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EVALUATION OF PLEURAL FLUID C-REACTIVE PROTEIN IN ETIOLOGICAL DIAGNOSIS OF PLEURAL EFFUSION

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ABSTRACT:

Background: Pleural effusions are a common adverse effect of fluid buildup inside the pleural area.due to the anatomical nature and lack of a direct access, this condition is a top diagnostic challenge. The treatment varies depending on the pleural illness. One of two things the pleural effusion can do is either particular or general qualities. When there may be an imbalance between pleural fluid creation and absorption, pleural effusion occurs. Currently, the distinction between exudative and transudative effusion is made using Light's criteria. If the pleural effusion is exudative, a thorough diagnostic workup is required to identify the likely local cause of the fluid. Exudative pleural effusions are currently assessed in addition with pleural fluid mobileular mobility and differentials, glucose level, adenosine deaminase (ADA), fluid GeneXpert for Mycobacterium TB (MTb), fluid culture, and cytology. The sensitivity and specificity of the aforementioned checks, however, are unreliable. Because CRP in the pleural fluid might result from increased diffusion from the blood due to infected capillary leaking, the levels of pleural fluid CRP are likely to reflect serum CRP levels.

Aim: Evaluation of pleural fluid c-reactive protein in etiological diagnosis of pleural effusion

Material and Method: This was a possible observational study that was conducted. Fifty patients with pleural effusion in all were selected for the research, and the amount of CRP in the pleural fluid was measured. All of the subjects had interviews with element records, exams, and investigations in accordance with the predesigned and pretested proforma. Patients' informed permission was obtained before they could take part in the trial. CRP-Turbilatex-Quantitative Turbidimetric Immunoassay, which is based entirely on the classical agglutination response, was used to measure the CRP in pleural fluid.

Results: Our investigation found significant differences in serum, fluid levels, and fluid/serum ratios for LDH, total protein, and CRP in addition to CRP fluid/serum ratio for each organisation. A strong association between CRP, LDH, and total protein fluid levels developed. One incidence of liver cirrhosis and one case of cardiac effusion were found among the 50 patients with pleural effusion. The pleural fluid test was performed after the diuretics were stopped in the three instances since they had been getting them and had become, by Light's standards, transudative.

Conclusion: The estimation of pleural fluid In order to differentiate between exudative and transudative effusions, CRP might be utilised as a diagnostic tool. Moreover, pleural fluid CRP is a statistically significant marker for separating exudative effusions that are not tubercular from tubercular effusions. CRP levels in pleural fluid can be utilised as an additional diagnostic tool for exudative effusions. It makes a clear distinction between parapneumonic effusions and empyema and tuberculous and malignant effusions.

Keywords: CRP, LDH, Transudative effusions, Exudative effusions, liver cirrhosis, Tuberculous, Pleural fluid, MTb, ADA.

Introduction:

A buildup of fluid in the pleural space is referred to as a pleural effusion. Pleural effusion happens when the volume of fluid in the pleural space exceeds the physiological limit of 0.1–0.2 ml/Kg. Pleural effusion arises when there is an overproduction of pleural fluid or when the fluid reabsorption is compromised. Pleural effusions have a variety of etiologies and can be a secondary sign of other diseases, however they can be a main symptom of many illnesses. [1] Pleural effusion results from an imbalance between the production and absorption of pleural fluid.[2]. Identifying whether a pleural effusion is exudative or transudative is the first step in treating it. An exudative pleural effusion requires the fulfilment of at least one of Light's criteria, which are: pleural fluid protein divided by serum protein greater than 0.5; pleural fluid lactate dehydrogenase divided by serum LDH greater than 0.6; or pleural fluid LDH greater than two-thirds of the upper limit of normal serum LDH. On the other hand, transudative pleural effusions are excluded from all rules. [3] Some of the diagnostic techniques utilised in pleural effusion include radiology (standard radiography, ultrasonography, computerised tomography), thoraccentesis (pleural fluid analysis), closed pleural biopsy, and video aided thoracoscopic biopsy. Using Light's criteria, pleural fluid is presently categorised into exudates and transudates. Malignant, parapneumonic, and tubercular effusions are still routinely used to categorise exudative effusions. Currently, pleural fluid is used to detect adenosine deaminase (ADA) to identify tubercular effusion from other exudative effusions. To detect tubercular effusions, ADA levels must be above a certain threshold (>45 IU). [4,5]

The aetiology of pleural effusion is determined by the pleural fluid protein/serum protein ratio, bilirubin ratio, lactate dehydrogenase in pleural fluid, lactate dehydrogenase ratio, cholesterol in pleural fluid, cholesterol ratio, and albumin gradient. With the exception of the bilirubin ratio, all eight tests showed equivalent levels of diagnostic accuracy. [6]

The CRP level is the clinically relevant screening test for inflammatory disorders. [7,8] The acute phase protein known as C-reactive protein is produced by both adipocytes and the liver. Because inflammatory cells release the cytokines IL-6, TNF, and IL-1, this protein is generated more often. [9] A clinically effective organ disease screening test, severity index, and therapy response indicator is the measurement of CRP levels. 10 the pleural fluid CRP is likely to mirror serum CRP levels because it may be brought on by increased blood diffusion as a result of inflammatory capillary leaks in the pleural fluid. [11,12] A recent study found that the C-reactive protein in pleural fluid may be utilised as a diagnostic tool to differentiate between pleural effusions with and without bacterial aetiology.[13]

CRP levels in pleural fluid have attracted attention among the indicators now under investigation. CRP levels in pleural effusion haven't yet been studied in very many studies. In this protein, generated more frequently in response to inflammatory cells' release of the cytokines IL6, TNF, and IL1. In order to determine the clinical significance and diagnostic utility of the CRP level in pleural fluid in the etiological diagnosis of exudative pleural effusion, the current study set out to evaluate these factors. [14,15,16.]

Material and Methods

An institution-based prospective observational research was carried out. Pleural effusions were highlighted as possible markers based on the clinical examination and patient history. We eliminated patients who had hemothorax, post-pleurodesis, chylothorax, or frank empyema.

Data collection: The research consisted of 50 instances in total. All respondents had extensive anamnesis interviews, surveys, and tests using a form that had been previously created and tested.

The patient who agreed to take part in the trial provided informed consent. Hemogram by ESR, serum biochemistry, chest radiograph (PA view), sputum Gram staining, sputum AFB staining, pleural fluid analysis of total and fractional counts, A pleural chemistry, and pleural examination were conducted in addition to the standard evaluation of the patient inclusion criteria. Pleural fluid cytology, pleural fluid Gram staining, and fluid AFB staining. To investigate the biochemical parameters of protein, albumin, LDH, and CRP, venous blood and pleural effusion were concurrently collected. After completing the analyzer's entire calibration, biochemical analyses were carried out utilising a multichannel analyzer (Vitrios 350). For pleural effusion, the CRP value was measured by immunoturbidimetry. [17]

Inclusion criteria: The study included patients who went to the pulmonary medicine OPD and were diagnosed with pulmonary infections associated with acute febrile illness, pulmonary infiltrates, purulent

sputum, and response to antibiotic treatment or emphysema in conjunction with the discovery of frank pus in the pleural cavity with pleural effusion.

Exclusion criteria: Patients under the age of 10, those who were receiving care in an emergency room, those who were in critical condition, and those who refused to take part in the study were eliminated.

Procedure

The diagnosis of pleural effusion was verified and the patient was made to sit on the side of the bed with their arms and heads resting on one or more pillows on the bedside table while having a thoracentesis. A thoracentesis was performed posteriorly toward the spine, where the ribs could be felt readily, after cleaning with an antiseptic solution. This position was chosen because it is close to the arteries, veins, and nerves that run directly below the ribcage. The skin was anaesthetized by injection of lidocaine with a small 25-gauge needle. Above the rib, the little needle was then changed out for a 1.5-inch long 22-gauge needle. A progressive needle penetration into the pleural space was performed to aspirate the pleural fluid. A 50- to 60-mL syringe containing 1 mL of heparin was then inserted into the pleural region to prevent clotting. When there is clotting, it is difficult to determine the pH of the pleural fluid or to get differential white blood cell counts. After numerous rounds of aspiration, the syringe was completely filled. A diagnostic thoracentesis can be carried out with the use of commercially available kits. [18.]

Estimation of C-Reactive Protein (CRP)

The CRP-Turbilatex-Quantitative Turbidimetric Immunoassay method, which is based on agglutination reactions, was used to assess the CRP in pleural fluid. Agglutinin is created when latex particles coated with a specific anti-human CRP mix with pleural fluid (the test material) that contains CRP. When compared to a standard CRP concentration, changes in absorbance (540 nm) brought on by this reaction may be determined. [19]

Result:

In the current study, 100 people with pleural effusion from a variety of causes took part. Data are presented as number and percentage for sex and range and mean SD for age for the cases under investigation, respectively.

Table 1: Sex and age distribution on studied cases.

Variable	Number
Gender	
Male	25
Female	25
Age (Range)	21-77
Age (Mean ± SD)	55.8±12.5

Table 2: Laboratory investigations of the serum and the pleural fluid.

Laboratory Investigations	Pleural effusion patients (n = 50)
LDH (mg/L)	
Fluid level	794.6±88
Serum level	4.1
Fluid/serum ratio	650±374.5
Protein (mg/L)	
Fluid level	5.3± 2.4
Serum level	8.04±2.2
Fluid/serum ratio	0.8±0.18
CRP (mg/L)	
Fluid level	17.8± 8.7
Serum level	65.4±42.6
Fluid/serum ratio	0.5±0.4

LDH, total protein, and CRP serum, fluid, and fluid/serum ratio levels varied significantly across the two groups, with the fluid/serum ratio of CRP being the only exception..

Discussion

The research comprised 50 individuals with plural effusions in total. The sub-categorization of pleural effusion, a clinically common consequence of various respiratory disorders, is mostly based on regular pleural fluid sampling and biochemical, cytological, and pathological testing. [20]

The aforementioned tests' sensitivity and specificity, however, are insufficient to accurately diagnose an exudative effusion. Finding the specific aetiology of the exudative effusion can be accomplished with excellent success using thoracoscopy and invasive methods like pleural biopsy. However, most patients are reluctant to undergo it since it is so intrusive. Surgery-related issues are particularly common with these invasive treatments. Cytological tests are time-consuming and frequently provide false-negative findings. It is thus necessary to develop an unique biomarker that offers an early diagnosis with high sensitivity and specificity. CRP, an acute-phase reactant generated by hepatocytes, is a crucial diagnostic test for the screening of infectious and non-infectious illnesses in a laboratory. In the current study, we evaluated the role of pleural fluid CRP in the differential diagnosis of exudative effusion.

Ages of the participants in our research varied from 21 to 77, and males were more frequently afflicted than women. Men were afflicted more frequently than women in Qu et al's research of 87 patients with exudative pleural effusion (62 cases out of 87 individuals) (25 patients).

The current analysis found that the fluid to serum ratio of CRP in transudative and exudative effusions is not significantly different. In agreement with our findings, Hoda Abu-Youssef et al. (2010)21 found that the CRP in fluid to serum ratio does not statistically differ between transudative and exudative effusions. Hoda Abu-Youssef et al. (2010) found that the mean CRP levels in exudative and transudative pleural fluid effusions differed statistically significantly (p 0.003), with higher levels in the latter. [21]

In 187 patients with exudative pleural effusions, Gabhale SD et al. discovered that the pleural fluid CRP level was higher in parapneumonic effusions than in tuberculous effusions, with a mean value of 134.03 in parapneumonic and 66.54 in tuberculous effusions. [22] Similar conclusions were drawn from a research by Perlat K et al., who found that pleural CRP levels in an exudative effusion were below 30 mg/L, strongly indicating malignancy, and over 30 mg/L, strongly indicating an inflammatory aetiology. [23]

Pleural fluid protein was used in a research by Patel AK and Choudhury S to discriminate between exudates and transudates with a cut-off value of 3 g/dL. [24] The mean pleural protein was 5.41.1 in tubercular effusion, 4.61.1 in malignant effusion, and 4.00.4 in parapneumonic effusion in a research by Gabhale SD et al., which reported a similar outcome. [22] According to Izhakian et al.[25,] parapneumonic effusions exhibited pleural fluid CRP levels that were greater than those of other exudative effusions at a cut-off value of >1.38 mg/dl. Additionally, according to Porcel et al.[26], severe parapneumonic effusions necessitated pleural fluid evacuation when the level of pleural fluid CRP was >10 mg/dl. While Radhakrishnan et al.[27] utilised a cut-off value of pleural fluid CRP >70 mg/dl in their survey, our study's threshold for parapneumonic effusion from tuberculosis was 47.4 mg/dl.

The study's advantages included the adaptability of exudative effusion diagnosis, accurate CRP level measurement, and comparison of a well-known marker. To determine the specific role of CRP in exudative pleural effusions, further extensive investigation will be required.

Conclusion:

As a diagnostic tool, CRP in pleural fluid can be used to differentiate between exudative and transudative effusions. A statistically significant criterion for separating tubercular effusions from exudative effusions that are not tubercular is pleural fluid CRP. It is evident from the current study that exudative pleural effusions may be distinguished from one another using pleural fluid CRP testing. CRP levels in pleural fluid can be utilised as an additional diagnostic tool for exudative effusions. It makes a clear distinction between parapneumonic effusions and empyema and tuberculous and malignant effusions. The importance of pleural fluid CRP in distinguishing between malignant and tuberculous effusion, however, was not significant in our investigation. Our findings unequivocally demonstrate that pleural fluid CRP is a very rapid and affordable treatment.

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