Original Research Article

A STUDY ON FACTORS INFLUENCING THE OUTCOME OF THROMBOLYSIS IN ACUTE MYOCARDIAL INFARCTION IN ICCU OF TERTIARY CARE UNIT

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A B S T R A C T

Background: Coronary artery disease is a leading global health burden, with fibrinolysis proving to reduce mortality in acute myocardial infarction. This study aimed to identify the success rate of thrombolysis in ICCU and the impact of various factors on the success of thrombolysis, including age, sex, alcohol consumption, smoking, hypertension, diabetes mellitus, location of MI, and the time interval between the onset of chest pain and initiation of thrombolytic therapy.

Material and Methods: This observational prospective cohort study included 95 patients at Government Vellore Medical College and Hospital, from May 2018 to April 2019. Patients were divided into two groups based on the success or failure of thrombolysis. Factors such as age, sex, alcohol consumption, smoking, systemic hypertension, diabetes mellitus, location of MI, and the time interval between the onset of chest pain were analysed.

Results: The overall success rate of thrombolysis was 56 (58.95%) and the failure was 39 (41.05%). The mean age group was 58.28±10.90. There were no significant differences in age, sex, or location of MI between the successful and failed thrombolysis groups (p>0.05). The window period had a significant relationship with the success of thrombolysis, with patients presenting within 4 h having a better success rate than those presenting later (p=0.001). There were no significant differences in hypertension, diabetes, smoking, and alcohol consumption between the success and failure of thrombolysis (p>0.05).

Conclusion: The window period significantly influenced the success of thrombolysis, with higher success rates observed in patients presenting within 4 hours of symptom onset and didn't have a significant impact on thrombolysis success.

Key Words: Acute Myocardial Infarction, Thrombolysis, Streptokinase, Coronary Artery Disease, ICCU, Time Window.

INTRODUCTION

Coronary artery disease (CAD) has become a widespread disease causing a significant health burden in almost all countries worldwide. In the USA alone, 1.37 crore people have been suffering from coronary artery disease.[1,2] As far as our country is concerned, the number of patients suffering from coronary heart disease has doubled in rural areas from 2 to 4% and tripled from 3.45 to 9.45% in urban areas from 1960 to 1990. The numbers are comparatively higher in the southern parts of our country accounting for 13% in urban areas and 7% in rural areas. The mortality due to CVS ailments was one-fourth that of all-cause mortality in our country in the year 1990.[3] 213 Out of one lakh population after the third decade are suffering from CAD.[1] The rising prevalence of coronary artery disease is attributed to increased life expectancy and reduced mortality following initial cardiac events. Globally, cardiovascular diseases account for nearly one-third of all deaths, with

coronary events contributing to over 50% of these fatalities.

Coronary artery disease is described as "inadequate functioning of the heart as a result of the mismatch between the supply of blood and demand of cardiac myocytes due to blockage of blood vessels supplying the musculature of the heart". CAD accounts for almost one-fourth of the mortalities in many developed countries. It also accounts for a considerable disease burden in the country. The increase in the occurrence of the illness can be due to the increasing longevity of the population, consumption of food rich in lipids, and reduced physical activity.

The understanding of coronary artery disease (CAD) evolved significantly, from Herrick's 1912 post-mortem study identifying thrombus as the cause of myocyte death to angiography confirming this theory. Modern fibrinolytic agents like streptokinase, alteplase, reteplase, and tenecteplase have demonstrated reduced mortality in AMI patients, with studies like GISSI, ISIS-2, and GUSTO-I providing strong evidence for their efficacy.[4]

As these agents are expensive, streptokinase is left to be the drug of choice for fibrinolysis in the Government Vellore Medical College and Hospital. The treatment of AMI is dramatically altered by fibrinolysis. The incidence of favourable outcomes was 54% in a sub-study in the GUSTO trial using angiography one hour after the initiation of heparin administration. The rate of death and impact of the disease on quality of life are decreased by fibrinolysis. However, treatment with fibrinolytic agents has not been successful in many patients. Therefore, there is a fair scope for improvement. The factors that determine the success of fibrinolysis must also be determined.

Aim

This study aimed to identify the success rate of thrombolysis in ICCU and the impact of various factors on the success of thrombolysis, including age, sex, alcohol consumption, smoking, systemic hypertension, diabetes mellitus, location of myocardial infarction (MI), and the time interval between the onset of chest pain and initiation of thrombolytic therapy.

MATERIALS AND METHODS

This observational prospective cohort study included 95 patients who were administered streptokinase for STEMI in the ICCU of the Government Vellore Medical College and Hospital, Vellore, from May 2018 to April 2019. This study was approved by the Institutional Ethics Committee before initiation, and informed consent was obtained from all patients.

Inclusion Criteria

Patients with anginal pain typical of AMI along with electrocardiographic evidence of STEMI. The criteria for fibrinolysis were 2 mm or more elevation of the ST segment in two contiguous limb leads, and the time interval between the time of onset of pain and time of starting streptokinase infusion should be < 12 hours.

Exclusion Criteria

Patients with late presentation 12 h after the onset of angina, recurrent AMI, presence of bundle branch block, and development of pericarditis were excluded.

Methods

The patients were divided into two groups. Group A included patients who had successful thrombolysis and group B included those who failed thrombolysis. The patient had a history of natural pain, time of onset of pain, history of hypertension and diabetes, smoking, and alcohol consumption. The window period was calculated from the time of the first onset of pain to the time of needle insertion for the streptokinase infusion.

Blood pressure was recorded using a sphygmomanometer, with the patient in a sitting posture on the right arm. The appearance of 1st phase of the Korotkoff sound was considered systolic BP, and the disappearance of 4th phase of the Korotkoff sound was taken as diastolic BP. Two blood samples were taken: a fasting sample after 8 h of fasting and a postprandial sample 2 h after consuming food.

Statistical Analysis

Data are presented as mean, standard deviation, frequency, and percentage. Categorical variables were compared using Pearson's chi-square test. Significance was defined as $p<0.05$, using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0 (IBM-SPSS Corp., Armonk, NY, USA).

RESULTS

The mean age group was 58.28 ± 10.90. There were no significant differences in age and sex between the successful and failed thrombolysis groups (p=0.783, p=0.677). [Table 1]

There were no significant differences in hypertension, diabetes, smoking, and alcohol consumption between the success and failure of thrombolysis (p=0.342, p=0.202, p=0.432, p=0.205). The overall success rate of thrombolysis was 56 (58.95%) and the failure was 39 (41.05%). [Table 2]

The window period had a significant relationship with the success of thrombolysis, with patients presenting within 4 h having a better success rate than those presenting later (p=0.001). There were no significant differences in the location of MI between the success and failure of thrombolysis (p=0.259). [Table 3]

Table 1: Demographic details

		Frequency (%)	Thrombolysis		P value
			Success	Failure	
Age group in year	30-40	6 (6.3%)	3 (50%)	3 (50%)	0.783
	41-60	49 (51.6%)	30 (61.2%)	19 (38.8%)	
	> 61	40 (42.1%)	23 (57.5%)	17 (42.5%)	
Gender	Male	61 (64.2	35 (57.3%)	26 (42.7%)	0.677
	Female	34 (35.8%)	21(61.8%)	13 (38.2%)	

Table 2: Comparison of co-morbidities in gender with thrombolysis success rate

		Gender		Thrombolysis		P value
		Male	Female	Success	Failure	
Hypertension	Yes	17	19	19 (52.8%)	17 (47.2%)	0.342
	No	44	15	37 (62.7%)	22 (37.3%)	
Diabetics	Yes	16	23	26 (66.7%)	13 (33.3%)	0.202
	No	45	11	30 (53.6%)	26 (46.4%)	
Smoking	Yes	46	0	29 (63%)	17 (37%)	0.432
	No	15	34	27 (55.1%)	22 (44.9%)	
Alcoholic	Yes	38	1	20 (51.2%)	19 (48.8%)	0.205
	No	23	33	36 (64.3%)	20 (35.7%)	

Table 3: Comparison of window period and location of MI with thrombolysis success rate

		Frequency (%)	Thrombolysis		P value
			Success	Failure	
Window Period	< 4 hours	41 (43.16%)	33 (80.5%)	8 (19.5%)	0.001
	4 to 8 hours	35 (36.84%)	16 (45.7%)	19 (54.3%)	
	> 8 hours	19 (20%)	7 (36.8%)	12 (63.2%)	
Location of MI	Anterior	47 (49.47%)	25(53.2%)	22(46.8%)	0.259
	Inferior	48 (50.52%)	31(64.6%)	17(35.4%)	

DISCUSSION

In our study, the overall success rate of thrombolysis was 56 (58.95%), and failure was 39 (41.05%) for fibrinolysis with streptokinase. The impact of various factors on the success of thrombolysis, including age, sex, alcohol consumption, smoking, systemic hypertension, diabetes mellitus, location of myocardial infarction (MI), and the time interval between the onset of chest pain and the initiation of thrombolytic therapy. In the study by Ronad et al., the overall success rate of thrombolysis was 65%. Diabetics, hypertensives, smokers, and alcoholics did not differ significantly from the non-diabetic, non-hypertensive, non-smokers, and alcoholics groups (p>0.05).[5]

In our study, patients aged 40–60 years had the highest success rates, and there was no significant relationship between age and thrombolytic outcomes (p=0.783). In a study by Paudel et al., 46.2% (36) were females. A total of 7.7% (6) of elderly patients presented with atypical symptoms, among which syncope was the most common. Young patients were more likely to have hypertension than elderly patients (70.7% vs. 39.7%; p<0.001).[6]

In our study, there were no significant differences in sex between success and failure of thrombolysis (p=0.677). In the Cohen et al. study, the triple endpoint occurred in 17.8% of women versus 13.3% of men and was significant (p<0.05).[7]

In our study, there were no significant differences in hypertension and diabetes between the success and failure of thrombolysis (p=0.342 and p=0.202, respectively). In the Stenestrand and Wallentin study, diabetics, hypertensives, smokers, and alcoholics did not differ statistically from the non-diabetic, non-hypertensive, non-smoker, and non-alcoholic groups, respectively (p> 0.05). Streptokinase/tenecteplase did not differ in their outcome statistically (p>0.05).8 Hossain et al. study reported that in acute ST-segment elevation myocardial infarction (STEMI), admitted at the coronary care unit, 126 patients were non-diabetic and 61 patients were diabetic. Streptokinase was administered to all the patients. Resolution (reduction) of elevated ST segment was evaluated after 90 minutes of streptokinase administration and was significantly higher in non-diabetic than diabetic (p<0.001), while failed reperfusion (<30% ST resolution) was significantly higher in diabetic patients (p<0.001).9 Gray et al. study found that in 98 patients who received thrombolytic therapy, the median time to peak enzyme release was 15.5 h (7.5-24 h) in diabetic patients (n = 26) and 12 h (5-26 h) in non-diabetic patients (n = 72) (p=0.005).[10]

In our study, there were no significant differences in smoking and alcohol consumption between success and failure of thrombolysis (p=0.432, p=0.205). In the Purcell study, smoking was not an independent prognostic factor after adjustment for post-thrombolysis plasma fibrinogen OR 0.5 (95% CI 0.4–1.1) (p=0.1), although its insignificance may be due to the small sample size. In non-smokers, there was a subgroup with persistent ST elevation, high post-thrombolysis fibrinogen levels, and 40% short-term mortality. No similar high-risk subgroup was observed in smokers.[11]

Rimm et al. study found that haemostatic factors related to a thrombolytic profile were modestly affected by alcohol based on published associations

between these biomarkers and the risk of coronary heart disease 30 g of alcohol a day would cause an estimated reduction of 24.7% in the risk of coronary heart disease.12 Ridkerpm et al. found that a direct association was found between alcohol consumption and plasma level of t-PA antigen, such that mean plasma levels of t-PA antigen for daily, weekly, monthly, and rare or never drinkers were 10.9,9.7,9.1, and 8.1 ng/mL, respectively (p<0.0001).[13]

In our study, there were no significant differences in the location of MI between successful and unsuccessful thrombolysis (p=0.259). The window period had a significant relationship with the success of thrombolysis, with patients presenting within 4 h having a better success rate than those presenting later (p=0.001). In Gibson et al. study reported that a culprit location in the left coronary circulation (left anterior descending or circumflex) (p=0.02, p<0.0001), pulsatile flow (i.e., reversal of flow in systole, a marker of heightened microvascular resistance, p=0.0003, p< 0.0001) and thrombus (p=0.002, p=0.03).14 In Ronad et al. study, the time window period, that is those presenting within 0-4 hrs of symptom onset had a higher success rate compared to those presenting later (p<0.01).[5]

CONCLUSION

The window period significantly influenced the success of thrombolysis, with higher success rates observed in patients presenting within 4 h of symptom onset. Age did not have a significant impact on thrombolysis success, although the 41-60-year age group showed better outcomes. Although females exhibited higher success rates, sex was not a significant factor. Similarly, systemic hypertension, diabetes mellitus, smoking, and alcohol consumption did not have a significant influence on thrombolysis success, although smokers and non-alcoholics had better outcomes. The location of myocardial infarction (MI) did not significantly affect success, however, patients with inferior wall MI had higher success rates. Overall, a thrombolysis success rate of 58.95%.

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