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The Effect of Vitamin E Supplementation on Lipid Peroxidation in Patients with Endothelial Dysfunction

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ABSTRACT. The theory of aging by free radicals agree that age is the the consequence of accumulation of lesions induced by free radicals. We use indirect measurement of lipidperoxidation, which is a measure of the reaction products of free radical damage to the lipid substrate, mainly consisting of membrane polyunsaturated fatty acids. Low plasma levels of Vitamin E has been associated with a risk factor of 2.6 times higher early coronary heart disease. Material and methods. We studied a group of 33 patients with cardiovascular disease and/or hypertension (Group I) of atherosclerotic etiology. We administered 2 x 600 alpha-tocopherol mg /day (Vitamin E) for 7 days in capsules. In order to determine the extension of lipoperoxidation we have determined ATB-reactive substances by the method of Satoh in peripheral venous blood, prior to administration of vitamin E and 7 days after treatment. We compared this group (Group I), with another group of patients with symptomatic ischemic heart disease (Group II) without nutritional supplementation. Results.Baseline there is a average level of substance ATB - reactive similar in the two groups, but significantly lower in Group I after nutritional supplementation with alpha-tocopherol. Conclusions. Alpha-tocopherol supplementation in patients with cardiovascular disease, over 60 years, revealed a significant decrease in lipid peroxidation, with protective effect on endothelial dysfunction
KEYWORDS: aging, lipidperoxidation, vitamin E

In 1956, Harman proposed the theory which shows that aging can be influenced by free radicals. Aging occurs as a consequence of free radicals accumulation which causes various damages. Indirect measurement of lipid peroxidation, which is a measure of the reaction products from the lipid radicals on the substrate, essentially on membrane polyunsaturated fatty acids, was often used in clinical trials. Low plasma levels of vitamin E was associated with a high risk of early coronary heart disease, 2.6 times higher as normal levels(1).

Several studies have shown that lipid peroxidation causes a significant decrease in the plasma concentration of alpha-tocopherol(5).

Based on these considerations we propose to study the effect of alpha-tocopherol supplementation on lipid peroxidation in a group of cardiovascular patients.

MATERIAL AND METHOD.

We studied a group of 33 patients with cardiovascular disease and/or hypertension (L I, group I) of atherosclerotic etiology.

We administered 2 x 600 alpha-tocopherol mg / day for 7 days.

In order to determine the extension of lipoperoxidation, ATB-reactive

substances have been determined by the method of Satoh in peripheral venous blood before the administration of vitamin E, and after 7 days of treatment.

We compared this group (Group I), with another group of patients with atherosclerotic symptomatic ischemic heart disease, on which we have measured the extension of lipoperoxidation with ATB-reactive substances under basal conditions and hemodynamic balance. This was the second group (LII) and was composed of patients aged over 60 years.

We have selected this control group because of similar atherosclerotic pathology and advanced age which implies a similar oxidative stress. We excluded from the evaluated group persons with neoplasm, fever, inflammatory diseases, diabetes, jaundice, regardless of etiology.

RESULTS

The study group included 33 patients aged 55-80 years with an average age of 65.72 years.

Table 1.

Patients	33	%
Men	21	63,6
Women	12	36,3
The average age = 65,72 years		

Patients were hospitalized for decompensated cardiovascular disease, mainly atherosclerotic coronary heart disease, symptomatic efort angina, aggravated angina pectoris, left ventricular failure. Some of them were associated with other vascular disease, especially hypertension.

Table 2 Cardiovascular disease associated in tested patients.

	Number	%
Total patients	33	-
Symptomatic ischemic heart disease	33	100
Subacute/chronic myocardial infarction	9	27,2
Conduction abnormalities (Left/ Right Bundle Block)	9	27,2
Hypertension	18	54,4
Atherosclerotic aortic stenosis	2	6

From the functional point of view, the patients were divided as follows:

Table 3

Left ventricular failure	Number	%
NYHA Class I	3	9,1
NYHA Class II	12	36,4
NYHA Class III	18	54,5

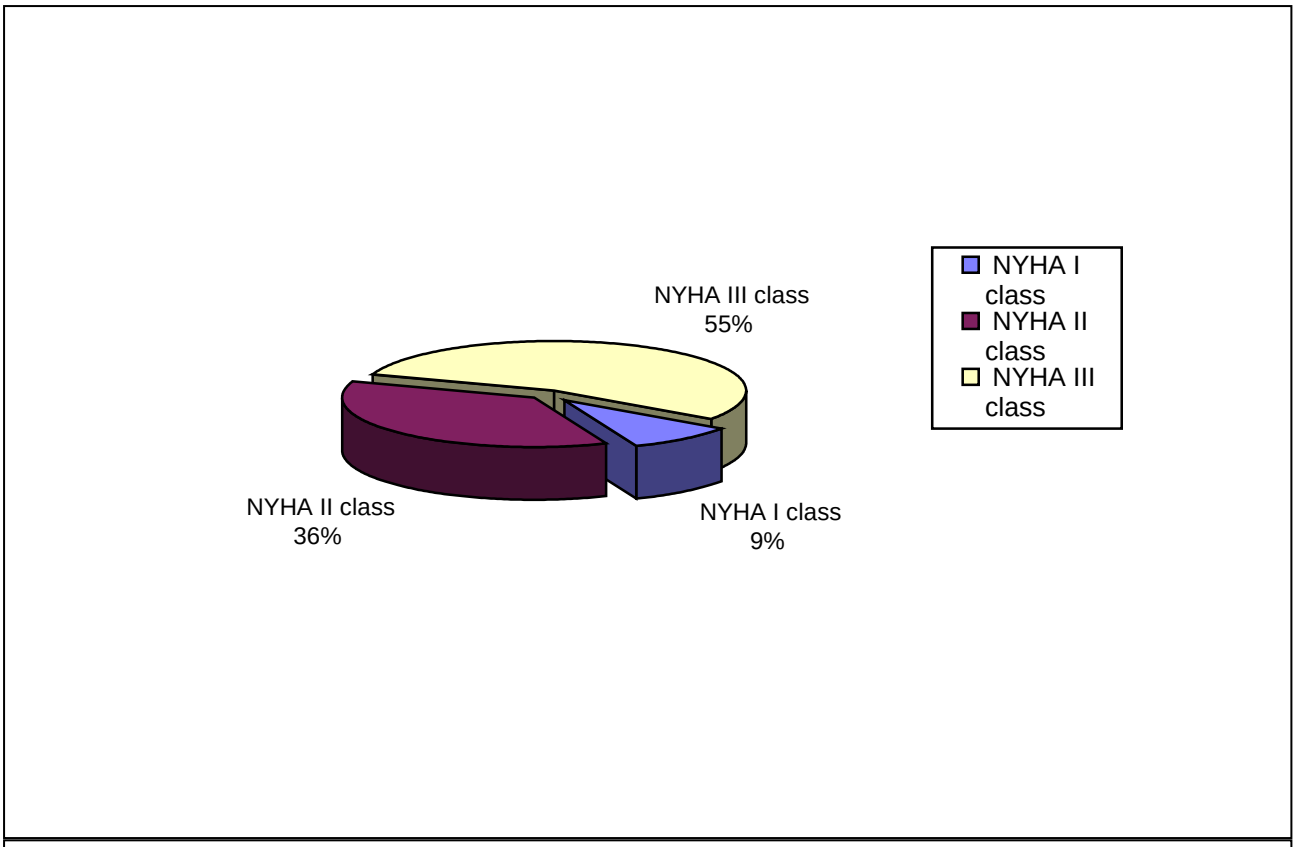

Fig.1.Classification of the study group by NYHA functional class.

Table 4 Radiologic appearance of the heart in L.I.

Heart size	Number	%
Normal heart (Rx)	9	27,2
Left Ventricular Hipertrophy	12	36,3
Right Ventricular Hipertrophy	3	9
Cardiomegaly	9	27,2

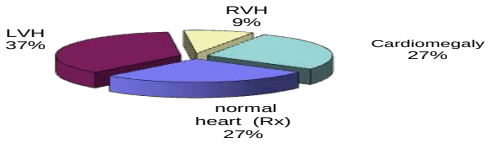

Fig2 . Radiologic appearance of the heart at included group.

Patients with cardiomegaly, and those with left ventricular hypertrophy radiological represented 64% of the study group and only 27% of patients had normal sized heart.

The data presented shows that patients tested had an older age and cardiovascular damage of a longer duration with an important functional and morphological response.

Extension of lipoperoxidation was assessed by serum levels of ATB-reactive substances at admission and then 7 days after treatment with high-dose alpha-tocopherol.

Table 5 ATB-reactive substances nmol/ml

Substances level ATB-reactive at tested group	At admission	After treatment	p
	4.54 ± 0.62	2.69 ± 0.54	< 0.001

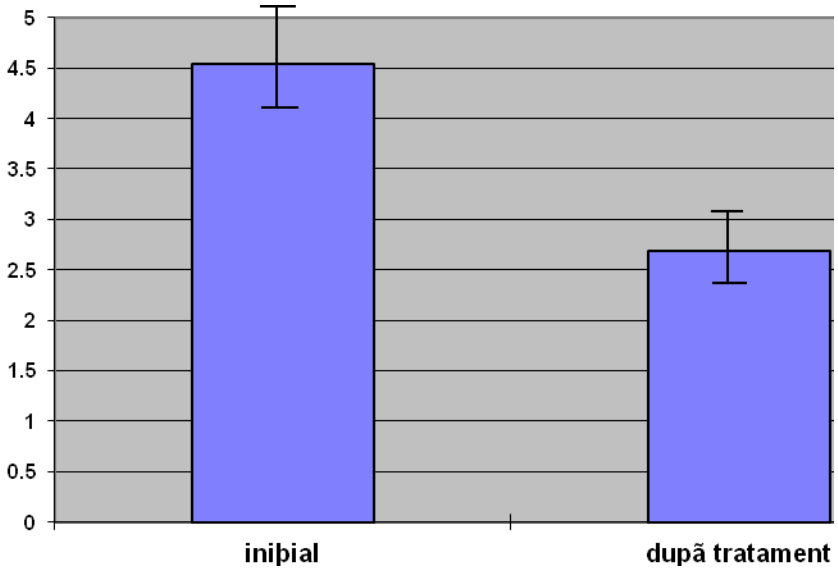

Fig.3 The level of ATB – reactive substance level at tested group

Considering that the average age of the group was 65.72 years, we compared the average values of ATB-reactive substances with basal serum obtained from another group of vascular patients, aged over 60 years, and which have not received antioxidant treatment.

	L I	**L II**	**p**
At admission	4,54 ± 0,62	4,0+1,4	0,6
After treatment	2,69 ± 0,54		< 0,001

Table 6 Comparative level of ATB-reactive substances (nmol/ml) in the studied groups

There is a baseline average level of the ATB - reactive substance similar in the two groups, but significantly lower in the stuied group after treatament with alpha-tocopherol.

DISCUSSION.

Vitamin E is a fat-soluble vitamin that acts as an antioxidant and free-radical scavenger in lipophilic environments. Vitamin E requires bile for absorption, and 25% of it is absorbed orally. The vitamin is stored in adipose tissue, liver, and muscle.(1,2,3)

The antioxidant activity of vitamin E and alpha-tocopherol mainly is exercised because of its ability to capture hydroxiperoxil radicals (LOO •) resulting from the lipoperoxidation of unsaturated fatty acids and after that transforms them into lipidic hydroperoxides after the folowing reaction.

Vit E + LOO •→ LOOH + Vit E •

As shown in this reaction, vitamin E is consumed in the elimination of peroxide radicals, thus explaining the results of studies wich revealed the decrease of plasma levels of vitamin E via oxidative stress (4, 5,).

The biology of aging is accompanied by a decrease in the antioxidant capacity of the body or of an increase in oxidative activity of RLO, which creates an imbalance in the oxidant / antioxidant balance.

In our study regarding extension of lipoperoxidation we found elevated ATB-reactive substances in the group of patients with atherosclerotic heart disease and aged over 60 years compared to

average ATB reactive substances found in patients under this age.

Increasing of ATB-reactive substances in the peripheral blood of the elderly means growth of RLO generation at the cellular level via activation of xanthine oxidase in terms of ischemia and onset of lipid peroxidation. This will lead to increased serum hydroperoxides, including their degradation products, measured as ATB-reactive substances.

Supplementation with the antioxidant vitamin E in our case, allows the body to cope, with decreased oxidative stress, thereby increasing plasma antioxidant capacity and help prevent oxidative damage.

In our study, supplementation with a dose of 1200 mg / day of alpha-tocopherol resulted in a significant reduction in the level of ATB-reactive substances to the basal level after treatment for 7 days,from 4.54 +/- 0.62nmol/ml values to 2.69 +/-0.54 nmol/ml values.(7)

Compared with the group of patients with ischemic heart disease (group II) who have highlighted an extension of lipoperoxidation in basal conditions and hemodynamic balance, in the context of increasing oxidative stress in the elderly, the average reactive substances ATB group I was also significantly decreased after administration of alpha-tocopherol.

CONCLUSIONS

In conclusion, our study of alpha-tocopherol supplementation in high doses in patients aged over 60 years, revealed a significant decrease in lipid lipoperoxidation after treatment, compared to control group.

This decrease in lipidperoxidation measured by the ATB-reactive substances confirms the literature data regarding the antioxidant action of vitamin E.

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