

Symposium

Symposium 10 (II-S10)

Novel Simulation Methods in Pediatric Cardiology and Cardiac Surgery: Its Potential and Limitation

Chair: Keiichi Itatani (Department of Cardiovascular Surgery, Kyoto Prefectural University of Medicine, Japan)

Chair: Isao Shiraishi (Department of Pediatric Cardiology, National Cerebral and Cardiovascular Center, Japan)

Co-host: ANSYS Japan K.K.

Co-host: Siemens Healthcare K.K.

Co-host: Materialise Japan K.K.

Sat. Jul 8, 2017 2:00 PM - 3:30 PM ROOM 7 (Seminar and Exchange Center, 2F The Music Studio Hall)

2:00 PM - 3:30 PM

[II-S10-04] Cardiovascular simulation based on classical lumped parameter models: still a valid approach for congenital heart disease

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Keywords: simulation, electric circuit, congenital heart disease

Although three-dimensional Computational Fluid Dynamics (3D-CFD) has become a prevalent tool for cardiovascular simulation, it has not become easily accessible for clinicians due mainly to complex model construction. In contrast, albeit classical, computer simulations of the cardiovascular system using a relatively simple system based on the lumped parameter of an electric circuit can provide a valid support in analyzing and solving many of clinical questions. By changing the connection and parameters of the electric circuit, we can easily simulate hemodynamics in various types of congenital heart disease not only at baseline but also in response to variable test conditions. For example, hemodynamic performance of Fontan circulation in response to exercise, the effect of fenestration and venous compliance in Fontan circulation, the effect of left ventricular stiffness on ASD shunts and the effect of shunt sizes and locations in TGA circulation can be easily simulated for better understanding of their pathophysiology and selecting appropriate therapies. In addition, loads, rate, and ventricular functional dependence of hemodynamic indexes, e.g. Tei index or ejection fraction, can be determined, which guides clinicians to use them appropriately in the clinical practice. These issues will be discussed in this presentation in further detail.