THROMBOLYTIC THERAPY SUCCESS RATE AND TIME TO THROMBOLYSIS IN PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION

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ABSTRACT

Objective: To determine the thrombolytic therapy success rate and time to thrombolysis in patients with ST-elevation Myocardial infarction (STEMI).

Material and methods: This descriptive cross-sectional study was conducted at the cardiology department of Khyber Teaching Hospital Peshawar. All patients with ST-elevation myocardial infarction 18 years and above presenting within twelve hours of symptom onset were enrolled. ECGs done before and 90 minutes after the administration of thrombolytic therapy were analyzed for ST-segment resolution (STR). The time of chest pain onset, the time to seek medical advice, and the start of thrombolytic therapy were recorded in addition to other information. Thrombolytic therapy was labeled Successful if there was STR of 50% and above with relief of chest pain. All the data was analyzed using SPSS software.

Results: The total study population was 168 with a mean age of 57.67 ±11.99 years while the mean BMI was 26.3± 4.5. The mean time to thrombolytic therapy was 5.96±4.1 hours. Door-to-needle time in minutes was 33.8± 9.77. There were 66% (n=107) males while 34% (n=55) patients were females. Overall Thrombolytic success rate was 69.1% (n=112). Those thrombolysed within 6 hours of symptoms onset showed a higher success rate than those receiving Streptokinase late (p = 0.004). The age of the patient, gender, and cardiovascular risk factors did not affect thrombolytic success.

Conclusion. Thrombolytic therapy is an effective option for STEMI patients with a high success rate if administered earlier.

Keywords: Thrombolytic Therapy, Success Rate, Time to Thrombolysis, St Elevation Myocardial Infarction

INTRODUCTION

Globally Cardiovascular disease (CVD) is the major cause of mortality and morbidity while its prevalence is much higher in economically deprived and socially underdeveloped countries.[1, 2] The presence of cardiovascular risk factors causes accelerated atherosclerosis.[3]

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Improving health care services with advances in treatment options a significant decline in mortality from cardiac diseases has occurred, the scenario is unfortunately worsening in Pakistan with CVD affecting people at a younger age, and the prevalence of CVD risk factors is much higher than the international figures. In addition, there seems no political will and strategy to invest in the health sector shortly, and increasing economic, and political instability is making it even worse than ever.[4, 5]

ST elevated myocardial infarction (STEMI) occurs when there is abrupt coronary occlusion, causing myocardial ischemic injury leading to necrosis. Restoring myocardial perfusion by treating occluded vessel well in time before irreversible injury occurs influences the immediate and late clinical outcomes in STEMI patients. [6,7] Practically Reperfusion therapy is delayed in many cases due to lack of awareness, inaccurate initial diagnosis, unavailability of transportation services, and financial constraints. In contrast to European society where the use of reperfusion therapy is very high, this is delayed or denied to many of our patients due to lack of health insurance and

many other factors contributing to poor outcomes. [8] Any local healthcare system should aim to facilitate swift identification and timely treatment of patients experiencing STEMI. Availability of health care services, primary health care physician training, and their active involvement and widespread community awareness is one very important aspect to decrease times to seek medical advice and get early therapy and has significantly improved times to seek early advice but in Pakistan, the reported delay is still longer. [9, 10]

Irrespective of the selection of fibrinolytic therapy, an established time-dependent reduction in clinical events including both mortality rate and morbidity from STEMI occurs if given within 12 hours of symptoms onset. Therefore every effort to minimize the delay in recognition and early administration of appropriate reperfusion therapy is the key to improving outcomes. [9] Furthermore offering treatment in less than 4 hours of symptom onset predict significantly favorable outcomes, [11] while failed thrombolysis predicts increased mortality. **[12]**

Data support the use of fibrinolytic reperfusion within twelve hours of symptoms and one study evaluating the effect of thrombolytic therapy on ST-segment resolution showed that in patients receiving treatment before 12 hours, there was complete resolution in 72.88% of patients, while those receiving it later than this had poor ST-segment resolution as per ECG findings. [13] Streptokinase has shown comparable efficacy and safety in STEMI patients.[14]

The latest guidelines suggest administering fibrinolytic therapy followed by transferring the patient to a PCI-capable center within 3 to 24 hours. Nevertheless, every STEMI-referring hospital should be prepared to initiate an alternative approach for patients unable to undergo primary reperfusion. This begins with promptly interpreting the 12-lead ECG within 10 minutes of the patient's arrival. The diagnosis of STEMI should trigger an immediate activation of the transfer protocol. The STEMI-referring hospital should have structured protocols for patient care and the commencement of transportation.

Though primary PCI is the preferred method of coronary reperfusion today, the primary PCI program is not yet mature with a lot of challenges to get it to the international standards, and where a lot of patients even today are getting treated with fibrinolytic therapy as the default strategy without proceeding for subsequent invasive therapy in the recommended time. Moreover, where tPA has replaced streptokinase for coronary reperfusion worldwide we still use streptokinase as the only available reperfusion agent for STEMIs therefore this study was conducted to determine the efficacy of this therapy for coronary reperfusion and to see the importance of administering thrombolytic therapy earlier specially if PPCI facility is not available within the recommended time, which will help guide us in improving revascularization strategy.

METHODOLOGY

The study population consisted of consecutive patients over 18 years of age with STEMI (defined as >1 mm ST-segment elevation in ≥2 limb leads or >2 mm ST-segment elevation in ≥2 precordial leads) admitted to cardiac care unit of Khyber Teaching Hospital, Peshawar, Pakistan and has no contraindications to thrombolytic therapy. Patients were excluded if the presentation was after 12 hours of symptom onset, patients with cardiogenic shock, and patients with contraindication to thrombolytic therapy. All patients were loaded with 300mg acetylsalicylic acid, 300mg Clopidogrel, rosuvastatin 20mg, and enoxaparin followed by streptokinase 1.5 million units over one hour. A detailed history was recorded and ECGs done before and 90 minutes after administration of thrombolytic therapy were analyzed for ST-segment resolution and patients were reassessed for chest pain. The time of chest pain onset, time to seek medical advice, and the start of thrombolytic therapy were recorded in addition to other information in the prespecified Performa. Consultant cardiologist decided on the success of thrombolytic therapy according to standard criteria. Thrombolytic success was defined as relief of chest pain along with 50% or more ST-segment resolution.

Data was analyzed using SPSS v20 (IBM Corp.). Mean and standard deviation were used for quantitative variables while frequency and percentages were calculated for categorical variables. A two-sided Chi-Square test was used to compare categorical variables. A p-value of ≤0.05 was deemed significant.

RESULTS

Between September 2023, to March 2024, a total of 168 STEMI patients were included in the study. The mean age of the studied population was 57.67 ±11.99 SD years while the mean BMI was 26.3± 4.5 SD. The mean time to thrombolytic therapy was 5.96 hours ±4.1 SD.

Door-to-needle time in minutes was 33.8± 9.77 SD. There were 66% (n=107) males while 34% (n=55) patients were females. The most common cardiovascular risk factor was Hypertension 63% (n=102) while DM was noted in 47.5% (77) patients, family history of CAD in 42% (68), dyslipidemia in 32% (52), smoking in 33.3% (54) and obesity in 30% (49) patients. Before thrombolysis, all patients received 300mg of aspirin, 300mg of clopidogrel (except those who were more than 75 years old and received only 75mg of clopidogrel), and 20mg of rosuvastatin. In addition, all patients were given enoxaparin too. Among the studied population 35% of patients were already on antiplatelet therapy, 56% ACE inhibitors/ ARBs, 20% statins, and 42% Beta blockers.

Overall Thrombolytic success rate was 69.1% (n=112), though a slightly higher number of patients showed STR of 50% or more 71.6% (n=116) while pain relief was achieved in 81.5% (n=132) patients. Time had a significant impact on thrombolytic success with those thrombolysed within 6 hours of symptoms onset showing a higher success rate against those receiving Streptokinase late (76.9% vs 55.2%, p = 0.004). The age of the patient, gender, and cardiovascular risk factors did not affect thrombolytic success. (Table: 2)

TABLE 1: BASELINE CHARACTERISTICS OF PATIENTS

Mean Age	57.67 ±11.99
Gender Male Female	 66% (n=107) 34% (n=55)
BMI	26.3± 4.5
Mean symptom onset to SK Time (Hours)	5.96hours ± 4.1 SD
Door to Needle Time (Mins)	33.8± 9.77 SD
DAPT Loading at Presentation	100%
CVD Risk Factors DM HTN CAD Family History Obesity Dyslipidemia Smoking	 47.5% (77) 63% (102) 42% (68) 30.3% (49) 32.1% (52) 33.3% (54)

BMI: Body Mass Index, SK: Streptokinase, DAPT: Dual Anti Platelet Therapy, DM: Diabetes Mellitus, HTN: Hypertension, CAD: Coronary Artery Disease

Table 2: THROMBOLYTIC SUCCESS RATE AND PATIENT CHARACTERISTICS

	Successful thrombolysis %(n)	P value (Pearson Chi-Square) Asymp. Sig. (2-sided)
Time to Thrombolytic Therapy: < 6 hrs ≥6 hrs	 76.9%(80) 55.2 (32)	0.004
Age Group: <60 Years ≥60 Years	 70.4% (57) 67.9% (55)	0.734
Gender: Male Female	 72.9% (78) 61.8% (34)	0.148

Hypertensive Normotensive	68.6% (70) 70% (42)	0.855
Diabetic Non Diabetic	68.8% (53) 69.4% (59)	0.938
Dyslipidemia No Dyslipidemia	76.9% (40) 65.5% (72)	0.140
Obese Non Obese	65.3% (32) 70.8% (80)	0.487
Smokers Non Smokers	64.8% (35) 71.3% (77)	0.400

DISCUSSION

Our study showed that administering thrombolytic therapy earlier improves the success rate of thrombolytic therapy. Similar results of high thrombolytic success rate were demonstrated earlier in a study by Saleem et. al.[13] The study also demonstrated that other factors including, diabetes mellitus, hypertension, and the use of inotropic drugs at admission are predictive of thrombolysis failure while smoking is associated with high success rate. Our study did not prove any association between HTN, DM, smoking, and thrombolytic therapy. One study reported a complete response to thrombolytic therapy in 53.4%, 29.1% showed partial resolution while failed thrombolysis was reported in 17.5% of patients. Their definition and patient selection differed from our population. In addition, this study also showed a positive association between failed thrombolysis and increasing age, CVD risk factors including diabetes, hypertension, high LDL cholesterol, and duration of symptoms. [15]

There is very limited old local data available about the thrombolytic therapy success rate. Another local study reported a similar thrombolytic success rate of 72.8% when streptokinase was administered within 12 hours of symptoms onset. Moreover, they reported poor response to thrombolytic therapy in patients with Diabetes and Hypertension.[16] Older studies comparing ST resolution in Diabetic vs non-diabetics have reported high rates of complete STR in non-diabetic STEMI patients but they used an STR of >70% to define complete STR. [17] In addition to lower STR rate with streptokinase, diabetic patients have higher baseline risk profiles, poorer clinical presentation, and more complex lesion patterns leading to adverse clinical outcomes.[18] One approach to improve STEMI outcomes is prehospital activation of reperfusion services, especially primary PCI.[19] Based on our study results we recommend that where primary PCI services are not available or cannot be provided without delay, streptokinase should be given as an effective alternative rather than transferring them to a far-flung PCI-capable hospital for improved clinical outcomes.

Study limitations

The research was conducted at a single center and involved a limited number of patients. Patients receiving thrombolytic therapy after 12 hours of symptoms onset and those with cardiogenic shock were not studied.

CONCLUSION

Thrombolytic therapy using streptokinase is an effective treatment option for all STEMI patients with a high success rate if administered within six hours of chest pain onset.

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