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Research Article

SERUM EFFUSION ALBUMIN GRADIENT AND PLEURAL FLUID PROTEIN THIOLS IN DIFFERENTIAL DIAGNOSIS OF PLEURAL EFFUSSION

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ABSTRACT
Pleural effusion is a common clinical disorder and is either a manifestation or a complication of one or other respiratory or non-respiratory disease. The main aim of the present study is to evaluate SEAG and pleural fluid level as parameter to differentiate between transudates from exudates. It can be concluded from the present study that protein thiols which are the major oxidants are consumed in the patients with pleural disease because of increased consumption in the serum and these protein bound thiols are decreased in pleural fluid.

Keywords*: SEAG (Serum Effusion Albumin Gradient, Protein Thiol, Pleural Fluid, Transudates, Exudates*

INTRODUCTION
Broaddus *et al.,* (1992) differentiated trasudates from exudates, by measurement of levels of protein and LDH in the serum and the pleural fluid. Meisels *et al.,* (1990) reported that the serum-effusion albumin gradient (SEAG) is useful when patients are receiving concurrent diuretic therapy.
Light's criteria (1992) are the most sensitive for identifying exudates but have lower specificity than other criteria. Burgers *et al.,* (1995) reveals that an albumin gradient of 1.2 gm/dl or less tends to be more specific in congestive cardiac failure (CCF) on diuretics.
Chakko (1990) suggested that the problem of high protein transudates is more common in the evaluation of ascites too, which has led to the development of serum – ascites albumin gradient. A gradient of less than 1.1 g/dl has been shown to be the best predictor of exudative ascites and has become an accepted method for differentiating exudates from transudate.
Rector WG *et al.,* (1984) recommended that the clinical appearance suggests a transudative effusion but the pleural effusion is an exudates according to Light's criteria (1992), then the difference between serum and pleural fluid albumin levels by a level of more than 1.2 gm/dl would suggest the effusion to be a transudate.
Hamonda *et al.,* (1995) analyzed that the Oxidative status of pleural fluid by taking pleural fluid malondialdehyde level (PMDA) as well as different antioxidant enzymes to differentiate transudates from exudates. The imbalance between oxidants and antioxidants referred as oxidative stress has been associated with various respiratory disorders is reported by Gupta KB (2002).
Halliwell (1997) suggested that Albumin a major plasma protein contains an exposed – SH group over cysteine – 34 residues provide the bulk of total thiol pool. These reduced thiol groups that exist both intraceullar and extracellular contribute majority of the total antioxidant capacity of the plasma.

MATERIALS AND METHODS
The study is conducted on 56 male / female patients who were diagnosed as pleural effusion clinically, radiologically and thoracocentesis is done already by physician in Basaveshwar Teaching and General Hospital at BTGH with written informed consent. A total of 56 patients of pleural effusion were taken with diverse etiology, then venous blood sample and pleural fluid were collected from these patients after diagnosing clinically, radiologically and after thoracocentesis.

Inclusion Criteria:
Cases clinically diagnosed as having pleural effusion with diverse etiology.
Exclusion Criteria:
Cases with either no cause were definitely diagnosed or more than one cause present will be excluded from the study.
Data was collected on standard proforma, detailing the medical history, physical examination and investigation.
Parameters Studied:
1. Serum Albumin
2. Serum Total Proteins
3. Serum Lactate dehydrogenase
4. Serum protein thiols
5. Pleural fluid Albumin
6. Pleural Fluid Total Protein
7. Pleural Fluid Lactate dehydrogenase
8. Pleural Fluid Protein thiols

Other Investigations:
1. Chest X Ray – PA view
2. CT scan of chest

The biochemical parameters are estimated and calculated.
Criteria of light *et al.,* (namely: pleural fluid / serum protein ratio, pleural fluid / serum LDH ratio, pleural fluid LDH concentration).
1. Albumin gradient (serum albumin concentration minus pleural effusion albumin concentration).
2. Protein gradient (serum total protein concentration minus pleural effusion total protein concentration) when separating transduates from exudates cut off points recommended in literature were used.

The clinical presumption of nature of effusion (transudate or exudates) was based on all available information obtained just before performing thoracocentesis and was compared with that obtained from biochemical criteria.
Biochemical parameters are determined using semi auto analyzer chem.-7 and spectrophotometer.
Statistical software:
The statistical software namely SPSS 16.0, stata 8.0, Medicale 9.0.1 were used for analysis of data. Microsoft word and Excel have been used to generate graphs, tables etc.
Statistical methods:
Results on continuous measurements are presented on Mean $\pm$ SD (Min-Max) and results on categorical measurements are presented in Number (%).

RESULTS AND DISCUSSION

Table 1 shows the comparison of serum between transudate and exudates. It is evident from the table the concentration of protein thiols in serum is markedly reduced in patients with exudates as compared to transudate.

Table 1: Comparison of serum (total protein, albumin, LDH, thiols) between transudate and exudates

Biochemical parameter	Exudates	Transudate	Significance
Total protein	5.4 $\pm$ 0.88	6.1 $\pm$ 0.76	P < 0.001
Albumin	3.08 $\pm$ 0.44	3.82 $\pm$ 0.45	P < 0.001
LDH	532.9 $\pm$ 193.9	310.6 $\pm$ 107.2	P < 0.001
Protein thiols	66.2 $\pm$ 19.4	116.8 $\pm$ 27.7	P < 0.001

Table 2 shows the comparison of pleural fluid between transudate and exudates. It can be noticed from the table that protein thiols in pleural fluid is significantly reduced in patients with exudates as compared to transudate.

Table 2: Comparison of pleural fluid (total protein, albumin, LDH, thiols) between transudate and exudates

Biochemical parameter	Exudates	Transudate	Significance
Total protein	5.04 ± 1.38	3.07 ± 0.87	P < 0.001
Albumin	2.56 ± 0.52	2.00 ± 0.44	P < 0.001
LDH	473.5 ± 248.7	123.6 ± 92.81	P < 0.001
Protein thiols	51.39 ± 22.3	151.1 ± 15.0	P < 0.001

Table 3 shows the comparison of sensitivity specificity and PPV of SEAG with Light's criteria. It is evident from the table that all the parameters have higher percentage values as compared with Light's criteria (1992).

Table 3: Comparison of sensitivity, specificity and PPV of SEAG with light's criteria

	SEAG	**LIGHT'S**
Sensitivity: transudate	92.31%	76.92%
Exudate	93.34%	76.67%
Specificity: Transudate	83.34%	76.67%
Exudates	92.31%	76.92%
PPV: Transudate	82.76%	74.07%
Exudates	93.34%	79.31%

The results presented in this study demonstrate that the concentration of protein thiol in serum is markedly reduced in patients with exudates compared to transudates. The decreased plasma thiol levels may be due to enhanced free radical generation in patients with exudates, which is mainly due to several inflammatory condition associated with exudative pathology. On contrary transudative effusion is not related majorly to inflammatory pathology but results from an imbalance between hydrostatic and oncotic pressure. Therefore there is no much generation of free radicals in transudates.

The present study has shown that even though taking into account the light's criteria and SEAG in differentiating exudates and transudates. The greater differential value was found with a combination of SEAG and pleural fluid protein thiols, which correctly classified 92.31% of transudates and 93.34% of exudates with sensitivity and specificity of 92.31% and 83.34% and 93.34% and 92.31% respectively.

The present study shows that measurement of serum and pleural fluid protein thiols in patients with pleural effusion of diverse etiology proved to be better marker for the differentiation of exudates and transudates, as this method provided a high sensitivity and specificity for characterization of effusion as an exudates and transudates compared to light's criteria.

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