Orosomucoid in Pleural Effusions

Original Article

Adenosine Deaminase Activity, Marker for Tuberculosis

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ABSTRACT

Objective: To estimate enzyme adenosine deaminase activity in the pleural fluid which can serve as a marker for tuberculosis. *Method:* One hundred and forty patients with pleural effusions with different aetiologies were studied and screened for pleural fluid enzyme adenosine deaminase activity. *Results:* Hundred patients with tuberculous effusions (Group I) and thirty with malignant effusions (Group II) were compared for pleural fluid adenosine deaminase activity. The ADA activity was found to be significantly increased in tuberculous pleural effusions ($p < 0.001$), when compared with malignant pleural effusions. The ADA activity in Group III patients i.e. patients with effusions due to empyema was high when compared with Group II patients, but statistically not significant ($p < 0.01$). *Conclusion:* Adenosine deaminase (ADA) activity in the pleural fluid of patients with tuberculous and malignant effusions, empyema and effusions due to haemothorax, pneumothorax and congestive heart failure was estimated. This served as a very good marker for tuberculous effusions when compared with other effusions. *(The Ind. Pract. 2007; 60(8):481-484)*

KEYWORDS

Pleural Effusion, ADA: Adenosine deaminase, Tuberculosis, Malignancy, Empyema, Haemothorax, Pneumothorax, Congestive Heart Failure.

INTRODUCTION

Adenosine deaminase (EC 3.5.4.4) called ADA by Spencer et al[1] is an enzyme of purine catabolism which catalyzes the conversion of adenosine to inosine.[2] Its distribution in human organism is ubiquitous,[3] but its physiologic role is especially important in lymphoid tissue. Its level is ten times higher in lymphocytes than in erythrocytes[4] and particularly in T-lymphocytes with variations according to cellular differentiation.[5] It is involved in monocyte- macrophage maturation. It is a predominant T-lymphocyte enzyme and its plasma activity

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is high in diseases where cellular immunity is stimulated.[6] In patients with pleural tuberculosis, T-lymphocytes predominate in the fluid.

MATERIAL AND METHODS

One hundred and forty patients presenting with pleural effusions admitted to our hospital for diagnosis of respiratory diseases were included in our study. Patients were divided into following four groups:

I 100 patients suffering from tuberculosis

II 30 patients with malignancy

III 7 patients with empyema

IV 3 with miscellaneous diseases like haemothorax, pneumothorax and congestive heart failure.

Our study included 64 males and 36 females with tuberculous pleural effusions and 16 males and 14 females with pleural effusions due to malignancies. Patients with tuberculosis ranged from 14-70 years of age and those with malignancies ranged from 35-80 years of age.

The patients with tuberculous pleural effusions included 6 immunocompromised patients, 3 were having tuberculous polyserositis, 2 with hydropneumothorax and others having acute or chronic inflammation due to tuberculosis. The carcinomatous pleural effusions included 28 lung metastasis (15 adenocarcinomas, 3 small cell carcinomas, 2 non small cell carcinomas, one spindle cell carcinoma and 4 undiagnosed, one secondary metastasis, one papillary adenocarcinoma), one cancer of cervix and one malignant lymphoma.

In all the patients, a standard clinical protocol and routine laboratory tests viz. total proteins, glucose, lactate dehydrogenase activity were carried out. Pleural biopsy and bacteriologic study of pleural fluid was also carried out. The ADA activity was determined with Galanti and Guisti's colorimetric method[7] in pleural fluid samples stored at –20° C until assayed.

Results were statistically compared according to student's unpaired t-test.

RESULTS

The mean ADA activity in carcinomatous effusions was 22.72 ± 32.15 U/L, this was significantly ($p < 0.001$) lower than that in tuberculous effusions (90.63 ± 46.93 U/L). The ADA values above 40 U/L were found in 4 of 30 (13.3 %) carcinomatous effusions and 89 of 100 (89%) tuberculous effusions, showing a significant difference. In only 15 of 110 noncarcinomatous patients, the ADA activity was in low range of that obtained in tuberculous patients (Table 1).

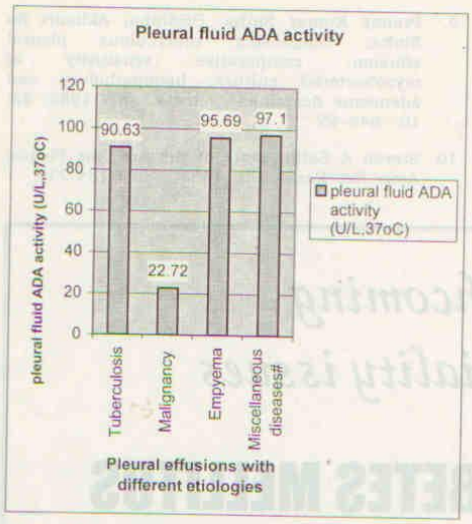
The difference in the ADA activity in patients of group II i.e. malignant pleural effusions when compared with those of group III i.e. empyema was found to be statistically not significant ($p < 0.1$), though a wide difference in values. The ADA activity was found to be less than 40 U/L in 11 patients having tuberculous effusions, out of which 3 were immunocompromised. The other 3 HIV positive patients showed no difference in the values i.e. the ADA activity was more than 40 U/L. Though the ADA activity was less than in malignant pleural effusions, the higher ADA values were also found in

Table 1

	Tuberculosis	Malignancy	Empyema	Miscellaneous Diseases#
Pleural fluid ADA activity (U/L, 37°C)	90.63 ± 46.93	22.72 ± 32.15	95.69 ± 101.05	97.1 ± 90.7

Miscellaneous diseases: Haemothorax, Pneumothorax and congestive heart failure

Values are expressed as Mean ± standard deviation.



 # Miscellaneous diseases: haemothorax, pneumothorax and congestive heart failure.

empyema and in patients with miscellaneous diseases like haemothorax, pneumothorax and congestive heart failure (Graph 1).

DISCUSSION

Our findings confirmed that ADA is a very good parameter for diagnosis of tuberculous effusion. Its sensitivity (80.5%) and specificity (98%) is very high. The values of ADA activity seen in patients with tuberculous pleural effusions are higher than that obtained in patients with malignant pleural effusions ($p < 0.001$). In malignant effusions, ADA activity is found to be very low compared to tuberculous and other non-tuberculous effusions. Because of its high specificity, ADA activity in pleural fluid is superior to all conventional testing like sputum testing or histopathology for diagnosis of tuberculosis.[8]

Determination of ADA activity is less costly and comparatively easy test that can be considered in the early routine study of patients with pleural effusions, particularly if diagnosis of tuberculosis is suspected and in places where prevalence of this disease is very high.

The reason why the activity of this enzyme is high in tuberculous effusion is not clear. ADA has a crucial role in the differentiation or proliferation of lymphoid cells.[9] T-cell activation, in particular has been found to have causal relationship with the activity of this enzyme. The increased ADA activity in tuberculous pleurisy probably is a consequence of local lymphocyte and macrophage activation.[10] Previous studies have shown that the percentage of T-lymphocyte subpopulation in tuberculous pleural fluid is higher than in peripheral blood. Ocana et al[6] have found a high percentage of T-lymphocytes in tuberculous effusion, but this was not correlated with the activity of ADA ($p < 0.10$). This suggests that the activity of the enzyme may be correlated more to the maturation stage of T-cell than to its number.

It is concluded that the activity of ADA can be used as the biochemical marker in the diagnosis of tuberculous pleural effusion and can be used for differentiating carcinomatous pleural effusions from tuberculous pleural effusions because of high sensitivity and specificity.

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