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Homocysteine and Lipid Levels in Hypertensive Coronary Heart Patients

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Abstract

Aim: As in many countries, coronary heart disease (CHD) is the leading cause of death in our country. Modifiable risk factors for CHD include smoking, hypertension, diabetes, diet, obesity, sedentary life, and hyperlipidemias. The aim of this study was to determine the homocysteine, Lp (a), von Willebrand factor (VWF) levels in male CHD which do not contain any irreversible risk factors.
Material and method: In our study, male subjects with similar body mass indexes around 50-55 years of age, gender, familial predisposition, and non-modifiable risk factors were included in the study. Patients with CHD did not have any risk factors (10 patients, Group I), CHD and only hypertension (18 patients). Factor levels of homocysteine, Lp (a) and von Willebrand were compared between Group II) and control group (52 healthy, Group III).
Result: Homocysteine levels, Group I: 16.5 ± 4.1 µmol / L, Group II: 20.1 ± 6.2 µmol / L, Group III: 11.8 ± 2.4 µmol / L, Lp (a) levels, Group I: 24.5 ± 6.1 mg / dl Group II: 36.6 ± 5.5 mg / dl, Group III: 20.8 ± 4.6 mg / dl. VWF levels were determined as Group I: 216.5 ± 12.8 mU / ml, Group II: 223.8 ± 9.2 mU / ml, and Group III: 86.9 ± 19.5 mU / ml. Homocysteine, Lp (a), VWF levels were significantly higher in both groups with CHD ($p < 0.05$).
Conclusion: It is thought that homocysteine, Lp (a) and VWF should be among the routine tests such as other lipid parameters in the diagnosis of CHD.
Keywords: Coronary heart disease, Hypertension, Lp (a), Homocysteine, von Willebrand factor
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Introduction

Today, coronary heart disease (CHD) is among the leading causes of death in Turkey as it is in many other countries and it is predicted that the mortality rate will increase from 28.9% to 36.3% between 1990 and 2020 (1,2). CHD is defined as pathological events due to ischemia due to inability to feed the myocardium due to obstruction in the coronary arteries and atherosclerosis is the most common cause (3,4).

Atherosclerosis is characterized by chronic progressive plaques widening towards the lumen, narrowing the arteries, called intimate atheroma (5,6). As a result of this narrowing of the coronary arteries, blood flow is reduced, ischemic changes occur and CHD occurs. When CHD risk factors are examined, age, gender, familial predisposition and changeable risk factors include non-modifiable risk factors such as smoking, hypertension, diabetes mellitus, diet, hyperlipidemia, obesity, sedentary life, and stress (6-11).

Hypertension causes endothelial dysfunction and paves the way for atherosclerosis. Since there is endothelial dysfunction in hypertension, nitric oxide (NO) secretion is prevented, as a result, vasodilator response decreases, thrombosis and leukocytes endothelial adhesion is facilitated, resulting in CHD (12). Among the new risk factors for CHD in recent years; homocysteine, von Willebrand factor (VWF), lipoprotein a (Lp (a)). Homocysteine; methionine, remethylation and metabolism by transsulfuration is an amino acid showing a free radical-like effect (13,14). There are many studies showing that homocysteine increases the risk of CHD especially by endothelial dysfunction (15,16). Lp (a), fibrinogen and extracellular matrix affinity to plasminogen with a high affinity, atherosclerotic plaque is a lipoprotein inhibiting the solution of microtrombosis (17,18). There are studies that increase Lp (a) increases the risk of CHD (19,20).

VWF is a protein stored in Weibel-Palade bodies synthesized by endothelium, which contains multimers for the binding of platelets in its structure (21). VWF has been shown to induce endothelial adhesion and activation of platelets, as well as to assist activation of factor VIII (FVIII) and increase the risk of CHD (22,23). In this study, we aimed to compare homocysteine, Lp (a), von Willebrand factor levels between healthy individuals with similar characteristics and CHD with no risk factors and only CHD with hypertension among risk groups.

Material and Methods

Patients admitted to the cardiology clinic with chest pain were included in the study. Group I (n = 10) who had a myocardial infarction or had a critical lesion as a result of coronary angiography and concomitant defect in the segment of the related vessel, without any risk factors, Group II (n = 10), only hypertension group II (n = 18) and completely healthy Group III (n = 52, control group) was formed. Male subjects with similar age and body mass index were included in the study. For hypertension, blood pressure was considered as cystolic> 140 mmHg and diastolic> 90 mmHg.

Blood was collected from the patients after fasting for at least 12 hours and Lp (a), VWF, and Homocysteine levels were stored at -20 ° C for evaluation. Homocysteine levels are based on the measurement of anti-S-adenosyl homocysteine antibodies in plasma that are

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formed by enzymatic conversion of L-homocysteine to S-adenosyl-L-homocysteine by ELISA. ELX800 (USA) instrument was used for the measurement and the results were measured in µmol / L, VWF levels were measured in plasma by ELISA method in ELX800 (USA) instrument and the results were given mU / ml. IMUBIND / Norway brand kits were used in the study. Lp (a) was studied in the Space protein analyzer in serum and the results are given in mg / dl.

Statistical Analysis: SPSS 9.0 program was used for statistical analysis of the obtained data. The data in the study groups showed a homogeneous distribution, so LSD and Tukey B tests were used as post ANOVA tests in pairwise comparison of the groups in which one-way analysis of variance (ANOVA) was applied. The lowest level of significance was accepted as $p < 0.05$.

Result

The mean age of the patient group (Group I-II) was 50.5 ± 8.07, the mean age of the control group was 48.3 ± 6.9, the body mass index was 26.7 ± 2.3 in the patient group and 25.1 ± 2.7 in the control group. Homocysteine levels, Group I: 16.5 ± 4.1 µmol / L, Group II: 20.1 ± 6.2 µmol / L, Group III: 11.8 ± 2.4 µmol / L, Lp (a) levels, Group I: 24.5 ± 6.1 mg / dl Group II: 36.6 ± 5.5 mg / dl, Group III: 20.8 ± 4.6 mg / dl.

VWF levels were determined as Group I: 216.5 ± 12.8 mU / ml, Group II: 223.8 ± 9.2mU / ml, and Group III: 86.9 ± 19.5mU / ml. Homocysteine, Lp (a), VWF factor levels were significantly higher in both groups with CHD compared to control group ($p < 0.05$). Lp (a) levels were significantly increased in Group II when compared with the other groups. unchanged (Table 1).

Table 1: Comparison of biochemical data between patient and control groups

Değişkenler	**Grup I (n=10)**	**Grup II (n=18)**	**Grup III (n=52)**
Homosistein µmol/L,	16.5±4.1	20.1 ±6.2	11.8 ± 2.4
Lp(a) mg/dl	24.5±6,1	36.6 ±5.5	20.8 ± 4.6
VWF mU/ml	216.5 ±12.8	223.8 ± 9.2	86.9 ± 19.5

Abbreviations: Lp (a): Lipoprotein a, VWF: von Willebrand factor

Discussion

According to World Health Organization data, it is predicted that the mortality rate related to CHD will increase to 36.3% in 2020 (1,2)**.** Therefore, it is very important to prevent the occurrence of CHD and to diagnose the disease in the early period before progression. When CHD risk factors are examined, among the irreversible risk factors; age, gender, familial predisposition, and changeable risk factors include smoking, hypertension, diabetes mellitus, diet, hyperlipidemia, obesity, sedentary life, and stress (6-11). In our study, CHD with

no risk factors and the only risk factors for CHD with hypertension, homocysteine, Lp (a), which is considered as independent risk factor for the disease, VWF levels, the importance of these parameters in determining the disease We compared the same parameters among the patients and investigated the changes of these parameters in CHD with hypertension.Bostom et al. (24) investigated CHD-related deaths in men and women over 60 years for 10 years, and found that homocysteine was an independent risk factor for these deaths. In their study, Della-Morte et al. (25) found that the risk of prematureatherosclerosis was increased in individuals with extremely high homocysteine levels. In a study by Wang et al. (26), it has been shown that CHD development can be reduced by decreasing homocysteine levels. In our study, both CHD groups were found to be significantly higher than the healthy group. The cause of this condition is homocysteine endothelial dysfunction, atherogenesis causing LDL, oxidized LDL to reach and collect molecules such as damaged endothelium, then macrophage and T lymphocytes to participate in the event, smooth muscle proliferation, connective tissue development, formation of atherosclerosis is shown (27).

Several studies have shown that Lp (a) levels are increased in CHD (28,29). Similarly, in our study, Lp (a) levels were significantly higher in both CHD groups compared to healthy group. It is stated that Lp (a) has a structural similarity with plasminogen and competes with plasminogen to bind to fibrinogen and fibrin receptors, thus causing thrombotic effects (28, 20). VWF levels have been shown to increase in CHD in many studies (30,31). In our study, the patient group was found to be higher than the control group. It is suggested that VWF is released from the endothelium, the adhesion of the platelets to the endothelium initiates its activation, influences the platelet glycoprotein IIb-IIIa, which supports the binding of fibrinogen, causing platelet aggregation, and also increases the risk of CHD by assisting the activation of factor VIII (FVIII). 23,32).

Researchers have shown that hypertension is a changeable risk factor for CHD. When atherosclerotic cardiovascular diseases are examined, it has been shown that hypertension is responsible for approximately 35%, and CHD is 2-3 times higher in hypertensives than normal (33). In the Framingham study, it was found that hypertension increased the risk of CHD by 1.6 times in men and 2.5 times in women (34). It has been reported that mortality is increased in patients with hypertensive CHD (35,36). Hypertension generally causes endothelial damage, inhibition of nitric oxide release as a result of this damage, thus vasodilatation, inhibition of platelet adhesion and aggregation, inhibition of vascular smooth muscle proliferation, activation of myocardial oxygen, has been proposed (37,38). In our study, homocysteine, Lp (a), VWF levels were found to be significantly higher in the hypertensive CHD group and not statistically significant CHD between the other parameters. As a result; It is thought that homocysteine, Lp (a), Von Willebrand factor should be among the routine tests such as other lipid parameters in detecting.

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