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Combined Endo-Epicardial Approach and Scar Dechanneling Ablation in Arrhythmogenic Right Ventricular Cardiomyopathy

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Abstract

A 47-year-old male diagnosed with Arrhythomogenic Right Ventricular Cardiomyopathy (ARVC) was referred for ablation due to recurrent ventricular tachycardia. Using the CARTO® 3 V6 system, both endocardial and epicardial voltage maps were acquired revealing an extensive epicardial scar with abundant local abnormal ventricular activities (LAVA) in distribution compatible with conducting channels. Epicardial scar dechanneling ablation allowed abolition of all LAVA's. This case highlights the advantage of a combined endo-epicardial approach as a first-line therapy for ARVC, as well as of scar dechanneling ablation, which allowed elimination of all LAVA's with a lesser extensive ablation.

Keywords: Ventricular tachycardia; Epicardial ablation; Arrhythmogenic right ventricular cardiomyopathy; Scar dechannelling ablation

Abbreviations: ARVC: Arrhythomogenic Right Ventricular Cardiomyopathy; LAVA: Local Abnormal Ventricular Activities; RV: Right Ventricle

Introduction

A 47-year-old male diagnosed with Arrhythomogenic Right Ventricular Cardiomyopathy (ARVC) was referred for ablation due to recurrent ventricular tachycardia with appropriate shocks despite optimized therapy with amiodarone and mexiletine.

The procedure was performed under general anesthesia with continuous invasive arterial blood pressure monitoring. Programmed right ventricular (RV) stimulation induced a non-tolerated ventricular tachycardia (Figure 1-A) that required termination by overdrive pacing. Using the CARTO 3 V6 system (Biosense-Webster, Irvine, CA, USA), an endocardial high-density substrate voltage map of the RV (Figure 1-B and D) was obtained during stable sinus rhythm and a limited area with local abnormal ventricular activities (LAVAs) was identified at the mid-ventricular portion of the free wall. Since ARVC is typically associated with a more extensive epicardial arrhythmogenic substrate, a percutaneous subxyphoid access to the pericardial space was performed. The substrate epicardial map revealed a wider area of scar with abundant LAVAs in distribution compatible with conducting channels (pathways of orthodromically activated sites inside the scar – Figure 1-C and E), poorly matching the location of the endocardial regions with suspicious electrograms (Figure 2). Epicardial ablation of the anomalous conducting channels was performed. After ablation, VT was non-inducible with up to 4 extrastimuli from 2 different endocardial sites and the substrate map documented abolition of all LAVA's.

This case highlights the advantage of a combined endo-epicardial approach as a first-line therapy, since ARVC typically presents a wider epicardial substrate, and of scar dechanneling ablation, which allowed elimination of all LAVA's with a lesser extensive ablation.

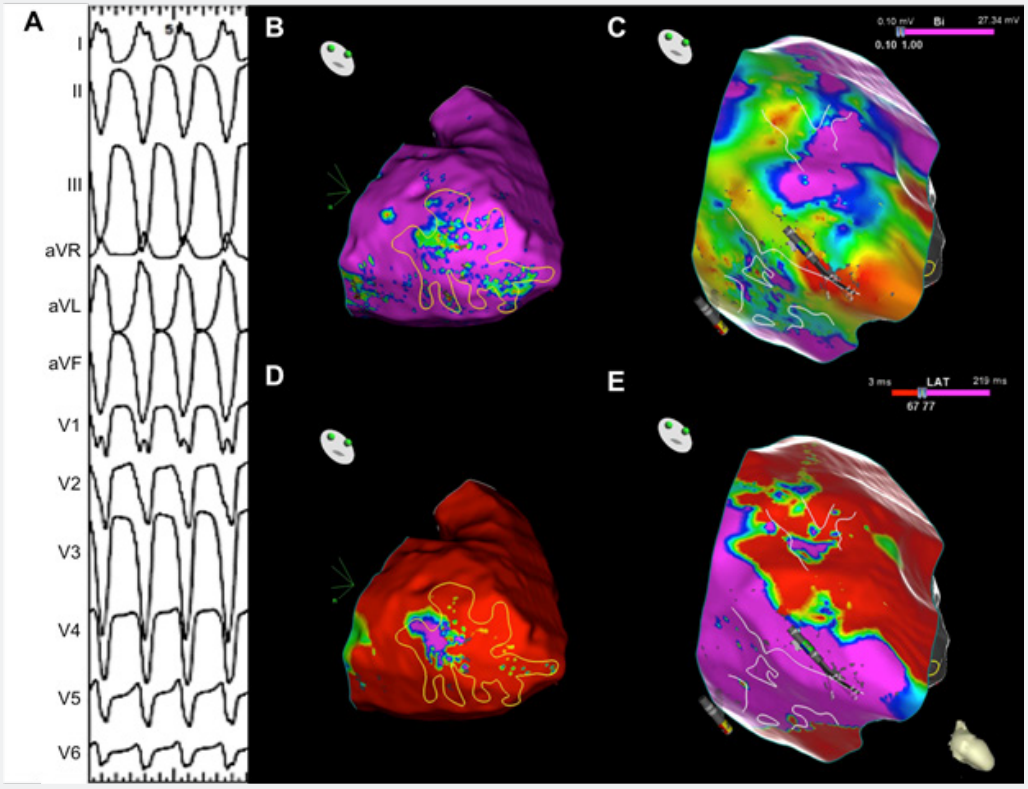

Figure 1: A. 12-lead-ECG ventricular tachycardia presenting left bundle brunch-like pattern, left superior axis and delayed RS transition at the precordial leads, suggestive of origin at the right ventricle free wall. High-density substrate maps of the right ventricle obtained during sinus rhythm, displaying the bipolar voltage at the endocardium (B) and epicardium (C) and the distribution of the late potentials (areas activated after the end of the QRS complex are color-coded in purple) at the endocardial (D) and epicardial surfaces (E). To facilitate the comparative analysis, Endo and Epi scars areas were identified using the same voltage cutoffs values for dense scar (<0.1mV) and border zone (<1.0mV). Regions where local abnormal ventricular activities (LAVA's) were located at the endocardium and epicardium are depicted with yellow and white lines, respectively.

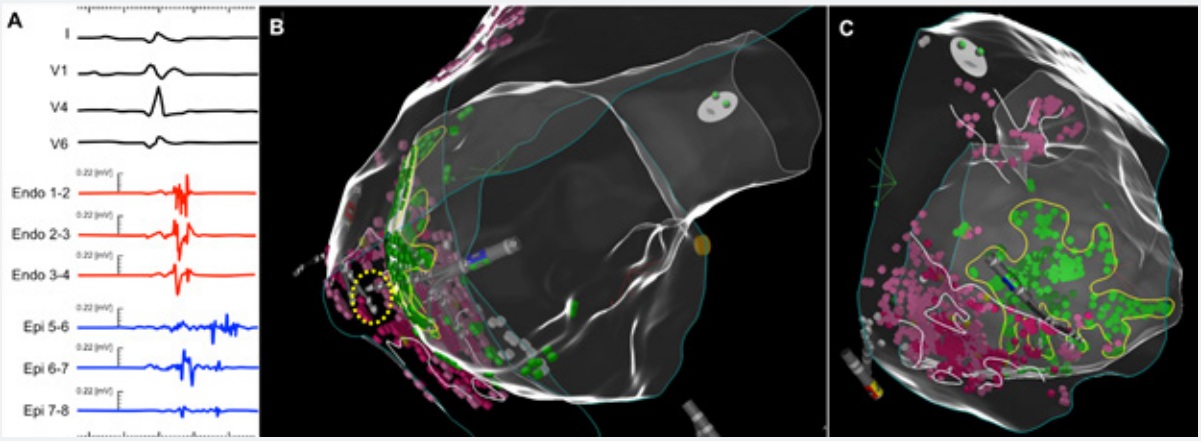

Figure 2: Imperfect matching of the endocardial and epicardial regions with local abnormal ventricular activities (LAVA's) and distinctive characteristics of the abnormal electrograms. The most delayed epicardial electrogram (A, Epi 5-6), occurring 142 ms after the QRS complex, presents low voltage and high fractionation while the correspondent endocardial electrograms presents distinctive characteristics, with a very short delay between the LAVA's and the far-field component originated at the healthy muscle (Endo 1-2 to 3-4). B depicts the Pentaray catheter at the epicardial surface and correspondent endocardial region (distance between points below 5mm). C presents both maps superimposed and reveals that the overlapping area is very small, justifying that it would be impossible to locate the critical substrate with an exclusively endocardial approach. All the electrograms from the epicardial (2866 points) and endocardial (3851 points) were analyzed and manually tagged. Green tags represent the endocardial LAVA's and pink tags represent the epicardial LAVA's (darker points represent the more delayed LAVA's in each map) and the regions were the LAVAs were located were delineated with yellow and white lines, respectively.

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