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Original Research Article

Clinical Profile of Right Ventricular Infarction in Patients with Acute Inferior Wall Myocardial Infarction

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Abstract

Introduction: Coronary artery disease is the commonest form of heart disease and the leading cause of morbidity and mortality throughout the world. Its prevalence among Bangladeshi has doubled during the past two decades. Myocardial infarction is one of the most common diagnosis in hospitalized patients. ***Objective*:** To find out the clinical profile of right ventricular infarction in patients with inferior wall MI. ***Methods*:** The study was a hospital based observational cross sectional study. 30 consecutive patients of Inferior wall myocardial infarction as proved by E.C.G. admitted from June 2019 to June 2020 to the ICCU, Department of Cardiology, Al-Helal Specialized Hospital Ltd. Mirpur, Dhaka, Bangladesh. All the Patients were studied at the time of admission, during management in hospital and followed up in the hospital until recovery or death. Criteria only patients with definite evidence of IMI in 12 lead standard ECG were included in this study. For these patient's additional Right Precordial leads were taken at the time of admission and repeated at 12 hours, 24 hours and 48 hours. ***Result:*** Out of the total 150 cases of acute MI admitted in Al-Helal Specialized Hospital Ltd. Dhaka, Bangladesh. The incidence of IMI among all the cases of AMI was 20.0% our study showed a peak incidence of RVI in the age group of 51 – 60 years but the peak incidence of IMI was in the age group of 61 years above. Our study showed a very high incidence of IMI and as well as RVI in males compared to females. This may be due to association of many risk factors which is more common in males. Our study shows percentage of various risk factors associated with MI. In most of cases multiple risk factors co-existed. In our study chest pain was the commonest symptom followed by sweating. Syncope was essentially an important presenting symptom in RVI. Palpitation was the least presenting symptom in IMI. In our study ST segment, ST of RV4 was elevated in all the 15 cases of RVI, ST elevation in all four leads (RV3, RV4, RV5 and RV6) was in 8 cases, ST elevation in any lead in 7 cases and ST of V1 was elevated in 9 cases. The incidence of VF was significantly high in cases of RVI and it was a major cause for mortality. Mortality is significantly high in RVI were as it is lower in IMI without RVI. ***Conclusion*:** The incidence of mortality and complications can be reduced only when we are fully aware of the diagnosis and the complications that can occur in RVI. So in all cases of IMI, RVI should be looked for by using simple and specific investigation like RPLs of ECG. Clinically RVI can be suspected when there is bradycardia, irregular pulse, hypotension and elevated JVP with clear lungs in a setting of Acute MI. ECG is a very simple investigative tool. The Advantage of ECG is it is easily available, noninvasive, cost effective, specific and sensitive. Involvement of the right ventricle in inferior wall myocardial infarction significantly affects the mortality and morbidity and complications.

Keywords: Clinical Profile, Inferior Wall MI, Ventricular Infarction, IWMI.

INTRODUCTION

Coronary artery disease is the commonest form of heart disease and the leading cause of morbidity and mortality throughout the world. Its prevalence among Indians has doubled during the past two decades [1]. Myocardial infarction is one of the most common diagnosis in hospitalized patients. Acute myocardial infarction is the single most important cause of morbidity and mortality in developed countries [2]. In developing countries, it follows infections. Cardiovascular diseases have becomes the leading cause of mortality in Bangladesh. Myocardial infarction was previously thought to be a disease of mainly the left ventricle. Right ventricular infarction was just a

pathological entity. Several authors had recognized the existence of the right ventricular dysfunction in context of acute myocardial infarction but little attention was paid to its clinical aspects. In 1974, the first time described potentially serious and unique haemodynamic consequences of right ventricular infarction. In last two decades epidemiological characteristics have transitioned from infectious diseases, under nutrition to non-communicable disease. Inferior wall MI is associated with about 30 to 50% of right ventricular myocardial infarction. The incidence of Right Ventricular MI in patients with inferior wall myocardial infarction was 10-50%. Now it is recognized as one of the major non-communicable public health problem. There is increased incidence of acute myocardial infarction in developing countries because of multiple factors like unhealthy food habits, stress factors, increase in habits like smoking and alcohol and rapid urbanization [3, 4]. There is an advent of newer diagnostic techniques for the disease, but still ECG remains the pillar as it is non-invasive and easily available. Now right ventricular MI is diagnosed using right sided precordial leads (RPL) with introduction of RPL diagnosis of RVI has become easy and economical. RVMI is not uncommon in acute MI and has its own therapeutic and prognostic implications. Management of RVMI differs from other MIs. The presence of RVI is known to increase the chances of cardiogenic shock, arrhythmias and conduction blocks [1]. The demonstration of right ventricular dysfunction is important because it is often associated with a distinct clinical syndrome requiring specific management. With the present study, author assessed the incidence of IWMI, its association with right ventricular infarction and function and its clinical outcome.

METHODOLOGY

The study was a hospital based observational cross sectional study. 30 consecutive patients of Inferior wall myocardial infarction as proved by E.C.G. admitted from June 2019 to June 2020 to the ICCU, Department of Cardiology, Al-Helal Specialized Hospital Ltd. Mirpur, Dhaka, Bangladesh. All the Patients were studied at the time of admission, during management in hospital and followed up in the hospital until recovery or death. Criteria only patients with definite evidence of IMI in 12 lead standard ECG were included in this study. For these patient's additional Right Precordial leads were taken at the time of admission and repeated at 12 hours, 24 hours and 48 hours. A detailed case history was taken and a detailed physical examination was done at the time of admission. For recording ECG 12 lead ECG (3 standard leads, 3 augmented limb leads, 6 precordial leads) machine was used. The recording was made at 25 mm/sec. Speed and 1 mv =10 mm. Right precordial leads were applied on the areas of chest which the leads corresponded on the left. Criteria for diagnosing RVI ST elevation in II, III, avF, V1 and ST elevation in all are any one of the right procordial leads i.e. RV3, RV4, RV5, RV6 and associated mirror changes in the anterior leads. As Echo Cardiography and Coronary Angiography was not performed on all the patients in this study, so the reports of these investigations was not considered for the diagnosis of RVI. Inclusion Criteria All the patients with definite evidence of acute inferior wall myocardial infarction as proved by 12 lead ECG along with right ventricular pericardial leads RV3, RV4, RV5, RV6 and associated mirror changes in the anterior leads.

Exclusion Criteria

- ECG evidence of LBBB
- History of previous MI
- Cor pulmonale
- Suspected pulmonary embolism
- Associated pericardial disease.

Patients with chest pain of more than 24-hour duration, as ST elevation in RPLs is transient Emphasis was given to the examination of blood pressure, S3 and S4 and systolic murmur of Tricuspid regurgitation. Continuous ECG monitoring was done to detect arrhythmias and conduction defects. Routine investigations like Random Blood Sugar, Urea, Creatinine, total Cholesterol and in most of the cases Creatinine phosphokinase, lactate dehydrogenase and SGOT were estimated. As Echo and Angiogram were done in very few patients, there were not considered for this study.

RESULTS

Out of the total 150 cases of acute MI admitted in Al-Helal Specialized Hospital Ltd. Mirpur, Dhaka, Bangladesh. The incidence of IMI among all the cases of AMI was 20.0%. Our study showed a peak incidence of RVI in the age group of 51–60 years but the peak incidence of IMI was in the age group of 61 years above. In our study group of IMI RVI incidence was 40.0%. So the incidence of RVI in all cases of AMI was 10 %. Our study showed a very high incidence of IMI and as well as RVI in males compared to females. The incidence of IMI among all the cases of AMI was 20.0%.

Table 1: Incidence in all groups.

	Total No. of All AMI	No. of IMI among AMI	Percentage
Incidence in all groups (n)	150	30	20.0%

Table 2: Incidence of RVI in IMI.

	Total No. of IMI	No. of RVI in IMI	Percentage
Incidence of RVI in IMI (n)	30	10	33.33%

Table 3: Age Incidence.

Age in years	IMI without RVI (n = 20)	RVI (n = 10)	Total (n = 30)
21 – 30	1 (5.0%)	- -	1 (3.33%)
31 – 40	3 (15.25%)	1 (10.0%)	4 (13.33%)
41 – 50	4 (20.0%)	2 (20.0%)	6 (20.0%)
51 – 60	6 (30.0%)	6(60.0%)	12 (40.0%)
61 and above	6 (30.0%)	1 (10.0%)	7 (23.33%)

Our study showed a peak incidence of RVI in the age group of 51–60 years but the peak incidence of IMI was in the age group of 61 years above.

Table 4: Sex Incidence.

Sex	Total Incidence in IMI = n	IMI without RVI = n	RVI = n
Male	24 (80.0%)	17 (85.0%)	8 (80%)
Female	6 (20.0%)	3 (15.0%)	2 (20%)

Our study showed a very high incidence of IMI and as well as RVI in males compared to females. This may be due to association of many risk factors which is more common in males.

Table 5: Incidence of Risk Factors.

Risk Factors	IMI without RVI (n = 20)	RVI (n = 10)	Total (n = 30)
Diabetes	5 (25.0%)	1 (10.0%)	6 (20.0%)
Hypertension	9 (45.0%)	4 (40.0%)	14 (46.67%)
Smoking	16 (80.0%)	7 (70.0%)	23 (76.67%)
Family History	8 (40.0%)	5(50.0%)	12 (40.0%)
Alcohol	4 (20.0%)	3 (30.0%)	7 (23.33%)

Our study shows percentage of various risk factors associated with MI. In most of cases multiple risk factors co-existed.

Table 6: Symptomatology at Presentation.

Symptoms	RVI (n = 10)	IMI without RVI (n=20)	IMI (n = 30)
Chest Pain	10 (100%)	18 (90.0%)	28 (93.33%)
Syncope	5 (50.0%)	1 (5.0%)	5 (16.67%)
Palpitation	1 (10.0%)	1 (5.0%)	2 (6.66%)
Sweating	7 (70.0%)	16 (80.0%)	22 (73.33%)
Angina Pain within 24 hrs.	2 (20.0%)	3 (15.0%)	6 (20.0%)

In our study chest pain was the commonest symptom followed by sweating. Syncope was essentially an important presenting symptom in RVI. Palpitation was the least presenting symptom in IMI.

Table 7: Physical findings at presentation.

Physical Finding	IMI (n = 30)	RVI (n = 10)	IMI without RVI (n=20)
a. Pulse:	23 (76.67%)	4 (40.0%)	18 (90.0%)
Normal(60 – 100)	5 (16.67%)	5 (50.0%)	1 (5.0%)
Bradycardia (< 60)	2 (6.66%)	1 (10.0%)	1 (5.0%)
Blood Pressure	16 (53.33%)	1 (10.0%)	12 (60.0%)
Normotensive (100- 140/60-90)	7 (23.33%)	7(70.0%)	2 (10.0%)
Hypotensive (<100/<60)	7 (23.33%)	2 (20%)	6 (30.0%)
JVP	-	-	-
Normal	8 (26.67%)	4 (40.0%)	3 (15.0%)
Elevated	5 (16.67%)	2 (20.0%)	1 (5.0%)
rt Sounds S3/S4	2 (6.66%)	1 (10.0%)	2 (10.0%)

e.Tricuspid regurgitation murmur	5 (16.67%)	1 (10.0%)	6 (30.0%)
f. Respiratory Crepitations	10 (33.33%)	2 (20.0%)	8 (26.66%)

Table 8: ECG Findings of RVI.

	Changes in RPLs	No. of patients of RVI (n=10)	Percentage
1.	Changes in only one RPL	0	0
2.	In only two leads	4	40.0
3.	In all the four leads	5	50.0
4.	In number of patients ST in RV4	10	100.0
5.	Associated ST⇧ in V1	6	60.0

Table 9: Showing Clinical Course.

		RVI (n = 10)	IMI without RVI (n = 20)	Total (n = 30)
1.	Complicated	7 (70.0%)	12 (60.0%)	18 (60.0%)
2.	Uncomplicated	3 (30.0%)	8 (40.0%)	12 (40.0%)

Complications were significantly higher in RVI than in IMI without RVI in our study. This clearly indicated that patients with RVI were prone to develop some complication.

Table 10: Showing Arrhythmias.

	Type of Arrhythmias	RVI (n=10)	IMI without RVI (n=20)	Total (n =30)
1.	SVT/AF	0	0	0
2.	Ventricular Ectopics	2 (20.0%)	3 (15.0%)	4 (13.83%)
3.	Ventricular Tachycardia	1 (10.0%)	1 (5.0%)	1 (3.33%)
4.	Ventricular fibrillation	3 (30.0%)	1 (5.0%)	3 (10.0%)

The incidence of VF was significantly high in cases of RVI and it was a major cause for mortality. However, the incidence of it was very low in IMI without RVI. Ventricular Ectopics were seen at a similar incidence in both the groups. And most of them were transient which disappeared without any medication or causing any major problem.

Table 11: Showing conduction blocks.

	Conduction Block	RVI (n=10)	IMI without RVI (n=20)	Total (n =30)
1.	First Degree AV Block	0	2 (10.0%)	2 (6.67%)
2.	Second Degree AV Block	1 (10.0%)	1 (5.0%)	1 (3.33%)
3.	Complete Heart Block	4 (40.0%)	1 (5.0%)	6 (20.0%)

Our study shows the incidence of conduction block to be significantly high in cases of RVI. Complete Heart Block was commonly seen in the RVI and few of them it became normal that too after medication.

Table 12: Showing total incidence of Mortality after thrombolysis.

	No. of Patients (n = 30)	Mortality (n = 6)
With Streptokinase	18 (60.0%)	1 (16.67%)
Without Streptokinase	12 (40.0%)	5 (83.33%)

Our study shows a high incidence of mortality in non thrombolysed patients which proves the benefit of thrombolysis.

Table 13: Showing incidence of Mortality Total death in the study.

	RVI (n = 10)	IMI without RVI (n=20)
Mortality	5 (83.33%)	1 (16.67%)

Death in RVI group = 5 Death in IMI without RVI group = 1. Mortality is significantly high in RVI were as it is lower in IMI without RVI.

DISCUSSION

Our study consisted of 30 consecutive patients of AIMI as proved by ECG, who were admitted to ICCU of Al-Helal Specialized Hospital Ltd. Dhaka,

Bangladesh. Additional RPLs were taken. The incidence of VF in RVI was 26.6% where as in IMI without RVI was 2.8% in our study. Cinca *et al*., reported an incidence of 4% of patients developing VF during thrombolysis. His study included all cases of MI. Our study has only IMI and RVI. So incidence of VF in our study is very high [16]. The incidence of VT in RVI was 6.6% and 2.8% in IMI without RVI in our study. Lopez and Sendon *et al*., have reported very high incidence of VT and VF in cases of RVI who were catheterized (Swan Ganz Catheter) or were applie dpace makers. This might be due to the irritation by pacemaker or catheter of the injured RV [17]. Mortality rates, particularly, in RVI, is higher than compared to IMI without RVI. In our study the mortality in RVI was 46.6%. Whereas it was only 5.7% in IMI without RVI. In thrombolysed patients the mortality was significantly low (25%) compared with non thrombolysed patients (54%). Most of the cases of RVI were not suited for thrombolysis of the associated complications. George *et al*., found mortality rate to be 12% in patients with inferior wall myocardial infarction and significantly higher at 28% in patients having right ventricular involvement in inferior wall myocardial infarction cases [17]. Complications such as hypotension, shock, arrhythmia, cardiac arrest, AV block and cardiac failure were observed to be significantly lower in patients with isolated IWMI as compared to patients associated with RVMI except pulmonary edema. This is in concordance with the observations by Khan IS *et al*., Memon *et al*., and Memon AG *et al*., reported more than double in-hospital mortality in RVMI Group as compared to without RVMI [18, 19].

CONCLUSION

The incidence of mortality and complications can be reduced only when we are fully aware of the diagnosis and the complications that can occur in RVI. So in all cases of IMI, RVI should be looked for by using simple and specific investigation like RPLs of ECG. Clinically RVI can be suspected when there is bradycardia, irregular pulse, hypotension and elevated JVP with clear lungs in a setting of Acute MI. ECG is a very simple investigative tool. The Advantage of ECG is it is easily available, noninvasive, cost effective, specific and sensitive. Involvement of the right ventricle in inferior wall myocardial infarction significantly affects the mortality and morbidity and complications. The mortality rate in RVI is very high due to its association with complications. So RVI should be carefully searched for and the complications should be anticipated and necessary interventions should be undertaken as early as possible.

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