ORIGINAL ARTICLE

STUDY OF ARRHYTHMIAS IN ACUTE INFERIOR WALL MYOCARDIAL INFARCTION

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ABSTRACT: BACKGROUND AND OBJECTIVES: Arrhythmias remain a major cause of death in patients with myocardial infarction, despite considerable progress. Majority of these arrhythmias occurring within the first 24 hours. The aim of the present study is to identify the type of arrhythmias and time of their onset in patients presenting with acute inferior wall myocardial infarction. **METHODS:** A total of 100 consecutive patients admitted to the coronary care unit of Karnataka institute of medical sciences, Hubli, with inferior wall myocardial infarction between the period of 1st December 2011 and 30th November 2012 were included in the study. The risk factors for cardiac disease were evaluated through history, physical examination and blood investigations. Patients were monitored for arrhythmias, for 48 hours after onset of myocardial infarction. Type and time of onset arrhythmias was noted. **RESULTS:** Out of the 100 patients with inferior wall myocardial infarction studied, 40 patients had arrhythmias. Age and gender did not have statistically significant impact on time of onset or type of arrhythmia. Majority of arrhythmias occurred during 1-12 hours and complete heart block was the commonest arrhythmia (40%). There was no statistically significant effect of smoking, alcohol, hypertension, diabetes, left ventricular dysfunction, thrombolysis, on arrhythmias.

KEYWORDS: Arrhythmias, acute coronary syndrome, acute myocardial infarction, acute inferior wall myocardial infarction, complete heart block.

INTRODUCTION: Despite considerable progress in the management of coronary artery disease, it remains leading cause of death. Many of these deaths are attributed to the development of arrhythmias.[1] Approximately 25% of patients have conduction disturbance 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] Most arrhythmias are seen during the pre-hospital and coronary intensive care unit phase, which is the first 48 to 72 hours after the onset of symptoms.[3]

A leading hypothesis for major 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 uniform increase in extracellular potassium concentration. Whereas, cells in the border zone between ischemic region and normal myocardium are only partially depolarized and therefore have action potentials with larger amplitude. Slowing of impulse conduction occurs in markedly depressed areas leading to arrhythmias such as polymorphic ventricular tachycardia and ventricular fibrillation.[4]

The cellular electrophysiological mechanism for reperfusion arrhythmias appears to include washout of various ions such as lactate & potassium and toxic metabolic substance that have accumulated in ischemic zone. Cells in reperfused myocardial zones can exhibit action potentials of slow response type.[5] Incidence of malignant ventricular arrhythmia associated with infarction are affected by the extent of the underlying infarction.[6]

Inferior wall myocardial infarction account for 40-50% of all acute myocardial infarction with mortality rates of 2-9%.[7] Bradyarrhythmias occur more often in inferior than anterior wall myocardial infarction. Sinus bradycardia is the most common bradyarrhythmia during acute myocardial infarction, seen frequently in first 4-6 hours of infarction.[8] Atrioventricular block occurs in 9-33% of patients of inferior wall myocardial infarction.[9] Block of early onset is usually of short duration.[10] First degree atrioventricular block has no hemodynamic effects and requires no intervention. With complete atrioventricular block, the average mortality is 29%.

OBJECTIVES OF THE STUDY: The purpose of the study is to evaluate the incidence and profile of cardiac arrhythmias in acute inferior wall myocardial infarction, during the stay in hospital.

MATERIALS AND METHODS: A total of hundred consecutive patients admitted to coronary care unit of Karnataka Institute of Medical Sciences, Hubli, with inferior wall myocardial infarction between the period of 1st December 2011 to 30th November 2012 were included in the study. Patient was monitored during the stay in hospital and pattern of arrhythmia, if any, was noted.

Inclusion criteria: Patients more than 18 years of age, admitted to the cardiac care unit with acute inferior wall myocardial infarction.

Clinical data: A detailed history, including cardiac risk factors was taken. A thorough physical examination was done with emphasis on the cardiovascular system.

Investigations: 12 lead electrocardiogram (ECG) was taken at admission, 24 hours, and 48 hours and at time of arrhythmia. EAGLE 1000 multiparameter monitors were used to monitor the patients for 48 hours, for arrhythmia. All patients underwent routine blood investigations and 2D-Echocardiography analysis.

Statistical analysis: The test of significance used between the associations of different characteristics in this descriptive in hospital study was done using chi square test. For statistical significance, the P value was calculated and a value of less than 0.05 was considered significant.

RESULTS: Of the 100 patients, 58 were male and 42 were female. The predominant age group of the patients was 51-70 years.

AGE (in years)	MALE	FEMALE	TOTAL
<40	3	1	4
41-50	14	4	18
51-60	17	16	33
61-70	16	12	28
71-80	7	6	13
>80	1	3	4
Total	**58**	**42**	**100**

Table 1: Distribution of cases by age and gender

Risk factors	Male	Female	Total
Hypertension	20	21	41
Diabetes	13	14	27
Smoking	31	1	32
Alcohol	11	1	12

Table 2: Distribution of risk factors in the cases

Out of 100 cases, 41% of cases were hypertensive, 27% of cases were diabetics, 32% of cases were smoker, 11% were alcoholic and 14% were both hypertensive and diabetic.

Time	Male	Female	Total
Within 1st hour	5	2	7
1-12 hours	12	13	25
12-24 hours	5	4	8
>24 hours	0	0	0

Table 3: Time of arrhythmia detection and gender distribution

Majority of arrhythmias occurred during 1-12 hours of hospitalization. Arrhythmias occurred more commonly in females (45.23%) in comparison to males (37.93%), but was not statistically significant (p value is 0.53).

Thrombolysis	Arrhythmia	No arrhythmia	Total
Done	28	34	62
Not done	12	26	38
Total	40	60	100

Table 4: Effect of thrombolysis on arrhythmias

Out of 100 patients, 62 patients were thromobolysed. Arrhythmias occurred more commonly in thrombolysed individuals, but was not statistically significant (p value is 0.17).

ARRHYTHMIAS	MALE	FEMALE	Total
SINUS BRADYCARDIA	2	2	4
SINUS TACHYCARDIA	3	1	4
Atrial Fibrillation	1	1	2
Ventricular premature complexes (VPCs)	1	0	1
1st degree Heart Block	5	1	6
2nd degree Heart Block type 1	1	3	4
Complete Heart Block	7	7	14
VPC + 1ST degree Heart Block	1	0	1
VPC+ Sinus Bradycardia	1	0	1
JUNCTIONAL RHYTHM	0	1	1
TOTAL	**22**	**18**	**40**

Table 5: Different arrhythmias and their gender distribution

Complete heart block was the most common arrhythmia observed. Sinus tachycardia and 1st degree heart block occurred more commonly in males.

Factor		Arrhythmia	No Arrhythmia	Total	P value
Hypertension	Yes	16	25	41	0.86
	No	24	35	59	
Diabetes	Yes	6	21	27	0.27
	No	34	39	73	
Smoking	Yes	15	17	32	0.34
	No	25	43	68	
Alcohol	Yes	5	7	12	0.90
	No	35	53	88	
Left ventricular dysfunction (EF <40%)	Yes	25	15	40	0.16
	No	29	31	60	

Table 6: Comparison of effect of various factors on arrhythmia

Hypertension, diabetes, smoking, alcohol consumption and left ventricular dysfunction did not increase the risk of arrhythmias in a statistically significant way.

Majority of arrhythmias underwent spontaneous resolution constituting 67.5%. 27.5% of patients required pharmacological intervention, and 5% required electrical intervention.

DISCUSSION: In the present study arrhythmia was detected in 40% of the patients. Majority of arrhythmias occurred during the first hour of hospitalization. In the study by Aufderheide TP,[2] approximately 25% have cardiac conduction disturbance within 24 hours following infarct onset.

In the present study complete heart block was observed in 40% of the patients with arrhythmias. In a study by Courter SR et al, atrioventricular block is a common complication of acute inferior wall myocardial infarction, occurring in 9-33% of patients[9]. In a study by Rotman M et al, there is 19% incidence of high degree block complicating acute inferior wall myocardial infarction.[11] 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 prethrombolyitc 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 Framingham study[13] 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. However in our study no statistically significant association was found between smoking and the occurrence of arrhythmia.

In the present study 62% of arrhythmias occurred during the first 1-12 hours of hospitalization. In the study by Aufderheide TP,[2] 90% of patients with acute myocardial infarction have some cardiac rhythm abnormality within 24 hours following infarct onset.

In our study there was no statistically significant association between left ventricular dysfunction and arrhythmias. In a study by Yee GY et al,[14] in high risk post myocardial infarction patients with left ventricular ejection fraction <40% or frequent ventricular premature complexes, the risk of arrhythmic deaths was higher than that of non-arrhythmic deaths for up to 2 years. 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.

CONCLUSION:

- Arrhythmia occurred in 40% of the patients with inferior wall myocardial infarction.
- Majority of arrhythmias occurred during the first 1-12 hours of hospitalization.
- Complete heart block was the most common arrhythmia constituting about 40% of patients who had arrhythmias.
- There is no statistically significant difference in occurrence of arrhythmias in patients who were thrombolysed.
- There was no statistically significant difference in incidence and pattern of arrhythmia in patients with diabetes, hypertension and/or left ventricular dysfunction.

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