PACEMAKER/ICD PROBLEM OF THE MONTH

Repetitive pacemaker spike during the vulnerable period in a cardiac resynchronization therapy defibrillator

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Case summary

A 75-year-old man with nonischemic cardiomyopathy (left ventricular [LV] ejection fraction 0.30) presented with a history of several syncopal episodes for a few months prior to admission. Despite extensive investigations, no cause for the syncope was determined. In 2007, a dual-chamber Guidant Vitality 2 DR model T165 implantable cardioverter-defibrillator (ICD) was implanted. An integrated bipolar ICD lead (Guidant 0185) was placed in the right ventricular (RV) apex and an active fixation atrial lead (Guidant 4096) was placed due to the need for atrial pacing. In 2009, the patient developed congestive heart failure despite optimal medical management. Noninvasive evaluation revealed worsened LV dysfunction (ejection fraction = 0.20) and left bundle branch block with QRS duration 160 ms. The patient's ICD was upgraded to a cardiac resynchronization therapy defibrillation system (Boston Scientific Cognis P107). All existing leads were left in place, and an LV lead (Boston Scientific 4555) was successfully implanted. Echocardiography-guided pacemaker optimization was used, and both atrial and ventricular leads showed

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ABBREVIATIONS ICD = implantable cardioverter-defibrillator; **LV** = left ventricle; **PVARP** = postventricular atrial refractory period; **PVC** = premature ventricular contraction; **RV** = right ventricle (Heart Rhythm 2011;8: 148–151)

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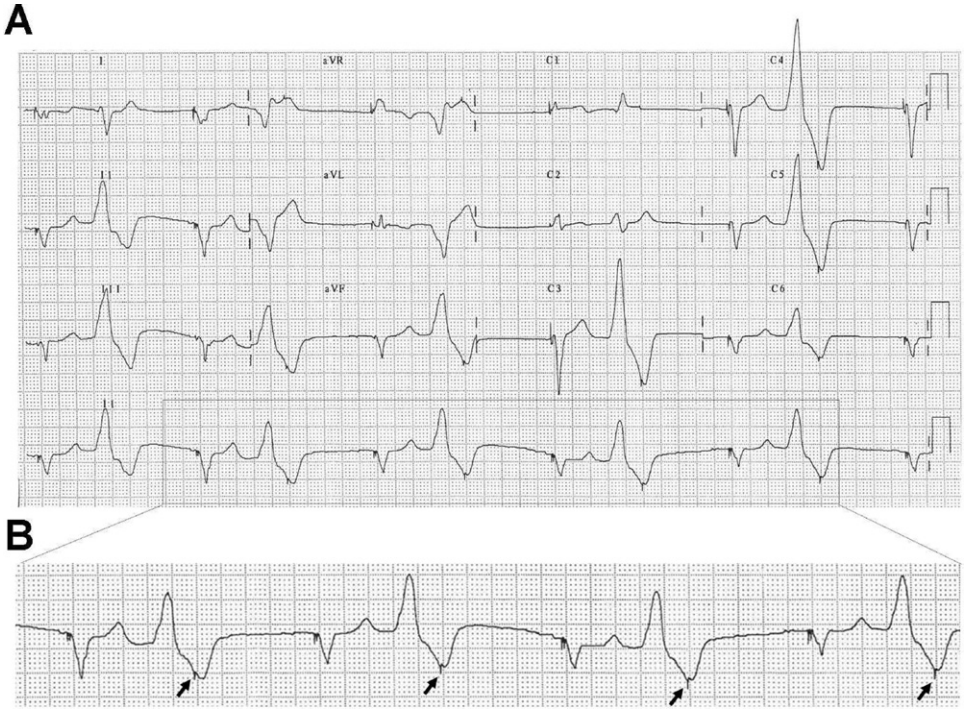

Figure 1 **A:** Twelve-lead ECG and rhythm strip from lead II recorded at routine evaluation 1 month after implant. **B:** Detail from rhythm strip.

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excellent parameters. The patient was discharged home 1 day later with the following programmed parameters for the device:

Mode: DDDR

Lower rate: 60 ppm

Upper rate: 130 ppm

Paced AV delay: 210 ms

Sensed AV delay: 190 ms

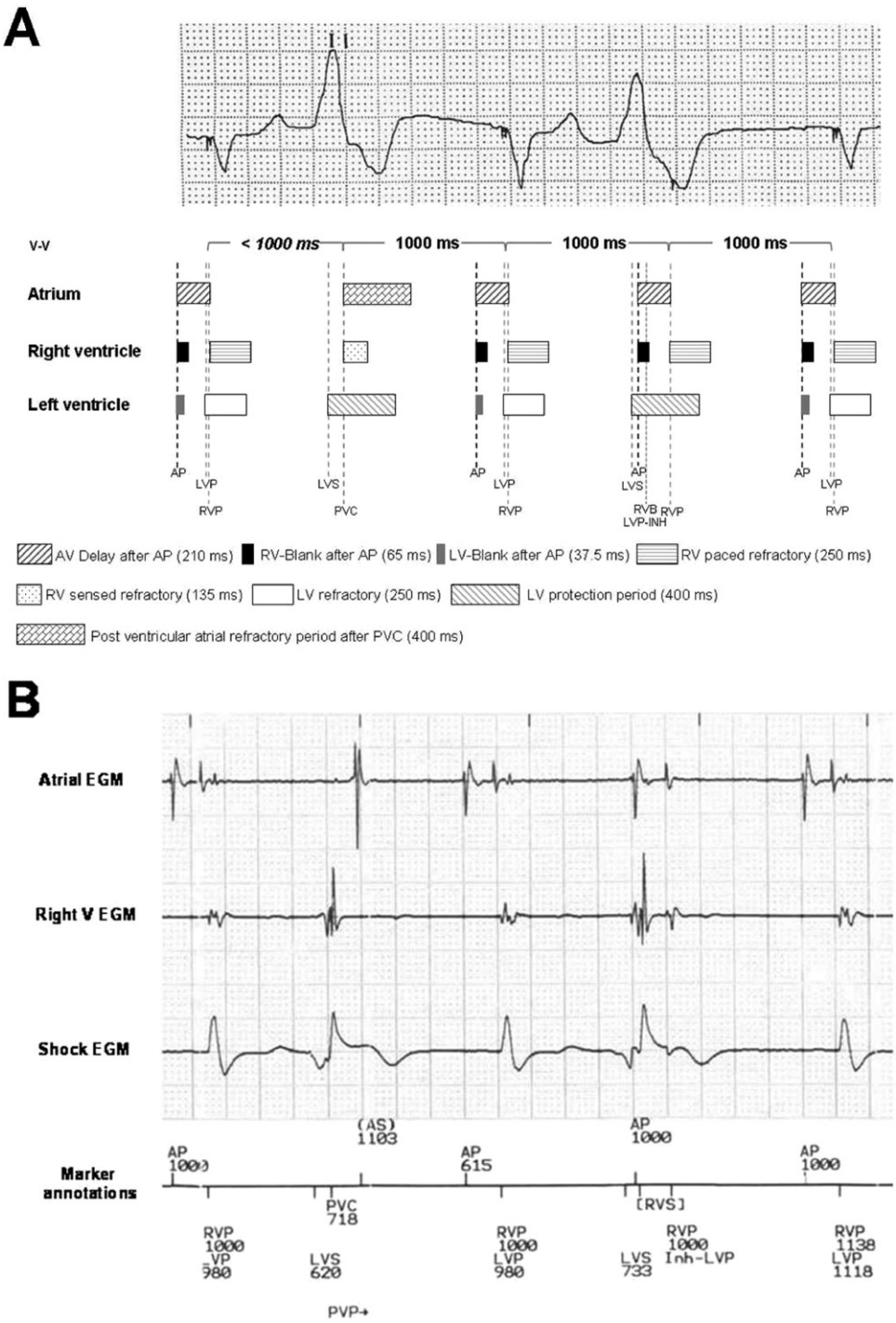

Figure 2 **A:** First five ventricular events from the rhythm strip (lead II) in Figure 1 with a block diagram illustrating the blanking and refractory periods. **B:** Printout from the device corresponding to a reproduced sequence of events that is equivalent to that observed in A. In the first premature ventricular contraction (PVC), right ventricular (RV) sensing occurs before atrial pacing; therefore, the event is classified as PVC, atrial pacing is inhibited (a native atrial event occurred soon after, classified as "AS," which denotes an atrial-sensed event during the postventricular atrial refractory period after PVC), and the event restarts the lower rate limit. In the second PVC, note the cross-talk indicated by [RVS] markers, which lead to RV pacing after the programmed AV delay (210 ms). AP = atrial-paced event; AS = atrial-sensed event; LVP = left ventricular-paced event; LVP-INH, Inh-LVP = inhibited left ventricular-paced event; LVS = left ventricular-sensed event; PVP→ = postventricular atrial refractory period after PVC; RVB = right ventricular-blanked event; RVP = right ventricular-paced event; RVS = right ventricular-sensed event.