Right ventricular sympathetic dysfunction in arrhythmogenic right ventricular cardiomyopathy: News or noise?

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Arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVC/D) is an inherited cardiac disorder characterized by fibrofatty infiltration of the myocardium, which predominantly involves the right ventricle (RV). Its diagnosis remains challenging due to lack of specific unique diagnostic criteria, incomplete penetrance, variable expression, and progressive nature of the disease.^{1,2} Imaging remains the cornerstone of diagnosing and managing these patients.³

MULTIMODALITY IMAGING FOR DIAGNOSIS OF ARVC/D

The current modified task force criteria for imaging abnormalities in ARVC/D are based on functional and morphological changes in the RV.⁴ These include RV dysfunction, dilation, regional wall motion abnormalities and aneurysm formation. Echocardiography and MRI both are extremely useful in detecting these changes. MRI can also detect the histological changes in the cardiac tissue in patients with ARVC-like fibrosis and fatty infiltration. Despite their utility there are several limitations of these imaging modalities. Histological changes lack specificity and are challenging to interpret given the thin walled nature of the RV. The assessment and reporting of regional RV wall motion abnormalities is also subjective and may be absent in the

early stages of the disease. Moreover, some or all of these findings may be seen in other disease processes like sarcoidosis,⁵ myocarditis⁶ and therefore, a more standardized, reproducible, and specific noninvasive imaging marker is needed for patients with ARVC/D.

The current study by Todica et al is a step forward in this direction. Sympathetic denervation assessment using SPECT/Planar imaging has been rarely utilized in ARVC and few reported studies have focused on the left ventricle.^{7,8} Authors report findings of Planar and SPECT MIBG imaging on 27 patients, of which, 17 met the modified task force criteria for ARVC. and the rest 10 had idiopathic VF which served as a control group. They calculated Planar H/M ratio, SPECT RV/Mediastinal, and LV/mediastinal ratio. Patients with ARVC had lower mean H/M ratio on planar imaging but it did not reach significance. On SPECT imaging patients with established ARVC had significantly reduced RV/M and LV/M ratio as compared to patients with idiopathic VF. Using receiver operating curve (ROC) analysis authors report a cut off value of 1.86 for the RV/M ratio, which gives the highest sensitivity and specificity for diagnosis of ARVC. Limitations of the current study include the small sample size and lack of data on clinical outcomes and specificity of their findings when compared to other diseases, which affect the right ventricle

CLINICAL APPLICATION AND FUTURE DIRECTIONS

Clinical applications of author's findings are currently limited because of the reasons highlighted below.

Sympathetic dysfunction in ARVC likely results from fibro-fatty infiltration of the myocardium resulting in damage to sympathetic nerve endings. It is therefore unlikely that RV sympathetic dysfunction is specific to ARVC and may also be seen in diseases like cardiac

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sarcoidosis and myocarditis. We need more studies in these subsets of patients to investigate how specific reduced RV/M and LV/M ratio is to ARVC. Longitudinal assessment of sympathetic dysfunction is also needed to shed light on how early or late in the disease process these abnormalities arise. A potentially more useful application would be to prognosticate patients who have already been diagnosed with ARVC. Regional sympathetic denervation predisposes to ventricular arrhythmias by causing heterogeneity in electrical properties of myocardium and promoting re-entry.⁹ As seen in ischemic cardiomyopathy, it is likely ARVC patients with abnormal MIBG SPECT are more prone to arrhythmic events. This has been shown in patients with LV sympathetic dysfunction but not RV. In future studies, relationship between degrees of abnormality and arrhythmic events needs to be investigated.

ARVC remains a challenging disease to diagnose and prognosticate. Imaging plays a pivotal role in diagnosing and prognosticating these patients. Assessment of sympathetic dysfunction by SPECT MIBG scan may provide an additional novel tool for the clinicians; however, the data on this imaging modality is limited currently, and further studies to better identify its role in the disease process are needed.

Disclosure

The author declares no conflict of interest.

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