Original Research Article

hs- CRP: A "Golden Marker" of Inflammation and Coronary Artery Disease

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ABSTRACT

Various studies have shown that increased levels of high sensitive C- reactive protein (hs-CRP) are associated with major cardiovascular risk.

hs-CRP is a non specific serum marker of inflammatory response. We aim to evaluate the relationship between pre procedural high sensitive C- reactive protein and angiographic signs in patients presenting with acute coronary artery disease.

The diagnosis is based on the ECG and enzyme profile. Increased total LDH level was taken as criteria for selection of patients. Total 100 cases were studied with coronary artery disease in the age group 40 to 70 years. They were followed for 7 days or until discharge. The high sensitive C- reactive protein levels were estimated in these 100 patients and the results were compared with 100 age and sex matched healthy controls in the same age group. The mean value of high sensitive C- reactive protein was 4.63 ± 1.43 was significantly higher ($p<0.001$) when compared with healthy controls.

high sensitive C- reactive protein level was found to be significantly higher in patients with coronary artery disease indicates that they are at risk to develops coronary artery lesions

Key Words: high sensitive C-reactive protein (hs-CRP), Acute Coronary Syndrome, Angiographic lesion, Inflammatory Marker.

INTRODUCTION

The prediction of Indians to coronary artery disease (CAD) has been confined beyond the diet. [1, 2] Indian populations are more prone to develop CAD at young age. Up to the year 2015 India will have the largest coronary artery disease burden in the world. [3] hs-CRP is the most sensitive of the acute reactants and its concentration increases rapidly during inflammatory process. It the liver is main organ for its synthesis and consists of five identical polypeptide chains that form a five member ring having that form a molecular of 105 KD. [4]

hs-CRP is well standard and it has limits of detection as low as 0.02g/dl. Various trials like physician health study and women's health study have shown that predictive values of hs-CRP are significantly higher than other traditional biochemical cardiovascular risk markers. [5, 6, 7] The main function of hs-CRP is to bind and detoxify endogenous toxic substances produced as a result of tissue damage. hs-CRP also helps to body to remove dead ,dying or foreign cells such as microbes through binding to phosphocholine on cell surface, activating the complement system and initiating opsonization and phagocytosis. [4]

The diagnosis of hs-CRP levels is helpful to correlate with the clinical severity of coronary artery disease and with coronary events in both acute and sub acute phase of myocardial ischemia. Patients who are hospitalized for treatment of acute coronary syndrome and have raised CRP levels have significantly more ischemic episodes during hospital stay then patients with lower CRP levels. [8, 9] Among patients with suspected coronary artery diseases undergoing coronary angiography, increased hs-CRP is strongly associated with specific high risk features of culprit coronary artery lesions. [10] hs-CRP levels reaches to peak up to 2 to 4 days after the initial events and thereafter often decline. [11, 12] In patients with acute coronary artery disease increased hs-CRP level is associated with presence of complex angiographic lesions and the need for revascularization. [13] It has been recently reported that hs-CRP correlate with number of vulnerable plaques and such patients also have increased risk of future CAD.

Hence as per above view, this study is conducted to evaluate the relationship between pre-procedural hs-CRP and angiographic features in patients with coronary artery disease.

MATERIAL AND METHODS

The present research was carried out in the Department of Biochemistry, B. J. Medical College, Pune in collaboration with Sassoon General Hospital, Pune and Department of Biochemistry PDVVPF's Medical College, Ahmednagar, Maharashtra. The Institutional Ethical Committee clearance was obtained and utmost care was taken during experimental procedure according to the Declaration of Helsinki 1975.

The study had been performed on total 200 cases, which included 100 age and sex matched (64 males and 36 females) healthy controls and 100 (69 males and 31 females) coronary artery disease patients which were previously diagnosed by ECG and enzyme profile. Increased total LDH level was taken as criteria for selection of patients. All patients were under the strict supervision of medical professionals during this period. All the patients having history of any heart disease, lung disorder, thyroid dysfunction, diabetes mellitus were excluded from the study. Screening with complete blood count, ESR, fasting blood glucose was performed and if found abnormal, were excluded from the study.

After obtaining a written consent from all the participants, total 3ml blood was withdrawn aseptically from the antecubital vein from each subject in plain bulb after 12 hrs overnight night fast. The samples were centrifuged at 3000 rpm for 10 min to separate. The separated serum was collected in polythene tube with cork and stored at -20^0C. The serum with no sign of hemolysis was used for analysis of the hs-CRP by using kit from Erba diagnostics on semi-autoanalyser (Chemiline) in the Biochemistry lab.

Statistical Analysis

The statistical analysis was carried out by using the SPSS (Statistical Package for Social Sciences) software. The Student 'z' test was applied for the statistical analysis and the results were expressed in mean ± SD, p values (p <0.001) were considered as highly significant.

RESULT

The baseline characteristics and clinical characteristics of acute coronary artery disease patients and control subjects have been shown in table 1 and table 2.

Table-1. Baseline characteristics of acute coronary artery disease patients.

Sr No	Baseline characteristics	Readings
1	Age (yrs) mean ± SD	54±11
2	Male	64%
3	Female	34%
Risk factors		
4	Diabetes	55%
5	Hypertension	66%
Smoking status		
6	Current smoker	24%
7	Past smoker	12%
8	Never smoked	64%
9	History of coronary disease	43%

Table-2. Clinical characteristics of acute coronary artery disease patients and control subjects.

Sr.No.	Parameter	Coronary artery patients (n=100)	Control group (n=100)
1	Hs-CRP (mg/dl)	4.63±1.43*	0.0±0.3

Statistical comparison was done between acute coronary artery disease patients and control group
Values are expressed in mean with standard deviation (mean ± SD).
*p<0.001- considered as highly significant.
 n= number of subjects.

A total 100 patients (64%) and (34%) females with coronary artery disease were studied.
Table 2- indicates that, the significantly higher (p<0.001) hs-CRP level was found when compared with healthy controls.

DISCUSSION

The development of an atherosclerotic plaque involves a complex interaction between the endothelium, inflammatory cytokinines and numerous blood elements. [11] Therefore physicians need a detailed understanding of the central role of inflammation in atherosclerosis, how to stratify patients at risk on the basis of inflammatory markers, and the impact of current and future therapeutic interventions to provide state-of-the-art medical care. [11, 12] Majority of population based studies have revealed that hs-CRP is exquisitely sensitive systemic marker of inflammation and a powerful predictive marker of future cardiovascular risk. [14, 15, 16] According to Ghazala Irfan et al observed that, there is a cohort of consecutive patients undergoing cardiac catheterization for suspected CAD, hs-CRP concentration were strongly associated with a clinical presentation of

acute syndrome and with distinct angiographic features of the lesions suggestive of acute pathophysiology. [9] Our findings strengthen the hypothesis that acute inflammation is a component of the pathophysiology of CAD. Therefore it suggest that inflammation is not only an important trigger mechanism of coronary syndrome related to plaque rupture, but also promoter of chronic atherosclerosis, as proposed that hs-CRP might play an atherogenic role through an interaction with low density lipoprotein.

Another study done by Espligreal et al shows that, hs-CRP was significantly higher in patients with CAD compare to healthy controls and correlate with complex angiographic lesion. [17] According to American Heart Association (AHA) and the Centre for Disease Control and Prevention (CDCP) shows that hs-CRP is an independent marker of CAD and CVD risk and may be useful as a prognostic indicator for recurrent events in patients with acute coronary disease. [4, 17, 18] Our result suggests that hs-CRP is not only a marker of vascular inflammation but may also play an important key role in plaque disruption.

CONCLUSION

The summary of our study lies in a fact that, there is clear trend that hs-CRP level correlate significantly with angiographic features of thrombi and eccentric lesions. The inflammation can be implicated in transformation of stable coronary plaque to unstable plaque rupture thrombus. Identification of markers indicating propensity of plaque rupture is of clinical importance and hs-CRP may be simple but golden marker in this regard.

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