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ST SEGMENT RESOLUTION IN ECG AFTER THROMBOLYSIS AND ITS CORRELATION TO CLINICAL OUTCOME AND EARLY COMPLICATIONS

Dr. Chetan Kumar Pattar[1], Dr. Shashibhushan J[2], Dr. Veena T[3], Dr. Vijayalaxmi I Khot[4*]

[1]Senior Resident, Department of General Medicine, Karwar Medical College Karwar India
[2]Professor and Unit Chief, [3,4]Senior Resident, Department of General Medicine, VIMS Ballari India.

Corresponding Author: Dr. Vijayalaxmi I Khot, Senior Resident, Department of General Medicine, VIMS Ballari India.

ABSTRACT

Background: Acute myocardial infarction is an important cause of morbidity and mortality of our times. It gets increasing importance as it affects people in the most productive period of their life. Objective: To study ST segment resolution with its correlation to clinical outcome and early complication.

Methods: This study was conducted among all patients with diagnosis of acute ST segment elevation admitted to VIMS Medical College and Hospital during period from 1st Nov 2019 to 31st Oct 2021.

Results: Mean age of population studied is 57.07, Male to female ratio 3:1 shows a clear male preponderance. Chest pain is most common mode of presentation seen in 99% of cases, followed by sweating and breathlessness. Hypertension is most common risk in the present study, followed by smoking and diabetes respectively. Anterior wall MI constitutes 65% compare to inferior wall MI 35%. Based on percentage of ST segment resolution after 90 minutes of thrombolysis. Patients divided into three categories. Patients with > 70% ST resolution (complete STR) constitute 46%, patients with 30-70% ST resolution (partial STR) constitutes 31%, patients with < 30% ST resolution (no STR) constitutes only 23%.

Conclusion: Patients with > 70% ST resolution (complete STR) associated with less frequent adverse events during hospital stay and less inpatient mortality.

Keywords: ST Segment Resolution, Correlation, Clinical Outcome, Early Complication

INTRODUCTION

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 as infectious diseases began to come under control with newer chemotherapeutic agents. Incidence in West has decreased due to the better care and treatment.

Thrombolysis has been the cornerstone of treatment for patients having STEMI by improving outcomes and preserving left ventricular function. Analysis of ST segment resolution on ECG, after thrombolytic therapy, in cases of STEMI provides an easier and cost-effective solution to assess coronary reperfusion. Patients with Acute MI experience sudden cardiac death due to ventricular tachycardia and fibrillation (VT/VF). The incidence of such events is more common in patients with failed thrombolysis in STEMI. ST segment changes reflect myocardial rather than epicardial flow and thus yield prognostic information beyond that provided by coronary

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angiogram alone. 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.[1]

Resolution of ST segment elevation, relief from chest pain, early peaking of serum concentration of creatinine kinase and reperfusion arrhythmias are some of the non- invasive markers of reperfusion. Resolution of chest pain and serum biochemical markers failed to satisfy the clinical necessities.

Schroder K 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.[2]

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.[3]

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.[4]

The current study is aimed at defining the extent of failed thrombolysis and assessing its demographic and clinical predictors in our hospital.

MATERIALS AND METHODS

This study was conducted among all patients with diagnosis of acute ST segment elevation according to ACC/AHA guidelines 2013,5 admitted to VIMS Medical College and Hospital during period from 1st Nov 2019 to 31st Oct 2021. Sample size: Minimum of 100 cases of diagnosed ST segment elevation myocardial infarction. Simple random sampling was used

Inclusion Criteria

All the patients with first attack of ST segment elevation myocardial infarction diagnosed according to ACC/AHA guidelines 2013 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, cardiomyopathies and congenital heart disease.

Electrolyte disturbances.

Bundle branch block

If the patient dies after 90 minutes of thrombolysis.

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

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. Standard lead II was cased to monitor and record rhythm disturbances. ECG were recorded on BPL Cardiart 408 Machine. Patients monitored on Hewlett Packard Code Master – Model M1722A. The other routine and necessary investigations of patients were subjected are as: Hb%, TC DC ESR, Urine : Albumi/Sugar Microscopy

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Lipid profile within 24 hours of onset of chest pain FBS, PPBS whenever necessary
B. urea, S creatinine, S. electrolytes CKMB, Trop T and Chest X-ray PA view (whenever necessary)
ST segment was measured 80 milliseconds 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.6
The percent resolution of ST segment resolution was calculated as the sum of ST segment elevation on first ECG minus the sum of ST segment elevation on second ECG, decided by initial sum of ST segment elevation.
Based on values obtained, study population divided into three categories: A, B and C.

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

Clinical details were recorded prospectively. 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

Qualitative data is represented in the form of frequency and percentage. To assess the association between variables Chi Square test was used. If the cell were small Fisher's Exact test was used. Continuous variables were represented as mean & Standard deviation. A P value of <0.05 was considered statistically significant. SPSS for windows Version-16 (2007) was employed for statistical analysis.

RESULT

In the present study, the minimum age of the patient is 30 years, maximum age 86 years. Maximum number of patients are in between 60-86 years constituting 53%. Mean age of present study is 57.07. In this study sex distribution shows a clear male preponderance.

Table 1: Age distribution of patients

AGE (years)	Frequency	Percent
30-40	14	14
40-59	33	33
60-86	53	53
Total	100	100

In this study chest pain was the most common mode of presentation, present in 99% cases associated with sweating in 54% cases, breathlessness seen in 40% cases. Syncope was seen in 10% cases and palpitation in 5% cases.

Table 2: Symptoms at presentation

Symptoms	Frequency	Percentage
Chest pain (n=100)	99	99

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Breathlessness(n=100)	40	40
Sweating(n=100)	54	54
Palpitations(n=100)	19	19
Syncope(n=100)	7	7
Others(n=100)	28	28
Total		100

In the present study hypertension is seen in 70%, diabetes mellitus is seen in 50% cases, smoking is seen in 62% cases, alcohol consumption in 43%, tobacco consumption in 49%, and family history of IHD is seen in 3%.

Table 3: Risk factors

Risk factors	Frequency	Percentage
Hypertension	70	70
Diabetes	50	50
Smoking	62	62
Tobacco	49	49
Alcohol	43	43
Family history of IHD	3	3
Past history of angina	0	0

Based on percentage of ST segment resolution after 90 minutes of thrombolysis. Patients divided into three categories. Patients with > 70% ST resolution (complete STR) constitute 46%, patients with 30-70% ST resolution (partial STR) constitutes 31%, patients with < 30% ST resolution (no STR) constitutes only 23%.

Patients with 30-70% ST resolution (partial STR) are associated with more frequent adverse events during hospital stay when compared to complete STR group, but less frequent adverse events when compare to no STR group.

Table 4: Outcomes in different subgroups of ST segment resolution

Outcome	Cat-A	Cat-B	Cat-C	
No adverse events	0	6	36	42
Adverse events excluding mortality	14	19	9	42
Mortality	9	6	1	16

Patients with < 30% ST resolution (no STR group) are associated with more frequent adverse events and inhospital mortality.

Table 5: Base line characteristics in ST segment resolution subgroups

AGE in years	Category A	CategoryB	CategoryC	Total	P-Value
30-40	3	5	6	14	
40-59	6	8	19	33	

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60-86	14	18	21	53	
	23	31	46	100	0.59

Table 6: Symptoms in ST segment resolution subgroups

Symptoms	Cat A	Cat B	Cat C	Total
Chest pain	23	31	45	99
Breathlessness	7	12	21	40
Sweating	13	16	25	54
Palpitations	6	5	8	19
Syncope	2	2	3	7
Others	9	6	13	28

Among adverse events, recurrent angina is most frequent adverse events seen in 44% cases, followed by LVF in 23% cases and cardiogenic shock in 20% cases and arrhythmia in 6% cases.

Table 7: Type of adverse outcome in subgroups

Adverse outcome	Categories		
	A	B	C
LVF	10	10	3
Cardiogenic shock	11	7	
Recurrent Angina	16	9	9
Arrhythmias	3	3	0

Inpatient mortality seen in 16 cases that is 16% cases. Most common causes of death is cardiogenic shock 75% cases followed by LVF in 37.5% cases.

DISCUSSION

In present study the mean age of patient is 57.07 years, which is similar when compared to other studies. 7-10 In the present study, there is a male preponderance. There is similar male preponderance in different study groups.[7-9]

In present study hypertension is single most common risk factor, followed by smoking and diabetes. Percentage of hypertensives are high compare to other studies. Percentage of smokers were also when compared to other studies.[7-10]

Base line variables in complete resolution group are similar to other study groups 6,7,9,11 except for diabetes, hypertension and smoking. Patients in the present study are of similar age group as compared to other study groups. Percentage of hypertensives and diabetecs among population group of present study is almost double that of other study groups.

Majority of baseline variables in partial resolution group similar with different study[6,7,9,11] groups. But mean age of present population group is similar compared to other studies. Percentage of smokers, hypertensives and diabetics are more in present population group when compare to other study groups.

When compare to other study[6,7,9,11] groups No resolution group in the present study are of similar age group. Hypertension is most frequent risk factor followed by smoking and diabetes. Percentage of risk factors are high when compare to other study groups. Ratio of inferior wall myocardial infarction to anterior wall MI are high when compare to other study groups. Mean

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time of onset of symptoms to treatment is also high in present study compare to other study groups

Adverse events in complete resolution group in the present study are similar to other study groups. Recurrent angina is the most frequent adverse event in the present study group which can be comparable to other study groups, followed by left ventricular failure. In hospital mortality 2.17% on present study which is similar to other study groups.

CONCLUSION

Patients with 30-70% ST resolution (partial STR) are associated with more frequent adverse events during hospital stay when compared to complete STR group, but less frequent adverse events when compare to no STR group.

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