Cardiovascular magnetic resonance rest and exercise-stress left atrioventricular coupling index to detect diastolic dysfunction

S.J. Backhaus¹, T. Lange¹, A. Schulz¹, R. Evertz¹, S.M. Frey², G. Hasenfus¹, A. Schuster¹

¹Heart Centre Goettingen, Goettingen, Germany
²University Hospital Basel, Department of Cardiology, Basel, Switzerland

Funding Acknowledgements: Type of funding sources: Public Institution(s). Main funding source(s): German Centre for Cardiovascular Research (DZHK)

Background: Left atrial and ventricular (LA/LV) dysfunction are inter-linked in heart failure with preserved ejection fraction (HFpEF), however little is known about their inter-play and relation to cardiac decompensation. We hypothesized that cardiovascular magnetic resonance (CMR) left atrioventricular coupling index (LACI) would identify pathophysiological alterations in HFpEF and be amenable to rest and ergometer-stress CMR.

Methods: Patient with exertional dyspnoea, signs of diastolic dysfunction (E/e’ ≥8) and preserved EF (≥50%) on echocardiography were prospectively recruited and classified as HFpEF (n=34) or non-cardiac dyspnoea (NCD, n=34) according to pulmonary capillary wedge pressure (PCWP) on right heart catheterisation (rest/stress: ≥15/25 mmHg). LA and LV volumes were assessed on short-axis real-time cine sequences at rest and during exercise-stress. LACI was defined as the ratio of the LA/LV end-diastolic volume. Cardiovascular hospitalisation (CVH) was assessed after 24 months.

Results: Volume-derived LA (p<0.008) but not LV (p≥0.347) morphology and function at rest and during exercise-stress detected significant differences comparing HFpEF and NCD. There was impaired atrio-ventricular coupling in HFpEF at rest (LACI 45.7 vs 31.6 %, p<0.001) and during exercise-stress (45.7 vs 27.9 %, p<0.001). LACI correlated with PCWP at rest (r=0.48, p<0.001) and during exercise-stress (r=0.55, p<0.001). At rest, LACI was the only volumetry derived parameter to differentiate NCD and HFpEF patients which were identified using exercise-stress thresholds (p=0.001). Resting and exercise-stress LACI dichotomised at their medians were associated CVH (p≤0.005).

Conclusions: Assessment of LACI is a simple approach for LA/LV coupling quantification and allows easy and fast identification of heart failure with preserved ejection fraction (HFpEF).