentioned above, the odds ratio of lymph node calcification was 22.9 in anthracosis, and this finding with 83% sensitivity and 89% specificity was able to diagnose anthracofibrosis. Bronchial calcification is also a noteworthy finding since its odds ratio was 9.4 for anthracofibrosis and hence, this finding (with 77% sensitivity and 72% specificity) can diagnose anthracofibrosis. Benign mass with or without calcification was the third most important radiological finding in anthracosis/anthracofibrosis patients (14-17%, respectively), which showed a benign course in follow up. Other radiological findings, such as collapse and bronchial stenosis, were also correlated with anthracofibrosis.

In a previous study in our region, collapse consolidation was the most frequent finding in chest radiographs (48%) (1). Amoli (8) also reported abnormal chest X-rays in all patients with anthracosis and the basic finding was streaky shadows along the bronchovascular marking in the paracardiac and parahilar regions. Törün et al. (9) offered a comprehensive description of chest radiographs and CT scans in anthracotic patients in Turkey. In their study, linear (streaky) shadows were detected in 40% of patients; which ranked second after collapse, detected in 48% of patients. Consolidation, reticulonodular patterns and masses were also reported in this study and the CT scan findings were similar to our study, except for lower frequency of calcification (22%). However, this study did not do a comparison with a control group. Hemmati et al. (10) reported that 80% (27/34) of their anthracotic patients had hilar or interlobar lymphadenopathy. A large study by Kim et al. (7) reported bronchial narrowing or atelectasis as the main stay of radiological findings detected by CT scan in 94% of their patients and 80% had smooth narrowing. In their study, enlarged lymph nodes were observed in 63% of patients, among which 57% showed calcification. In another study by Kim et al (11), bronchial narrowing with or without atelectasis (41% and 21%, respectively), lymph node enlargement (66%) and infiltrate (72%) were reported. Calcification of lymph nodes was observed in two-thirds of patients in their study, which is similar to our results.

In reports by Chung et al. (2), Hemmati et al. (10) and Kim et al. (7), the right middle lobe was the predominant site of involvement, but in our study and in studies by Towhidi et al. (1), Törün et al. (9) and Kim et al. (11), upper lobe involvement was more prevalent.

The nature of anthracosis and these black pigments has remained elusive. It seems that anthracotic granules are radio opaque; thus, in CT scan these materials look like calcification. We should emphasize that during radiological evaluations marked indubitable calcification has to be recorded and bronchial calcification should be in the direction of the bronchial wall. In 6-17% of cases, anthracotic lesions in bronchoscopy were located in regions that were not detected by CT. Thus, the accuracy of bronchoscopy is still higher than CT scan.

In our study, 80% of patients had anthracosis in the upper lobes. The only other remarkable pathologic finding in anthracotic patients was TB. Lymph node calcification was seen in TB patients, but this finding was significantly more frequent in TB patients that suffered from anthracosis/anthracofibrosis; therefore, we believe that lymph node calcification in anthracosis is independent of TB. Bronchial calcification was not frequent in TB patients; therefore, TB can be prevented in anthracotic patients.

Mass lesions were observed in 17% of simple anthracosis and 14% of anthracofibrosis patients. These lesions obligate the pulmonologist to perform a bronchoscopy or use other diagnostic procedures. In our study, transthoracic biopsy revealed TB in only one patient and the other patients showed anthracosis without other pathologies. These patients were enrolled in a follow up course for more than six months and all of the anthracotic patients were under medical supervision and no other pathologies (such as malignancies) were detected. In a large study by Kim et al. (11), lung cancer was reported in less than 5%. Therefore, we believe that anthracosis should be added to the list of benign mass lesions in CXR and CT scans. In this situation, the presence of calcification in mass lesions can help differentiate anthracosis from a malignancy (Figure 6). Although mass lesions had a benign course in our study, we still recommend doing a biopsy of mass lesions, because some researchers have reported malignancies in association with anthracosis (12,13).

Anthracosis can involve other organs in the body as well. Anthracosis in the liver and spleen has been reported (14). Moreover, calcification was also a radiographic sign for this disease (15). Therefore, we recommend considering anthracosis in the differential diagnosis of high attenuation images in all parts of the body, which should be differentiated from calcification (as their histopathology did not show calcium deposition).

Bronchial stenosis detected in CT scan was also observed in anthracofibrosis patients, but its image was not as clear as lymph node calcification because its diagnosis depends on the angle of bronchus to the position of the CT scan axis (Figures 5 and 8). In addition to anthracofibrosis, bronchial stenosis was seen in other benign and malignant intrabronchial lesions. For the time being, accurate radiological findings to differentiate between anthracofibrosis and other intrabronchial lesions do not exist, but high attenuated lesions inside the bronchus or in the lymph node adjacent to the lesion may help the diagnosis of anthracosis (Figures 3-6). In this case, bronchoscopy and biopsy seem to be the only accurate diagnostic methods.

Chung et al. (2) and Towhidi et al. (1) reported on the association of TB and anthracofibrosis. In our study, both of the anthracosis groups showed a significantly higher frequency of TB. Diagnosis of TB was made by either microbiological evaluation or histopathology. Radiographs that showed imaging signs, such as mass, infiltration and nodular patterns, were seen in anthracotic patients that were confirmed to have TB; however, lymph node and bronchial calcification and collapse were the only imaging findings that were significantly more prevalent in anthracosis associated with TB (30%). Park et al. (16) reported multiple bilateral involvements of the lobar to segmental bronchi by anthracosis, but they found that endobronchial involvement by TB in these patients tends to be more localized (one lobar bronchus and ipsilateral).

As a causative factor for anthracosis, history of wood fired hearth bread baking was found in 38-40% of patients, which was significantly more than the control group. Most of these subjects were females and homemakers, who baked their bread in traditional ground ovens and thus were exposed to large amounts of smoke produced by wood burning (17). The effect of this factor on radiological findings is unknown. Naccache et al. (18) reported on three patients with anthracofibrosis, who had a history of mixed mineral dust exposure and no history of TB. Transmission electron microscopy showed high levels of particle retention that suggested mixed mineral dusts were the cause of the anthracofibrosis. Presence of these mineral compounds could explain the high attenuation image in CT findings.

Malignant transformation was also reported as a late complication of anthracosis of the lung (4-19). In addition, some researchers believe that anthracosis may aggravate the course of malignancies in the lung (12). In the current study, malignancies were not seen in patients with anthracosis; therefore, we do not believe that anthracosis is a risk factor for malignancies.

In conclusion, simple anthracosis and anthracofibrosis can be accurately diagnosed by identifying lymph node and bronchial calcifications on CT scan imaging. Also, other radiological findings such as mass, collapse and infiltration may be seen in anthracosis that are usually related to anthracosis itself and show a chronic non-malignant course, except for TB, which should be excluded.

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