

Case Report

AV Nodal Reentrant Tachycardia Causing Inappropriate ICD Shocks In A Patient With Arrhythmogenic RV Dysplasia

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Abstract

We report a patient with an implantable cardioverter defibrillator (ICD) for arrhythmogenic right ventricular dysplasia (ARVD) who received inappropriate shocks for atrioventricular node reentry tachycardia (AVRNT). Patient had multiple shocks for tachycardia with EGM characteristics of very short VA interval and CL of 300 msec. An electrophysiologic (EP) study reproducibly induced typical AVNRT with similar features. The slow AV nodal pathway ablation resolved the ICD shocks. Despite increasingly sophisticated discrimination algorithms available in modern ICDs, the ability to differentiate SVT from VT can be challenging. Our patient received inappropriate shocks for AVNRT. When device interrogation alone is not conclusive, an EP study may be necessary to determine the appropriate therapeutic course.

Key Words: Arrhythmogenic right ventricular dysplasia; Implantable cardioverter defibrillator; Inappropriate shocks

Abbreviations

ARVD: Arrhythmogenic Right Ventricular Dysplasia
ICD: Implantable Cardioverter Defibrillator
VPS: Ventricular Programmed Stimulation
AVNRT: Atrioventricular Node Reentry Tachycardia
VT: Ventricular Tachycardia
SVT: Supraventricular Tachycardia

Introduction

Arrhythmogenic right ventricular dysplasia (ARVD) is an inherited degenerative disorder

involving progressive replacement of the myocardium by fibro fatty tissue. This is seen predominantly in the right ventricle though left ventricular involvement is not uncommon. The fibrofatty replacement provides the substrate for life threatening arrhythmias such as monomorphic ventricular tachycardia, polymorphic ventricular tachycardia (torsades de pointes), ventricular fibrillation and / or electrical storm (≥ 3 episodes of VT or VF within 24 hours requiring electrical cardioversion or defibrillation warranting ICD placement¹). Often supraventricular tachycardias (SVT) coexist in patients with known VT. Atrial fibrillation is the most common SVT known to have been responsible for inappropriate ICD shocks.

Modern implantable cardioverter defibrillators (ICDs) are sophisticated devices with arrhythmia discrimination algorithms that reliably differentiate SVT from VT and provide appropriate therapy. We report a patient with ARVD who had inappropriate shocks for AVNRT.

Case report

A 47-year old male presented with 3 ICD shocks for persistent ventricular tachycardia. He had known history of polysubstance abuse and coronary artery disease with angioplasty. Eight months prior to this admission he had presented with symptomatic monomorphic ventricular tachycardia (Cycle length 360 msec). A 2D-echo showed an ejection fraction of 40% followed by a coronary angiogram which showed non-obstructive disease with previously placed patent right coronary stent. Cardiac MRI confirmed a diagnosis of ARVD. He received a Biotronik Lexos DR ICD (model # 347000). Device interrogation during the current admission revealed a wide complex tachycardia (WCT) that received 3 ineffective shocks but resolved spontaneously. The WCT as shown by the Electrograms (EGMs) during ICD interrogation showed a short VA interval, a Cycle length (CL) of 300msec which were completely different from the VT seen during his initial clinical presentation (**Figure 1a-1c**). ICD shock failed to terminate the WCT which had a spontaneous termination later. Based on these observations, differentiating the arrhythmia (SVT vs VT) was inconclusive thus an electrophysiological study was done.

During EP study, no arrhythmia was inducible at baseline. With RV stimulation and Isoproterenol (2mcg) provocation, a typical AVNRT with a pacing cycle length of 500 msec and 3 extra stimuli of 290-280-270 ms, identical to the arrhythmia seen on ICD interrogation strips was easily and reproducibly induced (**Figure 2**). Presence of a short VA time (56 milliseconds) excluded an accessory pathway. A constant HA interval with resumption of tachycardia during ventricular pacing maneuvers and no A-A-V response after ventricular overdrive burst pacing excluded atrial tachycardia. The slow AV nodal pathway was ablated with RF energy with 3D-mapping (CARTO, Biosense Webster) for additional guidance. Following ablation, no inducible tachycardia, dual AV nodal physiology or echo beats were seen spontaneously or with Isoproterenol provocation. His pacing and sensing thresholds and lead impedance both in A and V leads seem to be appropriate after ablation. Defibrillation thresholds were unchanged.

Discussion

Our patient presented with sustained monomorphic VT, was diagnosed as ARVD by cardiac MRI, requiring ICD implantation. Subsequently he had inappropriate shocks due to AVNRT (atrial arrhythmia with a stable atrioventricular relationship). Due to differences in the characteristics of the two arrhythmias an appropriate diagnosis of the arrhythmia responsible for the inappropriate shocks could be established only with programmed electrical stimulation during an EP study.

