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Cardiac Magnetic Resonance-Guided Conducting Channel Delineation of an Aneurysmal Ventricular Tachycardia with the Same Circuit in the Reverse Direction

E-PAGE ORIGINAL IMAGE

A 54-year-old male patient with remote inferior wall myocardial infarction with inferoseptal left ventricular (LV) aneurysm (Figure 1A, Video 1) was referred for ablation of hemodynamically tolerated ventricular tachycardia (VT). Image processing (ADAS 3D Galgo Medical, Barcelona, Spain) was used to reconstruct myocardial scar from cardiac magnetic resonance (CMR) and to identify channels of heterogeneous tissue that could be directly involved in the VT reentry

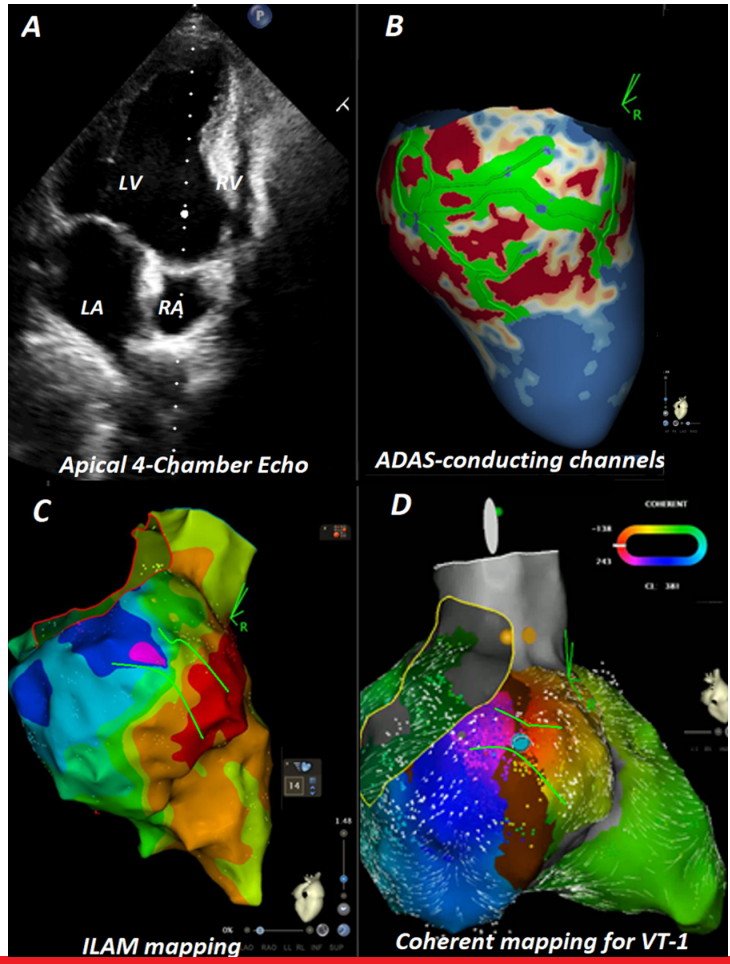

Figure 1. (A) Echocardiography shows inferoseptal aneurysm. (B) CMR with ADAS software shows the endocardial channel (green lines). (C) ILAM during the sinus rhythm shows the isochronal crowding/DZ as perfectly compatible with ADAS-guided channel (C), and coherent mapping (D). CMR, cardiac magnetic resonance; DZ, deceleration zone; LAM, late activation map.

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circuit (Figure 1B, Videos 2-4). Then, this 3-dimensional (3D) CMR analysis was uploaded into 3D electroanatomic mapping system (CARTO® Biosense Webster Inc., Diamond Bar, CA, USA). Isochronal late activation map (ILAM) demonstrated an area of isochronal crowding/deceleration zone on the basal inferoseptal part of LV aneurysm (Figure 1C). Two tachycardias (VT1-CL 395 msn and VT2-CL 375 msn) were induced by programmed ventricular stimulation. Activation and color-coded 3D mapping showed shared channels with 2 opposite reentry around the inferior aneurysm with simultaneous perimitral reentry (Video 5). The coherent mapping (Figure 1D, for VT-1) and ILAM were perfectly compatible with the CMR-guided channel delineation (Video 5). A single radiofrequency energy application at the shared site of slow conduction eliminated inducibility of both morphologies.

Integration of high-definition myocardial substrate data acquired via imaging techniques such as CMR and computed tomography has already been proved as a feasible and potentially effective solution for VT ablation, even in complex and cutting-edge scenarios. The VOYAGE (Ventricular tachycardia ablatiOn and mYocardial scAr characterization with maGnetic rEsonance) trial (ClinicalTrials.gov NCT04694079) will compare current standard of care with a tailored approach for VT radiofrequency ablation in terms of efficacy, safety, and efficiency.

Informed Consent: Written informed consent was obtained.

Video 1: Transthoracic echocardiography showing inferoseptal aneurysm.

Video 2: A video of the rotating left ventricle is seen.

Video 3: The layer representation of the myocardium in ADAS 3D, going from the endocardium to the epicardium, is seen.

Video 4: The different DICOM slices of the left ventricle and its 3D model correspondence is seen. The tissue is displayed in blue for non-enhanced tissue (healthy), in red for highly enhanced tissue (core), and in light blue to orange for the gray-area tissue. The white tubes are the centerlines of the automatically detected border-zone corridors.

Video 5: Activation and color-coded 3-dimensional propagation mapping shows the shared channels with 2 opposite reentry around the inferior aneurysm with simultaneous perimitral reentry (above VT-1, below VT-2)