

CASE IMAGE

Prolonged ventricular fibrillation in a patient with left ventricular assist device

Sol ventrikül destek cihazı olan bir hastada uzamış ventrikül fibrilasyonu

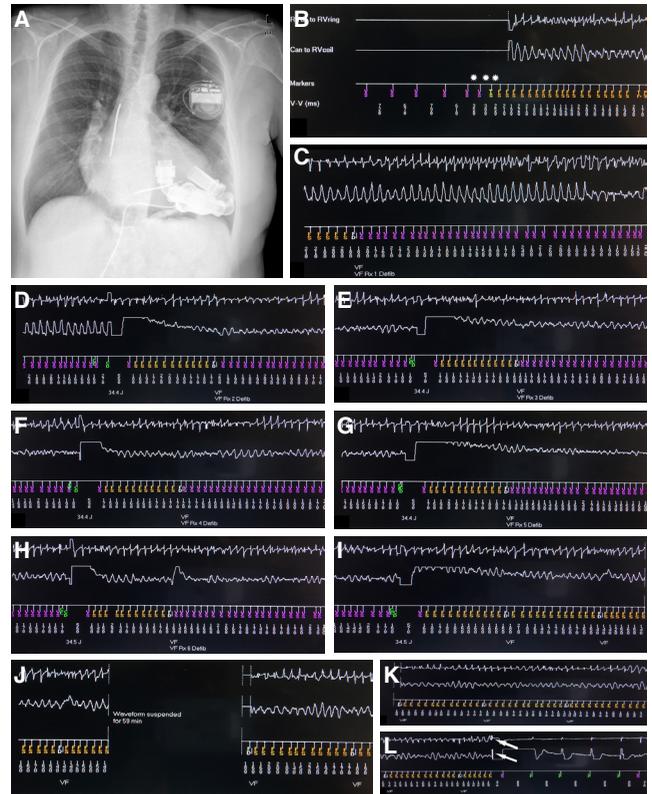
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A 50-year-old male with non-ischemic cardiomyopathy underwent a single electrode, dual coil implantable cardioverter-defibrillator (ICD) (Maximo II VR; Medtronic, Inc., Minneapolis, MN, USA) implantation for primary prophylaxis in 2015, as well as implantation of a continuous-flow, left ventricular assist device (LVAD) (HeartMate II; Thoratec Corp., Pleasanton, CA, USA) due to end-stage

heart failure in the same year (Fig. A). He was admitted to the emergency department with consequent 6 device discharges approximately 1 hour before admission with no other symptoms. Intravenous sedatives were provided and external defibrillation with a 200-J biphasic shock was applied by the emergency staff as a result of no measurable blood pressure with ventricular fibrillation (VF) on the electrocardiogram monitor. Device interrogation in our arrhythmia division revealed normal impedances: >10 mV R-wave and <1 V capture threshold. Appropriate ICD anti-tachycardia pacing and shock deliveries were detected for previous ventricular arrhythmias. The VF zone was set to 260 milliseconds with an initial detection of 30/40 intervals. Therapy for the zone were set to 6 consecutive 35-J biphasic shocks with cathodal and anodal shock vectors. As programmed, the device appropriately sensed and detected VF and delivered an appropriate first 35-J discharge that failed to terminate the fibrillation, followed by redetection of VF and a second 35-J shock that also failed to terminate the fibrillation, and continued redetection until all 6 35-J discharges were exhausted. The device then appropriately suspended intracardiac electrograms as VF until external defibrillation was given. External shock treatment resulted in pacing and sinus rhythm (Fig. B-L). No device replacement or lead revision was considered since the device was functioning appropriately, there was no symptom other than the shocks administered during VF, the infection risk of revision, and no proven mortality benefit of ICD in patients with continuous-flow LVAD. LVAD therapy maintains hemodynamics during ventricular arrhythmia to assist the left ventricle and preserve the Fontan-like physiology previously established in cases of congenital heart disease in the right heart. Various causes leading to failure of a device to terminate VF in-

clude an altered shock vector and defibrillation threshold due to altered preload/afterload conditions leading to a changed ventricular geometry; myocardial gene expression; an electrolyte imbalance; the use of antiarrhythmic medications, including insufficient beta-blocker use and/or chronic amiodarone use; and the localization of shock coils and the active can with respect to the heart.



Figures– (A) A posteroanterior chest X-ray reveals the implantable cardioverter-defibrillator and continuous-flow left ventricular assist device systems. **(B)** Probable 2 to 3 ventricular extra stimuli with short coupling intervals (asterisks) initiate the ventricular arrhythmia. **(C)** The device sensed and detected the ventricular fibrillation (VF), resulting in charging, and **(D)** delivering a 35-J shock that failed to terminate the VF and **(E)** redetection and recharging with resultant delivery of the second 35-J shock without termination of the VF. **(F-I)** This sequence continued until all device therapies were exhausted. **(J, K)** The device then suspended waveform for an hour without any intervention until **(L)** external defibrillation (arrows) was given, which terminated the VF episode and restored the programmed pacing rate of 70 bpm. The first line represents bipolar sense electrogram; the second line represents shock electrogram; the third line is the marker channel; the numbers at the bottom represent the cycle length in milliseconds between 2 V-V intervals.

CD: Charge delivered; CE: Charge ended; FD: Fibrillation detected; FS: Fibrillation sensed; VF: Ventricular fibrillation; VP: Ventricular paced event; VS: Ventricular sensed event.

