

INTRODUCTION

The significance of ventricular interaction is becoming more apparent in the current era since both ventricles are firmly linked, and they are still being actively studied under the category of ventricular interdependence. Aortic valve stenosis can induce right ventricular dysfunction due to pressure overload from increased left-sided filling pressure. Additionally, although various research have assessed pulmonary artery pressure in patients with severe AS, scarce data is known regarding the prevalence and prognostic importance of RV dysfunction in these patients. Hence, integrating new modalities such as 3D echocardiography and 2D speckle tracking could potentially improve the risk stratification systems and identify candidates for trans-catheter aortic valve replacement (TAVR) or surgical valve replacement (SAVR).

AIM OF THE WORK

The aim of the study was to assess the right ventricular systolic function in patients with severe AS using two-dimensional (2D) speckle tracking echocardiography and three dimensional (3D) echocardiography in order to detect the risk factors and prevalence of right ventricular dysfunction in these patients.

SUBJECTS AND METHODS

This is an observational prospective cohort study of patients with severe aortic stenosis who underwent echocardiographic examination at Alexandria Main University Hospital between March 2021 and February 2023. Beyond complete 2D transthoracic echocardiography, all patients underwent 3D transthoracic echocardiography and 2D speckle tracking echocardiography. Our study enrolled 32 patients with severe aortic stenosis and preserved left ventricular systolic function which were further divided into two groups:

Group I: Patients without right ventricular impairment; defined as 3D-RVEF > 45% by 3D echo or RV-GLS > -20 by 2D speckle tracking.

Group II: Patients with right ventricular impairment; defined as 3D-RVEF < 45% by 3D echo or RV-GLS < -20 by 2D speckle tracking.

RESULTS

By classifying patients into two groups according to 3D RV EF, 44% of the patients were <45% while 56% of the patients were >45%. The mean LV GLS and RV GLS were lower in the RV dysfunction group than patients with normal RV function with significant difference. Additionally, 3D RVEF have shown significant strong correlation with EOA_i and mPAP. Moreover, our cohort study have shown significant moderate correlation with LAVI, average E/e', LV-GLS, RV GLS 4C, RV GLS FW, and 3D LV mass index. Regarding 1 year follow-up, patients with decreased RVEF had higher incidence of heart failure symptoms and cardiovascular related hospitalization compared to that of maintained RV function.

Table 1: Comparison between the studied groups according to GLS (-ve)

GLS (-ve)	3D RV EF (%)		p
	>45 (n = 18)	<45 (n = 14)	
LV GLS			<0.0001*
Min. – Max.	12.70 – 23.10	6.0 – 21.0	
Mean ± SD.	17.46 ± 3.19	13.58 ± 4.47	
RV GLS 4C (-ve %)			
Min. – Max.	17.30 – 29.50	10.90 – 30.0	0.0056*
Mean ± SD.	22.09 ± 3.53	18.84 ± 5.67	
RV GLS FW (-ve %)			
Min. – Max.	16.70 – 38.60	12.80 – 29.10	0.0033*
Mean ± SD.	26.15 ± 6.56	20.18 ± 5.05	

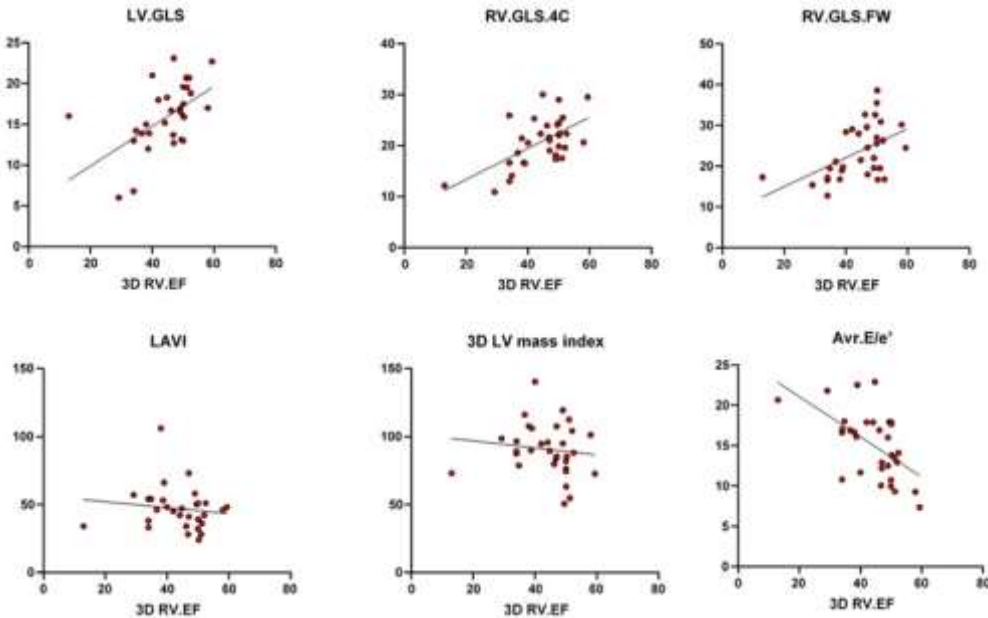


Figure 1: Correlation between 3D RVEF and other echocardiographic parameters

Table 2: Comparison between the studied groups according to prognosis and plan of management.

Follow up	3D RV EF (%)				P
	>45 (n = 18)		<45 (n = 14)		
	No.	%	No.	%	
CV related death					0.0853
No	18	100	12	86	
Yes	0	0	2	14	
CV related hospitalization					0.0229*
No	18	100	11	79	
Yes	0	0	3	21	
Management					0.0937
Medical	15	84	10	72	
TAVI/Surgical referral	3	16	4	28	

CONCLUSION

RV dysfunction is common in patients with severe high gradient aortic valve stenosis and preserved LV systolic function. 3D echocardiography and 2D speckle tracking detected subtle changes in RV function even before being detected by 2D echocardiographic right side conventional parameters including FAC, TAPSE and S' wave. Right ventricular dysfunction, even if subclinical, is an important cause or contributor to cardiovascular related hospitalization and mortality in patients with severe aortic stenosis. Therefore, early identification of right ventricular impairment in these patients is crucial. Hence, we suggest that RV dysfunction should be systematically looked for in aortic valve stenosis patients for better prognosis and management.