

Arrhythmias During the 1st Week of Acute Myocardial Infarction: An Observational Cross-Sectional Study

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ABSTRACT

Introduction: Though the management of coronary artery disease is more advanced now a days. It is still having higher incidence, morbidity, and mortality. The mortality and morbidity are mainly due to the development of arrhythmias.

Materials and Methods: We prospectively studied the clinical, laboratorial, electrocardiographical, and two-dimensional echo cardiographic parameters of around 118 patients with myocardial infarction at Government Medical College and hospital over a period of 2 years. The test of significance used between the associations of different characteristics was the Chi-square test. For statistical significance, the “*P* value” was calculated and a value <0.05 were considered as significant.

Results: Among 118 patients, 94 (79.88%) showed some kind of arrhythmias. Almost 90% of arrhythmias occurred during initial 24 h with more than half of these (48.93%) were observed during 1st h with statistical significance. Sinus bradycardia (21.30%) in isolation was the most common arrhythmia. Ventricular premature complexes in isolation being the second most common (11.70%). 71% of patients with arrhythmias had left ventricular (LV) dysfunction with ejection fraction <40%. Mortality was more in ventricular fibrillation (VF) and ventricular tachycardia (VT). VF had mortality of 75%, and VT had mortality of 66.66%.

Conclusion: Most of the patients with acute myocardial infarction develop some kind of arrhythmias. Most of the arrhythmias developed during initial 24 h with almost half of these occur during 1st h. Mortality and LV dysfunction are more common in patients developing arrhythmias specifically VF, and VT.

Keywords: Acute coronary syndrome, Acute myocardial infarction, Arrhythmias, Coronary artery disease

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INTRODUCTION

Coronary artery disease is the leading cause of death in the industrialized world. Indians also have a higher incidence, morbidity and mortality.¹ Morbidity and mortality are due to the development of arrhythmias during myocardial infarction (MI).²

Patients with acute MI have some cardiac rhythm abnormality, and around 25% have cardiac conduction disturbance within 24 h following infarct onset.³ Any rhythm disturbance can be seen in acute MI. Up to 25%

of patients with anterior MI develop tachycardias and hypertension⁴ while up to 50% of patients with inferior wall MI develop bradycardias and heart block.⁵ Coronary artery reperfusion due to thrombolytic therapy cause some arrhythmias.⁶

The study is conducted to evaluate the incidence and profile of arrhythmias in acute MI during the first 1 week of hospitalization. Attention is given to the peri-infarction period (considered as within 48 h of MI) as arrhythmias are most likely seen during 1st week.⁷

MATERIALS AND METHODS

This is a prospective observational cross-sectional study carried out over a period of 2 years from Nov-2012 to Oct-2014 consisting of 118 patients admitted in tertiary care center in Department of Medicine, Government Medical College, Latur.

Patients in hyper-acute or acute phase of MI above 18 years of age are included.

Patients with age <18 years. MI of more than 1 week old. Patients already on arrhythmogenic drugs like digoxin. Patients with K/C/O arrhythmias. Patients with valvular heart disease. Patients requiring intervention like angioplasty or pacemaker insertion. Patients with any one of the above were excluded from the study.

A written consent was taken from each patient involved in this study. The patients admitted were evaluated by detailed history, clinical examination and the required investigations. The patients were observed for arrhythmia for 7 days after the admission. 12-lead electrocardiogram (ECG) was taken at admission, at 24 h, 48 h and at the time of arrhythmia. Multi parameter monitors were used to monitor the patients for 48 h and the pattern of arrhythmias if any, was noted. After 48 h all the patients were regularly monitored by 12 lead ECG thrice a day and whenever needed till the discharge from the hospital. In addition to routine investigations, special investigations like two-dimensional echocardiography with Doppler flow study with, lipid profile and electrolytes were done during the first 7 days of hospitalization.

The diagnosis of acute MI (AMI) was done on the Third Universal Definition of MI.⁸ Detection of a rise and gradual fall of cardiac biomarker with one value being elevated. The preferred cardiac biomarker is troponin. In addition, one of the five following diagnostic criteria should be met:

1. Symptoms of ischemia
2. New (or presumably new) significant ST/T wave changes or left bundle-branch block (LBBB)
3. Development of pathological Q-waves on ECG
4. Imaging evidence of new loss of viable myocardium or regional wall motion abnormality
5. Identification of intracoronary thrombus by angiography or autopsy.

The diagnosis of arrhythmia was carried out as per AHA guidelines and treated accordingly.

The study was approved by Institutional Ethical Committee.

Results complied and statistically analyzed with Chi-square test.

RESULTS

A total number of 118 patients were studied. Majority were above the age of 50 years. Youngest patient was of 26-year-old while oldest one was of 78 years. Of 118 patients, 76 (64.40%) were male and 42 (35.60%) were female with male to female ratio of 1.8:1. Majority of males and females (83%) were above age of 50 years. Peak age for males was 50-59 years, and that for females was 60-69 years. Majority of patients (45.76%) had anterior wall MI, followed by inferior wall MI (28.81% patients).

79.66% of the patients were detected to have arrhythmias (Table 1).

91.48% of arrhythmias occurred within first 24 h with peak incidence (48.93%) during 1st h (Table 2).

Majority of arrhythmias underwent spontaneous resolution. It persisted in 15.95% of patients while 32.97% required pharmacological intervention and 10.63% required electrical intervention.

Sinus bradycardia in isolation was the most common arrhythmia seen in 21.30% of patients. Ventricular premature complexes (VPCs) in isolation were occurred in 11.7% of patients and were second most common arrhythmia. Both VPCs and sinus bradycardia also occurred with some of other arrhythmias. Overall bradyarrhythmias were occurred in 48.90% patients and tachyarrhythmias in 28.72% patients (Table 3).

Majority of arrhythmias (45.74%) in both males and females occurred during the 1st h of hospitalization and was statistically significant. Left ventricular (LV) dysfunction was common in the majority of patients with ventricular tachycardia (VT), ventricular fibrillation (VF) and second or third degree atrioventricular (AV) block.

Mortality in acute anterior wall MI with VF, VT and LBBB was more. It was 75%, 66.66% and 40%, respectively. One out of two patients of atrial fibrillation in lateral wall MI succumbed (Table 4).

DISCUSSION

ACS will be a major cause of death in the world. Many of the deaths are due to the development of arrhythmias during MI.⁹

During first 24 h in patients with acute MI some cardiac rhythm abnormality is seen. In a study by Aufderheide, 90% of patients with acute MI have some cardiac rhythm abnormality during the first 24 h following infarct onset.⁶ 80% patients had some kind of arrhythmia,

sinus tachycardia was observed in up to 6.70% of the patients. In a study by Milton H and Robbert S.E., sinus tachycardia was observed in up to 10% of the patients.¹⁰

Table 1: Arrhythmia occurrence

	Frequency	Percentage
Arrhythmia	94	79.66
No arrhythmia	24	20.33
Total	118	100

Table 2: Time of arrhythmia detection

Time of arrhythmia	Frequency	Percentage
1 st h	46	48.93
1-12 h	24	25.53
12-24 h	16	17.02
>24 h	8	8.5
Total	94	100

Table 3: Specific arrhythmia

Type of arrhythmia	Frequency	Percentage
VPCs	11	11.70
VT	5	5.30
VF	5	5.30
Sinus bradycardia	20	21.30
Sinus tachycardia	8	8.50
AF	4	4.25
LAHB	1	1.06
2 nd degree AV block	5	5.30
CHB	3	3.20
VPCs+first degree heart AV block+CHB	5	5.30
First degree AV block+CHB	5	5.30
VPCs+RBBB	3	3.20
VPCs+sinus bradycardia	4	4.25
VPCs+sinus tachycardia	5	5.30
LBBB	6	6.40
Sinus bradycardia+1 st degree AV of block	4	4.25
Total	94	100.00

VPC: Ventricular premature complexes, VT: Ventricular tachycardia, VF: Ventricular fibrillation, AF: Atrial fibrillation, LAHB: Left anterior hemiblock, CHB: Complete heart block, LBBB: Left bundle-branch block

Table 4: Mortality versus specific arrhythmia

Arrhythmia	Number of cases	Mortality (%)
Sinus bradycardia	20	1 (5)
Sinus tachycardia	8	1 (12.5)
VT	5	4 (80)
VF	5	4 (80)
AF	4	2 (50)
LBBB	6	2 (33.33)
VPCS+RBBB	3	1 (33.33)
VPCs+sinus Tachycardia	5	2 (40)
VPCs+sinus Tachycardia	5	2 (40)
VPCs+1 st degree AV block+CHB	5	1 (20)
Total	66	20

VPC: Ventricular premature complexes, VT: Ventricular tachycardia, VF: Ventricular fibrillation, AF: Atrial fibrillation, LAHB: Left anterior hemiblock, CHB: Complete heart block, LBBB: Left bundle-branch block, RBBB: Right bundle branch block

About 20% of patients show non-sustained VT and only 10% shows more than one run of VT in 24 h.¹¹ 2% of patients with MI shows sustained VT within 48 and is often transient and not associated with long-term risk of sudden cardiac death.¹² In our study, all the patients with VT had LV dysfunction with mortality of 50%. Non-sustained VT is linked to an increased risk of sudden death during the first 6-12 months after MI especially when associated with reduced LV ejection fraction EF (LVEF) (<40%). VT is frequently the terminal event in an episode of MI.¹³ sinus bradycardia is seen in 27.96% of patients. In a similar study by Pantridge and Adgey sinus bradycardia was observed in 25-40% of the patients.¹⁴ Intraventricular conduction delays, including bundle branch block and fascicular block, occur in up to 20% of patients.¹⁵ LBBB and right bundle branch block occurred in 2.4% and 3.6% of the patients respectively, and bifascicular block occurred in 2.9%.¹⁶ Second degree heart block Mobitz Type I is seen in up to 10% of patients, which is usually transient and resolves in 72 h. Mobitz Type II observed in <1%.¹⁷ The incidence of high degree AV nodal block in patients with RV involvement is 48% compared to only 13% in patients with inferior wall MI without RV involvement.¹⁸ The incidence of complete heart block (CHB) is lower in thrombolytic era. The AMI patients who develop CHB has poor prognosis than without CHB.¹⁹ Atrial fibrillation is seen in up to 15% of patients with MI, most commonly in those who have significant LV dysfunction.^{20,21} In high risk post-MI patients with LVEF <40% or frequent VPCs, the risk of deaths due to arrhythmia was higher than other deaths for up to 2 years.²²

CONCLUSION

Most of the patients with AMI develop some kind of arrhythmias. Most of arrhythmias developed during initial 24 h with almost half of these occur during 1st h. Mortality and LV dysfunction is more common in patients developing arrhythmias specifically VF, and VT.

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How to cite this article: Toshniwal SP, More RA, Kabara MV. Arrhythmias during the 1st Week of Acute Myocardial Infarction: An Observational Cross Sectional Study. *Int J Adv Health Sci* 2015;1(9):1-4.

Source of Support: Nil, **Conflict of Interest:** None declared.