ANALYSIS OF CARDIOSPECIFIC ENZYMES IN PATIENTS WITH CORONARY ARTERY DISEASE

Zehrija Mandak
Clinical Hospital Stip, R.N. Macedonia, zehra_mandak@yahoo.com
Valentina Velkovska Nakova
Faculty of Medical Science, University 'Goce Delchev' - Stip, R. N. Macedonia
valentina.velkovska@ugd.edu.mk
Milka Zdravkovska
Faculty of Medical Science, University 'Goce Delchev' - Stip, R. N. Macedonia
milka.zdravkovska@ugd.edu.mk

Abstract: The primary aim was to compare the specific and nonspecific cardiac enzymes in patients presented with acute coronary syndrome and those with selective coronary angiography. The second aim was to evaluate the relationship between different outcomes and levels of cardiac enzymes.

Retrospectively were analyzed 270 patients, 94 cases with acute coronary syndrome and 176 patients with selective coronary angiography (SCA). In all patients, myocardial serum enzyme levels (troponin I, creatinine phosphokinase (CK), aspartate aminotransferase (AST), lactate dehydrogenase (LDH)), and inflammatory markers (C-reactive protein and white blood cells) were measured. All patients were submitted to coronary angiography and outcomes were analyzed.

From 94 patients with ACSy, 56 (59.6%) patients received at least one coronary artery stent, 27 (28.7%) were referred to cardiac surgery for aorta-coronary bypass, and 11 (11.7%) died. From 176 patients with SCA, 46 (26.1%) received at least one coronary artery stent, 24 (13.6%) patients were referred for aorta-coronary bypass, 106 (60.2%) patients were without significant coronary plaques and were discharged with drug treatment, and no one died.

Patients with ACSy had significantly higher levels of troponin, AST, CK, and LDH compared to patients in SCA group. Mean values of CK-MB, CRP and peripheral white blood counts were not significantly different in patients with ACSy than in patients with SCA.

Statistically significant positive correlation between the ACSy event and troponin, AST, CK, and CKMB values were found. The correlation coefficient was strong for troponin and weak in other enzymes.

Using the general linear model-univariate procedure, only the age have statistically significant effect on coronary angiographic outcome.

Our findings suggest that serum levels of specific myocardial enzymes are elevated in patients presented with ASCy and can be used to identify patients for urgent coronary angiography. According to our results, the levels of the inflammatory markers can't be used for prognosis stratifications.

The advanced age have the highest impact on the coronary angiography outcomes in the group of patients which fulfill criteria for coronary angiography. Number of other cardiac markers (myoglobin, hyperuricemia and interleukins) were not analyzed in this study.

Keywords: acute coronary syndrome, cardiac enzymes, troponin, coronary angiography

1. INTRODUCTION

Acute coronary syndromes (ACSy) is still a leading cause of mortality, so early recognition is very important. This syndrome include: non-stabile angina pectoris, ST-elevation myocardial infarction (STEMI) and non-ST elevation myocardial infarction (NSTEMI). They are known to be associated with elevated serum levels of myocardial enzymes: troponin I, troponin T, total creatine phospokinase (CK), the myocardial isoenzyme of CK (CK-MB), aspartate aminotransferase (AST), and lactate dehydrogenase (LDH). Actually, one of the diagnostic parameter of ACSy is rise of cardiac enzymes in the blood[1].

The myocardial tissue necrosis during ACSy[2] reveal to an increase of inflammatory markers, such as C-reactive protein (CRP)[3, 4, 5], fibrinogen, peripheral white blood cell count (WBC)[6, 7], and erythrocyte sedimentation rate (ESR)[8].

Assessment of cardiac markers play an important role in the detection of ACSy when the patient's history and ECG are non-diagnostic or equivocal [9]. Detectable concentrations of high-sensitivity troponin, which indicate cardiomyocyte cell damage or death, are known to be present in a asymptomatic adults without any history of cardiovascular disease[10]. So, cardiac enzymes may be raised in non-ischaemic cardiac diseases, and other than cardiac disease, for example: cardiac trauma, acute rheumatic fever, congestive heart failure, end-stage renal failure, and myocarditis/pericarditis.

It is already known that patients with acute or chronic coronary disease have higher cardio specific and inflammatory markers than healthy individuals[11], but are these markers different in subgroup of patients which needed urgent or selective coronary angiography?

This article analyzed cardio specific and non-specific enzymes in patients presented with ACSy and those without criteria for ACSy, but with chest pain or ECG changes because of which selective coronary angiography were performed. Also the values of the markers were correlated with the outcomes of the patients after coronary angiography.

2. MATERIAL AND METHODS

Retrospectively were analyzed 270 patients, 94 cases with ACSy and 176 patients with selective coronary angiography. All patients were examined and treated at the department of cardiology, Clinical Hospital in Stip, Macedonia. Patients presented with criteria for ACSy were urgent hospitalized and coronary angiography was performed. Selective coronary angiography were done in patients without criteria for ACSy and in those with positive coronary stress test. A detailed medical history, physical examination, electrocardiogram, hematologic and biochemical screening was performed in all patients during hospitalization. In all patients, myocardial serum enzyme levels (troponin I, creatine phosphokinase (CK), aspartate aminotransferase (AST), lactate dehydrogenase (LDH)), inflammatory markers (C-reactive protein and white blood cells), lipid parameters, glycaemia, creatinine and blood urea were measured. Previous history and other comorbidities were noted. All patients were submitted to coronary angiography and outcomes were analyzed.

3. STATISTICAL ANALYSES

Independent T-test was used to compare analyzed variables between the groups. Sperman correlation was used to correlate outcomes with analyzed variables. GLM-Univariate analyzes was used to evaluate the influence of independent variables on dependent variable-outcome from the coronary angiography. $p < 0.05$ was used for statistical significance.

4. RESULTS

From 270 patients, 177 (65.6%) were male. The patients were divided in 2 groups: 94 patients with criteria for ACSy and 176 patients without ACSy, but with indication for selective coronary angiography (SCA). There was no statistically significant difference in gender, age and smoking habits between the two groups (Table 1). The incidence of dyslipidaemia and arterial hypertension were also not different between the groups.

From 94 patients with ACSy, 27 (28.7%) were referred to cardiac surgery for aorta-coronary bypass. Eleven (11.7%) patients, 4 women and 7 man, died. The remaining 56 (59.6%) patients received at least one coronary artery stent.

From 176 SCA, 24 (13.6%) patients were referred for aorta-coronary bypass. There was not lethality in these group of patients. One hundred and sixth (60.2%) patients were without significant coronary plaques and were discharged with drug treatment. The remaining 46 (26.1%) received at least one coronary artery stent.

Patients with ACSy had significantly higher levels of troponin I, AST, CK, and LDH compared to patients in other group. There was no statistically significant difference in the mean values of CK-MB, although the p-value was close to statistical significance. Mean values of CRP and peripheral WBC counts were not significantly different in patients with ACSy than in patients with SCA (Table 1).

Statistically significant positive correlation between the ACSy event and troponin I, AST, CK, and CKMB values were found (r=0.513, p<0.01; r=0.234, p<0.05; r=0.214, p<0.05; r=0,254, p<0.05). The correlation coefficient was strong for troponin I and weak in other enzymes. This confirms that troponin is the most sensitive marker for acute coronary syndrome. In only 2 patients from the SCA group troponin were elevated.

Using the general linear model-univariate procedure, only the age have statistically significant effect on coronary angiographic outcome (Table 2).

Table 1. Differences between demographic, cardiospecific and non-specific enzymes between two groups of patients

	Groups	Mean	Std. Deviation	P value
troponin	1	24714,9989	67559,73206	
	2	12,4429	23,17420	,001
AST	1	53,5833	66,13480	
	2	28,0276	16,42725	,001
CK	1	378,5294	528,08981	
	2	131,3434	152,14013	,000
CKMB	1	821,4803	3105,88225	
	2	202,9198	773,12568	,092
CRP	1	36,7286	50,20411	
	2	28,3333	8,18757	,339
LDH	1	298,34	221,312	
	2	217,00	80,699	,005
Leuk	1	10,1515	4,40098	
	2	9,6082	3,98036	,478
gender	1	1,29	,455	
	2	1,38	,486	,142
age	1	63,31	11,119	
	2	63,85	7,948	,678
DMT2	1	,55	,500	
	2	,44	,498	,086
smoking	1	,62		
	2	,61		,767

Table 2. Results for influence of factor variables on dependent variable-outcome from the coronary angiography, using GLM univariate procedure

Dependent Variable: outcome

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Model	115,311[a]	6	19,218	29,732	,000
DMT2	,228	2	,114	,176	,839
troponin	,140	1	,140	,216	,643
CK	,618	1	,618	,956	,330
CKMB	,693	1	,693	1,073	,303
age	2,916	1	2,916	4,511	**,036**
Error	73,689	114	,646		
Total	189,000	120			

5. DISCUSSION

The predominance of males in our study is a well-recognized risk factor (male sex) for coronary atherosclerosis. As expected the worse outcome was in the ACSy group. We could not compare the mortality percentage because of differences in patient selection, treatment options, country development, and hospital conditions in the studies. So every compilation of mortality rates across the post-ACSy cohorts must be interpreted with caution. Diabetes mellitus is known major cardiovascular risk factor, but according to our results, its present did not influence on the outcome[12]. These results were probably because all patients were analyzed including 106 without significant coronary plaques. In addition, there was not statistical difference between the numbers of patients with diabetes mellitus between the groups.

The mean values of CK-MB was not statistically different between the groups, although p value was near to the significance. Patients with elevated cardiac troponin I levels but negative CK-MB who were formerly diagnosed with unstable angina or minor myocardial injury are now reclassified as NSTEMI even in the absence of diagnostic ECG changes. CK-MB is the heart specific isoenzyme and has been the gold standard method for the diagnosis of AMI in many laboratories. It exists in large quantity in heart muscle, but is not totally cardiac specific and exists also in skeletal muscles and other tissues [12,13,14].

Troponins are expressed in both skeletal and cardiac muscle; there are isoforms of troponin I and T expressed selectively in the heart[15]. We evaluate just troponin I, and that should be preferred because of a better specificity[16]. Troponin I was raised in all patients with ACSy, and only in 2 patients without ACSy. We found significantly

positive strong correlation between troponin and ACSy event. This confirmed the importance of these enzyme in evaluation of patient with ACSy.

Inflammation is a recognized key component of acute coronary syndromes, but there was not difference in these parameters. So, the clinical use of these parameters can be compared with the cardiospecific enzymes.

The advanced age have the highest impact on the coronary angiography outcome. Other analyzed parameters must have impact on the outcome but we did not included healthy control group. Others studies also found age as the earliest predictor of poor survival [1].

6. CONCLUSION

Our findings suggest that serum levels of specific myocardial enzymes are elevated in patients presented with ASCy and can be used to identify patients for urgent coronary angiography. According to our results, the levels of the inflammatory markers can't be used for prognosis stratifications. The advanced age have the highest impact on the coronary angiography outcomes in the group of patients that fulfill criteria for coronary angiography.

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