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Research Article

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Assessment the Incidence of Inferior Wall Myocardial Infarction, its Association with Right Ventricular Infarction and Function and its Clinical Outcome

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ABSTRACT

Introduction: Myocardial infarction is one of the most common diagnoses in hospitalized patients. Myocardial infarction was previously thought to be a disease of mainly the left ventricle. Right ventricular infarction was just a pathological entity. Myocardial infarction may go undetected or may lead to catastrophic events leading to sudden cardiac death or causing severe hemodynamic derangements.

Objective: To find out the Assessment the incidence of Inferior Wall Myocardial Infarction, its association with right ventricular infarction and function and its clinical outcome.

Methods: The hospital based observational cross-sectional study was contacted at Department of Cardiology, Mymensingh Medical College Hospital, Bangladesh from 1st January 2022 to 30th January 2024. Conducted in intensive care unit, on an in-patient basis, consist of 50 cases of inferior wall MI. In patients with RVMI, the hospital death is high and major complications are greater. Right ventricular infarction leads to hemodynamic instability, atrio-ventricular conduction blocks, and in-hospital mortality in patients with inferior wall myocardial infarction.

Results: Out of the total 150 cases of acute MI were included. The incidence of IMI among all the cases of AMI was 33.3%. In our study group of IMI RVI incidence was 30%. So, the incidence of RVI in all cases of AMI was 10%. There is a significant association between IWMI and RVMI and RVMI is seen in about 20% of cases and most common complication encountered was hypotension followed by complete heart block. The mean age of participants was 58.33 and maximum number of patients was in the age group of 40-60 (43%) and consists of 80% males and 20% females. Among them 51.4% was hypertensive, 22.8% were diabetic, 74.3% smokers, 11.42% were alcoholics. In this study 58.33% of patients with RVMI and 2% of patients without RVMI were presented with hypotension at the time of admission. Complete heart block seen in 13.33% of IWMI patients and Hypotension seen in 20% IWMI patients RVMI group. Right ventricular myocardial infarction seen in 20% of IWMI cases and TR is seen 66% of patients of IWMI with RVMI and 4% of patients of IWMI without RVMI.

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. Involvement of the right ventricle in inferior wall myocardial infarction significantly affects the mortality and morbidity and complications.

Keywords: Clinical Profile, Inferior Wall Mi, Right Ventricular Infarction

Introduction

Myocardial infarction is one of the most common diagnoses in hospitalized patients. 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 [1]. Right ventricular function in about 50% of cases and associated with 20% of mortality the hospital death rate and complications are very high and associated with major complications. Acute myocardial infarction is the single most important cause of morbidity and mortality in developed countries [2]. In developing countries, it follows infections. Now it is recognized as one of the major non-communicable public health problems. There is increased

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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]. Myocardial infarction may go undetected or may lead to catastrophic events leading to sudden cardiac death or causing severe hemodynamic derangements. A myocardial infarction may be the first manifestation of coronary artery atherosclerotic disease [5]. The advent of more sophisticated diagnostic techniques and more precise hemodynamic measurement has demonstrated that right ventricular infarction is well defined clinical entity and value of recognizing patients with predominant right ventricular dysfunction is related not only to instituting appropriate therapy for severe pump failure but also to avoid inappropriate therapy. Although isolated right ventricular infarction had been described in autopsy reports as less than 3% of all acute myocardial infarction, the incidence of right ventricular infarction associated with inferior wall myocardial infarction has been shown to be as high as 30%–50% [6, 7]. Isolated right ventricular infarction is extremely rare. Even though the RVMI is seen in much number of cases clinically but the incidence of RVMI is very less than seen at autopsy [8]. With the present study, author assessed the incidence of Inferior Wall Myocardial Infarction, its association with right ventricular infarction and function and its clinical outcome.

Materials & Methods

The hospital based observational cross-sectional study was contacted at Department of Cardiology, Mymensingh Medical College Hospital, Bangladesh from 1st January 2022 to 30th January 2024. Conducted in intensive care unit, on an in-patient basis, consist of 50 cases of inferior wall MI. In patients with RVMI, the hospital death is high and major complications are greater. Right ventricular infarction leads to hemodynamic instability, atrio-ventricular conduction blocks, and in-hospital mortality in patients with inferior wall myocardial infarction. The main hemodynamic derangements associated with right ventricular infarction render the affected patient sensitive to decreased preload and loss.

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 patients' 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 precordial 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 were 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.

Every patient was continuously monitored for any complication of right ventricular infarction. If any complications developed were managed according to standard protocol and clinical outcomes were recorded. All the data were analyzed on SPSS version 23. Quantitative variables were expressed as mean ±SD and difference between groups means were tested by independent sample t-test. Qualitative variables were analyzed and represented as percentage. Pearson chi-square test was used to see the difference between proportions of the groups. Differences were considered significant at $p<0.05$.

Results

Table 1: Incidence in all groups (N=50)

	Total No. of All AMI	No. of IMI among AMI	Percentage
Incidence in all groups (n)	150	50	33.3%
	Total No. of IMI	No. of RVI in IMI	
Incidence of RVI in IMI (n)	50	15	30%

Out of the total 150 cases of acute MI were included. The incidence of IMI among all the cases of AMI was 33.3%. In our study group of IMI RVI incidence was 30 %. So the incidence of RVI in all cases of AMI was 10 %.

Table 2: Age Incidence of the patients (N=50)

Age in years	IMI without RVI (n = 35)	RVI (n = 15)	Total (n = 50)
21 – 30	2 (5.7%)	- -	2 (4%)
31 – 40	5 (14.2%)	2 (13.3%)	7 (14%)
41 – 50	7 (20.0%)	3 (20.0%)	10 (20%)
51 – 60	9 (25.7%)	9 (60.0%)	18 (36%)
61 and above	12(34.3%)	1 (6.6%)	13 (26%)

Table 3: Sex distribution of the patients (N=50)

Sex	Total Incidence in IMI = n	IMI without RVI = n	RVI = n
Male	40 (80%)	29 (82.8%)	11 (73.3%)
Female	10 (20%)	6 (17.1%)	4 (26.7%)

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 4: Incidence of risk factors (n=50)

Risk Factors	IMI without RVI (n = 35)	RVI (n = 15)	Total (n = 50)
Diabetes	8 (22.8%)	2 (13.3%)	10 (20%)
Hypertension	18 (51.4%)	7 (46.7%)	25 (50%)
Smoking	26 (74.3%)	10(66.7%)	36 (72%)
Family History	15 (42.8%)	8 (53.3%)	23 (46%)
Alcohol	4 (11.42%)	4 (26.6%)	08 (16%)

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

Table 5: Symptomatology at Presentation (N=50)

Risk Factors	IMI without RVI (n = 35)	RVI (n = 15)	Total (n = 50)
Symptoms	RVI (n = 15)	IMI without RVI (n=35)	IMI (n = 50)
Chest Pain	14 (93.3%)	32 (91.4%)	46 (92%)
Syncope	8 (53.3%)	4 (11.4%)	12 (24%)
Palpitation	1 (6.6%)	3 (8.5%)	4 (68%)
Sweating	9 (60%)	26 (74.3%)	35 (70%)
Angina Pain within 24 hrs.	5 (33.3%)	7 (20%)	12 (24%)

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 6: Physical findings at presentation (N=50)

Physical Finding	IMI (n = 50)	RVI (n = 15)	IMI without RVI (n=35)
a. Pulse:	37(74%)	6 (40%)	31 (88.4%)
Normal (60 – 100)	10 (20%)	6 (40%)	2 (5.7%)
Bradycardia (< 60)	3 (6%)	3 (20%)	2 (5.7%)
Blood Pressure	20 (40%)	2 (13.3%)	18 (51.4%)
Normotensive (100- 140/60-90)	15 (30%)	9 (60.0%)	5 (14.3%)
Hypotensive (<100/<60)	15 (30%)	4 (26.7%)	12 (34.3%)
JVP			
Normal	13 (26%)	11 (73.3%)	2 (5.7%)
Elevated	8 (16%)	5 (33.3%)	2 (5.7%)
rt Sounds S3/ S4	5 (10%)	2 (13.3%)	3 (8.5%)
e. Tricuspid regurgitation murmur	6 (12%)	2 (13.3%)	6 (17.1%)
f. Respiratory Crepitations	14 (28%)	6 (40.0%)	7 (20.0%)

Hypotension elevated JVP; Bradycardia and Kussumauls sign were increasingly associated with RVI when compared to IMI without RVI.

Table 7: ECG Findings of RVI (N=50)

Changes in RPLs	No. of patients of RVI (n=15)	Percentage	Total (n = 50)
Changes in only one RPL	0	0	10 (20%)
In only two leads	6	40.0	25 (50%)
In all the four leads	9	60.0	36 (72%)
In number of patients ST in RV4	14	93.3	23 (46%)
Associated ST in V1	10	66.6	08 (16%)

In our study ST segment, ST of RV4 was elevated in all the 14 cases of RVI, ST elevation in all four leads (RV3, RV4, RV5 and RV6) was in 9 cases, ST elevation in any lead in 6 cases and ST of V1 was elevated in 10 cases.

Table 8: Showing clinical course (N=50)

	RVI (n = 15)	IMI without RVI (n = 35)	Total (n = 50)
Complicated	12 (80.0%)	17 (48.6%)	29 (58%)
Uncomplicated	3 (20.0%)	18 (51.4%)	21 (42%)

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 9: Showing Arrhythmias (N=50)

Type of Arrhythmias	RVI (n=15)	IMI without RVI (n=35)	Total (n =50)
SVT/AF	0	0	0
Ventricular Ectopics	2 (13.3%)	4 (11.4%)	6 (12%)
Ventricular Tachycardia	1 (6.6%)	1 (2.8%)	2 (4%)
Ventricular fibrillation	4 (26.6%)	1 (2.8%)	5 (10%)

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 10: Showing conduction blocks (N=50)

Conduction Block	RVI (n=15)	IMI without RVI (n=35)	Total (n =50)
First Degree AV Block	0	3 (8.5%)	3 (6%)
Second Degree AV Block	1 (6.6%)	1 (2.8%)	2 (4%)
Complete Heart Block	7 (46.6%)	2 (5.7%)	9 (18%)

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 11: Showing total incidence of Mortality after thrombolysis (N=50)

	No. of Patients (n = 50)	Mortality (n = 9)	Total (n =50)
With Streptokinase	30 (60%)	3(33.4%)	3 (6%)
Without Streptokinase	20 (40%)	6 (66.6%)	2 (4%)

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

Table 12: Showing incidence of mortality total death in the study (N=9)

	RVI (n = 15)	IMI without RVI (n=35)	Total (n =50)
Mortality	6 (66.6%)	3 (33.4%)	3 (6%)

Death in RVI group = 6 Death in IMI without RVI group = 3
Mortality is significantly high in RVI were as it is lower in IMI without RVI.

Discussion

Based on early experiments of right ventricular performance, it was felt for many years that right ventricular contraction was unimportant in the circulation and that, despite loss of right ventricular contraction, pulmonary flow could be generated by a passive gradient from a distended venous system and active right atrial contraction [9]. However, recognition of the profound hemodynamic effects of right ventricular systolic dysfunction slowly became evident with the description of severe RVMI, resulting in severe right heart failure, clear lungs, and low-output hypotension despite intact global left ventricular systolic function. Because of its simplicity and its high sensitivity and specificity, recording of V4R is all set to be an intrinsic part of the early evaluation and electrocardiographic examination of acute IWMI [10]. Our study consisted of 50 consecutive patients of AIMI as proved by ECG, who were admitted to ICCU of our hospital. Additional RPLs were taken. The incidence of IMI among all the cases of AMI was 33.3%. In our study group of IMI RVI incidence was 30%. So, the incidence of RVI in all cases of AMI was 10%. 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 [11]. The incidence of VT in RVI was 26.6% and 2.8% in IMI without RVI in our study. Lopez and Sandon et al., have reported very high incidence of VT and VF in cases of RVI who were catheterized (Swan Ganz Catheter) or were applied pace makers. This might be due to the irritation by pacemaker or catheter of the injured RV [12]. 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. 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 [12]. 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 [13, 14]. The long-term clinical consequences of RV infarction are still not well-known. The available evidence suggests that it is not only predictive of major complications during the hospital course but also a possible independent risk factor for long-term mortality as well. Patients suffering from RV infarction may be more susceptible to future development of right heart failure; further studies based on long-term follow-up are needed in this regard.

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. 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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