

Usefulness of Pleural Fluid C - reactive protein in Diagnosing Etiology of Pleural Effusion

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Abstract: The aim of the study is to evaluate the sensitivity of pleural fluid CRP in identifying parapneumonic effusions. **Methods:** A single centre cross sectional study comprising of 50 patients was done at madras medical college and patients were divided into four groups according to their type of pleural effusion as follows: tuberculous, malignant, parpneumonic effusions and others and the pleural fluid CRP measured.

Keywords: C - reactive protein, exudate, malignancy, transudate, tuberculosis

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I. Introduction

Pleural effusion is one of the most common diagnoses made in the medicine wards. Pleural effusion is classified in to exudative and transudative effusions based on Light's criteria. In India infectious causes of pleural effusion like Tuberculosis and parapneumonic effusions are the commonest causes of pleural effusion. Tuberculosis is often diagnosed and treated empirically. The diagnosis of tuberculous effusion has become simpler after the advent of pleural fluid ADA. Malignancy causes massive pleural effusion and the diagnosis is made by the presence of malignant cells on cytology or on biopsy. Other causes of pleural effusion include connective tissue disorders, pulmonary embolism, mesothelioma. C-Reactive protein is an acute phase reactant that is elevated in blood and pleural fluid in many inflammatory conditions. This study is undertaken to assess the usefulness of pleural fluid C-Reactive protein in the diagnosis of etiology of pleural effusion.

II. Aim of the study

To find the role of CRP in the etiological diagnosis of pleural effusion.

III. Objectives

To differentiate transudative from exudative effusion using pleural fluid CRP. To categorise the etiology of exudative pleural effusion into tuberculous or malignant or parapneumonic effusion using pleural fluid CRP levels.

IV. Materials and methods

- 4.1. Setting: The study was conducted at the Institute of Internal Medicine, Madras Medical College.
- 4.2. Ethical committee approval: Obtained
- 4.3. Study duration: This study was conducted over a period of 6 months from Nov 2017 to April 2018
- 4.4. Study population: Patients admitted in medical ward, Institute of Internal Medicine, Madras Medical College
- 4.5. Sample Size: 50
- 4.6. Type of study: cross sectional study
- 4.7. Inclusion criteria: Newly diagnosed cases of pleural effusion
- 4.8. Exclusion Criteria: Patients unwilling to give consent, Patients on oral contraceptives, Patients with collagen vascular diseases on treatment, Patients with HIV

V. Data collection and methods

History was collected from the patients with a standard questionnaire and they were subjected to clinical examination. All patients who were diagnosed with pleural effusion clinically or with Xray were subjected to pleural fluid analysis comprising of Sugar, protein, LDH, ADA, gram stain, culture and sensitivity, cytology. Pleural fluid CRP was measured in all the patients. Effusions were grouped into exudative or transudative based on Light's criteria. Patients with transudative effusions were further subjected to echocardiogram and ultrasound abdomen. Exudative effusions were divided into four categories namely

parapneumonic, malignant, tuberculous effusion and others. Parapneumonic effusion is labeled when there are signs and symptoms of pneumonia with characteristic infiltrates on x ray with or without positive gram stain and culture of blood or pleural fluid cytology with neutrophilic predominance with normal ADA levels and no evidence of other systemic illnesses and clinical improvement with antibiotic therapy. Tuberculous effusion is defined as exudative effusion with lymphocytic predominance with ADA levels more than 40 units with or without positive Mantoux test with or without positive sputum for TB with or without positive pleural fluid AFB. In the absence of above evidence pleural fluid biopsy showing granuloma favoured diagnosis of tuberculous effusion. Malignant effusions were diagnosed based on positive pleural fluid cytology for malignant cells or biopsy proven lesions or by the presence of hemorrhagic effusion in a known case of malignancy.

VI. Statistical Analysis

All data were subjected to FISHER'S EXACT TEST, ANOVA TEST, UNPAIRED 't' tests. Individual group comparisons were made using parametric tests and non-parametric tests as appropriate. P value of <0.05 is taken as statistically significant. Statistical analysis was made using GRAPH PAD PRISM software.

VII. Observation and analysis

Total number of patients selected for the study were 50. among them 11 belonged to transudate and 39 belonged to exudate. In percentage, 22% were transudate and 78% were exudative.

VIII. Symptom Analysis

The total number of patients who had cough-48%, sputum-44%, hemoptysis-3%, fever-23% and loss of weight-13%. In parapneumonic effusions, cough with productive sputum was present in 82.3%, hemoptysis was seen in 5.8% and fever was present in 94.1% patients.

In patients with tuberculosis only 21% had cough, none of them had hemoptysis, fever was present in 35.7% and loss of weight was present in 35.7%.

8.2. TRANSUDATIVE PLEURAL EFFUSION:

The mean ESR among the transudative group were 15.6 mm/hr. Serum LDH was 85.81 and the LDH ratio was 0.41. Mean pleural fluid protein was 1.65 and the protein ratio was 0.30. Mean pleural fluid ADA was 15.54. Mean pleural fluid CRP was 7.21 mg/L.

8.3. EXUDATIVE PLEURAL EFFUSION:

8.3.1. TUBERCULOSIS: The ESR of this group was 39.28 mm/hr. The pleural fluid CRP was 50.5 IU/L (SD-8.89)

8.3.2. PARAPNEUMONIC EFFUSIONS: Parapneumonic effusions were predominantly present in males in this study. The mean ESR was 34.17. The serum LDH was elevated and the mean serum LDH was 273.58 IU and the pleural fluid LDH was elevated and the mean value was 420.29 IU and the LDH ratio was satisfying the criteria for exudate and the mean value was 1.565. The pleural fluid ADA was not significantly elevated as expected and the mean value was 23.70 IU. The cytology of pleural fluid is predominantly polymorphonuclear cells.

8.3.3. MALIGNANT EFFUSION: The mean ESR of malignant effusion is 15.5 mm/hr. The serum LDH is 178.75 IU. The total protein and protein ratio is 3.125 g/dL and 0.62. The mean pleural fluid ADA is 14.75 IU. The mean CRP of malignant effusions is 23.075

IX. Discussion

Our study aimed at bringing out the significance of CRP in the etiological diagnosis of pleural effusion. Comparing the mean CRP between the exudative and transudative effusion is extremely significant with the p value of <0.0001. Study conducted by us has a mean CRP of 7.21 mg/L (SD-2.27) in the transudative group. Our study was extremely significant in differentiating the two. A similar study conducted by Hoda et al. showed that the mean serum value was 0.30 (SD-0.11) and was significant with a P value of <0.0039.

The exudate group has a mean CRP value of 68.55 mg/dL (SD-40.04). The mean CRP in pleural fluid in another study is 67.6 mg/L (SD-6.74). Most of the studies also measured the serum CRP levels and the ratio of pleural fluid to serum CRP. The mean CRP ratio in the transudative group is 0.14 mg/dL (SD-0.11) and the exudative pleural fluid CRP is 0.39 (SD-0.34). But the pleural fluid to serum CRP ratio was not significant in our study. In another study done, CRP of transudative effusion had a median value of 0.34 and the mean is 0.36 (SD-0.19)

9.1. CRP IN EXUDATIVE PLEURAL EFFUSION The mean CRP in pleural effusion among different groups of exudate in our study is Tuberculosis-52.15 mg/L(SD-14.83),Malignancy-23.07 mg/L(SD-7.83),Parapneumonic effusion-103.47(SD-32.23).In a similar study conducted in Spain the mean CRP in malignancy was found to be 29.3mg/L(SD-16.1),Parapneumonic effusion-122.7(SD-48)and in tuberculosis the mean CRP was 67.8(SD-32.1).

Patients with parapneumonic effusion had the highest CRP values than those with Tuberculosis.Malignant pleural effusion had lower CRP levels in pleural fluid than others in the exudative group.

9.2. COMPARISON OF CRP IN PARAPNEUMONIC EFFUSION AND TUBERCULOSIS

9.2.1 PARAPNEUMONIC EFFUSION:The mean difference between parapneumonic and tuberculous effusion is -51.320.The P value is significant and is <0.001.

9.2.2. COMPARISON OF CRP IN MALIGNANT VERSUS TUBERCULOUS EFFUSION:The mean difference between malignancy and tuberculous group is +29.080 and P value is significant<0.05%

9.2.3. COMPARISON OF PARAPNEUMONIC EFFUSION AND MALIGNANCY:The P value is <0.001 and highly significant.Similar studies done with CRP levels in pleural effusion are in concordance with our study results.From the above analysis of CRP it is evident that Pleural fluid CRP levels are not only useful in differentiating Transudative versus exudative effusion but also help to differentiate malignant effusion from that due to tuberculosis or parapneumonic effusion.

X. Conclusion

Pleural fluid CRP is useful in differentiating exudative and transudative effusions. Pleural fluid CRP is elevated in all types of exudative effusions.Among the exudative group the CRP levels are highest in parapneumonic effusion than tuberculosis. If the pleural fluid CRP is $>7.21 \pm 2.27$ transudative effusion is unlikely.If the pleural fluid CRP is $>103.47 \pm 32.23$ parapneumonic effusion is more likely.If the pleural fluid CRP is $>52.15 \pm 14.83$ the diagnosis of tuberculous effusion is strongly considered.Malignant effusions had CRP value of 23.075 ± 7.83 . Pleural fluid CRP can be used to differentiate malignant from tuberculous effusion.CRP can be incorporated in the algorithm of pleural fluid evaluation in routine practice.

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