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ORIGINAL RESEARCH

Assessment of diagnostic accuracy of Bronchoalveolar lavage fluid in diagnosis of lung cancers

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Abstract
Background: Lung cancer is associated with high incidence and high case fatality rate. The present study was conducted to assess diagnostic accuracy of Bronchoalveolar lavage fluid in diagnosis of lung cancers.
Materials & Methods: BAL fluid obtained from 114 patients by lavage of respiratory tract in clinically and radiologically suspected lung lesionswas centrifuged at 3000 rpm for 15 minutes. Four smears were made from the sediment. Two smears were stained with Leishman stain and the other two with Pap stain. The biopsies were stained with H&E stain and the results of BAL were correlated with lung biopsy.
Results: Out of 170 samples, 118 were of males and 52 were of females.BAL fluid revealed SCC in 19, AC in 16, SmCC in 2, PDCC in 3 cases and severe dysplasia in 15 cases. Biopsy revealed SCC in 37, AC in 32, SmCC in 6, PDCC in 3 cases and severe dysplasia in 8 cases. The difference was significant ($P< 0.05$).BAL positive showed lung cancer in 40 cases and BAL negative in 45. Sensitivity was 50%, specificityin 88.9%, positive predictive value in 89% and negative predictive value64%.
Conclusion: BAL fluid analysis provides a rapid, reliable process to detect, subtype malignancies of the lower respiratory tract.
Key words: Bronchoalveolar lavage, Lung cancer, Pap stain

Introduction

Lung cancer is the most common cancer in the world. It is associated with high incidence and high case fatality rate. Lung cancer is estimated to be accounting for around 15% of newly detected cancers in India, more commonly in males, majorly attributed to smoking. There is increasing incidence of adenocarcinomas of lung in recent years.[1]
Bronchoalveolar lavage (BAL) fluid analysis helps in early detection, rapid diagnosis and treatment of lung cancer as the therapy is based on subtyping.[2]When BAL was initially developed as a tool to sample respiratory secretions in animal models of lung disease and subsequently adapted as a clinical tool to study interstitial lung disease (ILD), it was perceived as holding considerable promise for the diagnosis and management of various forms of ILD, such as sarcoidosis, idiopathic pulmonary fibrosis (IPF) and hypersensitivity pneumonitis (HP).[3]
BAL is now routinely used as a tool to diagnose respiratory infections, evaluate patients with acute respiratory failure or evidence of diffuse parenchymal lung diseases, and monitor the

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status of transplanted lung allografts.[4]Diagnostic and prognostic markers can be used on BAL fluids that speed up the diagnosis. BAL specimens may also be used formolecular analyses in the search for diagnostic or prognostic markers. The sensitivity of BAL is similar to transbronchial FNAC. BAL analysis has thus low morbidity and high diagnostic value.[5]The present study was conducted to assess diagnostic accuracy of Bronchoalveolar lavage fluid in diagnosis oflung cancers.

Materials & Methods

The present study involved analysis of BAL fluid obtained from 114 patients by lavage of respiratory tract in clinically and radiologically suspected lung lesions. The consent was obtained from all enrolled patients.

Data such as name, age, gender etc. was recorded. The BAL fluid was centrifuged at 3000 rpm for 15 minutes. Four smears were made from the sediment. Two smears were stained with Leishman stain and the other two with Pap stain. The biopsies were stained with H&E stain and the results of BAL were correlated with lung biopsy.Data thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table I Distribution of patients

Total- 170		
Gender	**Males**	**Females**
Number	118	52

Table I shows thatout of 170 samples, 118 were of males and 52 were of females.

Table II Diagnosis of lung cancer by BAL fluid analysis and biopsy

Lung cancer	BAL fluid	Biopsy	P value
SCC	19	37	0.01
AC	16	32	0.05
SmCC	2	6	0.04
PDCC	3	3	1
Severe dysplasia	15	8	0.05

Table II shows that BAL fluid revealed SCC in 19, AC in 16, SmCC in 2, PDCC in 3 cases and severe dysplasia in 15 cases. Biopsy revealed SCC in 37, AC in 32, SmCC in 6, PDCC in 3 cases and severe dysplasia in 8 cases. The difference was significant ($P< 0.05$).

Table III Analysis of BAL fluid

Outcome	Lung cancer present	Lung cancer absent	Total
BAL positive	40	5	45
BAL negative	45	80	125
Total	85	85	170

Table III shows BAL positive showed lung cancer in 40 cases and BAL negative in 45.

Table IV Accuracy of BAL

Accuracy	Percentage
Sensitivity	50%
Specificity	88.9%
Positive predictive value	89%
Negative predictive value	64%

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Table IV shows that sensitivity was 50%, specificity in 88.9%, positive predictive value in 89% and negative predictive value64%.

Discussion

Bronchoalveolar lavage (BAL) has gained widespread acceptance as a procedure that can be performed safely to retrieve respiratory secretions for the examination of cellular and acellular components for both diagnostic and research purposes.[6,7]In the early years following its introduction into clinical practice, bronchoscopy with BAL was perceived to hold great potential for diagnosis and management of ILD.[8] It eventually became clear, however, that although BAL nucleated immune cell patterns often had characteristics that were highly consistent with various forms of ILD, such as sarcoidosis, BAL cell counts and differentials, lymphocyte subsets, or soluble components could not be relied upon to make a confident diagnosis for many specific forms of ILD if used as a standalone diagnostic test.[9]The present study was conducted to assess diagnostic accuracy of Bronchoalveolar lavage fluid in diagnosis oflung cancers.

We found that out of 170 samples, 118 were of males and 52 were of females.Medha et al[10]aimed to detect diagnostic accuracy of BAL fluid analysis in detection of lung cancers. Out of 169 BAL fluids received, 38 (22.4%) were positive for malignancy. Squamous cell carcinoma was the most common cancer. BAL was reported falsely negative for malignancy in 49 cases (56.7%) proved by lung biopsy. BAL was reported falsely negative for malignancy in 49 cases (56.7%) proved by lung biopsy. One false positive case was noted. The sensitivity of BAL was 43% and specificity of BAL was 98.8%. The positive predictive value of BAL in the diagnosis of lung cancers was 97.36%. The negative predictive value of BAL in the diagnosis of lung cancers was 62.59%.The diagnostic accuracy of BAL was 70.4%.

We found that BAL fluid revealed SCC in 19, AC in 16, SmCC in 2, PDCC in 3 cases and severe dysplasia in 15 cases. Biopsy revealed SCC in 37, AC in 32, SmCC in 6, PDCC in 3 cases and severe dysplasia in 8 cases. Linder et al[11]assessed the utility of bronchoalveolar lavage as a technique for diagnosing lung cancer, 850 lavages from 421 patients were reviewed. Biopsy-proven lung carcinoma was present in 35 cases. Of these, 24 (68.6%) had cells diagnostic of malignancy on cytologic preparations of the bronchoalveolar lavage fluid. Agreement between cancer subtypes determined by lavage and by tissue biopsy was 79.1%; variation usually occurred between large cell undifferentiated carcinoma and adenocarcinoma, not with small cell anaplastic carcinoma. The subtype of tumors was most accurately determined by examination of Papanicolaou-stained slides. Reactive bronchial epithelium often mimicked carcinoma, but could be correctly identified by its characteristic cytomorphology. No false-positive diagnoses of lung cancer occurred in 386 patients. The sensitivity of bronchoalveolar lavage for the diagnosis of lung carcinoma is similar to that of transbronchial biopsy and Wang needle biopsy. Because bronchoalveolar lavage may detect opportunistic infections, interstitial lung diseases and malignant cells with a low morbidity, it is a useful tool to assess patients with pulmonary infiltrates.

We found that BAL positive showed lung cancer in 40 cases and BAL negative in 45. We found that sensitivity was 50%, specificity in 88.9%, positive predictive value in 89% and negative predictive value64%. Wongsurakiat et al[12]evaluated the value of bronchoalveolar lavage (BAL) and post-bronchoscopic sputum cytology in diagnosing peripheral lung cancer. The sequence of procedures in all cases was BAL and transbronchial forceps biopsy. The final diagnosis of these patients were primary lung cancer in 30 patients, metatastic lung cancer in five and benign diseases in 20. In the primary lung cancer group, BAL was positive for malignant cells in 14 of the 30 patients (46.7%). In seven (50%) of these patients, the cell type diagnosed by BAL agreed with the final diagnosis. The diagnostic yield of BAL was

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influenced by the size and segmental location of the lesion. Bronchoalveolar lavage provided a higher diagnostic yield (46.7%) than transbronchial biopsy (16.7%). In five patients with metastatic lung cancer and 20 patients with benign disease, BAL gave negative results in all. Post-bronchoscopic sputum cytology was positive in only two of the 26 patients (7.7%) from whom samples could be obtained. Bronchoalveolar lavage cytology proved to be a valuable diagnostic tool in detecting peripheral, primary lung cancer. Post-bronchoscopic sputum cytology provided no significant additional information.
The limitation the study is small sample size.

Conclusion

Authors found that BAL fluid analysis provides a rapid, reliable process to detect, subtype malignancies of the lower respiratory tract.

References

1. Koss, Leopold G, Melamed, Myron R. Koss' Diagnostic Cytology and Its Histopathologic Bases, 5th ed. Lippincott, Williams and Wilkins, 2006: 646.
2. Tockman MS, Mulshine JL, Piantadosi S, et al. Prospective detection of preclinical lung cancer: Results from two studies of heterogeneous nuclear ribonucleoprotein A2/B1 overexpression. Clin Cancer Res 1997; 3:2237-46.
3. Pirozynski M. Bronchoalveolar lavage in the diagnosis of peripheral, primary lung cancer. Chest. 1992 Aug; 102 (2): 372-4.
4. De Gracia J, Bravo C, Miravitlles M, Tallada N, Orriols R, Bellmunt J, Vendrell M, Morell F. Diagnostic value of bronchoalveolar lavage in peripheral lung cancer. American Review of Respiratory Disease. 1993 Mar 1; 147 (3): 649.
5. Ferlay, J., Soerjomataram, I., Dikshit, R., Eser, S., Mathers, C., Rebelo, M., et al. Cancer incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012. Int. J. Cancer, 136 (5): E359 – E86.
6. Behera D, Balamugesh T. Lung cancer in India. Indian J Chest Dis Allied Sci. 2004 Oct-Dec;46(4): 269-81.
7. Murray N, Coy P, Pater JL, Hodson I, Arnold A, Zee BC, Payne D, Kostashuk EC, Evans WK, Dixon P, et al. Importance of timing for thoracic irradiation in the combined modality treatment of limited-stage small-cell lung cancer. The National Cancer Institute of Canada Clinical Trials Group. J Clin Oncol. 1993 Feb;11 (2): 336-44.
8. Molina JR, Yang P, Cassivi SD, Schild SE, Adjei AA. Non-small cell lung cancer: epidemiology, risk factors, treatment, and survivorship. InMayo Clinic Proceedings 2008. Elsevier. May 3; 83 (5): 584-94.
9. Costabel U, Guzman J. Bronchoalveolar lavage. In: Schwartz MI, King TE Jr, eds. Interstitial Lung Disease. Hamilton, BC Decker, 2003; 114–133.
10. Medha S, Sunil Kumar Y, Shetty K.P, Shetty J. Diagnostic accuracy of Bronchoalveolar lavage fluid in diagnosis of lungcancers in a tertiary care hospital in coastal region of Karnataka. Trop J Path Micro 2017;3(3):322-328.
11. Linder J, Radio SJ, Robbins RA, Ghafouri M, Rennard SI. Bronchoalveolar lavage in the cytologic diagnosis of carcinoma of the lung. Acta Cytol. 1987 Nov-Dec;31(6):796-801.
12. Wongsurakiat P, Wongbunnate S, Dejsomritrutai W, Charoenratanakul S, Tscheikuna J, Youngchaiyud P, Pushpakom R, Maranetra N, Nana A, Chierakul N, Sakiyalak U, Ruengjam C. Diagnostic value of bronchoalveolar lavage and postbronchoscopic sputum cytology in peripheral lung cancer. Respirology. 1998 Jun; 3 (2):131-7.