

# INCIDENCE OF RIGHT VENTRICULAR INFARCTION IN PATIENTS WITH ACUTE INFERIOR WALL INFARCTION

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## ABSTRACT

**Objectives:** To find out the frequency of right ventricular infarction (RVI) in patients with acute inferior wall myocardial infarction and also to see its clinical correlation and prognostic value.

**Methods:** 198 consecutive patients with acute inferior wall myocardial infarction (MI) were enrolled. Elevated ST segments in V4R or V3R to V6R were used to diagnose RVI. We assessed the incidence of ST-segment elevation in these leads and their correlation on clinical ground.

**Result:** In 96 patients (48.5%), RVI was present. Clinical correlation showed that raised JVP was present in 58.5% and raised JVP with hypotension in 34.5% of patients. Normal JVP was present in 41.5% of patients in which 22% of patients were with hypotension and 20% of patients were without clinical findings. Hypotension observed in 53% of patients. Complications were higher in patients with elevated ST segments in V4R (51%) in contrast to those without RVI (21%). In-hospital mortality was more than double in RVI Group.

**Conclusion:** RVI in acute inferior MI is common. Elevated ST segments in V4R or V3R to V6R can be used to diagnose RVI. Clinical correlation can help but may not be diagnostic and it has higher mortality compared to inferior MI alone.

**Key Words:** Myocardial Infarction, Acute Inferior Wall Myocardial Infarction, Right Ventricular Infarction

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## INTRODUCTION

Myocardial infarction is a segmental disease of myocardium with a focal occlusion of one of three large coronary arteries (CA) or its branches during any particular event resulting in impairment of contractility restricted to the affected segment<sup>1</sup>. Irreversible cardiac damage is sustained if coronary artery is completely obstructed for at least 15 - 20 minutes, maximally in the areas at risk when it lasted for 4 - 6 hours, but most of the damage occurs in first 2- 3 hrs<sup>2,3</sup>.

The susceptibility of cardiac tissue to suffer necrosis depends on existing collateral flow<sup>4</sup>. Major cause of myocardial infarction (MI) is atherosclerotic coronary artery disease (CAD). It contributes to arterial stenosis, increased tendency for rupture of plaque and development of clot<sup>5-7</sup>. Until recently MI was considered a disease of left ventricle (LV) only<sup>8</sup>. Right ventricular infarction is characterized by decreased cardiac index (<2.5L/m<sup>2</sup>), with normal or decreased LV filling pressure and elevated RA pressure. (>10 mmHg) in patients

with inferior MI<sup>9,10</sup>. Clinically significant RVI is characterized by elevated JVP, clear lungs and systemic arterial hypotension<sup>11</sup>. It is usually caused by proximal R.C.A occlusion before its RV branch. Recently the frequency of its detection in patients with inferior wall MI is increased<sup>12</sup> due to early recognition of clinical findings of RVI and exclusion of related differential diagnoses.

Several factors are important in patients with RVI regarding hemodynamic and electro-cardiographic manifestations. These include the magnitude of infarction of right ventricle, the functional status of tricuspid valve and conduction from atria to ventricles.<sup>13</sup> Neuro-humoral signaling and control is also considered to be significant.

The presence of elevated ST-Segments in right precordial leads V3R to V6R especially in V4R may signify RVI<sup>14</sup>. Its diagnostic accuracy, sensitivity and specificity also been proved. Being freely available and relatively least expensive, ECG may be considered an important diagnostic tool of RVI.

The present study was aimed to determine ST-Segment elevation in right precordial leads in patients with pertinent clinical findings to find out the frequency of RVI at our centre Liaquat Medical College Hospital, Hyderabad<sup>14</sup>. Its importance also lies in the fact, that having made a correct diagnosis, more appropriate treatment can be instituted quickly to avoid hypotension i.e. IV fluid and aggressive thrombolysis can be given because of higher mortality in this group of patients<sup>15,16</sup>.

**METHODOLOGY**

During the period of November 1996 to November 1997, 198 patients of different ages and gender presenting with acute inferior wall MI admitted in coronary care unit of Liaquat Medical College Hospital, Hyderabad, were enrolled.

Electrocardiographic evidence was main criteria for diagnosis of RVI in all patients of inferior MI. A standard twelve lead ECG with right precordial leads V1R to V6R was performed in all patients. Lead V1R was placed at right sternal border in the fourth interspace, V2R left sternal border, V4R at the right mid-clavicular line in the fifth interspace. V3R mid-way between V2R and V4R. V5R (at the horizontal level of V4R) in the right anterior axillary line, V6R (at the horizontal level of V4R) in the right mid axillary line. All electrocardiograms standardized to 1mV. Definition of RVI was made by ST elevation of > 0.1 mV or Q wave in all or any one of the lead from V3R to V6R.

Clinical assessments were made on admission to correlate clinical features of RVI with electrocardiographic finding i.e. Raised JVP was defined as the patient at 45° position and visible pulsations of right internal jugular

vein above the clavicle).

Bio Statistical analysis of original study worked out on Chi-square method. P-value was considered significant if less than 0.05.

**RESULTS**

In our study of 198 patients with acute inferior wall myocardial infarction, the incidence observed on clinical grounds is reported as follows,

(a) Electrocardiographic Finding:

Among 198 patients of acute inferior wall MI, ECG performed at the time of hospitalization showed elevated ST segments in lead V4R in 96 patients (48.5%) and elevated ST segments in leads V3R to V6R in 80 of patients (40.9%). The age range of patients with RVI were 37 years to 70 years, mean age = 52 years. Out of 96 patients with RVI, 19 patients were female and 77 patients were male (1:4).

(b) Complications of acute inferior wall myocardial infarction

In our study of 198 patients with acute inferior MI 72 patients (36.5%) developed complications, among them 49 patients (50.5%) suffered RVI and 23 patients (22.5%) were without RVI. 18 patients developed shock (14 patients (14.5%) with RVI and 4 (4.1%) patients were without RVI), 26 patients developed conduction block (18 patients (18.7%) in those with RVI & 8 patients (7.8%) in those without RVI), 17 patients developed VF (10 patients 10.5% were with RVI 7 patients 7.0% without RVI). 10 patients developed tachyarrhythmia, (6 patients (6.25%) were with RVI & 4 patients (4.0%) without RVI). One patient developed TR.

**Table 1: Electrocardiographic incidence**

Right Precordial ST- Segment Elevation	No: of Patients	Percentage
Segment Elevation In leads V4R	96	48.5%
ST- Segment Elevation In leads V3R to V6R	80	40.4%

P value > 0.23

**Table 2: Clinical correlation with JVP and B.P**

Findings	With Hypertension without Shock	With Hypertension & shock	With Normal B.P	Total
Raised JVP	32	14	10	56
Normal JVP	21	0	19	40
	53	14	29	96

P value <0.001

**Table 3: Complications of acute inferior wall myocardial infarction**

Complication	Total	With ST elevation (V4R) n=96	Without ST elevation n=102	P- value
C- Shock	18	14 (14.5%)	4 (4.1%)	NS
Conduction Blocks	26	18 (18.7%)	8 (7.8%)	P> 0.83
Ventricular Fibrillation	17	10 (10.5%)	7 (7.1%)	NS
Tachyarrhythmia's	10	6 (6.2%)	4 (4.1%)	NS
TR	1	1 (1.1%)	0 0	
	72	49 (50.5%)	23 (22.5)	

P value > 0.62

## DISCUSSION

Standard ECG does not show specific changes to diagnose RVI<sup>16</sup>. It was observed that in lead V elevation of ST- Segment might be a marker of RVI. However its diagnostic yield was not further validated<sup>17</sup>. It was also demonstrated that patients with inferior wall MI and having elevated ST-segments in lead V4R are at greater risk of associated RV involvement. This finding was statistically significant regarding clinical parameters ( $p < 0.001$ ), scinti-graphically ( $p < 0.001$ ) and on echocardiography ( $p < 0.02$ ).

In our study of 198 patients, the frequency of RVI on the basis of elevated ST Segments in right precordial leads i.e. V4R was 48.5% and in leads V3R to V6R, it was 40.5%. Masami K et al,<sup>18</sup> showed ECG evidence of RVI as the most accurate, simple and easiest with an incidence of 30-50%.

So in our study we just observed and detected those patients of inferior MI having elevated ST Segments in right precordial leads. A clear correlation was found as in other studies around the world. Croft et al corrected the electrocardiographic evidence of RVI with radio-nucleotide studies and reported that elevated ST Segments in one or more right precordial leads showed increased sensitivity of 90% and specificity of (91%) in recognizing patients having RVI<sup>18</sup>.

In patients with inferior wall MI the incidence of RVI was found to be 30%, based on ECG evidence of ST-Segment elevation in V4R, in the study by Croft CH et al<sup>19</sup>. Recently electrocardiographic evidence of RVI was proved by four diagnostic procedures i.e. autopsy, coronary angiography, technetium 99m and hemodynamic measurements. An incidence rate of 54%<sup>20</sup> was reported based on elevated ST-segments in lead V4R. Its sensitivity was shown to be 88%, specificity 78% and diagnostic accuracy 87%.

In a largest prospective study, based on coronary angiography, elevated ST-segments in lead V4R was present in 32% of all patients with acute inferior wall MI<sup>21</sup>. Though incidence of RVI in our study was only based

on electrocardiographic evidence of RVI, no any other criteria used, still it was matched with various other studies.

## CONCLUSION

RVI in acute inferior wall MI is common. Elevated ST segments in V4R or V3R to V6R can be used to diagnose RVI. It would be desirable to include right precordial leads specially V4R in the routine ECG in all patients with inferior wall MI. Right ventricular dysfunction in often difficult to detect at the time of admission based on clinical parameters. Raised JVP and low BP can be considered for suspected RVI but their absence cannot exclude it. The detection of syndrome of RVI is vital as far as its management is concerned to reduce complications and mortality.

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#### CONTRIBUTORS

AGM and SB participated in design of study, data analysis and manuscript writing. MIS and BRD, helped in data management. All authors contributed significantly to the final manuscript.