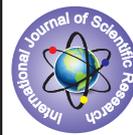


“INCIDENCE AND CLINICAL PROFILE OF RIGHT VENTRICULAR INFARCTION IN INFERIOR WALL MYOCARDIAL INFARCTION”.



Medical Science

KEYWORDS: Electrocardiography, Right ventricular infarction, Acute myocardial infarction

Dr. MARLA ASHOK KUMAR

Assistant Professor, Department of General Medicine, Gandhi Medical College, Secunderabad.

Dr. VEMULA RUSHENDRA KUMARI

Assistant Professor, Department of General Medicine, Gandhi Medical College, Secunderabad.

DR. B. LAXMI PRASANNA

Civil Assistant Surgeon, Hyderabad

ABSTRACT

Background and objectives: Acute right ventricular myocardial infarction complicates inferior wall myocardial infarction with an incidence of 14-84%. ECG is the cornerstone in diagnosis as it is cost effective and done easily. Hence we aimed to study right ventricular infarction in acute inferior wall myocardial infarction using right precordial leads. **Methods:** Present study is based on the analysis of 100 patients admitted to AMC and ICCU of the Gandhi General Hospital during January 2014 to September 2015, with acute inferior wall MI. 12 lead ECG with thorough physical examination was done along with right precordial mapping. ST > or =1mm in any one RPL was diagnostic of RVI. Results: A total of 31% patients showed RVI. 32.26% of patients of RVI presented with bradycardia, 9.68% Kussmaul's sign, 16.13% with complete heart block. Mortality in RVI was 10 times higher than without RVI (2.77%). **Interpretation and conclusion:** Clinical signs and symptomatology are not fully diagnostic of RVI in inferior wall acute MI. ECG can diagnose (using right precordial mapping) this condition very early. Early diagnosis will help in careful monitoring and management of such cases. physical examination was done along with right precordial mapping. ST > or =1mm in any one RPL was diagnostic of RVI. **Results:** A total of 31% patients showed RVI. 32.26% of patients of RVI presented with bradycardia, 9.68% Kussmaul's sign, 16.13% with complete heart block. Mortality in RVI was 10 times higher than without RVI (2.77%). **Interpretation and conclusion:** Clinical signs and symptomatology are not fully diagnostic of RVI in inferior wall acute MI. ECG can diagnose (using right precordial mapping) this condition very early. Early diagnosis will help in careful monitoring and management of such cases.

Introduction

Acute myocardial infarction is one of the commonest diagnoses, presenting with chest pain. It results from coronary artery atherosclerosis. Mortality with acute infarction is approximately 25% with slightly more than half of deaths occurring before the individual reaches the hospital. Hence it demands urgent management and careful monitoring¹.

Right ventricular infarction complicates upto half of inferior left ventricular infarctions. Suspicion is warranted in any patient with such an infarction. Early accurate diagnosis is imperative². For early diagnosis, electrocardiogram can provide the first clue that right ventricle is involved in such a patient with inferior wall ST-segment elevation myocardial infarction³.

Once diagnosed, right ventricular infarction management differs substantially from the routine management of left ventricular infarction.

This study is directed towards identifying right ventricular myocardial infarction in our hospital setting using right precordial electrocardiography.

Nuclear imaging techniques and invasive haemodynamic studies are still premature in many centers. ECG has always been the first investigation of choice which is easy and cost effective. This makes the present study relevant.

OBJECTIVES

1. To study right ventricular infarction in inferior wall myocardial infarction with reference to ECG manifestation.
2. To correlate ECG manifestations with echocardiographic findings wherever feasible.

METHODOLOGY

This study is based on the analysis of 100 patients admitted to the AMC and ICCU of the Gandhi Hospital during a period from January 2014 to September 2015.

CRITERIA:

Only patients with definite evidence of inferior wall Myocardial infarction as shown by 12 lead ECG were included in this study. For patients with inferior wall infarction additional right precordial leads were taken at the time of admission. 12 lead ECG machine was used and the recordings were made at 25 mm/sec speed and 1mv = 10mm setting.

Right precordial leads (RPL) were applied on the right precordium on the areas to which the leads corresponded on the left.

CRITERIA FOR DIAGNOSING RVI:

Elevated ST segment of >1 mm in atleast one of the right precordial leads (RPLs).

Echocardiography was performed in all cases.

INCLUSION CRITERIA:

All the patients with definitive evidence of acute inferior wall myocardial infarction as proved by 12 lead electrocardiography with right precordial leads and duration of chest pain less than 24 hours were considered in our study.

EXCLUSION CRITERIA:

1. ECG evidence of LBBB.
2. History of previous myocardial infarction
3. Corpulmonale
4. Suspected pulmonary embolism
5. Associated pericardial disease

A detailed case history was taken and careful physical examination was done with special reference to raised jugular venous pulse (JVP), Kussmaul's sign, hypotension,

S3/S4 and cardiac murmur. Lead II ECG monitoring was done during the stay in ICCU for the identification of arrhythmias and conduction blocks. Routine serum investigations like RBS, serum cholesterol, Blood urea nitrogen, triglycerides; along with serum enzymes CKMB,

was done at the time of admission. Echocardiography and Angiography was done wherever feasible.

Acute Myocardial infarction was treated with or without thrombolytic therapy. In cases with RV infarction who were haemodynamically compromised volume loading using normal saline (and inotropics in unresponsive cases) was done. Arrhythmias were treated accordingly.

RESULT AND OBSERVATION

Out of a total of hundred patients of acute inferior wall myocardial infarction, right ventricular infarction was associated in thirty one patients (31%) and sixty nine (69%) had inferior wall infarction without right ventricular infarction.

**TABLE - 1
DISTRIBUTION OF CASES ACCORDING TO THE SITES IN INFARCTION**

Type of Infarction	Positive for RVI	Negative for RVI	Total
Inferior	24	40	64
Inferolateral	2	14	16
Inferior and true posterior	5	15	20
Total	31	69	100

Right ventricular infarction in 31% cases positive for right ventricular infarction were more common in inferior wall infarction while it was less common in inferolateral wall infarction. There were 100 cases of inferior wall myocardial infarction out of which 31 were positive for RVI out of 16 cases of inferolateral infarction. Out of 20 cases of inferior and true posterior infarction, 5 cases were positive for RVI . Comparison of the two groups showed no significant differences in any of the observed characteristics.

**TABLE - 2
AGE GROUPING**

AGE GROUP	WITH EVIDENCE OF RVI		WITHOUT EVIDENCE OF RVI		TOTAL % N = 100
	N=31 (RVI)	%	N= 69 (NRVI)	%	
25-40	4	12.9	12	17.4	16
41-50	4	12.9	18	26.08	16.22
51-60	13	41.92	18	26.08	31
60-70	8	25.80	15	21.73	23
>71	2	6.45	6	8.70	8

The age incidence was more between the age group 51-60 years followed by 41- 50 years in both groups. In 51-60 years, 13 cases (41.92%) had RVI whereas 18 (26.08%) cases did not have RVI.

It was observed that 70 cases among 100 studied cases were males. In patients having RVI 20 (64.52%) cases were males and 11 (35.48%) cases were females. The male cases pre-dominated in both groups (64.52 and 72.46%).

**TABLE - 3
SYMPTOMATOLOGY AT THE TIME OF PRESENTATION**

SYMPTOMS	WITH EVIDENCE OF RVI		WITHOUT EVIDENCE OF RVI		TOTAL % N = 100
	N=31 (RVI)	%	N= 69 (NRVI)	%	
Chest pain	27	87.1	65	94.2	92
Sweating	16	51.61	37	53.62	53

Vomiting	10	32.25	21	30.43	31
Breathlessness	3	9.67	14	20.28	17
Palpitation	1	3.22	2	2.89	3
Syncope	4	12.9	1	1.44	5

The most common mode of presentation in both groups (with or without RVI) was chest pain (92 cases, 87.1 and 94.2% respectively). Only 4 patient with RVI and 4 patients without RVI did not have chest pain. Syncope was seen in 4 patient in RVI group and 1 patients NRVI group. Sweating was the next common symptom(16 patients, 51.61% in RVI and 37 patients , 53.62% in NRVI).

Smoking was the major risk factor present in both groups (42% in total, 38.7 and 43.47 % respectively). Followed by hypertension (35.48% and 42.02%).

There was no significant difference in presence of diabetes and hypertension in both groups. 19% patients had hypercholesterolemia.

It was observed that hypotension was more common in RVI group (32.36%) than patients without RVI (NRVI) (4.35%). Elevated JVP was also more common in patients with RVI (RVI group) (35.48%). Kussmaul's sign was observed in 3 patients the RVI (9.68%), but not observed in group NRVI. Also,

Bradycardia (PR <60) was present in 32.36% patients in RVI group which was found to be significantly higher in RVI group as compared to 2.9% in RVI group.

It was observed that patients with RVI had high degree AV block more commonly 5 cases (16.13%) as compared with NRVI group1 (1.45%).

Bradyarrhythmia was found in 10 cases(31%) in RVI group has compared to 5 (7.1%) in NRVI group.

It was observed that CK-MB was significantly raised in around 50% of cases in both the groups with a difference of around 10% in both the groups. Hyperglycemic state was observed 32.36% in RVI group as compared to 26.09% in NRVI group.

32.36% of RVI group patients were treated by volume loading as compared to only 5.80% in NRVI group. A total of 61% cases were thrombolysed with streptokinase. Cardiogenic shock was the cause of death for 4 case in RVI,5 patients in NRVI group.

3 patients (9.68 %) died of CHB which did not respond to other measures. Ventricular fibrillation caused death in 2 patients in NRVI group.

A high mortality of 22.58% was observed in RVI group as compared to 2.77% in non RVI group.

DISCUSSION

Right ventricular (RV) infarction rarely occurs in isolation, with approximately between one-third and half of the patients with inferior-wall myocardial infarction (IWMI) having some RV involvement. The reported incidence of RV infarction varies widely, depending on the criteria and methodology of the study in question. In 1982, simple ECG criteria for the diagnosis of this condition were defined which have proved to be both highly specific and sensitive. Overgaard et al in 2002 reported the incidence of right ventricular infarction is 23.7% of patients (384 patients, out of 1619 patients) in patients with inferior wall MI with the mortality rate of 8.1% in patients with associated right ventricular infarction.

The incidence of right ventricular infarction associated with inferior wall myocardial infarction in chapra et al was 32%. In the present study it was 31%.

This is comparable with the incidence described in other studies. The incidence in present study corroborates well with the other studies. Criteria of exclusion used were similar to those employed by Saran et al5.

Only patients who arrived within 24 h of onset of chest pain were included in this study. The incidence in the present study is lower than 52.73% which is reported by Klein et al6.

This could be due to the fact that the patients in the series by Klein et al85 were reported within 10 hr of the onset of symptoms, whereas in this study it is up to 24hr. Since Klein et al found that ST deviation in V4R is a very transient finding and sometimes it disappeared within 2 hr after the onset of chest pain. In our series ST elevation of 1 mm or more in leads V3R and V4R suggests infarction,

while Klein et al considered ST elevation of 0.5 mm or more as an evidence of right ventricular infarction.

Several other factors also influence the degree of ST elevation in V3R and V4R.

- 1) It will be expectedly less prominent in right precordial leads, if it is not prominent in leads II, III and avF.
- 2) ST segment in V3R and V4R is rightward as well as anteriorly oriented vector. Thus ST deviation seen in leads V5 & V6 produced by lateral wall extension of myocardial infarction could cancel out ST elevation in V3R & V4R.
- 3) ST elevation indicates transmural ischaemia rather than infarction.

All patients with previous history of myocardial infarction were excluded as per the criteria of exclusion applied in this study. Similar findings have been observed earlier in other studies.

In present study, average age of incidence was 52 years in RVTMI group, and 60 years in the NRVTMI group. S. Khan et al7 reported 100 cases of IWMI in which 86% were males and 14% females [20]. In our study, males predominated in RVTMI and non-RVTMI groups, 62% and 60% respectively.

In this study males contributing to 80 % which is comparable with other studies.

Smoking was the major risk factor present in both groups (38%, 43%). Other studies have showed a much higher incidence, with a 96% in S. George et al, 43.7% in D.A. Chhapra et al.

On comparing the complications in both the groups, Patients with right heart failure had more incidences of arrhythmia 12 out of 31 had arrhythmias in group RVI that is 38.70%. 5 patients developed complete heart block, 1 patient developed second degree heart block, 2 patients developed sinus tachycardia, and 4 patients developed sinus bradycardia. 11 out of 69 patients in group B developed arrhythmias (15.6%). 4 patients developed sinus tachycardia, 4 patients developed sinus bradycardia, 1 patient developed complete heart block and 2 patients developed VT.

Our findings are comparable with those reported by Braat et al8 & Garg et al9 several other series have reported a high incidence of IIO and IIIIO atrioventricular block associated with right ventricular infarction.

Complete Heart block was present in 31% of the cases as reported by Lloyd et al. In our study 16.13% cases showed this finding in RVI group. Only 1.45% of patients without RVI had complete heart block. This shows a significant risk in patients with RVI to develop complete Heart block. Cardiogenic shock was observed in 4 of 31 patients in the present study with a percentage of 7.14% which is comparable to

Shah et al, 1985 study whose incidence is 9%. In our study 32.26% of cases with RVI were treated with volume loading but the number of patients taken for thrombolysis was higher in patients without RVI (71% as compared to 38%). Most of the cases of RVI were not suited for thrombolysis due to associated complications.

Mortality rates in S.George et al were 28% in RVTMI group, and 12% in NRVTMI group. S. Khan et al observed in-hospital mortality (23.5%) was higher in RVTMI group than isolated IWMI (18.1%) Mortality rates in RVI were found to be high. In our study it was 22.58% as compared 2.77% in patients without RVI which was statically significant difference.

CONCLUSION

In patients with MI, especially those with IWMI, RV involvement is an important contributor to shock, which significantly increases the risk of mortality.

Although volume loading has long been considered the cornerstone of management in these cases, we can apprehend the harmful aspects of this therapy by understanding its effect on the interventricular septum.

Early successful reperfusion, especially using revascularization, contributes to the recovery from shock associated with RV infarctions, which thus results in an improved prognosis.

The maintenance of an adequate heart rate and atrioventricular synchrony is another key factor for sustaining a sufficient cardiac output in patients with RV infarction.

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