

## Global constructive work and left atrial reservoir function is reduced in patients with heart failure with preserved ejection fraction compared with patients with preclinical diastolic dysfunction

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Heart failure with preserved ejection fraction (HFpEF) remains an unresolved issue with morbidity and mortality comparable with that of reduced EF HF. Diastolic dysfunction (DD) is the hallmark of HFpEF but it is unclear why some patients do not develop symptoms and remain in preclinical DD (PDD) stage with the same degree of DD as patients with HFpEF. We assumed that patients with HFpEF might have more deteriorated global myocardial work (GW) and left atrial reservoir longitudinal strain (LALS) parameters compared with PDD patients.

**Methods:** 210 patients (150 female, mean age 71±5 years) of which 118 with PDD and 92 with HFpEF were enrolled in this study. PDD was diagnosed if patients had normal NT-proBNP values, and at least 3 of the following echocardiographic criteria at rest or after diastolic stress echocardiography: end-systolic left atrial volume index (LAVi) >34 ml/m<sup>2</sup>, LV E/e' >13, average LV e' >8.5, and systolic pulmonary artery pressure >30 mmHg. GW index (GWI) was obtained from pressure-strain loops composed from speckle tracking analysis indexed to brachial systolic blood pressure, global constructive work (GCW) was measured as the sum of positive work due to myocardial shortening during systole and negative work due to lengthening during isovolumic relaxation, global wasted work

(GWW) was calculated as energy loss by myocardial lengthening in systole and shortening in isovolumic relaxation, and GW efficiency (GWE) as the percentage ratio of constructive work to the sum of constructive work and wasted work. LALS was measured by speckle tracking echocardiography as average value of two basal segments in apical 4 chamber view along LAVi and 4D LV mass index (LVMI) offline by experienced echocardiographer who was unaware of the study aims.

**Results:** Patients with PDD and HFpEF have comparable values of LAVi, LVMI, GWI, GWW, and GWE (LAVi 38.4±3.9 ml/m<sup>2</sup> vs 39.1±4.1 ml/m<sup>2</sup>, p=NS; LVMI 82.8±11.4 g/m<sup>2</sup> vs 83.5±10.2 g/m<sup>2</sup>, p=NS; PDD GWI 2389±154 mmHg% vs 2368±139 mmHg%, p=NS; GWW 62±5 mmHg% vs 65±4 mmHg%, p=NS; GWE PDD 89±9% vs 87±11%, p=NS). LALS and GCW were significantly reduced in patients with HFpEF compared with PDD patients (LALS 21.3±7% vs 29±5%, p<0.01; GCW 1964±112 mmHg% vs 2259±164 mmHg%, p<0.01).

**Conclusion:** Patients with HFpEF have reduced LALS and GCW compared with PDD patients. Both parameters are indicative for LA and LV myocardial fibrotic burden respectively which might be one of the probable explanations of PDD transition to HFpEF.