Original Research

Evaluation of clinical, electrocardiographic and laboratory response of reperfusion therapy in patients with first acute myocardial infarction

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ABSTRACT

Introduction: Myocardial infarction (MI) therapy is one of the most common causes of death and health issue in the world, especially in developed countries. Thrombolytic administration is a preferred life saver method of acute MI if primary angioplasty is not possible. Given that the incidence of MI in patients with metabolic syndrome, so evaluation of therapeutic response to streptokinase in this regard is very important. **Methods:** In this descriptive analytical study, 340 acute coronary syndrome patients which have study inclusion criteria divided randomly in two groups (with and without metabolic syndrome each with 170 patients) and collected data analyzed by statistical methods using SPSS 20. **Results:** Pain improvement after treatment in the group without metabolic syndrome was significantly higher than another group (58.2% vs. 23.4%) ($P = 0.001$). ST-segment resolution at 90 min after treatment in the group without metabolic syndrome significantly higher than another group ($P = 0.002$). **Conclusion:** Results showed that using of angioplasty is recommended as the preferred method instead of thrombolytic treatment in patients with metabolic syndrome suffering from MI.

KEY WORDS: Myocardial infarction, metabolic syndrome, ST resolution

INTRODUCTION

Myocardial infarction (MI) is one of the most common causes of death and disability in various societies, especially in developed countries, and its complications are one of the main health problems in each country, especially in the big cities and among middle-aged and adult people [1,2]. Acute MI (AMI), which is the most common cause of acute attacks, is often caused due to obstructive coronary artery due to a blood clot, severe spasm of the arteries or atherosclerosis in the coronary arteries. In recent decades, despite of improving public health condition in many countries of the world, the incidence of cardiovascular diseases has become the most important health problem [1-3]. Returning of ST-segment is a good predictor of infarct artery patency and preserves myocardial perfusion in heart tissue level [4,5]. The successful resolution in ST-segment is as an electrocardiographic (ECG) signal of myocardial tissue repair which indicates the progression of infarction [6]. If the primary percutaneous coronary intervention (PCI) is not available, one of the initial treatment of AMI is the prescription of thrombolytic medication, which is considered the primary and preferred method of lifesaving [2,3]. Among thrombolytic medications, streptokinase (SK) due to the opening of the

blocked artery by thrombosis and reduction of mortality without any potential hemorrhagic complications is more important [7-9]. Quick start of SK and other thrombolytic medications leads to adjacent of ischemic myocardial perfusion to the infarct region. The success of thrombolysis in clot lysis and creating second reperfusion in saving myocardial ischemic and in preserving of myocardial function plays a key role [8]. The effect of thrombolytic medications in creating myocardial perfusion can be measured by several factors, and angiography is considered as a delayed and invasive method in approaching the patients who received thrombolytic medications.

Early hours after administration of thrombolytic medication, some clinical criteria including clinical response of pain reduction of angina after SK, ST-segment resolution, and rapid increase in cardiac enzyme creatine kinase-MB (CKMB) are predictable [10-12]. Some studies have shown that metabolic syndrome includes abdominal obesity and some metabolic disorders such as diabetes, hypertension, insulin resistance, and dyslipidemia which can put the patients at risk of cardiovascular disease and these factors affect the response to the thrombolytic medication [13-15]. Because of the high prevalence of metabolic syndrome in patients with MI and also its relationship with

coronary artery disease, doing study in this area is necessity. According to Meigs *et al.*, the risk of coronary artery disease in patients with metabolic syndrome was 34% in men and 16% in women, and the prevalence of metabolic syndrome in patients with coronary artery was 50%. Hence, identifying the role of metabolic syndrome in the response to thrombolysis in myocardial perfusion is better in the clot lysis process of insulin resistance in coronary artery and saving the areas caused by ischemic MI [16].

Dehghani *et al.* investigated the factors such as age, diabetes mellitus, low-density lipoprotein (LDL), site of MI, and the patient's delay affecting the response to treatment in patients who received SK in AMI [2].

As mentioned above, making quick decisions in choosing the type of treatment (angiography or use of thrombolytic therapy) is effective in the treatment response and reduction of mortality rate in these patients. The aim of this study was to evaluate clinical, ECG and laboratory response of reperfusion therapy in patients with first AMI.

METHODS

This is a descriptive analytical study that has been conducted on 340 randomly selected acute coronary syndrome patients which have MI symptoms and candidate for receiving SK during 2013-2014. Patients divided randomly in two groups with and without metabolic syndrome each with 170 patients. In the baseline, the ECG was taken from all patients and based on the ST-segment elevation (about at least 2 mm in two contiguous leads [v1-v6]) the ST elevation MI was confirmed and then they received SK.

The first history of patient, primary ECG, and then cardiac enzyme tests was performed for all patients. Clinical responses of the patients to SK by the average of pain criterion before SK injection based on pain visual analog scale (scale 0-10) and clinical response of pain after SK (50% improvement in pain analog scale) was assessed and in the patients' echocardiography, 50% of ST-segment resolution at 90 and 180 min after SK injection, compared to the first echocardiography, were examined. The amount of enzyme CKMB in baseline, 1st and 2nd days after SK was recorded. Then, all patients were divided randomly in two groups by metabolic syndrome criteria. All data collected by interview, register clinical information and ECG and blood samples were taken during specified hours and entered in a datasheet. The written consent form was taken from all patients before the study. Collected data were analyzed using statistical methods in SPSS 20.

RESULTS

About 51.5% of all patients were in group with metabolic syndrome and 48.5% in another group. In both groups, most of the patients were male and the mean age in the group without the metabolic syndrome was 59.5 ± 9.8 and in the group with the metabolic syndrome was 58.2 ± 10.3. In terms of

anatomical type, most of MI associated with anterior infarction with 42.1% and then related to extensive MI with 39.7% and there was not a significant difference between the two groups in terms of anatomic MI. In investigated patients, hypertensive with 62.1% had the highest prevalence [Figure 1]. The mean score of pain in baseline in the group without metabolic syndrome was 159 ± 65.6 and in a group with metabolic syndrome was 149 ± 52.8 and the difference between two groups was not significant.

The mean of pain before SK injection on the basis of pain visual analog scale in the group without metabolic syndrome was 5.3 ± 2.7, and it was 5.2 ± 2.8 in the group with metabolic syndrome, and there was no significant difference. The average amount of CKMB enzyme before SK injection was 53.3 ± 4.6 in the group without metabolic syndrome and 47.4 ± 4.3 in the group with metabolic syndrome and no significant differences were observed between the two groups. Clinical response to pain after SK injection (50% improvement in pain analog scale) in group without metabolic syndrome was higher than group with metabolic syndrome [Table 1].

ST-segment resolution rate about 50% at 90 min after SK was statistically significant between two groups and we can resulted that the group without metabolic syndrome responded better to the SK medication in terms of the 50% ST-segment resolution rate at 90 min [Figure 2]. 50% ST-segment resolution rate at 180 min after the SK in the two groups was not statistically different in none of MI types. The higher rate of the CKMB enzyme was similar between two groups.

DISCUSSION

The results were in favor of improving response to SK medication in the group without metabolic syndrome in terms of 50% ST-segment resolution rate at 90 min. However, the 50% ST-segment resolution rate at 180 min after the injection of SK in the two groups was not statistically different. In terms of the laboratory criteria, the higher rate of the CKMB enzyme in the 1st day compared to the 2nd day after SK was examined and the difference was not statistically significant between two groups.

Masoomi *et al.* investigated the thrombolytic effect of SK injection and evaluation of ST-segment in patients suffering MI
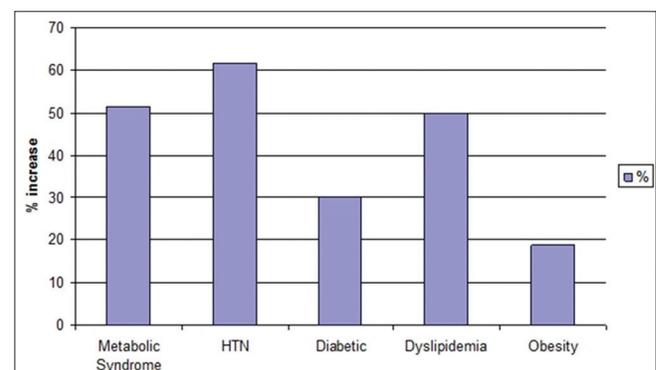

Figure 1: Frequency of diseases in myocardial infarction patients

Table 1: Clinical responses to pain and ST-segment resolution rate in two groups

Group	Percentage	*P* value	OR	CI
Clinical response to pain after streptokinase injection (50% recovery in pain analog scale)				
With metabolic syndrome	23.4	0.001*	0.22	0.14-0.35
Without metabolic syndrome	58.2			
50% resolution ST-segment in 90 min after SK injection				
With metabolic syndrome	40.6	0.002*	0.49	0.32-0.76
Without metabolic syndrome	58.2			
50% resolution ST-segment in 180 min after SK injection				
With metabolic syndrome	67.4	0.072	0.64	0.4-1.03
Without metabolic syndrome	76.4			
Rate of CKMB enzyme in 1st day compare to 2nd day after SK injection				
With metabolic syndrome	44.6	1	1	0.65-1.52
Without metabolic syndrome	44.8			

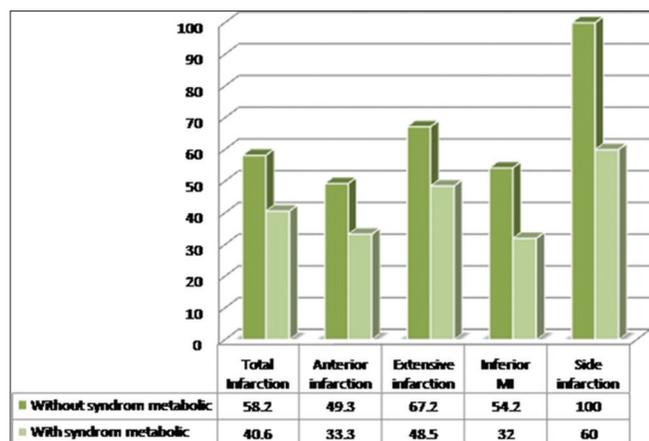*Significant at level 0.05. SK: Streptokinase, CKMB: Creatine kinase-MB

Figure 2: 50% resolution percent in ST-segment in 90 min after streptokinase injection

with diabetic and nondiabetic histories and they showed that the returning of ST-segment resolution at 180 min after SK was lower in diabetic patients compared with nondiabetic patients [17]. Khan *et al.* in a similar study examined the therapeutic effects of SK in diabetic patients compared with nondiabetic patients with first MI attack and concluded that patients with diabetes have worse results in ST-segment resolution compared to nondiabetic patients [18]. In this study, the difference between the ST-segment resolution rate of the patients without metabolic syndrome and the ST-segment resolution rate of the patients with metabolic syndrome was observed at 90 min, and this difference was resolved at 180 min. Furthermore, our cases had slightly overlap with the above-mentioned study samples, and it is true that diabetes is one of the criteria for metabolic syndrome but diabetic individuals, only 30% of our samples, existed in both study groups.

Dehghani *et al.* showed that there is a significant relationship between age, history of diabetes mellitus, LDL, site of MI, the patient delay and the effect of SK while in this study gender, risk factors of blood pressure, smoking, ischemic heart disease, the time of MI, and type of SK have been ineffective in response to SK medication.

They also concluded that patients with acute MI under the age of 30 years and >80 years, with diabetes, LDL over 100 mg/pd,

a large anterior MI, new left ventricular branch block or delay more than 12 h did not have appropriate respond to SK medication and it is probable that early invasive approach would be more effective than thrombotic therapy [2]. Our study had little overlap with Dehghani *et al.* and Zeymer *et al.* investigated the validity of ST-segment resolution as a non-invasive indicator for opening of the coronary artery and concluded that the location of myocardial infarcts effects on ST-segment resolution ate of in treatment with SK [19]. Furthermore, Guzman *et al.* in a study compared the ST-segment resolution rate in the anterior ST elevation MI and posterior myocardium wall after treatment with SK and concluded that returning of ST-segment after 2nd day of the injection of SK was lower in anterior MI that is mostly caused by the lack of unblocking the veins due to a lack of activity, larger infarct size and weaker systolic function [20].

As we mentioned in our study, 50% ST-segment resolution rate in 90 min after SK injection was a statistically significant difference between the two groups which represents 50% ST-segment resolution rates were not equal in the two groups in 90 min after the injection of SK. According to the results, the group without metabolic syndrome responded better to the SK medication in terms of 50% ST-segment resolution rate in 90 min. However, there was not any significant difference between none of the MI types and 50% ST-segment resolution rate in 90 min.

CONCLUSION

The results showed that ST-segment resolution can be used as an efficient measure, like angina pain, in response to thrombolytic. Delay in returning ST-segment elevation in the group with metabolic syndrome implies that the response to thrombolytic in this group is weaker or slower. If this 90 min delay in returning of ST is because of the establishment delay of perfusion, it can have a negative impact on the survival of the group. According to the results of this study, it is suggested that, if possible, primary PCI, be used as the preferred method in patients with metabolic syndrome who suffer from MI.

Also further studies have been conducted on the impact each of the components of metabolic syndrome separately.

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