Association Between Apolipoprotein-B100 and Apolipoprotein-A1 in Patients with Coronary Slow Flow

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ABSTRACT

Objective: Although several hypotheses have been suggested, the underlying mechanism of coronary slow flow phenomenon (CSFP) has not been well established yet. The aim of this study was to determine the roles of plasma apolipoprotein-B100 (Apo-B) and apolipoprotein-A1 (Apo-A1) in CSFP which have an atherogenic effect and anti-atherogenic effects respectively.

Methods: The study consisted of 31 patients with CSFP (group 1), 28 normal subjects as control group (group 2) and 30 patients with coronary artery disease (CAD) (group 3) detected by coronary angiography. CSFP was diagnosed by the TIMI frame count method. Blood Apo-B, Apo-A1, Apo-B/Apo-A1 ratio, and demographic parameters were compared between the groups.

Results: The Apo-B values were 93±25 mg/dL, 90±26 mg/dL, and 106±27 mg/dL in groups 1, 2 and 3, respectively (p=0.048 between group 1 and 3, p=0.041 between group 2 and 3, p= NS between group 1 and 2). The Apo-A1 values were 127±14 mg/dL, 125±21 mg/dL and 106±27 mg/dL in groups 1, 2 and 3 respectively (p=0.028 between group 1 and 3, p=0.021 between group 2 and 3, p= NS between group 1 and 2). The apo-B/apo-A1 ratio were 0.73±0.18, 0.69±0.23 and 0.98±0.20 in groups 1, 2 and 3 respectively (p=0.017 between group 1 and 3, p=0.010 between group 2 and 3, p= NS between group 1 and 2).

Conclusion: Although lower levels of plasma Apo-A1 and higher levels of Apo-B and the ratio of Apo-B to Apo-A1 are related with CAD, there is no relationship between these apolipoproteins and CSFP.

Key Words: Coronary slow flow phenomenon, Apolipoproteins, Atherogenic and anti-atherogenic effects

ÖZET

Koroner Yavaş Akım Hastalarında Apolipoprotein-B100 ve Apolipoprotein-A1 Arasındaki İlişki


Bulgular: Grup 1, 2 ve 3’deki ortalamalar Apo-B değerlerini sırasıyla 93±25 mg/dL, 90±26 mg/dL, 106±27 mg/dL olarak saptadık (grup 1 ile 3 arasındaki p=0.048, grup 2 ile 3 arasındaki p=0.041, grup 1 ile 2 arasındaki p= AD). Grup 1, 2 ve 3’deki ortalamalar Apo-A1 değerlerini sırasıyla 127±14 mg/dL, 125±21 mg/dL, 106±27 mg/dL olarak saptadık (grup 1 ile 3 arasındaki p=0.028, grup 2 ile 3 arasındaki p=0.021, grup 1 ile 2 arasındaki p= AD). Grup 1, 2 ve 3’deki Apo-B/Apo-A1 oranları ise sırasıyla 0.73±0.18, 0.69±0.23 ve 0.98±0.20 olarak saptadık (grup 1 ile 3 arasındaki p=0.017, grup 2 ile 3 arasındaki p=0.010, grup 1 ile 2 arasındaki p= AD).


Anahtar Kelimeler: Koroner yavaş akım fenomeni, Apolipoproteinler, Aterojenik ve anti-aterojenik etki

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INTRODUCTION

The coronary slow flow phenomenon (CSFP) is characterized by angiographically normal coronary arteries with delayed opacification of the distal vasculature. The pathophysiological mechanisms of CSFP remain uncertain. However, several hypotheses have been suggested for CSFP, including a form of early phase of atherosclerosis (1,2), small vessel dysfunction (3), Hagen–Poiseuille’s equation model (4), imbalance between vasoconstrictor and vasodilatory factors (5–7), inflammation (8), platelet function disorder (9,10), and interaction of plasma homocysteine and thyroid hormone concentrations (11).

Recently, several studies have focused on the importance of the lipid-transporting apolipoproteins. Apo-B transports all potentially atherogenic very low-density lipoprotein, intermediate-density lipoprotein (IDL) and low-density lipoprotein (LDL) particles, and Apo-A1 transports and acts as the major anti-atherogenic protein in the high density lipoprotein (HDL) particles (12). Low levels of plasma Apo-A1, high levels of Apo-B, and the ratio of Apo-B to Apo-A1 are considered to be independent risk factors for coronary heart disease (12, 13). Thus, in this study, we studied the relationship between the level of these apolipoproteins and CSFP.

PATIENTS AND METHODS

Thirty one patients (17 males and 14 females, mean age 52±9 years, group 1) with CSFP detected by coronary angiography by the TIMI "frame count" method were included in this study. Gender and age-matched 28 control subjects with no coronary or valvular disease (15 males and 13 females, mean age 49±10 years, group 2) and 30 CAD patients (16 males and 14 females, mean age 52±12 years, group 3) were included in this study.

Patients with heart failure, valvular heart disease, uncontrolled hypertension, previous myocardial infarction, diabetes mellitus, hypercholesterolemia, arrhythmia and thyroid function disorders were excluded from the study.

Coronary angiography was performed in all patients due to positive exercise test or typical chest pain. CAD was diagnosed when at least one coronary artery was stenosed >50 on coronary angiography.

Apolipoproteins were measured by immunochemical assay from serum, based on the measurement of immunoprecipitation in the liquid phase by analyzers (IMMAGE immunochemistry systems, copyright 2000 Beckman coulter, inc. USA). Normal apolipoprotein A-1 reference values were 90-170 mg/dL in males and 107-214 mg/dL in females. Normal apolipoprotein B reference values were 56-162 mg/dL in males and 51-171 mg/dL in females. Apo-B / Apo-A1 ratio exceeding one was suggestive for a high coronary risk and less than one for a low coronary risk. All participants underwent two-dimensional echocardiographic evaluation by an experienced research echocardiographer using commercially available echocardiography machines equipped with 3.5 MHz transducers (Vivid System Five, GE Vingmed Horten, Norway). Measurements were made according to the American Society of Echocardiography guidelines by a single cardiologist (14). Left ventricular ejection fraction (LVEF) was measured from the apical four-chamber and two-chamber views using the modified Simpson method (14).

RESULTS

The apo-B values were 93±25 mg/dL, 90±26 mg/dL, and 106±27 mg/dL in groups 1, 2 and 3, respectively (p=0.048 between group 1 and 3, p=0.041 between group 2 and 3, p= NS between group 1 and 2; Figure 1).

The apo-A1 values were 127±14 mg/dL, 125±21 mg/dL and 106±27 mg/dL in groups 1, 2 and 3, respectively (p=0.028 between group 1 and 3, p=0.021 between group 2 and 3, p= NS between group 1 and 2; Figure 2).

The apo-B/Apo-A1 ratio were 0.73±0.18, 0.69±0.23 and 0.98±0.20 in groups 1, 2 and 3, respectively (p=0.017 between group 1 and 3, p=0.010 between group 2 and 3, p= NS between group 1 and 2; Figure 3).

The baseline characteristics of the study groups, TIMI frame count for each artery and biochemical parameters are shown in Table 1.
The corrected TIMI frame count, Cx frame count, and RCA frame count were similar in control subjects and CAD and its means significantly lower in control subjects and CAD than CSFP. There was no difference between the two groups in terms of sex, age, heart rate, systolic blood pressure (BP), diastolic BP, body mass index (BMI), smoking, echocardiographic parameters and biochemical parameters.

**DISCUSSION**

In this study, we found that Apo-B, Apo-A1, and Apo-B/Apo-A1 ratio are similar in CSFP and control subjects but differed when compared to CAD group. Previous studies done for control subjects (16) and CAD patients (17) had similar levels of mean apo-B, apo-A1 and the apo-B/apo-A1 ratio as in our study. However, no study exists showing relationship between apolipoproteins and CSFP. That is why we planned this study.
The pioneering studies on the clinical relevance of apo A1 and apo B were presented about 20 years ago by Avogaro et al. (18,19), who showed, in 218 survivors of myocardial infarction and 160 controls that apolipoproteins were as good as lipids in discriminating and predicting atherosclerotic diseases. Furthermore, the protein moiety of lipoproteins is a better discriminator than lipids between atherosclerotic subjects and controls (18). In addition Snideman et al. confirmed the clinical relevance of apo-B as a better predictor of coronary atherosclerosis than plasma cholesterol (20). Other clinical trials have also been published, with most pointing to the importance of apo-B and apo-A1 as risk indicators (21, 22). Observations from the INTERHEART (23) and AFCAPS/TexCAPS (24) studies, demonstrated that the single most powerful predictor of all of the routine risk factors for CAD, with a very good linear risk relation, was the apo-B/apo-A1 ratio, which took into account all atherogenic and nonatherogenic lipoprotein species. These results were similar to the results of our CAD group. The results of CSFP group were similar to the control group.

SCFP was first defined by També in 1972 (25) on six patients with chest pain. However, since that time, only a limited number of studies have focused on the etiology of this unique angiographic phenomenon. Histopathologic studies have revealed the existence of the loss of lumen diameter, capillary and endothelial damage in these patients. Although the pathophysiological mechanisms of CSFP remain uncertain, there are several hypotheses that have been suggested. Pekdemir et al. showed diffuse calcification and intimal thickening in all segments of the vessels (26). However, focal stenosis and plaques formation suggesting coronary artery atherosclerosis weren’t observed in CSFP cases. In a study carried out by Sezgin et al. a relationship was established between CSFP and low HDL-C and high TG levels while there was no relationship with total cholesterol and LDL-C (27). In our study, apolipoproteins levels of CSFP and control groups were significantly different from CAD group while total cholesterol, LDL-C, HDL-C and TG levels were similar in all three groups. As it was found in our study, a former study done in CAD patients showed no correlation between Apo B/ Apo-A1 ratio and LDL and HDL (13). In previous studies, the cholesterol balance determined as the Apo B/Apo-A1 ratio has repeatedly been shown to be a better marker than lipids, lipoproteins and lipid ratios (12). Generally, CSFP patients have good prognosis (26). This good prognosis may be related with their having different levels of atherogenic and antiatherogenic apolipoprotein levels compared to CAD patients.

CONCLUSION

Although lower levels of plasma Apo A-1 and higher levels of Apo-B and the ratio of Apo-B to Apo-A1 are related with CAD, there is no relationship between these apolipoproteins and CSFP.

REFERENCES