THE RELATIONSHIP BETWEEN PLASMA TRIGLYCERIDE AND HIGH DENSITY LIPOPROTEIN CHOLESTEROL LEVELS IN DETERMINING CARDIOVASCULAR RISK

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In 1959, Albrink and Man first proposed a relationship between hypertriglyceridemia and coronary heart disease (CHD). The nature of this relationship remains controversial. Case control and prospective studies have demonstrated triglycerides to be an independent risk factor for CHD on univariate analysis. The significance of this is reduced when HDL-cholesterol is taken into account using multivariate analysis (Austin 1991). However if projected slope analysis is applied to the Framingham data, triglycerides remain a significant predictor of coronary death rate regardless of HDL-cholesterol levels in women, and in men with low HDL-cholesterol (Castelli 1986). In the Prospective Cardiovascular Munster (PROCAM) Study, men with both low HDL-cholesterol and high triglycerides had the highest rate of myocardial infarction (Assman et al. 1991). Thus the aim of this study is to define the reasons why a high triglyceride is associated with an increased risk of coronary heart disease when HDL-cholesterol is low, but not when it is normal, by examining fasting and post-prandial lipoprotein profiles.

Hypertriglyceridemic subjects with low (n=10) and normal (n=6) HDL-cholesterol levels participated in two study phases. The first phase involved taking fasting and post-heparin blood from the subjects. Fasting plasma was used to determine lipoprotein composition, density gradient data and LDL and HDL particle size, while post-heparin plasma will be used to measure lipase activity. The second phase involved taking postprandial blood samples every 2 hours for 8 hours after an oral fat load of 60g fat/m^2 body surface area. Triglyceride and cholesterol was measured in whole plasma and the various lipoprotein fractions.

The low HDL-cholesterol group were found to have smaller LDL and HDL particles, a greater number of VLDL particles but fewer HDL_2 and HDL_3 particles, greater VLDL triglyceride to protein ratio and LDL, HDL_2 and HDL_3 protein to cholesteryl ester ratios, and a delayed postprandial triglyceride clearance. The LDL and HDL density gradient data reflected the particle size and composition results, with the low HDL-cholesterol group tending to have more dense LDL and HDL. The results suggest a distinct difference in the metabolism of triglycerides between the 2 groups. The low HDL-cholesterol group appears to have an over-production of triglyceride-enriched VLDL particles aswell as a poor catabolism of the triglyceride-rich lipoproteins. In contrast, the normal HDL-cholesterol group appears to have an over-production of VLDL particles, but catabolism of these particles and chylomicrons would seem normal. Poor catabolism of triglyceride rich lipoproteins may be due to a decrease in the activity of lipoprotein lipase which hydrolyses the triglycerides in these lipoproteins. An elevated hepatic lipase activity, which hydrolyses HDL_2 triglycerides converting them to smaller HDL_3, may also explain why the low HDL-cholesterol group has fewer HDL_2 particles. Both lipoprotein and hepatic lipase activity will be measured at a later stage.

ALBRINK, M.J. and MAN, E.B. (1959). Arch. Intern. Med. 103: 4.
ASSMAN, M.D., BETTERIDGE, D.J., GOTTO, A.M. Jr and STEINER G. (1991). Am. J. Cardiol. 68 (suppl.): 30A.
AUSTIN, M.A. (1991). Arteriosclerosis and Thrombosis. 11: 2.
CASTELLI, W.P. (1986). Am. Heart J. 112: 432.

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