ORIGINAL ARTICLE

Associations between high density lipoprotein mean particle size and serum paraoxonase-1 activity

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Background: High density lipoprotein (HDL) particles are heterogeneous in composition, structure, size, and may differ in conferring protection against cardiovascular disease. HDL associated enzyme, paraoxonase-1 (PON1), has an important role in attenuation of atherogenic low density lipoprotein (LDL) oxidation. The aim of this study was to investigate the associations between HDL particle size and PON1 activity in relation to serum HDL cholesterol (HDL-C) levels. **Materials And Methods:** One hundred and forty healthy subjects contributed to this study. HDL was separated by sequential ultracentrifugation and its size was estimated by dynamic light scattering. Paraoxonase activity was measured spectrophotometrically using paraoxon as substrate. **Results:** Results of this study showed that PON1 activity had negative correlations with HDL mean particle size ($r = -0.22$, $P < 01$), HDL_2/HDL_3 ratio, and serum HDL-C levels ($r = -0.25$, $P < 0.01$). HDL mean particle size and HDL_2/HDL_3 ratio had negative correlation with body mass index (BMI), waist hip ratio (WHR), and serum triglyceride (TG) levels, and positive correlation with serum HDL-C levels. Serum HDL-C levels had significant positive correlations with age, total cholesterol (TC), and apolipoprotein A-I (apo A-I) and significant negative correlation with BMI, WHR, and TG. **Conclusion:** Based on the results of this study, determination of HDL mean particle size beside the serum PON1 activity may help to better understand the CAD risks, pathogenesis, and prognosis, and may also help to design therapeutic protocols toward beneficial modifications of HDL characteristics.

Key words: Dynamic light scattering, high density lipoprotein size, HDL-C, paraoxonase-1 activity, zetasizer

INTRODUCTION

There is a strong inverse relationship between plasma high density lipoprotein (HDL) level and the risk of developing coronary artery disease (CAD).[1,2] The major role of HDL is the reverse cholesterol transport, which leads to cholesterol movement from peripheral tissue and vessel wall to the liver.[3] Anti-inflammatory, antioxidant, anticoagulant, and profibrinolytic actions of HDL are among other functions that may contribute further to its ability to protect against CAD.[3] HDL particles are heterogeneous in their composition, structure, and size. Several methods such as immunoaffinity chromatography, ultracentrifugation.[4] gradient gel electrophoresis.[5] electron microscopy.[6] and nuclear magnetic resonance (NMR) have been used to isolate and characterize HDL subfractions and at least five subfractions of HDL with sizes of 7.3-13 nm have been identified.[7] One of the best known anti-inflammatory and antioxidant functions of HDL is its ability to inhibit the oxidation of low-density lipoprotein (LDL).[8] HDL exerts its inhibitory effects on oxidative modification of LDL, in part, by its related enzyme paraoxonase-1 (PON1) which can hydrolyze lactones, and several non-physiological substrates, such as aryl esters and organophosphates.[9] PON1 is transported in plasma as a component of HDL, and many studies have also shown that PON1 inhibits LDL oxidation *in vitro*.[10] There is a close physiological association between PON1 and HDL in plasma. HDL facilitates the secretion of the PON1 by the liver, stabilizes the enzyme,[11] and provides a hydrophobic environment which is needed for PON1 function.[12] In return, PON1 prevents the oxidation of HDL.[13] There is a wide inter-individual variation in PON1 activity and concentrations due to variation in *PON1* gene, and also, because of the influences of lifestyle factors such as smoking, alcohol consumption, etc.[14,15] A study of populations with high prevalence of atherosclerosis suggested that PON1 could influence HDL concentrations in patients with familial hypercholesterolemia.[16] It has been demonstrated that PON1 is present in small dense subclasses of HDL particles including apolipoprotein A-I (apo A-I) and

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