OR-35

Computational Modeling of Unipolar Intracardiac Electrograms Following Pulsed Field Ablation

Lana Balentović, Jernej Štublar, Tomaž Jarm, Bor Kos, Damijan Miklavčič, Lea Rems

Univerza v Ljubljani, Fakulteta za elektrotehniko, Slovenija

Owing to its largely non-thermal nature, pulsed field ablation has gained increasing attention as a treatment for atrial fibrillation, leveraging irreversible electroporation to target arrhythmogenic myocardial cells. Creation of durable transmural lesions is essential for prevention of arrythmia recurrence. Recently, unipolar intracardiac electrograms (iEGMs) have been proposed as a valuable tool for assessing lesion formation that could help guide the PFA procedure. This work presents two- and three-dimensional numerical models of cardiac tissue developed to study changes in unipolar iEGMs associated with lesions of varying sizes and transmurality status. The model coupled the monodomain partial differential equation with the Luo-Rudy cardiomyocyte model. A nonselective leak current was introduced accounting for an increase in membrane permeability due to electroporation. Unipolar iEGMs were obtained by solving Poisson's equation derived from the bidomain formulation. The model was able to reproduce key electrophysiological features associated with lesion formation, including conduction slowing, signal attenuation, and an alteration of iEGM morphology.