Short-Long R-R Sequence Induced Implantable Cardioverter Defibrillator Shock by Dislodged Lead Even Having Normal Interrogation Parameter

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ABSTRACT

Inappropriate shocks from an implantable cardioverter defibrillator (ICD) can cause potentially dangerous ventricular arrhythmias and impaired quality of life. We describe a case in which a dislodged lead caused inappropriate ICD shocks through simultaneous sensing of atrial and ventricular signals. Interestingly, repeated short-long R-R sequences were recorded, but ICD interrogation parameters were usually unchanged.

Key Words: ■ Defibrillators ■ Implantable ■ Lead

Introduction

Inappropriate shocks from an implantable cardioverter defibrillator (ICD) are of significant concern. We describe a case in which misreading of atrial signals as ventricular signals by a dislodged ventricular lead was the cause of inappropriate shocks. Confirmation of the lead location with immediate interrogation of the ICD event is essential for preventing inappropriate ICD shocks.

Case

A 59-year-old man with a history of dilated cardiomyopathy and severely impaired left ventricular function (left ventricular ejection fraction 25%) experienced an episode of multiple ICD shocks. An ICD (St. Jude Medical, St. Paul, MN, USA) with a single ventricular lead had been implanted one month previously for primary

prevention. The lead was positioned in the right ventricular (RV) apex with adequate slack, and there were no procedure-related complications. ICD programming was set as follows: single 8-pulse anti-tachycardia pacing (ATP) in the ventricular tachycardia zone (360-301 ms) or the ventricular fibrillation (VF) zone (≤ 300 ms), both followed by ICD shocks of 25 J, then 35 J. Ventricular sensitivity was set at 0.5 mV, with decay delay 60 ms, and duration of detection 12 beats. Postoperative and pre-discharge testing showed normal sensing, appropriate pacing parameters (sensed R wave amplitude of 11.7 mV, with pacing threshold 0.5 V at 0.5 ms and RV pacing impedance of 570 ohms), and stable lead position. He returned to the outpatient clinic 1 month later and the ICD parameters were still within normal range. However, 2 hours after the visit, he returned to the emergency room complaining of multiple ICD shocks without prodromal symptoms. During the ICD shocks, electrogram of each event showed the same pattern of repeated short-long R-R sequences, with misinterpretation of short-

Figure 2. (A) Chest X-ray showed the implanted lead was dislodged to the level of the tricuspid annulus. (B) Extracted lead tip and impacted cardiac tissues.

for the ventricular ICD lead could serve as adjunctive indicators for evaluation of the lead status. A T-wave avoiding algorithm was not effective in our case, because the device diagnosed the rhythm as VF when the detection criteria (12 cumulative intervals) had been fulfilled, even when the device filtered smaller R waves with associated T waves in some segments.

In the present case, misreading of atrial signals as ventricular signals by the dislodged lead was the cause of inappropriate shocks. The ICD interrogation parameters were usually within normal range and without any unexpected noise. Although the short-long R-R sequence is a common feature of T-wave oversensing, the dislodged lead in our case showed the same pattern. Confirmation of the lead location using a chest X-ray with immediate interrogation of the ICD event is crucial for preventing improper ICD shocks, especially during the first few months after ICD implantation.

Conflict of interest

The authors have no conflicts of interest to disclose.

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