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Study of Arrhythmias Associated With Acute Myocardial Infarction And Mortality

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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. The aim of the present study is to identify the type of arrhythmias and mortality in patients presenting with acute myocardial infarction. **METHODS:** A total of 100 patients admitted to the ICC unit of Govt. General Hospital, Gulbarga & Basaveshwar Teaching & General Hospital Gulbarga from January to December 1998 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%). Majority of mortality occurs with 24 hrs (66.6%). The overall incidence of mortality was 15%. Mortality was more in males (16.25%) than female (10%). Cardidogenic shock (40%) and left ventricular failure (33.33%) were the most common cause of death.

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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]. 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 [2]. In the first 48 to 72 hours after the onset of symptoms, most arrhythmias are observed during the pre-hospital and coronary intensive care unit phase [3].

The most important assumption for key mechanism of arrhythmias 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 [4].

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 [5]. Incidence of malignant ventricular arrhythmia associated with infarction are changed by the extent of the underlying infarction [6].

Inferior wall myocardial infarction report for 40-50% of all acute myocardial infarction with mortality rates of 2-9% [7]. 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 [8]. Block of early onset is generally of short duration [9]. 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 assess the incidence and profile of arrhythmias in acute myocardial infarction and mortality, during the stay in hospital.

MATERIALS AND METHODS: 100 patients with acute myocardial infarction admitted to the ICC unit of Govt. General Hospital, Gulbarga & Basaveshwar Teaching & General Hospital Gulbarga from January to December 1998 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

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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.

Criteria for established MI: The diagnosis of acute myocardial infarction was based on the following criteria:

1. Typical chest pain lasting for more than 30 minutes
2. ST segment elevation ≥ 1 mm in two or more of limb leads as measured 0.08 second after J point / serial ST segment and T wave changes and /or development of pathological Q-waves in the same leads.
3. Increase in serum CPK-MB enzyme level more than normal.

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.

Table-1: Age and gender distribution

Age group (years)	Male	Female	Total
< 30	04	00	04
31-40	14	00	14
41-50	21	03	24
51-60	26	10	36
61-70	14	06	20
71-80	01	01	02
> 80	0	0	0
Total	80	20	100

Table-2 : Distribution of risk factors

Risk factors	No. of patients	Percentage
Smoking	70	70
Hypercholesterolemia	36	36
Hypertension	25	25
Diabetes Mellitus	20	20
Family H/o of IHD	18	18

Table-3 : 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-4 : 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

Table-5 : Showing cause of death

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

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

Table-6 : Showing incidence of deaths among patients who received Thrombolytic Therapy and who did not received Thrombolytic Therapy with reference to Killip's class

Killip's class	No. of cases	Patients with thrombolytic Therapy		Patients without thrombolytic Therapy	
		No. of cases	No. of deaths (%)	No. of cases	No. of deaths (%)
Class I	54	38	0	15	2 (13)
Class II	24	12	0	14	1 (7)
Class III	14	5	2 (40)	6	3 (50)
Class IV	8	5	2 (40)	5	5 (100)
Total	100	60	04	40	11

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 presented in table-2.

Majority of arrhythmias occurred in less than 12 hours (30%) of hospitalization followed by 12-24 hrs (21%), 24-48 hrs (15%) and 48-72 hrs (10%) presented in table-3.

Among deaths, most of the deaths occur in CHB and ventricular tachycardia. 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 -4.

In present study, Cardiogenic shock (40%) the 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-5.

From table-6, the incidence of deaths was more in the group of patients without thrombolytic therapy (27.5%) as compared to that of patients who received thrombolytic therapy (6.66%). Further, according to Killip's class, there is increase in incidence of deaths from class I to class IV in patients without thrombolytic therapy and there is statistical significant linear trend was observed ($p=0.01$), whereas in patients with thrombolytic therapy, the incidence of deaths was occur in class III & IV.

DISCUSSION:

In this study, arrhythmia was detected in 76% of the patients. Majority of arrhythmias occurred within 12 hours of hospitalization. In the study by [2], approximately 25% have cardiac conduction disturbance within 24 hours following infarct onset.

In the present study complete heart block was observed in 15% of the patients with arrhythmias, whereas in a study done by Datey K K et.al [10] reported an incidence of 14% which is comparable to the present study. In a study by Rotman M et al [11], there is 19% incidence of high degree block complicating acute inferior wall myocardial infarction. In a study by Harpaz D et al [12], the incidence of complete heart block complicating acute myocardial infarction is lower in the thrombolytic era than in the prethrombolytic era.

In the present study first degree heart block occurred in 15% of the patients. This block is usually associated with other conduction abnormalities. When 1st degree heart block is an isolate finding, it has no hemodynamic effects and requires no intervention. It is not uncommon, however, to see 1st degree heart block progressing to complete heart block during inferior and posterior acute myocardial infarction.

The Yee Guan Yap et.al [13] 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, similar findings in our study shows smoking (70%).

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 by Afzal S. et al [14] reported an incidence of 81% of arrhythmia occurring within 24 hours of admission and Aufderheide TP [2], 90% of patients with acute myocardial infarction have some cardiac rhythm irregularity within 24 hours following infarct onset.

In the present study, the incidence of mortality was observed 15% whereas in a study done by Datey K K et.al[10] reported an incidence of 19% which is comparable to the present study and more mortality incidence i.e. 31% reported by Jullian et al[15] 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 by Gupta M.S. et.al [16] reported an incidence of left ventricular failure (32.6%) and cardiogenic shock (34.7%). In a study by Scott DS et al [17], the risk of sudden death is highest in first 30 days after myocardial infarction among patients with left ventricular dysfunction, heart failure or both.

In the present study, 4 (6.66%) patients who received thrombolytic therapy expired and 11(27.5%) patient who do not received expired, whereas in the study by Kumar T.A. et.al. [18] also reported an incidence of 8% vs 15.9% mortality in patients who received and who did not received thrombolytic therapy respectively.

CONCLUSION:

- 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%. Mortality was more in males (16.25%) than female (10%).
- Caridogenic shock (40%) and left ventricular failure (33.33%) were the most common cause of death.
- There is increase in incidence of deaths from class I to class IV in patients without Thrombolytic therapy and is statistical significant linear trend was observed ($p=0.01$).

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