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Original research article

A Study of Pleural Biopsy for the Diagnosis of Exudative Pleural Effusion

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Abstract

Background: Exudative pleural effusion often requires detailed investigations which include cytology, biochemical and microbial examinations. However, in some cases the diagnosis may remain elusive they are labeled as undiagnosed exudative pleural effusion. We in the current study tried to evaluate the etiological diagnosis of exudative pleural effusion by pleural biopsy**.**

Methods: This cross-sectional study was conducted in the Department of Pulmonology, Rajiv Gandhi Institute of Medical Sciences, Adilabad. Thoracocentesis was done and pleural fluid was sent for cytological examination, biochemical, examination, and microbiological profile assessment to determine the cause of the effusion. The undiagnosed cases of exudative pleural effusion were subjected to pleural biopsy.

Results: A total of n=45 cases of the pleural biopsy were included in this study. The gross appearance of the pleural fluid in cases was straw-colored in 100% of cases of tuberculosis and hemorrhagic in 75% of cases of malignancy. The diagnosis of tuberculosis and malignancy was made in 17.77% of cases each. The mean LDH values were 856 ± 210.36 vs 482.98 ± 115.66 p values were 0.012 considered significant. The ADA values were 40.36 ± 2.9 vs 18.44 ± 3.1 p=0.021 were considered significant.

Conclusion: Pleural biopsy when done in cases where thoracocentesis and cytological examination, biochemical, examination, and microbiological profile assessment failed to determine the cause of the effusion is a useful procedure. It may be used when facilities of thoracoscopy and imaging-guided cutting needle biopsies are not available.

Keywords: Pleural Biopsy, Tuberculosis, Malignancy, Pleural exudate

Introduction

Pleural effusion is a common presentation encountered by chest physicians. It is defined as the "Accumulation of fluid in pleural space". [1] There are several causes of pleural effusions and the vast majority of cases are detected with a small number of common causes. [2] The pleural effusions are of two types: transudative and exudative. [1] the transudative pleural effusions are with low protein content and they occur due to some systemic disorders such as cardiac, renal, or hepatic diseases. The exudative pleural effusions are with high protein content and occur due to underlying pleural pathologies such as tuberculosis, malignancies, or other infections. [3] Majority of cases the diagnosis is made by history, clinical examination, and investigations of pleural fluids. However, despite the availability of good clinical, radiological, and laboratory investigations in as much as 20 % of cases the diagnosis remains inconclusive. [4] Hence it is essential to strive to make a proper etiological diagnosis in exudative pleural effusions to give proper treatment. One of the important modalities for diagnostic work is percutaneous needle pleural biopsy of the parietal pleura which has efficacy of diagnosis in up to 50% of cases. [5] It has been found that the closed pleural biopsy is highly sensitive for the diagnosis of two of the important causes of exudative pleural effusion which include tuberculosis and malignancy. [6] The first known case of pleural biopsy was done in the year 1955 with the Vim Silverman needle. [7] Subsequently from the year 1958, Abram's pleural biopsy needle was used as it was found to be safe and easy to perform, and inexpensive. [8] In later years a different type of needle was introduced by Cope and Radja and sometimes Tru-Cut biopsy needle was also used. [9, 10] With this background the primary objective of the current study was to evaluate the etiological diagnosis of exudative pleural effusions when the cytological, biochemical, and microbiological examinations have remained inconclusive. The secondary objective was to determine the role of percutaneous needle biopsy from parietal pleura using Abram's needle in cases of undiagnosed exudative pleural effusion.

Material and Methods

This Cross-Sectional study was conducted in the Department of Pulmonology, Rajiv Gandhi Institute of Medical Sciences, Adilabad. Institutional Ethical committee permission was obtained for the study. Written consent was obtained from all the participants of the study. During the study period, a total of n=69 cases of pleural effusions were evaluated. The initial investigations include clinical examination, radiological assessment, and laboratory investigations. Thoracocentesis was done and pleural fluid was sent for cytological examination, biochemical, examination, and microbiological profile assessment to determine the cause of the effusion. Specific investigations were also done as per the requirement of the case and clinical settings. The etiology if was confirmed by the above-mentioned methods then they were excluded from the study. Patients in whom the investigations failed to elucidate the cause were labeled as undiagnosed cases of exudative pleural effusion and were subjected to pleural biopsy.

Inclusion criteria

1. Cases where routine investigations and pleural fluid examinations failed to determine the etiology of pleural effusion.
2. All the cases aged more than 20 years
3. Both males and females

Exclusion criteria

1. Cases with bleeding disorders
2. Those on anticoagulant therapy
3. Hemodynamically unstable patients

4. With emphysema or respiratory failure
5. Those not willing to undergo the procedure

The pleural biopsy was performed in a sitting posture the affected side of the chest was determined and the site for biopsy was selected. The area was then cleaned with antiseptics and a local anesthetic infiltration of 2% lignocaine was injected. A small incision of 0.5 cms was made just above the upper border of the rib selected site. Abram's needle was introduced through it. Multiple biopsies were taken with the needle. After the biopsy, the skin incision was sutured with a single stitch. Post-biopsy chest X-ray was taken to rule out iatrogenic pneumothorax. The pleural samples were placed in formalin-containing vials and sent for histopathological examination. All the cases were observed closely following pleural biopsy to determine the occurrence of any complications.

Results

Based on the inclusion and exclusion criteria a total of n=45 cases of the pleural biopsy were included in this study. The total number of males was n=35 (77.78%) and the total number of females was n=10 (22.22%). The mean age of the patients included in the study was 55.64 ± 6.5 years range was (21 – 75 Years). Based on the laterality of involvement right side effusion was found in n=24 (53.33%) cases and n=20 (42.22%) cases with left side involvement n=2(4.44%) cases with bilateral involvement. Pleural fluid was straw-colored in n=33(73.33%) and hemorrhagic in n=12(26.67%) cases. Histopathological examination of the pleural biopsy showed granulomatous inflammation suggestive of TB in n=8(17.77%) cases. Metastatic malignancy in n=8(17.78%) and chronic inflammation in n=10(22.22%) the other details have been depicted in Table 11.

Table 1: Pleural Biopsy Findings in the cases of the study

Pleural Biopsy Findings	Frequency	Percentage
Granulomatous Inflammation Suggestive of (TB)	8	17.77
Metastatic Adenocarcinoma	6	13.33
Metastatic Squamous Cell Carcinoma	1	2.22
Metastatic Small Cell Carcinoma	1	2.22
Chronic Inflammation	10	22.22
Inconclusive	19	42.22
Total	45	100

The mean age of the patients with tuberculosis was found to be 41.25 ± 3.5 compared to those with malignancy was 60.51 ± 5.5 years. The gross appearance of the pleural fluid in cases was straw-colored in 100% of cases of tuberculosis and hemorrhagic in 75% of cases of malignancy. The other details have been shown in table 2.

Table 2: Pleural biopsy histopathology findings and pleural fluid color

Pleural biopsy finding	Pleural fluid color	
	Straw color (n) (%)	*Hemorrhagic (n) (%)*
Granulomatous inflammation (TB) (n=8)	8(100%)	0 (0%)
Metastatic malignancy (n=8)	2 (25%)	6(75%)
Chronic inflammation (n=10)	8(80%)	2(20%)
Inconclusive (n=19)	15(78.94%)	4(21.05%)

The pleural biopsy findings were examined along with pleural fluid analysis reports it was found that the mean value of pleural fluid protein was 61.35 ± 5.2 vs 46.33 ± 4.3 the p values were 0.033 was considered significant. Similarly, LDH values were 856 ± 210.36 vs 482.98 ± 115.66 p values were 0.012 considered significant. The ADA values were 40.36 ± 2.9 vs 18.44 ± 3.1 p=0.021 were considered significant the other details have been depicted in table 3. In n=4 patients with chronic inflammation and n=5 patients with inconclusive pleural biopsy antitubercular therapy was started with improvement in clinic-radiological findings.

Table 3: Evaluation of pleural fluid findings versus pleural biopsy histopathology

Mean Pleural fluid composition values	Pleural Biopsy Findings			
	Granulomatous Inflammation (TB) Mean ± SD	*Metastatic malignancy Mean ± SD*	*Chronic inflammation Mean ± SD*	*Inconclusive Mean ± SD*
Protein (gm/L)	61.35 ± 5.2	46.33 ± 4.3	47.05 ± 6.4	47.90 ± 8.8
LDH (U/L)	856 ± 210.36	482.98 ± 115.66	549.03 ± 118.96	545.74 ± 110.37
ADA (U/L)	40.36 ± 2.9	18.44 ± 3.1	30.13 ± 6.7	26.64 ± 7.9
Total Leukocyte count/mm^3	1050.61 ± 750.14	435.23 ± 115.4	560.97 ± 250.23	1123.33 ± 650.5
Lymphocyte %	90.12 ± 3.5	67.74 ± 8.6	84.36 ± 12.6	87.26 ± 10.5

Discussion

This study to determine the role of percutaneous needle biopsy from parietal pleura when the diagnosis by thoracocentesis remained inconclusive. The mean age of the patients included in the study was 55.64 ± 6.5 years range was (21 – 75 Years). A similar study by JU Ahamed et al., [11] found the mean age of the patients was 52.7±16.0 years. Most of the cases in the current study were males 77.78%. Bedi M et al., [12] in Rajasthan found the male preponderance at 73.75% in agreement with the results of the current study. The probable factors which cause a male to be affected commonly are the prevalence of habits such as smoking and alcoholism. The present study found that 17.77% of cases were with tuberculosis as well as malignancy and 22.22% of cases with chronic inflammation. Sanwalka N et al., [13] found 54% of cases with tuberculosis, 16% of cases with malignancy, and 22% of cases with chronic inflammation. Al-Shimemeri et al., [4] in Saudi Arabia found 18.51% cases with neoplasia, 64.81% cases with tuberculosis, and 16.67% cases with empyema. S Pandit et al., [14] found 33.33 % cases of malignancy, 27.77% cases of tuberculosis, and 25% cases of non-specific inflammation. In this study, we found straw-colored pleural fluid in 73.33% of cases, and in 100% of cases of tubercular effusion the pleural fluid was straw-colored. In 75% of metastatic malignancy, the pleural fluid was hemorrhagic in color. V Victoria et al., [15] have found that the presence of bloody pleural fluid is the most common feature of malignancy which was like the observations of the current study. Among the cases of pleural malignancy metastatic adenocarcinoma was found in 75% of cases and 12.5% cases of Squamous cell carcinoma and small cell carcinoma. Our results are similar to a study by JU Ahamed et al., [11] which found 70% of cases with metastatic adenocarcinoma. S Bhattacharya et al., [16] 54% Adenocarcinoma, 9% squamous cell carcinoma, and 11% small cell carcinoma. The diagnostic yield for malignancy in this study was comparatively lower as compared to other studies where the yield was ranging from 30% to 70%. [17-19] it could be due to the variability of the race and region and the lower sample size of the current study. In this study, 85% of cases of histopathologically proven tubercular pleural effusion cases presented with a history of fever, chest pain, dry cough, and breathlessness. These observations are similar to those observed in previous similar studies. [11, 14] B Chernow et al., [20] have found breathlessness as the commonest symptom in 30% of cases however, the current study found dry cough and fever to be the predominant symptoms. In this study, the

pleural fluid ADA and LDH were elevated to a greater extent in tuberculosis cases as compared to malignancy. S Pandit et al., [14] also observed ASA values were greater than 70 U/L in 55% of cases of tuberculosis in their study. Therefore, in cases of undiagnosed exudative pleural effusion where pleural biopsy is contraindicated an elevated level of ADA and LDH may point to the diagnosis of tuberculosis. The common complications encountered during the pleural biopsy procedure include vasovagal syncope, pain at the site, and seepage of pleural fluid. In our study we found pain as the common complication and major complications such as pneumothorax and pulmonary edema were not found in any case. The results obtained in the current study must be understood from point of view that the sample size was less, and it is a single-center study. A large number of multicentered studies are required to in order better understand the etiologies and outcomes.

Conclusions

Within the limitations of the current study, it can be concluded that closed pleural biopsy when done in cases where thoracocentesis and cytological examination, biochemical, examination, and microbiological profile assessment failed to determine the cause of the effusion is a useful procedure. It may be used when facilities of thoracoscopy and imaging-guided cutting needle biopsies are not available. The rates of complications are also lower in closed pleural biopsy when done with adequate precautions.

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