



ORIGINAL RESEARCH

BULLÖZ LUNG DISEASE AND CIGARETTE SMOKING: A POSTMORTEM STUDY

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ABSTRACT

Objectives: Most patients with bullous emphysema are cigarette smokers. This autopsy-based study was performed to assess the relationship between bullous lung disease and smoking in the Turkish population.

Methods: One hundred and thirty-one autopsy cases, without any pulmonary injury or known pulmonary disease, and with reliable smoking history, were enrolled. They were divided into two: Group I (non-smokers, n=50, 26 males, and 24 females), and Group II (smokers, n=81, 74 males, and 7 females). Multiple bilateral wedge resections were performed for pathological examination. The relationship between bullous pathology and smoking was investigated.

Results: Bullae were found in 6% of group I, and in 40.7% of group II. 32% in group I, and 34.6% in group II had bullous emphysematous pathologies. Overall, 38% in group I, and 75.3% in group II had bullous lung diseases. Bullous lung disease was statistically more common in group II (p=0.087).

Conclusion: Even without any respiratory complaint, smoking causes bullous emphysematous pulmonary pathologies. As the incidence of cigarette smoking is high in Turkey, emphysematous changes and bullous lung diseases are expected to be common.

Keywords: Autopsy, Bullous emphysema, Cigarette smoking

BÜLLÖZ AKCİĞER HASTALIĞI VE SİGARA KULLANIMI: OTOPSİ ÇALIŞMASI

ÖZET

Amaç: Bu otopsi çalışması toplumumuzda sigara kullanımıyla büllöz akciğer hastalığı gelişmesi arasındaki ilişkiyi göstermek amacıyla yapılmıştır.

Materyal ve metod: Ölüm sebeplerine göre akciğer hasarı olmayan, bilinen akciğer hastalığı bulunmayan ve yakınlarından sigara kullanım öyküleri güvenilir şekilde alınabilen 131 vaka iki grupta incelendi: Grup I (sigara içmeyenler, n=50, 26 erkek, 24 kadın), Grup II (sigara içenler, n=81, 74 erkek, 7 kadın). Patolojik inceleme için her iki akciğerden multipl wedge rezeksiyonlar yapıldı. Büllöz patoloji gelişimiyle sigara içiciliği arasındaki ilişki incelendi.

Sonuçlar: Grup I'de %6, Grup II'de %40.7 oranında büle rastlandı. Grup I'de %32, Grup II'de %34.6 oranında büllöz amfizematöz değişiklikler saptandı. Toplamda, Grup I'de %38, Grup II'de %75.3 oranında büllöz akciğer hastalığı görüldü. Büllöz akciğer hastalığı Grup II'de istatistiksel olarak daha fazla bulundu (p=0.087), erkeklerde daha sıklıkla.

Tartışma: Solunumsal bir şikayete sebep olmasa bile, sigara kullanımı büllöz amfizematöz parenkimal değişikliklerin gelişmesine sebep olmaktadır. Sigara kullanım oranı yüksek olan toplumumuzda amfizematöz değişiklikler ve büllöz akciğer hastalığı gelişme riski yüksektir.

Anahtar Kelimeler: Otopsi, Büllöz amfizem, Sigara kullanımı

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INTRODUCTION

Bullous lung disease is characterized by the formation of blebs, bullae and emphysema. The term bulla is used to describe an air-filled space within the lung parenchyma resulting from deterioration of the alveolar tissue^{1,2}. Emphysema is a pathologic term that refers to a condition of the lung characterized by abnormal and permanent enlargement of airspaces near the terminal bronchioles accompanied by the destruction of the alveolar walls without obvious fibrosis^{2,3}. Most patients with bullous emphysema are cigarette smokers³⁻⁸. The incidence of smoking in the Turkish adult population is around 60-62% in males, and 16-24% in females^{9,10}.

Autopsy studies are performed to demonstrate all external and internal abnormalities, malformations, and diseases, and to obtain samples for histological examinations, and any other necessary investigations¹¹. This autopsy-based study was performed in order to assess the relationship of bullous lung disease and cigarette smoking in the Turkish population.

METHODS

Study Design

One thousand-two hundred and fifty autopsies were performed between November 2002-March 2003, in the Istanbul Forensic Medicine Institute of the Ministry of Justice of the Republic of Turkey. Cases admitted over 24 hours after death were excluded. Two hundred and ninety-eight subjects who had no pulmonary injury related to the cause of death or no known pulmonary disease were selected. Medical records were examined and the family members were questioned about the smoking history of the subjects. One hundred and sixty-seven cases whose smoking history was unremarkable were excluded, and the remaining 131 cases were taken into the study. The cases were divided into two groups: Group I (non-smokers, n=50, 26 males, and 24 females), and Group II (smokers, n=81, 74 males, and 7 females).

Methods

During the the autopsy, lungs of each case were investigated. Localization, size and numbers of macroscopically visible blebs and bullae were noted. Bullae larger than 5 cm in diameter were accepted to be giant. If there were more than one bulla in number, they were named as "multiple". Then, a wedge resection with part of the neighboring lung parenchyma was performed for all these lesions. In cases where there were no visible blebs or bullae, bilaterally multiple wedge resections concerning apical segments of the upper lobes and superior segments of the lower lobes were performed. Tissue samples were fixed in 10% formaldehyde solution for at least 48 hours, and examined by the same pathologist who was blinded to the cigarette smoking history of the subjects.

Analysis:

Chi-square, t-test, and Fisher's exact test were used for the statistical analysis, and $p < 0.05$ was considered to be statistically significant.

RESULTS

The characteristics of both groups are given in table I. Group I consisted of non-smoking cases (N= 50, 26 males, 24 females, mean age 36 ± 23 years), whereas group II consisted of smoking cases (N= 81, 74 males, 7 females, mean age 43 ± 18 years). Cases in group II had smoked 26 ± 24 pack/years. The causes of death of the cases were listed in table II. For both groups, cranial and abdominal traumas, and gun-fire and penetrating injuries were the most common causes of deaths.

Of twenty-six men in group I, 18 (69.2%) had normal pulmonary parenchyma, and 6 (30.8%) had bullous pathology, whereas of 74 men in group II, 18 (24.3%) had normal parenchyma, and 56 (75.7%) had bullous pathology. Concerning the female subjects, of 24 women in group I, 13 (54.2%) had normal pulmonary parenchyma, and 11 (45.8%) had bullous pathology. Of 7 women in group II, 2 (28.6%) had normal parenchyma, and 5 (71.4%) had bullous pathology. Bullous pathology was relatively more common in male subjects, but the results were statistically insignificant ($p=0.087$).



Table I. Group Characteristics

	Group I (non-smokers)	Group II (smokers)
N	50	81
Male/Female	26/24	74/7
Mean age (years)	36±23	43±18
Range (years)	15 – 96	16 – 93
Smoking status (pack/years)	0	26±24

Table II. Causes of death

Cause	Group I (n, %)	Group II (n,%)
General body trauma*	12, 24%	23, 28.4%
Gun-fire and penetrating injuries	10, 20%	20, 24.7%
Intoxications**	9, 18%	14, 17.3%
Cardiovascular pathologies	8, 16%	11, 13.6%
Suicide by hanging	3, 6%	6, 7.4%
Others***	8, 16%	7, 8.6%

*Cranial and abdominal traumas

**Including food, drug, and carbonmonoxyde poisoning

***Drowning, Cranial aneurisms, and unknown causes

The characteristics of bullous lesions are listed in table III. Three bullae (6%) were seen in group I, all being single, with a size of less than 5 cm in diameter. Of 33 bullae (40.7%) observed in group II, 17 (52%) were multiple and bilaterally located, 10 (30%) were multiple and unilaterally located. Most bullous lesions (82.1%) were located apically, and in 17.9% of the cases, the superior segments of the lower lobes were affected.

The results of the pathological examinations of the cases are given in table IV. Thirty-one cases (62%) in group I, and 20 cases (24.7%) in group II had normal pulmonary parenchyma. Three cases (6%) in group I, and 13 cases (16%) in group II had bullae only.

Sixteen cases (32%) in group I, and 48 cases (59.3%) in group II had bullous emphysematous pathologies. Overall, 19 cases (38%) in group I, and 61 cases (75.3%) in group II had bullous lung diseases. The bullous lung disease was statistically more common in group II, which consisted of smoking subjects ($p < 0.0001$) Figure 1 shows a sample of the macroscopic appearance of the cut surfaces of apical bullous lesions from two autopsies of male smokers having a small bulla along with mild emphysema, and a large bulla and prominent fibrosis. In the microscopic sections of lung tissue samples of another smoker case, bullous and emphysematous changes (Fig. 2) are shown.



Table III. Characteristics of bullous lesions

Characteristics of bullous lesions	Group I (n, %)	Group II (n, %)
Single (<5cm)	3, 100%	4, 12%
Single (>5cm)	0, 0%	2, 6%
Multiple (unilateral)	0, 0%	10, 30%
Multiple (bilateral)	0, 0%	17, 52%
Total	3, 100%	33, 100%

Table IV. Results of pathological examination of wedge resections.

Results of pathological examination	Group I (n, %)	Group II (n, %)
Normal parenchyma	31, 62%	20, 24.7%
Bullae and bullous emphysema	19, 38%	61, 75.3%
with normal parenchyma	3, 6%	13, 16%
with emphysematous parenchyma	16, 32%	48, 59.3%



Fig. 1. Macroscopic appearance of cut surfaces of apical bullous lesions in two male smokers: the one on the left has a small bulla and mild emphysema, and the one on the right has a large bulla and prominent fibrosis

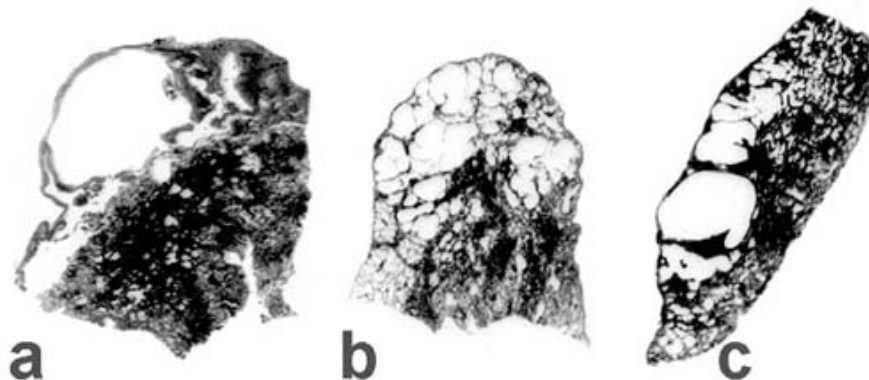


Fig. 2. Scanned images of Hematoxylin and Eosin stained microscopic sections of lung tissue samples with (a) bulla, (b) panacinar emphysema, and (c) paraseptal bullous emphysema.



DISCUSSION

Pulmonary diseases such as chronic bronchitis, emphysema, respiratory bronchiolitis-associated interstitial lung disease are related to cigarette smoking³⁻⁸. Emphysema induced by smoking is a common disease in the industrialized part of the world⁶. Smoking is reported as a causative in the development of bullae⁴⁻⁵. In the postmortem study of emphysema in coal workers and non-coal workers, Cockcroft et al⁷ reported that emphysema was quite common in postmortem surveys of the general population. They also showed that there was a statistically significant tendency for higher emphysema scores in smokers than in non-smokers among the coal workers⁷. Sixty-one of the 81 smokers (75.7%) and 19 of the 50 non-smokers (38%) had bullous lung diseases in our study. As was expected, bullous lung disease was statistically more common in cigarette smokers.

Nearly all smokers develop histological evidence of emphysema of various degrees of severity, ranging from minimal to advanced, particularly if they smoke more than 1 pack/day, but only a minority (15%) develops enough physiological dysfunction to become clinically symptomatic³. Eighty-one cases were smokers in our study, and none of them had a known lung disease as reported by their relatives.

In the study of Tylen et al⁶, high resolution computed chest tomography was performed to investigate the pulmonary parenchyma of 57 smokers and 32 non-smokers. It has been reported that emphysematous changes were detected in 44% of smokers and 3% of non-smokers. In our study, pathological examination showed bullous lung diseases in 75.3% of smokers and in 38% of non-smokers. The rate of bullous lung pathology in non-smokers is relatively high in our study. This can be either due to the “secret smoking” for traditional reasons, or to the high incidence of “passive smoking” in the Turkish population. Again, the reason why this group of subjects is relatively young could be the above-mentioned “passive smoking” at any

age and also the early initiation of smoking in the Turkish population.

Patients with bullous diseases can be divided into two groups: those with structurally abnormal lung parenchyma in addition to the bullae and those with normal pulmonary parenchyma^{1,2}. Concerning both groups, we found that 61% of our cases had bullae, 80% had emphysematous lung parenchyma, and 20% had normal lung parenchyma. These findings seem to correlate with the literature. The number of cases having bullae with underlying emphysematous parenchyma is relatively high^{1,2}.

Bullae predominate in the upper lobes in smokers^{4,5}. Bilateral involvement is more common in the case of multiple bullae⁴. Our results were similar to the literature. In our study, 82.1% of bullae were localized in the upper lobes, and in 27 cases of multiple bullae, 63% were bilaterally located.

In the Turkish adult population, about 60-62% of males, and 16-24% of females are smokers^{9,10}. In our study, the ratios were 74% in males, and 22.5% in females. Due to that, the prevalence of bullous lung disease was relatively higher in male subjects than in female subjects, but the results were statistically insignificant.

Cigarette smoking causes the development of bullous emphysematous pulmonary parenchymal pathologies even without any respiratory complaint. Since the incidence of cigarette smoking is high in the Turkish population, emphysematous changes and bullous pathologies of the lungs are expected to be common.

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