Prospective Observational Research to Assess the Efficacy of Thrombolytic Therapy with IV Streptokinase in Patients with Acute ST-Elevation Myocardial Infarction

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Abstract

Aim: To determine the efficacy of thrombolytic therapy with IV streptokinase in acute ST elevation myocardial infarction patients. **Methods:** A prospective observational study was conducted in the Department of Cardiology Patna Medical College and Hospital, Patna, Bihar, India for 1 year. Total 120 Patients with diagnosis of acute ST segment elevation before and after thrombolysis with Streptokinase Were included in this study. Based on values obtained, study population divided into three categories. Category A: <30% resolution of the sum of ST segment elevation. Category B: 30%-70% resolution of the sum of ST segment elevation. Category C: >70% resolution of the sum of ST segment elevation. **Results:** Mean age of present study is 50.77 ± 10.02. Male patients were significantly increased (75%) when compared with Female patients (25%). In this study chest pain was the most common mode of presentation, present in 111 (92.5%) patients associated with sweating in 103(85.83%) patients, breathlessness seen in 31 (25.83%) patients. Syncope was seen in 13 (10.83%) patients and palpitation in 7 (5.83%) patients. In this study Ratio of anterior wall myocardial infarction (61.67%) to inferior wall MI (38.33%). Complete ST resolution seen among 41.67% cases, partial resolution seen among 43.33% and no resolution among 15% cases (Table 5). Thrombolysis time of <3 hours, 3-5 hours and more than 5 hours was noted in a, b and c categories patients. B and c categories patients were significantly increased when compared with a category patients. The mortality is 9.17%. **Conclusions:** In the present study we conclude that the efficacy of IV streptokinase for thrombolysis in acute STEMI is 41.67%. Patients with no resolution of ST segment 90 minutes following thrombolysis associated with more frequent adverse events and increased mortality compare to partial and complete resolution group.

Keywords: Acute myocardial infarction; ST segment resolution and thrombolysis

Introduction

Thus did James Herrick describe the autopsy of his first patient in his seminal paper in 1912,[1] attributing myocardial infarction to coronary artery thrombus. He went on to state, "The hope for the damaged myocardium lies in the direction of securing a supply of blood." Over the next 68 years, controversy raged as to whether coronary artery thrombus was a cause of myocardial infarction or whether the clot formed after death and was merely a post-mortem finding. In 1980, DeWood and colleagues[2] reported finding thrombus in the infarct-related arteries of 90% of patients undergoing acute coronary artery surgery in the first few hours after the onset of acute myocardial infarction. Although Herrick was referring to collateral blood flow when he wrote of "securing a supply of blood," his original insight forms the basis for the use of thrombolytic therapy.

The first use of thrombolytic therapy in patients with acute myocardial infarction was reported by Fletcher and colleagues in 1958.[3] In the early 1960s and 1970s, 24 trials were performed evaluating the efficacy of intravenous streptokinase. By modern standards, these trials had major design flaws. For instance, patients were randomized up to 72 hours after the onset of myocardial infarction, and low doses of streptokinase (50 000 to 150 000 IU) were used. The theoretical basis for the administration of thrombolytic therapy was also not yet established, and this, together with lack of evidence of efficacy in a single trial, led to the abandonment of further investigation into this mode of treatment.

In conditions of emergency where it becomes difficult to perform PCI, fibrinolysis becomes the immediate solution to such STEMIpatients preventing early deaths. Among the other fibrinolytics, Streptokinase is a non-fibrin selective fibrinolytic involved as a thrombus and lysis, to restore supply to epicardial artery.[4,5] One in five middle aged adults are known to have an underlying CAD which could progress to MI. Most developing countries like India are expected to experience a sharp rise in Ischemic Heart Disease next to Infectious diseases. Initiation of fibrinolytic therapy immediately within some 0-3 hr brings down the short and long term complications by 15% and 25% respectively, but there is a hesitant in prescribing a fibrinolytic agent immediately. Unsuccessful reperfusion therapy with fibrinolytics could lead to its increased adverse effects causing complications. Thus time factor remains essential for success in reperfusion therapy. This reperfusion therapy with fibrinolytics not only compromises flow to epicardial artery but also enables microvascular flow monitored clearly with the help of ECG and not alone with cardio angiogram. 180 min is the expected time for Streptokinase rescue intervention.[6-8]

Clinical outcomes of fibrinolytic therapy would include resolution of elevated ST segment, relief from coronary pain, early Creatinine Kinase rise (CK-MB), development of reperfusion arrhythmias, T wave inversion from ECG. Minimum of 24 hr is required for T wave inversion and 12 hr for CK-MB peak.[9] Complete resolution could be defined as the reduction in >70%, partial resolution as the reduction of 30% to 70% and no resolution as reduction of <30% after 180 min of post thrombolysis in ST. PCI remains superior to fibrinolytic reperfusion but cost issues and other logistic reasons makes thrombolysis more effective and first priority. Management of MI in a developing country is still sparse due to non-availability of many resources, thus requiring strong primary prevention programs at the community level.[10-12] The aim of the present study to determine the efficacy of thrombolytic therapy with IV streptokinase in acute ST elevation myocardial infarction patients.

Material and methods

A prospective observational study was conducted in the Department of Cardiology, Patna medical college and Hospital, Patna Bihar, India for 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

Total 120 Patients with diagnosis of acute ST segment elevation before and after thrombolysis with Streptokinase Were included in this study. Patients with previous history of acute myocardial infarction patients coming to hospital after 12 hours of onset of symptoms, Patients with conventional contraindications for thrombolytic therapy, patients with previous history of valvular heart disease, cardiomyopathies and congenital heart disease. All the data were collected in a pre-tested proforma.

Based on values obtained, study population divided into three categories A, B and C

Category A: <30% resolution of the sum of STsegment elevation.

Category B: 30%-70% resolution of the sum of STsegment elevation.

Category C: >70% resolution of the sum of STsegment elevation.

Clinical details were recorded retrospectively, in hospital, major adverse events were defined as the occurrence of any of the following. Killip Class II-IV left ventricular failure, cardiogenic shock, recurrent angina, significant arrhythmias (which needs definite pharmacological, DC cardioversion and interventions like pacing) and death. Adverse events were divided according to timing <48 hours after admission and >48 hours after admission. An uncomplicated course was defined as no major adverse event during entire inpatient stay.

Statistical analysis

For statistical analysis, one-way analysis of analysis of Variance (ANOVA) was used, followed by the Newman- Keuls Multiple Comparison test.

Results

In the present study, the minimum age of the patient is 30 years, maximum age. 73 years. Maximum numbers of patients in between 40-60 years constitute 58.33%. Mean age of present study is 50.77 ± 10.02. (Table 1).

Table 1: Age Distribution of Patients

Age group(years)	Number of cases=120	Percentage	P-value
Below 40	26	21.67	
40-60	70	58.33	0.002
Above 60	24	20	

Table 2. Shows that sex wise distribution of patients; Male patients were significantly increased (75%) when compared with Female patients (25%).

Table 2: Sex distribution of Patients

Gender	Number ofcases	Percentage	P-value
Male	90	75	0.000
Female	30	25	

In this study chest pain was the most common mode of presentation, present in 111 (92.5%) patients associated with sweating in 103(85.83%) patients, breathlessness seen in 31 (25.83%)

patients. Syncope was seen in 13 (10.83%) patients and palpitation in 7 (5.83%) patients. (Table 3).

Table 3: Symptoms at presentation

Symptoms	Number ofcases	Percentage	P-value
Chest pain	111	92.5	0.0000
Sweating	103	85.83	0.0000
Breathlessness	31	25.83	0.0000
Palpitation	7	5.83	0.0000
Syncope	13	10.83	0.0000

Table 4: Type of Infarction

Type of infarction	Number of cases	Percentage	P-value
Anterior wall	74	61.67	
Inferior wall	46	38.33	0.155

In this study anterior wall Myocardial infarction was not significant compared with inferior wall myocardial infarction. (Table 4). Complete ST resolution seen among 41.67% cases, partial resolution seen among 43.33% and no resolution among 15% cases. (table 5). Thrombolysis time of <3 hours, 3-5 hours and more than 5 hours was noted in a, b and c categories patients. B and c categories patients were significantly increased when compared with a categories patients (Table 5).

Table 5: Symptom onset to thrombolysis time

Thrombolysis time	Categories		
	A	B	C
<3 hours	8	6	44
3-5 hours	0	20	7
>5 hours	11	20	4
P-value	0.024	0.000	0.000

Table 6: Outcome

Thrombolysis time	Categories		
	A	B	C
No adverse event	--	14	37
Adverse event excluding mortality	12	33	13
Hospital mortality	6	0	5

In this table no. 6 showed that the A, B and C categories of MI patients outcome. In No adverse events patients were significantly present in B categories compared with C and A categories patients. Adverse event excluding in hospital mortality were also significantly present in B categories patients compared with A and C categories but in hospital mortality were significantly present in A categories patients compared with B and C categories patients (table 6).

Discussion

The most important therapeutic goal in the management of acute myocardial infarction is early restoration of complete infarct artery perfusion after the occurrence of an acute coronary occlusion. More than 200 000 patients have been

randomized in clinical trials of thrombolytic therapy, and in no other area of medicine has a therapy been so extensively investigated. Each year between 1.5 and 2 million patients worldwide are admitted to hospital with acute myocardial infarction. Unfortunately, many of these patients do not receive thrombolytic therapy, and countless lives are lost despite the best scientific evidence of its safety and efficacy. Under usage and delay in administering thrombolytic therapy are the two greatest challenges facing physicians caring for patients with acute myocardial infarction.

The present study documents the usefulness of the standard electro-cardiographic ST segment resolution after 90 min following thrombolytic therapy as a predictor of coronary artery reperfusion. In our study the mean age of patients is 50.77 ± 10.02 which was concordant with the study done by Sezer et al, who also reported $58.2+11.2\%$ of electro-cardiographic ST segment resolution.[13]

In this present study participated 120 acute ST elevation MI patients were included both male and female patients. Male patients were significantly increased (75%) when compared with Female patients (25%) which was concordant with Scroder et al.[14] French et al, and Dong et al, who reported males are commonly affected compared with Female.[15,16]

From the results obtained in our study it is clear that risk factors of smoking, hypertension, diabetes and prior angina was seen among Acute ST elevation MI patients students is 79.17%, 52.5%, 37.5% and 15% respectively. Which was similar with the previous studies conducted by French et al, Zeymer U et al, Dong et al, and Bhatial et al.[17,18] Base line variables in complete resolution group similar to other study groups, except for age and smoking. Patients in the present study are 10 years younger compared to other study groups. Percentage of smokers

among population group of present study almost doubles that of other study groups.

Ratio of anterior wall myocardial infarction (61.67%) to inferior wall MI (38.33%) very high when compared to other study groups (Mean time of onset of symptoms to treatment also highin present study compared to other study groups (French et al, Zeymer U et al, Dong et al, and Bhatial et al.

Adverse events in complete resolution group in the present study are similar to other study groups. Arrhythmias are most frequent adverse events. In the present study group which can be comparable to other study groups. Followed by left ventricular failure. In hospital mortality is 9.17% in present study which is similar to other study groups.

Most frequent adverse event in no resolution group in the present study, LVF followed by cardiogenic shock. Even in other study groups LVF is the most frequent adverse event. But percentages of adverse events in the present study group are higher compare to other study groups.[19]

Conclusion

In this present study we conclude that the efficacy of IV streptokinase for thrombolysis in acute STEMI is 41.67% and patients with no ST segment resolution at 90 minutes following thrombolysis were associated with more frequent adverse events and increased mortality compared to partial and complete resolution group. Percentage of resolution of ST segment following 90 minutes of thrombolysis as a diagnostic test helps in risk stratification of patients.

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