RESPIRATORY MEDICINE (2001) **95,** 548–552
doi:10.1053/rmed.2001.1053, available online at http://www.idealibrary.com on IDEAL®

Haemoptysis: aetiology, evaluation and outcome — a prospective study in a third-world country

A. T. ABAL,* P. C. NAIR* AND J. CHERIAN†

*Chest Department, Al-Rashed Allergy Centre and Faculty of Medicine, Kuwait University, Kuwait; and †Department of Radiology, Al-Sabha Hospital, Kuwait

Haemoptysis is an alarming symptom, and the management depends upon the aetiology. Emergency management depends upon localization of the site of bleeding by roentgenogram, computerized chest tompgraphy and bronchoscopy.

We prospectively evaluated 52 patients with haemoptysis admitted to the Chest Hospital, Kuwait for 1 year (January 1998 to December 1998) and followed them up for 1 year (January 1999 to December 1999). There were 42 males (80·8%) and 10 (19·2%) females, with a mean age of 42·2 (16–86) years. Of these, 26·9% were Kuwaiti nationals, 36·5% were Arab non-Kuwaiti nationals, 34·6% were Asians and 1·9% were other nationals.

The aetiologies of haemoptysis were bronchiectasis (21·2%), old pulmonary tuberculosis with bronchiectasis (17·3%), active pulmonary tuberculosis (15·4%), bronchitis (5·8%), aspergilloma, rheumatic heart disease and carcinoid (1·9%). Aetiology could not be identified in 25% of patients. The site of bleeding in haemoptysis could not be localized by the consultants in 18 (32%) by roentgenogram, 16 patients (37%) by CT scan and 23 patients (50%) by Fibreoptic bronchoscopy. Sequential estimation of hemoglobin showed a mean of 13·56 (SD 1·9) and 13·31 (SD 1·8) after 24 h. The difference in mean was statistically significant ($p < 0·036$).

Conservative management was given in 80·8%, and embolotherapy or surgical intervention in 19·2% of patients. Only 12% of patients had recurrent haemoptysis at 1-year follow up.

In conclusion, bronchiectasis and pulmonary tuberculosis were the major causes of haemoptysis in this study. Roentgenogram, CT scan and fibreoptic bronchoscopy are useful for localizing the site of bleeding. Sequential estimation of haemoglobin may be helpful in assessing the severity of haemoptysis, but larger studies are required to address this observation. The outcome of haemoptysis is generally good, with a low mortality and recurrence rate.

Key words: haemoptysis; aetiology; CT scan; bronchoscopy.

RESPIR. MED. (2001) **95,** 548–552

Introduction

Haemoptysis is often an alarming presenting symptom. A major problem in haemoptysis is the wide spectrum of aetiologies that may result in haemoptysis (1–3) and variations in the reported prevalence. The effective management of haemoptysis depends upon identification of the aetiology and localization of the site of bleeding. The outcome of haemoptysis is generally good, but vary according to the modality of treatment. This study prospectively evaluates the aetiology of haemoptysis, the role of roentgenogram, high resolution computerized tomography of the chest (HRCT-chest) and fibreoptic bronchoscopy (FOB) in localizing the site of bleeding, outcome and recurrence in a large tertiary chest hospital in Kuwait.

Received 27 September 2000 and accepted in revised form 31 January 2001.

Correspondence should be addressed to: Dr: A.T. Abal, Department of Medicine, Faculty of Medicine, P.O.Box 24923, Safat 13110, Kuwait. Fax: +965 53 38 907; E-mail: pcnairdr@hotmail.com

Materials and methods

This study prospectively evaluated 52 patients admitted to the Chest Hospital, Kuwait, with haemoptysis. The period of study was 1 year, from January 1998 to December 1998. All the patients were admitted to hospital for further investigation. Demographic data were entered in a predesigned performa.

The type and quantity of haemoptysis was recorded by the admitting physician or by the staff nurse during the hospital stay. Haemoptysis was quantified as < 50 ml, 50–100 ml and > 200 ml per day. In this study haemoptysis of more than 200 ml was defined as massive haemoptysis (4,5). We also recorded the type of haemoptysis, first episode or recurrent haemoptysis.

0954-6111/01/07548+05 $35·00/0

Admitting radiograph, blood chemistry, coagulation profile and blood screening were done routinely. Blood hemoglobin was repeated after 24 h. The chest consultants carried out FOB within 1 week or as an emergency in massive haemoptysis. Bronchoscopists were asked to comment on (1) active bleeding or not, (2) site of bleeding and (3) endobronchial abnormality. Bronchial lavage was done and sent for routine culture (for acid-fast bacillus) and cytology (for malignant cells). Transbronchial or endobronchial biopsies were done in relevant cases.

Two consultant radiologists (J.C. and H.D.) were asked to characterize the chest radiograph and HRCT-chest as normal or abnormal. If it was characterized as abnormal, the investigators were asked to indicate the site of bleeding in lobes or undetermined, and diagnosis or abnormality.

Final hospital discharge diagnosis was established by consensus after consideration of all clinical, radiographic, HRCT-chest and bronchoscopic findings. Patients for whom aetiology could not be established, were diagnosed as haemoptysis of unknown aetiology. Conservative management, embolotherapy or surgery was offered in relevant cases. Conservative management was the preferred mode of treatment. All patients were followed-up for one year until December 1999. Patients were followed up by outpatient visits, home telephone calls and review of hospital files at 3-month intervals.

The statistical analysis has been carried out using SPSS-statistical package (version 9).The descriptive statistics mean and standard deviation (SD) were used to describe the finding. Paired *t*-test was used to test the difference in mean between two dependent groups. Kappa statistics was used to evaluate the agreement between two sets of diagnostic tests. Macnamer test was used to test the difference in two dependent variables. *P*-value $\leq 0{\cdot}05$ was taken as the level of significance.

Results

Fifty-two patients were admitted to the Chest Hospital, Kuwait, during the 1-year study period. There were 42 males (80·8%) and 10 (19·2%) females, with a mean age of 42·4 (16–86) years. Of these 26·9% ($n=14$) were Kuwaiti nationals, 36·5% ($n=19$) were Arab non-Kuwaiti nationals, 34·6% ($n=18$) were Asians and 1·9% ($n=1.9\%$) were other nationals. Of the patients, 38·5% ($n=20$) of patients were non-smokers, 21.2 % ($n=11$) were ex-smokers, and 40·4% ($n=21$) were current smokers. A total of 73·1% ($n=38$) of patients were admitted for the first episode of haemoptysis, and 26·9% ($n=14$) for recurrent haemoptysis. Of these, 38·5% ($n=20$) gave history of blood-stained sputum, 61·5% ($n=32$) of frank haemoptysis and 30·8% ($n=16$) had massive haemoptysis. Duration of haemoptysis varied from a minimum of 1 day to a maximum of 30 days (mean 6·85 day). A quarter of patients ($n=13$) had history of pulmonary tuberculosis, 9·6% ($n=5$) had bronchiectasis, and 1.9 % ($n=1$) had aspergillosis. *Staphylococcus aureus* was isolated from the sputum culture in two patients, *H. influenza*, *Pseudomonas aeroginosa*, and *Klebsiella* from one patient each. *Mycobacterium tuberculosis* was isolated from sputum in eight patients, and hence diagnosed as active pulmonary tuberculosis. Chest radiograph, which was done in all cases, was reported as abnormal by the consultant radiologists in 82·7% and as normal in 17·3% of the patients. HRCT was normal in 11·6% ($n=6$) and abnormal in 67·2%, HRCT could not be done in 21·2% ($n=11$). HRCT showed only one bronchiectasis among the 17·3% of normal chest radiographs.

Bronchoscopy was performed by the consultant chest physicians in all except six patients. Results showed one case of bronchitis, two cases of bronchiectasis, one case of active pulmonary tuberculosis, one patient died and one case of unknown aetiology since the patient refused the procedure. Bronchoscopy was normal in 61·5% ($n=32$) and abnormal in 26.9% ($n=14$). The diagnostic yield of bronchoscopy was only in detecting endobronchial lesions. Bronchoscopy was able to detect two endobronchial carcinoids, two endobronchial masses, four signs of inflammation, two polyps and endobronchial granulation, tumour trachea and epiglottis bleed in one patient each. However, bronchoscopy was done as an emergency in cases of massive haemoptysis and within 1 week in all other cases, but active bleeding was seen only in 45·6% of cases. Blood Heamoglobin was estimated on the day of admission and repeated after 24 h. The mean heamoglobin was 13·56 (SD = 1·9) and 13·31 (SD = 1·8) after 24 h. The paired difference in mean was 0·24 ($P<0.036$).

The final discharge diagnosis is shown in Table 1. Among the 52 patients studied, bronchiectasis was the most common cause of haemoptysis in 21·2% ($n=11$), post-tubercular sequlae with fibrosis and bronchectasis in 17·3% ($n=9$), followed by active pulmonary tuberculosis in 15·4% ($n=8$). Carcinoma of the lung was detected in 9·6% ($n=5$), and all these patients presented with recurrent non-massive haemoptysis. Respiratory infections contributed to 8·8% ($n=3$) and aspergilloma in a Tuberculous cavity in 1·9% ($n=1$). Mitral stenosis is well known to present as haemoptysis, and we had one case of mitral stenosis which presented as massive haemoptysis. One case of carcinoid also presented as massive haemoptysis. The aetiology of

TABLE 1. The aetiology of haemoptysis in the present series studied

	Number	Percentage
Bronchiectasis	11	21·2
Old pulmonary TB	9	17·3
Active pulmonary TB	8	15·4
Carcinoma	5	9·6
Bronchitis	3	5·8
Aspergilloma	1	1·9
RHD	1	1·9
Carcinoid	1	1·9
Unknown cause	13	25

RHD, rheumatic heart disease; Pulmonary TB, pulmonary tuberculosis.

haemoptysis could not be detected in 25% ($n=13$) of patients.

When the site of bleeding by roentgenogram, HRCT, and bronchoscopy was compared with respect to the sides (right or left), the agreement reached was perfect, with a $\kappa=1$ with respect to roentgenogram and CT scan, and in the case of others, CT/bronchoscopy and roentgenogram/bronchoscopy the agreement was moderately strong, with a $\kappa=0{\cdot}7$ ($P<0.001$). When cross-tabulation was done between roentgenogram and bronchoscopy for each of the CT scan groups, it was observed that complete agreement could be reached for the CT scan group as follows: Right middle lobe (RML) 1/1, right lower lobe (RLL) 1/1, left upper lobe (LUL) 1/1, left lower lobe (LLL) 2/2. In cases of right upper lobe (RUL) 1/4 could have complete agreement and in cases of more than one lobe 4/5 have complete agreement. Two of the lingular lobe group could not reach agreement.

TREATMENT OUTCOME

Conservative management was given in 80·8% ($n=42$). Emergency surgical intervention was given in 7·7% ($n=4$) and embolotherapy in 11·5% ($n=6$). In one patient angiogram was done, but embolotherapy failed to stop bleeding. Only two patients (3·8%) died during the study period. One patient died due to massive haemoptysis and was diagnosed as having active pulmonary tuberculosis. The second patient was diagnosed as having carcinoma of the lung, with recurrent non-massive haemoptysis, but the cause of death cannot be directly attributed to haemoptysis.

All patients were followed up for 1 year. Six patients developed recurrent haemoptysis (11·5%). Recurrent non-massive haemoptysis was found in two patients with bronchiectasis, three patients had post-tubercular sequlae and one patient had haemoptysis of unknown aetiology (repeat investigations could not detect the aetiology). None of the patients with active tuberculosis had haemoptysis during the follow-up period.

Discussion

Kuwait is a prosperous oil-rich Gulf country. The total population of Kuwait is 2 254 954, of which only one third constitutes Kuwaiti nationals (812 255). The remaining expatriate population (1 442 699) are mainly from Asian Arab countries.

Aetiology of haemoptysis is listed in Table 1. Bronchiectasis, old pulmonary tuberculosis and active Pulmonary tuberculosis are the leading causes in the cohort studied. Tuberculosis was reported as an important cause in many of the older series published (6–9), Tuberculosis is still an important cause of haemoptysis, with high prevalence of the disease. The finding of bronchiectasis as the main cause of haemoptysis in this study (20%) agrees with Hirschberg *et al.* but tuberculosis was a rare finding (1·4%). MacGuinness *et al.* prospectively studied haemoptysis at Bellevue Hospital, New York, and found that bronchiectasis accounted for 25% and tuberculosis for 16% of cases (10).

The incidence of bronchogenic carcinoma was low in this study. Hirschberg *et al.* (3) reported lung carcinoma in 19%, of which 54% had primary carcinoma and 46% had metastatic carcinoma. The incidence of carcinoma varies in the different series published, e.g. Alaoui *et al.* (11) 34%, Johnston and Reisz (12) 19%.

All the patients had full investigations to find out the aetiology of haemoptysis, but we could not find the aetiology in 25% of the cases. Saunders and Smith (8), Set *et al.* (13), Santiago *et al.* (2) and Miller *et al.* (14) noted similar findings.

The high incidence of tuberculosis in this study may be due to the high expatriate population from highly endemic areas. The ability of HRCT-chest to delineate the airways was well-established (15–18). Naidich *et al.* advocated the use of CT scan as only a screening technique in haemoptysis, whereas Hopnik *et al.* found that CT did not make any difference to case management. The role of CT scan in the management of haemoptysis is also controversial (5,14,18). The role of FOB in the evaluation of patients with haemoptysis is also controversial, especially in cases in which the chest radiograph is normal (19,20). The active management of haemoptysis depends on identification of the site of bleeding. We evaluated the role of roentgenogram, FOB and CT scan in accurately localizing the site of bleeding, which guide embolization or surgical procedure in relevant cases.

The consultant radiologists and bronchoscopists were asked to comment on the site of bleeding in relation to lobes of the lung, whether more than one lobe was involved, or lobe or undetermined. When the site of bleeding was compared with respect to right or left the κ index was 1 and 0·7 ($P<0{\cdot}001$), respectively, which was statistically significant. On cross-tabulation complete agreement was seen only in RML, RLL, LUL and LLL. The agreement is weak in RUL, lingula and more than one lobe. This indicates that roentgenogram, HRCT and bronchoscopy may be complementary in localizing the site of bleeding in haemoptysis, but the interpretation is limited by the fewer number of patients in this study. The site of bleeding could not be localized in 18 cases (32%) by roentgenogram, 16 cases (37%) by CT scan and 23 cases (50%) by FOB. The combined use of bronchoscopy and CT chest has the best yield in evaluating haemoptysis (21). Christopher *et al.* (22), in his study of 120 patients with massive haemoptysis, found that the lung from which the intra-bronchial haemorrhage originated could be localized with reasonable confidence only in 76 (68%) of patients by localized radiographic appearance, red blood cell isotope scanning, endoscopy or a combination of these.

Sequential estimation of blood haemoglobin reduction gastrointestinal in bleed and haemorrhagic shock, indicating the severity of bleeding, is well established, but this is not addressed in cases of haemoptysis. Mean haemoglobin on the day of admission was 13·56 (SD 1·9) and 13·31 (SD 1·8) after 24 h. This difference in mean was statistically significant ($P<0{\cdot}036$). Howver, the number of patients studied was too low to validate this finding, so large studies are required to confirm this observation.

In this study conservative management was preferred, and 80·8% of patients were managed conservatively. Emergency surgical intervention in the form of lobectomy was done only in 7·7% of patients. This was low when compared to the study published by Christopher *et al*. (22), where 42 surgical interventions were done in 120 cases of massive haemoptysis. Embolotherapy was carried out in only four cases of massive haemoptysis. In spite of the conservative management in 80·8%, mortality was very low (3·8%) in this study. The outcome of haemoptysis was generally good, with all patients surviving and discharged home, although rates of mortality in non-trauma patients have been reported to be as high as 30–50% in the various studies published (23,24).

All the patients who were to be discharged were alive at the end of the follow-up period of 12 months. Christopher *et al*. recorded a recurrent rate of 36·5% during the follow-up of 6 months (22). The recurrent rate was only 12% ($n=6$) in this study (three patients with bronchectasis, two patients with carcinoma and one patient with unknown aetiology). One of the observations in this study was that none of the patients with active tuberculosis had recurrent haemoptysis after full treatment during the 1-year follow-up period. None of the patients after pulmonary artery embolization were reported to have recurrence, but it has been reported that recurrence rate after embolization is 12–54% in previous studies (26).

Conclusion

The most common causes of haemoptysis are bronchiectasis and pulmonary tuberculosis. Roentgenogram, HRCT, and FOB are only complementary in localizing the site of bleeding in haemoptysis and sequential estimation of haemoglobin may be helpful in assessing the severity of haemoptysis. The outcome of haemoptysis is generally good, with a low mortality and recurrence rate.

Acknowledgements

The authors thank Professor Sugathan, Faculty of Community Medicine, Kuwait University, for the statistical support and Dr M.D. Haroun for the radiological interpretation.

References

1. Naidich DP, Funtk S, Ettenger N, Arranda C. Haemoptysis: CT-bronchoscopic correlation in 58 cases. *Radiology* 1990; **177**: 357–362.
2. Santiago S, Tobias J, Williams AJ. A reappraisal of the causes of haemoptysis. *Arch Intern Med* 1991; **151**: 2449–2451.
3. Hirshberg B, Biran I, Glazer M, Mordechai R. Haemoptysis: aetiology, evaluation and outcome in a tertiary referal Hospital. *Chest* 1997; **112**: 440–444.
4. Amirana M, Fraler R, Tirschweli, *et al*. An aggressive surgical approach to significant haemoptysis in patients with pulmonary tuberculosis. *Am Rev Resp Dis* 1968; **97**: 187–192.
5. Bobrowitz ID, Ramakrishna S, Shim YS. Comparision of medical vs surgical treatment of major haemoptysis. *Arch Intern Med* 1983; **143**: 1343–1346.
6. Abbott OA. The clinical significance of pulmonary hemorrhage: a study of 1316 patients with chest diseases. *Dis Chest* 1948; **14**: 824–42M.
7. Moersch HJ. Clinical significance of haemoptysis. *JAMA* 1952; **148**: 1461–1465.
8. Saunders CR, Smith AT, The clinical significance of haemoptysis. *N Engl J Med* 1952; **247**: 790–793.
9. Heller R. The significance of haemoptysis. *Tubercle* 1946; **26**: 70–74.
10. McGuinness G, Beacher JR, Harkin TJ, *et al*. Haemoptysis: prospective high resolution CT/bronchoscopic correlation. *Chest* 1994; **105**: 1155–1162.
11. Alaoui AY, Barial M, Boutahiri A, *et al*. Clinical characteristics andaetiology in haemoptysis in a pneumology service: 291 cases. *Rev Mal Respir* 1992; **9**: 295–300.
12. Johnston H, Reisz G. Changing spectrum of haemoptysis: underlying causes in 148 patients undergoing fibreoptic bronchoscopy. *Arch Inter Med* 1989; **149**: 1661–1668.
13. Set PAK, Flower CDR, Smith, *et al*. Haemoptysis: comparative study of the role of CT and fibreoptic bronchoscopy. *Radiology* 1993; **189**: 677–680.
14. Miller AB, Boothroyd AE, Edwards E, *et al*. The role of computed tomography (CT) in the investigation of unexplained haemoptysis. *Respir Med* 1992; **86**: 39–44.
15. Naidich DP, Lee JJ, Garay SM, *et al*. Comparison of CT and fibreoptic bronchoscopy in evaluation of bronchial diseases. *Am J Roertgenol* 1987; **148**: 1–7.
16. Webb WR, Gamsu G, Glazer G. Computerised tomography of the abnormal pulmonary hilum. *J Comput Assist Tomography* 1981; **5**: 485–490.
17. Young K, Aspestrand F, Kolbenstvedt A. High resolution CT and bronchography in the assesment of bronchiectasis. *Acta Radiol* 1991; **32**: 439–441.
18. Haponik EK, Britt EJ, Smith PL, Blecker ER. Computed chest tomography in the evaluation of haemoptysis: impact on diagnosis and treatment. *Chest* 1987; **91**: 80–85.
19. Jackson CV, Savage PJ, Quinn DL. Role of fibreoptic bronchoscopy in patients with haemoptysis and a normal chest roentgenogram. *Chest* 1985; **87**: 142–144.
20. Poe RH, Isreal RH, Marium MG, *et al*. Utility of fibreoptic brochoscopy in patients with haemoptysis and a non localising chest roentgenogram. *Chest* 1988; **92**: 70–75.
21. Goldstein I, Tapilsky M, Segev D, Isakov A, Heller I. Haemoptysis: aetiology, evaluation and outcome in a tertiary referral hospital. *Chest* 1997; **112**: 440–444.
22. Christopher J, Knott-Craig MD, Gerhard Oostuizen J, *et al*. Management and prognosis of massive haemoptysis. *J Thoracic Cardiovasc Surg* 1993; **105**: 394–397.

23. Conlan AA, Hurwitz SS, Krige J, *et al*. Massive haemoptysis. *J Thorac Cardiovasc Surg* 1983; **85**: 120–124.
24. Gourin A, Garzon AA. Operative treatment of massive haemoptysis. *Ann Thoracic Surg* 1974; **18**: 52–60.
25. Corey R, Hla KM. Major haemoptysis: reassessment of conservative management. *Am J Med Sci* 1987; **294**: 301–309.
26. Kim KJ, Yoo JH, Sung NC, *et al*. The factors related to recurrence after transcatheter arterial embolisation of haemoptysis. *Korean J Int Med* 1997; **12**: 45–51.