

Utility of bronchoalveolar lavage in cytology; a study at tertiary care hospital

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ABSTRACT

Background: Numerous case reports have shown the advantage of using bronchoalveolar lavage (BAL) in cytologic diagnosis of primary and secondary malignant neoplasm of the respiratory system. **Aim:** The aim of this study was to determine the usefulness of BAL in the diagnosis of malignant and non malignant lesions of the lower respiratory tract. **Material & Method:** A retrospective analysis of 13 cases of BAL fluid received at cytology department was analyzed for its utility in diagnosing and its usefulness for confirming the diagnosis. **Result:** From 13 cases 3 cases were found to be positive for malignant cells. Male to female ratio was 4:1. Age distribution varied between 18 years to 80 years. **Conclusion:** BAL proved to be a valuable diagnostic tool in detecting malignant and non malignant lesions.

Keywords: BAL, Malignant cells, Lung Malignancy

Introduction

Broncho alveolar lavage (BAL) was introduced into clinical practice in the early 1980s[1]. Broncho alveolar lavage (BAL) is a method to recover a sample of cells that occupy the lining of the airways and alveoli[2]. Cytology of BAL provides useful information on the status of tissues adjacent to airspaces that exude cells into airspaces. The use of cytological methods in the diagnosis of malignant lesions of the respiratory tract has been generally acclaimed as one of its most successful applications[3]. Despite clear evidence that BAL cytology can be used to diagnose various lung diseases, it is under-utilized as a diagnostic tool. Analysis of BAL fluid can lead to the diagnosis of pulmonary infection as well as provide WBC differential cell counts and other findings that can aid in the diagnosis and management of a variety of lung diseases, but the results of BAL analysis must always be interpreted in the context of clinical presentation,

radiographic imaging studies, and other pertinent testing. Our aim was to study and compare the efficacy of very unpopular cytological technique in diagnosing carcinoma of lung by correlating them with histopathological diagnosis by bronchial biopsy. BAL cytology can be used as a diagnostic tool has been highlighted in our study. Our study includes 13 BAL samples which were received at cytology laboratory of Govt. Medical College, Surat in the year 2012. Samples were subjected to processing and staining. Microscopic evaluation was done and their conclusions were reported.

Materials and methods

The samples were obtained by flexible fiber-optic bronchoscopy done by the pulmonologist. Broncho-alveolar lavage samples were received as 20ml aliquots of normal saline in sterile vials. The total fluid received is kept at room temperature and received in laboratory within 1 hr of collection because the cells are not well preserved in the saline solution. Once received BAL is assessed for its physical properties and then it is subjected to processing. In a centrifuge machine BAL fluid is centrifuged at 1500 rpm for 10 minutes and a cell suspension is prepared. Processing is easily and quickly

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accomplished by streaking a cell suspension onto a microscope slide with the aid of a straight edge, typically a second microscope slide. A number of slides are prepared and then they are fixed in methanol by two techniques, i.e. dry fixation (air drying and fixation) and wet fixation. The air dried smears were stained with May-Grunwald Giemsa and the wet fixed slides with Papanicolaou and Hematoxylin & Eosin stains.

To ensure that the obtained material represents the situation in the alveoli (BAL), a number of criteria have been established. A BAL fluid is regarded non-representative if it fulfills one of the following criteria:

- i) volume < 20 ml,
- ii) total cell count < 60,000 cells/ml,
- iii) presence of > 1% squamous epithelial cells,
- iv) presence of > 5% bronchial epithelial cells,
- v) presence of extensive amounts of debris,
- vi) severely damaged cell morphology.

BAL fluid, its appearance, colour, percentages of various cellular components can lead to diagnosis of various lung diseases.

Results

Our study includes 13 BAL samples which were received at cytology laboratory of Govt. Medical College, Surat in the year 2012. Samples were subjected to processing and staining. Microscopic evaluation was done and their conclusions were reported. Majority of BAL fluid samples received from various patients had complained of cough with expectoration. Male to female ratio was 4:1. Age distribution varied between 18 years to 80 years. Out of 13 BAL samples received 3 showed malignant lesions. All 3 samples with malignant cells on cytology were found to have malignant lesion on histopathological evaluation. 9 BAL samples on cytology were reported as malignant cells are not appreciated. Further follow up of these samples was not possible as patients were lost to follow up. For 1 fluid no conclusive opinion could be arrived was reported on cytological evaluation and its further follow up was also not possible.

Discussion

The diagnostic and prognostic utility of BAL was first evaluated in the 1980s. By definition BAL is a method for the recovery of cellular and non-cellular components from the lower respiratory tract (e.g. alveoli)[4]. It is a safe technique, with few major complications[5]. In many cases (e.g. pulmonary proteinosis, alveolar hemorrhage, eosinophilic pneumonia) BAL can replace

lung biopsy[6]. Broncho-alveolar lavage (BAL), which was originally developed as a therapeutic tool for pulmonary conditions like pulmonary alveolar proteinosis, cystic fibrosis and intractable asthma, also has gained acceptance and steady popularity as a tool for diagnosing lung cancer[3,7]. The investigatory technique of BAL has become one of the most valuable research tools for studying inflammatory mechanisms in a wide range of diseases that affect the lungs and airways in humans. In addition, cytological and microbiological testing of BAL samples are of established value for assisting in clinical diagnosis and management of many lung diseases, and these procedures are available routinely [8].

Bronchoalveolar lavage (BAL) represents an additional tool in the assessment of the health status of the lung that can facilitate the diagnosis of various diffuse lung diseases as well as malignant lesions. BAL fluid is competent to provide cells and solutes from the lower respiratory tract. BAL fluid can be analyzed to determine white blood cell (WBC) profiles and to detect respiratory pathogens. Although BAL is seldom useful as a "stand-alone" diagnostic test for the diagnosis of diffuse infiltrative lung disease, when combined with clinical data and high-resolution computed tomography of the chest, BAL WBC profiles can contribute significantly to the diagnosis of specific forms of interstitial lung disease (ILD) and malignant lesions.

The BAL procedure is practically associated with no mortality and carries a low complication rate of 0–2.3%[9-11]. The BAL fluid obtained from healthy, nonsmoking adults without lung disease contains only small percentages of lymphocytes, neutrophils and other inflammatory cells; alveolar macrophages are the predominant cell population (80–90%). Differential cell count in healthy non-smokers have been reported to show macrophages >80%, lymphocytes ≤15%, neutrophils ≤3%, eosinophils ≤0.5%, and mast cells ≤0.5%.¹² A high percentage of epithelial cells (>5%) is indicative of contamination of the alveolar samples by bronchial cells.

Percentage of various cells can give clue to diagnosis of a specific disease. Apart from the cells mentioned above various abnormal cellular components can be present. Malignancy can be diagnosed on the type of cells present. BAL is not as sensitive for solid tumours as biopsy and cytology techniques. Diffuse malignant infiltrates can be reliably diagnosed in 60–90% of cases. The highest yield is seen in widespread malignancies, such as primary bronchoalveolar carcinoma or lymphangitic carcinomatosis due to adenocarcinoma. It can also provide diagnostic cytological material in

haematological malignancies of the lung, including Hodgkin's disease, non-Hodgkin lymphoma, leukaemia, Waldenstrom's macroglobulinaemia, myeloma and mycosis fungoides.[13,14]BAL has achieved the greatest diagnostic value among immunocompromised patients with pulmonary infiltrates. The sensitivity of BAL ranges from 60–90% in the diagnosis of bacterial infections, 70–80% in mycobacterial, fungal and most viral infections, and from 90–95% in *Pneumocystis carinii* pneumonia. The characteristic cysts of *Pneumocystis* can be detected on May-Grunwald-Giemsa stained slides. In cytomegalovirus pneumonia, the characteristic cytomegalic-transformed cell (the owl eye cell) with typical nuclear or cytoplasmic inclusions is highly specific and can be seen on light microscopy in 30–50% of cases. CT scan was done in only 2 patients of all the samples received. BAL Cytology can be useful to diagnose malignant lesions of lung and can give conclusion with certainty that the lesion is not malignant which has been highlighted in our study.

Conclusion

Bronchoalveolar lavage is an easily performed and well tolerated procedure able to provide cellular contents, cellular products, and proteins from the lower respiratory tract. In the rapidly evolving field of pulmonary diagnostic tests, If BAL is properly performed and analyzed, characterization of BAL fluid specimens with the determination of nucleated immune cell patterns, BAL has a specific value for the diagnosis of certain ILD's, such as alveolar proteinosis, *Pneumocystis* pneumonia, bronchoalveolar carcinoma, malignant non-Hodgkin lymphoma and alveolar haemorrhage, allowing surgical lung biopsy to be avoided. Although it provides good diagnostic efficacy, it is under utilized as a diagnostic tool. Before any surgical interventions are undertaken a cytological evaluation of BAL fluid should always be considered. This method is also valid support for research. Genetic and molecular biomarkers, with different diagnostic/prognostic significance, can be detected in BAL.

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