Early Detection of Subclinical Atrial Flutter-Fibrillation in Patients with Unexplained Palpitation Using a Novel VDD Defibrillator with Integrated Atrial-Sensing Rings

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ABSTRACT

A 56-year-old man with an implantable cardioverter-defibrillator (ICD) presented with unexplained heart palpitations, which were usually aggravated after ingesting alcohol. He had a history of coronary artery bypass graft surgery 8 years ago, and an ICD was placed (i.e. a single ventricular shock coil with integrated atrial-sensing rings [VDD ICD lead]) 1.5 years ago for primary prevention of sudden cardiac death associated with ischemic cardiomyopathy. Repeated electrocardiograms and echocardiograms showed no evidence of atrial flutter-fibrillation; this was clearly demonstrated using several atrial electrogram strips during the ICD analysis.

Key Words: ▪ Implantable Cardioverter-Defibrillator ▪ Atrial Fibrillation ▪ Stroke

Introduction

A significant proportion of patients who receive implantable cardioverter-defibrillators (ICDs) have a history of atrial fibrillation (AF) at the time of the initial procedure, or new-onset AF episodes during follow-up. In a subanalysis of the PainFree SmartShock™ Technology study, new-onset AF was detected in approximately 22% of patients with ICDs in the first 12 months of follow-up.1,2 Device-detected AF, even if asymptomatic, has been closely associated with an increased risk for stroke or systemic embolism.3,4 In addition, subclinical AF has been detected in almost 30% of patients with cryptogenic stroke when continuously monitored using implantable cardiac devices.5 We report the case of a patient with subclinical AF detected only after ICD analysis with integrated atrial-sensing rings.

Case

A 56-year-old man presented with several episodes of unexplained heart palpitations, which were usually aggravated one or two days after ingesting alcohol. He underwent coronary artery bypass graft surgery for three-vessel coronary artery disease eight years before presentation. Despite optimal medical treatment, the left ventricular ejection fraction gradually decreased to 19%. For the primary prevention of sudden cardiac death, an ICD was placed 18 months ago using a novel single-chamber VDD ICD (Iforia 7 VR-T DX®, Biotronik Inc., Berlin, Germany) and a single-coil active lead with integrated atrial sensing rings (Linoxmax S DX®, Biotronik Inc., Berlin, Germany) (Figure 1). The VDD ICD was programmed to detect atrial tachyarrhythmia >200 beats per minute (bpm). Ventricular tachycardia zone settings...
were as follows; >162 bpm for monitoring alone, >182 bpm for anti-tachycardia pacing and shock, and >200 bpm for shock with 30~40 J.

A thorough review of the patient’s medical records, multiple 12-lead electrocardiograms (ECGs) (recorded >20 times), and echocardiograms (performed >10 times) showed no evidence of atrial or ventricular tachyarrhythmic episodes (Figure 2). However, ICD analysis revealed multiple episodes of atrial flutter with 2:1 conduction, and AF with irregularly irregular RR intervals, which were clearly recorded in atrial and far-field electrograms (Figure 3). Moreover, some AF episodes lasted more than 4-10 hours. During the paroxysmal atrial flutter-fibrillation episodes, ventricular rates increased up to 200-210 bpm without triggering inappropriate shock or antitachycardia pacing.

The CHA₂DS₂-VASc (congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, stroke/transient ischemic attack [TIA], vascular disease, age 65-74 years, sex category) score of the patient was calculated and determined to be two, because of the patient’s history of diabetes and heart failure; antiarrhythmic and anticoagulation therapies were initiated after confirming the presence of significant atrial flutter-fibrillation.

Discussion

The incidence of device-detected atrial tachyarrhythmia was reported in up to 50% of patients during a 2-year follow-up. However, a significant proportion of those episodes may be silent (approximately 90%), increasing the risk for delayed anticoagulation therapy in patients with a high risk for stroke.

Detection of subclinical AF using a conventional single-chamber ICD system is quite limited. In addition, ICD recipients usually have several risk factors for stroke, including congestive heart failure, hypertension, old age, diabetes, and past history of systemic embolism. Using a dual-chamber ICD with an independent atrial lead may enhance the efficacy of AF detection; however, dual-chamber ICD placement is usually associated with higher costs, longer fluoroscopy and procedure time, and more complications, including pneumothorax, tamponade, hematoma, and lead dislodgement. Moreover, using a dual-chamber ICD could make the subsequent lead extractions more difficult in case of ICD system infection.

A novel VDD ICD system with two integrated atrial rings mounted 15-18 cm from the single-coil defibrillation lead tip, can provide information on atrial rhythm and stored atrial electrograms. This additional information may be helpful in discriminating ventricular tachyarrhythmia from supraventricular tachycardia, or in the early detection of subclinical AF as shown in our case. Our patient did not show any evidence of AF during more than eight years of follow-up in multiple tests of 12-lead ECG and telemonitoring. Even with repeated echocardiograms...
Figure 2. No evidence of atrial fibrillation was observed in repeated 12-lead electrocardiographic examinations. Q-waves in anteroseptal and inferior leads along with multiple suture wires in Figure 1 are compatible with a history of ischemic cardiomyopathy with 3-vessel coronary artery disease.

Figure 3. A clear demonstration of atrial flutter with 2:1 conduction revealed after ICD analysis (upper). Atrial flutter degenerated into atrial fibrillation recorded in atrial electrogram and irregularly irregular RR interval shown in far field (FF) electrogram (lower). ICD, implantable cardioverter-defibrillator.
transmitral E- and A-waves were always measured by pulsed-wave Doppler. Combined ECG recording during examination also revealed no AF rhythms. In patients with a high risk for stroke (CHA₂DS₂-VASc score, 2), optimal anticoagulation therapy may be greatly delayed if conventional ICD were placed. Therefore, this novel VDD ICD system with two integrated atrial sensing functions may be useful in better managing patients with silent AF, without increasing the complexity of an ICD procedure.

References


