A study on arrhythmias in golden hour of acute myocardial infarction

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Abstract

Introduction: Acute myocardial infarction is the commonest cause of death and disability and it poses great economic burden than any other ailments. In AMI the main cause for mortality is arrhythmias, which are due to an autonomic nervous system imbalance, electrolyte imbalance and ischemia which causes conduction blockade in the infarcted zone. Arrhythmias affect the prognosis of the patient after AMI by causing hemodynamic instability and also by directly affecting the myocardial contractility. The common type of arrhythmias in anterior wall myocardial infarction is tachyarrhythmia's while in inferior wall myocardial infarction, brad arrhythmias are common.

Aim: To Study The

(1) The incidence of arrhythmias in 100 patients with acute myocar dial infarction admitted to intensive coronary care unit of Katuri Medical College and Hospital.

(2) The incidence of different types of arrhythmias in Acute Myocardial Infarction.

(3) To interpret effect of arrhythmias on mortality and morbidity in patients in the golden hour of acute myocardial infarction.

Materials &methods: 100 consecutive patients with Acute Myocardial Infarction were admitted within 1 hour of chest pain to the intensive care unit of Katuri Medical College and Hospital were studied over a period of 12 months.

Observation and results: Of the total 100 patients, 80 patients had Arrhythmias, in which Sinus Tachycardia (18%) was the most common type followed by Ventricular tachycardia, followed by Ventricular fibrillation (13%). 16 deaths were observed of which 14

were due to arrhythmias and the most common type was Ventricular fibrillation.

Conclusion: Most common type of arrhythmias observed was tachyarrhythmias (80%) than bradyarrhythmia's (20%). Sinus tachycardia (18%) is the most frequent type observed followed by Ventricular tachycardia and Ventricular fibrillation (13%). Next most common type are Ventricular premature depolarization (12%). Most dangerous arrhythmias was Ventricular fibrillation and mortality rate is higher in patients with them (NO=4). Still there is higher incidence of arrhythmias and complications were observed in patients with acute myocardial infarction in poor resource settings. So early diagnosis, prompt recognition and institution of appropriate therapy (drugs, electrical cardioversion) may improve the outcome.

Keywords: Arrhythmias, AMI (Acute Myocardial Infarction), ventricular tachyarrhythmia, Ventricula Fibrillation.

Introduction

Acute myocardial infarction is the commonest cause of death and disability and it poses great economic burden than any other ailments. In AMI the main cause for mortality is arrhythmias, which are due to an autonomic nervous system imbalance, electrolyte imbalance and ischemia which causes conduction blockade in the infarcted zone.

Even though there are vast advances in the mode of diagnosis and management of Infarction related arrhythmias over the past 25 years it continues to be a major cause of mortality in industrialized world and is emerging as a great health hazard in developing countries. The development of acute myocardial infarction is a fatal event in about one third of the patients, and among this,half of the deaths occurs due to

Ventricular Tachyarrhythmias that occurs within one hour of the event.[1,2]

Arrhythmias affect the prognosis of the patient after AMI by causing hemodynamic instability and also by directly affecting the myocardial contractility. The common type of arrhythmias in anterior wall myocardial infarction is tachyarrhythmia's while in inferior wall myocardial infarction brad arrhythmia's are common.[3,4]

Timely restoration of flow in the epicardial infarct related artery combined with improvement of the downstream zone of the infracted myocardium ultimately results in a limitation of infarct size. Because the recognition and treatment of arrhythmias in the first hour not only reduces the in- hospital mortality, but also the long-term survival is also excellent in those patients Therefore, proper therapy of arrhythmias during the crucial period following myocardial infarction and thorough monitoring of heart rhythm are crucial for lowering the mortality rate.

The "Golden hour of myocardial infarction" is the first 60 minutes. "Total ischemic time" is within 120 minutes. The first 60 minutes of myocardial infarction is important because during an attack of acute myocardial in fraction while the central zone of the in farctconta ins the necrotic issue that is irreversibly lost, the fate of surrounding is chaemic myo cardium (ischaemic penumbra) may be improved by timely restoration of coronary perfusion , reduction of myocardial oxygen demands , prevention of the accumulation of noxious metabolites , and blunting the impact of mediators of reperfusion injury (eg. Free radicals produced by oxygen and excessive calcium)

Aims of the study

The study's objective is to evaluate:

1.   The incidence of arrhythmias in 100 patients with

acute MI admitted to intensive coronary care unit of Katuri Medical College and GeneralHospital,Guntur.

2. The incidence of different types of arrhythmias in Acute Myocardial Infarction.

3. Interpreting the impact of arrhythmias on mortality and morbidity in patients during the critical period following an acute myocardial infarction.

Materials and methodology

100 consecutive patients with AMI admitted within 1 hour of chest pain to the intensive care unit of Katuri Medical College and general Hospital were studied over a period of 12 months. All patients admitted to ICCU with clinical features and ECG evidence suggestive of acute Myocardial Infarction are taken. They were subjected to continuous ECG monitoring and 2d ECHO study. Results were taken up for study. It is a prospective observational study.

Inclusion criteria

• All patients having symptoms and an ECG that indicate an acute myocardial infarction.

• Arrhythmias both before and after thrombolytic.

Exclusion criteria

• Patients without Myocardial Infarction showing arrhythmias.

• Patients with previous history of myocardial infarction, previous cardiac surgeries and those who have been treated outside

• Valvular heart diseases patients were excluded from the study.

The diagnosis was made with taking history from the patient, Electrocardiogram,2d ECHO and cardiac biomarkers (CK-MB, Trop T), Physical examination (Pulse rate- rhythm, character, volume, Blood Pressure, Jugular Venous Pressure, Apical impulse position and
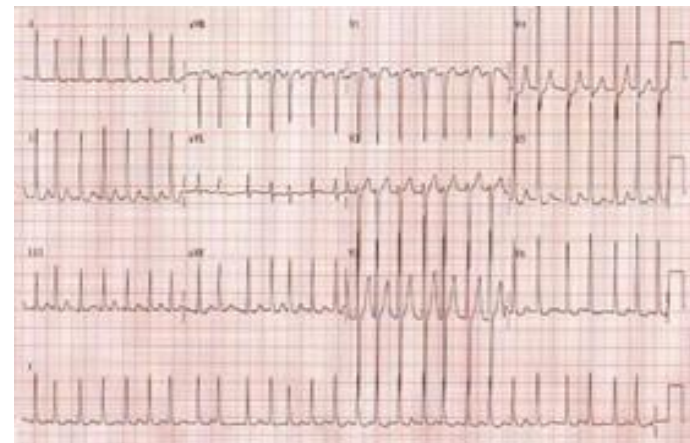
character, Auscultation of heart sounds, respiratory rate and added sounds.
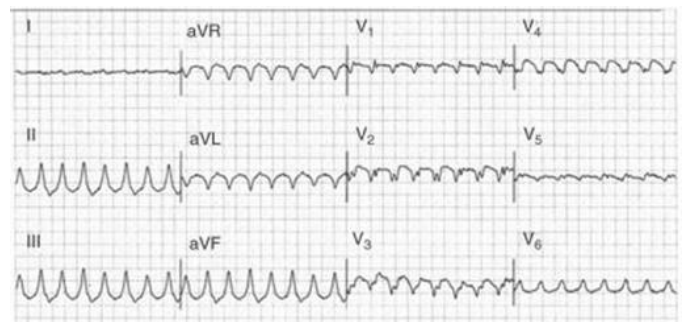

Graph 1: sinus tachycardia with AMI

Graph 2: Sinus bradycardia with Ami

Graph 3: Atrial fibrillation with AMI

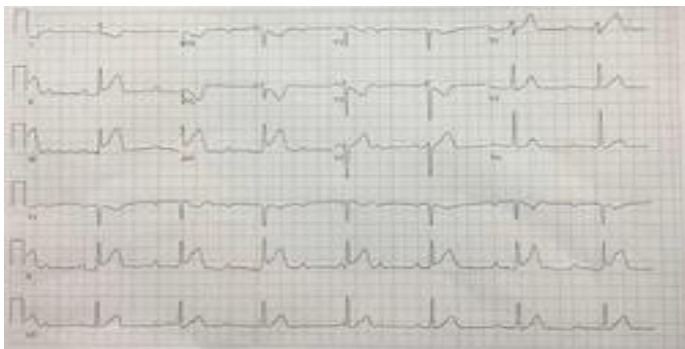Graph 4: Ventricular Tachyarrhythmia with AMI

Graph 5: Right Bundle Branch Block with AMI

Graph 6: Complete Heart Block with AMI

Graph 7: First Degree Atrio Ventricular block with AMI

Graph 8: Second Degree Atrio Ventricular block with AMI

Observation and results

Total number of patients with acute myocardial infarction under study are100.

Table 1: Incidence of Arrhythmias inAMI.

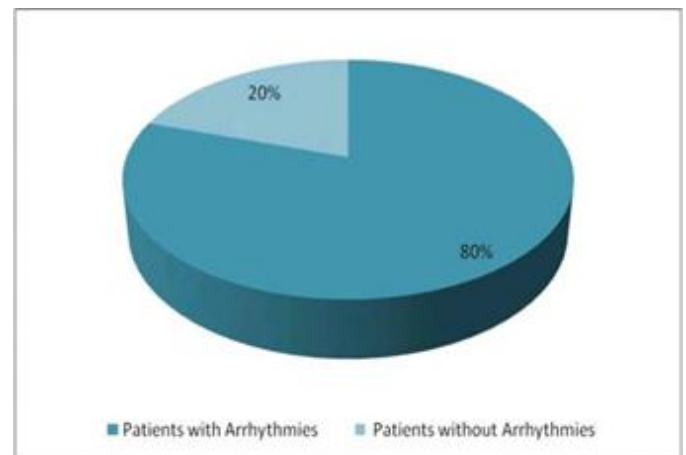| No. of patients with arrhythmias	No. of patients without arrhythmias
80%	20%

Chart 1: Incidence of Arrhythmias in AMI.

Table 2: Distribution of Arrhythmias in Patients with AMI.

S.no	Arrhythmias	% Of Cases
1	Sinus Tachycardia	18%
2	Sinus Bradycardia	9%
3	Ventricualar Tachycardia, Ventricular Fibrillation	13%
4	Ventricular Premature Depolarisations	12%
5	Accelerated Idioventricular Rhythm	10%
6	Atrial Fibrillation	2%
7	Right Bundle Branch Block	2%
8	Left Bundle Branch Block	2%
9	Right Bundle Branch Block + Left Anterior Hemi fascicular Block	2%
10	1^0AtrioVentricular Block	1%
11	2^0AtrioVentricular Block	3%
12	Bifascicular Block	3%
13	Complete Heart Block	3%
14	No Arrhythmias	20%

Chart 2: Distribution of Arrhythmias in Patients with AMI.
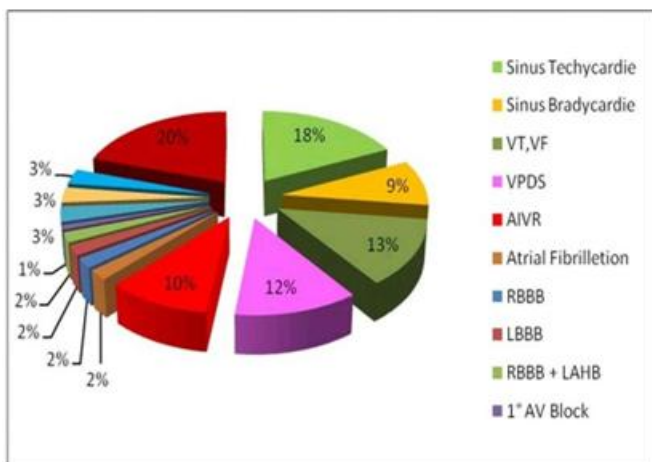
Sinus tachycardia is the most common type of arrhythmias (18%) next common type is Ventricualar Tachycardia+ Ventricular Fibrillation (13%). Next most common type are Ventricular Premature Depolarisations.

Table 3: mortality in AMI

| Total no. Of deaths	Arrhythmias	Carcinogenic Shock
16	14	2

Chart 3: MORTALITY IN AMI.
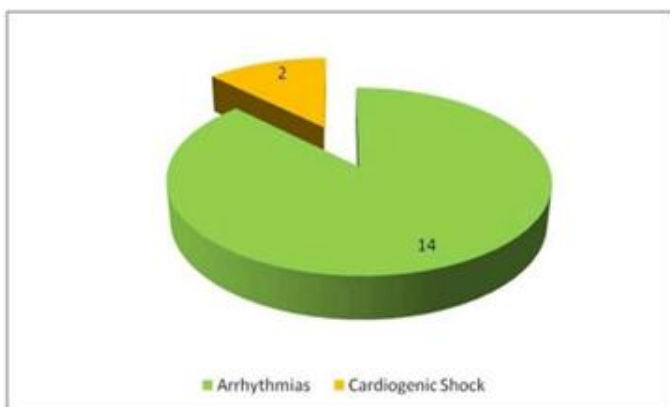
16 patients (9 males and 7 females) died out of which 2 patients were in cardiogenic shock other 14 patients had arrhythmias.

Table4:Mortality in relation to the type of arrhythmias

S.NO	Type of Arrhythmias	Deaths
1	Ventricular Fibrilation	4
2	Bifascicular Block	2
3	Complete Heart Block	2
4	Sinus Tachycardia	2
5	Ventricular Tachyarrhythmia	1
6	A trail Fibrillation	1
7	Accelerated Idioventricular Rhythm	1
8	Ventricular Premature Depolarisations	1

Chart 4: Mortality in relation to the type of arrhythmias
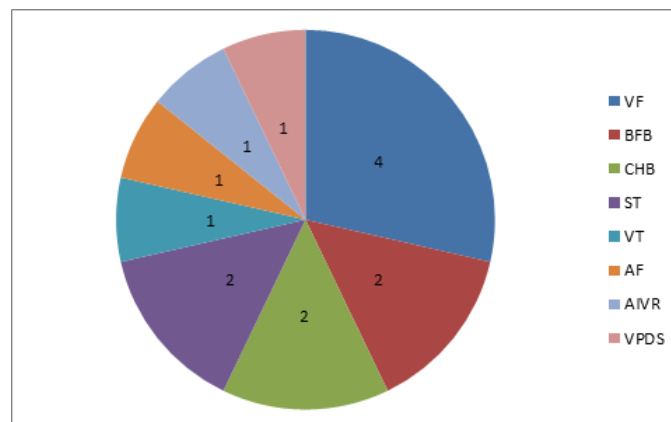
Out of 16 deaths 4 patients had ventricular fibrillation, 2 patients had Bifascicular block, 2 patients had complete heart block, 2 patients had persistent sinus tachycardia, one patient had ventricular tachycardia, one patient had atrial fibrillation, one had Accelerated Idioventricular Rhythm and another one had Ventricular Premature Depolarisations.

Discussion

Study by Jehangir A Shah et al in 2021 including 110 patients found the incidence of arrhythmias with Acute Myocardial Infarction in 89.1% of cases which is comparable to our study 80%.[5]

Another study by Puneet Rajendra Patil et al on 2017 on 102 patients found incidence of arrhythmias with AMI in 78.7% which is on par with our study.[6]

According to a studyconducted by Hreybe H et al, CardiologyDepartment of the Medical Collegeof Georgia, Augusta, Georgia, USA— "Location of acute myocardial infarction and associated arrhythmias"

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patients with inferior wall MI were more likely to develop Rady arrythmiasin contrast to patients with anterior wall who showed a predilection to develop tachyarrhythmia's. This was in concordancetoourstudy.[7]

According to an niter rest in articleby Sorin J. Brenner, David Tschopp "Complications of Acute Myocardial Infarction" — In anterior wall MI the most common arrhythmia noted was AIVR(50%) followed by Ventricular Tachyarrhythmia/Ventricular Fibrillation in4to8%.Barring sinus tachycardia, the higher incidence of Ventricular Tachyarrhythmia/Ventricular Fibrillation in our study — 22.41%can be explained by the fact that this was a small study group of only 100 patients of which majority of patients with Ventricular Tachyarrhythmia / Ventricular Fibrillation had multiple risk factors.[8]

Paul Erik Bloch Thomsen et al in 2010 on 297 patients found 13 % incidence of Ventricular Tachycardia, 7% Sinus Bradycardia and 3% with Ventricular Fibrillation. Predefined Tachy and Brady arrhythmias was found to be 46%. This is comparable to our study in which Sinus Tachycardia incidence is 18% and Ventricular Tachycardia incidence is 13%.[9]

Bulent Gore neck et al in 2014 concluded that incidence of arrhythmias in AMI is as follows, Accelerated Idioventricular Rhythm (15-42%), Sinus Bradycardia (28%), Non-Sustained Ventricular Tachyarrhythmia (26%), Sinus Tachycardia (22%), Atrial Fibrillation (9%), Sustained Ventricular Tachyarrhythmia (2-4%), which is comparable to our study.[10]

Christian Juhl Terkelsen et al in 2009 had similar incidences of different types of arrhythmias incidence with AMI like Accelerated Idioventricular Rhythm (42%), Sinus Bradycardia (28%), Non-Sustained Ventricular Tachyarrhythmia (26%), which is on par with our study.[11]

Jehangir A Shah et al also concluded that Accelerated Idioventricular Rhythm (37.3%) was the most common type of arrhythmia followed by Sinus Tachycardia (36.4%) and Ventricular Tachyarrhythmia (22.7%), they also concluded that 15.5% was the mortality rate which is similar to our study 14% due to arrhythmias.[5]

According to the result analysis of the GUSTO-III trial — "Sustained ventricular arrhythmias and mortality among patients with acute myocardial infarction", The 30- daymortalityrate was 44% who experienced Ventricular Tachyarrhythmia/Ventricular Fibrillation died compared to our studyof33%30-daymortalityrate. This discrepancy can probably be explained by the fact that in our study only patients who were admitted in the first hour were taken up for study and early intervention was possible.[12]

According to a study— "Survival and follow-up after pace maker implantation after MI: patients with complete heart block"- Alt E, Volker R et al after IWMI when a patient developed complete heart block, when a pace maker was inserted the mortality at ewaslo win the order of 2 to 5%, however info intervention was done the mortality rate was high as 47.5%. According to Braun wald 5 to 10 % of patients with ST Elevated Myocardial Infarction had more predilection for Bifascicular blockandhigherinhospitalmortalityrate.[13]

Conclusion

In our study,

- Most common type of arrhythmias observed was tachyarrhythmias (80%) than bradyarrhythmia's (20%).

- Sinus tachycardia (18%) is the most frequent type observed followed by Ventricular Tachyarrhythmia/Ventricular Fibrillation (13%)

- Next most common type is Ventricular Premature

Depolarization's (12%)

• Most dangerous arrhythmias were Ventricular Fibrillation and mortality rate is higher in patients with Ventricular Fibrillation (NO=4)

Still there is higher incidence of arrhythmias and complications were observed in patients with acute myocardial infarction in resource poor setting. So early diagnosis, prompt recognition and institution of appropriate therapy (drugs, electrical cardio version) may improve the outcome.

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