

## **Research Article**

# **Comparison of Diagnostic Efficacy of Cholinesterase Levels to Differentiate Pleural Exudates and Transudates that of Lights Criteria**

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**Abstract:** Pleural effusion is a common clinical condition faced in everyday practice. The first step in the management of pleural effusion is its differentiation into transudates and exudates. Light's criteria is the most widely used parameter to differentiate pleural effusions but studies have shown that Light's criteria misclassifies a significant number of cases. The present study was undertaken to evaluate the usefulness of pleural fluid cholinesterase (PChE) level in pleural fluid to differentiate transudates and exudates and to compare their diagnostic efficacy with the Light's criteria.

**Keywords:** Pleural effusion, Transudate, Exudate, Pseudocholesterase (ChE), Light's criteria.

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## **INTRODUCTION**

Pleural effusion often develops in patients with thoracic or systemic diseases [1]. Such effusion has traditionally been classified as transudate or exudate based on the etiology and underlying pathology, and differentiating the two types of pleural effusion is critical for guiding treatment. Many criteria have been used to distinguish them, but none of them has been found to be satisfactory. It was found that Light's criteria misclassified large number of effusions [2]. Cabrer *et al.* estimated Cholinesterase (ChE) activity in pleural effusions of diverse etiologies and concluded that there exists differences in the activity of ChE and it was possible to differentiate transudate and exudates [3]. Garcia and Padilla confirmed the importance of estimation of ChE activity in the diagnosis [4].

The present study was planned to evaluate the diagnostic efficacy of the estimation of cholinesterase level in pleural fluid to classify transudative and exudative pleural effusions in comparison with light's criteria.

## **MATERIALS AND METHODS**

The study was conducted in Department of Medicine, Basaveshwara Teaching and general hospital, attached to Mahadevappa Rampure Medical College, Gulbarga. 50 patients with pleural effusion were selected for study between December 2006 to April 2008.

## **Inclusion Criteria**

- Tubercular effusion was diagnosed by X-ray, pleural fluid and sputum AFB.
- Malignant effusion – malignant cells in the pleural fluid with or without histological evidence.
- CHF effusion as diagnosed by cardiomegaly on roentgenogram and echocardiography, presence of pulmonary congestion and absence of other lesions in the chest X-ray.
- Nephrotic syndrome as diagnosed by establishing proteinuria of > 3 gm/ 24 hours, oedema, hypoalbuminemia and hypercholesterolemia.
- Pancreatitis as diagnosed by history, serum amylase > 1000 u/ml and ultrasound abdomen.
- Pleural effusion due to other well determined cause.

## **Exclusion Criteria**

- Effusions of undetermined origin
- Effusions with more than one possible cause
- Empyemas
- Hemothorax
- Persons with history of exposure to organophosphorus compounds.

All the patients selected for the study were evaluated in detail, comprising of detailed history, clinical examination and relevant investigations.

Patients with clinical evidence of pleural effusion were first send for chest X-ray PA and lateral view and ultrasound thorax if required.

Following investigations were done on all the patients in the study group.

- Partial haemogram including ESR
- Urine albumin, sugar
- RBS
- Blood urea/ creatinine
- Liver function tests
- Serum lactic dehydrogenase
- Serum cholinesterase

Then the diagnostic thoracentesis was performed taking great care not to let the fluid mix with blood.

Pleural fluid was immediately sent for following investigations.

- Pleural fluid cytology including malignant cells
- Proteins, sugar
- Lactic dehydrogenase
- Cholinesterase

Effusions were individually classified as

transudates or exudates after careful evaluation of all clinical data and investigation results. The criteria's analyzed for separation of transudative and exudative pleural effusions are as follows:

- The criteria of Light et al, is in based on three parameters
  - a. Pleural fluid to serum proteins >0.5
  - b. Pleural fluid to serum LDH > 0.6
  - c. Pleural fluid LDH > 200 IU

Exudative pleural effusions meet at least one of the following criteria, whereas transudative pleural effusion meets none.

- Pleural fluid cholinesterase values > 2000 U/L are taken as exudates and those < 2000 U/L are taken as transudate.
- Pleural fluid to serum cholinesterase ratio: Ratio > 0.5 is taken as exudates and those < 0.5 are taken as transudate.

**RESULTS**

Following observation were made after studying 50 cases of pleural effusion admitted to Basaveshwara Teaching and General Hospital, Gulbarga between Dec. 2006 to April 2008.

**Table 1: Showing Number and Percentage of Misclassifications as Transudates and Exudates by using different Parameters**

Investigations	Transudates		Exudate	
	No. of Cases (n = 20)	Percentage	No. of Cases (n = 30)	Percentage
Light's criteria	03	06	02	04
Pleural fluid cholinesterase	02	04	02	00

The misclassification of transudates and exudates were less with Pleural fluid cholinesterase compared to Light's criteria. But even pleural fluid cholinesterase misclassified two transudates.

**Table 2: Number and Percentage of Misclassified Transudates**

Criteria's	CCF (n = 18)	Nephrotic syndrome (n=1)	Cirrhosis (n = 1)	Total (n = 20)	Percentage
Light's criteria	03	00	00	03	06
Pleural fluid cholinesterase	02	00	00	02	04

Light's criteria misclassified 3 transudates, while Pleural fluid cholinesterase 2 transudate.

**Table 3: Number and Percentage of Misclassified Exudates**

Criteria's	PTB	Pneu.	CRF	Post CABG	Malig.	Others	Total	Percentage
Light's criteria	2	0	0	0	0	0	2	4
Pleural fluid cholinesterase	0	0	0	0	0	0	0	0

Light's criteria misclassified 2 exudates, pleural fluid cholinesterase not misclassified any exudate.

**Table 4: Showing Diagnostic Validity of Various Parameters**

Investigation	Sensitivity	Specificity	PPV %	NPV %	Efficiency %
Light's criteria	93	85	90	89	90
PF Cholinesterase	100	90	94	100	97

Pleural fluid choline esterase has more sensitivity, specificity and efficiency compared to Light's criteria.

**DISCUSSION**

Pleural effusion occurs in a large variety of conditions, but correct diagnosis of underlying diseases is essential for rationale management of pleural effusion. Early 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. Many tests were used to differentiate transudate from exudates, in the past transudates were separated from exudates by specific gravity, cell count and presence or absence of clotting of fluids. But no single chemical tests or series of tests has yet proved to be completely reliable.

In their initial study in 1972, Light *et al.* [11] used pleural and serum levels of proteins and LDH to establish criteria for segregating transudates from exudates with a sensitivity and specificity of 99% and 98% respectively. Recently however, several prospective studies [5-10] were unable to reproduce the excellent results obtained by Light *et al.* [11].

In the present study, by using pleural fluid cholinesterase level 2 cases of transudates were misclassified. By using Light's criteria 10% of cases were misclassified.

Eduardo *et al.* in 1996, conducted study on 153 patients with pleural effusion to differentiate transudate and exudates [10]. They compared Lights criteria with pleural fluid cholesterol, pleural fluid to serum cholesterol, pleural fluid cholinesterase and pleural fluid to serum cholinesterase ratio. Results were as following

- Misclassification rates by Lights criteria was 7.8%
- Misclassification rates by pleural fluid cholesterol level with cut off value of 50 mg/dl was 7.8%.
- Misclassification rates by pleural fluid to serum cholesterol with cut off value 0.30 was 6.5%
- Misclassification rates by pleural fluid cholinesterase with cut off values of 1140 for Group A and Group B was 8.5%.

Misclassification rates by pleural fluid to serum cholinesterase ratio with cut of value 0.23% was only 1.38%. These criteria correctly classified 98.77% of 153 pleural effusion patients.

**Table 13: Showing Comparison of Misclassification of Pleural Effusion by Eduardo et al study and Present Study using Various Parameters**

Criteria Used	Study of Eduardo <i>et al.</i> [10]	Present Study
	% of Misclassification	% of Misclassification
Light's criteria	10	10
PF Cholinesterase	06	04

In the present study, the misclassifications using PF cholinesterase is lower than the study by Eduardo *et al.* But both the studies shows that compared to Light *et al.* criteria, pleural fluid cholinesterase is a better parameter to separate transudate from exudates.

The present study and the study by Eduardo *et al.* [10] shows that number of misclassification is higher using Light's criteria compared to pleural fluid cholinesterase. While present study, using PF cholinesterase misclassified 6% of pleural effusions, Eduardo *et al.* [10] misclassified 8.5%. This could be attributed to the fact that, since the cholinesterase is synthesized in the liver, the levels can be influenced by different disorders. This include hepatitis, cirrhosis, acute infections, pulmonary embolism chronic renal failure and after surgical procedures.

**CONCLUSION**

Sensitivity, specificity and diagnostic efficacy of pleural fluid cholinesterase level as diagnostic parameter to differentiate transudates and exudates are higher than Light's criteria used in the study. The numbers of misclassifications are more with the Light's criteria than the PF cholinesterase. Hence, the pleural fluid cholinesterase level is one of the reliable parameter in separating pleural transudates from exudates.

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