CO-RELATION BETWEEN LACTATE DEHYDROGENASE AND CREATINE KINASE-MB IN ACUTE MYOCARDIAL INFARCTION

Kale Bhagwat¹, Habbu Padmini²

¹ Lecturer, Pandit Deendayal Upadhyay Dental College, Solapur, Maharashtra.
² Tutor, KBN Medical College, Gulbarga, Karnataka

Corresponding author: Lecturer, Pandit Deendayal Upadhyay Dental College, Behind Solapur University, Kegaon Dist.- Solapur, Maharashtra. Pin Code - 413 002
Email: kalebhagwat2644@rediffmail.com

ABSTRACT. The aim of our study was to know the most potent cardiac marker from SGOT, LDH and CK-MB and to evaluate the sensitivity and specificity of that marker in diagnosis of myocardial infarction. For this purpose we were selected 30 patients of acute myocardial infarction from different hospitals of solapur city. Blood samples from 30 healthy volunteers were collected and referred as controls. In acute myocardial infarction (AMI) patients the activity of SGOT and LDH were found significantly higher (p < 0.01) as compared to controls. The values were 71.82 ± 12.26 IU/L (control = 35.48 ± 4.43 IU/L) and 239.79 ± 27.57 IU/L (control = 170.39 ± 16.82 IU/L) respectively for SGOT and LDH. But, as both of above markers are also found to be increased in many other clinical conditions, they are non-specific for diagnosis of acute myocardial infarction. Thus, are useful only along with CK-MB to know severity of myocardial infarction. On other hand, CK-MB also found to be elevated at significant level (p < 0.01). The values were 22.88 ± 3.39 IU/L (control = 11.04 ± 2.03 U/L). CK-MB is present in large proportion in myocardium and also it is only specific for myocardial tissue. Thus, it is not found to be elevated in any other clinical conditions. Similarly, CK-MB gets elevated in serum more early as compared to other markers in myocardial infarction hence, it has been considered as the ‘Gold Standard’ for confirmation of acute myocardial infarction.

Key Words: Myocardial infarction, lactate dehydrogenase, creatine kinase-MB, myocardium.

INTRODUCTION

Myocardial infarction (MI) or acute myocardial infarction (AMI), commonly known as a heart attack, results from the interruption of blood supply to a part of the heart, causing heart cells to die. This is most commonly due to occlusion (blockage) of a coronary artery following the rupture of a vulnerable atherosclerotic plaque which is an unstable collection of lipids (cholesterol and fatty acids) and white blood cells (especially macrophages) in the wall of an artery. The resulting ischemia (restriction in blood supply) and ensuing oxygen shortage, if left untreated for a sufficient period of time, can cause damage or death (infarction) of heart muscle tissue (myocardium). (Nigam,2007 ; Rashmi Raghuvanshi et.al.,2007 ; WHO,1979 ; Antman E et al.2000) Diagnosis of acute myocardial infarction is based on clinical features, presence of risk factors, electrocardiographic change and levels of cardiac biomarkers in the serum. Some patients with myocardial infarction have atypical signs and symptoms. Classical symptoms of acute myocardial infarction include sudden chest pain (typically radiating to the left arm or left side of the neck), shortness of breath, nausea, vomiting, palpitations, sweating, and anxiety (often described as a sense of impending doom). Women may experience fewer typical symptoms than men, most commonly shortness of breath, weakness, a feeling of indigestion and fatigue. Some have little or no chest discomfort and the electrocardiographic changes may not indicate the diagnosis. In such cases cardiac biomarkers are a useful diagnostic tool, especially 4 to 6 hour after the onset of signs and symptoms of myocardial infarction. In patients with possible acute myocardial infarction who have atypical signs and symptoms and inconclusive electrocardiographic findings, measurements of serum levels of cardiac biomarkers are used to assist in the diagnosis and appropriate
RESULTS AND DISCUSSION

Myocardial ischemia results from the reduction of coronary flow to such an extent that supply of oxygen to the myocardium does not meet the oxygen demand of myocardial tissue. When this ischemia is prolonged and irreversible then myocardial cell death and necrosis occurs which is defined as myocardial infarction. (Golam K. alam and David B, 2002)

Oxygen deprivation due to prolonged ischemia leads to a cascade changes in the metabolism in the myocardial tissues beginning from anaerobic glycolysis, inhibition of ATP-dependent transport process in cell membrane, electrolyte shift, cellular edema and to finally loss of cell membrane integrity. Due to increased glycolysis lactate concentration decreases the intracellular pH, resulting in release and activation of lysosomal proteolytic enzymes and thereby disintegrating intracellular structures and structurally bound proteins. The release and appearance of these ischemia affected biomolecules in the blood stream is an outcome of these metabolic changes. (McCullough D et.al1992 ; Kent Lewandowski et.al.2002)

The diagnosis of acute myocardial infarction (AMI) has traditionally been based on the characteristic clinical history, electrocardiographic abnormalities and increased serum concentrations of cardiac marker enzymes. ECG is the most widely used method of the diagnosis of myocardial infarction. But many times ECG shows inconclusive pattern. Thus, the measurements of serum enzymes as a reflection of damage to myocardial muscle cells still play an important role in the diagnosis of AMI. The most commonly used biomarkers are serum glutamate oxaloacetate transaminase (SGOT), creatine kinase-MB (CK-MB) and lactate dehydrogenase (LDH). (Behar S. et. al.,1977; Rude R et.al.1983; Drexel H et.al.,1983; Chan K et.al.,1986 ; Patel N and Graham J, 1999 ; Mauro Panteghini, 2004) We had estimated the activities of above enzymes in acute myocardial infarction with respect to control.

According to our estimation, serum glutamate oxaloacetate transaminase (SGOT) activity in controls were 35.48 ± 4.43 IU/L while same in patients of myocardial infarction were found to be 71.82 ± 12.26 IU/L. Thus, there was nearly 2.0 times increase in SGOT activity in acute myocardial infarction as compared to controls (p < 0.01). (Table-I)

The activity of lactate dehydrogenase (LDH) in controls were 170.39 ± 16.82 IU/L while in patients of...
Myocardial infarction were 239.79 ± 27.57 IU/L. Thus, there was nearly 1.4 times increase in LDH activity in acute myocardial infarction as compared to controls (p < 0.01). (Table-I)

The activity of creatine kinase-MB (CK-MB) in controls were 11.04 ± 2.03 U/L while in patients of myocardial infarction were 22.88 ± 3.39 U/L. Thus, there was nearly 2.1 times increase in CK-MB activity in acute myocardial infarction as compared to controls (p < 0.01). (Table-I)

<table>
<thead>
<tr>
<th>Enzyme Activity</th>
<th>Control (N = 30)</th>
<th>AMI Patients (N = 30)</th>
<th>P Value Compared To Normals</th>
</tr>
</thead>
<tbody>
<tr>
<td>CK-MB activity in IU/L</td>
<td>11.04 ± 2.03</td>
<td>22.88 ± 3.39</td>
<td>p &lt; 0.01</td>
</tr>
<tr>
<td>SGOT activity in IU/L</td>
<td>35.48 ± 4.43</td>
<td>71.82 ± 12.26</td>
<td>p &lt; 0.01</td>
</tr>
<tr>
<td>LDH activity in IU/L</td>
<td>170.39 ± 16.82</td>
<td>239.79 ± 27.57</td>
<td>p &lt; 0.01</td>
</tr>
</tbody>
</table>

The levels of serum glutamate oxaloacetate transaminase activity begin to rise 3-8 hours after the onset of the myocardial injury with peak levels on an average at 24 hours and finally it returns to normal levels in 3-6 days. It was considered as a very good marker of cardiac injury as it was found to be normal in pulmonary embolism, acute abdominal conditions and other heart conditions such as angina and pericarditis. But later on, its use becomes limited due to its elevation in trauma to skeletal muscles, bone and liver diseases. Thus, this may have chances of false positive results. (Varley H and Gowenlock A,1984 ; Baron D et.al. 1956; Kachmar J, 1976)

An increase in serum lactate dehydrogenase (LDH) activity is found following myocardial infarction beginning within 6 – 12 hours and reaching a maximum at about 48 hours and it remains elevated for 4-14 days before coming down to normal levels. The prolonged elevation makes it a good marker for those patients admitted to the hospital after several days of myocardial infarction. However, its use is discouraged due to its non-specificity as its increased levels are found in progressive muscular dystrophy, myoglobinuria, leukemia, pernicious anemia, megaloblastic and hemolytic anemia, renal disease and in generalized carcinoma. On other hand as erythrocytes contain large amount of lactate dehydrogenase, any slight hemolysis causes large elevation in serum enzyme activity of lactate dehydrogenase thus predicting false positive results. (Fogh A and Strensen,1982 ; Lee T and Goldman L, 1986) Serum creatine kinase activity increases following myocardial infarction beginning within 6 hours and peaking on an average at 24 hours and returning to normal within 2-3 days. The area under the peak and the slope of the initial rise are proportional to the size of the infarction. However, its presence in large amounts in skeletal muscle and increased levels found in muscular dystrophy, hypothyroidism, hypothermia, alcoholism, cerebrovascular accidents and a variety of myopathies make it unsuitable as a marker of myocardial injury. However, creatine kinase has three isoenzymes namely CKBB, CKMB and CKMM each consisting of two subunits named according to main tissue of occurrence : B (brain) and M (skeletal muscles). Myocardium contains 40% CKMB and 60% CKMM where as skeletal muscles contain about 97% CKMM, 2-3% CKMB and traces of CKBB. Being highest in proportion in myocardium CKMB has been used as the biochemical marker in patients with suspected acute myocardial infarction (AMI). Serum CK-MB kinetics gives useful information regarding the extent and timing of myocardial injury. It begins to increase between 3-5 hours after the onset of infarction and peaking at 16-20 hours. Excluding acute myocardial infarction , other diseases never causes elevation in the serum CK-MB activity. Thus, it has been considered as the 'Gold Standard' for confirmation of acute myocardial infarction. (Seckinger D et.al,1983 ; Roberts R,1988; Collison P et.al.,1992; Lott J et.al.1995)

**CONCLUSION**

Myocardial ischemia results from the reduction of coronary flow to such an extent that supply of oxygen to the myocardium does not meet the oxygen demand of myocardial tissue. When this ischemia is prolonged and irreversible then myocardial cell death and necrosis occurs which is defined as myocardial infarction. Among the diagnostic tests available to detect heart muscle damage are an electrocardiogram (ECG), echocardiography, cardiac MRI and various blood tests. The most often used blood cardiac markers are the creatine kinase-MB (CK-MB), serum glutamate oxaloacetate transaminase, lactate dehydrogenase and the troponin levels. However, assay of troponin is
costly. The other cardiac markers like serum glutamate oxaloacetate transaminase (SGOT) and lactate dehydrogenase (LDH) are non-specific as they are elevated in other diseases also. Thus, being highest in proportion in myocardium CK-MB has been used as the biochemical marker in patients with suspected acute myocardial infarction (AMI). Serum CK-MB kinetics gives useful information regarding the extent and timing of myocardial injury. It begins to increase between 5-6 hours after the onset of infarction and peaking at 22-24 hours. Excluding acute myocardial infarction, other diseases never causes elevation in the serum CK-MB activity. Thus, it has been considered as the ‘Gold Standard’ for confirmation of acute myocardial infarction.

Acknowledgment
I would like to thank the Biochemistry Department of V. M. Medical College, Solapur. I am also indebted to all the patients and our colleagues for their co-operation in this research.

REFERENCES
21) Rao B and Deshpande V. Experimental biochemistry : a student companion, I. K. international, New Delhi, 1st edn. 2007
22) Rashmi Raghuvanshi and Aiki Kaul. Xanthine oxidase as a marker of myocardial infarction. IJCB, 2007; 22 (2): 90-
