

ASSESSMENT OF RIGHT VENTRICULAR STRAIN AND 3D EJECTION FRACTION IN MODERATE AND SEVERE FUNCTIONAL TRICUSPID REGURGITATION

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INTRODUCTION

- Functional tricuspid regurgitation is characterized as tricuspid valve leakage during systole in the presence of structurally normal leaflets and chordae. However, its progression leads to right ventricular dilation and dysfunction. Historically, Right ventricle has been considered as a neglected cardiac chamber that does not contribute significantly to overall cardiac function. Yet, in recent years, many studies showed up that Right ventricular function has been an independent predictor of Morbi-mortality in many cardiovascular diseases
- Due to the asymmetric complex architecture of Right ventricle, the assessment of Right ventricular function by conventional echocardiography has many limitations that are overcome by Three-dimensional echocardiography and strain (two-dimensional speckle tracking echocardiography)

AIM OF THE WORK

- The aim of this study was to evaluate additional value of Right ventricular strain and Three-dimensional Right ventricular ejection fraction to assess right ventricular dysfunction in patients' native valvular disease with moderate and severe functional tricuspid regurgitation

PATIENTS AND METHODS

- This research comprised twenty-five subjects with moderate to severe functional tricuspid regurgitation and preserved Tricuspid annular plane systolic excursion. The Three-dimensional Right ventricular ejection fraction was quantified, and the two-dimensional speckle tracking echocardiography parameters of the Right ventricle were generated using dedicated software

RESULTS

- During the 12 months of this study, from May 2023 to May 2024, a total of twenty-five patients matched our inclusion criteria.

- Our data revealed that in patients with functional tricuspid regurgitation, the majority of whom were due to Rheumatic heart disease, with normal Tricuspid annular plane systolic excursion, 76% had reduced Right ventricular function by strain and 3D. Right ventricular dysfunction has been identified in 44% of the population study who had a Three-dimensional Right ventricular ejection fraction <45%, in 72% with Right ventricular global longitudinal strain <|-20|%, and in 64% with Right ventricular free wall strain <|-23|%.
- Furthermore, compared to patients with moderate tricuspid regurgitation, those with severe tricuspid regurgitation exhibited significantly decreased Right ventricular function parameters.

Distribution of the studied patients (n=25) based on demographic characteristics and anthropometric measurements

	N	%
Gender		
Females	20	80.0
Males	5	20.0
Age (years)		
Mean ±SD	50.28±13.18	
Median (IQR)	47.0(41.5-55.0)	
Min-max	33.0-83.0	
BSA(m ²)		
Mean ±SD	1.81±0.18	
Median (IQR)	1.89 (1.61-1.98)	
Min-max	1.52-2.10	
NYHA	N	%
NYHA I	10	40.0
NYHA II	12	48.0
NYHA III	3	12.0

Distribution of the studied population based on 2D/3D transthoracic echocardiography findings

RA area (cm ²)	
Mean ±SD	21.75±5.01
Median (IQR)	22.9(17.5-25.2)
Min-max	14.1-34.9
TV annulus diameter (mm)	
Mean ±SD	34.33±4.69
Median (IQR)	35.6(32.0-37.0)
Min-max	19.6-42.0
Basal RVEDD (mm)	
Mean ±SD	39.92±5.23
Median (IQR)	41.0(36.5-43.0)
Min-max	21.5-47.9
FAC (%)	
Mean ±SD	36.42±8.67
Median (IQR)	33.6(31.0-43.45)
Min-max	21.0-60.0
TAPSE(mm)	
Mean ±SD	20.63±4.12
Median (IQR)	19.0(17.0-23.0)
Min-max	17.0-33.0

3D RVEF (%)	
Mean ±SD	47.39±8.5
Median (IQR)	45.2(42.1-52.0)
Min-max	33.4-65.0
RV GLS(%)	
Mean ±SD	-17.22±4.63
Median (IQR)	-15.8(-21.85—14.15)
Min-max	-26.2 - -9.1
RV free wall strain (%)	
Mean ±SD	-21.24±6.44
Median (IQR)	-20.0(-26.8- -16.75)
Min-max	-34.7- -9.5
PASP(mmHg)	
Mean ±SD	42.12±10.29
Median (IQR)	41.0(35.5-47.5)
Min-max	25.0-67.0
LVEF(%)	
Mean ±SD	59.65±8.47
Median (IQR)	60.0(55.0-64.3)
Min-max	35.0-74.0
LV size (mm)	
LVEDD	
Mean ±SD	53.12±10.31
Median (IQR)	50.0(45.5-59.9)
Min-max	36.0-77.0
LVESD	
Mean ±SD	35.39±8.59
Median (IQR)	32.0(31.0-40.85)
Min-max	21.0-55.0

Distribution of patients with right ventricular (RV) dysfunction based on 2D speckle tracking and 3D RVEF

Specific RV function parameters *	N	%
RVGLS	18	72
RV FWS	16	64
3D RVEF	11	44

CONCLUSIONS

- Functional TR leads to alterations in right-sided heart shape and RV function is affected by the severity of TR. Due to its predictive and prognostic value, RV evaluation is clinically significant in Tricuspid regurgitation. The use of 3D echocardiography for RV assessment allows us to overcome the geometric assumptions of 2D echocardiography. Furthermore, RV function evaluation using 3D echocardiography and 2D speckle tracking echocardiography contribute to earlier detection of RV dysfunction in significant TR than conventional echocardiographic parameters.