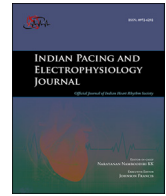




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Incessant tachycardia in a patient with advanced heart failure and left ventricular assist device: What is the mechanism?



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ABSTRACT

We present a case of incessant wide-complex tachycardia in a patient with left-ventricular assist device, and discuss the differential diagnosis with an in-depth analysis of the intracardiac tracings during the invasive electrophysiologic study, including interpretation of the relative timing of the fascicular signals during tachycardia and in sinus rhythm, and interpretation of pacing and entrainment maneuvers.

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1. Case presentation

A 54-year-old man with end-stage hypertrophic cardiomyopathy had a Heart Mate II (Thoratec Corporation, Pleasanton, CA) left ventricular assist device (LVAD) for advanced heart failure and had a cardiac resynchronization therapy-defibrillator (CRT-D) in place. At the time of his LVAD implantation, linear surgical cryoablations had been performed from the apical cannula to the mitral valve annulus along the posterior and posteroseptal left ventricle (LV). He now presented with palpitations and congestive heart failure. He was noted to be in a wide complex tachycardia at 172 beats per minute with intermittent changes in the QRS axis/morphology (Fig. 1A). The tachycardia could be interrupted with overdrive pacing from the right or left ventricular pacing lead, but would subsequently reinitiate. On echocardiography, the LVAD cannula was normally positioned without any evidence of LV chamber

collapse or mechanical interaction between the cannula and the myocardium. The patient was started on flecainide 150 mg by mouth two times a day to suppress the tachycardia. This however converted it to a slow (107 beats per minute) but incessant tachycardia with a stable rate and consistent morphology.

He was brought to the electrophysiology laboratory and diagnostic catheters were placed in the coronary sinus (CS), right ventricle (RV) and His bundle region. He was in sustained tachycardia with a stable cycle length (560–570 msec) and morphology, and a slower dissociated sinus rhythm in the atria. Some sinus beats advanced the His bundle electrogram and QRS without any change in the surface QRS morphology, and reset the tachycardia (Fig. 1B, asterisk). The tachycardia was unable to be overdriven with atrial pacing due to atrioventricular (AV) block at faster pacing rates. The tachycardia terminated with a premature ventricular complex (PVC) during attempted atrial overdrive pacing, but reinitiated with the first AV conducted beat (Fig. 1C). The HV (His to ventricle) interval for conducted atrial beats was 88 msec and HV interval during tachycardia was 60 msec.

Overdrive pacing from the RV posteroseptal catheter was performed. Pacing at successively shorter cycle lengths demonstrated progressive fusion (Fig. 2A). Mapping of the fascicular signals on the mid-to-basal right ventricular septum during tachycardia demonstrated a distal-to-proximal activation of the right bundle branch and His. The response to entrainment from the RV septum is shown in Fig. 2B. What can you deduce about the tachycardia circuit?

Abbreviations: AV, atrioventricular; CRT-D, cardiac resynchronization therapy-defibrillator; CS, coronary sinus; HV, His to ventricle; LV, left ventricle; LVAD, left ventricular assist device; PVC, premature ventricular complex; RV, right ventricle; VT, ventricular tachycardia.

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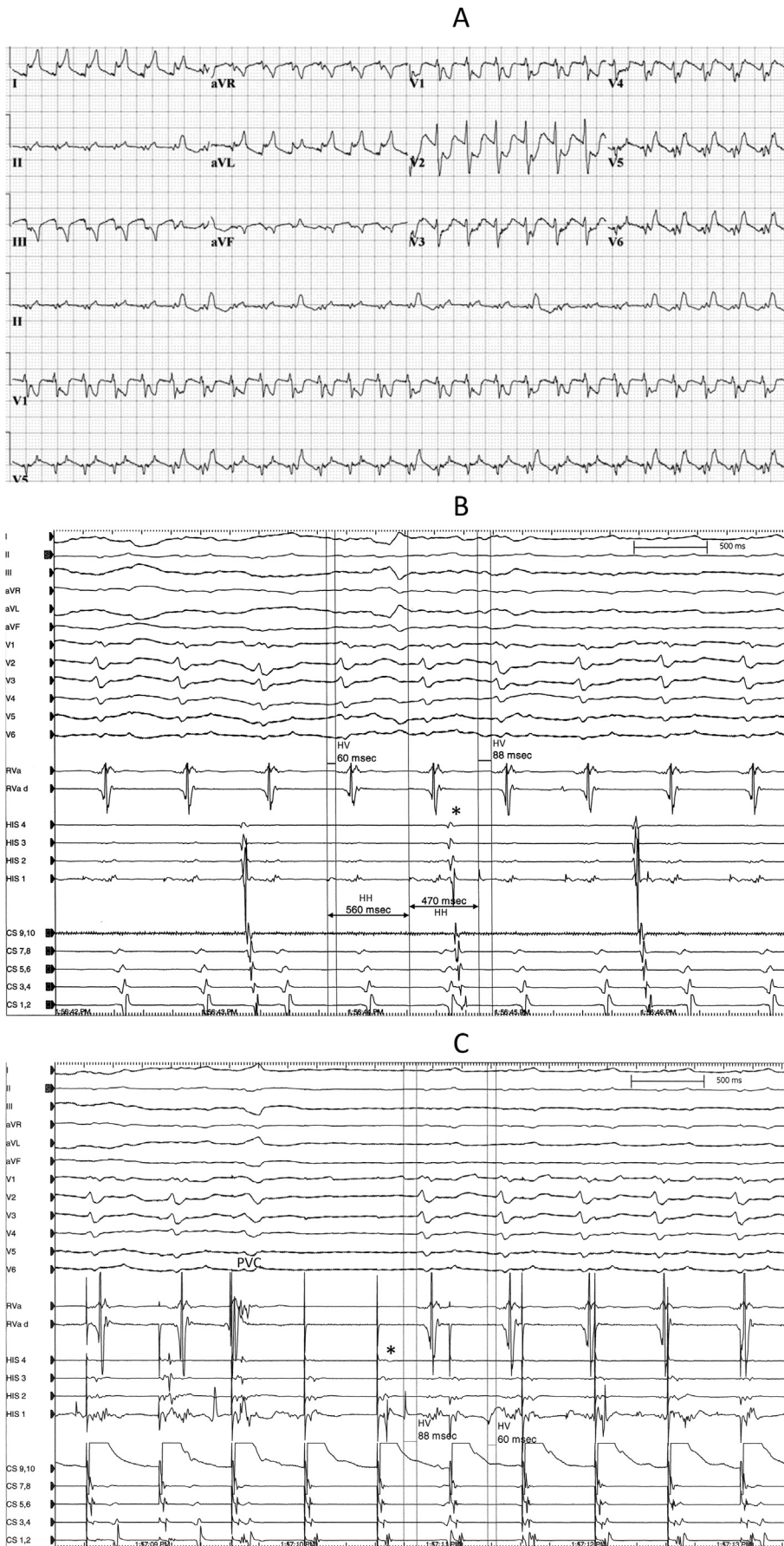


Fig. 1. Panel A – 12-Lead electrocardiogram of the presenting tachycardia. **Panel B** – Surface electrocardiogram and intracardiac electrograms of the clinical tachycardia. A sinus beat (asterisk) advances the His bundle electrogram and the QRS complex, and resets the tachycardia. **Panel C** – Termination of tachycardia with a premature ventricular complex (PVC) during attempted overdrive pacing from the atrium (dissociated). Subsequently the second atrial complex (asterisk) conducts to the ventricle with HV interval of 88 msec and QRS morphology same as tachycardia, and reinitiates tachycardia. HH, His to His; HV, His to Ventricle/QRS.

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