

## Assessment of diagnostic efficacy of BAL and FNAC with reference to biopsy in suspected cases of pulmonary malignancy

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### Abstract

**Background:** Lung cancer is amongst the most commonly diagnosed major cancers. It is important to diagnose lung cancers as early as possible before the lesion has reached a visible and palpable tumor. This study was intended to find out efficacy of various diagnostic modalities in identifying pulmonary malignancies for easy and early diagnosis.

**Aims:** To assess the efficacy of BAL and FNAC in suspected cases of pulmonary malignancy.

**Methodology:** Prospective, observational study conducted in a tertiary care institute over a period of four years.

115 consecutive cases of suspected bronchogenic carcinoma were admitted. BAL and 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 pulmonary malignancy.

**Results:** Out of the 107 cases of pulmonary malignancy, the most common type was Adenocarcinoma followed by squamous cell carcinoma and small cell carcinoma. Sensitivity of BAL was found to be 39.25% and FNAC was found to be 97.19%. Specificity was found to be 100% for both FNAC and BAL. Positive predictive value and negative predictive value was better with FNAC than that of BAL.

**Conclusions:** Image guided FNAC of pulmonary lesions is a simple, safe, less expensive technique with low morbidity and leads to early and quick diagnosis when compared to trucut biopsy. In this study combination of BAL and FNAC can establish the diagnosis of bronchial carcinoma in most cases. Although histopathology remains the gold standard for diagnosis one can rely on cytology techniques for quick reporting of lung lesions.

**Keywords:** BAL; Biopsy; FNAC; Pulmonary malignancy; Sensitivity; Specificity.

### Introduction

The burden of Lung cancer will be quite enormous in developing India because of smoking and air pollution. To tackle the problem of late diagnosis, more accessible and affordable diagnostic technique to be employed. According to the GLOBOCAN 2018 report the estimated incidence of lung cancer was 67,795 and mortality was 63,475. In India, lung cancer constitutes 6.9 per cent of all new cancer cases and 9.3 per cent of all cancer related deaths in both sexes, it is the commonest cancer and cause of cancer related mortality in men, with the highest reported incidences from Mizoram in both males and females (Age adjusted rate 28.3 and 28.7 per 100,000 population in males and females, respectively) [1]. It accounts for about 17% of the total new cancer cases in males and 23% of the total cancer deaths [2]. If diagnosed at early stage, then it can be cured by surgery with or without chemotherapy/radiotherapy. In advanced stages cure is difficult to achieve but quality of life and life span can be enhanced by chemotherapy. Clinician should enquire about frequency and duration of cough, shortness of breath, presence of hemoptysis, chest pain, loss of weight and loss of appetite [3].

In patients with chest x-ray abnormalities, immediate decision of chest CT with or without contrast should be taken for further evaluation. Screening by low dose CT as a routine is superior to chest x-ray at detecting small and pre-symptomatic lung cancers. However, till date there are no evidences that support the decrease in mortality with routine radiological screening [4].

Though HPE (Histopathological examination) is considered gold standard for diagnosis of lung cancer but

FNAC is also a well-established alternative to open biopsies. FNAC is a quick, effective, physically non traumatic, non-invasive and inexpensive method. When FNAC and Immunocytochemistry are combined in diagnosis, A quick and correct guide can be provided for clinician for selecting the highly selective and specific treatment for various phenotypes of carcinoma which improves the prognosis of patients.

It is important to diagnose lung cancers as early as possible before the lesion has reached a visible and palpable tumor. Stage at the time of diagnosis decides the prognosis of the cancer. For earliest diagnosis different modalities are available which include radiology, bronchoscopy for BAL, brushings and bronchial biopsy and FNAC [5,6].

The present study focuses on the efficacy of the above mentioned modalities in suspected cases of bronchogenic cancer.

### Materials and Methods

**Study Design:** This study was a prospective cross-sectional study, performed in the department of pulmonary medicine at a tertiary care center in Andhra Pradesh, India, over a period of four years.

**Study Population:** 115 consecutive cases of suspected bronchogenic carcinoma both genders, attending the department of pulmonary medicine above the age of 18 years during the study period, were selected by adhering to the inclusion and exclusion criteria. An ethical committee approval was obtained.

**Inclusion Criteria:** People with clinical or radiological suspicious of pulmonary malignancy and willing to undergo

CT Chest, BAL, FNAC, biopsy after written consent.

**Exclusion Criteria:** Patients with established cases of pulmonary malignancy, tuberculosis, hemodynamic unstable, HIV.

Six cases of tuberculosis and one case of BOOP were excluded. Carcinoid cases proven on FNAC were excluded from the study as biopsy could not be done in those cases.

The study was approved by the institutional ethics committee.

**Study Protocol:** The selected patients after informed consent were admitted in the hospital for further evaluation by detailed medical history, clinical examination and investigations like Chest X-ray and routine blood investigation like complete blood picture, blood sugar, serum urea and creatinine, coagulation time, bleeding time, prothrombin time. All patients underwent a CT/contrast-enhanced CT scan of the thorax for better anatomical delineation. This was followed by Fiberoptic bronchoscopy (FOB).

Bronchoalveolar lavage (BAL) fluid was sent for malignant cell type in all patients. FNAC and biopsy for cytopathology and histopathology respectively were done in all the patients. Patients having central and peripheral lesions on chest radiograph are further evaluated by FOB/ CT-guided FNAC. After detailed evaluation, determination of bronchogenic carcinoma was attempted. Finally, efficacy of BAL, FNAC has a diagnostic method was assessed using biopsy as gold standard.

**Results**

During the study period of four years, patients with chest radiograph suggestive of bronchogenic carcinoma were enrolled. Overall, mean age of the patients was found to be 58.53 years. Among the 107 patients, 77 were male and 30 were female. 79 were smokers and 28 were non smokers.

Most common chest symptoms were cough (n=51) followed by breathlessness (n=44), fever (n=07), Hemoptysis (n=14), and chest pain (n=26) as shown in Table 1.

**Table 1: Symptoms**

Symptoms	No. of cases in 107 patients
Cough	107
Breathlessness	98
Chest pain	68
Hemoptysis	38
Fever	09

**Table 3: Co-relation of test results of bronchoalveolar lavage (BAL) and fine needle aspiration cytology (FNAC)**

Statistics	BAL	FNAC
Sensitivity (TP/TP+FN)	39.25	97.19
Specificity (TN/TN+FP)	100	100
Positive Predictive Value (TP/TP+FP)	100	100
Negative Predictive Value (TN/TN+FN)	60.74	02.80

In histopathological examination, adenocarcinoma (Fig. 4) was found in 79 cases, squamous cell carcinoma (Fig. 3) was found in 22 cases and small cell carcinoma in four cases.

On examination pleural effusion in 41 cases, lymphnode present in 27 cases and wheeze in 11 cases.

On chest x-ray PA view, unilateral presentation is most common (n=99), right upper lobe is most commonly involve followed by left upper lobe than right lower lobe and left lower lobe. Most common presentation as mass (Fig. 1) followed by mass with effusion, collapse, mass with cavity. Chest x-ray was normal in one patient.

In CT chest also mass was the most common but associated with collapse (Fig. 2) or obstructive pneumonia or effusion or metastasis are identified properly for further evaluation. In eight cases, bilateral presentation was seen. In one cases, CT chest was normal. Right side disease was more common than left side.

In bronchoscopy, normal mucosa and airway seen in 43 cases, in 8 cases mass (Fig. 5) was seen, narrowing with mass was seen in 07 cases, narrowing either due to extrinsic compression or mass with narrowing was seen in 48 cases, and erythematous patch was seen in one case. Bronchoscopy also helps in obtaining sample (Fig. 6).

In our study 115 cases of suspected lung carcinoma, 8 cases were negative for malignancy on biopsy and the remaining 107 cases were evaluated by both FNAC and BAL.

In this study, BAL showed 42 true positive cases and 65 cases were found to be false negative. FNAC gave better results with 104 true positive cases and 6 true negative cases, 3 cases were false negative and there were no false positive cases (Table 2).

**Table 2: Results**

Test results	BAL	FNAC
TP(True Positive)	42	104
TN(True Negative)	08	08
FP(False Positive)	0	0
FN(False Negative)	65	03

Sensitivity of BAL was found to be 39.25% and FNAC was found to be 97.19%. Specificity was found to be 100% for both FNAC and BAL. Positive predictive value and negative predictive value was better with FNAC than that of BAL. (Table 3).

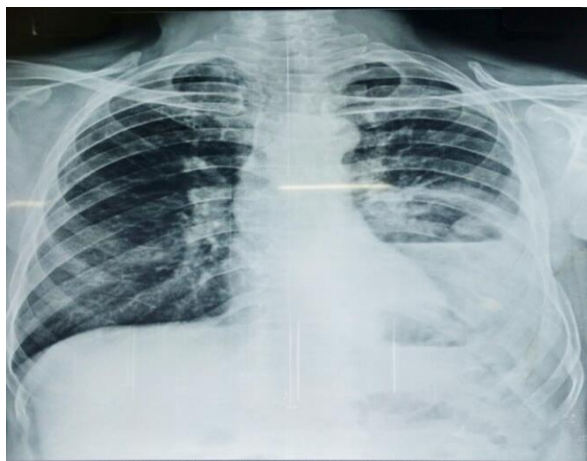


Fig. 1: Chest X-ray poster anterior view showing left lower lobe cavitating mass



Fig. 2: Chest CT showing right middle lobe peripherally situated mass with air bronchogram suggestive of bronchoalveolar cell carcinoma with left collapsed lung with hydro pneumothorax

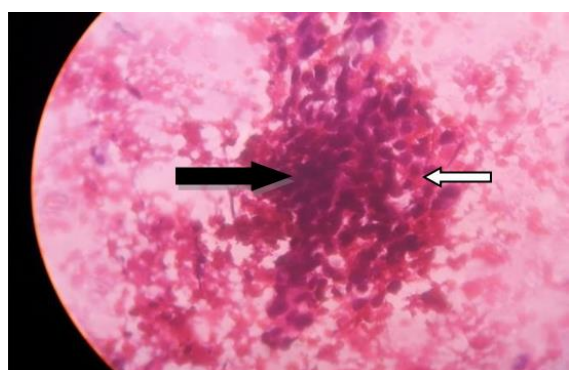


Fig. 3: FNAC shows cluster of cells with moderate eosinophilic cytoplasm (white arrow) with atypical hyperchromatic nuclei (black arrow) as squamous cell carcinoma.(H&E,40x)

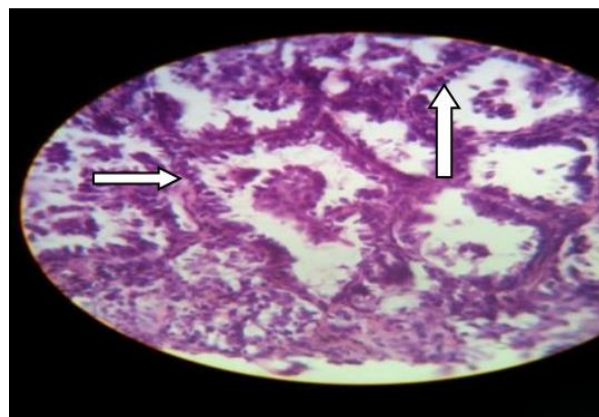


Fig. 4: Biopsy shows tumor cells growing along the lining of alveolar structure exhibiting lepidic pattern(white arrows) of growth suggestive of adenocarcinoma (H&E,40x)



Fig. 5: Bronchoscopic picture showing Right main bronchus mass



Fig. 6: Bronchoscopic guided FNAC of Left upper lobe mass

### Discussion

Lung cancer is the leading cause of cancer related deaths in men and women. The mortality can be reduced by early detection. Lung cytology and histopathology play a vital role in conclusive diagnosis of lung cancer. BAL is less conclusive 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 [7].

A good number of procedures are available to get tissue diagnosis from suspected cases but it is wiser to choose a tool to diagnose and pathologically stage the patients with lung cancer at the same time. The procedure should be safe, least invasive and cost effective. If there evidence of extra pulmonary spread either radiologically or clinically it is wiser to choose a CT/ultrasound guided FNAC and biopsy. For visible endobronchial lesions endobronchial needle aspiration gives immediate diagnosis.

The prognosis of lung cancer depends on the stage at the initial diagnosis. Therefore the earlier the cancer is the better will be the prognosis [8]. Different modalities used for early diagnosis are radiological investigations, TBNA, bronchial biopsy, bronchial washings, BAL and image guided FNAC [9].

In present study 107 cases were studied, 42 were correctly diagnosed in BAL and 104 in FNAC. The cytological sampling by BAL procedure depends upon the exfoliated cells from the lesion and further on the technical skills.

Lung cancer cases are usually detected at late stages there by leading to increase in number of deaths. Early and timely detection of disease improves management and long term survival of patients [10].

The important tools for diagnosis are based on pulmonary cytology and histopathology. Broncho Alveolar Lavage (BAL) and FNAC are such techniques which are helpful in early diagnosis.

Out of 115 suspected cases, 107 cases were diagnosed by bronchial biopsy, of which 77 were males and 30 were females giving to male to female ratio of 2.56:1. In 2013 study conducted by Bodh et al, male female ratio was found to be 3.35:1 [11].

In our study, tobacco smoking was found to be important factor important etiological factor for developing lung carcinoma. Smoker to nonsmoker was found to be 2.82:1. The results were similar to a study done by Rajasekharan et al., [12].

The most common type of lung cancer was found to be adenocarcinoma 73.83% followed by squamous cell carcinoma 20.56% and small cell 03.73%, but in Khan et al., has found squamous cell carcinoma as the most common type of lung cancer [10].

In the present study, cases were correctly diagnosed as malignant by BAL and there were no false positive cases. In 65 cases BAL showed false negative results which are later confirmed as malignant by biopsy. Similar results were observed in Wongsuriat et al., [13].

In our study, BAL has found to be having a sensitivity of 39.25% and specificity of 100% as compared to 83% sensitivity and 83.4% specificity in a study done by Annette Zimpfer et al., [14].

In our study, FNAC was found to be useful tool with 97.19% sensitivity and 100% specificity, therefore promises to be a convenient cytological technique. The sensitivity and specificity of FNAC was found to be 90% in a study done by Rivera and Mehta et al., [15].

In our study complications like streaky hemoptysis is seen in 05 cases after procedure, severe chest pain during and after procedure in 02 cases and small pneumothorax in 02 cases. In all other cases post procedure uneventful.

In our study, FNAC was found to be more helpful in diagnosing lung malignancy for early diagnosis.

There are a number of cytological procedures available for pursuing diagnosis of pulmonary lesions. For central lesions TBNA is preferred technique whereas for the peripheral lesions it is better to for image guided FNAC and biopsy. However, amongst all of these BAL is the safest procedure and by increasing the number of attempts while obtaining a sample can increase its sensitivity and specificity especially in peripheral lung lesions.

## Conclusions

Image guided FNAC of pulmonary lesions is a simple, safe, less expensive technique with low morbidity and leads to early and quick diagnosis when compared to trucut biopsy. It was concluded in our study that the combination of BAL and FNAC can establish the diagnosis of bronchial carcinoma in most cases. Although histopathology remains the gold standard for diagnosis one can rely on cytology techniques for quick reporting of lung lesions, especially CT-FNAC where typing of tumors could be done efficiently.

**Conflict of Interest:** None declared.

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