

In-Silico clinical trials as a new paradigm in medicine

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Abstract— In silico clinical trial represents a new paradigm for development of new drug and medical device. In SILICOFCM project Familial Cardiomyopathy disease was modelled with comprehensive list of patient specific features such as genetic, biological, pharmacologic, clinical, imaging. In electrophysiology, the goal is to determine the electrophysiological properties of all compartments and signal propagation characteristics within the body. A coupled model which includes multiscale modelling of realistic sarcomeric system, genetics patient profile, electrophysiology, realistic directions of muscle fibers, solid-fluid interaction coupled to electrophysiology of the heart was implemented. Initial results give influence of left ventricle deformations on deformations of mitral valve, and on general blood flow in heart. Also drug distribution in the heart and effects of different drugs are tested for cardiomyopathy disease. InSilc project is devoted to in silico mechanical stent testing within ISO 25539 standards and in silico stent deployment for metallic and biodegradable material. Fluid-structure interaction and nonlinear contact problem are used for complex modeling of stent, arterial wall and blood flow. Also atherosclerosis model for plaque growing is coupled with this system. In-silico projects will connect basic experimental research with clinical study and bioinformatics, data mining and image processing tools using very advanced computer models for drug, stent and patient database in order to reduce animal testing and clinical studies.

Keywords- *in-silico, cardiovascular disease, fluid-structure interaction, contact problem, stent deployment*

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