ABSTRACT

Objective: The purpose of this study is to compare the sufficient accuracy of three different techniques of echocardiography for left ventricular ejection fraction.

Study Design: Retrospective study

Place and Duration: Saidu Group Of Teaching Hospital, Saidu Sharif, Swat, KPK, From September, 2021 to February, 2022.

Methods: Total 90 patients of both genders with age 18-70 years were included. All the patients admitted to hospital with complaint of chest pain. After getting informed written consent detailed demographics of enrolled cases were recorded. All of these techniques (M-mode echocardiography, simpson’s biplane mode and global longitudinal strain) were used to measure the left ventricular ejection fraction of patients within a 3-month period that did not include a myocardial infarction or revascularization. SPSS 23.0 was used to analyze all data.

Results: We found that 82 (91.1%) were male patients and 8 (8.9%) were females. Mean age of the patients was 53.6±12.47 years and had mean BMI 25.8±11.44 kg/m². Hypertension was found in 50 (55.6%) cases, followed by dyslipidemia in 35 (38.9%) patients, diabetes mellitus in 23 (25.6%) cases. Cigarette smokers were 15 (16.7%). We found that accuracy of global longitudinal strain was higher for left ventricular ejection fraction than that of M-mode echocardiography and simpson’s biplane mode but the difference was insignificant.

Conclusion: We concluded in this study use of these three techniques for LVEF was highly useful to diagnose accuracy but global longitudinal strain was showed better accuracy than that of simpson’s biplane mode and M-mode echocardiography.

Keywords: Chest Pain, LVEF, global longitudinal strain, M-mode echocardiography, Simpson’s biplane mode, Accuracy

INTRODUCTION

An essential goal of noninvasive cardiac imaging is the evaluation of left ventricular ejection fraction (LVEF) with sufficient feasibility, accuracy, and reproducibility. Patients experiencing heart failure are now categorised based on whether or not their LVEF is maintained. Prognosis in individuals with myocardial infarction [1], heart failure [2], and valve disease can be predicted in part by left ventricular ejection fraction. In addition, LVEF thresholds are used in current practice guidelines for decision making in various clinical scenarios, such as the recommendation for device implantation or pharmacological interventions in patients with heart failure [3,4] and the suggestion for valve replacement in individuals with severe valvular disease. [5] Clinical studies frequently use left ventricular ejection percentage as a primary or secondary end objective for participant selection. [6,7]

To assess global and localised left ventricular function, strain by speckle tracking echocardiography makes use of 2-dimensional grey scale pictures. Systolic function can be evaluated using peak global longitudinal strain (GLS). GLS may be more effective than LVEF in diagnosing and ruling out acute coronary heart disease, according to previous research [8, 9]. Furthermore, in post hoc analysis, GLS has higher intra- and inter-observer repeatability than LVEF [9,10].

Although 2DE is widely used, it does have a few drawbacks that are well acknowledged, the most notable of which are LV foreshortening and the inability to acquire distinct projections in the same cardiac cycle. Patients with irregular heartbeats are especially in need of the latter (i.e. atrial fibrillation). Using a 3D-array transducer, it is possible to get the apical four-two and three chamber views concurrently in the TP mode, overcoming these restrictions.

When comparing LV volume and EF, RT3DE has demonstrated excellent agreement with MRI and superiority over quantitative 2DE [11,12]. These results indicate that RT3DE can be used as a substitute for MRI in estimating LVEF.

Since it is conducted on still frames, quantitative 2D-EF using the BPS rule can be time demanding, and the endocardial boundary tracing can be challenging to accomplish, particularly in patients with low picture quality. Clinical experience has shown that visual estimation of LVEF is faster and easier to do, even in patients with low picture quality.

The LV ejection fraction (LVEF) is often collected using three or more testing procedures in such individuals, which may result in duplicate data on LV systolic function and elevate healthcare expenses. Patients having left heart surgery with coronary angiography are at increased risk for radiation exposure and contrast-induced acute renal damage when ICLV is used. [13]

Different non-invasive methods have been studied and compared to ICLV to see which is more accurate for assessing LVEF. [14,15]

The purpose of this study was to examine the reliability of LVEF measured using Simpson’s biplane, M-mode echocardiography and GLS measured using speckle tracking echocardiography, even when performed by echocardiographers with varying degrees of experience.

MATERIAL AND METHODS

This retrospective study was conducted at Saidu Group Of Teaching Hospital, Saidu Sharif, Swat, KPK, From September, 2021 to February, 2022, and comprised of 90 patients. After getting informed written consent detailed demographics of enrolled cases were recorded. Patients were not included if they had no history of chest discomfort, had recently experienced an acute myocardial infarction, or had undergone percutaneous coronary intervention or coronary artery bypass grafting before the LVEF was assessed using all three diagnostic methods.

Without having suffered a myocardial infarction or undergoing surgical or interventional cardiac revascularization, each patient underwent Simpson’s biplane, M-mode echocardiography and GLS all within a 3-month period.

Using a Vivid 7 Scanner, pictures and cineloops of echocardiographic exams were digitally recorded and then analysed. The two sets of echocardiographic examinations were done on the same patient during the same consultation, with each examiner being unaware of the other’s recordings and findings. Two-dimensional grey scale echocardiography was used to record three cardiac cycles in a row from six different image planes, 3
We found that accuracy of GLS was higher for left ventricular ejection fraction than that of M-mode echocardiography and Simpson's biplane mode but the difference was insignificant. (Table 3)

### DISCUSSION

Patients with cardiac artery disease and heart failure, in particular, can benefit from an accurate measurement of LVEF because of its prognostic significance and capacity to guide pharmacological and interventional therapy. The need of patients complaining chest discomfort are sent for a left heart catheter with angioplasty and Simpson's biplane mode because doctors believe it is cardiac in nature. With regards to coronary angiography, According to the research of Witteles et al.[16], ICLV was performed on 81.1% out 96,235 participants. M-mode echocardiography may expedite the development of contrast-induced acute kidney injury in individuals who are already at risk for this illness during unenhanced images such kidney damage, diabetes, anaemia, hypovolemic, or heart problems. [17,18] Obtaining an LVEF value is a frequent part of the clinical evaluation process, and this is only one of several quasi-cardiac procedures regularly performed. It is possible that M-mode echocardiography provides redundancy on Left ventricular systolic function in people for whom LVEF measurements obtained via non-invasive cardiac techniques are trustworthy and equal to those obtained by M-mode echocardiography

In current study 90 cases were presented. Among these 82 (91.1%) were male patients and 8 (8.9%) were females. Mean age of the patients was 53.6±12.47 years and had mean BMI 25.8±11.44 kg/m². Frequency of obstructive coronary artery disease was 40 (44.4%) and non-obstructive CAD was 50 (55.6%). (Table 1)

Table-1: Demographics of included cases

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>53.6±12.47</td>
<td></td>
</tr>
<tr>
<td>Mean BMI (kg/m²)</td>
<td>25.8±11.44</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>82</td>
<td>91.1%</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>8.9%</td>
</tr>
<tr>
<td>Disease Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstructive CAD</td>
<td>40</td>
<td>44.4%</td>
</tr>
<tr>
<td>Non-Obstructive CAD</td>
<td>50</td>
<td>55.6%</td>
</tr>
</tbody>
</table>

Hypertension was found in 50 (55.6%) cases, followed by dyslipidemia in 35 (38.9%) patients, diabetes mellitus in 23 (25.6%) cases. Cigarette smokers were 15 (16.7%). (Table 2)

Table-2: Association of other diseases

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>50</td>
<td>55.6%</td>
</tr>
<tr>
<td>No</td>
<td>40</td>
<td>44.4%</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>35</td>
<td>38.9%</td>
</tr>
<tr>
<td>No</td>
<td>55</td>
<td>61.1%</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>23</td>
<td>25.6%</td>
</tr>
<tr>
<td>No</td>
<td>67</td>
<td>74.4%</td>
</tr>
<tr>
<td>Cigarette Smokers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
<td>16.7%</td>
</tr>
<tr>
<td>No</td>
<td>75</td>
<td>83.3%</td>
</tr>
</tbody>
</table>
regression models, despite large variability between LVEF readings from different techniques and modalities. However, direct comparison of the predictive impact for LVEF by multiple modalities was not feasible since LVEF was assessed by multiple methods for different patients. Small decreases in LV function, especially in ischemic heart disease, have been compared between GLS and LVEF in a number of prior research.

CONCLUSION

We found in this study use of these three techniques for LVEF was highly useful to diagnose accuracy but global longitudinal strain was showed better accuracy than that of simpson’s biplane mode and M-mode echocardiography.

REFERENCES