To Study the Efficacy of Bronchoalveolar Lavage, Bronchial Brush Cytology and Bronchial Biopsy in Diagnosing Lung Cancer

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ABSTRACT

Introduction: Lung cancer is one of the most common malignancies amongst the industrialized nations. There are six million new cases of lung cancer which corresponds to 12.7% of the world's cancer incidence that were diagnosed in 2008. Bronchial brushings for exfoliative cytology use disposable cytology brush, with a diagnostic yield of 72% and 45%, respectively, for central and peripheral lesions. The aim of the present study was to study the efficacy of bronchoalveolar lavage, bronchial brush cytology and bronchial biopsy in diagnosing lung cancer.

Material and methods: This Prospective intervention based observational study was conducted among patients attending respiratory OPD at Chatrapati Shivaji Subharti Hospital Meerut, with suspicion of lung cancer, from November 2015 – June 2017. BAL was obtained by introducing a bronchoscope in the lower respiratory tract and specimens obtained by means suction apparatus after infusing 60ml or more saline and re-aspirating it in a MUCUS EXTRACTOR with spare closing cap Materials obtained by broncho-alveolar lavage and brushing were fixed by various fixatives. To take a biopsy sample the bronchoscope tip was taken to the site of visible tumour in the lung. All the data obtained was arranged in a tabulated form and analysed using SPSS software

Results: The present study comprised of 40 patients who included 26 males and 14 females. There were 28 smokers and 12 non-smokers. Out of all 40 patients We found that visible endobronchial abnormities were endobronchial growth seen in 28 patients, mucosal infiltration seen in 6 patients and external compression seen in 6 patients. Specificity was 38% in BAL, 44% in brush cytology and 97% in biopsy technique. Positive predictive value was 48.21% in BAL, 88.93% in Brush cytology and 95.26% in biopsy.

Conclusion: In this study it was found that BAL fluid, bronchial brush cytology and bronchial biopsy are effective in diagnosing lung cancer.

Keywords: Bronchoalveolar, Cytology, Specificity

INTRODUCTION

History of lung cancer dates back to the early 1400s, when the incidence of death of approximately 50% of miners working along the border of Germany and the Czech Republic happened because of a pulmonary disease called bergkrankheit (mountain disease).[1,2] Lung cancer is one of the most common malignancies amongst the industrialized nations. There are six million new cases of lung cancer which corresponds to 12.7% of the world's cancer incidence that were diagnosed in 2008.[3] For the treatment of lung cancer in best possible and successful way, early diagnosis at an early stage is the key. For early diagnosis different modalities can

be applied eg. radiology, bronchoscopy, bronchial biopsy, brushing, bronchoalveolar lavage (BAL) cytology etc.[4] Bronchial biopsies cannot be performed in more peripheral sites or in patients at risk of haemorrhage. Bronchoscopic washing, brushing may be used to complement tissue biopsies in the diagnosing lung lesions.[5,6] Bronchoalveolar lavage (BAL), which was originally developed as therapeutic tool for pulmonary conditions like pulmonary alveolar proteinosis, cystic fibrosis and intractable asthma, also has gained acceptance and steady popularity as a tool for diagnosing lung cancer.[7] Bronchial brushing (BB) is a technique where surface of a suspected lesion, visualized through a bronchoscope, is scraped by brush that are specially designed to pass through bronchoscope in order to collect the cytological sample. Bronchial brushings can be used for exfoliative cytology or microbiological analysis. Bronchial brushings for exfoliative cytology use disposable cytology brush, with a diagnostic yield of 72% and 45%, respectively, for central and peripheral lesions.[8] Confirmation of the type of lung cancer by cytology is of utmost importance before treatment can be determined. The aim of the present study was to study the efficacy of bronchoalveolar lavage, bronchial brush cytology and bronchial biopsy in diagnosing lung cancer.

MATERIAL AND METHODS

This Prospective intervention based observational study was conducted among patients attending respiratory OPD at Chatrapati Shivaji Subharti Hospital Meerut, with suspicion of lung cancer, from November 2015 – June 2017. Adults more than 18 year without any sex specifications with suspected malignancy were included in the study. Paediatric patients, patients with bleeding disorders or recent myocardial infarction were excluded from the study. All the subjects were informed about the study and a written consent was obtained from all. The study was approved by the institute's

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Visible endobronchial abnormalites	Endobronchial growth	Mucosal infiltration	External compression
No. of patients	28	6	6
Table-1: Bronchoscopic appearance in patients			

INDICES	BAL	BRUSH	BIOPSY
Sensitivity	20.2%	41.4%	83.5%
Specificity	38%	44%	97%
Positive predictive value	48.21%	88.93%	95.26%
Negative predictive value	70.24%	90.65%	92.11%
False negative index	62.14%	15.53%	12%
False positive index	12.21%	5.86%	2.88%
Accuracy	74%	89%	95%
Table-2: Comparison of indices of BAL and brush cytology and Biopsy			
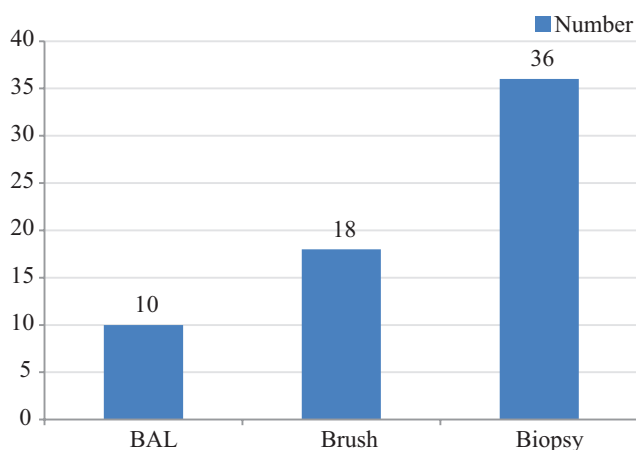
Graph-1: Sampling technique used in the study.
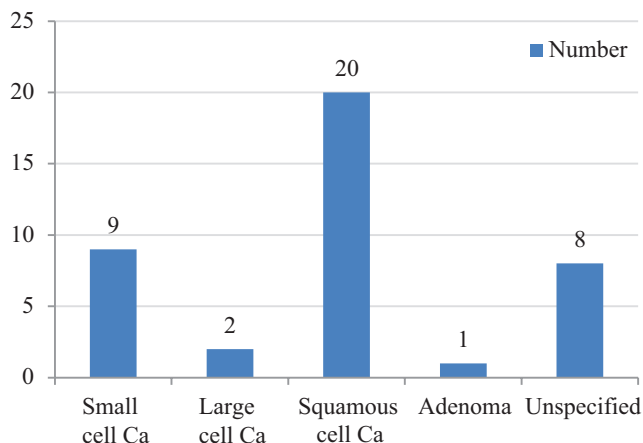
Graph-2: Cytological variation in patients

ethical board. The required Interventional procedure via a bronchoscope MODEL- OLYMPUS BF TYPE 1T150 was performed. BAL was obtained by introducing a bronchoscope in the lower respiratory tract and specimens obtained by means suction apparatus after infusing 60ml or more saline and re-aspirating it in a MUCUS EXTRACTOR with spare closing cap. A minimal volume of 5 ml of a pooled BAL sample was needed for BAL cellular analysis. The optimal volume is 10 to 20 ml. The recovered fluid was collected in traps made of materials to which cells are poorly adherent, such as polycarbonate,unsiliconised glass and polyethylene. A Disposable Cytology Brush of ALTON

with a working channel of 1.8mm nylon brush mounted on a steel guide wire was introduced through the inner channel of bronchoscope to brush the areas which are considered abnormal under bronchoscopic vision for bronchial brushing. Materials obtained by broncho-alveolar lavage and brushing were fixed by various fixatives. To take a biopsy sample the bronchoscope tip was taken to the site of visible tumour in the lung. The forceps are introduced through the bronchoscope channel and then the opened forceps were jammed against the surface of the tumour, 3-4 biopsy was taken in each visible lesion.

STATISTICAL ANALYSIS

All the data obtained was arranged in a tabulated form and analysed using SPSS software. Chi- square test and Fisher's exact test were used for the analysis of data. Probability value of less than 0.05 was considered as significant.

RESULTS

The present study comprised of 40 patients who included 26 males and 14 females. There were 28 smokers and 12 non-smokers.

Graph 1 show the sampling technique used in the study. Out of 40 patients, using various sampling technique suggestive of CA positive by BAL in 10 patients, brush cytology in 18 patients and biopsy in 36 patients. Application of chi- square test gives "p" value of 0.01, which is significant.

Table 1 shows the bronchoscopic appearances amongst the subjects. Out of all 40 patients We found that visible endobronchial abnormities were endobronchial growth seen in 28 patients, mucosal infiltration seen in 6 patients and external compression seen in 6 patients. Application of chi square test shows p value 0.01 which is significant.

Graph 2 shows the cytological variation amongst the subjects. Out of 40 patients,9 were of small cell carcinoma, 2 was of large cell carcinoma, 20 were of squamous cell carcinoma, 1 was of adenoma and 8 were unspecified. On applying chi square test, the difference was statically significant amongst all the groups (P < 0.05).

Table 2 compared the sensitivity and specificity of BAL, brush cytology and biopsy technique in diagnosing lung cancer and found that sensitivity was 20.2% in BAL, 41.4% in brush cytology and 83.5% in biopsy. Specificity was 38% in BAL, 44% in brush cytology and 97% in biopsy technique. Positive predictive value was 48.21% in BAL, 88.93% in Brush cytology and 95.26% in biopsy. The negative predictive value was 70.24% in BAL, 90.65% in brush cytology and 92.11% in biopsy. False negative index was highest in BAL (62.14%). Highest accuracy was displayed by Biopsy (95%).

DISCUSSION

With the advent of flexible fiber-optic bronchoscope, respiratory cytology took a new turn as samples like

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bronchial washings, bronchial brushings, broncho-alveolar lavage and trans-bronchial needle aspirations could be collected from the respiratory tract, yielding significant amount of cytological material. 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.[9] In our study out of 40 patients, 28 were smokers and 12 were non- smokers. This is similar to the results of Richard D et al[10] who obtained patients with cancer of the lung, stomach, and large bowel. Altogether 649 men and 60 women with carcinoma of the lung were interviewed. Of the men 0.3% and of the women 31.7 % were non-smokers. Among the smokers a relatively high proportion of the patients with carcinoma of the lung fell in the heavier smoking category. According to a study by V Noronha et al[11], statistically significant differences between the non-smoker group and the smokers with regard to gender, age at presentation, use of smokeless tobacco and histopathology. The non-smokers were more likely to be female, present at a younger age (median age 53 years), have a history of use of smokeless tobacco and pathologically, to be diagnosed with adenocarcinoma. Non-smokers appeared to present at a more advanced stage, however this was not statistically significant as compared to the smokers. Fifty-two percent of the patients with lung cancer in our study were non-smokers. This is the highest proportion reported so far. In a study by Toh et al., from Singapore, 32.5% of lung cancer patients were never-smokers, [12] while in the United States, approximately 10% of lung cancer cases occur in non-smokers. [13] Smokers have a higher occurrence of co-morbidities including coronary artery disease, cerebrovascular disease and chronic obstructive pulmonary disease, limiting their ability to receive optimal management of lung cancer. BAL sampling technique was used in 10 patients, brush cytology in 12 patients and biopsy in 18 patients. This is in accordance to DS Gaur et al.[14] A better sensitivity was noted in a study by Gaur et al[66] as they adopted a utilized method of Brush biopsy and thick-needle aspiration biopsy. It was found that endobronchial abnormalies were endobronchial growth seen in 28 patients, mucosal infiltration seen in 6 patients and external compression seen in 6 patients. Similar results were obtained in the study of William et al[14]. In a study conducted by Shalinee Rao et al[16], to evaluate the efficacy of bronchial wash cytology in the diagnosis of bronchopulmonary lesions and assess the role of morphometry in categorizing dysplastic/malignant lesions. Bronchial wash cytology technique showed high specificity. Cytohistopathology correlation showed 62.06% concordance rate. They concluded that Bronchial wash cytology has low sensitivity in detecting pulmonary lesions. It can be of value in patients with contraindication for biopsy. Morphometry can be a useful adjunct to cytomorphology, especially in situations where biopsy is contraindicated. In study by Dinesh R et el.[17] broncho-alveolar lavage, brush cytology and biopsy were taken from all patients. They investigated 39 male and 11 female patients ranging from 31 to 80 years of age. Most

common type of malignancy was adenocarcinoma (25/50) followed by squamous cell carcinoma (14/50). Bronchoscopic BAL was positive in 15(30%) individuals, bronchial brush was positive in 44(88%) individuals and bronchoscopic biopsy was positive for malignancy in 46(92%) individuals. Traditionally, squamous-cell carcinoma of the lung was thought to be smoking-related, rather than adenocarcinoma. The increase in the incidence of adenocarcinoma was thought to be mainly attributable to a change in smoking pattern and an increased preference for filter cigarettes that have low tar, but high nitrate content. [18] Earlier studies reported that the increased incidence of adenocarcinoma was confined to smokers. [19,20]

CONCLUSION

In this study it was found that BAL fluid, bronchial brush cytology and bronchial biopsy are effective in diagnosing lung cancer. It also proved efficient in identifying the cytological pattern of various lung carcinomas in BAL fluid, bronchial brush cytology and bronchial biopsy.

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