

ORIGINAL RESEARCH

**A STUDY OF INCIDENCE AND SIGNIFICANCE OF
ARRHYTHMIAS IN EARLY AND PRE DISCHARGED PHASE
OF ACUTE MYOCARDIAL INFARCTION**

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ABSTRACT

Background: Arrhythmias and conduction disturbances those are likely to be significant problems during the early phases of AMI. The arrhythmias and conduction abnormalities discussed include sinus bradycardia, AV block, Idioventricular rhythm, VT, and VF. In general, the acute management of these rhythm disturbances is the same in the early and in the late phases of AMI

Materials & Methods: The present study was conducted in 100 patients of acute myocardial infarction to evaluate the incidence and significance of early and predischarge cardiac arrhythmias.

Results: By seventh hospital day, twenty patients had expired and the remaining eighty patients were monitored in CCU for two hours and arrhythmias were noted. Complicated ventricular premature contraction (i.e. Lown class III-V) was observed in two (25%) patient. Fifteen (18.75%) patients had Lown class 0-II VPC's. Two (2.5%) patients had supraventricular tachycardia and 6 (7.5%) patients had heart blocks.

Conclusion: Early arrhythmias (within 24 hours of AMI.) were significantly associated with in hospital mortality and complicated course, while no significant bearing on long term (6 month) cardiac event was noted.

Key words: Arrhythmias, AMI, supraventricular tachycardia

INTRODUCTION

Ischemic heart disease (IHD) causes more deaths and disability and incurs greater economic costs than any other illness in the developed world, IHD is the most common serious, chronic, life-threatening illness in the United States, where >12 million persons have IHD, >6 million have angina pectoris, and >7 million have sustained a myocardial infarction. A high-fat and energy-rich diet, smoking, and a sedentary life style are associated with the emergence of IHD. In the United States and Western Europe, it is growing amongst the poor rather than the rich (who are adopting more healthful life-styles), while primary prevention has delayed the disease to later in life in all socioeconomic groups. With urbanization in the developing world, the prevalence of risk factors for IHD is increasing rapidly in these regions. Large increases in IHD throughout the world are projected, and IHD is likely to become the most common cause of death worldwide by 2030¹.

In India an estimated 1.17 million people died due to IHD and according to projections the number of deaths due to IHD was to increase from 1.17 million in 1990 to 1.59 million in 2000 and 2.03 million by 2010. There were over 5 million persons suffering from IHD during 1999. The prevalence of IHD is reported to be 2-3 times higher in the urban population as compared to the rural population. In one study, the prevalence of IHD among adults (based on clinical and ECG criteria) was estimated at 96.7 per 1000 population in the urban and 27.1 per cent in rural areas².

Arrhythmias and conduction disturbances those are likely to be significant problems during the early phases of AMI. The arrhythmias and conduction abnormalities discussed include sinus bradycardia, AV block, Idioventricular rhythm, VT, and VF. In general, the acute management of these rhythm disturbances is the same in the early and in the late phases of AMI. Sustained VT and VF are exceptions, however, in that their occurrence after the first 24 h has more ominous implications for long term electrical instability and sudden cardiac death³.

The incidence of arrhythmias is higher in patients the earlier they are seen after the onset of symptoms. Many serious arrhythmias develop after the hospitalization, even before the patient is monitored. When patients are seen very early during the course of AMI, they almost invariably exhibit evidence of increased activity of the autonomic nervous system. Thus, sinus bradycardia, sometimes associated with AV block, and hypotension reflect augmented vagal activity.

Patients with significant left ventricular dysfunction have a relatively fixed stroke volume and depend on changes in heart rate to alter cardiac output. However, there is a narrow range of heart rate over which the cardiac output is maximal, with significant reductions occurring at both faster and slower rates. Thus, all forms of bradycardia and tachycardia can depress the cardiac output in patients with AMI⁴.

The Cardiac Arrhythmia Suppression (CAST) trials and the Canadian Amiodarone Myocardial Infarction Arrhythmia Trial (CAMIAT) identified high-risk patients after AMI using the criteria of ventricular arrhythmia on ambulatory ECGs. In the placebo groups, the range of death attributable to arrhythmia varied from 48 to 66 percent. The range of deaths attributable to arrhythmia in the placebo group was 45 to 67 percent. Patients in trials with a mixture of

etiologies of left ventricular dysfunction including old AMI, such as the Studies of Left Ventricular ion (SOLVD) prevention and SOLVD treatment trials have a lower percentage of deaths attributable to arrhythmia⁵.

Sustained VT and VF occur most frequently in the first year following AMI. As ischemic cardiomyopathy develops over many years, deaths attributable to VT/VF decrease and proportionately more "sudden deaths" are attributable to asystole, electromechanical dissociation, or a high-degree heart block. Also, non-cardiac conditions emulate the circumstances of VT or VF (for instance, massive pulmonary embolism, ruptured abdominal or thoracic aortic aneurysm or massive stroke). Thus, the temporal influence on cause specific mortality after AMI is an important consideration. Risk stratification for arrhythmic death, seems most relevant immediately following myocardial infarction⁶.

MATERIALS AND METHODS

The present study was conducted in 100 patients of acute myocardial infarction to evaluate the incidence and significance of early and predischarge cardiac arrhythmias.

ELIGIBILITY CRITERIA:

All the patients who were admitted to the coronary care unit as a case of acute myocardial infarction irrespective of site of infarct were included in the study.

EXCLUSION CRITERIA:

All diagnosed patients of acute myocardial infarction who were on drugs like digitalis, B-Blockers and other anti-arrhythmic drugs electrolyte imbalance prior to admission in coronary care unit were not be included in the study and patients who was having any associated other heart disease. (Viz. Rheumatic heart disease, congenital heart disease, myocarditis, etc.) also excluded.

OBSERVATIONS

TABLE -1

AGE AND SEX DISTRIBUTION OF THE PATIENTS IN STUDY GROUP

Age	Sex	
	Female	Male
40-50	60	0
51-60	68	5
61-70	36	2
>70	14	4

The age and sex distribution has been shown in table-no. 1. There were 89% males and 11% females. The age of the patients ranged from 40 yrs to 90 yrs. The mean age of the patients being

57 11.9 yrs. The maximum number of patients (39%.) were of the age group 51-60 yrs, 30% of the patients were of the age group 40-50yrs, 20% of the patients were in 61-70 yrs age group and 11% of the patients belonged to the age group of > 70 yrs.

TABLE -2**DISTRIBUTION OF THE PATIENTS WITH RELATION TO THE SITE OF INFARCTION**

	Site of Infraction	No. of cases	Percentage
1	Anterior wall MI	26	26
	Extensive Ant. Wall		
2	MI	15	15
3	Anteroseptal MI	19	19
4	Anterolateral MI	9	9
5	Inferior Wall MI	30	30
6	Inferolateral MI	1	1
	Total	100	100

Distribution of the patients with relation to the site of infarction has been shown in table no.2. Highest number of patients 68% has anterior wall myocardial infarction this includes anterior wall 26% anteroseptal 12% extensive anterior wall 15% anterolateral 9%.Next Highest numbers of patients 30% had inferior wall MI, one patient had inferolateral MI.

TABLE -3**INCIDENCE OF ARRHYTHMIAS IN 1st24 hours**

	Type of arrhythmias	No. of cases	Percentage
1	C.VPC	20	20
2	VPC	22	22
3	VT	20	20
4	SVT	3	3
5	BLOCKS	16	16
	Total	81	81

Incidence of arrhythmias in 1st24 hours has been shown in the observation table no. 3 which shows that the incidence of complicated ventricular premature contractions (C.VPC) ventricular was 20%. The incidence of simple premature contraction was 22% ventricular tachycardia was

observed in 20% of the patients. 3% of the patients had supraventricular tachycardia which included one patient with atrial fibrillation.

TABLE -4**INCIDENCE OF ARRHYTHMIAS ON 7th HOSPITAL DAY**

	Type of arrhythmias	No. of cases	Percentage
1	C.VPC	2	2.5
2	VPC	15	18.5
3	SVT	2	2.5
4	BLOCKS	6	7.5
	Total	25	31.25

Incidence of arrhythmias on 7th hospital day has been shown in table no. 4. By seventh hospital day, twenty patients had expired and the remaining eighty patients were monitored in CCU for two hours and arrhythmias were noted. Complicated ventricular premature contraction (i.e. Low class III-V) was observed in two (25%) patient. Fifteen (18.75%) patients had Low class 0-II VPC's. Two (2.5%) patients had supraventricular tachycardia and 6 (7.5%) patients had heart blocks.

Incidence of arrhythmias observed at 14th day (pre-discharged) has been shown in table no. 5. By the time of discharge of the patients, two more patients expired leaving behind 78 survivors who were monitored on the day of discharge. It was observed that eight (10.25%) of the patients were associated with complicated ventricular premature contractions. Eighteen (23.07%) patients had Low class I-II or uncomplicated ventricular premature contractions. Two (2.56%) patients were associated with supraventricular tachycardia; six (7.69%) patients were associated with heart blocks.

TABLE -5**INCIDENCE OF ARRHYTHMIAS OBSERVED AT 14th DAY (PRE-DISCHARGED)**

	Type of Arrhythmias	No. of cases	Percentage
1	C.VPC	8	10.25
2	VPC	18	23.07
3	SVT	2	2.56
4	BLOCKS	6	7.69
	Total	34	43.57

TABLE -6
SIGNIFICANCE OF ARRHYTHMIAS IN EARLY AND PREDISCHARGED PHASE OF AMI

	Types of Arrhythmias	No. of cases	Complicated course in CCU		Arrhythmias persisted at discharge	Complicated course at follow up				Fresh arrhythmias at discharge	Complicated course at 6 month follow up			
			No. of cases SD	%		SD	LVF	CHF	RA		SD	LVF	CHF	RA
1	No VPC	36	0	0	31	-	-	-	-	15	-	3 (20%)	1 (6.66%)	-
2	VPC	22	0	0	14	1 (17.14%)	-	-	-	4	-	2 (50%)	-	1 (25%)
3	C.VPC	20	6	30	6	3 (50%)	1 (16.6%)	-	-	2	1 (50%)	-	-	1 (50%)
4	VT	20	14	70	6	1 (16.66%)	-	-	-	-	-	-	-	-
5	Blocks	16	8	50	6	1 (16.66%)	-	-	-	-	-	-	-	-
6	SVT	3	1	33.33	1	-	-	-	-	-	-	-	-	-

of them required readmission for left ventricular failure. There are twenty patients who were found to have ventricular tachycardia in the first twenty four hour of the monitoring. Fourteen (70%) of them had a complicated course and died suddenly during their course of hospitalization. Six patients survived ventricular tachycardia and only one (16.66%) had a complicated course during their follow-up period and died suddenly. None had ventricular tachycardia during cardiac monitoring at the time of discharge.

There are sixteen patients who found to have blocks. Eight patients (50%) had in hospital complicated course and died suddenly during hospitalization, Block reverted in two patients and in six patients it persisted till the time of discharge. One (16.66%) of the patients had a complicated course during their follow-up and died suddenly. There were three patients with supraventricular tachycardia in the first twenty four hour of cardiac monitoring, one (33.33%) of the patients had complicated course and died suddenly. This settled in one and persisted in one, none of them had complicated course during the follow-up period.

DISCUSSION

One hundred patients who were diagnosed to be a case of acute myocardial infarction were taken up, for the study. They were continuously monitored for first twenty four hour on a cardiac monitor. The cardiac events like arrhythmias left ventricular failure, congestive heart failure, cardiogenic shock, and sudden cardiac death were noted. Malignant arrhythmias were treated by conventional antiarrhythmic drugs.

The potential risk of cardiac arrest from the onset through the first 72 hours after myocardial infarction (the acute phase) may be as high as 15 to 20%. In this study fourteen out of twenty patients of ventricular tachycardia died suddenly during the course of hospitalization proving that the highest risk of sudden coronary death in relation to the acute myocardial infarction is found

in the group of patients who have ventricular tachycardia or ventricular fibrillation during the convalescent phase (3 days to 5 days) after myocardial infarction, about 50 to 80% mortality in 6-12 months has been observed among these patients and at least 50% of the deaths are: sudden. Aggressive intervention has reduced the incidence drastically to 15 to 20% in 18 months or better⁷.

Similarly, on the seventh hospital day, and on the day of discharge, (average 14 days after hospitalization) the survivors were monitored. The various cardiac events mentioned earlier noted and the survivors of acute myocardial infarction were followed up in the cardiology clinic at a minimum interval of 15 days for a period of 6 months and subsequent cardiac events like left ventricular failure, congestive heart failure, arrhythmias were noted⁸.

Although investigators like Weinblatt et. al.; Helander et. al.; Cole et. al., and Kotler et. al., have assessed prognosis after myocardial infarction, but there is little information regarding subsequent cardiac events including arrhythmias, LVF, CHF, Reinfarction, Palpitation, Cardiac Shock, Sudden death during the course of hospitalization and after hospital discharge at follow-up. This investigation is unique in its systematic prospective analysis of all patients during both the early and late phase of their hospitalization for acute myocardial infarction. This comprehensive approach enabled us to correlate coronary risk factors, extent and severity of acute myocardial infarction and continuous cardiac monitoring with the prognosis in the early and late prognosis after hospital discharge. Our findings are consistent with those of Kotler et. al., Vismara et. al., Barg et. al., who found that the presence of complicated ventricular premature contractions at the time⁹.

The coronary risk factors evaluated in this study are age. Hypertension, diabetes, previous myocardial infarction, history of angina, family history of myocardial infarction, cigarette smoking, and the site of infarction, arrhythmias and left ventricular failure was analyzed to identify the prognosis in early and late phase of acute myocardial infarction as discussed in great detail in the observation section.

It has been observed that the myocardial infarction is male dominant (M: F= 89:11). Maximum incidence of myocardial infarction occurred in the age group of 51-70 years. Maximum number of hospital mortality 61.11% was observed in 51-60 years age group. The mortality after hospital discharge was 60% in the age group of 45-55 years. This study correlates with the study of Vismara et. al., who have noted greater frequency of sudden deaths in young patients¹⁰.

In the present study, the incidence of arrhythmias as observed during continuous cardiac monitoring in the first twenty four hour of the hospital admission in coronary care unit was 81%. The results in the study correlate well with the study of Fluck et. al., who observed an overall incidence of 86% of arrhythmias during cardiac monitoring of patients with acute myocardial infarction. The incidence of 81% in this study is comparable with 87.5% of the incidence of arrhythmias in the CCU phase of acute myocardial infarction as observed by Vismara et. al. and Olson et. al. The incidence of complicated ventricular premature contraction as observed during first twenty four hour of cardiac monitoring was 20%. This is comparable with the result of

Vismara et. al. 1975 who observed the incidence of complicated ventricular premature contractions to be 28.9%¹¹.

The incidence of simple ventricular premature contraction in this study is 22%. There were 36 patients who had no ventricular premature contraction. Adding them up, the incidence of simple ventricular premature contraction Lown 0-II Is 58%. This can be compared with the 61.6% of Schulze et. al. 48% of Olson et. al. and 37.6% of Maggioni et. al. .The incidence of ventricular tachycardia during the first twenty four hour of cardiac monitoring is 20%. This is comparable to 15.22% of Awadhi et. al. and 16% of Vismara et. al..The number of patients with heart block who had poor prognosis was s eight; the presence of conduction defect cannot be associated with long term mortality¹².

The incidence of arrhythmias reduced to 31.25% on the seventh day of hospital admissions. The incidence of complicated ventricular premature contraction was 2.5% and that of simple ventricular premature contraction was 18.75%. This result is comparable to that of Olson et. al. who observed that the decreased to its lowest value in the first week after acute myocardial infarction, when the patients were in the hospital ward¹³.

The incidence of arrhythmias as observed during the time of hospital discharge is 43.57%. This result is comparable with that of Garg et. al. who has observed an incidence of 36.1%, on a one hour continuous cardiac monitoring at the time of discharge. Little difference in result is because of the fact that the author has not taken into consideration the conduction defects and supra ventricular arrhythmias and has mainly studied the significance of ventricular arrhythmias on cardiac events at one year follow-up¹⁴.

The incidence of complicated ventricular premature contraction as observed at the time of hospital discharge was 10.25% compared to the 11.4 % incidence of complicated ventricular premature contraction as observed by Barg et. al. on a one hour continuous cardiac monitoring at the time of discharge. Similarly, the incidence of simple ventricular premature contraction of 23.07% can be compared with that of 24.7% of Garg et. al. .It was determined in this study that electrical instability of the ventricular myocardium in the early phase and in the pre discharged phase of acute myocardial infarction is an important prognostic factor for long-term survival. Thus, the presence of ventricular arrhythmias in the first twenty four hours of hospital admission and in the pre-discharged phase correlated significantly with subsequent cardiac events during the course of hospitalization and at follow-up for six months after hospital discharge. In contrast, all patients without ventricular premature contraction in the late hospital phase or in the early phase survived .In the present study thirty six patients had no ventricular premature contractions in the early phase of hospitalization all of them survived and progressed well to be discharged, at time of discharge there were forty six patients who had ventricular premature contractions, patients, thirty one patients continued to fare well. The fifteen Out of these forty six patients who joined this group at the time of discharge had complicated course in 26.66% at follow-up. Three patients (20%) had Left ventricular failure and one patient had congestive heart failure, none of them died suddenly at follow-up or required readmission. This finding correlates with the study of Garg et. al.¹⁵⁻¹⁶.

CONCLUSION

It is therefore concluded that significantly large number (81%) of the patients develops cardiac arrhythmias during first 24 hour of acute myocardial infarction. The commonest premature arrhythmia was simple ventricular contraction (22%) followed by complex ventricular premature contraction (20%) and ventricular tachycardia (20%). The overall incidence of cardiac arrhythmia were high among patients with high risk factors like cigarette smoking (36%), hypertension (24%), history of angina (15%), pre- discharge cardiac arrhythmia was significantly associated with cardiac mortality and complicated course during 6 month follow-up. Early arrhythmias (within 24 hours of AMI.) were significantly associated with in hospital mortality and complicated course, while no significant bearing on long term (6 month) cardiac event was noted. However, a long period of follow-up is required to establish it.

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