

FREQUENCY OF ST-SEGMENT RESOLUTION AFTER THROMBOLYSIS IN ACUTE ST ELEVATION MYOCARDIAL INFARCTION PATIENTS

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ABSTRACT:

BACKGROUND:

Acute Coronary Syndrome (ACS) is the term collectively used for referring to clinical manifestations of myocardium ischemia which include unstable angina, myocardial infarction with non-ST-segment elevation and myocardial infarction with ST-segment elevation.¹ Myocardial Infarction (STEMI) is characterized by ST elevation presented on the ECG, that is the electrical presentation of the occlusion due to thrombosis in a coronary artery. After the fibrinolytic therapy in STEMI cases, the resolution of ST-segment is analyzed on ECG which serves as easy and cost-effective solution for the assessment of coronary reperfusion. In a study, it is found that 61.5% patients of STEMI showed ST-resolution after streptokinase.

AIMS & OBJECTIVE:

To determine the frequency of ST-segment resolution after streptokinase in acute STEMI patients.

MATERIAL & METHODS:

This cross-sectional study was carried out from 08-07- 2016 to 07-01-2017. After taking approval from ethical committee and explaining the procedure informed consent was taken. Ninety-two (92) patients were included from emergency Department of Tabba Heart Institute Karachi on the basis of inclusion/exclusion criteria via non-probability consecutive sampling technique. ECGs were taken at presentation. ST elevation was recorded in respective leads. Injection streptokinase was administered. ECG was performed after 60 minutes of infusion of injection streptokinase. ST resolution in the lead with the maximum ST elevation was noted and was labeled as positive as per operational definition.

RESULTS:

The range of the age in this study was from 25 to 80 years with mean age of 54.9 ± 4.8 years. Out of 92 patients, 56(60.9%) were male and 36(39.1%) were female. Regarding ECG changes sixty six patients (71.7%) were successfully resolved after streptokinase in acute STEMI patients while in twenty-six patients (28.3%) did not resolve.

CONCLUSION:

Streptokinase is effective in majority of patients with acute STEMI patients. Thus, streptokinase could be a preferred therapy for thrombolysis in management of STEMI, particularly in those centres where primary angioplasty facility is not available.

KEY WORDS:

ST-elevation myocardial infarction, streptokinase, ST- segment resolution.

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Author's Contribution: GA: Data collection, study design, concept. SA: Data analysis. SK: Data collection, ZMB: Literature search. KA: Questionair design. SU: Data Analysis.

INTRODUCTION:

Acute Coronary Syndrome (ACS) is the term collectively used for referring to clinical manifestations of myocardium ischemia which include unstable angina, myocardial infarction with non-ST-segment elevation and myocardial infarction with ST-segment elevation. In the US, cardiovascular diseases are the foremost cause of death (26% per year). In 2006, among the number of deaths that occurred, around half of them were in women. The Center for Disease Control (CDC), in 2009, estimated the number of Americans with a first myocardial infarction and recurrent attack as 785,000 and 470,000 respectively.² ST-Elevation Myocardial Infarction (STEMI) is characterized by ST elevation presented on the ECG, that is the electrical presentation of the occlusion due to thrombosis in a coronary artery.³

Coronary angiography provides definite evidence of reperfusion of epicardial coronary arteries, ST segment resolution on ECG better reflects the microvascular coronary reperfusion. The successful coronary vessel thrombolysis is compulsory for better prognosis, however, the micro-vascular reperfusion strongly corresponds with achieving good outcome even more. Therefore, the resolution of ST-segment is considered to be a better parameter of prognosis as it can be used for assessing the information that cannot be provided by cardiac angiography alone.⁴ Moreover, a study by Schroeder et al reported that the failure of ST-segment resolution serves as the most powerful and independent predictor of early mortality ($p=0.0001$). The resolution of ST segment can also be utilized as a tool that aids to identify the requirement of timely invasive coronary interventions for the patients who are under the risk to develop complications due to non-resolution of ST-segment after thrombolytic therapy.⁵ In a study, it is found that 61.5% patients of STEMI showed ST-resolution after administration of streptokinase.⁶

Further studies are required, especially regarding the prevention of complications and recurrent MI because of the associated greater risk of unpredicted death. Moreover, the complete reperfusion after MI is necessary for the survival and

improvement of left ventricular function, however, it might not be possible in a number patients because of various factors and require a persistent research for improved outcomes in the long-term in patients with MI. In centers where primary angioplasty facility is not available, thrombolysis with SK can be life saving. It would be easier to deal such cases in emergency department of remote areas.

MATERIALS & METHODS:

This cross-sectional study was done at Tabba Heart institute Karachi from July 8th, 2016, to January 7th, 2017. Taking the prevalence of ST-segment resolution in acute STEMI i.e. 61.5%, margin of error $d=10\%$ and 95% level of confidence. Sample size was $n=92$. Patients age between 25-80 years regardless gender with ST-segment elevation myocardial infarction (as per operational definition) and received streptokinase on presentation were included in this study. Patients with systolic Blood pressure <90 mmHg, Q-wave myocardial infarction, severe cardiac failure, moderate to severe valvular heart disease, uncontrolled hypertension and active peptic ulcer disease were excluded from the study.

DATA COLLECTION PROCEDURE:

Data collection started after approval from ethical committee, explaining the procedure and informed consent was taken. Ninety-two patients were recruited from emergency department of Tabba heart institute Karachi on the basis of criteria already explained. ECG recordings were taken at time of presentation. ST-elevation recorded in millimeters in the lead with maximum elevation. Streptokinase was administered. Repeat ECG was done after 60 minutes of streptokinase administration. ST resolution was recorded in the lead with the maximum ST elevation and labeled as successful thrombolysis.

DATA ANALYSIS:

Data was gathered in a self-designed database and was analyzed by the use of SPSS version 19.0. The age of the patients was expressed as mean \pm S.D and the risk factors (hypertension, diabetes and smoking history) were expressed as frequency and percentages. Family history of ischemic heart disease and outcome variable (ST-segment resolution). Effect modifiers were control through stratification of age, gender, Diabetes,

hypertension, history of smoking and family history of ischemic heart disease. Fisher Exact/Chi- square test was applied to observe the correlation between these variables with the outcome variable, taken $P \leq 0.05$ as significant.

RESULTS

Age range in this study was from 25 to 80 years with mean age of 54.9 ± 4.8 . Out of 92 patients, 56(60.9%) were male and 36(39.1%) were female. 44(47.9%) percent patients of acute STEMI were diabetic, 58(63.1%) were hypertensive, 75(81.9%) were smokers and 42(46%) were had history of ischemic heart disease sixty patients (71.7%) were

successfully resolved after streptokinase in acute STEMI patients while in twenty-six patients (28.3%) could not resolved [Table I].

When results were stratified with respect to age and hypertension, significant difference was observed but when outcome was stratified with respect to gender, diabetes and smoking, no significant difference was observed, shown in table no: 1,2.

When results were stratified with respect to age, duration of marriage and BMI, significant difference was observed [Table II].

Table 1: Frequency and percentage of gender, diabetes, hypertension, smoking, family h/o of Ischemic heart disease, ST-segment resolution.

		Frequency	Percentage (%)
Gender	Male	56	60.9%
	Female	36	39.1%
Diabetes	Yes	44	47.9%
	No	48	52.17%
Hypertension	Yes	58	63.1%
	No	34	36.9%
Smoking	Yes	75	81.9%
	No	17	18.1%
Family history of ischemic heart disease	Yes	42	46%
	No	50	54%
ST-segment resolution	Yes	66	71.7%
	No	26	28.3%

Table 2: Stratifications of patients with ST-segment resolution with respect to age

		ST-segment resolution		P-value
		Yes	No	
Age groups	25-50	22	19	0.001
	>50-80	44	07	
Gender	Male	39	17	0.578
	Female	27	09	
Diabetes	Yes	32	12	0.840
	No	34	14	
Hypertension	Yes	47	11	0.010
	No	19	15	
Smoking	Yes	53	22	0.631
	No	13	04	
Family history of ischemic heart disease	Yes	31	11	0.686
	No	35	15	

DISCUSSION:

For the reperfusion of MI, the first used thrombolytic agent was streptokinase.¹ Despite the higher rates (80 %) of cardiovascular diseases are reported to occur in middle- and low-income countries, the evidence and research regarding the risk factors is observed to be largely derived from developed countries. Hence, the exact effect of risk factor on MI throughout the globe is unknown yet. Moreover, the progressing effects of streptokinase with time also needs to be investigated further.⁷ Patients with acute MI arrive rapidly at our hospital comparatively because of its locality in the centre of city and because they can avail the timely treatment of thrombolytic therapy and be benefited by the setup as the streptokinase (SK) is funded by the Government. The reperfusion therapy for myocardial infarction now come with various modes which differ from each other with regard to effectiveness, complexity and cost.⁸ The acute STEMI treatment using the thrombolytic therapy is observed to be associated with reduced mortality and decreased number of complications.⁹

Thrombolytic therapy with SK and other thrombolytic agents reduces mortality and is mainstay of revascularization option for most of the patients after an acute STEMI coming to hospitals in developing countries.¹⁰ Efficacy of SK is comparable to more expensive thrombolytics like alteplase, reteplase (recombinant tissue plasminogen activator; Rt -PA), in reducing mortality.¹¹

Enoxaparin is also remarkably better as compared to unfractionated heparin, is also suggested as a part of adjunctive therapy alongside streptokinase and is a potent agent for anticoagulation that results in comparable adjusted outcomes in contrast to comparatively expensive

regimens that utilize a fibrin-specific lytic therapy.¹² The streptokinase regimen (1.5 MU/60 minutes) has persisted to be the same for the past 20 years in STEMI patients

The reperfusion of the culprit artery that is the cause of myocardial infarct has become among the fundament of treatment for acute ST-elevation myocardial infarction.¹³ For acute reperfusion and the patency of infarct related vessel, intravenous fibrinolytic agents are the frequently used approach which are also in routine use in substantial clinical trials and have revealed their unmatched benefits.¹⁴

Thrombolytic therapy with SK has highest potency if administered during the first 90 minutes after the onset of acute MI symptoms.¹⁵ Examining ST-segment resolution at 1 hour after the administration of SK enables to accurately stratify the risk for mortality and congestive heart failure.¹⁶ However, the preferred treatment strategy should be primary angioplasty when there is a possibility of inter-hospital transfer of the patient within 120 minutes.¹⁷

In present study 66 patients (71.7%) were successfully resolved after streptokinase in acute STEMI patients while in twenty-six patients (28.3%) could not resolve. According to the HIT-4 trial, ST-segment was resolved in >70% of the acute STEMI patients.¹⁸ The limitation of this study was the absence of control group and therefore, no comparison could be made.

CONCLUSION:

Streptokinase is effective in majority of patients with acute STEMI patients. Thus, streptokinase could be a preferred therapy for thrombolysis in management of STEMI, particularly in those centres where primary angioplasty facility is not available.

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