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Use of heart rate to guide exercise training intensity in patients with atrial fibrillation

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Background: The current guidelines for the prescription of exercise in patients in cardiovascular disease rehabilitation programs recommend heart rate reserve (HRR) as the primary method for guiding exercise intensity. In this context, HRR is adopted as a surrogate measure of the oxygen uptake reserve (VO2R). The %HRR during exercise shows close agreement with %VO2R in some studies and is recommended parameter to guide exercise training in patients with heart failure. However, the relationship between %HRR and %VO2R in atrial fibrillation (AF) is not well described. Given the growing role exercise is now receiving in AF and its incorporation into latest AF guidelines, there is an absence of data which have assessed the relationship between HRR and VO2R in patients with AF to assess its validity as a metric for guided exercise prescription as already seen in healthy and CVD populations.

Purpose: The aims of this study were therefore to assess the relationship between %HRR and %VO2R in patients with AF.

Methods: 101 patients with AF presenting for a cardiopulmonary exercise test (CPET) were enrolled in the study. Resting and Peak HR and VO2 values from CPET were used to calculate HRR and VO2R. HR and VO2 values were recorded continuously throughout exercise to determine %HRR and %VO2R at each workload. Linear regression was used to calculate the slope and y-intercept for %HRR versus %VO2R. Predefined analysis was performed to assess impact of rhythm during exercise, beta blockers and chronotropic incompetence (CI) on the association between HRR and VO2R.

Results: The mean slope of %HRR - %VO2R was 0.79±0.4 being significantly less than 1.0 (mean difference: -0.21, 95% CI -0.30 to -0.12, p<0.001). The mean y-intercept slope calculated was 20.1±41.6, which significantly differed from a hypothetical value of 0 (mean difference: 20.1, 95% CI 11.9 to 28.3, p<0.001). There was poor correlation between %HRR and %VO2R (r2=0.16). Although VO2peak was unaffected by rhythm during exercise (p=0.8) or CI (p=0.3), it was reduced with beta-blockers (p=0.02). However, the HRpeak was increased in AF (p<0.01) and reduced in presence of CI (p<0.01) or beta-blockers (p=0.02). AF rhythm during CPET, beta-blockers or CI did not independently explain the poor correlation between VO2R and HRR.

Conclusion: In patients with AF, %HRR is not equivalent to %VO2R, with wide variation at different exercise intensities. There was no significant effect of rhythm at time of testing, presence of chronotropic incompetence or beta-blockers on the relationship between %HRR and %VO2R in AF patients. These findings highlight that the HR prescription of exercise intensity in AF patients should be guided by the individualised HR-VO2 relationship assessed by a CPET rather than assumed equivalence. More studies are strongly promoted to further assess methods of guiding exercise intensity in AF patients.
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