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Diagnostic role of different biochemical parameters in pleural effusion

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ABSTRACT

Introduction: A pleural effusion, an excessive accumulation of fluid in the pleural space, indicates an imbalance between pleural fluid formation and removal. For diagnosing and treatment plan, pleural effusions have to be classified into transudate and exudate.

Aim: The aim of present study was to analyze various biochemical parameters (LDH, pH, Glucose, Triglycerides, Cholesterol, Creatinine, Amylase and ADA) in pleural fluid and to correlate these Biochemical parameters with diagnosis of the patients.

Materials and Methods: The study was a hospital based descriptive study. The study was conducted over a period of one year on 100 samples. Total 100 samples were enrolled in the study. Both serum and pleural fluid samples were collected and quantitatively analyzed using semi-automated analyzer.

Results: The results of the present study shows that The Mean±SD of concentration of glucose in pleural fluid was 65.69±14.13 mg/dl, total protein 3.53±1.53g/dl, albumin 1.64±0.85g/dl, cholesterol 58.9±13.05mg/dl, triglycerides 68.7±10.47mg/dl, creatinine 1.73±0.96mg/dl, amylase 49.56±17.78IU/L, LDH 299.82±65.46 U/L and ADA was 49.56±17.78U/L.

Conclusion: It was concluded that Biochemical parameters play important role in diagnosing Pleural effusions. These markers when used collectively their diagnostic efficacy is greatly increased. The SEAG is superior to Light's criteria in identifying the transudative effusions. It is also observed that Light's criteria identified exudative effusions better than SEAG.

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1. Introduction

All healthy humans have a small amount of pleural fluid that lubricates the space and facilitates normal lung movements during respiration. The pleural fluid normally provides lubrication between the parietal and visceral membranes and the organs contained within the space.¹ A pleural effusion, an excessive accumulation of fluid in the pleural space, indicates an imbalance between pleural fluid formation and removal. Accumulation of pleural fluid is not a specific disease, but rather a reflection of

underlying pathology. Pleural effusions accompany a wide variety of disorders of the lung, pleura, and systemic disorders. Therefore, a patient with pleural effusion may present not only to a pulmonologist but to a general internist, rheumatologist, gastroenterologist, nephrologist, or surgeon. To treat pleural effusion appropriately, it is important to determine its cause.² For diagnosing and treatment plan, pleural effusions have to be classified into transudate and exudate. The routine pleural fluid evaluation usually includes determination of protein, pH, lactate dehydrogenase, glucose, and albumin levels, with adenosine deaminase levels and cell count for differential and cytological examination.³ If the diagnosis is not

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appropriate, it may result in severe complications.

The most commonly used method for differentiating exudates from transudates was established by Light et al.⁴ Fluid is considered exudative if it meets one or more of the following: (a) pleural/serum protein ratio greater than 0.5 (b) pleural/serum lactate dehydrogenase (LDH) ratio than two-thirds of the normal upper limit for serum.

Another method used for differentiating exudates from transudates was Serum - pleural effusion albumin gradient (SEAG). Albumin gradient (serum albumin concentration - pleural effusion albumin concentration).

The main purpose of this study was, to study the diagnostic role of biochemical parameters in pleural effusion. To treat pleural effusion appropriately, we have divided the pleural effusions into the transudative and exudative pleural effusions with help of various biochemical parameters.

2. Aim and Objectives

To analyze various biochemical parameters in pleural fluid and To correlate these Biochemical parameters with diagnosis of the patients.

3. Materials and Methods

The study was a hospital based descriptive study. The study was conducted over a period of one year on 100 samples. Total 100 samples were enrolled in the study. Both serum and pleural fluid samples were collected and quantitatively analyzed using semi-automated analyzer.

4. Results

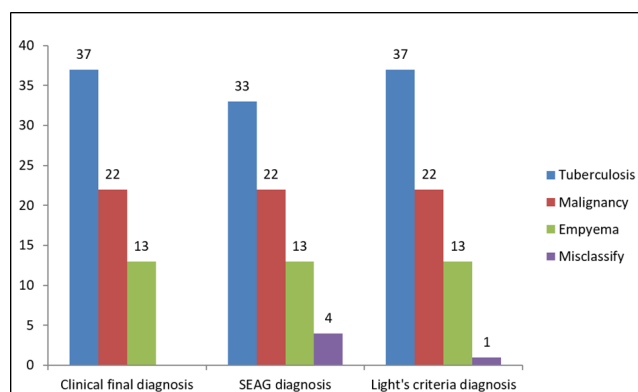


Fig. 1:

Figure 1 showing Comparison of clinical diagnosis of exudative pleural effusions with SEAG diagnosis and Light's criteria diagnosis out of total 72 patients 37 were tubercular, 22 malignant and 13 patients are empty and these results was highly statistically significant with $p = < 0.0001$ and these results was highly statistically significant

with $p = < 0.0001$. emic SEAG could only identify the 68 pleural effusion as exudative and Lights criteria identify 73 effusion as exudative. SEAG misclassify 4 tubercular effusions whereas light's criteria misclassify only 1 CHF effusion.

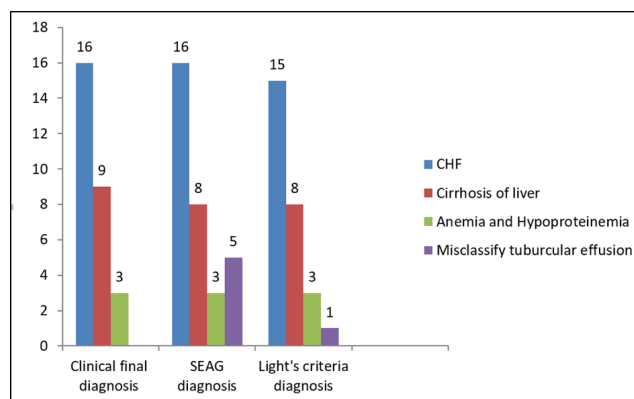


Fig. 2: Comparison of clinical diagnosis of transudative pleural effusions with SEAG diagnosis and Light's criteria diagnosis

Figure 2 showing comparison of clinical diagnosis of transudative pleural effusions with SEAG diagnosis and Light's criteria diagnosis out of 28 patients 16 were congestive heart failure cases, 09 having liver cirrhosis and 03 patients have anaemia SEAG could identify 32 effusion as transudative and Lights criteria identifies 27 effusions as transudative. SEAG misclassify 5 tubercular effusion whereas Light's criteria misclassify 1 tubercular effusion.

5. Discussion

The present study show analysis of biochemical parameters (LDH, pH, Glucose, Triglycerides, Cholesterol, Creatinine, Amylase and ADA) in both pleural fluid and serum. Results of present study were consistent with the other study conducted by Sandeesh V et al. (2020),⁵ Das AK et al. (2009),⁶ Burgess LJ et al. (1995),⁷ Dhar MC et al (2000).⁸ According to present study Lights criteria's specificity for exudate was 96.43% and sensitivity was 100%. SEAG criteria had specificity 96.43% and sensitivity 94.37% for exudate. However, Lights criteria had specificity of 100% and sensitivity 96.43%. SEAG criteria have specificity 94.37% and sensitivity 96.43%. Levels of glucose, ADA and LDH in pleural fluid of exudate effusions were 59.52 ± 10.43 , 54.42 ± 16.92 and 330.3 ± 50.06 respectively, and these results was highly statistically significant with $p = < 0.0001$.

Levels of glucose, ADA and LDH in pleural fluid of transudate effusions were 78.85 ± 11.80 , 39.21 ± 15.12 , 234.8 ± 41.5 and these results was highly statistically significant with $p = < 0.0001$.

Table 1: Pleural fluid biochemical parameters of exudate and transudate

Parameters	Type of pleural effusion	Number of cases	mean±SD	P value
pH	Transudate	32	6.59±0.7	0.5
	Exudate	68	6.68±0.61	
Glucose (mg/dl)	Transudate	32	78.85±11.80	< 0.0001
	Exudate	68	59.52±10.43	
Total protein (g/dl)	Transudate	32	2.69±1.02	0.0001
	Exudate	68	3.92±1.52	
Albumin (g/dl)	Transudate	32	1.06±0.48	< 0.0001
	Exudate	68	1.91±0.85	
Cholesterol (mg/dl)	Transudate	32	45.5±9.26	< 0.0001
	Exudate	68	65.26±9.29	
Triglycerides (mg/dl)	Transudate	32	62.6±10.23	< 0.0001
	Exudate	68	71.54±9.37	
Creatinine (mg/dl)	Transudate	32	1.83±0.96	0.4
	Exudate	68	1.68±0.97	
Amylase (IU/L)	Transudate	32	64.8±8.26	0.7
	Exudate	68	64.08±10.00	
LDH (U/L)	Transudate	32	234.8±41.5	< 0.0001
	Exudate	68	330.3±50.06	
ADA(U/L)	Transudate	32	39.21±15.12	< 0.0001
	Exudate	68	54.42±16.92	
Serum biochemical parameter				
Albumin (g/dl)	Transudate	32	2.92±0.6	< 0.0001
	Exudate	68	1.86±0.57	
LDH(U/L)	Transudate	32	440.9±65.08	< 0.0001
	Exudate	68	372.2±72.32	

mean±SD of transudative and exudative pleural effusion according to SEAG criteria

Table 2: Sensitivity and specificity of SEAG and Light's criteria in comparison to clinical diagnosis

	Type of effusion	SEAG	Light's criteria
Sensitivity	Transudate	96.43%	96.43%
	Exudate	94.37%	100%
Specificity	Transudate	94.37%	100%
	Exudate	96.43%	96.43%

6. Conclusion

It was concluded that Biochemical parameters play important role in diagnosing Pleural effusions. These markers when used collectively their diagnostic efficacy is greatly increased. The SEAG is superior to Light's criteria in identifying the transudative effusions. It is also observed that Light's criteria identified exudative effusions better than SEAG.

7. Source of Funding

None.

8. Conflict of interest

None.

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