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Original Research Article

A study to assess the cholesterol levels in pleural fluid and its role in differentiate between exudative and transudate pleural effusion

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ABSTRACT

Background: The pathophysiology of the transudate pleural effusion occurs when the systemic factors are involved in the formation and absorption of plural effusion, where the source of pleural fluid is originating from Lung, Peritoneal or Pleural Cavity. The origin of exudative pleural fluid effusion is when capillaries or the pleural surfaces where the fluid originates gets altered. Hence when we the pleural fluid is found to be transudate further diagnostic evaluation is not required and treat the systemic disease affecting it and if the fluid is exudate we need to investigate further to find out the cause of effusion.
Objective: To assess the role of pleural fluid cholesterol in differentiating exudative and transudative pleural effusion.
Materials and Methods: The present cross sectional study was conducted by the Department of Chest and Respiratory Medicine at Chamarajanagara Institute of Medical Sciences from March 2019 to December 2019. A total of 100 cases of clinically confirmed cases of pleural effusion cases were selected for the purpose of the study.
Results: Based on the Light's Criteria the Pleural Fluid was analyzed and 94% of them were classified as exudates and 6% of them to be transudates and Pleural fluid cholesterol of more than 45mg/dl 74% of them were exudates and 26% of them were transudates. In the present study based on final diagnosis out of 74 subjects who were classified as exudates, 72 subjects were classified as exudates and misclassified 2 cases as transudate. Lights Criteria diagnosed only 4 cases as transudate pleural fluid among the 26 cases of transudate pleural fluid based on final diagnosis**.**
Conclusions: Light's criteria is the most accepted criteria for differentiating between exudates and transudate in pleural effusion. By the Present study we could conclude that the estimation of Pleural Cholesterol Level has good sensitivity, Positive Predictive Value than lights criteria in diagnosing exudative and transudate Pleural Fluid.

1. Introduction

The pleural fluid is the collection of fluid between the outer and inner pleural membrane and it contains only few milliliters of fluid.

When the rate of absorption is lesser than the rate of accumulation due to pathological reasons the fluid keeps accumulating in the space and is known as Pleural Effusion. The Plural effusion is further divided into Exudate and transudate based on the pathophysiology. [1,2]

The pathophysiology of the transudate pleural effusion occurs when the systemic factors are involved in the formation and absorption of Plural effusion, where the source of pleural Fluid is originating from Lung, Peritoneal or Pleural Cavity. [3]

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The origin of Exudative Pleural Fluid effusion is when capillaries or the pleural surfaces where the fluid originates gets altered. Hence when we the pleural fluid is found to be transudate further diagnostic evaluation is not required and treat the systemic disease affecting it and if the fluid is exudate we need to investigate further to find out the cause of effusion.[4,5]

The level of protein in the pleural fluid is used to differentiate between exudate and transudate with the cut off value of 3 gm/dl. Further in the year 1972 Light et al., came out with light Criteria to differentiate between exudate and transudate. When one of the three criteria is met then the fluid can be considered as exudates and transudate pleural fluid should not meet any of the criteria.[6]

The Light's Criteria is defined as-[7]

1. Ratio of Pleural Fluid Protein and Serum Protein More than 0.5.
2. Ratio of Pleural Fluid LDH and Serum LDH to be more than 0.6.
3. The LDH value in Pleural Fluid more than two third of upper Limit of Serum LDH.

The levels of cholesterol in the pleural Fluid is been considered as one of the important parameter in determining the type of pleural fluid. The pleural fluid cholesterol level of cut off value of 45 mg/dl will is said to eliminate the possibility of being misclassified as either transudate or exudate and the present study aim to assess the role of Cholesterol level in differentiating between exudative and transudative pleural fluid.[8,9]

To objective of this study was to determine the Role of Cholesterol in pleural fluid in differentiating 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 100 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 Pleural Fluid Cholesterol levels were measure by the enzymatic method and the level of cholesterol more than 45 mg/dl was considered to be cut off value based on other studies for the purpose of differentiating between transudate and exudative Pleural Fluid.

The Pleural Fluid was classified into transudate and exudate fluid based on Lights criteria along with etiological causes and it was also classified into transudate and exudate Fluid based on Cholesterol Level cut off value and analyzed.

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

3. Results

Total of 100 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	5	5
	25-40 years	35	35
	41-60 years	44	44
	>60 years	16	16
Gender	Male	62	62
	Female	38	38
Location	Rural	76	76
	Urban	34	34

Table 2: Distribution of Pleural Effusion Fluid based on Light's Criteria

	Exudates	Transudates
Light's Criteria	94 (94%)	6 (6%)
Based on Cholesterol level in Pleural effusion (Pleural fluid cholesterol of more than 45mg/dl)	74((74%)	26(26%)

In the present study nearly 5 % of them were aged less than 25 years, 35% of them between 25 to 40 years, 44 % between 41 to 60 years and 16% were aged more than 60 years of age. Among the study subjects 62% of them were male and 38% of them females. Majority of them 76% were from rural areas and 34% of them from urban areas.Table 1

Table 3: Distribution of Mean Cholesterol level among study subjects.

Final Diagnosis		N	Mean	SD	P value
Pleural Fluid Cholesterol	Exudate	74	84.10	23.78	< 0.0001
	Transudate	26	25.24	09.42	

Table 4: Comparison of type of Pleural Fluid based on Light Criteria along with Classification based on Pleural Cholesterol Levels

		Final Diagnosis Based on Pleural Cholesterol levels		Total	P Value
		Exudative	Transudative		
Light's Criteria	Exudative	72(76.5%)	22(23.5%)	94(100%)	0.001
	Transudative	2(33.3%)	4(66.7%)	6(100 %)	
Total		74(74%)	26(26%)	100	

Table 5: Diagnostic test of Pleural Fluid Cholesterol Level with comparison to Light's Criteria classification

Diagnostic Test	Value	95% CI
Sensitivity	97.30 %	90.58% – 99.67%
Specificity	15.38%	4.36 % -34.87%
Positive Predictive Value	96.6%	73.45%-79.48%
Negative Predictive Value	66.67%	28.0%-91.14%
Accuracy	76%	66.43%-83.98%

Based on the Light's Criteria the Pleural Fluid was analyzed and 94% of them were classified as Exudates and 6% of them to be Transudates and Pleural fluid cholesterol of more than 45mg/dl 74% of them were exudates and 26 % of them were transudates.Table 2

The mean Pleural Fluid Cholesterol among exudate was found to be 84.10 mg/dl and among transudate it was 25.24 mg/dl and the association was found to be statistically significant.Table 3

In the present study based on final diagnosis out of 74 subjects who were classified as exudates, 72 subjects were classified as exudates and misclassified 2 cases as transudate.Table 4

Out of 26 cases of transudate cases as per final diagnosis, Lights criteria diagnoses only 4 cases as transudates.

In the present study it was found that by Pleural Fluid Cholesterol levels was found to be having a sensitivity of 97.3%, Specificity of 15.38% with PPV of 76.6% and NPV of 66.67% and diagnostic accuracy of 76%.Table 5

4. Discussion

In this study, a total of 100 patients 26 with transudates and 74 with exudates were considered according to clinical diagnosis.

The distribution of age group among the study subjects in the present study and the gender distribution was found to be similar and comparable to the study findings of Devi etal.,[10] and Poongavanam et al.,[11] study, where male was found to be most affected by Pleural Effusion. Another study done by Aloona et al.,[12] also found social Profile similar to our study findings.

In the present study the mean Pleural Fluid Cholesterol levels was found to be 84.10 among exudates fluid and 25.24mg/dl among transudate pleural fluids. In the study done by Devi HJG et al.,[10] the mean Pleural Cholesterol level among exudate fluid was 81.36 mg/dl and among transudate fluid it was 26.25 mg /dl. In another study done by Rogerio et al.,[13] the mean pleural fluid cholesterol level among exudate fluid was 90.39 mg/dl and transudate the fluid cholesterol level was 25.39 mg/dl. In another study Aloona et al.,[12] the mean cholesterol levels among transudative pleural fluids were 47.27mg/dl and exudative fluid pleural cholesterol level was 69.49 mg/dl which is almost similar to our study findings.

In the present study the Pleural Cholesterol Levels between the transudate and exudative pleural fluid was found to be statistically significant in the present study and it is similar to the study findings of Aloona et al.,[12], Hamm et al.,[9] study, and Valdes et al.,[8] study.

Further in the present study the diagnosis of Pleural Fluid Cholesterol level in determining the type of fluid in comparison to Lights criteria the Pleural fluid cholesterol was found to be having a sensitivity of 97.3%, Specificity of 15.38%, PPV was 76.6%, NPV was 66.675 and Diagnostic Accuracy of 76% in diagnosing Transudate and exudative Pleural Fluid.

In the study done by Aloona et al.,[12] the sensitivity, specificity, positive & negative predictive value is 94.12%, 100%, 100% and 88.89% respectively. In other studies, done by Valdes et al.,[8] Ram et al.,[14],and Gill et al.,[15] findings were comparable to our study findings.

5. Conclusions

Light's criteria is the most accepted criteria for differentiating between exudates and transudate in pleural effusion. By the Present study we could conclude that the estimation of Pleural Cholesterol Level has good sensitivity, Positive Predictive Value than lights criteria in diagnosing Exudative and transudate Pleural Fluid.

6. Conflict of Interest

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

7. Source of Funding

None.

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