Role of Pleural Biopsy in the Etiological Diagnosis of Exudative Pleural Effusion

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Abstract

Introduction: Pleural effusion is a common clinical problem in developed as well as developing countries like Pakistan. Pleural effusions are grossly classified as either exudative or transudative. Tuberculosis, malignancy and empyema are common causes of exudative pleural effusion, less common being pulmonary embolism and connective tissue disorders. Despite the magnitude of the problem, the exudative pleural effusion presents a common diagnostic problem. In the western countries malignancy and empyema are common causes of exudative pleural effusion where as in Pakistan tuberculosis is the most frequent one.

Objective: The objective of this study is to observe the role of pleural biopsy in the etiological diagnosis of exudative pleural effusion.

Design: Cross – sectional study.

Setting: Institute of Chest Medicine, King Edward Medical University / Mayo Hospital Lahore.

Material and Method: One hundred and thirty diagnosed patients of exudative pleural effusion (according to Light's criteria) were included in this study. Pleural fluid was sent for total leucocyte count, differential leucocyte count, biochemistry, Gram's staining and culture, AFB smear and culture, and malignant cytology. Pleural biopsy was done in all the cases.

Results: Out of 130 cases of exudative pleural effusion, adequate sample of pleural biopsy was taken in 118 (90.7%) patients. In 12 (9.7%) patients sample of pleural biopsy was inadequate. Out of which 52 patients (44.06%) had granulomatous inflammation most likely tuberculosis, 19 patients (16.10%) had malignancy, 14 patients (11.86%) had chronic empyema and in 33 patients (27.96%) there was non-specific inflammation.

Conclusion: Pleural biopsy is a valuable tool in the diagnosis of exudative pleural effusions especially in developing countries like Pakistan where more sophisticated investigations like thoracoscopy are not widely available.

Key words: Pleural effusion, Pleura, Exudates, transudates, Tuberculosis.

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Introduction

Pleural effusion is an excessive accumulation of fluid in the pleural space.[1,2] The space lies between the lung and chest wall. Normally it contains a very thin layer of fluid, which serves as a coupling system. Pleural fluid accumulates when pleural fluid formation exceeds pleural fluid absorption.[3]

Pleural effusion is classified as exudative and transudative on the basis of Light's criteria. According to these criteria, all exudates have at least one of the following while transudates have none.

1. Ratio of pleural fluid protein to serum protein > 0.5.
2. Ratio of pleural fluid LDH to serum LDH > 0.6.
3. Pleural fluid LDH > 2/3 of upper limit of serum LDH.[4]

Worldwide exudative effusions are usually due to empyema, malignancy, tuberculosis, pulmonary embolism and connective tissue diseases.[1,8] In our setup the common causes of exudative pleural effusions are tuberculosis, parapneumonic effusion and malignancy.[5-7]

Pleural fluid analysis is mandatory in all cases of effusions. If a patient has an exudative pleural effusion, the following tests on the pleural fluid should be obtained, i.e the gross appearance of the fluid, glucose level, total leukocyte count, differential cell count, microbiological studies and malignant cytology.[3] Pleural fluid cytology helps in the diagnosis of malignant effusions. If the cytology is negative but there is strong clinical suspicion of malignancy then thoracoscopy is procedure of choice. If thoracoscopy is not available, then needle biopsy of pleura should be performed.[3]

Pleural fluid culture for acid fast bacilli is positive in less than 40% cases of tuberculous effusion. In this situation detection of DNA from Mycobacterium in the effusion by PCR or determination of adenosine deaminase is helpful in the diagnosis of tuberculous effusion.[3]

Pleural fluid examination in purulent pleural effusion or empyema reveals predominant polymorphonuclear cells and positive Gram stain or culture.[4] When clinical features are suggestive of pulmonary embolism, then D-dimer is a good screening test and diagnosis is established by V/Q Scan, spiral CT scan or pulmonary angiography. In cases of pleural effusion due to connective tissue diseases like Rheumatoid arthritis, SLE and Systemic sclerosis the investigations of choice are antinuclear antibodies, Rheumatoid factor and anti-DNA antibodies in serum.[9]

De Francis and coworkers first pioneered pleural biopsy in 1955, and this was followed three years later by introduction of Abrams and Cope pleural biopsy needles.[10] Pleural biopsy is a valuable and time tested investigation in diagnosing tuberculous and malignant pleural effusions. The yield of pleural biopsy depends on age of patient, number of biopsy specimens, technique and histopathological expertise.

We are interested in this study because a lot of patients present with exudative pleural effusions in our hospital so that early diagnosis and management can lead to their better survival.

Material and Method

Study Design

Cross – sectional study.

Setting

Institute of Chest Medicine, King Edward Medical University / Mayo Hospital Lahore.

Sample Size

130 cases.

Sampling Technique

Non Probability purposive sampling.

Inclusion Criteria

- Patients of both sexes with clinical and radiological evidence of pleural effusion.
- Patients with exudative pleural effusion (according to Light's criteria).

Exclusion Criteria

- Transudative pleural effusion.
- Patients with bleeding diathesis.

Data Collection

One hundred and thirty diagnosed patients of exudative pleural effusion fulfilling the inclusion criteria were selected from outpatient and inpatient department of Institute of Chest Medicine of King Edward Medical University / Mayo Hospital Lahore. Informed consent was taken and subjects were asked about their demographic profile. Pleural fluid was aspirated and sent for total leucocyte count, differential leucocyte count, biochemistry (protein, glucose, LDH), Gram's staining and culture, AFB smear and culture, and malignant cytology. The fluid was considered an exudates as per any of the following criteria : ratio of pleural fluid to serum protein greater than 0.5; ratio of pleural

fluid to serum lactate dehydrogenase (LDH) greater than 0.6; or pleural fluid LDH greater than ⅔ of the upper limits of normal serum value.

Informed consents were taken from all patients for pleural biopsy. Pleural biopsy was done in all the cases. Patients were made to sit on bench with their hands resting on the table. After selecting the site, area cleaned with Pyodine, and anaesthetized with 2% lignocaine. A small incision made with surgical blade parallel to the ribs. Abrams needle inserted, fluid aspirated to confirm the position and then biopsy taken at 3, 6 and 9 clock position, minimum of four biopsy specimens were taken, stored and sealed in 10% formaldehyde and sent for histopathology. Therapeutic aspiration was also done. Incision site stitched with silk and aseptic dressing done. A check X-rays was done in all cases.

Results

In this study, a total of 130 diagnosed patients of exudative pleural effusion who fulfilled the inclusion criteria were included.

Out of these 130 patients, 76 (58.5%) were males and 54 (41.5%) were females (Table 1).

The mean age of the patients was 36.13 ± 13.44 years. Among the study cases, 20 (15.4%) patients were between 13 – 19 years of age, 30 (23.1%) patients were between 20 – 29 years of age, 34 (26.1%) patients were between 30 – 39 years of age, 22 (16.9%) patients were between 40 – 49 years of age and 24 (18.5%) patients were more than 50 years of age (Table 2).

Table 1: Gender Distribution. (n = 130).

Sex	No. of Patients	Percentage
Male	76	58.5 %
Female	54	41.5 %
Total	130	100%

Table 2: Demographic Characteristics. (n = 130).

Age (Years)	No. of Patients	Percentage
13 – 19	20	15.4%
20 – 29	30	23.1%
30 – 39	34	26.1%
40 – 49	22	16.9%
> 50	24	18.5%
Mean ± S.D.		36.13 ± 13.44

Table 3: Results of pleural biopsy (n = 118).

Histopathology	No. of Patients	Percentage
Tuberculosis	52	44.06%
Malignancy	19	16.10%
Empyema	14	11.86%
Non-specific Inflammation	33	27.96%

Adequate sample of pleural biopsy was taken in 118 (90.7%) patients. In 12 patients (9.3%) sample was inadequate. Out of 118 patients definite diagnosis was made in 85 (72.03%) of patients. Out of which 52 patients (44.06%) had granulomatous inflammation consistent with tuberculosis, 19 patients (16.10%) had malignancy, 14 patients (11.86%) had empyema and in 33 patients (27.96%) there was non-specific inflammation (Table 3).

Discussion

Pleural effusion is fairly common clinical entity in developed as well as in developing countries like Pakistan. Pleural effusions are grossly categorized as either exudative or transudative. The common causes of exudative pleural effusion described in literature are malignancy, tuberculosis, empyema (parapneumonic), pulmonary embolism and connective tissue disorders.

In this study out of 130 diagnosed patients of exudative pleural effusion, in 118 (90.6%) patients adequate sample of pleural biopsy was taken, out of this 52 (44.06%) patients showed evidence of tuberculosis, 19 (16.10%) patients had malignant effusion, 14 (11.86%) patients were diagnosed as cases of empyema and in 33 (27.96%) patients no specific cause was found. Tuberculosis was on the top of the list as the underlying cause of exudative pleural effusion.

Our study group consisted of mainly young patients with majority i.e; 64 (49.2%) in the range of 20 – 40 years of age. Mean age of the patients was 36.13 ± 13.44 years.

Multiple studies had been carried out on this topic earlier in different parts of the world with varying results. A similar study conducted locally, by Shaikh SJ et al showed in their study that 35 out of total 50 (66%) patients developed tuberculosis as the most common cause of exudative pleural effusion.[11] Almost similar trend was seen in our study with tuberculosis found in 49.2% of cases and empyema in 20.8% of cases. The main difference between this study and our study was the age difference of patients. The age in our group ranged from 13 – 60 years, while Shaikh SJ et al conducted study in pediatric age group (3 – 14 years). So, according to these two studies, the etiological causes of exudative effusions are same.

Another local study by Ahmad A et al showed that 40 of 108 (37%) patients had tuberculosis,[12] the most frequent cause of exudative pleural effusion, followed by malignancy in 31 (29%) and complicated parapneumonic effusion (empyema) in 19 (18%) patients. This study was conducted only in large and massive pleural effusion, while in our study there was no such limitation. Despite this difference in amount of pleural effusion, the results of this study were consistent with our study data.

Internationally a study by Zablockis R et al described malignant effusion (16.5%), para-pneumonic effusion (13%), pleural empyema (9%), tuberculosis (6%) and pulmonary embolism (5.5%) as the common etiological diagnosis of exudative pleural effusion.[13] These results were different from our study showing malignant effusion the most frequent cause of exudative pleural effusion. The reasons being this study was conducted in western setup, where malignancy and empyema are frequent causes of exudative pleural effusion as compared to tuberculosis.[14] While in Pakistan TB is endemic and we are at 8th position among the 22 high burden countries.

A wide range of diagnostic yield of pleural biopsy has been reported in literature. Fishman AP, et al[15] reported 40% diagnostic yield of pleural biopsy in their patients. Baum GL et al.[16] reported 51% diagnostic yield of pleural biopsy in their meta analysis of 14 studies including 2893 patients. A study undertaken by Heidariet *et al*[17] on 100 patients suggested that pleural biopsy showed 97% results in diagnosing tuberculous pleural effusion and 91% in Malignant Pleural effusion. Another study done by Frank[18] showed the diagnostic yield of pleural biopsy in 40 – 70% cases in both tuberculous and malignant pleural effusion. In a local study by Ihsanullah et al the diagnostic yield of pleural biopsy was found to be 95% in malignant, tuberculous and Anthracosis.[19] In our study the yield of pleural biopsy was 72.96% and most common disease was tuberculosis 44.06% which was comparable with most of the local studies.[11,12,19]

Conclusion

Pleural biopsy is a valuable tool in the diagnosis of exudative pleural effusions especially in developing countries like Pakistan where more sophisticated investigations like thoracoscopy are not widely available. It should be used as a routine diagnostic procedure in the diagnosis of exudative pleural effusions.

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