



Non Invasive Imaging (Echocardiography, Nuclear, PET, MR and CT)

ASSOCIATION BETWEEN BIVENTRICULAR REMODELLING AND PEAK EXERCISE PERFORMANCE: THREE-DIMENSIONAL ECHOCARDIOGRAPHIC STUDY IN A LARGE ATHLETIC COHORT

Moderated Poster Contributions

Non Invasive Imaging Moderated Poster Theater, Posters, Hall A

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Session Title: What's New in the World of Exercise?

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Background: Regular physical exercise induces complex remodelling of the left- (LV) and also the right ventricle (RV). Despite these well-known adaptive changes, data are scarce concerning the relationship between cardiac structural and functional alterations and peak exercise performance. Our aim was to explore the correlations between resting LV and RV parameters and peak exercise capacity in a large cohort of athletes using three-dimensional (3D) echocardiography and cardiopulmonary exercise testing (CPET).

Methods: Competitive athletes of various exercise regime (n=467; 70% male; 20±6 years; 15±7 training hours/week) were enrolled. Beyond conventional protocol, full volume datasets focused on the LV or the RV were acquired for 3D analysis. LV and RV end-diastolic volume indices (EDVi), ejection fraction (EF), LV mass index (Mi) and global longitudinal strain (GLS) were measured using dedicated software. Treadmill CPET was performed on the same day to determine peak oxygen consumption (VO₂/kg).

Results: Age was not associated with LV and RV volumes, however, it showed an inverse relationship with LVEF (r=-0.11, p<0.05) and LVGLS (r=-0.13, p<0.01). We found a positive correlation between VO₂/kg and LVEDVi (r=0.39, p<0.001), RVEDVi (r=0.36, p<0.001) and LVMI (r=0.29, p<0.001), while LVEF (r=-0.16, p<0.01), LVGLS (r=-0.21, p<0.001) and RVEF (r=-0.19, p<0.001) showed an inverse association with CPET-derived exercise performance. Using multivariate linear regression, gender, heart rate, body surface area, systolic blood pressure, amount of static and also dynamic training, weekly training hours, LVEDVi, RVEDVi, LVEF and LVGLS were independent predictors of VO₂/kg with an overall R² of 0.53 (p<0.001).

Conclusion: Higher LV and RV volumes but lower biventricular function is associated with better exercise performance in athletes. Beyond basic morphometric parameters, the type and intensity of training and several LV and RV structural and functional parameters are independent predictors of CPET-derived peak exercise capacity. These results point toward the usefulness of 3D echocardiography in the monitoring of training status and performance prediction of elite athletes.