

ORIGINAL RESEARCH

Comparison of results of bronchoalveolar lavage and transbronchial lung biopsy among patients with pulmonary pathologies

Dr. Shamima

Assistant Professor, Department Of Pathology Institute, Prasad Institute Of Medical Sciences, Banthara, Lucknow, Uttar Pradesh, India

Corresponding Author

Dr. Shamima

Assistant Professor, Department Of Pathology Institute, Prasad Institute Of Medical Sciences, Banthara, Lucknow, Uttar Pradesh, India

Received: 29 September, 2023

Accepted: 04 October, 2023

Abstract

Background: The present study was undertaken for comparing the results of bronchoalveolar lavage and transbronchial lung biopsy.

Materials & methods: 30 specimens of bronchoalveolar lavage submitted for cytological examination and all the specimens of transbronchial lung biopsy submitted for histopathological examination were included in the study. The relevant data of patient was recorded in pre designed performa. The BAL fluid was collected in containers that didn't promoted cell adherence to container surfaces. A minimal volume of 5 ml of a pooled BAL sample was needed for BAL cellular analysis. Three micron thick paraffin sections were cut and stained with Hematoxylin and Eosin (H&E) stain. The slides were then subjected to histopathological examination under both low power (10x) and high power (40x).

Results: Malignant pathologies and non-malignant pathologies were seen in 50 percent of the patients each. Overall sensitivity, specificity and accuracy of BAL in diagnosing malignant pathologies were 72.32%, 88.46% and 79% respectively. Overall sensitivity, specificity and accuracy of BAL in diagnosing non- malignant pathologies were 88.46, 72.32% and 79% respectively.

Conclusion: The diagnosis of neoplastic lesions of the lung is a diagnostic problem for pulmonologists because some malignant lesions mimic infectious or inflammatory conditions. In such a clinical setting, BAL has a relevant role in detecting neoplastic cells or can also rule out malignant lesions.

Key words: Bronchoalveolar lavage, Biopsy, Transbronchial

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution- Non Commercial- Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non- commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Introduction

Developing countries have to bear burden of both communicable and noncommunicable diseases simultaneously. The recent Global Burden of Disease (GBD) survey data have shown that pulmonary diseases are prevalent in substantial number in India. Chronic pulmonary pathologies are of particular importance for having wide variations in morbidity and mortality in various Indian states.¹ BAL is a non-invasive procedure performed with the fiberoptic bronchoscope in a wedge position within the selected bronchopulmonary segment. The examination of cells and solutes from the lower respiratory tract provides valuable information about diagnosis and yield insights into immunologic, inflammatory, and infectious processes taking place at the alveolar level. The cytological analysis of BAL fluid is commonly used in the management of a variety of lung diseases.^{2, 3} BAL is an excellent method of obtaining

specimens to rule out opportunistic infections in immunocompromised individuals. It is important to combine culture results with cytology which may show viral intranuclear or intracytoplasmic inclusion bodies on examination of pulmonary epithelial cells. this may help identify viruses like herpes simplex and CMV. BAL is also very useful for detection of fungi and mycobacteria which may not always be identified in blood. The one big disadvantage of BAL is that many potentially pathogenic microorganism may have colonized the airways in the absence of any clinical disease and hence their recovery may not be meaningful.^{4, 5} Despite the great advancements in non-surgical biopsy, many of the diffuse lung diseases still require open lung biopsy, which remains the diagnostic gold standard. This is particularly true for idiopathic ILD, which requires a larger tissue specimen for pathological diagnosis.⁶ Hence; under the light of above-mentioned data, the present study

was undertaken for comparing the results of bronchoalveolar lavage and transbronchial lung biopsy.

Materials & methods

The present study was undertaken for comparing the results of bronchoalveolar lavage and transbronchial lung biopsy. Thirty specimens of bronchoalveolar lavage submitted for cytological examination and all the specimens of transbronchial lung biopsy submitted for histopathological examination were included in the study. The relevant data of patient was recorded in pre designed performa. The BAL fluid was collected in containers that didn't promoted cell adherence to container surfaces. A minimal volume of 5 ml of a pooled BAL sample was needed for BAL cellular analysis. Transbronchial specimens received from Chest and TB department were fixed in 10% buffered formalin. After fixation the specimen were subjected to gross examination for size and external appearance. Multiple pieces taken and they were processed. Three micron thick paraffin sections were cut and stained with Hematoxylin and Eosin (H&E) stain. The slides were then subjected to histopathological examination

under both low power (10x) and high power (40x). All the results were recorded in Microsoft excel sheet and were analysed.

Results

Mean age of the patients was 55.6 years. 60 percent of the patients were males while the remaining were females. Smoking habit was present in 70 percent of the patients. Diabetes and hypertension was seen in 20 percent and 30 percent of the patients respectively. Malignant pathologies and non-malignant pathologies were seen in 50 percent of the patients each. Among the malignant lesions, adenocarcinoma was seen in 30 percent of the lesions while SCC was present in 20 percent of the pathologies. Among non-malignant lesions, tuberculosis was seen in 40 percent of the lesions while Candida infection was seen in 10 percent of the lesions. Overall sensitivity, specificity and accuracy of BAL in diagnosing malignant pathologies were 72.32%, 88.46% and 79% respectively. Overall sensitivity, specificity and accuracy of BAL in diagnosing non- malignant pathologies were 88.46, 72.32% and 79% respectively.

Table 1: Histopathologic diagnosis on Transbronchial lung biopsy

| Histopathologic diagnosis | | Number of patients | Percentage of patients |
|---------------------------|----------------------------|--------------------|------------------------|
| Malignant | Adenocarcinoma | 9 | 30 |
| | SCC | 6 | 20 |
| | Total | 15 | 50 |
| Non-malignant | Tuberculosis | 12 | 40 |
| | Fungal infection (Candida) | 3 | 10 |
| | Total | 15 | 50 |
| Overall | | 30 | 100 |

Table 2: Accuracy of BAL in relation to malignancy pathologies

| Statistics | Value | 95% CI |
|-------------|---------|--------------------|
| Sensitivity | 72.32 % | 50.12 % to 88.34 % |
| Specificity | 88.46 % | 69.75 % to 98.75 % |
| Accuracy | 79 % | 95.28 % to 89.36 % |

Table 3: Accuracy of BAL in relation to non-malignancy pathologies

| Statistics | Value | 95% CI |
|-------------|---------|--------------------|
| Sensitivity | 88.46 % | 69.75 % to 98.75 % |
| Specificity | 72.32 % | 50.12 % to 88.34 % |
| Accuracy | 79 % | 95.28 % to 89.36 % |

Discussion

Considerable progress has been made during the past 10 years in understanding the clinico-pathologic similarities and differences among the various lung pathologies. Different methods are used to diagnose lung carcinoma including radiology, bronchoscopy, bronchial brushing, Broncho-alveolar lavage cytology and bronchial biopsy. However bronchial biopsy cannot be obtained in all cases, especially in peripheral lungtumors and in patients at risk of hemorrhage. Bronchial lavage was originally developed as therapeutic tool in conditions like

pulmonary proteinosis, cystic fibrosis and intractable asthma. It has gradually emerged and has been accepted as a tool for diagnosing lung carcinoma. BAL is a non-invasive procedure performed with the fiberoptic bronchoscope in a wedge position within the selected bronchopulmonary segment. The examination of cells and solutes from the lower respiratory tract provides valuable information about diagnosis and yield insights into immunologic, inflammatory, and infectious processes taking place at the alveolar level.^{7- 10}Hence; under the light of above-mentioned data, the present study was undertaken for

comparing the results of bronchoalveolar lavage and transbronchial lung biopsy. In the present study, mean age of the patients was 55.6 years. In a study conducted by Adams TN et al, mean age of the patients was 58.4 years.¹¹ In the current research, 60 percent of the patients were males while the remaining were females. Venkatesh V et al, in their study reported that there were 74 percent males and 26 percent females.¹² Smoking habit was present in 70 percent of the patients. Diabetes and hypertension was seen in 20 percent and 30 percent of the patients respectively. In a study conducted by Adams TN et al 42% of the patients were smokers. The prevalence of smoking was 35.9% in the study conducted by Sareen et al.^{12, 13}

In the present study, malignant pathologies and non-malignant pathologies were seen in 50 percent of the patients each. Among the malignant lesions, adenocarcinoma was seen in 30 percent of the lesions while SCC was present in 20 percent of the pathologies. Among non-malignant lesions, tuberculosis was seen in 40 percent of the lesions while Candida infection was seen in 10 percent of the lesions. In a study conducted by Poletti Vet al, 66.81 percent of the pulmonary pathologies were malignant while the remaining 33.19 percent were non-malignant. Gaur et al, in another study, reported that 36.2 percent of the lung pathologies were malignant in nature while the remaining 73.8 percent were non-malignant. In their study, 10.7 percent of the patients were diagnosed with tuberculosis.^{14, 15} In another study conducted by Radha et al, out of the 91 cases four were inadequate. They diagnosed tuberculosis in 22 cases, malignancy in 13 cases, fungal infection in 7 cases and 38 bacterial infections. Accurate diagnosis was not possible in 7 cases. Out of 13 malignancies four were adenocarcinomas, five squamous cell carcinomas two small cell carcinomas and two poorly differentiated carcinomas. There were seven fungal lesions; 4 cases had candida, two of these also had coexisting AFB. Aspergillosis in two, one was pneumocystis carinii infection.³ In the present study, overall sensitivity, specificity and accuracy of BAL in diagnosing malignant pathologies were 72.32%, 88.46% and 79% respectively. Overall sensitivity, specificity and accuracy of BAL in diagnosing non-malignant pathologies were 88.46%, 72.32% and 79% respectively. Bronchoalveolar lavage only is diagnostic of a specific disease only in a small minority of illnesses. Though characteristic cell patterns can be found in many cases of various interstitial lung disorders, overlapping between different diseases exists. Recent reports have shown that standardization of BAL procedures and the assessment of normal values for differential cell counts are still largely unsolved problems. But since absolute cell counts have been shown to be of only limited value in clinical use without exact standardization of BAL sampling and processing and vary widely even in healthy subjects differential

counts render sufficient clinical information. Bronchial inflammation may have significant influence on granulocyte counts and makes interpretation of lavage results more difficult. Nevertheless, BAL is of value for interpreting clinical findings and, especially together with transbronchial biopsy, it may give a more complete view of parenchymal inflammation. In some cases, lavage is more sensitive in detecting increased alveolar cellularity and quantitative estimation of inhaled dust particles is easier, due to the greater amount of alveoli reached by BAL (Fend F et al).¹⁶

Conclusion

The diagnosis of neoplastic lesions of the lung is a diagnostic problem for pulmonologists because some malignant lesions mimic infectious or inflammatory conditions. In such a clinical setting, BAL has a relevant role in detecting neoplastic cells or can also rule out malignant lesions.

References

1. Efaled B, Ebang-Atsame G, Rabiou S, et al. The diagnostic value of the bronchoalveolar lavage in interstitial lung diseases. *J Negat Results Biomed*. 2017;16(1):4.
2. Patel PH, Antoine M, Ullah S. Bronchoalveolar Lavage. [Updated 2020 Aug 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK430762/>
3. Radha S, Afroz T, Prasad S, Ravindra N. Diagnostic utility of bronchoalveolar lavage. *J Cytol*. 2014;31(3):136-138.
4. Chaudhry R, Bhimji SS. *Anatomy , Thorax , Lungs*. 2018;1-4.
5. Singh V, Sharma BB. Respiratory disease burden in India: Indian chest society SWORD survey. *Lung India*. 2018;35(6):459-460. doi:10.4103/lungindia.lungindia_399_18
6. Pourabdollah, M., Shamaei, M., Karimi, S., Karimi, M., Kiani, A., & Jabbari, H. R. Transbronchial lung biopsy: the pathologist's point of view. *The Clinical Respiratory Journal*. 2014; 10(2): 211-216.
7. Ikeda S. Flexible bronchofiberscope. *Ann Otol Rhinol Laryngol* 1970; 79:916-9.
8. Smiddy JF, Ruth WE, Kerby GR, Renz LE, Raucher C. Flexible fiberoptic bronchoscope (letter). *Ann Intern Med* 1971; 75:971.
9. Sackner MA, Wanner A, Landa J. Applications of bronchofiberscopy. *Chest* 1972; 62(Suppl:70-8)
10. Cantrell ET, Warr GA, Busbee DL, Martin RR. Induction of aryl hydrocarbon hydroxylase in human pulmonary alveolar macrophages by cigarette smoking. *J Clin Invest* 1973; 52:1881-4.
11. Adams TN, Batra K, Silhan L, Anand V, Joerns EK, Moore S, Butt YM et al. Utility of Bronchoalveolar Lavage and Transbronchial Biopsy in Patients with Interstitial Lung Disease. *Lung*. 2020; 198: 803-810.
12. Venkatesh V, Bommusamy. Comparative Study of efficacy of Broncho-alveolar lavage, bronchial brush and bronchial biopsy in diagnosis of lung tumours. *Trop J Path Micro* 2018;4(2):215-219.
13. Sareen R, Pandey CL. Lung malignancy: Diagnostic accuracies of bronchoalveolar lavage, bronchial

- brushing, and fine needle aspiration cytology. Lung India. 2016;33(6):635-641.
14. Poletti V, Patelli M , Poggi S , • Bertanti T , Spiga L. , Ferracini R . Transbronchial Lung Biopsy and Bronchoalveolar Lavage in Diagnosis of Diffuse Infiltrative Lung Diseases. Respiration 1988;54:66–72.
 15. Gaur DS, Thapliyal NC, Kishore S, Pathak VP. Efficacy of Broncho-Alveolar Lavage and Bronchial Brush Cytology in Diagnosing Lung Cancers, Journal of Cytology 2007; 24 (2) : 73- 77
 16. Fend F, G Mikuz G, Ott G, Rothmund J. Diagnostic value of combined bronchoalveolar lavage and transbronchial lung biopsy. Pathol Res Pract. 1989 Mar;184(3):312-7.