ASSESSMENT OF LEFT ATRIAL FUNCTION B Y 3D TRANSTHORACIC ECHOCARDIOGRAPHY AND 2D SPECKLE TRACKING ECHOCARDIOGRAPHY IN PATIENTS WITH RHEUMATIC MITRAL STENOSIS

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INTRODUCTION

In developing countries, rheumatic mitral valve stenosis is still a problem. Its progression leads leads to left atrial damage, which predisposes to atrial fibrillation, thrombus formation, and decompensated heart failure, all of which substantially modify the prognosis and course of the disease. As a result, left atrium evaluation was shown to be clinically significant in mitral stenosis.

Due to the complexity of the left atrium geometry, currently used techniques like antero-posterior dimensions and 2D echo delivered Left atrium volume have several limitations that are corrected by 3D provided LA volumes. Additionally, functional evaluation with speckle tracking echo enables us to evaluate the three physiological functions of the left atrium: the pump, the conduit, and the reservoir

AIM OF THE WORK

The aim of this study was to assess left atrial function using 2D speckle tracking echocardiography and 3D transthoracic echocardiography in patients with moderate – severe mitral valve stenosis in comparison to normal healthy subjects.

PATIENTS AND METHODS

This research comprised fifty-five patients with moderate to severe rheumatic mitral stenosis and fifty healthy controls. The 3D Left atrial volumes indexed to BSA, and EF were quantified, and the left atrial 2D speckle tracking echo parameters: left atrial strain reservoir (LASr), LA strain conduit (LAScd), and LA strain contraction (LASct) were generated using dedicated software.

RESULTS

Fifty patients matched our inclusion criteria, and fifty healthy controls were studied and included in the final analysis.

3D Left atrium (LA) maximum and minimum volumes indexed to body surface area were both significantly higher in MS than in the control group, whereas 3D LA emptying fraction was significantly lower in MS than in the control group, all with (p=0.001).

LA 2D strain echo parameters reservoir, conduit, and contraction were significantly lower in the mitral stenosis group than in the control group with a (p= 0.001).

2D Left ventricular global longitudinal strain were significantly low in MS compared to control group with (p= 0.001). All LA assessment parameters (3D LAVmaxI, 3D LAVminI, 3D LAEF, 2D LASreservoir, 2D LASconduit, 2D LAS contraction, 2D LAD, 2D LAVI) correlated with each other with a p <0.01. However, only 3D LAEF, 2D LASr, 2D LAScd, and 2D LASct showed a correlation with the mitral valve area with a p <0.05, but 3D LAVmaxI and 3D LAVminI did not.

Additionally, in the comparison of moderate and severe mitral stenosis subgroups, 3D LAVmaxI and 3D LAVminI did not show any statistically significant differences between the two groups, although 3D LAEF, 2D LASr, 2D LAScd, and 3D LASct did show significant difference with p<0.05

Table 1: Basic demographic and clinical characteristics of the study group

	Patients	Control
Sex	No (%)	No (%)
Female	41(82)	23(46)
	Mean ± SD	Mean ± SD
Age (years)	40.2 ± 8.8	34.2 ± 6
BSA (m^2)	1.81 ± 0.16	1.85 ± 0.12
HR (Beats/min)	80 ± 12.9	
Systolic (mmHg)	102.9 ± 8.95	
Diastolic(mmHg)	65.62 ± 5.35	
NYHA	No (%)	
I	3 (6)	
II	18 (36)	
III	29 (58)	

Table 2: Echocardiographic parameteres of the study group

	Patients Mean ± SD n=50	Control Mean ± SD n=50	t	p
MDG (mmHg)	12 ± 5.9			
MVA (cm^2)	0.92 ± 0.26			
2D LAD (mm)	50.8 ± 8			
2D LAVI (ml/m^2)	69.2 ± 25.6			
3D LAVmaxI (ml/m^2)	65.2 ± 24.7	22 ± 3.9	-12.54	<0.001
3D LAVminI (ml/m^2)	45.3 ± 23.2	6.67 ± 2.3	-12.15	<0.001
3D LAVminI (ml/m^2)	31.22 ± 13.29	69.85 ± 8	15.22	<0.001
LASr (%)	17.01 ± 8.8	53.5 ± 12.6	14.1	<0.001
LAScd (%)	-7.75 ± 4.5	-36.6 ± 10.9	-6.5	<0.001
LASct (%)	-9.4 ± 5.4	-16.9 ± 4.9	-5.4	<0.001
LV GLS (%)	-17 ± 3.6	-20.6 - 2.1	5.3	<0.001

Table 3: Correlation between LA 3D echo parameters and different parameters

	3D LAVmaxI		3D LAVminI		LAEF	
	r	p	r	p	r	p
MVA	-0.151	0.272	-0.218	0.11	0.427**	0.001
MDG	0.157	0.253	0.274*	0.043	-0.490**	0.001
LAD	0.587**	0.001	0.595**	0.001	-0.395**	0.001
LAVI	0.814**	0.001	0.859**	0.001	-0.605**	0.001
LASr	-0.487**	0.001	-0.595**	0.001	0.788**	0.001
LAScd	0.425**	0.001	0.540**	0.001	-0.661**	0.001
LASct	0.464**	0.001	0.545**	0.001	-0.758**	0.001

Table 4: Correlation between LA speckle tracking parameters and different parameters

	LASr		LAScd		LASct	
	r	p	r	p	r	p
MVA	0.322*	0.017	-0.351**	0.009	-0.269*	0.047
MDG	-0.325*	0.016	0.436**	0.001	0.2	0.144
LAD	-0.362**	0.007	0.333*	0.013	0.362**	0.007
LAVI	-0.483**	0.001	0.448**	0.001	0.447**	0.001

CONCLUSION

LA assessment is of clinical significance for its predictive and prognostic value in mitral stenosis. The use of 3D echo for LA assessment allows us to overcome the geometric assumptions of 2D echo. In addition, left atrium function assessment parameters by 3D echo and 2D speckle tracking echo correlate better with mitral stenosis severity than conventional LA size measurements in mitral stenosis, which may be of great importance in the monitoring and prevention of atrial fibrillation, thrombus formation, stroke, and heart failure in patients with mitral stenosis. Further research may study the role of left atrium function assessment by 3D echo and strain echo in clinical follow up and intervention timing in patients with mitral stenosis.

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