

Pacemakers do not always tell the truth: diagnosis of ventricular tachycardia for supraventricular tachycardia on pacemaker telemetry

Kalp pili her zaman doğru söylemeyebilir: Kalp pili telemetresindeki supraventriküler taşikardiye ventriküler taşikardi tanısı

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Summary – Pacemaker telemetry reflects algorithm-dependent interpretations about the cardiac rhythm. For these data to be useful, it is necessary to recognize the limitations of each algorithm and its interactions with pacing and sensing parameters. We report on a case in which pacemaker Holter recording showed several episodes of nonsustained supraventricular tachycardia which were erroneously classified as ventricular tachycardia.

Özet – Kalp pili telemetresi kalp ritmi hakkında, cihazda kullanılan algoritmaya bağımlı yorumları yansıtır. Bu verilerin yararlı olabilmesi için, her bir algoritmaya ait kısıtlılıkların ve bu algoritmanın uyarma ve algılama parametreleriyle ilişkilerinin bilinmesi gerekir. Bu yazıda, kalp pili Holter kayıtlarının sürekli olmayan supraventriküler taşikardi epizotları göstermesine rağmen, kalp pili tarafından durumun yanlışlıkla ventrikül taşikardisi olarak tanımlandığı bir olgu sunuldu.

The main purpose of pacemaker telemetry is to monitor cardiac rhythm problems over a long period. Today, these data are being increasingly used to demonstrate the presence or absence of arrhythmias.^[1-3] However, pacemaker telemetry only reflects an interpretation of its algorithm about the cardiac rhythm. Thus, these data can only be useful if the limitations of each algorithm are recognized.

We report on a case in which pacemaker Holter recording showed several episodes of nonsustained supraventricular tachycardia which were erroneously classified as ventricular tachycardia.

CASE REPORT

A 84-year-old male patient with a two-year history of dual-chamber pacemaker implantation (Symphony DR 2550, Sorin Group, Montrouge, France) for sick sinus syndrome was admitted to another center with presyncope and recurrent nonsustained palpi-

tations. Although interrogation of the pacemaker showed normal parameters (AAIsafeR mode), pacemaker telemetry demonstrated several episodes of nonsustained ventricular tachycardia (Fig. 1a). The patient had normal left ventricular systolic function and noncritical coronary artery disease. The telemetry of the pacemaker stored both atrial and ventricular channel activities during tachycardia episodes. These recordings showed ventricular activity with dissociated but irregular atrial sensing, which was interpreted by the pacemaker as VT.

The patient was then referred to our center for further evaluation of these episodes. A careful evaluation of these tracings at our center revealed that the tachycardia (cycle length 330 msec) actually started with an atrial premature beat followed by a prolonged atrioventricular conduction time (Fig. 1a), and that, during tachycardia, there was a negative component

Abbreviation:

VT Ventricular tachycardia

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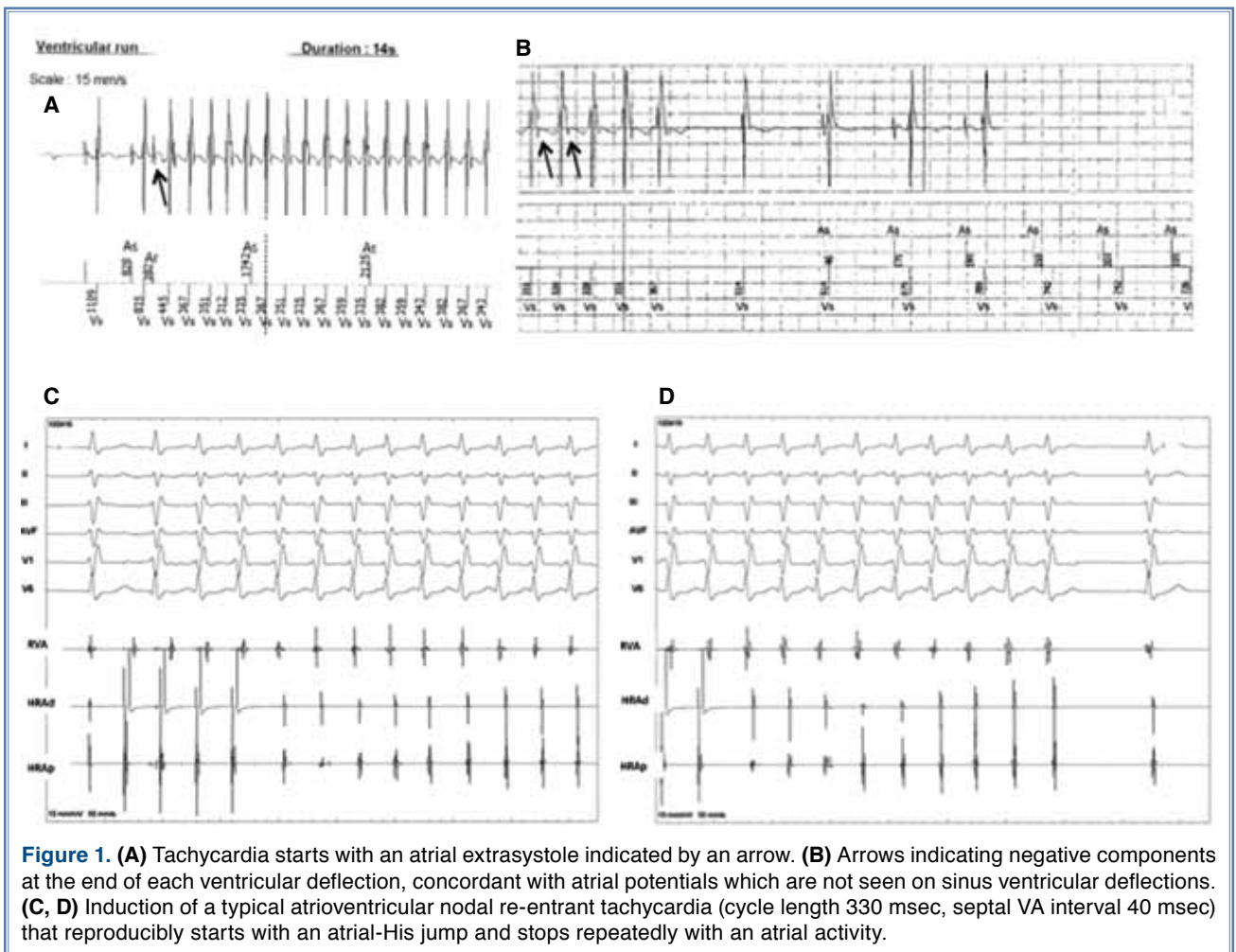


Figure 1. (A) Tachycardia starts with an atrial extrasystole indicated by an arrow. **(B)** Arrows indicating negative components at the end of each ventricular deflection, concordant with atrial potentials which are not seen on sinus ventricular deflections. **(C, D)** Induction of a typical atrioventricular nodal re-entrant tachycardia (cycle length 330 msec, septal VA interval 40 msec) that reproducibly starts with an atrial-His jump and stops repeatedly with an atrial activity.

at the end of each ventricular deflection concordant with atrial potentials which were not seen on sinus ventricular deflections (Fig. 1b). Tachycardia ceased with an atrial activity and a junctional rhythm with sinus rhythm was observed at the end (Fig. 1b). These findings were also confirmed by an electrophysiological study where a typical atrioventricular nodal re-entrant tachycardia (cycle length 330 msec, septal VA interval 40 msec) was induced, which reproducibly started with an atrial-His jump and stopped repeatedly with an atrial activity (Fig. 1c, d). It was not possible to sustain the tachycardia even under isoproterenol infusion, so no differential pacing maneuvers were performed. Retrograde conduction during ventricular pacing was decremental and concentric. No VT was induced by ventricular stimulation from the right ventricular apex with three cycles and three extra protocols. A slow-pathway ablation was performed. After radiofrequency ablation, the tachycardia was no longer inducible. Pacemaker Holter showed no further episodes of tachycardia after one-month follow-up.

DISCUSSION

Theoretically, for diagnostic purposes, dual-chamber detection that uses both atrial and ventricular intracardiac signals should be superior to single-chamber ventricular detection devices. However, early nonrandomized and some recent randomized studies failed to show any superiority of dual-chamber over single-chamber devices in respect of arrhythmia detection.^[4-6] Friedman et al.^[7] demonstrated a decrease in the number inappropriate detections with dual-chamber pacemakers when compared to single-chamber devices. Atrial sensing is the predominant cause of detection errors in dual-chamber pacemakers.^[8]

In our case, even though it was a dual-chamber pacemaker, it was not possible to detect a typical atrioventricular nodal re-entrant tachycardia because almost all the atrial potentials appeared during post-ventricular atrial blanking period of the pacemaker. Some atrial waves that came out of the atrial blanking

were sensed possibly because of the changing retrograde fast pathway or upper common pathway conduction (slightly changing VA intervals) in an advanced-age patient receiving beta-blocker therapy. Normally, when a pacemaker detects refractory atrial senses, these will appear on the annotation bar despite the fact that they are hidden in the QRS complex. Possibly, in our case, the fused EGM algorithm of the pacemaker (demonstration of the atrial and ventricular activities on the same channel) was not able to detect the atrial sensing events occurring at the same moment with ventricular activity.

Our case demonstrates that pacemaker Holter algorithms may fail to detect the correct arrhythmia, and it is of great importance to recognize possible limitations of the algorithms used for the detection of arrhythmias. A merged intracardiac ECG used in this patient's pacemaker was unable to detect refractory atrial signals and thus could not differentiate the mechanism of the arrhythmia.

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Key words: Algorithms; arrhythmias, cardiac/diagnosis; pacemaker, artificial; tachycardia, ventricular/diagnosis.

Anahtar sözcükler: Algoritma; aritmi, kardiyak/tanı; kalp pili; taşikardi, ventriküler/tanı.