ORIGINAL RESEARCH PAPER

Cardiology

KEY WORDS: rv dysfunction, echocardiography, anterior wall myocardial infarction,inferior wall myocardial infarction.

EVALUATION OF RIGHT VENTRICULAR FUNCTION IN MYOCARDIAL INFARCTION AND ITS PROGNOSTIC SIGNIFICANCE

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ABSTRACT

Background: Unlike LV,RV function has not been widely studied after anterior myocardial infarction.

Objectives: The current study aimed to compare RV function in patients with IWMI & AWMI.

Methods: 50 patients consecutively presented to the Emergency Department with chest pain were divided on their electrocardiographic findings.Accordingly,26 patients had inferior MI and 24 had anterior MI.Conventional echocardiographic parameters was acquired at admission and then at the time of discharge then at followup.Student t-test and the chi-square test were respectively used for comparisons of the normally distributed continuous and categorical variables in the two groups. Besides, $P < 0.05$ was considered to be statistically significant.

Results: Out of the 50,52% were male and 48% were female subjects with associated comorbidities of diabetes mellitus in 32% of the patients and hypertension in 44% of patients.78% of patients showed no signs of heart failure,12% in class I, 6% in class II and 2% each in class III and class IV of heart failure.58% of patients had RV dysfunction at admission which reduced to 48% at discharge and which further dropped to 30% at one month follow up.The average duration of hospital stay was 5.6days for patients without RV dysfunction and 6.4% for patients with RV dysfunction.In the IWMI group 61.5% of patients had RV dysfunction and in the AWMI group 54.2% of patients had RV dysfunction.

Conclusions: RV dysfunction is also associated with AWMI and patients with RV dysfunction at the time of admission have a longer duration of hospital stay and this RV dysfunction improves dramatically irrespective of LV function improvement.

INTRODUCTION

- Right ventricular dysfunction in acute coronary syndrome is traditionally being said to be associated with acute Inferior Wall MI, when proximal right coronary artery is the culprit (1,2).
- It is because right ventricle free wall is exclusively being supplied by right coronary artery.
- It is now recognized that free wall contraction contributes only a part of total systolic volume.
- Changes of the right ventricle contraction of the interventric ular septum and the crista supraventricularis may be far more important than that of the free wall. Since the major blood supply for inter ventricular septum is from left anterior descending artery, acute anterior wall MI can also lead to RV dysfunction.
- Right ventricular (RV) dysfunction predicts poor prognosis in acute myocardial infarction. The sensitivity of clinical findings for RVMI is as low as 10%. Right side ECG leads give information of right ventricular free wall only. As Tissue Doppler study of RV gives better information of global RV function we intended to do this study.
- Assessment of Left Ventricular (LV) function using 2D echocardiography shortly after acute Myocardial Infarction (MI) is essential and one of the most important prognostic parameters. However, the association between Right Ventricular (RV) function and adverse events after acute MI is poorly known, especially in patients with mild LV dysfunction (3).
- Unlike left ventricular function, less attention has been paid to Right Ventricular (RV) function after Myocardial Infarction (MI).

Review of literature

- Because of therapeutic implications, there has been growing interest in early recognition of RV infarction with non-invasive techniques. Zornoff et al. demonstrated that in patients with Left Ventricular Ejection Fraction (LVEF) ≤ 40%, RV function was a significant independent predictor of death and development of heart failure after an acute MI (4). Thus, quantitative assessment of RV function after MI should be noted.
- GISSI-3 echo substudy (5)was one of the few landmark studies which evaluated the pattern of right ventricular (RV) functional recovery and its relation with left ventricular (LV) function and interventricular septal (IVS) motion in low risk patients after acute myocardial infarction (AMI) in over 500 subjects and concluded that In low risk patients after AMI, RV function recovered throughout six months of follow up and was already significant at discharge. TAPSE was significantly related to LVEF at 24–48 hours. The magnitude of RV functional recovery was higher in patients with lower initial LVEF
- Up to now, most studies on RV function after MI have concentrated on patients with inferior infarction. Nearly 50% of patients with inferior infarcts and 10% or fewer patients with anterior infarcts show evidence of RV involvement. Yet, inferior and anterior infarctions lead to quite different RV hemodynamic responses. Patients with inferior infarction, despite equivalent infarct size, are associated with a much lower mortality rate compared to those with anterior infarction. Therefore, the site of MI can predict the severity and extension of infarction. Furthermore, some investigators have reported RV dysfunction after inferior infarction, but not after anterior infarction (6), while others have found it in both groups (7).
- Thomas M. Gorter et al evaluated Right Ventricular Function After Acute Myocardial Infarction Treated With Primary Percutaneous Coronary Intervention and concluded that Right ventricular (RV) dysfunction is a powerful risk marker after acute myocardial infarction and Primary percutaneous coronary intervention (PCI) has markedly reduced myocardial damage of the left ventricle, but also reduced RV damage which was assesed by using cardiac magnetic resonance imaging (MRI)(8).
- Abtahi F et al. In their study concluded that RV dysfunction commonly occurs after a first acute ST-elevation MI. However, RV functional changes are more pronounced in patients with anterior MI after studying 60 patients consecutively presented to the Emergency Department with chest pain who were divided into two groups based on the electrocardiographic findings. Accordingly, 25 patients had inferior MI (IMI group) and 35 ones had anterior MI (AMI group). Echocardiography was performed 48 hours after starting the standard therapy(9).

Objectives

- Due to these conflicting reports, the current study aims to compare the extent of RV dysfunction in patients admitted

during the first acute ST-segment elevation inferior or anterior infarction.

Methodology:

- The study is a descriptive cross sectional study with the study setting from the In-patients of the department of cardiology of MGM Hospital . Clinical findings and echocardiography of consecutive 50 patients with myocardial infarction during the period of sept 2015 to sept 2017, who met the inclusion and exclusion criteria, were taken. Age, gender distribution, risk factors, clinical findings, ECG and Echocardiographic findings including, TAPSE, Tissue Doppler MPI, ejection fraction were analysed.
- The study was a descriptive cross sectional study with the study setting from the Inpatients of the department of Cardiology at M.G.M Medical College,Aurangabad. The study subjects were all first time acute ST segment elevation myocardial infarction patients .

Study period:

- Two years

Inclusion criteria:

- All patients with first time acute ST segment elevation MI was included in the study.
- ST segment elevation of >1mm in two contiguous leads (V1-V6 for anterior MI and L2, L3, aVf for IWMI) with cardiac enzyme elevation was the criteria for infarction.

Exclusion criteria:

- Patients with prior MI .
- Patients with poor transthoracic echocardiography window .
- Patient with valvular heart disease, congenital heart disease, LBBB or paced rhythm, Cardiomyopathy.

Sampling method:

- Sample size was 50 patients.
- After obtaining informed consent, patients demographic data, clinical findings, ECG and Echocardiography findings were recorded in a pre-structured Proforma.
- Echocardiography evaluation of both RV and LV function was done within 48 hrs of admission.

EVALUATION OF LV FUNCTION:

- End-diastolic dimension (EDD), End systolic dimension (ESD)
- Ejection fraction (EF) (modified Simpson method),
- Doppler tissue imaging of medial and lateral mitral annulus.

EVALUATION OF RV FUNCTION:

- Eccentrcity index(Lei Index)
- TAPSE
- RVOT-SF
- MPI/Tei Index
- Fractional Area Change
- RVS'
- Dp/Dt

Results:

- Out of the 50 patients in our study,52% were male and 48% were female subjects with associated comorbidities of diabetes mellitus in 32% of the patients and hypertension in 44% of patients.
- 78% of patients showed no signs of heart failure,12% in class I, 6% in class II and 2% each in class III and class IV of killip classification of heart failure.
- Out of the total study group 94% were treated with fibrinolysis and 6 % were taken up for PAMI.
- Out of the total study group 10% had mild, 62% had moderate and 18% had severe LV dysfunction.
- 58% of patients had RV dysfunction at admission which reduced to 48% at discharge and which further dropped to 30% at one month follow up.
- The average duration of hospital stay was 5.6days for patients without RV dysfunction and 6.4% for patients with RV dysfunction.
- In the IWMI group 61.5% of patients had RV dysfunction and in the AWMI group 54.2% of patients had RV dysfunction.

Discussion

- The results of the current study demonstrated that both anterior and inferior infarction had marked effects on RV function.
- Very few studies have stated the importance of rv systolic function in post mi patients.
- Similar to previous studies our study has also stated a significant number of patients with anterior wall myocardial infarction suffer from rv dysfunction at the time of admission.
- Our study has also found the gradual improvement in rv function at the time of discharge and significant improvement at one moth follow up which has not been looked at in previous studies.
- Our study has also stated that the patients presenting with rv dysfunction at admission have a longer duration of hospital stay which has not been studied in any of the studies mentioned above.
- The improvement in rv systolic function is independent of the lv fuction.
- Considering RV involvement in MI and its high mortality, more attention should be paid to detection of RV function in acute MI. The results of our study suggested that RV function provided important information for prognosis after MI(10)
- The results of a study suggested that RV function provided important information for prognosis after MI in patients treated with primary PCI and relatively preserved LV function (11) .Besides, another study on 423 patients with normal LV function revealed that reduced RVEF had a mild relationship with one-year mortality (12)
- These results show that changes in RV function subsequent to MI are closely related to LV alterations. However, in a meta-analysis conducted by Mehta et al., RV dysfunction in inferior infarction was not correlated to the extent of LV myocardial damage (12).
- Akdemir et al. also demonstrated that TAPSE, as an indicator of RV function, was lower in patients with acute anterior MI than in the control group in the absence of apparent systolic dysfunction. This was attributed to RV diastolic dysfunction (13).
- In conclusion, the present study suggested that RV function was affected in both anterior and inferior wall myocardial infarction, and the duration of hospital stay is significantly more in patients with rv dysfunction at admission and this rv dysfunction improves dramatically at the end of one month which is independent of lv sysytolic function.

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