

EP CASE REPORT

Ventricular fibrillation triggered by a pacemaker-mediated tachycardia protection algorithm

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A 27-year-old man with complex congenital heart disease (double discordance and complete congenital atrioventricular block) previously implanted with a single-chamber pacemaker was successfully resuscitated from sudden death due to ventricular fibrillation (VF). Echocardiography showed a moderately dilated right systemic ventricle with systolic dysfunction (right ventricular ejection fraction 35%). The left ventricle was normal. A dual-chamber implantable cardioverter defibrillator (ICD) (Biotronik Iperia DR, Berlin, Germany) was implanted for secondary prevention of sudden cardiac death. Programmed parameters were: DDDR mode; lower and upper rate limits = 45–160 bpm; paced atrioventricular (AV) delay = 150 ms, atrial and ventricular pacing thresholds = 0.5 V; atrial and ventricular sensing thresholds = 1 mV and 2 mV; post ventricular atrial refractory period (PVARP) = 250 ms. Four months later, the patient collapsed. Device interrogation documented new VF episode.

At the beginning of recording, sinus tachycardia at 153 bpm during exercise is observed. Seven atrial sensed (As) events are normally followed by ventricular pacing (Vp) after the programmed AV delay value (mark 1). Surprisingly, the 8th 'As' event is followed by a 'Vp' with a longer AV delay (mark 2). The following atrial event is identified as 'Ars' since it occurs during the PVARP (mark 3). Consequently, the device does not trigger a paced AV delay. Spontaneous ventricular activation occurs which is probably a premature ventricular contraction

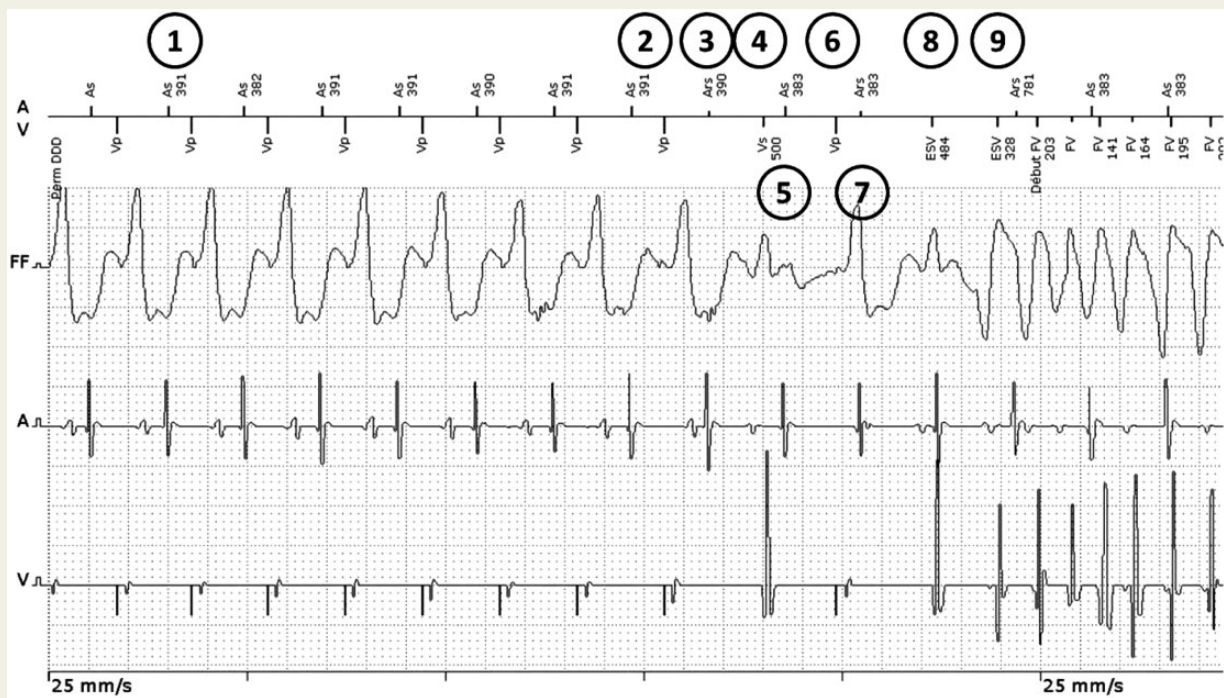


Figure 1 Onset of the VF episode. From top to bottom: A and V markers, ventricular far-field electrogram, atrial electrogram and ventricular electrogram. See text for details. As, atrial sensed; Vp, Ventricular pacing; Ars, atrial refractory sensed event; Vs, Ventricular sensed; ESV, premature ventricular contraction; FV, Fibrillation ventricular.

(PVC) as the patient has complete AV block (mark 4). The subsequent atrial event is detected as 'As' (mark 5), since it occurs after the far-field protection and atrial triggered ventricular pacing (VAT mode) follows with a long AV delay since the ventricular activation is limited by the maximal tracking rate (mark 6). The next atrial event occurs during the PVARP and is classified as 'Ars' (mark 7) not triggering a paced AV delay. A PVC occurs (mark 8) and VF is initiated after this short cycle–long cycle sequence (mark 9).

The *primum movens* of this VF is probably the longer paced AV delay triggered by the device. The device extended its nominal paced AV delay because a pacemaker-mediated tachycardia (PMT) was suspected due to the repetitive 'As-Vp' sequence at a high atrial rate. In fact, the patient was exercising, with a spontaneous sinus rate at 153 bpm, close to the maximal tracking rate (160 bpm). In order to confirm PMT, Biotronik devices extend the programmed AV delay by 50 ms which unfortunately led to a cascade of events triggering VF.

Many cases reported atrial¹ or ventricular arrhythmias² triggered by algorithms aiming to avoid right ventricular pacing. However, to the best of our knowledge, this is the first case describing a VF mediated by a PMT protection algorithm. In order to avoid a recurrence, we searched for retrograde VA conduction which was absent in this patient with complete antegrade AV block and therefore, the PMT intervention algorithm was deactivated. The patient was discharged from the hospital, restarted playing sport and remained free of VF.

Conflict of interest: none declared.

References

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