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Malonaldehyde Levels in Dental Disorders and Effect of Anti Oxidant Supplementation on it

Smita Sharma[1*], Rami Abdullah Ali Al Daghreer[2], Hamad Aldaghreer[3]
[1]MD Biochemistry, DTCD. Associate Prof. Biochemistry MM Institute of Medical Sciences Research, Mullana. Ambala, India
[2]Masters in Biotechnology, Ministry of Health, Nejran Saudi Arabia
[3]Director, Ministry of Health, Nejran, Saudi Arabia

Abstract: Free radical induced lipid peroxidation has been implicated in pathogenisis of several disorders. Lipid peroxidation product malonaldehyde (MDA) was analyzed before and after Vitamin c supplementation (500 mg single dose daily for 6 weeks) in 25 patients of leukoplakia, 47 patients of oral submucous fibrosis, 21 patients of candidiasis, 67 patients of dental caries, 62 patients of oral cancer and 50 healthy controls. Significantly elevated levels of MDA were observed in leukoplakia, oral submucous fibrosis, and cancer as compared to controls ($p<0.05$). After six weeks of vitamin C supplementation MDA levels decreased in patients of candidiasis and dental caries but in leukoplakia, oral submucous fibrosis and cancer not much change was observed. These findings indicate a role of free radicals in their pathogenesis and effect of Vitamin C supplementation on their levels.

Keywords: Oral Disease, MDA Level, Lipid Peroxidation Products, Vitamin C.

Research Paper

***Corresponding Author:**
Smita Sharma
MD Biochemistry, DTCD. Associate Prof. Biochemistry MM Institute of Medical Sciences Research, Mullana. Ambala, India

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INTRODUCTION

Free radicals can be defined as molecules or molecular fragments with an unpaired electron which imparts certain characteristics to the free radicals such as reactivity [1]. Reactive free radicals are able to produce chemical modifications and to damage proteins, lipids, carbohydrates, and nucleotides in the tissues [2]. It is known that free radicals are probably mediators for tissue damage in neoplastic diseases [3]. Reactive free radicals may damage cells by initiation of lipid peroxidation that causes profound alteration in the structural integrity and unctions of cell membrane [2]. Free radical induced lipid peroxidation has been implicated in the pathogenesis of several disorders including cancer. The concentration of lipid peroxidation product Malonaldehyde (MDA) is most widely used [4, 5]. Saliva is a diagnostic sample for many oral and systemic diseases [6]. In this study, role of free radicals (salivary MDA) in dental conditions such as oral submucous fibrosis, candidiasis, dental caries, leukoplakia and oral cancer has been explored. Effect of vitamin C supplementation on salivary MDA levels was also explored.

MATERIALS AND METHODS

Subjects: 25 patients (M:F , 13;12) of leukoplakia, 47 (M:F, 16:21) of oral submucous fibrosis, 62 (M;F, 8:4) of oral cancer, 67 (M:F 31:36) of dental caries and 21 patients (M:F, 11:10) of candidiasis in age group 15-60 yrs attending Out Patient Department of Maharashi Markendeswar University, MullanaAll diagnostic tests were done for diagnosing particular diseases. 50 (M:F, 25:25) healthy subjects in age group 15-60 yrs were taken as controls. Non-stimulated whole saliva samples were collected and transported over ice. Samples were centrifuged and stored at -200C. MDA was analysed by Thiobarbituric Acid (TBA) reaction [7].

RESULTS

Elevated salivary MDA levels were observed in patients with dental caries and candidiasis as compared with controls although the difference was not statistically significant (3.42 ± 0.22 (M) & 3.36 ± 1.42 (F), 3.45 ± 1.39 (M) & 3.29 ± 1.37 (F) v/s 3.38 ± 0.33 (M) & 3.24 ± 0.54(F) ng .ml-1, respectively $p>0.05$). While significantly high MDA levels were observed in leukoplakia, oral submucous fibrosis and cancer (Table 1, $p<0.05$). After vitamin C supplementation decrease in MDA levels was observed only in patients of dental caries and candidiasis. This decerease was not statistically significant. Not much change was observed in MDA levels in leukoplakia, oral submucous fibrosis and cancer.

DISCUSSION

Lipid peoxidation has been shown to cause a profound alteration in structural integrity and functions of cell membrane. A study in a baby hamster kidney cell line and its polyoma-virus transformed malignant counterpart reported high levels of lipid peroxidation products and low levels of alpha tocopherol in transformed cells suggesting that lipid peroxidation is increased in the precancerous conditions and malignant state [8]. In the present study high MDA levels were observed in leukoplakia, oral submucous fibrosis and cancer as compared to controls (table 1, P< 0.05), indicating a role of free radicals in pathogenesis of precancerous lesions and cancer.

Table 1: Salivary MDA levels of patients with dental caries, candidiasis, leukoplakia, oral submucous fibrosis, oral cancer and controls (Mean +/- SD)

	Sex	Salivary MDA Levels (ng.ml-1)	
		Before vitamin C supplementation	After vitamin C supplementation
Controls (n=50)	M	3.38 ± 0.33	No Vitamin C supplementation done.
	F	3.24 ± 0.54	
Dental Caries (n = 67)	M	3.42 ± 0.22	3.39 ± 0.21
	F	3.36 ± 1.42	3.28 ± 1.36
Candidiasis (n = 21)	M	3.45 ± 1.39	3.37 ± 1.37
	F	3.29 ± 1.37	3.25 ± 1.38
Leukoplakia (n = 25)	M	3.92 ± 0.33 *	3.95 ± 0.32
	F	3.97 ± 0.27 *	3.96 ± 0.25
Oral Submucus Fibrosis (n = 47)	M	4.15 ± 0.37 *	4.17 ± 0.33
	F	4.07 ± 0.33 *	4.05 ± 0.34
Oral Cancer (n = 62)	M	5.23 ± 0.32 *	5.25 ± 0.33
	F	4.97 ± 0.49 *	4.95 ± 0.45

*Significant at the level of p <0.05.

Elevated MDA levels have been reported.in oral leukoplakia and cancer [9, 10]. The body contains a number of protective antioxidant mechanisms, whose specific role is to remove harmful oxidants as they form, or to repair damage caused by reactive oxygen species [11]. Recent medical and dental research is geared towards prevention of free radical medicated diseases by using specific antioxidants. Preliminary data indicates protective role of anti-oxidant supplementation in prevention of precancerous lesions [12]. In our study it has been observed that anti-oxidant vitamin C supplementation for six weeks was helpful in patients of dental caries and candidiasis but for leukoplakia, oral submucous fibrosis and oral cancer prolonged supplementation is recommended. Saliva being a non invasive and easy to collect sample, can be used to assess MDA and anti-oxidant status of patient with an oral lesion.

Further studies on larger scale should be performed to clarify the importance and role of anti-oxidant vitamins in oral diseases.

Conflicts of Interests: All authors have none to declare.

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