Echocardiographic Assessment of Left Ventricular Function in Acute Myocardial Infarction

Sajaad Manzoor¹, Gaurav Aggarwal², Manjeet Bhati³, Abhinav Rastogi⁴, Dil Preet Reehal⁵

ABSTRACT

Introduction: Myocardial Infarction is one of the leading cause of deaths & mortality worldwide. Echocardiography is the key investigation in cases of myocardial infarction and confirms the presence of regional wall motion abnormality, presence of left ventricular dysfunction and to assess ejection fraction, as left ventricular ejection fraction has both therapeutic and prognostic significance. Study aimed to Assess Left Ventricular Function In Case Of Acute Myocardial Infarction With Comparison Between Non ST Elevation Myocardial Infarction And ST Elevation Myocardial Infarction.

Material and methods: Fifty consecutive patients of STEMI and NSTEMI admitted from the outdoor patient department / emergency ward /cardiology unit in MMIMSR Mullana, Ambala, were considered for the study. The echocardiographic measurement were done and comparative analysis were done. Chi square test was applied and values less than 0.05 was taken as significant.

Result: A statistically significant difference between two groups was observed for ventricular dimensions (LVIDd and LVPWd), EF%/FS/CO, In this study smoking emerged as a major risk factor with preponderance of inferior wall MI in patients with no other cardiovascular risk factor.

Conclusion: In this study STEMI was more common in younger age group with male preponderance. LVEF/CO/ left ventricular dimension were more compromised in STEMI than NSTEMI. Left ventricular dysfunction after acute myocardial infarction predicts long term mortality, and reduced LVEF may prompt greater consideration of invasive treatment and to guide care strategy.

Keywords: Echocardiography, Left Ventricular Function, Acute Myocardial Infarction, Smoking.

INTRODUCTION

Myocardial infarction is one of the commonest conditions in hospitalized patients in our country. Mortality rate of acute Myocardial Infarction is approximately 30% with more 32% of all deaths in 2017 is due to myocardial infarction. Classically E.C.G in STEMI, ST elevation occurs in 2-3 hours, T wave inversion occurs within 8-12 hours and develops pathological Q wave over next 18-24 hours to days later .In case of NSTEMI, ST segment depression more than 1 mm, 0.08 sec after J point T wave inversion.

Echocardiographic and left ventricular systolic function - Echocardiography is helpful in the assessment of systolic dysfunction include left ventricular systolic volume, left ventricular ejection fraction (LVEF), assessment of diastolic dysfunction/ filling pressure E:A Ratio and left atrial volume.¹²

LVEF is generated by using the Simpson’ Biplane method, left ventricular ejection fraction identified with echocardiography have been well validated⁶ and gives important information on the relationship between the location and size of RWMA present, ECG location and size, the status of the patient, complication and survival.⁵

Echocardiography and diastolic dysfunction - When diastolic dysfunction precedes systolic dysfunction,⁸ it has been validated as an early indication of CCF after an AMI.⁷ Diastolic dysfunction can be graded as 4 main grades. GRADE 1/-Mildly impaired diastolic dysfunction with abnormal relaxation pattern. GRADE 2/- Moderately impaired diastolic dysfunction with pseudo normal relaxation pattern. GRADE 3 AND GRADE 4 – Are severely impaired diastolic dysfunction with restrictive relaxation pattern. GRADE 3 is reversible while grade 4 is not.³

Our aim is to do the Echocardiographic assessment of left ventricular function in patients of acute myocardial infarction and compare the function in between patients of STEMI and NSTEMI. This assessment will lead to know that, how intensive management is required for both types of myocardial infarction – STEMI/NSTEMI. Echocardiographic Study was done to assess left ventricular function in cases of acute myocardial infarction with comparison between non ST elevation myocardial infarction and ST elevation myocardial infarction.

MATERIAL AND METHODS

A Prospective, Observational, Clinical Study was conducted on fifty consecutive patients of STEMI and NSTEMI admitted in MMIMSR, Mullana, Ambala from December 2017 to July 2019. Ethical clearance was taken from institutional ethical board before start of the study.

¹Assistant Professor, Department of Cardiology, ²DM Resident, Department of Cardiology, ³DM Senior Resident, Department of Cardiology, ⁴DM Resident, Department of Cardiology, ⁵MBBS Student, MM Institute of Medical Sciences, Mullana, Ambala, Haryana, India

Corresponding author: Dr. Abhinav Rastogi, DM Resident, Department of Cardiology, MMIMSR, Mullana, Ambala, India

How to cite this article: Sajaad Manzoor, Gaurav Aggarwal, Manjeet Bhati, Abhinav Rastogi, Dil Preet Reehal. Echocardiographic Assessment of left ventricular function in acute myocardial infarction. International Journal of Contemporary Medical Research 2020;7(8):H1-H5.

DOI: http://dx.doi.org/10.21276/ijcmr.2020.7.8.34
Inclusion criteria
1. Patients age more than 18 year and less than 80 years.
2. First time presented with myocardial infarction.

Exclusion criteria
1. Previous history of Myocardial Infarction.
2. Those who denied for admission and further treatment.

Diagnosis of acute myocardial infarction was considered if at least two of the following criteria are satisfied:
1. Chest pain typical of MI, i.e lasting more than 20 minutes and not relieved by nitrates or rest
2. Elevation of serum cardiac enzymes level, i.e CPK-MB, Trop-T/I and LDH.
3. Electrocardiography changes-
   a. New ST elevation at the J point in to contiguous leads of >0.1 mv in all leads other than leads V2-V3.
   b. T wave inversion ≥1mm in at least two anatomically contiguous leads.

2 D Echocardiography
Echocardiographic assessment was done by using model VIVID-E colour doppler echocardiography machine of GE.

STATISTICAL ANALYSIS
The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 21.0 statistical Analysis Software. The values were represented in Number (%) and Mean ±SD.

RESULTS
The present study in which a total of 25 patients with confirmed diagnosis of ST-elevated myocardial infarction (Group I) and a total of 25 patients with confirmed diagnosis of non-ST-elevated myocardial infarction (Group II) were enrolled.

<table>
<thead>
<tr>
<th>SN</th>
<th>Parameter</th>
<th>Group I (n=25)</th>
<th>Group II (n=25)</th>
<th>Statistical significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>t'</td>
<td>p</td>
</tr>
<tr>
<td>1.</td>
<td>LVIDd</td>
<td>45.52 ± 9.28</td>
<td>56.12 ± 7.20</td>
<td>-2.050</td>
</tr>
<tr>
<td>2.</td>
<td>LVIDs</td>
<td>34.28 ± 10.66</td>
<td>31.12 ± 5.55</td>
<td>2.050</td>
</tr>
<tr>
<td>3.</td>
<td>IVSd</td>
<td>8.99 ± 1.85</td>
<td>9.67 ± 1.77</td>
<td>1.315</td>
</tr>
<tr>
<td>4.</td>
<td>IVSs</td>
<td>11.30 ± 1.52</td>
<td>11.02 ± 1.96</td>
<td>-1.329</td>
</tr>
<tr>
<td>5.</td>
<td>LVPWd</td>
<td>8.94 ± 1.74</td>
<td>10.03 ± 1.51</td>
<td>-2.372</td>
</tr>
<tr>
<td>6.</td>
<td>LVPWs</td>
<td>11.90 ± 1.84</td>
<td>11.82 ± 1.52</td>
<td>0.168</td>
</tr>
</tbody>
</table>

Table-1: Comparison of Left Ventricular Dimensions between two study groups (mm)

<table>
<thead>
<tr>
<th>SN</th>
<th>Parameter</th>
<th>Group I (n=25)</th>
<th>Group II (n=25)</th>
<th>Statistical significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td>t'</td>
<td>p</td>
</tr>
<tr>
<td>1.</td>
<td>Mean Age±SD (Range) in years</td>
<td>54.08±9.55 (38-70)</td>
<td>56.12±7.20 (42-68)</td>
<td>-0.843</td>
</tr>
<tr>
<td>2.</td>
<td>Age &lt;50 years</td>
<td>10 (40.0%)</td>
<td>8 (32.0%)</td>
<td>0.347</td>
</tr>
<tr>
<td>3.</td>
<td>Age &gt; 50 years</td>
<td>15 (60.0%)</td>
<td>17 (68.0%)</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Gender</td>
<td>Male</td>
<td>18 (72.0%)</td>
<td>18 (72.0%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>7 (28.0%)</td>
<td>7 (28.0%)</td>
<td></td>
</tr>
</tbody>
</table>

Table-2: Comparison of Demographic and Anthropometric profile of patients enrolled in the study
shortening and cardiac output was significantly lesser in Group I as compared to that in Group II (p<0.05) (table-4). None of the cases of group I had multiple wall involvement whereas in Group II, seven (28%) had multiple wall involvement. In Group I, majority (n=14; 56%) had inferior wall involvement followed by anterior wall involvement (n=10; 40%) and one case without any RWMA involvement. In comparison, in Group II, maximum (n=11; 44%) had no RWMA followed by seven (28%) cases having multiple wall involvement – of these three cases had anterior+ inferior wall involvement and four cases had anterior + lateral wall involvement, four (16%) had anterior wall involvement and three (12%) had inferior wall involvement. On evaluating the data statistically, the difference between two groups was found to be statistically significant (p<0.001) (table-5).

**DISCUSSION**

Echocardiography was done to assess the left ventricular function, the result obtained was compared between STEMI and NSTEMI. As Echocardiography is a noninvasive test which can play an important role in recognizing cardiac dysfunction and pathology, as well as follow up response to therapy.

**Age:** The proportion of patients whose age is <50 years was higher in STEMI (40%) group 1, as compared to NSTEMI group 2 (32%). Yet the difference was not significant statistically (p=0.556). This finding is in agreement with the previous study conducted by Good man et al and Murphey et al in which NSTEMI Patients group was older than the group of patients with STEMI.

**Sex:** In the present study majority of the patients in both group (STEMI and NSTEMI) i.e. 72% were male, and 28% were female. The male to female ratio was 2.57:1. This study was in agreement with study done by Akram et al in which male to female ratio was 5.25:1, other studies by Gupta et al, and Goodman et al also reported male preponderance. But it differed from the study conducted by AlymHegazy et al who noted that there was no significant difference in the sex factor of the patients.

**BMI:** Mean body surface area of patients in group 1 (STEMI) was 1.63±0.11m$^2$ as compared to 1.66±0.11m$^2$ in group 2 (NSTEMI). Statistically, the difference between two groups was not significant (p=0.250)

**Risk-factor**

**Smoking:** In the present study smoking was found to be major risk factor for Acute STEMI, Precisely Inferior wall MI (56%). In INTER HEART study smoking is the second most important risk factor for acute MI. Another study conducted by Queck DK et al in Malaysia found that the risk of acute MI found was 23.9% as compared to control i.e. 12.8%. Another study done by Sanger R.P et al in year 1997-2003 observed that by implementing no smoking law at public places for six months decrease the mortality from Acute MI.

In A Retrospective study done by Vaidya CV et al conducted...
in Gandhinagar in 2015 of all new patient with STEMI, smoking emerged as the most important risk factor (40.7%), followed by hypertension (20.3%) and dyslipidemia (15.3%).

**Echocardiographic Parameters:** In comparison of left ventricular function between the two study groups, statistically no significant difference was observed between two groups except for LVIDd and LV PWd. Mean LVIDd was found to be higher in STEMI Group 1 (40.52±9.28mm) as compared to that in NSTEMI Group 2 (40.84±6.64mm) with P value =0.46. LV PWd was found to be lower in group 1 (STEMI) (8.94±1.74mm) in comparison to NSTEMI GROUP 2 (10.03±1.51mm) P=(0.022). For the remaining parameters i.e. LVIDs/ IVSd/ IVSs/ LV PWs, there was no significant difference between the two groups (P>0.05).

It was observed that mean EF/FS/and CO was significantly lesser in STEMI as compared to NSTEMI. Mean EF(%) in STEMI patient was 42± 10.02 and 50.12±0.63 in patient with NSTEMI in present study. Similar results were observed by Amy Leigh Miller et al9 observes STEMI has low left ventricular ejection fraction compare to NSTEMI.

In our study, no significant difference between the two groups was observed for E/A RATIO, DT, IVRT, and Heart Rate.

**CONCLUSION**

In this study STEMI was more common in younger age group with male preponderance. LVEF/CO/ left ventricular dimension were more compromised in STEMI than NSTEMI. As coronary flow is severely affected in cases of STEMI. The assessment of LVEF is a core performance measure for patient of STEMI and NSTEMI, because LVEF has both therapeutic and prognostic significance. Left ventricular dysfunction after acute myocardial infarction predicts long term mortality, and reduced LVEF may prompt greater consideration of invasive treatment and to guide care strategy.

In the above study, smoking has emerged as an important risk factor for acute myocardial infarction especially inferior wall myocardial infarction.

The present study highlights the immediate need to initiate measures to raise awareness about the harmfulness of smoking among the general population especially young adults. Initiative at individual and government levels are required to develop a program to control smoking especially among youth.

**ACKNOWLEDGEMENT**

Department of Cardiology, MMIMSR, Mullana, Ambala (Haryana)

**REFERENCES**


17. Ambrose JA, Barua RS. The pathophysiology of...


Source of Support: Nil; Conflict of Interest: None
Submitted: 11-07-2020; Accepted: 12-08-2020; Published: 31-08-2020