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Original Research Article

Study of Conduction Abnormalities in Acute Myocardial Infarction

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Abstract

Myocardial infarction is the most common non-communicable disease responsible for increasing mortality worldwide, especially in India. The aim of the study is to record electrocardiograph in acute myocardial infarction patients and interpret conduction abnormalities associated with it to prevent mortality and morbidity

This study was conducted in District Headquarters Hospital & DNB Postgraduate Teaching Institute, Virudhunagar. It is a cross sectional study conducted for a period of 14 months between March 2020- April 2021 with a sample size of hundred patients.

In our study incidence of conduction abnormalities in acute MI is 63%. Incomplete right bundle branch block is the most common conduction defect followed by left anterior hemi block. Anterior wall MI is the most prevalent followed by inferior wall MI. Increased Risk of mortality in patients presenting with High degree heart blocks.

Hence as per our study it's always better to evaluate conduction abnormalities in MI patients so have proper observation and follow up to reduce morbidity and mortality.

Keywords: Myocardial Infarction, Conduction Abnormalities, Bundle Branch Block.

Introduction

Acute myocardial infarction is a global epidemic. As a leading cause of mortality and morbidity, myocardial infarction is a major health problem [1]. Worldwide, more than 3 million people STEMI and 4 million develop NSTEMI a year [2]. Many of these deaths are attributed to the development of arrhythmias during period of myocardial infarction (MI) [3]. The most important assumption for the key mechanism of arrhythmia in the acute phase of coronary occlusion is micro re-entry. In the homogeneity of electrical characteristics of ischemic myocardium, cells at the center of the ischemic zone have a relatively consistent increase in extracellular potassium. Whereas, cells in border zone between ischemic and normal myocardium are only partially depolarized.

The cellular electrophysiological method for reperfusion arrhythmia occur due to washout of different ions such as lactate, potassium and other toxic substances accumulated in ischemic zone [4].

Various types of conduction blocks develop following myocardial infarction, in acute inferior wall MI, first-degree atrio–ventricular (AV) blocks present in 2-12%, second degree AV block in 3-10% and complete heart block (CHB) in 3-7%. Complete heart block is more common in inferior wall than anterior wall MI [5] Bundle branch blocks are associated with poor prognosis in myocardial infarction with increased extent of myocardial damage [6]. Hence, this study aims to assess mortality and identify incidence of conduction abnormalities in acute myocardial infarction. Also to study the incidence of conduction disturbances with age and sex distribution and various risk factors

Materials and Methods

This study conducted in department of general medicine, government headquarters hospital, Virudhunagar. From March 2020 to April 2021.Patients admitted with acute myocardial infarction in emergency ward, intensive care unit, government Headquarters hospital, were included in the study. Hundred cases admitted with acute myocardial infarction were included. This was done as a descriptive Cross sectional study.

Data collection will be done using proforma for patients at Virudhunagar, Government headquarters hospital. Data will be entered in ms excel and analysis will be done using SPSS Statistical software. When the patient was admitted in our hospital, after obtaining informed consent, 12 lead conventional electrocardiograph was taken serially in patients with acute myocardial infarction to study conduction abnormalities. All ST elevation myocardial infarction patient were included in the study. While patients with pre-existing conduction blocks, tachy or bradyarrythmias, history of previous myocardial infarction, H/O Medications (eg. beta blockers, ivabradine) were excluded from this study.

Results

In our study of 100 patients with myocardial infarction, 63 had conduction abnormality while rest did not have conduction abnormality

In our study 8 patients died and all had conduction abnormalities which was statistically significant with a p value less than 0.05.

Next, we analyzed correlation between comorbidities and conduction defects. In our study 45 patients had comorbidities, among which 18 had diabetes only, 16 had hypertension only and rest 11 had both diabetes and hypertension. Among these 25 had conduction abnormalities. Statistically there was no significant relationship with p value of 0.77.

Next, we analyzed the correlation between age and conduction defects. In our study 21 patients was between 21-45 age group and 15 among them had conduction abnormalities. 39 patients was in 46-60 age group and 20 had conduction abnormalities. 40 patients was in 61-85 and 28 among them had conduction abnormalities. P value was 0.151 and not significant.

We also correlated conduction defects with development and complications. In our study population total of 11 patients developed some sort of complication and 10 among them had conduction abnormalities which shows a statistically significant correlation with a p value of 0.042.

In our study most common site of infarct was anterior wall (35%) followed by Inferior wall (32%).

Table 1: Site of Infarct

Site Of Infarct	No Of Patients
Anterior Wall MI	35
Inferior Wall MI	32
Inferoposterior Wall MI	10
Anterolateral Wall MI	19
Anteroinferior Wall MI	3
Anteroinferopos Wall MI	1

We also correlated the location with conduction abnormalities and there was no significant relation between them with a p value of 0.208.

Table 2: Correlation Between Site of Infarct and Conduction Abnormality

Site of Infarct	Conduction Defects	No Conduction Defects	Totals
Anterior Wall MI	18	17	35
Inferior Wall MI	24	8	32
Anterolateral Wall MI	12	7	19
Inferoposterior Wall MI	5	5	10
Anteroinferior Wall MI	3	0	3
Anteroinferopos Wall MI	1	0	1
	63	37	**100**

Other findings in our study were like incomplete right bundle branch block is most common conduction defect followed by LAHB.

Inferior wall MI has highest incidence of conduction defects with 6 patients developing 1st degree heart block and 4 developed left anterior hemiblock.

Complications after acute myocardial infarction is most common in inferior wall infarct, with high incidence of AV block.

Total deaths following acute MI with most deaths associated with inferior wall infarction.

Discussion

In this study of 100 patients with acute MI, Maximum incidence occurred in age group of 50, with youngest patient aged 29 and oldest was 84.

In this study male patient forms 83% of study group and female population constituted 17% of study group. According to literature age group of 50-70 are more prone for myocardial infarction which correlates with our study [7].

In a review over 100,000 infarcts high degree AV block occurred in 4.7% overall, the AV block was new in 3.2% and was more common in inferior than anterior wall (7.3 vs 3.0%) especially in infarcts treated with thrombolysis(8.3%)

According to literature incidence of heart block are 15.8%(22), in our study incidence is 14% which correlates, also literature states that heart blocks are more common in inferior wall mi which correlates with our study.

In study conducted by Atkins and his group most common conduction abnormality is RBBB followed by LAHB, it correlates with our study group with RBBB the most common conduction abnormality.

A Study among 681 patients from one institution entered in TAMI-9 or GUSTO 1

Trial, the study showed incidence of transient BBB was 18.4%, while persistent BBB occurred in 5.3% of patients. RBBB was most common 13%, followed by LBBB (7%). Mortality was higher in patients with BBB

Thus the anatomical characteristics of Right bundle branch and anterior fascicle of left Bundle branch, Has characteristic length and slenderness which makes them more vulnerable to ischemia than more compact posterior fascicle of left bundle branch.

The mortality in patients with heart block is more than the mortality in patients without heart block [8].

In our study of 100 patients with acute MI, 18 had diabetes mellitus, 16 had systemic hypertension, 11 patients had both. In our study association between diabetes and conduction defect is 27% which correlates study by Rogdrigvez –morci *et al* where in a study of 300 patients conduction defect was present in 29.1% of diabetics.

The Framingham study has shown that incidence of arrhythmias, conduction disturbances and sudden death is considerably higher among Hypertensive. The sub endocardial fibrosis may be the involvement of conduction pathway.

In GUSTO-1 Trial, 41021 STEMI patients where studied in which incidence of previous hypertension was found in 38.1% of patients. Similar GISSI-2 trail which included 20491 patients with STEMI history of hypertension found in 35% of patients.

Maurizio G Abrignani *et al* [9] in his study of 4994 patients with hypertension found 4.9% developed AV block, 4.0% developed cardiogenic shock. In our study 2% of hypertensive patients developed AV block.

2015 meta-analysis revealed that smoking resulted in twice the risk of cardiovascular disease for current smokers and a 37% increase in risk with former smokers, among patients > 60 years old [10].

Study by Bhalli *et al* shows out of 119 smokers only 23 patients developed conduction abnormalities with non-significant P value, in this study incidence of smokers are 47% with 59% patients shows conduction defects.

Study by Ram R, Devi KB *et al* [11] conducted on 100 patients with acute MI shows that mortality is increased in patients with conduction block 41.2% compared to patients without conduction defects 16.8. In our study mortality following conduction block in acute MI is 28.5%, with 100% mortality in complete heart block patients .

High degree (2^{nd} or 3^{rd} degree) AV block is associated with increase in mortality risk which is largely seen within first 30 days; among 30 day survivors subsequent mortality does not increase [12] Increase in mortality with high degree AV block is still apparent in patients with an inferior wall MI treated with thrombolytic agent, largest experience comes from review of almost 76,000 patients enrolled in four Randomized controlled trials [12]

Among patients with inferior wall MI there is significant increase in mortality 15% in patients with AV block versus patients without AV block 4%. Among patients with anterior wall MI there is substantial increase in 30 day mortality 41% in patients with AV block compared to 8% in patients without AV block.

Cardiogenic shock is the most common cause of death in patients with acute myocardial infarction with incidence of 7-10 % [13] In GUSTO trial 11% of patients had shock on presentation while 89% of patients subsequently developed shock. Despite high advancements mortality rates due to cardiogenic shock rates between 50-80%, in

our study 3 patients developed cardiogenic shock with one patient died.

Incidence of heart failure developing after MI is approximately 13% of patients at 30 days and 20-30% at 1 year after for MI [14] Incidence of HF after MI discharge is highest in first months and decreases and remains stable at 1.3-2.2% afterwards. In our study 2 patients developed in-hospital heart failure after acute MI.

According to literature incidence of in-hospital Heart failure is three times higher in patients of 75-85 years old, while some studies say female gender is independently associated with heart failure [15] Many studies also say arterial hypertension increases the risk of arterial hypertension ranging from7-70% [16].

More common microvascular injury and myocardial hemorrhage contribute to excess Heart failure in patients with arterial hypertension. A higher heart rate at admission was a risk factor for HF after acute MI in several studies. The risk rises by 7–23% for every 10 beats [16] Tachycardia may reflect MI severity and imminent cardiac dysfunction.

Conclusion

Acute MI is most common in male sex with incidence of 83% and female sex 17%. Most common age group for Acute MI is 50 years in both sex, conduction abnormalities are predominant after 60 years of age. Incidence of conduction abnormalities in acute MI is 63%. Incomplete right bundle branch block is the most common conduction defect followed by left anterior hemiblock. Anterior wall MI is the most prevalent followed by inferior wall MI.

Conduction abnormalities including AV blocks are more common in acute inferior wall MI. Increased Risk of mortality in patients presenting with High degree heart blocks. Type 2 diabetes mellitus is associated with high risk of conduction abnormalities in acute MI, 50% of diabetic develop conduction defects. Smoking is most common risk factor for acute MI followed by Alcohol intake.

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