IX International Conference on Computational Bioengineering
ICCB 2022
P. R. Fernandes and J. Folgado (Editors)

Abstract ID 80

SILICOFCM PLATFORM, CARDIOMYOPATHY AND ELECTROMECHANICAL COUPLING

Nenad Filipović[(1)], Igor Saveljic[(1)], Bogdan Milićević[(2)], Miljan Milošević[(2)], Miloš Kojić[(1)]
[(1)]BIOIRC Kragujevac, Serbia
[(2)]University of Kragujevac, Serbia
fica@kg.ac.rs, isaveljic@kg.ac.rs, bogdan.milicevic@uni.kg.ac.rs, miljan.m@kg.ac.rs, mkojic42@gmail.com

Keywords: left ventricle, cardiomyopathy, electrophysiology, electromechanical coupling

Summary: We presented heart modeling using simulated drugs for cardiomyopathy and electromechanical coupling of the left ventricle and whole heart in the SILICOFCM project. The geometry of the heart with seven different regions of the model was included: 1) Sinoatrial node; 2) Atria; 3) Atrioventricular node; 4) His bundle; 5) Bundle fibers; 6) Purkinje fibers; 7) Ventricular myocardium. Monodomain model of modified FitzHugh-Nagumo model of the cardiac cell was used. Six electrodes (V1-V6) were positioned on the chest to model the precordial leads and the results were compared to real clinical measurements. Inverse ECG method was used to optimize potential on the heart. A whole heart electrical activity in the torso embedded environment, with spontaneous initiation of activation in the sinoatrial node, incorporating a specialized conduction system with heterogeneous action potential morphologies throughout the heart was described. Body surface potential maps in a healthy subject during progression of ventricular activation in nine sequences which were corresponding to ECG signal were presented. Finally, the results with parametric model and PV diagrams depending on the change of Ca2+, elasticity of the wall and the inlet and outlet velocity profile are presented. It is directly affected to the ejection fraction function. Future research will be more focused on in silico clinical trials where we will compare some clinical pathology findings on the body surface with standard 12 ECG electrode measurements.