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SHORT COMMUNICATION

ERYTHROCYTE ASCORBIC ACID AND PLASMA VITAMIN E STATUS IN PATIENTS WITH CARCINOMA OF PROSTATE

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Abstract : Prostate cancer is the most prevalent cancer found in men above the age of fifty years and is frequently diagnosed in men between 45 and 89 years of age with a median age of 72 years. This work was undertaken to assess oxidative stress and antioxidant status in patients with carcinoma of prostate. Erythrocyte ascorbic acid and plasma vitamin E levels were estimated in patients with carcinoma of prostate and compared to controls. It was observed that there was a significant decrease in Erythrocyte ascorbic acid and plasma vitamin E levels in patients with carcinoma of prostate compared to controls. The decrease in the levels of antioxidant vitamins may be due to the increased turnover for preventing the oxidative damage in these patients.

Key words : ascorbic acid vitamin E prostate cancer

INTRODUCTION

Prostate cancer is the most prevalent cancer found in men above the age of fifty years and is frequently diagnosed in men between 45 and 89 years of age with a median age of 72 years. The age of Indian patients of prostate cancer varies from 32–86 years with an average age of 43.5 years, which is much lower when compared to the average of patients in Western Countries (1). Free radicals are involved in a number of human disease processes (2, 3, 4, 5) including prostate cancer. Free radicals, primarily the reactive oxygen species (ROS), superoxide and hydroxyl radicals which are highly reactive having an unpaired electron in an atomic or molecular orbit are generated under physiological conditions during aerobic metabolism. As free radicals are potentially toxic, they are usually inactivated or scavenged by antioxidants before they can inflict damage to lipids, proteins or nucleic acids. Moreover the body's defense mechanisms would play an important role in the form of antioxidants and try to minimize the damage, adapting itself to the above stressful situation. Antioxidants are compounds that dispose, scavenge, and suppress the formation of free radicals, or

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oppose their actions (6) and two main categories of antioxidants are those whose role is to prevent the generation of free radicals and those that intercept any free radicals that are generated (7). They exist in both the aqueous and membrane compartment of cells and can be enzymes or non enzymes. The human body has a complex antioxidant defense system that includes the antioxidant enzymes Super Oxide Dismutase (SOD), Glutathione Peroxidase (GPX) and Catalase (CAT). These block the initiation of free radical chain reactions (8). The non enzymatic antioxidant components consists of molecules such as Glutathione (GSH), Vitamin E, Ascorbic Acid and beta-carotene that react with activated oxygen species and thereby prevent the propagation of free radical chain reactions. Alteration in the oxidant-antioxidant profile is known to occur in cancer (9, 10). In our previous study we showed that lipid peroxidation was significantly increased along with glutathione and superoxide dismutase activity in patients with prostate cancer compared to control subjects (11). However antioxidant vitamin status was not assessed. Therefore in the present study, concentrations of erythrocyte ascorbic acid and plasma vitamin E were estimated in patients suffering from prostate cancer before treatment.

METHODS

The study was conducted in Department of Biochemistry, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, Chinoutpally, Gannavaram (Mandal), A.P, India. Thirty histopathologically proven prostate carcinoma patients from surgical OPD of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation General Hospital, Chinoutpally, were chosen for the study. An equal number of age matched healthy subjects were also investigated. The control and patient groups had the same socioeconomic background. Therefore, changes in analytes due to nutritional factors are minimal. Due permission was obtained from the ethical committee of the Dr. PSIMS & RF General Hospital, Chinoutpally before the start of the work. The written consents were also taken from the patients prior to study. The controls and patients were divided into 2 groups.

Group 1 : Thirty healthy age matched controls.

Group 2 : Thirty patients with histopathologically proven prostate cancer.

The heparinised venous blood samples obtained from these subjects were used for the analysis estimation of ascorbic acid in erythrocytes and vitamin E in plasma. Plasma was separated by centrifugation at 1,000 g for 15 minutes. Separated plasma was used for the estimation of vitamin E. The buffy coat was removed and the packed cells were washed three times with physiological saline. The erythrocyte suspension was prepared by the method of Dodge et al., (12) modified by Quist (13). The packed cells were used for the analysis of ascorbic acid. Ascorbic acid levels were estimated in plasma by the method of Tietz (14). Plasma vitamin E levels were estimated by the method of Baker H et al (15). All reagents used were of analytical reagent grade obtained from Sigma chemicals, St. Louis, MO. Statistical Analysis between Group 1 (controls) and

Group 2 (patients) was performed by unpaired t-test using the stat - view package.

RESULTS AND DISCUSSION

The mean ± SD of erythrocyte ascorbic acid and plasma vitamin E are indicated in Table I.

TABLE I: The mean ± SD values of erythrocyte ascorbic acid and plasma vitamin E in controls and patients with carcinoma of prostate.

Parameter	*Group 1 (Controls) n=30*	*Group 2 (Patients) n=30*
Ascorbic Acid (mg/dl)	4.88±0.11	3.46±0.22*
Vitamin E (µmoles/L)	8.42±0.34	7.06±0.29**

*P<0.001 compared to controls; **P<0.01 compared to controls.

We observed a significant decrease in the levels of erythrocyte ascorbic acid, and plasma vitamin E (non enzymatic antioxidant defense system) in patients with with carcinoma of prostate when compared to controls. Free radical generation can induce oxidative stress. The decrease in the levels of these non enzymatic antioxidant vitamin parameters may be due to the increased turnover, for preventing oxidative damage in these patients suggesting an increased defense against oxidant damage in prostate cancer. Similar reports of decreased vitamin E levels were reported by Almushatat AS et al (16, 17, 18). These findings were supported by our earlier study (11), in which a significant reduction in the levels of glutathione and significant increase in superoxide dismutase activity were observed in patients with carcinoma of prostate compared to controls. A marked increase in lipid peroxidation in these patients was also noted. These results indicate that in prostate cancer patients the efficiency of the antioxidant vitamins in counteracting the damaging effects of free radicals is significantly reduced. Thus the results of the present study suggest that a cumulative functional insufficiency of the antioxidant vitamin system may play an essential role in the development of oxidative stress in prostate cancer patients.

In conclusion, the results suggest the necessity for therapeutic co-administration of antioxidant vitamins along with conventional drugs to such patients in the initial stages to prevent the oxidative damage and deterioration of the tissues. The findings implicate oxidative stress in the disease and cite the biochemical rationale for clinical trials of antioxidants to prevent and treat prostate cancer. However due to the limited number of cases included in this study, more studies may be required to substantiate the results and arrive at a definite conclusion in terms of safety and efficacy of adding antioxidant therapy as secondary therapy for the treatment of prostate cancer.

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