

A COMPARATIVE ANALYSIS OF FREQUENCY OF IN-HOSPITAL ARRHYTHMIAS IN PATIENTS WITH SUCCESSFUL VERSUS FAILED THROMBOLYSIS FOLLOWING ACUTE MYOCARDIAL INFARCTION

Sher Bahadar Khan¹, Rafiullah², Abdul Hadi³, Syed Tahir Shah⁴, Samiullah Khan⁵, Ikramullah⁶, Muhammad Abdur Rauf⁷, Hafiz ur Rehman⁸, Adnan Mahmood Gul⁹, Mohammad Hafizullah¹⁰

^{1,3-7,9,10} Department of Cardiology, Lady Reading Hospital & Khyber Medical University, Peshawar - Pakistan

^{2,8} Department of Cardiology, Saidu Teaching Hospital, Swat - Pakistan

Address for Correspondence:

Dr. Sher Bahadar Khan,

Senior Registrar,

Lady Reading Hospital, Peshawar - Pakistan

E-mail: docyousafzai@yahoo.com

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Contribution

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: To compare frequency of in-hospital arrhythmias in patients with successful and failed thrombolysis using streptokinase in patients presenting with acute myocardial infarction (AMI).

Methodology: This was a comparative study conducted at department of Cardiology, Lady Reading Hospital, Peshawar from October 2006 to October 2007. Two hundred patients with first AMI were divided into two groups: group A (successful thrombolysis) and group B (failed thrombolysis) using ECG criteria.

Results: A total of 200 patients were studied. Group A included 136 (68%) patients while group B included 64 (32%) patients. Among these 24 (12.0%) patients developed arrhythmias. Of these 8 patients were in group A and 16 patients were in group B (5.9% vs. 25.0%, $p=0.003$). Ventricular tachycardia was the most common arrhythmia. It was documented in 9 (4.5%) patients, with 2 patients in group A and 7 patients in group B (1.5% vs. 10.9%, $p=0.003$). The other arrhythmias which included atrial fibrillation, ventricular fibrillation and supraventricular tachycardia were statistically insignificant between the two groups ($p=0.174$). In hospital mortality was more common in patients with failed thrombolysis [6 (9.4%) vs. 3 (2.2%) ($p=0.023$)].

Conclusion: Failed thrombolysis is associated with complex arrhythmias and high in-hospital mortality.

Key Words: Myocardial infarction; thrombolysis; arrhythmias

INTRODUCTION

Each year, nearly 1 million individuals in the United States suffer an acute myocardial infarction (AMI) of which 20% to 25% experience sudden cardiac death due to ventricular tachycardia and fibrillation (VT/VF).¹ These complications occur more in patients with failed thrombolysis in ST-elevation myocardial infarction (STEMI) which results in increased rates of both hospital and long-term mortality.² In a study by Volpi A et al, VF occurred in less than 2% of hospitalized patients. This small proportion of patients who developed VF likely reflects marked increases in the utilization of a variety of effective cardiac therapies (including Percutaneous coronary intervention and thrombolytics).³ Sinus tachycardia is particularly common in patients with anterior infarction, especially if there is significant accompanying left ventricular dysfunction due to failed thrombolysis in STEMI. It results in augmentation of myocardial oxygen consumption, as well as a reduction in the time available for coronary perfusion, thereby intensifying myocardial ischemia and/or external myocardial necrosis.⁴ Atrial flutter is usually transient. The increased ventricular rate and the loss of the atrial contribution to left ventricular filling result in a significant reduction in cardiac output. Atrial fibrillation during STEMI is associated with increased mortality and stroke, particularly in patients with anterior wall infarction.⁵

These adverse events occur partly as a result of failed thrombolysis,⁶ and mega-trials have shown a clear message that failed thrombolysis are seen with patients who are not treated early,⁷ hence thrombolysis has become the established fact in the treatment of acute myocardial infarction.⁸

Coronary angiography is the gold standard to determine coronary artery patency after reperfusion therapy but it is expensive, invasive and not always available early. Therefore, bedside noninvasive markers are more attractive options.⁹ So the diagnosis of failed thrombolytic treatment is currently best achieved with repeat 12 lead ECGs. Many ECG criteria for the diagnosis of failed thrombolysis have been examined. Among these most reliable is the one showed by Sutton et al that less than 50% resolution of ST segment elevation in the worst infarct lead has a sensitivity of 81%, specificity of 88% and positive predictive value of 87% to predict less than TIMI-3 flow.⁹ It is further supported by a study published by De Belder that failure in the 50% resolution of ST segment, measured two hours after the start of thrombolysis has the diagnostic accuracy of about 80-85% for failure to achieve TIMI 3 flow.¹⁰ In another study ST segment resolution 90-180 minutes after thrombolysis was assessed which showed that it is a strong predictor of survival and preservation of left ventricular function and reduction in the incidence of arrhythmia and left ventricular failure.^{11,12}

The aim of this study was to compare frequency of in-hospital arrhythmias in patients with successful Vs failed thrombolysis using streptokinase in patients presenting with acute myocardial infarction (AMI).

METHODOLOGY

This comparative study was conducted at Cardiology department, Lady Reading Hospital Peshawar, from October 2006 to October 2007. Two hundred patients with first acute myocardial infarction were included in the study by Non-probability purposive sampling. Patients with persistent chest pain of ischemic nature presenting within 12 hours of onset of pain and having ST elevation of at least 2 mm in 2 or more leads on ECG were included in the study. Patients having contraindications to thrombolytic therapy, prior history of coronary artery bypass graft (CABG), bundle branch block or other electrocardiographic features where ST segment resolution cannot be determined and previous history of myocardial infarction were excluded from the study.

Informed consent was taken after explaining the purpose and procedure of the study. Data i.e. patients bio-data, various in-hospital complications were entered in the Performa. A baseline (pre-thrombolysis) 12 lead ECG, by CARDIOFAX NIHON KOHDEN (MODELNO.9620L) ECG machine was recorded immediately before initiation of streptokinase and at 120 minutes thereafter (post-thrombolysis ECG). The lead with maximum ST segment elevation in the pre-thrombolysis ECG was used for comparison with the post-thrombolysis ECG. ST segment elevation was measured in millimeters at 80 ms beyond the J-point.

Successful thrombolysis was defined as $\geq 50\%$ resolution of the maximum ST segment elevation at 120 minutes. Failed thrombolysis was defined $< 50\%$ resolution of the ST segment elevation in the lead with the maximum ST segment elevation two hours after the initiation of streptokinase.

Data was analyzed using SPSS version 12. Chi-square test was applied to determine the p value by comparing the proportions/percentages of arrhythmias between failed and successful thrombolysis. P- Value ≤ 0.05 was considered significant.

RESULTS

A total of 200 patients with acute myocardial infarction treated with streptokinase were included in this study. On the basis of our ECG criteria for successful/ failed thrombolysis, these 200 patients {(male=147(45.5%), (female =53(26.5%)} were divided into two groups i.e successful thrombolysis group (group A) and failed thrombolysis group (group B). Group A included 136 (68%) patients and group B included 64 (32%). In group A out of 136, anterior MI was present in 47(43.6%), inferior MI was present in 88(64.7%)

Table 1: Arrhythmias In Group A and Group B (n = 200) P-value = 0.003

Arrhythmias	Group A (n=136)	Group B (n=64)	Total
Present in cases	08 (5.9%)	16 (25.0%)	24 (12.0%)
Not present in cases	128 (94.1%)	48 (75.0%)	176 (88.0%)

Table 2: Types of Arrhythmias in Group A and Group B (n = 200)

	Group A (n=136)	Group B (n=64)	Total	OR (95% CI)	P-value
AF	02 (1.5%)	03 (4.7%)	05 (2.5%)	3.1 (2.1 – 6.8)	0.174
VT	02 (1.5%)	07 (10.9%)	09 (4.5%)	2.1 (0.4 – 2.8)	0.003
VF	02 (1.5%)	03 (4.7%)	05 (2.5%)	2.9 (1.9 – 6.1)	0.174
SVT	02 (1.5%)	03 (4.7%)	05 (2.5%)	3.1 (2.1 – 6.8)	0.174

AF = Atrial fibrillation, VT = Ventricular tachycardia, VF= Ventricular fibrillation,
SVT = Supraventricular tachycardia

**Table 3: Deaths in Group A and Group B (n =200),
1.5 (95% CI, 0.7 to 3.6) P-value = 0.023**

Death	Group A (n=136)	Group B (n=64)	Total
Present in cases	03 (2.2%)	06 (9.4 %)	09 (4.5%)
Not present in cases	133 (97.8%)	58 (90.6%)	191 (95.5%)

and lateral MI was present in 01 (0.7%) patients. In group B out of 64, anterior MI was present in 41(64 %), inferior MI was present in 22(34.4%) and lateral MI was present in 01 (1.6 %) patients.

There were total 24 (12.0 %) patients who developed arrhythmias. Of these 8 patients were in group A and 16 patients were in group B (5.9% vs. 25.0%, $p=0.003$). (Table-1)Ventricular tachycardia was the most common arrhythmia. It was documented in 9 (4.5%) patients, with 2 patients in group A and 7 patients in group B (1.5% vs. 10.9%, $p=0.003$). The other types of arrhythmia i.e. atrial fibrillation, ventricular fibrillation and supraventricular tachycardia were statistically not significant in the two groups ($p=0.174$) (Table 2).

There were total 9 (4.5%) patients who died during their stay in the hospital. These included 3 (2.2%) patients in group A and 6 (9.4%) patients in group B. These findings show that in-hospital mortality was more common in patients with failed thrombolysis ($p=0.023$) (Table 3).

DISCUSSION

In this study, frequency of in-hospital arrhythmias were studied in patients of AMI with successful vs failed

thrombolysis. In our study, thrombolysis was successful, in terms of ST-segment resolution, in 53%.¹² Similarly in a study by Lee et al¹³, and Goldhammar et al¹⁴ the success rate was 43.2% and 56.4% respectively, which is almost the same as compared to present study.

In our study in successful thrombolysis group anterior MI was present in 47(43.6 %), inferior MI was present in 88(64.7%) and lateral MI was present in 01 (0.7%) patients. In failed thrombolysis group, anterior MI was present in 41(64 %), inferior MI was present in 22(34.4%) and lateral MI was present in 01 (1.6 %) patients. This is an accordance to a study by Lee et al, in anterior infarct was associated with higher thrombolysis failure (AOR 0.07, 95% CI 0.03–0.16; $p < 0.001$).¹³

In this study there were total 24 (12.0 %) patients who developed arrhythmias. Of these 8 patients were in successful thrombolysis and 16 patients were in failed thrombolytic group (5.9% vs. 25.0%, $p=0.003$). Ventricular tachycardia was the most common arrhythmia. It was documented in 9 (4.5%) patients, with 2 patients in successful thrombolysis and 7 patients in failed thrombolysis group (1.5% vs. 10.9%, $p=0.003$). The other types of arrhythmia i.e atrial fibrillation, ventricular fibrillation

and supraventricular tachycardia were statistically not significant in the two groups ($p=0.174$). Our results correlates with prospective study by Rahman S et al in which post myocardial infarction, arrhythmia due impaired left ventricular function and left ventricular heart failure was the most common complication i.e. to 33 (62%), patients with failed thrombolysis as compared to 26 (27%) patients in with successful thrombolysis ($p<0.001$).¹⁵ This is an accordance to Bhatia L et al study, where patients with failed thrombolysis had more than twice the rate of adverse events i.e. sudden death and arrhythmia ($p<0.001$).¹² This is also an accordance to a study by Lee et al, where thrombolysis failure was associated with higher mortality after one year, in which arrhythmia was the commonest finding. (crude OR 7.61, 95 % CI 0.95-61.24; $p= 0.04$).¹³ Lee et al., findings correlate to our study, were total 9 (4.5%) patients who died during their stay in the hospital. These included 3 (2.2%) patients in successful thrombolysis group and 6 (9.4%) patients in failed thrombolysis group. These findings show that in-hospital mortality was more common in patients with failed thrombolysis ($p=0.023$).¹³ This is also an accordance to Camm AJ and Huikuri HV studies, who have also been proven that survivors of an acute myocardial infarction (AMI) who have impaired left ventricular ejection fraction (LVEF < 0.40) are at high risk of dying suddenly due to cardiac arrhythmias.^{16,17} In a study by Rahman S et al., the most striking difference was in the proportions of patient who had an uncomplicated in-hospital stay i.e. 62% of the successful thrombolysis group compared with 17% of the failed thrombolysis group ($p<0.001$). After adjustment for other factors, ST resolution (successful) was the only independent predictor of an uncomplicated recovery in hospital (OR 6.8, 95% CI 2.3 to 19.9, $p<0.001$).¹⁵

In another study, left ventricular ejection fraction was higher in successful thrombolysis group compared with failed thrombolysis group ($p<0.001$) and LV failure and arrhythmia was less frequent in successful thrombolysis group in comparison with failed thrombolysis group ($p<0.001$).¹⁴

Our study concludes that there is a significant difference between arrhythmia (p value of <0.001) in patients with failed and successful thrombolysis presenting with acute MI treated with streptokinase and failed thrombolysis was associated with a higher mortality rate as compared to successful thrombolysis (9.4% vs 2.2%, $p<0.023$).

There were a few limitations in this study which should be highlighted.

1- Criteria for thrombolysis failure with streptokinase were based solely on ECG, and achievement of TIMI grade 3 flow was not confirmed with coronary angiography, which is the gold standard.

2- The ST segment after acute myocardial infarction is

dynamic, and our use of static measurements could have led to errors in labeling of patients as successful or failed reperfusion.

3- The small size of our sample increases the likelihood of type 1 or 2 errors. Moreover, the results do not translate to patients with bundle branch block or other electrocardiographic features where ST segment resolution cannot be determined.

CONCLUSION

Failed thrombolysis in patients with acute myocardial infarction using streptokinase is associated with complex arrhythmias and increase mortality.

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