Variability of Body Surface Potential Maps for different action potential patterns simulation study

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The aim of the study was to simulate body surface potential maps (BSPM) with use of ECGSim program and than compare with measured BSPM maps. The toolbox for ECGsim program was developed which allows BSPM simulation of mean potentials of the QRS, QRS-T, ST-T, ST complexes, mean potential of the T-wave, T-wave alternans, width of the QRS complex, ST-T length, amplitude of T-wave peak, ST elevation and differential maps of QRS-T, QRS, ST-T, and ST complexes. Graphical representation of spatial distribution of values of these parameters was implemented. BSPM recordings were carried out with use of 64 leads high resolution ECG system. The study group consisted of 7 patients with inferior myocardial infarction, 4 patients with anterior myocardial infarction and 4 patients with coronary artery disease. Correlation between QRS-T maps calculated in simulated and measured data were observed for patients with inferior myocardial infarction. In case of ST-T maps with inferior myocardial infarction and anterior myocardial infarction the similarities are not significant. Comparison of measured and simulated QRS maps showed significant correlation in case of inferior myocardial infarction in contrast to anterior myocardial infarction, were the correlation was not clear. Simulated maps of ST segment elevation have comparable pattern to those obtained before and after stress test. The ischemic ST segment depression was visible in simulated maps in precordial area of a chest as well as in the data measured during stress test. Values of T-wave alternans ratio simulation are similar to those calculated in recorded ECG signals. The results obtained during simulation and measurements are similar. Simulation done with use of ECGSim program can be used for description of measured body surface potential maps.