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# Analysis of patients with hemoptysis in a reference hospital for chest diseases

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## ÖZET

### *Referans bir göğüs hastalıkları hastanesinde hemoptizili hastaların analizi*

Göğüs uzmanları, çeşitli hastalıklara bağlı ortaya çıkabilen ve tedirgin edici bir semptom olan hemoptiziyle sıklıkla karşılaşmaktadır. Bu çalışmada, referans bir göğüs hastalıkları hastanesinde hemoptizinin en sık nedenlerinin ortaya konması amaçlanmıştır. Çalışmaya, üç aylık bir çalışma süresi içinde, hastanemiz acil servisine hemoptizi yakınmasıyla başvuran tüm hastalar alındı. Çalışmaya dahil edilen 143 (106'sı erkek, 37'si kadın) hastanın yaş ortalaması  $48 \pm 17$  yıldır. Her hastanın tıbbi öyküsü alındı, fizik muayenesi yapıldı ve akciğer grafisi çekildi. Balgamda aside dirençli basil (ARB), toraks bilgisayarlı tomografisi (BT), fiberoptik bronkoskopi (FOB), ventilasyon-perfüzyon sintigrafisi, ekokardiyografi, kulak-burun-boğaz muayenesi ve üst gastrointestinal sistem endoskopisi seçilmiş hastalarda yapılan ileri incelemelerdi. Hemoptizinin en sık nedenleri bronşektazi (%22.4), akciğer kanseri (%18.9), aktif tüberküloz (%11.2) ve inaktif tüberkülozdu (%10.5). Balgamda ARB bakılması 102 hastada yapıldı ve bunların %15.6'sında pozitif bulundu. Toraks BT 102 hastada çekildi ve %81.3'ünde patoloji saptandı. FOB 46 hastada yapıldı ve hastaların %67.4'ünde kanama odağı tespit edildi. Sonuç olarak; hastanemizde hemoptizinin en sık nedenleri bronşektazi, akciğer kanseri ve tüberkülozdu. Bu bulguya dayanarak, hemoptizili bir hastaya tanısız yaklaşımda, ilk olarak; tıbbi öykü alınmasının, fizik muayenenin yapılması, akciğer grafisi çekilmesinin; ikinci olarak balgamda ARB bakılmasının; üçüncü olarak toraks BT çekilmesinin ve son olarak da FOB yapılmasının gerektiği kanısındayız.

**Anahtar Kelimeler:** Bronşektazi, etyoloji, hemoptizi, akciğer kanseri, tüberküloz.

## SUMMARY

### *Analysis of patients with hemoptysis in a reference hospital for chest diseases*

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Chest physicians frequently come across with the symptom hemoptysis, an alerting symptom which may result from a wide variety of disorders. In this study, we aimed to determine the main causes of hemoptysis in a reference hospital for chest diseases. All the patients who admitted to our emergency clinic with hemoptysis during three months of study period were included in the study. The mean age of 143 patients (106 males, 37 females) who were included in this study was  $48 \pm 17$  years. Medical history, physical examination and chest radiography were performed for each patient. Sputum examination for acid fast bacilli, computed tomography of thorax, fiberoptic bronchoscopy, ventilation-perfusion scintigraphy, echocardiography, ear-nose-throat examination and upper gastrointestinal system endoscopy were the further diagnostic investigations for selected patients. Bronchiectasis was the most common cause of hemoptysis (22.4%), followed by lung cancer (18.9%), active tuberculosis (11.2%), and inactive tuberculosis (10.5%). Sputum smear for acid fast bacilli was performed in 102 patients and were positive in 15.6% of them. Computed tomography of thorax was performed in 102 patients and was pathologic in 81.3% of them. Fiberoptic bronchoscopy was performed in 46 patients and localized the bleeding site in 67.4% of them. In conclusion, the most common causes of hemoptysis were bronchiectasis, lung cancer and tuberculosis in our hospital. Based on this finding, we suggest that, the diagnostic approach to the patients presenting with hemoptysis should include first a detailed medical history, physical examination, and chest radiography; second sputum smear for acid fast bacilli; third computed tomography of thorax and lastly fiberoptic bronchoscopy.

**Key Words:** Bronchiectasis, etiology, hemoptysis, lung cancer, tuberculosis.

Hemoptysis is an alerting symptom which may result from a wide variety of disorders. The etiology of hemoptysis in various studies is based on the geographic location, the patient population studied, the diagnostic tests employed and the time of publication. Although exact percentages vary in large general populations, bronchiectasis, tuberculosis, and bronchogenic carcinoma are the leading causes of hemoptysis (1-3). Efficient tuberculosis control programs, widespread usage of antibiotics, and new techniques used for diagnosis have changed the etiologic distribution of hemoptysis (4-6).

Diagnostic procedures for the evaluation of patients with hemoptysis consist of mostly chest radiography, computed tomography (CT) of thorax, and fiberoptic bronchoscopy (FOB) (6,7). The development of FOB and thorax CT has improved the ability to determine the etiology of hemoptysis. In this prospective study, we aimed to determine the etiology and evaluation of patients with hemoptysis in a reference hospital in Turkey.

#### MATERIALS and METHODS

All the patients who admitted to the emergency clinic of Atatürk Chest Diseases and Chest Surgery Education and Research Hospital with hemoptysis during three months of study period were included into the study. A total of 143 patients

were evaluated prospectively. Fifty-three percent (n= 76) of the patients were hospitalized and 47% (n= 67) were evaluated on an outpatient basis. Demographic data, medical history, the history of medication with anticoagulant agents, physical examination findings, severity of hemoptysis, and prior hemoptysis episodes were recorded for each patient. Severity of hemoptysis was determined on the basis of medical history and observation in the emergency unit for 24 hours. Severity of hemoptysis was classified as mild if the amount is less than 10 mL/day, moderate if it is 10-100 mL/day and severe if it is more than 100 mL/day (8). Repeated attacks after a minimum of 30 days interval were accepted as recurrent hemoptysis.

Complete blood count, blood chemistry, and chest radiography (posterior-anterior and lateral) were performed for each patient. Firstly, patients with possible radiological findings supporting the diagnosis of pulmonary tuberculosis on chest radiography had undergone sputum examination for acid fast bacilli (AFB). Sputum examination for AFB was not performed for patients who have lobar pneumonia or pulmonary mass lesion. Secondly, thorax CT was performed for most of patients. It was the practice of our service to recommend high resolution thorax CT (HRCT) together with standard CT for the evaluation of patients with normal chest radiographs

suspicion of bronchiectasis. Thirdly, FOB was performed either to obtain biopsy from the patients with suspicion of malignancy or localize the bleeding size. Ventilation-perfusion scintigraphy, echocardiography, ear-nose-throat (ENT) examination, and upper gastrointestinal system (GIS) endoscopy, coagulation tests were the further diagnostic investigations for selected patients. Coagulation tests were performed for each patient with undetermined hemoptysis. Since there was not any patients with arterial or venous thrombosis, thrombocytopenia, or recurrent abortions, lupus anticogulant was not performed for any patient. Patients diagnosed as undetermined hemoptysis were included into the follow up program for one year.

Statistical analysis was carried out using SPSS package program version 10.0 Demographic and baseline clinical characteristics were presented as mean  $\pm$  SD.

## RESULTS

The study group comprised of 143 patients (106 males, 37 females) with a mean age of  $48 \pm 17$  (range: 13-98) years. The majority of the patients were male (74%) and most of them (82%) were smokers. There were 67 current smokers, 20 ex smokers, 19 never smokers in the male group and the mean smoking history was  $23.4 \pm 20.1$  pack-years. There were 12 current smokers, 1 ex smoker, 24 never smokers in the female group and the mean smoking history was  $5.4 \pm 11.4$  pack-years. The causes of hemoptysis are listed in Table 1. Bronchiectasis was the most common cause of hemoptysis accounting for 22.4% of the patients followed by lung cancer (18.9%), active tuberculosis (11.2%), and inactive tuberculosis (10.5%).

Hemoptysis was mild in 67.8% (n= 97), moderate in 22.4% (n= 32), and severe in 9.8% (n= 14) of the patients. Seventy-seven percent (n= 110) of the patients admitted with first hemoptysis episode, 23% (n= 33) with recurrent hemoptysis. The leading causes of mild, moderate, severe, first episode and recurrent hemoptysis are listed in Table 2. While lung cancer (20%) was

**Table 1. The causes of hemoptysis.**

Diagnosis	Number	N (%)
Bronchiectasis	32	22.4
Lung cancer	27	18.9
Active tuberculosis	16	11.2
Inactive tuberculosis	15	10.5
Chronic obstructive pulmonary disease	8	5.6
Pneumonia	7	4.9
Hydatid cyst	3	2.1
Alveolar hemorrhage and glomerulonephritis	2	1.4
Acute respiratory distress syndrome	1	0.7
Others*	9	6.3
Pseudohemoptysis**	4	2.8
Undetermined***	19	13.2

\* Mitral stenosis, 2 (1.4%); lung abscess, 2 (1.4%); pulmonary emboli, 1 (0.7%); aspergilloma, 1 (0.7%); anticoagulant therapy, 1 (0.7%); prior diagnosis of endobronchial schwannoma, 1 (0.7%); prior diagnosis of eosinophilic granuloma, 1 (0.7%).

\*\* Epistaxis, 2 (1.4%), hematemesis, 2 (1.4%).

\*\*\* In four patients multiple peripheral micronodules are found in thorax CT, but they were not considered as a cause for hemoptysis.

the leading cause of first hemoptysis episode, bronchiectasis (27%) was the leading cause of recurrent hemoptysis.

The diagnostic techniques used for evaluation of hemoptysis are listed in Table 3. Chest radiography was performed for all of the patients and was found pathologic in 84.6% (n= 121) of the patients. The causes of 22 patients with normal chest radiography findings are listed in Table 4. Sputum smear for AFB was investigated in 71.3% (n= 102) of the patients who have radiographic findings suspected to be due to tuberculosis. Sixteen patients (15.6%) had positive sputum smear for AFB and diagnosed as active tuberculosis. Two months later the diagnosis was confirmed by positive cultures for *Mycobacterium tuberculosis*. Thorax CT was performed in 71.3% (n= 102) of the patients. CT findings were abnormal in 81.3% (n= 83) and normal in

**Table 2. The leading causes of mild, moderate, severe, first episode and recurrent hemoptysis.**

	N	%	The leading causes	N	%
Mild hemoptysis < 10 mL/day	97	67.8	Lung cancer	22	22.6
			Bronchiectasis	17	17.5
			Tuberculosis	10	10.3
			Inactive tuberculosis	9	9.2
Moderate hemoptysis 10-100 mL/day	32	22.4	Bronchiectasis	10	31.2
			Tuberculosis	5	15.6
			Inactive tuberculosis	3	9.3
			Lung cancer	3	9.3
Severe hemoptysis > 100 mL/day	14	9.8	Bronchiectasis	5	35.7
			Inactive tuberculosis	3	21.4
			Lung cancer	2	14.2
			Tuberculosis	1	7.1
First episode of hemoptysis	110	76.9	Lung cancer	24	21.8
			Bronchiectasis	23	20.9
			Tuberculosis	14	12.7
			Inactive tuberculosis	10	9.1
Recurrent hemoptysis	33	23.1	Bronchiectasis	9	27.2
			Inactive tuberculosis	5	15.1
			Lung cancer	3	9.1
			Tuberculosis	2	6.1

**Table 3. The diagnostic techniques used for diagnosis.**

Diagnostic technique	Abnormal	Normal	Total
Chest radiography	121 (84.6%)	22 (15.4%)	143
Sputum stain for AFB	16 (15.6%)	86 (84.4%)	102
Thorax CT	83 (81.3%)	19 (18.7%)	102
FOB	31 (67.4%)	15 (32.6%)	46
V/P scintigraphy	1 (100%)	-	1
Echocardiography	2 (100%)	-	2
Upper GIS endoscopy	2 (9.5%)	19 (90.5%)	21
ENT examination	2 (9.5%)	19 (90.5%)	21
INR	1 (100%)	-	1

AFB: Acid fast bacilli, CT: Computed tomography, FOB: Fiberoptic bronchoscopy, V/P: Ventilation/perfusion, GIS: Gastrointestinal system, ENT: Ear-nose-throat.

18.7% (n= 19) of the patients. HRCT was performed in 35.6% (n= 51) of patients with suspicion of bronchiectasis.

Thirty-two patients were diagnosed as bronchiectasis, 27 as lung cancer, 15 as inactive tuberculosis, seven as pneumonia, three as hydatid cyst, two as lung abscess, and one as aspergillo-

ma. Inactive tuberculosis was diagnosed on the basis of prior medical history, compatible chest radiography, and negative mycobacterial cultures. The patients with lobar pneumonia were diagnosed clinically and radiologically. All of them were treated by antibiotics and improved completely. The diagnoses of hydatid cyst and aspergillo-

**Table 4. The causes of hemoptysis in patients with normal chest radiography findings (n= 22 patients).**

Diagnosis	Number	%
Undetermined*	8	36.4
Chronic obstructive pulmonary disease	4	18.2
Tuberculosis sequela	3	13.6
Bronchiectasis	3	13.6
Endobronchial schwannoma	1	4.5
Alveolar hemorrhage and glomerulonephritis	1	4.5
Pseudo-hemoptysis**	2	9.1

\* In four patients multiple peripheral micronodules are found in thorax CT, but they were not considered as a cause for hemoptysis.

\*\* One patient with epistaxis and one patient with hematemesis.

gilloma were reached by thorax CT and were confirmed after the operations. Eight patients with a prior history of chronic obstructive pulmonary disease (COPD) underwent thorax CT to exclude malignancy and then included into the follow up program.

FOB was performed in 32% (n= 46) of the patients and the bleeding site was localized in 67.4% (n= 31) of them. The materials obtained by bronchoscopy were routinely examined for AFB and cytologic abnormalities. The diagnosis of lung cancer was done by bronchoscopic biopsy in 22 patients, by transthoracic biopsy in two patients, and on the basis of clinical and radiological findings in three patients who did not approve FOB.

One patient with clinical suspicion of pulmonary emboli underwent ventilation perfusion scan and diagnosed as pulmonary emboli. Two patients with a medical history of congestive heart failure were diagnosed as mitral valve stenosis by echocardiography. Pseudo-hemoptysis was diagnosed in four patients: two as epistaxis after ENT examination and two as hematemesis after upper GIS endoscopy. Anticoagulant therapy was responsible from hemoptysis in one patient. In two patients alveolar hemorrhage and glomerulonephritis were diagnosed by both serology and renal biopsy. Two patients admitted with

previous diagnoses of eosinophilic granuloma and endobronchial schwannoma. Patients with normal physical examination findings, chest radiography, thorax CT, FOB, ENT examination, upper GIS endoscopy and no evidence of systemic diseases were diagnosed as undetermined hemoptysis. The etiology of hemoptysis was not found in 19 patients. In the undetermined group there were 13 patients with mild hemoptysis and five patients with moderate hemoptysis. Only one patient diagnosed as idiopathic hemoptysis had severe hemoptysis attack.

Nineteen patients with undetermined hemoptysis and eight patients with COPD were re-evaluated at the end of one year. Seven patients in COPD group did not have another hemoptysis attack after antibiotic therapy. Only one patient admitted to the hospital with another hemoptysis attack and diagnosed as acute exacerbation of COPD. Four patients in undetermined hemoptysis group had experienced another hemoptysis attack. In one of these four patients hemoptysis did not recur after psychiatric therapy. Two of them had a single hemoptysis attack but did not admit to the hospital. One of them attended to our emergency clinic with massive hemoptysis at the end of one year. After a diagnostic work-up including angiography, we could not discover the etiology of hemoptysis and it was classified as idiopathic hemoptysis. Four patients in the undetermined hemoptysis group who have pulmonary nodules on thorax CT did not experience another hemoptysis attack during one year and on control thorax CT, the size and the number of nodules were not different from the initial size and number.

## DISCUSSION

Much of the knowledge about the etiology of hemoptysis is based on the data collected between 1930 and 1960. In those studies bronchiectasis, tuberculosis and lung cancer were the most likely causes of hemoptysis (1-3). Since then there have been advances in the practice of medicine. Efficient tuberculosis control programs, widespread usage of antibiotics, and development of FOB have changed the etiologic distribution



of hemoptysis (4-6). Table 5 shows the main causes of hemoptysis in different series. Comparing with the previous studies Johnston and Reisz mentioned in their paper that hemoptysis is less likely to be caused by bronchiectasis or tuberculosis, while hemoptysis caused by bronchitis has increased proportionately (4). In a group of patients undergoing FOB for the evaluation of hemoptysis, Santiago et al found bronchitis as the second leading cause of hemoptysis after lung cancer (5). Hirschberg et al defined the incidence of bronchiectasis as 20% in their series, although tuberculosis was very rare (1.4%) due to the low incidence of disease in Israel (6).

In our study, bronchiectasis (22.4%), lung cancer (18.9%), active tuberculosis (11.2%), and inactive tuberculosis (10.5%) were the leading causes of hemoptysis. Hemoptysis due to either active or inactive tuberculosis totally accounted for 21.7% of the patients which is more than the ratio of lung cancer patients. Recently in a study from Turkey, lung cancer (34.2%) was the leading cause of hemoptysis followed by bronchiectasis (25%) and tuberculosis (17.6%) (14). In this study all of the tuberculosis cases were actively ill and the rate of active tuberculosis in their series was higher than our series. Although it was not mentioned in their paper, we think that they might have considered inactive tuberculosis patients in the bronchiectasis group. Also, Celik et al.; analysed 155 patients with hemoptysis and found that lung cancer (48%) was the leading cause of hemoptysis followed by tuberculosis (12%), and bronchiectasis (9%) (15). However, in another study from Turkey, a higher rate of tuberculosis with a ratio of 56% was reported (16). Combining the results of these studies and ours, we think that bronchiectasis, lung cancer and tuberculosis are still problems of Turkey.

Posterior-anterior and lateral chest radiography accompanying with a detailed medical history and physical examination is the first step to evaluate a patient presenting with hemoptysis (17). As a second step, sputum smear for AFB is a cheap and easy way of diagnosing tuberculosis

especially in endemic areas. A positive AFB sputum smear would prevent further diagnostic investigations. FOB is a considerably valuable method in locating the site of bleeding, removal of cloths which may cause obstruction, direct visualization of endobronchial tumors, foreign bodies, granulomas and infiltrations. It also allows collection of histologic samples, but is not useful in detecting peripheral tumors (17). CT has been shown to be accurate in the diagnosis of a wide range of bronchial abnormalities including both central tumors and peripheral lesions and especially bronchiectasis (18). There is conflicting data whether the clinician should choose CT or FOB as a further diagnostic step in evaluating hemoptysis patients with normal chest radiographs (18,19). Maraslı et al. compared the diagnostic value of thorax CT and FOB in 50 patients with hemoptysis, but normal chest radiographs. Thorax CT was diagnostic in 56% of the patients, whereas FOB was diagnostic in 18% of the patients (20). In two studies from Turkey, which were investigating the main causes of hemoptysis in patients with normal chest X-rays, tuberculosis sequela and bronchiectasis were the main etiological factors (21,22). In both studies HRCT was found more valuable than FOB in the diagnosis of bronchiectasis and tuberculosis sequela. By using both modality (HRCT and FOB), Günes et al., could not determine the cause of hemoptysis in 28%, and Senyigit et al., in 36.5% of the patients. In another study, bronchiectasis (35.2%) was again the most common cause of hemoptysis in patients with normal chest X-rays (21,22). Undetermined hemoptysis was present in 29.4% of the cases (23). In our study, the cause of hemoptysis was not determined in 36.4% of the patients who have normal chest X-rays. COPD (18.2%), tuberculosis sequela (13.6%), and bronchiectasis (13.6%) were the most common etiological factors of hemoptysis in patients with normal chest X-rays.

The studies, investigating the value of FOB, in patients with hemoptysis and nonlocalizing chest radiographs conclude that in patients aged over 40 years old FOB is worthwhile as 3-6% of such

**Table 5. Main causes of hemoptysis in different series.**

Author	Study period	Year of publication	Geographic location	No of cases	Bronchiectasis	Tuberculosis	Lung cancer	Bronchitis	Pneumonia	Undetermined	Others
Abbott <sup>9</sup>	1940-47	1948	Atlanta	497	21%	22%	21%	2%	2%	4%	28%
Souders and Smith <sup>2</sup>	1941-51	1952	Boston	105	28.5%	1.9%	3%	12.4%	1%	18%	35%
Moersch <sup>1</sup>	1950	1952	Mayo Clinic	200	26.5%	5.5%	29.5%	9%	8%	-	21.5%
Santiago <sup>5</sup>	1974-81	1991	Los Angeles	264	0.5%	6%	29%	23%	11%	22%	9%
Johnston and Reisz <sup>4</sup>	1977-85	1989	Kansas City	148	1%	7%	19%	37%	5%	3%	28%
Knott-Craig <sup>10</sup>	1983-90	1993	South Africa	120 massive bleeding	51% (all had tuberculosis)	73%	5%	-	4%	8%	10%
Alaoui <sup>11</sup>	1985-90	1992	Casablanca Morocco	291	15%	19%	34%	3.5%	7%	3%	18.5%
McGuinness <sup>7</sup>	1991-92	1994	New York	57	25%	16%	12%	5%	12% (aspergilloma)	19%	5%
Hirshberg <sup>6</sup>	1980-95	1997	Jerusalem Israel	208	20%	1%	19%	18%	16%	8%	18%
Domoua <sup>12</sup>	5 years	1994	Abidjan Ivory Coast	142	11.2%	49.3%	4.2%	-	13.3% and 7.7% aspergilloma	-	25%
Abal <sup>13</sup>	1998-99	2001	Kuwait	52	21.2%	15.4%	-	5.8%	-	-	1.9%
Fidan <sup>14</sup>	2000	2002	Istanbul Turkey	108	25%	17.6	34.3%	-	10.2%	-	12.9%
Present study	2002	-	Ankara Turkey	143	22.4%	11.2%	18.9%	5.6%	4.9%	13.2%	6.3%

cases will have neoplastic disease, but in patients aged less than 40 years old, outpatient follow-up is advised as serious pulmonary pathology is unusual (24,25). Despite medical history, physical examination, conventional chest radiographs and FOB, up to 50% of patients with hemoptysis may remain without a diagnosis (26).

Considering the etiologic profile of our patients, we think that CT should be considered as the third step in the diagnostic evaluation of patients presenting with hemoptysis. By this way patients without abnormalities on CT should be spared an invasive diagnostic procedure. In our study, diagnosis of bronchiectasis, inactive tuberculosis, hydatid cyst, aspergiloma and lung abscess were all established by CT. Also CT did not fail to determine lung cancer. In all the cases with suspected malignancy, CT demonstrated the lesion and FOB was performed for histopathological diagnosis. A normal CT provides additional reassurance to the patients with undetermined hemoptysis but more long term studies are needed to ensure that such a finding can be used to discontinue medical supervision of such patients. That's why we follow up patients with undetermined hemoptysis. After one year follow-up we can say that the diagnoses did not change in those patients. Patients are sometimes unable to identify hemoptysis from hemorrhage from upper airway or gastrointestinal tract. For this reason ENT examination, gastroenterology consultation, and upper GIS endoscopy must be a part of diagnostic evaluation. In our study we had four patients (2.8%) with pseudo-hemoptysis. After a detailed medical history, physical examination and chest radiography, a clinician should suppose the etiologies such as pulmonary emboli or cardiogenic problem such as mitral valve stenosis and perform proper diagnostic studies. In different series the rate of undetermined hemoptysis vary from 8 to 25% (2,5,6,13). In our study, the etiology of hemoptysis was not determined in 13.2% of the patients despite the further investigations involving CT scan, FOB and ENT examination, and upper GIS endoscopy.

In conclusion, bronchiectasis, tuberculosis and lung cancer are the leading causes of hemoptysis in our hospital. Based on this finding, the diagnostic approach to the patients presenting with hemoptysis should include first a detailed medical history, physical examination, and chest radiography; second sputum smear for AFB; third thorax CT and lastly bronchoscopy.

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