# Original Article

## Study of ST Segment Resolution after Thrombolysis in Acute Myocardial Infarction- As Predictor of Outcome

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**ABSTRACT:**
**Background:** Coronary heart disease (CHD) is a major cause of mortality and morbidity all over the world. Acute myocardial infarction is one of the most common diagnoses in hospitalised patients in industrialized countries. For this reason an attempt has been made in this study to determine the failure rate of thrombolysis  in Acute Myocardial Infarction using ECG criteria. **Material and Methods:** One hundred cases of acute ST elevation Myocardial infarction were taken for the study admitted between March 2015 to May 2016. Patients were taken from ICCU of department of medicine S.S. Medical College and S.G.M. Hospital Rewa (M.P.). Written and informed consent was taken from each patient to participate in the study. **Results:** 79% cases were males of which maximum belonged to the 51-60 yrs age group while majority of females were from 61-70 years age group. 77.17% of those who had successful thrombolysis were males while 83.3% of those who had failed thrombolysis were also males. Diabetes, Hypertension and previous history of Ischemic heart diseases were risk factors for STEMI. **Conclusion:** Our study concluded that long symptom to needle time is an important predictor of failed thrombolysis in acute myocardial infarction patients. Hence it is important to educate public about prompt recognition of symptoms and seeking medical help urgently. patients with old age, diabetes, hypertension and dyslipidemia, such patients should be monitored and treated aggressively.
**Key words:** Coronary heart disease, Pericarditis, Thrombolysis.

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## BACKGROUND

According to a report of World Health Organization (WHO) in 2005, cardiovascular disease (CVD) caused 17.5 million (30%) of the 58 million deaths that occurred worldwide.[1,2] While the prevalence and mortality due to CHD is declining in the developed nations[3] the same cannot be held true for developing countries. Despite the impressive strides in diagnosis and management over the past three decades, acute myocardial infarction continues to be a major health problem in industrialized world and is becoming and increasingly important problem in developing countries.[4]

Although 60 to 70% of treated patients can be successfully reperfused, thrombolytic treatment fails in a substantial proportion. Since alternative modes of coronary intervention are available, it is prudent to identify patients with failed thrombolysis so that they can be offered alternative modes of reperfusion.[5] The present study is aimed at defining the extent of failed thrombolysis and assessing its demographic and clinical predictors in our hospital.

## MATERIAL AND METHODS

Observational Study conducted at  Shyam Shah Medical College and Associated S.G.M.H Rewa from March 2015 to May 2016.
100 patients admitted to the ICCU of Department of Medicine SSMC and SGMH Rewa.

**Inclusion criteria:**
1. Symptoms of acute myocardial infarction within 6 h of onset of chest pain
2. STEMI, is defined as new ST elevation at the J point in at least 2 contiguous leads of>2mm (0.2 mV) or more in men >45 years or >0.25mV in men <45 years or >1.5 mm (0.15 mV) in women in leads V2-V3 and/or 1 mm (0.1 mV) or more in other contiguous limb leads

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3. Age ≥18 years.

**Exclusion criteria:**
1. Late thrombolysis (> 12 hrs from onset of pain)
2. Recurrent MI
3. Presence of left bundle branch block
4. Development of pericarditis
5. Age <18 years
6. Women of childbearing potential not using contraceptives.
7. Any previous history of hemorrhagic stroke
8. History of stroke, dementia, or central nervous system damage within 1 year.
9. Head trauma or brain surgery within 6 months
10. Known intracranial neoplasm
11. Suspected aortic dissection
12. Internal bleeding within 6 weeks
13. Active bleeding or known bleeding disorder
14. Major surgery, trauma, or bleeding within 3 weeks
15. Traumatic cardiopulmonary resuscitation within 3 weeks.

In patients with acute MI after considering inclusion and exclusion criteria, history and clinical examination done. Baseline serial ECG at 1hr, 2 hr and other investigations (RBS, Lipid Profile, RFT, cardiac enzymes- troponin T, CBC) were done. Patients were treated with 325mg of Aspirin and 15 lakh units of streptokinase infusion over 1 hour. Other treatments β blockers, ACE inhibitors, Heparin, Analgesics) were used as indicated.

Patients are assigned to successful/ failed thrombolysis is based on ECG taken 90 minutes after thrombolysis. Failed thrombolysis is considered if there is less than 50% ST segment resolution in the single lead showing maximum ST segment at baseline ECG.

**STATISTICAL ANALYSIS**
Continuous data were expressed as mean + SD and median and analyzed by unpaired t test. Categorical data are presented as numbers and percentages, were analyzed by chi-square test.

p value of 0.05 or less was considered as statistically significant.

## RESULTS

**Distribution of cases according to Age**

| Age Groups (years) | Males | % | Females | % | Total |
|---|---|---|---|---|---|
| 21-30 | 1 | 1.2 | 1 | 4.7 | 1 |
| 31-40 | 4 | 5.0 | 1 | 4.7 | 5 |
| 41-50 | 19 | 24 | 3 | 14.2 | 21 |
| 51-60 | 29 | 36.7 | 4 | 19 | 33 |
| 61-70 | 15 | 18.9 | 8 | 38 | 23 |
| 71-80 | 8 | 10.1 | 3 | 19 | 12 |
| >80 | 3 | 3.7 | 1 | 4.7 | 4 |
| Total | 79 | | 21 | | 100 |

$\chi^2 = 6.237$ P value 0.3972

Among males, maximum patients were in the age group 51-60 yrs followed by 41- 50 yrs. Among females, maximum patients were in the age group 61 – 70 yrs, followed by 51 – 60 yrs.

**Mean age**

| Sex | Successful thrombolysis (70) | Failed thrombolysis (30) |
|---|---|---|
| Age | 57.45 ± 13.7278 | 61.76 ± 16.6098 |
| Age (males) | 55.85± 13.0677 | 62.24 ± 17.7371 |
| Age (females) | 62.87 ± 20.4678 | 59.4 ± 26.8477 |

P value 0.1802 (non significant)

Above table shows mean age among males was 55.85± 13.06 and 62.24 ±17.73 in successfully and failed thrombolysed group.
Mean age among females was 62.87 ± 20.46 and 59.4 ± 26.84 in successfully and failed thrombolysed group.

**Sex distribution**

| Sex | Successful thrombolysis(70) | Failed thrombolysis (30) |
|---|---|---|
| Male | 54 (77.14%) | 25 (83.3%) |
| Female | 16 (22.8%) | 5 (16.67%) |

P value= 0.6682 (non significant)

Out of 79 males, 54 (77.14%) had successful thrombolysis and 25(83.3%) had failed thrombolysis. Out of 21 females, 16 (22.8%) had successful thrombolysis and 5 (16.67%) had failed thrombolysis.

**Distribution of cases according to Residence**

| Resident | No. of Cases | Percentage |
|---|---|---|
| Rural | 24 | 24.0% |
| Urban | 76 | 76.0% |
| Total | 100 | 100.0 |

24% patients were living in rural areas and 76 % were living in urban areas.

**Risk factors in MI (n=50)**

| Showing Past History | No. of Cases | Percentage |
|---|---|---|
| Diabetes Mellitus | 22 | 44 |
| Hypertension | 21 | 42 |
| Ischemic Heart Disease | 7 | 14 |
| Total | 50 | 100.0 |

Out of 100 patients, 22 were diabetics, 21 were hypertensives and 7 were having prior ischaemic heart disease.

**Thrombolysis in  diabetic patient(n=22)**

| | Successful thrombolysis (n=70) | | Failed thrombolysis (n=30) | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Diabetics | 10 | 45.5% | 12 | 54.5% |
| Non diabetics | 58 | 74.3% | 20 | 25.7% |

$\chi^2$ =5.32 P value = 0.02 ( highly significant)

Among diabetics, 54.5% had failed thrombolysis. Among non diabetics 25.7% had failed thrombolysis.

**Thrombolysis in Hypertensives (n=21)**

| | Successful thrombolysis (n=70) | | Failed thrombolysis (n=30) | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Hypertensives | 2 | 9.5% | 19 | 90.4% |
| Non hypertensives | 68 | 97.1% | 11 | 13.9% |

$\chi^2$ = 42.7          P value <0.0001 (extremely significant )

Among hypertensives, 90.4% had failed thrombolysis. Among non hypertensives, 13.9% had failed thrombolysis

**Distribution of cases according to Addiction Habit**

| SN | Showing Addiction Habit | No. of Cases | Percentage |
|---|---|---|---|
| 1 | No addiction | 34 | 34.0% |
| 2 | Addiction | | |
| | Tobacco Chewing | 54 | 54.0% |
| | Smoking | 36 | 36.0% |
| | Alcohol | 11 | 11.0% |
| | Tobacco + Smoking | 25 | 25.0% |
| | Tobacco + Alcohol | 09 | 9.0% |
| | Tobacco + Smoking + Alcohol | 08 | 8.0% |

34 patients were having no addiction. 36 patients were smokers, 54  were tobacco chewers and 11 were alcohol addicted.25 were both smokers and tobacco chewers. 9 were tobacco chewers and alcoholics. 8 were tobacco chewers and smokers.

**Time of maximum chest pain**

| SN | Time of maximum Chest Pain | No. of Cases | Percentage |
|---|---|---|---|
| 1 | 12:00 AM to 6:00 AM | 40 | 40% |
| 2 | 6:01 AM to 12:00 Noon | 35 | 35% |
| 3 | 12:01 Noon to 6:00 PM | 15 | 15.0% |
| 4 | 6:01 PM to 12:00 Mid night | 10 | 10.0% |
| | | 100 | 100.0% |

40% patients had maximum chest pain during early morning from 12:00am to 6:00 am followed by 35% patients who had maximum chest pain during 6:00am to 12:00 noon.

**Thrombolysis in relation to time of onset of MI (n=100)**

| | Successful thrombolysis(n=70) | | Failed thrombolysis (n=30) | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Time to thrombolyse< 6 hrs | 36 | 92.3 | 3 | 7.7 |
| Time to thrombolyse> 6hrs | 34 | 55.7 | 27 | 44.3 |

$\chi^2$=13.459          P value 0.0002  ( highly significant)

Patients who were thrombolysed within 6 hrs had 7.7% failed thrombolysis as compared to patients who were thrombolysed >6 hrs who had 44.3% failed thrombolysis.

**Co-relation of troponin T on admission with thrombolysis failure**

| | Successful thrombolysis (n=70) | | Failed Thrombolysis (n=30) | |
|---|---|---|---|---|
| | No. | % | No. | % |
| TroponinT positive | 32 | 59.2 | 22 | 40.8 |
| TroponinT T negative | 38 | 82.6 | 8 | 17.4 |

$\chi^2$ =5.385          p value 0.0203 (Highly significant)

Patients with positive troponin T on admission were having high thrombolysis failure 40.8% as compared to 17.4% failure rate in patients with negative troponin T on admission.

## DISCUSSION

In the present study, maximum incidence of MI was in the age group 51-60 years. Mean age in failed group was 61.76 ± 16.60 yrs and 57.45 ± 13.72yrs in successful group. Though higher age was associated with failed thrombolysis it was statistically significant. Similar observation was seen GISSI –2(1990)[6] and Gabriel et al (1990)[7].

In present study, 24% patients were living in rural area and 76% patients were living in urban areas. The decreased incidence of rural compared to urban papulation in the present series may be due to the delay in seeking medical care in the rural population due to lack of awareness and transportation problem.

Pais et al (1996), Gopalanetal (2004), Ramanakumar et al (2004),Yusuf et al (2004) showed that rapid change in dietary habits coupled with decreased physical activity in India as consequence of urbanisation may partly explain the increase in CAD.

Diabetes is one of the important risk factorsfor CHD and diabetics have a poor prognosis after MI which can be partly due to abnormalmicrovascular flow. In present study diabeticshad a higher trend towards failed thrombolysis.  Only 22% were diabetic patients in the present study. 54.5% of the diabetic patients did not achieve successful thrombolysis as compared to non-diabetic in whom failure was seen in 25.7% (p=0.02).

As shown by Mak et al(1977), diabetic cohorts in a GUSTO-I trial (n = 5,944) had a higher mortality rate at 30 days with OR 1.77 and this risk was maintained after one year [8].

Hypertension was seen in 90.4% of patients with failed and 9.5% of patients with successful thrombolysis which was significant.

Hypertension is a known risk factor for higher mortality in patients who have AMI, and it is additive to other known risk factors, as shown in the Framingham study(1994)[9]

In present study, among smokers,66.6%and and 33.4% of patients have  successful and failed thrombolysis, respectively. Among non smokers, 71.8% and and 28.2% of patients have  successful  and failed thrombolysis, respectively. The difference in the success rate of thrombolysis among smokers and non smokers was not significant.

Similar observation was made by GISSI – 2(1990)[10]andSezeret al.(2004)[11] Zahgeret al(1995),[12] showed that smoking was significantly associated with successful thrombolysis and lower mortality, which he attributed to incidence of acute MI in younger age and lesser atherosclerotic burden, more thrombus at the site in smokers.

In present study among tobacco chewers 64.8% and 35.2%  had successful and failed thrombolysis. Among non tobacco chewer, 76% and 24% had successful and failed thrombolysis. The difference in the success rate of thrombolysis among tobacco chewers and non tobacco chewers was not significant.

In present study, among alcoholics72.7% and 27.3% had successful failed thrombolysis. Among non alcoholics, 69.6% and 30.4% patients had successful and failed thrombolysis. The difference in the success rate of thrombolysis among alcoholic and non alcoholic was not significant.

Out of 100 patients in this study,40% patients have maximum chest pain 12:00AM to 6:00 AM, 35% have chest pain was during 6:01 AM to 12:00 Noon.

Kapiotiset al(1997)[13] and Siesset al(1982)[14] showed that platelets aggregation has been reported to be more responsive duringmorning .Ehrlyet al (1973)[15], Kubota et al (1987)[16] and Tofleret al (1987)[17] showed that early morning hypercoagulability could enhance the intracoronary thrombosis and there by increases the risk of major advance cardiac events (MACE) .

In the present study, 39 patients came to hospital within 6 hours from the onset of chest pain, out of which 36 (92.3% ) patients have successful thrombolysis and 3 (7.7%)have failed thrombolysis.61 patients came to hospital after 6 hours, out of which 34 (55.7%) patients were successfully thrombolysed and 27 (44.3%) patients have failed thrombolysis, p value 0.0002.

This observation is in concordance with Kharash et al(1996).[18]who concluded that shorter the time lag between onset of pain and treatment the better are the results.

In the present study, 54 patients were having positive troponin T and 46 were having negative troponin T. Among successfully thrombolysed patients, 32 patients (45.71%) were having positive troponin T and 38 patients (54.28%) were having negative troponin T. Among failed thrombolysis group, 22 patients (73.3%) were having positive Troponin T and 8 patients (26.67%) were having negative Troponin T, p value 0.0203.

Keller et al (2009), Kontos et al (2004), Eggers et al (2007) , showed that cardiac troponins have not only diagnostic value, but yield prognostic information as well.

## CONCLUSION

- In present study failed thrombolysis was observed in 30% patients using<50% maximum ST segment resolution at 90 min post thrombolysis as criteria.
- In the present study, maximum incidence of MI was in the age group 51-60 years in males followed by age group 41 – 50 ys.
- Mean age in failed group was 61.76 $\pm$ 16.6098yrs and 57.45 $\pm$ 13.7278yrs in successful group.
- Among males, mean age was significantly higher in group with failed thrombolysis (62.24 $\pm$ 17.7371) wheras in females, it was significantly higher in group with successful thrombolysis (62.87 $\pm$ 20.4678).
- Diabetics had a higher trend towards failed thrombolysis. 45.45 % had successful thrombolysis and 54.5% had failed thrombolysis.
- Among hypertensives, 90.4% had failed and 9.5% patients had successful thrombolysis.

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