



Original Research Article

Comparison of safety, efficacy and diagnostic value of bronchoalveolar lavage, brush cytology vs endobronchial lung biopsy in lung masses

Akhilesh Tiwari^{1,*}, J K Mishra¹, G N Srivastava¹, Amrita Ghosh Kar², Deepak Shah¹

¹Dept. of TB & Respiratory Diseases, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

²Dept. of Pathology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India



ARTICLE INFO

Article history:

Received 15-03-2021

Accepted 20-03-2021

Available online 30-04-2021

Keywords:

BAL (bronchoalveolar lavage)

Bronchial washing

Bronchial biopsy

Fiberoptic bronchoscopy

ABSTRACT

Introduction: FOB (Fiberoptic bronchoscopy) has a great scope for diagnosis as well as therapy of various pulmonary disorders. Bronchial washings and brushings have been commonly preferred along with bronchoalveolar lavage (BAL) fluid cytology in lung masses.

Objective: To study sensitivity, specificity, safety of bronchoalveolar lavage, Brush cytology vs endobronchial biopsy.

Materials and Methods: This prospective intervention based Cross sectional study was conducted among patients attending respiratory OPD at Sir Sunder Lal Hospital, BHU, Varanasi, with suspicion of lung Mass (70 cases).

Results: Combined study of BAL, Brush cytology is as good as Bronchial biopsy in same patients simultaneously for diagnosing lung masses into malignant and non-malignant.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

1. Introduction

Fiberoptic bronchoscopy (FOB) is widely used in diagnostic evaluation for toilet of the tracheobronchial tree. Fiberoptic bronchoscopy (FOB) is an important entry in the armamentarium of procedures listed in management of respiratory problems. It is a simple and a safe procedure. Bronchoscopic materials are commonly subjected to cytological evaluation whenever there is a suspicion of malignancy. Radiological evidence of a mass and direct visualization of the lesion through a bronchoscope are not definitive evidence of malignancy.

However bronchial washings and brushings have been commonly preferred. Bronchoalveolar lavage (BAL) fluid cytology has the potential to provide sensitive & specific means to diagnose patients & may provide relevant information about the disease. Lung Mass and Pulmonary Nodule should be characterised on the basis of number, size and density as determined by CT scan. A solitary pulmonary

nodule is defined as single discrete pulmonary opacity, surrounded by normal lung tissue, that is not associated with adenopathy or atelectasis. Lesion >3 cm are almost always malignant. So current convention is that solitary pulmonary nodule must be 3 cm or less in diameter. If lesion are >3 cm it refers to as Lung mass and should be managed with the understanding that they are most likely malignant; Prompt diagnosis and resection is usually advisable.¹

2. Materials and Methods

This prospective intervention based cross-sectional study was conducted among patients attending respiratory OPD at Sir Sunder Lal Hospital, BHU, Varanasi, with suspicion of lung mass (70 cases) which were chosen on the basis of history, physical examination, Chest X-Ray and computed tomography of chest, from October 2018 – July 2020. Adults more than 40 year without any sex specifications with suspected Lung mass were included in the study.

* Corresponding author.

E-mail address: kaushik.kaushik777@gmail.com (A. Tiwari).

2.1. Inclusion criteria

1. Patient with undiagnosed lung mass on the basis of history, examination, chest X-ray and CT scan of chest.

2.2. Exclusion criteria

1. Hemodynamically unstable patients and uncooperative patient.
2. Uncontrolled cardiac arrhythmia, severe pulmonary hypertension.

The instrument used was fibre optic bronchoscope, OLYMPUS BF TYPE 1T150. Accessories used were forceps for biopsy, 1.3 mm nylon brush mounted on a steel guide wire for taking brushings. Investigations included screening for HIV and HbsAg, ECG, X- Ray chest and CT thorax. Patients were taken up for the procedure after overnight fasting. Lavage samples were all sent in normal saline except cytology was sent in 10% formalin.

3. Observation and Results

The study group consisted of 70 cases, in which all are diagnosed as Lung mass on CT scan, over a study period of 3 years. All three techniques (Bronchoalveolar lavage, Bronchial brush cytology, Bronchial biopsy) were used simultaneously in all patients under study. The most of the patients with lung mass, 31 (44.2%) in this study were in 54-74 age group. Mean age of patients having lung mass was 58.83 In the study. Among all lung mass cases male sex predominance seen by 1.59:1. In my study 43 (61.4%) males and 27 (38.6%) were females.

In comparison between bronchoalveolar lavage cytology findings and histopathological diagnosis showed that, 5 (7.1%) Positive, 9 (12.9%) Suspicious/Atypical, and 56 (80%) negative for malignancy diagnosed. I had included both (positive and Suspicious/Atypical) as Malignancy, because it came as malignant in both Brush Cytology and Bronchial biopsy. So, out of 70 Lung mass cases 14 (20%) malignant and 80 (56%) non-malignant in Table 1.

Brush cytology and BAL are less Invasive and safe than Bronchial biopsy. In study group, via Brush cytology, 15 (21%) Squamous cell carcinoma, 9 (12.9%) Adenocarcinoma, 6 (8.6%) Small cell carcinoma, 27 (38.6%) non-malignant, and 13 (18.5%) were Inconclusive. On other hand, Bronchial biopsy showed, 29 (41.4%) Squamous cell carcinoma, 14 (20%) Adenocarcinoma, 5 (7.2%) Small cell carcinoma, 14 (20%) non-malignant, and 8 (11.4%) Inconclusive. In both procedures Squamous cell carcinoma is more common than others, and false negative value of Brush cytology also minimised by Bronchial biopsy. Isolated value of Brush cytology is less than Bronchial biopsy, it should combine simultaneously with BAL cytology in same case Table 2. On applying chi square test, the difference was statically significant amongst all the

groups p value < 0.05, <0.01 and <0.01 respectively.

4. Discussion

In all Lung mass cases, we have done BAL, Bronchial brushings and Bronchial biopsy procedures in every patients. Then differentiated into Malignant lesion 48 (68.6%), non malignant 14 (20%), and Inconclusive 8 (11.4%). The sensitivity of BAL in various other studies from literature varies from 21% to 78%.² My results fall within this range (Table 1). This reported a wide range of sensitivity may be due to difference in case selection. BAL sensitivity and its accuracy haveily depends on site and multiple attempts by which it has taken.

In my study Bronchial Washing and Bronchial Brush cytology gave heigher sensitivity of 52.94% the BAL fluid analysis and cytology. Since cytological yield by BAL technique relies mainly on cells 'exfoliated' in the bronchial epithelium from the malignant lesion, the adequacy of its samples depends on several important factors, especially (a) The degree of differentiation of malignant growth. (b) Preservation of the morphology of cytological material obtained. (c) Technical skill of the pulmonologist who is retrieving the lavage fluid from the bronchus.

In general, poorly differentiated, anaplastic lesions have more discohesive cells in to well differentiated lesions.³ Thus, such lesions exfoliate larger number of cells into the bronchial cavity than the well differentiated lesions, therefore giving a better yield. Also, these exfoliated cells start developing degenerative changes while they are lying in the bronchus, thus losing their morphological details which are important in differentiating them from non-malignant cells shed off by the normal bronchial epithelial lining.^{4,5} diagnostic yield. Although the sensitivity of BAL was low 21.57% compared to other techniques, but it is still very useful technique as it is least invasive and with multiple sampling the yield can be improved.²

Like BAL, there is a wide range of sensitivity of Bronchial brush cytology and washings varying from 21% to 93% (Table 3).² Bronchial brush cytology and washing have better sensitivity 52.94% in my study, because of technique the surface of the suspicious lesion is scraped by the help of a brush passed in through the bronchoscope, therefore managing to 'dislodge' the cells from the surface of those well differentiated malignant lesions too, which do not exfoliate cells readily, therefore giving a better yield than BAL and thereby giving less false negative. This technique not only manages to give better cellular yield, but, it also preserves the morphological details of cells better. In my study, the sensitivity, specificity and accuracy of BAL samples were 21.57%, 74.21%, and 76% respectively (Table 3).⁶ Gaur DS et al., reported sensitivity of 39.40%; while⁷ Sareen R et al., reported a sensitivity as high as 72.69% for BAL. Studies have shown that increasing the number of attempts at obtaining BAL sampling can

Table 1: Comparison of cytological finding of BALF (BAL fluid) with histopathological type in lung mass cases

Histopathological Type	Positive (%)	Suspicious / Atypical (%)	Negative (%)	Total
Squamous Cell	2	6	21	29
Adenocarcinoma	3	3	8	14
Small Cell Ca	0	0	5	5
Others	0	0	14	14
Inconclusive	0	0	8	8
Total	5 (7.1)	9 (12.9)	56 (80)	70

Table 2: Comparison of histopathological type in brush cytology and bronchial biopsy in lung mass cases

Histopathological Type	Brush Cytology (%)	Bronchial Biopsy (%)
Squamous cell carcinoma	15 (21.4)	29 (41.4)
Adenocarcinoma	9 (12.9)	14 (20)
Small cell carcinoma	6 (8.6)	5 (7.2)
Others	27 (38.6)	14 (20)
Inconclusive	13 (18.5)	8 (11.4)
Total Cases	70 (100)	70 (100)

Table 3: Comparison of indices of BAL, brush cytology and bronchial biopsy

Indices	BAL	Brush cytology	Bronchial Biopsy
Sensitivity	21.57%	52.94%	76.55%
Specificity	74.21%	84.21%	96.25%
Positive Predictive Value	78.57%	87%	91.29%
Negative Predictive Value	40%	64.23%	82%
Efficacy	43.57%	69.28%	78.42%
Accuracy	76%	84%	89.86%

improve its sensitivity, specificity and accuracy. In all cases, Bronchial biopsy done, after taking BAL, brush cytology and washing. It was more helpful into categorisation of different pathologic type of lung cancers. Its accuracy, efficacy are higher due to multiple attempts and tissue biopsy analysis. In my study its sensitivity, specificity, accuracy were 76.55%, 96.25%, and 89.86%. It was very much reliable with various studies.

5. Conclusion

In our country, there is an enormous burden of TB in the general population, that's why is a great risk of missing the diagnosis of cancer; therefore, it is prudent to use BAL cytology, Brush cytology techniques which are affordable, quick, and reliable for the screening of suspected cases. In this study it was found that BAL fluid, bronchial brush cytology and bronchial biopsy are effective in diagnosing lung malignancy and non malignancy in pulmonary masses. Combined study of BAL, Brush cytology is, as good as bronchial biopsy in same patients simultaneously for diagnosing lung masses into malignant and non-malignant. It also proved efficient in identifying the cytological pattern of various lung carcinomas in bronchial brush cytology and bronchial biopsy.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

References

1. Fishman's pulmonary diseases and disorders. 5th ed.;
2. Chopra SK, Genovesi MG, Simmons DH, Gothe B. Fiberoptic bronchoscopy in the diagnosis of lung cancer : comparison of pre-and post-bronchoscopy sputa, washing, brushing and biopsies. *Acta Cytol.* 1977;21:524–7.
3. Husain AN. The lung. In: Kumar V, Abbas AK, Fausto N, editors. Robbins and Cotran pathologic basis of disease. India: Saunders; 2004. p. 711.
4. Johnston WW, Elson CE. Respiratory tract. In: Bibbo M, editor. Comprehensive cytopathology. Philadelphia: W.B. Saunders Company; 1997. p. 325–401.
5. Truong LD, Underwood RD, Greenberg SD, McLarty JW. Diagnosis and typing of lung carcinomas by cytopathologic methods. A review of 108 cases. *Acta Cytol.* 1985;29:64–5.
6. Garg S, Handa U, Mohan H, Janmeja AK. Comparative analysis of various cytohistological techniques in diagnosis of lung diseases. *Diagn Cytopathol.* 2007;35(1):26–31. doi:10.1002/dc.20577.
7. Sareen R, Pandey CL. Lung malignancy: Diagnostic accuracies of bronchoalveolar lavage, bronchial brushing, and fine needle aspiration cytology. *Lung India.* 2016;33(6):635. doi:10.4103/0970-2113.192882.

Author biography

Akhilesh Tiwari, Junior Resident III

J K Mishra, Professor

G N Srivastava, Professor and Head

Amrita Ghosh Kar, Professor

Deepak Shah, Associate Professor

Cite this article: Tiwari A, Mishra JK, Srivastava GN, Kar AG, Shah D. Comparison of safety, efficacy and diagnostic value of bronchoalveolar lavage, brush cytology vs endobronchial lung biopsy in lung masses. *J Community Health Manag* 2021;8(1):20-23.