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Original Research Article

CLINICAL PROFILE, PROGNOSIS, AND OUTCOME IN PATIENTS WITH RIGHT VENTRICULAR MYOCARDIAL INFARCTION (RVMI) AND WITHOUT RVMI IN INFERIOR WALL MYOCARDIAL INFARCTION (IWMI)

S. S. Srinivasan[1], R Arun[2], A. Rudrappa[3], R. Sampath Kumar[2]

[1]Senior Resident, Department of Cardiology, Government Stanley Hospital and Medical College, Tamilnadu, India
[2]Senior Assistant Professor, Department of Cardiology, Government Stanley Hospital and Medical College, Tamilnadu, India
[3]Assistant Professor, Department of Cardiology, Government Stanley Hospital and Medical College, Tamilnadu, India

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Corresponding Author:
Dr. R. Sampath Kumar,
Email: drsampath1972@gmail.com

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Abstract

Background: Coronary artery disease continues to be the major cause of morbidity and mortality on a global scale. Despite advances in the diagnosis and management of acute coronary syndrome (ACS), inferior wall myocardial infarction (IWMI) with right ventricular myocardial infarction (RVMI) continues to be a common spectrum leading to negative short- and long-term consequences. Coexisting RVMI increases overall mortality in patients with IWM. This study assesses the clinical profile, prognosis, impact on ACS management, and prognostic relevance of acute IWMI WITH RVMI compared to isolated acute IWMI. **Materials and Methods:** We analysed 200 patients with IWMI and IWMI WITH RVMI between April 2021 and August 2021. The clinical profile and outcome of patients with ACS-isolated IWMI and IWMI with RVMI were compared. Cases were analysed concerning the clinical presentation, major adverse cardiac events (MACE), and mortality during hospitalisation. **Result:** RVMI had a higher rate of diaphoresis, hypotension, elevated jugular venous pressure, rhythm disturbance, and conduction disturbances than patients with isolated IWMI. Atrioventricular block (95% CI 2.0–7.1, $p < 0.001$), high level of Troponin I and NT- Pro BNP, cardiogenic shock (95% CI 1.7–3.9, $p < 0.001$), atrial fibrillation (95% CI 0.9–2.9, $p = 0.001$), high TPI requirement and Poor outcome noted in patients with RVMI. **Conclusion:** AVMI complicates the short-term mortality and outcomes after inferior MI. It is related to high in-hospital complications, specifically in patients with I–III° atrial fibrillation, AV block, and cardiogenic shock. Nevertheless, the impact on long-term mortality wants further study.

INTRODUCTION

Coronary artery disease continues to be the major cause of morbidity and mortality at the global level.[1] Blood flow in one of the coronary arteries is reduced or completely stopped, which results in acute coronary syndrome. In one-third to half of the patients who present with inferior wall myocardial infarction (IWMI),[2-4] acute right ventricular myocardial infarction (RVMI) develops, and it greatly adds to the clinical and hemodynamic instability in these patients.[5,6] RVMI is a complication of IWMI and it happens when the right ventricle is also impacted by the heart muscle's blood flow being blocked. Patients with RVMI require more active management because they have a worse prognosis than those with IWMI alone.[5-7] Both sets of patients have symptoms such as chest discomfort, shortness of breath, and palpitations, and both have a similar clinical profile to IWMI without RVMI patients. While hypotension, jugular venous distention, and peripheral edema are all common symptoms of right ventricular failure, patients with RVMI are more prone to these symptoms.[4-7]

Anterior wall MI and RVMI can occasionally coexist and happen infrequently.[8] Hospital morbidity and mortality rates rise when the right ventricle (RV) is involved in an inferior MI.[9] Early diagnosis of RV contribution in a patient with acute MI is crucial for prognosis and treatment selection, such as aggressive primary percutaneous coronary intervention (PCI) with a focus on RV branch

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revascularization to prevent any unfavourable complications that could arise from this diagnosis.

Although there have been improvements in identifying and treating acute coronary syndrome (ACS), inferior wall myocardial infarction with right ventricular myocardial infarction (RVMI) continues to be a prevalent spectrum that can have detrimental short- and long-term results. Patients with RVMI have a worse prognosis than patients without RVMI. In-hospital consequences such as cardiogenic shock, arrhythmias, and death are more common following RVMI. Patients with RVMI also experience worse long-term results, including a higher risk of heart failure, recurrent myocardial infarction, and mortality. In patients with IWMI, coexisting RVMI raises overall death rates.[5-7] Thus, this study evaluates the Clinical profile and prognosis of Acute IWMI WITH RVMI compared to Isolated Acute IWMI, its impact on ACS management, and its associated prognostic significance.

MATERIALS AND METHODS

This prospective study was conducted at Stanley Medical College. In total, 200 patients were enrolled and allocated into two groups: Group I: 100 patients with isolated IWMI, and Group II: 100 patients with IWMI and RVMI who were admitted to our hospital between April 2021 to August 2021.

Inclusion Criteria

- Age > 18 years old of both genders
- Patients with isolated IWMI
- Patients with IWMI and RVMI

Exclusion Criteria

Corpulmonale, suspected pulmonary embolism associated with the pericardial disease were excluded.

Diagnosis of inferior myocardial infarction (chest pain, raised troponin I, and ECG demonstration of IWMI with ST-segment advancement in leads II, III, and AVF were used to regulate an inferior MI).

RVMI was diagnosed by recording further right precordial leads and detecting ST-segment raise in leads V3R-V6R and V1.

Patients' clinical characteristics were obtained from electronic health archives. Collected data comprised baseline characteristics (age, gender, clinical symptoms on admission, high blood pressure, diabetes mellitus, coronary artery disease, Killip class, systolic blood pressure, diastolic blood pressure, ECHO finding, in-hospital mortality, in-hospital problems like cardiogenic shock, cardiac rhythm, and conduction disorders.

Statistical Analysis

Group I and II were compared depending on clinical features, echo findings, complication, and mortality using SPSS statistical software version 23.00 (IBM/ SPSS). Data are described as mean ± SD or proportions. The results were assumed significant when the p-value was <0.05.

RESULTS

The study comprised 200 patients; 100 patients with isolated IWMI were tagged as Group I, and another 100 patients with IWMI AND RVMI were tagged as Group II. We compared the baseline characteristics between patients with and without the participation of the right ventricular in inferior MI. In Group I – females 26 (26%) and males 74 (74%), In Group II, females 16 (16%) and males 84(84%) were involved in the study. The mean age for Group I was 61.2±5, and for Group II was 61 ± 10 years.

Patients with group II (IWMI +RVMI) had significant hypotension (4%- 40 %, p < 0.001), elevated JVP (4%-56 %, p< 0.001), frequently stated to Killip class IV than patients without RVMI (6 % vs 30 %, p < 0.001), ECHO findings: TAPSE ≥ 1.5 (p< 0.001), MPI-TDI≥0.69 (2 %- 75 % p< 0.001), S′ velocity ≤ 12.3 (3%-70 %, p< 0.001), Cardiac enzymes: average troponin T ≥ 42 ug/dl, (p< 0.01), average NT-pro BNP≥1900 (p< 0.01) had a higher range in RVMI patients. Non-significant differences were reported between other baseline characteristics. The evaluation of baseline characteristics among groups is described in [Table 1].

The analysis discovered that patients with RVMI had a significantly increased incidence of a cardiogenic shock than patients without RVMI involvement (p < 0.001). Electrical complications were more likely to occur in patients with inferior MI and RVMI. A significant difference between Group I and Group II was observed in I–III atrioventricular (AV) block incidence (p < 0.001) and atrial fibrillation incidence (p = 0.001).

Patients with RVMI also had a higher incidence of TPI requirement (2%- 29 %, p < 0.001) and longer stay in ICCU (4%-25%, p < 0.001) compared to isolated IWMI patients. In-hospital mortality rates were higher in patients with group II (RVMI) patients (2%-10% p <0.01). The rates of complications within groups are described in [Table 2].

Table 1: Baseline characteristics among study groups

Characteristic	GROUP I (IWMI)	GROUP II (IWMI /RVMI)	P-value
Male	74	84	NA
Female	26	16	NA
Age (years)	61.2± 5	61±10	NA
Smoking	70	60	NA
BMI≥30 (kg/m2)	40	38	NA
Diabetes	68	72	NA

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Hypertension	65	68	NA
Previous MI	8	5	NA
Renal impairment (CrCl< 60mL/min)	1	3	NA
WINDOW PERIOD <4 H	24	20	NA
WINDOW PERIOD 4-6 H	20	24	NA
WINDOW PERIOD 6-8 H	16	12	NA
WINDOW PERIOD 8-10H	16	18	NA
WINDOW PERIOD 10-12H	24	26	NA
Nausea, Vomiting, diaphoresis, and Pallor	25	40	0.43
Hypotension	4	40	<0.001
Elevated jugular venous pressure	4	56	<0.001
Kussmaul sign	0	72	<0.001
Holosystolic murmur	0	1	NA
Killip class			
I	78	58	NA
II-III	12	12	NA
IV	6	30	<0.01
Average TAPSE < 1.5	1.9	1.2	<0.001
Average MPI-TDI ≥ 0.69	2	75	<0.001
S′ velocity≤ 12.3	3	70	<0.001
Cardiac troponin	25ug/dl	42 ug/dl	<0.01
Average NT-pro BNP	1,010 pg/dl	1,900	<0.01
RBBB	6	12	0.15
LBBB	8	14	0.45

Table 2: Outcomes in the study population

Characteristic	GROUP I (IWMI)	GROUP II (IWMI /RVMI)	P value
Atrial fibrillation	6	39	<0.001
Cardiogenic Shock	3	30	<0.001
I–III° AV block	4	25	<0.001
TPI	2	29	<0.001
ICCU stay > 7 days	4	25	<0.001
Death	2	10	<0.01

DISCUSSION

A passive gradient from an expanded venous system and an active right atrial contraction were thought to be able to provide pulmonary flow despite the lack of right ventricular contraction, according to earlier studies of right ventricular function.[10] In spite of intact global left ventricular systolic function, acute RVMI induces significant right heart failure, clear lungs, and low output hypotension. It gradually became clear that right ventricular systolic dysfunction has significant hemodynamic repercussions. Due to its ease of use, high sensitivity, and specificity, V4R recording is poised to become an essential component of the early assessment and electrocardiographic investigation of acute IWMI.[11]

Wehe studied 200 patients to assess the prognosis and clinical profile of acute IWMI with RVMI compared to isolated acute IWMI, its impact on ACS management, and the associated prognostic significance. The mean age of patients for Group I was 61.2±5, and for Group II was 61 ± 10 years with male preponderance, which is consistent with findings of earlier studies of a similar nature.[12-15] In the current study, smokers made up 200 individuals in total, with 70% in Group I and 60% in Group II, and this was comparable to findings described by Iqbal et al. and Khan et al.[12,15]

In this study, patients with group II (IWMI +RVMI) had significant hypotension, elevated JVP, and frequently declared to Killip class IV than patients without RVMI, ECHO findings: TAPSE ≥ 1.5, myocardial performance index (MPI)-TDI≥0.69, S′ velocity ≤ 12.3, Cardiac enzymes: average troponin T ≥ 42 ug/dl, average NT-pro BNP≥1900 had a higher range in RVMI patients. A further finding of the current investigation was that individuals with RVMI had a considerably higher incidence of a cardiogenic shock than those without RVMI involvement. Electrical problems were more likely to occur in patients with inferior MI and RVMI. In addition, individuals with RVMI required TPI more frequently and were longer in the ICCU than patients with isolated IWMI. Patients in group II (RVMI) had greater in-hospital mortality rates.

Chockalingam et al,[16] reported that 50 (37%) of the 135 individuals with IWMI had right ventricular involvement, while Ravikeerthy et al,[13] found that the prevalence was 30%, Iqbal et al. reported that 16 (32%) of the 50 inferior walls MI cases they evaluated displayed symptoms of RVMI. As a result, the author's conclusions about the prevalence of RVMI in IWMI strongly support the data that are already accessible.

Khan et al,[15] examined 50 acute IWMI and found that most patients' systolic blood pressure remained steady, with a mean SBP of 113±35mmHg and a mean diastolic blood pressure of 73±17mmHg. El Sebaie et al. examined 76 patients with substantial RCA lesions, dividing them into 43 patients with proximal RCA stenosis and 33 with distal RCA stenosis. They discovered non-significant differences between the systolic and diastolic blood

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pressure groups.[17] Therefore, it appears that RVMI in IWMI is unaffected by blood pressure. Additionally, there was no significant difference in hypertension levels among the groups in this investigation.

Complications such as atrial fibrillation, cardiogenic shock, I–III° AV block, TPI, ICCU stay > 7 days, and death were significantly inferior in patients with isolated IWMI than those with RVMI. This is in line with the findings reported by Memon et al. and Khan et al,[14,15] But it was not consistent with the results reported by Iqbal et al.[12] In the present study, deaths reported as 10% had associated RVMI and 2% isolated IWMI. In a study of 50 acute IWMI cases, Ravikeerthy et al. reported that patients with associated RV infarction (RVMI) had a mortality rate of 15%. In contrast, those with isolated inferior wall MI (IWMI) had a mortality rate of 3.33%.[13] According to George et al., patients with IWMI had a mortality rate of 12%. Still, those with right ventricular involvement had a mortality rate that was much higher at 28%.[18] In-hospital mortality was more than twice as high in the RVMI Group compared to the control group, according to Memon et al.[14] Thus, it is possible to conclude that patients with IWMI are more likely to experience problems and die when the right ventricle is affected.

CONCLUSION

Therefore, it may be concluded that patients with inferior wall MI have a higher risk of complications and fatality when the right ventricle is involved. A routine of adequately aggressive therapy is initiated in response to early RVMI identification and risk classification of persons with an associated RVMI in order to manage the elevated risk of life-threatening arrhythmic outcomes.

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