

Catheter ablation of persistent ventricular tachycardia in a patient with a left ventricular assist device: Electrophysiological challenge

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A 67-year-old male patient with ischemic cardiomyopathy (ICM), with an implantable cardioverter-defibrillator implanted (ICD) in secondary prevention after left ventricular assist device (LVAD) — HeartMate3 (Abbott Labs, Chicago, IL, US) implantation a year earlier was admitted for persistent ventricular tachycardia 150/min lasting about three weeks. Telemetry control of the ICD showed similar ventricular tachycardia (VT) episodes for a few months before admission with different duration and unsuccessful anti-tachycardia pacing. Pharmacotherapy based on amiodarone was unsuccessful, and all reversible causes of arrhythmia were excluded. Electrical cardioversion terminated VT only for a few hours. The patient was entirely dependent on the LVAD with the closed and fibrotic aortic valve. Despite suitable left ventricular (LV) hemodynamic tolerance of VT, the patient started to develop right ventricular (RV) failure, with mainly gastric problems and abdominal and limb edemas with significantly elevated liver enzymes. Pre-procedural computed tomography (CT) scans located the inflow cannula in the LV (Figure 1A). A significant reduction of impeller speed or switching off the device were impossible. Catheter ablation was performed using the CARTO electro-anatomical system (Biosense Webster Inc., CA, US) under general sedation with a transeptal approach.

After entering the LV, the position of the inflow cannula was marked on the CARTO map under fluoroscopic control, and then the activation and voltage mapping (0.10–1.0 mV)

was performed (Figure 1 B–D). The magnetic field generated by the LVAD created slight artifacts on surface ECG, mostly corrected with EP system (Lab-system Pro, Boston Scientific) without impairing the mapping process. Intracardiac signals were not interrupted. Mapping showed extensive low-voltage areas and macro-reentry VT. Entrainment mapping confirmed the location of the VT critical isthmus on the apical-lateral wall, and VT terminated a few seconds after the radiofrequency (RF) application (40 W; 15 ml/min) started (Figure 1E, Supplementary material, Figure S1A, B). The control ventricular stimulation program did not induce VT. Due to extensive LV fibrosis and non-inducibility, the procedure was finished. In 3-month follow-up, VT did not recur.

Ventricular arrhythmias are the most significant cause of mortality in patients after LVAD implantation [1]. Indication for catheter ablation exists in the case of incessant VT, recurrent ICD interventions, or progressive RV failure [2].

Electromagnetic interference caused by fully magnetic LVAD can be a significant issue during map acquisition, as systems rely on the magnetic field to create 3D maps [3]. In the presented case, intracardiac signals and the mapping process were uninterrupted. Moreover, the risk of impeller damage by catheters should be taken into consideration. The anatomy of the LV, changed by the apical position of the device and the suction force of the inflow cannula, is a significant risk factor for this complication. Pre-procedural CT scans

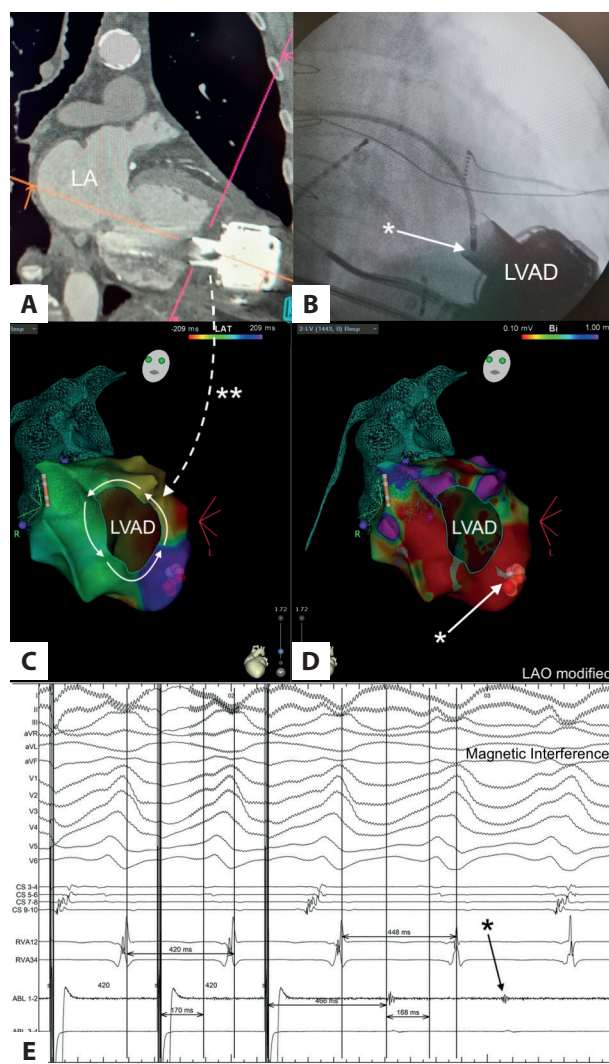


Figure 1. **A.** Pre-procedural CT scans of the heart with precise localization of the LVAD inflow cannula in the LV. **B.** Fluoroscopy view of the LVAD and an ablation catheter from RF ablation spot (*), AP view. **C.** Activation map of the LV (LAO modified projection) during VT (CARTO, Biosense Webster Inc., CA, US) performed with the SmartTouch™ ablation catheter and automatic points acquisition (total points acquired:1445). The inflow cannula was marked and cut from the LV FAM (**). The map showed macro-reentrant VT with a critical isthmus located in the lateral-apical segment of the LV (*). **D.** Voltage bipolar (0.1–1.0 mV) map (LAO modified projection) of the LV shows extensive scarring. **E.** Entrainment pacing from the VT critical isthmus. VT with CL 448 ms is entrained by pacing with CL 420 ms with concealed fusion, PPI-VT CL =18 ms, S-QRS = EGM-QRS. VT terminated after 7 seconds after RF application at this spot. Surface ECG shows slight magnetic artifacts

Abbreviations: CL, cycle length; CT, computer tomography; FAM, fast anatomical map; ECG, electrocardiography; EGM, electrogram; LV, left ventricular; LAO, left anterior oblique; VT, ventricular tachycardia; LVAD, left ventricular assist device; PPI, post pacing interval; RF, radiofrequency

with precise localization of the cannula or intracardiac echocardiography (ICE) used during the procedure may help to avoid such a problem. However, this complication has not yet been reported in the literature [4].

Ablation of VTs in patients with LVADs should be considered if there are indications for the procedure because acute procedural success, complications, and recurrences are comparable to the non-LVAD-related VT population [5].

Article information

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