The relation between lipoprotein (a) levels and findings of coronary artery angiography

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Abstract

BACKGROUND: Lipoprotein (a) [LP (a)] has been identified as one of the independent risk factors for coronary artery diseases. Various studies on the amount of serum LP(a) with relation to intensity and extent of observed lesions on coronary angiography have yielded in different results. Therefore, this study aimed to examine the importance of LP(a) levels and its relationship with the findings of coronary artery angiography.

METHODS: The present research was conducted by considering clinical symptoms, level of serum lipids and amount of LP (a) in 92 patients who were under angiography because of chronic stable angina. The angiography was performed in a standard way with conventional views and was interpreted by at least two cardiologists.

RESULTS: The levels of LP(a) were considerably higher in the group with two-vessel coronary artery lesions (55 ± 45 mg/dl) as compared with the patients with one-vessel (30.3 ± 27 mg/dl) or three-vessel diseases (26.9 ± 15 mg/dl). The statistical analysis of the results in these three groups demonstrated that there was no relationship between the levels of serum LP(a) and intensity of observed lesions on the coronary angiography.

CONCLUSION: Although a few studies have reported a statistical relationship between the serum levels of LP (a) and intensity of observed lesions on coronary angiography, similar to numerous other researches, such a relationship was not observed in the present study. However, the findings of this study confirm that LP (a) should be considered as a risk factor for early coronary artery diseases.

Introduction

Coronary artery diseases are one of the important mortality factors in developing countries.[1] Health challenges in diagnosis, prevention, treatment, and retreatment of the patients with coronary artery diseases have called for screening asymptomatic patients and determining factors related to intensity of coronary artery diseases.[2] Therefore, lipoprotein (a) [LP(a)] has been considered as an independent risk factor of cardiovascular diseases in recent years.[1]

LP (a) molecular structure is similar to that of plasminogen. It thus directly attaches to the binding sites of plasminogen, intervenes in the fibrinolysis cycle, and finally, leads to the creation of thrombosis. LP (a) is hence supposed to have a role in the creation of myocardial infarction and unstable angina.[3] In addition; it has been observed that patients with definite coronary artery diseases have normal lipid profile. However, serum LP (a) levels in most of these patients is sometimes higher than normal.[4] Furthermore, the relationship between LP (a) level and level of atherosclerosis has been investigated. Various studies have been performed to evaluate the findings of coronary angiography in terms of intensity, extent, and level of plasma LP (a) with different results.[5,6] Accordingly, this type of research should be repeated, which is why the present study was designed.

Materials and Methods

In this cross-sectional analytical correlative study, subjects were selected from patients who were under angiography in the Cardiology Laboratory, Chamran Hospital (Isfahan, Iran) during April 2003-March 2004. Patients were included based on the history of coronary artery diseases such as stable angina or its equivalents and positive exercise test with or without ischemic changes in electrocardiogram at rest. In

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addition, the patients were matched for age, sex, and risk factors (Table 1). The exclusion criteria were history of liver diseases like cirrhosis, advanced renal diseases, pregnancy, history of advanced malignant neoplasm, receiving male and female sex hormones like oral estrogen, acute myocardial infarction, and receiving neomycin and nicotinic acid.[7]

The number of subjects was calculated as 30 people in each group considering a reliability coefficient of 99% and the lowest difference between LP (a) levels in groups with 1-3 involved coronary arteries. In this study, 92 patients were qualified for the study who were allocated into 3 groups of 30 with one-vessel to three-vessel diseases, respectively. The coronary angiography for each patient was interpreted by 2 cardiologists based on the standard categorization.[8]

Before conducting coronary angiography, fasting venous blood samples were taken. After separating the serum, the samples were kept at -70ºC and sent to the laboratory of Isfahan Cardiovascular Research Center (Isfahan, Iran). The serum level of LP (a) was measured using enzyme-linked immunosorbent assay (ELISA) method in the range of 3-15 mg/dl while the laboratory was unaware of the status of patients' coronary artery involvement. After obtaining test results, the data was analyzed in SPSS$_{10}$ using Kruskal-Wallis, one-way analysis of variance (ANOVA) and multivariable regression analysis.

Results

The median of LP (a) was 19.7 mg/dl, 45.7 mg/dl, and 15.4 mg/dl in the first group with one-vessel involvement, the second group with two-vessel involvement, and the third group with three-vessel involvement, respectively. As can be observed, the level of LP (a) in the second group was considerably higher than that in the other 2 groups while the third group had the least level of LP (a).

None of the risk factors including an age younger than 55 years old, diabetes, smoking, history of myocardial infarction, and their simultaneity significantly predicted the effects on the measured LP (a) levels.

Based on the stepwise multivariable regression model, only simultaneous two-vessel involvement could estimate the level of LP (a) with a β coefficient of 26.3 ± 7.8. Serum LP (a) levels in patients with and without left main coronary artery disease (LMCAD) were 38.8 ± 33.3 mg/dl and 40.3 ± 36.1 mg/dl, respectively.

There was no significant difference in the level of LP (a) between patients with and without total occlusion of coronary arteries (41.7 ± 36.3 mg/dl vs. 36 ± 29.9). LP (a) levels was higher than 35 mg/dl in patients with the occlusion of coronary arteries which was not significantly different from the total non-occlusion involvement of coronary arteries (Table 2). In addition, there was a weak insignificant negative relationship between serum LP (a) level and age. Evaluating the intensity of artery involvement based on the number of involved main coronary arteries showed similar results.

Table 1. Comparing risk factors and LP (a) levels based on the intensity of coronary artery involvement

Risk factors	One-vessel involvement	Two-vessel involvement	Three-vessel involvement
Age (years)	56 ± 10.7	57.3 ± 8.96	60 ± 8.4
Male gender	18 (60%)	18 (52.9%)	19 (67.9%)
Hypertension	11 (36.7%)	11 (32.4%)	8 (26.6%)
Diabetes mellitus	3 (10%)	3 (6.8%)	5 (17.9%)
Hyperlipidemia	10 (33.3%)	16 (47.1%)	17 (60.7%)
Smoking	3 (10%)	9 (26.5%)	15 (53.6%)
History of familial premature coronary artery disease	3 (10%)	6 (17.6%)	3 (10.7%)
History of myocardial infarction	10 (33.3%)	13 (38.2%)	15 (53.6%)
LP (a) mg/dl	30.38 ± 27.3	55 ± 45.7	26.9 ± 15.4
LP (a) level < 35 mg/dl	20 (66.7%)	15 (44.1%)	20 (71.6%)

Values are expressed as mean ± SD or number (%).
LP (a): Lipoprotein (a)

Table 2. Frequency of LP (a) levels at different levels of coronary artery involvement

LP(a)	< 5 mg/dl	5-18 mg/dl	10-40 mg/dl	> 40 mg/dl
One-vessel involvement	2 (6.7%)	13 (43.3%)	7 (23.3%)	8 (26.7%)
Two-vessel involvement	3 (8.8%)	7 (20.6%)	6 (17.4%)	18 (52.9%)
Three-vessel involvement	4 (14.3%)	13 (46.4%)	5 (17.9%)	6 (21.4%)
Two- and three-vessel involvement	7 (11.3%)	20 (32.3%)	11 (17.7%)	24 (38.7%)

Values are expressed as number (%).
LP (a): Lipoprotein (a)

Discussion

This study was conducted to determine the relationship between serum LP (a) level and intensity of coronary artery involvement in patients who underwent coronary artery angiography. In different studies, LP (a) has been identified as an atherogenic and thrombogenic factor[3,4] whose increase has been considered as a risk factor for cardiovascular diseases, except in the black race.[9] However, the existence of such relationships in special populations like menopausal women and diabetic patients is still controversial.[10,11]

In the present research, although LP (a) levels were higher in patients with total occlusion of coronary arteries, patients with LMCAD, and men, the difference was not significant. The findings of other studies do not support a uniform trend of LP (a) level in patients with total occlusion of coronary arteries. The associations between LP (a) levels and gender have also been controversial among different studies.[3,12]

LP (a) levels of patients with various coronary artery involvements were higher than that of the normal population. On the other hand, LP (a) levels in patients with simultaneous involvement of two vessels were higher than those with one-vessel involvement and simultaneous involvement of all three main coronary arteries. Similar recent studies have not shown any significant relationship between LP (a) levels and coronary artery involvement.[13,14] Uusimaa et al. reported LP (a) levels to be higher in patients with coronary artery involvement. However, they could not establish any significant relationship between LP (a) levels and the intensity of coronary artery involvement.[2] Likewise, Sposito et al. confirmed higher LP (a) levels in menopausal women with simultaneous involvement of several vessels compared to those with involvement of one coronary artery.[10]

This research indicated higher LP (a) levels in subjects with simultaneous involvement of several coronary arteries compared to patients with 1 involved artery. However, similar to other studies, the difference between the two groups was not significant.

We found serum levels of LP (a) in the population under 55 years of age to be significantly higher than individuals above 55 years old, which may indicate the atherogenic effect of LP (a) in early involvement of coronary arteries. Gambhir et al. suggested LP(a) levels to be significantly higher in patients younger than 40 years old.[4] Hahmann et al. reported a higher level of LP(a) in the early involvement of coronary arteries, especially in men.[12] Considering the findings of this study and similar investigations, although a higher level of LP(a) is identified as an independent factor for coronary artery diseases today, no strong evidence has yet been found to support the role of increased LP (a) levels as a predictor of intensity of coronary artery involvement. It seems that further studies in special subgroups with coronary artery diseases with different levels of risk factors can determine the possibility of using this biologic marker for predicting cardiac events.

Nevertheless, higher LP (a) level in early involvement of coronary arteries in this research and similar studies necessitates more attention to physiopathological identification of this change in the early involvement of coronary arteries.

Acknowledgments

Conflict of Interests

Authors have no conflict of interests.

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