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Continuous ECGI Mapping of Spontaneous VT Initiation, Continuation and Termination with Antitachycardia Pacing

Junjie Zhang, BS^{*}, Kavita A. Desouza, MD[†], Phillip S. Cuculich, MD^{*,‡}, Daniel H. Cooper, MD^{*,‡}, Jane Chen, MD, FHR^{*,‡}, and Yoram Rudy, PhD, FHR^{*,‡}

^{*}Cardiac Bioelectricity and Arrhythmia Center, Washington University in St Louis, St. Louis, MO

[†]Cardiovascular Division, St. Luke's - Roosevelt Hospital Center, Columbia University College of Physicians & Surgeons, New York, NY

[‡]Cardiovascular Division, Washington University School of Medicine, St. Louis, MO

A 40-year-old woman with nonischemic cardiomyopathy and a left ventricular (LV) ejection fraction of 35% was referred for recurrent ventricular tachycardia (VT). She experienced 248 VT episodes treated by antitachycardia pacing (ATP) over 14 days. In 2005, she received an implantable cardioverter defibrillator for an episode of syncope and nonsustained VT. She later underwent an invasive electrophysiology study (EPS) with inducible VT and an ablation of the AV nodal reentrant tachycardia. Since then, she experienced symptomatic VT, terminated by ATP. Her VT was unresponsive to sotalol and mexiletine. Two EPS in early 2010 failed to induce VT despite intravenous isoproterenol and triple extrastimuli at two right ventricular (RV) sites; therefore, no ablations were performed.

Upon admission, the patient underwent noninvasive Electrocardiographic Imaging (ECGI)^{1–3}. The online movie shows a continuous reconstruction of epicardial activation during initiation, continuation and termination by ATP of spontaneous VT during ECGI procedure. The images in Figure 1A summarize the events. Note that the VT triggering beat differed in origin and activation sequence from the following beats of the sustained monomorphic VT. This first VT beat (VT1) originated from the inferolateral LV base, while subsequent VT beats (VT2...VT14) originated from the superolateral LV base with a cycle length (CL) of 343 ms. After 14 VT beats, ATP started pacing at 85% of VT CL. The first ATP beat (P1) was a fusion beat of the VT and right RV pacing wavefronts. The remainder ATP beats (P2...P8) captured the ventricles and showed exclusive RV pacing pattern. The

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Correspondence: Yoram Rudy, PhD, Cardiac Bioelectricity and Arrhythmia Center, 260 Whitaker Hall, Campus Box 1097, 1 Brookings Dr., St. Louis, MO, 63130, Phone: 314-935-8163, Fax: 314-935-8168, rudy@wustl.edu.

Online Data Supplement:

Movie Clip: ECGI Activation Movie.mov

Wavefront propagation during VT initiation, continuation and termination by ATP. The activation wavefront is shown in red. An asterisk (*) indicates the earliest epicardial activation site. A plus sign (+) indicates the right ventricular pacing site.

Disclosures:

Dr. Rudy co-chairs the scientific advisory board of and holds equity in CardioInsight Technologies. CardioInsight Technologies does not support any research conducted by Dr. Rudy, including that presented here. Jane Chen receives speaker honorarium from Medtronic.

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recovered atrial paced beat following ATP was identical to the sinus beat before VT onset. ECGI identified a low-voltage zone (scar)³ on posterolateral LV (Figure 1B, dark blue).

Following ECGI, monomorphic VT with a CL of 341 ms was induced with LV programmed stimulation in EPS. Pacing from the posterolateral LV scar yielded a QRS with a near-perfect match to the induced VT. Ablation in this region rendered the tachycardia noninducible. The patient has been arrhythmia-free during follow-up.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.