Prognostic Significance Of Arrhythmias In ST Elevation Myocardial Infarction

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Abstract
Objective
In this study we analyzed the incidence and prognostic significance of various types of arrhythmias in ST elevation myocardial infarction. We further analyzed the in hospital and 30 day outcome in arrhythmics and non arrhythmic patients. Informed consent was taken by all the patients and the study was approved by Institutional Ethics Committee, MP Shah Government Medical College and Guru Gobind Singh Hospital, Jamnagar.

Material and Methods
A prospective plus retrospective study was done in 100 patients suffering from ST elevation myocardial infarction in a tertiary care hospital, GG Hospital, Jamnagar. Data was analyzed with SPSS software (version 13.0).

Results
In this study we found that around 45% of all the patients suffering from ST elevation myocardial infarction had some sort of arrhythmia, trivial or fatal. Prognostic significance was studied in the form of in-hospital mortality and 30 days follow up. Diabetes mellitus, smoking, low ejection fraction were identified as independent markers for poor outcome. Anterior wall myocardial infarction was found to be associated with poorer prognosis as compared to inferior wall myocardial infarction. Hemodynamic parameters like cardiogenic shock and heart failure were also taken into consideration to evaluate the prognosis.

Conclusion
This study provides a bird eye view about the incidence and prognosis of various types of arrhythmias following acute coronary syndrome.

Keywords: Arrhythmia, Prognosis, STEMI

Introduction

Coronary artery disease is the leading cause of death globally. In 2001 coronary artery disease accounted for 7.1 million deaths worldwide[1], 80% of which were in low income countries like India[2]. It has been estimated that by 2010, 60% of the world's heart disease are expected to occur in India[3]. Indians are prone to get coronary artery disease at an earlier age than do people in developed countries because of the high prevalence risk factors like diabetes and hypertension.[4,5]

Coronary artery disease is classified into stable angina and acute coronary syndrome. Acute coronary syndrome (ACS) includes ST segment Elevation Myocardial Infarction (STEMI), Non ST segment

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Elevation Myocardial Infarction (NSTEMI), and unstable angina.[6,7]

In the Indian population ST segment elevation myocardial infarction is the most common type of acute coronary event and contributes to 60.6% of overall incidence of acute coronary syndrome.[8] The overall mortality in STEMI is approximately 4 to 7 % or even less in the published clinical trials.[9,10] However this is not the case in the real world situation.[11,12] This is because the patients enrolled in the randomized trials are selected ones and represent low-risk subgroups. Therefore the results of these trials are not applicable to 50% of patients in clinical practice.[13] A realistic view can be obtained from registry data. In India, CREATE registry data recorded in-hospital mortality rate of 7.9% and 30 day mortality rate of about 8.6%[8], which included both patients with unstable angina and AMI. V.Jacob Jose and Satya N. Gupta from Vellore, (Tamil Nadu) observed 16.9% in hospital mortality rate among the South Indian population following STEMI.[14]

Almost 80 - 90 % of patients develop some type of rhythm abnormality after acute myocardial infarction. The spectrum of arrhythmias following AMI, include ventricular arrhythmias (the major cause of sudden death), conduction system disturbances and atrial arrhythmias.[15] Arrhythmias are one of the most common causes of in-hospital, early (<30 day) and late mortality and morbidity following acute coronary syndrome. Arrhythmias influence the outcome directly or indirectly by their effect on the myocardium and hemodynamic status of the individual. Many studies have analyzed the influence of different types of arrhythmia individually, but data from India is scarce.

In this study we have analyzed the incidence and prognostic significance of the entire spectrum of arrhythmia in a cohort of patients with acute ST segment elevation myocardial infarction in a tertiary care hospital in Gujarat.

Aim Of The Study

1. To estimate the incidence of various types of arrhythmias in patients with acute ST elevation myocardial infarction.

2. To analyze the pattern of arrhythmias in relation to the different regions of the ventricle wall with ST elevation myocardial infarction.

3. To assess the in-hospital outcome, 30 day mortality in Arrhythmic and Non-arrhythmic population.

Materials And Methods

Study Design

1. Single Center
2. Retrospective + Prospective

Study Period

Study was conducted between July 2020 to January 2023

Sample Size : 100 patients

Study Participants:

Inclusion criteria: Patients who presented within 12 hrs of onset of symptoms with evidence of STEMI and received thrombolytic therapy with streptokinase.

Exclusion criteria :

1. Patients with Non STEMI or Unstable angina

2. People with previous history of coronary artery disease

3. People with previous history of arrhythmias

4. People with previous history of cardiomyopathy or heart failure

Statistical Analysis :

All the data were analyzed with SPSS software (version 13.0). Categorical variables were compared by Chi square test($X2$ test) or Fischer exact test and continuous variables were presented as mean +/-SD and werecompared to the Student "t" test. A probability value of <0.05 was considered statistically significant.

Results And Analysis

One hundred patients with acute ST Elevation MI were analyzed. Clinical and demographic characteristics are summarized in Table 1.

Table 1 : Distribution of type of MI

Type of MI		Numbers
Anterior wall MI	Anteroseptal MI	20
	Anterolateral MI	20
	Extensive anterior wall MI	19
Inferior wall MI	Isolated IWMI	21
	Inferior + right ventricular MI	7
	Inferior + posterior + right ventricular MI	6
	Inferior + posterior wall MI	3
High lateral wall MI		3
Anterior + inferior wall MI		1

Totally 45 (45%) patients have experienced significant arrhythmias The most common type of arrhythmia noticed was VPC, almost in 70% of participants.

Analysis of Risk Factors :

Fig. 1: Risk factors of arrhythmia
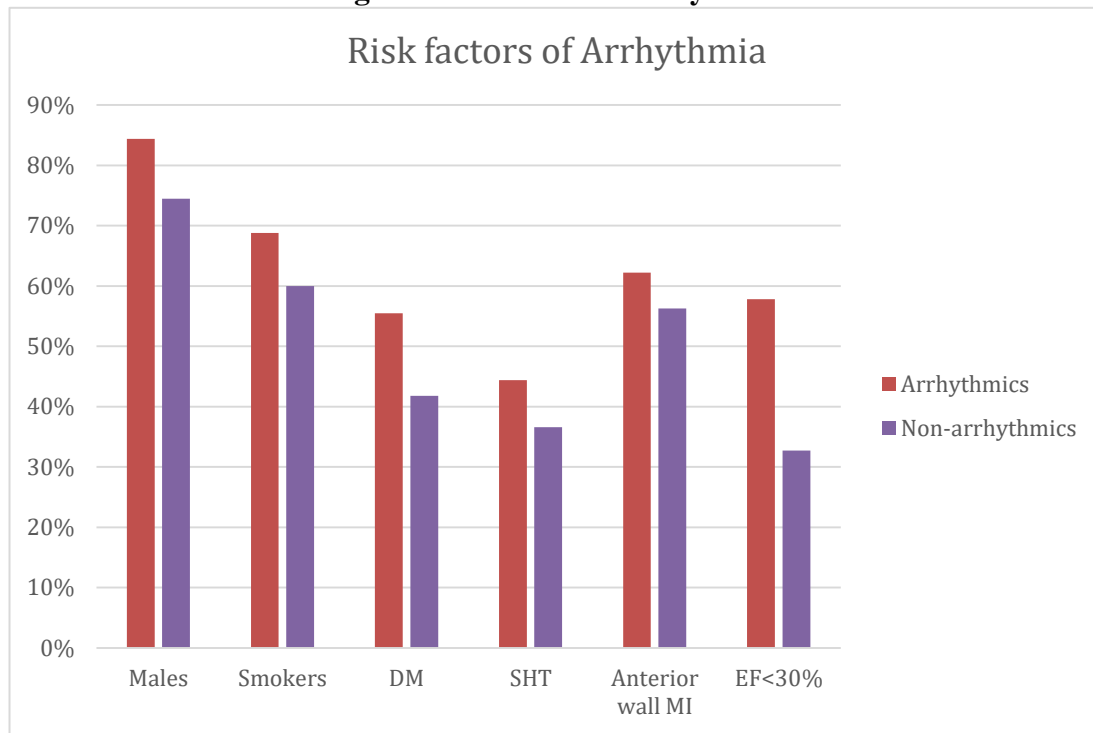
The above analysis shows that anterior wall MI, male sex along with diabetes mellitus, smoking, hypertension and low EF are important risk factors for the incidence of arrhythmia.

Incidence of arrhythmias

The incidence of different types of arrhythmias among the entire study population (n=100) is shown in Figure 2 below.
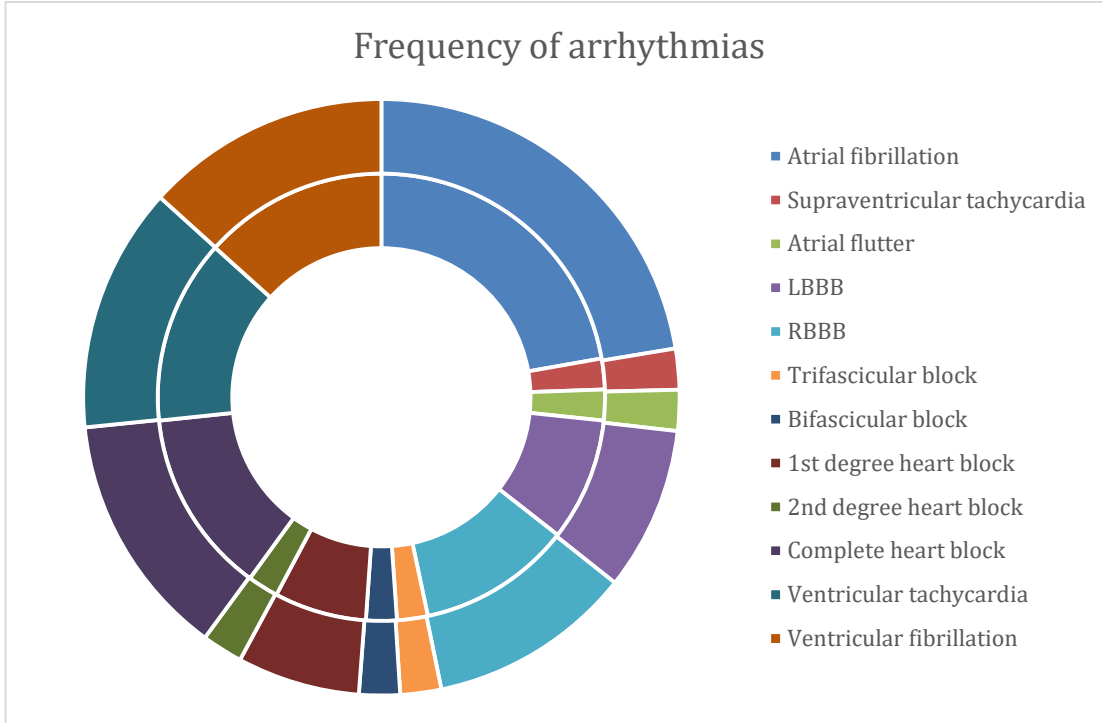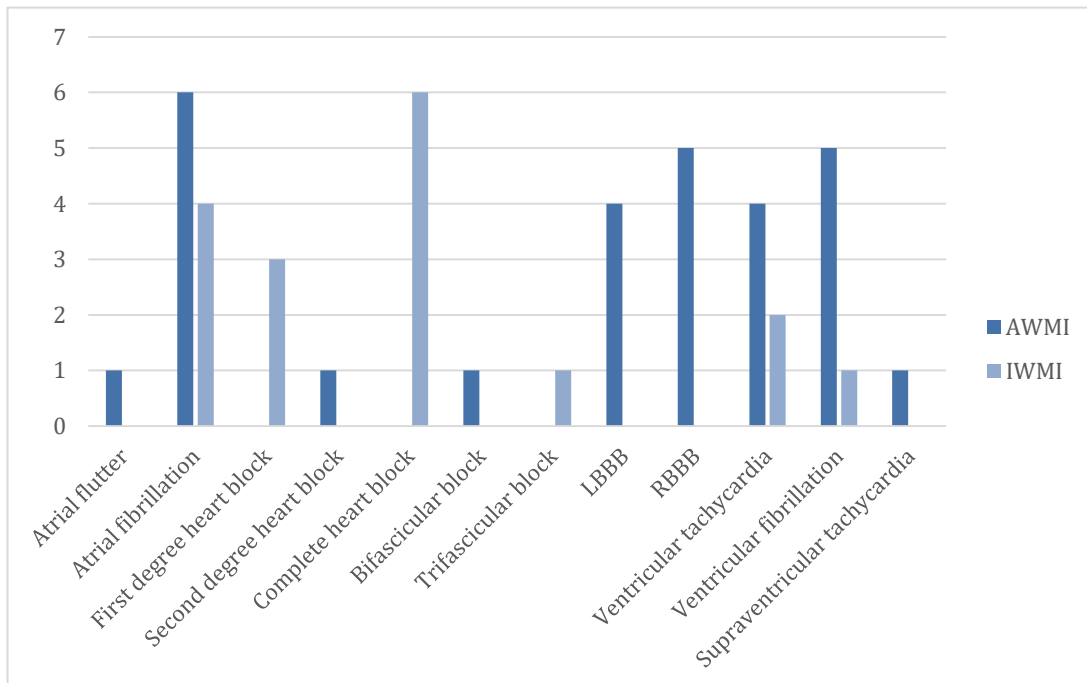
Fig 2: Frequency of arrhythmias

Fig. 3: Comparison of incidence of arrhythmia in relation to regional wall of ventricle with MI

Analysis Of Outcome

Hospital Events:

Table 2 summarizes in-hospital events among arrhythmic and non – arrhythmic population. Patients with arrhythmia had higher incidence of cardiac failure 16 out of 45 (35.5%) compared to 7 out of 55 in non arrhythmics (P value <0.01, relative risk =3).

**Table 2: Hospital events in arrhythmic & Non- Arrhythmic population**

HOSPITAL EVENTS					
	Arrhythmics (n=44)		Non-Arrhythmics (n=56)		P Value
	Count n=44	(%)	Count n=56	(%)	
Killip Class 1	26	59 %	46	82.1 %	< 0.01
Killip Class 2	11	25 %	5	8.9 %	< 0.01
Killip Class 3	5	11.3%	2	3.5 %	< 0.01
Cardiogenic Shock	9	20%	4	7.2%	< 0.01
Mortality	13	28.8 %	4	7.2%	< 0.01

Outcome In Relation To Type Of Arrhythmia

Table 3 : In hospital outcome in different groups of Arrhythmia

	Heart failure	Cardiogenic shock	Mortality
Atrial fibrillation	25%	16.66%	16.66%
AV block	33.30%	33.30%	20%
Bundle branch block	36.36%	9.09%	18.18%
Ventricular fibrillation	50%	33.33%	66.67%
Ventricular tachycardia	66.66%	33.33%	50%

Fig 4: Comparison of outcome among different groups of arrhythmia

Comparison of outcome among different groups of arrhythmias
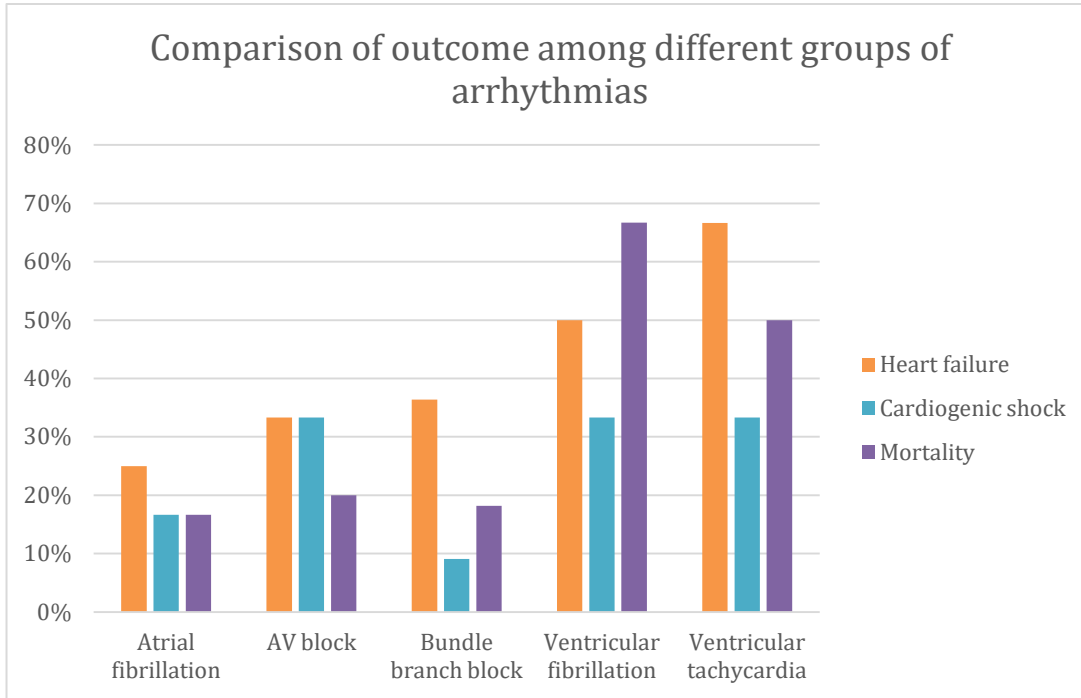
30 day follow up

30 day follow up data was available for 66 patients. 5 (7.5%) patients developed heart failure. One (1.5%) patient died during this period. One patient presented with recurrence of VT reverted with pharmacological treatment.

Conclusion

1. 45% of patients with STEMI had anyone type of clinically significant arrhythmia. Patients with anterior wall STEMI had higher incidence of arrhythmia (n=28 of 59) (47.5%) than STEMI in other location(41%)

2. Tachyarrhythmias are more common than bradyarrhythmias, accounting for 53.3% (n=24) of arrhythmic population (n=45).

3. Atrial fibrillation is the most frequent type of arrhythmias with incidence rate of 10% followed by complete heart block (6%) ,VF (6%), VT (6%). 5 patients had RBBB, 4 had LBBB.

4. Male sex, diabetes mellitus, smoking, systemic hypertension, anterior wall involvement were the important risk factors significantly associated with incidence of arrhythmia.

5. Incidence of arrhythmias was more in patients with poor left ventricular function (EF<30%).

6. Occurrence of arrhythmia during acute STEMI increase the risk of mortality by 3.5 fold, heart failure by 3 fold, cardiogenic shock by 2.9 fold and significantly reduces the ejection fraction.

7. In-hospital events were higher among patients with tachyarrhythmias than bradyarrhythmias. The observed mortality rate was 58.3% (n=7 out of 12 patients). Ventricular tachycardia and fibrillation were the major contributors .

8. The mortality rate among patients with bradyarrhythmias was 19%. Patients with LBBB had higher mortality (25%) than RBBB(20%).

9. In addition to diabetes mellitus, smoking, anterior wall MI, incidence of arrhythmia after acute STEMI is an independent predictor of poor prognosis.

10. Event rate during 30 day follow up was 7% heart failure, 1.5% mortality (1 of 66 patients).

11. Incidence of arrhythmia and its complication in patients with STEMI still remains high in resource poor settings. Early recognition and

treatment with appropriate drug, electrical cardioversion may improve the outcome .

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