



EVALUATION OF DIAGNOSTIC EFFICACY OF BAL AND FNAC WITH REFERENCE TO LUNG BIOPSY

Pathology

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ABSTRACT

Background: Lung cancer is one of the most commonly diagnosed major cancers. It is important to diagnose lung cancers as early as possible to improve disease management and long term survival of patients. This study was intended to find out efficacy of two cytology diagnostic techniques for identifying pulmonary lesions for easy and early diagnosis. **Aims and Objective:** To assess the efficacy of BAL and FNAC with reference to lung biopsy which is the gold standard for final diagnosis. **Material and Methods:** Present study is prospective study conducted at Pathology Department, S. S. G. Hospital and Medical College, Baroda. The study includes 32 consecutive cases in which BAL, FNAC and biopsy were done to all the patients. Biopsy is taken as gold standard for comparison of BAL and FNAC to find the diagnostic efficacy in identifying various neoplastic and nonneoplastic lung lesions. **Results:** Among 32 cases, diagnostic efficacy of BAL and TBNA were compared with lung biopsy results. Sensitivity of BAL was 50% and FNAC was 83.3%. Specificity of BAL was 90% and FNAC was 62.5%. Positive predictive value and accuracy was better with FNAC than that of BAL. **Conclusions:** BAL is safest technique for cytology examination but conclusive diagnosis can be obtained only when representative cells exfoliating in bronchial wall. Image guided FNAC of pulmonary lesions is a simple, safe, less expensive technique with low morbidity and leads to early and quick diagnosis compared to lung biopsy. In present study, BAL and FNAC cytology technique were assessed for its efficacy in relation to lung biopsy. The study concludes that although histopathology remains the gold standard for diagnosis one can rely on cytology techniques.

KEYWORDS

BAL (Bronchoalveolar lavage), FNAC (Fine needle aspiration cytology), Lung biopsy.

INTRODUCTION

Lung cancer is currently the most frequently diagnosed and leading cause of cancer related deaths in men and women. Thus, it is a common cause of cancer related mortality worldwide. The increasing incidence could be due to increase in smoking, change in life style, increased environmental pollution. In addition, the availability of different modern diagnostic modalities also increased chance to detect lung cancer. For early diagnosis different diagnostic modalities are available which include; radiology, bronchoscopy, bronchial biopsy, transbronchial or transthoracic lung fine needle aspiration cytology (FNAC), bronchoalveolar lavage (BAL) washing cytology and brush cytology. It increases the outcome of the diagnostic accuracy in each patient because each has specific advantages and disadvantages. However their combined use yields the best results.^{1,2,3}

Bronchoscopic bronchoalveolar lavage washing is safe technique for cytology examination. Fine needle aspiration cytology (FNAC) is quick, effective and relatively inexpensive technique which may aid and complement tissue biopsies in the diagnosis of lung lesions^{4,5}. There is still disagreement as to the value and reliability of BAL and FNAC in comparison with histology for the diagnosis of various lung lesions.

Aim of present study is to evaluate diagnostic efficacy of two very popular cytological techniques i.e. BAL and FNAC in diagnosing various non neoplastic and neoplastic lesions of lung by correlating them with histopathological diagnosis of lung biopsy.

MATERIAL AND METHODS

The study was a prospective study, conducted at the Department of Pathology at S. S. G. Hospital and Medical College Baroda over period of May 2018 to February 2020. Total 32 cases were selected where BAL, FNAC samples as well as bronchial biopsy were available. The case was not included when any of the three samples was not received or inadequate. Histopathological diagnosis of lung biopsy was considered as the "Gold Standard."

Detailed clinical history, clinical examination and imaging study

investigations like Chest X-ray, CT scan, MRI and other routine investigations were assessed from requisition form. BAL fluid and FNAC slides were received for cytological examination to diagnose various lesions of lung. Patients having central lesions on chest radiograph were approached by bronchoscope and peripheral lesions were approached by CT scan for FNAC and lung biopsy.

BAL fluid was centrifuged and wet fixed smears were stained by Hematoxylin and Eosin stain and Papanicolaou (PAP) stain while dry fixed smears were evaluated by Giemsa and AFB stain. FNAC slides were received in fixative solution for cytology slides (methanol) and examined by Hematoxylin and Eosin stain and PAP stain. Lung biopsies were received in 10% formalin. BAL, FNAC and lung biopsy cases were evaluated by at least two pathologists.

RESULTS

During the study period, 32 cases of simultaneous sampling for BAL, FNAC and lung biopsy were included. The mean age of patients was 59.9 years. Among the 32 patients, 26 were male and 6 were female with M:F ratio of 4.3:1.

Table 1 Distribution Of Various Lung Lesions In BAL, FNAC And Lung Biopsy

Diagnostic Category	BAL	FNAC	Lung biopsy
Malignant	11 (34.4%)	20 (62.5%)	20 (62.5%)
Inflammatory/Dysplastic /Tb	19 (59.4%)	10 (31.3%)	12 (37.5%)
No significant pathology	2 (6.2%)	2 (6.2%)	0

Table 2 Results Accuracy Of BAL And FNAC

	TP	TN	FP	FN
BAL	11	9	01	11
FNAC	20	05	03	04

Table 3 Co-relation Of Statistical Test Results Of BAL And FNAC.

	BAL	FNAC
Sensitivity (TP/TP+FN)	50%	83.3%
Specificity (TN/TN+FP)	90%	62.5%

Positive Predictive Value (TP/TP+FP)	91.6%	86.9%
Negative Predictive Value (TN/TN+FN)	45%	55.5%
False Negative Rate (FN/FN+TP)	50%	16.6%
False Positive Rate (FP/FP+TN)	10%	37.5%
Accuracy (TP+TN/TP+TN+FP+FN)	62.5%	78.1%

In present study, 20 (62.5%) cases were diagnosed by FNAC and bronchial biopsy to be suffering from lung cancer while 11 (34.4%) cases showed malignancy in BAL. Among inflammatory, dysplastic or tuberculous lesions, maximum number of cases, 19 (59.4%) were in BAL as compared to 10 (31.3%) cases in FNAC and 12 (37.5%) cases of lung biopsy (Table 1).

Among malignant lesions of lung, most common is small cell carcinoma 6 cases, followed by 5 cases of adenocarcinoma and non small cell lung carcinoma each. Rest were squamous cell carcinoma 3 cases and one case of poorly differentiated carcinoma.

BAL cytology showed 11 True Positive cases and 9 True Negative cases, as confirmed by biopsy. Moreover, 01 case was diagnosed as False Positive and 11 cases as False Negative by BAL. FNAC showed 20 True Positive cases and 05 True Negative cases with 03 cases as False Positive and 04 cases as False Negative (Table 2).

Sensitivity of FNAC was 83.3%; while that of BAL was 50%. Specificity of FNAC was 62.5% and that of BAL was 90%. Similarly Positive Predictive Value, Negative Predictive Value, False Negative Index and False Positive Index of BAL and FNAC were illustrated in Table 3. Accuracy of FNAC was 78.1% while that of BAL was 62.5%. Among neoplastic lung lesions, 20 cases were diagnosed by FNAC and lung biopsy while only 11 cases were diagnosed as neoplastic lesions in BAL indicating FNAC is superior diagnostic tool as compared to BAL. The biopsy specimens evaluated for histopathological examination showed much better morphological features and helped in categorizing cases into specific type of carcinomas in comparison to the cytological material obtained by either BAL or FNAC.

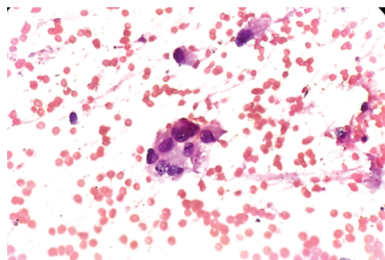


Figure 1 BAL fluid examination showed discohesive cluster of malignant epithelial cells having anisonucleosis, irregular distribution of nuclear chromatin, irregular nuclear membrane arranged in acinar configuration diagnosed as adenocarcinoma (H&E stain, $\times 400$).

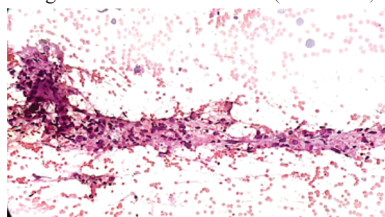


Figure 2 Fine needle aspiration cytology (FNAC) showed pleomorphic cells with abundant cytoplasm and hyperchromatic nuclei diagnosed as squamous cell carcinoma (H&E stain, $\times 100$).

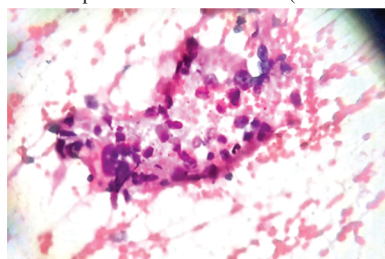


Figure 3 FNAC showed malignant cells showing marked anisonucleosis, vesicular nuclear chromatin and prominent nucleoli diagnosed as non small cell lung carcinoma (H&E stain, $\times 400$).

DISCUSSION

Lung cancer is the leading cause of cancer related deaths in men and women. However, mortality can be reduced by early detection. Lung cytology and histopathology play a vital role in conclusive diagnosis of lung cancer. BAL is less sensitive as compared to FNAC and biopsy but it is comparatively safer, requiring less expertise and can be done in peripheral lesions and in patients with risk of bleeding.⁵

Cytology examination as Bronchial washings, BAL fluid, FNAC or brush cytology are considered a new turn as they could be collected from the respiratory tract, yielding significant amount of cytological material.⁶ In our study, in comparison to BAL, FNAC gave higher number of True Positive and while BAL detected higher number of True Negative cases.

Since cytological sampling by BAL technique relies mainly on cells 'exfoliated' from the pathological lesion in the bronchial epithelium, the adequacy of its samples depends on several vital factors, especially the degree of differentiation of malignant growth, preservation of the morphology of cytological material and technical skill of the pulmonologist who is retrieving the lavage fluid from the bronchus (Figure 1). In poorly differentiated malignant lesions, the smears show more discohesive cells in comparison to well differentiated lesions.⁷ Thus such lesions exfoliate larger number of cells into the bronchial cavity than the well differentiated lesions that leads to yield of higher number of representative cells. There is also chances of false negative results if the sample received is less in amount.⁸

The suspicious pathological areas were guided by ultrasound guided bronchoscope in centrally located lung lesions while peripheral lesions guided by CT scan for transthoracic route to perform fine needle aspiration cytology and lung biopsy. These methods are highly sensitive as they detect the cells which do not exfoliate cells readily. Thus, the chances of getting adequate diagnostic cytological sample by FNAC and lung biopsy greatly increases in comparison to BAL samplings. (Fig. 2 & 3).

In present study, the Sensitivity, Specificity and Accuracy of BAL samples were 50%, 90% and 62.5% respectively, when a single sample of BAL was collected (Table 3). Truong et al reported Sensitivity of 66.0%; while Ng. & Horak reported a Sensitivity as high as 74.0% for BAL.⁹ Studies have shown that increasing the number of attempts at obtaining BAL sampling can improve its Sensitivity, Specificity and Accuracy.^{8, 10, 11} However, the inconvenience caused to the patient, in spite of BAL technique being noninvasive, outweighs when other techniques like FNAC and biopsy are available. In our study, the values of Sensitivity, Specificity and overall Accuracy of FNAC were 83.3 %, 62.5 % and 78.1 % respectively, which were remarkably superior in sensitivity and accuracy to those of BAL (Table 3). The Sensitivity of 83.3% for FNAC in our study was in agreement with various other workers like Zavala et al¹² (88.5%), ; Zimpfer et al., (83%)¹³, Rivera Mehta et al (90%)¹⁴ Even, Raghavendra et al¹⁵ reported the Sensitivity of FNAC to be as high as 100% in their study.

Various workers have tried to combine the two techniques in order to improve the yield of diagnostic cytological material. Govert et al¹⁶ reported 85.3% sensitivity on combining BAL and bronchial brushing technique; while Vijeta Tomar et al¹⁷ reported a higher sensitivity of 88.88% by combining BAL, Bronchial brushing and FNAC for diagnosis of malignant neoplasms of lung.

The prognosis of lung cancer depends on the stage at the initial diagnosis. Therefore the earlier the cancer is detected, better will be the prognosis and detection at late stages increases number of mortalities.¹⁸ The important tools for diagnosis are based on pulmonary cytology and histopathology. Though histopathology is gold standard for diagnosis, Broncho Alveolar Lavage (BAL) and FNAC are important cytology techniques which are helpful in early diagnosis. Though BAL has less sensitivity in most of the studies, it is safer procedure as compared to FNAC and Biopsy.

CONCLUSION

Lung tumors are the most common cause of death due to cancer in men and are now emerging as an important cause of cancer related mortality in females. FNAC (transbronchial or transthoracic) is a much superior technique in the diagnosis and morphological typing of lung cancers, as it demonstrates far better specificity, sensitivity and accuracy, in comparison to bronchoalveolar lavage.

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