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Tissue Mitral Annular Displacement as a predictor of Myocardial Infarction outcomes in comparison to Global longitudinal strain

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Abstract

Background; Left ventricular (LV) dysfunction in the days to months following an acute myocardial infarction (MI) identifies patients at higher risk of sudden cardiac arrest (SCA) and death, **Aim and objectives:** The aim of the study was to assess Tissue Mitral Annular Displacement (TMAD) as a predictor of MI outcomes in comparison to Global longitudinal strain (GLS). **Subjects and methods**: This single center study conducted in Banha University Hospital. Included 323 patients with STEMI and were followed up to 6 months. **Result;** mitral displacement and LV strain is useful in assessment and follow up STEMI patient. **Conclusion**: Left ventricular strain and mitral displacement were suitable for the assessment of global LV systolic function and follow up patients with myocardial infarction.

Keyword: Tissue Mitral Annular Displacement; predictor; Myocardial Infarction; Global longitudinal strain.

1. Introduction

Left ventricular (LV) dysfunction in the days to months following an acute myocardial infarction (MI) identifies patients at higher risk of sudden cardiac arrest (SCA) and death. Even in the era of primary percutaneous coronary intervention, baseline LV ejection fraction (EF) is an independent predictor of survival after MI. **[1]**

The extent of this adverse cardiac remodeling is related to the development of heart failure and is associated with increased morbidity and mortality. **[2]**

The gradual introduction of speckle tracking echocardiography (STE) into clinical practice and its validation for diagnosis and risk stratification in different cardiac disease with a great feasibility have allowed appreciating its potential additive value also for patients with CAD **[3].**

In fact, speckle tracking analysis is capable to assess typical ischemic subendocardial damage through several parameters: longitudinal strain (LS), which is the most used STE parameter to assess the early affection of subendocardial fibers of all cardiac chambers; bull's eye representation of left ventricular global LS (LVGLS) that provides a regional evaluation of LV injury according to coronary vascularization territories **[4].**

Standard 3 apical images (apical long axis, 4-chamber, and 2-chamber views) are required to assess GLS. **[5]**

Longitudinal strain by 2D-STE is assessed along the LV curvature and reflects myocardial deformation. TMDA may be affected by local wall motion abnormality

The aim of the study was to assess Tissue Mitral Annular Displacement (TMAD) as a predictor of MI outcomes in comparison to Global longitudinal strain (GLS).

2. Patients and Methods

This single center study was conducted in Cardiology Department, Banha University Hospital & during 2022. The current study included 323 patients with STEMI.

Methods: All patients were subjected into: **Informed consent, demographic data:** age **and** sex, **risk factors**: DM**,** HTN**,** smoking**,** dyslipidemia and family history of ischemic heart dis- ease (IHD).

Clinical examination focusing on: General examination in the form of **Vital signs** (Blood pressure, Temperature, Heart rate, Respiratory rate) and **signs of** (Pallor, Cyanosis, Jaundice, and Lymph node enlargement).

Cardiovascular examination: To assess Killip classification**: lead ECG with special concern for the following data: Rate, rhythm**

Ischemic changes: STEMI: Defined as new (or increased) and persistent ST-segment elevation in at least two contiguous leads

iv. Investigations: Laboratory study including: hemoglobin concentration (Hb %), red blood cells (RBCs), white blood cells (WBCs), platelet count. Cardiac markers and liver function **(**Total lipids, Serum total cholesterol, serum HDL cholesterol, Total cholesterol/HDL cholesterol ratio, Serum triglycerides, Serum Phospholipids, LDL, VLDL, HDL**).** Liver Test Profile and serum creatinine.

Standard resting transthorathic echocardiography (TTE): Standerd 2D Echo was performed to all patients. **Patients position:** all Subjected examined in the Left Lateral decubitus Position. according to recommendation of **American society of echocardiography (ASE)** As follow: The evaluation start with an assessment of the anatomy of left ventricle.

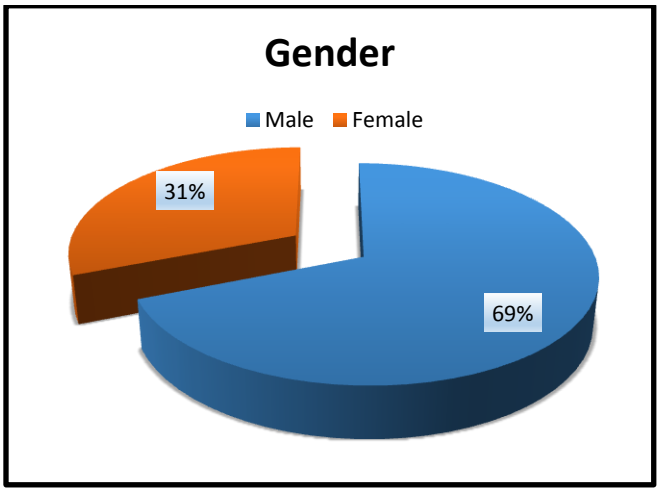
M-Mode: The mean of 5 measurements for diameter in sequential cardiac cycles was used for data analysis. Three elastic indices of aortic stiffness, namely aortic distensibility (D), stiffness index (β), and elastic modulus (Ep), will calculated as $D = 2 (As\_Ad)/[Ad(Ps\_Pd)]$, $\beta = \ln(Ps/Pd)/[(As\_Ad)/Ad]$, and $Ep = (Ps\_Pd) / [(As\_Ad)/Ad]$, respectively, where Ps=systolic blood pressure, Pd=diastolic blood pressure, and ln=natural logarithm**.**

3. Results

Out of 323 patients enrolled in the study period, their median age was 61.76 years. There was higher percentage of male patients than female. The median LVEDV and

LVESV were 49.94 and 35.06; respectively. The median GLS was 14.01 and the median LVEF was 45.02. The median initial CK-MB was 69 ng/mL while the median peak CK-MB was 229.42. The median Troponin-T was 4175.99 ng/L

The following figure: Distribution of studied patients regarding gender.



The baseline, clinical, and laboratory characteristics of the study population stratified according to outcome were presented. STEMI patient that enrolled in our study and had worse outcome were older in age, had higher incidence of diabetes and hypertension (p value <0.05). Left ventricular longitudinal strain had predictive role in outcome.

The following table: Distribution of patients as regard general examination.

	Studied patients (N= 323)				
	Median	**IQR**		**Minimum**	**Maximum**
Heart Rate (beats/min.)	74.46	72.0	76.0	63.0	91.0
Systolic BP (mm/Hg)	119.44	115.0	122.0	85.0	154.0
Diastolic BP (mm/Hg)	73.65	72.0	77.0	54.0	88.0

4. Discussion

This study showed that ST segment elevation MI that had worse outcome tend to be older, with more incidence of diabetes & hypertension and lower left ventricular ejection fraction (LV EF%).

Studies have shown that the systolic excursion of the mitral annulus is a clinically useful measure of LV systolic function. The mitral annulus moves toward the apex during systole because of longitudinal LV deformation **[6]**.

Our results were supported by **Yang et al., [7]** who performed a 10 years national based study and found that AMI was significantly higher in males than females ($p<0.001$).

Also, in agreement with our results **Sonoda et al., [8]**reported that male sex was significantly associated with the incidence of complications after AMI but in contrast to our results they reported that age was significantly associated with complications.

Our results were supported by the systematic review by **Rathore et al., [9]** who stated that the most important risk factors are physical inactivity, smoking, alcohol consumption, dyfslipidemia, diabetes mellitus, hypertension, and obesity.

5. Conclusion

Left ventricular strain and mitral displacement were suitable for the assessment of global LV systolic function and follow up patients with myocardial infarction.

Limitation: small sample size so need larger studies with more follow up.

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