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Original Research Article

TO STUDY THE ROLE OF PLEURAL FLUID CHOLESTEROL ESTIMATION IN DIFFERENTIATING TRANSUDATIVE FROM EXUDATIVE PLEURAL EFFUSION

Jaydeep Medhi[1], Sahidul Islam[2], Sadiqul Islam[3], Basanta Hazarika[4], Jogesh Sarma[5], Chiranjita Phukan[6]

[1]*Assistant Professor, Department of Pulmonary Medicine, Nalbari Medical College & Hospital, Nalbari, Assam, India.*
[2]*Assistant Professor, Department of Medicine, Lakhimpur Medical College & Hospital, Lakhimpur, Assam, India.*
[3]*Associate Professor, Department of Medicine, Nalbari Medical College & Hospital, Nalbari, Assam, India.*
[4]*Professor & HOD, Department of Pulmonary Medicine, Gauhati Medical College & Hospital, Guwahati, Assam, India.*
[5]*Professor of Pulmonary Medicine & Ex Principal of Nalbari Medical College & Hospital, Nalbari, Assam, India.*
[6]*Professor & HOD, Department of Medicine, Nalbari Medical College & Hospital, Nalbari, Assam, India.*

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Corresponding Author:
Dr. Sahidul Islam,
Assistant Professor, Department of Medicine, Lakhimpur Medical College & Hospital, Lakhimpur,Assam, India.
Email: saahidoc@gmail.com

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ABSTRACT

Background: Pleural effusion is a very common clinical problem encountered in a day-to-day practice of a clinician. When encountered with such a case often the first crucial step is to try to know if the accumulated fluid is of transudative or exudative nature. For this purpose, clinicians often take the help of Light's criteria. But it has some limitations in the form of both low specificity and sensitivity and also on the dependence of several parameters making it cost ineffective. Keeping all these factors in mind we undertook this study to evaluate if a single parameter i.e. pleural fluid cholesterol estimation, could be used as a valuable alternative to Light's criteria to differentiate exudative from transudative pleural effusion.

Materials and Methods: We studied a total of 130 cases between August 2018 to July 2019 in the Department of Pulmonary Medicine, Different units of Internal Medicine and allied specialities (Nephrology, Cardiology and Gastroenterology), in Gauhati Medical College & Hospital, Guwahati. Statistical analysis was done using various internet sites as per need and relevance.

Results: Our study found out the sensitivity and specificity of pleural fluid cholesterol in differentiating transudative and exudative effusion to be 89.80% and 84.38% respectively. Though we recommend further studies to validate the findings of the current study.

Conclusion: the present study states that pleural fluid cholesterol level can be a valuable alternative to Light's criteria for differentiating exudative from transudative pleural effusion with equal sensitivity and specificity at a lower cost.

Keywords: Lights criteria, pleural effusion, cholesterol, transudative and exudative effusion.

INTRODUCTION

Pleural effusion is a collection of excess of fluid in pleural space and it is a common prevalent medical problem. Incidence of pleural effusion varies according to aetiology. Pleural effusion can be either transudative or exudative. Accurate evaluation in terms of differentiating between transudative and exudative pleural effusion has been a challenge to clinician over the years.

Traditionally Lights criteria have been used to differentiate exudative from transudative pleural effusion. Romero et al. reported that Light's criteria had a very high sensitivity (98%) but relatively a lower specificity (77%). In view of the lower specificity of the Light's criteria, several recent studies have evaluated alternate criteria. Here, we

try to evaluate the practicality of one such alternate method i.e. to use pleural fluid cholesterol level as to differentiate exudative from transudative type.

Pleural fluid cholesterol is thought to be derived from degenerating cells and vascular leakage from increased permeability. Hence a high cholesterol level is naturally expected in exudative pleural fluid. Few studies have now shown that pleural fluid cholesterol levels differ significantly in transudative and exudative pleural effusion. The cut off value of pleural fluid cholesterol is taken as 45 mg/dl (1.16 mmol/L).

Keeping all these points in mind and knowing fully well about all the constraints and limitations, this study was undertaken with the following aim and objective.

MATERIALS AND METHODS

It is a hospital based observational study conducted in the Department of Pulmonary Medicine, Different units of Internal Medicine and allied specialities (Nephrology, Cardiology and Gastroenterology), in Gauhati Medical College & Hospital, Guwahati. Both indoor and outdoor patients were included in the present study. Ethical clearance was obtained from the Institutional Ethical Committee in prior.

Inclusion Criteria

All patients with radiological pleural effusion of more than 14 years of age of either sex were included for the study.

Exclusion Criteria

1. Patients with hypercholesterolemia.
2. Patients on drug known to cause hypercholesterolemia.
3. patients with bleeding diathesis.
4. Patients not willing to give consent.

A total of 130 cases meeting the inclusion and exclusion criteria were finally enrolled the study. Study was done between August 2018 to July 2019.

Etiological Diagnosis

The patients were classified as transudative or exudative pleural effusion on the basis of their final diagnoses based on a spectrum of clinical plus diagnostic methods relevant to diagnose that disease.

The diagnoses of the patients were defined by the following predetermined criteria:

(1) Pleural effusion of Congestive heart failure (Michael S Figueroa et al.75)

(2) Pleural effusion of chronic kidney diseases.

(3) Cirrhosis patients were diagnosed by history, clinical examination, liver function test, imaging and upper GI endoscopy.

(4) Neoplastic effusions were diagnosed if one of the following criteria was met:

- Detection of malignant cells at cytologic examination.
- Pleural biopsy.

(5) Para-pneumonic effusion was identified when there was an acute febrile illness with purulent sputum, pulmonary infiltrate and responsiveness to antibiotic treatment, and/ or identification of an organism in the pleural effusion in the absence of any other explicable cause.

(6) Tuberculous pleurisy was diagnosed if one of the following criteria was met:

- Identifying bacillus in pleural fluid or biopsy specimen on cultures.
- The presence of caseous granulomas in pleural biopsy tissue.
- Radiological and clinical evidence of tuberculous pleurisy with acid-fast bacilli positive sputum.

(7) The diagnosis of SLE was arrived based on American College of Rheumatology criteria (Revised Classification Criteria for SLE).

(8) Chylothorax was diagnosed, if the pleural fluid triglyceride level exceeded 110 mg/dL.

RESULTS

FINDINGS

Out of 130 cases of pleural effusion, 75.38% cases were observed to have exudative pleural effusion whereas 24.62% cases had transudative pleural effusion on the basis of aetiology.

Table1: Types of pleural effusion based on etiology

Type of pleural effusion	Number	Percentage (%)
Transudative	32	24.62
Exudative	98	75.38
Total	130	100

Table 2: Distribution of exudative pleural effusion cases based on aetiology.

Exudative pleural effusion	Number	Percentage (%)
Tuberculosis	34	34.69
Parapneumonic/empyema	31	31.64
Malignancy	30	30.61
Chylothorax	2	2.04
SLE	1	1.02
Total	98	100

Table 3: Distribution of transudative pleural effusion cases based on aetiology.

Transudative pleural effusion	Number	Percentage (%)
CKD	14	43.75
CCF	10	31.25
Cirrhosis	7	21.88
Hypoalbuminemia	1	3.12
Total	32	100

Table 4: Values related to different parameters used in differentiating transudative and exudative pleural effusion by using Light's criteria.

Pleural fluid examination	Number of cases (N = 130)	Percentage (%)
Pleural fluid by serum protein ratio < 0.5 g/dl (Transudates) ≥ 0.5 g/dl (Exudates)	 34 96	 26.15 73.85
Pleural fluid by serum LDH (U/L) < 0.6 (Transudates) ≥ 0.6 (Exudates)	 30 100	 23.08 76.92
Pleural fluid LDH> 2/3rd of the upper limit of normal serum LDH (individualized) Transudates Exudates	 33 97	 25.38 74.62

Table 5: Showing the mean value of pleural fluid cholesterol among Exudative effusion based on etiology.

Exudative pleural effusion	Mean value (± SD) of cholesterol (mg/dl)
Tuberculosis	75.06 ± 15.52
Parapneumonic effusion/empyema	76.87 ± 15.93
Malignancy	74.40 ± 17.22
Chylothorax	74.50 ± 0.0
SLE	87.00 ± 0.0

Table 6: Transudative and exudative pleural effusion as differentiated by pleural fluid cholesterol in comparison to the etiological diagnosis.

Types of pleural effusion	Etiological diagnosis (N = 130)	Number of cases differentiated by pleural cholesterol (cut off value 5.35)	Number of cases truly classified (%)	Number of cases falsely classified (%)
Exudative	98	93	88 (89.80%)	10 (10.20%)
Transudative	32	37	27 (84.38%)	5 (15.62%)

Table 7: Sensitivity, specificity and P-value of the parameters studied in 130 cases of pleural effusion.

Criteria	Sensitivity (%)	Specificity (%)	P value
P/S protein (0.5)	91.84	81.25	< 0.05 (significant)
P/S LDH (0.6)	87.76	56.25	< 0.05 (significant)
P. LDH (2/3rd)	86.73	62.50	< 0.05 (significant)
Light's Criteria	91.84	81.25	< 0.05 (significant)
P. Cholesterol (45)	89.80	84.38	< 0.05 (significant)

DISCUSSION

In the present study, the average value of pleural fluid cholesterol in transudative and exudative pleural effusion was 33.22 ± 9.08 and 75.54 ± 15.87

In our study, the sensitivity and specificity of pleural fluid cholesterol in differentiating transudative and exudative effusion was 89.80% and 84.38% respectively. In this study, 10 (10.20%) cases of the exudative pleural effusion and 5 (15.62%) cases of the transudative pleural effusion cases were misclassified by these criteria.

In the our study, we also evaluated the mean value of pleural fluid cholesterol in all types of pleural effusion based on the aetiology.

Among transudative effusion cases, the mean value of pleural fluid cholesterol in CKD, CCF, Cirrhosis and hypoalbuminemia was 33.79 ± 8.76, 34.0 ±10.48, 33.0 ± 7.72 and 19.0 ± 0.0 respectively.

Among exudative effusion cases, the mean value of pleural fluid cholesterol in TB, parapneumonic

effusion/empyema, Malignancy, chylothorax and SLE was 75.06 ± 15.52, 76.87 ± 15.93, 74.40 ± 17.22, 74.50 ± 6.36 and 87.0 ± 0.0 respectively.

More studies will be necessary in future with the large number of cases to give a comment regarding its aetiology.

In the present study, pleural fluid cholesterol estimation showed little bit lower sensitivity but higher specificity than the Light's criteria in differentiating between transudative and exudative effusion.

Pleural fluid cholesterol estimation can be used as first step as an alternative to Light's criteria in differentiating between transudative and exudative pleural effusion.

CONCLUSION

From the present study it can be concluded that, determination of pleural fluid cholesterol is a cheap and useful test in differentiating between transudative and exudative pleural effusion and is comparable to Light's criteria which is most commonly used to differentiate transudative and exudative pleural effusion. Therefore, the role of pleural fluid cholesterol estimation in differentiating between transudative and exudative pleural effusion as an alternative or addition to Light's criteria is promising.

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