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Original Research Article

Washings, Biopsy and Bronchial Brushings in Diagnosis of Lung Collapse: A Comparative Study

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Abstract

Background: An essential tool in the toolbox of techniques indicated for the diagnosis of respiratory issues is the bronchoscopy. The study's goal was to contrast the two bronchial findings related to lung collapse.

Objectives: In order to examine the sensitivity of bronchial brushings, washings, and biopsies in determining the cause of the collapse, as well as to assess the value of fiberoptic bronchoscopy.

Materials and Methods: Forty individuals who were enrolled in our tertiary institution participated in the current study. Patients who showed collapse-like persistent opacities on chest radiography underwent fiberoptic bronchoscopy. If the patient satisfied the requirements of our study, a thorough clinical history, physical examination, and normal investigations were performed, followed by a fiberoptic bronchoscopy. For the analysis, SPSS version 21 was utilised.

Results: The patients ranged in age from 18 to 60, and there were 3:1 more men than women among them. On bronchial biopsy, malignant causes were identified in 25 (65%) of the total 40 cases, and inflammatory causes in 10 cases (35%) of the cases. As validated by a biopsy, bronchial washing revealed 14 true positive, 7 true negative, 8 positive, and 11 negative instances, whereas bronchial brushing revealed 16 true positive, 6 true negative, 10 positive, and 8 negative cases.

Conclusions: We draw the conclusion that fiberoptic bronchoscopy has proven to be quite effective in identifying the precise cause of diverse lung collapse situations.

Keywords: Washing, Biopsy, Bronchoscopy, Brushings, Lung collapse, neoplasm.

Introduction

The first endobronchial examination was performed in the final decade of the nineteenth century to remove inhaled foreign objects. Shigeto Ikeda's invention

of flexible fiberoptic bronchoscopy in 1967 gave clinicians new perspectives. An essential tool in the toolbox of techniques indicated for the diagnosis of respiratory issues is the bronchoscopy. [1] It is a widely used technique for both diagnosing and treating a variety of lung illnesses. In contrast to being a disease entity in and of it, lung collapse is an air-less peripheral gas exchange zone that is an aberrant condition associated with a number of pulmonary illnesses. Bronchial blockage, which manifests as a collection of clinical, physical, and roentgenographic symptoms, is the primary cause of lung collapse. Once the collapse is identified it is imperative to diagnose the etiology of collapse. Therefore, it is necessary to use diagnostic tools such as fiberoptic bronchoscopy to get an accurate diagnosis of underlying cause in a patient presenting with collapse on chest radiograph or CT Chest. [2] Although there are many different etiological variables, they can all result in some similar alterations at specific times during the formation of a bronchial blockage.

The source could be totally inside the bronchial lumen, inside the bronchial wall, or entirely outside the bronchial wall in the peribronchial or nearby tissue. [3] The diagnosis of uncommon infections, neoplasms, and other non-infectious causes can be made using bronchoscopy, which enables careful examination of the bronchial tree for endobronchial lesions and foreign bodies, aids in recovering deep respiratory secretions, brushing, and biopsy, and helps in recovery of these secretions. FOB aids in making a more accurate bacteriological and histological diagnosis by not just assisting in the assessment of the illness area.

Material and Methods

The present prospective study was carried out on 40 patients from Jan 2021 to January 2022. The study included patients whose chest X-rays suggested collapse at the time of presentation. The history of the patient, observations made during the physical examination, and pertinent investigations were completed. A Fujinon flexible video bronchoscope was used to do the bronchoscopy. Lung endobronchial biopsies were performed. Additionally, endobronchial washings and brushes were acquired. The biopsy specimens were preserved in formalin, and slices stained with hematoxylin-eosin were analyzed. Wherever necessary, special stains like Ziehl-Neelsen, Periodic acid-Schiff (PAS), reticulin, etc., were carried out. Haematoxylin-Eosin and May-Grunwald Geimsa stains were used to color the brushing smears. After being cytocentrifuged, the washings were used to analyze the sediment for cytology. Slides were reviewed by pathologists, who also provided reports. The study received permission from an ethical commission. After discussing them to all participants, written informed consent was obtained from each.

Statistical Analysis

The above date is compared using a scientific approach. Continuous variables were expressed as mean with standard deviation (SD). Categorical variables were expressed as absolute numbers and proportions. Bivariate relationship for categorical variables was assessed using Pearson's χ 2 test or Fisher's exact test. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated separately for washing and brushing. SPSS -VERSION 21 SOFTWARE was used for analysis. A P value of < 0.05 was considered statistically significant.

Results

Table 1: Demographic and Clinical Characteristics of study participants (N=40)

Characteristics	**N (%)**	**p-value**
Age (Mean±SD)	45.4±12.4	0.11
Sex Male	30 (75)	**0.01***
Female	10 (25)	
Chief complaints**		
Cough with expectoration	27 (70)	**0.01***
Hemoptysis	3 (5)	0.32
Fever	3 (5)	0.98
Breathlessness	12 (27)	0.21
Chest pain	9 (23)	0.34
Loos of appetite	7 (20)	0.55
Hospital stay		
<1 month	20 (50)	**0.01***
1-2 months	7 (20)	0.21
>2 months	13 (30)	0.35

*p<0.05 is considered statistically significant
** multiple responses

According to Table 1, there are a total of 40 patients, ranging in age from 18 to 60. 45.4 12.4 years old was the average age. The study, which had a 75% male preponderance, was determined to be statistically significant (p 0.05). Breathlessness was found to be the second most prevalent chief complaint after cough, which was determined to be significant (p 0.05) in 70% of patients. The majority of patients spent less than one month in the hospital, which was noteworthy.

Table 2: Radiological Findings and Lobe involvement

Radiological findings	N (%)
Rt side lung collapse	27 (70)
Lt side lung collapse	13 (30)
Lobe involvement	
Rt upper lobe	10 (25)
Rt middle lobe	5 (7)
Right lower lobe	3 (5)
Right total lung	4 (6)
Left upper lobe	9 (23)
Left lower lobe	5 (7)
Left total lung	4 (6)

As per table 2 the most common radiological finding was right sided lung collapse seen in 70% of patient. The most common lobe involved was right upper lobe (25%) followed by left upper lobe (23%). But these findings are not significant (p>0.05).

Table 3: Distribution of lesions as per Bronchial Biopsy

Lesions	**N(%)**
Non-neoplastic	15 (35)
Neoplastic	25 (65)
Tubercular	10 (25)
Pneumonia	3 (5)
Fungal	4 (6)
Inadequate tissue	8 (23)

Table 3 suggests Histological analysis of the patients revealed that 25 (65%) were classified as neoplastic and 15 (35%) as non-neoplastic. The most frequent malignant lesion, observed in 25% of cases, is tubercular, followed by insufficient tissue (23%).

Table 4: (a) Comparison of Methods in terms of Test results

Methods	Test results			
	True positive	True negative	False positive	False negative
Bronchial washing	14	7	8	11
Bronchial brushing	16	6	10	8

Table 4: (b) Comparison of Methods in terms of Test results

Characteristics	Bronchial Washing	Bronchial brushing
Sensitivity	53.4	86.4
Specificity	72	90.20
PPV	78.6	94.6
NPV	40.6	78.8

Brushings, washings, and biopsies were carried out in all 40 cases in accordance with table 4(a&b). Only 14 out of 40 instances had positive washings, with a sensitivity of only 53.48% and a specificity of 72%. There was a 78.6% positive predictive value and a 40.6% negative predictive value. Consequently, the outcomes weren't exactly promising. 16 out of 40 brushings tested positive, with a sensitivity of 86.41% and a specificity of 90.20%. In comparison to the negative predictive value, which was 78.8%, the positive predictive value was 94.6%. On the other hand, tuberculosis was identified in 7 individuals based on the presence of caseation necrosis, acid-fast bacilli, and reticulin stains.

Discussion

An important indicator of lung illness is collapse. Therefore, in a patient who presents with collapse on a chest radiograph or CT-Chest, it is vital to use diagnostic methods such fiberoptic bronchoscopy to determine the exact etiology. Lung cancer, endobronchial tuberculosis, infection, endobronchial metastases, bronchiectasis, foreign body, mucous plug, etc. are some of the main reasons of lung collapse. [4] Obstruction caused by a central endobronchial lesion is the most frequent cause of lobar collapse. Airway obstruction, not the tumors themselves, typically causes the first symptoms of malignancies that develop in the proximal airways. In fact, almost 40% of patients receiving a first assessment had radiographic abnormalities related to airway blockage. [5] The most frequent of these observations are consolidation, mucus filling bronchiectasis, and collapse. A central obstructive tumor should always be regarded as the primary cause in an adult with collapse. In adults under the age of 40, bronchial carcinoid tumor is more likely to occur than bronchogenic cancer. Approximately 75 percent of initial lung tumors can be directly seen with a flexible bronchoscope. For a pathological analysis, bronchial biopsies and brush samples can be collected. [6] The proximity of core tumors to the major carina can be used to directly assess operability. [7] Endobronchial tuberculosis affects 10–40% of patients with active pulmonary tuberculosis. On a chest radiograph, 25–35% of individuals with endobronchial tuberculosis show signs of collapse.

A useful method for identifying endobronchial TB is bronchoscopy. The most frequent indicator of FOB in the current series was a question regarding malignancy. In our investigation, 28 (87.5%) instances had sufficient tissue that could be used for reporting. These results support the idea that using FOB, an

appropriate tissue may be collected, and in the majority of cases, a diagnosis can be made. They are comparable to those of a research by Hansen et al. [8] in which enough tissue was recovered in 93% of cases. The bulk of the lesions on histological investigation were malignant lesions. Squamous cell carcinoma was the most prevalent tumor among the neoplasms. In 18 (56.25%) patients, bronchoscopy revealed an endobronchial growth, whereas the remaining patients had stenosis or damaging mucosa. With positive predictive values reaching 90%, we discovered that brushing specimens produced a high diagnostic yield. The concordance percentage between bronchial biopsies and brushings, according to Melanie et al. [9], was 97%. The specificity of washings was determined to be 70%, however the sensitivity was just 52.38%. As a result, negative washing results cannot be relied upon to rule out cancer. Hadfield et al. [10] also came to the conclusion that washings alone are not helpful in diagnosing lung illnesses but can provide a reliable diagnosis of cancer when positive. Additionally, two incidences of Aspergillus infection were identified. In 7 patients (21.87%), tuberculous granulomas were discovered. Brushings and washings were not found to be helpful in the group suspected to be non-neoplastic. Additionally, the American Thoracic Society provided evidence of this. [11,12]

Conclusion

According to a study, fiberoptic bronchoscopy can be utilized to successfully diagnose individuals who present with lung collapse on chest X-ray or CT-Chest lung disorders. Neoplastic disorders can be accurately diagnosed by brushing the bronchial tubes. However, washings play a relatively small part in the diagnosis of lung collapse instances. Malignancy was the most frequent cause of collapse (65%). To further characterize the role of this modality in patients who present with lung collapse, however, large-scale investigations are required.

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