

Efficacy of bronchial cytology in diagnosing lung lesions and its correlation with bronchial biopsy

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Abstract

Introduction: Neoplastic and non-neoplastic lung lesions have a high rate of morbidity and mortality. Lung cancer is the frequently diagnosed cause for cancer related deaths and tuberculosis is still the leading cause of death in developing countries. Timely detection of disease plays an important role in the management and long term survival of patients. For early diagnosis different diagnostic modalities are available which include bronchoalveolar lavage, bronchial brush, fine needle aspiration cytology and bronchial biopsy. Bronchoalveolar lavage and bronchial brush are very effective in the diagnosis and differential diagnosis of lung cancers. Bronchial brushings often offer excellent specimens and accurate information about the site of the lesion. Better diagnostic yield is often obtained when cytologic techniques are used together with bronchial biopsy.

The present study was undertaken to ascertain the role and diagnostic utility of bronchoalveolar lavage, bronchial brush and bronchial biopsy in diagnosing lung lesions.

Method: A prospective study was conducted in the Department of Pathology in Kathmandu Medical College and Teaching Hospital, Sinamangal, Kathmandu, Nepal from January 2016 to December 2017 (2 years). A total of 48 cases were included in the study. Bronchoalveolar lavage, bronchial brush and bronchial biopsy slides were stained with routine cytological and histological staining and examined.

Results: Out of 48 cases, bronchoalveolar lavage smears revealed 24 non-neoplastic, 19 neoplastic and 5 suspicious cases. Bronchial brush smears revealed 24 neoplastic, 22 non-neoplastic and 2 suspicious cases. Bronchoscopic biopsy revealed 31 neoplastic and 17 non-neoplastic lesions. The bronchial brush cytology showed sensitivity of 82.76%, specificity of 89.47% and accuracy of 85.42%.

Conclusion: Combination of bronchial cytology and biopsy can be considered as the best procedures for the diagnosis of lung lesions.

Keywords: Bronchoalveolar lavage, Bronchial brush, bronchial biopsy, non-neoplastic and neoplastic lung lesions.

Introduction

Lung cancer is currently the most frequently diagnosed major cancer in the world and most common cause of cancer mortality worldwide.¹ The Global incidence of lung cancer is increasing at the rate of 0.5% per year and is the leading cause of death in most countries.

Smoking is considered to be the cause of 85% of deaths due to lung cancer death.^{2,3}

Similarly, pulmonary tuberculosis still remains a leading cause of death in developing countries and it is estimated that 1.7 billion individuals are infected worldwide with 8 to 10 million new cases and 3 million deaths per year.⁴

To address the high mortality associated with lung lesions successfully, it should be diagnosed at an earliest possible. Bronchoscopy is perhaps the invaluable tool for diagnosing lung lesions. Various diagnostic techniques have been developed using flexible fiberoptic bronchoscopy.^{5,6} For early diagnosis different diagnostic modalities are available which include bronchoalveolar lavage, bronchial brush, fine needle aspiration cytology and bronchial biopsy. Bronchoalveolar lavage and bronchial brush are very effective in the diagnosis and differential diagnosis of lung cancers. Bronchial brushings often offer excellent specimens and accurate information about the site of the lesion.⁷

Though histopathological diagnosis of bronchial biopsy is considered the gold standard for diagnosis of lung lesions, it has certain drawbacks.⁸ Bronchial biopsies cannot be performed in more peripheral sites or in patients at risk of haemorrhage. Bronchoalveolar lavage and brushing may complement tissue biopsies in the diagnosis of peripheral lung cancers.^{9,10}

Better diagnostic yield is often obtained when cytologic techniques are used together with bronchial biopsy. In general concordance between cytology and histopathology ranges from 70-90% and the bronchial biopsy is confirmatory for most of the cytological findings.⁵

The present study was undertaken to ascertain the role and diagnostic utility of bronchoalveolar lavage, bronchial brush and bronchial biopsy in diagnosing lung lesions.

Methods

A prospective study was conducted in the Department of Pathology in Kathmandu Medical College and Teaching Hospital, Sinamangal, Kathmandu, Nepal from January 2016 to December 2017 (2years). A total 48 cases were included in the study. The samples for cytological and histological examination were collected from the patients with signs and symptoms, radiology and bronchoscopic examination suggestive of a lung mass. Bronchoalveolar lavage fluid smears were prepared after cytospin and centrifugation. Two of the slides were fixed in alcohol and two air dried. Bronchial brush material was smeared on four slides, two were alcohol fixed and two were air dried. All Alcohol fixed slides were stained with Papanicolaou stain and air dried smears were stained with May- Grunwald Giemsa Stain. Bronchial biopsies were processed as per

standard histopathological techniques which include paraffin embedding and Haematoxylin and Eosin (H&E) staining. Ziehl-Neelsen (ZN) staining for acid fast bacilli (AFB) and Periodic Acid Schiff (PAS) was done where needed.

Results

In this present study, out of 48 cases, 33 (68.75%) were male and 15 (31.25%) were females with male to female ratio of 2.2:1. The age of patients ranged from 23–84years (mean age 62.23).

Bronchoalveolar lavage smears revealed 24 non-neoplastic, 19 neoplastic and 5 suspicious cases. **(Figure: 1)**

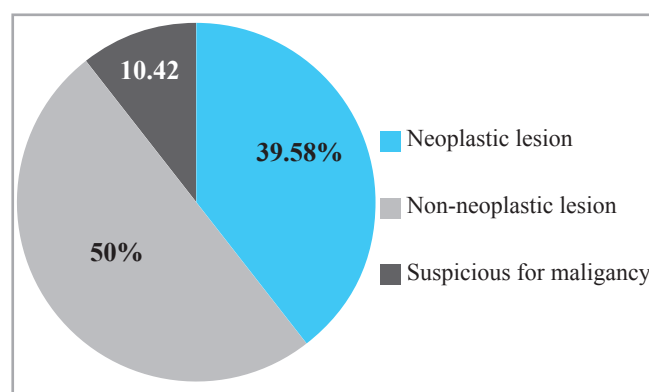


Figure No. 1: Bronchoalveolar lavage findings

Out of 24 non-neoplastic cases, 8 turned out to be neoplastic on bronchial biopsy. All 19 neoplastic cases on BAL were proven to be neoplastic on bronchial biopsy. Of the 5 suspicious cases, 4 were neoplastic and one was non-neoplastic (non-specific inflammation with reactive atypia).

Bronchial brush smears revealed 24 neoplastic, 22 non-neoplastic and 2 suspicious. **(Figure: 2)**

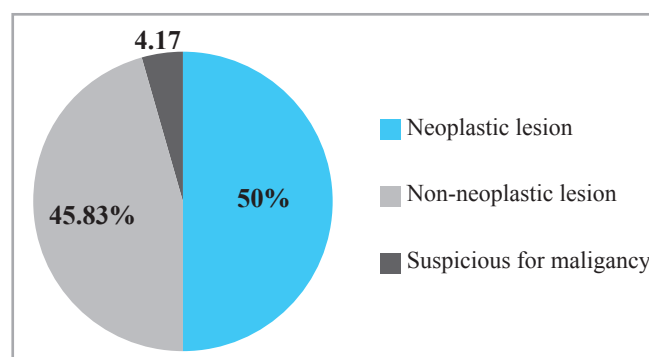


Figure No. 2: Bronchial brush findings

All 24 neoplastic and 2 suspicious cases were proven to be neoplastic on biopsy. Of 22 non-neoplastic cases, 5 turned out to be neoplastic on bronchial biopsy.

Out of 48 cases, bronchoscopic biopsy revealed 31 neoplastic and 17 non-neoplastic lesions. (Table: 1)

Amongst the neoplastic lesions most common being squamous cell carcinoma (51.61%) and non-neoplastic lesions being non-specific inflammation (70.59%). (Table: 2&3)

Table: 1 Comparison of bronchoalveolar lavage, bronchial brush and bronchial biopsy results.

CATEGORY	Bronchoalveolar lavage	Bronchial brush	Bronchial biopsy
Non-neoplastic	24	22	17
Neoplastic	19	24	31
Suspicious	05	02	-
TOTAL	48	48	48

Table: 2 Neoplastic lesions on bronchial biopsy.

Diagnosis	Cases	Percentage
Squamous cell carcinoma	16	51.61%
Small cell carcinoma	8	25.81%
Adenocarcinoma	7	22.58%
Total	31	100%

Table: 3 Non-neoplastic lesions on bronchial biopsy.

Diagnosis	Cases	Percentage
Non-specific inflammation	12	70.59%
Tuberculosis	03	17.65%
Aspergillosis	02	11.76%
Total	17	100%

Sensitivity of bronchial brush was 82.76%, while bronchoalveolar lavage was only 67.86%. Specificity of bronchial brush was 89.47% and that of bronchoalveolar lavage was 80%. Similary accuracy of bronchial brush was 85.42%, while that of bronchoalveolar lavage was 72.92%. (Table: 4)

Table: 4 Statistical analysis of bronchoalveolar lavage and bronchial brush cytology.

Indices	Bronchoalveolar lavage	Bronchial brush
Sensitivity	67.86%	82.76%
Specificity	80%	89.47%
Positive predictive value	82.61%	92.31%
Negative predictive value	64%	77.27%
Accuracy	72.92%	85.42%

Discussion

Neoplastic and non-neoplastic lung lesions have a high rate of morbidity and mortality. Lung cancer is the frequently diagnosed cause for cancer related deaths and tuberculosis is still the leading cause of death in developing countries.¹¹Timely detection of disease plays an important role in the management and long term survival of patients. With the advent of flexible fiberoptic bronchoscope, respiratory cytology took a new turn as samples like bronchoalveolar lavage, bronchial brushing and transbronchial needle aspirations could be collected from the respiratory tract, yielding significant amount of cytological material.¹² With this, the emphasis shifted from biopsy to the use of cytology as a first line diagnostic and management tool in patients with advanced or inoperable malignancy.¹¹

The age group of the patients included in this study ranged from 23-84 years with male predominance. Similar age group with male predominance was also observed in studies done by Pavani M et al.¹³, Gaur DS et al.¹⁴, and Bodh A et al.¹⁵

Out of 48 cases, bronchial biopsy showed 31 neoplastic and 17 non-neoplastic lesions in this study. Among the 31 neoplastic cases, squamous cell carcinoma was the predominant (51.61%), followed by small cell carcinoma (25.81%) and adenocarcinoma (22.58%). Similar to studies done by Bhat N et al.¹⁶, Bodh A et al.¹⁵, Gaur DS et al.¹⁴ and Matsuda M et al.¹⁷, where squamous cell carcinoma was more common than other malignancies. This is in contrast to studies in western countries, where incidence of adenocarcinoma has surpassed squamous cell carcinoma.

In our study bronchial brush could diagnose 13 cases (54.17%) as squamous cell carcinoma, 6 cases (25%) as small cell carcinoma and 5 cases (20.83%) as adenocarcinoma. Bronchoalveolar lavage was able to diagnose 10 cases (52.63%) as squamous cell carcinoma, 5 cases (26.32%) as small cell carcinoma and 4 cases (21.05%) as adenocarcinoma. Thus it was obvious that samples obtained by bronchial brush showed better cytological morphology than bronchoalveolar lavage, which helped in morphological classification of lung cancers. (Table: 5)

Table: 5 Neoplastic lesions on bronchoalveolar lavage, bronchial brush and bronchial biopsy.

Diagnosis	Bronchoalveolar lavage		Bronchial brush		Bronchial biopsy	
	Cases	percentage	Cases	Percentage	Cases	Percentage
Squamous cell carcinoma	10	52.63%	13	54.17%	16	51.61%
Small cell Carcinoma	5	26.32%	6	25%	8	25.81%
Adenocarcinoma	4	21.05%	5	20.83%	7	22.58%
Total	19	100%	24	100%	31	100%

Bronchoalveolar lavage, bronchial brush and bronchial biopsy showed that the non-specific inflammation was common among the non-neoplastic lesions, followed by tuberculosis and aspergillosis in this study, which is similar to the studies done by Tuladhar A et al.²⁰ and Pavani M et al.¹³

In our study, in comparison to bronchoalveolar lavage, bronchial brush gave higher number of true positive and true negative cases, and lesser number of false positive and false negative cases, showing its superiority over bronchoalveolar lavage in diagnosing lung lesions. Similar findings were seen in studies done by Kapse VKR et al.¹⁸, Gaur DS et al. ¹⁴and Kotadia TP et al.¹⁹In bronchial brushing technique the surface of the suspicious lesion is scraped by the help of a brush passed in through the bronchoscope. Thus this technique manages to dislodge the cell from the surface of well- differentiated malignant lesion too, which do not exfoliate cells readily. Thus, the chances of getting adequate diagnostic cytological sample by bronchial brush greatly increases in comparison to bronchoalveolar samplings. Cells retrieved show better preserved morphological details in comparison to the bronchoalveolar lavage samples. All these factors contribute in the increased diagnostic yield of bronchial brush samplings.¹⁴

In our study, the values of sensitivity, specificity and accuracy of bronchial brush were 82.76%, 89.47%, and 85.42% respectively. Which were superior to those of bronchoalveolar lavage. Similar findings was seen in the studies done by Daur DS et al.¹⁴, Kotadia TP et al.¹⁹ and Mufti ST et al.²¹ (Table: 6). With good sensitivity, specificity and accuracy, bronchial brush shows to be very convenient cytological technique that can be utilized for diagnosis of various lung lesions, as it saves time needed for the processing of biopsy specimens.

Table: 6 Statistical comparison of bronchial brush.

Author	Sensitivity	Specificity	Accuracy
Kotadia TP et al.	88.46%	66.67%	82.85%
Gaur DS et al.	87.30%	97.60%	93.90%
Mufti ST et al.	82.1%	72.7%	80%
Present study	82.76%	89.47%	85.42%

Conclusion

In comparison to bronchoalveolar lavage, cell yield is more in bronchial brushings and can be used in diagnosing lung lesions. It yields almost same information as biopsy and is particularly useful in patients with evidence of obstruction or risk of haemorrhage. So the combination of bronchial cytology and biopsy can be considered as the best procedures for the diagnosis of lung lesions during bronchoscopy.

Conflict of interest: None declared

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