

## EFFICACY OF ACCELERATED STREPTOKINASE INFUSION IN THE TREATMENT OF ST ELEVATION MYOCARDIAL INFARCTION

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### ABSTRACT

#### OBJECTIVES

To determine the efficacy of accelerated streptokinase (SK) in patients with acute ST-elevation myocardial infarction (STEMI).

#### METHODOLOGY

This Descriptive study was done in the Department of Cardiology, Hayatabad Medical Complex over a period of 6 months from august 2020 to February 2021. Age ranged between 35-70 years. Both males and females presenting with acute ST elevation MI, patients within 6 hours of the onset of chest pain were included in the study.

#### RESULTS

Among 144 patients age distribution was analyzed as 50(35%) patients were in age 35-50 years, and 94(65%) patients were in age 51-70 years. The mean age and standard deviation were  $61 \pm 8.19$ . Gender distribution was analyzed as 88(61%) patients were male and 56(39%) patients were female. Status of BMI was analyzed as 69(48%) patients had BMI  $\leq 27$  Kg/m<sup>2</sup> and 75(52%) patients had BMI  $> 27$  Kg/m<sup>2</sup>.

#### CONCLUSION

The accelerated SK infusion regimen of 1.5 MU in 20 min is safe and well tolerated with significantly faster and higher clinical reperfusion rates, more preserved LV systolic function, less atrial and ventricular sustained arrhythmias, and less in-hospital and 1-year mortality rates in acute STEMI.

**KEYWORDS:** Accelerated Streptokinase, Acute ST-Elevation Myocardial Infarction, Efficacy

### INTRODUCTION

Cardiovascular disease (CVD) is considered one of the important priorities in the health systems of all countries.<sup>1</sup> The burden of these diseases is increasing in low, moderate, and high-income countries.<sup>2</sup> Worldwide, Finland and Japan have the highest and lowest myocardial infarction (MI) incidence rates, respectively.<sup>3,4,5</sup> Since 1987, the adjusted incidence rate of hospitalization for acute myocardial infarction or fatal coronary artery disease in the United States has declined by 4 to 5% per year.<sup>6</sup> Nevertheless, approximately 550,000 first episodes and 200,000 recurrent episodes of acute myocardial infarction occur Annually.<sup>7</sup> Globally, ischemic heart disease has become the leading contributor to the burden of disease as assessed based on disability-adjusted life years.<sup>8</sup> Ischemic dysfunction of cardiac myocytes during ST elevation myocardial infarction (STEMI) can impair the systolic and diastolic function of the right, left or both ventricles. When the ischemic injury is extensive, the ventricular function can be impaired to such a degree that cardiogenic shock occurs, whereby cardiac output falls and elevated ventricular filling pressures lead to heart failure.<sup>9</sup> The decreased cardiac output then propagates a vicious cycle of

progressively worsening coronary perfusion, myocyte dysfunction, and ultimately end organ hypoperfusion.<sup>10</sup> Thrombolytic therapy is easily and quickly administered and is readily available; it requires little skill or equipment, and yields greater benefit the sooner it is given after the onset of symptoms.<sup>11</sup> Streptokinase (SK) is a thrombolytic medication and enzyme. As a medication, it is used to break down clots in some cases of myocardial infarction (heart attack), pulmonary embolism, and arterial thromboembolism. The type of heart attack it is used in is an ST Elevation Myocardial Infarction (STEMI). It is used intravenously. Side effects include nausea, bleeding, low blood pressure, and allergic reactions.<sup>12</sup> Streptokinase (SK) is the most widely used fibrinolytic agent especially in economically burdened countries due to the higher cost of the more effective recent generations of fibrinolytic such as tissue plasminogen activator (t-PA).<sup>13</sup> Most randomized trials used a slow infusion of SK over 60 minutes, this may have been due to concerns regarding ensuing hypotension or hemorrhagic complications of SK with faster regimens. However, some evidence points to the fact that a minimum dose of 500 U/kg/min may be needed for effective tissue level reperfusion, a dose that cannot be obtained with such a relatively slow

infusion over 60 minutes.<sup>14</sup> In one study, the rate of coronary reperfusion was numerically higher in the accelerated SK dose (60.2%) than in the standard dose (57.1%).<sup>15</sup> The other reported efficacy of accelerated SK in patients with STEMI is 62%.<sup>16</sup> The present study is designed to determine the efficacy of accelerated SK in the treatment of newly diagnosed STEMI. Our major concern to conduct this study was that in Peshawar, data regarding the effect of streptokinase in patients with STEMI is lacking especially in the past 5 years. This study will give us fresh local data about the efficacy of accelerated streptokinase SK and will formulate future research strategies to identify the usefulness of accelerated streptokinase (SK) in STEMI patients.

## METHODOLOGY

This Descriptive study was done in the Department of Cardiology, Hayatabad Medical Complex over a period of 6 months from August 2020 to February 2021. Age ranged between 35-70 years. Both males and females presenting with acute ST elevation MI, patients within 6 hours of the onset of chest pain were included in the study. Accelerated SK dose regimen defined as 0.75 MU over 10 minutes and followed 50 minutes by the second infusion of 0.75 MU over 10 minutes if there were no ECG signs of coronary reperfusion. The standard dose regimen was defined as 1.5 MU over 60 minutes infused intravenously. Patients with already diagnosed conduction abnormalities, including BBB on medical records, Patients with a history of cardiac interventions, and Patients with a history of renal failure, liver cirrhosis and diabetes (as determined by medical records) were excluded from the study. Statistical analysis was done using SPSS 27.0 for windows. A p-value of  $\leq 0.5$  was considered significant.

## RESULT

Among 144 patients age distribution was analyzed as 50(35%) patients were in age 35-50 years, and 94(65%) patients were in age 51-70 years. The mean age and standard deviation were  $61 \pm 8.19$ . (Table No 1). Gender distribution was analyzed as 88(61%) patients were male and 56(39%) patients were female. Status of BMI was analyzed as 69(48%) patients had BMI  $\leq 27$  Kg/m<sup>2</sup> and 75(52%) patients had BMI  $>27$  Kg/m<sup>2</sup>. The status of hypertension among 144 patients was analyzed as 127(88%) patients were hypertensive while 17(12%) patients were non-hypertensive. The status of diabetes mellitus among 144 patients was analyzed as 95(66%) patients were diabetic while 49(34%) patients were non-diabetic. The efficacy of

accelerated streptokinase among 144 patients was analyzed as accelerated streptokinase was effective in 92(64%) patients and was not effective in 52(36%) patients. (Tables 1,2 & 3)

**Table 1: Efficacy of Accelerated Streptokinase W.R.T History of Hypertension**

Efficacy	Hypertensive	Non Hypertensive	Total	P-Value
Effective	81 (64%)	11 (64%)	92 (64%)	0.9404
Not effective	46 (36%)	06 (36%)	52 (36%)	
Total	127 (100%)	17 (100%)	144 (100%)	

**Table 2: Efficacy of Accelerated Streptokinase W.R.T Diabetes Mellitus**

Efficacy	Diabetic	Non-Diabetic	Total	P-Value
Effective	61 (64%)	31 (64%)	92 (64%)	0.9109
Not effective	34 (36%)	18 (36%)	52 (36%)	
Total	95 (100%)	49 (100%)	144 (100%)	

**Table 3: Efficacy of Accelerated Streptokinase W.R.T History of BMI**

Efficacy	$\leq 27$ Kg/m <sup>2</sup>	$> 27$ Kg/m <sup>2</sup>	Total	P-Value
Effective	44 (64%)	48 (64%)	92 (64%)	0.9769
Not effective	25 (36%)	27 (36%)	52 (36%)	
Total	69 (100%)	75 (100%)	144 (100%)	

## DISCUSSION

Cardiovascular disease (CVD) is considered one of the important priorities in the health systems of all countries.<sup>1</sup> The burden of these diseases is increasing in low, moderate, and high-income countries.<sup>2</sup> Worldwide, Finland and Japan have the highest and lowest myocardial infarction (MI) incidence rates, respectively.<sup>3,4,5</sup> Since 1987, the adjusted incidence rate of hospitalization for acute myocardial infarction or fatal coronary artery disease in the United States has declined by 4 to 5% per year.<sup>6</sup> Nevertheless, approximately 550,000 first episodes and 200,000 recurrent episodes of acute myocardial infarction occur annually.<sup>7</sup> Globally, ischemic heart disease has become the leading contributor to the burden of disease as assessed based on disability-adjusted life years.<sup>8</sup> Ischemic dysfunction of cardiac myocytes during ST elevation myocardial infarction (STEMI) can impair the systolic and diastolic function of the right, left or both ventricles. When the ischemic injury is extensive, the ventricular function can be impaired to such a degree that cardiogenic shock occurs, whereby cardiac output falls and elevated ventricular filling pressures lead to heart failure.<sup>9</sup> The decreased cardiac output then propagates a vicious cycle of progressively worsening coronary perfusion, myocyte dysfunction, and ultimately end-organ hypoperfusion.<sup>10</sup> Our study shows that among 144 patients 50(35%) patients were in age 35-50 years, and

94(65%) patients were in age 51-70 years. The mean age and standard deviation were  $61 \pm 8.19$ . 88(61%) patients were male and 56(39%) patients were female. 69(48%) patients had BMI  $\leq 27$  Kg/m<sup>2</sup> and 75(52%) patients had BMI  $> 27$  Kg/m<sup>2</sup>. 127(88%) patients were hypertensive while 17(12%) patients were non hypertensive. 95(66%) patients were diabetic while 49(34%) patients were non diabetic. Moreover, accelerated streptokinase was effective in 92(64%) patients and was not effective in 52(36%) patients. Similar results were observed in another study conducted by Siri wattana K et al in which There were 423 STEMI patients in the CCU of Nakornping Hospital, 211 patients were treated with SK infusion, but 87 patients from the 211 patients were excluded due to missing data.<sup>15</sup> Therefore, 124 patients were included in the present study. Baseline characteristics were comparable between the two groups. The rate of coronary reperfusion was numerically higher in the accelerated SK dose (60.2%) than in the standard dose (57.1%), but this difference did not reach statistical significance ( $p=0.81$ ). No TIMI major bleeding occurred in both group. There was no statistically significant difference in the hospital mortality rates (accelerated SK dose 3.9% versus standard dose 9.5%,  $p=0.27$ ). In another study conducted by Bendary A et al concluded similar results in which both groups were statistically matched in all baseline criteria.<sup>16</sup> There was a significant difference between both groups regarding each parameter of successful reperfusion in favor of an accelerated regimen. When all these parameters were combined, 31 patients (62%) had successful reperfusion in group I versus 19 patients (38%) in group II ( $P = 0.016$ ). We did not report any significant difference between both groups regarding in-hospital mortality, in-hospital heart failure, major bleeding, hypotension or allergic reaction to SK. The mean pre-discharge ejection fraction was higher in group I than in group II ( $50.9 \pm 6.6\%$  versus  $47.3 \pm 4.6\%$ ,  $P = 0.002$ ). similar findings were reported by other researchers as well.<sup>17</sup> Research conducted by Ghaffari S et al reported that the mean age was  $59 \pm 12$  years (79% male). There were no differences in baseline data between groups.<sup>18</sup> Clinical, electrocardiographic, and physiologic reperfusion indices revealed significantly faster and higher reperfusion rates and better preserved LVEF at discharge in group A. Sixty-three per cent of patients in either group underwent invasive coronary angiography at a mean of 5 days with comparable findings. Atrial fibrillation, malignant ventricular arrhythmias on the second day, and in-hospital and late mortality rates occurred more frequently in group B patients. In multivariate analysis, accelerated SK infusion was the only independent predictor of higher

electrocardiographic reperfusion (OR = 3.2, CI: 1.93–5.3,  $P < 0.001$ ). They concluded that the accelerated SK infusion regimen of 1.5 MU in 20 min is safe and well tolerated with significantly faster and higher clinical reperfusion rates, more preserved LV systolic function, less atrial and ventricular sustained arrhythmias, and less in-hospital and 1-year mortality rates in acute STEMI.

## LIMITATIONS

One of the limitations of our study is the reduced study population carried out in a single tertiary care hospital. Thus to confirm our results, a randomized control trial with a larger sample size should be carried out on patients from different hospitals in future.

## CONCLUSION

The accelerated SK infusion regimen of 1.5 MU in 20 min is safe and well tolerated with significantly faster and higher clinical reperfusion rates, more preserved LV systolic function, less atrial and ventricular sustained arrhythmias, and less in-hospital and 1-year mortality rates in acute STEMI.

**CONFLICT OF INTEREST:** None

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