EFFECT OF SHORT TERM VITAMIN E SUPPLEMENTATION ON LIPID PEROXIDATION IN ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

In view of sufficient body of evidence to substantiate the role of free radical mediated oxidative injury in myocardial infarction (M.I.), the utility of exogenous supplementation with antioxidant substance, vitamin E was studied. Forty patients of acute myocardial infarction were divided into two equal groups, one who received vitamin E and the other who did not. Plasma MDA levels showed a reduction in patients of M.I. who received vitamin E as well as in those who did not, however, the decrease was significantly more in the vitamin E treated subgroup.

KEY WORDS: Vitamin E, Lipid peroxidation, Myocardial infarction.

INTRODUCTION

Vitamin E (or α -tocopherol) is one of the important antioxidants which scavenge free radicals and protect the body against their harmful effects. The richest sources of vitamin E are vegetable oils (soyabean, corn, cotton seed, sunflower) and their products. The recommended dietary allowance is 8 mg of α -tocopherol (12 IU) for women and 10 mg (15 IU) for men (1). The absorption of tocopherols is dependent on the person's ability to digest and absorb fat for which bile is essential. In the blood, the bulk of the tocopherol is found in the low density lipoprotein (LDL). There is no single organ for storage of vitamin E, but in terms of absolute amounts, adipose, liver and muscle account for most of the body's tocopherol. α -Tocopherol is now known to be the principal, if not sole, chain breaking lipophilic antioxidant in tissues and plasma (2,3). It inhibits lipid accumulation and oxidant and fatty peroxide level in vascular endothelial cell. A therapeutic benefit by vitamin E in spontaneous atherosclerosis has been demonstrated (4). At micromolar concentrations

exogenously administered vitamin E substantially reduces oxidative damage to vascular endothelium *in vivo* from neutrophils (5).

In two large scale prospective studies (6,7), a high dietary intake of vitamin E was found to be associated with a significantly reduced risk of coronary artery disease. The alpha - tocopherol, beta - carotene lung cancer prevention study (8) did not find a significant reduction in coronary disease mortality, probably due to the small dose of vitamin E given (50 mg/day). On the other hand, significant reduction in levels of lipid peroxides by exogenous vitamin E supplementation have also been observed (9,10). The optimum dose of vitamin E is still a matter of debate. We report here the results of our study with 800 mg of vitamin E for 3 months in acute M.I. patients.

METHODS

Forty patients of acute myocardial infarction (M.I.) were included in the study by random selection and were divided into two equal groups, of which one received vitamin E and the other did not. The diagnosis of M.I. was made according to the criteria recommended by the WHO(11), where two out of the following three, if present, were diagnostic : a) Typical anginal chest

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pain, b) Typical ECG changes, c) Serially rising cardiac enzyme levels. The MILIS criteria were used for the ECG diagnosis of acute M.I. (12)

Twenty of the forty patients were given oral supplementation with vitamin E in the dose of 800 mg of α - tocopheryl acetate per day for a period of three months. Plasma levels of malondialdehyde (MDA), which is an indicator of free radical mediated lipid peroxidation, was measured by the method of Satoh (13) before and after vitamin E supplementation. Similarly plasma MDA was estimated in twenty other patients of M.I. who did not receive vitamin E. The change in MDA levels with and without vitamin E was compared between both groups.

RESULTS

It was observed that plasma MDA levels declined significantly ($P < 0.01$) in the vitamin E supplemented as well as non-supplemented group of M.I. patients after 3 months (Table 1). However the reduction was more in the group of patients who received the vitamin E (1.84 ± 1.09 nmol/ml) than in those of the group without vitamin E (0.83 ± 0.42 nmol/ml), (Table 2).

Table 1. MDA reduction with and without Vitamin E

Study group	MDA before vitamin (MDA-1) (nmol/ml)	MDA after vitamin (MDA-2) (nmol/ml)	P-value
Vit. E given (n = 20)	6.99 ± 2.45	5.15 ± 2.21	< 0.01
Vit. E not given (n = 20)	7.11 ± 1.76	6.28 ± 1.59	< 0.01

Table 2. Comparison of MDA change*

Study group	(MDA-1)-(MDA-2)	P-value
Vit. E given (n = 20)	1.84 ± 1.09	< 0.01
Vit. E not given (n = 20)	0.83 ± 0.42	

*Comparison was between the group of patients who received vitamin E and of those who did not receive it.

DISCUSSION

Now that there is a sufficient body of evidence to substantiate the role of free radical mediated oxidative injury in myocardial infarction, the focus has recently shifted to devise ways and means to counteract this oxidative insult. Though the human body contains various endogenous antioxidants, but in conditions such as atherosclerosis, these may prove insufficient against the huge load of free radicals. It is here that the utility of exogenous supplementation with anti-oxidant substances, specially vitamins is being seriously considered and studied.

Two recent prospective cohort studies, the Nurses Health Study and the Health Professionals Follow-up Study (6,7), observed a 35-40 percent reduction in the incidence of major coronary events (non fatal M.I. and cardiac deaths) among the subjects with highest vitamin E intake over a four-to-eight year follow up period, as compared to those with the lowest intake. The benefit was greatest in subjects taking 100 to 250 IU of supplemental vitamin E per day. The alpha-tocopherol, beta-carotene cancer prevention study(8), on the other hand did not show any reduction in coronary artery disease with vitamin-E (50 mg/day) over eight years. In contrast, in the Cambridge heart antioxidant study, there was a 77 percent reduction in non fatal M.I. with α - tocopherol over 510 days.

The administration of lipid soluble antioxidants such as α - tocopherol is associated with an increase in the LDL resistance to oxidative modification. The optimum dose of vitamin E (α - tocopherol) required to reduce LDL oxidation is still a matter of debate. Doses of 400 IU/day for 8 weeks were required to have significant effect on LDL oxidation (14). Other studies proposed 300 IU/day and 500 IU/day to reduce oxidizability (15).

In our study we found a significant reduction in MDA levels in the patients of M.I. who received vitamin E as well as in those who did not, though the decrease was significantly more marked in the vitamin treated subgroup. Whether this dose and duration of vitamin E given was sufficient is difficult to judge. In a recent study, it was found that 1200 IU/day of α - tocopherol is more potent in

decreasing the oxidative susceptibility of LDL than 400 IU/day (16).

In spite of the above evidence of α -tocopherol being beneficial against lipid peroxidation, a precise cause and effect relation between the resistance of LDL to oxidation and the potential benefits of antioxidant therapy with respect to either atherosclerosis or its clinical

expression has not been established. If an increase in the LDL resistance to oxidation is both necessary and sufficient to limit atherosclerosis and its clinical expression, such as M.I., then in clinical trials antioxidant supplementation should be associated with objective effects on atherosclerosis, that is reductions in the size or extent of lesions or reductions in coronary stenosis.

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