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Original Research Article

Role of ADA in the Differential Diagnosis of Pleural Effusion

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ABSTRACT

Introduction: Tuberculosis is one of the oldest and commonest infectious diseases. According to World Health Organization (WHO), tuberculosis is estimated to affect more than a billion individuals worldwide with 8.7 million cases and 1.4 million deaths each year. Adenosine deaminase has been proposed to be a useful surrogate marker for tuberculosis in pleural fluids. Studies have confirmed high sensitivity and specificity of Adenosine deaminase for early diagnosis of extra pulmonary tuberculosis.
Materials and Methods: study comprised of 100 cases of pleural fluid. In this study we divided cases in to three groups: Group 1 (Tuberculosis) 52 cases, Group 2 (Malignancy) 26 cases and Group 3 (Non-tuberculosis non-malignancy effusion) 22 cases. ADA estimation was carried in all cases of pleural fluid.
Results: Tuberculous pleural effusion is most common cause than other effusion. Male (57 Cases) are more predominant affected than female (43 cases) in all type of pleural effusion. Pleural effusion is more common in 18-50 year of age group (37 Cases). ADA value is higher in TB pleural effusion then other types of effusion, Mean ADA level in TB pleural effusion was 28.8 ±7.80 IU/L.
Conclusion: Estimation of ADA in pleural fluid is simple, inexpensive and rapid and also specific and sensitive for diagnosis of tuberculous effusion. Most common cause of pleural effusion was tuberculosis after malignant pleural effusion.

Keywords: Adenosine deaminase, Tuberculosis, Pleural fluid.

INTRODUCTION

Tuberculosis (TB) is a major public health problem in developing countries. Although the majority of patients with TB have pulmonary TB, extrapulmonary TB affecting mainly the lymph nodes and pleura serves as the initial presentation in about 25% of adults. [1] TB is the leading cause of pleural effusions in some countries. [2]

TB is one of the oldest and commonest infectious diseases also known as "*master of death" or "Captain of death*." [3] It is still a global burning problem and now the world's seventh leading cause of death. [4]

Tuberculosis is one of the commonest chronic infectious diseases, which is highly endemic killing approximately five lakh patients every year in India. [5] It usually affects lungs but cases of extrapulmonary tuberculosis are not rare. Delay in diagnosis and in initiating treatment results in poor prognosis and sequelae in upto 25% of cases. [6] Pleural effusion is a common problem in clinics and

can result due to a number of diseases. The available tests and procedures for the confirmation of its etiology are ineffective in majority of cases. Thus, there is a need for a sensitive and specific test that is reliable and rapid. [7]

The sensitivity of acid-fast staining and culture for *M. tuberculosis* in pleural fluid is low. [8] Elevated levels of adenosine deaminase (ADA) in the pleural fluid exhibit sensitivity and specificity values exceeding 90 per cent for diagnosis of pleural tuberculosis. [9,10] The activity and thus the diagnostic efficacy of ADA, is decreased in patients with uraemia, even after three sessions of haemodialysis. [11] In chronically dialsed patients these effects may be more pronounced. Nucleic acid amplification tests (NAATs) for *M. tuberculosis* in pleural fluid have poor sensitivity (43-77%) but good specificity (96-98%) for the diagnosis of tuberculous pleuritis. [12]

Medical thoracoscopy is a valuable tool in the evaluation of undiagnosed exudative pleural effusions as one can obtain large pleural biopsy specimens under vision. [9] In some studies, a diagnosis of pleural tuberculosis could be made in 100 per cent patients with thoracoscopy, which was higher than the yield of closed pleural biopsy (51-79%), [13,14] The percentage of so-called "idiopathic" pleural effusions can be reduced to 4 per cent with the use of thoracoscopy. [15]

Pleural fluid adenosine deaminase (ADA) has been shown to be a useful biochemical marker of TP and provides a reliable basis for a treatment decision, particularly in areas where the disease is prevalent. However, the elevation may be limited in early stages of disease, and in addition, high levels of ADA can also be found in patients with neutrophilic effusions such as parapneumonic effusions or empyemas. [16]

Aim and Objectives

Aim: To determine the role of ADA in differential diagnosis of pleural effusion.

Objectives: To examine the diagnostic utility of pleural adenosine deaminase (ADA), in differential diagnosis of pleural effusions.

MATERIALS AND METHODS

The study was carried out at Dhiraj Hospital over a period of 6 months from date of approval from ethics committee. Investigations was carried out in the department of CENTRAL LABORATORY of Dhiraj Hospital, Piparia of SBKS Medical institute and research center

Dhiraj General Hospital is a multi-specialty tertiary care center. This hospital caters not only patients from rural Gujarat but even adjoining regions of Madhya Pradesh. This was a prospective, interventional study.

This is a prospective study of 100 cases of pleural fluid were analyzed .Their ADA value, microscopy and other biochemistry results correlated with clinical diagnosis.

In this study we divided cases in to three groups: Group 1 (Tuberculosis), Group 2 (Malignancy) and Group 3 (Non-tuberculosis non-malignancy effusion)

ADA estimation was carried out by spectrophotometry method based on the principle of Guisti and Galanti method of enzymatic analysis (Guisti and Galanti, 1984). [17]

OBSERVATION & RESULTS

Table 1: No. of cases in various cases of pleural effusion

Type of effusion	Male	Female	Total	Percentage %	Ratio M:F
Tuberculous Pleural effusion	30	22	52	52	1.36:1
Malignant Pleural effusion	15	11	26	26	1.36:1
Non-tuberculosis non-malignancy effusion	12	10	22	22	1.2:1
Total	**57**	**43**	**100**	**100**	**1.32:1**

Table no. 01 shows tuberculous pleural effusion is most common cause than other effusion. Male are more predominant affected than female in all type of pleural effusion. In present study 52% cases of pleural effusion having diagnosis of tuberculosis and 30% patients were male and 22% patients were female.

Table no. 02 shows pleural effusion more common in 18-50 year of age group. TB pleural effusion is also more common (22 cases) in 18-50 year of age group. Malignant pleural effusion is more common (20 cases) in above 50 year of age.

Table 2: Age distribution in various cases of pleural effusion

Age	Tuberculous Pleural effusion	Malignant Pleural effusion	Non-tuberculosis non-malignancy effusion	Total
0-1 year	4	0	1	5
1-5year	6	1	2	9
5-18 year	8	2	3	13
18-50 year	22	3	12	37
>50 year	12	20	4	36
Total	**52**	**26**	**22**	**100**

Table 3: Mean ADA, ADA range in various group of pleural effusion

Type of effusion	Mean ± SD IU/L	Range of ADA	P value
Tuberculosis Pleural effusion	28.8 ±7.80	15.8-46.2	0.0001
Malignant Pleural effusion	10.2 ± 2.10	6.8-14.5	0.001
Non-tuberculosis non-malignancy effusion	12.4 ±2.86	8.5-16.2	0.0001

Table no. 03 shows ADA value is higher in TB pleural effusion then other types of effusion. For tuberculous pleural effusion Mean ADA level were 28.8 ±7.80.

P value <0.001 is highly significant for TB and non TB effusion.

Table no. 04 shows comparison between hematological and biochemical parameter in various types of pleural effusion.

Table 4: Biochemical, Haematological effusion, analysis of various group of pleural

Variable	Tuberculosis Pleural effusion	Malignant Pleural effusion	Non-tuberculosis non-malignancy effusion
pH	7.21±0.01	7.15±0.09	7.08±0.14
Glucose mg·dL^{-1}	103± 10.2	108.1±44.5	110.4±32.8
Protein mg·dL^{-1}	5.8±6.2	4.8±1.0	5.4±4.6
Cholesterol mg·dL^{-1}	82.5±21.4	83.8±29.7	84.6±29.1
LDH IU·L^{-1}	462±301.0	690.3±402.5	443.2±267.6
WBC µL	2140± 1210	2685±1862	2627±2007
Neutrophil %	9.12±6.21	13.75±10.61	15.45±7.96
Lymphocyte %	86.24±10.32	72.87±13.65	70.52±12.60
Monocyte %	3.21±1.24	7.05±6.26	8.50±7.61

DISCUSSION

Table 5: Comparative analysis of disease wise distribution in pleural effusion

Type of effusion	Present study %	A. Dambal et al [18]	Bhavsar Kaushal M et al [19]	Vinay Bharat el al [20]	F.Y.Khan et al [21]
Tuberculous Pleural effusion	52	65.5	66	58	33
Malignant Pleural effusion	26	18.2	18	17	16
Non-tuberculosis non-malignancy effusion	22	16.3	16	25	51
Total	**100**	**100**	**100**	**100**	**100**

Table 6: Comparison of range of ADA level in various groups of Pleural effusion

Type of effusion	Present study ADA Mean ± SD	Lamsal M el al [22]	Vinay Bharat el al [20]
Tuberculous Pleural effusion	28.8 ±7.80	34.53 ± 10.27	67.78 ± 37.39
Malignant Pleural effusion	10.2 ± 2.10	18.20 ± 3.20	22.90±9.06
Non-tuberculosis non-malignancy effusion	12.4 ±2.86	16.71 ± 5.16	22.17 ± 15.11

In this study, the exact role of ADA in pleural effusion with and without tuberculosis and its usefulness in diagnosing tuberculosis is tried to justify.

In present study incidence of TB pleural effusion was 65 %, which was comparable with studies of A.Dambal et al, [18] Bhavasar Kaushal M et al, [19] Vinay Bharat el al, [20] F.Y. Khan et al [21]

In the present study ADA value of Tubercular pleural effusion significantly increase as compared with non tubercular and malignant pleural effusion, which was compared with study of Lamsal M et al [22] and Vinay Bharat et al [20]

CONCLUSION

Estimation of ADA in pleural fluid is simple, inexpensive and rapid and also specific and sensitive for diagnosis of tuberculous effusion. Most common cause of pleural effusion was tuberculosis after malignant pleural effusion. Tuberculous effusion was more common seen in 18-50 year. Male are more predominant affected than female.

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