HEMOPTİZİ: TANISAL YÖNTEMLERİN KARŞILAŞTIRILMASI VE AKCİĞER KANSERİ İÇİN RİSK FAKTÖRLERİNİN BELİRLENMESİ

Hemoptysis: Comparison of Diagnostic Modalities, and Prediction of Risk Factors of Lung Cancer

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ÖZET

Amaç: Hemoptizinin farklı etyolojik nedenlerinin sıklığını, bilgisayarlı akciğer tomografisi, bronkoskopinin tanısal başarısını ve cut-off değerleriyle akciğer kanseri için risk faktörlerini belirlemeye çalıştık.

Gereç ve Yöntemler: Bozok Üniversitesi ve Yozgat Devlet Hastanesinde mayıs 2009 ve ocak 2012 tarihleri arasında hemoptizisi olan 80 hasta retrospektif incelendi.

Bulgular: Hastalar yaş ortalaması 48.1±10.71 (21-71) yıl olan 47 (58.8%) erkek ve 33(41.2%) kadından oluşmaktadır. Hemoptizinin ana etyolojisi bronşiektazi (42.5%) takiben akciğer kanseri (17.5%), pnömoni (15%), akciğer absesi (8.8%) ve idiopatik (16.2%) idi. Akciğer tomografisinin tanısal başarısı 52.5% ve bronkoskopinin 37.5% iken beraber kullanıldıklarında başarı 83.8% olmaktadır. Kanser ve kanser-dışı grup arasında yaş (p<0.001), hemoptizi miktarı (p=0.011), hemoptizi süresi (p<0.001) ve sigara içiciliği paket/yıl (p<0.001) açısından istatistiksel anlamlı fark vardı. Akciğer kanseri hastalarında hemopizi süresi için 10 gün (Se: 92.86%; Sp: 81.82), kanama miktarı için 40 ml (Se: 92.86%; Sp: 45.45), sigara için 18 paket/yıl (Se: 92.86%; Sp: 96.97%) ve yaş için 56 yıl (Se: 100%; Sp: 100%) cut-off değerleri bulundu.

Sonuç: Hemoptizinin en sık nedenleri olarak bronşiektazi ve akciğer kanserini bulduk. Teşhis için akciğer tomografisi ve bronkoskopi tamamlayıcı yöntemlerdir. Akciğer kanseri tanısını atlamamak için tanımlanmış rsik faktörleri akılda tutulmalıdır.

Anahtar kelimeler: *Akciğer kanseri; Akciğer tomografisi; Bronkoskopi; Etyoloji; Hemoptizi.*

ABSTRACT

Background: We aimed to identify the relative frequency of different etiologies of hemoptysis, diagnostic yield of computerized chest tomography, bronchoscopy and risk factors for lung cancer with their cut-off levels.

Method: We reviewed 80 patients with hemoptysis retrospectively at the Yozgat State Hospital and Bozok University Hospital, Yozgat, Turkey between May 2009 and January 2012.

Results: There were 47 male (58.8%) and 33 female (41.2%) patients with a mean age of 48.1±10.71 (21-71) years. The main etiology of hemoptysis was bronchiectasis (42.5%), followed by lung cancer (17.5%), pneumonia (15%), lung abscess (8.8%) and idiopathic (16.2%). The diagnostic yield of chest CT was 52.5% and that of bronchoscopy was 37.5% while the yield was 83.8% together. There was statistically significant difference between cancer and non-cancer group patients in terms of age (p<0.001), volume of hemoptysis (p=0.011), duration of hemoptysis (p<0.001), and smoking duration package/years (p<0.001). The cut-off value in the lung cancer patients was found for the duration of hemoptysis as 10 days (Se: 92.86%; Sp: 81.82), the amount of bleeding as 40 ml (Se: 92.86%; Sp: 45.45), package/years for smoking as 18 (Se: 92.86%; Sp: 96.97%), and the age as 56 years (Se: 100%; Sp: 100%).

Conclusion: We found that bronchiectasis and lung cancer were the most common reasons for hemoptysis. CT of the chest and bronchoscopy are complementary modalities for the diagnosis. Defined risk factors should be kept in mind not to skip the diagnosis of lung cancer.

Key words: *Lung cancer; Tomography of chest; Bronchoscopy; Etiology; Hemoptysis.*

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INTRODUCTION

Hemoptysis, literally comes from two Greek words ˝hemo˝ which means "blood", and ˝ptysis˝ which means to spit, and is defined as the expectoration of mere blood or blood-stained sputum (1). Hemoptysis is a worrisome symptom and accounts referral reasons for 6,8% outpatients and 11% inpatients of chest clinics while 38% patients are forwarded to thoracic surgery (2). The relative frequencies of hemoptysis etiologies have wide variations in the literature. These variations depend on time of the study, age and gender of the patient, population, geographic region, the status and the amount of smoking, diagnostic methods, and criteria used for diagnosis. Effective antituberculous therapy, increased use of antibiotics, remarkable improvements in Computerized Tomography (CT) and Fiberoptic Bronchoscopy (FOB) technology have contributed to these diversities. Clinical outcome of hemoptysis ranges from asymptomatic bleeding to airway obstruction due to massive bleeding. Every hemoptysis attack should be investigated in order to find out the etiology, especially the lung cancer. Being older than 40, being male, bleeding for more than one week and positive smoking history are the known increased risk factors for lung cancer in patients with hemoptysis (3, 4).

In this study, our purpose is defining the etiology of hemoptysis, the pathologies and diagnostic yields of the chest CT and FOB, and the risk factors for lung cancer with their cut-off levels.

MATERIAL AND METHODS

In this study, we investigated clinical files of 80 patients whose primary presenting symptoms were hemoptysis in Yozgat State hospital and Bozok University Hospital between May 2009 and January 2012. Age, gender, medical history, physical examination, comorbidities, use of antiaggregant or anticoagulant medication, smoking status and the package amount, volume of blood loss and the duration of it, number of hemoptysis, chest radiography and computerized tomography pathologies, bronchoscopy findings, diagnostic tests used, the treatment and the final diagnosis were clinical variables collected.

Severity of hemoptysis was classified on the basis of the clinical condition and the volume of the blood loss as being mild if the amount was less than 30 mL/day or only streaking of sputum, moderate if it was 30-100 mL/day, severe if it was 100-600 mL/day, and massive if it was more than 600 mL/day (5). Number of hemoptysis were classified as ˝the first attack˝ and ˝the recurrent hemoptysis˝ repeated with a minimum of 30 days interval.

Laboratory tests including complete blood count, biochemistry, coagulation tests and sputum examination including gram staining and culture for Acid Fast Bacilli (AFB) and bacteria were performed for all patients. Hemoptysis was concluded after ear-nose-throat and gastrointestinal system examination and pseudohemoptysis or hematemesis were excluded. All patients had cardiac examinations for mitral stenosis, tricuspid endocarditis, and congenital heart disease and left heart failure.

Fiberoptic bronchoscopy was performed by pulmonologist to assess endobronchial abnormalities. Transbronchial or bronchial biopsies and lavage were performed and sent for histopathology and microbiology for cancer, tuberculosis and other suspected pathologies. Radiography and computerized tomography of the chest were evaluated by a radiologist for presence or absence of abnormality and type of pathology. Chest CT and bronchoscopy were methods used to name the diagnosis. Idiopathic hemoptysis was the final diagnosis after a thorough evaluation, and no clear reasons were found for hemoptysis. Conservative therapy and surgery were administered in order to control hemoptysis.

The Statistical Package for the Social Sciences (SPSS) version 20.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. The variables were investigated using visual (histograms, probability tests) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk's Test) to determine whether or not they were normally distributed.

Descriptive analyses were presented using medians and the interquartile range for the non-normally distributed and ordinal variables. Variables were not normally distributed and group numbers were low, therefore, nonparametric tests were used. The Mann-Whitney U and the Kruskal-Wallis tests were used to compare the ordinal and scalar variables. A p-value less than 0.05 was considered to be statistically significant. In order to determine a cut-off value of age, package per year, the duration and the amount of hemoptysis for lung cancer, a Receiver Operating Characteristic (ROC) Curve Analysis was constructed, and the area under the curve was reported, which is representative of the discriminatory ability of the variable cut-off. Sensitivity and specificity values of the best cut-off variables were determined using the ROC Curve Analysis. The cut-off levels of the segments were calculated using MedCalc 9.2.0.1 Program (MedCalc Software, Mariakerke, Belgium).

RESULTS

Bronchiectasis was found to be the most frequent etiology of hemoptysis followed by lung cancer (Figure 1).

Among 80 patients, 47 (58.8%) were male, 33 (41.2%) were female (Male/Female ratio was 1.43:1), and the average age was 48.11±10.71 (median: 45, range: 21-71) years. The average smoking history was 10.00±9.44 (median: 10, range: 0-32) package/year. 27 of the patients (33.8%) were non-smokers, 26 (32.5%) were active smokers, and 27 (33.8%) were former smokers. The average bleeding volume was 66.44±35.38 (median: 60, range: 10-120) ml, There were no massive hemoptysis and 10 patients (12.5%) were mild, 47 patients (58.8%) were moderate and 23 patients (28.8%) were severe hemoptysis. The average bleeding period was 9.13±2.37 (median: 9, range: 4-14) days. The number of the patients with first episode was 43 (53.7%) while recurrent episode was observed in 37 (46.35) patients. The demographic data for each etiology are shown in Table 1.

Figure 1: Etiologies in patients with hemoptysis (n = 80).

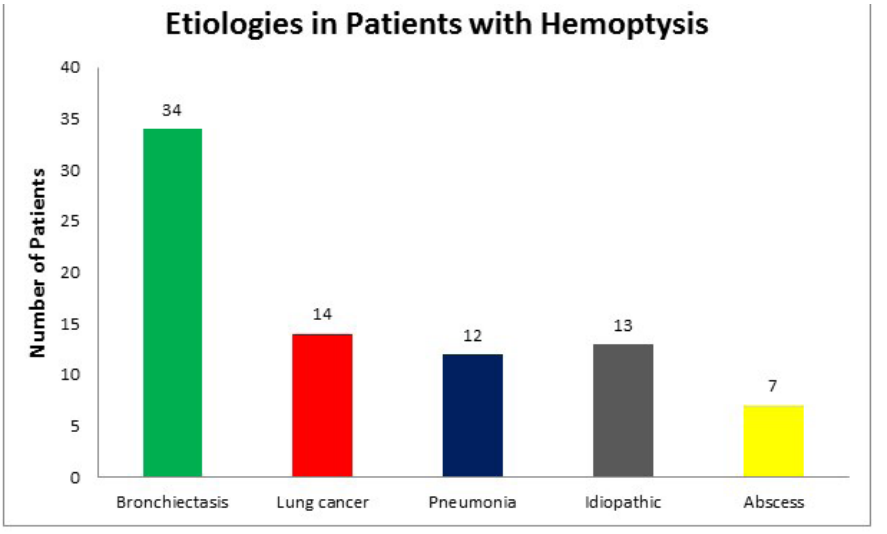

Table 1: Demographic data for each group.

Variables	Bronchiectasis (n = 34)	Lung Cancer (n = 14)	Pneumonia (n = 12)	Abscess (n = 7)	Idiopathic (n = 13)
Age	46.85 ± 3.67	68.14 ± 2.32	45.42 ± 4.03	39.71 ±4.79	36.85±5.21
Gender (M/F)	14/20 (41.2%/58.8%)	11/3 (78.6%/21.4%	7/5 (58.3%/41.7%)	5/2 (71.4%/28.6%)	10/3 (76.9%/23.1%)
Smoking (package/year)	5.71±6.38	24.5±8.08	6.0±7.58	5.71±5.46	11.62±3.10
Smoking history (%)					
Non smoker	7 (50)	1(7.1)	6(50)	3(42.9)	7(53.8)
Smoker	8(23.5)	5(35.7)	3(25)	3(42.9)	7(53.8)
Former smoker	9(26.5)	8(57.1)	3(25)	1(14.3)	6(46.2)
Volume of hemoptysis (ml)	55.74 ± 35.76	86.43 ± 26.78	69.17±39.88	61.43±34.85	73.08±31.99
Mild	9 (26.5%)	0 (0%)	0 (0%)	0 (0%)	1 (7.7%)
Moderate	18 (52.9%)	9 (64.3%)	7 (58.3%)	5 (71.4%)	8 (61.5%)
Severe	7 (20.6%)	5 (35.7%)	5 (41.7%)	2 (28.6%)	4 (30.8%)
Duration of Hemoptysis (days)	8.18 ± 2.05	12.14 ± 1.17	7.92 ± 2.23	7.57 ± 1.13	10.31 ± 1.03
Episode of hemoptysis					
First	18 (52.9%)	10 (71.4%)	6 (50%)	3 (42.9%)	6 (46.2%)
Recurrent	16 (47.1%)	4 (28.6%)	6 (50%)	4 (57.1%)	7 (53.8%)

Chest x-rays were normal in 28 (35%) patients while being abnormal in 52 (65%) patients. All patients in the Lung Cancer and the Abscess Groups had at least one pathology on radiographies while no patients of the Idiopathic Group had any abnormalities on chest x-rays. Consolidation was the most common pathology seen on the chest x-rays of 25 (48%) patients, followed by mass in 8 (15.3%) patients, bronchiectasis in 10 (19.2%) patients, abscess in 5 (9.6%) patients and hilar lympadenopathy in 4 (7.9%) patients (Table 2).

Table 2: Chest x-ray pathologies.

	Bronchiectasis (n=34)	Lung Cancer (n=14)	Pneumonia (n=12)	Abscess (n=7)	Idiopathic (n=13)
Normal	13 (38.2%)	0 (0%)	2 (16.7%)	0 (0%)	13 (100%)
Consolidation	10 (29.4%)	4 (28.6%)	8 (66.7%)	3 (42.9%)	0 (0%)
Mass	0 (0%)	8 (57.1%)	0 (0%)	0 (0%)	0 (0%)
Cystic	10 (29.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Abscess	0 (0%)	0 (0%)	1 (8.3%)	4 (57.1%)	0 (0%)
Hiler enlargement	1 (2.9%)	2 (14.3%)	1 (8.3%)	0 (0%)	0 (0%)

Chest CT was performed to all patients and the pathologies were observed as 19 (23.8%) consolidation, 8 (10%) mass, 13 (16.3%) cystic, 7 (8.7%) abscess, 12 (15%) hilar enlargement, 15 (18.7) fibrosis, 6 (7.5%) emphysema (Table 3). Fiberoptic Bronchoscopy was not performed in 21 (26.3%) patients while 59 (%73.7) patients underwent FOB and findings were observed as 12 (20.3%) endobronchial lesions, 9 (15.3%) hyperemia, 13 (22%) hemorrhage, 8 (13.6%) chronic changes, 5 (8.5%) circumferential narrowing, and 12 (20.3%) extrinsic compression signs. In our study no patients had FOB complication (Table 4).

Table 3: Pathologies of Ct-Thorax for each etiology.

	Bronchiectasis (n=34)	Lung Cancer (n=14)	Pneumonia (n=12)	Abscess (n=7)	Idiopathic (n=13)
Consolidation	11 (32.4%)	1(7.1%)	5 (41.7%)	2 (28.6%)	0 (0%)
Mass	0 (0%)	8 (57.1%)	0 (0%)	0 (0%)	0 (0%)
Cystic	13 (38.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Abscess	0 (0%)	2 (14.3%)	0 (0%)	5 (71.4%)	0 (0%)
Hyler enlargement	1 (2.9%)	3 (21.4%)	6 (50.0%)	0 (0%)	2 (15.4%)
Fibrosis	8 (23.5%)	0 (0%)	1 (8.3%)	0 (0%)	6 (46.2%)
Emphysema	1 (2.9%)	0 (0%)	0 (0%)	0 (0%)	5 (38.5%)

Table 4: Findings of Bronchoscopy for each etiology.

	Bronchiectasis (n=34)	Lung Cancer (n=14)	Pneumonia (n=12)	Abscess (n=7)	Idiopathic (n=13)
Not Performed	21 (61.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Endobronchial lesion	0 (0%)	12 (85.7%)	0 (0%)	0 (0%)	0 (0%)
Hyperemia	6 (17.6%)	0 (0%)	1 (8.3%)	0 (0%)	2 (15.4%)
Hemorrhage	5 (14.7%)	0 (0%)	5 (41.7%)	1 (14.3%)	2 (15.4%)
Chronic changes	1 (2.9%)	0 (0%)	2 (16.7%)	2 (28.6%)	3 (23.1%)
Circumferential narrowing	0 (0%)	0 (0%)	0 (0%)	2 (28.6%)	3 (23.1%)
Extrinsic compression signs	1 (2.9%)	2 (14.3%)	4 (32.3%)	2 (28.6%)	3 (23.1%)

It was found that chest CT had a diagnostic yield of 52.5% while FOB had 37.5% for all patients. When these two techniques were used together, diagnostic yield was increased up to 83.8%. The diagnosis could not be named in 13 (16.2%) patients.

In the male group, 13 (27.7%) were nonsmokers, 18 (38.3%) were active smokers and 16 (34%) were former smokers while in the female group, nonsmokers were observed as 14 (42.45) patients, active smokers in 8 (24.2%) and former smokers as 11 (33.3%) patients. There were no significant differences between the male and female groups for package/year (p=0.07). It was the same for age (p=0.10), amount of bleeding (p=0.008) and duration of hemoptysis (p=0.17).

Idiopathic patients were followed up with an average duration of 9.2±3 (6-14 months).

The organisms isolated in pneumonia were Streptococci pneumonia (33.3%), Haemophilus influenza (25%), Klebsiella pneumonia (25%) and unidentified organisms (16.7%).Histological analyses of lung cancer revealed the following results; squamous cell (50%), adenocarcinoma (28.6%), and small-cell carcinoma (21.4%). There were 66 patients in the non-cancer group while there were 14 in the cancer group. (Table 5) There was a statistically significant difference between the lung cancer group and the non-cancer group in terms of age (p<0.001), volume of hemoptysis (p=0.011), duration of hemoptysis (p<0.001) and smoking package/year (p<0.001). There was a tendency for male predominance in the lung cancer group compared to subjects with the non-cancer group, but it did not reach the level of significance (p=0.097). However, the subjects were grouped further according to age (below 40 and ≥40). Among subjects who were ≥40 years old, there was obvious predominance for being male in the lung cancer group (n=14) compared to the non-cancer group (n=51) (p=0.035).

ROC analysis was performed to estimate the cut-off levels in the lung cancer group for duration of hemoptysis, amount of bleeding, age of years and package/year. The area under the receiver operating characteristic curve (AUC) for the duration of hemoptysis in the lung cancer group was good (p=0.935). The cut-off value for the duration of hemoptysis in the lung cancer patients was 10 days (Se: 92.86% ; Sp: 81.82). The cut-off level for the amount of bleeding was 40 ml (AUC: 0,716; Se: 92.86%; Sp: 45.45). The cut-off level for duration of smoking was eighteen package/year according to ROC analysis. (AUC: 0.943; Se: 92.86%; Sp: 96.97%). Also the cut-off level was found as 56 for the age (AUC: 1.000; Se: 100%; Sp: 100%).

Patients with lung cancer had a higher frequency of smoking history compared to the subjects with non-cancer etiology (p=0.027). All subjects with cancer had one or more chest x-ray findings while only 57.6% of the non-cancer group had findings on chest x-ray, the difference was significant (p=0.002).

The most frequent diagnosis in case of recurrent hemoptysis was bronchiectasis (43.2%), but it was not significant (p=0.901), and the odds ratio for bronchiectasis in recurrent hemoptysis was 0.945 (95% CI: 0.389-2.299).

There was no correlation between the age and the amount of bleeding (r=0.156 p=0.167), meanwhile there was a weak but significant correlation between the age and the duration of bleeding (r=0.245, p=0.028). There was a strong and significant correlation between package/year of smoking and duration of bleeding (r=0.793, p<0.001) as well as between package/year and amount of bleeding (r=0.727 p<0.001)

Table 5: Comparison of cancer and non-cancer groups.

Variables	Non-lung Cancer (n = 66)	Lung Cancer (n=14)	p-value
Age	43.86 ± 5.79	68.14 ± 2.32	0.000
Gender (M/F)	36 / 30 (54.5% / 45.5%)	11 / 3 (78.6% / 21.4%)	0.097
Smoking (package/year)	6.92 ± 6.36	24.5 ± 8.08	0.000
Volume of hemoptysis(ml)	62.2 ± 35.69	86.43 ± 26.78	0.011
Mild-moderate	48 (72.7%)	9 (64.3%)	
Severe	18 (27.3%)	5 (35.7%)	
Duration of Hemoptysis (days)	8.48 ± 2.04	12.14 ± 1.17	0.000

DISCUSSION

Presence of hemoptysis alerts patient to seek chest physician, and therefore, full diagnostic investigation is required until clarifying the cause. The ratios of the etiologies vary in different series according to the features of the population studied and the diagnostic methods used. Assessment of 11 reports, which were performed between 1974 and 2012 with 1996 patients from different parts of the world, showed that 26.9% had sequel or active pulmonary tuberculosis, 15.6% lung cancer, and 15.4% bronchiectasis. Bronchitis was the fourth reason with 9.3%. Despite expressive improvement in screening and therapeutic devices, 9.6% patients remained idiopathic (4-13). (Table 6).

Table 6 : Main causes of hemoptysis.

	Santiago[6]	Hirshberg[4]	McGuinness[7]	Fidan[5]	Unsal[11]	Tsoumakidou[8]	Prasad[9]	Abal[10]	Ozgul[12]	Lee[13]	Current study	Mean of series
Year of study	1974-1981	1980-1995	1991-1992	2000	2002	2001-2003	1996-2002	1998-1999	2000-2005	2005-2010	2009-2012	1974-2012
Location	Los Angeles, USA	Jerusalem, Israel	New York, USA	İstanbul, Turkey	Ankara, Turkey	Crete, Greece	Lucknow, India	Safat, Kuwait	İstanbul, Turkey	Gwangju, Korea	Yozgat, Turkey	
No of cases	264	208	57	108	143	184	476	52	203	221	80	1996
Bronchogenic carcinoma	78 (29%)	39 (19%)	7 (12%)	37 (34.3%)	27 (18.9%)	24 (13%)	24 (5 %)	5 (9.6%)	44 (21.7%)	13 (5.9%)	14 (17.5%)	312 (15.6%)
Bronchiectasis	2 (1%)	41 (20%)	14 (25%)	27 (25%)	32 (22.4%)	48 (26.1)	18 (3.8%)	11 (21.2%)	9 (4.3%)	72 (32.6%)	34 (42.5%)	308 (15.4%)
Tuberculosis	15 (6%)	3 (1.4%)	9 (16%)	19 (17.6%)	16 (11.2%)	8 (4.3%)	329 (69.1%)	8 (15.4%)	89 (43.8%)	41 (18.5%)	-----	537 (26.9%)
Pneumonia	15 (6%)	33 (16%)	7(12%)	11 (10.2%)	7 (4.9%)	8 (4.3%)	8 (1.7%)	-----	20 (9.7%)	----	12 (15%)	121 (6.06%)
Bronchitis	62 (23%)	37 (18%)	4 (7%)	----	8 (5.6%)	42 (22.8:%)	19 (4%)	3 (5.8%)	11 (5.5%)	----	----	186 (9.3%)
Abscess	5 (2%)	2 (0.96%)	------	----	2 (1.4%)	-------	2 (0.4%)	----	3 (1.9%)	----	7 (8.8%)	21 (1.1%)
İdiopathic	57 (22%)	17 (8%)	11 (19%)	----	19 (13.2%)	10 (5.4%)	13(2.8%)	13 (25%)	13 (6.3%)	26 (11.7%)	13(16.2%)	192 (9.6%)
Miscellaneous	22 (8%)	36 (16.64%)	3 (5%)	9(12.9%)	9(6.3%)	13 (7%)	12(2.5%)	3 (5.7%)	14 (6.8%)	45 (20.3%)	----	166 (8.3%)

Our study was coherent with recent series. Bronchiectasis (42.5%) and lung cancer (17.5%) were the main reasons of hemoptysis. Our hospital has no inpatient clinic for tuberculosis and three important reference centers are very close to the city of Yozgat. Outpatients' records for hemoptysis were incomplete, therefore, they were not included. In contrast to other series, the mean age of this study was smaller (48.11±10.71), and the female patients (41.2%) had much more ratios. Also, only 32.5% were active smokers and the mean package/year of smoking was low (10.00±9.44). We thought that all these factors affect the frequency of tuberculosis and bronchitis. Although all cases had radiography and CT of the chest as screening modalities and 73.7% patients underwent FOB, 13 (16.3%) patients were grouped as idiopathic hemoptysis.

In recent decades, bronchitis is rising in developed countries whereas in developing countries tuberculosis is still an important factor. Studies before 1950s showed that tuberculosis and bronchiectasis were important causes of hemoptysis in developed countries while effective antituberculosis therapy and control of childhood infections with antibiotics and vaccines diminish their frequency (14, 15).

Tuberculosis is still the most important problem in regions with a high prevalence of the disease. Nawal et al (16). from India, conducted a prospective study and found that tuberculosis, old and active together, was the major cause in 34.5% of 110 patients

Wong et al. (17) grouped 160 patients with hemoptysis according to below or above 60 years of age in Malaysia, Southeast Asia. Tuberculosis was the primary reason in 27% of patients younger than 60 while bronchogenic carcinoma was the main cause in 49.3% of older group. They advised not to accept tuberculosis for every hemoptysis attack especially in patients who were older than 60 despite high prevalence of the disease. Another study from the Asia-Pacific region reported that hemoptysis was accepted most often as tuberculosis without prior diagnostic evaluation. They noted to investigate other reasons for hemoptysis especially for old ages (18). In Portugal, pulmonary tuberculosis, active or sequel, preserve its importance. Pires et al. (19) analyzed 221 patients and reported that tuberculosis (32.1%) and bronchiectasis (15.8%) were the main reasons of hemoptysis Recent studies from Turkey have shown that bronchiectasis and lung cancer are the leading causes, and tuberculosis is still an important problem. Celik et al. and Dogan et al. (20, 21) reported 22% and 56% ratios that were similar to the series performed in referral centers

We found at least one pathology of chest x-ray for all cancer patients similar with Pires et al. and McGuinnes et al. Weaver et al. detected abnormality of chest radiology in 26 of the 28 cancer patients (7, 19, 22). All cancer patients (18.9% and 34.3%) had chest x-ray pathology in studies reported by Unsal et al. and Fidan et al (5, 11). Santiago et al. (6) found abnormality in chest x-rays in 94.8% of cancer patients. Although up to 10% of patients with hemoptysis due to lung cancer may have a normal or non-localizing chest roentgenogram, our study supported the initial choice of screening modality of the chest radiography in the evaluation of hemoptysis.

Increased utilization of FOB and CT of the chest in course of time affect the order of frequency. There is no definite order to apply them in the algorithm. Davoodi et al. investigated 40 patients in order to determine the efficacy of CT of chest and FOB. They found that CT of the chest detected the etiology in 60% of patients while FOB in 32.5%. They stated that CT of the chest was more efficient than FOB to detect the site and cause of hemoptysis (23). Senyigit et al. analyzed 82 hemoptysis cases who had a normal chest x-ray retrospectively. They found that the diagnostic yield of CT of the chest was 57% and that of FOB was 16%. When they combined these two modalities, the accuracy was increased to 63%. They concluded that both CT of the chest and FOB should be used in all hemoptysis cases (24). Hirshberg et al. (4) reported the diagnostic yield of CT scan as 67% and that of FOB as 42%. Combination of these two methods had positive yield of 93%4. Another study which was conducted between 2004 and 2008 with 237 patients produced 76.7% diagnostic yield for chest CT and 44.8% for FOB. The best ratio was achieved by combination of two utilities (87.3%) In our study, the diagnostic accuracy of chest CT was 52.5% and that of FOB was 37.5%. We reached 83.8% positive yield when they were used together. CT of the chest is also required for staging of lung cancer. FOB is useful method for most cases even bronchiectasis and lung cancer may present normal radiography. Our results verified that CT of the chest and FOB do not compensate each other, but rather, they are complementary techniques for identifying the causes of hemoptysis.

We found statistically significant difference between cancer and non-cancer group patients in terms of age ($p<0.001$), volume of hemoptysis ($p=0.011$), duration of hemoptysis ($p<0.001$), and duration package/year ($p<0.001$). There was male predominance above 40 years of age in cancer group ($p=0.035$). By ROC analysis, we estimated the cut-off value for the duration of hemoptysis (10 days), amount of bleeding (40 ml), package/year of cigarette smoking (18) and age of years (56) for lung cancer patients. Up to now, there has not been a study defining the cut-off level for risk factors in patients with lung cancer. Our study is unique for this kind of reports. Poe et al. defined three risk factors associated with bronchogenic carcinoma. These were age of ≥50, male gender and ≥40 package/year smoking. They also found that the diagnostic yield of bronchoscopy was increased with the amount of bleeding ≥30 ml25. Herth et al. (26) analyzed 135 patients with idiopathic hemoptysis for 6.6 years.

During the follow-up, 6% patients who were smokers and who were >40 years old had lung cancer within three years. They concluded that closer follow-up was required in the defined patients at risk (26). McGuinnes et al. found significant difference between lung cancer and non-cancer groups when the age was above 50 years and smoking rate was >40 package/year (7). Weaver et al. defined four risk factors showing a high probability of lung cancer which were >40 years, pathologic chest x-ray, bleeding duration ≥1 week and smoking ≥40 package/year (22).

Our study has some limitations, particularly its being retrospective is one of the limitations. Our study population consisted of only inpatients. Our center was unable to manage massive hemoptysis and had no tuberculosis clinic. There are three reference centers very close to the city of Yozgat, and therefore, some urgent hemoptysis cases were directed to these centers. These factors can affect the population of the study.

CONCLUSIONS

We found that bronchiectasis and lung cancer were the main causes of hemoptysis. Although tuberculosis can be primary cause in some studies from Turkey, our data is compatible with recent series in the literature. Combination of chest CT and FOB is the best diagnostic approach. Bleeding more than 10 days and 40 ml, smoking ≥18 package/year and age ≥56 years were defined as risk factors for patients with lung cancer.

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