

AEPC-AHA-JSPCCS Joint Symposium

AEPC-AHA-JSPCCS-TSPC Joint Symposium (I-AJS)

New applications of cardiovascular magnetic resonance in pediatric cardiology

Chair:Satoshi Yasukochi(Heart Center, Nagano Children's Hospital, Japan)

Chair:Brandley S. Marino(President of VDY, AHA)

Chair:Gurleen Sharland(President of AEPC)

Fri. Jul 7, 2017 1:00 PM - 2:30 PM ROOM 3 (Exhibition and Event Hall Room 3)

1:00 PM - 2:30 PM

[I-AJS-05]4D flow MRI and Blood Flow Imaging for Adult Congenital Heart Surgery

○Keiichi Itatani¹, Masaaki Yamagishi², Takako Miyazaki², Nobuyoshi Maeda², Satoshi Taniguchi², Shuhei Fujita², Hisayuki Hongu², Satoshi Numata¹, Sachiko Yamazaki¹, Tomoya Inoue¹, Kazuki Morimoto¹, Suguru Ohira¹, Kaichiro Manabe¹, Rina Makino¹, Hiroko Morichi¹, Kosuke Nakaji³, Kei Yamada³, Shohei Miyazaki⁴, Toyoki Furusawa⁴, Teruyasu Nishino⁴, Hitoshi Yaku¹ (1.Department of Cardiovascular Surgery, Cardiovascular Imaging Research Labo, Kyoto Prefectural University of Medicine, Japan, 2.Department of Pediatric Cardiovascular Surgery, Kyoto Prefectural University of Medicine, Japan, 3.Department of Radiology, Kyoto Prefectural University of Medicine, Japan, 4.Cardio Flow Design Inc., Japan)

Background: Recent progress in cardiac MRI and blood flow imaging is outstanding and 4D flow MRI and computational fluid dynamics (CFD) flow simulation have been expected for wide clinical applications. Because long-term outcomes of congenital heart diseases have close relationship with its hemodynamics, cardiac MRI and blood flow imaging have advantages in the evaluation of adult congenital diseases.

Method and Results: 4D flow MRI is applied to the variety of patients with adult congenital heart disease. Flow energy loss (EL) is a parameter of cardiac workload and a predictor of ventricular deterioration. Pulmonary stenosis and regurgitation in patients with Tetralogy of Fallot are evaluated not only with right ventricle (RV) volume and regurgitant fraction, but also with EL estimation. Other anomalies including the situation after one and a half repair or single systemic RV is also evaluated with 4D flow MRI and flow EL. For the determination of the surgical strategies, CFD flow simulation is a powerful tool because it enables virtual surgery on a computer. Complicated Fontan circulation such as hepatic factor maldistribution in azygous connection is one of the good candidates for blood flow diagnosis with 4D flow MRI and surgical planning in CFD flow simulation.

Conclusions: 4D flow MRI is a novel and powerful tool for the evaluation for indication of adult congenital heart surgery, especially for cases with RV dysfunction and for Fontan cases. CFD flow simulation is useful for the determination of surgical procedures.