PREVALENCE AND PATTERNS OF RIGHT VENTRICLE DYSFUNCTION IN PATIENTS WITH END-STAGE RENAL DISEASE ON MAINTENANCE HEMODIALYSIS

Eman Mohamed El Sharkawy, Noha Mohamed Elkholy, Rasha Mohamed Aba Yazeed, Didier MANZI

Departments of Cardiology and Angiology,Faculty of Medicine, Alexandria University

Introduction

As the prevalence of End-Stage Renal Disease (ESRD) continues to rise worldwide, driven by factors such as improved survival rates and increased access to renal replacement therapy (RRT) such as hemodialysis, the burden of cardiovascular complications has also grown. Right ventricle (RV) dysfunction has emerged as a major contributor to morbidity and mortality among ESRD patients undergoing hemodialysis. While Cardiac Magnetic Resonance imaging (CMR) is recognized as the gold standard for RV assessment, significant advancements in echocardiography, particularly 3D and speckle tracking echocardiography (STE), have greatly improved the ability to evaluate the RV. Given its accessibility and enhanced capabilities, echocardiography has become an excellent and practical tool for assessing RV function.

Aim of the work

To assess the prevalence and characterize the patterns of right ventricular dysfunction in patients with ESRD on maintenance hemodialysis.

Methods

A total of 42 patients with ESRD who had undergone maintenance hemodialysis for a minimum of six months were enrolled prospectively at Alexandria main university and Almowasah hospitals. A thorough evaluation of RV function and its patterns was conducted using a multimodal echocardiographic protocol incorporating two-dimensional, three-dimensional and speckle tracking echocardiography (STE).

Results

RV dysfunction prevalence ranged from 9.5 to 40.5% according to the echocardiographic method employed. The highest detection rates were achieved by 2D right ventricular free wall strain (RVFWS) and 3D RV ejection fraction (RVEF). The predominant pattern observed was volume overload, indicated by RV dilation. Comparison in patients with and without intradialytic hypotension (IDH) showed that patient with IDH exhibited significantly reduced RV function parameters with the exception of FAC : reduced TAPSE (1.71 vs. 2.20 ; p=0.001), lower TDI s' (9.75 vs. 11.30 ; p=0.020), diminished RVFWS (15.60 [12.65 – 23.20] vs. 22.0 [19.10 – 24.70]; p=0.033) and lower 3D RVEF (43.25 vs 49.0 ; p=0.010).

Table 1: Demographic and basic clinical characteristics of the study population

Variables	
Age (years)	48.14 ± 13.23
Gender	
Male (%)	59.5
BMI (kg/m^2)	26.67 ± 4.30
BSA (m^2)	1.82 ± 0.15
Smoking, n (%)	11 (26.2)
HTN, n (%)	31 (73.8)
DM, n (%)	7 (16.7)
HR (beat/min)	78.60 ± 8.12
Systolic blood pressure (mmHg)	131.0 ± 14.47
Diastolic blood pressure (mmHg)	79.83 ± 7.24
NYHA	
I	61.9
II	38.1

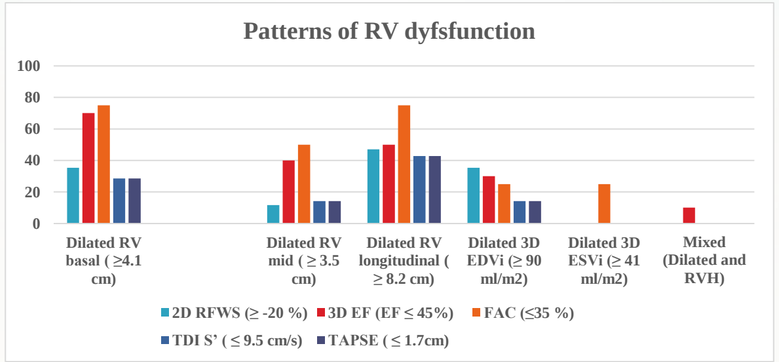

Figure 1: Patterns of RV dysfunction in the study population (n=42)

Table 2: comparison between patients with and without IDH

	Intradialytic hypotension		Test of sig.	p
	No Hypotension (n = 34)	Hypotension (n = 8)		
TAPSE (cm)			t= 3.506*	0.001*
Median (IQR)	2.20 (2.0 – 2.40)	1.71 (1.50 – 1.86)		
TDI S' velocity (cm/s)			t= 2.427*	0.020*
Median (IQR)	11.30 (10.70 – 12.20)	9.75 (7.86 – 11.85)		
RVFAC (%)			t= 1.131	0.290
Median (IQR)	45.20 (43.10 – 50.0)	39.20 (34.10 – 49.15)		
RVFWS (%)			t= 2.213*	0.033*
Median (IQR)	22.0 (19.10 – 24.70)	15.60 (12.65 – 23.20)		
3D RVEF			t= 2.710*	0.010*
Median (IQR)	49.15 (46.70 – 54.0)	43.25 (41.75 – 48.85)		

Conclusion

RV dysfunction is frequently observed in individuals with ESRD undergoing maintenance hemodialysis, with volume overload constituting the principal pathophysiological pattern. Accurate identification necessitates multimodal echocardiographic evaluation incorporating advanced imaging modalities (3D and STE). Notably, the marked reduction in RV function parameters in patients with IDH offers potential prognostic value for identifying individuals susceptible to hemodynamic compromise during dialysis sessions.