

## CASE REPORT

### Dual-chamber implantable cardioverter–defibrillator. Is it useful in patient with permanent atrial fibrillation?

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#### Funding Information

No sources of funding were declared for this study.

Received: 14 November 2015; Revised: 9 April 2016; Accepted: 23 May 2016

*Clinical Case Reports* 2016; 4(8): 747–751

doi: 10.1002/ccr3.608

#### Introduction

Many patients are diagnosed with atrial fibrillation (AF). If these patients also have indications for an implantable cardioverter–defibrillator (ICD), single-chamber devices are preferable because AF does not provide interesting information for treatment.

However, it is very unusual to encounter a patient with an established permanent AF for >20 years that coexists with paroxysmal atrial flutter (A Fl).

We describe a case of stored episodes in a single-chamber ICD implanted in a patient diagnosed with permanent AF for 28 years that suggested the presence of paroxysmal A Fl concomitant with permanent AF.

#### Case Presentation

The patient was a 76-year-old male who was diagnosed with permanent AF in 1987 (he had been on anticoagulation therapy since that time) and was on antiarrhythmic treatment (digoxin). The patient did not have arterial hypertension. The other comorbidities included

#### Key Clinical Message

In patients with permanent atrial fibrillation (AF) and implantable cardioverter–defibrillator (ICD) implant indication, a single-chamber device is the choice because AF does not provide interesting information for the treatment. It is very unusual to find patients with permanent AF that coexist with atrial tachycardia with various degree of Atrioventricular block.

#### Keywords

Atrial fibrillation, atrial flutter, atrial tachycardia, dual chamber ICD.

obstructive sleep apnea, peripheral vascular disease with a femoroiliac bypass, and transient global amnesia episodes. Multiple ECG recordings revealed the presence of AF, and in 2006, a 24-h Holter recording revealed AF during the entire recording period with rates that varied between 42 and 122 bpm. There was no history of previous cardioversion.

In January 2013, the patient suffered an out-of-hospital sudden death episode due to ventricular fibrillation (VF). After cardiopulmonary resuscitation and external cardioversion, the patient converted back to the preexisting underlying AF rhythm. The patient was submitted to a coronariographic study that revealed chronic obstruction of the right coronary artery with contralateral supply circulation, a 37% left ventricle ejection fraction (LVEF) with anterior hypokinesia and posteroseptal akinesia. An echocardiographic study revealed a 35% LVEF and severe dilatation of the left atrium (LA, volume of 108 mL).

In February 2013, a single-chamber ICD (Paradym RF VR 9250, Sorin Group) was indicated for implantation, and the corresponding defibrillation lead (Durata 7120,

St. Jude Medical) was placed in the apex of the right ventricle (RV).

All electrogram recordings (EGM) exhibited an arrhythmic pattern compatible with AF (Fig. 1).

Self-terminated episodes of rhythmic ventricular rates were recorded since October 2014. No change in morphology was detected, and the RR intervals seemed to act as a multiplying factor relative to a base cycle. The most likely explanation was the existence of an atrial rhythm with different degrees of AV block. Occasionally, 1:1 conduction is classified as ventricular tachycardia (VT) due to its stability, and the device delivers antitachycardia pacing (ATP) and/or shocks (Fig. 2). Notably, the patient had never received type Ic antiarrhythmic drugs.

All the patient's ECGs that were acquired during out- and in-hospital follow-ups revealed AF. Consequently, we did consider the utilization of an electrophysiological study to assess the regular arrhythmias.

In a recent recording (Fig. 3), a change from AF into an atrial rhythm with stable AV conduction and later variable AV conduction was observed.

The patient did not exhibit any clinical signs compatible with an ischemic event during their evolution; therefore, no new coronariographic study was performed.

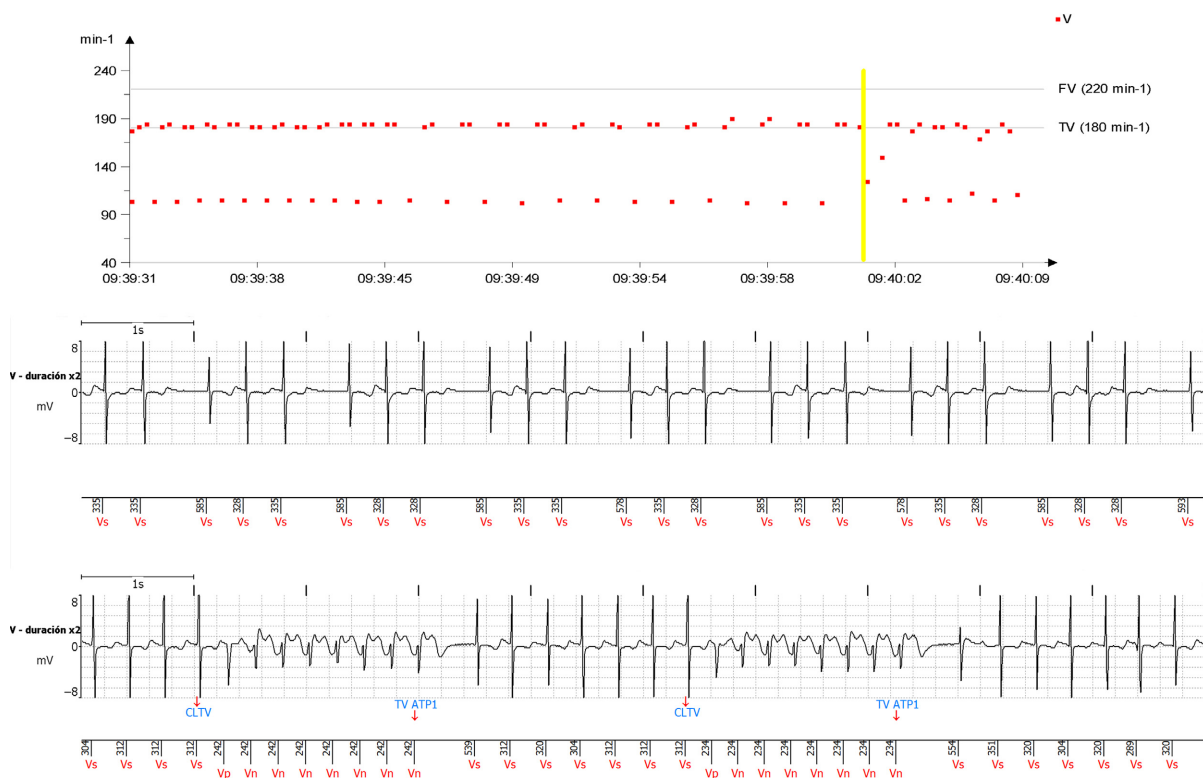
## Discussion

AF is the most common arrhythmia in clinical praxis. The incidence of AF is increasing with the aging of the population, and AF is associated with the existence of other pathologies, such as hypertension and heart failure. Moreover, the mortality and morbidity of AF increase due to thromboembolic complications and heart failure.

AFs are classified as paroxysmal (spontaneous termination), persistent (lasting more than 7 days and requiring termination with an external intervention), or permanent (the physician and the patient accept that it is impossible to return to a NSR) [1, 2]. AF commonly exhibits a progressive evolution. In the first stage, AF frequently coexists with other atrial arrhythmias, primarily A Fl, and it is possible for each arrhythmia to transform into one of the other arrhythmias within the same clinical episode. The roles of type Ic drugs, such as A Fl transformers and inducers, which are used for the treatment of patients with AF are also known [3–5]. However, AF is undoubtedly associated with a less altered atrial structure, both mechanically and electrically.



**Figure 1.** An atrial fibrillation episode.



**Figure 2.** A variable AV conduction episode (possible A FI). Inappropriate ATP therapy was delivered due to the high level of stability of the atrial rhythm.

Patients suffering from paroxysmal AF progress to more frequent and long-lasting episodes and into persistent and permanent stages. Numerous recordings have documented that this progression is associated not only with the evolution time [6–9] but also with the existence of other comorbidities as indicated by the HATCH score [10, 11]. This evolution occurs along with structural changes at the atrial level that include chamber dilatation and substitution of the myocardial tissue with fibrotic tissue that causes the situation to be irreversible [12].

The uniqueness of our case lies in the fact that the patient exhibited permanent AF with a long evolution (more than 25 years) that exhibited very stable supraventricular rhythms. In this specific case, a very important structural alteration of the left atrium was present, and the other comorbidities were recognized as factors that led to the irreversibility of the AF.

We were unable to precisely determine the nature of the atrial arrhythmia, which could only be clarified with a device with an atrial lead. We were only able to deduce the existence of the atrial arrhythmia in an indirect manner (i.e., based on the regular ventricular

rhythm with a morphology identical to that of the irregular rhythm). However, we were able to label the condition as an atrial tachycardia–flutter with variable AV block, and based on the patient’s clinical status, all signs seemed to indicate that the atrium was unable to sustain any regular rhythm.

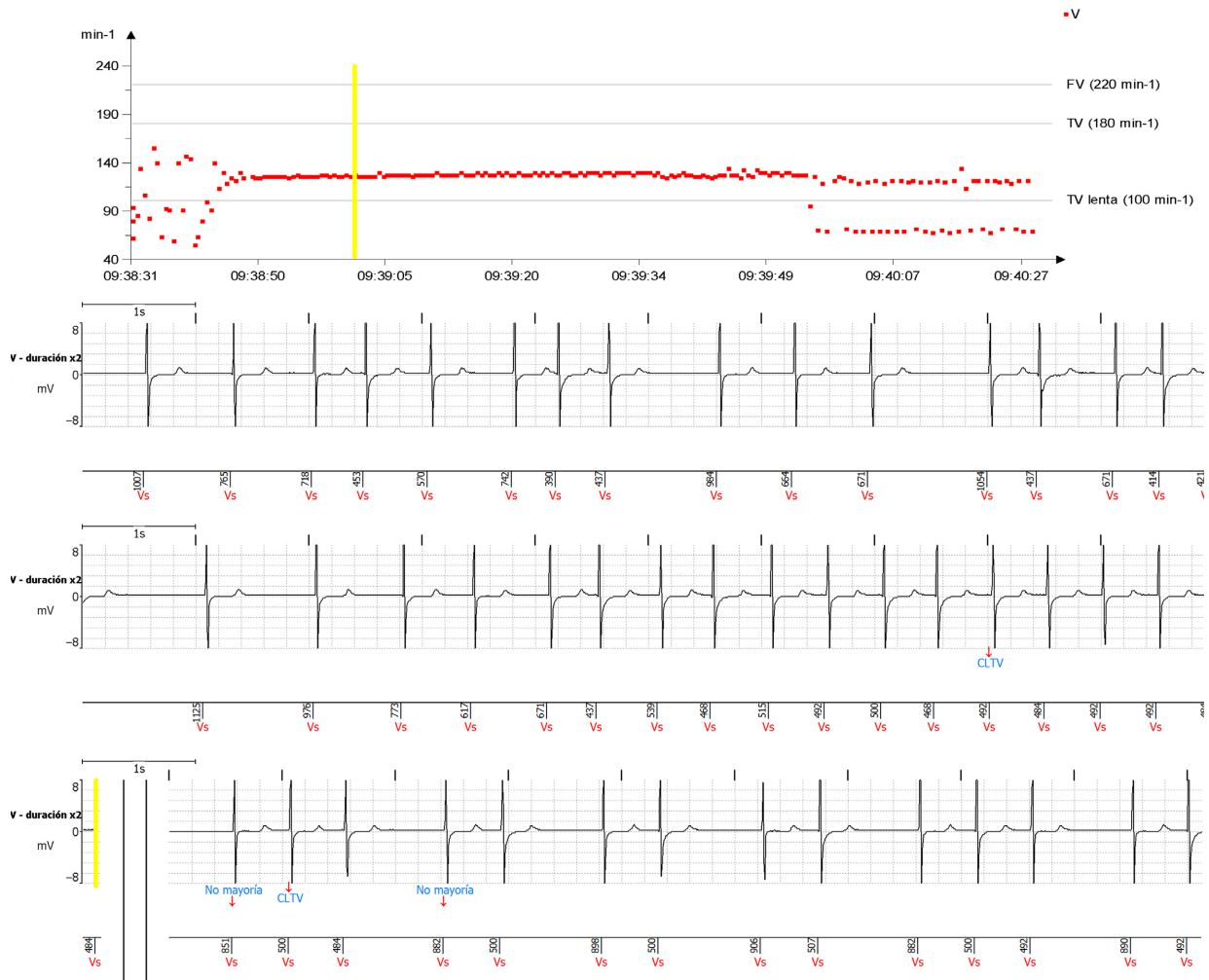
## Conclusion

AF is a fascinating arrhythmia due to its ubiquity and unexpected evolution.

This case raises the question of whether dual-chamber devices should also be implanted in cases with documented AF. Only the availability of adequate information about the atrial activity can provide real insight into the rhythms of such patients and prevent the application of inappropriate therapies with discrimination algorithms, such as chamber of origin and association-level algorithms.

## Conflict of Interest

None declared.



**Figure 3.** Interesting episode demonstrating the transition from atrial fibrillation into a stable atrial rhythm with variable AV conduction.

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