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Risk Factors for a Second Episode of Hemoptysis

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ABSTRACT

Background: Of lung diseases, Hemoptysis is an alarming symptom. It is difficult for clinicians to choose how to deal with patients who had a single episode of hemoptysis, especially if the cause is unknown. Using multivariate analysis, investigations were done to see whether any factor in the initial episode could be a predictor of second episode. **Aim:** In this study, by using multivariate analysis, to check whether any clinical factor present during initial episode of hemoptysis are useful predictors of second episode of hemoptysis. **Materials and Methods:** 100 Patients with initial episode of hemoptysis, their medical records were reviewed. Patients who had undergone both chest CT and bronchoscopic examinations were selected in the study. **Results:** 100 patients were selected. From bronchial lavage fluid, active and inactive fluid were isolated in 17 (17%) cases. On further examination, diagnosis was not established in 27 (27%) cases. The predictors of hemoptysis were bacteria from bronchial lavage which has shown a 62 patients were negative for bacteria and 7 patients were positive for bacteria out of a total of 69 patients in initial episode and 21 patients showed negative to bacteria and 10 patients showed positive to bacteria out of a total of 31 patients in reccurent episode. All the demographic details of initial episode and recurrent cases are insignificant on comparision. Most of the cases of recurrent cases are positive for bacteria from bronchial lavage and ethiology is known. Regardless of the volume of the initial episode, the failure to determine the etiology of an initial episode of hemoptysis was associated with an increased risk of a massive second episode (P = 0.040).**Conclusion:** There is an increased possibility of a second episode of hemoptysis in patients with bacterial colonization of the respiratory tract or an initial episode of hemoptysis of unknown etiology.

Keywords: Hemoptysis, Blood, Multivariate Analysis.

Introduction

Hemoptysis is the coughing up of blood or blood-stained mucus from the bronchi, larynx, trachea, or lungs. This can occur with lung cancer, infections such as tuberculosis, bronchitis, or pneumonia, and certain cardiovascular conditions[1].Hemoptysis is considered massive at 300 mL (11 imp fl oz; 10 US fl oz). In such cases, there are always severe injuries[2].The primary danger comes from choking, rather than blood loss. Conditions which commonly involve hemoptysis include bronchitis and pneumonia, lung cancers and tuberculosis. Other possible underlying causes include aspergilloma, bronchiectasis, coccidioidomycosis, pulmonary embolism, pneumonic plague, and cystic fibrosis. Rarer causes include hereditary hemorrhagic telangiectasia (HHT or Rendu-Osler-Weber syndrome), Goodpasture's syndrome, and granulomatosis with polyangiitis. In children, hemoptysis is commonly caused by the presence of a foreign body in the airway[3].The condition can also result from over-anticoagulation from treatment by drugs such as warfarin. Blood-laced mucus from the sinus or nose area can sometimes be misidentified as symptomatic of hemoptysis (such secretions can be a sign of nasal or sinus cancer, but also a sinus infection). Extensive non-respiratory injury can also cause one to cough up blood[4].Cardiac causes like congestive heart failure and mitral stenosis should be ruled out. The origin of blood can be identified by observing its color. Bright-red, foamy blood comes from the respiratory tract, whereas dark-red, coffee-colored blood comes from the gastrointestinal tract. Sometimes hemoptysis may be rust-colored. Of underlying diseases of lungs, hemoptysis is an alarming

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symptom. The causes and variations in the reported prevalence is the main problem in treating hemoptysis, After the initial active bleeding has stopped with treatment, another problem arises which is second episode of hemoptysis[5].The second episode of hemoptysis may be severe , though the first episode was slight expulsion of blood sputum. Hence, it is difficult for clinicians to choose how to deal with patients who had a single episode of hemoptysis, especially if the cause is unknown. In this study, by using multivariate analysis, to check whether any clinical factor present during initial episode of hemoptysis are useful predictors of second episode of hemoptysis.

Materials and Methods

100 patients with initial episode of hemoptysis, their medical records were reviewed. All patients who had undergone both chest CT and bronchoscopic examinations were selected in the study. High resolution CT scans are routinely performed in this hospital if any abnormality is observed in the conventional CT scan. For culture of micro-organisms, bronchial lavage by polymerase chain reaction of mycobacterium and cytological examinations along with bronchoscopic examinations were performed. In relevant cases, endobronchial or transbronchial biopsy were performed. In cases of severe hemoptysis requiring embolotherapy, chest angiography was suggested. Patients upper airway bleeding were excluded from the study. The institutional review board approved this study and informed consent was taken from all the patients. On the basis of available clinical data, chest CT, and bronchoscopic findings, the cause of hemoptysis was determined. Infection is the bacterial isolation from the bronchial lavage fluid, accompanied by respiratory signs and symptoms, whereas colonization is a state in which host defenses limited the bacterial activity and hence such respiratory signs and symptoms were absent. Age, sex, smoking history, blood pressure, history of anticoagulant therapy, chest CT findings, type of bacteria isolated with bronchial lavage, etiology, time to recurrent hemoptysis, amounts of initial and recurrent hemoptysis, and treatment were collected from all the patients. The cases were divided into three groups namely Trivial (Blood streaked sputum), Moderate(<500 mL/24 hours) and massive (≥500 mL/24 hours). When appropriate, conservative treatment was given to all patients. Follow up was taken. Chi square test or Probability test was used to assess the relation between categorical variables. Mann-Whitney test was used to evaluate the difference in mean between groups. Statistical significance was indicated by P value less than 0.05.

Results

100 patients were selected. From bronchial lavage fluid, active and inactive fluid were isolated in 17 (17%) cases. On further examination, diagnosis was not established in 27 (27%) cases.

Table 1: Patients characteristics for prediction of recurrent hemoptysis

Variable	Total(n=100)	Initial Episode(69)	Recurrent cases(31)	P value
Age (Years)<60/≥60	49/51	41/28	12/19	NS
Gender Female/Male	22/78	20/49	6/25	NS
Smoking Smoker/Non-smoker	60/40	45/24	17/14	NS
Blood Pressure (mmHg) <160/≥160	70/30	47/22	18/13	NS
Anticoagulant therapy No/Yes	80/20	60/9	29/2	NS
Chest CT abnormality Yes/No	62/38	49/20	25/6	NS

All the demographic details of initial episode and recurrent cases are insignificant on comparison

Table 2: Patients characteristics for prediction of recurrent hemoptysis

Variable	Total(n=100)	Initial Episode(69)	Recurrent cases(31)	P value
Bacteria from bronchial lavage –ve/+ve	82/18	62/7	21/10	0.001
Etiology Known/Unknown	84/16	59/10	22/9	0.016
Amount of initial bleeding Trivial/moderate or massive	30/70	20/49	12/19	NS
Initial treatment Conservative/Embolotherapy	88/12	65/4	31/0	NS

NS-Not significant

Most of the cases of recurrent cases are positive for bacteria from bronchial lavage and etiology is known.

Table 3: Etiology of initial hemoptysis

Known	Total(n=100)	Initial Episode(69)	Recurrent cases(31)	P value
Bronchitis	25	20	7	NS
Bronchiectasis	20	14	6	
Infection	16	10	5	
Others	16	14	3	
Unknown	23	11	10	

Table 4: Etiology of initial hemoptysis of infection

Infection	Total(n=16)	Initial Episode(10)	Recurrent cases(5)	P value
Pneumonia	4	4	0	NS
Abscess	2	0	1	
Aspergilloma	4	2	3	
Tuberculosis	6	4	1	

Table 5: Etiology of initial hemoptysis for others

Others	Total(n=16)	Initial Episode(14)	Recurrent cases(3)	P value
Lung cancer	5	5	0	NS
Hemorrhagic diathesis	5	3	2	
Bronchial vascular abnormality	3	3	1	
Pulmonary sequestration	1	1	0	
Bronchial atresia	1	1	0	
Tracheal ulcer	1	1	0	

Discussion

In our study, 100 patients were selected. From bronchial lavage fluid, active and inactive fluid were isolated in 17 (17%) cases. On further examination, diagnosis was not established in 27 (27%) cases. Bacteria from bronchial lavage was the predictor of hemoptysis which has shown a 62 patients were negative for bacteria and 7 patients were positive for bacteria out of a total of 69 patients in initial episode and 21 patients showed negative to bacteria and 10 patients showed positive to bacteria out of a total of 31 patients in reccurent episode. All the demographic details like age, gender, smoking, blood pressure, anticoagulant therapy, CT of chest abnormality, amount of initial bleeding and initial treatment embolotherapy of initial episode and recurrent cases are insignificant on comparision. Most of the cases of recurrent cases are positive for bacteria from bronchial lavage and ethiology is known. Regardless of the volume of the initial episode, the failure to determine the etiology of an initial episode of hemoptysis was associated with an increased risk of a massive second episode (P = 0.040), whereas in a study done by **Nobuhiko Seki *et al*;** odds ratio of 13.5, P = 0.001 in the isolation of bacteria from bronchial lavage fluid was determined and odds ratio of 7.0, P = 0.014 in the failure to determine the cause of the initial episode of hemoptysis were significant independent predictors of a second episode of hemoptysis[6]. Even if colonization, representing host-bacterial equilibrium, had occurred, isolation of either *Pseudomonas aeruginosa* or *Haemophilus influenzae* increased the likelihood of a second episode of hemoptysis (P = 0.077) by subset analysis . Hence, regardless of the volume of the initial episode, the failure to determine the etiology of an initial episode of hemoptysis was associated with an increased risk of a massive second episode (P = 0.042).**Adel Ayed *et al***[7]; conducted a study in which fifty-three patients were studied, 27 in group 1 and 26 in group 2. The mean age of the patients was 47.2 years (range, 29–70 years). Urgent examination with a combination of rigid and flexible fiberoptic bronchoscope localized the bleeding site in 45 patients (85%). Age>50 years, hypertension, hemoglobin on admission<10 g/dl, cause of hemoptysis, and a prior attack of hemoptysis were the predictors for the need of emergency surgery. The overall hospital mortality rate was 4% (2/53). Postoperative complications occurred in 13 patients (25%). Complications were more common in patients who received blood transfusion than non-transfused patients (9/23 and 4/30, respectively; P=0.03). Patients with tuberculosis as the cause of massive hemoptysis had more complications 5/8 in comparison to all other patients (P=0.02). The mean

follow-up was 4.5 years (range, 3–6 years) for all patients who survived. Hemoptysis recurred in four patients (8%) and all from group 1 (P=0.02). **Hirshberg B *et al***[8];observed that bronchiectasis (20%), lung cancer (19%), bronchitis (18%), and pneumonia (16%) accounted for most causes of hemoptysis. In contrast to older studies, active tuberculosis was a rare finding (1.4%). Bronchiectasis and bleeding diathesis were major causes of moderate to severe hemoptysis while bronchitis and lung cancer were commonly associated with milder degrees of bleeding. CT scan was the most sensitive diagnostic test when employed alone, with a positive yield of 67%. However, it failed to locate at least three cases of lung cancer. When combining a CT study together with a bronchoscopy, the positive yield increased to 93%. The mortality rate for patients with mild to moderate hemoptysis was low (2.5% and 6%, respectively), while patients with massive hemoptysis had high mortality rates (38%). Patients with lung cancer or bleeding diathesis had higher mortality rates compared with the rest of the cohort. **B R Lee *et al***[9]; found in their study that bronchiectasis (32.6%), active pulmonary tuberculosis (18.5%), fungus ball (10.8%), and lung cancer (5.9%) accounted for most causes of hemoptysis. Computed tomography scan was the most sensitive diagnostic test when employed alone, with positive yield of 93.2%. There were 161 cases of conservative treatment (72.9%), 42 cases of bronchial artery embolization (BAE) (19.0%), and 18 cases of surgery (8.1%). Regarding the amount of hemoptysis, 70 cases, out of 221 cases, were mild (31.5%), 36 cases moderate (16.2%), and 115 cases massive hemoptysis (52.0%). Most of the patients were treated conservatively, but if there was more bleeding present, BAE or surgery was more commonly performed than the conservative treatment ($p \leq 0.0001$). In the multivariate model, severe hemoptysis and lung cancer were independently associated with short-term recurrence. BAE was independently associated with long-term recurrence, and lung cancer was associated with in-hospital mortality. The overall in-hospital mortality rate was 11.3%. In a study done by **Fidan A *et al***;[10] 79 were men and 29 were women, and the mean age was 51.74 +/- 17.51. In 77 of the cases it was the first attack, while in 31 it was recurrent. According to the severity of hemoptysis, it was classified as "mild" (<30 cm^3), "moderate" (30-100 cm^3), "severe" (100-600 cm3) and "massive" (>600 cm^3). Lung cancer was the leading cause of hemoptysis (34.3%) followed by bronchiectasis (25.0%), tuberculosis (17.6%), pneumonia (10.2%) and pulmonary embolism (4.6%). Statistical analysis by chi-square test revealed that most of the lung cancer patients had mild hemoptysis (odds ratio 3.5; P<0.05), and the most frequent etiology in recurrent hemoptysis was bronchiectasis (odds ratio 3.25; P=0.01). Most of the lung cancer patients were male (P=0.002).

Conclusion

There is an increased possibility of a second episode of hemoptysis in patients with bacterial colonization of the respiratory tract or an initial episode of hemoptysis of unknown etiology.

Conflict of Interest: None
Source of Support: Nil

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