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ORIGINAL ARTICLE

Post Thrombolytic Angiographic Profile and TIMI Flow in Patients with ST-Elevation Myocardial Infarction

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ABSTRACT

Background: Myocardial infarction (MI) is the leading cause of morbidity and mortality worldwide. Primary Percutaneous coronary intervention (PPCI) is recommended as a treatment of choice in patients with STEMI but fibrinolysis also remains prevalent as a reperfusion strategy in most of the patients with STEMI presenting to non-PCI capable hospitals where timely PPCI cannot be performed.

Objectives: To assess the angiographic characteristics and angiographic success of thrombolysis in terms of TIMI 3 flow in patients who underwent angiography after thrombolysis for STEMI and the factors most commonly associated with unsuccessful thrombolysis.

Methods: All 130 hospitalized patients in the department of Cardiology, at Bolan Medical Complex Hospital, Quetta from 31st July 2021 to 30th November 2021 with an acute ST-segment elevation MI (STEMI) diagnosis who received thrombolytics were included in this observational study. We didn't include patients who couldn't benefit from thrombolysis e.g. NSTEMI, contraindication to thrombolytics, and refused fibrinolysis. A 12-lead electrocardiogram (ECG) was performed when the patient arrived in ER and a repeat ECG was done 90 minutes after the administration of a thrombolytic agent (streptokinase). To assess the angiographic success of thrombolysis, coronary anatomy, and TIMI flow, we performed coronary angiography in all patients included in this study.

Results: The study included 130 patients, 72 of whom had successful thrombolysis and 58 who had unsuccessful thrombolysis. Angiography reported TIMI 3 flow rates of 48(36.9%). Subjects in the unsuccessful thrombolysis group had the single-vessel disease in 29 (50%) and a multi-vessel disease was found in 19 (32.75%) of the patients. Patients with successful thrombolysis had Single vessel disease 6 (19.3%), Multivessel disease 1 (3.2) It was observed that patients with diabetes mellitus had a significant rise in the number of failed thrombolysis compared to those without diabetes mellitus ($p<0.005$). It was also observed that anterior wall MI was significantly at risk for a failure in thrombolysis (82.1%) compared to inferior wall MI (17.8%).

Conclusions: Effective thrombolysis was more prevalent than failed thrombolysis in our study. This data reiterates the utility of thrombolysis in resource-limited settings. Patients with diabetes, anterior wall MI, and delay in the presentations of the patients have a higher risk of thrombolysis failure. Type B lesions and multivessel disease were also prevalent in subjects with unsuccessful thrombolysis. According to the findings of this study, screening for risk factors before starting thrombolysis can aid in the development of alternative treatment methods that reduce failure rates and redirect resources to more successful treatment options.

Keywords: Post thrombolytic; Angiographic Profile, TIMI flow; St-elevation; Myocardial Infarction

INTRODUCTION

As one of the most common causes of mortality and morbidity, ST-elevation myocardial infarction (STEMI) is a major public health concern. Treatment options have developed considerably over the years. As per AHA guidelines, the primary percutaneous coronary intervention (PPCI) is the treatment of choice. for ST-elevation myocardial infarction (STEMI). To perform primary PCI, an experienced team must be on hand, since it has a greater success rate and better TIMI grade.[1–4]. However, limited resources, affordability issues, and inadequate transportation facilities to PCI-capable hospitals prevent the PCI from becoming the default reperfusion strategy, thus, making fibrinolysis the prevalent reperfusion strategy. Clinical trials have also proved that earlier fibrinolytic administration, improves myocardial salvage, preserves left ventricular function and decreases mortality and morbidity. Thus favoring the key role of pharmacological reperfusion in the acute treatment of STEMI. Patency rate and TIMI flow were the parameters used to assess the thrombolysis 'success. Studies show that a fibrin-specific treatment improves infarct artery patency over a fibrin nonspecific agent. As a result, it's been found that using non-specific agents increases the risk of thrombolysis failing.[5] When it comes to infarct treatment, thrombolysis with streptokinase (fibrin nonspecific) is the most commonly used reperfusion strategy in countries like Pakistan. The patency rate of the coronary arteries is around 60% with recently available thrombolytic medications. For patients with MI, the time it takes for them to get to a hospital for treatment is more essential than the type of thrombolytic medication used. Data has shown that every 30-minute delay increases the relative risk of one-year mortality by 8 times.[6] However, even though thrombolysis is a popular technique, it frequently fails. Investigating the causes of a failure is critical. An adequate examination of unsuccessful thrombolysis will help explore the aspects that significantly play a role in thrombolysis successes, as it is well-established that thrombolysis has a superior prognosis. Thrombolysis failures can be minimized by performing an in-depth investigation of these and other parameters. This study attempts to reveal the angiographic success of thrombolysis and the difference in angiographic parameters in patients with successful and failed thrombolysis and the important factors associated with unsuccessful thrombolysis.

MATERIAL AND METHODS

This observational study was carried out in the cardiology department of Bolan Medical Complex Hospital Quetta from 31st July 2021 to 30th November 2021. ST-elevation myocardial infarction (STEMI) patients who were presented at our tertiary care institution and were later diagnosed with ST-segment elevation MI (according to the Third universal definition of MI) were the focus of our investigation. Patients who had received thrombolytics were included in this investigation. A straightforward sampling method was used to choose the 130 patients who took part in the trial. Patients with STEMI evidenced by electrocardiography were

included while patients with other ischemic changes on ECG, biomarker elevation (NSTEMI), previous myocardial infarction, having an MI-related left bundle branch block, contraindication to thrombolysis, and who had not given consent for thrombolysis were excluded from the study, Streptokinase-treated patients who died within 60 minutes, suffering from long-term kidney problems were excluded from the study. Before the start of the study, the Institutional Ethics Committee gave its assent. Before any data was collected, participants were given a thorough explanation of the study and allowed to give their informed permission. The history of onset of chest pain, risk factors for coronary heart disease, and the arrival time at the hospital were got using a structured interview schedule. Other information was elicited, like treatment history, and the history of systemic disorders. A physical examination was done. At the time of presenting their first ECG was obtained. Based on ECG abnormalities and the location of ST-segment elevation, patients were categorized as having an anterior or inferior wall MI. Patients were given loading doses of antithrombotics,(Aspirin, clopidogrel, and anticoagulants) as per AHA guidelines. Thrombolysis was initiated with 15 lakh units of streptokinase infusion over 1 hour. During the thrombolysis phase, all patients were constantly monitored and their hemodynamic parameters were examined. Rhythm issues including idioventricular rhythm, any atrioventricular blocks, or tachyarrhythmias during the reperfusion phase were monitored and managed accordingly Relief of chest pain after thrombolysis was assessed by the visual analog scale, and a repeat ECG was done at 90 min after the administration of a thrombolytic agent to look for the settling of ECG changes (resolution of ST-segment elevation by >50% in the index lead showing the greatest degree of elevation on presentation) and development of reperfusion arrhythmias. It was defined as a failure of thrombolysis if the ST elevation remained above 50% for more than 90 minutes following thrombolysis. A further sign of a failed thrombolysis is persistent chest pain. The success of thrombolysis was assessed via measurement of angiographic parameters such as TIMI (Thrombolysis in Myocardial Infarction trial) flow grade classification and TIMI myocardial perfusion grade classification (TMP). The data was entered and analyzed using SPSS version 10. For both successful and failed thrombolysis, percentages were determined. To perform the risk factor analysis, both parametric and nonparametric tests were employed. P-values less than <0.05 were deemed significant.

RESULTS

The study statistically analyzed all 130 patients in the study group. There were two groups of participants in the study: those who had successful thrombolysis and those who had failed thrombolysis. 72 (55.38%) of the 130 patients in the research belonged to the successful thrombolysis group, whereas 58 (44.61%) belonged to the unsuccessful thrombolysis group.

A total of 130 patients were recruited for the study with a mean age ± SD of 53.47±10.17 years. There were 117 (90.0%) males and 13(10.0%) females. Baseline characteristics of patients with the thrombolytic agent used are shown in **Table 1**.

TIMI 3 flow was present in 36.9% (n =48) patients while 35% (n = 46) patients achieved TMP 3 grade. Out of 48 patients with TIMI 3 flow, the risk factors such as HTN, Diabetes Mellitus, smoking, dyslipidemia, family history of coronary artery disease, and history of ischemic heart disease and prior MI were seen 19 (39.5%), 10 (20.8%), 19 (39.5%), 30 (62.5%), 12 (25.0%) and 5(10.4%) respectively. **Table 1** The mean duration of angina in patients with TIMI-3 flow was 4.126 ± 2.63.

Moreover, a higher ejection fraction was observed with successful thrombolysis (34.7%) while it was observed only in two patients with failed thrombolysis 2(3.4%). The observed association was significant statistically (p<0.002). **Table 2**

The coronary angiogram findings are depicted in **Table 3**. It was observed that type B lesion was found to be maximum among the patients with failed thrombolysis 39 (67.2%) while type A lesion was found to be among 15(25.8%) of failed thrombolysis and type C lesion was found to be among 12(20.6%) of the failed thrombolysis patients. Subjects in the unsuccessful thrombolysis group had the single-vessel disease in 29 (50%) and a multi-vessel disease was found in 19 (32.75%) of the patients. Patients with successful thrombolysis had Single vessel disease 6 (19.3%), Multivessel disease 1 (3.2)

Table 1: Characteristics and predictors of TIMI flow rates in the study population (n = 130)

Characteristics	TIMI 3 Flow		P-value
	No (n =82)	Yes (n= 48)	
Age	54.71 ± 11.49	52.23 ± 10.504	0.175
Sex distribution			
Males	73 (62.3%)	44 (37.6%)	0.529
Females	9 (70.0 %)	4 (30%)	
Risk factors			
HTN	25 (30.4%)	19 (39.5%)	0.381
Diabetes Mellitus	12 (14.6%)	10 (20.8%)	0.236
Smoking	43 (52.4%)	19 (39.5%)	0.345
Dyslipidemia	55 (66.0%)	30 (62.5%)	0.541
F/H/O CAD	9 (10.9%)	12 (25.0%)	0.071
Past H/O IHD and prior MI	n =9 (10.9%)	n =5 (10.4%)	0.852
Mean angina duration	5.614 ± 3.46	4.126 ± 2.63	0.06
Angina duration upto 3 hours	n =30 (36.5%)	n = 19 (39.5%)	0.577
Angina duration upto 1 hour	n = 4 (4.8%)	n = 6 (12.5%)	0.218
Killip class			
KC-1	64 (78.0%)	44 (91.66%)	0.11
KC-II	5 (6.0%)	3 (6.2%)	
KC-III	9 (10.9%)	1 (2.0%)	
KC-IV	4 (4.8%)	0 (0%)	
Coronary angiography-based ira			
LAD	49 (59.7%)	16 (33.3%)	0.014
LCx	8 (9.7%)	9 (18.7%)	
RCA	25 (30.4%)	23 (47.9%)	
Vessel involvement			
Normal	56 (77.77)	10 (17.24)	<0.0001
Single vessel disease	14 (19.44)	29 (50.0)	
Multi vessel disease	2 (2.77)	19(32.75)	
Door-to-needle time			
Upto 30 min	73 (89.0%)	43 (89.5%)	0.243
31-60 min	9 (10.9%)	4 (8.3%)	
>60 min	0 (0%)	1 (2.0%)	

Table 2: Echocardiographic findings of the study participants (n = 130).

Characteristics	Successful Thrombolysis n=72(%)	Failed Thrombolysis n=58 (%)	p-value
Ejection fraction			
>55%	25 (34.72)	2 (3.44)	<0.002
45-54%	35 (48.61)	23(39.65)	
35-44%	12 (16.66)	31(53.44)	
<35%	0(0)	2 (3.44)	

Table 3: Type of lesion with failed thrombolysis (n = 58)

Type of lesion	Number	Percentage
Type A	15	25.8%
Type B	39	67.2%
Type C	12	20.6%

DISCUSSION

In the study, thrombolysis was effective in 55.38% of the patients. Overall TIMI-3 flow rates, as well as combined TIMI 2/3 flow rates, were significantly higher than prior studies which were lacking in optimal antithrombotic therapies.[7] TIMI grade 3 flow was achieved more frequently in patients with an infarct-related artery other than the LAD, attributable to the fact that the myocardial territory of LAD

being very large leads to extensive necrosis of the myocardium that it supplies and contributes to worse outcomes.[7] Therefore, patients with anterior wall myocardial infarction had a higher percentage of patients who failed thrombolysis, which was statistically significant. Patients with inferior wall MI had a higher chance of thrombolysis success. Patients with failed thrombolysis had a multivessel disease and type B lesion was more commonly seen than type A and Type C lesion in subjects with unsuccessful thrombolysis. According to several research, the percentage of failed thrombolysis ranges from 25 to 45%. In this study, 72(55.38%) of the 130 patients in the research belonged to the successful thrombolysis group, whereas 58(44.61%) belonged to the unsuccessful thrombolysis group. Research by Katyal et al. found that 34% of thrombolysis attempts were ineffective. In their investigation, Sudhindra et al. observed similar outcomes.[1,8] However, 44% of thrombolysis failures were discovered by Richardson S.G et al., which is similar to our findings.[9] According to our study, 20.8% of diabetics had failed thrombolysis. Similarly, Sudhindra, et al.,[8] and Samith M. Rafulah, et al.,[9] found a substantial link between diabetes and the ST segment.[10] According to our findings, thrombolysis failure is influenced by the time it takes for thrombolysis to begin. These findings are supported by other studies, including those by Lee YY and others. A 10% increase in thrombolysis failure was seen every 60 seconds when treatment was delayed after the onset of symptoms, according to his findings.[11] Patients who came within six hours of thrombolysis had a better prognosis, according to the GISSI-2 trial. According to Sudhindra et al., it took 5.85±2.47 hours from door to needle in failed thrombolysis, but just 4.55±2.4 in the successful group. 85% of the cases in our experiment who arrived at the coronary unit within three hours were successfully treated with thrombolysis.When it comes to successful thrombolysis, grade 3 TIMI flow is necessary. Jeffery et al. found that patients with a greater ejection percentage had improved TIMI 3 flow and a reduced death rate during their research.[12] TIMI flow was shown to be greater following successful thrombolysis in our study than following thrombolysis failure.

CONCLUSION:

Effective thrombolysis was more prevalent than failed thrombolysis in our study. This study reiterates the utility of thrombolysis in resource-limited settings where mechanical reperfusion for STEMI cannot be performed on time. Thus, our study supports the pharmaco invasive strategy for STEMI with fibrinolysis in conjunction with routine loading with dual antiplatelet therapy and anticoagulant and

subsequent invasive assessment and PCI if needed, in areas where significant healthcare resource and infrastructure constraints exist. Failed thrombolysis was linked to diabetes, anterior wall MI (LAD territory), and a Type B coronary artery lesion. This study also demonstrates the need for screening before beginning thrombolysis. This will help to reduce failure rates and focus resources on more effective treatment choices.

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