JCK E-Oral Presentation

JCK E-Oral Presentation 2 (III-JCKEOP02)

Chair:Atsuko Kato(Division of Cardiology, The Labatt Family Heart Centre, Department of Pediatrics, The Hospital for Sick Children, University of Toronto, Toronto, Canada)
Chair:Takaya Hoashi(Department of Pediatric Cardiovascular Surgery, National Cerebral and Cardiovascular Center, Suita, Japan)
Sun. Jul 9, 2017 1:00 PM - 2:00 PM E-Oral Presentation Area (Exhibition and Event Hall)

1:00 PM - 2:00 PM

[III-JCKEOP02-03]Development of a New and Rapid 3D Printing System for Manufacturing Super Flexible Replicas of Congenital Heart Disease

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[Backgrounds] Recently, 3D printing technology has been applied for diagnosis and surgical simulation of congenital heart disease. We have shown a unique technology that manufactures precise and super flexible polyurethane replicas of congenital heart disease by means of stereolithography followed by vacuum casting. To improve limitations in time and cost of this technique, we here developed a novel and rapid 3D printing system in collaboration with several Japanese chemical and mechanical companies. [Materials and Methods] The new 3D printing machine consists of 4 inkjet heads with 200x500mm size that can reproduce not only child but also adult heart and thoracic aorta. Inkjet materials with similar texture to the human heart were also developed. We preliminary manufactured several different types of heart replicas including ASD, VSD, TOF, and ccTGA. [Results] After printing conditions have been optimized, super flexible replicas of congenital heart disease were manufactured with precise external surface and detailed internal structure of the atria and ventricles. The replicas exhibited similar texture to the real heart and allow surgeons simulation surgery by cutting and suturing. Whole process takes approximately 48 hours including initial 3D image processing. [Conclusions] We have successfully developed a new 3D inkjet printing technology based on industry -academia collaboration. Further improvements of ink materials and printing technologies are necessary to reduce time and cost of the replicas to be used all over the world.