3-DIMENSIONAL LATE GADOLINIUM ENHANCEMENT INCREASES THE DIAGNOSTIC YIELD OF CARDIAC MAGNETIC RESONANCE

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BACKGROUND AND AIMS

Cardiac magnetic resonance (CMR) using late gadolinium enhancement (LGE) fails to detect scar tissue in patients with abnormalities on the three-dimensional (3D) electroanatomical map 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). 3D-LGE enables high-spatial resolution more appropriate to the thin-walled right ventricle than two-dimensional (2D) LGE.

The aim of our study 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

POPULATION

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.

CARDIAC MAGNETIC RESONANCE

Myocardial fibrosis was visually assessed on delayed enhancement CMR images acquired 15 min after administration of 0.2 mmol/kg intravenous gadobutrol (1.5T Magnetom Avanto®, Siemens Healthineers), using an isotropic 1.5mm 3D sequence with respiratory navigator, and/or a standard 2D inversion-recovery sequence in LV short axis with 8mm-thickness contiguous slices

3D ELECTROANATOMICAL BIPOLAR VOLTAGE MAPPING

A 3D electroanatomical bipolar voltage map of the RVOT was performed in sinus rhythm (0.5 mV-1.5 mV color display) with the Carto 3 or Ensite Precision systems in a point-by-point manner (Figures 1 and 2)

Areas with electrograms <1.5 mV represented the low voltage areas (LVAs).

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.

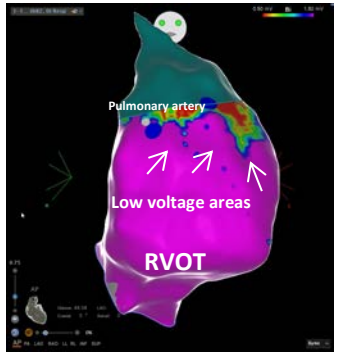


Figure 1

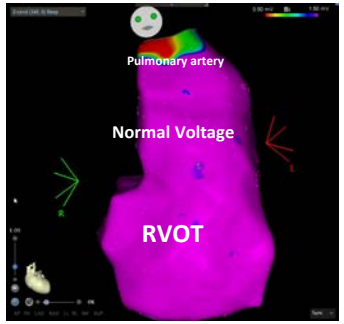


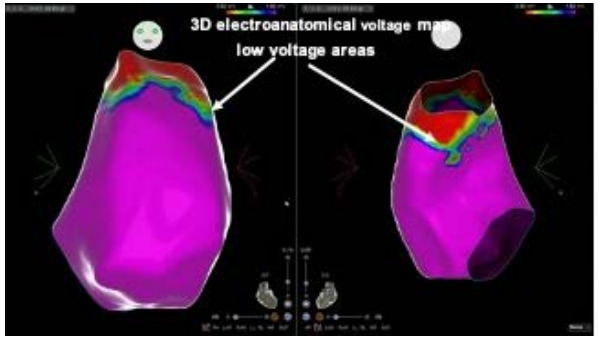
Figure 2

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).
- The site of origin of the PVCs was the RVOT in 17 patients and the left ventricular outflow tract (LVOT) in 5.
- The two groups 2D LGE and 3D LGE did not differ in relation to age, gender, site of origin of the PVCs and number of points used for the voltage map.
- LVAs were present in 18 patients (82%), 9 in the 3D-LGE group and 9 in the 2D-LGE group, p=0.707. In the 2D LGE group CMR failed to demonstrate abnormalities of the RVOT in all patients that presented with LVAs. In the 3D-LGE group CMR showed presence of fibrosis (Figure 3) **in 3 out of 9 patients with LVAs (33%).**

	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



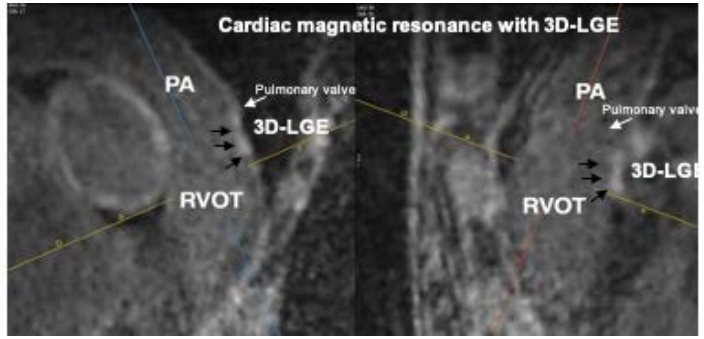


Figure 3

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.