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Assessment of ST Segment Resolution as a Predictor of Outcome in Acute Myocardial Infarction after Thrombolysis

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Abstract :
Objectives: *This study was undertaken to assess the resolution of ST segment at 90 min of thrombolysis in ST segment elevation myocardial infarction as a predictor of short term outcome in terms of adverse events & mortality during hospital stay.*
Methods: *A total of 50 patients with first episode of ST elevation myocardial infarction without any conventional contraindication for thrombolysis were taken for the study. Based on the percentage resolution of ST segment at 90 min of thrombolysis, patients were divided into three groups. Complete resolution (>70%), Partial resolution (30-70%) and No resolution (<30%).*
Results: *In our study, 10(20%) patients had no resolution, 20(40%) had partial resolution and 20(40%) had complete resolution. During the hospital stay, No resolution group 4 of 10(40%) had adverse events and in hospital mortality was present in 5 of 10(50%) patients. In partial resolution group 11 of 20(55%) patients had adverse events and nil in-hospital mortality. Patients in complete resolution had fewer adverse events 7 of 20(35%) and nil in-hospital mortality.*
Conclusion: *Patients with No resolution of ST segment at 90 min of thrombolysis had frequent adverse events and higher mortality when compared to patients with partial and complete ST segment resolution.*
Keywords : *Acute Coronary Syndrome (CAD), ECG, ST segment Elevation MI, ST segment resolution, Thrombolysis.*

I. Introduction

Acute myocardial infarction (AMI) is one of the most common diagnoses in hospitalized patients in industrialized countries. In the United States, approximately 525000 patients experience a new AMI, and 190,000 experience a recurrent AMI each year. More than half of AMI related deaths occur before the stricken individual reaches the hospital. The in-hospital mortality rate after admission for AMI has declined from 10% to about 6% over the past decade. The 1 -year mortality rate after AMI is about 15%. Mortality is approximately fourfold higher in elderly patients (over age 75) as compared with younger patients.[1]

The mortality and morbidity caused by acute myocardial infarction are major public health concern in the industrialized world and also slowly becoming a leading cause of mortality in developing countries.[2]

The Global Burden of Diseases Study reported that the disabilityadjustedlife years lost by CHD in India during 1990 was 5.6 million in men and 4.5 million in women; the projected figures for 2020 were 14.4 million and 7.7 million in men and women respectively.[3]

Primary goal of therapy in ST elevation myocardial infarction has been to restore normal blood flow in the occluded epicardial coronary artery as rapidly as possible. Early and sustained patency of infarct related artery is necessary, it is not sufficient to ensure optimal outcome of reperfusion therapy. So optimal goal of therapy is reperfusion implies nutrient blood flow at tissue level.

Reduction in ST segment elevation, relief from chest pain, early peaking of serum concentration of creatine kinase and reperfusion arrhythmias are some of the non-invasive markers of reperfusion. Chest pain resolution and biochemical markers failed to satisfy the clinical necessities. In the last decade several observations led to ST segment elevation resolution as rapid, simple and inexpensive marker for assessing the success or failure of reperfusion therapy.

Farrer M et al. suggested that previous studies have shown an association between each resolution of ST elevation after thrombolysis and improved coronary patency and clinical outcome.[4]

Since 1987 Anthon K et al. work on critical role of coronary thrombosis in acute myocardial infarction has been confirmed. This provides the scientific basis for thrombolytic therapy, the advent of which has been cause of much global excitement and revolutionized treatment of AMI.[5]

Schroder R et al. commented that ST segment resolution as measured by two cut-off points, one at 70% and other at 30% from start of thrombolysis significantly predicts enzymatic infarct size.[6]

Vismay R et al. in his study shown that, ST segment resolution of >50% was observed in 76.67% 0f patients treated with streptokinase and 86.67% in tenecteplase group.[7]

The mainstay of treating ST segment elevation myocardial infarction (STEMI) in India in most of the centres presently is by thrombolysis using intravenous fibrinolytics.[8,9]

The GISSI trial published in 1986 proved the efficacy of intravenous streptokinase as an effective thrombolytic agent in the treatment of acute STEMI.[10]However, use of streptokinase was associated with multiple problems like transient hypotension, allergic reactions, anaphylaxis and induction of systemic lytic state.[11]

The newer generation of thrombolytic agents has better fibrin specificity, and better tolerability than streptokinase. Tenecteplase (TNK) is one such newer generation thrombolytic agent with increased fibrin specificity, lesser fibrinogenolysis and with a 90% patency of infarct-related artery (IRA) and 63% TIMI 3 flow rates. Patients can also undergo PCI safely after3 hours after administration of TNK.[11] Data regarding the safety and efficacy of the indigenously developed TNK was studied by Iyengar et al. in the Elaxim Indian registry. Over all 95.43% patients had clinically successful thrombolysis (CST). However, patients receiving delayed treatment more than 6 hours after the onset of chest pain had low CST. Also CST was significantly higher in patients receiving early thrombolysis that is less than 3 hours (96.54%) thus stressing the need for early reperfusion therapy.[12]

This study is an effort to analyze the patients with acute STEMI and comparing their ECG findings on admission and subsequently after thrombolysis and the outcome of thrombolytic therapy in terms of mortality and morbidity during hospital stay.

II. Methodology

Source of data:

A total of 50 patients with diagnosis of acute ST segment elevation myocardial infarction according to ACC/AHA guidelines, admitted to BASAVESHWAR HOSPITAL, GULBARGA during the study period from 1st Jan 2015to30th June 2016 were taken up for study considering the inclusion and exclusion criteria.

Inclusion criteria:

All the patients with ST segment elevation myocardial infarction for the first time, diagnosed according to ACC/AHA guidelines without any conventional contraindications for thrombolysis before 12 hours of onset of symptoms.

Exclusion criteria:

· 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, cardiomyopathy and congenital heart disease.
· If patient dies before 90 minutes after thrombolytic therapy
· Bundle branch block.
· Other causes of ST segment elevation.

Method of collection of data:

Data was collected in a pre-tested proforma by meeting objectives of study, detailed history, physical examination thorough cardiovascular and other systems examination and necessary investigations recorded.

A detailed case history was taken in every patient who fulfilled the criteria for thrombolysis and a meticulous examination was done as per proforma and relevant investigations were done and thrombolytic agent (i.v. streptokinase and iv tenecteplase) was administered.

A 16 lead ECG consisting of 12 conventional leads and 4 right sided chest leads was recorded at the time of admission, 90 minutes after the thrombolysis, everyday subsequently for 7 days/hospital stay. Standard lead II was used to monitor and record rhythm disturbances.

The other investigations to which patients were subjected are:

· Hb, TC, DC, ESR.
· Urine- albumin, sugar, microscopy.
· FBS,PPBS.
· Fasting lipid profile.
· Blood urea, Serum creatinine.
· Serum electrolytes.
· CPK-MB,Trop-I.
· Chest X ray.
· Echocardiogram.

ST segment elevation was measured 80 millisecond after the J point. The summed ST segment elevation was measured by summing the ST segment amplitude in all leads. With ST elevation at base line ECG (before thrombolysis) and at 90 min ECG (post thrombolysis) using methods described by Schroder et al.[15]

Percentage resolution of ST segment was calculated as the sum of ST segment elevation on first ECG minus the sum of ST segment elevation on second ECG, divided by initial sum of ST segment elevation. Based on percentage ST segment resolution, study population were divided into three categories: A, B and C.

1. Category A: < 30% resolution of the sum of ST segment elevation.
2. Category B: 30% - 70% resolution of the sum of ST segment elevation.
3. Category C: > 70% resolution of the sum of ST segment elevation.

Clinical details were recorded prospectively. In the hospital, major adverse events 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 cardio version and interventions like pacing) and death.

Statistical Analysis

The continuous variable such as age was expressed in terms of mean ± standard deviation, as calculated using Microsoft Excel 2007. The statistical significance of the observations was determined by calculation of p value using Chi-square test. The statistical analysis was done using SPSS 17.0 software. A p value of <0.05 was taken as statistically significant. The graphs and tables were generated using Microsoft Excel and Word 2007.

III. Results

The following were the observations made from the study of 50 cases on ST segment resolution after thrombolysis in acute ST-segment elevation myocardial infarction.

In this present study, the minimum age was 28 years & maximum age 80years. Maximum numbers of patients were in age group 46-65 years (58%). Mean age in the present study was 61.66± 10.84 years.

In the present study, sex distribution showed male preponderance. 68% were males & 32 % were females. M: F ratio was 2:1 .

In this study, chest pain (94%) was the most common presentation, followed by sweating (80%) and nausea and vomiting (46%). Lesser presenting complaints were dyspnea (22%) & syncope seen in (16%) & palpitations in (8%) of patients.

In this study, smoking was the most common risk factor seen in 68% of study population. Hypertension (42%) and diabetes mellitus (38%) were other common risk factors. Family history of IHD was positive in 18 % & hyperlipidemia in 12% of patients.

In the present study, anterior wall MI (62%) was more common than inferior wall MI (38%).

In this study, 64% of patients were thrombolysed within 6 hrs of onset of symptoms & 36 % in between 6-12 hrs. In the present study, Majority of patients at presentation were in killips class I (54%) and class II (36%) in the present study. (fig-1), (table- 1)

In the present study, Complete ST resolution [category C] was seen in 40%, partial resolution [Category B] in 40% &no resolution [Category A] in 20%. (fig- 2), (table-2)

In the present study, Majority of patients were in the age group between 46-65 years (58%). 13 of 29(45%) patients had complete resolution in this age group. 32% were in age group 66- 85 years & 3 of 16 of them had no resolution.

In this study, sex distribution showed male preponderance. 68% of cases were males, 32 % were females. Similar distribution was also noted in each category of ST resolution.

In this present study, Anterior wall MI (62%) was more common than inferior wall MI (38%). Our study showed no statistical significance associated between type of infarction and ST segment resolution (p > 0.05). (fig-3), (table-3)

In this present study, of the 31 patients thrombolysed within <6hrs of onset of symptoms, 16 had complete resolution. Only 4 of 19 patients thrombolysed between 6-12 hrs of symptom onset had complete resolution. There was no significant statistical association between time of symptom onset and ST segment resolution (p>0.05). (fig-4), (table-4)

In this study, majority of patients at presentation were in class I (54%) and class II (36%). Our study showed significant statistical association between the Killip class at presentation and ST resolution and its outcome (p <0.05). (fig-5), (table-5)

In this study, 25 of 50 patients (50%) had adverse events including death. 80% of patients had adverse events within 48 hrs. (fig-6), (table-6)

The study showed LVF (40%) as the most common adverse event, followed by arrhythmias seen in 36 % of patients. Recurrent angina (13%) and cardiogenic shock (11%) were other adverse events documented. Adverse events were more in Category A than in Category B. Patients in Category C had lesser adverse events. (fig-7), (table-7)

In this study 23 of 50 patients (46%) had no adverse events, 13 (57%) of them were seen in Category C. 22 of 50 (44%) had adverse events excluding in-hospital mortality, 50% were in Category B and 32% of patients in Category C and 18% of patients in Category A respectively. 5 of 50 (10%) patients had in-hospital mortality, majority of them seen in category A (100%). Our study showed significant statistical association between ST resolution and outcome in form of adverse events & in-hospital mortality ($p < 0.05$). (fig-8), (table-8)

Present study showed 10% in-hospital mortality. Cardiogenic shock & VT/VF were the cause of death. (fig-9), (table-9, 10)

IV. Figures and Table

Table 1: Killip class at presentation

Sl. No.	Killip Class	No. of Cases	Percentage
1	I	27	54.00
2	II	18	36.00
3	III	4	8.00
4	IV	1	2.00

Table 2: ST segment resolution 90 min after thrombolysis

ST Segment resolution	No. of Cases	Percentage
Category A <30%	10	20.00
Category B 30-70 %	20	40.00
Category C >70%	20	40.00

Table 3: Type of MI & STR subgroups

Type	Category A		Category B		Category C	
	No.	%	No.	%	No.	%
AWMI	7	70.00	12	60.00	12	60.00
IWMI	3	30.00	8	40.00	8	40.00

Table 4: Time interval between onset of symptoms to thrombolysis in STR subgroups

Thrombolysis Time	Category A	Category B	Category C
<6 HRS	5(50%)	10 (50%)	16 (80%)
6-12 HRS	5(50%)	10 (50%)	4 (20%)

Table 5: Killip class in STR subgroups

Killip Class	Category A	Category B	Category C
I	2 (20%)	9 (45%)	16(80%)
II	3 (30%)	11 (55%)	4 (20%)
III	4(40%)	0	0
IV	1(10%)	0	0

Table 6: Onset of Adverse events & STR subgroups

Adverse Effects	Category A	Category B	Category C
<48 hrs	4 (57.14%)	10 (100%)	6 (75%)
>48 hrs	3 (42.86%)	0(0%)	2(25%)

Table 7: Type of Adverse events in STR subgroups

Type Of Adverse Event	Category A	Category B	Category C
LVF	7(39%)	7(39%)	4(22%)
Cardiogenic Shock	5(100%)	0	0
Recurrent Angina	2(33%)	3(50%)	1(17%)
Arrhythmias	7(44%)	6(37%)	3(19%)

Table 8: Outcome in STR subgroups

Outcome	Category A	Category B	Category C
No Adverse Event	1 (10%)	9 (45%)	13 (65%)
Adverse Event Excluding In-Hospital Mortality	4 (40%)	11 (55%)	7 (35%)
In-Hospital Mortality	5 (50%)	0	0

Table 9: In hospital mortality and ST resolution subgroups.

	Category A	Category B	Category C
In-Hospital Mortality	5(100%)	0	0

Table 10: Cause of in hospital mortality.

Cause Of Death	No. of Cases	Percentage
Cardiogenic Shock	3	60.00
VT/VF	2	40.00

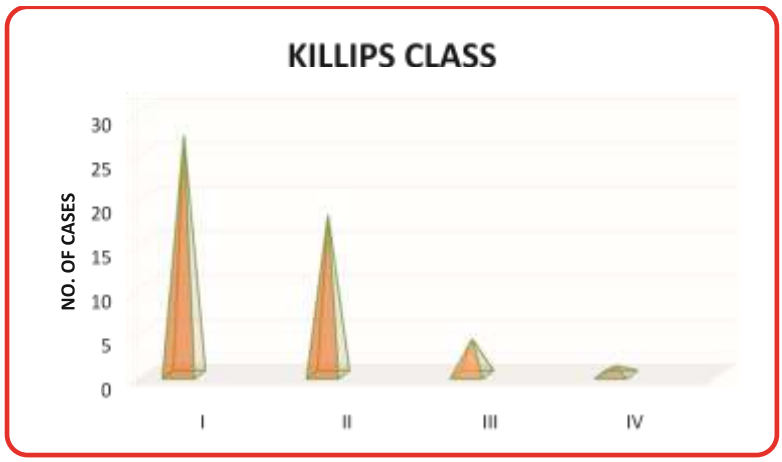

Figure 1: Killip class at presentation.

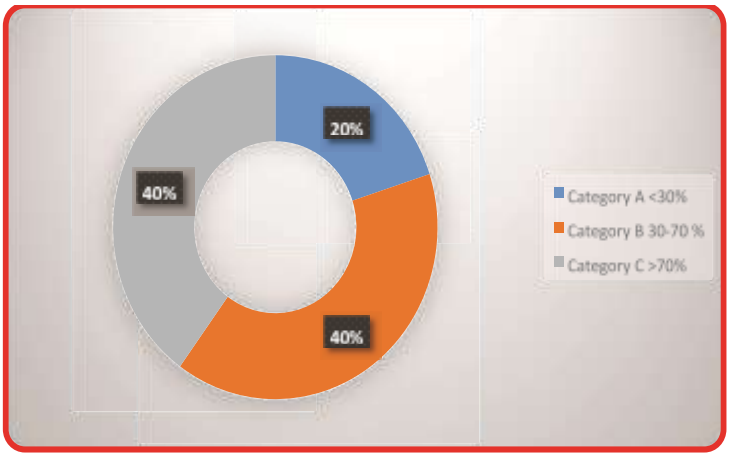

Figure 2: ST segment resolution 90 min after thrombolysis.

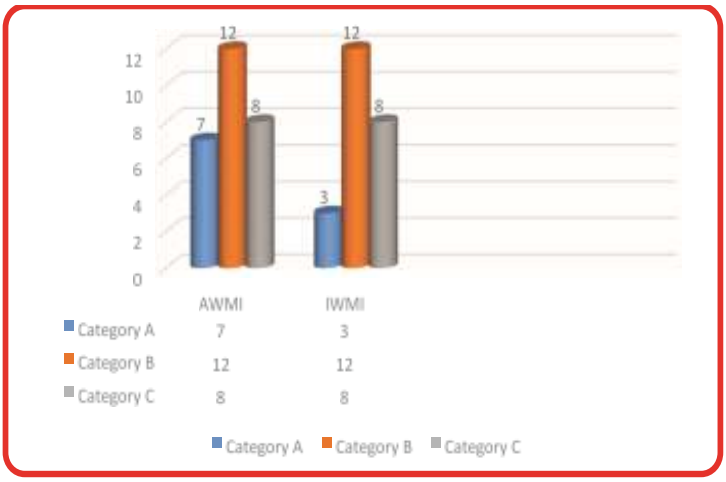

Figure 3: Type of MI & STR subgroups

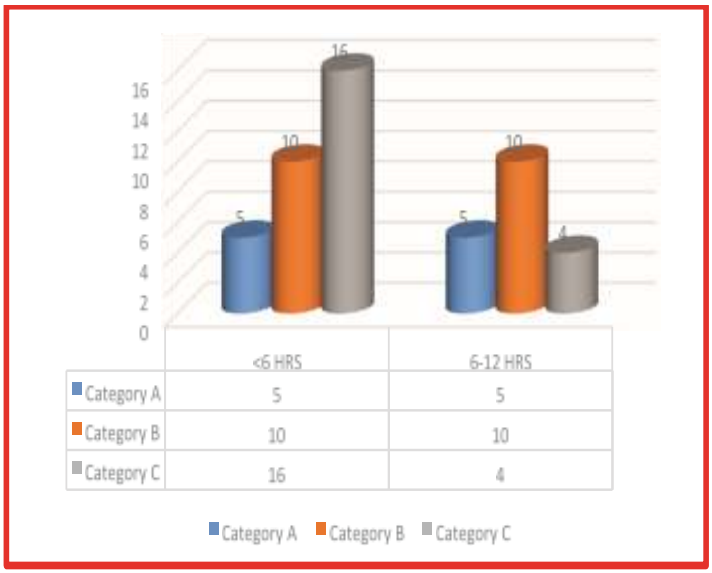

Figure 4: Time interval between onset of symptoms to thrombolysis in STR subgroups

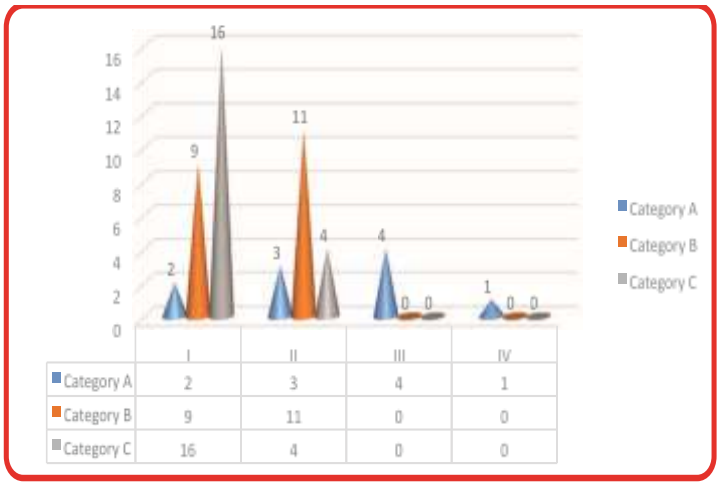

Figure 5: Killip class in STR subgroups

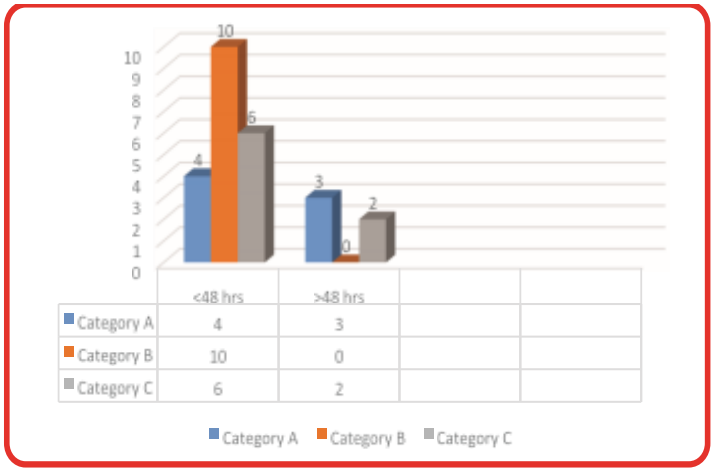

Figure 6: Onset of Adverse events & STR Subgroups

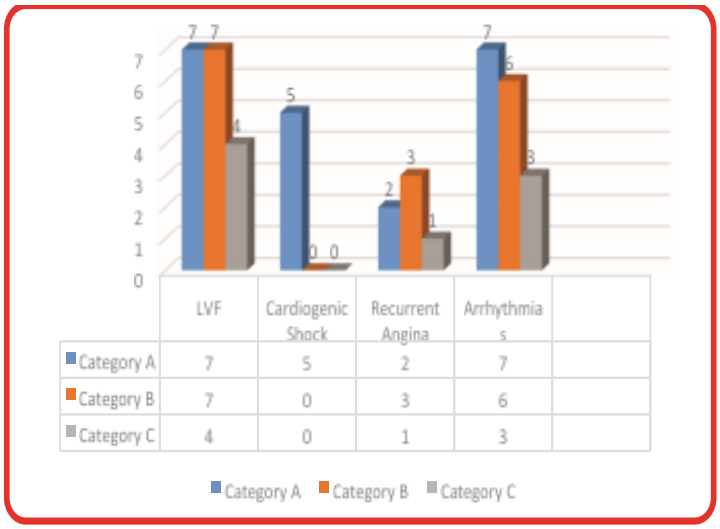

Figure 7: Type of Adverse events in STR subgroups.

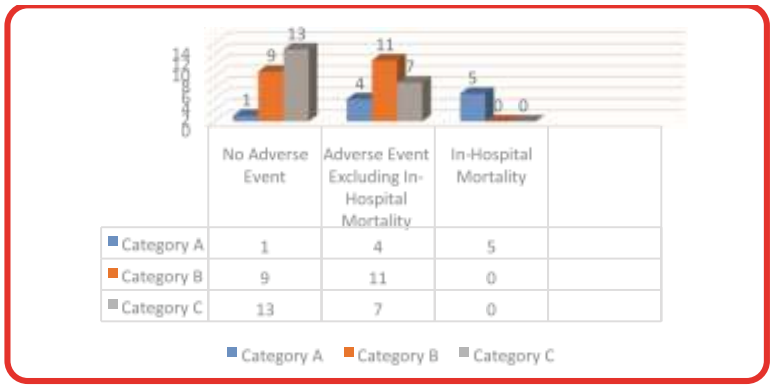

Figure 8: Outcome in STR subgroups

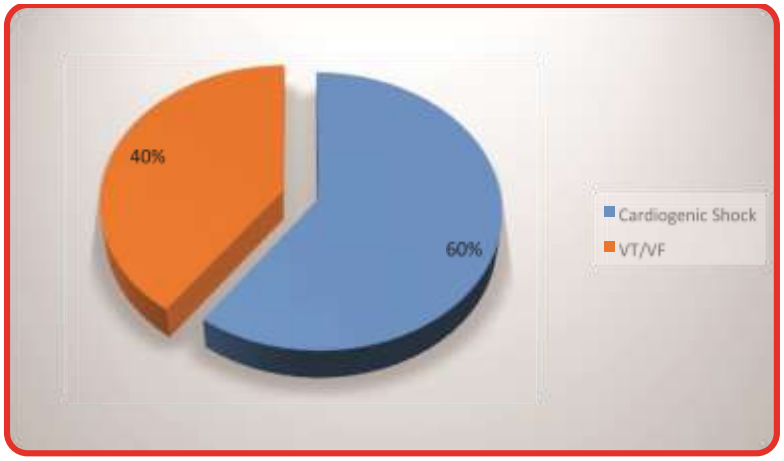

Figure 9: Cause of in-hospital mortality

V. Discussion

CVD accounts for approximately 12 million deaths annually and to the common cause of death globally. Since past 3 decades there is considerable decline in incidence and prevalence of CAD in the industrialized western world, where as the incidence is increasing in the developing world.

The Asian Indians, whether living in their own country or elsewhere have much higher incidence of CAD as compared to all other ethnic groups.[14] India experienced more than 2.3 million deaths in 2008 due to cardiovascular diseases (CVD), and more than half of these deaths (1.3 million) were due to ischemic heart disease .[16]

CAD among Asian Indians has been found to be more severe, diffuse and associated with serious complications and increasing mortality at a younger age.[13]

Many epidemiological studies have identified certain risk factor, which increases the susceptibility of an individual to the morbidity and mortality of acute myocardial infarction.

Acute myocardial infarction resulting from an interplay of these risk factors, some modifiable the others non-modifiable, produce many a time a crippling and devastating effect on the moral and quality of life of an individual, not to speak of the resultant increased mortality.

Early salvage of myocardial tissue by reperfusion with thrombolytic agents improves the morbidity and prevents early mortality, as per worldwide multi centric well-controlled trails.

Our study was unique in a way that all 50 patients were from rural background. The present study documented the usefulness of the standard electro-cartographic ST segment resolution after 90 min following thrombolytic therapy as a predictor of coronary artery reperfusion.

Age is one of the non-modifiable risk factor for acute MI. In the present study, mean age was 61.66–10.84 year. Our results nearly correlated with mean age of 60.9 – 12 yrs in western population by Schroder et al,[15] and also with mean age of 60 – 11 yrs in western population by Dong et al.[18]53 yrs But mean age was greater then to the studies of INTERHEART study of Yusuf et al[21]which was 53 yrs, which were based on Indian population.

In this study 68% were males & 32% were females, who had acute STEMI, suggestive of male preponderance. Similar observations were documented in the study done by Schroder et al.[15], French et al.[17], Dong et al.[18], Misiriya KJ et al[19].

In this study smoking was found to be the most common risk factor. It was seen in 68% of patients, percentage of smokers were higher than similar studies of French et al.[17], Dong et al. It is one of the most common modifiable risk factors.

In this study hypertension (42%) was the second most common risk factor.

Various studies have shown association of diabetes mellitus and CAD. H /O Diabetes mellitus (DM) is present in 19 of 50 cases (38%) of this study. Present study showed higher incidence of diabetes mellitus in patients than similar study done by French et al.[17], Dong et al.[18], Misiriya KJ et al[19], Bhatial et al[23],probably due to higher prevalence in India.[21]

Hyperlipidemia is a well known risk factor for the development of CAD. In our study 6 of 50 cases (12%) had hyperlipidemia.

In our study 31 0f 50 had AWMI (62%) and 19 patients had IWMI (38%).

In the present study, complete resolution subgroup had 20 of 50 (40%) cases. Mean age was 65.10 +/- 10.90 years, mean age was similar to the studies of Schroder et al.[15], French et al.[17],Dong et al[18].,probably due to early onset in Indian population.[21] Female group (44%) showed better resolution which is contrary to the study done by Schroder et al.[15], French et al.[17], Dong et al.[18]. This is probably due to less number of cases & can also be associated with lesser prevalence of smoking among Indian female.[20] Smoking & hypertension incidence were consistent with study conducted by Schroder et al.[15], French et al.[17], Dong et al[18]. Diabetics (32%) were higher in our study, probably due to higher prevalence in India.[23]Our study showed resolution of IWMI than AWMI. It was similar to other study of Schroder et al.[15], French et al.[17], Anderson et al.[22]. Time of thrombolysis from onset of symptoms <6 hrs was noted in 16 of 20 (80%). Time interval between symptom onset & thrombolysis of <6 hrs had significant statistical association on the outcome of thrombolysis ($p< 0.05$). (table-11)

Table 11: Baseline variables among Complete ST resolution subgroup (> 70% resolution)

	Schroder et al.,[15]1995 (n=1398)	**French et al.,[17]2001 (n=869)**	**Dong et al.,[18]2002 (n=121)**	**Anderson et al.,[22] 2002 (n=2352)**	**Present study, 2016 (n=50)**
Percentage of cases	49%	38.25%	38.11%	44%	40%
Mean age	60.9	57.8	60	63	65.15 +/10.90
Female	24%	20%	22%	30%	44%
Smoking	42%	44%	48%	42%	38.2%
Hypertension	30%	27%	53%	39%	38%
Diabetes	10%	8%	12%	13%	32%
Anterior wall	33%	-	20%	39%	38.7%
Inferior wall	77%	-	80%	61%	42.1%
Mean time of onset of symptoms to initiation of treatment (hours)	-	2.8 – 1.1	3.7 – 2	2.9	-
Killip class > I	10%	-	8%	-	17.5%

A total of 20 of 50 cases (40%) were in the partial resolution study group. In present study mean age of 59.7 +/- 9.5 years was noted, which was similar to the study conducted by Schroder et al.[15], French et al.[17], Dong et al.[18]

In this study incidence of smoking, hypertension, AWMI resolution than IWMI were comparable to other studies. Higher diabetics of 52.6% were noted in partial resolution subgroup, other study conducted by Schroder et. al[15], French et. al[17], Dong et.al[18] showed to have lesser incidence of DM. Time interval between symptoms onset & thrombolysis of <6hrs in 32% and 6-12 hrs in 52.6%. (table-12)

Table 12: Baseline variables among Partial ST resolution sub group (30 – 70% resolution)

	Schroder et al.,[15]1995 (n=1398)	**French et al.,[17]2001 (n=869)**	**Dong et al.,[18] 2002 (n=121)**	**Anderson et al.,[22]2002 (n=2352)**	**Present study, 2016 (n=50)**
Percentage of cases	30%	31%	35.87%	29%	40%

Mean age	61.6	56.9 – 9.6	61 – 14	62	59. 7 +/- 9.50
Female	26%	23%	20%	22%	31.25%
Smoking	-	41%	49%	44%	44.1%
Hypertension	-	26%	52%	40%	33.33%
Diabetes	16%	8%	22%	13%	52.6%
Anterior wall	62%	-	47%	56%	38.7%
Inferior wall	38%	-	53%	44%	42.1%
Time of treatment (hours)	-	2.8 – 1.3	4.4 – 2.8	2.9	5.0–1.22
Killip class > I	14%	-	7%	-	47.8 %

In this present study 20% (10 of 50) were in no-resolution subgroup. Mean age of 58.5 years, it was in accordance to study conducted by Schroder et al.[15], French et al.[17], Dong et al.[18].But the mean age was more when compared with other subgroup of our study & INTERHEART study of Yusuf et al.[21] It probably suggested poorer outcome in older population. Sex distribution, hypertension were similar to other studies. Percentage of DM was higher in this group. Percentage of Smoking was lesser when compared to other studies. Ratio of AWMI to IWMI was similar compared other study conducted by Schroder et al.[15], French et al.[17], Dong et al.[18]. (table-13)

Table 13: Baseline variables among No ST resolution sub groups (< 30% resolution)

	Schroder et al.,[15] 1995 (n=1398)	**French et al.,[17] 2001 (n=869)**	**Dong et al.,[18] 2002 (n=121)**	**Anderson et al.,[22] 2002 (n=2352)**	**Present study, 2016 (n=50)**
Percentage of cases	21%	30.6%	34.97%	26%	20%
Mean age	62.8	58.3 – 9.2	60	63	58.5 +/- 12.5
Female	27%	20%	17%	25%	25%
Smoking	-	43%	40%	41%	18%
Hypertension	-	27%	63%	44%	28.5%
Diabetes	22%	11%	19%	16%	16%
Anterior wall	58%	-	62%	56%	22.5%
Inferior wall	42%	-	38%	44%	16%
Time of treatment (hours)	-	2.8 – 1.1	4.5 – 2.8	2.8	-
Killip class > I	34%	-	26%	-	35%

Adverse events in patients with complete resolution in the present study showed LVF (22%), as the most frequent adverse event, followed by arrhythmias (19%), which were higher when compared to studies of Schroder et al.[15]& Anderson et al.[22]. No cases of cardiogenic shock, or in-hospital mortality seen in the present study, probably due to less number of patients under study. (table-14)

Table 14: Adverse events and in-hospital mortality in complete resolution subgroup

	Schroder et al.,[15] 1999 (n=1398)	**Anderson et al.,[22] 2002 (n=2352)**	**Present study, 2016 (n=-50)**
LVF	13%	13.9%	22%
Cardiogenic shock	2.6%	2.2%	0
Arrhythmias	13%	NA	19%
Recurrent angina	13%	3.4%	17
In-hospital mortality	4%	3.2%	0

Most common adverse event in patients of partial resolution wasrecurrent angina(50%), left ventricular failure(39%) followed by arrhythmias(37%). Recurrent angina(50%).was the most common adverse event when compared to other studies conducted by Schroder et al.[15] & Anderson et al[22] were left ventricular failure was the most common adverse event. However percentage of adverse events were higher in the present study than study conducted by Schroder et al.[15] & Anderson et al.[22] (table-15)

Table 15: Adverse events and in-hospital mortality in partial resolution subgroup

Partial resolution group	Schroder et al.,[15] 1995 (n=1398)	Anderson et al.,[22] 2002 (n=2352)	Present study, 2016 (n=50)
LVF	20%	18.9%	39%
Cardiogenic shock	3.8%	3.1%	0
Arrhythmias	15%	NA	37%
Recurrent angina	1.83%	2.7%	50%
In-hospital mortality	2%	6.6%	0%

Most frequent adverse event in no-resolution group in the present study was cardiogenic shock (100%), followed by arrhythmias (44%) & LVF (39%). Cardiogenic shock was not common adverse event in other similar studies, were left ventricular failure was most common adverse event. Percentage of adverse events and In-hospital mortality (100%) in the present study group was higher than similar study conducted by Schroder et al.[15]& Anderson et al.[22] (table-16)

Table 16: Adverse events and in-hospital mortality in No resolution subgroup

No resolution group	Schroder et al.,[15] 1995 (n=1398)	Anderson et al.,[22] 2002 (n=2352)	Present study, 2016 (n=50)
LVF	32%	23.3%	39%
Cardiogenic shock	17%	6.7%	100%
Arrhythmias	24%	NA	44%
Recurrent angina	14%	40%	33%
In-hospital mortality	18%	6.6%	100%

Mortality: In-hospital mortality was seen in 5 of 50 cases accounting for 10%. Mortality incidence was in accordance to study of Misiriya KJ et al[19] and Schroder et al.[15] Most common cause of death in our study was due to cardiogenic shock (3 of 5 deaths) followed by VT (2 of 5 death). 100% of deaths were observed in no-resolution group.

Higher mortality was associated with AWMI & Killip class III/IV.

Limitations

- Small sample size (n= 50).
- ST segment after acute myocardial infarction is dynamic and occur use of static measurement could have led to errors in labelling of patients as successful a failed reperfusion.
- In the present study, only short term outcome assessed in the form of in-hospital adverse events and in-hospital mortality.
- Study findings were not correlated with coronary angiography and nuclear imaging which were gold standard investigation for estimating coronary artery patency and myocardial perfusion respectively.

VI. Conclusion

The present study on the ST segment resolution after 90 min of thrombolysis conveys useful information regarding the outcome of patient with acute STEMI. Our study showed that patient with complete ST segment resolution (>70%) had a lesser adverse events and mortality whereas patients with no ST segment resolution (<30%) were associated with more frequent adverse events and mortality.

On the basis of our study, early and complete ST segment resolution predicts reperfusion of the ischemic myocardial tissue and its salvage. Early recognition and timely thrombolysis with appropriate agent predicts early reperfusion and will help in decreasing significantly the increased morbidity and mortality that is prevalent today because of acute myocardial infarction

Hence, ECG taken one at admission and second ECG after 90 min of thrombolysis is a simple, non-invasive & early marker of prognosis. It can be used in all patients at any hospital, including rural hospitals with limited infrastructure. It would guide for timely triage of patients to appropriate therapeutic intervention.

A conclusion section must be included and should indicate clearly the advantages, limitations, and possible applications of the paper. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extentions.

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