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Research Article

Evaluation of Cardiac Troponin I and CK-MB in Sudanese Patients with Acute Coronary Syndrome

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Abstract: The objective of the study was to estimate levels of cardiac troponin I and CK-MB in patients with acute coronary syndrome. A total of 70 patients categorized according to ECG results to non-ST elevation myocardial infarction (NSTEMI) or ST myocardial infarction (STEMI) patients or unstable angina (UA). 5.0 ml of venous blood samples were collected and separated to obtain serum for estimation of serum troponin I and CK-MB. The mean values of CK-MB and cTnI were 65.0 ±10.4 and 6.5 ± 8.2, respectively. 32.1% of patients with UA show elevated CK-MB (> 25 U/L) while 96.6% of patients with STEMI and 83.3% show elevated levels of CK-MB. cTnI seen elevated (>1.5 ng/ml) as follows: 3.5 % in patients with UA, 96.6% in patients with STEMI, and 50% in patients with NSTEMI. From the results of this study and previous studies, no available biomarker offers ideal diagnostic properties for ACS, such as early detection, high sensitivity and specificity, easy availability, and cost effectiveness. But cTnI and CK-MB with ECG were with sufficient sensitivity and specicifity in diagnosis of STEMI patients.
Keywords: ACS, cTnI, CK-MB, STEMI, Unstable angina

INTRODUCTION

The diagnosis and management of patients with acute coronary syndrome (ACS) have evolved dramatically over the past decade. Biomarkers play an important role in the diagnosis of ACS, especially in unstable angina and non-ST-segment elevation myocardial infarction. Among these, cardiac troponin and creatine kinase appear to be the most sensitive and specific markers of myocardial injury (1).

A biomarker is a substance used as an indicator of a biologic state mainly diagnosis or monitoring of diseases. Cardiac biomarkers are protein components of cell structures that are released into circulation when myocardial injury occurs. In a patient having a typical chest pain, ECG changes, and elevation of cardiac biomarkers, most likely this patients is with myocardial injury. Because chest pain and ECG are highly variable and not specific, the biomarker abnormality lend objectivity to help define the diagnosis of acute myocardial infarction (AMI) [2].

Cardiac biomarkers are not used for the diagnosis of AMI, but are very useful in patients of non-diagnostic ECG. The patients with ischaemic chest pain and diagnostic ECG with ST segment elevation may be candidates for thrombolytic therapy or primary angioplasty. Treatment should not be delayed to wait for cardiac marker results, especially since the sensitivity is low in the first 6 hours after symptom onset [3].

The most common cardiac biomarkers used in the evaluation of acute coronary syndrome are troponin T and I, CK-MB, myoglobins, and C-reactive protein (hs-CRP). Out of these troponin T and I are the markers of choice for detecting the heart damage because of its good specificity and senstivity[1].

This study aimed to evaluate the Troponin I and CK-MB in patients with acute coronary syndrome.

MATERIALS AND METHODS

The study was conducted in Khartoum state at Alshaab Hospital and Sudan Cardiac Center during the period from September 2014- November 2014. Consecutive 70 patients categorized according to ECG results to non-ST elevation myocardial infarction (NSTEMI) or ST myocardial infarction (STEMI) patients or unstable angina (UA). The patient were admitted at cardiac care units complains from the common symptoms of acute coronary syndrome (ACS) which is typical chest pain, sweating, breathing shortness and some of them had palpitation and vomiting. 5.0 ml of venous blood samples were collected and separated to obtain serum to be analyzed for troponin I and CK-MB.

Statistical analysis

The data was analyzed by the computer software program Statistical Package for Social Sciences (SPSS version 10, Chicago). Results were expressed in mean ± standard deviation (M±SD).

RESULTS

This study shows that 96.6% of total 30 STEMI patients had significantly higher CK-MB compared to NSTEMI patients who show 83.3% of total 12 NSTEMI patients had elevated CK-MB at baseline samples in the other ACS 32.1% of total 28 OF UA shows slightly elevated CK-MB and 67.8% had normal CK-MB regarding too Troponin I, the shows 96.6% of total 30 STEMI patients had significantly higher cTn compared to NSTEMI patients which shows 50% of total 12 NSTEMI patient also had significantly higher cTn while in the other side of UA the results shows only 3.5% of 28 patient with UA had high cTn There was a significant difference regarding peak of Troponin I and CK-MB levels between the 3 groubs, STEMI patients had significantly higher peak Troponin I and CK-MB levels compared to NSTEMI patients and UA.

Table 1: Frequency of patients according to ECG results

Diagnosis	Patients Frequency	Percentage%
STEMI	30	42.9%
NSTEMI	12	17%
UA	28	40%

Table 2: Mean of age, CK-MB, and Troponin I in study population

Variable	Mean ± SD
Age	65.0 ±10.4
Troponin I ng/ml	6.5 ± 8.2
CK-MB U/L	87.2 ± 10.6

Table 3: Descriptive analysis of cardiac markers according to final diagnosis

Cardiac Markers	Final diagnosis		
	UA	STEMI	NSTEMI
CK-MB			
Positive (>25 U/L)	32.1%	96.6%	83.3%
Negative (<25 U/L	67.8%	3.33%	16.6%
Troponin I			
Positive (>1.5 ng/mL)	3.5%	96.6%	50%
Negative (<0.6 ng/mL)	96.4%	3.33%	50%

DISCUSSION

Many published studies confirmed that cardiac troponin (cTnI and cTnT) are the most diagnostically sensitive and specific biomarker of myocardial injury [11-13].

Using cardiac troponins is recommended for the diagnosis of AMI by the National Academy of Clinical Biochemistry (NACB) Laboratory Medicine Practice Guidelines [10] and the International Committee `of Experts in Epidemiology, Pathology, Clinical, and Laboratory Medicine [14].

Serial sampling, including a baseline sample and follow-up examination 8 to 12 hours after symptom onset is recommended [4].

In the early days, the elevated serum levels of CK-MB, the cardiac-specific isoform of CK, was used for the diagnosis of myocardial necrosis. This measure satisfied one component of the diagnostic criteria for MI, as proposed by the World Health Organization, and was later extended for monitoring trends and determinants in a cardiovascular disease study [14-16].

Causes can lead to false-positive CK-MB [1]

- Significant skeletal injury
- Myocarditis
- Blunt chest trauma
- Cardiac catheterisation
- Shock
- Cardiac surgery
- Post-cardio-pulmonary resuscitation

This study showed that 96.6% of total 30 STEMI patients had significantly higher Creatine kinase myocardial bound (CK-MB) compared to NSTEMI patients which show 83.3% of total 12 NSTEMI patients had elevated CK-MB at baseline samples in the other ACS 32.1% of total 28 OF UA shows slightly elevated CK-MB and 67.8% had normal CK-MB regarding too Troponin I, the shows 96.6% of total 30 STEMI patients had significantly higher cTn compared to NSTEMI patients which shows 50% of total 12 NSTEMI patient also had significantly higher cTn while in the other side of UA the results shows only 3.5% of 28 patient with UA had high cTn There was a significant difference regarding peak of Troponin I and

CK-MB levels between the 3 groubs, STEMI patients had significantly higher peak Troponin I and CK-MB levels compared to NSTEMI patients and UA.

So we can relies that the cTn appears to be the most sensitive and specific biomarker among all other diagnostic biomarkers for ACS.

CONCLUSION

cTn have significantly higher peak compared to CK-MB in all 3 groups of ACS STEMI, NSTEMI AMI and UA patient. These data suggest that the lack of the specificity of CK-MB will play an independent role in replacing CK-MB testing by cTn as the gold standard, serial testing of cTn and CK-MB has been suggested to increase the sensitivity and specificity in detecting myocardial injury.

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