

## Exercise induced reduction in myocardial work predicts significant coronary artery disease in patients with false negative stress echocardiography

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Stress echocardiography (SE) is a reliable technique for the diagnosis of coronary artery disease (CAD) with high sensitivity and specificity. However in patients with small left ventricular (LV) cavity caused by marked concentric hypertrophy the sensitivity of SE is low. We assumed that in patients with false negative SE evaluation of global myocardial work (GW) might detect significant CAD.

**Methods:** 238 patients with chest pain (98 female, mean age 61±5 years) without history of CAD were referred to SE for CAD confirmation. 94 (39.5%) patients had negative SE and were enrolled in our study for re-examination. Age and gender matched 50 healthy subjects served as controls. GW index (GWI) was obtained from pressure-strain loops composed from speckle tracking analysis indexed to 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) 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 were measured after submaximal treadmill SE at the heart rate of 100–110 beats per minute (109±11 s after SE) using EchoPac software by blinded experi-

enced echocardiographer. All patients were referred to coronary angiography after re-examination.

**Results:** 42 (44.7%) patients had lower GWI values than the lowest limit of GWI value in controls. These patients had significant reduction in GWI, compared with remaining 52 patients in whom GWI did not differ from those of controls (GWI 1897±112 mmHg% vs 2518±243 mmHg%,  $p<0.01$ ). GCW, GWE and GWW were comparable between patients with or without reduced GWI (GCW 2283±107mmHg% vs 2321±110 mmHg%,  $p=NS$ ; GWE 96.9±1.1% vs 97.4±1.2%,  $p=NS$ ; GWW 57±3 mmHg% vs 53±4 mmHg%,  $p=NS$ ). 28 (66.7%) of 42 patients with GWI reduction and 8 (15.0%) of 52 patients without GWI reduction had at least one vessel significant CAD. GWI had sensitivity, specificity, and accuracy in detection of CAD 78%, 76%, 77% respectively with 67% positive predictive value, and 85% negative predictive value. 29 (80.5%) patients out of 36 with significant CAD had concentric increase in LVMi compared with true negative SE patients (83±6 g/m<sup>2</sup> vs 71±4 g/m<sup>2</sup>,  $p<0.01$ ). GWI was the predictor of significant CAD (area under the curve 0.793).

**Conclusion:** GWI extends diagnostic power of conventional SE in detection of CAD, especially in patients with smaller LV cavity due to concentric hypertrophy when sensitivity of conventional SE is low.