FREQUENCY OF RIGHT VENTRICULAR INFARCTION AMONG PATIENTS PRESENTING WITH ACUTE INFERIOR WALL MYOCARDIAL INFARCTION


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ABSTRACT

Objective: To determine the frequency of right ventricular infarction among patients with acute inferior wall myocardial infarction.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: Ayub Teaching Hospital, Abbottabad from, Jan 2017 to Sep 2017.

Methodology: A total of 163 patients aged 18-75 years and admitted to coronary care unit (CCU) with first attack of acute inferior wall myocardial infarction, were recruited through non probability purposive sampling. Electrocardiogram and Echo were performed of all patients and their findings were noted for the frequency of right ventricular infarction in acute inferior wall myocardial infarction.

Results: There were 117 (72%) males and 46 (28%) females. Patients were stratified according to their age in four groups i.e. 13 (8%) patients were less than 40 years of age, 26 (16%) patients were aged between 41 and 50 years, 46 (28%) patients were between 51 and 60 years of age and 78 (48%) patients were above 60 years of age. Mean ± SD was 60 ± 1.28. Out of 163 patients, 44 (27%) had right ventricular infarction while 119 (73%) did not have right ventricular infarction.

Conclusion: The frequency of right ventricular infarction among patients presenting with acute inferior wall myocardial infarction was 27%.

Keywords: Acute inferior wall myocardial infarction, Right ventricular infarction.

INTRODUCTION

Coronary artery disease (CAD) is a major health hazard around the globe and has now become the most common cause of death in the civilized word1,2. It is responsible for an approximately 7.2 million deaths per year or 12% of all deaths in the western countries and thus is a major cause of morbidity and mortality worldwide3. In 2014 alone, it caused 9.87% of all deaths in Pakistan, and the numbers are expected to increase in future4. Given the high disease burden, acute myocardial infarction has remained a principal focus of cardiovascular therapeutics.

Among CAD, Right ventricular infarction (RVI) was considered a less important and less common entity in the past. However, in recent year RVI has been increasingly demonstrated due to more advanced techniques and guidelines1. Also, right ventricular dysfunction after myocardial infarction is a poor prognostic marker, as it is associated with increased in-hospital mortality and morbidity5,6.

Occlusion of left circumflex branch (LCX) or right coronary artery (RCA) is the major reason for acute inferior myocardial infarction (AIMI). The infarct-related artery (IRA) of acute inferior myocardial infarction can significantly influence the disease progression of AIMI patients. When RCA shown to be the IRA, patients often undergo right ventricular infarction, intermittent cardiac pacing, as well as severe hemodynamic complications, leading to shock, arrhythmias, and even death. However, the prognosis for those with LCX occlusion is much better. Unfortunately, the RCA shown to be the culprit artery in AIMI is much more common than the LCX7.

An electrocardiogram (ECG) is the first diagnostic test performed in patients complaining
of chest pain. If the left ventricle is involved, evidence of inferior lead ischemia/infarction in leads II, III, and AVF is likely to be present. Disproportionate ST-elevation in lead III>II is pathognomonic for RVMI and warrants further investigation. ST elevation in the V1 lead is also highly suspicious for RVMI and is even more specific when coupled with ST-depression in lead V2. Overall, conventional left sided electro-cardiography is a poor indicator of RV ischemia/infarction due to the position of the right side of the heart. If right side dysfunction is suspected, a right-sided ECG is the most sensitive and specific, as ST elevation in V4R >1.0 mm has 100% sensitivity, 87% specificity, and 92% predictive accuracy. Conduction abnormalities such as right bundle branch block, bradycardia, or complete heart block can also manifest themselves in the ECG but may also be non-specific8-10.

Echocardiography has a high threshold for detecting right-sided myocardial dysfunction, and its increasing availability and fidelity has made it a rising diagnostic modality in a variety of settings such as the emergency department and the operating room. Findings on echo suggestive of RVI include studying right ventricular size, function and contractility11.

Early reperfusion is the mainstay of treatment in these patients. Reperfusion not only promotes right ventricular function recovery, but also prevents the development of complications and improves survival12.

The recent study was designed to determine the frequency of RVI among patients with acute inferior wall myocardial infarction. Firstly, no similar study was performed locally, and this study provided data for the local guideline making. Secondly, there is limited data available about the adverse outcome of AIMI in terms of RVI.

METHODOLOGY

It was a descriptive cross sectional study conducted from January 2017 to September 2017 in the department of cardiology, Ayub Teaching Hospital, Abbottabad. A total of 163 patients aged 18-75 years and admitted to CCU with first attack of acute inferior wall myocardial infarction, were recruited through non probability purposive sampling. Patients with any previous history of heart failure or ischemic heart disease or myocardial infarction, patients with acute pericarditis and/or acute myocarditis were excluded from the study to control confounding. Sample size was calculated using 27% percentage of right ventricular infarct post IAMI, and with 95% confidence interval and 5% margin of error.

The diagnosis of Acute Inferior Wall MI was made on the basis of characteristic retrosternal chest pain radiating to left shoulder or jaw and not relieved by intake of nitrates and elevated serum troponin levels of more than 0.1 ng/dl measured in the laboratory and ECG showing an ST segment elevation of >1.0 mm in limb leads II, III, aVF. Right ventricular infraction (RVI) was diagnosed on echocardiography findings i.e. evidence of right ventricular akinesia/hypokinesia/dilatation or development of new tricuspid regurgitation. Patients with any of these findings were considered to have RVI.

After obtaining the approval from hospital’s ethics and research committee, an informed written consent was taken from the patients and the details of the study were explained to them. Then, a complete history and physical examination was performed on all patients included in the study. Next, ECG and Echocardiographic studies were performed on all patients and their findings were recorded on a pro forma. All investigations were done by the same cardiologist having atleast 5 years’ experience.

Data collected was analyzed using SPSS version-22. Frequency and percentage were calculated for categorical variables like gender and RVI. Means and SD was calculated for numerical variable like age. RVI was stratified among age and gender to see the effect modifications. All results were presented in the form of tables and graphs.

RESULTS

A total of 163 patients were observed in this study conducted at the department of cardiology
Ayub Teaching Hospital Abbottabad. There were 117 (72%) males and 46 (28%) females. Patients were stratified according to their age in four groups i.e. 13 (8%) patients were less than 40 years of age, 26 (16%) patients were aged between 41 and 50 years, 46 (28%) patients were aged between 51 and 60 years of age and 78 (48%) patients were above 60 years of age. Mean ± SD was 60 ± 1.28.

Table-I: Frequency of right ventricular infarction in acute inferior wall myocardial infarction (n=163).

<table>
<thead>
<tr>
<th>Right Ventricular Infarct</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>44 (27)</td>
</tr>
<tr>
<td>No</td>
<td>119 (73)</td>
</tr>
<tr>
<td>Total</td>
<td>163 (100)</td>
</tr>
</tbody>
</table>

Out of 163 patients, 44 (27%) had right ventricular infarction while 119 (73%) did not have RVI. Some of the results are shown in the tables. When the frequency of RVI in IWMI was stratified by age groups (p-value = 0.997) or gender may be due to the fact that they used cardiac MRI which is more advanced compared to echo in diagnosing RVI. They also observed that gender had no effect on RVM frequency which is in accordance with our study.

Iqbal et al\textsuperscript{15}, observed that the frequency of RVM\textsubscript{i} was 48.5% among patients presenting with IWMI. They enrolled 198 patients with acute inferior wall MI in their study, and used ECG criteria for diagnosing RVI. In addition, they also reported that right ventricular infarct in IWMI patients results in two folds higher mortality.

Pfisterer et al\textsuperscript{16}, had shown that the frequency of RVI in the inferior wall myocardial infarction (IWMI) was 33.2%. His study concluded that among patients with IWMI, highest mortality was found in those patients who were complicated by either complete heart block or bundle branch block. Another similar study conducted by Holman et al\textsuperscript{17}, they reported that complete heart block was the most significant factor in defining poor outcome though reperfusion therapy tend to improve this.

A study conducted in Karachi Pakistan had shown that 23.6% of the patients with inferior wall MI had high degree AV block while 37.7% had right ventricular infarction\textsuperscript{18}. They had concluded that advancing age and late presentations were significant risk factors for high degree AV block with resultant worse mortality.

Right ventricles are mostly supplied by the right coronary artery (RCA), and it is when its proximal portion is occluded that the right

\begin{table}[h]
\centering
\caption{Frequency of right ventricular infarction in acute inferior wall myocardial infarction (n=163).}
\begin{tabular}{|c|c|}
\hline
Right Ventricular Infarct & n (%) \\
\hline
Yes & 44 (27) \\
No & 119 (73) \\
Total & 163 (100) \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Stratification of right ventricular infarction in acute inferior wall myocardial infarction with age (n=163).}
\begin{tabular}{|c|c|c|c|c|c|}
\hline
RVI & <40 years & 41–50 years & 51-60 years & 60 years & Total & p-value \\
\hline
Yes & 4 & 7 & 12 & 21 & 44 & 0.997 \\
No & 9 & 19 & 34 & 57 & 119 & \\
Total & 13 & 26 & 46 & 78 & 163 & \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Stratification of right ventricular infarction in acute inferior wall myocardial infarction with gender (n=163).}
\begin{tabular}{|c|c|c|c|}
\hline
RVI & Male & Female & Total & p-value \\
\hline
Yes & 32 & 12 & 44 & \\
No & 85 & 34 & 119 & 0.873 \\
Total & 117 & 46 & 163 & \\
\hline
\end{tabular}
\end{table}

(p-value=0.873), the results were found to be statistically insignificant.

**DISCUSSION**

Acute right ventricular myocardial infarction (RVM\textsubscript{i}) is a common complication affecting 30 (50%) of patients after inferior wall myocardial infarction (IWMI)\textsuperscript{13}.

We investigated the frequency of right ventricular infarct in patients with acute inferior wall myocardial infarction, and it was found to be 27%. A similar study was performed by Jensen et al\textsuperscript{14}, who reported a higher frequency of RVM\textsubscript{i} i.e. 47%. One reason for their higher frequency
Frequency of Right Ventricular Infarction

ventricular infarct develops. RVI, when develop, leads to reduced RV contractility, leading to hemodynamic compromise. The overall situation can further be complicated by bradyarrhythmias. Treatment involves reperfusion therapies and volume resuscitations. However, even in the absence of reperfusion therapies, right ventricles may still recover with spontaneous recovery of RV function, though recovery is usually slow and has a higher in-hospital mortality.19,20

This study is not without certain limitations. Firstly, we did not obverse the frequency of in-hospital mortality of RVI. Secondly, other associations like diabetes, hypertension and cigarette smoking were not looked into and their relationship with the RVI was not studied. Finally, RVI with inferior wall MI is known to cause complications like complete heart block and cardiogenic shock. We neither documented these complications nor observed their correlation with age or gender.

CONCLUSION

The frequency of right ventricular infarction among patients presenting with acute inferior wall myocardial infarction was 27%.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFERENCES


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