

“An Evaluation & Correlation of C-Reactive Protein & Malondialdehyde in Acute Myocardial Infarction.”

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Abstract:

Introduction: Acute Myocardial Infarction (AMI) is a medical emergency despite impressive advancement in diagnosis and management. The purpose of this study was to investigate and correlate C-reactive protein (CRP), an inflammatory marker and serum Malondialdehyde (MDA), an index of lipid peroxidation in Acute Myocardial Infarction.

Materials and Methods: The study was conducted in 80 subjects divided in two groups, 50 patients with AMI (35 years to 81 years) and 30 age and sex matched healthy control. Serum CRP & Serum MDA readings were taken on day 1, 3, 5 and at the time of discharge (8±1days) from the onset of symptoms which is found statistically significant on all the days as compared to the control.

Results: CRP and MDA has a definite pattern in AMI, CRP level starts to decline by 3rd day and MDA levels starts to decline by 5th day. There is also a significant positive correlation between CRP and MDA on day 1.

Conclusion: These results suggest that inflammation and oxidative stress may play important role in acute myocardial infarction; hence, monitoring of these parameters is highly recommended which may be beneficial to improve the patient's outcome following AMI.

Keywords: Acute Myocardial Infarction, *C - reactive protein (CRP)*, Malondialdehyde (MDA), Lipid Peroxidation, Oxidative Stress.

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INTRODUCTION:

Acute myocardial infarction that occurs from interruption of blood supply to a part of the heart which causes damage and potential death of heart tissue¹. It has now become an important health problem despite impressive advancement in diagnosis and management over the last three decades. Over the last decade, disease is often premature and severe, with serious complication and increase mortality in the young.²

Total circulating C-reactive protein levels in the setting of acute myocardial infarction is likely represents a marker of chronic vascular inflammation as well as the inflammatory response to acute myocardial injury, which is dependent on infarct size and host (immune) response factors.³ Sabatine MS et al labelled CRP as a predictor of outcome in AMI and Torzewski M et al, Pasceri V et al, Wang CH et al also stated that CRP to have a direct effect to promote atherosclerotic processes.^{4,5,6,7}

Malondialdehyde, a highly reactive three carbon dialdehyde is a marker of lipid peroxidation which is likely to represent the production of free radical and thereby oxidative stress.⁸ Thus any imbalance between prooxidant and antioxidant defences in which the former dominates defined as “oxidative stress” of which lipid peroxidation is one important manifestation⁹ Oxidative stress may play important role in the pathogenesis of myocardial infarction.¹⁰

Materials and Methods:

The study is conducted in a group of 80 individuals consisting of 30 normal healthy subjects as control and 50 diagnosed cases of Acute Myocardial Infarction, irrespective of age and sex taken randomly from the admitted patients of Cardiology department of Gauhati Medical College (GMC), Assam. The Research

and Ethical committee of GMC has approved this study and Informed consent was obtained from all patients and control subjects participating in this study.

Selection of the patient is done on a history of Heavy, Squeezing or Crushing central chest pain, characteristic electrocardiogram (ECG) changes and elevated creatine kinase isoenzyme MB (CK-MB) and troponin t within 12 hrs of onset of pain. (Alpert JS et al 2000) and their blood samples for estimation of Serum C-Reactive Protein & Malondialdehyde were collected on day1, day3, day5 and at the time of discharge(8±1) .

Diseases which may interfere with the results of the present study like Renal failure, Rheumatic fever ,Rheumatoid Arthritis, Inflammatory Bowel disease, Gout ,Neoplastic disease and Bacterial Infection were excluded from the current study. None of the subjects (patients or controls) were taking antioxidant, vitamin supplements, probucol, quinidine, disopyramide, or other drugs known as affect the study.

All patients received antiplatelet therapy (aspirin or clopidogrel), unfractionated heparin, GP (Glycoprotein) IIb/IIIa inhibitors, beta blockers and oral ACE inhibitors.

Taking all aseptic and antiseptic precautions 3 ml of blood is drawn from the Ante cubital vein. All the biochemical estimations were done based on colorimetric principles. Serum Malondialdehyde (MDA) was measured as thiobarbituric acid reactive substance by colorimetric method by modified procedure of Yagi's and Satoh's methods (Satoh K 1978)¹⁰ and Serum C-Reactive Protein was estimated by using the Turbidimetric Immunoassay method (Chenillot O et al 2000).

SPSS 16.0 statistical package were used. The results obtained were presented in Mean \pm SD and then compared between different groups of the study by applying students't' test, probability (p) less than 0.05 is considered significant. Pearson's correlation coefficients were calculated to correlate between CRP and MDA.

Observations & Results:

The test group comprises of 50 individuals with AMI (38 males and 12 females, age ranging from 35 years to 81 years) with a mean of 56.5 years and 30 individuals (25 males and 5 females, age ranging from 38 years to 77 years) with a mean of 53.4 years comprises of the control group.

Serum C - reactive protein and Malondialdehyde readings were taken on Day 1, 3, 5 and at the time of discharge (8 \pm 1) from the onset of symptoms and Table 1 shows statistically significant value of Serum C - reactive protein and Malondialdehyde on all the days as compared to Controls group. Figure1 shows mean CRP & MDA levels on Day 1,3,5 & Discharge, CRP peaks around 3rd day & MDA around 5th day followed by decline. Again Table 3 shows a positive correlation between CRP and Malondialdehyde on day 1 compared to the control group but we did not find any significant correlation between CRP & Malondialdehyde on day3, 5 and at the time of Discharge (8 \pm 1).

Discussion: C-reactive protein, an acute phase protein, is an inflammatory and a risk marker³ and is also a predictor of outcome in Acute myocardial infarction⁶. This study showed that the CRP level in AMI is markedly elevated and starts to decline by 3th day not reaching the baseline by discharge which matches with the result obtained by Kushner I et al, 1998.¹²

MDA, a marker of lipid peroxidation, have a significantly higher values in AMI on all the days as compared to the control subjects (p<0.001). However the values differ from study to study which may be due to different methods employed for measuring lipid peroxidation. The current study also showed that MDA has a definite pattern in AMI and its level continues to

Table 1. Clinical and biochemical indexes in the study group

Parameter	#Control Subjects	#AMI Patients
DAY 1 OF AMI		
CRP (mg/dl)	0.43±0.19	3.94±2.77**
MDA (nmol/ml)	1.85±0.22	2.58±0.83**
DAY 3 OF AMI		
CRP (mg/dl)	0.43±0.19	5.53±3.24**
MDA (nmol/ml)	1.85±0.22	2.97±0.82**
DAY 5 OF AMI		
CRP (mg/dl)	0.43±0.19	5.18±3.10**
MDA (nmol/ml)	1.85±0.22	3.56±0.96**
AMI ON DISCHARGE(8±1)		
CRP (mg/dl)	0.43±0.19	4.03±3.01**
MDA (nmol/ml)	1.85±0.22	3.31±0.90**

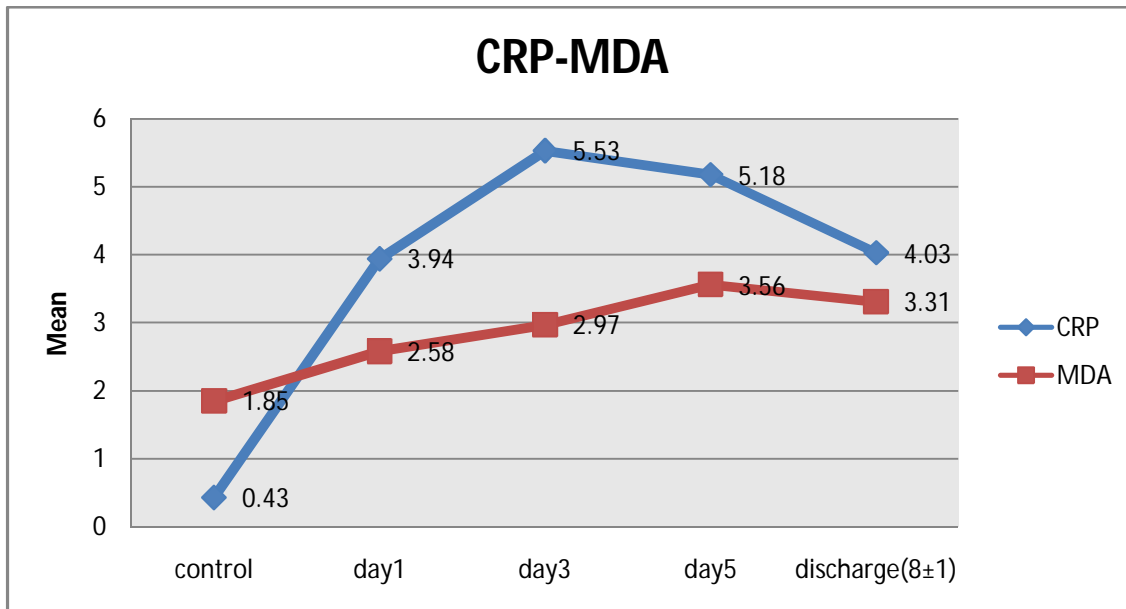
Legend #Values are given as mean ± S.D. (*p<0.05-Significant, **p<0.001-Highly Significant, NS-Not significant)

Table 2: Correlations between CRP & Malondialdehyde (MDA) in DAY 1, 3, 5 & Discharge (8 ±1) OF AMI.

	r value	#p value
CRP & MDA ON DAY1	0.34	<0.05*
CRP & MDA ON DAY 3	0.18	>0.05^{NS}
CRP & MDA ON DAY 5	0.16	>0.05^{NS}
CRP & MDA ON DISCHARGE(8 ±1)	0.09	>0.05^{NS}

Legend #*p<0.05-Significant, NS-Not significant

Figure: 1 Comparison of Mean CRP & MDA against time



rise and peaks around 5th day followed by gradual decline not reaching the baseline by discharge which matches with the result obtained by Justo aznar et al 1983.¹²

Our results show a statistically significant and a positive correlation of MDA with CRP on day 1 ($P < 0.05$) and the results matches with YANG Huijian et al 2011 suggesting inflammation & Oxidative stress associated with AMI but the current study fails to show statistical significant correlation between CRP & MDA on Day 3, 5 & on the day of discharge.¹³ It can be speculated that the conventional treatment received in AMI may have different impact on these parameters.

It is always seen that symptomatic & definitive treatment been given following AMI and least importance is given to CRP & MDA follow up as the patient is discharge even when the levels are high enough as seen from our figure1. As CRP is an inflammatory & risk marker along with MDA, these parameters should be followed and patient should not be discharged until these parameters show a marked decline.

Conclusion:

The current study suggest that inflammation & oxidative stress may play important role in acute myocardial infarction and was an attempt at better understanding the behaviour of these biochemical parameters in AMI. It also suggests that anti-inflammatory & anti-oxidant medication may be beneficial in acute myocardial infarction and gradual monitoring of these parameters is highly recommended to improve patient outcome.

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