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Is Arterial hypertension an intermediate step to heart failure with preserved ejection fraction?

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Background. Arterial hypertension (HT) is one of the main risk factors for the development of heart failure with preserved ejection fraction (HFpEF). The evaluation of cardiorespiratory fitness during the exercise may provide a clearer insight into this association.

Purpose. We assessed the hemodynamic, respiratory and metabolic characteristics of HT subjects and patients with HFpEF and HT (HFpEF-HT), combining cardiopulmonary exercise test (CPET) and exercise stress echocardiography (ESE).

Methods. We studied 170 consecutive subjects, undergoing a symptom-limited graded ramp bicycle CPET-ESE: 52 stable (NYHA I-III) outpatients with HFpEF-HT (69 ± 13 years; 44 males, 85%) on optimal medical therapy, 86 well-controlled HT subjects (66 ± 10 years; 72 males, 84%) and 32 age and sex-matched healthy controls (59 ± 15 years; 24 males, 75%). Oxygen consumption (VO₂), left ventricular (LV) ejection fraction (EF), global longitudinal strain (GLS), E/e' and LV compliance (expressed as end-diastolic volume [EDV] / E/e' ratio) were measured during exercise, including rest and peak lung ultrasound for B-lines evaluation.

Results. HT patients showed peak VO₂ values (18.7 ± 2 ml/min/kg) higher than HFpEF-HT (15.2 ± 2 ml/min/kg, p < 0.0001) but lower than controls (24.4 ± 7.3 ml/min/kg, p < 0.0001). Regardless of a similar EF, HT subjects had lower low-load (at 4 min of effort) GLS (18.2 ± 3%) than controls (20.9 ± 3%, p < 0.0001), but higher than HFpEF-HT (16.8 ± 5%, p = 0.04). Likewise, peak diastolic function (E/e' and LV compliance) was altered in HT patients (9.1 ± 2 and 13.4 ± 2) when compared to controls (6.2 ± 1 and 17.8 ± 2, all p < 0.0001), but less than in HFpEF (12.7 ± 3, p < 0.0001 and 12.1 ± 3, p = 0.003), as confirmed by peak B-lines (HFpEF-HT: 16 [interquartile range (IQR): 10 – 22], HT: 8 [IQR: 4 – 10] and controls: 0 [IQR: 0 – 2]; p < 0.0001). LV hypertrophy was reported in 37 patients (27%); it was more common in HFpEF (24/37, 65%) and associated with a significantly worse peak VO₂ and systo-diastolic profile (all p < 0.05).

Conclusions. HT subjects represent an intermediate step from healthy subjects to HFpEF, showing altered functional capacity and systo-diastolic profile (Figure). LV hypertrophy characterises the clinical stage and portends a more severe cardiorespiratory fitness impairment.

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