

Three-dimensional late gadolinium enhancement increases the diagnostic yield of cardiovascular magnetic resonance to detect low voltage in the right ventricular outflow tract

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Background: Cardiac magnetic resonance (CMR) using late gadolinium enhancement (LGE) fails to detect scar tissue in patients with electroanatomical abnormalities and biopsy-proven structural heart disease. It has shown conflicting data regarding existence of structural abnormalities in patients with idiopathic premature ventricular contractions (PVCs) from the right ventricular outflow tract (RVOT). Three-dimensional (3D) LGE enables high-spatial resolution more appropriate to the thin-walled right ventricle than two-dimensional (2D) LGE.

Objective: Our aim was to evaluate if the use of 3D-LGE would improve the performance of CMR to detect low voltage areas in the RVOT of patients with PVCs.

Methods: Since May 2020 we performed 3D-LGE CMR in 11 consecutive patients that underwent ablation of frequent PVCs. A control group of 11 consecutive patients that underwent catheter ablation by the same operator and had a 2D-LGE CMR performed before ablation was also studied. All patients had normal 2D-LGE CMR. A 3D electroanatomical bipolar voltage map of the RVOT was performed in sinus rhythm (0.5 mV-1.5 mV colour display). Areas with electrograms <1.5 mV represented the LVA. The area adjacent to the pulmonary valve usually displays voltage between 0.5 and 1.5 mV and is classified as transitional-voltage zone. Presence of LVAs outside this transitional-voltage zone were estimated. We compared the accuracy of CMR for detecting LVA in the two groups: 3D LGE and 2D LGE.

Results: The median number of points used for the voltage map was 344 (242-450). 18 patients (82%) displayed LVAs. The site of origin of the PVCs was the RVOT in 17 patients and the left ventricular outflow tract (LVOT) in 5. Comparison between groups is displayed in the table. 2D LGE CMR failed to demonstrate abnormalities of the RVOT in any of the patients that presented with LVAs. 3D CMR showed presence of fibrosis (Figure) in 3 out of 9 patients with LVAs (33%).

Conclusion: CMR using 3-D LGE techniques showed an increased power to diagnose structural abnormalities. This technique may be a better choice in initial stages of RVOT disease.

	All sample N = 22	3D-LGE CMR N = 11	2D-LGE CMR N = 11	p-value
Age in years, median (Q ₁ -Q ₃)	47 (35-68)	62 (34-55)	42 (34-55)	0.243
Male gender, n (%)	8 (36)	3 (27)	5 (46)	0.330
PVCs RVOT/LVOT	17/5	9/2	8/3	0.500
Nº points in the map, median (Q ₁ -Q ₃)	344 (242-450)	350 (259-450)	300 (158-345)	0.076
Low voltage areas, n (%)	18 (82)	9 (82)	9 (82)	0.707

Abstract Figure.

