

Global longitudinal strain and left ventricle dyssynchrony changes during stress echocardiography in response to antihypertensive treatment optimization

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Background. The positive effect of blood pressure (BP) lowering medications on global longitudinal strain (GLS) and left ventricle (LV) dyssynchrony even in patients with narrow QRS complexes at rest has been established at rest. The dynamic changes of GLS and dyssynchrony markers on exertion are still remain underinvestigated, especially in patients with hypertensive response to exercise (HRE).

Purpose. The aim of the study was to define if any changes in GLS and dyssynchrony markers assessed during exercise stress echocardiography (SE) can occur after the optimization of antihypertensive treatment.

Methods. 18 patients without coronary artery stenosis on coronary angiography, underwent exercise SE on treadmill. All patients had arterial hypertension and HRE, defined as elevation of systolic BP ≥ 190 mmHg in women and ≥ 210 mmHg in men or ≥ 180 mmHg from the second stage of standard Bruce protocol. After optimization of BP lowering medications (addition/dose correction of ACEI/ARB, CCB or diuretics) we repeated SE within 138.5 ± 85.1 days. GLS and dyssynchrony markers at rest and on exertion from both tests were subsequently analyzed with the QLab and 3D-Q Advanced software.

Results. The target systolic BP at rest was reached in all 18 patients (145.8 ± 21.8 mmHg vs. 126.1 ± 14.5 mmHg, $p = 0.03$), moreover exercise BP on exercise decreased significantly (209.4 ± 15.4 mmHg vs. 170.8 ± 14.4 mmHg, $p = 0.003$). We observed improvement in tolerance to exertion (7.2 ± 2.4 METs vs. 8.7 ± 3.0 METs, $p = 0.0004$), 2D and 3D-ejection fraction increase ($4.7 \pm 2.2\%$ vs. $8.8 \pm 2.1\%$, $p = 0.0002$ and $3.9 \pm 4.9\%$ vs. 10.8 ± 8.5 , $p = 0.03$) and significant reduction of wall motion score index (1.21 ± 0.24 vs. 1.03 ± 0.11 , $p = 0.001$). The speckle tracking analysis revealed increase in GLS on exertion (-20.4 ± 3.5 vs. -23.78 ± 3.2 , $p = 0.001$) and its increment (-0.28 ± 2.1 vs. 3.17 ± 1.89 , $p = 0.0006$), while the level of rest GLS remained unchanged (-20.61 ± 2.9 vs. -20.61 ± 2.6 , $p = 0.9$) (Fig. 1). The dyssynchrony marker STE-TIME SD-IMPOST (standard deviation of time from QRS onset to peak segmental longitudinal strain on exertion) has also diminished (47.3 ± 18.4 vs. 33.8 ± 12.2 , $p = 0.005$).

Conclusions. Stress-induced wall motion abnormalities and poor increase/decrease in GLS observed in patients with HRE even in absence of coronary artery stenosis can resolve or diminish after antihypertensive treatment optimization.

Speckle tracking LV-dyssynchrony markers in patients with narrow QRS complexes can also decrease in response to BP-lowering medications.

Abstract Figure 1.

