



CASE REPORT

Failure to deliver a shock in a dual-chamber implantable cardioverter-defibrillator: A case report



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KEYWORDS

Dual-chamber;
Implantable
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Atrial fibrillation;
PARAD+ algorithm;
Ventricular
tachycardia;
Appropriate therapy

Abstract

Introduction: Inappropriate implantable cardioverter-defibrillator (ICD) therapies due to supraventricular tachyarrhythmia (SVT) are a common problem.

The authors report this case to warn of a possible detection problem and subsequent failure of deliver appropriate therapy in patients with atrial fibrillation (AF) and a dual-chamber ICD using the PARAD+ algorithm. To our knowledge this is the first reported case of failure to deliver a shock in a dual-chamber ICD due to the PARAD+ algorithm.

Case report: The authors present a case of a 68-year-old Caucasian man with permanent AF and a dual-chamber Sorin Paradym ICD with the PARAD+ algorithm, who presented an episode of sustained ventricular tachycardia (VT). The ICD did not store the event and did not delivery a therapy, although the heart rate curve was consistent with an episode of VT. No evidence of system dysfunction was found.

Conclusion: Due to simultaneous occurrence of VT and AF rhythms and alternation in rhythm classification by the PARAD+ algorithm the number of cycles needed to diagnose VT was not achieved and no therapy was delivered.

In patients with permanent or long-term persistent AF with a dual-chamber ICD using the PARAD+ algorithm, discrimination should be based only on the ventricular channel. In patients with paroxysmal or persistent recurrent AF the risk of not delivering VT therapy must be weighed against the risk of inappropriate therapy.

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PALAVRAS-CHAVE

Dupla-câmara;
 Cardioversor-
 desfibrilhador
 implantável;
 Fibrilhação auricular;
 Algoritmo PARAD+;
 Taquicardia
 ventricular;
 Terapia apropriada

Falha na entrega de choque num cardioversor-desfibrilhador implantável: caso clínico**Resumo**

Introdução: as terapias inapropriadas de um cardioversor-desfibrilhador implantável (CDI) devido a taquiarritmias supraventriculares (TSV) são ainda um problema comum.

Os autores relatam este caso de modo a alertar um possível problema de detecção e subsequente falha na entrega de terapia apropriada em pacientes com CDI de dupla-câmara e fibrilhação auricular (FA) com o algoritmo PARAD+. Ao nosso conhecimento, trata-se do primeiro caso reportado de falha na entrega de choque num CDI de dupla-câmara, devido ao algoritmo PARAD+.

Caso clínico: os autores relatam um caso de um homem de 68 anos de idade, caucasiano, com FA permanente, portador de um CDI de dupla-câmara Paradyd Sorin com o algoritmo PARAD+, que apresentou um episódio de taquicardia ventricular (TV) mantida. O CDI não armazenou o episódio e não administrou qualquer terapia, apesar de a curva da frequência cardíaca ser consistente com um episódio de TV. Não foi encontrada nenhuma evidência de disfunção do sistema.

Conclusão: Devido à ocorrência simultânea de ritmos de TV e FA e à alternância na classificação de ritmo pelo algoritmo PARAD+, não foi alcançada a persistência programada para a detecção de TV e a terapia não foi administrada.

Em pacientes com FA persistente de longa duração/permanente com CDI de dupla câmara com algoritmo PARAD+, a discriminação deve ser baseada apenas no canal ventricular. Em pacientes com FA paroxística/persistente recorrente o risco de não entrega de terapia para a TV deve ser equilibrado com o risco de terapia inapropriada.

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Introduction

The broadening of indications for treatment with an implantable cardioverter-defibrillator (ICD) to include patients at risk (primary prevention) has further increased the importance of limiting the incidence of device-related adverse events in order to preserve patients' quality of life.

Inappropriate delivery of ICD therapies triggered by supraventricular tachyarrhythmias (SVT) is a common problem, occurring in 16–22% of patients.¹

Studies have shown that detection enhancements in dual-chamber ICDs are able to reduce inappropriate therapies due to SVT and associated adverse clinical outcomes. However, other studies have failed to find an improvement in rhythm classification or a reduction of shocks with the use of dual-chamber algorithms.²

Recently, more advanced detection algorithms have been proposed in order to reduce the number of inappropriate ICD therapies. The PARAD and PARAD+ algorithms correctly identify ventricular tachycardia (VT) in more than 99% of cases, and slow VT (150 bpm) in 94%. Their specificity for SVT detection is particularly high (92%), with 86% of episodes of atrial fibrillation (AF) or atrial flutter being correctly classified.³ The PARAD+ algorithm, which inhibits VT therapy when a long ventricular cycle is detected, improves the performance of the PARAD algorithm in AF, by increasing specificity for AF in the slow zone, without decreasing sensitivity for VT.⁴

The authors report the case of a patient with a dual-chamber ICD with the PARAD+ algorithm who presented sustained VT but no therapy was delivered.

Case report

The authors report a case of a 68-year-old Caucasian male with a history of paroxysmal AF, stroke and ischemic cardiomyopathy with severe left ventricular systolic dysfunction, who had a dual-chamber ICD (Paradyd DR, Sorin) implanted after an episode of monomorphic VT in 2010. In 2011 AF became permanent. No therapies were delivered by the ICD.

On December 31, 2012 the patient suddenly complained of rapid and persistent palpitations, dyspnea and dizziness. The ECG revealed VT with a rate of 170 bpm (Figure 1). His blood pressure was 70/45 mmHg. An external shock was immediately delivered, which successfully terminated the VT approximately two hours after the onset of palpitations.

Interrogation of the ICD revealed no abnormal sensing or pacing parameters. Ventricular autosensing histograms revealed that all detected ventricular waves were well above the sensitivity threshold. The ICD was programmed with four detection zones and corresponding therapies: slow VT zone, programmed at 462 ms for 100 consecutive cycles, with no therapy (monitoring zone); VT zone, programmed at 400 ms for 50 consecutive cycles, with anti-tachycardia pacing (ATP) and shock; a fast VT zone at 300 ms for 14 consecutive cycles, with ATP and shock; and finally a ventricular fibrillation (VF) zone at 250 ms. The PARAD+ detection algorithm was activated.

In the arrhythmia history stored in the device, after the last follow-up on September 14, 2012 there were 15 episodes, but none was dated December 31, 2012, and none was labeled as VT. The most recent episode was dated

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