**Assessment of Left Ventricular Function by Global Longitudinal Strain in Patients With non ST Elevation Myocardial Infarction. Comparative Study With Conventional Method.**

**Introduction**

**The** noninvasive assessment of ventricular function remains central to modern cardiology. The volume-based measurement of left ventricular ejection fraction (LVEF) is fundamentally different from direct measurement of myocardial motion by tissue Doppler imaging and myocardial deformation, and the reliability and precision of these measurements are also different. In the era of precision medicine, patient-specific measurements are used to make decisions about therapies in individual patients, as well as guidance across patient populations. Moreover, the current era is also marked by the emergence of heart failure with preserved ejection fraction (HFpEF)—in which ejection fraction (EF) is not useful prognostically—as the predominant form of heart failure (HF). [[1](file:///C:\Users\zalmq\Desktop\1.Roger%20VL,%20Go%20AS,%20Lloyd‐Jones%20DM,%20Benjamin%20EJ,%20Berry%20JD,%20Borden%20WB,%20Bravata%20DM,%20Dai%20S,%20Ford%20ES,%20Fox%20CS,%20Fullerton%20HJ,%20Gillespie%20C,%20Hailpern%20SM,%20Heit%20JA,%20Howard%20VJ,%20Kissela%20BM,%20Kittner%20SJ,%20Lackland%20DT,%20Lichtman%20JH,%20Lisabeth%20LD,%20Makuc%20DM,%20Marcus%20GM,%20Marelli%20A,%20Matchar%20DB,%20Moy%20CS,%20Mozaffarian%20D,%20Mussolino%20ME,%20Nichol%20G,%20Paynter%20NP,%20Soliman%20EZ,%20Sorlie%20PD,%20Sotoodehnia%20N,%20Turan%20TN,%20Virani%20SS,%20Wong%20ND,%20Woo%20D,%20Turner%20MB;%20on%20behalf%20of%20the%20American%20Heart%20Association%20Statistics%20Committee%20and%20Stroke%20Statistics%20Subcommittee%20.%20Heart%20disease%20and%20stroke%20statistics–2012%20update:%20a%20report%20from%20the%20American%20Heart%20Association.%20Circulation.%202012;%20125:e2–e220.)] In this contemporary review, LVEF and strain are compared to evaluate the benefits of combining these complementary techniques.

**Acute** coronary syndromes (ACS) continue to be a major cause of morbidity and mortality.[2] Data from the United States and Europe have reported a decrease in the incidence of ST‐elevation myocardial infarction (STEMI) with an increase in non‐ST‐elevation myocardial infarction (NSTEMI) in the past decade.[[2](file:///C:\Users\zalmq\Desktop\2.Rogers%20WJ,%20Frederick%20PD,%20Stoehr%20E,%20Canto%20JG,%20Ornato%20JP,%20Gibson%20CM,%20Pollack%20CV,%20Gore%20JM,%20Chandra‐Strobos%20N,%20Peterson%20ED,%20French%20WJ.%20Trends%20in%20presenting%20characteristics%20and%20hospital%20mortality%20among%20patients%20with%20ST%20elevation%20and%20non‐ST%20elevation%20myocardial%20infarction%20in%20the%20National%20Registry%20of%20Myocardial%20Infarction%20from%201990%20to%202006.%20Am%20Heart%20J.%202008;%20156:1026–1034.)]

**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. LVEF by echocardiography has been regarded as a cornerstone in the prediction of outcome and is the most widely available method for evaluation of LV function.

**It** is a vital measurement when determining whether patients benefit from an implantable cardioverter-defibrillator (ICD) or cardiac resynchronization therapy (CRT) [[4](file:///C:\Users\zalmq\Desktop\4.Ponikowski%20P,%20Voors%20AA,%20Anker%20SD,%20Bueno%20H,%20Cleland%20JG,%20Coats%20AJ,%20Falk%20V,%20Gonzalez-Juanatey%20JR,%20Harjola%20VP,%20Jankowska%20EA,%20et%20al.%202016%20ESC%20guidelines%20for%20the%20diagnosis%20and%20treatment%20of%20acute%20and%20chronic%20heart%20failure:%20the%20task%20force%20for%20the%20diagnosis%20and%20treatment%20of%20acute%20and%20chronic%20heart%20failure%20of%20the%20European%20Society%20of%20Cardiology%20(ESC)%20developed%20with%20the%20special%20contribution%20of%20the%20heart%20failure%20association%20(HFA)%20of%20the%20ESC.%20Eur%20Heart%20J.%202016;37(27):2129–200.)]. In addition, LVEF is used to define systolic heart failure and has a great impact on the selection of medical treatment [[4](file:///C:\Users\zalmq\Desktop\4.Ponikowski%20P,%20Voors%20AA,%20Anker%20SD,%20Bueno%20H,%20Cleland%20JG,%20Coats%20AJ,%20Falk%20V,%20Gonzalez-Juanatey%20JR,%20Harjola%20VP,%20Jankowska%20EA,%20et%20al.%202016%20ESC%20guidelines%20for%20the%20diagnosis%20and%20treatment%20of%20acute%20and%20chronic%20heart%20failure:%20the%20task%20force%20for%20the%20diagnosis%20and%20treatment%20of%20acute%20and%20chronic%20heart%20failure%20of%20the%20European%20Society%20of%20Cardiology%20(ESC)%20developed%20with%20the%20special%20contribution%20of%20the%20heart%20failure%20association%20(HFA)%20of%20the%20ESC.%20Eur%20Heart%20J.%202016;37(27):2129–200.)]. Several echocardiographic methods have been used to measure LVEF but at present, the Simpson’s biplane method is most widely used [[5](file:///C:\Users\zalmq\Desktop\5.Lang%20RM,%20Bierig%20M,%20Devereux%20RB,%20Flachskampf%20FA,%20Foster%20E,%20Pellikka%20PA,%20Picard%20MH,%20Roman%20MJ,%20Seward%20J,%20Shanewise%20JS,%20et%20al.%20Recommendations%20for%20chamber%20quantification:%20a%20report%20from%20the%20American%20Society%20of%20Echocardiography's%20Guidelines%20and%20Standards%20Committee%20and%20the%20Chamber%20Quantification%20Writing%20Group,%20developed%20in%20conjunction%20with%20the%20European%20Association%20of%20Echocardiography,%20a%20branch%20of%20the%20European%20Society%20of%20Cardiology.%20J%20Am%20Soc%20Echocardiogr.%202005;18(12):1440–63.)]. Determining LVEF by echocardiography is associated with a high level of inter-observer variability, which to a certain degree can be improved using contrast enhanced echocardiography and 3D echocardiography [[6](file:///C:\Users\zalmq\Desktop\6.Hoffmann%20R,%20Barletta%20G,%20von%20Bardeleben%20S,%20Vanoverschelde%20JL,%20Kasprzak%20J,%20Greis%20C,%20Becher%20H.%20Analysis%20of%20left%20ventricular%20volumes%20and%20function:%20a%20multicenter%20comparison%20of%20cardiac%20magnetic%20resonance%20imaging,%20cine%20ventriculography,%20and%20unenhanced%20and%20contrast-enhanced%20two-dimensional%20and%20three-dimensional%20echocardiography.%20J%20Am%20Soc%20Echocardiogr.%202014;27(3):292–301.)]. Reliability of LVEF depends on image quality and in particular the ability to visualize the endocardial border [[6](file:///C:\Users\zalmq\Desktop\6.Hoffmann%20R,%20Barletta%20G,%20von%20Bardeleben%20S,%20Vanoverschelde%20JL,%20Kasprzak%20J,%20Greis%20C,%20Becher%20H.%20Analysis%20of%20left%20ventricular%20volumes%20and%20function:%20a%20multicenter%20comparison%20of%20cardiac%20magnetic%20resonance%20imaging,%20cine%20ventriculography,%20and%20unenhanced%20and%20contrast-enhanced%20two-dimensional%20and%20three-dimensional%20echocardiography.%20J%20Am%20Soc%20Echocardiogr.%202014;27(3):292–301.)].

**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 [7,[8](file:///C:\Users\zalmq\Desktop\8.Grenne%20B,%20Eek%20C,%20Sjoli%20B,%20Dahlslett%20T,%20Uchto%20M,%20Hol%20PK,%20Skulstad%20H,%20Smiseth%20OA,%20Edvardsen%20T,%20Brunvand%20H.%20Acute%20coronary%20occlusion%20in%20non-ST-elevation%20acute%20coronary%20syndrome:%20outcome%20and%20early%20identification%20by%20strain%20echocardiography.%20Heart.%202010;96(19):1550–6.),[9](file:///C:\Users\zalmq\Desktop\9.Dahlslett%20T,%20Karlsen%20S,%20Grenne%20B,%20Eek%20C,%20Sjoli%20B,%20Skulstad%20H,%20Smiseth%20OA,%20Edvardsen%20T,%20Brunvand%20H.%20Early%20assessment%20of%20strain%20echocardiography%20can%20accurately%20exclude%20significant%20coronary%20artery%20stenosis%20in%20suspected%20non-ST-segment%20elevation%20acute%20coronary%20syndrome.%20J%20Am%20Soc%20Echocardiogr.%202014;27(5):512–9.)].

In addition, GLS has better intra- and inter-observer reproducibility in post hoc analysis compared to LVEF [7, 10, [11](file:///C:\Users\zalmq\Desktop\11.Negishi%20T,%20Negishi%20K,%20Thavendiranathan%20P,%20Cho%20GY,%20Popescu%20BA,%20Vinereanu%20D,%20Kurosawa%20K,%20Penicka%20M,%20Marwick%20TH,%20Investigators%20S.%20Effect%20of%20experience%20and%20training%20on%20the%20concordance%20and%20precision%20of%20strain%20measurements.%20JACC%20Cardiovasc%20Imaging.%202017;10(5):518–22.)]. Furthermore, GLS may be analyzed in a majority of patients with good feasibility [12] and may be measured as fast as LVEF [7, 13].

**Rationale:**

Both Left ventricular (LV) global longitudinal strain (GLS) and LV ejection fraction (LVEF) are useful parameters for assessment of LV function.[[14](file:///C:\Users\zalmq\Desktop\15.%09by%20the%20American%20College%20of%20Cardiology%20Foundation%20and%20the%20American%20Heart%20Association%20Prognostic%20Value%20of%20Left%20Ventricular%20Global%20Longitudinal%20Strain%20and%20Ejection%20Fraction%20in%20Patients%20With%20Non-ischemic%20and%20Ischemic%20Heart%20Disease%2010%20November%202015)]

Non-ST elevation myocardial infarction (NSTEMI) left ventricular function, will be estimated by both Simpson’s biplane method and GLS.

**Research question :**

**Does** the use of GLS by speckle tracking echocardiography give superior results to evaluate left ventricular function than using of LVEF BY simpson’s biplane in non ST elevation myocardial infarction?

**Hypothesis:**

We hypothesize that GLS speckle tracking echocardiography is an added value to evaluate left ventricular function *for non STEMI patients* in comparison with LVEF Simpson’s biplane method.

**The aim of the study:**

TO compare between GLS speckle tracking echocardiography and Simpson’s biplane methods for assessment of left ventricular function in non STEMI patients.

**Objectives:**

**To** investigate the value of assessment of left ventricular function in non STEMI patient by:

* GLS by speckle tracking echocardiography
* LVEF by Simpson’s biplane method.

And to compare between assessment of left ventricular function by GLS and Simpson’s biplane method.

**Material and methods:**

**Technical design:**

**Site of the study:**

**This** study will be conducted in Cardiology Department, Faculty of Medicine, Zagazig University.

**Sample size:**

Sample size Assuming that the IALS endo was 13.7+\_ 4.9 vs 10+\_3.7 before vs 6hour STB. At 80% power and 95% CI. The estimated sample will be 44cases.open epi.

**Inclusion criteria :**.

* Non STEMI confirmed by ECG and cardiac enzymes.

**Exclusion criteria:**

* Pregnant females.
* valvular heart diseases.
* Cardiomyopathy.
* Patients on chemotherapy.
* Anemia.

**Operational design:**

All patients will be subjected to the following:

* An informed written consent will be obtained from each patient.
* Full history taking.
* Proper clinical examination.
* **Electrocardiography** 12-lead electrocardiograms (ECG) of the patients will be recorded.ST-depression and T wave inversion are the classic signs of ischemia on an ECG in the NSTEACS.
* **Echocardiographic:**

Evaluation will be performed using:

* ECHO LVEF BY Simpson’s biplane method
* Left ventricular end-systolic volume (ESV),end diastolic volume(EDV)and LV ejection fraction(EF)will be measured from apical two and four chamber views using modified Simpson’s biplane.
* GLS by speckle tracking echocardiography.

The following are pragmatic points to remember:

* GLS is a simple parameter that expresses longitudinal shortening as a percentage (change in length as a proportion to baseline length).
* GLS is derived from speckle tracking, and analyzed by post-processing of apical images of the LV.[15]
* **Following laboratory tests**: cubital venous blood sample will be collected from each patient for:
* Cardiac enzymes Troponin .
* CBC.
* **Follow up** for the patients for any complication or MACE (Major Adverse Cardiac Events) during inhospital stay.

**Administrative design:**

* Ethical consideration: A written informed consent will be taken from the patients with explanation of the procedure, possible hazards& IRB and the study will be approved from ethical committee of the hospital.

**Results**

* Collected data will be presented in tables, and suitable graphs and analyzed according to standard statistical methods.

**Discussion:**

* Discussion will be done on results which will be compared to related relevant literatures, and scientific researches to explain the reasons for getting such results.

**Conclusion and Recommendations:**

* Will be derived from the findings of the study.

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