

EP CASE REPORT

Termination of ventricular tachycardia with high-power ablation after endocardial entrainment of a non-endocardial circuit in a patient with left ventricular assist device

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A 47-year-old man with non-ischaemic cardiomyopathy (left ventricular ejection fraction of 10%) with prior left ventricular assist device [LVAD (HeartWare, Framingham, MA, USA)] presented with incessant ventricular tachycardia (VT) below the rate detection of his device. External defibrillation terminated VT. Daily episodes of incessant slow VT continued despite therapy with intravenous amiodarone, lidocaine, and procainamide. The patient was brought to the electrophysiology laboratory for endocardial mapping and ablation via a transseptal approach. Percutaneous or surgical epicardial access and epicardial mapping was deemed prohibitive in the setting of intra-pericardial LVAD.

High-density endocardial mapping and entrainment was performed via a short-spaced linear multi-electrode catheter (MEC) with 2 mm electrodes and 2 mm spacing (Livewire St Jude Medical, St Paul, MN, USA) during incessant VT at a cycle length of 415 ms. A high-frequency (1000 Hz) low-voltage (0.01 mV) recorded signal was observed continuously on the MEC likely due to electromagnetic recording from the nearby LVAD pump. Relatively preserved endocardial voltage was observed during tachycardia. Entrainment mapping from the MEC was performed at the sites of earliest endocardial activation (on-time with QRS), which demonstrated a peculiar outer-loop-type response in the absence of recordable low-voltage diastolic electrical potentials during VT.¹ Due to the LVAD signal recording on the MEC, very low amplitude diastolic potentials could not be excluded (*Figure 1A*).

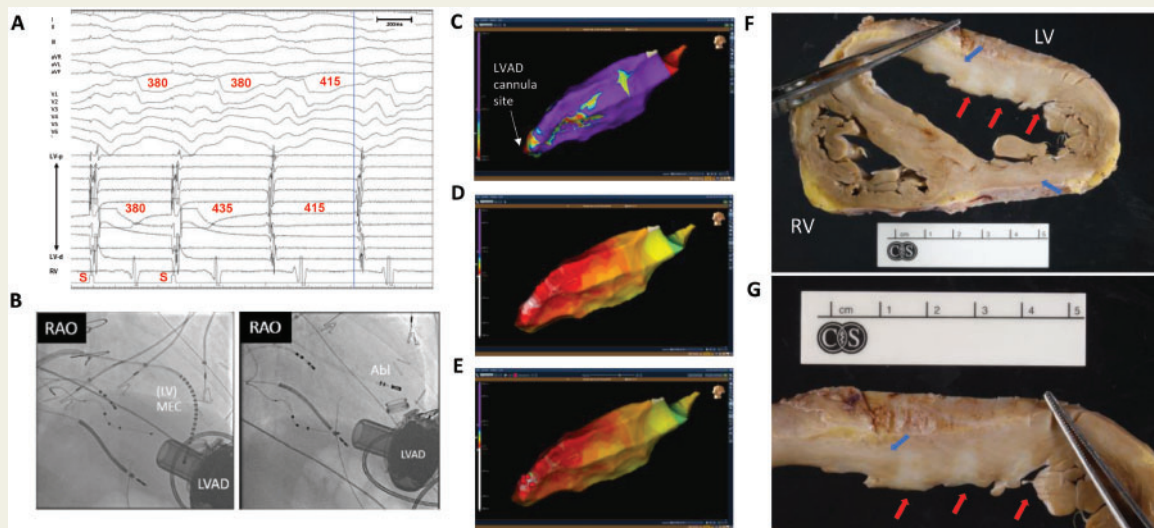


Figure 1 (A) Entrainment at the earliest endocardial site (0 ms—blue line) with the MEC (LV) demonstrates a response consistent with an outer-loop site in the healthy endocardium. (B) Fluoroscopic views of the MEC, Abl, and LVAD. (C) Bipolar endocardial voltage map during tachycardia. (D) Endocardial activation map. (E) Endocardial ablation lesion set (red dots). (F and G) Gross pathology of the explanted heart after heart transplant. Note mid-myocardial and sub-epicardial scar (blue arrows) and ablation lesions in the area of the antero-lateral apical left ventricle demonstrating lesion depth up to 1 cm (red arrows). Abl, ablation catheter; LV, left ventricle; LVAD, left ventricular assist device; MEC, multi-electrode catheter; RAO, right anterior oblique; RV, right ventricle.

Ablation was performed at the best endocardial entrainment sites titrating power to 50 W with irrigated 4 mm catheter (Flexability, Abbott, IL, USA) for a duration of 3 min. The use of high power and long duration ablation in this case was deemed necessary to achieve a deeper lesion from the relatively healthy endocardium to reach non-endocardial tissue in the setting of likely mid-myocardial or sub-epicardial VT circuit.² Delayed tachycardia termination was observed and after further ablation VT was rendered non-inducible. Outside of one episode of faster pace-terminated VT the night of ablation, the patient remained arrhythmia-free off antiarrhythmic therapy for the duration of his hospitalization. Pathology after heart transplantation (2 months later) revealed a hypertrophied left ventricle with mid-myocardial scar and sizable endocardial ablation lesions with depth of up to 1 cm (Figure 1F, G).

This case demonstrates that the absence of endocardial signal precocity or low-voltage should not preclude an attempt at entrainment mapping of VT. In fact, if such a response is seen, it may indicate proximity to a non-endocardial circuit where high-power prolonged-duration ablation may be effective. Prolonged high-power ablation with open-irrigated cooling can facilitate deeper RF lesions but at the cost of increased risk of mechanical and thromboembolic complications.³ The extent of lesion formation and depth with high-power prolonged-ablation may not have been achieved with lower power and duration in this case.

Conflict of interest: none declared.

References

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