Sun. Jul 9, 2017

ROOM 3

Postgraduate Course Video Session

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

Chair:Tadashi Ikeda(Department of Cardiovascular Surgery, Kyoto University Graduate School of Medicine, Japan)
Chair:Shingo Kasahara(Department of Cardiovascular Surgery, Okayama University, Japan)
3:10 PM - 5:00 PM ROOM 3 (Exhibition and Event Hall Room 3)

[III-PCV-01] PA VSD PDA - Neontal Rastelli

○Chang-Ha Lee (Department of Cardiovascular Surgery, Sejong General Hospital, Bucheon, Korea)

3:10 PM - 5:00 PM

[III-PCV-02] Staged complete repair without homograft use in patients with pulmonary atresia–ventricular septal defect and major aortopulmonary collateral arteries

○Akio Ikai[1], Junichi Koizumi[2], Takayuki Hagiwara[2], Tomoyuki Iwade[2], Ryoichi Kondo[2],Satoshi Nakano[3], Shin Takahashi[3], Kotaro Oyama[3] (1.Department of Cardiovacular Surgery, Mt Fuji Shizuoka Children's Hospital, Japan, 2.Department of Cardiovascular Surgery, Iwate Medical University, Japan, 3.Department of Pediatric Cardiology, Iwate Medical University, Japan)

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

○Tae-Jin Yun (Division of Pediatric Cardiac Surgery, Asan Medical Center, Seoul, Korea)

3:10 PM - 5:00 PM

[III-PCV-04] The Yasui Operation for Patients with Adequate-sized Ventricles and VSD Associated with Aortic Arch and Left Ventricular Outflow Tract Obstructions

○Toshihide Nakano, Hideaki Kado (Department of Cardiovascular Surgery, Fukuoka Children's Hospital, Fukuoka, Japan)

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[III-PCV-05] Valve Sparing Aortic Root Replacement in Children and Young Adults

○Sivakumar Sivalingam (National Heart Institute, Kuala Lumpur, Malaysia)

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[III-PCV-06] Ross Procedure in children by using hand sewed PTFE valved conduits for pulmonary artery reconstruction

○Bing Jia (Cardiothoracic Surgery Fudan University Children's Hospital, China)

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[III-PCV-07] Half-turned truncal switch operation for TGA and TGA type DORV with left ventricular outflow obstruction

○Masaaki Yamagishi (Department of Pediatric Cardiovascular Surgery, Children's Medical Center, Kyoto Prefectural University of Medicine, Kyoto, Japan)

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[III-PCV-08] TGA/LVOTO double root translocation

○Shoujun Li (National Center for Cardiovascular Diseases, Fuwai Hospital, Peking Union Medical College, China)

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[III-PCV-01] PA VSD PDA - Neontal Rastelli

○Chang-Ha Lee (Department of Cardiovascular Surgery, Sejong General Hospital, Bucheon, Korea)

Keywords: tetralogy of Fallot, pulmonary atresia, right ventricle pulmonary artery conduit

Patients with TOF with pulmonary atresia may have an wide spectrum of severity ranging from simple valvar atresia to complete absence of true pulmonary arteries. There is great variability in the anatomy of the true pulmonary arteries in those patients. At mild end of the spectrum, pulmonary blood flow is usually supplied by a PDA. The branch pulmonary arteries are normally developed. Looking at the clinical features, those patients are ductal dependent and will present a profound degree of cyanosis after birth when the ductus closes. Therefore, it is essential that a surgical procedure be undertaken in the newborn period. For those patients, surgical managements include staged and early primary repair. One-stage repair for those include intracardiac repair and RVOT reconstruction. The techniques of RVOT reconstruction are individualized according to the RVOT anatomy. For those with simple valvar atresia, trans-junctional patch reconstruction is possible to maintain the RV- PA continuity. For those with the unfavorable anatomy, however, RVOT reconstruction should be established by interposition of a conduit between the RV and PA. Until recently, the conduit suitable for those has been various homografts. These conduits are limitedly available in our situations. Since 2004, 29 neonates with TOF PA PDA underwent one-stage repair in our hospital and 12 (41%) of whom had valveless autopericardial RV-PA conduit for RVOT reconstruction. In this lecture, I would like introduce our treatment strategy in those neonates and share our experience of this conduit.

3:10 PM - 5:00 PM (Sun. Jul 9, 2017 3:10 PM - 5:00 PM ROOM 3)

[III-PCV-02] Staged complete repair without homograft use in patients with pulmonary atresia– ventricular septal defect and major aortopulmonary collateral arteries

○Akio Ikai[1], Junichi Koizumi[2], Takayuki Hagiwara[2], Tomoyuki Iwade[2], Ryoichi Kondo[2],Satoshi Nakano[3], Shin Takahashi[3], Kotaro Oyama[3] (1.Department of Cardiovacular Surgery, Mt Fuji Shizuoka Children's Hospital, Japan, 2.Department of Cardiovascular Surgery, Iwate Medical University, Japan, 3.Department of Pediatric Cardiology, Iwate Medical University, Japan)

Keywords: PAVSD MAPCA, unifocalization, Rastelli

Objective: Repair of PAVSD and MAPCAs remains challenging, particularly without the use of a homograft. We show our surgical strategy consisting of primary unifocalization and staged complete repair in video.
Methods: Since 2007, 11 consecutive patients with PA-VSD and MAPCAs underwent primary unifocalization (UF). Median patient age and body weight were 7.3 months and 7.3 kg, respectively.
Surgical technique of primary UF: A median sternotomy incision of a length longer than is usually made. Central dissection for MAPCAs was performed without cardiopulmonary bypass. After initiation of cardiopulmonary bypass, origins of all MAPCAs were clamped with a vascular clip. All patients underwent primary UF using tissue-to-tissue anastomosis with continuous 8-0 polypropylene suture. The central pulmonary artery (PA) was absent or diminutive in all cases; therefore, the floor of the central PA was created using MAPCAs with end-to-end anastomosis. The anterior wall of the central PA was created

using a fresh autologous pericardial patch with a target diameter of at least 10 mm. The source of pulmonary blood flow was established using a modified Blalock-Taussig shunt.
Results: There was one early death. Post-UF cardiac catheterization showed that mean PA pressure was 16.1 mmHg. Ten patients underwent staged complete repair at a mean interval of 7.1 months after UF. The median ePTFE conduit diameter was 16 mm. The mean intraoperative RV/LV ratio was 0.53.
Conclusions: Even without a homograft, primary UF was completely and successfully performed.

3:10 PM - 5:00 PM (Sun. Jul 9, 2017 3:10 PM - 5:00 PM ROOM 3)

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

○Tae-Jin Yun （Division of Pediatric Cardiac Surgery, Asan Medical Center, Seoul, Korea）

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.

3:10 PM - 5:00 PM (Sun. Jul 9, 2017 3:10 PM - 5:00 PM ROOM 3)

[III-PCV-04] The Yasui Operation for Patients with Adequate-sized Ventricles and VSD Associated with Aortic Arch and Left Ventricular Outflow Tract Obstructions

○Toshihide Nakano, Hideaki Kado （Department of Cardiovascular Surgery, Fukuoka Children's Hospital, Fukuoka, Japan）

Keywords: Yasui operation, aortic arch obstruction, left ventricular outflow tract obstruction

Background: In patients with severe aortic stenosis/aortic atresia with aortic arch obstruction, biventricular repair is feasible in the presence of VSD and adequate-sized ventricles.**Patients and Method:**From 1985 to 2016, 24 patients had undergone Yasui operation. Yasui Operation is consisted with three parts. (1) Intraventricular rerouting creating a left ventricular outflow to both aortic and pulmonary valves (making double outlet left ventricle). (2) Aortic arch reconstruction by either DKS anastomosis and arch reconstruction, or Norwood type arch reconstruction. (3) Creating a right ventricle to pulmonary artery continuity with valved conduit. Seventeen patients were staged following bilateral pulmonary artery banding (PAB) in 11, arch repair with PAB in 4, and Norwood in 2. **Results:**Median age and body weight at Yasui operation was 23 days and 3.2 kg for primary repair and 6.9 months and 5.3 kg for staged repair. VSD was enlarged in 9 patients. There were 2 operative deaths and 2 late deaths. Overall actuarial survival was 86.8% at 5 years and 77.2% at 10 years. Three patients required reoperation for left ventricular outflow tract (LVOT) obstruction, and freedom from LVOT reoperation was 88.2% at 5 years and 70.6% at 10 years. The latest cardiac echo (6.4±6.2 years after the Yasui operation) showed LV ejection fraction of 68±8 % and LVOT peak velocity of 1.1±0.3 m/s.**Conclusion:** Yasui operation can be performed with excellent results in patients with adequate-sized two ventricles and VSD associated with obstruction of the aortic arch and LVOT.

3:10 PM - 5:00 PM (Sun. Jul 9, 2017 3:10 PM - 5:00 PM ROOM 3)

[III-PCV-05] Valve Sparing Aortic Root Replacement in Children and Young Adults

○Sivakumar Sivalingam （National Heart Institute, Kuala Lumpur, Malaysia）

Valve sparing aortic root replacement is typically performed for aortic aneurysm rather than valve disease, though minor valve abnormalities and functional disturbances of the valve created by root distortion are often addressed as part of root replacement. Most patients have congenital connective tissue disorders, such as Marfan syndrome and Loeys-Dietz syndrome but increasingly adolescents with enlarged aortas associated with bicuspid aortic valve are being evaluated and considered for prophylactic surgery to prevent rupture and dissection.

Valve sparing root replacement exists in 2 major forms, the remodeling procedure and the reimplantation procedure. The remodeling operation reconstitutes the aortic root with a prosthetic tube graft that has 3 tongues sewn to the aortic annulus. While it reproduces the shape of the sinuses faithfully, it does not stabilize the aortic annulus and can therefore can lead to late valvular incompetence. For most children having aortic root replacement, aortic annulus stabilization is important for durability of the repair. The reimplantation operation, which enclosed the entire aortic valve complex within the prosthetic graft,

stabilizes the annulus and is therefore the preferred operation. Neither the remodeling nor reimplantation operations allow growth. So in adult size annulus at least allows the possibility of an operation that can endure until adulthood.

We present two cases of Marfan' s syndrome that underwent aortic valve sparing root replacement. The first case was an 8-year-old female who presented with severe mitral regurgitation and dilated aortic root. The mitral valve regurgitation was severe with bileaflet prolapse with dilated annulus. The aortic root was dilated with a score more than 11.02. The patient successfully under went mitral valve repair and aortic root replacement using remodeling technique. The second case was an 18-year-old female with Marfan' s syndrome who presented with severe heart failure and multi organ failure. She was diagnosed with severe aortic regurgitation, severe tricuspid regurgitation, root dilatation and pulmonary hypertension. During intra-operative the non-coronary and the right coronary artery were dilated along with ascending aortic aneurysm. She successfully underwent mechanical tricuspid valve replacement, aortic valve replacement and partial root replacement by remodeling technique.

References:
1.Patel ND, Arnaoutakis GJ, George TJ, et al: Valve-sparing aortic root replacement in children: Intermediate-term results. Interact Cardiovasc Thorac Surg 12:415-419, 2011.
2.Zanotti G, Vricella L, Cameron D: Thoracic aortic aneurysm syndromes in children. Semin Thorac Cardiovasc Surg Pediatr Card Surg Annu 11:11-21, 2008
3.Cameron DE, Vricella LA: Valve-sparing aortic root replacement in Marfan syndrome. Semin Thorac Cardiovasc Surg Pediatr Card Surg Annu 8:103-111, 2005

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[III-PCV-06] Ross Procedure in children by using hand sewed PTFE valved conduits for pulmonary artery reconstruction

○Bing Jia （Cardiothoracic Surgery Fudan University Children's Hospital, China）

Object To explore the value and feasibility of the ROSS procedure in children with aortic valve diseases by using hand sewed PTFE valved conduits for pulmonary artery reconstruction.
Method From August 2006 to October 2015 , 15 children underwent Ross procedure. The classic root replacement was applied. The material for reconstruction of the pulmonary artery was pulmonary homograft in 4, aortic homograft in 1, bovine jugular vein conduit in 5, and hand sewed PTFE conduits in 5 cases.
Result All 15 cases survived after the Ross procedure. Two of them were bleeding after surgery with one case of chest re-exploration. The mean follow-up time was 75 months. 4 cases had various degree of calcification and obstruction of the valved RV-PA conduit. No event happened on the new aortic valve.
Conclusion The Ross procedure is a good optional procedure for treating aortic valve diseases in children with acceptable outcomes.

3:10 PM - 5:00 PM (Sun. Jul 9, 2017 3:10 PM - 5:00 PM ROOM 3)

[III-PCV-07] Half-turned truncal switch operation for TGA and TGA type DORV with left ventricular outflow obstruction

○Masaaki Yamagishi （Department of Pediatric Cardiovascular Surgery, Children's Medical Center, Kyoto Prefectural University of Medicine, Kyoto, Japan）

Keywords: Left ventricular outflow obstruction, Halt-turned truncal switch operation

We developed an innovative surgical technique, half-turned truncal switch operation (HTTSO), for TGA with left ventricular outflow obstruction to ensure straight and non-obstructive aortic and pulmonary ventricular outflow tracts using an autologous half-turned " truncal block" which involves both semilunar valves (J Thorac Cardiovasc Surg 2003;125:966-8).**Case**: 12 month, female, 7800g. The aorta was transected above the sino-tubular junction. Pulmonary trunk also divided just before its bifurcation. Both coronary arterial buttons were resected. The truncal block involving both semilunar valves was separated from the ventricular outflow. Resected truncal block was half-turned. Posteriorly translocated aortic annulus was anastomosed to the left ventricular outflow orifice. The VSD was closed with an ePTFE patch. Both coronary buttons were anastomosed to the corresponding defects of the aortic wall. After the pulmonary bifurcation was translocated anteriorly, the aorta was reconstructed by end-to-end anastomosis. Pulmonary trunk was anastomosed to the RV outflow. The distal stump of the pulmonary trunk was anastomosed to the pulmonary bifurcation.**Discussion**: HTTSO has various advantages such as wide and straight left ventricular outflow tract and wide right ventricular outflow tract, which has growth potential. TGA or TGA type DORV with antero-posterior great arteries and mild to moderate PS is optimum indication of HTTSO. HTTSO can be also indicated to patients with small RV, remote VSD, restrictive VSD, and bicuspid pulmonary valve.

3:10 PM - 5:00 PM (Sun. Jul 9, 2017 3:10 PM - 5:00 PM ROOM 3)

[III-PCV-08] TGA/LVOTO double root translocation

○Shoujun Li （National Center for Cardiovascular Diseases, Fuwai Hospital, Peking Union Medical College, China）

Objective: To present a long-term result of biventricular repair of transposition of great arteries (TGA) with noncommitted ventricular septal defect (VSD) and left ventricular outflow tract obstruction (LVOTO) by double-root translocation (DRT) technique.
Methods: Between November 2004 and June 2016, a total of 142 consecutive patients underwent a double-root translocation procedure at a median age of 4.2 years (range from 8 months to 26 years), which included 9 dextrocardia, 27 coronary anomalies and 16 collateral circulation. Three cases had suffered for Glenn shunt and 16 cases had BT shunt. The VSD was repaired with a Dacron patch. The neo-pulmonary artery was reconstructed with a mono-cusp bovine jugular vein patch or a homograft patch. The median follow-up interval was 62 months (range from 12 to 124 months). Biventricular outflow tract function was assessed by echocardiography.
Results: There were 8 deaths in hospital and 13 follow-up deaths. Nine patients needed re-intervention (mitral valvuloplasty 4, tricuspid valvuloplasty 1, pulmonary valvuloplasty 2, pulmonary arterioplasty 2). Six cases needed pacemaker installation. The CPB and cross-clamp time was 280.0±75.8 minutes and 191.0±46.1 minutes. The mean time of ICU stay and mechanical ventilation was 15 days and 8.3 days. Fourteen patients required early support by extracorporeal membrane oxygenation. Postoperative

echocardiography showed satisfactory hemodynamic effect of the reconstructed biventricular outflow tract and ventricular function. No patient had aortic regurgitation and 16 patients had trivial or mild pulmonary insufficiency in follow-up.

Conclusions: The results showed an optimized solution for biventricular repair of TGA with noncommitted VSD and LVOTO by DRT technique.