Original Article

Study of comparison of yield of bronchial brushing and broncho-alveolar lavage in diagnosis of lung cancer

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Abstract
Flexible fiber-optic bronchoscope revolutionized respiratory cytology, as techniques like bronchial brushings, broncho-alveolar lavage and bronchial biopsy became more easy, accessible and popular, shifting the emphasis from diagnosis of advanced malignancy in operable patients to the use of cytology as a first line diagnostic and management tool. **Objective:** To compare the yield of bronchial brushing and bronchoalveolar lavage cytology in lung cancer. **Methodology:** the present study was carried out at dr. S.C.G.M.C. Nanded, Maharashtra. In patients having lung cancer, bronchoscopy done and bal, bronchial brushing and endobronchial biopsy samples were collected. Comparison of yield of bronchial brushing and bronchoalveolar lavage cytology was done, in patients, in whome biopsy samples are positive for malignant cells. The statistical test(chi-square test) was applied to test the significance. **Results:** out of 56 patients bronchial brushing yielded 45 (80.35%) to be malignant as compared to bal cytology which yielded 15(26.78%) to be malignant. the difference in yield by both techniques was found to be statistically significant ($p < 0.05$). **Conclusion:** bronchial brushing has better diagnostic yield as compared to broncho Alveolar Lavage cytology in patients having lung cancer.
Keywords: Bronchoalveolar lavage(BAL) , Bronchial Brushing(BB) , Endo bronchial Biopsy

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INTRODUCTION

The use of cytological methods in the diagnosis of neoplastic lesions of the respiratory tract has been generally considered as one of its most successful application Flexible fiber-optic bronchoscope revolutionized respiratory cytology, as techniques like bronchial brushings, broncho-alveolar lavage and bronchial biopsy became more easy, accessible and popular, shifting the emphasis from diagnosis of advanced malignancy in operable patients to the use of cytology as a first line diagnostic and management tool. Today respiratory tract cytology is well established throughout the world as a vital diagnostic procedure in the evaluation of any patient with suspected lung malignancy. Broncho-alveolar lavage (BAL), which was originally developed as a therapeutic tool for pulmonary conditions like pulmonary alveolar proteinosis, cystic fibrosis, also has gained acceptance and steady popularity as a tool for diagnosing lung cancer. Bronchial brushing (BB) is a technique where surface of a suspected lesion, visualized through a bronchoscope, is scraped in order to collect the cytological sample. Our aim was to study and compare the efficacy of these two very popular cytological techniques in diagnosing carcinoma of lung by correlating them with histopathological diagnosis by bronchial biopsy.

MATERIAL AND METHODS
Study Population
Fifty six adult patients having lung cancer on tissue biopsy from Dr. SCGMC and Hospital, Nanded were enrolled in to study.
Inclusion Criteria
We have included the Patients who have been diagnosed to have lung cancer on tissue biopsy.
Exclusion Criteria

We have excluded all the patients, whose tissue biopsy samples are negative for malignant cells.

METHODOLOGY

After initial screening, and signing of informed consent form, patient were further evaluated. According to the study protocol, detailed clinical history regarding the onset and progress of the disease was taken. Symptoms studied in detail were cough, chest pain, fever, breathlessness, haemoptysis, change in voice, weight loss, anorexia, symptoms of superior vena cava obstruction, smoking habits, past history of the diabetes, hypertension, and tuberculosis. The general examination was carried out with special reference to, lymphadenopathy, clubbing, and hypertrophic pulmonary osteoarthropathy. After clinical examination, detailed examination of the respiratory system was carried out and all other systems were thoroughly examined. After all necessary investigations, preanaesthetic checkup and written, informed consent, patients were taken for bronchoscopy and during bronchoscopy BAL , Bronchial Brushing and Endo bronchial Biopsy samples were collected and sent for cytological examination accordingly. The Yield of Broncho alveolar lavage and Bronchial Brushing for diagnosis of Lung cancer in patients, in whom Endo bronchial biopsy (Gold Standard investigation) is positive for malignant cells, is compared using statistical tests.

Statistical Analysis

Statistical test applied is Chi-square test for comparison of yield in diagnosis of lung cancer using BAL cytology and Bronchial Brushing.

RESULT

This study was carried out in tertiary Government hospital with specialized pulmonary care unit, in 56 patients, who have been diagnosed to have lung cancer on tissue Biopsy.

Table 1: Study Population – Age Distribution (n= 56)

Sr No.	Age Group	Malignant	
		No.	%
1	13-30	0	0
2	31-50	13	23.21
3	51-70	39	69.64
4	71-90	4	7.14
	Total	**56**	**100.0**

Majority of patients with lung cancer, 39 (69.64%) in this study were in 51-70 age group. Mean age of patients having lung cancer was 56.73.Youngest patient diagnosed malignant was 35 years age group and oldest one was 75 years age group.

Table 2: Smoking status amongst the patients [n (n1+n2) = 56]

Pattern	Malignant			
	M (n_1=49)		F (n_2=7)	
	n	%	n	%
Smoker	48	97.96	0	0
Nonsmoker	1	2.04	7	100
Total	**49**	**100**	**7**	**100**

Out of all patients of lung malignancy, 48 (97.96%) of Male patients were smoker and no female which was diagnosed to have lung cancer were smoker. It was also found that higher the smoking index greater the chances of malignancy

Table 3: Signs and Symptoms of patients with lung Malignancy (n=56)

Signs and Symptoms	Malignant (n=56)	
	n	%
Cough with expectoration	51	91.07
Chest pain	40	71.43
Fever	31	55.36
Breathlessness	37	66.07
Haemoptysis	20	35.71
Clubbing	18	32.14
Change of voice	13	23.21
Lymphadenopathy	9	16.07

Each of the patients had 2 or more symptoms and/or signs. Majority of patients (51 out of 56) 91.07% with lung malignancy in our study had cough as most common symptom. Other common symptoms in malignant cases were chest pain [40 (71.43%)], breathlessness [37 (66.07%)], fever [31 (55.36%)], haemoptysis [20 (35.71%), change of voice [13(23.21)] and lymphadenopathy [9 (16.07%)] patients.

Table 4: Yield of bronchoalveolar lavage in the cases of lung cancer (n = 56)

Abnormal Cells on BAL	n	%
Yes	15	26.78
No	41	73.21
Total	**56**	**100**

In our study 15 (26.78%) patients of lung cancer had abnormal (malignant) cells in Bronchoalveolar Lavage.

Table 5: Yield of Bronchial Brushing in the cases of lung cancer (n = 56)

Abnormal Cells on Bronchial Brushing	n	%
Yes	45	80.35
No	11	19.65
Total	**56**	**100**

In our study 45 (26.78%) patients of lung cancer had abnormal (malignant) cells in Bronchial Brushing.

Table 6: Comparision of Yield of Bronchial Brushing and BAL in diagnosis of lung Cancer in present study

Method	Positive for Malignant Cells		Negative for Malignant Cells		Total	Statistical Significance
	No.	%	No.	%		X^2 = 25.25
Bronchial Brushing	45	80.35	11	19.65	56 (100%)	p value=0.000000503
Bronchoalveolar lavage	15	26.78	41	73.21		p value < 0.005

The Difference in Yield of Bronchial Brushing and Bronchoalveolar lavage fluid for diagnosis of lung cancer is statistically highly significant , with yield of Bronchial Brushing is much better as compared to yield of BAL .(p value < 0.005)

DISCUSSION

Bronchoscopy is one of the gold standard investigations in lung diseases. Tracheobronchial tree is directly visualized by Bronchoscopy. Era of Bronchoscopy has changed from Rigid Bronchoscopy to Flexible Bronchoscopy This has opened new horizons for lung diseases. In this era there is increase in various lung diseases as the result of increase in environmental pollution and smoking. Due to increase in the life expectancy and increase in smoking pattern, 10-20% of patient's presents as non-resolving consolidation, increasing trends of lung cancer is observed. With the advent of flexible fiber-optic bronchoscope, respiratory cytology took a new turn as samples like Bronchial Brushing, broncho-alveolar lavage and trans-bronchial needle aspirations could be collected from the respiratory tract, yielding significant amount of cytological material.[1] With this, the emphasis shifted from diagnosis of malignancy in operable patients and confirmation of metastases, to the use of cytology as a first line diagnostic procedure on which crucial management decisions could be based.[1,2]

Age and gender distribution

Majority of patients with lung cancer, 39 (69.64%) in this study were in 51-70 age group. Mean age of patients having lung cancer was 56.73.Youngest patient diagnosed malignant was 35 years age group and oldest one was 75 years age group. Out of total patients of lung cancer , majority patients were males (87.50%).

Rajah et al. (2012)[3] studied bronchoscopy in cases of lung cancer and reported that mean age of males was 65.9 years and that of females was 64 years. Most patients were males (59.3%). This is similar to our observations.

Smoking Habits

Among malignant lesions, 97.96% males were smokers.. Incidence of lung malignancy increases as number of years of smoking and smoking index increases. Higher rate of smoking was strongly associated with lung cancer (80% cases) in a study by *Manikam TG*.[4]

Clinical Presentation

Majority of patients (51 Out of 56) 91.07 % with lung cancer in our study had cough as most common symptom. Among other symptoms, 40 (71.43%) patients had chest pain, breathlessness in 37(66.07 %), fever in 31 (56.36%) patients, haemoptysis in 20 (35.71%) patients, clubbing in 18 (32.14%), change in voice in 13 (23.21%) and lymphadenopathy in 9 (16.07%).

Jindal and Behera[5] study in 1990 reported cough (88%) as most common symptom in patients with lung cancer. Symptoms with lesser frequency than cough as reported were haemoptysis (69.2%), chest pain (52.6%) and change of voice (29.2%).

Rawat et al. [6] also reported same presentations with lung malignancy patients having cough (72.90%) as most common symptom followed fever in 58.92%, haemoptysis in 38%, breathlessness in 50.9% and hoarseness of voice in 18%.

Bronchoalveolar Lavage VS Bronchial Brushing

In our study, in comparison to BAL (26.78%), bronchial brushing gave higher Yield (80.35%) in patients with lung cancer, whose diagnosis was confirmed on endobronchial biopsy, showing its superiority over BAL in diagnosing lung cancer. The difference in yield by both techniques was statistically significant (p value < 0.005) *DS Gaur et al*[7.] *(2007)* reported better accuracy of Bronchial Brushing (87.32%) as compared to BAL in his study which correlates with our study. He further states that , Since cytological sampling by BAL technique relies mainly on cells ′exfoliated′ from the malignant lesion in the bronchial epithelium, the adequacy of its samples depends on the degree of differentiation of malignant growth; In general, less differentiated, anaplastic lesions have more loosely cohesive cells in comparison to well differentiated lesions.[8] Thus such lesions exfoliate larger number of cells into the bronchial cavity than the well-differentiated lesions. Secondly, while these exfoliated cells are lying in the bronchus, they start developing degenerative changes, thus progressively losing their morphological details which are important in differentiating them from non-malignant cells shed- off by the normal bronchial epithelial lining. If the technique of collecting BAL is not proper, the sample retrieved might be less in amount and thus may have lesser cytological material than expected, thus again increasing the chances of false negative results.[9,10] All these factors, present individually or together, affect the overall yield and diagnostic value of BAL specimens. Bronchial brushing technique has the advantage that the surface of the suspicious lesion is scraped with the help of a brush passed in through the bronchoscope.[9] Thus this technique manages to ′dislodge′ the cells from the surface of those well-differentiated malignant lesions too, which do not exfoliate cells readily. Thus, the chances of getting adequate diagnostic cytological sample by BB greatly increase in comparison to BAL sampling. Moreover, since the surface of the malignant lesion is scraped by the brush, the cells retrieved show better preserved morphological details in comparison to the cells which have already exfoliated into the bronchial cavity. All these factors contribute in the increased diagnostic yield of Bronchial Brushing samplings.

CONCLUSION

Bronchial Brushings (BB) has better diagnostic yield, as compared to Broncho Alveolar Lavage(BAL) cytology in diagnosis of patients with lung Cancer.

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