Original Research Paper

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GLOBAL LONGITUDINAL STRAIN IN PATIENT WITH ACUTE MYOCARDIAL INFARCTION POST PCI USING SPECKLE TRACKING ECHOCARDIOGRAPHY.

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ABSTRACT **Background & Objective:** Left ventricular ejection fraction (LVEF) is an established method for evaluation of left ventricular (LV) systolic function.Our aim was to compare GLS by 2D speckle tracking echocardiography in patient with Acute Myocardial Infarction before and within 48 hours after percutaneous coronary intervention over LVEF calculated using Simpson biplane method. **Method:** A total Patients of 70 with age equal or greater than 21 presenting with Acute Myocardial Infarction who underwent PCI in the Cardiology department of Government Rajaji hospital, Madurai were included in our study . Echo was done before and within 48 hours of PCI . EF was calculated using Simpson's method and Global longitudinal strain was calculated using 2D speckle tracking echocardiography. **Result:** Post PCI GLS was increased significantly compared to pre PCI GLS value (-14.6 vs.-12.9;p<0.002) , whereas EF by Simpsons method did not showed any significant increase following PCI(44.09 vs 45.4;p<0.95). Similarly improvement in GLS value was significantly higher when target vessel revascularization was in Non Left anterior descending territory (-14.2 vs.-15.8;p<0.001) than LAD (-11.9 vs.-12.7;p<0.002). **Conclusion:** Improvement in LV functions by restoring the patency of the culprit artery and recovery of LV functions occurs as early as within 48 h postrevascularization.

KEYWORDS : Global Longitudinal strain, Speckle tracking Echocardiography,Myocardial infarction,Left ventricular ejection fraction.

INTRODUCTION

Left ventricular ejection fraction (LVEF) is the established method for evaluation of LV systolic function and can be measured by a number of imaging modalities [1]. In addition, LVEF is used to define systolic heart failure and has a great impact on the selection of medical treatment [2].

Strain by speckle tracking echocardiography is a technique that utilizes 2-dimensional gray scale images to evaluate both global and regional function of the left ventricle. Peak global longitudinal strain (GLS) may be used to measure systolic function. Previous studies have shown that GLS may both diagnose and exclude acute coronary heart disease better than LVEF [3] .

Several echocardiographic methods have been used to measure LVEF but at present, the Simpson's biplane method is most widely use.A major limitation of LVEF in patients with myocardial infarction is that the Simpson's biplane method is based on an assumption of symmetric LV geometry. The presence of regional myocardial dysfunction as a result of myocardial infarction alters LV geometry. As a consequence, the Simpson's biplane method by echocardiography may partly fail to measure LVEF with precision, and level of echocardiographic experience may affect how LVEF is measured.

GLS does not rely on geometric assumptions but measures myocardial function with precision. [4]. Strain by speckle tracking measure directly segmental myocardial deformation of the LV in a 16-segment model. Average deformation of LV is expressed as GLS. In addition, GLS may be more sensitive than LVEF to changes in long-axis shortening, which makes GLS useful in evaluation of LV function where LVEF is preserved . After the region of interest (ROI) is set in strain measurement, speckle tracking is performed automatically by the respective software[5].Since several studies have shown advantages of GLS compared to LVEF in the evaluation of LV function especially for mild systolic dysfunction, GLS is increasingly used in clinical practice[6].

The aims of this study were as follows:
1. To assess the LV systolic function in patients with acute ST-elevation MI (STEMI), by calculating LVEF using Simpson's biplane method of disks, and GLPSS by using STE before and after PCI.
2. To assess the superiority of GLPSS over LVEF to detect the early improvement in LV function post-PCI.

MATERIALS AND METHODS

This was an observational study, which was conducted between MAY-2021 to DEC-2021 in the Department of Cardiology, Government Rajaji Hospital , Madurai India.

SAMPLE SIZE:70

INCLUSION CRITERIA:

A total of 70 patients between the age of 21 and 80 years of both gender presenting with acute STEMI as diagnosed by electrocardiogram (defined as new ST elevation at the J point in at least 2 contiguous leads ≥2 mm in men or ≥1.5 mm in women in leads V2 –V3 and/or of ≥1 mm in other contiguous chest or limb leads),admitted in the department of cardiology, who underwent PCI were enrolled in this study. A detailed clinical history was obtained, and examination of all these patients was performed. Routine blood test, electrolyte, and renal function were obtained for all participants.

EXCLUSION CRITERIA:

The exclusion criteria were as follows:

- Patients having preexisting cardiomyopathy
- Moderate to severe valvular heart disease
- Morbid obesity and poor echocardiographic window
- Pulmonary edema
- Left bundle branch block
- Sustained atrial fibrillation and ectopics
- Congenital heart disease
- Cor pulmonale
- Moderate to large pericardial effusion

All patients underwent two-dimensional(2D) echocardiography before PCI and within 48 h post procedure. A standard echocardiographic study was done using echocardiography machine GE Healthcare Vivid Ultrasound E9 according to the guidelines of the American Society of Echocardiography. Data acquisition was performed using 3.5MHz transducer. LV function was assessed by measuring EF using Simpson's biplane method of disks as well as 2D speckle tracking to assess GLPSS. GLPSS was calculated pre- and post-PCI by using automated function imaging technique using an apical 3-chamber view, apical 4-chamber view, and apical 2-chamber view. All echocardiograms were read by two cardiologists in a blinded manner with inter-observer and intra-observer variability of 2.1% ± 2% and 1.1% ± 1%, respectively.

STATISTICALANALYSIS:

The paired t-test was used to compare either LV EF or GLPSS between pre- and post-PCI. The independent t-test was used to compare change in GLPSS between target vessel revascularization involving left anterior descending (LAD) artery and non-LAD.

RESULT:

A total of 70 patients presenting with STEMI, found to be having obstructive CAD on coronary angiography were enrolled in this study. The clinical characteristics of the patients are shown in Table 1. Post PCI GLS was increased significantly compared to pre PCI GLS value (-14.6 vs.-12.9;p<0.002) , whereas EF by Simpsons method did not showed any significant increase following PCI(44.09 vs 45.4;p<0.95). Similarly improvement in GLS value was significantly higher when target vessel revascularization was in Non Left anterior descending territory (-14.2 vs.-15.8;p<0.001) than LAD (-11.9 vs.-12.7;p<0.002).

TABLE 1:Clinical characteristics of 70 patients with acute ST elevation myocardial infarction who underwent percutaneous coronary intervention

Total	70
AGE	
<60 Years	55(78.57%)
≥60 Years	15(21.43%)
Male	61(87.14%)
Female	9(12.86%)
T2DM	24(39.28%)
Smoker	40(57.14%)
Hypertension	19(27.14%)
Diagnosis On ECG	
AWMI	42(60%)
IWMI	26(37.14%)
LWMI	2(2.85%)
Target Vessel Revascularized	
LAD	42(60%)
RCA	17(24.85%)
LCX	11(15.71%)

Figure 1:Showing Type of MI and Vessel Revascularized

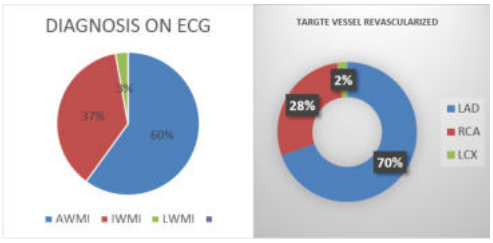


Figure 2: Change in left ventricular ejection fraction and global longitudinal peak systolic strain pre- and post-percutaneous coronary intervention.

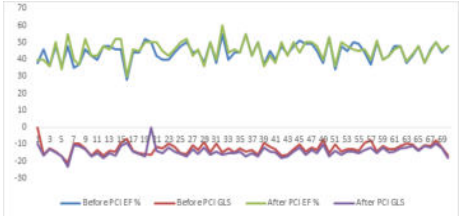


Figure3: Pre and post-percutaneous coronary intervention strain in a patient of Anterior wall myocardial infarction

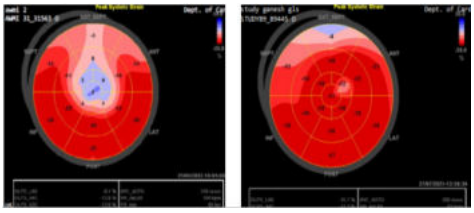


Figure 4 :Change in global longitudinal peak systolic strain pre and post PCI in LAD territory.

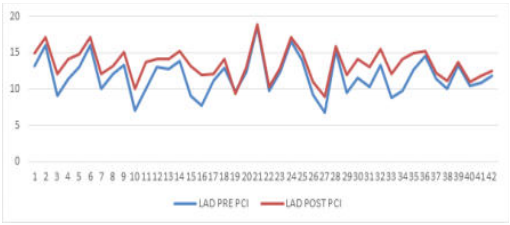


Figure 5: Pre- and post-percutaneous coronary intervention strain in a patient of inferior wall myocardial infarction

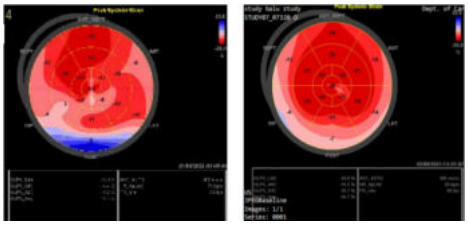
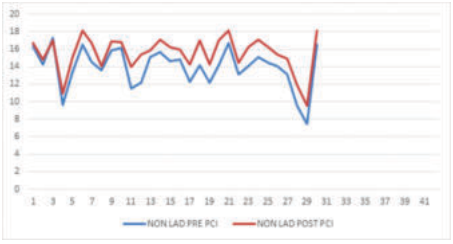


Figure 6:Change in global longitudinal peak systolic strain pre and post PCI in Non LAD territory.



DISCUSSION:

Following acute MI, due to interrupted blood supply, the affected myocardium develops ischemia or infarction depending upon the duration of arterial occlusion and the presence or absence of collaterals. Part of the affected myocardium is stunned or hibernating. Restoring the blood supply allows the stunned and hibernating myocardium to recover in most of the patients. In our study, we measured GLPSS and LVEF before and after PCI. Post-PCI measurement was made no later than 48 h. The study demonstrated a significant improvement in GLPSS as early as 48 h as compared to EF. It also demonstrated that the improvement in GLPSS was more when non-LAD vessels were revascularized. Similar discrimination according to the vessel revascularized was not seen in EF [7].A number of previous studies have compared the ability of GLS and LVEF to detect small reductions in LV function, particularly in ischemic heart disease [8]. In these studies, GLS and segmental strain had better ability than LVEF to predict infarct size and segmental viability in patients with myocardial infarction [9], diagnose coronary artery occlusion in patients with NSTEMI [10], exclude coronary artery disease in patients with chest pain [11], predict risk of ventricular arrhythmias [12] and predict mortality. [3]

LIMITATION:

At present, there is no industrial standard for strain analysis among different echocardiographic machine vendors.

The number of patients in the study was small.

CONCLUSION:

The present study demonstrates that GLS is a more reproducible method for evaluation of LV function than LV EF.improvement in LV functions by restoring the patency of the culprit artery and recovery of LV functions occurs as early as within 48 h postrevascularization. Hence, it can be easily applied to assess LV functions in the large subset of the population without incurring any additional cost.

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