

Role of Fiberoptic Bronchoscopy and Utility of Bronchial Washings and Brushings in the Diagnosis of Lung Diseases

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ABSTRACT

Transbronchial lung biopsy via fiberoptic bronchoscope is an extremely useful technique by which bronchial as well as lung biopsies along with brushings and washings can be easily and safely taken.¹ Fiberoptic bronchoscopy (FOB) was performed and biopsies were done in 250 patients. In addition, bronchial brushings and washings were also taken in 140 and 115 cases, respectively. Adequate material was obtained in 242 cases. The cases were broadly classified into neoplastic and non-neoplastic categories. Malignancies and specific granulomatous diseases, tuberculosis and sarcoidosis were the main diseases diagnosed. Brushings showed a sensitivity of 88.2% and a specificity of 98.9% for the diagnosis of neoplasms. On the other hand, washings had only a 34.9% sensitivity and a 98.6% specificity in diagnosing neoplastic disorders. We concluded that FOB is a safe and effective tool in the diagnostic work-up of suspected malignancies and neoplastic lung diseases.

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Key words: Fiberoptic bronchoscopy, Bronchial washings, Bronchial brushings, Transbronchial lung biopsy.

INTRODUCTION

Lung may be involved in inflammatory infections, congenital or neoplastic disease and are also affected in systemic diseases and disorders. In 1965, the advent of flexible fiberoptic bronchoscope revolutionised the practice of pulmonary medicine. It offers a convenient modality to take biopsy specimens and respiratory tract specimens with high yield and low and acceptable results. The diagnostic yield of flexible fiberoptic bronchoscope is determined by the indication for its use and the skills of endoscopist as well as the pathologist.¹ This study evaluated the utility of bronchial brushings and washings obtained by FOB in establishing the diagnosis in pulmonary diseases and also examine the concordance between bronchial biopsy and cytology specimens obtained during the same bronchoscopic procedure.

MATERIAL AND METHODS

This was a retrospective study of all bronchial and transbronchial lung biopsies performed over a period of five years, from 2003 to 2008 in out-patients and in-patients settings of Dayanand Medical College and Hospital, Ludhiana (Punjab).

Patient's history, observations on physical examination and relevant investigations were noted. Fiberoptic bronchoscopy was carried out using either an Olympus OF2T10 or a Fuginon BR4-YL2 bronchoscope. Endobronchial and transbronchial lung biopsies were taken. Endobronchial brushings and washings were also obtained in some cases. The biopsy specimens were fixed in formalin and Haematoxylin-Eosin stained sections were examined. Special stains including Ziehl-Neelsen, Periodic acid-Schiff (PAS), reticulin, etc were done wherever required. The brushing smears were stained with May-Grunwald Geimsa and Haematoxylin-Eosin stains. The washings were cyto-centrifuged and the sediment was used for cytology. Two pathologists evaluated the slides separately.

RESULTS

The present series consisted of 250 patients; 77 (30.8%) females and 173 (69.2%) males. Brushings were obtained in 140 (56%) cases and washings in 115 (46%) of these cases. The age of the patients varied from 10 years to 90 years, with the majority over 40 years. The majority of patients presented with complaints of cough with expectoration, haemoptysis, fever and breathlessness. A few of them complained

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of weight loss, loss of appetite, hoarseness of voice, chest pain and pleural effusion. One patient had iridocyclitis also. The most frequent radiological findings included tumour mass, lung collapse, consolidation, pneumonitis and mediastinal widening. A suspicion of malignancy was the indication in 100 (40.4%) cases while inflammatory and interstitial lung diseases were the clinical diagnosis in the rest.

The bronchoscopic findings in these patients included presence of a growth (22%), unhealthy mucosa (29%), congestion (28%) and stenosis in 1% cases. Normal mucosa and lung was visualised in 21% cases. Adequate tissue (sufficient for processing) was obtained in 242 (97%) cases.

On histological examination, the cases were broadly classified as being neoplastic (64, 26%) and non-neoplastic (146, 59%) (Table).

Table. Histological diagnosis

Diagnosis	Number of Cases (%)
Neoplastic	64 (26%)
Non-small cell carcinoma	60
Small cell carcinoma	03
Metastases	01
Non-neoplastic	146 (59%)
Granulomatous diseases	76
Inflammatory diseases	38
Interstitial lung diseases	32
No specific pathology	32 (13%)
Inadequate tissue	08 (2%)

In the neoplastic category, non-small cell carcinoma accounted for majority of the tumours which further subtyped wherever possible. Squamous cell carcinoma accounted for 36 cases (Figure 1) and 10 cases were diagnosed as adenocarcinoma. Further subtyping could not be done in 14 cases. There were three cases of small cell carcinoma (Figure 2).

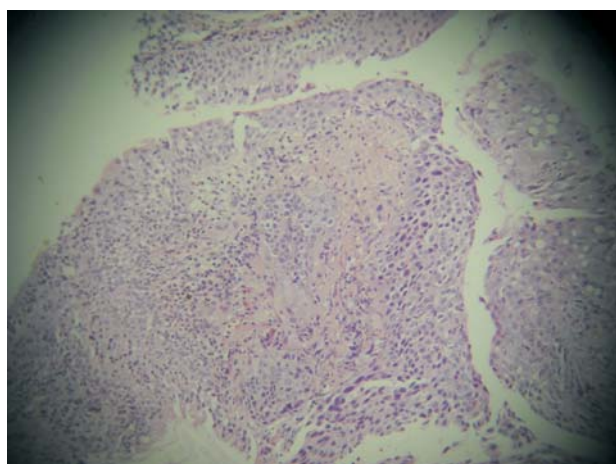


Figure 1. Photomicrograph of bronchial biopsy showing squamous cell carcinoma (Haematoxylin-Eosin x40).

Bronchoscopic examination revealed a mass lesion in 55 (86%) of these patients. The rest had unhealthy mucosa; while one patient had stenosis.

Brushings were obtained in 51 cases of suspected carcinoma and washings in 43 cases. Brushings showed the presence of malignant cells in 45 cases with a sensitivity of 88.2% and a specificity of 98.8%. The positive predictive value was 97.8% while the negative predictive value was 93.6%. Forty of these subtyped into small or non-small cell category. Any further subtyping was not done on cytology. On the other hand, washings were positive for tumour cells in only 15 cases with a sensitivity of only 34.9% and a specificity of 98.6%. Positive predictive value was 93.8% while negative predictive value was 71.7%. Hence, the results were not very encouraging.

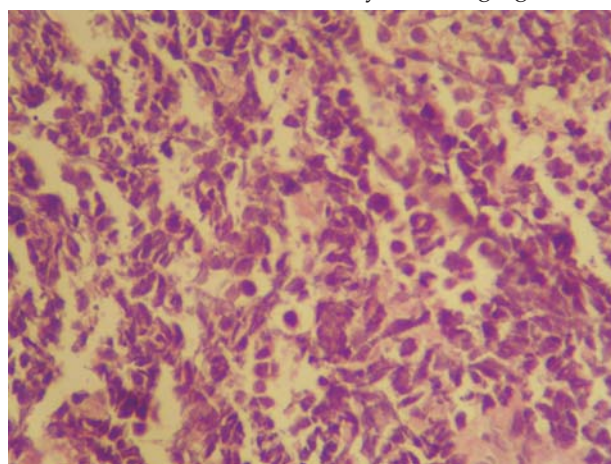


Figure 2. Photomicrograph of bronchial biopsy showing small cell carcinoma (Haematoxylin-Eosin x400).

Out of the 146 patients in the non-neoplastic category, granulomatous diseases formed the majority (76 cases) (Figure 3). Based on the presence of caseation necrosis, acid-fast bacilli and reticulin stains, tuberculosis was diagnosed in 36 patients and sarcoidosis in 22 cases. Further typing of 18 cases could not be done.

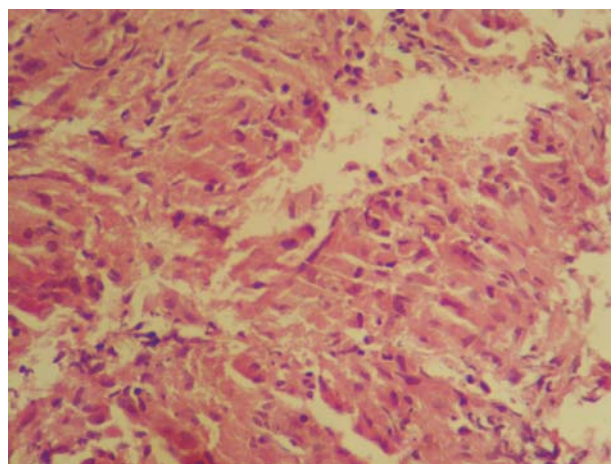


Figure 3. Photomicrograph of bronchial biopsy showing epithelioid cell granuloma (Haematoxylin-Eosin x400).

In the inflammatory group of 38 cases, three were diagnosed infection with *Aspergillus* (Figure 4). The branching fungal hyphae were seen within the areas of necrosis. The remaining had a non-specific acute and inflammatory infiltrate. Thirty-two patients had interstitial lung diseases in which thickening of the alveolar septae along with proliferation of pneumocytes and infiltration by inflammatory cells was identified. Out of the 146 cases of non-neoplastic category, brushings were obtained in 97 cases and washings in 72 cases. The bronchial brushings showed the presence of granulomas in only four cases. In others, there was no remarkable cytological observations. Pneumothorax occurred in five (2%) cases while minor bleeding was observed in three cases. Overall complication rate was 3.2%.

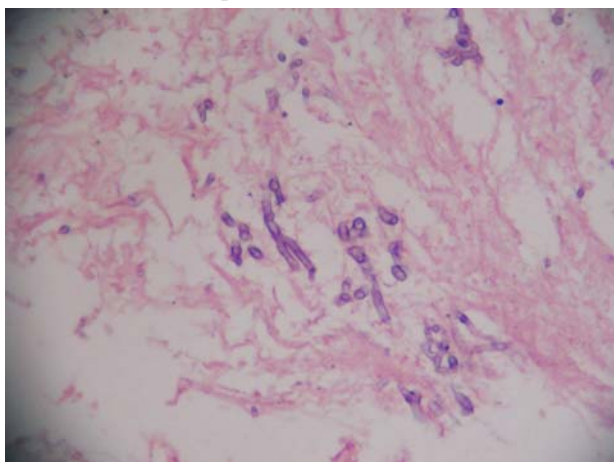


Figure 4. Photomicrograph showing fungal hyphae of *Aspergillus* within the area of necrosis (Periodic acid-Schiffx400).

DISCUSSION

In the present series, a suspicion of malignancy was the commonest indication for FOB. In another similar study performed by Jindal *et al*,³ the pre-bronchoscopic diagnosis was bronchogenic carcinoma in majority of their cases.

In our study, adequate tissue, sufficient for reporting, was obtained in 242 (97%) cases. These findings are in concordance with a study performed by Hansen *et al*⁴ in which adequate tissue was obtained in 93% cases which substantiates the fact that with FOB an adequate tissue can be attained and a diagnosis can be established in majority of the cases. The complication, pneumothorax and minor bleeding, were infrequent occurring in only 3.2% cases. A similar complication rate was noted by Prasoon *et al*.⁵

On histopathological analysis, non-neoplastic lesions constituted the majority. In other studies, Hansen *et al*⁴ reported 31% cases of neoplastic category and 62% as non-neoplastic, Abdul Aziz *et al*² found 28% neoplasms and 72% cases were non-neoplastic disease. Among the neoplasms, squamous

cell carcinoma was the commonest tumour. In the series of Faber *et al*⁶ neoplastic lesions accounted for 31% cases with squamous cell carcinoma being the commonest tumour. Bronchoscopic examination revealed a mass in 55 (86%) patients, while the rest had unhealthy mucosa or stenosis. Pande *et al*⁸ in their study found a mass lesion on bronchoscopy in 82% of the cases. We found a high diagnostic yield with brushing specimen with positive and negative predictive values exceeding 90%. Melanie *et al*⁹ reported a concordance rate of 97% between bronchial biopsy and brushings. Hansen *et al*⁴ reported a positivity of 91% by brushings while Matsuda *et al*¹⁰ also gave results similar to our study. On the contrary, washings were found to have a sensitivity of only 34.9% though the specificity was 98.6%. Thus, negative washing results are not reliable to rule out malignancy. Hadfield *et al*¹¹ too concluded that washings alone are not useful in diagnoses of lung diseases but when positive can give a fairly reliable diagnosis of malignancy.

Three cases of *Aspergillus* infection were also diagnosed, all in immunocompromised patients. The biopsies of all these three cases showed large areas of necrosis. Gupta *et al*¹² reported granulomatous diseases in 33% cases followed by interstitial lung disease in 28% cases and non-specific inflammation in 25% cases. Kalra *et al*¹³ in their study of parenchymal lung diseases diagnosed interstitial fibrosis in 76% cases and granulomatous lesions in 32% cases, similar to our study. In the suspected non-neoplastic group brushings and washings were not found useful. This was also documented by the American Thoracic Society.¹⁴

In the non-neoplastic category, tuberculosis and sarcoidosis were the commonest granulomatous lesions diagnosed by FOB. In the interstitial lung diseases, on the other hand, the transbronchial biopsy was not found to be useful in the diagnosis of any specific entity. A large proportion of biopsies had non-specific inflammation or insufficient tissue.

CONCLUSIONS

We conclude that fiberoptic bronchoscopy can be successfully employed for the diagnosis of lung diseases, including malignancies and granulomatous lesions. Bronchial brushings can very reliably diagnose neoplastic diseases. On the other hand, washings have a very limited role in the diagnosis of lung disorders.

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