Postgraduate Course Video Session

Postgraduate Course Video Session (III-PCV)
Complex BVR Video Session - Callenges and technical solutions -

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Sun. Jul 9, 2017 3:10 PM - 5:00 PM ROOM 3 (Exhibition and Event Hall Room 3)

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[III-PCV-03]Utilization of 3-D printed heart model in the surgical treatment of DORV with remote VSD

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Objective: Thanks to the recent development of 3-D printing technology, 3-D print models of the hearts with congenital heart disease (CHD) became available in the field of pediatric cardiology and cardiac surgery. Since 2015, 3-D print heart models have been utilized for surgical simulation training course and preoperative assessment of complex cardiac anomalies in our program.
Methods: For the determination of surgical strategy in 13 patients with double outlet right ventricle (DORV) with remote ventricular septal defect (VSD), 3-D print wall models of the hearts and great vessels were made of flexible rubber-like material based on the processed data from cardiac computed tomography (CT). Median age at CT was 17.4 months (3 days to 60 years). Clinical uses of the 3-D print models were 1) Intuitive and direct-vision driven preoperative decision making for surgical strategies, 2) Direct measurement of distance between VSD and the aortic valve (AV), 3) Delineation of the relationship between VSD, AV, and the tricuspid valve (TV), and 4) Preoperative surgical simulation using the 3-D print model.
Results: Six patients underwent anatomic repair (biventricular repair in 3, one and a half ventricle repair in 3), and three patients are waiting for anatomic repair. In the remaining four patients, we elected to put the patients on the Fontan track due to TV interposition between the VSD and the AV (n=2), MV straddling (n=1), and associated multiple muscular VSD (n=1). All patients with anatomic repair (n=6) survived, and no patient developed significant left ventricular outflow tract obstruction or valve regurgitation on postoperative echocardiography.
Conclusions: Feasibility of anatomic repair can be precisely assessed preoperatively by utilizing 3-D print model in patients with DORV with remote VSD. Utilization of this state-of-the-art technology enables the pediatric cardiac surgeons to gain confidence in their surgical strategies prior to the anatomic repair and to shorten the aortic cross-clamping time by exempting them from intracardiac exploration. Thus, the preoperative decision making of surgical strategy (i.e. anatomic repair vs. Fontan procedure) can be finalized by utilizing 3-D print heart models.