

Case Report

Open Access

Programmed inappropriate ICD ventricular defibrillation for cardioversion of persistent atrial fibrillation

Panagiotis Korantzopoulos*, George Grekas, Thomas Pappas and John A Goudevenos

Address: Department of Cardiology, University of Ioannina School of Medicine, 45110 Ioannina, Greece

Email: Panagiotis Korantzopoulos* - p.korantzopoulos@yahoo.gr; George Grekas - ggrekas@otenet.gr; Thomas Pappas - tompap7@yahoo.gr; John A Goudevenos - igoudev@uoi.gr

* Corresponding author

Published: 12 September 2008

Received: 9 August 2008

Cases Journal 2008, 1:152 doi:10.1186/1757-1626-1-152

Accepted: 12 September 2008

This article is available from: <http://www.casesjournal.com/content/1/1/152>

© 2008 Korantzopoulos et al; licensee BioMed Central Ltd.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract

In this report we briefly describe a patient with a dual chamber implantable cardioverter defibrillator in the context of severe ischemic cardiomyopathy who developed persistent atrial fibrillation. After appropriate anticoagulation and under mild sedation the patient was successfully cardioverted to sinus rhythm after a programmed ventricular synchronized defibrillation using his defibrillator. Programmed internal cardioversion of persistent atrial fibrillation in patients who have an implantable cardioverter defibrillator without atrial defibrillation capabilities could be an effective and safe therapeutic option. Unlike external electrical cardioversion, this strategy does not interfere with the implantable cardioverter defibrillator, is more effective, and obviates the need of general anesthesia. This strategy should be further evaluated in clinical trials.

Case report

A 73-year-old Caucasian man presented to the outpatient clinic for evaluation of a recent episode of implantable cardioverter defibrillator (ICD) shock therapy. He had been implanted a dual chamber ICD (Model 1871, Vitality DR, Guidant Corp.) for secondary prevention due to resuscitated sustained ventricular tachycardia, not related to a correctable cause, in the context of severe ischemic cardiomyopathy. His past medical history was significant for coronary artery disease (old myocardial infarction and coronary artery bypass surgery), hypertension, diabetes mellitus, and hyperlipidemia. The patient's medications included metoprolol, ramipril, glimepiride, aspirin, and simvastatin.

Interrogation of the stored events revealed that the recent episode of shock was an appropriate defibrillation (21 J

biphasic shock) of ventricular arrhythmia (cycle length 330 ms) that classified into the VF zone. However, electrocardiographic examination and evaluation of the current electrograms revealed the presence of atrial fibrillation (AF) with a ventricular response of 84 beats/min (Figures 1, 2). The duration of AF was unknown while no event of inappropriate shock attributed to AF was detected. All hematological and biochemical studies including thyroid function tests were within normal limits. An echocardiographic study showed left ventricular (LV) dilatation with global systolic dysfunction (ejection fraction: 0.20) and evidence of increased filling pressures. The left atrial (LA) anteroposterior diameter was 41 mm and the LA diastolic volume 36 ml.

Taking into account the severely impaired left ventricular systolic function as well as the absence of LA enlargement



Figure 1
12-lead electrocardiogram of the patient at presentation.

we decided to follow a rhythm control strategy. Therefore, the patient was placed on appropriate anticoagulation therapy for 4 weeks and scheduled for cardioversion. He was admitted to the Coronary Care Unit and placed to electrocardiographic, non-invasive hemodynamic, and respiratory monitoring. After performing mild sedation with midazolam, the patient's ICD was externally programmed to deliver an R-wave synchronized ventricular biphasic shock of 31 J. The cardioversion was successful with immediate restoration of sinus rhythm (Figure 3). Subsequently, the patient was placed on amiodarone for sinus rhythm maintenance while continued receiving β -blocker therapy and anticoagulation. His recovery was rapid and uneventful and discharged 6 hours later. After a 10-month follow-up period, the patient remains on sinus rhythm and on good clinical condition. His LV ejection fraction has been improved to 0.28 while the LV filling

pressures are normal. Interestingly, the patient does not remember any shock or associated pain with respect to the AF cardioversion.

Discussion

ICD implantation rates are growing rapidly both for primary and secondary prevention of sudden cardiac death [1,2]. Given that ICD implantation is increasingly applied in patients with advanced structural heart disease, the prevalence of AF in ICD patients has been increased. Of note, a significant proportion of ICD patients have a history of AF or will develop AF after implantation while paroxysmal or persistent AF in ICD patients has been associated with subsequent appropriate therapy for ventricular arrhythmias [3-5]. Despite technological advances and sophisticated algorithms for improved discrimination between supraventricular and ventricular arrhyth-

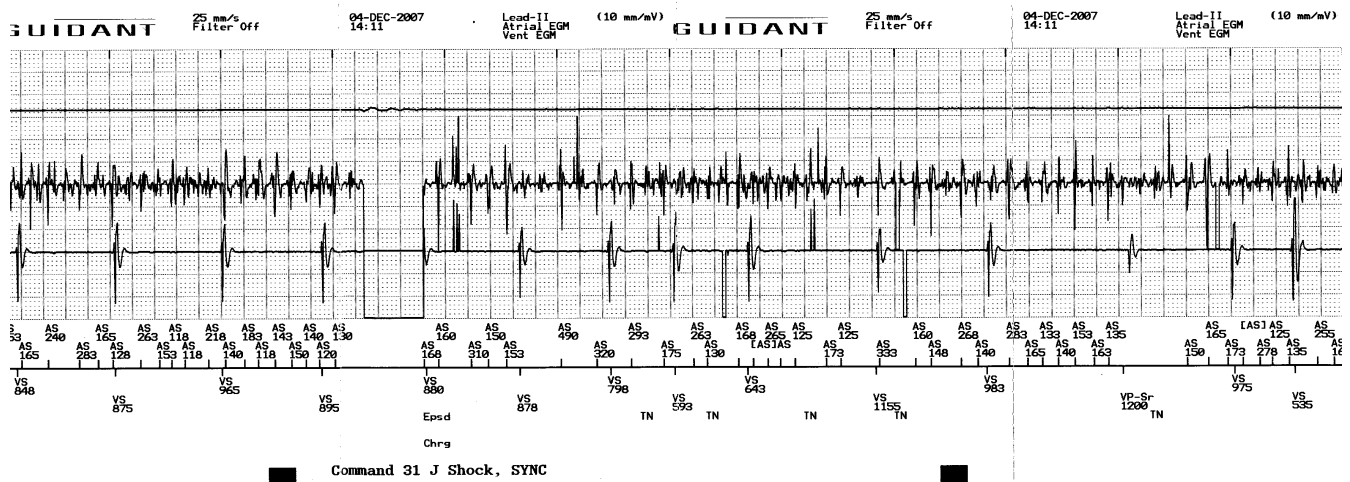


Figure 2
Interrogation of the ICD before cardioversion – Electrogram strip showing atrial fibrillation.

mias, inappropriate shocks represent a continuous problem in ICD patients and AF is the most frequent cause [6].

On the other hand, it is well-known that AF adversely affects myocardial performance, exercise tolerance, and quality of life, especially in patients with heart failure [7]. Moreover, AF per se is associated with increased morbidity and mortality mainly due to embolic events [7]. During the past few years ICDs that offer atrial defibrillator therapy have been developed. However, these devices have not gained wide acceptance [8]. The main reason for this fact is that the conscious patients experience pain during the atrial defibrillation shock. Even low energy shocks in the order of 1 J are uncomfortable for the patients leading to a significant impairment of the quality of life [8]. In

other words, their shocks are considered as painful as the standard ICD ventricular defibrillations [8].

Synchronized electrical cardioversion is the preferable choice of therapy for persistent AF while the pharmacological cardioversion has limited role in this form of AF [9,10]. In specific, internal defibrillation shocks are preferable and more effective compared to external shocks in ICD patients [10]. Low energy delivered by the internal defibrillation lessens the risk for interference with the ICD programming as well as the risk for endocardial damage whereas the need for general anesthesia is obviated.

Conclusion

Our case demonstrates that programmed ventricular ICD discharge under mild sedation could be an interesting option for quick, effective, and safe cardioversion of per-

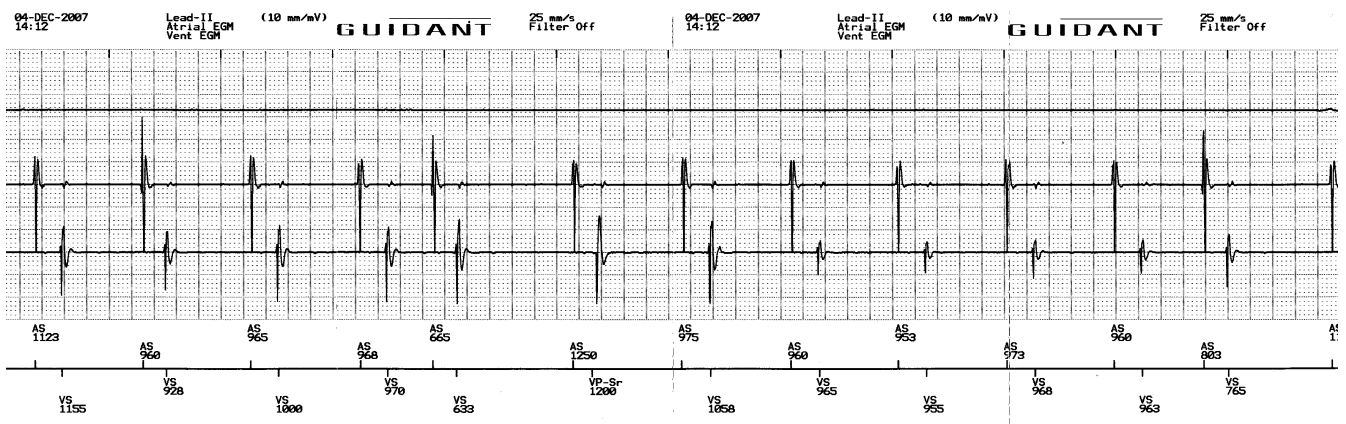


Figure 3
Electrogram strip after cardioversion of atrial fibrillation.

sistent AF. Taking into account the aforementioned considerations, this practice may have a particular role in patients with advanced heart failure. Undoubtedly, this strategy should be further evaluated in clinical trials.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written informed consent is available for review by the Editor-in-Chief of this journal.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

PK managed the patient, analyzed and interpreted the patient data, and he was a major contributor in writing the manuscript. GG managed the patient and involved in drafting the manuscript. TP involved in the care of the patient and in the drafting the manuscript. JAG searched the relative literature and critically revised the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We are grateful to Mr. George Kokkalidis, Senior Technician of Boston Scientific-Guidant Corp., for his assistance in the management of the patient.

References

1. Passman R, Kadish A: **Sudden death prevention with implantable devices.** *Circulation* 2007, **116**:561-571.
2. Exner DV: **Clinical trials of defibrillator therapy.** In *Clinical Cardiac Pacing, Defibrillation, and Resynchronization Therapy* 3rd edition. Edited by: Ellenbogen KA, Kay GN, Lau CP, Wilkoff BL. Saunders Elsevier, Philadelphia; 2007:357-384.
3. Best PJM, Hayes DL, Stanton MS: **The potential usage of dual chamber pacing in patients with implantable cardioverter defibrillators.** *Pacing Clin Electrophysiol* 1999, **22**:79-85.
4. Grönefeld GC, Mauss O, Li YG, Klingenhöben T, Hohnloser SH: **Association between atrial fibrillation and appropriate implantable cardioverter defibrillator therapy: results from a prospective study.** *J Cardiovasc Electrophysiol* 2000, **11**:1208-1214.
5. Stein KM, Euler DE, Mehra R, Seidl K, Slotwiner DJ, Lerman BB, Jewel AF, Worldwide Investigators: **Do atrial tachyarrhythmias beget ventricular tachyarrhythmias in defibrillator recipients?** *J Am Coll Cardiol* 2002, **40**:335-340.
6. Gehi AK, Mehta D, Gomes JA: **Evaluation and management of patients after implantable cardioverter-defibrillator shock.** *JAMA* 2006, **296**:2839-2847.
7. Benjamin EJ, Wang TJ: **The epidemiology of atrial fibrillation.** In *Atrial Fibrillation* Edited by: Kowey P, Naccarelli GV. Marcel Dekker, New York; 2005:1-26.
8. Dossdall DJ, Ideker RE: **Intracardiac atrial defibrillation.** *Heart Rhythm* 2007, **4**:S51-S56.
9. McNamara RL, Tamariz LJ, Segal JB, Bass EB: **Management of atrial fibrillation: review of the evidence for the role of pharmacologic therapy, electrical cardioversion, and echocardiography.** *Ann Intern Med* 2003, **139**:1018-1033.
10. Fuster V, Rydén LE, Cannom DS, Crijns HJ, Curtis AB, Ellenbogen KA, Halperin JL, Le Heuzey JY, Kay GN, Lowe JE, Olsson SB, Prystowsky EN, Tamargo JL, Wann S, Task Force on Practice Guidelines, American College of Cardiology/American Heart Association; Committee for Practice Guidelines, European Society of Cardiology; European Heart Rhythm Association; Heart Rhythm Society: **ACC/AHA/ESC 2006 guidelines for the management of patients with atrial fibrillation-executive summary: a report of the American College of Cardiology/American Heart Association Task**

Force on practice guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing Committee to Revise the 2001 Guidelines for the Management of Patients with Atrial Fibrillation). *Eur Heart J* 2006, **27**:1979-2030.

Publish with **BioMed Central** and every scientist can read your work free of charge

"BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime."

Sir Paul Nurse, Cancer Research UK

Your research papers will be:

- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:
http://www.biomedcentral.com/info/publishing_adv.asp

