Discrimination of coronary artery disease patients by means of heart rate variability analysis during exercise stress testing

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Methods: A database of treadmill stress testing was analyzed including the recordings of 78 patients with CAD (positive coronary angiography), 48 patients with low risk of a cardiac event (Framingham index <5%), and 66 asymptomatic volunteers. First, an integral pulse frequency modulation model with time-varying threshold was used to estimate the HRV signal. Second, the instantaneous power and frequency of the low-frequency (LF) and high-frequency (HF) HRV components were derived using a parametric decomposition of the Smoothed Pseudo Wigner Ville distribution, which makes use of respiratory information, which was indirectly derived from the ECG. Third, a Wilcoxon rank sum test was used to compare every pair of study groups regarding indices derived from the power and frequency of the LF and HF components at different time instants: the first minute of the exercise (n1), 3 minutes before peak stress (n2), 1 minute before peak stress (n3), and 3 minutes after peak stress (n4).

Results: The null hypothesis of equal medians between the CAD and low-risk groups is rejected (P < .01) for indices derived from the HF power at n1, n3, and n4; the LF power at n1, n2, and n3; and the HF frequency at n1 and n2. A linear discriminant analysis classified patients in the CAD and low-risk groups with a sensitivity of 75% and a specificity of 63% with only 1 variable and with sensitivity of 81% and specificity of 79% with 4 variables.

Conclusion: Indices derived from HRV analysis during exercise stress testing may improve the diagnosis of CAD.