Layer specific strain analysis and QTc interval in patients with STEMI and TIMI 3 early after percutaneous coronary intervention

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Background: Heart rate-corrected (QTc) interval may increase in the setting of ST-elevation myocardial infarction (STEMI) even after complete reperfusion of the infarct-related artery. The remaining ischemia affects ventricular repolarization and may be associated with an increased susceptibility for malignant ventricular arrhythmias. Two-dimensional (2D) speckle tracking echocardiography (STE) is an angle-independent technique for evaluating myocardial function. The study aimed to analyze the layers specific strain using STE in patients after percutaneous coronary intervention (PCI) and find a possible correlation with QTc interval.

Methods: 74 patients with STEMI and TIMI 3 flow after PCI were enrolled. The study did not include patients with bundle branch block, pacing, or treated with drugs that could increase the QTc interval. The evaluation consisted of clinical examination and laboratory tests. 12 leads electrocardiography evaluated QTc interval. Echocardiographic acquisitions were performed in the first 24–48 hours after PCI, and data were analyzed on the workstation. The global longitudinal strain was measured from apical views, at the level of the endocardium GLSAvgEndo, transmural GLSAvg, epicardium GLSAvgEpi; the difference between endocardium and epicardium longitudinal strain: GLSAvgEndo-GLSAvgEpi. Layer-specific GLS values were measured as the average of the longitudinal strain of 17 LV segments at each individual layer (Figure 1).

Results: Patients were divided in two groups: the first included 32 patients with a single vessel disease (43.24%) and the second, 42 patients (56.75%) with multiple vessel damage, but without other indication for revascularization except the culprit lesion. Values for layers strain and QTc interval in the first group were: GLSAvgEndo: −16.2 (SD 2.98, CV 0.18), GLSAvg: −11.46 (SD 6.98, CV 0.6), GLSAvgEndo-GLSAvgEpi: 3.54 (SD 1.06, CV 0.29), QTc: 452.5 (SD 22.65, CV 0.05) and in the second group: GLSAvgEndo: −13.22 (SD 4.01, CV 0.3), GLSAvg: −11.3 (SD 3.39, CV 0.29), GLSAvgEndo-GLSAvgEpi: 3.47 (SD 1.28, CV 0.37), QTc: 490ms (SD 43.07, CV 0.08). QTc interval correlated with layers strain in the first group: GLSAvgEndo: r=0.56, GLSAvg: r=0.67, GLSAvgEndo-GLSAvgEpi: r=0.54, and in the second group: GLSAvgEndo: r=0.73, GLSAvg: r=0.75, GLSAvgEndo-GLSAvgEpi: r=0.62.

Conclusions: 1. The present study identified decreased longitudinal strain in all myocardial layers in the first days after STEMI, even after a successful PCI. 2. Alterations of QTc dynamicity were more frequent in patients with multivessel lesions. 3. The electrical instability related by QTc interval correlated with the myocardial tissue damage related by STE. The correlation was more evident in patients with multivessel disease, even with remaining nonsignificant lesions, suggesting an ongoing process of microcirculatory perfusion damage.

Figure 1. Layers specific strain analysis