Research Article

A STUDY OF C-REACTIVE PROTEIN AND ITS RELATIONSHIP WITH CHD AND LIPID METABOLISM

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ABSTRACT

Inflammation is an important feature of atheroma and is associated with activation and proliferation of macrophages, endothelial and smooth muscle cells, the generation of growth factors and cytokines, the presence of other pro-inflammatory mediators, and the activation and deposition of complement particles. Increased serum CRP levels have been found recently in patients with both myocardial infarction and angina. Many trials have confirmed the association between high levels of CRP and the risk of future coronary events such as myocardial infarction and sudden cardiac death. A total 60 subjects were included in the study in the age group of 50-68 years. Troponin I, hs-CRP, serum total cholesterol, HDL-cholesterol, triglycerides, and VLDL levels were estimated and LDL-cholesterol was calculated by Fried-walds formula. There was a statistically significant difference between the ages of two groups. The total cholesterol and LDL levels were significantly increased in CHD patients as compared to control subjects p<0.001). Unlike other markers of inflammation, C-reactive protein levels are stable over long periods, have no diurnal variation, can be measured inexpensively with available high-sensitivity assays, and have shown specificity in terms of predicting the risk of cardiovascular disease. We conclude that in conjunction with Troponin I values, regular assay of CRP may play a valuable part in differential diagnosis and management of CHD.

Keywords: Coronary heart diseases (CHD), hs-CRP, atherosclerosis, troponin I.

INTRODUCTION

Inflammation is an important feature of atheroma and is associated with activation and proliferation of macrophages, endothelial and smooth muscle cells, the generation of growth factors and cytokines, the presence of other pro-inflammatory mediators, and the activation and deposition of complement particles[1]. Many publications have also reported a powerful correlation between microbial infection, both within the arterial lesions themselves and elsewhere, and cardiovascular disease (CVD)[2-4]. A feature of most forms of inflammation, tissue damage, and infection is the increase in the circulating levels of various plasma proteins known as acute-phase reactant, such as C-reactive protein (CRP) and serum amyloid A protein (SAA). These reactants are mainly produced by hepatocytes through increased expression of their genes by cytokines, which are produced by activated macrophage[5]. In healthy persons, CRP concentrations are very low, but they can rise tremendously in response to a wide variety of stimuli.

Atherosclerosis is now considered as an inflammatory disease and an elevated level of CRP in the circulating blood suggests persistent inflammation, particularly in the coronary wall, so that CRP can be used to monitor the progression of vascular inflammation[7].

C-reactive protein (CRP) is a constituent of blood that increases dramatically in presence of various diseases. It was first identified in the sera of patients of pneumonia and received its name because of its precipitating property with C-polysaccharide of the bacteria[8].

Increased serum CRP levels have been found recently in patients with both myocardial infarction and angina[9]. Many trials have confirmed the association between high levels of CRP and the risk of future coronary events such as myocardial infarction and sudden cardiac death[10].

The concentration of CRP in patients with angina pectoris was positively correlated with subsequent incidence of myocardial infarction or sudden coronary death[10]. Hence CRP could be considered as a sensitive marker of inflammation and elevated levels of CRP have been associated with future risk of myocardial infarction[7].

The aim of the present study was to know the association of CRP with CHD, association of CRP in lipid metabolism, and to correlate the levels of cardiac enzymes, CRP and lipid levels in myocardial infarction.

MATERIALS AND METHODS

This case control study was conducted at the department of Biochemistry and department of Medicine, JSS Medical College, Mysore, Karnataka. The study was funded by RGUHS grant. The study protocol was approved by Research Ethics Committee of JSS Medical College.

A total 60 subjects were included in the study in the age group of 50-68 years. The subjects selected were given a proforma with information on known factors such as smoking, alcohol, previous history of hypertension, diabetes mellitus, life style, diet and family history of CHD. A written informed consent was taken from the subjects before collecting the samples.

Exclusion criteria

Individuals with concomitant systemic diseases (thyroid disorders, acute infections, stroke, diabetic ketoacidosis, rheumatic diseases, chronic liver diseases, renal disorders, cancer and sepsis) and subjects who were critically ill or with ongoing or recent (<1 month) infectious diseases as well as patients with surgical procedure in last 3 months were excluded.

Sample collection and Biochemical estimations

Estimation of CRP was done with serum sample by using RX Daytona analyzer[11]. Sample reacts with specific antiserum to form a precipitate which is measured turbidimetrically at 340 nm. Fasting venous blood samples were collected under strict aseptic precautions with informed consent of the patients and control subjects. Serum total cholesterol, HDL-cholesterol, triglycerides, and VLDL levels were estimated by enzymatic method[12]. LDL-cholesterol was calculated by Fried walds formula[13]. Troponin I estimated by chemiluminescence method[14].

Statistical Analysis

Student's *t*-test was used for comparison between two groups and values expressed as mean± standard deviation. A *p*-value of <0.05 was considered as statistically significant.

RESULTS

The lipid profile, troponin I and hs-CRP levels of controls and cases are shown in table 1.There was a statistically significant difference between the ages of two groups. The total cholesterol and LDL levels were significantly increased in CHD patients as compared to control subjects. Moreover, HDL levels were significantly lower in CHD subjects when compared to controls.

The hs-CRP and troponin I levels were significantly higher in patients with CHD as compared to healthy individuals.

Table 1: Serum cholesterol, LDL and HDL cholesterol, serum triglyceride, hs-CRP and troponin I levels

	Controls (n=30)	Cases (n=30)
Age (years)	50.8667±10.03694	58.4667±10.19714***
Total cholesterol mg/dl (Mean ± SD)	161.33± 25.94	203.93± 28.23***
LDL cholesterol mg/dl (Mean ± SD)	93.66± 22.51	139.73 ± 28.97***
HDL cholesterol mg/dl (Mean ± SD)	38.5 ± 12.73	34.7 ± 5.26
Triglycerides mg/dl (Mean ± SD)	145.86± 145.86	147.50± 57.003
VLDL	29.30±6.052	29.50±11.46
Troponin I	0.023±0.0072	15.54±17.83***
hs-CRP	0.687±0.4155	29.89±33.51***

*** = Very Highly Significant ($p < 0.001$)

DISCUSSION

Atherosclerosis is now considered as an inflammatory disease and an elevated level of CRP in the circulating blood suggests persistent inflammation, particularly in the coronary wall, so that CRP can be used to monitor the progression of vascular inflammation[7]. C-reactive protein (CRP) is a constituent of blood that increases dramatically in presence of various diseases.

Several prospective studies have demonstrated that hs-CRP is an independent predictor of future risk for cardiovascular events among healthy individuals, as well as among patients with acute coronary syndromes. In addition, because half of all cardiovascular events occur in persons with low to average levels of low-density lipoprotein cholesterol, hs-CRP may aid in identifying patients at high risk for a first cardiovascular event who might otherwise be missed by lipid screening alone[15]. But we observed that hsCRP levels were significantly higher in patients with CAD compared to healthy individuals along with LDL cholesterol. The strong correlations of serum hs-CRP with LDL and smoking may be due to the putative pro-inflammatory effects of these two parameters[16].

In current strategies of global risk assessment, lipid testing is the only blood test routinely recommended. However, hs-CRP evaluation may have the potential to improve cardiovascular risk prediction models when used as in addition to traditional lipid profiles[17,18].

Increased CRP production is a non-specific response to most forms of cell death, tissue injury, infection, or inflammation, and it is clear that myocardial necrosis is a potent stimulus. All the patients studied here in whom there was a significant rise in Troponin I also showed a rise in CRP concentration,

Unlike other markers of inflammation, C-reactive protein levels are stable over long periods, have no diurnal variation, can be measured inexpensively with available high-sensitivity assays, and have shown specificity in terms of predicting the risk of cardiovascular disease[19,20].

Assay of CRP may also provide an objective criterion to assist in decisions regarding suitability of individual patients for transfer from the coronary care unit to the ward or from the ward to home. On all these grounds we suggest that, provided the results are interpreted in the light of detailed knowledge of the patients' clinical condition and in conjunction with Troponin I values, regular assay of CRP may play a valuable part in differential diagnosis and management of CHD.

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