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European Journal of Experimental Biology, 2012, 2 (1):217-221

ISSN: 2248 –9215
CODEN (USA): EJEBAU

The effect of prodromal angina pectoris on short-term prognosis of acute ST elevation myocardial infarction

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ABSTRACT

According to the report of World Health Organization coronary artery disease every year has been considered as the leading death cause of more than 3.8 million men and 3.4 million women all over the world. Prodromal angina that occurs a short time before acute myocardial infarction onset has efficient protective effect in cardiovascular system with ischemic preconditioning but in conditions such as old age and diabetes mellitus these efficient effects may decrease. This study was conducted to investigate the effects of prodromal angina pectoris on short term acute ST elevation in myocardial infarction. This analytical and prospective study conducted on 148 hospitalized patients with STEMI (ST elevation myocardial infarction), that divided into two groups, one with prodromal angina pectoris and the other without preinfarction angina. Angina pectoris is defined as transient myocardial ischemia existence during 24 hours before acute myocardial infarction onset. Fifty-nine patients were in the group with preinfarction angina and 89 patients in the group without preinfarction angina. In-hospital and out-hospital mortality in one month and left ventricular ejection fraction (LVEF) with echocardiography, serum creatine Kinase-MB (CKMB), intensity and rate of response to thrombolytic therapy according to ST echocardiography changes, and also in-hospital arrhythmias were investigated as variables of short term prognosis. There were significant differences between the results of patients with preinfarction angina with patients without preinfarction angina for heart failure intensity (p value< 0.001; relative risk =5.859) and infarction extent (mean CKMB=148.2 VS 3589; p value < 0.01). There were no significant differences between mortality and in-hospital arrhythmias and intensity and rate of response to thrombolytic therapy. Prodromal angina pectoris has desired effect on short term prognosis of STEMI patients that it seems this effect is due to reduction of infarction extent and limitation of involved part. Prodromal angina pectoris despite the efficient effect on infarction extent was not accompanied with lower in-hospital short term mortality in patients that had chest pain 24 hours ago. However, due to insufficient volume of the samples enough assurance did not obtained from the recent results accuracy. Thus, the authors suggest more sophisticated studies to elucidate the exact effects of prodromal angina pectoris on short term prognosis of acute ST elevation myocardial infarction.

Keywords: Prodromal angina pectoris, prognosis, acute ST elevation, myocardial infarction, Iran.

INTRODUCTION

According to the report of World Health Organization coronary artery disease annually is leading death cause of more than 3.8 million men and 3.4 million women all over the world. Despite the optimal therapies, coronary artery

disease mortality, especially in patients with diabetes mellitus and metabolic syndrome, is still significantly high [1]. In some studies, existence of angina pectoris before acute infarction has efficient effects on left ventricle function after myocardial infarction [2] but its effects on reperfusion of coronary artery creation is unknown [3].

Prodromal angina, which causes a short time before acute myocardial infarction onset has efficient protecting effects on cardiovascular system with ischemic preconditioning mechanism [4], however, in some conditions such as old ages or diabetes mellitus, these effects may decrease [5,6]. Prodromal angina that occurs before acute myocardial infarction onset improves left ventricle function and increases lifespan after reperfusion with ischemic preconditioning mechanism [7,8]. There are some evidences suggesting that prodromal angina significantly improves patient's prognosis in pervious coronary angioplasty [9]. Nevertheless, there is some controversy in the literature [10, 11].

At least three mechanisms, which may have protective role for prodromal angina, have been suggested: formation of coronary collateral arteries, faster resume of reperfusion, providing ischemic prognosis. Although formation of coronary arteries plays an important role in response to chronic ischemic and hypertension, proximal to the sustained occlusion of coronary arteries, this phenomenon cannot explain all effects of prodromal angina by itself [12]. Ischemic preconditioning is a phenomenon, in which the myocardial tissue that have had short term ischemic events and then involved reperfusion, it will better tolerate the next longer ischemic event. Thus, the infraction extent will be limited. This is of great importance for providing a protective effect. Patients with acute myocardial infarction based on electrocardiographic findings were divided into two groups: ST elevation myocardial infarction (STEMI) and non-ST elevation myocardial infarction (NSTEMI) that protective effect of prodromal angina mostly occurs in first group. Thus, in this prospective study, we investigated the effects of prodromal angina on short term in-hospital prognosis and the acute myocardial infarction with ST elevation after discharge of the patients with STEMI. We hope the results of this study provide the perception background of existing pathophysiological relationship between prodromal angina and involved phenomena in onset of infarction's better prognosis and pave the way for innovation of efficient methods for patient's prognosis development.

MATERIALS AND METHODS

Target population of this study were the patients with acute STEMI, almost of whom had clinical manifestations and they needed to be admitted in the coronary care units (CCU) of the hospitals. Therefore, the studied population contained all of the patients hospitalized at Taleghani hospital of Urmia with a diagnosis of acute STEMI since the end of October 2005 until the end of July 2006. Selection of samples from the population under study in both groups was done sectional and according to the presence or absence of prodromal angina pectoris. Prodromal angina pectoris is present in different types of chest pain or chest discomfort transition during 24 hours before the onset of infarction symptoms. Samples in both groups with or without intervention underwent standard diagnostic and medical therapeutic procedures. To determine the short term prognosis, variables of infarction extent, in hospital and one month mortality, severity of heart failure, AF, VF, sustained arrhythmia during admission time and depression rate of ST segment were evaluated in response to streptokinase in the first and third hours.

RESULTS

In this study 148 patients were examined, from which 73% were men and 27% were women. Of them, 39.9% were with prodromal angina and 60.1% were without angina. Variables that were examined to determine prognosis were: in-hospital mortality, one month mortality, level of CKMB, left ventricular ejection fraction (LVEF) in the discharge time, arrhythmia of admission time, outcomes leading to readmission or death, depression rate of ST segment after receiving streptokinase in one and three hours intervals. In-hospital mortality rate of STEMI was 5.1% in group with prodromal angina pectoris and 4.5% in group without preinfarction angina. Statistical analysis using chi-square test and Pearson coefficient with degree of freedom=1 (p-value=0.868) was obtained. Thus, the hypothesis of relationship between in-hospital mortality with prodromal angina pectoris was refused. Additionally, relative risk to accept this hypothesis with confidence interval= 95% is 0.189 to 4.075, respectively. Therefore, accuracy of the above hypothesis fails. **Figure 1** shows the in-hospital STEMI mortality in two groups with and without prodromal angina.

In condition of relationship between one month mortality and prodromal angina pectoris considering that no other mortalities were seen after patients discharge and during one month follow-up, one month mortality is equal to in-hospital mortality. In addition, base on this it can be claimed that there is no significant relationship between one month mortality and prodromal angina pectoris. The mean levels of CKMB in the group with prodromal angina pectoris were 148.2 with standard deviation= 143 and standard error 18.6, whereas mean CKMB levels in the group without preinfarction angina obtained 358.6 with standard deviation= 4.33 and standard error= 45.9. Considering

above, it is clear that mean CKMB levels in the group with preinfarction angina in comparison with the group without preinfarction angina is significantly lower. The used statistical tests were t-student for independent samples [|T| >1.96], Leven's test for variance equality and Mann-Whitney's non-parametric test.

Of 59 patients with prodromal angina pectoris 64% had (EF) more than 50%, 34% and lower than 50% whereas in the group without preinfarction angina just 24% had EF more than 50% and lower than 76%. Relative risk calculated= 5.859. to ensure accuracy of aforesaid hypothesis also chi-square test is used: p-value < 0.0001, Pearson coefficient= 24.65 and degree of freedom=1.

Therefore, the inverse relation between severity of heart failure and existences of prodromal angina pectoris with a statistically high reliable range is significant. In other words, individuals with prodromal angina pectoris compared to individuals without preinfarction angina at the discharge time have higher LVEF and severity of heart failure is lower in them. Of 59 patients with prodromal angina pectoris STEMI 10 cases had arrhythmia (16.9%) and from89 patients without prodromal angina pectoris STEMI 24 cases had arrhythmia (27%).

To determine the relation of experiences of outcomes leading to admission or death during the first month of STEMI with angina pectoris patient's status analyzed. From 59 patients with prodromal angina pectoris 79.7% were without a peculiar problem, 17% needed a review, and 3.3% were dead. In group without preinfarction angina from 89 patients 79.8% were without a peculiar problem and 15.7% needed a review and 4.5% were dead (see **Figure 2**).

To determine the relation of ST segment height reduction after Thrombolytic therapy with streptokinase and with prodromal angina pectoris in STEMI patients the changes of ST segment's height measured in first and third hours after MI (see **Figure 3**).

Statistics indicate a further decline of ST segment in most patients with preinfarction angina compared with individuals without preinfarction angina (22.6% in comparison with 19%). Considering above in two groups, one with prodromal angina pectoris and the other without prodromal angina pectoris, there was a significant difference just about infarction extent base on CKMB levels and severity of heart failure base on LVEF calculation by echocardiography and in other cases there was no significant difference, however, infarction extent and severity of heart failure with a high degree of confidence indicates a appropriate short-term prognosis in the group with angina pectoris.

DISCUSSION AND CONCLUSION

Several studies [13, 14] have indicated clinical benefits of angina pectoris presence before acute myocardial infarction decreasing in-hospital complications during admission time. These beneficial effects, although small, are seen in old persons and diabetes patients [15, 16] and there are inconsistent effects about patient's long-term prognosis. The important point of this study is this fact that existence of angina pectoris 24 hours before acute myocardial infarction in patients with STEMI does not cause improvement in, in-hospital and 30 days after discharge mortality. In some studies angina pectoris existence result 48 hours before acute infarction about in-hospital and one month after discharge mortality was alike to this study [17]. However, efficient effects of ischemic preconditioning are reported in previous studies [18]. It is noteworthy that in all of these studies angina pectoris is considered more than 48 hours. Overall, it seems that to create efficient effects of angina pectoris in, in-hospital and 30 days after discharge mortality, angina pain should last for more than 48 hours. This study's results are independent from protective effects of preinfarction angina on decreasing severity of heart failure 24 hours before myocardial infarction. Age, sex and other risk factors may affect the coronary arteries of the heart. The angina before acute myocardial infarction is accompanied by decreasing infarction size that is measured by CKMB levels that is according to previous studies results [19, 20]. In other words, existence of angina pectoris 24 hours before acute myocardial infarction has similar results in decreasing severity of heart failure with angina pectoris of 2 month ago. However, Chiu Wen *et al.* and colleagues did not find this efficient effect of preinfarction angina before infarction in individuals older than 60. Everngal and colleagues had indicated the effect of prodromal angina on ST segments height decrease that occurs 72 hours before infarction [22].

In this study, the response rate to the thrombolytic therapy base on changes of ST segment had no significant differences in individuals with angina pectoris and individuals without preinfarction angina (p>0.05). It is clear that relying solely on the ST segment changes as the only evidence establishing reperfusion, it is not possible to determine about effects of prodromal angina pectoris on the amount of myocardial damage. Nevertheless, this finding could be practical and valuable if it could obtain positive results. However, to obviate this mechanism with these negative results we need additional and more accurate searches such as angiographic changes of coronary artery. Results of this study though indicated desired effect of angina pectoris in decreasing the extent of infarction

in STEMI but did not confirm significant relation between mortality with existence of angina pectoris before infarction. In addition, in case of damages like severe ventricular arrhythmia, a significant relation was not seen. With more accurate analyze of obtained results about mortality it became obvious that by attention to both groups samples volume it is not possible to particularly determine about results because in cases that possibility of an event such as mortality is low, instead of samples following from a Gaussian distribution they follow a Poisson or asymmetric distribution. While explaining this quantity with Poisson distribution, we will need at least a volume of samples equal or more than 345 cases, that it is approximately equal to actual sample volume. Yet obtained results recommend another study with higher volume of samples.

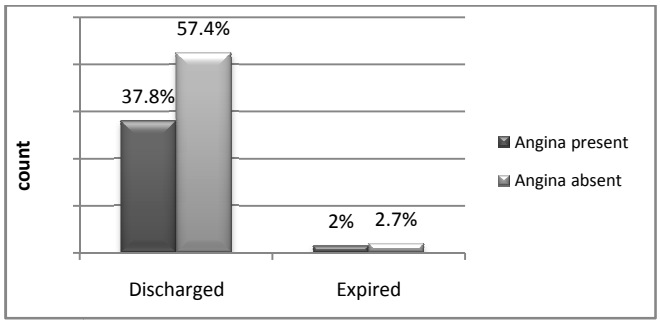

Figure 1: The in-hospital STEMI mortality in two groups with and without prodromal angina.

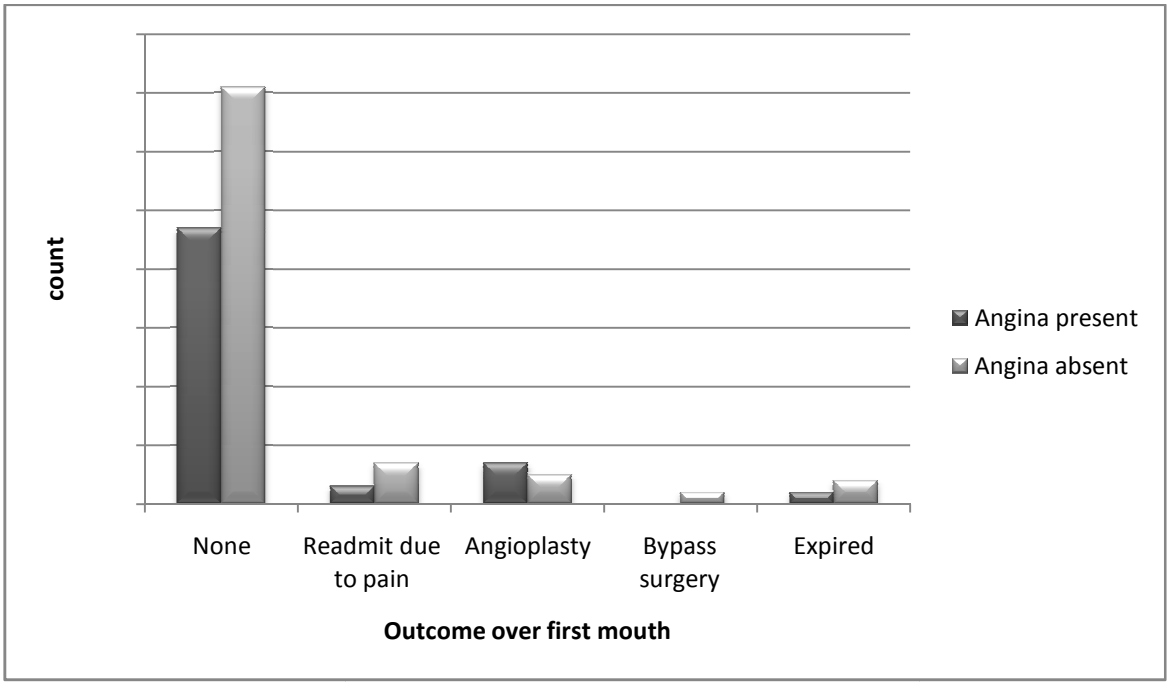

Figure 2: The outcomes of STEMI patient's in two groups with and without prodromal angina.

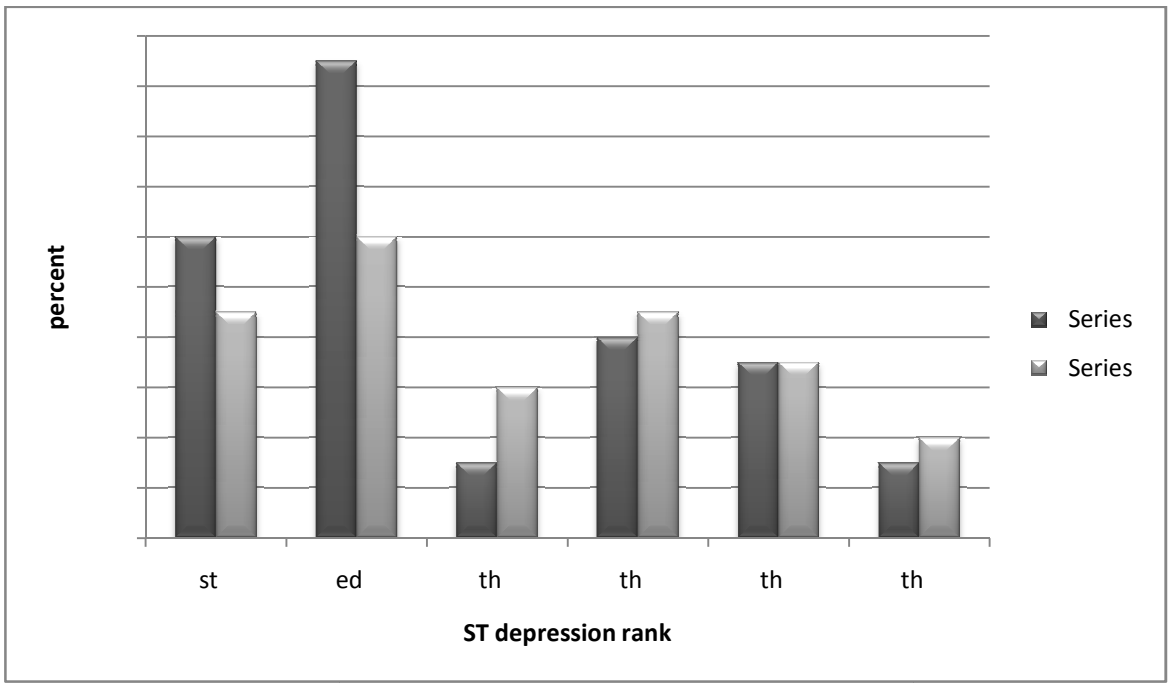

Figure 3: graph of frequency percent of ST segment depression rank separated by groups.

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