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Electrocardiographic Comparison of Ventricular Premature Complexes During Stress Test in Patients with Catecholaminergic Polymorphic Ventricular Tachycardia and Healthy Subjects

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Objective:
The purpose of this study was to evaluate whether electrocardiographic characteristics of ventricular premature complexes (VPC'S) during stress test distinguish patients with catecholaminergic polymirphic ventricular tachycardia (CPVT) from healthy subjects.

Background:
CPVT is a rare but highly malignant inherited arrhythmia disorder. Although standardized exercise stress test is the most reliable way to diagnose CPVT, in 30% only single ventricular premature beats were recorded. VPC'S can occur during stress test of asymptomatic and healthy subjects.

Methods:
We compared the electrocardiographic characteristic of VPC'S during stress test in 16 calsequestrin-2 (CASQ2) mutation carriers CPVT patients with that in 36 healthy subjects.

Results:
CPVT patients had a significantly more VPC'S (31±14 vs 3±4, p< 0.0001), longer mean QRS duration (139±18 ms vs 121±21, p= 0.004) and longer coupling interval (CI) (476±58 ms vs 355±61 ms, p< 0.0001). CPVT patients more often exhibited left bundle branch block (LBBB) pattern with inferior axis morphology (14 of 16 (88%) vs 0 of 36 (0%), p< 0.0001), couplets (6/16 (38%) vs 1/36 (3%), p=0.002) and more often had bigeminy or trigeminy during the peak stress (12 of 16 (75%) vs 0 of 36 (0%), p<0.0001). The first VPC appeared at higher work level among CPVT patients (13±5 METS vs 7±6 METS, p=0.0001) and never at the recovery period (0 of 16 (0%) vs 15/36 (42%), p=0.001). The presence of VPC after 1 minute of the recovery was more often in the healthy subjects (13 of 36 (36%) vs 0 of 16 (0%), p=0.004). The most sensitive characteristics for the detection of CPVT were higher PVC burden (>10 /test),(100% sensitivity, 100% negative predictive value), LBBB pattern with inferior axis (88% sensitivity, 94% negative predictive value) and CI longer than 400 ms (88% sensitivity, 94% negative predictive value). Bigeminy or trigeminy or LBBB pattern with inferior axis were most specific for CPVT at 100% (100% positive predictive value, 92% negative predictive value). First VPC in the recovery and the presence of VPC more than 60 seconds in the recovery were most specific for healthy subjects (100% specificity, 100% positive predictive value). In multivariate analysis, QRS duration > 120 ms (odds ratio 4.4, 95% confidence interval 1.08-18.05, p= 0.038), and first VPC at higher work level (odds ratio 1.2, 95% confidence interval 1.04-1.36, p= 0.01), each predicted the presence of CPVT.

Conclusions:
Several electrocardiographic criteria can help distinguish VPC'S originating from CPVT compared with healthy subjects.