Serial values for hematologic and biochemical analysis after myocardial infarction in rats

Mi-Jin Lee, Hyun-Jin Tae, Ying-Hua Li, Do-Hyeon Yu, In-Ae Han, Seok-Won Lee, Dong-Choon Ahn¹, In-Shik Kim, Jin-Ho Park

College of Veterinary Medicine & Bio-Safety Research Institute, Chonbuk National University, Jeonju, 561-756, South Korea; ¹School of Veterinary Medicine, Kangwon National University, Chuncheon, 200-701, South Korea
(Received 27 April 2008, accepted in revised from 19 June 2008)

Abstract

To diagnose acute myocardial infarction (MI), many cardiac markers have been used in hematologic and biochemical analysis, and many studies have been published for hematologic and biochemical analysis associated with human acute MI. However, after occurrence of acute MI, the serial investigation for values in hematologic and biochemical analysis including chronic MI has rarely been performed. To observe the change of the serial values in hematologic and biochemical analysis, we induced artificial MI. The left main descending artery (LMDA) of the left coronary artery was ligated during the progression (day 1, 3, 5, 7, 14 and 30) of MI. Total 66 Sprague-Dawley rats were divided into the sham group (n=24, thoracotomy without LMDA ligation) and the experimental (MI) group (n=42, with LMDA ligation). And all individual in each group was sacrificed at day 1, 3, 5, 7, 14 and 30 for the hematologic and biochemical analysis. In comparison of hematologic analysis between the sham and MI groups, the mean values of red blood cell (RBCs), hemoglobin and hematocrit (HCT) showed a steady increase. In biochemical analysis, the mean values of glucose, cholesterol, total creatine kinase (CK) and isoenzyme MB, and lactate dehydrogenase (LDH) were increased in all MI groups compared with the sham groups. The results of this study suggest that early hematologic and biochemical mean values occurred after acute MI are similar to those of human acute MI. In conclusion, we could observe the
alterations and serial values in hematologic and biochemical analysis to the extent of chronic status after acute MI.

Key words: Hematology, Biochemistry, Myocardial infarction, Serial values

Introduction

The main cause of myocardial infarction (MI) is a focal complete obstruction in one of the main coronary arteries as a result of platelet aggregation and coagulation. This event causes irreversible ischemic damage or death of myocardial cell, which results in impaired contractility of the heart muscle within seconds\(^1\). Thus, MI acts as a significant factor of acute heart failure or left ventricular dysfunction. Clinical signs of MI can present differently in individual patients, with symptoms that range from none at all to sudden cardiac death. Despite the diversity of the symptoms of MI, some characteristic symptoms exist including characteristic chest pain, looking pale, sweating, syncope and impairment of cognitive function without other cause\(^1\)\(^\sim\)\(^5\).

When these symptoms are encountered, clinicians perform diagnostic tests, including serial electrocardiograms (ECG), X-rays and blood tests, to determine if MI is involved\(^5\)\(^\sim\)\(^6\). Quick and reliable diagnosis of MI is the most important factor affecting the mortality and morbidity of this condition. The diagnosis of MI has been based on the presence of two of the three following conditions: characteristic chest pain, diagnostic ECG changes and elevation of the cardiac markers in blood samples\(^2\)\(^\sim\)\(^5\)\(^,\)\(^7\)\(^\sim\)\(^9\). For example, because several markers with different sensitivities and specificities are used for the diagnosis of MI, it is very difficult to make an accurate diagnosis using only a single marker\(^5\). In addition, ECG could been a poor diagnostic test for acute MI patients because approximately half of all acute MI patients show normal or no diagnostic ECG\(^6\). Therefore, many researchers have constantly performed the study for accurate diagnosis of MI.

Among some conditions for the evaluation of acute MI, cardiac markers in serum have been facilitated by the development of highly sensitive and specific determinations. Many studies for changes in the activity of serum enzymes, such as aspartate aminotransferase (AST), lactate dehydrogenase (LDH), creatine kinase (CK) and isoenzyme MB (CK-MB), have been widely performed in the early phase of suspected ischemic myocardial injury\(^5\)\(^,\)\(^7\)\(^\sim\)\(^9\). In addition, recently several studies have been reported for the correlation between the value such as WBC\(^10\)\(^,\)\(^11\), hematocrit (HCT)\(^12\)\(^,\)\(^13\) and glucose\(^14\)\(^\sim\)\(^16\) and the mortality in MI patients. Like this, many studies have been published for hematologic and biochemical analysis in relation to acute MI in human. However, few studies for the serial observation of alterations in hematologic and biochemical analysis from acute to chronic MI has been accomplished. Therefore, we observed the serial alterations in hematologic and biochemical