
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-S10-03] Simulation Medicine and Blood Flow Imaging Developed in Japan

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Background: Recent progress in imaging and computer technology has provided novel imaging technology in cardiovascular medicine: simulation medicine. Simulation medicine is a kind of "virtual therapy" based on imaging or hemodynamic data. Because congenital heart disease has complicated anatomy and physiology, simulation medicine has been applied in the earliest days in cardiology especially related to the hemodynamics of Fontan circulation. I introduce the recent development of simulation medicine and blood flow imaging in Japan.

Method and Results: Blood flow imaging is based on several modalities. We have developed echocardiography blood flow visualization software VFM (vector flow mapping), which visualizes vortex flow patterns and evaluates its efficiency. 4D flow MRI is another noninvasive flow visualization tool, which has advantages on evaluation in the right ventricle. CFD (computational fluid dynamics) is a computer flow calculation tool, and patient specific CFD model not only provides detail information of hemodynamics, but also enables virtual surgery in a computer. We have developed a CFD model that realizes physiological flow. Flow energy loss is a parameter of cardiac workload and is a predictor of ventricular deterioration, and wall shear stress (WSS) is a stress on intima, and abnormal WSS causes intimal thickening or dilatation.

Conclusions: Several types of blood flow imaging and simulation medicine are developed in Japan. Evaluation of blood flow in patients with long-term after arch repair, RVOTR, and Fontan procedures is a good application for these new technologies.