

Relations of Lipids and Lipoproteins with Angiographically Assessed Coronary Artery Disease

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ABSTRACT

Back ground: Coronary artery disease (CAD) has diverse etiology. Atherosclerosis is a major cause of CAD. Plasma lipids and lipoproteins abnormalities are frequently associated with the presence of atherosclerotic CAD.

Aim: To find out the discriminators and predictors of the presence, extent and severity of CAD, in terms of lipids and lipoproteins.

Stud period: March 2013 to January 2014

Methods: One hundred twenty three male patients of CAD admitted for coronary angiography and 50 apparently healthy control male subjects were selected for lipids and lipoproteins analysis.

Results: Analysis of study data showed that lipids and lipoproteins abnormalities except chylomicron were present only in patients having abnormal coronary angiograms.

Conclusion: It was concluded that LDL, HDL2-C and ratio of LDL/HDL2-C were discriminators and potentially predictors of presence (>50% stenosis), extent (number of vessel involved) and severity (maximum present stenosis of lumen) of CAD.

Keywords: Discriminators, predictors, lipoproteins.

INTRODUCTION

When cholesterol accumulates in the wrong place, for example within wall of artery, it can not be readily mobilized and its presence eventually leads to the development of atherosclerotic plaque. The cholesterol that accumulates in the atherosclerotic lesion originates primarily from plasma lipoproteins including low density lipoproteins (LDL)¹. Subsequently raised levels of LDL were found in patients with abnormal angiograms. An atherogenic component of serum capable of stimulating the deposition of intracellular cholesterol was represented by LDL, in one case very low density lipoprotein (VLDL) but not by other class of lipoproteins².

Overall, of 11 univariate analysis, 7 studies disclosed a positive association between baseline triglycerides and incidence of CAD³. Significantly raised levels of triglycerides were also observed in patients of CAD as compared to control subjects. In angiographically assessed CAD studies triglycerides was discriminator of groups with obstructive coronary arteries. Prospective and case controlled studies have shown inverse relation of high lipoprotein (HDL) levels to the presence and incidence of CAD. Principally HDL2-C rather than HDL3-C is related to CAD. Several circulating biomarkers have been implicated in symptomatic transformation of the

atherosclerotic carotid plaque through their association with plaque erosion, rupture, and thrombosis^{4,5,6,7,8,9,10}, and it has been proposed that such biomarkers could play an important part in identifying those asymptomatic subjects with CS who would benefit from carotid plaque removal or sealing^{11,12}. Since individual biomarkers may lack a sufficient discriminating power to impact clinical decision-making, it has been suggested that a "multi marker approach" will provide more powerful and clinically useful information¹³.

The association between total cholesterol concentration with CAD has been well established through a number of important studies. In this country, disease pattern is somewhat different than in European and USA populations^{14,15}. Considering this aspect, this study was planned to find out the discriminators and predictors of the presence, extent and severity of CAD, in terms of lipids and lipoproteins.

MATERIAL AND METHODS

One hundred twenty three male patients of CAD admitted for coronary angiography and 50 apparently healthy control male subjects were selected for lipids and lipoproteins analysis. Data were analyzed by student 't' test for group comparisons. Inter relations and relationships between the variables were analyzed by calculating correlation coefficient 'r' and regression line respectively.

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RESULTS

Patients having history of excessive fatty diet intake were greater in number (30%) as compared to control subjects (918%). 32% of patients were ex-smoker and 30% were in control groups. Both groups have equal (28%) positive family history of CAD. Significantly raised levels of total cholesterol, triglycerides, LDL, VLDL, VLDL-C and significantly

low levels of total HDL-C, HDL2-C and HDL3-C were found in patients of CAD when compared with control subjects, discriminating the presence, extent and severity of CAD. Results are shown in the form following tables. All values are expressed as Mean±sem and number of observations is given in parenthesis.

Table 1: Comparison of serum values of lipids and lipoproteins among SVD, DVD, and TVD

Serum (mg/dl)	SVD(2)	DVD (36)	TVD (41)
Total choleste	205.65±4.60	214.00±7.28	234.85±13.79
Triglycerides	177.31±10.77	192.86±10.97	197.85±13.86
LDL	137.97±5.25	154.97±7.70	172.46±15.08
VLDL	92.50±2.25	114.69±2.20	122.45±2.75
VLDL Choleste	35.47±2.25	38.58±0.20	39.70±2.75
Total HDL Cholesterol	36.13±0.80	35.00±1.47	30.02±0.79
HDL3 choleste	24.41±0.66	24.50±0.76	23.12±0.61
HDL2 choleste	11.81±0.96	9.11±0.51	6.90±0.41

*P<0.05, **P < 0.02, ****P <0.001

The values are significant as compared to controls subjects x=SVD vs TVD, y=DVD vs TVD, z=SVD vs DVD

Table 2: Comparison of serum values of lipids and lipoproteins between 71-91% stenosis and 91-100% stenosis in patients of atherosclerotic coronary artery disease

Serum (mg/dl)	71-80% stenosis	91-100% stenosis
Total cholesterol	203.90±6.17	230.30**±8.90
Triglycerides	172.29±10.33	201.13*±9.30
LDL	141.07±6.94	167.16±9.62*
VLDL	101.14±7.75	120.71±7.55
VLDL Cholesterol	35.56±2.28	40.43±1.33
Total HDL Cholesterol	33.00±0.95	32.89±0.61
HDL3 cholesterol	23.80±0.70	24.00±0.47
HDL2 cholesterol	9.19±0.62	8.89±0.48

*P < 0.05, ** P < 0.02 The values are significant as compared to 71-90% stenosis of coronary vessel.

Table 3: Comparison of serum values of lipids and lipoproteins IHD patients and patients having atherosclerotic CAD

Serum (mg/dl)	IHD (123)	CAD (109)
Total cholesterol	216.61±5.37	219.45±6.21
Triglycerides	182.71±6.65	190.08±7.43
LDL	153.28±5.89	157.47±5.74
VLDL	107.93±5.04	111.75±5.74
VLDL Cholesterol	36.58±1.34	38.11±1.46
Total HDL Cholesterol	35.47±0.77	33.65±0.53****
HDL3 cholesterol	24.30±0.38	26.64±0.58***
HDL2 cholesterol	11.17±0.63	9.10±0.41

*P < 0.05, ** P < 0.02 The values are significant as compared to IHD patients.

Table 4: Comparison of ratios of total cholesterol/HDL cholesterol, total cholesterol/HDL2 cholesterol, LDL/total HDL cholesterol and LDL/HDL2 cholesterol among the patients having SVD, DVD, and TVD

Serum (mg/dl)	SVD (32)	DVD (36)	TVD (41)
TC/ THDL-C	5.58±0.18	6.48*±0.27	7.98****±0.47***
TC/HDL2-C	20.73±1.50	25.62**±1.53	38.00***±13.86
LDL/HDL-C	3.90±0.19	4.70*±0.27	5.93***±0.49*
LDL/HDL2-C	13.50±1.17	18.11***±1.41	28.59***±2.87***

*P < 0.05, ** P < 0.02, ***P <0.01, ****P<0.001

DISCUSSION

In the earliest studies serum total cholesterol was the only lipid incriminated for risk of CAD¹⁶. In the end of the 6th decade triglycerides measurement has become feasible, triglyceride has been considered also a major risk factor in pathogenesis of CAD¹⁷. When great amount of research has been taken place in metabolism and partition of total cholesterol in lipoproteins and atherogenic potential of the later. In studies attention has been given on the role of various subclasses of lipoprotein particularly LDL and HDL in CAD¹⁸.

High-density lipoprotein-cholesterol protects against atherosclerosis via several anti-inflammatory, antioxidant, and antithrombotic effects, including reverse cholesterol transport in the liver, prostacyclin release, and the inhibition of endothelial adhesion molecule expression, monocyte chemotactic activity, and LDL oxidation¹⁹. Our novel finding of HDL-cholesterol as an independent predictor of CS-symptomatic status in patients with established carotid atherosclerosis is consistent with the association between low HDL-cholesterol with the unstable carotid plaque phenotype on conventional histology²⁰. It is also consistent with the finding of low HDL-cholesterol more frequent in stroke and TIA patients with atherosclerotic large-vessel stenosis than in those with stroke/TIA in the absence of atherosclerotic large-vessel stenosis²¹. The failure of previous studies to identify a link between low HDL-cholesterol and the neurological symptoms of carotid atherosclerosis may have been due to the inclusion of relatively small samples and/or the classification of the patients with last symptoms of CS >3-6 months as asymptomatic⁸, which would blunt any potential differences between the truly asymptomatic vs. those with prior symptoms of CS. Previous work suggested a protective role for high HDL-cholesterol levels against the progression of carotid atherosclerosis rather than its symptomatic conversion; there is also recent prospective evidence that increased HDL-cholesterol protects against the progression of intracranial atherosclerosis²².

The CS severity was similar in the symptomatic and asymptomatic subjects included in the present study, which supports the concept of a protective role played by high HDL-cholesterol through reducing the risk of symptomatic transformation of the carotid plaque. A recent study of left main coronary artery atherosclerosis²³ indicated that a low HDL/LDL-cholesterol ratio may be related to an increased lipid content and smaller fibrous content observed on the plaque radiofrequency IVUS imaging, possibly rendering the atherosclerotic plaque more amenable

to symptomatic transformation. Such an association is yet to be evaluated for carotid bifurcation atherosclerotic disease.

Raised level of any individual lipid or lipoprotein not necessarily indicates the presence of CAD. In present study, significantly raised levels of VLDL were present in patients with normal angiogram when compared with control subjects ($P < 0.001$). However, no other relation was found with the other lipids and lipoproteins which were in normal range, comparable to control subjects.

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