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Original research article

Broncho alveolar lavage cellular analyses as a diagnostic intervention for patients with suspected ild in conjunction with hrct imaging

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Abstract

Background: Nowadays, bronchoalveolar lavage is used to identify interstitial lung disease. The clinical utility of BAL was constrained by high-resolution CT. By following the recommendations of the American Thoracic Society, this study improved the BAL technique and employed a combination of clinical evaluation and HRCT to determine the cause of ILD.

Method: In this case, we have done the prospective continuous study at the Department of Pulmonology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India between May 2021 to April 2022. After receiving a detailed description of the procedure and the aims of the study, all patients who participated in the trial gave their informed consent. All data collecting procedures were strictly adhered.

Result: We tweaked the BAL procedure per ATS's recommendations. Idiopathic pulmonary fibrosis, hypersensitivity pneumonitis, connective tissue disorder, sarcoidosis, pneumoconiosis, acute respiratory distress syndrome, eosinophilic lung disease, lymph node carcinoma, aspiration bronchiolitis, and pulmonary histocytosis were all among the diagnoses for the sixty patients studied. Statistically, there was a large difference in the total number of observed differences between ILDs. We classified the different ILDs according to the ATS criteria.

Conclusion: The inclusion of BAL to clinical and HRCT data improved diagnostic accuracy and led to better management of ILDs by integrating information about the illness's acute vs chronic character and the cause of acute exacerbation.

Keywords: BAL, Broncho alveolar, HRCT imaging**,** interstitial lung disease

Introduction

Interstitial lung disorders are an umbrella term for a collection of conditions characterised by inflammation and fibrosis of the lung parenchyma on both sides of the body (ILD). When a person with a normal immune system develops an ILD, there is no reason to suspect infection or cancer [1-3]. Exertional dyspnea is a clinical hallmark of ILDs, whereas impairments in lung function and gas exchange, as well as radiological infiltrates on both sides of the lungs, are hallmarks of the disease. Excessive collagen deposition and fibroblastic proliferation are pathological traits, both of which can be found in the interstitium and the lumen of the smaller airways [4, 5].

Pneumoconioses, such as silicosis, asbestosis, coal miners pneumoconiosis, and hypersensitivity pneumonitis, are work-related disorders with established causes that contribute to ILDs. Idiopathic interstitial pneumonias and sarcoidosis are two examples of granulomatous lung illnesses that affect the interstitium but have no clear aetiology [6, 7].

Despite the overwhelming complexity of ILD aetiology, there is a surprising amount of overlap amongst ILDs in terms of clinical presentation, physiological abnormalities, imaging findings, and histologic patterns. Nonetheless, in many instances, a definite diagnosis may be determined from the patient's clinical history, laboratory testing, and HRCT characteristics. Some ILDs may be diagnosed using a fibre optic bronchoscope and a Broncho alveolar lavage procedure, whereas in other cases, a Tran's bronchial biopsy was necessary. Open thoracotomy or video-assisted thoracoscopic surgery for lung biopsies may be necessary for the remaining instances [8, 9].

Materials and Methods

In this case, we have done the prospective continuous study at the Department of Pulmonology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India between May 2021 to April 2022. After receiving a detailed description of the procedure and the aims of the study, all patients who participated in the trial gave their informed consent. All data collecting procedures were strictly adhered.

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Inclusion Criteria

- Patients with ILD are identified based on clinical and HRCT results.
- Immunocompetent individuals with acute and chronic
- ILDs who can tolerate the procedure
- Patients older than 18 years old.

Exclusion Criteria

- Patients with ILD who have bleeding problems
- Patients with ILD who have unstable cardio-respiratory conditions

Patients were hospitalised to our hospital and underwent standard blood tests, such as HIV testing and HRCT of the chest, heart, and rheumatological examinations. Patients with sufficient respiratory status were treated to the BAL technique once their cardiac fitness had been determined.

Statistical Analysis

After calculating the midpoints of the range of cell counts discovered from the fluid analysis, a nonparametric analysis was conducted on the cohort. When comparing cell counts among ILDs, SPSS version 13 was used to determine statistical significance at a level of P 0.05.

Results

Following informed consent, 60 consecutive ILD patients were enrolled in the research. Patients with clinical suspicion of ILD underwent HRCT, and with the exception of two patients with ARDS, BAL was conducted after identifying the location for fluid collection in the lungs based on HRCT results. Following ATS protocols, we collected, transported, processed, and analysed BAL fluid.

Table 1: Age group distribution

Sr. No.	Age group	No. of Patients
1.	20-40 years	21
2.	41-60 years	28
3.	>60 years	11

The above graph illustrates the distribution of ages out of 0 patients.

Table 2: Gender distribution

Sr. No.	Gender	No. of Patients
1.	Female	25
2.	Male	35

The accompanying bar chart depicts the gender breakdown of 60 total patients.

Table 3: Symptoms wise distribution

Sr. No.	Symptoms	No. of Patients
1.	Dyspnoea	39
2.	Cough	10
3.	Wheeze	4
4.	Nil	7

The majority of the sixty individuals that were analysed reported dyspnea.

Table 4: Symptoms wise distribution

Sr. No.	Symptoms	Patients
1.	Non smoker	42
2.	Smoker	18

The percentage of patients who smoked is shown in the preceding pie chart.

Table 5: PFT wise distribution

Sr. No.	PFT	No. of patients
1.	Obstructive	12
2.	Restrictive	24
3.	Mixed	27

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4.	Not done	4
5.	normal	5

As can be seen above, mixed and restrictive was the most common finding among the 60 individuals evaluated.

Table 6: HRCT pattern wise distribution

Sr. No.	HRCT pattern	No of patients
1.	Proximal bronchiectasis	3
2.	Cystic	3
3.	Fibrosis	7
4.	Nodular	5
5.	Not done	3
6.	NSIP	12
7.	UIP	22
8.	PMF	3

The data above depicts the frequency with which each HRCT pattern was seen among the patients who participated in the study. Below is a visual representation of the prevalence of these distinct ILDs. The data presented above illustrates total cell counts (BAL) in comparison to the normal control for 60 patients (NC). How many Alveolar Macrophages are present in the lungs of people with different ILDs, compared to those of healthy people. ILD-specific differences in the range of BAL lymphocyte counts compared with reference values. Neutrophil numbers differ from the norm in several inflammatory lung diseases. Silicosis is only found in males, while the prevalence of IPF and CHP is highest in men (as shown in the preceding graph). Women were more likely to suffer from sarcoidosis than men were in the population analysed.

Discussion

Clinical diagnostic tests are rated based on their sensitivity, specificity, degree of invasion, repeatability, and significance to reaching a diagnosis. These factors guide the creation of cutting-edge medical diagnostic tools while ensuring the steady decline in relevance of their predecessors [10]. It's worth noting that as the pathophysiology of a disease develops over time, a more nuanced and comprehensive set of clinical tests may be needed to arrive at a definitive diagnosis and better treatment strategy. It may be difficult to understand how an old way of diagnosing an illness is still relevant to modern medicine. It is now well-accepted that bronchoalveolar lavage may be used safely to collect a sample of alveolar secretions for diagnostic analysis of its cellular and acellular components [11]. It was formerly thought that bronchoscopy and BAL might be used for a variety of purposes in the evaluation and treatment of ILD [12]. Despite the fact that BAL immune cell features typically exhibited characteristics that were extremely consistent with a number of different ILD subtypes, it became apparent that these tests alone could not be relied upon to provide a definitive diagnosis in a number of different ILD subtypes. BAL data were prone to high fluctuation, and the possible number of illnesses is far more than the number of clearly detectable cellular patterns, all of which made evaluating interstitial lung disease difficult [13]. This is due to the fact that BAL cell differentials may often only increase the plausibility of some diagnoses and decrease the plausibility of others, and that in only rare instances can the data lead to a distinct outcome. Since of this uncertainty, and because experts' perceptions can vary according on their specific clinical contexts and levels of expertise, BAL is often viewed differently depending on whom you ask [14, 15].

HRCT was first used clinically in the early 1990s. HRCT imaging patterns were consistent with certain ILDs including IPF and sarcoidosis, increasing the likelihood of a correct diagnosis. Although HRCT scans are generally well-accepted in the early stages of ILD, many individuals with new-onset ILD may not display the unique patterns that allow a diagnosis to be confirmed with high confidence using imaging alone. However, the combination of clinical data, HRCT findings, and BAL fluid analysis may provide an accurate diagnosis, sparing the patient the need for a surgical lung biopsy [16]. The BAL cell pattern can provide useful information of the specific ILD diagnosis if the bronchoscopist collects the fluid with the correct technique, the differential cell count is performed in accordance with good clinical laboratory practise by staff with sufficient experience in BAL cytological analysis, and the results are interpreted by an expert familiar with the wide variety of specific forms of ILD [17, 18]. Therefore, the current study used BAL to diagnose and treat people suspected of having ILD in accordance with the criteria and recommendations established by the ATS. Using the cellular pattern we obtained, we were able to include the differential diagnoses of individuals into the ATS classification system. In addition to the first case, we found that the BAL procedures for the other three people were inappropriate [19]. We later made many separate diagnoses of ILDs based on clinical findings, HRCT findings, and BAL cell pattern. And last but not least, with the three distinct evaluation methods. When clinical diagnosis was combined with HRCT, the list of possible diagnoses was narrowed down to only two conditions. The

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cellular pattern in the BAL, along with the results of the clinical exam and HRCT, may aid in making a more precise diagnosis of ILD. The stability of the patient's state, the acuteness or chronicity of the disease, and the likely cause of the acute exacerbation are all aspects of the diagnosis that have improved. Therefore, the treating physician must determine whether or not to also treat the primary cause of the acute exacerbation. As a result of this systematic approach to evaluation, patients received better care [20, 21].

Based on the honeycoomb look, HRCT has suggested four possible diagnosis for patients, including IPF, CHP, asbestosis, sarcoidosis, and CVD. Patient's clinical presentation and BAL tests suggested four potential diagnoses, including IPF, NSIP, acute lung disease, and suppurative infection. A combination of clinical, HRCT, and BAL data indicated that the patient had an acute exacerbation of idiopathic pulmonary fibrosis with bronchitis, most likely due to a superimposed infection. This allowed the doctor to treat the infection and stop the acute episode. Patients had honeycomb-like cystic abnormalities on HRCT, which raised a differential diagnosis similar to that of patients, but the prevalence of histocytosis in the lung secretion shown by BAL helped to confirm the diagnosis of pulmonary histocytosis. This resulted in a change in the course of treatment for the patient [20-22].

The HRCT of Patient showed bilateral upper lobe fibrosis with traction bronchiectasis, supporting the clinical diagnosis of ILD. As a result of BAL input, the original diagnosis of noninfectious bronchitis was changed to subacute exacerbation of CHP with accompanying neutrophilic lymphadenitis. Patient, on the other hand, had an acute worsening of CHP because of bronchitis and suppurative infection, as shown by a neutrophil count of more than 50% in the cellular pattern. Together with clinical and HRCT findings, the BAL was essential in establishing the diagnosis of eosinophilic pneumonitis. HRCT is, together with a clinical examination, a crucial test in the diagnosis of sarcoidosis, silicosis, and ILDs associated to collagen vascular diseases. BAL may be used to predict the acute, subacute, or chronic nature of various illnesses, as well as the presence or absence of an infection. There was no need for anything more than a chest x-ray and clinical criteria to determine that ARDS was present [21-23].

In some ILDs, BAL performed according to ATS guidelines may act as an important test along with clinical and HRCT findings for a proper diagnosis; whereas, in others, HRCT was found to be very successful in predicting the diagnosis, BAL aids in predicting the acute/chronic nature of the disease and gives the hint on the superadded infection status that would help in proper management. Therefore, individuals suspected of having ILD may have a BAL done frequently in addition to a clinical evaluation and HRCT [24].

Conclusions

In some ILDs, including lymphangitis carcinomatosis, Eosinophilic lung disorders, and Langerhans cell histocytosis, the cellular profile of a Broncho alveolar lavage specimen can replace the necessity for a surgical lung biopsy. In the context of clinical and radiological symptoms characteristic of a particular ILD, the cellular profile of the BAL fluid may lend credence to the diagnosis. A positive BAL result is critical for proving that an infection is the root cause of an ILD flare-up. Thromboembolic event or left heart failure should be considered if infection cannot be ruled out. In asymptomatic patients with HRCT signs of early ILD, the presence of inflammatory cells in the BAL cellular analysis has been identified, which may indicate an exacerbation in the near future. A BAL, alongside clinical examination and HRCT, may be performed routinely in ILD.

Conflict of Interest: None

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