

# Changes in the Ventricular Gradient Measured During Exercise Tests Predict Antiarrhythmic Therapy in Primary Prevention ICD Patients

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## Introduction

The clinical utility of current noninvasive predictors to identify candidates for primary prevention ICD implantation remains controversial. Exaggerated reactivity of cardiac electrophysiology to changes in autonomic tone could indicate arrhythmia vulnerability. Consequently, we investigated whether changes in the ventricular gradient (VG, a measure for action potential duration (APD) heterogeneity in the heart) during exercise tests predict arrhythmias.

## Methods

We studied the exercise tests of 106 primary prevention ICD patients, of whom 15 had anti-arrhythmic therapy (AT) during follow-up. Because of abundant arrhythmias during their tests, 4/15 AT patients were excluded. The remaining 11 AT patients were each matched (age, sex, etiology, EF, device) with two patients who had no AT during follow-up. Exercise ECGs were analyzed with our dedicated analysis program BEATS, that synthesizes a VCG and determines onset-QRS, end-QRS and end-T in every normal beat. Finally, intra-individual differences in VG magnitude were computed between the exercise and recovery phases of each exercise test, in the 95-110 bpm heart-rate range. Statistical analysis was done with the unpaired t-test with unequal variances.

## Results

Clinical characteristics of the AT group and the non-AT group did not differ (age  $58.9 \pm 12.2$  vs  $55.1 \pm 14.1$  yrs; NYHA class  $2.2 \pm 0.6$  vs  $2.3 \pm 0.9$ ; EF  $23.8 \pm 9.0$  vs  $25.3 \pm 6.7\%$ ; follow-up  $3.0 \pm 0.6$  vs  $2.8 \pm 0.7$  yrs). Changes (recovery-exercise) in the VG magnitude differed significantly:  $-19.9 \pm 27.2\%$  (AT group) vs  $2.8 \pm 27.1\%$  (non-AT group),  $P < 0.05$ .

## Discussion

Autonomic influences on the heart during exercise and recovery differ dramatically. Due to the inhomogeneous innervation of the heart and due to disease this may give rise to variable changes in local APDs, thus setting the stage for reentrant arrhythmias. The observed changes in VG may denote regional changes in APD inhomogeneity. In conclusion, ICD patients whose VG is sensitive to changes in autonomic tone are more susceptible to arrhythmias than those with a stable VG.