Significance of change in heart rate recovery from test to test

Authors:
N. Sydo[1], T. Sydo[2], J.G. Murphy[3], B. Merkely[1], T.G. Allison[4], [1]Semmelweis University Heart Center - Budapest - Hungary, [2]Csolnoky Ferenc Hospital, Cardiology - Veszprem - Hungary, [3]Mayo Clinic - Rochester - United States of America, [4]Mayo Clinic, Sports Cardiology Clinic - Rochester - United States of America,

Topic(s):
Exercise testing and training

Background: Heart rate recovery (HRRec) is a powerful predictor of mortality in many cardiovascular (CV) diseases. If so a change in HRRec should signal a change in mortality risk.

Purpose: We analyzed a large cohort of patients who underwent 2 stress tests to determine the significance of a test-to-test change in HRRec.

Methods: Non-imaging exercise tests performed on patients from Minnesota ages 30–89 years from 1994 through 2010 were reviewed. Patients with 2 tests performed a minimum of 6 months apart were included. Patients were assigned to 4 groups according to their HRRec change: NN = HRRec normal (<13 bpm) both tests; NA = normal becomes abnormal; AN = abnormal becomes normal; and AA = abnormal both tests. Mortality was determined from Minnesota and National Death Indices. Mortality risk according to HRRec change was assessed using Cox regression with adjustment for age, sex, presence of CV disease, hypertension, diabetes, current smoking, and use of a HR-lowering drug.

Results: A total of 6,512 qualifying patients (76% men) were included in the analysis. Mean age was 53±13 years. CV disease was established in 2540 patients (39%), hypertension in 1757 (27%), diabetes in 475 (7.3%), current smoking in 523 (8.6%), and use of HR-lowering drug in 2120 (33%). HRRec overall was similar between the first and second tests (17±9 vs 17±10) performed an average of 4.0±3.2 years apart. Number of patients by HRRec change was 3797 for NN (58%), 756 for NA (12%), 775 for AN (12%), and 1184 for AA (18%). There were 913 deaths (14%) over a mean follow-up of 10.2±4.7 years after the second test. Using NN with 232 deaths (6.1%) during follow-up as the referent, the age-sex-risk factor-adjust hazard ratio [95% confidence interval] for total mortality was 2.01 [1.62–2.49] for NA, 1.50 [1.18–1.90] for AN, and 2.83 [2.38–3.36] for AA.

Conclusions: HRRec change on consecutive exercise tests has a significant independent impact on all-cause mortality. The best outcomes were

seen in patients with NN HRRec. Compared to patients with AA HRRec, improved HRRec (AN) patients showed reduced risk. Similarly, worsening HRRec (NA) patients had increased risk versus NN HRRec patients.