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ORIGINAL ARTICLES

Role of Bronchial Brushing and Bronchial Biopsy in the Diagnosis of Lung Cancer

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Summary :

In an endeavour to find out the efficacy of bronchial brushing and bronchial biopsy, fibreoptic bronchoscopy was done in 102 cases. Of the 102 cases, 91 persons were male and 11 persons were female. 95 (93.2%) cases came out to be lung cancer, 03 (2.9%) were tuberculosis and in 04 (3.9%) cases, no diagnosis could be possible. Out of 95 cases of lung cancer, 04 cases of lung cancer were not diagnosed by bronchial brushing and bronchial biopsy or bronchoalveolar lavage (BAL). But they are diagnosed by FNAC of the lymph nodes as metastatic lung cancer and FNAC of the lung. The results of bronchial brushing were compared with those of bronchial biopsy in the diagnosis of lung cancer. 84 (88.4%) cases of lung cancer were diagnosed by bronchial brushing and 57 (60%) cases of lung cancer were diagnosed by bronchial biopsy. When bronchial brushing technique was compared with bronchial biopsy, it showed that bronchial brushing was superior to bronchial biopsy (P=<0.001), which is highly significant. When both the techniques were combined the diagnostic yield was 95.8%. The sensitivity and specificity of bronchial brushing and bronchial biopsy in the diagnosis of lung cancer were evaluated. It showed that sensitivity of bronchial brushing was 88.4% and that of bronchial biopsy was 60% whereas specificity was 100% for each in the diagnosis of lung cancer. In the diagnosis of lung cancer, the combination of both techniques i.e, bronchial brushing and bronchial biopsy was superior to either of the techniques. Here sensitivity of combined technique was increased to 95.8% from 88.4% of bronchial brushing.

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Introduction :

Pulmonary radio-opaque shadow often poses a diagnostic dilemma for the clinicians. Flexible fibreoptic bronchoscopy is used widely for diagnosing both central airway and peripheral parenchymal lesions.[1,2,3] The method allows a direct inspection of the lesion as well as tissue diagnosis from the biopsy material and cytological materials. About 80% of the lung cancers can be seen and sampled at bronchoscopy, which is indicated in most patients in whom the diagnosis is suspected.[4] Bronchoscopy is the most useful

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investigation in the evaluation of a patient suspected of harbouring a lung cancer, as it provides diagnostic material for submission to the pathologist and allows the bronchoscopist to see centrally placed tumours, thereby enabling surgical decisions regarding operability to be taken. The bronchial tree can be inspected to segmental level and diagnostic material can be obtained by the aspiration of bronchial washings, by so-called brush biopsy and by forceps biopsy. As the tip of the fibreoptic bronchoscope is manoeuvrable, the tumour is more easily reached and histological diagnosis is therefore more likely to be made.[5]

Whenever possible, both the brush and forceps should be used on all lesions, including central lesions that are endoscopically visible and peripheral lesions that require fluoroscopy to localize the biopsy tool to the radiographic abnormality. This combination of brush and forceps biopsies produces the highest diagnostic yield.[6] The brush has scattering or scavenger effect and facilitates sampling of extended areas of bronchial mucosa.

The forceps permit focal biopsy of endobroncheal lesions and of the carina for staging as well as providing lung tissue by the transbroncheal biopsy (TBB) technique.[7]

In central tumour visible through the bronchoscope, the single technique with the highest diagnostic yield was bronchial brushing and post bronchoscopic sputum specimens had the lowest diagnostic yield[8].

Bronchoscopy is less helpful in peripheral lesions, particularly lesions less than 2 cm. in diameter. For lesions less than 2 cm, the diagnostic yield is in the range of 20% or less; however, lesions larger than 4 cm may be diagnosed in 50% to 80% of cases.[9]

Materials and Methods :

The study was carried out in the department of Respiratory Medicine, Institute of Diseases of the Chest & Hospital (IDCH), Mohakhali, Dhaka, during the period January 1998 to December 1999. It was a prospective type of study. The aims and objectives of the study was to find a simple, cheap, reliable easily available technique in the fibreoptic bronchoscopy which has a higher diagnostic yield as compared to bronchial biopsy so far as the diagnostic accuracy of the lung cancer is concerned. To find out the efficacy of bronchial brushing and bronchial biopsy in the diagnosis of lung cancer and to compare the efficacy of both modalities in the diagnosis of lung-cancer.

Inclusion Criteria of Cases was the clinical features suggestive of centrally placed carcinoma of the lung presenting with cough, hemoptysis, dyspnoea or chest pain, chest radiography suggestive of centrally placed neoplasm or a suspected mitotic lesion in the chest x-ray that failed to resolve after a variable period of broad spectrum antibiotic treatment or observation or both with or without the symptoms and signs of chest pain, cough, hemoptysis, weight loss, clubbing.

Criteria of Exclusion was poor level of cooperation, recent myocardial infarction, bleeding diathesis, poorly controlled asthma, sputum positive for acid fast bacilli. A total number of 130 consecutive patients suspected of having lung cancer were selected conveniently on the basis of history, clinical and radiological findings. Of them 28 patients were dropped from the study, who could not fulfill the criteria. All the data collected through questionnaire were recorded systematically and were analysed statistically. P-value of <0.05 was considered as significant.

Results :

Total number of cases were 102. Of them 91 (89.2%) were male and 11 (10.8%) were female. Male female ratio was 8.3:1. Age distribution of patients are shown in Table I. Out of 102 cases mean age was 60.83 (SD±10.65), the lowest age was 30 years and highest age was 90 years. Most of the patients (71.6%) belonged to 51-70 years age group. Table II shows smoking status of patients. Maximum patients were smoker n=91 (89.2%) and 11 patients were nonsmoker (10.8%). Most of the smokers smoked more than 20 pack-years n=64 (62.8%). Out of 95 lung cancer cases 63 (71 %) patients smoked for more than 20 pack-year, 24 (27%) smoked for 10-20 pack-year. So, there was a positive relation between lung cancer and smoking.

Table III summarises the chest x-ray findings of the patients. 64 (62.8%) patients had right sided lesion 38 (37.2%) patients had left sided lesion. In most of the patients the size of the suspected lesion were more than 4cm in diameter, n=57 (55.9%), 45 (44.1 %) had lesions 2-4cm in diameter.

Table IV shows results of sputum examination for malignant cells. 70 (68.6%) patients were examined. Malignant cells were absent in 65 (63.7%) cases. It was present only in 5 (4.9%) cases. All of them had squamous cell carcinoma.

Table V shows the results of FOB in 102 cases. Suspected endobronchial lesions were found in all the patients (n=102). Bronchial brushing and bronchial biopsies were taken from the suspected lesions. Bronchoalveolar lavage (BAL) fluid was taken in some of the patient. 91 (89.2%) patients revealed lung malignancy and their histological types were ascertained. Among the malignant cases, squamous cell carcinoma was at the top of the list 46 (45.1 %), 30 (29.4%) patients had small cell carcinoma, 10 (9.8%) patients had adenocarcinoma, 04 (3.9%) patients had large cell carcinoma, one had adenosquamous cell carcinoma.

Table VI shows the comparison between the bronchial brushing and the bronchial biopsy in the diagnosis of 95 cases of lung cancer. 84 (88.4%) patients showed bronchial brushing positive; 57 (60%) patients showed bronchial biopsy positive. A combination of both bronchial brushing and bronchial biopsy were positive in 91 (95.8%) cases. Bronchial brushing and bronchial biopsy both were negative in 4 (4.2%) cases. So, bronchial brushing technique was superior to bronchial biopsy technique in the diagnosis of lung cancer.

Final diagnosis of patients is shown in Table VII. Squamous cell carcinoma was at the top of the list 47 (46.1 %), 31 (30.4%) patients had small cell carcinoma, 11 (10.8%) patients had adenocarcinoma. Despite all available efforts, in 4 patients the diagnosis was inconclusive. CT guided FNAC was advised for them.

Comparison was made between bronchial brushing and bronchial biopsy in the diagnosis of lung cancer as shown in Table VIII showing superiority of bronchial brushing among the 95 cases of lung cancer, definite histologic diagnosis was possible with bronchial brushing in 84 (88.4%) cases and diagnosis was not possible with bronchial brushing in 11 (11.6%) cases. Diagnosis was possible with bronchial biopsy in 57 (60%) cases and not possible in 38 (40%) cases. So, the sensitivity of bronchial brushing in the diagnosis of lung cancer was 88.4% and that of bronchial biopsy was 60% only. Finally it was evident that bronchial brushing is superior to bronchial biopsy in the diagnosis of lung cancer ($P = <0.001$).

Sensitivity and specificity of bronchial brushing and bronchial biopsy in the diagnosis of lung cancer were calculated and shown in Table IX and X. It is seen from the tables that combination of the methods such as bronchial brushing and bronchial biopsy is superior to either of the method in the diagnosis of lung cancer.

Table-I

Incidence of age in 102 cases

Age in years	Number of cases	Percentage (%)
< 40	3	2.9
41-50	14	13.7
51-60	42	41.2
61-70	31	30.4
71-80	9	8.8
> 80	3	2.9
Total	102	100

Table-II

Showing smoking status of patients

	Smoking status				Total
	Non smoker	Smoker			
Duration of smoking in pack years		<10 pack Year	10-20 pack year	>20 pack year	
Number of patients	11 (10.8%)	02 (1.9%)	25 (24.5)	64 (62.8%)	102 (100%)
Number of lung cancer	06 (6.3%)	2 (2%)	24 (27%)	63 (71 %)	95 (100%)

Table-III

Showing findings of chest x-ray in various patients X-ray chest postero-anterior view

		No. of cases	Percentage	Lung cancer cases	Percentage
Site of lesion	Right side	64	62.8	59	57.8
	Left side	38	37.2	36	35.3
Size of the lesion	2-4 cm. in diameter	45	44.1	43	42.2
	>4 cm in diameter	57	55.9	52	51.0
	Nil	86	84.3	-	-
	Rib erosion	06	5.9	-	-
Associated complication	Cavitation	03	2.9	-	-
	Pleural effusion	03	2.9	-	-
	COPD	02	2.0	-	-
	Fibrosis	01	1.0	-	-
	Intrapulmonary metastasis	01	1.0	-	-

Table-IV

Showing presence of malignant cells in the sputum smears

	Sputum for malignant cell			
	Absent	Present	Not done	Total
No. of cases	65	05	32	102
Percentage	63.7	4.9	31.4	100

Table-V

Showing different types of lesion found in FOB in 102 cases

Type of lesion in FOB	No. of	Percentage cases	(%)
Lung malignancy	Squamous cell carcinoma	46	45.1
	Small cell carcinoma	30	29.4
	Adenocarcinoma	10	9.8
	Large cell carcinoma	04	3.9
	Adenosquamous cell carcinoma	01	1.0
	Total	91	89.2
Non-malignant	Tuberculosis	03	2.9
Non-specific		08	7.9

Table-VI

Showing efficacy of bronchial brushing and bronchial biopsy in the 95 diagnosis of lung cancer cases

Method used	No. of cases	Percentage
Brushing positive, biopsy positive	50	52.6
Brushing positive, biopsy negative	34	35.8
Brushing negative, biopsy positive	07	7.4
Total positive	91	95.8
Brushing negative, biopsy negative	04	4.2
Brushing positive	84	88.4
Biopsy positive	57	60

Table-VII

Showing final diagnosis of patients

Diagnosis		No. of cases	Percentage (%)
Lung carcinoma	Squamous cell carcinoma	47	46.1
	Small cell carcinoma	31	30.4
	Adenocarcinoma	11	10.8
	Large cell carcinoma	05	4.9
	Adenosquamous cell carcinoma	01	1.0
Non-malignant lesion	Tuberculosis	03	2.9
Inconclusive		04	3.9
Total		102	100

Table-VIII

Comparison between bronchial brushing and bronchial biopsy in the diagnosis of lung cancer in 95 patients

Method used	Diagnosis possible No. of patient	Diagnosis not possible No. of patient	Total no. of patient
Bronchial brushing	84	11	95
Bronchial biopsy	57	38	95

$X^2 = 20.04$; df = 1; P = <0.001

Table-IX

Sensitivity and specificity of bronchial brushing and bronchial biopsy in the diagnosis of lung cancer

	Bronchial brushing Lung cancer	Bronchial biopsy Lung cancer
Sensitivity	88.4%	60%
Specificity	100%	100%

Table-X

Sensitivity and specificity of combined bronchial brushing and bronchial biopsy in the diagnosis of lung cancer

	Lung Cancer
Sensitivity	95.8%
Specificity	100%

Discussion :

The study was carried out to find out the efficacy of bronchial brushing and bronchial biopsy in the diagnosis of lung cancer and to compare the methods.

Total number of cases were 102 in our series, of them 91 (89.2%) were male and 11 (10.8%) were female. Less percentage of female in this study can be explained by the fact that social and religious factors in our country and dependence of female on husband and or guardian and over and above lung malignancy is not common in female. Male and female ratio was 8.3:1; this is very much similar with the findings of Mahmud et al[10]. In his series, the male : female ratio was 9:1. This has also correlated with the findings of Ahmad et al.[11] Most of the patients in our series belongs to 51-70 years age groups, n=73 (71.6%). Of them 69 (67.6%) were proved to have malignancies. This finding is similar with others. In a series of 473 patients, Baum et al.[17] found 51% of them belongs to above 50 years age group. This finding is also consistent with the finding of Mahmud et al.[10] In his series majority of the patients was aged between 50-60 years.

In the present study, majority of patients were smoker 91 (89.2%), of them 64 (62.8%) smoked more than 20 pack-years (20 sticks per day for one year is one pack-year) [Table II]. Among the 95 lung cancer cases 89 (93.7%) were smoker, most of them were heavy smoker. In a series of 100 patients with Bronchogenic carcinoma, David et al.[12] found 80% of them were heavy smokers. This finding is very much similar with our findings.

Chest X-ray was done in all patients. Right sided lesion was dominating in 64 (62.8%) patients (Table III). 45 (44.1 %) patients had lesions 2-4cm in diameter. 57 (55.9%) patients had lesions more than 4cm in diameter. In a series of 850 patients Hossain et al.[13] found right sided lesion in 56% cases, which is very much consistent with our findings.

Sputum examination was done in 70 (68.6%) cases for malignant cell (Table IV). But only 5 (4.9%) revealed malignancy. All of them were squamous cell carcinoma. In Majumder's series[14] sputum for malignant cell was positive in 3% cases. This is similar to our findings.

Fibreoptic bronchoscopy was done in all the patients, n=102. Bronchial brushing and bronchial biopsy showed 91 (89.2%) lung cancer, 3 (2.9%) patients had tuberculosis. Of these 3 tuberculous

patients 2 were diagnosed from bronchial biopsy and the remaining 1 from bronchoalveolar lavage (BAL). In 04 (3.9%) cases no definite diagnosis could be obtained. In another 04 (3.9%) cases diagnosis could not be established with bronchial brushing and bronchial biopsy, but they were diagnosed as lung cancer by FNAC of the lymph nodes and FNAC of the lung. Of these 4 cases, 3 were diagnosed as metastatic lung malignancy by FNAC of the lymph nodes and the remaining one was diagnosed by FNAC of the lung. Among the lung cancer cases squamous cell carcinoma was predominating n=47 (46.1 %), next small cell carcinoma 31 (30.4%), 11 (10.8%) patients had adenocarcinoma, 05 (4.9%) had large cell carcinoma, only one had adenosquamous cell carcinoma. With all efforts the diagnosis could not be made in 04 cases. CT guided FNAC was advised for them. Among the lung cancer cases, 91 cases were diagnosed by bronchial brushing and bronchial biopsy i.e. 95.8% of the patients. This finding is consistent with the finding of Matsuda et al.[15] They diagnosed lung cancer 415 (93.7%) of 443 malignant patients by a combination of both technique bronchial brushing and bronchial biopsy. Kvale et al[8] also found in their series, 86% of their patients to be of lung malignancy by bronchial brushing and bronchial biopsy. In our series 84 (88.4%) cases of lung cancer were diagnosed by bronchial brushing and 57 (60%) cases lung cancer were diagnosed by bronchial biopsy. This finding is consistent with that of Matsuda et al.[15] In their series, they showed that among the total 443 cases of lung cancer, 400 (90.3%) were diagnosed to be lung cancer by bronchial brushing and 287 (64.8%) cases were diagnosed by bronchial biopsy. Kvale et al[8], found in their series 53 (77%) cases were diagnosed as lung malignancy by bronchial brushing and 49 (71 %) by bronchial biopsy. These findings are not consistent with our findings.

As in Table VIll, it is seen that bronchial brushing is superior to bronchial biopsy in the diagnosis of lung cancer. Statistical analysis was done (chi-square test) and this was highly significant; P=<0.001: It is seen from the present study that when bronchial brushing and bronchial biopsy are combined the diagnostic yield is 95.8%. Finally sensitivity arid specificity of bronchial brushing and bronchial biopsy in the diagnosis of lung cancer were evaluated as shown in Table IX and Table X.

Sensitivity for bronchial brushing is 88.4% where as for bronchial biopsy is 60% in the diagnosis of lung cancer. Specificity in lung cancer is 100%. Complications were very minimum, bleeding occurred in only 9 cases out of 102 patients at the site of the lesions. Six patients had developed bronchospasm, 3 patients developed fever after bronchoscopy. No other major complications noted. Lukomsky et al.[16] showed 5.1 % minor complications and 0.3% major complication. This is because they used tetracaine as topical anaesthesia in their series. In conclusion, bronchial brush is cheap and easily available. Bronchial brushing is easy to perform as compared to the bronchial biopsy and also cheap as well as very effective method in the diagnosis of lung cancer. Bronchial brushing is superior to bronchial biopsy in the diagnosis of lung cancer. The diagnostic yield of bronchial brushing is higher than bronchial biopsy and the combination of the two techniques gives the highest percentage of positive diagnosis. So, whenever a patient undergoes fibreoptic bronchoscopy, bronchial brushing should be taken in all cases for better diagnostic yield of lung cancer.

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