

To Know the Frequency of Right Ventricular Infarction in Patients with Inferior Wall Myocardial Infarction

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ABSTRACT

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

Study Design: Retrospective study

Place and Duration of Study: This study was carried out in Department of Medicine at Civil Hospital Karachi from 1st November 2011 to 30th April 2012.

Materials and Methods: In this study 65 adult patients of either sex with ECG evidence of inferior wall infarction were enrolled who were admitted in medical department at Civil Hospital Karachi. The duration of the study was 6 months. Inclusion criteria were age > 12 years of either sex or acute inferior wall myocardial infarction on electrocardiography (ST- segment elevation of more than or equal to 1 mm in at least two or three leads i.e. II, III, and aVF). Exclusions criteria were age less than 12 years and evidence of either right or left bundle branch block on ECG. Data was analyzed through SPSS software.

Results: Out of these 65 patients, 45 (69%) were male and 20 (31 %) were female. All patients with acute inferior wall myocardial infarction were divided into three age groups i.e. 3(4%)cases were < 40 years, 44(58.66%) cases between 40-60years , and 18(24%) cases in > 60 years. From a total of 65 patients presented with acute inferior wall myocardial infarction, 40 (62%) were not associated with right ventricular infarction (Group-I), whereas 25 (38%) were associated with right ventricular infarction (Group-II), On ECG, ST-segment elevation in leads V 3R and V 4R was present in 1 out of 40 (2.5%) patients in Group-I, and 23 out of 25 (92%) in Group-II ($p < 0.001$). The sensitivity, specificity, positive and negative predictive value of raised JVP was 72%, 82.5%, 78.2% and 82.5% respectively. The sensitivity, specificity, positive and negative predictive value of clear lung fields in the presence of raised JVP was 84%, 87.5%, 80.7% and 89.7% respectively. ST-segment elevation in leads V3R and V4R was 92% sensitive, 97.5% specific, having 95.8% positive and 95.12% negative predictive value. On echocardiography right ventricular dilatation was 96% sensitive, 97.5% specific, having 96% positive and 97.5% negative predictive value.

Conclusion: In conclusion, frequency of right ventricular infarction is 38.46% in association with inferior infarction in our clinical settings.

Key Words: Right ventricular infarction, inferior wall infarction, electrocardiography

INTRODUCTION

Until about a decade ago, right ventricular infarction was recognized infrequently and usually thought not to be of great consequence because of inadequate diagnostic methods and unwarranted assumptions regarding the dispensability of the right ventricle, may now be diagnosed using well-accepted criteria. Right ventricular infarction (RVI) as assessed by various diagnostic methods accompanies infero-posterior wall myocardial infarction in 30 to 50% of patients¹. Recognition of the syndrome of RVI is important as it defines a significant clinical entity, which is associated with considerable immediate morbidity and mortality and has a well-delineated set of priorities for its management. Patients may clinically present with hypotension, elevated jugular venous pulse (JVP), and occasionally shock, all in the presence of clear lung

fields². The ST-segment elevation of ≥ 1 mm in the right precordial leads V₄R is a readily available electrocardiographic sign used for diagnosis of RVI. Other diagnostic approaches for assessing RVI include echocardiography, radionuclide ventriculography, technetium pyrophosphate scanning, and hemodynamic measurements³. The proper management of RVI includes volume loading to maintain adequate right ventricular preload, inotropic support, and maintenance of atrioventricular synchrony. Reperfusion therapy should be initiated at the earliest signs of right ventricular dysfunction^{4,5}. Finally, complete recovery over a period of weeks to months is a rule in a majority of patients, suggesting right ventricular "stunning" rather than irreversible necrosis has occurred. The purpose of this study was to find out the frequency of right ventricular infarction in patients presenting with

acute inferior wall myocardial infarction, in our clinical setting.

MATERIALS AND METHODS

This was a case control study, conducted on patients presenting with acute inferior wall myocardial infarction, admitted in the Departments of Cardiology and Medicine, DUH & Civil Hospital Karachi, from 1st November 2011 to 30th April 2012. This study consisted of 65 patients were divided into two groups. Group-I patients having inferior wall infarction without any evidence of right ventricular infarction, Group-II patients having inferior wall infarction with any evidence of right ventricular infarction. Inclusion criteria were age > 12 years of either sex or acute inferior wall myocardial infarction on electrocardiography (ST- segment elevation of more than or equal to 1 mm in at least two or three leads i.e. II, III, and aVF). Exclusions criteria were age less than 12 years and evidence of either right or left bundle branch block on ECG.

RESULTS

From a total of 65 patients presented with acute inferior wall myocardial infarction, 40 (62%) were not associated with right ventricular infarction (Group-I), whereas 25 (38%) were associated with right ventricular infarction (Group-II), Out of these 65 patients, 45 (69%) were male and 20 (31 %) were female. Out of 45 male patients, 29 (64%) were in Group-I and 16(34%) were in Group-II. Out of 20 female patients, 11 (55%) were in Group-I and 9 (45%) were in Group-II.

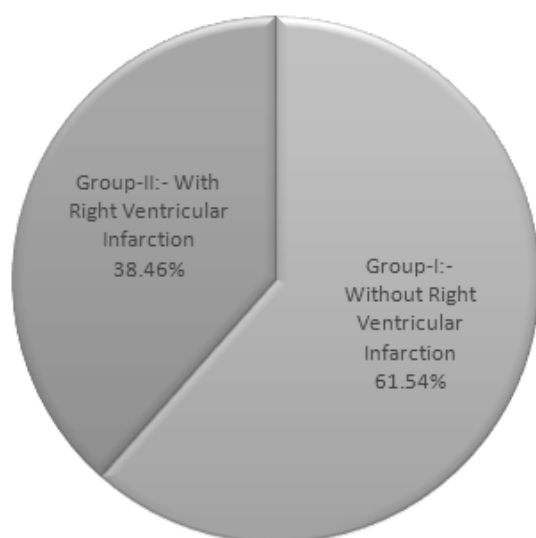


Chart No.1: Frequency of right ventricular infarction in patients with acute inferior wall myocardial infarction

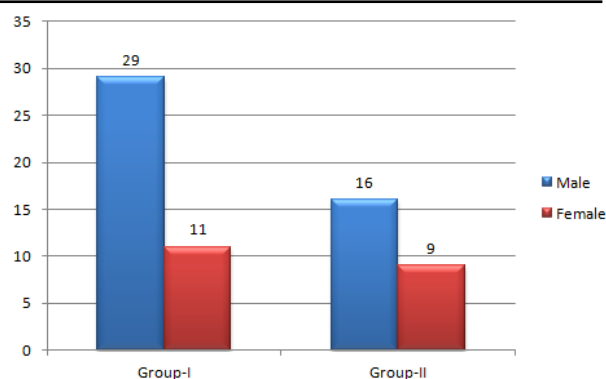


Chart No. 2: Frequency of right ventricular infarction in different sex groups

Table No. 1:-Patients Profile

Variable	GROUP-I Without Right Ventricular Infarction (n=40)		GROUP-II With Right Ventricular Infarction (n=25)	
	Number of Patients	% Age	Number of Patients	% Age
Age				
<40 Years	2	5%	1	4%
40-60 Years	25	62.5%	19	76%
>60 Years	13	32.5%	5	20%
Total	40	100%	25	100%
ECG Finding in Right Sided Chest Leads in Right Ventricular Infarction				
ST Segment Elevation in V3R and V4R	1	2.5%	23	92%
Non- ST Segment Changes in V3R and V4R	39	97.5%	2	8%
Total	40	100%	25	100%
P value	<0.001		<0.001	
Hypotensive Presentation in Right Ventricular Infarction				
Hypotensive patient	1	2.5%	21	84%
Non- Hypotensive patient	39	97.5%	4	16%
Total	40	100%	25	100%
Frequency of Clear Lung Field in the presence of raised jugular venous pressure in right ventricular infarction				
Clear Lung Field with Raised JVP	5	12.5%	21	84%
Clear Lung Field without Raised JVP	35	87.5%	4	16%
Total	40	100%	25	100%

All patients with acute inferior wall myocardial infarction were divided into three age groups i.e. 3(4%) cases were < 40 years, 44(58.66%) cases between 40-60 years, and 18(24%) cases in > 60 years. On ECG, ST-segment elevation in leads V3R and V4R was present in 1 out of 40 (2.5%) patients in Group-I, and 23 out of 25 (92%) in Group-II ($p < 0.001$). Systemic hypotension was found in 2 out of 40 (5%) patients in Group-I, and 21 out of 25 (84%) in Group-II. ($p < 0.001$). Raised JVP was found in 5 out of 40 (12.5%) patients in Group-I, and 18 out of 25 (72%) in Group-II ($P = 0.007$). Clear lung field in the presence of raised JVP was found in 5 out of 40 (12.5%) patients in Group-I, and 21 out of 25 (84%) in Group-II ($P = 0.002$). In this study out of 40 patients in Group-I, 5 were suffering from congestive cardiac failure, 5 from chronic obstructive pulmonary disease and 1 from pulmonary embolism. Other clinical features like Pulsus paradoxus, Kussmaul's sign, S4 gallop, and murmur of tricuspid regurgitation were not present in group-I. In group-II, Pulsus paradoxus was present in 9 out of 25 (36%) patients, Kussmaul's sign in 5 out of 25 (20%) patients, S4 gallop in 7 out of 25 (28%) patients, and murmur of tricuspid regurgitation in 6 out of 40 (24%) patients. Enzymatic analysis of mean CK-MB was 90 u/l in Group-I, and 200 u/l in Group-II ($P < 0.0001$). The mean AST was 80 u/l in Group-I, and 140 u/l in Group-II ($P < 0.001$). The mean LDH was 600 u/l in Group-I, and 1200 u/l in Group-II ($P < 0.001$). On Echocardiography right ventricular dilatation was present in 1 out of 40 (2.5%) patients in Group-I, and 24 out of 25 (96%) in Group-II ($P < 0.0001$). In this study sensitivity, specificity, positive and negative predictive value of shock was 84%, 97.5%, 95% and 91% respectively. The sensitivity, specificity, positive and negative predictive value of raised JVP was 72%, 82.5%, 78.2% and 82.5% respectively. The sensitivity, specificity, positive and negative predictive value of clear lung fields in the presence of raised JVP was 84%, 87.5%, 80.7% and 89.7% respectively. ST-segment elevation in leads V3R and V4R was 92% sensitive, 97.5% specific, having 95.8% positive and 95.12% negative predictive value. On echocardiography right ventricular dilatation was 96% sensitive, 97.5% specific, having 96% positive and 97.5% negative predictive value.

DISCUSSION

Right ventricular myocardial infarction, long unrecognized because of a lack of diagnostic methods and unsupported beliefs regarding the dispensability of the right ventricle, may now be diagnosed using well-accepted criteria⁶. Recognition of the syndrome of right ventricular infarction is important as it defines a significant clinical entity, which is associated with considerable immediate morbidity and mortality and has a well-delineated set of priority for its management.

The frequency of right ventricular infarction in this study was 38% (25 out of 65 patients), which was higher as compared to previously reported local studies but comparable with international studies. The incidence of right ventricular infarction in patients with inferior infarction was 16% in one local study⁷ and 21.9% in another⁸. Simon-R⁹ reported 25 to 53% incidence of right ventricular infarction associated with acute infero-posterior myocardial infarction and frequency can vary according to the diagnostic methods used. The high frequency of right ventricular infarction in this study can be due to some valid reasons like, this was hospital not community based study. Most of the patients reported early in emergency department, and right-sided chest leads were recorded immediately. Furthermore there was early collection of blood sample for cardiac enzymes and Color Doppler Echocardiography was done under the supervision of consultant cardiologist.

This study shows no significant difference between male ($P = 0.053$) and female ($P = 0.655$) in patients with or without right ventricular infarction. However, total number of male patients was slightly more as compared to female, which explains that female patients are less prone to have cardiovascular disease before menopause. Similarly no significant difference was found between different age groups i.e. 3(4%) cases were < 40 years, 44(58.66%) cases between 40-60 years, and 18(24%) cases in > 60 years. However, total numbers of patients between 40-60 years were more as compared to other groups, which can be due to increase exposure of risk factors for cardiovascular disease in this age group.

In this study right-sided precordial leads were recorded along with standard 12 leads electrocardiogram on all patients. Every patient had ST-segment elevation of ≥ 1 mm in inferior leads (II, III, and aVF). ST-segment elevation of ≥ 1 mm was noted in V3R and V4R in 1 out of 40 (2.5%) patients without right ventricular infarction and 23 out of 25 (92%) patients with right ventricular infarction. Presence of ST-segment elevation in one patient without right ventricular infarction was because, the patient was in pulmonary embolism. The lead V3R and V4R were 92% sensitive, 97.5% specific, and had 95.8% positive predictive value for diagnosis of right ventricular infarction and was highly significant ($P < 0.001$). The results of this study were comparable with both local and international studies. Zafar⁸ found ST-segment elevation in leads V3R and V4R 80-90% sensitive. O'Connor RE¹⁰ found ST-segment elevation in lead V4R a reliable marker for right ventricular infarction (sensitivity 88%) with inferior myocardial infarction. Now it is generally agreed that during acute inferior wall myocardial infarction the right-sided chest leads are simple but highly sensitive and specific variables to identify a subgroup of patients with right ventricular infarction within this study clear lung fields in the

setting of raised jugular venous pressure was observed in 21 out of 25 (84%) patients with right ventricular infarction and 5 out of 40 (10%) in patients without right ventricular infarction. Clear lung fields was 84% sensitive 87.5% specific, and had 80.7% positive predictive value for diagnosis of right ventricular infarction and was highly significant ($P=0.002$). The results of this study were comparable with previously published international studies¹¹.

Pulsus paradoxus was present in 9 out of 25 (36%) patients with right ventricular infarction and was 36% sensitive for diagnosis of right ventricular infarction in patients with inferior myocardial infarction. The results of this study were comparable with local study¹².

Fourth heart sound was observed in 7 out of 25 (28%) patients with right ventricular infarction and was 28% sensitive for diagnosis of right ventricular infarction in patients with inferior myocardial infarction. The results were comparable with the study of Ioannidis JP¹³ almost result are same.

Murmur of tricuspid regurgitation was present in 6 out of 25 (24%) patients with right ventricular infarction and was 24% sensitive for diagnosis of right ventricular infarction. While in the study of Kantos MC that reported the murmur of tricuspid regurgitation of right sided cardiac gallops can be appreciated. In one series, 11 of 16 patients with Kussmaul's sign had a right sided fourth heart sound and 4 had right sided third heart sound¹⁴.

The enzymatic evaluation in this study revealed significant difference of mean CK-MB ($P<0.001$), mean AST ($P=0.001$), and mean LDH ($P<0.001$) in patients with or without right ventricular infarction. Positive predictive value of enzymes for right ventricular infarction increases if values are two to three times normal. The higher enzymatic values in patients, with right ventricular infarction in this study were comparable with both local⁷ and internationally¹⁵ published data.

During this study Two-dimensional and Color Doppler Echocardiography was done in all patients. Right ventricular dilatation (RVD) was noted in 1 out of 40 (2.5%) patients in Group-I, and 24 out of 25 (96%) patients in Group-II. The presence of right ventricular dilatation in patient without right ventricular infarction was because patient might be suffering from cor-pulmonale secondary to chronic obstructive pulmonary disease¹⁶. The absence of right ventricular dilatation in 1 out of 25 (4%) patient with right ventricular infarction was because; echocardiography was done in the very early stage of right ventricular infarction before right ventricular dilatation was occurred. RVD was 96% sensitive, 97.5% specific, and had 96% positive predictive value for diagnosis of right ventricular infarction and was highly significant ($P<0.001$). The results of this study were comparable with international studies but high as compared with local studies. In a

locally⁷ reported study right ventricular dilatation was found in 50% by bedside echocardiography. Bellamy¹⁷ found Two-dimensional echo cardiography to be 82% sensitive and 93% specific. The reason of high frequency of right ventricular dilatation in this study was that, during this study high resolution Two-dimensional and Color Doppler Echocardiography was done under the supervision of consultant cardiologist. As right ventricular dilatation is an important and highly specific non-invasive echocardiographic sign obtained in patients with right ventricular infarction in comparison to invasive hemodynamic parameters, so echocardiography should always be preferred in our clinical setting for diagnosis of right ventricular infarction especially when facilities for hemodynamic monitoring were not available.

CONCLUSION

The frequency of right ventricular infarction is 38.46% in association with inferior infarction in our clinical settings. Right ventricular infarction are slightly more common in males than females. Hypotension, raised jugular venous pressure and clear lung fields are useful indicators of right ventricular infarction. Pulses paradoxus, Kussmaul's sign, fourth heart sound and murmur of tricuspid regurgitation are also valuable signs of right ventricular infarction in the setting of inferior wall infarction. Enzymes evaluations of two to three times normal values are good indicators for right ventricular infarction.

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