

Interplay among Antioxidants and Oxidants in Psoriasis

Soheila Nassiri, MD¹
 Farhad Malekzad, MD¹
 Mojdeh Sarlak, MD¹
 Marjan Saeedi, MD¹
 Mehdi Hedayati, MD²
 Mehdi Qaisari, MD¹

1. Skin Research Center, Shohada-E-Tajrish Hospital, Shahid Beheshti University Of Medical Sciences, Tehran, Iran.

2. Endocrine and Metabolism Research Center, Shahid Beheshti University Of Medical Sciences, Tehran, Iran.

Corresponding author:

Marjan Saeedi, MD
 Skin Research Center, Shohada-e-Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
 Email: marjan406@yahoo.com

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Abstract

Background: The etiology of psoriasis, a chronic inflammatory skin disease, has not been elucidated. However, Oxidant / antioxidant imbalance is suspected. The aim of this study was to evaluate oxidant / antioxidant status in psoriatic patients.

Method: forty two psoriatic patients and 42 age and sex matched controls were recruited for this study. Serum total antioxidant capacity (TAC), oxidized light density lipoprotein (Ox-LDL) and malondialdehyde (MDA) levels were determined.

Results: A statistically significant increase in the serum level of MDA was found between patients and controls. No significant difference was found in the serum levels of other parameters in the two groups.

Conclusion: Our results supported the hypothesis of an imbalance between oxidants and antioxidants in psoriasis and pointed to the probability of an increased risk of cardiovascular diseases in psoriatic patients. (*Iran J Dermatol* 2009;12:56-59)

Keywords: psoriasis, antioxidants, oxidants

Introduction

Psoriasis is a chronic, inflammatory disease with polygenic predisposition combined with triggering environmental factors such as trauma, infection and medications¹. The exact pathogenesis of this disease is still unknown.

Reactive oxygen species (ROS) that originate in the environment and skin may damage cell compounds such as protein, lipid and DNA²⁻⁷. A complex of human antioxidant enzymes catalyzes the reaction of ROS scavenging. These are superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx)⁸. Studies on antioxidant enzyme activity demonstrate the participation of ROS in tissue lesion processes, especially in chronic inflammatory processes⁹. ROS produced during an inflammatory process results in increased lipid peroxidation and formation of MDA. Therefore, overproduction of ROS because of a chronic inflammatory state and the decreased activity of antioxidants may play a significant role in the pathogenesis of psoriasis and probably in the increased risk of cardiovascular disorders in these patients⁷.

Several studies have investigated the role of oxidants/antioxidants systems in psoriasis with discordant results. Therefore, the purpose of this study was to investigate the blood levels of MDA and Ox-LDL (a marker of LDL oxidation) and TAC (representative of blood antioxidant status) in patients with psoriasis.

Patients and Method

The study was conducted according to the principles of the declaration of Helsinki and was approved by the Medical Ethics Review Board of the Skin Research Center of Shahid Beheshti University of Medical Sciences. A written consent was obtained from all participants.

The study group included 42 patients with psoriasis (32 males and 10 females) with a mean age of 38.6 ± 15.1 , and 42 sex and age matched healthy controls (32 males and 10 females) with a mean age of 38.4 ± 12.3 . All the patients were diagnosed clinically and histologically by a dermatologist. All the controls were examined by a dermatologist and none of them had a disease history of any kind. In the psoriatic group, disease

severity was graded according to the area of the psoriasis lesions. Eleven patients had a mild disease (less than 10% of body surface), 22 had a moderate disease (between 10 and 30% of body surface) and 9 had a severe disease (more than 30% of body surface).

None of the patients had used systemic or topical medications and or any phototherapy for at least two months prior to blood collection. The subjects in control and patient groups were not taking any kind of antioxidants (vitamins, carotenes, etc) and oral contraceptive pills. Participants with a history of alcohol abuse, diabetes mellitus, cardiovascular diseases and other inflammatory disorders (such as rheumatoid arthritis, asthma and atopic dermatitis) were excluded from the study. Moreover, we evaluated ESR values in both groups, and excluded all individuals with increased values.

Blood samples from cases and controls were collected from May 2007 to May 2008 in order to obtain whole blood, plasma and serum. None of the collected samples were icteric or haemolysed.

Serum levels of TAC and MDA were determined with commercial colorimetric kits (Japan Institute for the control of Aging (JalCA), Shizuoka, Japan). Oxidized LDL levels were determined by ELISA (Ox-LDL ELISA, Mercodia AB and Uppsala, Sweden). All intra-assay coefficients of variation were less than 10%.

The statistical analysis was performed using SPSS version 16. To evaluate the differences between the cases and controls, we used the student's t-test. A P-value less than 0.05 was considered statistically significant. The measurements were expressed as mean \pm standard deviation (S.D)

Results

A total of 42 psoriatic patients (mean age 38.6 ± 15.1), including 11 with a mild disease, 22 with a moderate disease and 9 with a severe disease and 42 controls (mean age 38.4 ± 12.3) were investigated in this study.

The results of the plasma levels of TAC, Ox-LDL and MDA in psoriatic patients and healthy controls

are summarized in table-1. Statistically significant increased levels of MDA were noted in psoriatic patients (P-value<0.05). No statistically significant difference was found in the serum level of other parameters in the two groups.

Discussion

Current evidence indicates that interactions between genes and the environment are vital in the pathogenesis of psoriasis. Many environmental factors such as trauma, infection, oxidant drugs, alcohol and smoking have been linked to this disease¹⁰, but the exact role of mentioned factors in the etiology of psoriasis is still controversial. One hypothesis for the pathogenesis of psoriasis is the imbalance between oxidants and antioxidants; this hypothesis gains its value from the fact that psoriasis, as a chronic inflammatory skin disorder, is associated with cardiovascular disorders, diabetes mellitus and rheumatoid arthritis. These associated diseases are known as oxidative stress conditions^{11,12}. Previous reports of increased levels of oxidants and decreased capacity of antioxidants in psoriasis all add to the importance of oxidant-antioxidant imbalance in psoriasis^{6,13,14,15,16,17}.

Reactive oxygen species (ROS) produced during the inflammatory process in psoriasis may result in increased lipid peroxidation; this process may lead to cell damage. It is also responsible for a decrease in the cAMP/cGMP ratio leading to epidermal hyperproliferation^{7,15,16,18}.

ROS induced oxidation of polyunsaturated fatty acids results in the formation of lipid peroxidation products such as MDA⁷.

In this study, we evaluated the serum levels of MDA, the end product of lipid peroxidation, and Ox-LDL which represents LDL oxidation. A significant increase in serum MDA in psoriatic patients was found in our study. Baz et al, Kural et al. and Utas et al. have all reported increased levels of serum MDA, too^{7,19,20}. However, in a study performed by Yildirim et al, serum MDA was not increased in psoriatic patients but they reported increased levels of tissue MDA⁶. In another study

Table 1: Plasma MDA, OxLDL and TCA levels (mean \pm standard deviation) in patients with psoriasis and controls

Group	OxLDL* (mU\l)	MDA** (nmol\mL)	TCA*** (U\ml)
Cases	11 \pm 4.9	7.1 \pm 2.1	9.3 \pm 4.3
Control	12.5 \pm 5.1	6.1 \pm 2.1	11 \pm 5.1
P-value	>0.05	<0.05	>0.05

*The assay sensitivity and intra assay coefficient of variation were 1mU/L and 8.6% respectively.

** The assay sensitivity and intra assay coefficient of variation were 0.002nmol/ mL and 6.4% respectively

*** The assay sensitivity and intra assay coefficient of variation were 0.04U/mL and 3.6% respectively

performed by Kokcam et al, serum MDA levels were not increased in psoriatic patients but MDA levels in RBC samples were significantly higher in psoriatic patients²¹. Nevertheless, all of these reports mentioned increased levels of MDA in patients with psoriasis, a finding similar to ours.

We did not find any difference between cases and controls in terms of serum levels of Ox-LDL. To investigate the antioxidative system in psoriatic patients, we evaluated serum levels of TAC. In contrast to other studies^{11,19}, no significant difference was found between cases and controls regarding this parameter. This may be due to the younger age of our patients and also because Iranian regular diet contains more fruit and vegetable and less saturated fatty acid in comparison with western diets; however, more comprehensive studies are needed in this regard.

The correlation between disease severity and oxidants/antioxidants is controversial. Kural et al. found no correlation between PASI score and lipid profile, susceptibility of LDL to oxidation and oxidative stress in patients with psoriasis; This may be due to the fact that PASI score does not reflect disease severity correctly¹⁹. Rocha-Pereira et al., through comparative study of the lipid profile and the oxidative status between control and two groups of psoriasis patients (mild and severe), demonstrated that an imbalance between oxidants and antioxidants was also observed in mild psoriasis¹¹. Our cases (11 with a mild disease and 9 with a severe disease) were not sufficient for investigating the relationship between disease severity and MDA, TAC and Ox-LDL. Such a relationship should be investigated in a larger study with more patients.

Briefly, through finding significantly increased values of MDA, our study supports the hypothesis that some disturbances in the oxidant-antioxidant balance in favor of oxidation may have a role in the pathogenesis of psoriasis and may also contribute to the increased risk of cardiovascular disorders in patients with psoriasis.

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