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EVALUATION OF MYOCARDIAL DEFORMATION PARAMETERS IN INDIVIDUALS WITH EARLY REPOLARISATION PATTERN

Cardiology

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ABSTRACT

Background: The prevalence of early repolarization (ER) pattern in standard12-lead electrocardiography is as high as 13% in the general population.It is associated with an increased risk of idiopathic ventricular fibrillation (VF) and death. **Objective:** To detect whether there is any abnormality in the myocardial deformation parameters (global longitudinal strain and circumferential strain) of the left ventricle using 2D Speckle Tracking **Results:** There was no statistically significant difference between groups according to age and BMI. The mean age were 35.63±9 years in ER group and 30.86±4.09 years in control group respectively. Heart rate was higher in subjects with ER pattern (81±10 in ER and 74.86±7.2 in control group).There was a statistically significant difference between their studied groups regarding LV dimensions (LVEDD 43.57±2.89 and LVESD 28.93±1.79 in ER group). There was no statistically significant difference between groups according to LV longitudinal strain (-21.5±2.3 vs -20±2.5) for control and ER groups respectively. There was no statistically significant difference between groups according to LV circumferential strain (-19±3.0 Vs -20.6±3.8) for control and ER groups respectively. **Conclusion:** In healthy subjects with ER pattern, LV myocardial deformation by STE was comparable to control group with no statistically significant differences between both groups.

KEYWORDS

Left ventricular deformation parameters, Early repolarization pattern, 2D Speckle Tracking Echocardiography.

INTRODUCTION

The early repolarization (ER) pattern (ERP) was defined as ≥1-mm J-point elevation in ≥2 contiguous inferior or lateral leads.[1] The prevalence of early repolarization syndrome (ERS) in the general population is as high as 13%.[2]

Historically ERP is considered a variant of the normal electrocardiographic pattern, given its frequency in the population.[3] However, more recent studies have demonstrated positive, negative, and neutral associations between an ERP and various end points, including all-cause, cardiac, and arrhythmic mortality. [4] A meta-analysis of the studies showed that the risk ratio was 1.70 (95% confidence interval [CI]: 1.19–2.42; p=0.003) for arrhythmic death in patients with ER. [5]

Speckle-tracking echocardiography (STE) is a relatively new imaging technique that is increasingly used in the evaluation of global and regional myocardial functions[6]. Recent studies have shown that STE can be used in different clinical situations to evaluate cardiac mechanics in a feasible, reproducible, and accurate way [7].

The main objective of our study was to detect any abnormality in the myocardial deformation parameters (global longitudinal strain and circumferential strain) of the left ventricle using 2D Speckle Tracking Echocardiography in individuals with early repolarization pattern.

PATIENTS AND METHODS

This was a prospective case control study with two groups. The first group consisted of subjects with ER pattern (n-30). The other group was control without ER pattern (n-29). The study was conducted from January 2022 to June 2022.

Inclusion Criteria

Patients coming to OPD with ECG showing early repolarization patterns as cases and without the specified ECG definitive signs of ERP as controls.

Age 18- 60 years and both genders were included in the study.

Exclusion Criteria

1. Patients with LV dysfunction with EF < 50 %.
2. Patients with moderate to severe valvular heart disease.
3. Patients with history of CAD
4. Patients with arrhythmias as atrial fibrillation, advanced atrioventricular block, left or right bundle branch block.

All Studied Populations Were Subjected To:

1. Informed verbal consent.
2. Complete physical examination (BP, heart rate (HR), chest and cardiac examination).
3. Standard 12 lead ECG to detect the presence of early repolarization pattern which is defined as a J-point elevation of ≥0.1mV in at least two contiguous leads with either a QRS slurring or notching at 12 lead ECG.
4. Conventional 2D Echocardiographic examination
5. 2D Speckle tracking echocardiography study was obtained through marking the endocardial and epicardial borders.

Statistical Analysis

Recorded data were analyzed using the statistical package for the social sciences, version 20.0 (SPSS,USA). Quantitative data were expressed as mean± standard deviation (SD). Independent samples t-test of significance was used when comparing between two means. Pearson's correlation coefficient (r) test was used to assess the degree of association between two sets of variables.

RESULTS

Baseline characteristics of both cases and control were shown in table 1.

Majority of the study population in both groups were males. In the ER group, there were 80% (n-24) males and 86% (n-25) in controls. Mean age was 35.63±9 years in ER group and 30.86±4.09 years in control group. Hypertension and diabetes mellitus was present in 33% and 20% of patients in ER group. Patient with ER pattern group had higher heart rate compared to the control group with the mean heart rate in ER group of 81±10.31 and in controls were 74.86±7.24. The age and heart rate difference were statistically different between the two groups with P value<0.05. There was no statistically significant difference between groups regarding to gender and diabetes mellitus.

Comparison of 2-dimentional echocardiographic parameters were shown in table 1.

Patients with ER pattern group had mildly increased left ventricular dimensions with mean LVEDD 43.57±2.89 and LVESD 28.93±1.79 and the difference were statistically significant. The LV wall thickness in both groups remained within normal range and their difference were not statistically significant. Similarly, the LV filling pressure calculated by E/e' in both groups were normal. The mean LV ejection fraction calculated by simpsons method was 62.17±2.62% in ER pattern group and 61.72±1.98% in control group.

Strain deformation parameters findings and analysis were summarised in table 2.

LV longitudinal deformation(mean) of cases (ER pattern) at A4c level, A2C level were -20±2.6 and -20±3 with global longitudinal strain of -20±2.5. The circumferential strain of ERP group at mitral valve level, papillary muscle level, apical level were -16±4, -19.5±5, -24±5 with global circumferential strain of -20.6±3.8. The longitudinal and circumferential strain pattern was not statistically different between

the two groups.

Table 1: Baseline Clinical Characteristics And Echocardiographic Parameters:

VARIABLES	CASES (n-30)	CONTROLS (n-29)	P
AGE	35.63±9	30.86±4.09	0.012
MALES	80% (n-24)	86% (n- 25)	0.52
HYPERTENSION	33% (10)	0	0.001
DM	20% n-6	6.9% n- 2	0.142
HR	81±10.31	74.86±7.24	0.007
LVEDD	43.57±2.89	40.97±2.07	<0.001
LVESD	28.93±1.79	27.97±1.54	0.031
EF	62.17±2.62	61.72±1.98	0.469
E/e'	6.2±1.09	6.17±0.96	0.91
IVS	9.17±1.28	8.86±1.02	0.32
PW	8.50±1	8.41±0.73	0.70

Table 2: LV Longitudinal And Circumferential Deformation Parameters:

VARIABLE	CASES n-30	CONTROLS n-29	P
LONGITUDINAL			
A4C	-20±2.6	-21±3	0.4
A2C	-20±3	-21±2	0.2
GLOBAL	-20±2.5	-21.5±2.3	0.3
CIRCUMFERENTIAL			
MITRAL VALVE LEVEL	-16±4	-17±2.5	0.8
PAPILLARY MUSCLE LEVEL	-19.5±5	-18.0±2.8	0.38
APEX	-24±5	-23±7	0.2
GLOBAL	-20.6±3.8	-19±3.0	0.21

DISCUSSION

In this study, we evaluated LV myocardial deformation parameters in patients with early repolarization pattern and compared with normal controls.

Baseline characteristics showed statistically significant difference between both groups in age and presence of hypertension. Previous studies done by sinner et al and Ahamed et al showed no significant difference in age and risk factors.

On clinical and echocardiographic evaluation, significant difference was found in heart rate and LV dimensions. How-ever there were no significant difference between ejection fraction and E/e'. Our findings were in line with Aagaard[8] et al who conducted a study in long distance runners to assess the patterns of ER. There were no significant difference subjects with ER and without ER for LV wall thickness, LV dimensions, mass and ejection fraction. How-ever E/A ratio was higher in runner with ER pattern. This may be explained by increase in parasympathetic stimulation in runners.

In the medical literature, few studies were done to find the myocardial mechanics in patients with ER pattern by means of strain imaging. Our study showed no significant difference between myocardial deformation parameters in both longitudinal and circumferential mechanics.

Wilhelm[9] et al. evaluated LV longitudinal deformation parameters and found that there was no difference between the groups for global longitudinal strain, systolic strain rate, and diastolic strain rate values, as in our study.

Stankovic[10] et al. evaluated speckle tracking derived strain to distinguish acute coronary syndrome from a marked early repolarization. Speckle-tracking strain analysis revealed normal longitudinal peak systolic strain in all segments of inferior wall, ruling out wall-motion abnormalities in that region.

The study of Sauer[11] et al found an independent relationship between heterogeneity of electrical repolarization and that of contraction duration in the radial direction by strain imaging. This may denote the regional alteration in myocardial deformation parameters in patients in ER patterns

CONCLUSION

There was no correlation between global longitudinal and circumferential strains, diastolic parameters and ejection fraction with few exceptions. Further studies are recommended to show the potential clinical value of myocardial deformation in early repolarization patients.

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