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MITRAL ANNULAR PLANE EXCURSTION (MAPSE) CORRELATION WITH EJECTION FRACTION IN CARDIOVASCULAR DISEASE

Cardiology

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ABSTRACT

INTRODUCTION:MAPSE represents the amount of displacement of the mitral annular plane towards the apex and thus assess the global change in size of the LV(left ventricle) cavity (in the long-axis direction). Thus, it can be interpreted as the volume change during ejection and therefore a close association between the long-axis shortening and ejection fraction (EF) has been suggested in different patient groups with normal or reduced LV function.

BACKGROUND:Reduced MAPSE reflects impaired longitudinal function and thus provides complementary information to ejection fraction (EF), which represents the global result of both longitudinal and circumferential contraction1. Reduced long-axis deformation results from dysfunctional or stressed longitudinal myofibers due to ischaemia, fibrosis, or increased wall stress.MAPSE has been suggested as a surrogate measurement for LV function.

METHODS: Prospective analysis of 111 patients came to our OPD by two-dimensional transthoracic echocardiography was carried out. MAPSE and ejection fraction measured by qualitative visual inspection, M-mode (medial and lateral septal annulus), modifiedSimpson'smethod .MAPSE was compared against ejection fraction by modified Simpson'susing Standard statistical analysis.

RESULTS: There are 90 male and 21 femalepatients included in these studies. These patient are divided in to four category based on ejection fraction which includes, 1) EF less than 30 % EF(N=20) 2)EF 30-40 %(N=27) 3)EF 40-50%(N=10) 4)more than 50 %(N=54).MAPSE of the groups are 1)less than 30%-mean MAPSE=5.3, 2)30-40%EF mean MAPSE =7.52, 3) 40-50 %EF mean MAPSE=9.8 4)more than 50 % EF mean MAPSE=14.5. P value is 0.001.MAPSE cutoff value of less than or equal to 5 provided the best balanced predict EF <30%.From these study MAPSE less than 14 suggested presence of LV dysfunction.

CONCLUSION:MAPSE measurement is still especially helpful to evaluate LV systolic function in case of poor sonographic windows, since good imaging quality is required for most of the modern echocardiographic techniques.

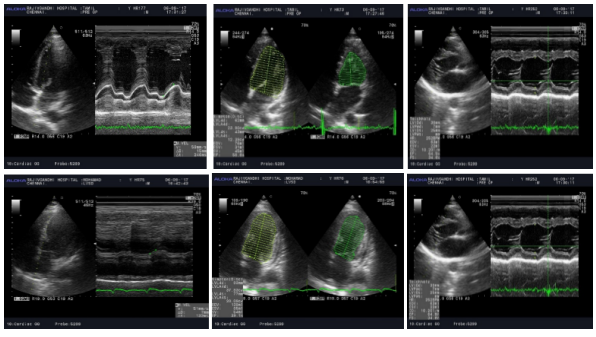
KEYWORDS

INTRODUCTION:

In daily clinical echocardiography, left ventricular (LV) systolic function can be correctly assessed using various echocardiography imaging methods in the majority of patients. However, the assessment of LV systolic function remains a challenge in a patients with poor image quality, caused mainly bylung disease,obesity tachycardia, or cardiac translocation[2]. Thequantitative assessment of ventricular function in those patients isstill difficult despite the use oftransducers with variable frequenciesand harmonic imaging as well as the application of various advanced echocardiography techniques, such as strain rate imaging, speckle tracking imaging, and three dimensional echocardiography. LV longitudinal shortening is a sensitive parameter reflecting cardiacpump functionand can be evaluated by measuring long-axis mitral annular plane systolic excursion (MAPSE).The measurement of M-mode-derived MAPSE does not require high imaging quality, because of the high echogenicity in the atrioventricular annulus[3].

MATERIALAND METHODS:

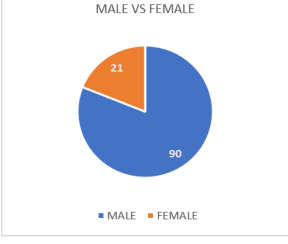
Prospective analysis of 111 patients came to our OPD overa period of one year between May 2016 to May2107 by two-dimensional transthoracic echocardiography was carried out. MAPSE and ejection fraction measured by qualitative visual inspection, M-mode (medial septal annulus), modifiedSimpson'smethod.MAPSE was compared against ejection fraction by modified Simpson's using Standard statistical analysis. All patients enrolled in the study underwentfull two-dimensional echocardiography examination using Phillips machine, and measurements were obtained in accordance with the current American Society of Echocardiography guidelines. In the current study, medial and lateral MAPSEmeasurements were taken and averaged for eachpatient by 2 different operators blinded to the results of each other. The average MAPSE values were used in obtaining MAPSE-derived EF and infurther analysis. Inter-observer and intra-observer variability's in MAPSE measurements were thentested by comparing the results of the 2 operators,as well as remeasuring MAPSE by a single operator. The following patients were excludedfrom the study: (1) patients with mitral valve diseaseor prosthetic mitral valve, (2) patients withhemodynamicunstable form of arrhythmia, (3) patients with acutecoronary syndrome, (4) patients with decompensatedheart failure.

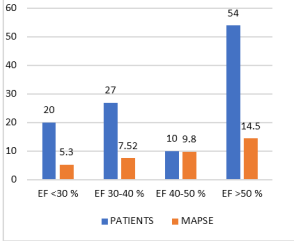


RESULTS:

Data were coded and analyzed using the SPSSprogram (Statistical Package for Social Sciences,IBM, Armonk, NY, USA). Qualitative data werepresented using the frequency and its relatedpercentage, while quantitative data were presentedusing the mean and standard deviation.

1.There are 90 male and 21 female patients included in these study.





2.These patient are divided in to four category which includes,

1) less than 30 % EF(N=20)
2) 30-40 %(N=27)
3)40-50%(N=10)
4)more than 50 %(N=54).

MAPSE of the groups are measured and grouped 1)less than 30%-mean MAPSE=5.3, 2)30-40%EF mean MAPSE =7.52, 3) 40-50 %EF mean MAPSE=9.8 4)more than 50 % EF mean MAPSE=14.5.MAPSE values correlated with corresponding EF values .various cut off valve can be obtained .MAPSE of <5 and <14 mm are corresponds to EF <30 % and EF <50 % which is statically significant P value is 0.001.

EF

EF	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
< 30	20	5.40	1.273	.285	4.80	6.00	3	7
30-40	27	7.52	1.889	.363	6.77	8.27	5	15
40-50	10	9.80	2.044	.646	8.34	11.26	6	13
> 50	54	14.15	1.720	.234	13.68	14.62	8	18
Total	111	10.57	4.047	.384	9.81	11.33	3	18

MAPSE

EF	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Below 30	20	5.40	1.273	.285	4.80	6.00	3	7
30-40	27	7.52	1.889	.363	6.77	8.27	5	15
40-50	10	9.80	2.044	.646	8.34	11.26	6	13
Above 50	54	14.15	1.720	.234	13.68	14.62	8	18
Total	111	10.57	4.047	.384	9.81	11.33	3	18

Discussion:

Although MAPSE and LV EF are related, they arenot entirelyin terchangeable. APSE is suggestedto be primarily representative of subendocardial, longitudinally oriented, myocardial fibers compared to the sub epicardial, circumferential fibers measured by LV EF and is known to detectmore subtle abnormalities of LV function. The current study showed that an average MAPSE cut-off value of less than or equal to 5 providedthe best balanced predict EF <30%[4]. A cutoff Our results were consistent with those of Matos et al.6 whostated that a MAPSE cutoff point of <6 served asan appropriate cutoff point to predict severely depressed EF less than or equal to 30%. Elnoamanyet al.14 demonstrated that a MAPSE value of<12 mm had 90% sensitivity and 88% specificity for the detection of EF <50%,which correlates with our cut off valve <14mm.

Study Limitations and Recommendations:

This was a prospective observational study over alimited period of time, and the number of femalepatients with depressed LV function and normalmitral valve during the period of the study wasnot sufficient to confirm the gender-specific differencesin MAPSE measurements postulated byMatos et al. or to validate the equation postulated by the authors to predict EF in femalesusing MAPSE-derived measurements.Whether or not diastolic dysfunction could affect MAPSE-derived measurements remainsanother area of future research. Comparing MAPSE-derived EF with CMR or3DTTE-derived LVEF by volumes should be consideredin future studies as these modalities representthe gold standard for quantification of LVfunction and are sought to be much more accuratethan the current 2D quantification methods.

CONCLUSION:

MAPSE is a simple method and can assess longitudinal function of the complete LVwalls, but it cannot detect small localized myocardial abnormalities. Despite routine use of newer and more refined echocardiography technologies nowadays, such as strain-rate imaging, speckle-tracking imaging,and 3D echocardiography, the use of MAPSE measurement is still especially helpful to evaluateLV systolic function in case of poor sonographicwindows with minimal inter- and intra-observer variability. An average MAPSE cut-off value of less than or equal to 5 provided the best balanced predictEF<30%and MAPSE less than 10 suggested presence of LV dysfunction.

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