

The Egyptian Society of Chest Diseases and Tuberculosis  
Egyptian Journal of Chest Diseases and Tuberculosis

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## ORIGINAL ARTICLE

# Diagnostic value of adenosine deaminase in tuberculous and malignant pleural effusion

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Received 22 August 2012; accepted 22 August 2012

Available online 24 January 2013

### KEYWORDS

Tuberculosis;  
Pleural effusion;  
Adenosine deaminase;  
Malignant effusion

**Abstract** *Introduction:* Tuberculous pleural effusion (TPE) is a common problem for differential diagnosis from malignant effusion (MPE) in epidemic areas of tuberculosis (TB). Prediction based on adenosine deaminase (ADA) is dependent on age as well as the tuberculosis incidence.

*Aim of the work:* To estimate the value of cutoff point of ADA in MPE and TPE & to evaluate its role in differential diagnosis in Egypt a country with high incidence of TB.

*Subjects & methods:* The study was conducted in Kaser El-Aini Hospital, Cairo University in the period from April 2011 to January 2012. It was carried on 30 patients. We retrospectively analyzed 30 patients with a definitive diagnosis of TPE ( $n = 19$ ) and MPE ( $n = 11$ ). The optimal cutoff value of ADA was determined using the receiver operating characteristic (ROC) curve. There was a statistically significant difference according to the levels of pleural fluid ADA between TPE and MPE groups.

*Result:* Confirm that ADA is a very useful parameter for the differential diagnosis of TPE and MPE, specifically in younger with a higher incidence of tuberculosis.

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*Abbreviations:* ADA, adenosine deaminase; TPE, tuberculous pleural effusion; MPE, malignant pleural effusion; ROC, receiver operating characteristic; TB, tuberculosis

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Peer review under responsibility of The Egyptian Society of Chest Diseases and Tuberculosis.

### Introduction

TPE is the most common form of the extra pulmonary tuberculosis in our country. Its definitive diagnosis is established by determining of the tuberculosis in the pleural fluid or pleural tissue. Acid fast bacilli can be determined by less from 25% with direct examination of the pleural fluid. In TPE, granulomatous pleuritis is determined in 80% of the cases with the pleural biopsy, while the histological examination combined with culture of the biopsy material increases the rate of diagnosis to 90% [1].



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The diagnosis cannot be established in 10–20% of the patients with these methods even in the best conditions. Therefore, many studies have been conducted to demonstrate the role of pleural fluid levels of ADA in the differential diagnosis of pleuritis in recent decades. High sensitivity and specificity values reported [2].

These values may vary according to the incidence of the tuberculosis and proportional frequency of the diseases included in the differential diagnosis of the community in which the measurements were done. The level of ADA is used more commonly in the countries with a moderate to high incidence of tuberculosis in the differential diagnosis of TPE. Because it is a less invasive and more inexpensive method that can be accessed more quickly and accurately specifically in young patients with a high prevalence of TPE [3].

### Materials and methods

#### Patients

Total 30 patients presenting with pleural effusions who were admitted to Kasr El Aini Hospital between April 2011 and January 2012 were studied. Informed consent was obtained from the patients. Clinical signs and symptoms, demographic data, and radiologic results were recorded. Of these 14 men and 16 women ranging age from 21 to 70 years old, 19 patients had tuberculous pleurisy, 11 patients had malignant pleuritis. The pleural fluid was exudative with predominantly mononuclear cells (lymphocyte count > 50%) in all patients.

#### Specimen collection and processing

For each subject, at least 40 mL of pleural fluid was collected in a syringe during thoracentesis. A portion of the sample was submitted for acid-fast staining, bacteriologic examination, cytological examination, and measurement of protein, lactate dehydrogenase (LDH), and glucose, ADA.

ADA activity was measured by auto analyzer using commercially available kits. ADA activity was measured by auto analyzer using commercially available kits.

The conditions considered for TPE diagnosis were:

- (1) Determination of the necrotizing granulomatous inflammation in the pleural sampling carried out with thorascopic biopsy;
- (2) While there was not any other reason to explain the pleural fluid with clinical and radiologic appearance suggesting TB with response to anti-TB treatment.

For the diagnosis of MPE, malignancy in cytology of the pleural fluid and/or on histology of the pleural tissue was considered. ADA activity in the pleural fluid was studied and the results were recorded as IU/L in all the patients.

#### Statistical analysis

Quantitative data were presented as mean and standard deviation (SD) values. For parametric data, Student's *t*-test was used for comparisons between mean values of two groups. One way ANOVA (Analysis of Variance) was used to compare between mean values of more than two groups. Tukey's post hoc test was used for pair-wise comparisons between mean values when ANOVA test is significant.

For non-parametric data, Mann–Whitney *U* test was used to compare between two groups. This test is the non-parametric alternative to Student's *t*-test. Kruskal–Wallis test was used to compare between more than two groups. This test is the non-parametric alternative to one-way ANOVA. Mann–Whitney *U* test was used for pair-wise comparisons between the groups when Kruskal–Wallis test is significant.

Qualitative data were presented as frequencies and percentages. Chi-square ( $\chi^2$ ) test was used for studying the comparisons between different qualitative variables.

Spearman's correlation coefficient was used to determine significant correlations between the different variables.

ROC (Receiver Operating Characteristic) curve was constructed to establish the optimal cut-off points and the likelihood ratios (LRs) of ADA.

#### Diagnostic accuracy of ADA

##### ROC curve analysis

ROC (Receiver Operating Characteristic) curve was constructed to establish the optimal cut-off points and the likelihood ratios (LRs) of ADA and interferon. (See Fig. 1).

##### ADA

ROC curve analysis of ADA values for the diagnosis of TB in the present study showed that the optimal cut-off point was determined at 30 IU/L. The likelihood ratios (LRs) were 3.76 and 0.14 for values above or below this cut-off point.

A total of 30 patients (14 male and 16 female) were included to the study. TPE group consisted of 9 male and 10 female; the mean (SD) age was  $29.2 \pm 12.2$  years, MPE group consisted of 5 men and 6 women; the mean (SD) age was  $55.2 \pm 11.9$  years. Table 1.

Mean age of the MPE group was significantly higher than the TPE group ( $P < 0.0001$ ). There was no statistically significant difference between the two groups in the gender distribution ( $P > 0.05$ ). (See Table 2)

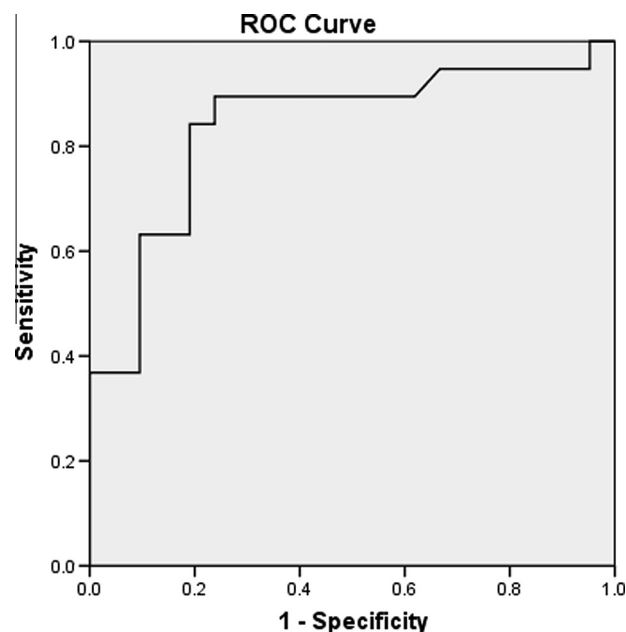


Figure 1 ROC curve for ADA.

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