Switch to DDD mode in SafeR algorithm could be delayed in paroxysmal atrial fibrillation and simultaneous occurrence of complete atrioventricular block

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We describe a patient with sinus node dysfunction and dual-chamber pacemaker in AAIsafeR pacing mode, who experienced a presyncopal episode. Device interrogation revealed that DDD mode switching was delayed due to the simultaneous occurrence of paroxysmal atrial fibrillation and complete atrioventricular block.

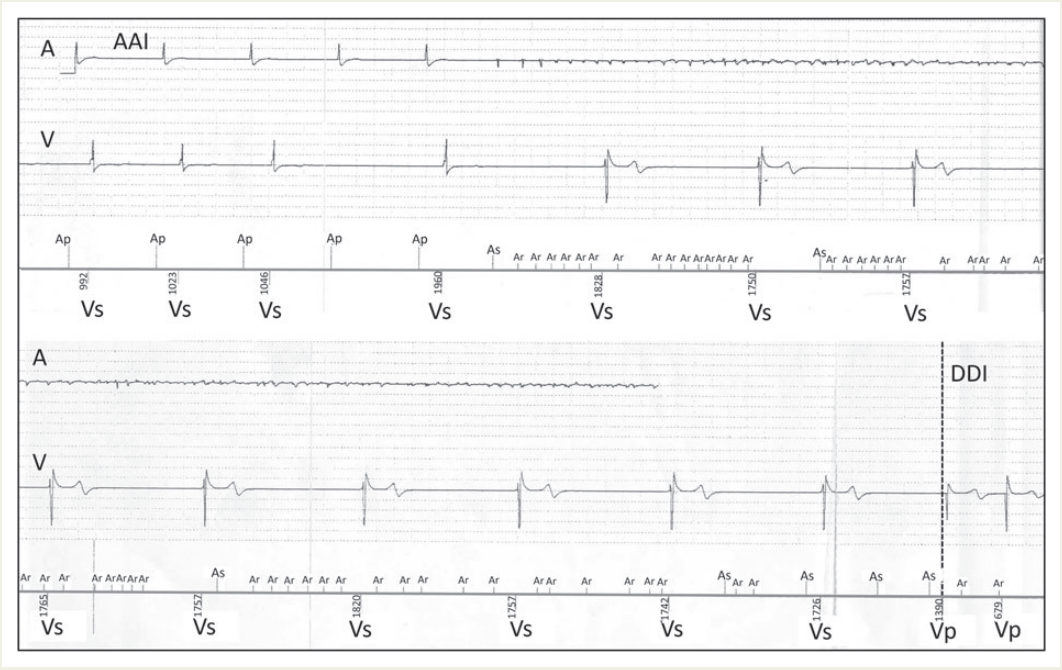

Figure 1 Atrial and ventricular electrograms with markers of an episode of atrial fibrillation and simultaneous occurrence of complete atrioventricular block that delayed switching to DDI mode.

Introduction

In patients with sinus node dysfunction (SND), the use of AAI pacing mode would avoid negative effects of right ventricular apical pacing.[1] However, it has been underused, because of potential risk of atrioventricular (AV) block. The AAIsafeR pacing mode was designed to combine the advantages of AAI with the safety of DDD pacing.

Case report

A 63-year-old female with SND underwent to implantation of dual-chamber pacemaker (Reply DR, Sorin Group CRM USA, Inc.) programmed in SafeR-mode (AAI< = >DDD). Two months later, she referred a presyncopal episode. Device interrogation showed an episode of AF associated with complete AV block and ventricular escape rhythm at 35 bpm, and that no switch to DDD mode had occurred.

Discussion

SafeR pacing mode provides AAI pacing while continuously monitoring AV conduction. The device switches to DDD mode upon the occurrence of pause (2 or 3 s, in this case programmed in 2 s), or first-, second- or third-degree AV block. In our patient, none of these conditions was present during atrial pacing thus keeping in AAI. In this family of pacemakers, the mode switch criterion due to atrial arrhythmia is related to a probabilistic counter of premature atrial sensed events. A window of atrial rate acceleration detection (WARAD) is initiated with the sensing of an atrial event corresponds to 62.5% of the previous P-P interval. If an atrial event is sensed during this

period, no AV delay is initiated. The device analyses consecutive groups of 32 cardiac cycles and mode switching is produced if $\geq$28 of 32 or $\geq 2\times$ 18 of 32 cardiac cycles are detected in the WARAD. Our patient developed a complete AV block at the onset of the AF episode. In cases of non-conducted atrial arrhythmias, the device switches to DDD mode if a ventricular pause $\geq$2 s is detected and to DDI after atrial arrhythmia confirmation. Thus, since ventricular escape rhythm presented an R-R interval inferior to 2 s, the device did not pace the ventricle until atrial arrhythmia was confirmed (64 cycles $= 2\times$ 18 of 32) and switched to DDI. Moreover, the patient presented atrial tachyarrhythmia undersensing that further delayed switching to DDI mode. In consequence, clinical complain of the patient was compatible with a period of time of $\sim$17 s at 35 bpm (*Figure 1*). If the required pause for switching to DDD mode had been programmed to 3 s, a heart rate of 20 bpm could have been present during this period. It is therefore advisable to program the asystole criterion to 2 s in programmable devices. In conclusion, although no difference in syncope rate between SafeR and DDD pacing mode has been reported,[2] a redesign of the WARAD algorithm in combination with SafeR could be necessary to avoid symptoms for delayed change mode in patients who develop atrial tachyarrhythmia.

Conflict of interest: none declared.

References

1. Nielsen JC, Kristensen L, Andersen HR, Mortensen PT, Pedersen OL, Pedersen AK. A randomized comparison of atrial and dualchamber pacing in 177 consecutive patients with sick sinus syndrome: echocardiographic and clinical outcome. *J AmColl Cardiol* 2003;**42**:614–23.
2. Stockburger M, Boveda S, Moreno J, Da Costa A, Hatala R, Brachmann J *et al.* Long-term clinical effects of ventricular pacing reduction with a changeover mode to minimize ventricular pacing in a general pacemaker population. *Eur Heart J* 2015;**36**:151–7.