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A COMPARATIVE STUDY BETWEEN PLEURAL FLUID CHOLESTEROL AND LIGHT'S CRITERIA FOR DIFFERENTIATION OF EXUDATIVE AND TRANSUDATIVE PLEURAL EFFUSION

General Medicine

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ABSTRACT

Introduction: Pleural effusion is one of the common clinical disorders encountered in the medical wards. In a patient with pleural effusion diagnosis can be arrived by history, clinical examination and radiological techniques. Pleural effusion is collection of fluid in intrapleural space and manifestation of several diseases, both pulmonary and extra pulmonary, often isolated 1. Based on the underlying pathological abnormality and mechanism of formation, effusion may be either transudative or exudative. To find out etiology, first step is to differentiate whether the pleural effusion is of exudate or transudate type. Etiology of pleural effusions differ in different parts of the world.

Aims And Objectives: The study is conducted to compare between pleural fluid cholesterol and Light's criteria for differentiation of transudative and exudative pleural effusion. The sensitivity and specificity of pleural fluid cholesterol estimation as an independent biochemical marker in exudative pleural effusion.

Methodology: The present work was conducted in the N.R.S. Medical College and Hospital Kolkata(Department of GENERAL MEDICINE). Study was done from February 2018 to 1st May 2019 i.e., through one year and three month period. 70 patients both male and female Patients admitted in N.R.S MEDICAL COLLEGE with symptoms suggestive of pleural effusion.

Result And Analysis: Our study showed that mean serum protein level in tuberculous effusion patients is 6.322 gm/dl. In Para pneumonic effusion cases mean serum protein level is 6.867 gm/dl. Mean serum Protein level in transudative effusion cases is 6.923 gm/dl. In patients with malignant effusion, the mean serum protein level is 6.492 gm. /dl. In empyema patients, mean serum protein level is

Summary: Pleural effusion develops in a variety of illnesses. Based on the underlying pathology and mechanism of formation, effusions may be either transudates or exudates. Analysis of pleural effusion is an important diagnostic step to guide further investigations and treatment.

Conclusion: Pleural fluid cholesterol with a cut-off value of >55 mg/dL is better than Light's criteria in the differentiation of exudative pleural effusions. The sensitivity and specificity of differentiation can be improved by combining pleural fluid protein with pleural fluid cholesterol. Both these criteria are cost effective than the Light's criteria because it does not require a simultaneous blood sampling for differentiation. So in a country like India where there is maximum financial constraints, it will be helpful for rural and urban poor patients. In resource-limited settings, pleural fluid cholesterol can replace Light's criteria for classification of pleural effusion.

KEYWORDS

LIGHT'S CRITERIA, PLEURAL FLUID CHOLESTEROL, EXUDATIVE AND TRANSUDATIVE

INTRODUCTION

Pleural effusion is one of the common clinical disorders encountered in the medical wards. In a patient with pleural effusion diagnosis can be arrived by history, clinical examination and radiological techniques. Pleural effusion is collection of fluid in intrapleural space and manifestation of several diseases, both pulmonary and extra pulmonary, often isolated [1]. Based on the underlying pathological abnormality and mechanism of formation, effusion may be either transudative or exudative. To find out etiology, first step is to differentiate whether the pleural effusion is of exudate or transudate type. Etiology of pleural effusions differ in different parts of the world.

In Indian scenario, infectious causes of pleural effusion particularly tuberculosis and pneumonic consolidation leading on to parapneumonic effusion will be the leading cause of pleural effusion. Though worldwide the incidence of empyema has come down due to early initiation of antibiotic therapy, in India still many cases of empyema and loculated pleural effusion are encountered in tertiary care hospitals.

After diagnosing pleural effusion in a patient, thoracentesis should be done under strict aseptic precautions and after getting concurrence from the patient.

Pleural fluid aspirate is analysed for various parameters like protein, glucose, LDH etc. Light et al. [2] derived the Light's criteria for identifying transudates and exudates. The most commonly accepted criteria for differentiating exudate from transudate is LIGHT'S CRITERIA. It involves measurement of the serum and pleural fluid protein and lactate dehydrogenase (LDH) levels.

Apart from routine pleural fluid analysis of protein and LDH, various researchers studied role of various parameters to find out the set of indicators which will be simple and cost effective. Many newer investigations for diagnosis of pleural effusion are in pipeline but nothing has been widely accepted among the clinicians.

Pleural fluid cholesterol is an important test which is useful for the differentiation of exudative and transudative pleural effusion. Various causes may be responsible for the presence of cholesterol in the pleural effusion. However, till recently, the cholesterol content of pleural fluid had been used along with the concentration of other lipid fractions to distinguish between chylothorax and pseudochylothorax [3]. No systematic study had been done of the cholesterol level in pleural effusion due to various causes till recently. Few studies have now shown that pleural fluid cholesterol levels differ significantly in transudative and exudative pleural effusion [4]. These studies have shown a high sensitivity and specificity for pleural fluid cholesterol levels to differentiate between transudative and exudative effusion. We aimed to use the criteria of pleural fluid cholesterol levels to distinguish between transudative and exudative pleural effusion.

Light's criteria require the simultaneous measurement of serum and pleural fluid protein and LDH, totalling to four biochemical variables, which is cumbersome. Therefore, we compared the robustness of the pleural fluid cholesterol method with Lights criteria in differentiating transudates and exudates. We also combined pleural fluid protein with cholesterol and evaluated its efficiency in differentiating exudates. Such type of study not done in eastern states of India till now and it seems to us that it is cheap and less cumbersome.

1. The study is conducted to compare between pleural fluid cholesterol and Light's criteria for differentiation of transudative and exudative pleural effusion.

2. The sensitivity and specificity of pleural fluid cholesterol estimation as an independent biochemical marker in exudative pleural effusion.

METHODOLOGY

Study Area:

The present work was conducted in the N.R.S. Medical College and Hospital Kolkata (Department of GENERAL MEDICINE). Study was done from February 2018 to 1st May 2019 i.e., through one year and three month period. 70 patients both male and female.

Study Design:

It was a prospective, hospital based, single Centre study.

Inclusion Criteria :

• Adult patients admitted in our hospital with diagnosis of pleural effusion.

Exclusion Criteria:

• Pregnant woman
• Patients with pulmonary embolism, CKD(Chronic kidney disease)

Study Tools:

• Lipid profile
• Pleural fluid cholesterol, protein, sugar, LDH, ADA, cell type, cell count, CBNAAT, TBPCR , malignant cell detection
• Serum LDH , protein
• Blood sugar, Urea, creatinine
• Liver function test(LFT)
• Sputum gram stain, culture and ziehl-nielsen(ZN) staining
• ECG,2D Echo, chest x-ray/CECT thorax if necessary
• Other routine investigations

RESULT AND ANALYSIS

Our study showed that 27 cases out of 70 cases in the study are below the age of forty years Comprising 38.6 % of total cases, 30 cases are between 40-60 yrs comprising 42.9 % of total cases, 13 cases are 60yrs or more comprising 18.6% of total cases. Among 70 patients in the study males are 32 and females are 38 cases. Comprising 45.7% and 54.3% respectively. Among 70 study subjects, 57 cases are exudates and rest 13 are transudates. Within exudates cases, TB pleural effusion, malignancy, para-pneumonic effusion are 37, 12, 6 and 2 respectively and within transudate cases, congestive heart failure, chronic liver failure and nephritic syndrome are 6, 5 and 2 respectively. Among 70 subjects, exudates are 57 and transudates are 13 in number which are diagnosed by different diagnostic criteria which are mentioned above. When we use light's criteria it misclassified 1 case among the exudates (57 according actual etiology) as transudate and 2 cases among transudates (13 according actual etiology) as exudates.

We found that when we use pleural fluid cholesterol, it only misclassified 1 case among the exudates (57 cases according actual etiology) but there is no misclassification from transudates. Lymphocytic pleural effusion is 37 cases out of 70 cases comprising 52.9%. All the lymphocytic cases are tuberculous etiology. 8 pleural effusions are neutrophilic in nature which comprises 11.4%. 6 neutrophilic effusions are par pneumonic and 2 cases of empyema. 12 cases are malignant pleural effusion with 17.1% of total. 13 pleural effusions are acellular with 18.6% of total. All the acellular pleural effusions are transudate in nature. Out of 70 cases chest x ray showed right sided pleural effusion in 31 cases comprising 44.3%, 26 cases of left sided pleural effusion with 37.1%, 13 cases of bilateral effusion which comprises 18.6%.

Our study showed that mean serum protein level in tuberculous effusion patients is 6.322 gm/dl. In Para pneumonic effusion cases mean serum protein level is 6.867 gm/dl. Mean serum Protein level in transudative effusion cases is 6.923 gm/dl. In patients with malignant effusion, the mean serum protein level is 6.492 gm. /dl. In empyema patients, mean serum protein level is 6.85 gm/dl. In patients with tuberculous pleural effusion the mean serum LDH level is 307.784 U/L. In patients with Para pneumonic effusion, the mean serum LDH value is 303 U/L. In transudative effusion patients the mean serum LDH value is 348.538 U/L. In malignant effusion cases, the mean serum LDH is 317.167 U/L. In empyema cases, the mean serum LDH level is 298 U/L. In tuberculous pleural effusion patients, the mean value of serum cholesterol is 163.459 mg/dl. In Para pneumonic effusion patients, the mean level is 176.667 mg/dl. In transudative effusion cases, the mean serum cholesterol is found to be 157.769 mg/dl. In malignant cases, the mean serum cholesterol level is 160.833 mg/dl. In cases of empyema, the mean level is found to be 155 mg /dl.

Table: Mean Pleural Fluid Protein Level

ETIOLOGY	N	MEAN	SD
TB	37	3.373	1.148
Para Pneumonic	6	4.267	0.388
Transudate	13	4.954	0.79
Malignancy	12	4.508	0.412
Empyema	2	4.65	0.354

Table: Mean Serum Cholesterol Level

ETIOLOGY	N	MEAN	SD
TB	37	163.459	20.345
Para Pneumonic	6	176.667	33.092
Transudate	13	157.769	23.591
Malignancy	12	160.833	14.434
Empyema	2	155	21.213

Table: Mean Serum LDH Level

ETIOLOGY	N	MEAN	SD
TB	37	307.784	124.803
Para Pneumonic	6	303	114.394
Transudate	13	348.538	257.271
Malignancy	12	317.167	115.719
Empyema	2	298	110.309

DISCUSSION

Early and decisive evidence of the transudative or exudative nature of a pleural effusion may be of considerable clinical value and is often used as a basis for further diagnostic procedures and therapeutic considerations. No single chemical test or series of tests has yet proved to be completely reliable. Hence, the search for diagnostic improvements is kept alive.

In present study, we considered the etiological diagnosis as the gold standard and compared the efficacy of Lights criteria and pleural fluid cholesterol level in differentiating transudates and exudates.

The first step in diagnosing the etiology of pleural effusion is to establish whether it is an exudate or atransudate. Light's criteria were designed to approach a 100% sensitivity and specificity for differentiating exudates. However, subsequent validation studies reported a lower specificity of 65%–85%. The reasons for this lower specificity are as follows: i) The original study by Light et al. [5] had rigorous inclusion criteria and hence the high specificity could not be replicated in subsequent studies on unselected populations, ii) The original recommendation to use an LDH value of 200 U/L decreased reproducibility because of differing assay techniques, and iii) Light's criteria uses multiple tests combined in an "or rule", thus increasing the likelihood of identifying a target condition. However, in doing so, it also increases the likelihood of incorrectly identifying other conditions (false positive result) and lowers the specificity [6].

Valdes L. et al. [7] Used pleural fluid cholesterol cut off value 55 mg/dl and showed that it had a sensitivity of 91 % and specificity of 100 % for diagnosis of exudates and with a threshold of 0.3, P/SCHOL had a sensitivity of 92.5 percent and a specificity of 87.6 percent.

In this study, we used pleural fluid cholesterol value 55 mg/dL as the cut-off, and the sensitivity and specificity were 98.2% and 100%, which was consistent with previous studies and which is non-inferior than light's criteria (sensitivity 98.2% and specificity 84.6%) .

When we used P/S CHOL cut off value, 0.3 the sensitivity and specificity was 98.2 % and 92.3 % respectively.

The combination of pleural cholesterol concentration with pleural fluid protein has also been used to differentiate exudates from transudates. Patel and Choudhury et al. [8] combined pleural fluid cholesterol (≥60 mg/dL) with total protein (≥3 g/dL) and obtained a 100% sensitivity and specificity in identifying the exudates.

In our study, the combination of pleural fluid cholesterol and pleural fluid protein produced better results than that of cholesterol with pleural fluid only (sensitivity 100% vs. 98.2% and specificity 100% vs. 100%).

CONCLUSION

Pleural effusion develops in a variety of illnesses. Based on the

underlying pathology and mechanism of formation, effusions may be either transudates or exudates. Analysis of pleural effusion is an important diagnostic step to guide further investigations and treatment. The most commonly accepted criteria for differentiating exudates from transudates is Light's criteria. But different studies showed some discrepancies in the results and also this criteria needs simultaneous measurement of four biochemical parameters including both blood and pleural fluid which is cumbersome and also costly in a country like India. But if we consider pleural fluid cholesterol value it is less cumbersome and also cost effective.

1) Pleural fluid cholesterol with a cut-off value of >55 mg/dL is better than Light's criteria in the differentiation of exudative pleural effusions.

2) The sensitivity and specificity of differentiation can be improved by combining pleural fluid protein with pleural fluid cholesterol.

3) Both these criteria are cost effective than the Light's criteria because it does not require a simultaneous blood sampling for differentiation. So in a country like india where there is maximum financial constraints, it will be helpful for rural and urban poor patients.

4) In resource-limited settings, pleural fluid cholesterol can replace Light's criteria for classification of pleural effusion.

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