



Prognostic importance of distressed (Type D) personality and shocks in patients with an implantable cardioverter defibrillator

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ABSTRACT

Background: Clinical trials have shown the benefit of implantable cardioverter defibrillator (ICD) treatment. In this study, we examined the importance of chronic psychological distress and device shocks among ICD patients seen in clinical practice.

Methods: This prospective follow-up study included 589 patients with an ICD (mean age = 62.6 ± 10.1 years; 81% men). At baseline, vulnerability for chronic psychological distress was measured by the 14-item Type D (distressed) personality scale. Cox regression models of all-cause and cardiac death were used to examine the importance of risk markers.

Results: After a median follow-up of 3.2 years, 94 patients (16%) had died (67 cardiac death), 61 patients (10%) had experienced an appropriate shock and 28 (5%) an inappropriate shock. Inappropriate shocks were not associated with all-cause ($p=0.52$) or cardiac ($p=0.99$) death. However, appropriate shocks (HR = 2.60, 95% CI 1.47–5.58, $p=0.001$) and Type D personality (HR = 1.85, 95% CI 1.12–3.05, $p=0.015$) were independent predictors of all-cause mortality, adjusting for age, sex, left ventricular ejection fraction, cardiac resynchronization therapy (CRT), secondary indication, history of coronary artery disease, medication and diabetes. Type D personality and appropriate shocks also independently predicted an increased risk of cardiac death. Other independent predictors of poor prognosis were older age, treatment with CRT and diabetes.

Conclusion: Vulnerability to chronic psychological distress, as defined by the Type D construct, had incremental prognostic value above and beyond clinical characteristics and ICD shocks. Physicians should be aware of chronic psychological distress and device shocks as markers of an increased mortality risk in ICD patients seen in daily clinical practice.

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1. Introduction

The Multicenter Automatic Defibrillator Implantation Trial II (MADIT-II) [1] and Sudden Cardiac Death in Heart Failure Trial (SCD-HeFT) [2] showed that implantable cardioverter defibrillator (ICD) treatment improves survival in patients who are at risk for ventricular arrhythmias [3]. The combination with cardiac resynchronization therapy (CRT-D) may further improve the clinical course of heart failure [4–6]. However, in addition to these clinical trials, research needs to further examine the outcome of ICD treatment in the real world of clinical practice [3].

Secondary analyses of MADIT-II, SCD-HeFT and the Defibrillation in Acute Myocardial Infarction Trial (DINAMIT) have shown that ICD shocks are associated with poor survival [7–9]. Advanced heart failure and comorbid conditions may attenuate the survival benefits of ICD treatment in some patients [10–12]. Psychological distress may also affect the cardiovascular system through several pathways [13–16], especially through an important involvement of the autonomic nervous system [17–19] and the induction of increased QT dispersion [18,19], increased T-wave alternans [20,21] and arrhythmia [21–24]. Both ICD shocks [25] and Type D (distressed) personality [26] have been related to distress. Type D is a propensity to chronic psychological distress that has been shown to predict adverse events in cardiac patients [27–29].

It has been argued that more research is needed on risk stratification among ICD patients seen in clinical practice [3,9]. Therefore, we wanted to examine the importance of shocks and Type D personality as risk markers of mortality following ICD treatment in the real world.

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2. Methods

2.1. Patient sample

Patients in the study had their first ICD implanted between May 2003 and February 2009 in 2 Dutch referral hospitals (Amphia Hospital, Breda, and Catharina Hospital, Eindhoven). Patients completed a psychological questionnaire at the time of implantation (between 1 day to 3 weeks after implantation). Patients who did not return the questionnaire within 1 week received a reminder telephone call and a letter including the questionnaire. Questionnaires were returned in a stamped, pre-addressed envelope and were checked for completeness. Inclusion criteria were age between 18 and 80 years and sufficient knowledge of Dutch; exclusion criteria were cognitive impairment (e.g. dementia) and psychiatric disorders except for affective disorders. From the 645 patients that were enrolled in the study, 56 had missing data on left ventricular ejection fraction (LVEF) or shocks during follow-up or survival status. Hence, 589 patients (91%) were included in the current analyses. The study was approved by the Medical Ethics Committees of both participating hospitals, was conducted in accordance with the Helsinki Declaration, and all patients provided written informed consent. The authors of this manuscript have certified that they comply with the Principles of Ethical Publishing in the International Journal of Cardiology.

2.2. Shocks during follow-up

Shocks were considered to be appropriate if they were triggered by ventricular tachycardia or ventricular fibrillation [7] and inappropriate if they were triggered by nonventricular arrhythmias or abnormal sensing [8]. Device interrogation was used to obtain information on the nature of shocks as judged by electrophysiologists.

2.3. Type D (distressed) personality

Type D personality refers to an increased vulnerability for psychological distress that predicts poor cardiovascular outcomes [27]. All patients completed the 14-item Type D Scale (DS14) [28] at the time of implantation. The DS14 consists of two 7-item subscales, negative affectivity (e.g. "I often feel unhappy") and social inhibition (e.g. "I am a 'closed' person"). Items are scored on a 5-point Likert scale (subscale scores from 0 to 28). Patients scoring high on both subscales, according to a standardized cut-off score ≥ 10 , are classified as having a Type D personality. The DS14 is a reliable scale, with Cronbach's alpha values of 0.88/0.86 and test-retest reliability over a 3-month period between $r = 0.72$ and 0.82 [28].

2.4. End points

The end points were all-cause death and death from cardiac causes. Medical records were checked to see whether the patient had a cardiologic check-up after January 1, 2009. Patients who had a cardiologic check-up after this date were considered alive and their follow-up date in the study was set as the most recent date they had a check-up. For patients who did not have a check-up after January 1, 2009 or who died, vital status or cause of death were discussed with the treating cardiologist and/or general practitioner.

2.5. Cardiac and non-cardiac covariates

In order to examine the incremental value of shocks and distress as predictors of mortality, a number of covariates were included as potential confounders in the multivariable models. Cardiac covariates were obtained from the medical records at baseline, and included left ventricular dysfunction (i.e., LVEF > 35% versus LVEF $\leq 35\%$), CRT

Table 1
Covariates in the total study population, and stratified by survival status.

Characteristics	Total sample N = 589	Stratified by survival status		P value
		Survivors N = 495	Non-survivors N = 94	
<i>Cardiac covariates</i>				
CRT	30% (175)	27% (133)	45% (42)	0.001
LVEF $\leq 35\%$	83% (487)	81% (402)	90% (85)	0.030
Secondary indication	36% (210)	36% (176)	36% (34)	0.91
CAD	73% (428)	71% (353)	80% (75)	0.091
Beta-blockers	82% (481)	83% (411)	74% (70)	0.049
ACE-inhibitors	68% (400)	69% (340)	64% (60)	0.36
<i>Non-cardiac covariates</i>				
Diabetes	19% (111)	17% (86)	27% (25)	0.036
Smoking	18% (106)	18% (89)	18% (17)	0.98
Male gender	81% (476)	80% (396)	85% (80)	0.25
No partner	13% (78)	14% (67)	12% (11)	0.63

CAD = coronary artery disease; CRT = cardiac resynchronization therapy; LVEF = left ventricular ejection fraction; SD = standard deviation.
Bold values indicate significance at $p < 0.05$.

(no/yes), ICD indication (primary prevention versus secondary prevention), coronary artery disease (CAD; no/yes), beta-blockers, and ACE-inhibitors. Non-cardiac covariates included diabetes mellitus (as reported in medical records), smoking status at baseline (no/yes), and the demographics gender and marital status (having a partner versus having no partner).

2.6. Statistical analyses

Chi-square tests were also used to determine potential differences in cardiac and non-cardiac covariates stratified by survival status. A series of Cox regression analyses were performed to determine the univariate predictive value of age, appropriate and inappropriate shocks, Type D personality, and the cardiac and non-cardiac covariates in relation to all-cause and cardiac-related mortality. Multivariable Cox regression analyses were performed to determine the independent predictors for all-cause and cardiac-related death. All tests were two-tailed and a p -value < 0.05 was used to indicate statistical significance. All analyses were performed in PASW Statistics 17 for Windows.

3. Results

The mean age of the current cohort of ICD patients seen in clinical practice was 62.6 years (SD = 10.1 years); 476 (81%) were men and the majority of patients had a partner (87%). The median follow-up period was 3.2 years (range 0.8 to 6.5 years). During this period, 94 patients (16%) had died, with 67 (11%) due to a cardiac cause. There were 61 patients (10%) who experienced an appropriate shock and

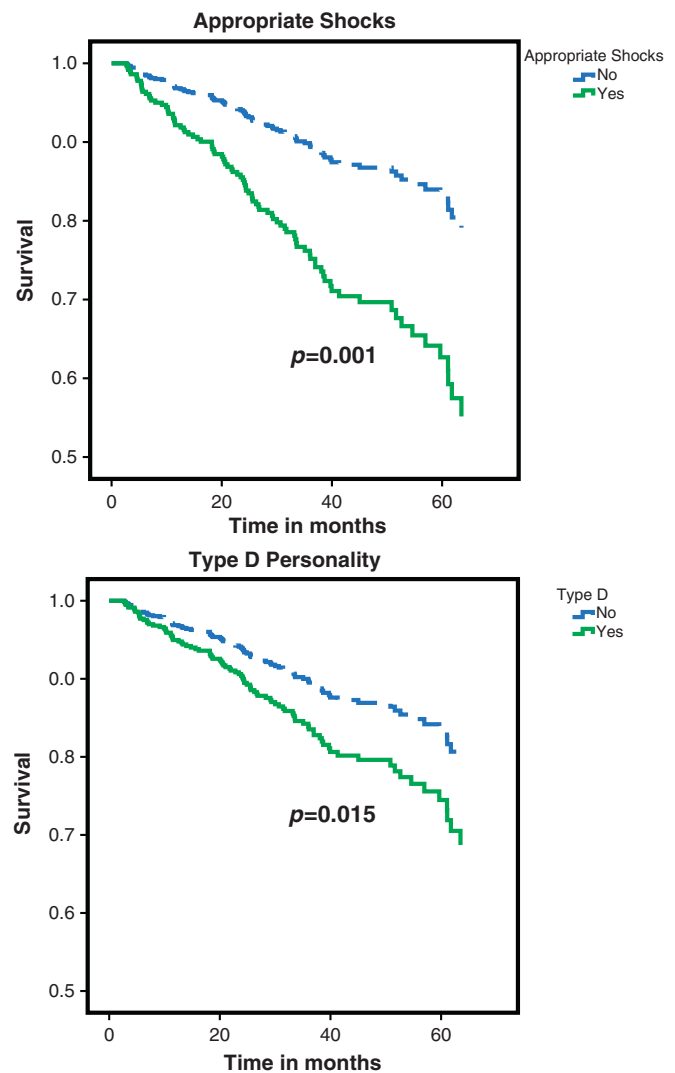


Fig. 1. Survival of ICD patients over time (N = 589), stratified by appropriate shocks (top) and Type D personality (bottom). All-cause death (N = 94) coded as 1. Multivariable analyses, adjusted for age, cardiac covariates and non-cardiac covariates.

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