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Original Research Article

A study to assess the role of C reactive protein as a marker in diagnosing pleural effusion

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ABSTRACT

Background: The cause of pleural effusion is due to systemic or localized pathology and based on the etiology involved the pleural effusion is either classified into transudate and exudate supported by Light's Criteria. Other than the marker used in Lights Criteria C reactive protein is said to be studied to determine its role in classifying exudate and transudate.
The present study was done to assess the role of C reactive protein in diagnosing pleural effusion.
Materials and Methods: The cross-sectional study was conducted by the Department of Chest and Respiratory Medicine at Chamarajanagara Institute of Medical Sciences from June 2019 to May 2020. A total of 120 cases of clinically confirmed cases of Pleural Effusion Cases were selected for the purpose of the study among the outpatient and inpatient in the Department of General Medicine and Respiratory Medicine Department.
Results: The Mean CRP of 1.05±1.09 was found to be cut off value for differentiating between transudate and exudate Pleural fluid. At the Cut off value of 1.05 CRP it was found to be having a sensitivity of 75.4% and 77.6% of sensitivity.
Conclusions: From the present study we could conclude that the CRP Value of 1.05mg/dl was found to be having a good specificity and sensitivity in classifying the pleural fluid into transudate and exudate. Finally we could conclude that CRP can be used as a Biomarker to differentiate between Transudate and Exudate when Lights criteria falls in borderline.

1. Introduction

The collection of fluid between the two layers of pleural due to imbalance in the homeostatic factors in the secretion and absorption of Pleural fluid. The secretion of pleural Fluid is from the parietal Pleural is from the capillaries at the rate of 0.01 ml/kg/hr and gets cleared at the rate of 0.4ml/kg/hour.[1]

On an average each individual has approximately 8.5ml of Pleural Fluid which is considered to be normal and the normal pleural fluid consists of cell count approximately 1716 cell /mm^3 and mean red blood cells count being 700 cells/mm^3 with majority of them consists of 75% of macrophages and 25% lymphocytes and 2% consisted of mesothelial cells and eosinophils and neutrophils count.[2]

The formation of pleural fluid will be due to either localized or systemic pathology. The knowledge of underlying pathological process will help us to differentiate between transudate and exudate Pleural Fluid. The transudate Pleural fluid are either due to secondary for systemic cause like congestive cardiac failure, renal Failure and Liver Disease. The Exudates Pleural Fluid is either due to infectious etiology or local inflammatory reasons.[3,4]

Traditionally the pleural fluid is either classified into exudate or transudate based on the Light criteria where

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Pleural fluid protein and serum protein are considered which had a lot of disadvantages and misclassification of Plural effusion.[4]

Various Other characteristics of Plural fluid such as physical appearances, presence of locations, estimation of pleural glucose, Pleural fluid ph., ADA levels and CRP Level estimation can also be used to classify the fluid into transudate and exudate along with lights criteria for the borderline cases.[5,6]

C reactive Protein is considered as an acute phase reactant liberated by the hepatocytes in the liver whenever there is an inflammatory process. CRP is of two types hsCRP and lsCRP of which ls CRP is considered to be more sensitive marker when there is an inflammatory reaction.[5]

When the CRP is released into the blood stream during the early phase of inflammation in the body, CRP gets diffused into pleural space by diffusion and its presence can be detected. Among those with no inflammation Pleural Fluid does not consists of CRP even among normal subjects.

Thus estimation of Pleural Fluid CRP will act an absolute indicator of the inflammation and further Pleural fluid CRP was also found to be cost effective in estimating the CRP Value. Hence estimating of CRP will help in differentiating between transudate and exudate along with lights criteria.[7,8]

The objective of our study was to determine the diagnostic value of C Reactive Protein in pleural fluid to differentiate between exudative and transudative pleural effusion.

2. Materials and Methods

The cross-sectional study was conducted by the Department of Chest and Respiratory Medicine at Chamarajanagara Institute of Medical Sciences from June 2019 to May 2020.

A total of 120 cases of clinically confirmed cases of Pleural Effusion Cases were selected for the purpose of the study among the outpatient and inpatient in the Department of General Medicine and Respiratory Medicine Department.

2.1. Inclusion criteria

1. Age > 18 years.
2. Patients who were diagnosed with pleural effusion by Chest X ray.

2.2. Exclusion criteria

1. Aged less than 18 years.
2. Subjects who were diagnosed with Pleural Effusion in the past and treated for pleural effusion.
3. Patients having multiple etiologies or multiple organ dysfunction.

After getting the consent the data was collected from the patients and detailed history along with clinical examination, Chest X ray was performed to confirm the Pleural effusion. Pleural Fluid was taken by thoracocentesis with the help of USG and Fluid was sent for routine analysis along with estimation of CRP. The ethical committee permission was taken for the purpose of the study.

2.3. Methodology

STEP 1: Fulfilment of the inclusion criteria.
STEP 2: Clinical and radiological profile for assessing the pleural effusion.
STEP 3: Diagnostic Thoracocentesis.
STEP 4: Routine pleural fluid parameters assessed and classified as exudates / transudates based on Lights criteria.
STEP 5: Pleural fluid CRP assessed using nephelometric method (Beck Mann Coultre Immage 800 and calculated in mg/dL.
STEP 6: Classifying the pleural effusion.

Data was entered in M S Excel and analyzed using SPSS V 21. Data was represented using figures and Percentage. Chi Square test was used to check association between Categorical Variables and p values of less than 0.05 was considered to be statistically significant. Continuous Variables were expressed in the form of mean and Standard Deviation. Unpaired t test was used to test the association between the mean values.

3. Results

Total of 120 study subjects were analyzed and evaluate in the present study.

Table 1: Social Profile of Study subjects in the present study.

Social Profile		Frequency	Percentage
Age Groups	< 25 years	4	3.3
	25-40 years	19	15.8
	41-60 years	47	39.2
	>60 years	50	41.7
Gender	Male	41	34.2
	Female	79	65.8
Location	Rural	77	64.2
	Urban	43	35.8

In the present study nearly 41.7% of them were aged more than 60 years, 39.2% were aged between 41 to 60 years of age, 15.8% of them were between 25 to 40 years of age and 3.3 % were less than 3.3%. Majority of them were from Rural areas (64.2%) and 35.8% were from urban areas. Nearly 65.8% of them were Females and 34.2% were male.

Table 2: Distribution of study subjects based on lights criteria

Pleural Fluid Based on Lights criteria		Frequency	Percentage
Plural Fluid	Exudate	27	22.5
	Transudate	93	77.5

Based on the lights criteria in the present study nearly 93(77.5%) of them were classified as Transudate and 27(22.5%) were exudates.

Table 3: 3Comparison of Biological Values between exudative and transudative effusions

		Transudative	Exudative
Biochemical Values	Total Proteins	6.13+0.98	6.86+ 0.55
	Albumin	3.15+0.39	3.45+0.55
	Globulin	2.95+0.47	3.42+0.47
Pleural Fluid Proteins		1.61+0.48	4.68+1.02

From the Above table we could conclude that only serum globulin was found to be statistically significant between transudate and exudate pleural fluid with p value of less than 0.05 whereas albumin and protein were found to be statistically insignificant. The Globulin level was found to be 2.95+0.47 mg/dl in transudate and 3.42+0.47 in Exudative pleural fluid.

The proteins levels in the pleural fluid was found to be 1.61+0.48 among transudate pleural fluid and 4.68+1.02 among exudative Pleural fluid and the association was found to be statistically significant with p value of less than 0.05 in differentiating between transudate and exudate pleural fluid . This variable is also regarded as one of the criteria in differentiating transudates from exudates as per Lights Criteria.

Table 4: Comparison of pleural fluid CRP in differentiating exudates from transudates

	Transudative	Exudative	P Value
Pleural Fluid CRP	1.05+1.09	5.98+7.45	0.0001

From the present study CRP Value in the pleural fluid was found to be 1.05±1.09 among transudative Pleural fluid and 5.98±7.45 among exudative fluid with statistically significant value of less than 0.05.

On analyzing the cut off value of Pleural Fluid CRP using ROC curve it was found that cut off value of 1.05 had a sensitivity of 75.4% and specificity of 77.6% in differentiating between exudative and transudative Pleural Fluid

4. Discussion

The present study was done to evaluate the role of the CRP in differentiating between transudate and exudate fluid with reference to Lights Criteria.

The age group and gender distribution of male predominance seen in our study subjects seen in our study was found to be similar and comparable to the study findings of Ahmed et al.,[9] where 60% of them were male and 40 % were female with mean age of 54.5+10.7 years of age. In Another study done by Waffa et al.,[10] also Male subjects reported pleural effusion more than female and the mean age around 55 years of age.

On analysis of Biochemical values, it was found that on comparing the values between transudate and exudate pleural fluid it was found that total proteins were more among exudative pleural fluid, even albumin and globulin was also found to be more among the exudative pleural fluid and it was found that only globulin was found to be statistically significant between the transudate and exudate pleural fluid. Even the Pleural Fluid Protein was found to be more among exudative fluid and the association was found to be statistically significant.

The findings of our study was found to be in comparable to the study findings of Qiayoying et al.,[11] where they also opined that biochemical parameters were not statistically significant between transudative and exudative except globulin. In Another study done by Hassan et al.,[12] also concluded that pleural fluid protein was more among exudative pleural fluid then transudate and was statistically significant similar to our study findings.

In the present study the mean pleural fluid CRP level was found to be 5.98 among exudative pleural fluid and 1.05 among transudative pleural fluid and this association was found to be statistically significant. For the Cut off value of CRP of 1.05 had a ROC of 0.82 with sensitivity of 75.4% and specificity of 77.6% for differentiating Between transudative and exudative effusions.

Our study findings were found to be comparable with the study findings of Waffa et al.,[10] where CRP among transudate fluid was 1.13+0.57 and the association was found to be statistically significant with p value of 0.002. Where as in the study done by Ahmed et al.,[9] the values of CRP were found to be on higher side when compared to our studies or other studies, in transudative effusion it was 5.7 and in exudative fluid it was 16.1 with p value of 0. 0001. Abu-Youssef et al.,[13] also opined similar to our study findings with p value of less than 0.003.

In the study done by Alexandrakis et al.,[14] the sensitivity and specificity of CRP for cut off value of 1 mg/dl was found to be 74% and 74% with p value of 0.001 and it concluded that CRP can be pleural fluid marker in distinguishing the type of fluid. Even in the study done by Castano et al.,[15] the cut off value for CRP as biomarker in distinguishing transudate and exudate was found to be around 1mg/dl with significant p value which is comparable to our study findings.

5. Conclusions

From the present study we could conclude that the CRP Value of 1.05mg/dl was found to be having a good specificity and sensitivity in classifying the pleural fluid into transudate and exudate. Finally we could conclude that CRP can be used as a Biomarker to differentiate

between Transudate and Exudate when Lights criteria falls in borderline.

6. Acknowledgment

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7. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

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None.

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