Characteristics of lung cancer patients with asbestos-related radiological findings

Güntülü AK[1], Muzaffer METİNTAŞ[1], Selma METİNTAŞ[2], Sinan ERGİNEL[1], Füsun ALATAŞ[1], Hüseyin YILDIRIM[1], Emel KURT[1]

[1] Eskişehir Osmangazi Üniversitesi Tıp Fakültesi, Göğüs Hastalıkları Anabilim Dalı,
[2] Eskişehir Osmangazi Üniversitesi Tıp Fakültesi, Halk Sağlığı Anabilim Dalı, Eskişehir.

ÖZET

Asbeste bağlı radyolojik bulguları olan akciğer kanserli hastaların özellikleri

Bu çalışmanın amacı; asbest teması ve asbeste bağlı radyolojik bulguları olan akciğer kanserli hastalarla asbest teması olmayan akciğer kanserli hastaların özelliklerini karşılaştırmaktır. Değerlendirilen 766 akciğer kanserli hastanın, 607'sinin asbest teması öyküsü ve asbeste bağlı radyolojik bulgusu yoktu, 88'inin asbest temas öyküsü ve asbeste bağlı radyolojik bulgusu vardı. Kalan 71 hastanın ise mesleksel asbest teması ve asbeste bağlı radyolojik bulgusu yoktu, ancak kırsal temas öyküsünü net alamadığımız için bu 71 hastanın verilerini çalışma dışında bıraktık. Asbest teması öyküsü ve asbeste bağlı radyolojik bulgusu olmayan hastalar ile temas öyküsü ve asbeste bağlı radyolojik bulguları olan hastalar yaş, cinsiyet, sigara öyküsü, semptomlar ve semptom süresi, fizik muayene bulguları, tümörün histolojik tipleri, göğüs radyografisi bulguları, tümörün yerleşim yeri, evresi ve sağkalım bakımından kıyaslandı. Asbeste bağlı radyolojik bulguları olan akciğer kanserli hastalar asbest temas öyküsü olmayan hastalardan daha yaşlıydı. Bu hastalar arasında erkek hasta ve sigarayı bırakmış olan hasta oranı daha fazlaydı. İki grup arasında semptomlar, semptom süresi, fizik muayene bulguları, tümörün histolojik tipi, göğüs radyografisi bulguları, evre ve ortanca sağkalım bakımından fark yoktu. Asbeste bağlı radyolojik bulguları olan grupta tümörün orijini akciğerin periferal alanları ve alt zonlarıydı. Asbeste bağlı radyolojik bulguları olan hastaları değerlendirirken, göğüs radyografisinde akciğerlerin periferal alanlarının ve alt zonlarının akciğer kanseri yönünden daha dikkatli değerlendirilmesini öneriyoruz.

Anahtar Kelimeler: *Akciğer kanseri, asbest, radyoloji, epidemiyoloji.*

Yazışma Adresi (Address for Correspondence):

Dr. Güntülü AK, Eskişehir Osmangazi Üniversitesi Tıp Fakültesi, Göğüs Hastalıkları Anabilim Dalı, 26000 ESKİŞEHİR - TURKEY

e-mail: guntuluak@mynet.com

SUMMARY

Characteristics of lung cancer patients with asbestos-related radiological findings

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[1] Department of Chest Diseases, Faculty of Medicine, Eskişehir Osmangazi University, Eskişehir, Turkey,
[2] Department of Public Health, Faculty of Medicine, Eskişehir Osmangazi University, Eskişehir, Turkey.

The purpose of the current study was to compare the characteristics of lung cancer patients who had exposure to asbestos and asbestos-related radiological findings (ARRF) to the characteristics of patients who had no exposure. Of the 766 lung cancer patients evaluated, 607 had no exposure to asbestos and no ARRF, 88 had ARRF and a history of exposure, remaining 71 patients had no exposure to asbestos occupationally and no ARRF, but we could not obtain environmental exposure history from them. So we excluded these 71 patients' data. The study patients were compared with respect to age, gender, smoking history, duration and nature of symptoms, findings on physical examination, tumor histological types, chest X-ray (CXR) findings, tumor site and stage, and survival. Lung cancer patients with ARRF were more often males, former smokers, and older than patients with no history of exposure to asbestos. There were no differences between the groups of patients in terms of the duration of symptoms, the distribution of symptoms, the findings on physical examination, tumor histological type, and the CXR findings. There was no difference between the two groups of patients in the distribution among tumor stages and median survival. The anatomic site of origin of the tumor in the group with ARRF was peripheral and in the lower zone of the lung. We suggest that specific attention should be given to the peripheral and lower zones of the lungs on CRX during the evaluation of the patients with ARRF for lung cancer.

Key Words: *Lung cancer, asbestos, radiology, epidemiology.*

Lung cancer is the leading cause of cancer-related deaths worldwide and it is expected to continue to be the leading cause in the future (1). The most important factor in the etiology of lung cancer is cigarette smoking (2). However, exposure to many substances of environmental and occupational origin, such as asbestos, nickel, cadmium, and arsenic, may also cause lung cancer (3). The relationship between asbestos exposure, which is a significant occupational and environmental carcinogen, and lung cancer was first defined in the 1950s (4). The risk of lung cancer is increased in patients with pleural plaques and asbestosis who have been radiologically diagnosed as having had exposure to asbestos, irrespective of the cigarette smoking history (5).

The role of asbestos in the histological type of tumor and anatomic location of the tumor is a major topic of discussion. Although there are some studies reporting adenocarcinoma as the most prevalent histological type of tumor in this patient group, some other studies have reported that there is no difference in the distribution of histological types (6-10). While some studies indicate that lung cancer in patients with exposure to asbestos is mostly confined to the lower lobes and periphery, there is no difference in these characteristics between the two groups according to other studies (6,7,9-11). However, both differences in the histological type of tumor and anatomic location of the tumor, if any, are important because determination of histological differences indicate that asbestos may play a significant role in the etiology of lung cancer and may in turn result in different pathogenic functions. Thus, the clinical manifestation and course of the disease may indeed be different. When chest X-ray (CXR)s of patients with exposure to asbestos are examined, especially in the context of lung cancer screening, one should be aware that some anatomic zones should be more carefully evaluated, thus leading to more effective screening results with a lower margin of error.

Also, different clinical findings may necessitate different therapeutic approaches, at least for the best supportive care modalities.

In the current study, the epidemiologic, clinical, and CXR findings of patients with epidemiologic- and radiological-proven exposure to asbestos were compared to the findings of patients with no history of exposure to asbestos and no radiological evidence suggestive of exposure to asbestos. The purpose of the study was to determine whether lung cancer patients with exposure to asbestos have different or specific demographic, clinical, and CXR findings or features.

MATERIALS and METHODS

Patient Population

The current study was conducted retrospectively by documenting the findings of 766 lung cancer patients, all of whom had a histopathological-confirmed diagnosis of lung cancer in our clinic between January 1990 and December 2005. The birthplaces of the patients, the places where they resided, their occupations, their asbestos exposure histories, asbestos exposure times, ages, and histopathological types of tumors were examined and the data were verified by comparison to data from studies that were previously carried out in our region and that indicated the locations where environmental exposure to asbestos existed (12,13). CXRs and thoracic computed tomographic (CT) scans of the patients were re-evaluated by two thoracic physicians experienced in asbestos-related lung diseases and asbestos-related radiological findings (ARRF). In lung cancer screening studies, CXRs are generally used and for this reason, the CXR findings were documented in the current study. Despite the fact that thoracic CT findings were evaluated for all patients, specific lung cancer CT findings were not discussed herein. As asbestos exposure-related diseases have a high specificity and sensitivity on CT scans, the CT findings were used only for confirmation and to prove exposure to asbestos.

Asbestos Exposure

The Eskisehir district is located in central Turkey. The population of Eskisehir is 641.057, of whom 477.436 live in the city, where no significant occupational exposure to asbestos is in question, and 163.621 who live within the 403 villages around the city. Soil mixtures containing asbestos fibers can be found in some of the villages, which are referred to as white soil. The villagers who engage in agriculture use this soil, either as a whitewash or a plaster material (white stucco) for coating walls, as well as for insulation and water-proofing floors and roofs. Of the 72 villages from which we took white soil samples to be analyzed for mineral content, nearly all types of asbestos fiber contamination were found. Whereas most of the samples contained tremolite and chrysotile as the primary fiber types, some samples had actinolite and anthopholyte fibers. More than 10.000 people are still living in these villages who were exposed to asbestos, and some of the villagers continue to be exposed to asbestos (12). According to our estimation, around 100.000 villagers exposed to asbestos at some part of their lives are now living in the vicinity of Eskisehir. The cumulative fiber count of the villagers during their lifespan ranged from 0.19-14.61 f/mL-years (13).

According to our data, 88 patients were shown to have asbestos-related CXR findings and thoracic CT scan findings and a definite history of exposure to asbestos. There was not a history of exposure to asbestos or radiological findings of consistent with exposure to asbestos in 607 of the 766 patients. Remaining 71 patients had no exposure to asbestos occupationally and no ARRF, but we could not obtain environmental exposure history from them in detail. So we excluded these 71 patients' data. As a result, the 88 patients having ARRF and a history of exposure to asbestos and the 607 patients without a history of exposure to asbestos or CXR findings were compared in terms of age, gender, cigarette smoking history, duration and nature of symptoms, findings on physical examination, histological type of tumor, CXR findings, tumor site and stage, and survival.

Definitions

Findings specific to asbestos exposure were considered findings related to pleural plaque, diffuse pleural fibrosis, and asbestosis during CXR screenings (5,12-14).

Smoking History

Patients were assigned a current smoking status based on whether they had never smoked (never smokers), had not smoked for > 1 year (former smokers/ex-smokers), or were smoking at the time of the study (current smokers). Those patients who had quit smoking for < 1 year were classified as current smokers. The pack-years of cigarette smoking were calculated as the product of the duration of smoking in years and the average number of cigarettes smoked per day.

Clinical Investigations

The time between the beginning of the patient's complaints and referral to our clinic was designated as the period of symptoms. Symptoms were classified as follows: Intrapulmonary (cough, chest pain, dyspnea, and hemoptysis), extrapulmonary intrathoracic (hoarseness, dysphagia, complaints related to the superior vena cava and Horner's syndromes, etc.), paraneoplastic syndrome [clubbing, hypertrophic osteoarthropathy, inappropriate antidiuretic hormone secretion, hypercalcemia, leucocytosis, thrombocytosis (excluding other causes), thrombophlebitis, etc.], and metastatic and systemic (weight loss, sweating, lack of appetite, etc.). Physical examination findings were classified as local, intrathoracic, and metastatic findings.

Patients, in keeping with the new international system, were staged by thoracic CT scan, abdominal CT scan or ultrasonography, cerebral CT or magnetic resonance imaging, and bone scintigraphy, and when necessary, invasive procedures were carried out on the mediastinal or suspicious areas (15).

Radiological Evaluation

Chest radiographic findings were classified as a mass, hilar enlargement, mediastinal enlargement, pleural effusion, atelectasis, pneumonia, nodule, or a cavity.

For tumor locations, CXR findings were used because, as previously mentioned, CXRs are generally performed for screening purposes. The lungs were divided into upper, middle, and lower zones by means of two horizontal lines drawn through the upper and lower borders of the hilum. The lungs were also divided into central (perihilar) and peripheral (subpleural) regions. The latter region is the 4 cm wide parenchymal zone at the periphery of the lobes that is devoid of radiologically visible vessels (16). In addition, to determine whether the tumor had a centrally located, the following findings were taken into consideration if one or several of the findings existed: The hilum increased in size, there was a laterally convex hilar shadow, strands radiated into the lung from the hilum, carcinomatous pleuritis, distal hyperinflation, a paradoxical hilum sign, a small hyperlucent lung (Fraser sign), atelectasis, distal pneumonia, bronchial stenosis or amputation, a filling defect, superior vena cava compression, diaphragmatic paralysis, or esophageal stenosis; if none of these findings existed, the tumor was considered to be peripherally located (16).

Statistical Analysis

SPSS, version 10.0, was used for all analyses. Univariate analysis was used to compare data. In comparing the median survival of patients, the Kaplan-Meier method was utilized. A p value < 0.05 was considered significant.

RESULTS

Of the 695 patients, 639 (91.9%) were male and 56 (8.1%) were female. The mean age of the patients was 60.4 ± 9.6 years (range, 28-86 years). Sixty-six (4.9%), 18 (1.3%), and 4 (0.3%) patients had radiological evidence of exposure to asbestos, as manifested by plaque, diffuse pleural fibrosis, and asbestosis, respectively. Asbestos exposure commenced at birth and the average exposure period for the 88 patients was 38.2 ± 2.6 years (range, 5-79 years). Of the 88 patients with ARRF, 12 had occupational exposure to asbestos and 76 (86.4%) had environmental exposure to asbestos due to the use of the white soil in the rural area. The demographic characteristics and cigarette smoking histories of both groups of patients are shown in Table 1.

It has been observed that the patients with lung cancer that have ARRF are older compared to patients without a history of exposure to asbestos. The rate of male patients was found to be higher in the patients with lung cancer that had ARRF.

A difference was not established between the two groups of patients in terms of pack-years of cigarette smoking, but the rate of patients who were former smokers in the group with ARRF

Table 1. Demographic characteristics and cigarette smoking histories of patients by group.

	Patients with no asbestos exposure (n= 607)	Patients with ARRF (n= 88)	p
Age at diagnosis, year	60.2 ± 9.7	62.7 ± 8.9	0.016
Sex, n (%)			
Male	553 (91.1)	86 (97.7)	0.033
Female	54 (8.9)	2 (2.3)	
Pack-years	47.1 ± 1.3	53.6 ± 3.7	0.072
Cigarette smoking status, n (%)			
Never smoker	50 (8.2)	3 (3.4)	
Former smoker (ex-smoker)	105 (17.3)	24 (27.3)	0.034
Current smoker	452 (74.5)	61 (69.3)	

ARRF: Asbestos-related radiological findings.

was observed to be high (Table 1). The rate of ARRF in male patients without a cigarette smoking habit to all patients was 2.2%; this rate was 69.9% in the female patients. This was not a surprising finding, since smoking among women in Turkey is not as high as in men.

The time from the onset of symptoms to the referral of patients to the clinic was an average of 91.5 ± 3.4 days (median, 60.0 days). The symptoms, physical examination findings of patients based on groups are shown in Table 2.

No difference was observed in the duration of symptoms and distribution, and the distribution of physical examination findings.

CXR findings of patients by groups and tumor locations on CXRs are shown in Table 3.

Among all 695 patients, the radiological investigation of 3 patients was interpreted as normal. In the remaining 692 patients, the most common finding of lung cancer was a mass (n= 309, 45%). This was followed by hilar enlargement (n= 294, 42.8%), mediastinal enlargement (n= 122, 17.8%), pleural effusion (n= 112, 16.3%), atelectasis (n= 108, 15.7%), pneumonia (n= 85, 12.4%), and other findings. When the two groups of patients were compared in terms of CXR findings consistent with lung cancer, a statistically significant difference did not exist between them (Table 3).

The anatomic location of the tumor was not clearly established in six patients. When the two groups of patients were compared in terms of the location of the lung cancer, it was observed that the tumor was located peripherally in 50.6% of those

Table 2. Clinical findings of patients by group.

	Patients with no asbestos exposure (n= 607)	Patients with ARRF (n= 88)	p
Period of symptoms, days	90.6 ± 3.6	98.1 ± 9.4	0.457
Symptoms, n (%)			
Intrapulmonary	572 (94.2)	87 (98.9)	0.072
Extrapulmonary intrathoracic	124 (20.4)	19 (21.6)	0.801
Paraneoplastic syndrome complaints	169 (27.9)	26 (29.5)	0.746
Metastasis complaints	79 (13)	17 (19.3)	0.109
Systemic complaints	496 (81.7)	77 (87.5)	0.182
Physical examination, n (%)			
Local	398 (65.7)	58 (65.9)	0.966
Intrathoracic spread	137 (22.6)	24 (27.3)	0.333
Metastasis	196 (32.3)	33 (37.5)	0.336

ARRF: Asbestos-related radiological findings.

Table 3. Chest X-ray findings and tumor locations of patients by group.

	Patients with no asbestos exposure (n= 607)	Patients with ARRF (n= 88)	p
Chest X-ray findings, n (%)			
Mass	271 (45.1)	38 (43.2)	0.737
Hilar enlargement	263 (43.8)	31 (35.2)	0.131
Mediastinal enlargement	105 (17.5)	17 (19.3)	0.672
Pleural effusion	94 (15.7)	18 (20.5)	0.380
Atelectasis	97 (16.1)	11 (12.5)	0.256
Pneumonia	71 (11.8)	14 (15.9)	0.275
Nodule	31 (5.2)	4 (4.5)	0.807
Cavity	27 (4.5)	3 (3.4)	0.642
Location of tumor, n (%)			
Central	422 (70.5)	43 (49.4)	< 0.001
Peripheral	177 (29.5)	44 (50.6)	
Location of tumor according to zones, n (%)			
Upper zone	178 (29.7)	22 (25.3)	0.005
Middle zone	291 (48.6)	31 (35.6)	
Lower zone	105 (17.5)	27 (31.0)	
Multiple zone	25 (4.2)	7 (8.0)	

ARRF: Asbestos-related radiological findings.

patients with ARRF, whereas the tumor was located peripherally in 29.6% in the group of patients with no history of exposure to asbestos (p< 0.001). When the zones of distribution of the tumours were examined, a difference between the two groups of patients could not be established with respect to upper, middle, or > one zone; however, it was observed that tumors originated from the lower zone at a rate of 31% in the group with ARRF and tumors originated from the lower zone at the rate of 17.5% in the group without a history of exposure to asbestos (p= 0.005). Thus, tumors were more frequently peripheral and most were located in the lower zone in patients with ARRF when compared to the other group (Table 3).

Histopathological type of tumor, and tumor stages at the time of diagnosis are listed in Table 4.

Table 4. Histopathological types of tumors, and tumor stages of patients by group.

	Patients with no asbestos exposure (n= 607)	Patients with ARRF (n= 88)	p
Histopathological types, n (%)			
Small cell carcinoma	171 (28.2)	23 (26.1)	0.967
Squamous cell carcinoma	249 (41)	36 (40.9)	
Adenocarcinoma	112 (18.5)	17 (19.3)	
Large cell carcinoma	20 (3.3)	2 (2.3)	
Mixed histologic types	4 (0.7)	1 (1.1)	
Non-small cell carcinoma	51 (8.4)	9 (10.2)	
Stage, n (%)			
I	26 (4.4)	3 (3.4)	0.712
II	43 (7.4)	9 (10.5)	
IIIA	62 (10.6)	9 (10.5)	
IIIB	173 (29.6)	29 (33.7)	
IV	281 (48.0)	36 (41.9)	

ARRF: Asbestos-related radiological findings.

The most common tumor histological types that existed in the 695 patients were squamous cell carcinoma (n= 285, 41%), small cell carcinomas (n= 194, 27.9%), adenocarcinomas (n= 129, 18.6%), and others. When the patients with ARRF and the patients with no exposure to asbestos were compared in terms of tumor histological type, a statistically significant difference did not exist between the two groups (Table 4).

Staging was not completed in 24 of the patients. Of the remaining 671 patients, 29 (4.3%) were stage I, 52 (7.7%) were stage II, 71 (10.6%) were stage IIIA, 202 (30.2%) were stage IIIB, and 317 (47.2%) were stage IV disease. A statistically significant difference did not exist between the two groups of patients when compared in terms of their distribution to stages (p= 0.712; Table 4).

The median survival of patients with radiological findings related to asbestos was 7.17 ± 1.18 months, and it did not differ from the median survival of patients (7.47 ± 0.54 months) without a history of exposure to asbestos (log rank= 0.60; p= 0.437).

DISCUSSION

An etiological relationship between lung cancer and exposure to asbestos is now widely accepted. While some studies claim that lung cancer and asbestosis (parenchymal fibrosis) are somehow related, other studies report that asbestos fibers might cause lung cancer without asbestosis (10,17-19). In a consensus report by the Helsinki Criteria for Diagnosis and Attribution on Asbestos, Asbestosis, and Cancer, it was stated that it is not necessary to demonstrate asbestosis on CXRs or in biopsied tissues in order to attribute a causal role to asbestos in cases of lung cancer (20). Thus, although asbestos does not cause any changes in the pleura or lung parenchyma, inhalation of asbestos fibers increase the risk of lung cancer. Various studies on patients with lung cancer report that, along with exposure to asbestos, the risk of lung cancer ranges from 6 to 23% (6,21,22). On the other hand, in a well-conducted study, Hillerdal stated that the risk of lung cancer increases in patients with pleural plaques and asbestosis who had been radiologically diagnosed (5).

In our study, the mean age of lung cancer patients with and without ARRF was 62.7 ± 8.9 and 60.2 ± 9.7 years, respectively (p= 0.016), and the rate of male patients with ARRF was higher compared to patients with no asbestos exposure. In this study, the fact that lung cancer patients with findings consistent with exposure to asbestos were older and were comprised of more males may, in our opinion, depend on the frequency of cigarette smoking in males, because cigarette smoking may facilitate the appearance of radiological changes related to asbestos. As a matter of fact, in a field-based, cross-sectional study, it has been reported that the frequency of pleural plaques and diffuse pleural fibrosis increases with age, and the rate of male patients is relatively higher (13).

A multiplicative effect between exposure to asbestos and cigarette smoking with regard to lung cancer occurrence has been clearly demonstrated (23). In this study, a difference was not established between cigarette pack-years and current and never smoker rates between the groups. However, ex-smoker rates were higher in the group with ARRF (17.3% versus 27.3%, p= 0.033). The rate of smoking cessation in patients with ARRF may have resulted from making them more aware of the relationship between cigarette smoking and exposure to asbestos and intimidating them with this fact, thus facilitating the decision to quit smoking.

Adenocarcinomas have been reported in some studies to be relatively more common among persons exposed to asbestos than among unexposed persons (6,7). Contrariwise, other studies indicated that the distribution of lung cancer cell type did not change in people with exposure to asbestos (8-10). On the other hand, in some studies, a dose-effect relationship between the lung burden of asbestos bodies and the frequency of lung adenocarcinoma has been stressed, and it has also been reported that adenocarcinoma was relatively frequent in people with heavy exposure to asbestos and asbestosis (6,7,10,24).

The fact that adenocarcinoma is more frequent in people that suffer from asbestosis is suggestive of the possibility of scar carcinoma, but an absolute opinion has not been formulated on the issue. In addition, it has been reported that a meaningful relationship may exist between the period of exposure to asbestos and the incidence of adenocarcinoma (25). Lower levels of exposure to asbestos were found to be related to squamous cell carcinoma, and it has been established that the impact of smoking during the pathogenic process underlying lung cancer might be responsible for this finding (5,22). In this study, the most common tumor histological type in all patients was squamous cell carcinoma. Following squamous cell carcinomas in frequency were small cell carcinomas and adenocarcinomas. A difference in terms of tumor histological types was not established between patients with radiological findings related to asbestos and patients with no exposure to asbestos. The basis for this might be that cigarette smoking is related to all the histological types of lung cancers and determines the pathogenesis because most of the patients in both groups were either cigarette smokers or non-smokers.

In our patients, the most commonly seen CXR findings were central or peripheral masses (45.0%), followed by hilar enlargement (42.8%), mediastinal enlargement (17.8%), pleural effusion (16.3%), atelectasis (15.7%), pneumonia (12.4%), and others. A difference was not established in terms of the distribution of CXR findings of lung cancer in both groups.

In general, lung tumors are more common in the upper lobes than in the lower lobes. However, in some well-conducted studies, it has been reported that lung cancer was more frequently located in the lower lobes in people exposed to asbestos, and in people exposed to asbestos with no asbestosis (6,10,26). In another study, it was observed that the rate of the location of the tumor in the lower lobe was 25% in persons with no asbestos exposure, 45% in persons with asbestos exposure < 15 years, and 80% in persons with exposure for ≥ 15 years (26). On the other hand, in another study, it has been reported that the rate of upper lobe tumors in people exposed to asbestos was higher, possibly resulting from less ventilation and lymphatic clearance in the upper lobes (9). There are some other studies that have reported that there was no difference in the lobar distribution of lung cancer in people exposed to asbestos, but the peripheral location of the tumor in people exposed to asbestos was greater (7). Similarly, in another study, it was reported that the peripheral location of the tumor was more frequent in ex-smokers and asbestos-exposed people, and the rate was increased along with the period of quitting smoking (27). In our study, the peripheral location rate of the tumor in groups with ARRF was higher compared to the group with no exposure (50.6% versus 29.6%, respectively). When we looked at the distribution of the tumors to the zones, a difference was not found in terms of the distribution of tumors in the upper, middle, and multiple zones between the two groups, but in the group with ARRF, the location of the tumor in the lower zone was greater compared to the group with no exposure (31% versus 17.5%, respectively; p= 0.005). This property confirms the findings of many other studies, and to our belief, the ease with which asbestos fibers reach the periphery and its concentration in that zone results from the accumulation and concentration of fibers in the lower lobe because of the gravity. The accumulation of asbestos fibers in the lower lobes and the typical lower lobe distribution of paranchymal fibrosis in asbestosis caused the formulation of an opinion and the research on the fact that the carcinogenic impact of asbestos might be more evident in lower lobes. In a study that evaluates the periphery of normal lungs, it has been reported that the length of amosite fibers were shortest in the anterior parts of the upper lobes, a little longer in the lingula, and the longest in the posterior basal parts of the lower lobe (28). Similarly, in another study that assessed cases of lung cancer, the concentration of asbestos bodies was reported to be lower in the upper lobes (29).

The stage of lung cancer is an important prognostic factor. Unfortunately, most of the patients have advanced stage disease at the time of the diagnosis. For this reason, more than two-thirds of these patients are inoperable during the diagnostic process (30,31). In our study, 77.4% of the patients had stage IIIB or IV disease. When compared in terms of distribution to stage, a difference was not established between the two groups. The radiological findings related to asbestos exposure did not affect the severity of disease and survival as expected.

Consequently, in lung cancer patients with ARRF, it was established that the mean age, rate of male patients, rate of ex-smokers, rate of lower zone and peripherally located lesions were all higher. For this reason, when screenings are carried out on the said group or examinations, the location characteristics of the tumor should be seriously considered and special attention should be attached to lower and peripheral zones during the CXRs assessment.

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