Original Article

Frequency and Outcome of Mitral Regurgitation in Acute ST-Elevation after Myocardial Infarction

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ABSTRACT

Objective: Determine the frequency and Outcome of Mitral Regurgitation in Acute ST-Elevation after Myocardial Infarction.

Study Design: Experimental / Observational study

Place and Duration of Study: This study was conducted at Cardiology Department, Idris Teaching Hospital Sialkot Medical College Sialkot from Jan 2018 to May 2019.

Materials and Methods: 350 Patients from Cardiology department of Idris teaching Hospital Silakot Medical College Sialkot were enrolled in study after fulfilling the inclusion criteria. Procedure of research was explained to the patient and informed consent was taken. Demographic data, name, age, gender, and address was recorded on the attached proforma. Patients were assessed on transthoracic echocardiography by the consultant for presence or absence of mitral regurgitation. Severity of MR will act as effect modifier and was addressed through stratification. Patients were kept in the ward for at least three days. They were examined by the ward consultant for pulmonary edema (fine inspiratory basal crepitation on chest auscultation) or Death (No electrical activity on ECG) immediately after diagnosis of mitral regurgitation and then every eight hours for the following three days

Results: Out of 350 patients (54.3% females). 38.6% patients suffered from MR as the complication of MI. of all the patients who suffered from MR, 68.1% suffered from mild, 21.5 % from moderate and 10.4% suffered from severe grade of MR. 12 % of the patients died and 46.7 % developed acute pulmonary edema after development of MR as a complications of MI. The study also shows that mostly patients suffering from MR after AMI were elderly and female, 52.5 % and 62.2 % respectively.

Conclusion: This study demonstrates that there is high frequency of Ischemic Mitral Regurgitation (IMR) after MI in our population and mostly sufferers of this complication are female and elderly population. IMR if present after MI is associated with poor outcome in terms of death and acute heart failure.

Key Words: ST elevation myocardial infarction, mitral regurgitation.

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INTRODUCTION

Myocardial infarction is the leading cause of death in the United States and in most industrialized nations throughout the world. Approximately 450, 000 people in the United States die from coronary disease per year.[1] The survival rate for U.S. patients hospitalized with MI is approximately 95%. This represents a significant improvement in survival and is related to improvements in emergency medical response and treatment strategies.

Complications of MI include arrhythmic, mechanical, inflammatory (early pericarditis and post-MI syndrome) sequelae, as well as left ventricular mural thrombus (LVMT). In addition to these broad categories, right ventricular (RV) infarction and cardiogenic shock are other possible complications of acute MI.

There are three major mechanical complications of acute myocardial infarction (MI): rupture of the left ventricular free wall; rupture of the interventricular septum; and the development of mitral regurgitation. One study compared 225 patients who had a first MI and experienced one of these complications to 1012 patients with a first MI without these mechanical complications[2]. Delayed hospitalization (≥24 hours), undue in-hospital physical activity, and post infarction angina increased the risk of rupture in predisposed patients.

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The causes of mitral regurgitation (MR) after acute MI include ischemic papillary muscle displacement (previously known as papillary muscle dysfunction), left ventricular dilatation or true aneurysm, and papillary muscle or chordal rupture[3, 4]. Ischemic mitral regurgitation is mitral insufficiency caused by myocardial infarction.[5] It results from local and global LV remodeling and that is an independent predictor of heart failure and death. MR typically occurs 3-10 days after an AMI, though this onset may vary according to the mechanism of MR. Papillary muscle rupture resulting in MR occurs within 1-14 days.

Mild-to-moderate MR is often clinically silent and detected on Doppler echocardiography performed during the early phase of AMI. In this case, MR rarely causes hemodynamic compromise. Severe acute MR that results from the rupture of papillary muscles or chordae tendineae results in abrupt hemodynamic deterioration with cardiogenic shock. Rapid diagnosis, hemodynamic stabilization, and prompt surgical intervention are needed because acute severe. MR is associated with a high mortality rate.

Ischemic mitral regurgitation is a disease of the myocardium (both infarcted and normally perfused) that disturbs mitral valvular function; MR to due other etiologies is a valvular disease that affects the myocardium. The cellular, molecular, and genetic effects on the myocardium of these two different causes of MR are probably unrelated. Lessons learned from experience with MR of non ischemic origin are not likely applicable to IMR. Recent clinical and laboratory studies are beginning to improve our understanding and approach to this vexing clinical problem.

MATERIALS AND METHODS

350 Patients from Cardiology department of Idris teaching Hospital Silakot Medical College Sialkot were enrolled in study after fulfilling the inclusion criteria. Procedure of research was explained to the patient and informed consent was taken. Demographic data, name, age, gender, and address was recorded on the attached proforma. Patients were assessed on transthoracic echocardiography by the consultant for presence or absence of mitral regurgitation. Severity of MR will act as effect modifier and was addressed through stratification. Patients were kept in the ward for at least three days. They were examined by the ward consultant for pulmonary edema (fine inspiratory basal crepitation on chest auscultation) or Death (No electrical activity on ECG) immediately after diagnosis of mitral regurgitation and then every eight hours for the following three days.

RESULTS

Out of 350 patients (54.3 % females). 38.6 % patients suffered from MR as the complication of MI. of all the patients who suffered from MR, 68.1% suffered from mild, 21.5 % from moderate and 10.4% suffered from severe grade of MR. 12 % of the patients died and 46.7% developed acute pulmonary edema after development of MR as a complications of MI. The study also shows that mostly patients suffering from MR after AMI were elderly and female, 52.5 % and 62.2 % respectively.

Table No. 1: Baseline characteristic of the patients (n=350)

Baseline characteristics of patients presenting with AMI			
Baseline Characteristics		**Frequency**	**Percent**
Age	30-50 years	68	19.4
	51-60 years	197	56.3
	61-70 years	85	24.3
Sex	Male	160	45.7
	Female	190	54.3

Key: n Number of patients

Table No. 2: Distribution of patients by frequency of MR (n=350)

MR	No.	Percentage
Present	135	38.6
Absent	215	61.4
Total	350	100.0

Key: n Number of patients

Table No. 3: Distribution of patients according to the severity of MR

	Grading of Severity	No.	Percentage
MR (n - 135)	Mild	92	68.1
	Moderate	29	21.5
	Severe	14	10.4

Key: n Number of patients

Table No. 4: Frequency of MR according to age distribution

MR	Age Groups	Frequency	Percent
Present n=135	30-50 years	21	15.6
	51-60 years	43	31.8
	61-70 years	71	52.6
Absent n=215	30-50 years	47	21.8
	51-60 years	154	71.7
	61-70 years	14	6.5

Key: n Number of patients

Table No. 5: Frequency of MR according to sex distribution

MR	Gender/Sex	Frequency	Percent
Present n=135	Male	51	37.8
	Female	84	62.2
Absent n=215	Male	109	50.7
	Female	106	49.3

Key: n Number of patients

Table No. 6: Distribution of patients by outcome

	MR Present (n = 135)		MR absent (n = 215)	
Outcome	**No.**	**%tage**	**No.**	**%tage**
Heart failure (Acute pulmonary edema)	63	46.7	21	9.8
Died	16	12	4	1.8
Uneventful Discharge	56	41.3	190	88.4
Total	135	100.0	215	100.0

Key: n Number of patients

Table 1 presents the baseline characteristic of the patients presenting with AMI. Table 2 Presents the distribution of patients by frequency of MR. Table 3 Presents the distribution of patients according to the severity of MR. Table 4 Presents the frequency of MR according to the age distribution. Table 5 Presents the frequency of MR according to sex distribution and table 6 Presents the distribution of patients by outcome.

DISCUSSION

Coronary heart disease (CHD) is the leading cause of mortality worldwide and caused 1 of every 5 deaths in the United States in 2004.[6,7,8] Acute coronary syndromes are manifestations of a progressive atherosclerotic process which culminates in rupture of atherosclerotic plaques and the formation of mural thrombi.[9,10,11] Despite impressive advances in diagnosis and management over the past four decades, STEMI continues to be a major public health problem in the industrialized world and is becoming an increasingly important problem in developing countries.[12,13,14] In the United States, in 1 year, nearly 1 million people suffer from an acute MI.[15,16,17] More than 1 million people with suspected acute MI are admitted yearly to coronary care units in the United States.[18,19,20] 90 Of particular concern from a global perspective are projections that the burden of disease in developing countries will become similar to those now afflicting developed countries.[21,22] Given the wide disparity of available resources to treat STEMI in developing countries, major efforts are necessary on an international level to strengthen primary prevention programs at the community level.[23,24,25]

The short-term mortality rate of patients with STEMI who receive aggressive pharmacological reperfusion therapy as part of a randomized trial is in the range of 6.5 to 7.5 percent,[26] whereas observational data bases suggest that the mortality rate in STEMI patients in the community is 15 to 20 percent. Complications of Myocardial infarction emerge as one of the principal determinants of mortality in patients with STEMI.[27] There are three major mechanical complications of acute myocardial infarction (MI): rupture of the left ventricular free wall; rupture of the interventricular septum; and the development of ischemic mitral regurgitation.

Ischemic mitral regurgitation is mitral insufficiency caused by myocardial infarction. The causes of mitral regurgitation (MR) after acute MI include ischemic papillary muscle displacement (previously known as papillary muscle dysfunction), left ventricular dilatation or true aneurysm, and papillary muscle or chordal rupture. MR typically occurs 3-10 days after an AMI, though this onset may vary according to the mechanism of MR. Papillary muscle rupture resulting in MR occurs within 1-14 days.[28]

Ischemic mitral regurgitation may present suddenly in association with AMI or chronically with CHF as a late manifestation of postinfarction ventricular remodeling. In all cases (by definition) the valve leaflets and subvalvular apparatus are structurally normal. Whether, when, and to what degree IMR develops is dependent on the size, transmurality, and location of the MI. Mild-to-moderate MR is often clinically silent and detected on Doppler echocardiography performed during the early phase of AMI. In this case, MR rarely causes hemodynamic compromise. Severe acute MR that results from the rupture of papillary muscles or chordae tendineae results in abrupt hemodynamic deterioration with cardiogenic shock[29]. Rapid diagnosis, hemodynamic stabilization, and prompt surgical intervention are needed because acute severe MR is associated with a high mortality rate. Acute ischemic MR is seen with increased frequency in anterior wall infarction, more extensive wall motion abnormalities, a persistently occluded infarct artery, larger end-systolic and end-diastolic ventricular volumes, and severe heart failure.

Mitral regurgitation is known to be a frequent complication of AMI. When present, it may exhibit a broad range of severity, from clinically evident and hemodynamically obvious to clinically silent and detected only as an incidental finding on catheterization or Doppler echocardiography. Ischemic MR following MI is associated with increased mortality. No study has yet been done in Pakistan to analyze the outcome of post myocardial infarction MR. The purpose of the present study is to determine the outcome of patients having acute myocardial infarction with mitral regurgitation, in terms of heart failure or even death & to identify the high risk patients for early intervention in terms of pharmacological and invasive therapy.[30]

In the present study, 350 patients of acute MI were included. In the study population, 45.7 % were male and 54.3 % were female, 19.4% patients were in the age group of 30-50 years, 56.3% patients were in the age group of 51-60 years and 24.3% patients were in the age group of 61-70 years. In the study group 38.6 % patients suffered from MR as the complication of MI. Of all the patients who suffered from MR, 68.1%

suffered from mild, 21.5 % from moderate and 10.4% suffered from severe grade of MR. Different frequency of MR are recorded in different studies.

In the present study, mostly elderly and female patients suffered from MR after MI. The results show that 52.6% patients with age 61 to 70 years suffered from MR. The results show that 37.8% patients were male and 62.2 % patients were female among the patients who suffered from MR after MI. This finding was also recorded in other studies.

In the present study, poor outcome of the patients suffered from MR after MI was recorded in terms of death and acute pulmonary edema. The study shows that 12 % of the patients died and 46.7 % developed acute pulmonary edema after development of MR as a complication of MI. The study also shows that mostly patients suffering from this poor outcome were elderly and female.

To define the incidence of mitral regurgitation (MR) and elucidate its potential contribution to the development of severe congestive heart failure after acute myocardial infarction (AMI), Doppler echocardiograms were obtained within 48 hours of onset of AMI in 59 patients. MR was detected in 23 of the 59 patients (39%). Patients with MR were older (71 +/- 3 vs 62 +/- 2 years, p less than 0.005). Mortality determined 8 to 14 months after the index AMI was 48% (11 of 23) in patients with MR but only 11% (4 of 30) in those without it (p less than 0.01).

CONCLUSION

In conclusion, the findings of the present study indicated that there is high frequency of IMR after MI in our population and mostly sufferers of this complication are female and elderly population. IMR if present after MI is associated with poor outcome in terms of death and acute heart failure. Early detection and management can reduce the mortality of this complication. This study was done on a small sample size with three days follow up only. However it provides significant data regarding the mitral regurgitation among the patients of acute myocardial infarction presented in the emergency of Punjab Institute of Cardiology.

Author's Contribution:

Concept & Design of Study:	Imran
Drafting:	Iftikhar Anwar, Mansoor Hassan
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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