



## The Diagnostic and Prognostic Value of Certain Acute Phase Proteins in Serum and Plasma of Acute Myocardial Infarction

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### ABSTRACT

**Aim:** The purpose of this study is to investigate the diagnostic and prognostic value of certain acute phase proteins in serum and plasma of cases of acute myocardial infarction. Myocardial infarction is the catastrophic frequently fatal form of ischemic heart disease that results from precipitous reduction or arrest of a significant portion of the coronary flow. **Design/Methods:** Acute myocardial infarction was studied in three groups depends on with or without associated complications. **Results:** in all three groups, mean serum levels of Alpha1 Antitrypsin, Alpha1 Acid Glycoprotein, Ceruloplasmin and Fibrinogen on seventh day is higher than the first and fifteenth day mean. **Discussion:** The serum levels of Alpha1 Antitrypsin, Alpha1 Acid Glycoprotein, Ceruloplasmin and Fibrinogen levels were significantly increased in seventh day compared with other previous days. **Conclusions:** Alpha1 Antitrypsin, Alpha1 Acid Glycoprotein, Ceruloplasmin and Fibrinogen is a useful index, not only in the diagnosis and prognosis, but also in some critical situations of taking some important decision.

**KEYWORDS :** Myocardial Infarction, Alpha1 Antitrypsin, Alpha1 Acid Glycoprotein, Ceruloplasmin and Fibrinogen

### Introduction

Ischemic heart disease is the most widespread health problem over the age 35. The death rate due to coronary artery disease is increasing in developing countries<sup>1</sup>. The diagnosis and inability to predict prognosis, poses difficult problem, because of a non-availability of specific and sensitive laboratory tools. The magnitude of this problem dictates, that many medical personnel are involved in some aspects of recognition and treatment of ischemic heart disease, of which myocardial infarction is the most important one<sup>2</sup>.

Once the myocardial infarction has set in, it may take up any of the several pathways. The first and foremost is sudden cardiac death. The incidence of which is 20-25%. If the patient reaches the hospital in a stable condition and has no extension of infarction, 75 – 80% chances of surviving the attack<sup>3</sup>. However the first one week may be smooth recovery or may be marked by a number of complications<sup>4,5</sup>.

The relation between acute phase proteins and inflammation was observed as early as 1921 (Fahraeus et al.). in late forties Tiselius moving boundary electrophoresis showed alterations in plasma proteins during inflammation. In myocardial infarction, severe coronary arterial narrowing gives rise to ischemic necrosis of myocardial cells<sup>6</sup> which become evident 5-6 hrs after the onset of myocardial ischemia.

The various acute phase proteins include C- reactive protein (CRP), Alpha1 Antitrypsin, Alpha1 Acid Glycoprotein, Ceruloplasmin and Fibrinogen. The concentration of alpha-globulins and fibrinogen were found to increase roughly in proportion to the intensity and spread of inflammatory process<sup>7</sup>.

The significance of individual acute phase proteins in cases of myocardial infarction, with regard to diagnosis and prognosis has been undertaken by many workers. In the present study, it is proposed to undertake comparative study of acute phase proteins over a period of seven days as serial estimation in 1st, 3rd and 7th days.

### II. Materials and Methods

#### Ila. Chemicals:

Trypsin, CRP latex antigen, Tyrosine, Fibrinogen and Thrombin were purchased from Sigma chemical company, USA. All the other chemicals used were of analytical grade.

#### Iib. Experimental Design

Forty two patients in the age group of 45-70 admitted in the intensive care unit of Meenakshi Medical College Hospital And Research Institute, Kanchipuram, Tamil Nadu for the study. This includes 30 male patients with acute myocardial infarction in whom a provisional diagnosis was made with specific change in electrocardiogram, indicating

acute myocardial infarction. The remaining twelve patients, including two females were cases of angina, without specific electrocardiographic changes.

The patients were divided into three groups are included

Group- I - Patients were ultimately discharged in good condition (Control)

Group-II – Patients were admitted with myocardial infarction (ECG changes)

Group-III- Patients with myocardial infarction, associated with one or more complications and ultimately resulted in death.

#### Iic. ETHICAL CONCERN

Ethical clearance was obtained from the Ethical committee meeting conducted at Meenakshi Medical College and Hospital.

#### III. Biochemical analysis

Alpha - Antitrypsin was estimated according to the method of Erlanger (1961), C-Reactive Protein were estimated according to the method of Levinger et al., (1958),

#### IV. Results

##### C- REACTIVE PROTEINS IN MYOCARDIAL INFARCTION PATIENTS:

Table 1: Shows the variation in mean serum level of CRP during the study in the three different groups.

In all three groups, mean serum level on first day is higher than the mean serum level of control group. Peak levels are seen on the third day, in all three groups when group –I and Group-II shows a decline in the mean serum level after 3 days, persistent elevation is seen in Group-III.

Particulars	Group-I	Group-II	Group-III
First day	37.0 ± 15.17	56.9 ± 15.07 a*	60.8 ± 15.25b*
Third day	70.00 ± 16.51	91.1 ± 22.76a@	121.6 ± 21.92b@
Seventh day	47.6 ± 16.72	63.5 ± 18.43a*	116.2 ± 41.56a*

Each value is expressed as mean ± SD in each group.

a: as compared with Group I

b: as compared with Group II

Statistical significance: \* p<0.001; @ p<0.01; # p<0.05.

**ALPHA<sub>1</sub> ANTITRYPSIN IN MYOCARDIAL INFARCTION PATIENTS:**

Table 2: Shows the variation in mean serum level of Alpha<sub>1</sub> Antitrypsin during 7<sup>th</sup> days after myocardial infarction in the three different groups.

In all three groups, mean serum level on first day is higher than the mean serum level of control group. Peak levels are seen on the seventh day, in all three groups when group –I and Group-II shows a decline in the mean serum level after 3 days, persistent elevation is seen in Group-III.

Particulars	Group-I	Group-II	Group-III
First day	142.80 ± 54.28	148.7 ± 42.67a*	143.0 ± 42.56b*
Third day	202.1 ± 58.45	204.4 ± 55.47a@	209.0 ± 65.59b@
Seventh day	242.8 ± 49.91	230.1 ± 44.36a*	258.9 ± 47.51a*

Each value is expressed as mean ± SD in each group.

a: as compared with Group I

b: as compared with Group II

Statistical significance: \* p<0.001; @ p<0.01; # p<0.05.

**V. Discussion**

**C - reactive protein:** from the table.1 has been observed that CRP is the most responsive and sensitive index, not only in diagnosis, but also to differentiate those cases of acute myocardial infarction without complications and those associated with complications. Mean serum CRP levels in Group III shows a significant increase than the mean serum levels in Group-II thus indicating that CRP estimation, may serve as a specific criterion for prognosis. The persistent elevated mean serum level (1.3 + 0.1) on the third day and the mean serum levels (0.6+ 0.03). Because after uncomplicated myocardial infarction, CRP should decline after third day and failure in fall of CRP levels, indicates inter current complications, which require investigations.

Three interesting Cases in our present study provides the potential value of regular monitoring of CRP as an useful index for taking some important decisions/ 2 cases belong to Group-III both males. 65 years and 60 years old respectively. ECG recording soon after admission showed changes suggestive of Acute anteroseptal infarction in one case and anterior wall infarction in the second case8.

Alpha 1antitrypsin is a specific index for diagnosis, since the peak levels in all the three groups are significantly increased compared with the mean value of control Group ( Table 2). In the present study, the peak level (242.8 + 49.91) in uncomplicated cases, Group-I is higher than the peak level (230.1 + 44.36) observed in group-II (cases associated with complication). But their increase is not significant.

The ischemic myocardium releases proteases, that activate the complement system. C3 has been observed to localize on injured and infarcted myocardial cells. At this time an inflammatory reaction occurs giving rise to the synthesis of Alpha 1 Antitrypsin9. This increase in the Alpha 1 Antitrypsin level may be due to the response of the myocardium to attempt a repair of damaged tissue, since Alpha 1 Antitrypsin is known to enhance fibrosis, by its inhibitory effect on collagenase and elastase.

Though persistant elevation after seven days, indicate bad prognosis as observed in the present study, the prognostic importance of Alpha 1 Antitrypsin needs to be evaluated further with larger group of patients.

**V. Statistical analysis**

For statistical analysis, one way analysis of analysis of Variance (ANOVA) was used, followed by the Newman-Keuls Multiple Comparison test.

**VI. Conclusion**

From the present study, estimation of serum CRP and Alpha 1 Antitrypsin is an useful index, not only in the diagnosis and prognosis, but also in some critical situations of taking some important decisions like assessment of condition of the patients for transfer from coronary unit or for discharge.

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