IN-HOSPITAL COMPLICATIONS OF ACUTE RIGHT VENTRICULAR MYOCARDIAL INFARCTION

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ABSTRACT

Objective: *To determine the in-hospital complications of acute right ventricular myocardial infarction (RVMI).*

Methodology: *This study was conducted at Cardiology Department, Lady Reading Hospital, Peshawar from May to October 2009. A total of 100 patients with acute RVMI were evaluated for in-hospital complications.*

Results: *Male patients were 77 (77%) and females 23 (23%). Patient's mean age was 59.96+12.3 years with age range 28-82 years. Total in-hospital complication events were 174. In-hospital complications were present in 77% patients. Cardiogenic shock was the commonest complication with frequency of 25.8% followed by acute left ventricular failure (LVF) in 17.8% and atrioventricular blocks (AV Blocks) in 14.3% respectively. Re-infarction occurred in 5.7% (10) patients. Thirty eight patients died in our study (21.8%). Among RVMI patients, 65% stayed in-hospital for more than 4 days.*

Conclusion: *Frequency of complications is higher and cardiogenic shock is the most common complication in acute RVMI patients.*

Key Words: *Right ventricular myocardial infarction (RVMI), Complications, Myocardial infarction.*

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INTRODUCTION

Atherosclerosis of the coronary and peripheral vasculature is the leading cause of death all over the world[1]. In the year 2000, ten million people had an acute MI world over[2]. Pakistanis are part of an ethnic group who have the highest prevalence rates of coronary artery disease (CAD) compared to any other country. CAD manifests at a younger age and is known to take a much more aggressive course with wide-spread vessel involvement, larger infarct sizes and higher subsequent mortality in this country[3]. Mortality due to CAD in Pakistan is 410/10,0000[4]. The established modifiable risk factors for CAD are: dyslipidemia, hypertension, diabetes, obesity, smoking, and physical inactivity[5].

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Although, death rate from acute MI has declined by 30% over the last two decades yet it has a fatal outcome in approximately one third of patients[1, 6]. However, acute inferior myocardial infarction (IMI) has better short and long term prognosis with mortality of about 8%[7]. When IMI is complicated by acute RVMI, mortality rises to 28%. In hospital mortality is even higher in elderly patients and reaches up to 50%[8].

Acute RVMI complicates 20-50 % of acute IMI as reported by different studies[9, 10]. Gumina et al-[11]showed an increased rate of cardiac arrest (17.9%), homodynamic compromise (14.7%), ventricular arrhythmias (13.7 %) and mechanical complications (3.9 %) when IMI was complicated by RVMI. The major cause of death in patients with acute RVMI

is cardiogenic shock[4]. Thus acute RVMI complicating IMI has worse prognosis. It is an independent predictor of major complications and mortality[7, 12].

Timely recognition of complications is very helpful in the management of acute RVMI. Because its management is different from anterior or isolated IMI and usually requires volume loading with intravenous fluids. Treatment with drugs such as nitrates and morphine causes vasodilatation and precipitates hypotension in RVMI patients and should be avoided[13].

This study is aimed to find the frequency of in-hospital complications of acute RVMI in our set up. It will help physicians to identify and manage complications well on time thus reducing mortality from this treatable condition.

METHODOLOGY

This case series study was conducted at Cardiology Department, Lady Reading Hospital, Peshawar from May to October 2009. Study protocols were approved from hospital ethical committee. Estimated sample size was 128 based on 34% frequency of RVMI in acute IMI[1] and approximately 1000 patients population of IMI. However, because RVMI is uncommon condition and enrolment was slow, therefore, sample size was kept limited to 100 patients.

Patients of all ages and both genders who presented with acute IMI complicated by acute RVMI were considered eligible for inclusion in the study. Patients were enrolled using non probability purposive sampling technique. Informed consent was taken from all the patients. Patients with acute IMI having ST segment elevation of more than 1 mm in any lead of v3, v4, v5 or v6 on right sided precordial chest leads and/or evidence of right ventricle akinesia / hypokinesia /dilatation or new tricuspid regurgitation on echocardiography (echo) were defined as acute RVMI. Patients with associated anterior or lateral MI, left or right bundle branch block and recurrent MI on presentation were excluded because these associated conditions mask the diagnose of RVMI. Patients with valvular heart disease and cardiomyopathy were also excluded from the study as these conditions independently affect the outcome in acute MI patients.

Patients were assessed initially for the diagnosis, presence of risk factors and complications. Detailed past and present history was taken. Complete clinical examination including general physical examination and systemic examination was carried out. Pulse and blood pressure were recorded. Height and weight were measured and body mass index (BMI) calculated. Blood pressure was measured in sitting position using appropriate size cuff after resting the patient for five minutes. ECG on arrival with right side chest leads for the diagnosis of RVMI, detection of AV Blocks and arrhythmias was taken. Initial echo was carried out within 24 hours for the diagnosis and for the detection of mechanical complications. ECG (Cardiofax) and echo (Siemens Acoson CV-70) were performed on same machine by the same operator to control bias. Fasting or random blood glucose and serum cholesterol were done from hospital laboratory within 24 hours of presentation to detect diabetes and hypercholesterolemia.

Patients were monitored with cardiac monitors (Nihon Kohden) for initial 24 hours to detect arrhythmias and AV Blocks. They were followed, till discharge or death, daily and also as needed with history, clinical examination, ECG and echo to detect arrhythmias, AV Blocks, cardiogenic shock and acute LVF. Cardiac enzyme (CK-MB) was measured in patients having new chest pain or new ST segment elevation in any two contiguous leads to detect recurrent MI. All the information was recorded on a pre-designed proforma.

Risk factors that were assessed include: diabetes, hypertension, hypercholesterolemia, family history of CAD, obesity, previous history of angina. Operational definitions for risk factors were as follow: Diabetes: self-reported history of diabetes or use of anti-diabetic medications or fasting blood sugar of more than 126 or random blood sugar more of than 180. Hypertension: self-reported history of hypertension or the use of anti-hypertensive drugs or documented blood pressure more than 140/80. Hypercholesterolemia: random blood cholesterol equal or more than 200 mg/dl. Family history of CAD: self-reported history of CAD in first degree relative. Smoking: regular use or within six months of more than five cigarettes daily for at least a month. Obesity: BMI more than 29.9. Previous history of angina: past history of exertional chest pain. CAD: documented CAD on coronary angiography or history of MI or patients on anti-angina therapy.

Following in-hospital complications were studied: cardiogenic shock, acute LVF, arrhythmias (supraventricular tachycardia (SVT), atrial fibrillation (AF), ventricular tachycardia (VT) and ventricular fibrillation (VF)), AV Blocks (first degree, second degree and third degree heart block), mechanical complications (ventricular septal rupture, papillary muscle rupture and free wall rupture), re-infarction, death of a patient before discharge and more than four days of hospital stay. Operational definitions for in hospital complications were as follow. Acute LVF: systolic blood pressure less than 100 mm of Hg and

heart rate more than 100/minute with bilateral crepitation's on auscultation. Cardiogenic shock: blood pressure less than 80 mm Hg with cold clammy skin. Re-infarction: recurrent chest pain or ST segment re-elevation after initial resolution with CK-MB value more than 3ng/ml (normal range 0-3ng/ml). SVT: regular heart rate of more than 100/ minute on ECG. AF with FVR: irregular rhythm with absent P waves on ECG and heart rate more than 100 beats per minute. VT: ECG based diagnose by two cardiologists with consensus. VF: bizarre ECG with absent pulse and blood pressure. AV Blocks includes first degree, second degree and third degree heart blocks (HB). First degree HB: PR interval more than 0.2 seconds on ECG. Second degree HB: every second, third or fourth P wave is not followed by QRS on ECG. Third degree HB: when there is no correlation between P wave and QRS complex on ECG. Death: death due to any reason during hospital stay.

Data was entered and analyzed using statistical package for social sciences (SPSS) version13.0. Mean and Standard Deviation were calculated for continuous variables like age of the patient. Frequencies and percentages were calculated for qualitative variables such as risk factors, gender, cardiogenic shock, acute LVF, arrhythmias, AV Blocks, mechanical complication, in-hospital complications and duration of hospital stay.

RESULT

Study population was 100 patients. There were 77 (77%) males and 23 (23%) female patients. Male to female ratio was 3:1. The age of patients ranged 28-82 years with mean age 59.96 + 12.3 years. Frequency of various risk factors in patients with acute RVMI is shown in table1.

A total of 174 complications developed during hospital stay in 100 patients. In-hospital complications were present in 77% patients. The most common complication in acute RVMI was cardiogenic shock which developed 45(25.8%) times followed by acute LVF 31(17.8%) times. AV Blocks were present in 25(14.3%) cases. Re-infarction occurred 10 (5.7%) times. Table 2 shows detail frequency of various complications.

Overall in-hospital mortality was 38% among patients with acute RVMI. However, when RVMI was complicated by cardiogenic shock, in-hospital mortality reached 52%. Hospital stay for RVMI patients was longer as compared to those not complicated

Table 1: Frequency of various risk factors in RVMI patients (n=152)

Risk factors*	Frequency (percentage)
diabetes	21 (13.8)
hypertension	44 (28.9)
hypercholesterolemia	5 (3.3)
family history of CAD	30 (19.7)
smoking	23 (15.1)
obesity	20 (13.1)
previous history of Angina	9 (5.9)

*Multiple risk factors may be present in a patient. Each one was taken separately. Therefore number exceed the patient number.

Table 2: Frequency of various in-hospital complications in RVMI (n=174)

Complications*	No of Complications	Percentage
left ventricular failure	31	17.8%
cardiogenic shock	45	25.8%
reinfarction	10	5.7%
atrioventricular blocks	25	14.3%
mechanical complications	01	0.5%
arrhythmias	24	13.9%

*Multiple complications may be present in a patient. Each one was taken separately.

by RVMI. Among RVMI patients, 65% had hospital stayed for more than 4 days.

Thrombolysis was given to 75 (75%) patients in this study, while 25 patients (25%) were not thrombolysed. These patients presented late or had contraindications to thrombolytic therapy and were not candidate for thrombolytic therapy.

DISCUSSION

Three fourth of RVMI patients developed some form of complication. Cardiogenic shock, acute LVF (mechanical complications) and AV Blocks were common complications in this study. There are many explanations for high percentage of these complications. First, these complications are correlated. Majority of patients with AV Blocks went into cardiogenic shock and LVF. Secondly all types (first, second and third degree) and both transient as well as permanent AV Blocks were included. Thirdly, frequency of complications is higher in RVMI as was observed in previous studies. Frequency of re-infarction was two fold in patients with acute RVMI as compared to isolated acute IMI. Mortality in RVMI was high and increased more than two times in those with associated cardiogenic shock. Isolated IMI has low mortality as reported in literature[14]. In our study thrombolytic was given to 75% patients. Patients who were not thrombolyzed, they either came late to hospital or had some contraindications to streptokinase. Complications were higher in those who were not thrombolyzed. Frequency of arrhythmias and mechanical complications were similar in our and other national and international data[1, 10, 11].

Khan[1] in his hospital based study of 100 patients from Karachi observed that RVMI has two times more complications when IMI is complicated by RVMI. Mortality due to RVMI was 23.5% and reached 50% due to associated cardiogenic shock. One study from India[10] reported that RVMI was present in 37% of IMI patients and 66% patients were thrombolyzed. Frequency of cardiogenic shock and HB was 42% and in-hospital mortality was 16% among patients with RVMI. Gumina et al[11]showed an increased rate of cardiac arrest (17.9%vs. 7.3%), homodynamic compromise (14.7% vs.7%), ventricular arrhythmias (13.7 % vs.7.5%) and mechanical complications (3.9 % vs. 0.84%) when IMI was complicated by RVMI as compared to isolated IMI.

Duration of hospital stay was longer in RVMI patients. More than 65% patients had hospital stay for more than 4 days. On the other hand majority of patients not having RVMI were discharged on third day. RVMI patients had higher rate of complications resulting their stay in-hospital for longer period.

This study has few limitations. It was a descriptive study. Sample size was small and not according to the calculated sample size. Direct comparison with acute IMI was not made and only patients having IMI complicated with RVMI were considered. However, despite these limitations, it is clear from this study that patients with RVMI have higher complications and mortality.

CONCLUSION

Frequency of complications is higher and cardiogenic shock is the most common complication in acute RVMI patients.

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CONTRIBUTORS

MAI conceived the idea and wrote the manuscript of the study. NK, MF & MAR helped in the write-up of the manuscript. SBK, IS & ZK helped in literature review and statistical analysis. MH supervised the study. All the authors contributed significantly to the research that resulted in the submitted manuscript.