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## Significance of combined cardiopulmonary and echocardiographic stress test to distinguish the hemodynamic and metabolic responses of hypertensive patients with or without heart failure

Pugliese NR.<sup>1</sup>; Mazzola M.<sup>1</sup>; De Biase N.<sup>1</sup>; Natali A.<sup>1</sup>; Gargani L.<sup>2</sup>; Pedrinelli R.<sup>1</sup>; Dini FL.<sup>1</sup>

<sup>1</sup>Azienda Ospedaliero Universitaria Pisana, Pisa, Italy

<sup>2</sup>Institute of Clinical Physiology (IFC), Pisa, Italy

**Background.** Arterial hypertension (HT) is one of the main risk factors for the development of heart failure with preserved ejection fraction (HFpEF). However, little is known regarding the hemodynamic and metabolic responses of patients with HT during the stress test.

**Purpose.** We assessed the hemodynamic and metabolic characteristics of HT subjects and patients with HFpEF and HT (HFpEF-HT) by 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) out-patients with HFpEF-HT (69 ± 13 years; 44 males, 85%), 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%). During the exercise, we assessed oxygen consumption (VO<sub>2</sub>), cardiac output (CO) systemic vascular resistance (SVR) and arterial-venous oxygen content difference (AVO<sub>2</sub>diff).

**Results.** Peak systolic blood pressure was significantly more elevated in HT subjects (205.7 ± 23 mmHg) than controls (190.9 ± 29 mmHg; p = 0.005) and patients with HFpEF-HT (177.5 ± 26 mmHg; p = 0.03). HT patients exhibited a peak VO<sub>2</sub> (18.7 ± 2 ml/min/kg) that was higher than HFpEF-HT patients (15.2 ± 2 ml/min/kg; p < 0.0001), but lower than controls (24.4 ± 7.3 ml/min/kg; p < 0.0001). Peak CO was significantly more elevated in HT (12.3 ± 0.4 ml/min) and controls (13.3 ± 0.6 ml/min) than in HFpEF-HT (9.8 ± 0.4 ml/min; p < 0.0001). Both HFpEF-HT and HT patients displayed a significantly reduced peak AVO<sub>2</sub>diff (13.3 ± 1 and 13.5 ± 1 vs 16.9 ± 1 mL/dL; p < 0.0001) and increased SVR compared to controls (1066 ± 36 and 1054 ± 33 vs 904 ± 42 dyne-s/cm; p = 0.01).

**Conclusions.** CPET-ESE was valuable to characterise the hemodynamic and metabolic responses of patients with HT (Figure). HT subjects present a decreased AVO<sub>2</sub>diff similar to HFpEF patients, suggesting an early peripheral dysfunction, probably related to the impaired reduction of SVR during exercise.

Abstract P1556 Figure.

