

The Diagnostic and Prognostic Value of C-Reactive Protein in Patients With Acute Myocardial Infarction

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Abstract

The aim of this study is to assess the diagnostic and the prognostic value of C-reactive protein in patients with acute myocardial infarction. From October 2005 to October 2007 one hundred patients with acute myocardial infarction (AMI) were admitted to the coronary care unit (CCU) in Diwaniya Teaching Hospital were studied regarding the value of C-reactive protein during the first 72 hours of the infarction and through out the period of complications. The results were compared with those obtained from control group which consisted of 30 persons of matched age and sex.

We found that the mean serum level of C-reactive protein (CRP) of those with AMI was $68\text{mg/L} \pm 59.93$ and its concentration reaches a peak in all patients in the second day of infarction. The level was significantly higher than the level of CRP in the control group (mean = 6mg/L), ($p < 0.005$). We also found that CRP remained persistently high in patients with complicated AMI in comparison with uncomplicated patients.

So this study showed that CRP level is useful diagnostically and prognostically in patients with AMI and it is a simple bed side test that it is available in different medical centers.

Introduction

Acute phase reactant proteins are synthesized by the liver in response to acute tissue damage. Serial estimation of these proteins^{1, 2} particularly C-reactive protein (CRP)³ have been used in evaluation of patients hospitalized because of suspected AMI⁴ in addition to monitoring the prognosis and complications of AMI^{5, 6}.

An association of acute response with tissue injury and inflammation is now a known fact and a number of these acute phase proteins, such as CRP¹, alpha-1

antichromotryptin⁷, alpha-acidglycoprotein⁷, serum amyloid A-protein⁷ and fibrinogen⁸ have been shown to increase in response to such tissue injury including AMI.

A number of recent reports have showed that CRP may play a significant role in modulating inflammatory immune response after AMI and other forms of tissue injury^{9, 10}. Human CRP may localize in the infarcted heart tissue and this suggest that this acute phase protein promote local complement activation and hence tissue damage¹¹.

There are some difficulties that faced during management of AMI. Establishing the diagnosis of infarction by itself may sometimes be a clinical problem, and even when the diagnosis is confirmed there are difficult points like the recognition of complications, the prognosis in post infarct period, and the difficulty in deciding the time of discharge of patients from the CCU. Therefore it is suggested that serial measurement of serum CRP level may be useful in the diagnosis and prognosis of 1st AMI¹².

The aim of this study is to determine if there is any significant association between AMI and CRP in regard to diagnosis and prognosis.

Patients and Methods

CRP was measured in one hundred patients with AMI who were admitted to the CCU in Diawanya Teaching Hospital during the period between October 2005 to October 2007. Careful history measuring blood level of cardiac enzymes, sugar and lipids profile, CRP was measured within the first 72 hours of onset of AMI and throughout the period was obtained and proper clinical examination was done. Those patients with other causes of increased CRP were excluded, for example infection, arthritis^{1,2}. Diagnosis of definite AMI was made according to the world health organization criteria which are based on the presence of at least two of the following three criteria:

1- Clinical history of chest pain, typically AMI results in sever chest pain lasting

more than 30 minutes and unrelieved by sublingual nitroglycerin.

- 2- ECG criteria of AMI or evolving infarction , the earliest ECG change is usually ST elevation, later on there is diminution in the size of the R wave, and in transmural (full thickness) infarction a Q wave begins to develop.
- 3- AMI causes a detectable rise in the plasma concentration of enzymes and proteins that are normally concentrated within cardiac cells, the most widely used enzyme in detection of AMI is creatine kinase (CK), a more sensitive and cardiac specific isoform of this enzyme (CK-MB), and the cardio specific proteins T and I (which were not available in our hospital) , other enzymes AST and LDH.

Venous blood samples were centrifuged and stored at 4 C⁰ for a period before estimation or frozen before assaying them. The concentration of CRP is determined using latex agglutination test and its quantitative estimation was done by a series of doubling dilution technique¹⁶. The results were compared with the results obtained from a control group, which consisted of (30) persons of matched age and sex. The control group selection depended upon the absence of history of chest pain or risk factors for ischemic heart disease (a part from the age and sex), history of organic heart disease, liver disease or arthritis and they should have normal ECG and chest X-ray film. Those persons who had chosen from out patients clinics, companions of patients.

Results

Table 1: Demonstrates the characteristics of patients and control groups

Subjects	Total No.	Mean Age	No. of males	No. of females	Mean serum CRP
Patients group	100	55.58± 7.06 year 40-80	74	26	68mg/L±59.93 12-192
Control group	30	56.13±6.66 year 40-80	14	16	6mg/L

P<0.005 SD: (+) standard deviation

The patient's group mean CRP level was 68mg / L while the mean CRP in control group was normal and it is referred to as 6mg / L.

Table 2: Illustrates the venous concentration of CRP in different patients with AMI in the first 48 hours

Patient group		Control group	
No.	CRP(mg/l)	No.	CRP (mg/l)
6	12	30	6
6	24		
6	36		
44	48		
20	96		
18	192		

This table show that the CRP concentration in patients with AMI is significantly higher than that in control group and its concentration reach its peak in all patients in the first 48 hours after infarction.

The following table illustrates the complication of AMI and shows a comparison between CRP in such patients and those with uncomplicated MI in hours.

Type of complication	No.	Mean duration of peak CRP elevation in hours
Heart failure	12	80
Pericarditis	4	84
Supraventricular tachycardia	4	48
Atrial fibrillation	4	48
Total	24	65hr S-D±19.96
Uncomplicated No.	76	24hrs

P :< 0.05

Among one hundred patients, four developed pericarditis and has persistently elevated CRP concentration. In two

patients it remained elevated till discharge and in the other it returned to baseline at the fourth day of infarction.

Discussion

CRP was originally named because it reacts with the C-polypeptide of pneumococci^{1, 2}. CRP can be detected in the serum of normal people but usually at low levels and is elevated when there is tissue injury like AMI, infection, inflammation (including collagen diseases) and malignant diseases.

In our study there was statistically significant association between first AMI and elevation of CRP and was in agreement with Bernard-DR, loglois study which showed that out of other acute phase proteins only CRP was significantly increased during the first 36 hours of AMI¹².

The increase in CRP level in our study usually begins within the first 24 hours after the onset of chest pain and reaches its peak at 48 hours in all patients and this is in agreement with Uin-Chin –Aeta 2004 who studied 24 patients with AMI for a period of 96 hours and showed that plasma CRP concentration increases and reached its peak at 24 hours after the onset of symptoms and found that the mean maximum CRP concentration was 69.2mg/L¹⁴, which is near to that found in our study (68mg/L).

In our study we found that 24 patients with AMI (24%) who had complications showed persistently elevated CRP. The associated complications included : heart failure, supraventricular tachycardias, atrial fibrillation, pericarditis and cerebrovascular accident.

The association between persistently elevated CRP and post MI complications was studied by Uedaa S, Yamamoto K, and Takahashi M¹⁵. Who showed that patients with persistently high serum CRP

level might have high probability of complications like sub acute cardiac rupture.

Conclusions

- 1- CRP is a sensitive but non specific marker for diagnosis of AMI because it can increase in other causes of tissue injury and inflammation like surgery, infection, arthritis, vasculitis, and others . It is helpful in the diagnosis of AMI in parallel with the clinical history, ECG, and elevation of cardiac enzymes.
- 2- CRP can be easily measured in a side laboratory compared with cardiac enzymes and can be useful in the diagnosis of AMI in any health center in the rural area where facilities for cardiac enzymes measurement may not be available.
- 3- Daily measurement of CRP may help in early detection of complications of AMI during hospitalization.
- 4- CRP with clinical parameters can be useful as a guide to short term outcome in patients with AMI and is useful regarding the decision for patient discharge.
- 5- CRP is useful diagnostically and prognostically in patient with AMI and it is a simple bed side test that can be available in different medical centers.

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