Study of Rhythm Disturbances in Acute Myocardial Infarction

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Abstract

Introduction: Cardiac rhythm disturbances are common presentation in acute coronary syndromes and are cause of frequent serious complications in acute myocardial infarction (AMI). However due to availability of early reperfusion therapy and primary angioplasty, arrhythmias have cause a reduction in mortality. Arrhythmias are key events before, during or after the occurrence of acute MI. There are few clinical studies describing the types of arrhythmias, their correlation with the clinical profile of acute MI and effect on outcomes. In rural tertiary care centre, patients of acute MI, receive reperfusion therapy. The Indian population from central India is mostly a farming community from rural areas with limited medical aid resources. A tertiary care centre can only provide early reperfusion therapy in acute MI. There is very little data on rhythm disturbances in acute myocardial infarction from this geographic region.

Objectives: To study rhythm disturbances in acute myocardial infarction(AMI) and its effect on outcome.

Methods: All cases of acute ST elevation and non ST elevation MI having rhythm disturbances during reperfusion or ICU stay admitted between April 2012 to 2014.

Results: Rhythm disturbances were seen in 40-69 years of age. Chest pain (97%) and palpitation (63%) were commonest complaints. Hypertension was commonest risk factor. Sinus tachycardia (86%), ventricular ectopics (17%) and ventricular tachycardia (16%) were commonest tachyarrhythmias and sinus bradycardia (68%), right (23%) and left (18%) bundle branch blocks commonest bradyarrhythmias. Mortality was higher in tachyarrhythmias.

Conclusion: Compared to studies elsewhere it was observed that sinus tachycardia and bradycardia were commonest arrhythmias in AMI. That atrial fibrillation as observed in most studies elsewhere was not a common arrhythmia in this study. Mortality was statistically significant in tachyarrhythmias in both ADMI(55.71%) and IDMI(17.14%) as compared to bradyarrhythmias with p<0.0001.

Background

Cardiovascular diseases (CVD) are leading cause of mortality in India. An estimated 23.6 million cases of CVD will be reported in patients younger than 40 yrs in 2015. Coronary artery disease is progressively increasing in Indian population and will be the commonest cause of mortality in patients younger than 50 years. Various studies from India have shown high prevalence of the disease, approaching approximately 11% in the urban population and 7% in the rural population across India.1 Cardiac rhythm disturbances are common presentation in acute coronary syndromes and are cause of frequent serious complications in acute myocardial infarction (AMI). There are few related studies on arrhythmias and their effect on outcomes. Some studies observed that due to availability of early reperfusion therapy and primary angioplasty there is reduction in mortality due to arrhythmias.2 In few studies, such as the Cardiac Arrhythmia Suppression Trial (CAST)3,4 and the Gruppo Italiano per lo Studio della Sopravvivenza nell’Infarto Miocardico study (GISSI-2),5 investigators assessed the frequency of premature ventricular complexes (PVCs). Also researchers documented tachyarrhythmias like ventricular tachycardia and fibrillation as common events in acute MI.6,7 Arrhythmias are key events before, during or after the occurrence of acute MI. There are few clinical

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studies describing the types of arrhythmias, their correlation with the clinical profile of acute MI and their outcomes. In resource poor hospitals or rural tertiary care centre, patients of acute MI receive reperfusion therapy preferably over primary PCI. The Indian population from central India is mostly a farming community from rural areas. This tertiary care centre provides limited healthcare services to rural population. There is very little data on rhythm disturbances in admitted cases of acute myocardial infarction from this geographic region. We sought to study the clinical profile of arrhythmias in our tertiary care center.

**Objective**

1. To study the arrhythmias that occur in patients hospitalised for acute myocardial infarction (AMI).
2. To study effect of rhythm disturbances on outcome in AMI

**Material and Methods**

**Study setting**

Medical intensive care unit of rural tertiary care hospital of central India.

All patients admitted between April 2012 till April 2014 were included in the study. Data on 116 cases was collected and reported. Cases of both acute ST elevation and non ST elevation AMI were admitted to ICU. According to the Third Universal Definition of myocardial infarction (MI) expert consensus document published in October 2012 by the global Myocardial Infarction Task Force, acute myocardial infarction was defined as increased cardiac biomarkers during 1) symptoms of myocardial ischemia 2) new significant ST-T wave changes or left bundle branch block 3) development of pathological q waves on ECG 4) new loss of viable myocardium or regional wall motion abnormality on imaging 5) intracoronary thrombus on angiography or autopsy.

**Inclusion criteria**

1. All adult cases of acute myocardial infarction (STEMI or NSTEMI) as per the above definition; 2. Who developed arrhythmias detected during either reperfusion therapy or hospital stay.

**Exclusion criteria**

1. Any history of rheumatic heart disease
2. Infective endocarditis
3. Cardiomyopathy
4. Dyselectrolytemia
5. Old MI

Detailed clinical examination, laboratory reports and electrocardiogram (ECG) were sought. Multipara ECG monitor and print ECG records were observed during patient’s hospital stay. ECG was recorded on admission, just before starting thrombolytic therapy, mid thrombolysis and after thrombolysis. Those who were not thrombolysed, ECG was recorded on occurrence of an event on the monitor. Patient’s detailed history, clinical examination and cardiac biomarkers like CKMB were done and recorded in the data collection form. Co-investigators took ECG and recorded in the data collection form. Co-investigators took ECG and recorded in the data collection form. The reports were reviewed by co-investigators. We analysed arrhythmias in a 12 lead ECG taken over length of monitoring period in those on reperfusion therapy as well as those not thrombolysed. In those thrombolysed, the time from admission to reperfusion and post thrombolysis, ECG was done to document arrhythmias.

**Results**

In our study more number of cases both males and females were in the age group of 40-69 years. Average age of females was 63 years as compared to 58 years in males and the difference in age in relation to gender carried a statistically significant p value=0.04, Z -value 2.07.

Precordial chest pain (97.41%) followed by palpitation (62.93%), sweating (43.10%) and breathlessness (37.07%) were the most significant complaints.

Hypertension was the commonest risk factor.

There were more cases with one risk factors (44.82%) and least number of cases had three or more risk factors (8.62%). However presence of more than one risk factor carried no statistically significant correlation with mortality.

Cardiac biomarkers, CKMB above 25 IU/L was considered elevated and observed in 84.48%. ECG showed ST elevation in the anterior leads (86.25%). Pathological q waves were recorded in 32.50% of AWMI and 27.78% of IWMI. There was no statistical significant differences in ECG evidence in both types of MI.

Thrombolysis was given to 64.29% cases of AWMI and 35.71% cases of IWMI. These patients received intravenous streptokinase infusion. None of these patients underwent PCI. 12 cases presented with chest pain of a duration between 6.1 to 24 hours. Out of these 4 received thrombolysis. Statistical analysis revealed p value of <0.0001 which was significant. Odd’s ratio showed strong correlation when applied.

Thrombolysis was given to 70 out of 116 cases. While thrombolysis was given in 64.29% of AWMI, and 36% of IWMI, in comparison to 76% of AWMI and 24% of IWMI who did not receive thrombolysis, this difference was statistically significant (p<0.005).
Tachyarrhythmias (83%) were common in AWMI and bradyarrhythmias (86.11%) were common in IWMI, these observations were statistically significant (Table 1).

Both types of rhythm disturbances were analysed in terms of distribution of age. However, between 50 to 69 years the occurrence of both tachyarrhythmias (27.59%) and bradyarrhythmias (23.28%) was highest. But this analysis carried no statistical significance. The correlation of types of rhythm disturbances and the gender showed both types of arrhythmias were common in the male cases. An attempt to see the correlation of tachyarrhythmias or bradyarrhythmias in particular age group and gender, it was observed that in males the events were frequent in age group of 60-69 years, mean age was 63 years. However, between 50 to 69 years the occurrence of both tachyarrhythmias (27.59%) and bradyarrhythmias (23.28%) was highest. But this analysis carried no statistical significance. The correlation of types of rhythm disturbances and the gender showed both types of arrhythmias were common in the male cases.

Out of the 116 cases of acute myocardial infarction admitted, 70 cases received thrombolysis. Rhythm disturbances recorded in the post thrombolysis period showed tachyarrhythmias in 72.86% cases and bradyarrhythmias in 58.57% cases. All these were reperfusion arrhythmias, the differences in occurrence of the rhythm disturbances in thrombolysed and in non thrombolysed cases carried statistical significance p = 0.000 and Chi square 73.21.

Both non q MI and q wave MI was commonly seen in AWMI as compared to IWMI and this difference was statistically significant (p<0.005).

Tachyarrhythmias caused high mortality in both AWMI and IWMI as compared to bradyarrhythmias and this was statistically significant (Table 4).

Overall mortality was 12.50% in AWMI and 19.44% in IWMI. Mortality was comparatively higher in IWMI.

### Discussion

This cross sectional study of 116 cases of acute myocardial infarction admitted in the rural tertiary care hospital was conducted to find out occurrence of rhythm disorders and the outcome in cases of AMI during hospital stay. There were 82 (70.69%) males and 34 (29.31%) females. In both the gender rhythm disturbances were observed in the age group of 60-69 years. Mean age of males was 57 years and females was 63 years.

70 cases (60.34%) were thrombolysed. 64 cases (56.64%) had presented with chest pain and thrombolysed within 6 hours, 4 cases (3.54%) who had chest pain between 6.1 to 24 hours were also thrombolysed. Of the three cases without chest pain 2 cases had ST segment elevation on the ECG, and presented in the window period and thereby received thrombolysis. The commonest risk factor for AMI was hypertension (59.48%), closely followed by diabetes (35.34%) and smoking (22.41%). These figures are comparatively higher than other studies where diabetes 19% and hypertension 23%,6,9 are common risk factors.

CKMB as a marker of AMI was studied in all cases and a value of more than 25IU/L was considered as significant. Mean CKMB levels was 41.93 ± 14.33 IU/L. 98 cases (84.48%), showed elevated CKMB levels. Those who received thrombolysis in the window period...
had a favourable outcome as seen by statistically significant p value.

Both q wave MI and non q MI were common in AWMI as compared to IWI and this difference was statistically highly significant.

Cardiac monitoring revealed arrhythmias in 105 cases (90.52%) during the hospital stay. Of the 80 cases of anterior wall MI, there were 66 (82.50%) tachyarrhythmic events and 41 (51.25%) bradyarrhythmic events. In 36 cases of inferior wall MI, 21 (58.33%) had tachyarrhythmias and 31 (86.11%) had bradyarrhythmias. Tachyarrhythmias were commonly observed in anterior wall MI (82.50%) and bradyarrhythmias in inferior wall MI (51.25%). This difference was statistically significant. Both these events occurred in similar proportions across all age groups. About 12% cases had no arrhythmic events. However, both types of arrhythmias were more frequent in males as compared to females and this difference was statistically significant.

Commonest arrhythmias observed were sinus tachycardia followed by ventricular ectopics, supraventricular ectopics and ventricular tachycardia. In most other studies atrial fibrillation was reported in between 4 to 26%, in our study the event occurred merely in 1 case. Also there was 100% mortality reported in cases of AMI with atrial fibrillation. Ventricular tachycardia was also a common event (67%) in other studies, in our study it was reported in only 16% cases. In our study sinus tachycardia was the commonest documented event (86%), but in all other studies it was documented between 30-40%. Ventricular fibrillation was a rare event (1.15%) in this study compared to other studies (2 to 4%). The bradyarrhythmias commonly recorded was sinus bradycardia (69%) and observed to be transient in AMI, however mortality in these cases was 20%. Contrary to other study, it was not a common event (14-20%). The other common rhythm disturbance was bundle branch blocks (41.67%). Few studies recorded a very low incidence of bundle branch blocks, (3%) cases. This study observed a mortality of only 23.52% in RBBB and 15.38% in LBBB, other studies reported a mortality of as high as 30-60%.

The difference in distribution of cases receiving thrombolysis and site of infarction showed statistical significance. There were 51 tachyarrhythmic (72.86%) and 45 bradyarrhythmic (58.57%) reperfusion events. Whereas 36 tachyarrhythmic and 31 bradyarrhythmic events in those not receiving thrombolysis. This difference in the types of rhythm disturbances was statistically significant (p=0.000, S<0.05).

70 cases underwent thrombolysis and out of these 45 (64.29%) cases had AWMI, and 25 (35.71%) cases had IWI, this difference in the distribution of patients thrombolysed in relation to site of infarction was statistically significant.

In this study 62 out of 70 cases thrombolysed had reperfusion arrhythmias, the commonest being sinus tachycardia and sinus bradycardia, followed closely by ventricular ectopy, RBBB and LBBB.

Mortality in AWMI was 12.50% and in IWI was 19.44%. However, this difference carried no statistical significance. Of the 70 cases who received thrombolysis both tachyarrhythmias and bradyarrhythmias caused similar mortality which was 12.86%. In non thrombolysed cases mortality with tachyarrhythmia was 15.22% and with bradyarrhythmia 17.39%. This carried no statistical significance.

The occurrence of reperfusion arrhythmias in relation to the site of infarction revealed that tachyarrhythmias (55.71%) were commonest in AWMI and statistically significant as compared to bradyarrhythmias (17.14%). However bradyarrhythmias had equal frequency (40-45%) in both types of MI.

Conclusion

The clinical profile of arrhythmias in acute MI may vary from one centre to the other. It is imperative to document the events and understand their course and outcome. This study observed that compared to global trend the profile of arrhythmias was different from that observed elsewhere.

Limitations

The study had time constraints therefore long term post discharge followup was not possible. Hence annual mortality could not be calculated. Sequential CK MB measurements were done in few cases only. Inability to evaluate modifiable risk factors. Technical and economy constraints did not allow coronary angiography and 2D Echo in most cases. Holter monitoring again could not be done in all these cases, rather by multipara monitors, again due to resource limitation.

References


