Platelet-Activating Factor Acetylhydrolase Concentration in Children With Abdominal Obesity

To the Editor:

In human obesity, increased oxidant stress is an important factor in the development of atherosclerosis.1 Oxidation of the lipid components of low-density lipoprotein (LDL) is causative, because oxidized LDL contributes to many of the stages of progression of atherosclerosis. In particular, small dense LDL particle, which is frequently associated with abdominal obesity,2 is susceptible to oxidative modulation. Even in obese children, oxidative stress including oxidized LDL formation is increased.3,4 Platelet activating factor acetylhydrolase (PAF-AH) is a Ca2+-independent phospholipase A2 that catalyzes the conversion of platelet activating factor (PAF) to lyso-PAF. Another physiological function of plasma PAF-AH is to degrade oxidized phospholipids, which are formed during the oxidative modification of lipoproteins. Therefore, PAF-AH may play a significant role in atherogenesis as an antioxidant. We measured PAF-AH concentration in children with abdominal obesity and investigated its relationship with anthropometric and metabolic parameters.

The subjects were 17 obese children (10 male, 7 female) aged 11.9±0.7 years (mean±SE) who presented to our outpatient clinic with obesity. Obesity was defined as a relative body weight >120%, which was calculated according to the standard weight obtained for sex, age, and height on the basis of data from the Ministry of Education, Science, Sports, and Culture.5 Skinfolds were measured at triceps and subscapular regions using a skinfold caliper. Waist circumference was measured at the umbilical level. Blood samples were collected in the morning after a 12-hour fast. Serum total cholesterol (TC), high-density lipoprotein cholesterol (HDLC), and triglyceride (TG) levels were determined by standard enzymatic methods. LDL cholesterol (LDLC) was calculated by means of the Friedewald formula. LDL peak particle diameter was determined using gel electrophoresis according to our previous report.2 Apolipoprotein B (ApoB) concentration was measured by turbidimetric immunossay. Plasma insulin and glucose concentrations were determined and homeostasis model of assessment ratio (HOMA-R) was obtained using Matthews formula as an index of insulin resistance.6 Plasma PAF-AH concentration was measured by ELISA.7 All children were free from disease except for hyperlipidemia and obesity. Informed consent was obtained from each child and the parents.

The prevalence of hypercholesterolemia (>220 mg/dL), hypertriglyceridemia (>120 mg/dL), and low HDLC level (<40 mg/dL) was 23.5%, 64.7%, and 1.8%, respectively. We found a child with glucose intolerance (>110 mg/dL). HOMA-R was 5.4±2.1.4. All children had abdominal obesity, which was defined as waist/height ratio over 0.5. PAF-AH concentration was 1.5±0.1 μg/mL, with no significant sex difference. In simple regression analyses, PAF-AH concentration correlated positively with relative weight (r=0.272, P=0.0316), waist/height ratio (r=0.296, P=0.0240), subscapular/triceps ratio (r=0.312, P=0.0304), and LDLC level (r=0.248, P=0.0421), but not with apoB level (r=0.171, P=0.0988), HDLC level (r=0.079, P=0.2738), peak LDL particle diameter (r=0.192, P=0.0787), or HOMA-R (r=0.018, P=0.6043). In stepwise regression analysis (Table), LDLC level and waist/height ratio emerged as significant and independent determinants explaining 68.8% of the PAF-AH concentration variability after relative weight and subscapular/triceps ratio were taken into account.

These results suggested that abdominal obesity in children might be associated with oxidative stress, with antioxidative modulation of lipoproteins.

In adults with metabolic syndrome, total plasma PAF-AH activity was reported to be higher than in those without metabolic syndrome.6 Adults with non–insulin-dependent diabetes mellitus also have increased plasma PAF-AH activity, which is correlated with their LDLC level.3 In our study, plasma PAF-AH concentration was correlated with LDLC level and waist/height ratio. Waist circumference is a major component of metabolic syndrome. In children, however, waist/height ratio rather than waist circumference is a better predictor of cardiovascular risk, because their height increases with aging.10 Therefore, our results demonstrated that PAF-AH concentration, as well as a high LDLC level, is associated with abdominal adiposity in obese children.

Tsimihodimos et al reported that LDL-associated PAF-AH activity is mainly distributed on the small dense LDL particles.11 In our study, however, PAF-AH concentration is not correlated with peak LDL particle diameter. In children with abdominal obesity, antioxidative modulation of lipoproteins may precede the development of the predominance of small dense LDL. In Japanese adults with hyperlipidemia, the distribution of PAF-AH between HDL and LDL was altered with higher concentration of LDL-associated PAF-AH and lower non-HDL associated PAF-AH to apoB ratio.6 In our study, PAF-AH to apoB ratio correlated negatively with HDLC level (r²=0.244, P=0.0437), not with LDLC level or peak LDL particle diameter. Therefore, not only plasma concentration of PAF-AH but also the distribution of PAF-AH should be investigated to determine the mechanisms contributing to atherogenicity in obese children.

PAF-AH deficiency is associated with atherosclerotic occlusive disease in Japanese adults, suggesting a protective role of PAF-AH.12 In abdominal obese children, PAF-AH concentration was elevated with increasing degree of abdominal fatness. PAF-AH may play an important role as the antioxidative factor even in the early phase of atherosclerosis.

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