Pro-arrhythmia in atrial fibrillation suppression pacing algorithms

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Atrial overdrive pacing algorithms have been partially effective in controlling atrial fibrillation (AF). A 76-year-old man with history of a cardiomyopathy and paroxysmal AF underwent implant of a dual-chamber ICD. After enabling preferential pacing (PP) algorithms, marked control of his AF was demonstrated, but with inappropriate ICD shocks secondary to a typical AV nodal re-entrant tachycardia. After successful slow pathway modification, no further episodes were documented with suppression of his AF burden with PP algorithms enabled.

Case report

Atrial overdrive pacing algorithms including preferential pacing (PP) attempt to maximize atrial pacing and overdrive suppress atrial ectopy that may initiate and sustain atrial fibrillation (AF). These algorithms have been partially effective in controlling AF burden.1,2

Figure 1

Dual-chamber defibrillator tracings demonstrating initiation of a narrow complex tachycardia at 360 ms cycle length (25 mm/s). Initiation was believed to be related to a P-wave in the atrial refractory/blanking period (AR) conducted to the ventricle via the fast pathway (FP), followed by a preferential pacing algorithm paced event (PP) conducted to the ventricle via the slow pathway (SP). This event is followed by initiation of typical AV node re-entry (antegrade SP, retrograde FP), diagnosis favoured by a short-VA interval. The second tachycardia beat demonstrates the absence of a retrograde P-wave (X) believed to be related to an already depolarized atrium by a paced event (PP). This mechanism is repeated in the fourth and sixth tachycardia beats.
We present a case of a 76-year-old man with a documented ischaemic cardiomyopathy, sinus node dysfunction, and paroxysmal AF, who underwent successful implant of a dual-chamber defibrillator. Prior to enabling PP, significant progression of his paroxysmal AF prompted clinical admission due to decompensated heart failure signs and symptoms, despite Class III antiarrhythmic drugs. An almost complete resolution of his atrial arrhythmia burden was documented after enabling PP algorithms. During subsequent follow-up visits, complaints of palpitations and ICD shocks without loss of consciousness started to appear. Device interrogation of the episodes demonstrated multiple events of narrow complex tachycardia followed by inappropriate ICD shocks (Figure 1). Disabling PP algorithm features demonstrated a return of his symptomatic AF burden.

With the presumptive diagnosis of a supraventricular tachycardia (SVT), the patient underwent an electrophysiological study demonstrating dual AV node physiology, reproducible echo beats and inducible typical AV nodal re-entrant tachycardia. An anatomically guided slow pathway modification was performed with successful resolution of the dual AV physiology and echo beats, rendering the arrhythmia non-inducible. During subsequent follow-up visits, no further episodes of AF, SVT, ICD shocks or congestive heart failure re-admissions were documented with PP algorithms enabled.

The effectiveness of pacing algorithms for AF suppression remains controversial.1–3 Our case illustrates a highly effective response rate in AF burden with PP algorithms, along with a demonstrable and reproducible pro-arrhythmia leading to symptomatic palpitations, sustained SVT, and inappropriate ICD shocks. Pro-arrhythmia with PP is uncommon.2,3 It is possible that SVT would have demonstrated later in the clinical course regardless of the utilization of PP algorithms considering the patient’s background of dual AV node physiology. However, slow pathway modification successfully treated his pro-arrhythmia while obtaining clinically significant improvements in his AF from 37% to less than 3% burden by PP algorithms.

Conflict of interest: none declared.

References

CASE REPORT

Cardiac resynchronization implantable cardioverter defibrillator: normal or abnormal behaviour?

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Cardiac resynchronization permits atrial-synchronized simultaneous pacing of both left and right ventricles in order to optimize mechanical contraction. In case of an atrial tachycardia, a VVI-ventricular sense'-tracking modus can be programmed to maintain biventricular pacing. In this case report, we describe the use of this modus.

Case and discussion

A 44-year-old male patient with idiopathic dilated cardiomyopathy, complete left bundle branch block, and syncope due to non-sustained ventricular tachycardia was implanted with a cardiac resynchronization defibrillator (CRT-D) 3 years ago (Medtronic InSync Sentry 7298). He was now admitted because of heart failure.

A new onset atrial tachycardia was diagnosed. Since the arrhythmia appeared to be therapy resistant, the CRT-D was manually reprogrammed to a VVI-ventricular sense'-tracking modus. The electrocardiogram (ECG) shown in Figure 1 was taken after reprogramming. In this modus a conducted complex that is sensed in the right ventricle triggers a left ventricular pacing stimulus to optimize resynchronization.

In the tracing, the first three complexes show normal biventricular pacing behaviour at the lower rate. The fourth beat is a typical pseudo-fusion beat: despite a conducted beat, sensing in the ventricle occurs late during ventricular activation leading to a biventricular pacing spike within the QRS complex. In beats 5 and 6, right ventricular sensing of similarly conducted beats leads to triggered left ventricular pacing (‘ventricular sense'-tracking). The same happens during the seventh beat, which is a (presumably left) ventricular