Volume-4, Issue-12, Dec-2015 • ISSN No 2277 - 8160

Research Paper | Medical Science

Diagnostic utility of bronchoalveolar lavage, a study of 373 consecutive cases.

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ABSTRACT

Bronchoalveolar lavage (BAL) is a diagnostic procedure by which cells and other components from bronchial and alveolar spaces are obtained for various studies. One of the main advantages of BAL is that it can be done as a day care procedure. Material obtained by BAL can give a definite diagnosis in conditions such as infections and malignancies.

The aims and objective of this study were to assess the utility of BAL as a diagnostic tool to determine the diagnostic accuracy of the material obtained from BAL in various infections and neoplastic lesions.

This study was done in a multispeciality Hospital, in Siliguri West Bengal. Bronchoscopy was done as an outpatient procedure and lavage fluid obtained was analyzed. This is a prospective study done

from June 2013 to April 2015. 373 BALs were analyzed for total and differential count, microbiological examination and cytological evaluation. Cases selected included nonresolving pneumonias, diffuse lung infiltrates, lung masses, infiltrates in immunosuppressed hosts and ventilator-associated pneumonias.

Though, Tuberculosis & Malignancy were diagnosed in 95 (25.46%) & 64 (12.33%) cases respectively, definite diagnosis was not given in 228 (61.1%) cases. In total 41 cases of bacterial pneumonias were diagnosed, Klebsiella pneumoniae was the most common organism found in this study (31.71%).

Definite diagnosis can be made in tuberculosis, fungal infections, bacterial pneumonias and malignancies.

KEYWORDS : Bronchoalveolar lavage; infections; malignancy.

INTRODUCTION:

Bronchoalveolar lavage (BAL), which is a saline wash of the bronchial tree, readily explores large areas of the alveolar compartment. After its introduction as a research and therapeutic tool in 1970, BAL has been appreciated extensively for clinical applications in the field of opportunistic infections, malignancies and interstitial lung diseases (ILD) [1, 2]. In selected cases, BAL is useful for establishing or ruling out a diagnosis with only a low risk of incorrect diagnosis. Bronchial wash cytology is a widely accepted safe, simple, and minimally invasive technique to evaluate cell morphology[3].

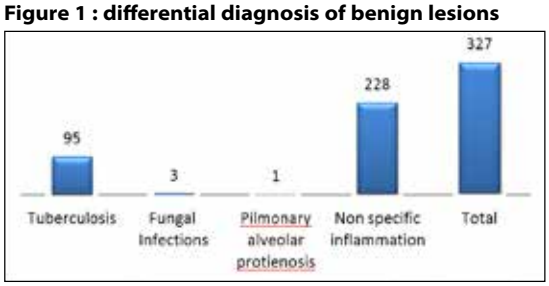
The aim of this study was to evaluate the efficacy of bronchial wash cytology in the diagnosis of bronchopulmonary lesions.

MATERIALS AND METHODS:

BAL was done in patients in whom clinical, radiological and routine laboratory investigations did not yield a definitive diagnosis. Clinical presentation included fever with cough, shortness of breath and chest pain.

BAL was obtained in 373 patients over a period of 23 months (June 2013 to April 2015). The procedure was done under strict sterile conditions with proper barrier precautions, using 5 mm flexible fiber-optic bronchoscope after spraying 10% lignocaine spray locally.

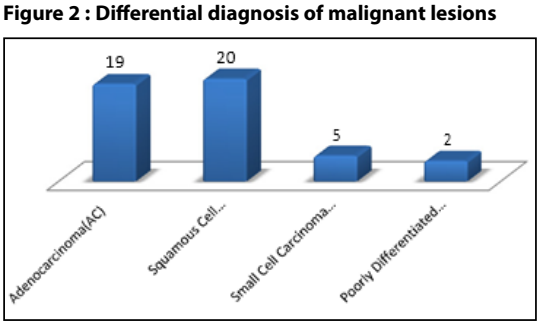
Figure 1 : differential diagnosis of benign lesions



BAL aliquots of 20 mL, 0.9% NaCl were used via syringe and a total of 120-150 mL was used. Suction of 100 mm of water was applied and about 70% of the total instillate was retrieved. This retrieved fluid was sent to the lab in different containers for total and differential counts, cytology and microbiological examinations.

Total count was evaluated using Neubaeur's chamber. Differential count was calculated using air-dried slides stained by Leishman's stain. Routine Hematoxylin, Eosin and PAP stains were done for cytology

Figure 2 : Differential diagnosis of malignant lesions



acid fast bacilli (AFB) and fungal stains were done for clinically suspected samples in non-immunosuppressed patients and in all samples collected from the immunosuppressed patients.

Adequacy of samples was assessed based on definite criteria by Chamberlain *et al* [4].

The criteria are –

1. Paucity of alveolar macrophages <10/10 hpfs.
2. Extensive epithelial cells.
3. Mucopurulent exudates.
4. Numerous red blood cells.
5. Degenerating changes.

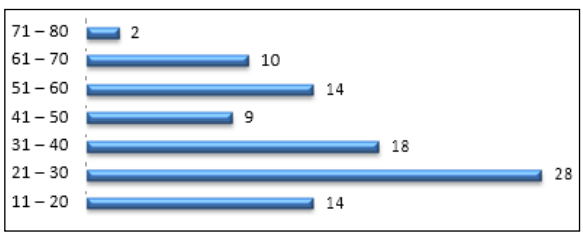
RESULTS:

BAL was done in a total of 373 patients. Median age of patients was 41 years (14 - 82 years). Out of these samples, 4 were inadequate.

We diagnosed 99 benign lesions and 46 malignant lesions. The distributions of patients on the nature of the lesion are given by fig.1 & fig. 2 for benign & malignant lesion respectively.

The age & gender variation of the 95 patients diagnosed with tuberculosis given by fig.3 & fig.4 respectively.

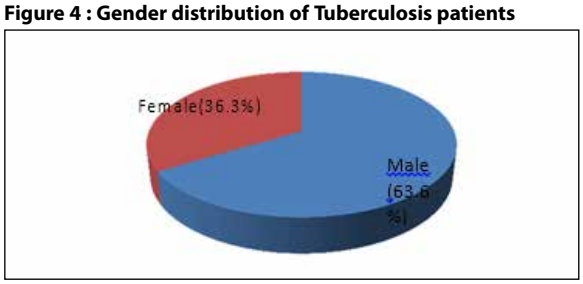
Figure 3 : Age distribution of Tuberculosis patients



In 228 patients, no specific diagnosis could be arrived cytologically and were categorized as non specific inflammatory lesions.

41 samples in this category were culture positive for various bacteria, fig. 5 gives an idea about the distribution of these bacteria in these patients.

Figure 4 : Gender distribution of Tuberculosis patients



In another 52 patients in this category, clinico-radiological findings were consistent with ILD. BAL cytology in this group of patient showed nonspecific inflammation.

DISCUSSION:

BAL is a useful and safe procedure for sampling cellular elements of lung. BAL as a diagnostic tool can be

used to accurately diagnose various infections and also obtain material for culture and sensitivity. It is a preferred investigative tool over invasive techniques like needle biopsies and thoracoscopy[5, 6].

The incidence of tuberculosis is on the rise[7], BAL samples the epithelial lining of alveoli and hence rate of detection of tuberculosis is more. It facilitates early detection of tuberculosis in sputum negative cases as well[8]. In a study by Baughman et al 87% of bronchoscopy specimens were positive for tuberculosis[8]. In another study by Radha et al, 24% of BAL specimens were positive for tuberculosis[9].

In our study, 25.46% of the cases were diagnosed as tuberculosis. The majority of the patients diagnosed with tuberculosis were between age group 20 to 40 years (48.4%) & male predominance was seen in all the age groups with tuberculosis (M: F=1.96:1). In a similar study by Mukherjee et al mean ages of males and females with tuberculosis were 43.7 ± 17.6 and 36.3 ± 16.9 years respectively, Male to female ratio was 2.25:1[7].

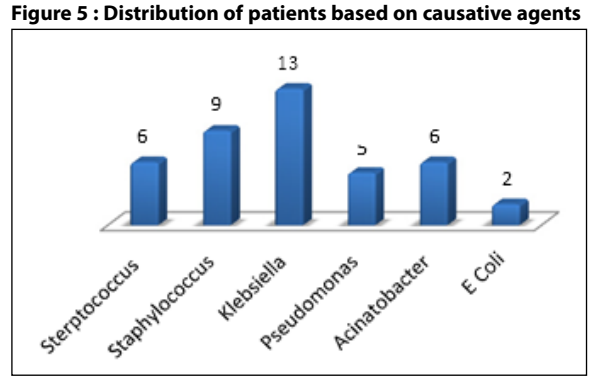
BAL can be a very useful in the diagnosis of fungal infections. BAL has a sensitivity of 98%. It is almost equal to bronchial biopsy in sensitivity and specificity[10, 11]. In our study, three patients were found to have fungal infection caused by *Candida albicans*. These patients were found to have severe lung disease with COPD. In an earlier similar study 7 patients out of 91 were detected to have fungal infection[9].

Pulmonary alveolar proteinosis (PAP) is a rare disease characterized by accumulation of abnormal surfactant like protein within the alveoli[12]. PAP has recently been recognized as a disease of impaired alveolar macrophage function caused by neutralizing anti- granulocyte- macrophage colony stimulating antibodies (anti GM-CSF antibody) [13]. BAL is a helpful tool in diagnosing PAP in conjunction with radiological and bronchoscopic findings. Presence of characteristic globules of PAS positive amorphous proteinaceous material along with very less inflammatory cells and absence or occasional alveolar macrophages suggests PAP in BAL samples[12, 13]. In our study we diagnosed one case of PAP in a 47 years old male with history of respiratory distress. A computerized tomographic scan of thorax for this patient showed ground glass appearance with typical mosaic pattern & bronchoscopy suggested accumulation of non-

foamy proteinaceous material in the distal air spaces. PAS stain of the BAL smear for this patient showed deposits of globular proteinaceous material with occasional inflammatory cells.

BAL is very useful diagnostic tool in diagnosing lung malignancies. Studies have shown very high sensitivity, specificity and accuracy[14,15]. In our study we diagnosed 46 cases of lung malignancy with 88.5% sensitivity, 90.9% specificity and 89.13% accuracy respectively.

Figure 5 : Distribution of patients based on causative agents



group of patients were nonspecific inflammatory cells with reactive bronchoalveolar cells.

For the diagnosis of routine infections, cultures of the BAL samples have proved useful for both ventilated and

non-ventilated patients 16, 17. In addition to the standardized BAL procedure, it is important to culture the fluid in a standard manner. Recommendations have been made for the technique of BALF cultures 18, 19. The examination of the cells in bacterial pneumonia usually demonstrates a marked increase in neutrophils, though this is not specific. In our study, differential cellular count of the BAL fluid was done on all the cases but the findings were not specific.

The use of Gram stain to identify bacteria was shown to be useful in diagnosing pneumonia 19. Subsequently, CHASTRE proposed counting the number of cells with intracellular organisms (ICO) 20. The diagnostic importance of cells with ICO is still unclear17.

The cellular and fluid components of BAL have been widely studied in patients with interstitial lung diseases such as sarcoidosis, hypersensitivity pneumonitis, and idiopathic pulmonary fibrosis21, 22. In our study, BAL cytology on all the 52 clinico - radiologically suspected ILD patients showed nonspecific inflammation with few reactive bronchoalveolar cells. Much of the data focuses on the immunology, pathogenesis, or progression of disease over time since BAL provides a way to evaluate the inflammatory cellular components of the lung, multiple times over the course of the patient's disease. However, the BAL findings are not specific for these disorders, and ultimately the diagnosis is based upon clinical, radiographic, and lung biopsy data21, 22.

CONCLUSIONS:

BAL is a useful diagnostic tool in diagnosing tubercular lesions, fungal infections, malignancies

and bacterial pneumonias. Beside this, it is also an useful complimentary diagnostic tool in diagnosing PAP. BAL is highly sensitive and specific in diagnosing pulmonary tuberculosis and lung malignancies. This tool should be used in all the patients where a clinical suspicion of one of the above diseases is high. In ILD, it has no diagnostic utility and its use is limited in follow up patients to look out for concomitant bacterial infections only.

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