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Letters

Nonsustained Ventricular Tachycardia at the Time of Implantation Predicts Appropriate Therapies on Rapid Ventricular Arrhythmia in Primary Prevention Patients With Nonischemic Cardiomyopathy

Results From the Very-High-Rate Registry

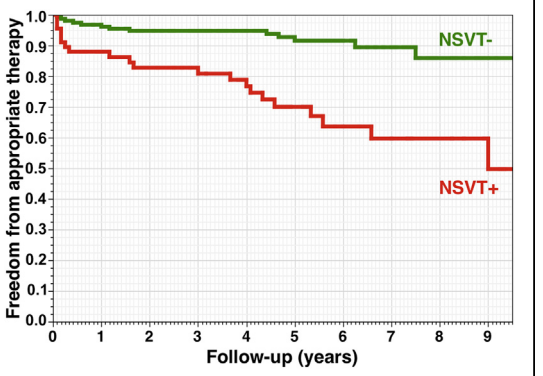
Recent results from the Danish trial call into question the benefits of implantable cardioverter-defibrillator (ICD) in primary prevention for patients with nonischemic cardiomyopathy (NICM) and a reduced left ventricular ejection fraction (LVEF), considering that a majority of these well-treated patients also received cardiac resynchronization therapy (CRT) (1). We sought to evaluate the factors associated with appropriate therapies for ventricular arrhythmias over 220 beats/min in NICM patients included in the VH-RATE (Very High Rate study) study (2,3).

Consecutive NICM patients with a reduced LVEF despite optimal medical therapy, who underwent the implantation of an ICD in primary prevention of sudden cardiac death, were included. Devices were programmed with identical tachycardia settings: a monitoring zone starting at a rate of 170 beats/min or above, and a ventricular fibrillation zone at 220 beats/min or above, with nominal settings for the number of detection intervals, according to the manufacturer (average 18 ± 4 detection intervals). Shock therapies were programmed at maximum output and antitachycardia pacing (ATP) before or during charging, when available. A 24-h electrocardiographic Holter monitoring was performed in all patients just before implantation to detect the presence of nonsustained ventricular tachycardia (NSVT) episodes (≥3 consecutive complexes and <30 s). Time to first appropriate therapy (ATP or shock) was recorded. Follow-up ended with death, heart transplantation, or ICD removal.

A total of 223 patients were included (60 ± 11 years of age, LVEF 24 ± 7%, 26% single chamber, 22% dual chamber, and 52% CRT devices). Patients were well treated, with 97% having a beta-blocker, although information on renin-angiotensin-aldosterone system inhibitors was not available. During a mean follow-up of 4.7 ± 2.5 years (median 4.7 years [interquartile range: 3.2 years]) (i.e., 1,051 patient-years), 35 (16%) patients experienced at least 1 appropriate therapy, including 24 (11%) patients with shocks (11 for ventricular fibrillation [VF], 10 for fast monomorphic ventricular tachycardia [VT], and 3 for both VT and VF), and 11 (5%) patients with ATP-only therapies.

After adjustment for age; sex; LVEF; New York Heart Association functional class; single-chamber, dual-chamber, and biventricular devices; history of atrial fibrillation; NSVT at the time of implantation; complete atrioventricular block; and treatment with a beta-blocker and amiodarone, patients with NSVT (n = 67, 30%) was the only independent factor associated with a higher risk of appropriate therapy over 220 beats/min (adjusted hazard ratio: 4.81; 95% confidence interval: 2.33 to 10.30; $p < 0.0001$) (Figure 1). NSVT on 24-h Holter monitoring at the time of implantation was

FIGURE 1 Freedom From Appropriate Therapy in Patients With or Without NSVT on 24-h Holter Monitoring at the Time of Implantable Cardioverter-Defibrillator Implantation



Freedom from appropriate therapy over 220 beats/min in patients with nonischemic cardiomyopathy according to the presence (NSVT+) or absence (NSVT−) of NSVT (≥3 consecutive complexes) at the time of implantable cardioverter-defibrillator implantation. NSVT = nonsustained ventricular tachycardia.

the only independent factor associated with a higher risk of appropriate shock on VF or polymorphic VT (adjusted hazard ratio: 5.21; 95% confidence interval: 1.63 to 18.80; $p = 0.005$). Patients with NSVT were also more likely to have NSVT episodes detected in the monitoring zone (170 to 220 beats/min) during follow-up (14.9% vs. 6.4%; $p = 0.04$).

Presence of NSVT alone identifies a subgroup (30%) of NICM patients (37% implanted with a CRT device) at very-high risk of rapid and potentially life-threatening ventricular arrhythmia (5.0 events per 100 patient-years vs. 1.7 events per 100 patient-years; $p < 0.0001$) (4). Even if ICD treated fast ventricular arrhythmia is not an equivalent endpoint as all-cause mortality, our findings suggest that NSVT may predict a higher risk population of NICM patients who will actually benefit from implantation of a defibrillator in primary prevention of sudden cardiac death. A new randomized study in that population may be needed (5).

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All authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the *JACC: Clinical Electrophysiology* author instructions page.

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Are Rotors Markers of Substrate or a Mechanism of Perpetuation of Atrial Fibrillation?

Rotor Ablation in AF: Many Unanswered Questions

We read with interest the recent paper published in *JACC: Clinical Electrophysiology* by Zaman et al. (1) titled "Recurrent Post-Ablation Paroxysmal Atrial Fibrillation Shares Substrates With Persistent Atrial Fibrillation."

In that paper, the rotors and focal sources are referred to as markers of electrical substrate, whereas earlier publications described the rotor as a mechanism of atrial fibrillation (AF) perpetuation. This is confusing and warrants further clarification.

Secondly, many studies have shown that pulmonary vein isolation (PVI) alone is enough for first or redo ablation in paroxysmal AF patients. Therefore, substrate ablation in paroxysmal AF patients does not seem to be justified.

Furthermore, in the Discussion section, the authors stated that studies suggesting nonexistence of rotors used empirical rules with technical errors such as cycle lengths of 250 to 500 ms in AF that are less consistent with AF. That is not correct. In the study by Yamabe et al. (2), the range of cycle lengths was 137 to 202 ms; AF was terminated by PVI alone without any additional lesions. Similarly, Benharash et al. (3) did not observe any difference in dominant frequency or Shannon entropy between focal impulse and rotor modulation (FIRM)-identified rotors and distant sites. In that study, the minimum cycle length used for AF induction was 180 ms. Also, electroanatomic mapping showed no rotational activation at FIRM-identified rotor sites in 96% of their patients (3).

Moreover, the authors have cited the OASIS (Outcome of Different Ablation Strategies In Persistent and Long-Standing Persistent Atrial Fibrillation) trial (4) and have stated that the paper has "subsequently been retracted due to non-randomization