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Research Article

Study on site of acute myocardial infarction associated with arrhythmias and outcome

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ABSTRACT

Background: Despite considerable progress, Arrhythmias remain a major cause of death in patients with myocardial infarction. Majority of these arrhythmias occurring within the first 24 hours. Few studies have shown that, frequently associated different arrhythmias with various distributions of myocardial infarctions. The aim of the present study is to identify the type of arrhythmias and outcome in patients presenting with acute myocardial infarction.
Methods: A total of 100 patients admitted to the ICC unit of govt. general hospital, Gulburga & Basaveshwar teaching & general hospital Gulburga from one year data were taken for present study. The risk factors for cardiac disease were evaluated through history, physical examination and blood investigations. All the patients were monitored for 48-72 hours for arrhythmias. Type and time of onset arrhythmias was also noted.
Results: Out of the 100 patients with myocardial infarction studied, 76 patients had arrhythmias. Majority of arrhythmias occurred during less than 12 hours and sinus tachycardia was the commonest arrhythmia (40%). The overall incidence of mortality was 15%. Majority of mortality occurs with 24 hours (66.6%). Mortality was more in males (16.25%) than female (10%). Cardiogenic shock (40%) and left ventricular failure (33.33%) were the most common cause of death.
Conclusions: Arrhythmia occurred in 76% of the patients with acute myocardial infarction. Sinus tachycardia was the most common arrhythmia constituting about 40% of patients who had arrhythmias.

Keywords: Arrhythmias, Acute myocardial infarction, LVF, Outcome

INTRODUCTION

Even though substantial progress in the management of coronary artery disease, it remains foremost and important cause of death all over the world. Many of these deaths are attributed to the development of arrhythmias.[1] Cardiac arrhythmias and conduction abnormalities cause difficulties in Acute Myocardial Infarction (AMI) have been associated with adverse prognosis in many reports.[2-7] Around 25% of patients have transmission trouble within 24 hours following myocardial infarction onset. Almost any rhythm disturbance can be associated with acute myocardial infarction, including bradyarrhythmias, supraventricular tachyarrhythmias, ventricular arrhythmias and atrioventricular block. Some rhythm disturbances in patients with acute myocardial infarction may be related to coronary artery reperfusion.[8] In the first 72 hours after the onset of symptoms, most arrhythmias are observed during the pre-hospital and coronary intensive care unit phase.[9]

Small studies have frequently associated different arrhythmias with various distributions of myocardial infarctions.[10,11] While most studies have suggested an association between inferior myocardial infarction and

AV blocks, the data on the incidence of ventricular tachyarrhythmia have been controversial.[10,11]

The most important assumption for key mechanism of arrhythmia in acute phase of coronary occlusion is micro-reentry due to inhomogeneity of electrical characteristics of ischemic myocardium. Cells of center of the ischemic zone have a relatively consistent increase in extracellular potassium concentration. Whereas, cells in the border zone between ischemic region and normal myocardium are only partially depolarized and consequently have action potentials with larger amplitude. Slowing of impulse conduction take place in noticeably depressed areas leading to arrhythmias such as polymorphic ventricular tachycardia and ventricular fibrillation.[12]

The cellular electrophysiological method for reperfusion arrhythmias emerge to include washout of different ions such as lactate & potassium and toxic metabolic substance that have accumulated in ischemic zone. Cells in reperfused myocardial zones can show action potentials of slow reaction type.[13] Incidence of malignant ventricular arrhythmia associated with infarction are changed by the extent of the underlying infarction.[14]

Inferior wall myocardial infarction report for 40-50% of all acute myocardial infarction with mortality rates of 2-9%.[15] Bradyarrhythmias occur more frequently in inferior than anterior wall myocardial infarction. Sinus bradycardia is the most common bradyarrhythmia throughout acute myocardial infarction, seen frequently in first 4-6 hours of infarction.[16] Block of early onset is generally of short duration.[17] First degree atrioventricular block has no hemodynamic effects and needs no intervention. With complete atrioventricular block, the on an average mortality is 29%.

Objectives of the study

The idea of the study is to evaluate the acute myocardial infarction associated with arrhythmias and outcome during the stay in hospital.

METHODS

100 patients with acute myocardial infarction admitted to the ICC unit of govt. general hospital, Gulburga & Basaveshwar teaching & general hospital Gulburga from one year data were taken for present study. Each patient gave written, informed consent to participate in the study and the study protocol was approved by the institutional review board including ethical issues. Patient was monitored during the stay in hospital and pattern of arrhythmia, if any, was noted.

Inclusion and exclusion criteria

Patients admitted to the ICCU with history of chest pain within 48 hours, electrocardiogram taken and those patients with acute changes of MI in ECG were included in the study. Those patients with angina pectoris and unstable angina (with atypical ECG changes) or chest pain due to any other cause excluded from the study. Subendocardial infarction is excluded from the study.

Data was collected in a pre-tested proforma by full filling objectives of the study, detailed history, physical examination, thorough cardiovascular and other systemic examination and necessary investigations. A twelve lead conventional electrocardiogram was recorded at the earliest after admission to the unit and electrocardiogram was repeated on three consecutive days after admission. All the patients were monitored for 48-72 hours for arrhythmias, acute left ventricular failure, cardiogenic shock and were treated with appropriate measure. Their stay in the ICCU was prolonged, if any complication developed or demanded further close observations. Patients were followed up for about 12-weeks in the medical wards or special room and then discharged.

At the time of admission to the ICCU, blood samples were drawn for routine investigations like Hb%, TC, DC, ESR, blood sugar, serum creatinine lipid profile and serum CPK-MB and SGOT, chest X-ray and echocardiography was done subsequently.

All patients were evaluated for risk factors like diabetes mellitus, hypercholesterolemia, hypertension and smoking. Routine investigations were restricted to the patients who really needed them. Enzyme studies were done in most of the cases. Patients were kept in the ICCU for a period of five days and more in complicated cases.

Statistical analysis

Descriptive statistics such as mean, SD and percentage was used. To find the linear trend, Chi square test was done. For statistical significance, the P value less than 0.05 was considered as significant.

RESULTS

Of the 100 patients with male and female ratio of 4:1. The largest age group of the patients was 31-70 years. Mean age of the patients 53.61 ± 12.43 years. Out of 100 cases, 70% of cases were smoking, 36% of cases were hypercholesterolemia, 25% of cases were hypertension, 20% of cases were diabetes mellitus and 18% were family history of IHD and other characteristics of the study population are presented in Table 1.

Majority of arrhythmias occurred in less than 12 hours (30%) appearance after admission to hospitalization followed by 12-24 hours (21%), 24-48 hours (15%) and 48-72 hours (10%) presented in Table 2.

Among deaths, most of the deaths occur in CHB and ventricular tachyacardia. According to type of arrhythmia, mortality occur in Atrial fibrillation (50%) followed by ventricular tachycardia (40%), IAVB + CHB

(33.33%), CHB (26.66%), ventricular premature beats (5.71%) and least in sinus bradycardia (2.5%) presented in Table 3.

Table 1: General characteristics of study population (n=100).

Variable	
Age (years)	53.61 ± 12.43 years
Gender [male (%)/female (%)]	80%/20%
Smoking	70 %
Hypercholesterolemia	36 %
Hypertension	25 %
Diabetes mellitus	20 %
Family H/o of IHD	18 %
Lower class	15 %
Middle class	55
Upper class	30
Ischemic heart disease	11
Myocardial infraction	07
COPD	10
CVA	02

Table 2: Showing time of appearance of arrhythmia after admission.

Time of appearance (hours)	No. of patients	Percentage
<12	30	30
12-24	21	21
24-48	15	15
48-72	10	10

Table 3: Showing relationship between mortality and arrhythmia.

Type of arrhythmia	Total No. of cases	Deaths	Percentage
Sinus tachycardia	40	1	2.5
Sinus bradycardia	15	2	13.33
Atrial fibrillation	2	1	50
Atrial tachycardia	2	0	0
Junctional rhythm	4	0	0
Ventricular premature beats	35	2	5.71
Ventricular tachycardia	10	4	40
RBBB + LHAB	2	0	0
IAVB + CHB	3	1	33.33
LAHB	8	0	0
CHB	15	4	26.66
RBBB	7	0	0
LBB	2	0	-
Total No. of deaths		15	100

In present study, maximum incidence of infarctions in anterior wall MI (55.24%) followed by inferior wall MI (40.78%) and least observed in combined (3.94%) presented in Table 4.

Table 4: Showing incidence of arrhythmia in relation to site of MI.

Site of infarction	Total No. of cases	Number of arrhythmia	%	Total
Anterior wall				
Extensive anterior wall MI	20	15	19.73	55.24
Anteroseptal MI	32	24	31.57	
Antero lateral MI	4	3	3.94	
Inferior wall MI				
Inferior wall MI only	12	9	11.84	40.78
Inferior with RV infarction	20	18	23.68	
Inferior lateral wall MI	8	4	5.26	
Combined: Interior+anterior wall MI	4	3	3.94	3.94

From Table 5, it was observed that, maximum incidence of arrhythmia like sinus tachycardia, VPCs bundle branch block were recorded in anterior wall MI, whereas, maximum incidence of arrhythmia like bradycardia and AV blocks were observed in inferior wall MI.

Table 5: Incidence of various types of Arrhythmia in relation to site of infarction.

Arrhythmia	Total	Anterior wall MI	Inferior wall MI	Combined MI
Sinus tachycardia	40	30	10	-
Sinus bradycardia	15	02	13	-
VPC	35	24	11	-
Ventricular tachycardia	10	8	2	-
First degree AV block	7	1	6	-
Second degree AV block	2	-	2	-
Complete heart block	15	1	12	2
Unifascicular block	18	13	4	1
Bifascicular block	2	2	-	-
Trifascicular block	-	-	-	-

Incidence of complication other than arrhythmia were presented in Table 6, it was observed that, majority of complications were recorded in left ventricular failure (26%) followed by cardiogenic shock (10%) and congestive cardiac failure (6%).

Table 6: Showing incidence of complication other than arrhythmia.

Complications	No. of patients	Percentage
Left ventricular failure	26	26
Cardiogenic shock	10	10
Cerebrovascular accident	02	02
Congestive cardiac failure	06	06
Pericarditis	02	02

Overall incidence of mortality was 15%. Out of 15 deaths, 8 deaths were documented in anterior wall MI constituting 53.33%, whereas 6 deaths (40%) was seen in inferior wall MI and only 1 (6.66%) death was observed in combined infarction. Maximum number of deaths (66.66%) were recorded within 24 hours of admission and least was observed after 78 hours (13.33%) presented in Table 7.

Table 7: Showing time of mortality.

Duration (hours)	Number of deaths = 15	Percentage
<24	10	66.66
24-78	03	20
>78	02	13.33

In present study, cardiogenic shock (40%) most common cause of deaths was observed followed by left ventricular failure (33.33%) and 13.33% of ventricular fibrillation and cardiac asystole each presented in Table 8.

Table 8: Showing cause of death.

Cause of deaths	No. of deaths	Percentage
Cardiogenic shock	6	40
Left ventricular failure	5	33.33
Ventricular fibrillation	2	13.33
Cardiac asystole	2	13.33

DISCUSSION

The study demonstrated that smokers have a 2-3 fold increase in sudden cardiac death in each decade of life between 30 and 50 years. This is one of the few risk factors in which the proportion of coronary artery disease deaths is increased in association with the risk factors,[18] similar findings in our study shows smoking (70%).

In this study, arrhythmia was detected in 76% of the patients. In the present study 51% of patients developed arrhythmias in one or the other form within 24 hours of admission, while 25% developed arrhythmia after 24 hours of admission, whereas in the study,[8] 90% of patients with acute myocardial infarction have some cardiac rhythm irregularity within 24 hours following infarct onset.

Majority of the arrhythmias (55.24%) were documented in anterior wall infarction.[19] reported an incidence of 53% of arrhythmias occurring in anterior wall MI which was comparable to the present study.

In the present study, the incidences of sinus tachycardia, VPC, VT and RBBB with respect to site of MI were comparable with the study.[20] In the present study, the incidence of AV block was more common in inferior wall MI compared to anterior wall MI (88.9% vs. 11.1%).[21] also reported a higher incidence of complete heart block in inferior wall MI compared to anterior wall MI (75% vs. 53%). In this study, 10 patients (66.66%) expired within 24 hours of admission while only 3 patients (20%) expired within 24-78 hours.[22] reported an incidence of 28.9% during first 24 hours, which is less than present study. In the present study, the incidence of mortality was observed 15% whereas in a study[23] reported an incidence of 19% which is comparable to the present study and more mortality incidence i.e. 31% reported by the study[20] as compared to present study.

In the present study, cardiogenic shock (40%) the most common cause of deaths was observed followed by Left ventricular failure (33.33%). In a study[24] reported an incidence of left ventricular failure (32.6%) and cardiogenic shock (34.7%). In a study,[25] the risk of sudden death is highest in first 30 days after myocardial infarction among patients with left ventricular dysfunction, heart failure or both.

CONCLUSIONS

- In arrhythmia occurred in 76% of the patients with acute myocardial infarction.
- Majority of arrhythmias occurred within 12 hours of hospitalization.
- Sinus tachycardia was the most common arrhythmia constituting about 40% of patients who had arrhythmias.
- The overall incidence of mortality was 15%.
- Cardiogenic shock (40%) and left ventricular failure (33.33%) were the most common cause of death.

In this study, we assessed the different conduction abnormalities and the arrhythmias associated with AMI. In addition, our data make available further information on short-term mortality following AMI and helps to recognize several predictors of in-hospital death in this setting. Whether early interventions after AMI with speeding or the use of antiarrhythmic drugs may modify these outcomes justify supplementary investigations.

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