Global constructive myocardial work predicts left ventricular disfunction onset beyond longitudinal strain in patients with significant primary mitral regurgitation

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Accurate surgical timing for significant primary mitral regurgitation (PMR) still remains an issue despite of several ways of left ventricular (LV) hidden disfunction detection, including LV global longitudinal strain (GLS). Since novel modalities such as myocardial work (MW) or area strain (AS) are currently available we assumed that they might predict surgical timing beyond known parameters.

Methods: 58 patients (31 female) 63±8 years, asymptomatic and with pulmonary systolic pressure (PSP) ≤45 mmHg on exercise echo test (ET), with PMR, in sinus rhythm, with ejection fraction (EF) ≥65% and GLS <–19.5% were enrolled into the study along with 23 healthy subjects matched by age and sex and followed up for 1 year. Comprehensive echocardiography (EchoCG) was performed with offline analysis including MW and AS by one experienced specialist. GW index (GWI) was obtained from pressure-strain loops derived from speckle tracking analysis multiplied by brachial systolic blood pressure.Global constructive work (GCW) 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) aa 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 were obtained by the dedicated software.

Results: 13 (22%) patients with PMR became symptomatic or increase PSP >50 mmHg on ET in 1 year follow up. EF, GLS, AS and GWI did not differ between symptomatic patients and those who remained asymptomatic during follow up, however these patients had significantly lower values of GCW, and higher values of GWW (EF 68.3±6.1% vs 69.2±6.5%, p=NS; GLS –22.4±2.3% vs 23.1±3.2%, p=NS, GWI 2452±161 mmHg% vs 2479±147 mmHg%, p=NS; GCW 1875±119 mmHg% vs 2321±124 mmHg%, p<0.01; GWW 118±9 mmHg% vs 88±7 mmHg%, p<0.03; GWE 93±8% vs 96±9%, p=NS; AS –32.5±5.4% vs –34.3±6.1%, p=NS;). Patients with subsequent symptoms development had significantly lower values of GCW and higher values of GWW. Among all parameters GCW was the predictor of MR clinical course worsening (AUC 0.769).

Conclusion: MR GCW is able to predict clinical course of patients with PMR beyond known conventional parameters.