Peak frequency analysis and differentiation between near-field and far-field electrograms of the ventricular tachycardia circuit leads to successful ablation of arrhythmia

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Achieving the subepicardial substrate of ventricular tachycardia (VT) during endocardial mapping can be challenging, particularly in the low-amplitude area [1, 2]. Multipolar electrodes and omnipolar technology allow the mapping of even small areas of electrically active tissue, particularly in the region of the post-infarction scar; they also provide a wealth of information useful for visualizing the arrhythmia substrate [3]. EnSite OT Near Field (Abbott Chicago, IL, US) is a complementary technology that enables distinction between near-field and far-field potentials of intracardiac electrograms in electroanatomic mapping. It facilitates differentiation of the arrhythmia substrate component from irrelevant signal elements [4].

We present the case of a 64-year-old man with a history of electrical storm, left ventricular (LV) inferior wall myocardial infarction, heart failure with reduced ejection fraction of ~30%, stable coronary artery disease, and an implantable cardioverter-defibrillator implanted for secondary prevention, who was admitted to the cardiac arrhythmia unit for recurrent ventricular tachyarrhythmias with a rate below implantable cardioverter-defibrillator detection. The patient was qualified for catheter ablation of underlying VT.

The patient was connected to an intracardiac recording system (Bard US) and an Ensite X electroanatomic system (Abbott). Decapolar and quadripolar diagnostic catheters were placed in the coronary sinus and His bundle area, respectively, *via* the right femoral approach. An Advisor HD Grid Mapping Catheter and subsequent Tacti Cath ablation catheter (both Abbott) were introduced into the LV *via* transseptal puncture. Clinical VT with a cycle of approximately 530 ms was easily induced during the electrophysiological study. Endocardial mapping of the LV was performed during the hemodynamically well-tolerated VT. A large post-infarction scar was visualized in the inferior-posterior part of the left ventricle. Despite using the multipolar catheter and the omnipolar technology, only the entry and exit tachycardia areas could be visualized on the propagation map while the critical tachycardia isthmus was not visible.

During the entrainment, it was possible to locate the areas close to the VT exit with up to 79% pace mapping and a postpacing interval (PPI) minus tachycardia cycle length (TCL) of around 44 ms. The EnSite OT near-field technology was then used, with peak frequency (PF) recorded signals set at 250–1000 Hz, to distinguish the near-field from the far-field components and to analyze the low-field region, allowing areas associated with VT conduction to be identified (Figure 1).

PF analysis of the fragmented potentials allowed selection of the site for further radiofrequency (RF) energy application. Possible modification of a part of the tachycardia circuit led to VT termination during RF application, probably with transmural application near the exit site. Clinical ventricular tachycardia was no longer induced during electrophysiological study after ablation.

The case presented here illustrates the potential benefits of using the PF tool as an

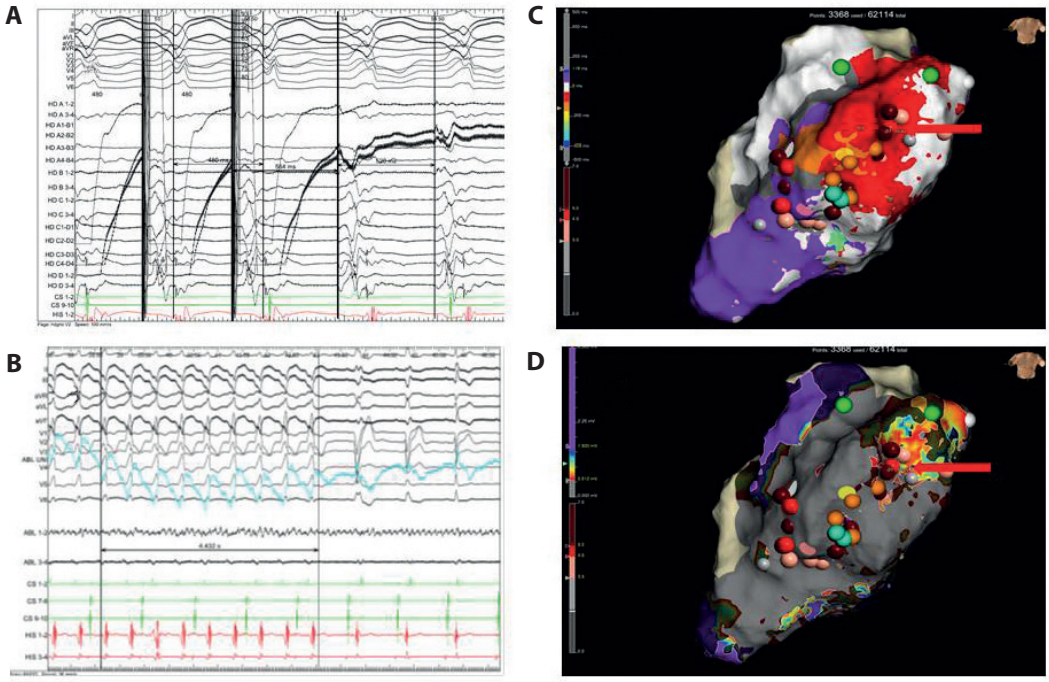

Figure 1. Sites of tachycardia interruption. **A.** IEGM recordings. Entrainment in application site near tachycardia exit. Pace mapping of tachycardia morphology 79% PPI TCL +44 ms. **B.** Moment of final VT interruption. **C.** Propagation map showing VT circle on left ventricular inferior wall with arrhythmia interruption site marked (red arrow) note that only half of circle was visible. **D.** Potential map with peak frequency analysis filter overlay highlighting area of interest in the scar

adjunct to multipole mapping and entrainment [5]. Although this method does not replace existing methods, it may reduce the risk of unnecessary applications at sites where far-field signals are present and may distinguish the correct fragmented potential as part of the arrhythmogenic substrate.

Article information

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