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The Role of Fiberoptic Bronchoscopy in Hemoptysis Patients of Unknown Etiology

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ABSTRACT

Background: To evaluate the efficacy of the fiberoptic bronchoscopy (F.O.B.) in the patients of hemoptysis with no previously made diagnosis. **Methods:** We enrolled hemodynamically stable patients having hemoptysis and subjected them to a series of investigations. After that 40 of these patients had no definitive diagnosis and they were subjected to F.O.B. **Result:** No organism was isolated in 35% while Mycobacterium Tuberculosis was obtained in 30%, Pseudomonas Aeruginosa in 17.5%, Bronchogenic Carcinoma in 5% of the subjects while few other organisms accounted for the rest. Bronchoscopy localizes the bleeding site among 47.5% of the subjects while it fails to do so in 52.5%. Highest site being reported was left upper lobe followed by right upper lobe. **Conclusion:** The results of the present study showed that F.O.B. is a safe procedure to perform in critically ill patients. The safety of the bronchoscope and the mortality obviously depend on the accuracy of selection of the patients for the procedure and the experience of the bronchoscopist and facilities available.

Keywords: Fiberoptic Bronchoscopy, Hemoptysis.

INTRODUCTION

Hemoptysis is described as blood expectoration from the lower respiratory tract, alone or mixed with mucus.[1,2] As it can be present in many diseases it is a non-specific symptom to diagnose any particular etiology. Expectoration of even small amount of blood can be because of dangerous etiology. In many cases severe hemoptysis can lead to a very poor prognosis. Hence, any quantity of blood expectorated should be thoroughly assessed.

Adults mostly suffered from the hemoptysis (mean age 62, male: female ratio 2:1) whereas children suffer rarely.[3] True hemoptysis, is the bleeding in the airways or lungs. Whereas pseudohemoptysis, is when the blood instigates not from lower respiratory tract but from elsewere. It can originate from upper G.I. tract or the upper respiratory tract. Careful examination of nasopharynx is also required because sometimes epistaxis can also be confused with hemoptysis.[4]

Different categorizations of severity of hemoptysis were proposed. We considered following classification system in our study; hemoptysis severity was evaluated based on blood loss level.

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Hemoptysis severity was classified as mild (less than thirty millilitre), moderate (thirty-one to hundred millilitre), severe (one hundred one to six hundred millilitre), massive hemoptysis (more than six hundred millilitre) as life-threatening hemoptysis as hemodynamic and respiratory system compromising.[5-7]

Etiologies: Hemoptysis etiologies have evolved over time and their record in the literature. While the occurrence of tuberculosis (T.B.) has decreased in established nations, the incidence and consequently prevalence of bronchiectasis has increased because of availability of advanced facilities for respiratory diseases.[8,9] Through the 1960s, 90% of cases of massive hemoptysis were accounted for by three etiologies: tuberculosis, bronchiectasis, and lung abscess.[10] The aetiology and pathophysiology of massive hemoptysis can be better defined with the advancement of equipments as well as frequently C.T. scanning usage. One of the most common causes of severe hemoptysis is bronchiectasis, T.B., mycetoma, necrotizing pneumonias, and lung cancer. While T.B. cause lesser cases of massive hemoptysis in latest research, still it is the leading reason of massive hemoptysis worldwide.[11,12]

Diagnosis: In addition to a proper anamnesis and a thorough physical examination, diagnostic tests are an important part of the clinical evaluation, such as X-Ray chest, CT scan and bronchoscopy.[13,14] Other tests, such as bronchial arteriography and echocardiogram13, may be important. Bleeding sites identification is really important in order to

successfully manage patients. This is very important to do in patients of life-threatening bleed.[15,16] Computed tomography (C.T.) and bronchoscopy are effective ways for bleeding origin's diagnosis and localization.[17,18]

Bronchoscopy is an endoscopic procedure for diagnostic and therapeutic purposes by visualizing the inside of the airways. Bronchoscope is a device which can be inserted into the airways from nose. In some cases it can also be inserted from mouth and rarely from tracheostomy. This makes physician to evaluate the airway for any abnormality. Anomalies like tumors, bleeding, foreign bodies can be evaluated and samples can be retrieved.[19]

Compared to C.T., however, which is effective for diagnosis of vascular and parenchymal disorders, bronchoscopy can help diagnose endobronchial anomalies (e.g., endobronchial malignancies). Fiberoptic bronchoscopy (F.O.B.) also visualizes upper airways and as well can provide with histopathological and microbiological specimens from lung lesions located either centrally or peripherally.[20-22] F.O.B. can also be useful in cases where endobronchial interventions are required.

Aim:

To assess the role of fiberoptic bronchoscopy in hemoptysis patients of unknown etiology.

Objectives:

To evaluate diagnostic yield of fiberoptic bronchoscopy in cases of hemoptysis.

Localize the bleeding site using fiberoptic bronchoscopy.

MATERIALS AND METHODS

This prospective observational study was done on subjects either reported to OPD (Outpatient department) or being admitted (Inpatient Department) in department of Pulmonary medicine after taking clearance from the ethical committee.

Study Duration: 1 year.

Type of study: Prospective observational study

Study centre: Department of Pulmonary Medicine, T.M.M.C. & R.C.

Sample Size: 40

Inclusion Criteria:

Age 18 years and above of either sex.

Hemodynamically stable patients presenting with hemoptysis.

Exclusion Criteria:

1. Patients not giving consent.
2. Patients of hemoptysis where a definite diagnosis is already made.
3. Patients with contraindications of bronchoscopy like:
   - Patients with unstable cardiovascular status like recent myocardial infarction (MI), life threatening arrhythmias.
   - Patients who are hemodynamically unstable.
   - Patients with bleeding disorders.
   - Neurological disorders like active seizures.
   - Severe hypoxemia that is likely to worsen during fiberoptic bronchoscopy.

Case selection:

The data was gathered in a pre-designed proforma, the complete history of the patient including age, gender, medical profile, history of smoking, seriousness of hemoptysis and its frequency, history of drug use and radiological picture was documented.

Protocol:

For all the patients a comprehensive clinical history was taken. Patient's complete physical examination were conducted. History of smoking whether present or not was noted. Based on the quantity of blood loss, grading of hemoptysis was done. Hemoptysis severity was classified as mild (less than thirty millilitre), moderate (thirty-one to hundred millilitre), severe (one hundred one to six hundred millilitre), massive haemoptysis (more than six hundred millilitre). Hemodynamic compromise because of bleed was considered to the Life-threatening hemoptysis. Regular haematological test was performed and wherever appropriate, sputum for acid fast bacilli, sputum for gene xpert, sputum for KOH, sputum for cytology and sputum for culture were sent. Patients were subjected for Chest roentgenogram. Computed tomography scan (C.T. scan) thorax was performed whenever required. F.O.B. was conducted in subjects where it was not possible to establish definitive diagnosis (chart 1). Patient of hemoptysis are subjected to Fiberoptic bronchoscopy to visualise the tracheobronchial tree in order to localize the lung lobe for bleeding and to obtain samples like bronchoalveolar lavage (BAL) fluid for isolation of microorganism and if required biopsy to be taken in cases of mass lesions for histopathological examination.

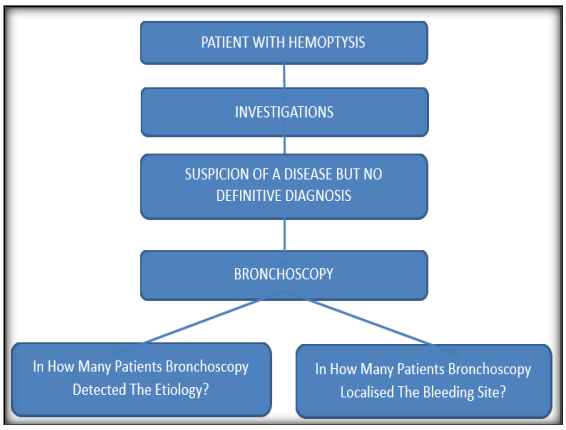

Figure 1: Consort Diagram.

RESULTS

This present prospective observational study was conducted among 40 patients either attending Outpatient Department or being admitted (Inpatient Department) in department of Pulmonary medicine having age >18 years. The male and female comprised of 67.5% males and 32.5% females [Table 1]. Maximum (62.5%) subjects were having age >50 years. Minimum subjects were in the range of 31-40 years age group (7.5%) followed by 19-30 as well as 31-40 years age group (15%) as shown in [Table 1].

The mean age of the study subject was 51.70±14.41 year with minimum and maximum age of 19 and 72 years respectively [Table 2].

Table 1: Gender and age distribution of the study subjects.

Variables	N	%
Gender		
Male	27	67.5
Female	13	32.5
Age group (in years)		
19-30	6	15
31-40	3	7.5
41-50	6	15
51-60	12	30
>60	13	32.5

Table 2: Mean age of the study population.

	Minimum	Maximum	Mean	SD
Age	19.00	72.00	51.70	14.41

Bronchoscopy localizes the bleeding site among 47.5% of the subjects while it fail to do so in 52.5% of the subjects as shown in [Table 3].

Bronchoscopy was able to find the bleeding site among 15%, 5%, 5%, 17.5% and 5% of the right upper lobe, right middle lobe, right lower lobe, left upper lobe and left lower lobe respectively [Table 4].

Table 3: Bronchoscopy report for localizing the bleeding site

Variables	N	%
Yes	19	47.5
No	21	52.5

Table 4: Distribution of bleeding site by bronchoscopy

Variables	N	%
R.U.L. - Right Upper Lobe	6	15
R.M.L. - Right Middle Lobe	2	5
R.L.L. - Right Lower Lobe	2	5
L.U.L. - Left Upper Lobe	7	17.5
L.L.L. - Left Lower Lobe	2	5
Total	19	47.5

Table 5: Findings of Bronchoscopy Investigations: Microorganisms Isolated

Variables	Yes		No	
	N	%	N	%
No organism isolated	14	35	26	65
Mycobacterium Tuberculosis	12	30	28	70
Klebsiella Pneumoniae	1	2.5	39	97.5
Staphylococcus aureus	2	5	38	95
Pseudomonas Aeruginosa	7	17.5	33	82.5
Citrobacter Freundii	1	2.5	39	97.5
Escherichia coli	2	5	38	95
Aspergillus Fumigatus	1	2.5	39	97.5
Enterococcus Faecalis	1	2.5	39	97.5
Enterobacter Cloacae	1	2.5	39	97.5
Candida Guilliermondii	1	2.5	39	97.5
Acinetobacter Calcoaceticus Baumanii	1	2.5	39	97.5
Pseudomonas Putida	1	2.5	39	97.5

Microorganisms isolated by bronchoscopy is shown in [Table 5]. No organism was isolated by bronchoscopy among the 14 subjects (35%). Thirty percent mycobacterium tuberculosis, 17.5% Pseudomonas Aeruginosa was isolated & other organisms accounted for the rest.

Multiple etiologies i.e. (a)Mycobacterium Tuberculosis + Pseudomonas Aeruginosa, (b) Mycobacterium Tuberculosis + Staphylococcus aureus, (c) Pseudomonas Aeruginosa + Aspergillus Fumigatus + Mycobacterium Tuberculosis and (d) Mycobacterium Tuberculosis + Enterococcus Faecalis was found in 7.5%, 2.5%, 2.5% and 2.5% of the subjects respectively [Table 6].

Table 6: Distribution of patients with multiple etiologies

Category	N	%
Mycobacterium Tuberculosis + Pseudomonas Aeruginosa	3	7.5
Mycobacterium Tuberculosis + Staphylococcus aureus	1	2.5
Pseudomonas Aeruginosa + Aspergillus Fumigatus + Mycobacterium Tuberculosis	1	2.5
Mycobacterium Tuberculosis + Enterococcus Faecalis	1	2.5

Squamous cell carcinoma and small cell carcinoma was revealed among 2.5% & 2.5% of the subjects [Table 7].

Table 7: Histopathological Examination

Variables	Yes		No	
	N	%	N	%
Squamous Cell Carcinoma	1	2.5	39	97.5
Small Cell Carcinoma	1	2.5	39	97.5

DISCUSSION

Blood coughing from a source below the glottis is hemoptysis. The substance produced ranges from blood to sputum tinged with nearly pure blood. Reported in over 100 different diseases, it is a common but non-specific medical symptom. Bronchoscopy is commonly done for the anatomical location of the bleeding site and for the exclusion of neoplasms.[23]

F.O.B. has a vital role to play in hemoptysis assessment, ranging from blood-tinged sputum to serious hemoptysis. Bronchoscopy may be used to conduct an endobronchial examination and to determine mucosal condition. Improvements are often non-specific and not clinical, therefore. It is helpful to monitor the bleeding immediately as well as to find a high source of bleeding. F.O.B. may be done for collecting specimens for cytological and microbiological researches. F.O.B. is the way to obtain bronchial secretions & bronchoalveolar lavage if hemoptysis is doubted. F.O.B. can also get biopsies or bronchial brushing if there is a doubt for lung cancer.[24]

In spite of the latest advanced analytic tools, nearly seven to twenty five percent of hemoptysis persists without recognized cause, whatever the severity of the bleeding.[25-27]

The present study showed male dominance with male constituting 67.5% of the subjects while females only comprised 32.5% of the subjects. Similar male dominance was showed by Michele Mondoni et al,[21] in their study conducted on bronchoscopy to assess patients with hemoptysis. Michele Mondoni et al,[21] revealed 69.2% of males in their study. Abal et al,[44] found hemoptysis 4.2 times more common in males than in females. Our findings were very similar to those found by later and Fidan et al,[28] (2.72:1). Emad A. Korraa et al,[29] also found male dominance with 53 (66.3%) male and 27 (33.8%) female patients.

In the present study maximum (62.5%) subjects were having age >50 years. Minimum subjects were in the range of 31-40 year age group (7.5%) followed by 19-30 as well as thrity one-forty (15%). Mean age among the study subject was 51.70±14.41 year with minimum and maximum age of 19 and 72 years respectively in the present study. Ashwin Songara et al,[30] in their study found similar results. According to Ashwin Songara et al,[30] hemoptysis was commonly (32%) found in the age group 51-60 years, followed by 41-50 years age group (26%). The patients in the age group of 30-39 and above 60 years comprised 16% of the group patients. The age group 20-29 years comprised the least i.e. 10%. David P. Naidich revealed mean age of 56 years in their study subjects.[31] Henry Gong et al,[32] reported mean age of 55 years in their study subjects.

In the present study, bronchoscopy localizes the bleeding site among 47.5% of the subjects while it fails to do so in 52.5% of the subjects. Shah NN et al,[33] in their study, of all the 157 patients, bleeding was localized in 76 (48.4%). It was located in 17 (10.8 percent) to a single point, 15 of which had bronchogenic carcinoma, and in 2 the upper respiratory tract was seen at the bleeding site. Bleeding was found in 31 (19.7%) patients to a section and 28 (17.8%) had multiple bleeding sites. Smiddy and Elliot,[34] performed flexible fiberoptic bronchoscopy among seventy-one subjects having active hemoptysis and found a single bleeding point among firty six%. Hemmorhage was seen to bronchopulmonary segment in thirty-eight percent of the subjects, multiple bleeding sites had been found among eight%, and the bleeding site was not localized among seven%.

Bronchoscopy was able to find the bleeding site among 15%, 5%, 5%, 17.5% and 5% of the right upper lobe, right middle lobe, right lower lobe, left upper lobe and left lower lobe respectively in the present study. In the present study highest site being reported was left upper lobe. Approximately similar results were reported by Songara A et al,[30] who found highest site being the left upper lobe followed by right upper lobe and right middle lobe and the least in left lower lobe and followed closely by right lower lobe.

In the present study, carcinoma was found in 5% of the subjects. Squamous cell carcinoma and small cell carcinoma was revealed among 2.5% and 2.5% of the subjects in the present study, respectively. Naveed Nazir Shah et al,[33] reported malignancy in 9.1% of the patients. In a study by Ashwin Songara et al,[30] malignancy was found in only 8.6% of the patients. Lederle and coworkers35 observed bronchogenic carcinoma in 4.7% of 106. In 7 cases (12 percent), Georgeann McGuinness and al,[36] reported bronchogenic carcinoma.

No organism was isolated by bronchoscopy among the 14 subjects (35%). Mycobacterium Tuberculosis was isolated among 30% of the subjects, Pseudomonas Aeruginosa among 17.5%, whereas Staphylococcus aureus as well as Escherichia coli was revealed among 5% of the subjects. Rest of the micro-organisms i.e. Klebsiella Pneumoniae, Aspergillus Fumigatus, Enterococcus Faecalis, Enterobacter Cloacae, Candida Guilliermondii, Acinetobacter Calcoaceticus Baumanii and Pseudomonas Putida was found among 2.5% of the subjects. Multiple etiologies in the same subject i.e. (a) Mycobacterium Tuberculosis + Pseudomonas Aeruginosa, (b)Mycobacterium Tuberculosis + Staphylococcus aureus, (c)Pseudomonas Aeruginosa + Aspergillus Fumigatus + Mycobacterium Tuberculosis and (d)Mycobacterium Tuberculosis + Enterococcus Faecalis was found in 7.5%, 2.5%, 2.5% and 2.5% of the subjects respectively in the present study. Songara A et al,[30] reported Mycobacterium tuberculosis in 7 (20%) cases was isolated via the L-J media slant at 37° C for up to weeks. Acinetobacter baumanii a pleomorphic aerobic gram negative bacillus was noted in 5 (14.2%) cases. Klebsiella pneumoniae another gram negative organism of the enterobacteriaceae group was grown in 6 (17.14%) cases of the ESBL group. Saphylococcus aureus a gram positive cocci was isolated in 2 (5.71%) of the cases. Citrobacter freundii, a gram negative bacilli and a facultative aerobe was seen to grow in only 1 (2.85%). Streptococcus pneumonia, a gram positive cocci was

isolated in a mere single case 1 (2.85%). Escherichia coli, a gram negative bacillus in 1 (2.85%) of ESBL and Amp C group.

The results of the present study showed that F.O.B. is a safe procedure to perform in critically ill patients. The safety of the bronchoscope and the mortality obviously depend on the accuracy of selection of the patients for the procedure and the experience of the bronchoscopist and facilities available.

CONCLUSION

In our study, F.O.B. has played a good role in both the identifying the bleeding site and as well as evaluating the cause. It is not unusual in our experience to have patients producing blood at altered times from diverse parts of the bronchial tree. Few patients in this study also had chest x-ray film anomalies that can be assumed to produce bleed, but a certain bleeding site was found elsewhere on bronchoscopy. It is thus extremely needed to find an instant diagnosis of site and the cause by F.O.B. and routine bronchoalveloar lavage with every event of hemoptysis, if possible. One should not assume a connection, between an episode of bronchial bleeding and an x-ray film lesion or a previously known bleeding site. The results of this study also showed that in critically ill patients, F.O.B. is a safe procedure to perform.

To conclude, bronchoscopy to assess hemoptysis should be done unless a specific cause has already been found. Having a significant history of smoking, it is a useful technique to exclude malignancy in patients with a normal or abnormal CXR. F.O.B. is a good way to find the site of bleed. The yield can be improved overtime in cases of hemoptysis with experience.

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