

CASE REPORT

Chirine Parsai · Robert F. Bonvini · Bruno Schnetzler  
Henri Sunthorn

## Cardiac transplantation in a patient with emotionally triggered implantable cardioverter defibrillator storms

Received: November 28, 2006 / Accepted: March 30, 2007

**Abstract** The implantable cardioverter defibrillator (ICD) may be responsible for psychological disorders especially among patients experiencing multiple shocks. An associated hyperadrenergic state (e.g., anger, anxiety) may trigger malignant ventricular arrhythmias repeatedly treated by ICD shocks, entertaining a “vicious circle” often difficult to interrupt. Despite aggressive cardiac and psychological therapeutic efforts, this condition may be refractory, finally leading to heart transplantation, as described in this case report.

**Key words** Anxious disorder · Heart transplantation · Implantable cardioverter defibrillator

### Introduction

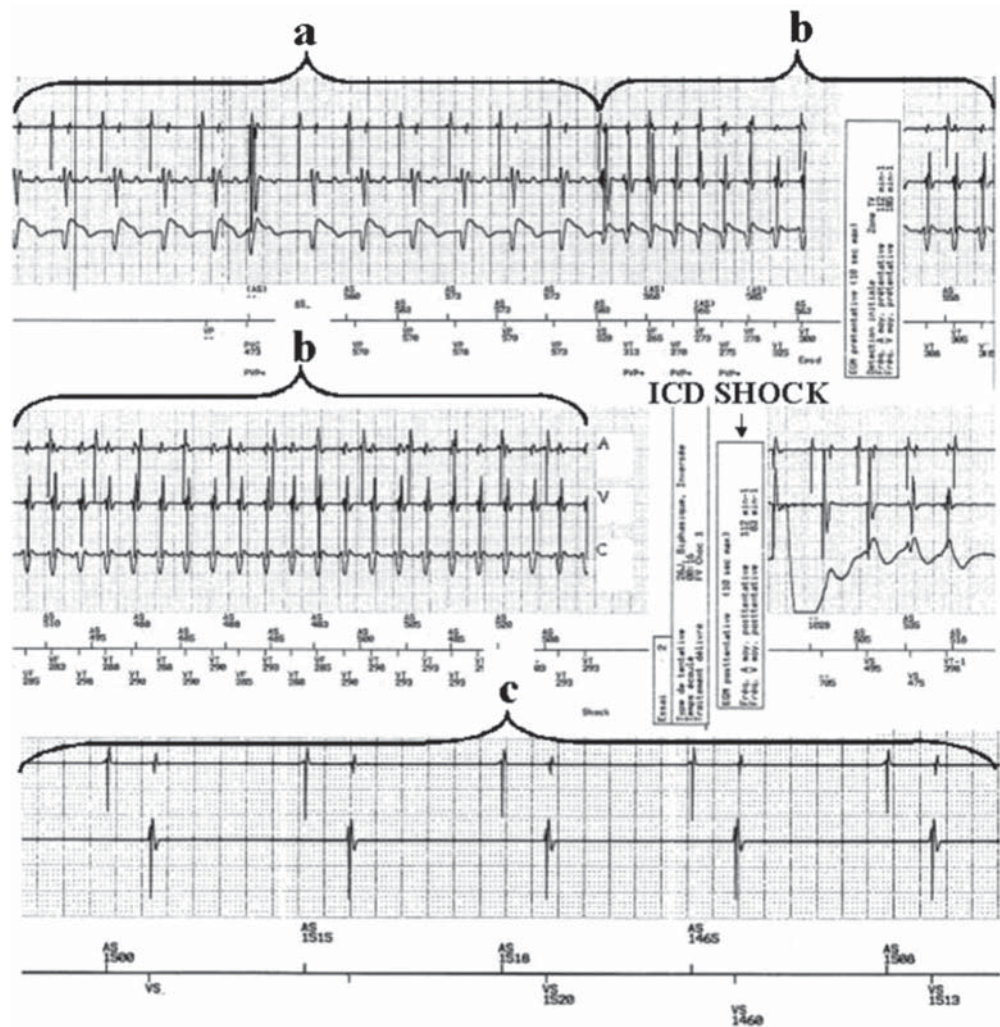
The implantable cardioverter defibrillator (ICD) is currently a recognized and effective therapy in rescued patients after sudden cardiac death (SCD) or at high risk of potentially lethal ventricular arrhythmias.<sup>1</sup> The implantation of such devices can be followed by psychological disturbances, such as major depressive episodes, or panic disorders, requiring specialized psychological support according to its severity.<sup>2</sup> The following report emphasizes how some patients, after receiving an ICD shock, may become very fearful about sustaining more shocks. This growing apprehension may trigger ventricular arrhythmias and thus storms of ICD shocks, draining the ICD and potentially resulting in severe myocardial damage, leading to cardiogenic shock requiring urgent cardiac transplantation, as occurred in our case.

### Case report

The workup of a 64-year-old man, complaining of palpitations and recurrent blackouts, showed an idiopathic dilated cardiomyopathy with a reduced left ventricular systolic function (LVEF: 40%). Following 24-h ECG recordings and electrophysiological study, fast and sustained unifocal ventricular tachycardias (VT) (250/min) were identified as the likely cause of syncope, leading to the implantation of an ICD (Guidant Ventak PR 12MDR 1851; Guidant, Zug, Switzerland).

Several days later, the patient experienced a couple of appropriate ICD-shocks, responsible for an outbreak of anxiety regarding impending shocks. The information retrieved from the ICD displayed adequate shocks following unsuccessful overdrive therapies of sustained VT. Despite an underlying marked sinus bradycardia (due to associated sinus node dysfunction and high beta blocker dosage: Fig. 1c), each event (Fig. 1b) was triggered by sinus tachycardia (Fig. 1a), always taking place in nerve-racking circumstances, suggesting major adrenergic discharges preceding the episodes. Due to ongoing appropriate ICD-shocks, despite maximal antiarrhythmic therapy (combination of amiodarone and beta-blockers), triggering factors such as long QT syndrome and metabolic disorders or channelopathies were also ruled out. The patient became increasingly fearful about sustaining more shocks despite adequate psychiatric support (psychotherapy besides antidepressant and anxiolytics regimens). A few weeks later this emotional aggravation triggered, following an argument, a storm of VT and ICD shocks. The unceasing shocks (up to 10 repetitive shocks) drained the ICD and probably resulted in severe myocardial damage, finally leading to a cardiogenic shock necessitating, as a last therapeutic resource, urgent cardiac transplantation. At the 9-month post-transplantation follow-up visit the patient was fully satisfied with his cardiological and his psychological condition.

**Fig. 1.** Device endocavitary electrogram. A, atrial; V, ventricular; C, shock. Sinus tachycardia at 105 bpm (a) degenerating into ventricular tachycardia at 220 bpm (b) which, after an unsuccessful overdrive protocol, was successfully ended with an internal shock delivered by the ICD (arrow). Patient's spontaneous rhythm: sinus bradycardia at 40 bpm with 1st degree AV block (c)



## Discussion

Numerous ICD trials have reported fairly high acceptance of these devices by patients and relatives.<sup>3,4</sup> However, anxiety, anger, depression, panic attacks, and agoraphobia have been recorded up to 50%.<sup>5</sup>

Among survivors of SCD, ICD is associated with similar or superior quality of life compared to standard antiarrhythmic drug therapy, in absence of repetitive ICD shocks.<sup>6</sup> In line with previous studies,<sup>7,8</sup> our case highlights the role of psychological distress as a trigger for malignant arrhythmias, through adrenergic discharge, thereby favoring shocks in ICD patients, finally impairing their quality of life. In these particular situations, psychological counseling, cognitive behavioral therapy, relaxation therapy, or meditation may play a major role in patient's management, and should therefore always be attempted in such psychological unstable patients.

To the best of our knowledge, this is the first described case where the indication for heart transplantation was defined by a device-induced myocardial failure and not by the underlying primitive cardiac disorder. As cardiac trans-

plantation can hardly be considered as a standard option for the management of patients with refractory ICD shocks, the effectiveness of left cardiac sympathetic denervation associated with high doses beta-blocker therapy could be questioned in this condition. By analogy with the short-term effectiveness of this procedure in long QT syndrome,<sup>9</sup> a reduction in catecholamine influence on the heart by this denervation could reduce arrhythmic events also in ICD patients.

In conclusion, our case suggests that ICD patients who experience frequent shocks are at increased risk of psychological disorders, which can, at the extreme, be responsible for an ICD-induced cardiogenic shock, urging for cardiac transplantation, which finally should be considered as an early therapeutic option for similar patients with refractory arrhythmia-induced unbearable shocks.

## References

1. Klein RC, Raitt MH, Wilkoff BL, Beckman KJ, Coromilas J, Wyse DG, Friedman PL, Martins JB, Epstein AE, Hallstrom AP, Ledingham RB, Belco KM, Greene HL; AVID Investigators (2003)

- Analysis of implantable cardioverter defibrillator therapy in the Antiarrhythmics Versus Implantable Defibrillators (AVID) Trial. *J Cardiovasc Electrophysiol* 14(9):940–948
2. Vlay SC, Olson LC, Fricchione GL, Friedman R (1989) Anxiety and anger in patients with ventricular tachyarrhythmias. Responses after automatic internal cardioverter defibrillator implantation. *Pacing Clin Electrophysiol* 12(2):366–373
  3. Sneed NV, Finch N (1992) Experiences of patients and significant others with automatic implantable cardioverter defibrillators after discharge from the hospital. *Prog Cardiovasc Nurs* 7(3):20–24
  4. Luderitz B, Jung W, Deister A, Marneros A, Manz M (1993) Patient acceptance of the implantable cardioverter defibrillator in ventricular tachyarrhythmias. *Pacing Clin Electrophysiol* 16(9):1815–1821
  5. Godemann F, Butter C, Lampe F, Linden M, Schlegl M, Schultheiss HP, Behrens S (2004) Panic disorders and agoraphobia: side effects of treatment with an implantable cardioverter/defibrillator. *Clin Cardiol* 27(6):321–326
  6. McCready MJ, Exner DV (2003) Quality of life and psychological impact of implantable cardioverter defibrillators: focus on randomized controlled trial data. *Card Electrophysiol Rev* 7(1):63–70
  7. Burg MM, Lampert R, Joska T, Batsford W, Jain D (2004) Psychological traits and emotion-triggering of ICD shock-terminated arrhythmias. *Psychosom Med* 66(6):898–902
  8. Lampert R, Joska T, Burg MM, Batsford WP, McPherson CA, Jain D (2002) Emotional and physical precipitants of ventricular arrhythmia. *Circulation* 106(14):1800–1805
  9. Li C, Hu D, Shang L, Ma S, Liu W, Li Y, Ma Z, Tang C, Mei Y, Wang L (2005) Surgical left cardiac sympathetic denervation for long QT syndrome: effects on QT interval and heart rate. *Heart Vessels* 20:137–141