Original Article

Evaluation of Cardiac Markers in Patients with Myocardial Infarction

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Abstract

Background: One of the major causes of morbidity and mortality worldwide is acute myocardial infarction (AMI). Various cardiac markers have been used from time to time for assessing the diagnosis and prognosis of the disease. Hence; we planned the present study to evaluation of cardiac markers in patients with myocardial infarction. **Subjects and Methods:** The present study included assessment of different cardiac markers in patients with myocardial infarction. For the present study, ethical approval was obtained from the ethical committee of the institution, and written consent was obtained after explaining in detail the entire research protocol. A total of 20 AMI patient and 20 healthy controls were included in the present study. Fresh blood samples were taken and mean serum creatine kinase (CK), and cardiac troponin (CT) values were assessed and compared. All the results were analysed by SPSS software. Chi- square test was used for assessment of level of significance. **Results:** Mean value of CK-MB among the patients of the AMI group and the control group was 28 IU/L and 18 IU/L respectively. Mean value of CT among the patients of the AMI group and the control group was 4.8 ng/L and 0.5ng/L respectively. The cardiac biomarkers were found to be significantly raised among the AMI patients in comparison to the healthy controls. **Conclusion:** These biomarkers are assessable biological variables which function as indices for health analysis.

Keywords: Acute myocardial infarction, Cardiac marker.

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Received: February 2018
Accepted: March 2018

Introduction

One of the major causes of morbidity and mortality worldwide is acute myocardial infarction (AMI). The highest risk of fatality occurs within the initial hours of onset of AMI. Thus, early diagnosis of cardiac ischemia is critical for the effective management of patients with AMI.[1] Improper diagnosis of patients with chest pain often leads to inappropriate admission of patients without AMI and vice versa.[2-4] Early diagnosis of acute myocardial infarction (AMI) in patients presenting with acute chest pain improves clinical outcome. Moreover, rapid exclusion of AMI is important to triage patients in view of limited resources in the emergency department. Measurement of cardiac troponin levels, as a marker of myocyte necrosis, is essential for diagnosing AMI. Compared with sensitive troponin assays, high-sensitivity troponin assays enhance the accuracy and speed of the diagnosis, improve outcome, and are cost-effective.[2,3]

The discovery of cardiac troponins, in particular, has heralded a new age in the diagnosis and treatment or management of a broad spectrum of diseases, grouped together under the heading of acute coronary syndrome, and including stable and unstable angina, and non-Q wave infarction to Q-wave infarction.[5,6] Hence; we planned the present study to evaluation of cardiac markers in patients with myocardial infarction.

Subjects and Methods

The present study was conducted in the department of cardiac medicine of the medical institute and it included assessment of different cardiac markers in patients with myocardial infarction. For the present study, ethical approval was obtained from the ethical committee of the institution, and written consent was obtained after explaining in detail the entire research protocol. A total of 20 AMI patient and 20 healthy controls were included in the present study. Complete demographic details of all the patients were obtained. Exclusion criteria for the present study included:

- Patients with history of any other systemic illness,
- Patients with any known drug allergy,
- Patients with history of any metabolic disorder

Fresh blood samples were taken and mean serum creatine kinase (CK), and cardiac troponin (CT) values were assessed and compared. All the results were analysed by SPSS software. Chi- square test was used for assessment of level of significance.

Results

In the present study, a total of 40 subjects were analysed. Mean age of the patients of the study group and AMI group

was 48.7 and 49.5 years. There were 12 males 8 females in the AMI group, while there were 11 males and 9 females in the control group. Mean value of CK-MB among the patients of the AMI group and the control group was 28 IU/L and 18 IU/L respectively. Mean value of CT among the patients of the AMI group and the control group was 4.8 ng/L and 0.5ng/L respectively. The cardiac biomarkers were found to be significantly raised among the AMI patients in comparison to the healthy controls.

Table 1: Demographic data

Parameter	AMI patients	Controls
Number of subjects	20	20
Mean age (years)	49.5	48.7
Males	12	11
Females	8	9

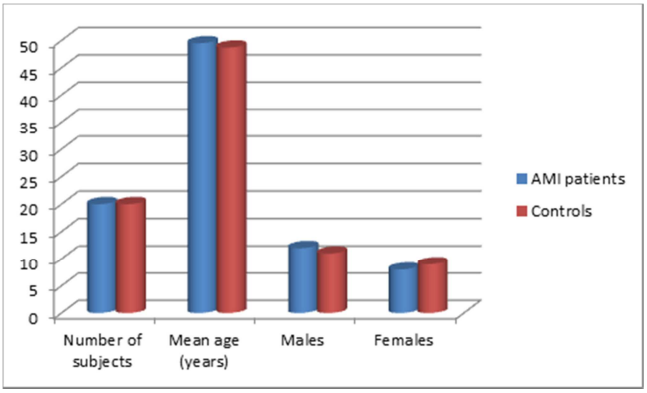

Figure 1: Demographic data

Table 2: Comparison of cardiac makers in between the two study groups

Biomarker	AMI patients	Controls	p- value
CK-MB (IU/L)	28	18	0.01
CT (ng/L)	4.8	0.5	0.00

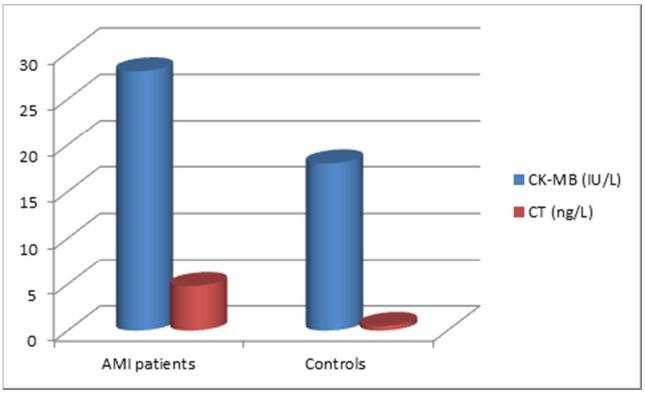

Figure 2: Comparison of cardiac makers in between the two study groups

Discussion

Myocardial infarction (MI) is the leading cause of death in the developed world. Biomarkers have an essential role in diagnosis, risk stratification, guiding management and clinical decision making in the setting of patients presenting with signs and symptoms of MI.[7]

Cardiac enzymes" is a broad term encompassing several intracellular myocyte components that can be found in serum and measured under certain circumstances such as myocardial ischemia, trauma, and myocarditis. In the proper clinical setting, elevation in the level of enzymes present in serum is a key in the diagnosis of myocardial infarction. While troponin is the most commonly used cardiac enzyme for diagnosis of myocardial infarction, others exist and may be helpful in some situations.[8-10]

In the 1970s radioimmunoassays were developed and revolutionized laboratory medicine including AMI diagnosis. Immunoassays for myoglobin and CKMB were developed. Subsequently immunoassays were substantially improved by using monoclonal antibodies, and rapid immunoassays for measuring the so-called CKMB "mass" replaced CKMB activity measurements as the criterion standard for AMI diagnosis.[11,12]

In the present study, a total of 40 subjects were analysed. Mean age of the patients of the study group and AMI group was 48.7 and 49.5 years. There were 12 males 8 females in the AMI group, while there were 11 males and 9 females in the control group. The early and accurate diagnosis of acute myocardial infarction is obviously a desirable goal for assessment of symptoms and planning of therapy. Additionally, expensive coronary care unit time should be utilized in a cost-effective manner. Chest pain syndromes are not specific, and absolute ECG diagnosis ("Q wave infarction") is specific but insensitive.[14]

In the present study, mean value of CK-MB among the patients of the AMI group and the control group was 28 IU/L and 18 IU/L respectively. Mean value of CT among the patients of the AMI group and the control group was 4.8 ng/L and 0.5ng/L respectively. The cardiac biomarkers were found to be significantly raised among the AMI patients in comparison to the healthy controls. Determination of CK–MB isoenzyme has a 98% predictive value for myocardial necrosis with a positive enzyme profile and a 100% negative predictive value for the absence of necrosis with a normal profile. Values must be assessed within 24 hours of symptom onset, however.[15]

Advances in assay technology have led to a refinement in the clinical ability to detect and quantify cardiomyocyte injury. These assays increased diagnostic accuracy at presentation, substantially reduced the sensitivity deficit of cTn at presentation for MI and the associated "troponin-blind" interval, and allowed the recent development of several novel strategies for the early rule-out or early rule-in of MI. These improved assays are labeled "sensitive" when able to detect cTn in ~20% to 50% of healthy individuals and "high-sensitivity" if they detect a cTn level in >50% of reference (apparently healthy) subjects, and if they have a coefficient of variation of <10% at the 99th percentile upper-reference limit of the assay. High-sensitivity assays can accurately detect cTn at lower levels than older-generation assays, giving them higher sensitivity for the detection of MI at presentation, which means that the time interval to the second measurement of high-sensitivity cTn (hs-cTn) can be significantly shortened, thereby reducing the time to diagnosis and improving efficiency in the ED.[12-14] Lee TH et al studied the performance of emergency room strategies using a single sampling of total creatine kinase (CK) only and total CK with, if total CK levels were elevated, CK-MB

levels in 639 patients with acute chest pain, including 386 patients who were admitted and 253 patients who were discharged. Acute myocardial infarction was diagnosed in 104 patients and excluded in 535. An elevated total CK level had a sensitivity of only 38% and specificity of only 80%, whereas a CK-MB level over 5% of an elevated total CK level had a sensitivity of only 34% and specificity of 88%. The sensitivities of both CK and CK-MB were higher in patients who arrived more than four hours after the onset of symptoms, and, in this population, the strategy using CK-MB performed significantly better than the strategy using total CK alone. Since a very positive CK-MB in a low-risk patient can greatly raise the probability of myocardial infarction, future strategies using CK-MB may have a role in selected subsets in determining which patients should not be sent home. However, the sensitivity of a single sampling of CK and CK-MB is too low for these assays to be used to exclude myocardial infarction in the emergency room or to be used as the rationale for deciding not to admit a patient.[16]

Conclusion

Under the light of above obtained results, the authors conclude that these biomarkers are assessable biological variables which function as indices for health analysis. However; further studies are recommended.

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How to cite this article: Onunu DD, Eze AN, Omuro EU. Evaluation of Cardiac Markers in Patients with Myocardial Infarction. Acad. J Med. 2018;1(1):4-6.

DOI: dx.doi.org/10.21276/ajm.2018.1.1.2

Source of Support: Nil, **Conflict of Interest:** None declared.