Journal of Cardiovascular Medicine and Cardiology

Giacomo Mugnai*, Livio Bertagnolli and Ruggero Tomei

Division of Cardiology, Department of Medicine - University Hospital of Verona, Verona, Italy

Dates: Received: August 31, 2014; **Accepted:** September 23, 2014; **Published:** September 25, 2014

***Corresponding author:** Giacomo Mugnai, MD, Division of Cardiology, Department of Medicine - University Hospital of Verona, Piazzale Stefani 1, 37126 – Verona, Italy, Tel: +39 045 8122320 ; Fax: +39 045 8122311; E-mail: mugnai.giacomo@gmail.com

www.peertechz.com

Keywords: DDI mode; Atrial fibrillation; Ventricular tachycardia

ISSN: 2455-2976

Case Report

Potential Arrhythmogenic Risk of DDI/DDD Pacing Modes During Atrial Fibrillation

Abstract

In patients with paroxysmal-persistent atrial fibrillation (AF), DDI and DDD pacing modes can be used to assess the clinical burden of AF. This report shows how the DDI mode might trigger ventricular tachyarrhythmias during AF. This potential arrhythmogenic phenomenon should be carefully considered when programming a device in DDI (or DDD) mode in patients with AF.

A 67-year-old man with an implantable-cardioverter defibrillator (ICD) phoned our Department of Cardiology to report the occurrence of palpitations and dizziness. He was implanted two years before with a dual-chamber ICD (Energen F143, Boston Scientific, Natick, MA, USA) in primary prevention for dilated cardiomyopathy with severely reduced left ventricular ejection fraction, without complication.

The device was programmed in DDI pacing mode in order to maintain atrial sensing and to assess the clinical burden of paroxysmal-persistent atrial fibrillation. As the patient was followed with the wireless Remote monitoring, he was told to send a transmission to the hospital; the device was interrogated and two episodes of non sustained ventricular tachycardia with a maximum duration of eight seconds were observed. Electrical parameters were normal and similar to those at implantation. Analyzing EGMs, the physicians noticed that ventricular tachycardias were triggered by a particular, unusual way (Figure 1A). During atrial fibrillation, some atrial beats were undersensed and then an atrial pacing stimulus was delivered at the programmed sensor rate starting the ventricular blanking period during which ventricular sensing was temporarily disabled so that no signal could be detected. The following ventricular intrinsic beat just occurred in the ventricular blanking period and was not detected by device which consequently delivered a pacing stimulus at the end of programmed interval of stimulation (Figure 1B). Thus, the ventricular paced beat was delivered during the vulnerable T-wave of "not-detected" ventricular intrinsic beat triggering a run of ventricular tachycardia which fortunately terminated spontaneously after a few seconds. Finally, the patient was invited to come to our outpatient cardiology division where the device was re-programmed using the "Smart" blanking algorithm (37.5 ms following paced events with automatic adjustment of ventricular sensitivity) in order to avoid R-wave undersensing during the ventricular blanking period. After one year from re-programmation, no further episodes of ventricular tachycardia have been recorded.

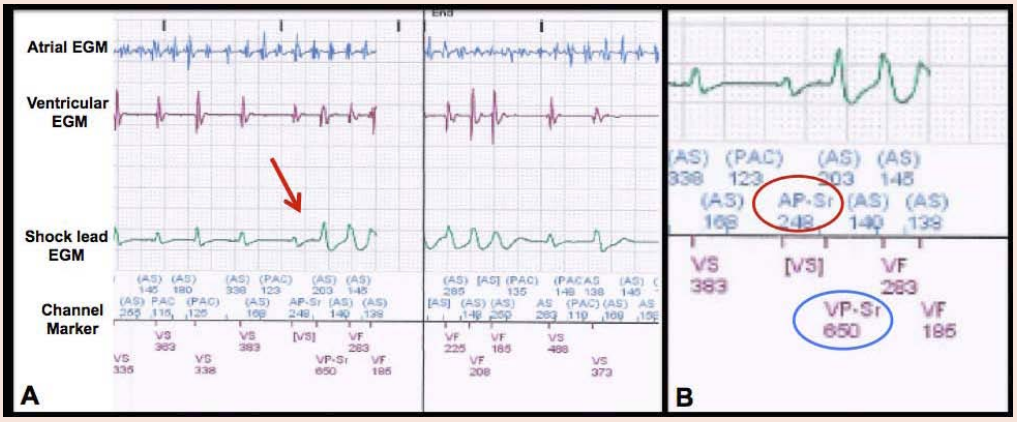

Figure 1: A: The picture shows intracardiac EGMs with the onset and the termination of the non-sustained ventricular tachycardia (arrow). B: The enlargement shows the precise mechanism responsible for the development of ventricular tachycardia. A paced atrial beat (red circle) following some undersensed atrial beats, during atrial fibrillation, began a ventricular blanking period; during this time interval, an intrinsic ventricular depolarization occurred and was not detected by the device. So, the following ventricular stimulation (blue circle) was delivered during the vulnerable T-wave of "not-detected" ventricular intrinsic beat triggering a run of ventricular tachycardia.

Citation: *Mugnai G, Bertagnolli L, Tomei R (2014) Potential Arrhythmogenic Risk of DDI/DDD Pacing Modes During Atrial Fibrillation. J Cardiovasc Med Cardiol 1(2): 033-034. DOI: 10.17352/2455-2976.000008*

In the DDI mode, both the atrium and the ventricle are sensed [1]. DDI mode may be useful when atrial tachyarrhythmias are inappropriately tracked to the ventricle by a DDD mode resulting in fast paced ventricular rates [1]. The DDI pacing mode is also an optimal programmation for the paroxysmal syncopal carotid sinus syndrome. Otherwise, both DDI and DDD modes are more suitable than VVI mode especially for those patients with paroxysmal-persistent atrial fibrillation because atrial sensing allows to evaluate the burden of atrial fibrillation in a specific period. However, during atrial fibrillation, some atrial beats may be undersensed and the present report shows that DDI pacing mode might indirectly induce ventricular tachyarrhythmias in the setting of ventricular stimulation during the vulnerable repolarization period of a "not-detected" ventricular intrinsic beat. In this case, it might be useful to program the device activating the "Smart" blanking algorithm or shortening fixed values of ventricular blanking period in order to promote R-wave detection during ventricular blanking period following atrial pacing. Alternatively, it might be also useful to increase the atrial sensitivity in order to avoid the atrial undersensing during atrial fibrillation. Another possible strategy may be also adjust AV intervals in order to delay a possible following ventricular stimulus avoiding the vulnerable repolarization period. Also the DDD mode might potentially trigger ventricular arrhythmias in the same way of DDI mode; however, the autoswitch pacing mode into VVI during atrial fibrillation is able to avoid this potential arrhythmogenic risk.

In conclusion, this potential arrhythmogenic phenomenon should be considered when programming a device in DDI or DDD pacing mode in patients with atrial fibrillation, especially in patients with pacemaker devices which are not able to treat life-threatening arrhythmias.

References

1. Kusumoto F, Goldschlager N (1996) Cardiac Pacing. N Engl J Med 334: 89-97.

Copyright: © 2014 Mugnai G, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Citation: Mugnai G, Bertagnolli L, Tomei R (2014) Potential Arrhythmogenic Risk of DDI/DDD Pacing Modes During Atrial Fibrillation. J Cardiovasc Med Cardiol 1(2): 033-034. DOI: 10.17352/2455-2976.000008