

Noninvasive Electrocardiographic Imaging with Magnetic Resonance Tomography in Candidates for Cardiac Resynchronization Therapy

S. Zubarev¹, M. Chmelevsky², M. Budanova¹, D. Potyagaylo², M. Trukshina¹, S. Rud¹, A. Ryzhkov¹, D. Lebedev¹.

¹ Almazov National Medical Research Center, Saint-Petersburg, Russia

² EP Solutions SA, Yverdon-les-Bains, Switzerland

Background: noninvasive electrocardiographic imaging (ECGI) with magnetic resonance tomography (MRI) is a contemporary diagnostic direction in arrhythmology.

Purpose: to compare late electrical activation zone and the changes in the structure of the left ventricle (LV) myocardium in candidates for cardiac resynchronization therapy (CRT).

Methods: study group included 61 patients (20 male) with sinus rhythm in 60 cases. The median (min; max) age at enrollment was 65 (47; 83) years. 36(59%) patients had ischemic heart disease (33 with myocardial infarction in the past), 25(41%) – dilated cardiomyopathy. 31 examined subjects had complete left bundle branch block (LBBB) without significant deviation of QRS axis, in 22 cases – LBBB with significant deviation of QRS axis, in 3 cases – left anterior fascicular block, in 5 cases – nonspecific wide QRS complex. At the first stage a multichannel electrocardiography as a part of noninvasive electrocardiographic imaging (ECGI) was performed by Amycard 01C EP LAB (EP Solutions SA, Switzerland). At the second stage, there was performed an MRI with injection of Gadovist contrast. At the third stage the activation of the LV epicardium during ventricle depolarization was evaluated by ECGI.

Results: the late activation zone on different QRS morphology was variable (from anterior till inferior LV wall). According to the MRI data, 41(67%) patients had fibrosis areas which didn't coincided with the late activation zone. 9(15%) participants had transmural scar including epicardium of LV which localization coincided with the late activation zone. In the last 11(18%) cases non-transmural scar excluding epicardial layer coincided with the late activation zone.

Conclusion: ECGI with MRI reveals correlation between late activation zone and areas of fibrosis on epicardial surface before CRT. This findings will change the strategy of LV lead implantation in cases where transmural scar including epicardial layer coincided with the late activation zone.