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Short Communication

Serum Adenosine deaminase (ADA) levels in surgically treated hydatid cyst patients

Sevil Isik[1], Ulku Karaman[2]*, Tugba Raika Kiran[3], Ali Özer[4]

[1]Department of General Surgery, Medical Faculty, Ordu University, 52100 Ordu, Turkey.
[2]High School Health, Ordu University, 52100 Ordu, Turkey.
[3]Continuing Education Research and Application Center, Inonu University, 44100 Malatya, Turkey.
[4]Department of Public Health, Inonu University, 44100 Malatya, Turkey.

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Adenosine deaminase (ADA) is an essential enzyme in the monocytes - macrophage system and in the proliferation and differentiation of lymphocytes. ADA activity is routinely used in the differentiation of other etiologies of tuberculosis pleurisy in clinical practice and elevated ADA levels are stated to indicate the severity of the disease. In this study the purpose was to compare the serum ADA levels between patients operated due to hydatid cyst and healthy individuals (control group). The serum ADA levels of surgically treated patient with hydatid cyst were analyzed and a significant decrease was observed in comparison with the control group (10.98±6.53 vs 21.11±14.07, $p<0.05$). Decreasing of ADA levels on surgical treated hydatid cyst patients can be interpreted as the inhibition of tissue damage or cessation of lymphocyte proliferation as a result of the elimination of the parasite by means of surgical treatment and breaking the relation between the parasite and immune cells of the host. Determination of ADA activity in hydatid cyst patients might be a diagnostic tool if further clinical trials are carried out.

Key words: Adenosine deaminase, hydatid cyst, operated patients.

INTRODUCTION

Hydatid cyst is a parasitic disease caused by the larva form of *Echinococcus granulosus* which lives in the small intestines of carnivores. The parasite is quite common in the world and in Turkey (Sayek, 2004; Hökelek and Arıkoglu, 2004). The ability of *E. granulosus* to cause infection and to have a viable parasitic life cycle depends on the immune system of the host and the relation between the host and the parasite (Zhang and Mc Manus, 2006; Siracusano et al., 2008). The defense of the host's immune system against the parasites (adult and larva) is provided by cells. Various cytotoxic agents, reactive oxygen and nitrogen byproducts produced by activated phagocytic cells play a great role in this mechanism. These products are oxidant products with the nature of free radicals and they negatively affect the parasitic viability (Amanvermez and Çelik, 2002; Clark and Rockett, 1996). Protoscolex has, in itself or in the cyst fluid, various immunomodulatory molecules - most importantly Antigen B (AgB) - which directly suppress the immune cells of the host or change the cytokine balance and stimulate cell populations. It is found that AgB modulates differentiation and maturation of monocytes, which are the precursor of macrophages in the tissue, directly or by means of increasing IL-4 release from Th2 cells, and it directly inhibits polymorphonuclear cells and their chemotaxis (Rigano, 2001). It is also reported that peripheral blood mononuclear cell (PBMC) series stimulated with AgB cause an increase in IL 4 and IL-13, regulate the transformation of monocytes to dendritic cells and increase the apoptotic rate in these series. While in the cell series collected from PBMC of CE patients with inactive cyst, Th1 polarization, which strengthens the immunity of the host, is observed; in the series of CE patients with active cysts, Th2 polarization, which causes sensitivity to diseases, is seen (Rigano et al., 2004).

Adenosine deaminase is an essential enzyme in the

*Corresponding author. E-mail: ulkukaraman44@hotmail.com. Tel: + 90 530 789 99 65.

Table 1. ADA levels that surgically treated patients vs control groups.

Groups \ ADA	N	Mean±Sd	P
Case	46	10.98±6.53	<0.001
Control	40	21.11±14.07	

monocytes - macrophage system and in the proliferation and differentiation of lymphocyte (Aldrich et al., 2000). It is in multiple molecular form in human tissue and it has a wide distribution (Piras et al., 1978). ADA activities are higher in T lymphocytes in comparison with the B lymphocytes. ADA activity is defined to be important for the normal lymphocyte function (Cassani et al., 2008).

In this study the purpose is to compare the serum ADA levels between patients operated due to hydatid cyst and healthy individuals in the control group.

MATERIALS AND METHODS

For the research an ethical board report is received and those who volunteered to give samples are included in the study. As it is considered to change the serum ADA levels in parasitic diseases, intestinal parasites are analyzed with native lugol, perianal area material taken with cellophane and sedimentation methods in the patient and control groups. 46 patients diagnosed with absolute hydatid cyst after surgery and tested positive according to serological tests (IHA and IFAT) composed the experiment arm in the study. Those positive for hydatid cyst but have different parasite in the feces, as well as those receiving any hormone medication, smokers and alcohol users are excluded from the study since the said factors would cause differences in the ADA levels. On the other hand, among the volunteers of the study, the ones without any parasitic infection, non-smokers, those who do not take any hormone medication and who do not consume alcohol are included in the control group. In the study the patients who tested positive are recalled and after making the explanations necessary for the study, 5 ml of blood sample is taken from those who agreed to participate, their sera are separated and kept at -20°C until the analysis.

Serum ADA levels of the samples are checked by using Ellis and Goldberg method. Ammonium ion, which is released from adenosine due to the effect of adenosine deaminase, forms the indophenol complex with green blue color as a result of Boertholet reaction (Ellis and Goldberg, 1970). The intensity of the color increases in proportion with the enzyme concentration in the environment. This complex is found to have 632 nm wavelength in the spectrophotometer.

Data are expressed as mean Standard deviation. Normality test is performed with the Shapiro-Wilk test. Independent sample t test is used in the statistical analysis. $P<0.05$ is accepted to be statistically significant and the SPSS 13.0 package program is utilized in the statistical analysis.

RESULTS AND DISCUSSION

The descriptive statistics for the ADA level in the study are given in Table 1. A significant decrease is observed between the ADA levels of the hydatid cyst patient group and the control group ($p<0.05$). However, there is no statistical relation between the serum ADA levels and IHA and IFAT results of the samples collected from the patients after surgery.

In this study, the serum ADA levels of surgically treated patients with hydatid cyst are analyzed and a significant decrease is observed in comparison with the control group. The evaluation is carried out 1 month after the operation and IHA and IFAT data showed high titrations of positivity. According to the resources there is one single study evaluating the serum ADA levels of hydatid cyst patients, namely the study of Kaya et al. (2009), which concludes that untreated hydatid cyst patients have higher ADA levels when compared with healthy individuals. In the study of Ellah et al. (2004), it is reported that the increase in ADA levels in hydatid cyst in bovine is correlated with the degree of hepatocellular damage. It is reported that ADA activity is routinely used in the differentiation of other etiologies of tuberculosis pleurisy in clinical practice and elevated ADA levels are stated to indicate the severity of the disease. Similarly, Balasaniants et al. (2001) stated that elevated serum ADA levels in tuberculosis patients indicated destructive and infiltrative changes in the lungs and also reported that it could be used in the follow up of the effectiveness of the treatment as it decreases in the post-treatment period. Similarly our results, the ADA activity is found to be lower in visceral leishmaniasis (Tripathi et al., 2008). Just as Karaman et al. (2009), identified a significant decrease in the ADA activity in patients with seropositive *Toxoplasma gondii* and *Giardia intestinalis* as compared to the healthy control group. They also reported that the low ADA levels did not cause any increase in T lymphocytes either because the toxoplasmosis infection was already existent or the oxidative stress increased in parasitic infections. The results of this study can be interpreted as the inhibition of tissue damage or cessation of lymphocyte proliferation as a result of the elimination of the parasite by means of surgical treatment and breaking the relation between the parasite and immune cells of the host.

Radiological findings and serological tests are also used in the diagnosis of hydatid cyst. In the follow up of operated patients, it is difficult to identify the reason for radiologically detected lesions, that is, postoperative changes or relapse of the disease. In addition, serological tests are needed in order to differentiate cystic changes like bilioma from relapse. However it is also reported that IHA, which is used most frequently in the follow up, may still be positive for years after treatment even if no relapse is in question (Kayaalp, 2007). For that reason, in the postoperative follow up of the patient, there is a need for tests which are complementary to the serological tests or which are more sensitive and more specific for treatment follow up. This preliminary study can lead

further investigations for the patients with hydatid cyst.

Conclusion

In this study it is concluded that, if randomized clinical studies are carried out, identifying the ADA activity in hydatid cyst patients can be an effective parameter that could be used in diagnosis and assessing the effectiveness of the treatment.

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