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### 1. PERCUTANEOUS TRANSLUMINAL MITRAL VALVULOPLASTY IN POST MITRAL VALVE REPAIR AND AORTIC VALVE REPLACEMENT PATIENT

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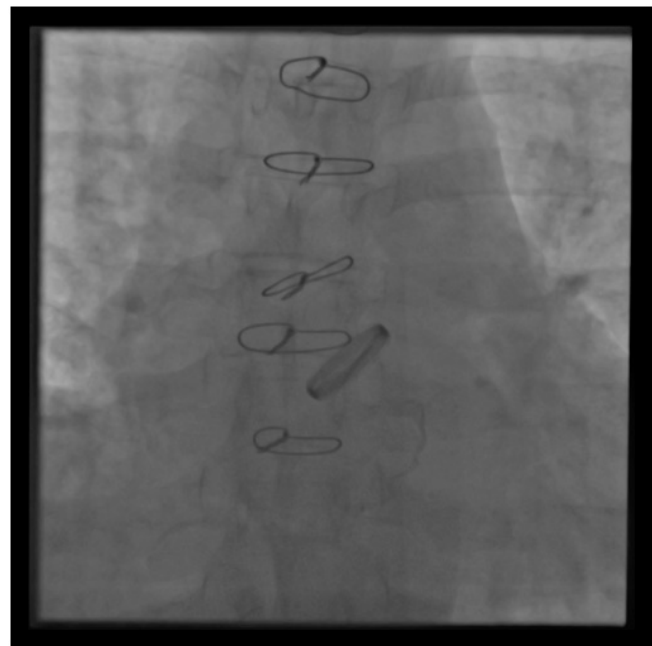
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A 34-year-old male, who underwent Aortic Valve replacement with mitral valve repair for rheumatic heart disease (RHD), Severe AR with moderate MR in 2007. Patient had NYHA class III Symptoms along with palpitation for 10 to 12 years. Hence he was taken for AVR and MV repair. Pre operation echo revealed RHD, Severe AR, Mod MR, Dilated LV (LVIDD/s 7.8/6.0cm), Dilated LA(4.3cm) and LVEF=55%. Intra-operative findings revealed Dilated LA and LV, thickened aortic leaflets with lack of centre coaptation, Thickened AML and PLML with rolled edges, mild commissural fusion, mild to moderate sub-valvular changes. He underwent AVR with ATS 20mm and Bilateral commissurotomy and papilotomy of P2, 27mmSJM ring angioplasty ring. Post repair no leak on saline test. Echocardiography after three month of surgery revealed Normally functioning aortic prosthetic valve, Mitral valve area of 1.6cm<sup>2</sup>.

In March 2017, after 10 years of AVR and MV repair, patient presented with of exertional dyspnea. He underwent echocardiography which revealed normally functioning Aortic Valve (peak gradient across Aortic valve 15mmHg, Mean gradient =7mmHg), commissural fusion with MVA of 0.7cm<sup>2</sup>, as shown in Fig 3, no significant subvalvar pathology or calcification of the valve, dilated LA. In view of suitable morphology of MV for percutaneous transluminal mitral valvuloplasty (PTMC) with Boston score (Wilkins

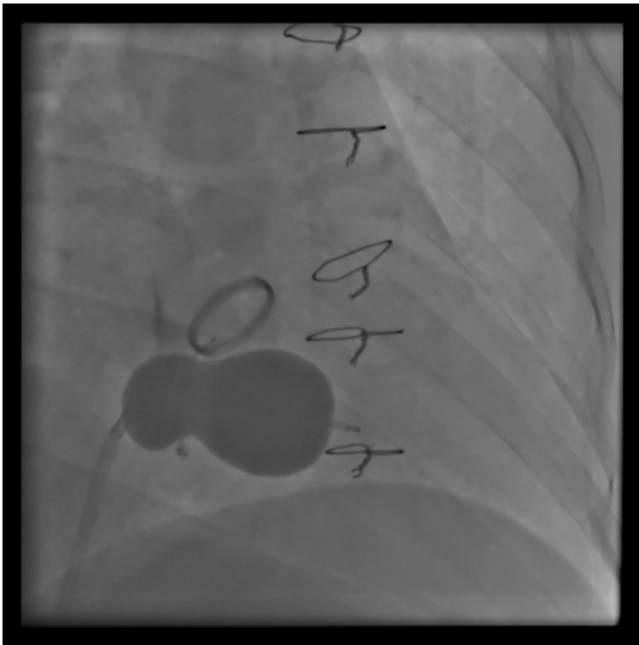
score) of 7, he was considered for PTMC. Heart team discussion was done. Team decide to attempt PTMC so that MV replacement (MVR) may be delayed for few more years. IV heparin infusion was started and warfarin was stopped. Three hours before the procedure heparin was stopped. Three hour after the PTMC IV heparin was started and continued until INR was in therapeutic range.

Through right femoral vein approach patient underwent PTMC with 26mmAccura balloon inflated to 26mm. Pigtail catheter was not kept in the ascending aorta as the metallic Aortic valve was the landmark for the septal puncture. Procedure was successful with single inflation. Medial commissure was split and lateral commissure was partially split.



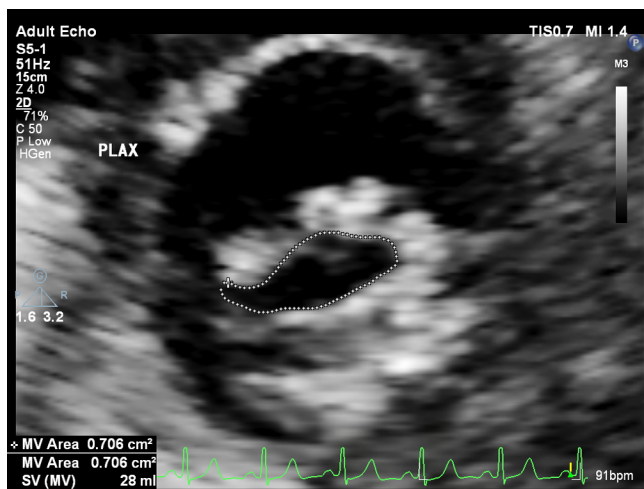
**1. Figure 1.** Prosthetic Aortic valve with Mitral valve ring.





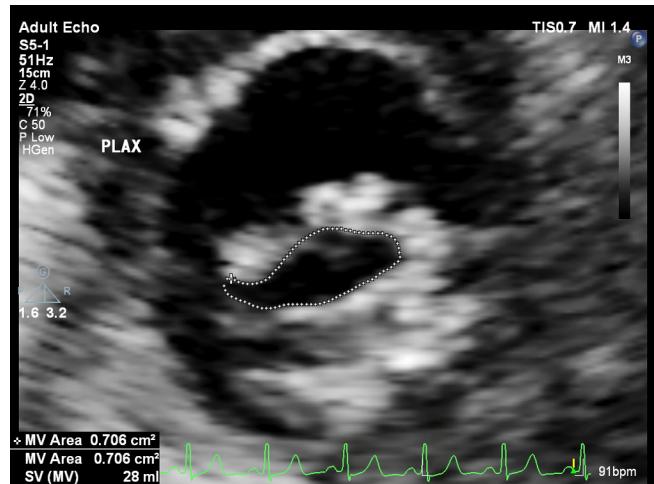
1. **Figure 2.** Balloon Dilatation during PTMC.

MVA increased from 0.6 to 1.3 cm<sup>2</sup> as shown in Fig 2, MV gradient decreased from 17mmHg to 7mmHg, mean left atrial pressure decreased from 15 to 7 mmHg. There was no increase in MR. During the procedure patient went into vasovagal reaction. Patient discharged after therapeutic range of INR was achieved. Patients is currently under follow with NYHA I symptom.



1. **Figure 3.** MVA=0.7cm<sup>2</sup> before PTMC.

**Conclusion:** In patients with suitable valve morphology, PTMC can be done successfully in MS following MV repair for severe MS. This may help to delay the need for MVR in younger patients.



1. **Figure 4.** MVA=1.3cm<sup>2</sup> post PTMC.

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## 2. EXPERIENCE ON TRANSCATHETER CLOSURE OF PATENT DUCTUS ARTERIOSUS IN NEPAL

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**Background and Aims:** In the current era, transcatheter closure of patent ductus arteriosus (PDA) using either coils or device is a well-established procedure. We want to describe our experience in PDA device closure in Nepal.

**Methods:** It was a retrospective study done with the hospital catheterization laboratory records. Patients age, gender device used any adverse outcome were analyzed.

**Results:** In Nepal first PDA device closure was done in March 2007. Till Novemebr 2017, 223 PDA device closure were done in four centres of Nepal. Most of the cases (203) were done in national heart Centre. During the study period 211 patients were attempted for transcatheter closure of PDA in national heart centre. Six patient were thought to have unfavorable size or shape, and transcatheter occlusion was not attempted. In one patients attempt was made to close the duct with cook coil which embolized to pulmonary artery. One patient device was retrieved as there was no significant decrease in the pulmonary artery pressure. Among the 203 PDA device closures most 149 procedures were done in the year 2016 and 2017. In 203 patient PDA was successfully closed. Among the 203 patients 155 were female and 48 were male. Age ranged from 0.4 years to 69 years with the mean of 13.5 years. The PDA was closed by Amplatzer duct occluder in 178 patients, Life tech PDA occluder in 14 patients, Hyperion PDA occlude in seven patients, Amplatzer muscular VSD in four patients. Most of the cases we did the antegrade technique. In few cases when we cannot cross the PDA through the pulmonary artery retrograde technique was used. In one case we closed a residual PDA after there was a PDA after the surgical closure.

**Conclusions:** Transcatheter closure of PDA can be done safely with high success rate in Nepal.

### 3. DEVICE CLOSURE OF NON ISCHEMIC, NON TRAUMATIC LEFT VENTRICULAR PSEUDOANEURYSM: A RARE PRESENTATION

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**Introduction:** Pseudoaneurysm of the LV cavity has been reported after myocardial infarction and myocardial surgery. It has been associated with mitral regurgitation and a high mortality. Conventional surgery however carries significant mortality, especially when combined with mitral valve replacement; and medical treatment carries an even higher mortality. We report a case of non ischemic and non traumatic pseudoaneurysm which was treated with device closure.

**Case Report:** 45 years old lady presented with history of dyspnea on exertion, chest pain since last 3 years with progressive worsening since last 3 months presently in NYHA class 3. Investigations done revealed cardiomegaly on

chest X-Ray. Echo revealed large apical pseudoaneurysm with preserved left ventricular function. Cardiac MRI done revealed presence of lobulated psuedoaneurysms from LV with enhancing wall suggestive of scar and fibrosis. The larger psuedoaneurysm was measuring 10x6.6x5.0 cm in maximal dimensions with a narrow neck, 3 mm in diameter and 4 mm in length, arising from the apex communicating with the LV cavity with movement of blood and also having intracavitary filling defect suggestive of a thrombus. There was also presence of another lobulated pseudo aneurysm measuring 3.1x2.8 cm in maximal diameter with a narrow neck of 4mm diameter and 15mm length arising from sub-mitral lateral wall extending in the atrioventricular groove communicating with the left Ventricle and indenting the Left Atrium. Coronary angiogram was done which revealed normal coronaries.

She was planned for device closure in view of narrow neck and pseudoaneurysm was successfully closed with Amplatzer vascular plug 3 size 12mm. Post device closure echocardiogram revealed complete occlusion of the pseudoaneurysm sac which was later confirmed on CT angiography.

**Discussion:** Pseudoaneurysm are mostly ischemic or traumatic (post surgical). This case was unique in the sense that there was no history of any surgical procedure and also that coronaries were normal. Percutaneous approach is attractive option as it carries less morbidity as compared to standard surgical approach.

### 4. COARCTATION OF AORTA IN ADULTS: CHALLENGES FACE

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**Introduction:** Coarctation of the aorta is a common congenital defect, which although normally detected and surgically repaired in childhood may present in adolescence or adulthood. Most common presentation is hypertension. Presentation can be complicated by associated lesions. The natural history of untreated coarctation is that of premature death from stroke and coronary heart disease or sudden death. We present three cases of unusual presentation and challenges thus faced.

Case Reports:

**Case 1:** A 45 year old post aortic valve replacement presented with dyspnea on exertion (NYHA class IV). Evaluation revealed severe prosthetic valve dysfunction with severe Pulmonary arterial hypertension. Patient was taken up for cath to assess hemodynamics but surprisingly found to have associated coarctation of aorta with almost atresia subsequently underwent stenting of coarctation. Post procedure the gradient across the prosthetic aortic valve also decreased significantly.

**Case 2:** A 65 years old post angioplasty to LAD and LCx presented with chest pain. Angiogram done revealed normal coronaries but had coarctation of aorta. patient had deranged renal function and developed anuria. Subsequently patient was taken up for coarctation stenting. After the procedure the renal function improved dramatically.

**Case 3:** 42 years old presented with history of recurrent admissions for pulmonary edema. Evaluation revealed severe aortic regurgitation. He was planned for aortic valve replacement. He was taken up cath for evaluation of coronaries but found to have near atresia of arch which was then relived by stenting of coarctation. Severity of AR decreased post procedure.

Discussion: Coarctation in adults though usually presents with uncontrolled hypertension but it can be complicated by presence of associated lesions like aortic regurgitation or complications like renal failure and also it can overestimate the severity of associated lesion as in our case it overestimated the severity of prosthetic valve dysfunction in first case and Aortic regurgitation in second case.

## 5. PERCUTANEOUS ASD CLOSURE OF CHILDREN LESS THAN 10 KG

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Background: Traditionally the procedure of percutaneous ASD closure is used to be done in children more than 15 kg.

Main limitation factor for small children is the size of delivery system and how to manage in a state of complication.

Objective: The aim of this study was to discuss the success, efficacy and safety of the percutaneous closure of symptomatic ASD in children less than 10 kg.

Method: Study was performed in 2 Pediatric Cardiology centers: Erciyes University and Gaziantep University. Total 32 patients were included. Demographic and angiographic data of these patients were gathered retrospectively from patients' records.

Results: Median weight of patients was 9,0 (8,2-9,5) kg, median age of patients was 19 (12,5-31,5) months. Female/male ratio was 21/11. Median mean pulmonary pressure was 25 (20,5-33) mmHg. The median value of measured defect sizes measured during angiograph was 13,0 (10,75-15,0) mm. Median value for preferred device size was 13,0 (9,0-15,0) mm. Weight/defect and body surface area/defect ratios were calculated. The ratio of weight per defect size was 0,64 (0,56-0,85) also ratio of body surface area per defect size was 0,030 (0,028-0,040).

Additional medical problems of patients were growth hormone deficiency, Mucopolysaccharidosis, Down syndrome in 3 patients. Additional heart problems of patients were severe pulmonary stenosis in 4 patients, large PDA in one patient, VSD in 2 patients. Pulmonary valvuloplasty, PDA closure, and percutaneous VSD closure were done in those patients in the same session with ASD closure. Types of devices used were: Amplatzer Septal Occluder in 26 patients, CeraFlex Septal Occluder in 2 patients, Figulla FlexII Atrial Septal Occluder in 3 patients, Memopart Septal Occluder in 1 patient.

After successful positioning, before deploying the device in one patient device was retrieved because of compression to the aorta.

No major complication was seen.

Conclusion: In experienced centers percutaneous ASD closure can be done effectively and safely in symptomatic children less than 10kg.

## 6. ATTACH-&RAISE TO THE ATRETIC PULMONARY VALVE WITH AN ENDHOLE CATHETER IS A GUARANTEE FOR SUCCESSFUL RADIOFREQUENCY VALVOTOMY IN NEONATES OF PULMONARY ATRESIA WITH INTACT VENTRICULAR SEPTUM

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**Background:** For neonates of pulmonary atresia with intact ventricular septum (PAIVS), Z score of tricuspid annulus is above -4.0, and without severe sinusoidal RV-coronary communication, a transcatheter perforation of the atretic PV appeared to be an optimal initial intervention to pave a way for final 2 ventricle circulation. However, the hypoplastic and tortuous RV outflow tract usually make this procedure difficult and risky.

**Method:** 1999 through 2017, there have been 15 PAIVS neonates received radiofrequency valvotomy (RFV) procedure in this Children's hospital. The procedure began with hot air cooking and hand molding of a 4F JR catheter, usually 1.5 or 2.0 cm of its first curve, to make it soft and compliant as much as possible. Assisted with a 0.035 Terrumo wire, we advanced it patiently until attached at the atretic PV, and even pointed and raised it. Afterwards, exchanging to an RF wire, and connect to the energy generator to perform RFV. Following a successful RFV, we used monorail catheters to perform balloon pulmonary valvuloplasty.

**Result:** In the first year, we failed in 2 cases. Afterwards, all 13 cases were successful. The initial 5 cases required 5-12 attempts of RFV procedure. However, all the later 8 cases were successful within 3 attempts. There was no mortality. We believe the key break through technique was making all possibility to get a firm attachment on the PV by the end-hole catheter.

**Conclusion:** Attach-&raise to the atretic pulmonary valve with an endhole catheter is a guarantee for successful RF valvotomy in neonates of PAIVS.

## 7. SERIAL PULMONARY ARTERY STENTING USING VARIOUS STENTS AND TECHNIQUES IN A YOUNG PATIENT WITH REPAIRED COMMON TRUNCUS ARTERIOSUS

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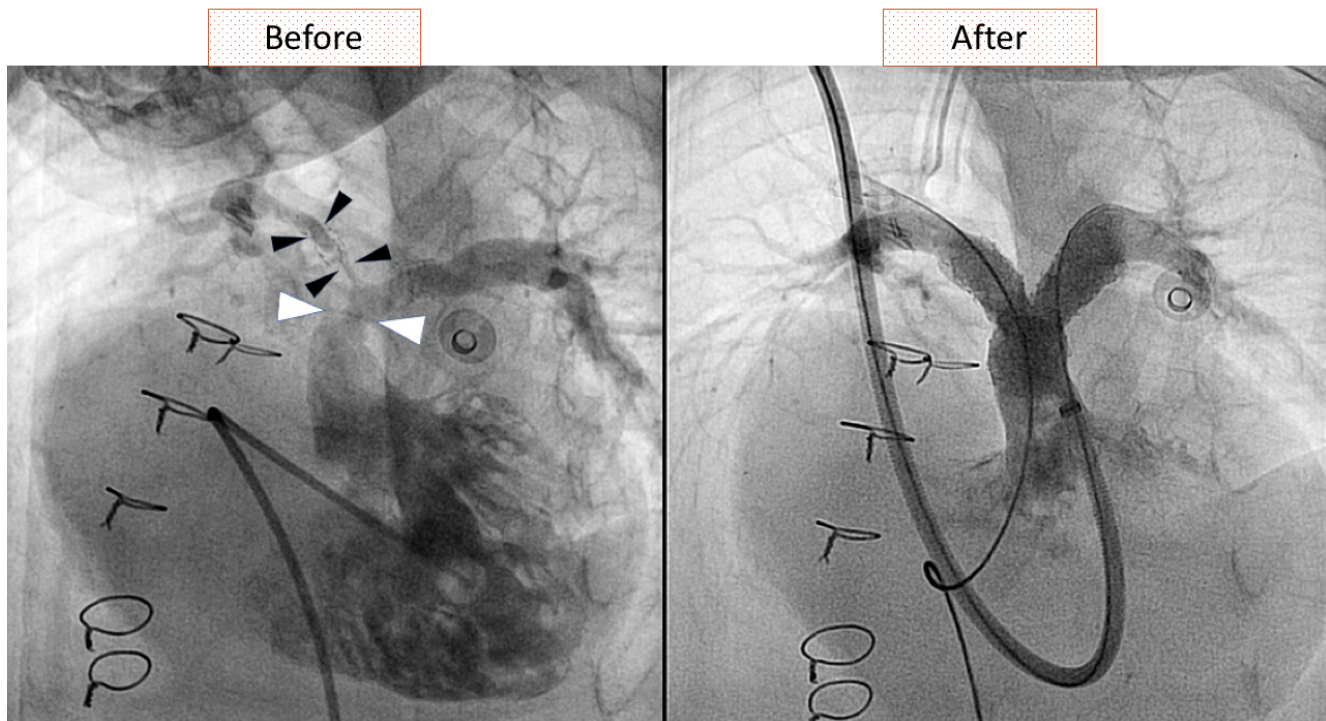
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**History and Physical Findings:** A female baby with common truncus arteriosus (CTA) type II received surgical repair at her age of 3 days. However, severe bilateral pulmonary artery (PA) stenosis developed soon after operation. Balloon dilatation was performed at her age of 2 months but the PA recoiled easily. We implanted bioabsorbable stents (Abbott BVS 3.5x18mm) at bilateral PAs and post-dilated up to 4.0 mm. Systolic right ventricular (RV) pressure decreased from 71 to 45 mmHg. However, follow-up echocardiography showed progressive increase in RV pressure. At her age of 5 months, we repeated cardiac catheterization and realized the PA diameter remained around 4 mm while bilateral bioabsorbable stent integrity had been disrupted. Because hemodynamic instability due to low cardiac output during the procedure, we implanted a metallic stent (Express SD 7x20mm premounted stent) for left PA stenosis using "jail technique". However, general condition remained unstable after unilateral PA stenting. We then arranged further cardiac catheterization for right PA stenting (Express 6 x 18 mm stent) using "Y-stent technique" 3 weeks later. Distal right PA was totally obstructed by an intimal flap after stenting, and rescued by an inflated balloon to reattach the flap to the vessel wall. Unfortunately, significant stenosis with obstruction was detected at RV outflow tract 6 months later. We sent the patient to surgery at her age of 11 months. During operation, the stents were explanted, and the outflow tract and branch PAs were extensively reconstructed. Follow-up echocardiography after redo operation revealed significant restenosis at bilateral PA junctions. The patient also developed significant edema and hepatomegaly since her age of 20 months.

**Indication for Intervention:** Stenting for bilateral recurrent postoperative PA stenosis

**Intervention:** Bilateral PA stenting was performed using "kissing stent technique" (2 premounted stents (GENESIS 2910) were inflated simultaneously). The effect was dramatic. Systolic RV pressure decreased from 104 to 17 mmHg. Although reperfusion lung edema developed in the following few days after the procedure, the condition was fairly managed by aggressive diuretics treatment and ventilator support. The patient was discharged home 7 days after stenting. Follow-up echocardiography revealed no obstruction across the RV outflow tract and bilateral PAs. The patient experienced much improvement in exercise tolerance after the procedure.

## 4<sup>th</sup> cardiac catheterization, 21m/o, BW:8.6kg



**7. Figure 1**

**Learning Points of the Procedure:** Kissing stent technique using stents dilatable to adult size can be an effective treatment for young patients with recurrent postoperative complex PA stenosis.

### 8. PERCUTANEOUS REPAIR OF POST-INFARCTION VENTRICULAR SEPTAL RUPTURE IN A PATIENT WITH MYOCARDIAL INFARCTION AND REFRACTORY HEART FAILURE

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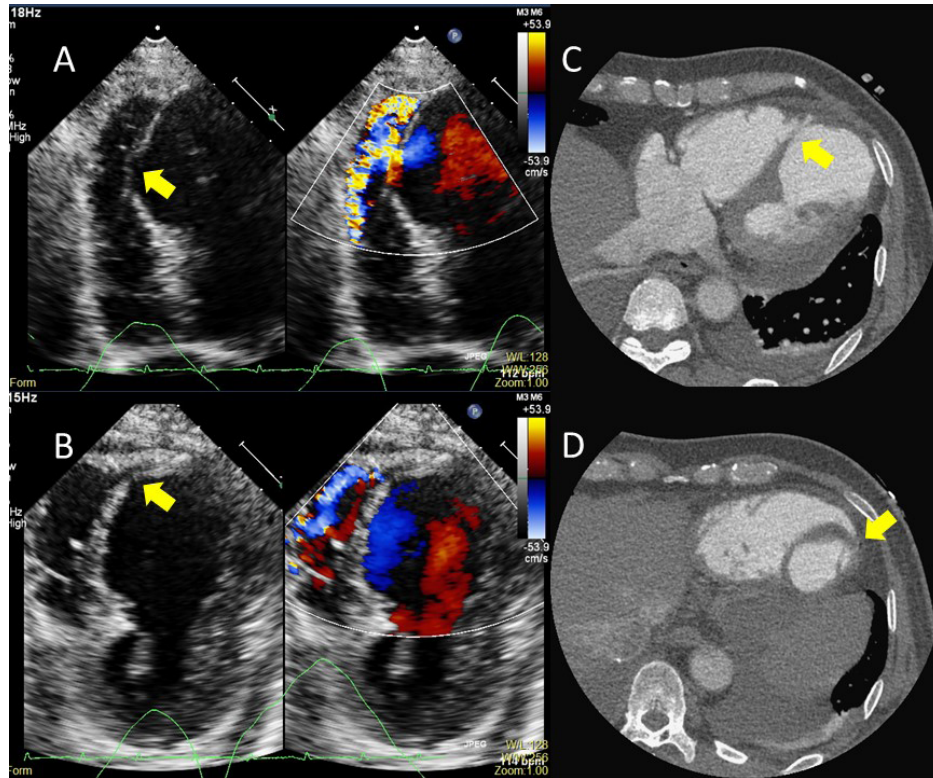
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**History and Physical:** A 62-year-old male suffered from acute chest pain and dyspnea for one week. He had the history of hypertension and was a smoker. He visited emergency department and desaturation without cardiogenic shock was noted. Physical examination revealed grade IV/VI pansystolic murmur over left lateral sternal border and bilateral crackles.

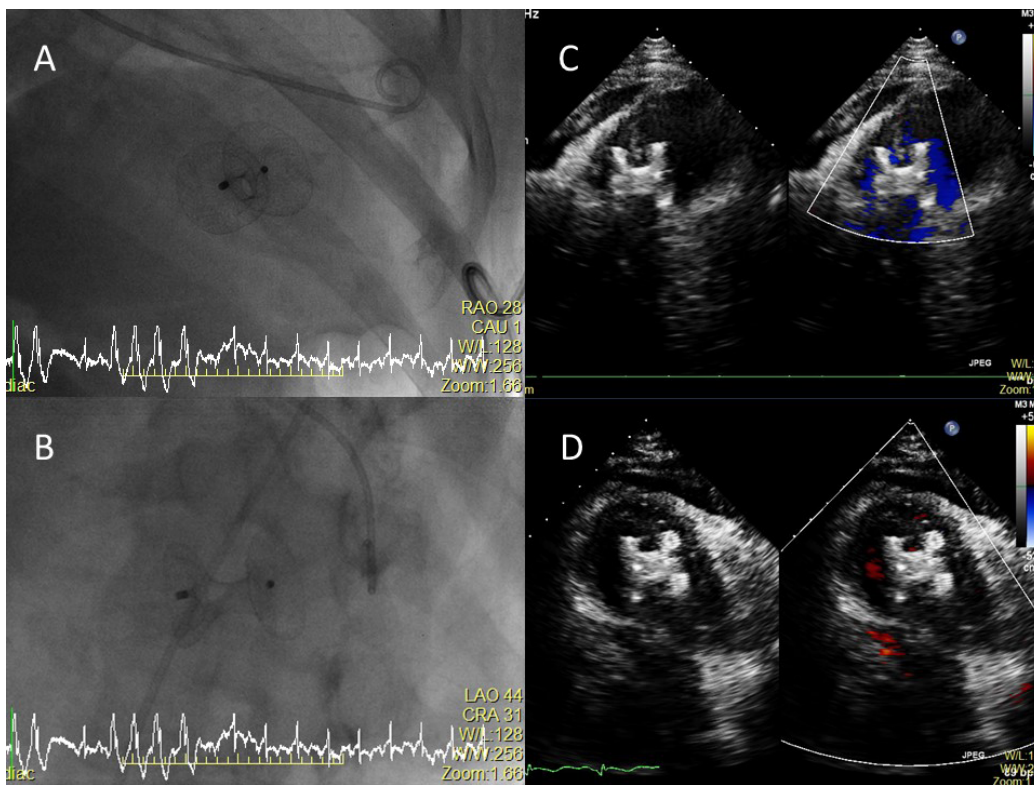
**Imaging:** Electrocardiogram revealed sinus tachycardia with poor R wave progression. Chest X-ray revealed pulmonary edema with bilateral pleural effusion. Echocardiography revealed hypokinesia of left ventricular (LV) apex and anterior wall with aneurysm formation, LV ejection fraction around 40 %, and the presence of two sites of ventricular septal rupture (VSR), which were located at middle inferoseptal wall (Figure 1A) and apical septal wall (Figure 1B). Computed tomography angiography findings were compatible with echocardiography. (Figure 1C and 1D). Coronary angiography revealed total occlusion of middle left anterior descending (LAD) artery (infarcted related artery) and chronic total occlusion of proximal right coronary artery.

**Indication for Intervention:** Surgical intervention with coronary artery bypass graft and VSR repair was suggested. However, he declined our suggestion.

**Intervention:** We performed percutaneous coronary intervention over middle LAD with a drug-eluting stent deployed on the 5th day after admission. Then, due to refractory heart failure, we performed percutaneous ventricular septal defect (VSD) occluder implantation on the



8. Figure 1.



8. Figure 2.

21st day after admission. The patient was under general anesthesia. We approached the middle inferoseptal VSR from right femoral artery route by a 6 Fr. JR 4 guiding catheter and a 0.032inch\*260cm guidewire. The guidewire crossed the middle inferoseptal VSR successfully and moved into inferior vena cava. A Snare kit was indwelled from right femoral vein into pulmonary artery. The guidewire was captured by the Snare kit and then it was externalized into right internal jugular vein. The measured size of VSR was 11.4mm by a 34mm sizing balloon and 12mm by real-time transesophageal echocardiography (TEE). A 10 Fr. delivery system was indwelled from right internal jugular vein into left ventricle by the guidance of the guidewire. Then a 20mm Amplatzer™ P.I. Muscular VSD Occluder was deployed to the middle inferoseptal VSR site successfully. The position was confirmed by the left ventriculography. (Figure 2A and 2B). His hemodynamic status improved immediately after implantation. TEE on the next day (Figure 2C) and the 12th day (Figure 2D) after intervention revealed that the site of implantation was optimal with much decreased interventricular shunt. He was discharged uneventfully on the 35th day after admission.

**Learning Points of the Procedure:** Interventional closure of post-myocardial infarction VSR is an alternative treatment option to surgical repair, with the advantage of immediate shunt reduction to prevent haemodynamic deterioration. A meta-analysis revealed that the successful device implantation rate was 89%, the overall inhospital/30-day mortality was 32%, and the major complications included device embolization, ventricular perforation and arrhythmias.<sup>1</sup>

**Reference:**

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**9. TREATMENT PREFERENCES OF HEMODYNAMICALLY SIGNIFICANT PATENT DUCTUS ARTERIOSUS IN NEONATES < 2500 GM AT THE ERA OF TRANSCATHETER CLOSURE: WHAT ARE NEONATOLOGISTS' CONSIDERATIONS?**

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**Background:** Transcatheter closure and surgical ligation of hemodynamically significant patent ductus arteriosus (PDA) are both treatments of choice for premature neonates when medical treatment fails or are contraindicated. However, factors regarding to which treatment option to be preferentially adopted by neonatologists remain unclear.

**Objective:** The aim of this study is to evaluate factors which may determine the treatment preference for neonatologist toward hemodynamic significant PDA in neonates < 2500 gm.

**Methods:** The retrospective study was conducted in one level 3 hospital from December 2016 to August 2017. Hemodynamically significant PDA in neonates < 2500 gm managed by either transcatheter closure or surgical ligation were included.

**Results:** There were 23 neonates included (8 with transcatheter closure, and 15 with surgical ligation). In surgical group, 10 (66.7%) procedures were performed within 8 hours after the decision was made by neonatologists, while all transcatheter closure were performed > 12 hours after decision making. Patients receiving surgical ligation had smaller birth body weight (BW) (median 763 (min.350-max. 1278) v.s. 1170 (680-2120) gm, p<0.05), younger age at procedure (10 (1-24) v.s. 25 (11-41) days, p<0.001), lower BW at procedure (738 (350-1230) v.s. 1318 (718-2190) gm, p<0.05), and less likely to having finished ibuprofen treatment ≥ 2 times (13.3% v.s. 87.5%, p<0.05). Besides, PDA associated comorbidity (66.7% v.s. 12.5%, p<0.05) and general comorbidity (93.3% v.s. 50%, p<0.05) were more prevalent in patients receiving surgical ligation. Transcatheter closure generally took longer procedure time (69 (37-104) v.s. 26 (10-45) minutes, p<0.001), but the intubation days after procedure were shorter (5 (0-17) v.s. 27 (1-82) days, p<0.05) than surgical group. No procedure failure was noted in both groups. Short-term complications were more common in surgical group. After excluding 8 (53.3%) surgical cases with comorbidities (ongoing infection, pulmonary hypertension requiring inhaled nitric oxide, and acute kidney injury with anuria) which were considered as



contraindications for transcatheter closure, the other 7 surgical cases had lower BW and more pre-procedural comorbidities comparing to those received transcatheter closure.

**Conclusion:** In the era when transcatheter PDA closure for premature neonates is safe and effective, we found that neonatologists generally prefer to send patients to surgery if there have been significant comorbidities prior to the intervention and if the patient was considered "too small". However, still a substantial portion of patients who received surgical ligation may be eligible for considering transcatheter closure.

#### 10. REFRACTORY KAWASAKI DISEASE WITH SUPERGIANT LCA AND RCA ANEURYSMS IN A 1-YEAR-9-MONTH OLD MALE TODDLER

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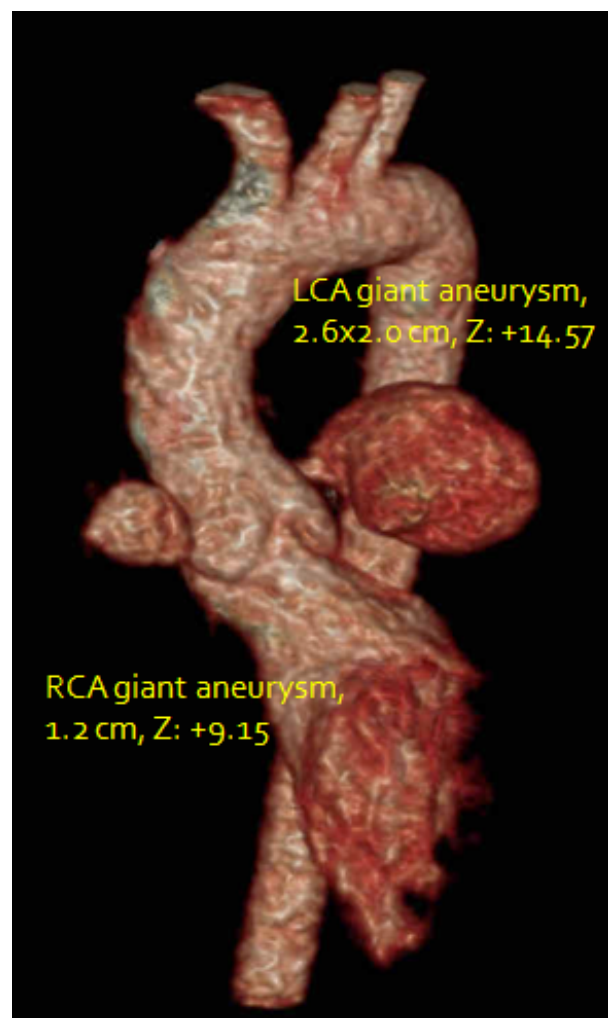
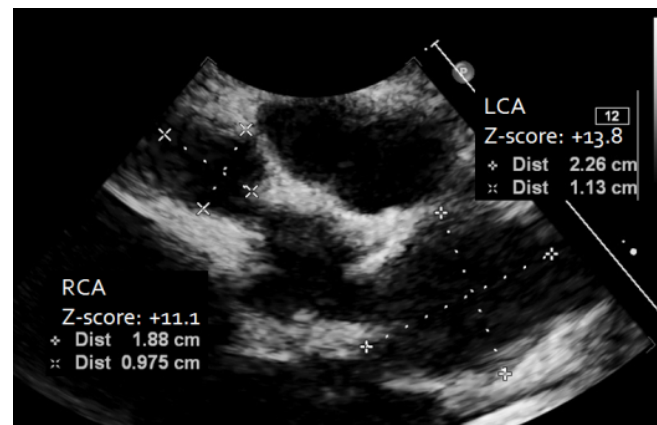
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**History and Physical:** This 1-year-9-month old male toddler was admitted to a certain hospital because of suspected group A streptococcus infection related acute tonsillopharyngitis on September 12, 2016. During the hospitalization, he had high fever over 5 days with clinical symptoms including bilateral non-exudative conjunctivitis, strawberry tongue and fissured lips, generalized maculopapular rash and plaques, extremities change, and neck lymph node enlargement over 1.5 cm, and typical Kawasaki disease was diagnosed. The initial echocardiograms showed RCA 2.8 mm, LCA 3.1 mm on September 14, 2016. Initial lab data showed CRP of 15.17 mg/dl, WBC of 9100/cumm, Hb of 10.4 g/dl, PLT of 123k/cumm, Albumin of 1.9 g/dl, GPT of 155 U/L but no pyuria. He totally received IVIG treatment twice and methylprednisolone pulse therapy at the 3rd course. He had fever for 20 days totally. A RCA giant aneurysm was detected by echocardiogram follow-up, and he was receiving aspirin treatment there. Nine months after discharge, the patient visited VGHTC-PCV OPD for follow-up of Kawasaki disease with coronary artery aneurysm. At our VGHTC hospital, echocardiography showed LCA and RCA giant aneurysms. Then, MDCT showed LCA super giant aneurysm 2.6cm and RCA giant aneurysm 1.2cm. Now, we prescribe Aspirin and Warfarin treatment for the patient. The patient is under close follow-up at our PCV OPD.

#### Imaging:





**Indication for Intervention:** According to 2017 AHA guidelines, further imaging with angiography (CT, MRI, invasive) may be considered for diagnostic and prognostic purposes during the first year and may be considered for periodic surveillance every 1 to 5 years thereafter (Class IIb; Level of Evidence C).

**Intervention:** Due to the patient's parents worry and the risk of intervention, we decided to arrange the MDCT rather than catheterization angiography.

**Learning Points Of The Procedure:** MDCT is also a good choice to evaluate the sizes and number of coronary artery aneurysms under the safer condition.

### **11. RENAL VEIN STENTING IN A FILIPINO TEENAGER WITH NUTCRACKER SYNDROME – FIRST REPORTED CASE IN THE PHILIPPINES**

*Jonas D. Del Rosario, MD, Maria Dorotan-Guevara MD, Erwin O. Ybañez, MD, Nicholas A. Cruz, MD*

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Nutcracker syndrome, also known as left renal vein entrapment is often a neglected cause of microscopic or gross hematuria. We present a case of a 15-year old female who presented with recurrent flank pain associated with hematuria. Whole abdominal CT scan revealed a decreased in the abdominal aorta:superior mesenteric artery angle measuring approximately 280 (normal value: 38-560) with resultant compression of the left renal vein and tortuosity of the second lumbar vein suggestive of nutcracker

syndrome. Renal duplex ultrasound showed compression of the left renal vein by the abdominal aorta and the superior mesenteric artery with an anteroposterior (AP) diameter of 0.13cm. There is note of renal vein distention (transverse AP diameter of 0.80 cm) after the area of compression. The patient underwent endovascular treatment of the renal vein using a 14 mm x 60cm self-expanding stent (Boston Scientific, Epic). Post left renal vein stenting duplex scan was done which revealed a patent stent and increased in the transverse AP diameter of the renal vein to 0.92 cm with normal venous flow. There were no immediate post-operative complications and resolution of symptoms after 3 days. At one-year follow-up, the patient has no recurrence of flank pain and hematuria. This is the first reported case of renal vein stenting in the pediatric population in the Philippines.

### **12. CUTTING BALLOON ATRIAL SEPTOSTOMY IN AN ADULT FILIPINO FEMALE WITH END-STAGE FENFLURAMIN-INDUCED PULMONARY ARTERIAL HYPERTENSION – FIRST REPORTED CASE IN THE PHILIPPINES**

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Group 1 Pulmonary arterial hypertension (PAH) is a debilitating, progressive disease resulting to recurrent morbidity and early mortality despite advance medical therapy. Atrial septostomy creates a right-to-left interatrial shunt, decreases right-sided heart filling pressure, and improves left-sided heart filling with eventual goal of improving systemic oxygen delivery due to improved cardiac output. This procedure has been proven as an effective therapeutic option providing notable clinical and hemodynamic improvement and increased survival in patients with advanced PAH.

We present a case of a 38-year-old female known case of Group 1 Pulmonary arterial hypertension (PAH) for 9 years who initially presented with syncope, shortness of breath, and bipedal edema. Patient also had prior intake of Fenfluramine (Bangkok), a diet pill known to cause PAH. Her 2D echocardiography at that time showed severely dilated right atrium and right ventricle with ventricular volume and pressure overload and severe pulmonary hypertension. Subsequent diagnostic right heart catheterization confirmed severe pulmonary hypertension with right atrial pressure (RAP) of 15 mmHg and mean pulmonary artery pressure (PAP) of 72 mmHg. Despite the patient's compliance with medical therapy consisting of

oxygen, Furosemide, Bosentan and Sildenafil she remained severely symptomatic at rest (NYHA functional class IV) with poor quality of life. Due to her refractory right-sided heart failure requiring frequent hospitalization patient underwent atrial septostomy. The septostomy was created with a transeptal puncture then followed by graded dilation initiated by a cutting balloon catheter then ended by serial static balloon dilation. This was guided by 3D echocardiography. A 10 mm atrial septal defect was created with a drop in RA pressure to 10mmHg and final oxygen saturation of 80-84% from right to left shunting. There was relief of shortness of breath after 72 hours from the procedure. The patient was maintained on oxygen, Bosentan and Sildenafil. At six-month follow-up, patient has shown sustained improvement in 6 minute-walk test and heart failure symptomatology.

This is the first successfully performed atrial septostomy in an adult in the Philippines as a therapeutic option for severe end stage PAH in a setting where heart-lung transplantation is not yet available.

**13. A CHALLENGING WATCHMAN LAA CLOSURE CASE**

*Jiandong Ding*

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History and Physical: A 66-year old woman presenting with nonvalvular Atrial Fibrillation (AF). Hypertension was the only risk factor. She suffered from AF for 20 years and was treated intermittently under anticoagulant therapy

because of abnormal fluctuations of INR when taking warfarin. She had a heavy past medical history: cerebral embolism that leading to left limb hemiplegia in 2007. In 2008, she suffered from spontaneous cerebral hemorrhage and finally she recovered without any sequela. Anticoagulant therapy was stopped and switched to aspirin, leading to a recurrent ischemic stroke in 2014. Then, the patient was put under dabigatran (110 mg twice a day). CHA2DS2-VASC score was estimated 5 and HAS-BLED score 6.

Imaging:

- 1) Baseline transesophageal echo rule out thrombus.
- 2) Baseline transesophageal echo measurements (Fig1).

Indication for Intervention: The patient with AF was at extreme high risk of stroke for many reasons: high CHA2DS2-VASC score, previous stroke on aspirin and was also at high risk of bleeding with the previous occurrence of a cerebral bleeding and high HAS-BLED score. The patient fulfilled FDA indication for Watchman:indicated for OAC, not suitable for warfarin, appropriate rationale for non-pharmacologic approach.

Intervention: Under general anesthesia, TEE guidance was performed. Location of the transeptal puncture was selected and confirmed by TEE. A double-curved access sheath was advanced into the left atrium and LAA angiography was performed. The max width of LAA ostium was 28mm by LAA angiography. A 33mm Watchman® device was selected for implantation. At first, the device was too proximal in the LAA and protruded into the left



| Angle       | Max Width | Max Length |
|-------------|-----------|------------|
| 45 degrees  | 23        | 33         |
| 90 degrees  | 24        | 30         |
| 135 degrees | 24        | 27         |



**13. Figure 1.**

atrium, shoulder was 11mm, full implant recapture, then, the device was too distal in the LAA and residual flow in the left atrium, partial retrieval and redeployment. Finally, the attachment of the device was checked with a Tug test and the device was deployed. The final angiogram and TEE showed a well-seated device, with no residual flow, that completely closed the LAA ostium (Fig2, mov1,2).

**Learning Points of the Procedure:** Coumadin ridge (ligament of Marshall) separates LAA and LUPV. If coumadin ridge protrudes far into LA, must push probe in and flex to see LAA without acoustic artifact.

When original sizing is done (outpatient TEE or CT), patient is often NPO, so LAA may be small. LAA may expand with hydration during watchman implant, needs remeasuring after volume load.

Attempt to cover all proximal trabeculations as trabeculated areas increase risk of thrombus formation.

Avoidance of pericardial tamponade: Echo guided transseptal puncture, pigtail catheter in front of sheath, slow deployment of device.

Avoid embolization: proper position and size of device.

Avoid periprocedural stroke: Adequate anticoagulation (ACT > 220), proper de-airing

#### 14. SUCCESSFUL STENTING OF OBSTRUCTED GLENN CIRCULATION ON DAY 5 POSTOPERATIVE DAY IN A 8-MONTHS-OLD GIRL

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<sup>3</sup> Southampton General Hospital; Interventional Congenital Cardiology; Child Cardiology

**History and Physical:** Superior vena cava (SVC) stenosis can be a rare but significant complication in patients undergoing Cavo-pulmonary anastomosis. Rarely hemodynamically significant obstruction can lead to SVC syndrome which carries a significant morbidity for these patients. Treatment options for SVC stenosis include surgical relief or catheter-based interventions, including balloon dilation or endovascular stent implantation.

Eight months old girl with Tricuspid atresia, large unrestricted VSD and severe subpulmonary stenosis underwent a Superior Cavopulmonary anastomosis, BT shunt takedown, Atrial septectomy and augmentation of right pulmonary artery. Unfortunately, postoperatively she continued to have low saturations with high central venous pressures. On further assessment clinically and echocardiographically, significant Glenn obstruction was strongly suspected.

**Indication for Intervention:** Diagnostic catheter on day 5 postoperative period suggested mean SVC pressures of 27 mm Hg with marked arterial waveform. Angiography suggested the Glenn anastomosis was compressed anteriorly probably by the aorta, as was the proximal left pulmonary artery.

**Intervention:** Following urgent MDT review she went back to the catheter lab next day and stent implantation was successfully performed into the left pulmonary artery using a 7 x 12 mm Cook Formula stent inflated to about 6mm and an 8 x 12 Cook Formula stent placed across the Glenn anastomosis. The final result of this was a significant fall in her mean SVC pressure to 17mmHg with good flow seen through both stents.

**Learning Points of the Procedure:**

- Superior vena cava obstruction can be successfully relieved by transcatheter stent implantation in patients post Superior Cavopulmonary anastomosis as early as day 5 postoperative period.
- Technical success and efficacy in relieving associated symptoms are high.

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### 15. MID-TERM FOLLOW-UP RESULTS OF TRANSCATHETER INTERATRIAL SEPTAL DEFECT CLOSURE

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**Background:** Transcatheter Interatrial Septal Defect Closure using Amplatzer was done in different centers. Experience of operator for select of best size of Amplatzer in this procedure could decreased complications.

**Objectives:** We studied immediate and midterm results of transcatheter closure of atrial septal defects (ASDs) using Amplatzer septal device closure.

**Materials and Methods:** The study included one hundred thirty seven patients (thirty one men, one hundred-six women; mean age  $8 \pm 7.3$  years; range 1–65 years) who underwent transcatheter closure of secundum ASD between Oct 2014 and Oct 2016 in our center. All the patients were evaluated by transthoracic echocardiography before and during the procedure and in adult patients, transesophageal echocardiography was performed before and during the procedure. Closure of ASDs was performed under general anesthesia with transthoracic echocardiography guidance. Follow-up controls were done at the day after procedure, one week, 1, 3, 6, and 12 months and annually thereafter. The median follow-up periods of ASD were 15 months.

**Results:** The mean ASD and device size were  $14.5 \pm 3.3$  and  $16.3 \pm 4.2$  mm respectively. The mean procedural and fluoroscopy times were  $21.3 \pm 4.7$  and  $5.1 \pm 1.9$  minutes. Immediate complication such as mortality, bleeding, fatal arrhythmia and device embolization did not occurred in any patients during and after the procedure. Cardiac arrhythmia were occurred in 4 patients during the first month after the procedure. Late device embolization did not occurred during the follow-up. No residual shunts were seen after procedure. Transient ischemic attack was occurred in one patient during the procedure and in one patient 2 days after the procedure without long term complication.

**Conclusion:** Transcatheter closure of ASDs using the Amplatzer devices is an efficacious and safe therapeutic

option and had low complications and could done in suitable patients.

### 16. PROCEDURAL AND SHORT OUTCOMES OF TRANSCATHETER RADIOFREQUENCY-ASSISTED PULMONARY VALVOTOMY AND BALLOON VALVULOPLASTY OF PATIENTS WITH PULMONARY ATRESIA WITH INTACT INTERVENTRICULAR SEPTUM

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**Background:** Pulmonary atresia-intact interventricular septum (PA-IVS) is a rare congenital heart disease. To improve cardiac circulation, the goal now is to carefully select patients to achieve a biventricular repair via transcatheter radiofrequency-assisted pulmonary valvotomy and balloon valvuloplasty (TRFAPV-BV) and to avoid early open heart surgery. Success rates of >80% have been reported. Due to its rarity, no single institution can provide a consistent interventional guideline. There is much to be learned from a multicentered approach to collecting longitudinal experience to a challenging clinical case.

**Objective:** We report our procedural and short-term outcomes in our patients who have undergone TRFAPV-BV with an emphasis on possibly identifying the predictors for survival and the need for additional transcatheter right ventricular outflow tract (RVOT) reintervention.

**Methodology:** This is a retrospective, descriptive, cohort study of all patients with PA-IVS who underwent TRFAPV-BV from Decemeber 2013 to April 2016. The hospital medical records of each patient was reviewed. Transthoracic two dimensional echocardiogram reports and clips, and cardiac catheterization reports pre and post-TRFAPV-BV were reviewed. In addition, each patient's clinical course through medical records were examined until their most recent clinical follow-up.

**Results:** There are 29 pediatric patients diagnosed with PA-IVS between December 2013 to April 2016. Out of these 29 patients with PA-IVS, 9 pediatric patients had a tripartite right ventricle underwent TRFAPV-BV, in whom 8 were described as successful, 89% (8/9). This study observed that the following parameters had a favorable outcome: tricuspid valve (TV) annulus z-score > -2.5, tripartite right ventricle, absence of ventricular to coronary connections, tricuspid to mitral valve ratio >0.5 and right-to-left ventricular pressure ratio of >1. Moreover, parameters after TRFAPV-BV of higher residual gradient across pulmonary

valve and lower pulmonary valve annulus z-scores may be predictive of the need for subsequent RVOT reintervention.

**Conclusion:** Using these parameters might predict good survival of patients and anticipate the need for a subsequent RVOT reintervention.

### 17. ENDOVASCULAR INTERVENTIONS IN HYPOPLASTIC LEFT HEART PHYSIOLOGY

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**Objective:** To present experience of endovascular procedures in newborns with hypoplastic left heart physiology.

**Methods:** Since 2012 to 2017yy. 15 patients with hypoplastic left heart physiology underwent hybrid procedures. All patients were newborns (1-9 days of life) in a critic condition. Body weight comprised  $2.24 \pm 0.14$ kg. Ascending aorta dimensions < 2 mm.

All 15 patients underwent bi-lateral banding of pulmonary arteries combined with stenting of Ductus arteriosus. In 2 patients used self expandable stent; in 13 - balloon expandable stent. In 3 patients intervention completed with Rashkind procedure.

**Results:** 4 of 15 patients made an unevenrtful recovery; 11 - died. In-Hospital mortality comprised 73.3%. One patient three years later underwent favorable re-stenting of Ductus arteriosus.

**Causes of mortality:** septic complication - in 2 patients; stent & istmus of the aorta thrombosis with consequent coronary insufficiency - in 4; stenosis of stent with occlusion of istmus of the aorta - in 1; left atrium perforation during Rashkind procedure - in 1; bleeding - in 1; fatal cardiac rhythm disturbances - in 3 patients.

**Conclusion:** Despite of high mortality hybrid procedures are the only choice of option in newborns with hypoplastic left heart physiology in critic condition & serve like a bridge for following intervention

### 18. POST-DILATATION TO PREVENT STENT MAL-APPOSITION AND JAILING IN AORTIC COARCTATION AND PULMONARY STENOSIS

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University of Yamanashi; Pediatrics; Pediatric Cardiology

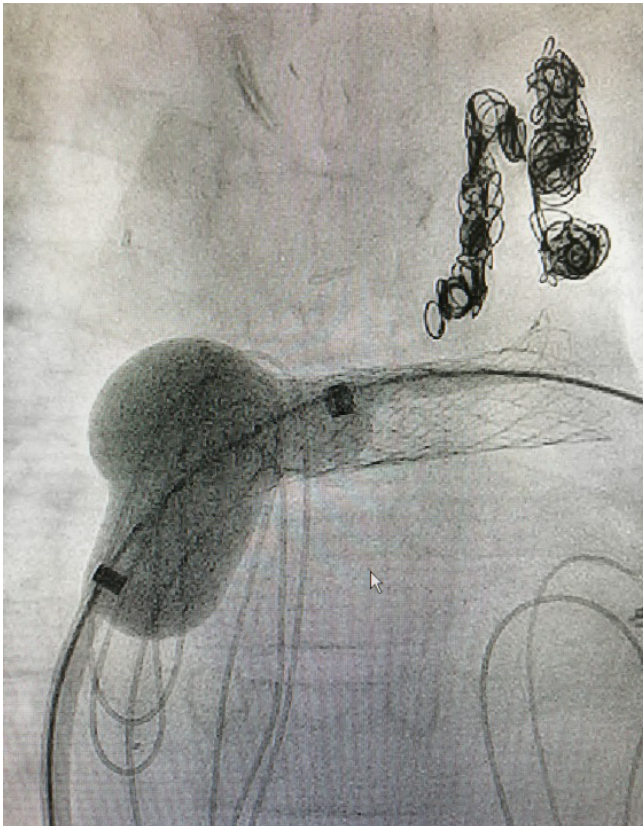
#### History and Physical:

**Case 1:** A 16-year-old boy with CoA. He previously underwent percutaneous stenting for recurrent CoA. The center of the first stent had been placed at the most stenotic site, apposing the aortic wall and avoiding jailing of the left subclavian artery. Follow-up CT angiography revealed deformity of the descending aorta at the proximal site, which might have been caused by the protrusion of the primary stent against the posterior wall of the aorta. An additional stent in the proximal site was proposed to prevent aortic wall injury.

**Case 2:** A 11-year-old boy with hypoplastic left heart syndrome. He underwent total cavopulmonary connection at the age of 2. Stenting(P3008) was performed for postoperative central PS at the age of 9. The proximal end of the stent protruded over the SVC anastomosis. Post-dilatation for the protruded part was proposed to prevent obstruction of systemic venous flow.

#### Imaging:





#### Intervention:

**Case 1:** After hemodynamic assessment, femoral arterial access was replaced with a 14-Fr sheath in a surgical “cut-down” manner, and a stent (P4010) was placed to cover the proximal end of the first stent. Because the additional stent remained incompletely apposed to both the anterior aortic wall and subclavian artery, a Coda 32-mm balloon (Cook Medical, Bloomington, IN) was advanced to the proximal end of the second stent and manually inflated to prevent stent mal-apposition and partial jailing of the left subclavian artery. Angiography and hemodynamic evaluation after the post-dilatation using the Coda balloon demonstrated complete apposition to the vessel wall and no measurable residual gradient.

**Case 2:** After placing a 14-Fr sheath at femoral vein, post-dilatation using a Coda balloon 32-mm was performed for the proximal end of the stent. Angiography after the procedure demonstrated complete apposition to the anastomosis. Both procedures were uncomplicated. The stent was briefly and successfully apposed to vessel wall with origin of side branch vessels opened, relieving obstruction and deformity of the vessel.

**Learning Point of the Procedures:** Aortic coarctation (CoA) and pulmonary stenosis (PS) are often located in curved segment and adjacent to the origin of other vessels. Stenting for such lesions is sometimes accompanied by stent mal-apposition and partial jailing of side branch vessel, which may be related with thrombosis or branch vessel occlusion. We performed post-dilatation using Coda balloon to appose the stent to vessel wall. Coda balloon is a spherical semi-compliant balloon catheter intended for temporary occlusion of large vessel and post-dilatation of stent graft in adult. Apposition using Coda balloon is a quite simple and effective resolution in stenting for CoA and PS.

### **19. IMPERFECT PDA STENTING IN A BABY GIRL WITH TETRALOGY OF FALLOT**

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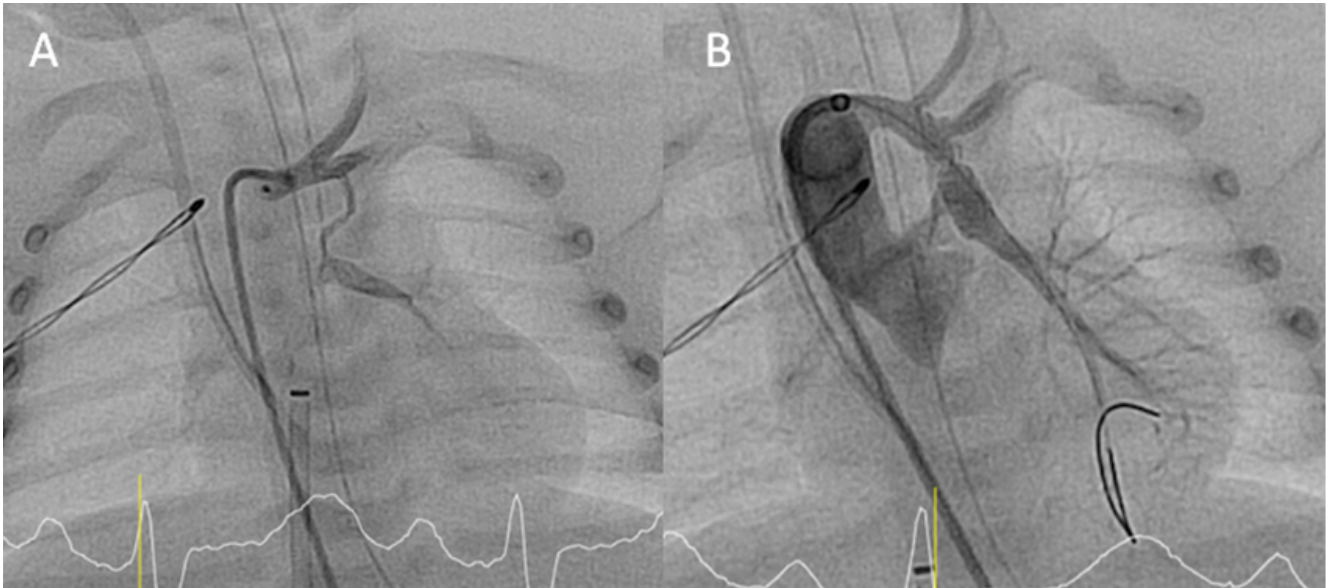
<sup>3</sup> National Taiwan University Children Hospital; Interventional Cardiology; Pediatric Cardiology

**History and Physical:** 7-day-old female baby was a victim of tetralogy of Fallot with small patent ductus arteriosus (PDA). After delivery, cyanosis (SpO<sub>2</sub>=75-80%) was noted with a Gr II/VI systolic murmur at her left middle sternal border. Prostaglandin E1 (PGE1, 5 ng/kg/minute) was given to maintain adequate pulmonary blood flow.

**Imaging and Indication:** Computed tomography demonstrated small pulmonary arteries (McGoon index:1.0). Therefore, we plan to do PDA stenting for her first-stage operation.

**Intervention:** Left innominate artery cineangiogram showed a small PDA connected between left subclavian artery (LSCA) and bifurcation of bilateral pulmonary arteries. (Figure A) We passed a Rinato coronary wire to his distal LPA via the PDA and then deployed a REBEL (4 x 8 mm) and a MULTI-LINK8 (3.5 x 15 mm) stent at his PDA. However, compromised LSCA flow and thrombosed stent (no flow) were noted 10 minutes after stent implantation. NC QUANTUM APEX balloon (4 x 15 mm) was advanced to redilate the two stents and successfully restore the flow.

Another Rinato wire was advanced to left innominate artery, through the mesh of the implanted stents, finally to her LSCA. NC Sprinter balloon (3.5 x 15 mm) was used to dilate the mesh at the origin of LSCA. Cineangiogram confirmed the patency of LSCA origin. (Figure B) She was



**19. Figure 1.**

discharged with a saturation of 90% 14 days after the procedure.

**Learning Points Of The Procedure:** PDA stenting is a good alternative of shunts for the cyanotic patients with TOF. However, PDA shortening may occur during the procedure. Careful implantation by using the relatively short stents might avoid disasters. Unexpected disturbance of LSCA flow can be rescued by the dilatation of mesh on the stent.

## **20. TRANSCATHETER CLOSURE OF AN SINUS VENOSUS TYPE ATRIAL SEPTAL DEFECT**

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**History and Physical:** A 2 year-8-month-old boy was noted to have congenital heart disease since infancy. The physical examinations revealed a toddler with poor body weight gain and systolic murmur.

**Imaging:** (See Figures 1-4)

**Indication for Intervention:** Failure to thrive.

### **INTERVENTION:**

- I. Under intracardiac echocardiography guidance (ICE)
- II. The defect was sized first by 24 mm Amplatzer sizing balloon.
- III. An 12 mm Amplatzer septal occluder was deployed

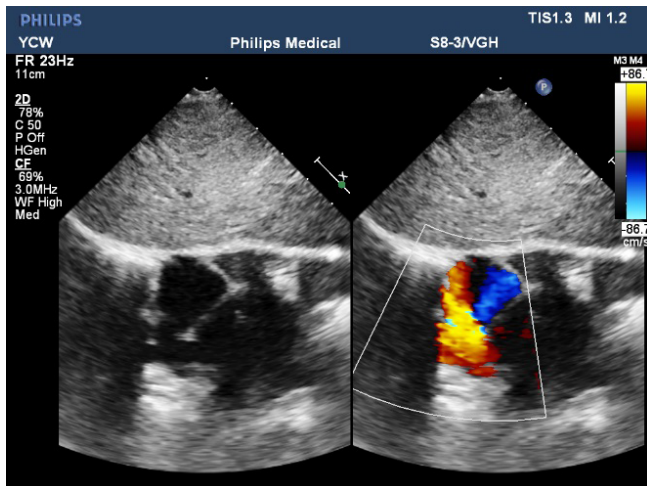


**20. Figure 1.**

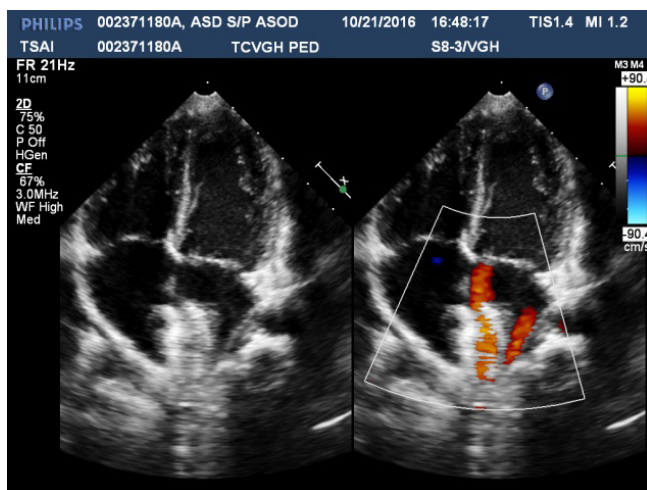
over the defect through a 7 Fr Amplatzer TorqVue 45 degree delivery system by standard technique.

- IV. After the stability was tested by wiggle maneuver, the device was then releases.
- V. The defect was completely closed, and the right middle pulmonary vein was drainage into left atrium between right and left discs.

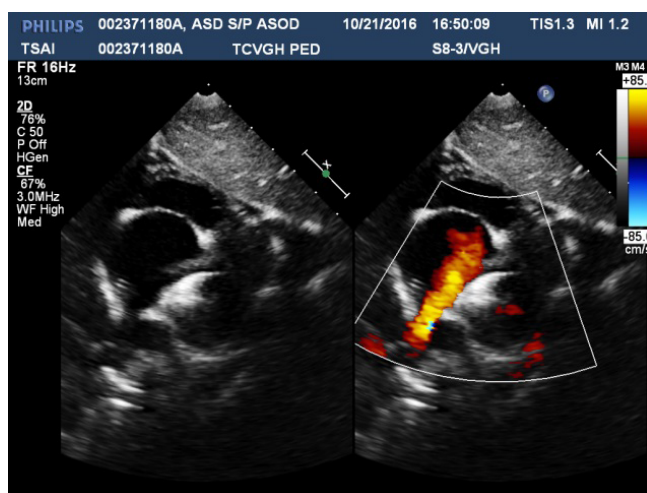




20. Figure 2.



20. Figure 3.



20. Figure 4.

**Learning Points of the Procedure:**

- I. Sinus venosus type ASD can be transcatheter closed.

Pulmonary vein can be drained between two discs of the septal occlude.

## 21. OUTCOMES OF TRANSCATHETER CLOSURE OF PATENT DUCTUS ARTERIOSUS IN CHILDREN WEIGHING LESS THAN 6-KILOGRAMS AT THE PHILIPPINE GENERAL HOSPITAL

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**Background:** Advancement in the field of cardiac catheterization and interventional cardiology in the form of transcatheter closure (TCC) of patent ductus arteriosus has replaced surgical ligation and/or transection as the primary treatment modality in symptomatic patients with a PDA. Different devices from the initial Ivalon plug to the Rashkind double umbrella, Sideris buttoned device, Gianturco coil or Duct-occlud device, and Amplatzer Duct Occluder (ADO) has been developed. Shape and size variability of ductus arteriosus and small patient size necessitated development of new devices or modifications for currently available devices. In the Philippines, there is limited published data on TCC of PDA in children less than six kilograms. For this analysis, outcomes in the form of technical success and occlusion rates as well as complications will be evaluated.

**Objective:** To determine the outcomes of transcatheter closure of patent ductus arteriosus in patients weighing less than 6 kilograms

**Methodology:** We conducted a retrospective study of forty five (45) patients (male 14, female 31; mean age  $8 \pm 3$  months, range 2months to 1 year old; mean weight  $5.0 \pm 0.78$  kilograms, range 3.4 to 5.9 kilograms) with echocardiographic evidence of PDA underwent transcatheter closure of PDA. Aortic angiogram was performed to evaluate the PDA. A second aortic angiogram was performed after device deployment. Echocardiography was repeated at 24 hours-, 1 month and 6months intervals to assess for occlusion and complications.

**Results:** A total of 45 patients were included in the study. The mean narrowest diameter of PDA was  $3.5 \pm 1.2$ mm (range 2mm to 5.6mm). Of the 41 patients with successful

deployment of device, residual shunt was noted in one patient at 6-month echocardiographic follow-up. The number of females was more than males. The overall technical success rate was 91%. The occlusion rate regardless of the type of device was 98% with a significant residual shunt rate of 2%. Minor and major complications were 11% and 11% respectively.

**Conclusion:** Transcatheter closure in children less than 6kg regardless of the device that was used is effective and safe in the Philippine setting

## 22. BREATH TAKING RETRIEVALS OF EMBOLIZED DEVICES

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**Objective:** This study was aimed to discuss the various techniques employed to retrieve the embolized devices during interventional cardiac catheterization procedures.

**Background:** Embolization of the devices may be due to many reasons varying from improper estimated size to problems with image quality just before device release. Once embolized the retrieval depends upon the type, site, size and position of the device. Additionally availability of the appropriate sheaths, variety of snares, bioptomes, balloons, biplane fluoroscopy and lot of patience is the pre-requisite for device retrieval.

**Methods:** In this total 11 devices were embolized from august 2010 to October 2017. Of these 7 were ASD, 3 PDA and one of them was VSD device.

Snares, sheaths, multiple catheters, balloons and wires were used to retrieve all the devices with reasonable results. The hemodynamic data and vita signs were carefully monitored during the procedures along with surgical back up.

All devices were removed successfully with variable time interval and fluoro exposure. The smallest patient in whom device was removed was 1 year of age. Various fluoro projections techniques were used to retrieve embolized devices. In certain situations balloon was inflated distal to device to change the position for favorable capture. There was no mortality or morbidity due the procedures. Patient's rhythms remained stable and no cardiac arrest was recorded.

**Conclusion:** Device embolization can be prevented with accurate preprocedure assessment and thorough estimation of position, stability, and residual flow judgment on color with good imaging. Device retrieval is safe if all the required equipment and expertise is available.

## 23. TRANSCATHETER INTERVENTION IN PATIENTS WITH COARCTATION OF AORTA IN A TERTIARY CARDIAC INTERVENTION CENTRE IN SRI LANKA: PATTERNS OF PRESENTATION, ECHOCARDIOGRAPHIC FEATURES AND FINDINGS AND OUTCOME FOLLOWING INTERVENTION

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**Background:** Coarctation of Aorta is a congenital abnormality which can have poor outcome without early intervention. Transcatheter intervention has made it the preferable modality of therapy for CoA over surgery.

**Objective:** To ascertain the patterns of presentation, clinical, echocardiographic features, modality of intervention and outcomes of coarctation of aorta patients whom presented for transcatheter intervention.

**Methods:** A retrospective analysis of patients' records were done from 2002-2017, in a tertiary cardiac specialist centre in Sri Lanka. 50 patient were included. Successful outcome was defined by a drop in pressure >50% or <20mmHg.

**Results:** Number of CoA patients n=50. Their age ranged from 8 -50 years. Mean age was 23.2 years. Males were 54%( n=27) of the populace. Majority, 54%( n=27) had asymptomatic hypertension. Amongst those symptomatic, shortness of breath was the commonest n=10(43.4%). Headache was seen in n=4( 17.3%). Most, n=25( 50%) had LVH on 2D-echo. All had preserved EF>60% on initial workup. Eighteen (36%) had additional echo structural abnormalities. Valvular abnormalities were the commonest n=13(72.2%). Bicuspid aortic valves were seen in n=4(22.2%), AR & MR were each observed in n =3 (16.6%). COA narrowest diameter was 1.5mm, and the maximum diameter was 15.4mm. Mean was 4.77mm. Eighteen(36%) underwent only balloon dilation, while n=25(50%) underwent direct stenting. The pre-procedural mean PG was 62.93mmHg and post- procedural PG was 11.79mmHg, the reduction was statically significant (P=0.00). Assessed separately the mean PG before intervention in the balloon dilation patients were 63.88 ±

33.87mmHg, and 62.24±21.55mmHg in the direct stented patients. Post intervention PG was 20.33 ± 22.5mmHg & 5.64±9.7mmHg in the balloon dilation and direct stenting group respectively. However there was no statistical significance between the mean pressure gradient difference (42.59mmHg & 54.71mmHg respectively) following intervention in between both arms (P=0.775). Majority showed interventional success n=41(93.2%). Procedural failure was seen n=3(6.3%) of the analyzed populace, of which n=2 belonged to the balloon dilation arm. Majority, n=39(78%) were free of complications. 4 patients had complications, Aneurysm formation and dissection were each noted at n=1(2%). Only n=10(20%) maintained long term follow up. Of those followed up, mean duration of follow up was 84.8± 56.9months. Most n=9 had preserved EF. Most n=9 showed insignificant residual PG across CoA. Five remain symptomatic, n=3 complaining of shortness of breath and n=2 complaining of chest pain. Most n=6, had good control of blood pressure. Only 1 patient developed TIA.

**Conclusion:** Transcatheter intervention in CoA appears to show immediate significant successful results, indicating it as an effective procedure. Balloon dilation alone or direct stent insertion has good immediate outcome, though our study did not show superiority on immediate success. Overall transcatheter management of CoA is a safe procedure. Complications though uncommon can be life-threatening. Long term residual persistence of symptoms and hypertension necessitate the need for better follow up.

#### **24. PERCUTANEOUS PULMONARY VALVE REPLACEMENT RESULTS OF ERCIYES UNIVERSITY PEDIATRIC CARDIOLOGY**

*Nazmi Narin<sup>1</sup>, Ali Baykan<sup>2</sup>, Özge Pamukçu<sup>3</sup>, Aydın Tuncay<sup>4</sup>, Suleyman Sunkak<sup>2</sup>, Onur Tasci<sup>2</sup>, Kazim Uzum<sup>5</sup>*

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**Background:** Percutaneous Pulmonary valve implantation is one of the most important inventions of the last century which improves the life quality of a group of patients. Right ventricular outflow tract dysfunction is the fate of operated Tetralogy Fallot, pulmonary atresia, truncus arteriosus, some forms of transposition of the great arteries.

**Objective:** To share our results and experience of our institution on percutaneous pulmonary valve replacement procedure.

**Methods:** Between February 2015- September 2017; percutaneous Pulmonary valve replacement was performed for 10 patients. Balloon interrogation diameters were determined by 34 mm Amplatzer sizing balloons. Andrastent XXL was used for pre-stenting for all cases. Z-med and BIB balloons were used for stent implantation. They were chosen 1 mm larger than the indentation diameter which was measured during interrogation.

**Results:** Mean age and weight of patient were 12±4.6 years and 38.5±17.6 kg respectively. All the patients were operated for tetralogy of Fallot. All the patients had native, large aneurysmatic right ventricular outflow tract (RVOT) dysfunction. Mean balloon interrogation diameter was 22±2.8 mm. Mean diameter of the balloon used for pre-stenting was 23±2.3 mm. All the cases except one were replaced with Edwards. Melody valve was used for the one with 19 mm sized balloon interrogation diameter. The procedure was performed successfully for all patients. 29 mm sized Edwards valve was implanted in 4 patients. 23 mm was implanted in 3 patients, 26 mm was implanted in 2 patients, 24 mm was implanted in one patient. Valve implantation of 2 patients was performed with stent implantation in the same session. For the rest of patients pulmonary valve implantation was performed 8-16 weeks after stent implantation. Procedure related mortality was not reported.

**Conclusion:** Transcatheter pulmonary valve implantation protect the patients from having right ventricle dysfunction. The patients without conduit; pre-stenting is mandatory to create a safe landing zone and limit the risk of stent fracture. Percutaneous pulmonary valve implantation is a safe, effective, non-invasive alternative treatment in RVOT dysfunction. Further experience in children is required therefore new studies with large number of patients should be done.

#### **25. PERCUTANEOUS CLOSURE OF AORTA-RIGHT ATRIUM TUNNEL IN A NEWBORN**

*Nazmi Narin<sup>1</sup>, Özge Pamukçu<sup>2</sup>, Ali Baykan<sup>3</sup>, Suleyman Sunkak<sup>3</sup>, Onur Tasci<sup>3</sup>, Aydın Tuncay<sup>4</sup>, Kazim Uzum<sup>5</sup>*

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<sup>4</sup> Erciyes University; Cardiovascular Surgery; Erciyes University

<sup>5</sup> Erciyes University; Non-Invasive; Child Cardiology

**History and Physical:** 24 years old pregnant woman was referred to us because of large right fetal heart. Fifteen days ago she was given intravenous paracetamol and obstetrician suspected from ductus constriction.

**Imaging:** Transthoracic echocardiography after birth revealed: large right atrium, 13mm Atrial Septal Defect. Tricuspid regurgitation velocity was 3.7m/s. Interestingly large ductal flow was detected. Because of her intrauterine history we have thought that pulmonary hypertension had worsened her situation. Despite anti-congestive treatment she got worse and Patent Ductus Arteriosus was occluded with 5x2 ADOII-AS. After Patent Ductus Arteriosus closure, nothing had changed her state. Then Transthoracic echocardiography was repeated: tunnel between aorta and right atrium was detected.

**Indication for Intervention:** Aorta-Right Atrium tunnel is a rare congenital lesion with an unknown etiology. Owing to the possible complications like risk of emboli, spontaneous rupture thrombosis, aneurysm formation, infective endocarditis, pulmonary vascular disease, coronary failure, aortic insufficiency, and calcification on the wall of the tunnel etc., it should be closed after certain diagnosis. Treatment options are surgery and transcatheter closure.

**Intervention:** Orifice of tunnel was occluded with 5x6 ADOII-AS from retrograde side (Figure 1). After closure she got better, extubated and inotropic support was terminated.

**Learning Points of the Procedure:** Aorta-Right atrium tunnels should be closed even the patients are asymptomatic. Our case is different because of enlarged Right Atrium and atypical location of tunnel orifice.

## **26. TRANSCATHETER CLOSURE WITH DEVICE IN PATIENTS WITH LARGE PATENT DUCTUS ARTERIOSUS AND MODERATE TO SEVERE PULMONARY HYPERTENSION IS EFFECTIVE AND SAFE**

*Radityo Prakoso*

National Cardiovascular Center Harapan Kita; Cardiology and Vascular Medicine Faculty of Medicine Universitas Indonesia; Pediatric Cardiology

**Background:** Transcatheter closure has become a preferred procedure as compared to surgical ligation for the patent ductus arteriosus (PDA). However in large PDA with moderate to severe pulmonary hypertension, the procedure poses a challenge and the data remains scarce. This study

aims to evaluate the efficacy and complications of this procedure.

**Methods:** Retrospective study has been conducted from January 2013 until September 2017 in National Cardiovascular Center Harapan Kita, Jakarta-Indonesia. The inclusion criteria were PDA with diameter  $\geq 8$ mm with recorded moderate to severe pulmonary hypertension (mPAP  $\geq 40$ mmHg by right heart catheterization). From 515 patients who underwent transcatheter closure during this period, 34 patients fulfilled the inclusion criteria. The results after procedure were observed clinically and by echocardiography.

**Results:** Median age was 19 years old (3-47 years old), median duct size was 9.8 (8.0-20)mm and mean mPAP (mean pulmonary artery pressure) was  $58.5 \pm 8.0$  mmHg. Median flow ratio (FR) before pulmonary vasodilator test was 1.8 (0.5-21) and median pulmonary artery resistance index (PARI) was 4.8 (0.7-20). Fifteen patients with PARI  $\geq 4$  WU.m<sup>2</sup> underwent pulmonary vasodilator test with median FR pre vasodilator test was 1.3 (0.5-3.3) increased to 4.3 (1-22),  $p=0.001$ ; mean PARI before vasodilator test was 9.6 improved to 0.9 (0.1-6),  $p=0.001$ ; with mean mPAP decreased from  $62.2 \pm 8.7$  to  $40.5 \pm 17.8$  ( $p=0.004$ ) accordingly after device closure. There was no cardiac death. During study, there was one case of device dislodge which underwent uneventful surgical ligation afterwards. Initial residual PDA before discharge was 60.6% which all comprises of minimum centrally residual. Upon follow up from one week to four months, no residual PDA was detected. A patient developed AV fistula after the procedure and underwent uneventful surgical ligation afterwards. The median length of stay in hospital was three days.

**Conclusions:** Transcatheter closure with device in large PDA with moderate to severe pulmonary hypertension was effective and safe provided that the PARI after vasodilator test was less than 8 WU.m<sup>2</sup>.

## **27. A COMPARISON OF DUCTAL STENTING AND BLALOCK TAUSSIG SHUNT IN DUCT DEPENDENT LESIONS: A SYSTEMATIC REVIEW**

*Radityo Prakoso<sup>1</sup>, Prissilia Prasetyo<sup>2</sup>*

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<sup>2</sup> University of Indonesia; Faculty of Medicine; General Practitioner

**Background:** Duct dependent cardiac lesion is a life threatening condition. Surgical Blalock-Taussig (BT) shunt is a treatment of choice in first stage palliation in such cases. Until recently, ductal stenting becomes a promising alternative treatment with less complications. The aim of this study is to compare the effectiveness and safety between ductal stenting and Blalock-Taussig shunt in duct dependent cyanotic lesions.

**Method:** Journal searching in PubMed, Cochrane, and MEDLINE databased from 2010 to 2017 was conducted. A total of 4 publications comprising 144 patients in ductal stenting group and 361 patients in Blalock-Taussig shunt group were included in this analysis. The primary outcome was one year survival rate and major adverse events consist of death related procedure, and restenosis that require reintervention to maintain adequate pulmonary blood flow.

**Results:** The pooled one year survival rate were 84% in ductal stenting group and 89% in BT shunt group. The pooled major adverse event rate were 18.8% in ductal stenting group and 28.5% in BT shunt group. Similar baseline characteristic (median age, median weight) and procedure type were adjusted. However, morphology of duct was variable among studies.

**Conclusion:** Ductal stenting is a promising alternative treatment for duct dependent cardiac lesion as it has comparable survival rate and less complications than BT shunt. However, patient selection, vascular access, technique, morphology of duct, type and also size (or length) of stent are critical to ensure the good results. A further large multicenter study was needed to support the practice of evidence-based medicine, especially in Indonesia and other South East Asia countries.

## 28. FIRST STAGE PALLIATION OF DUCT DEPENDENT LESIONS OF DUCTAL STENTING: A SYSTEMATIC REVIEW

*Radityo Prakoso<sup>1</sup>, Prissilia Prasetyo<sup>2</sup>*

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<sup>2</sup> University of Indonesia; Faculty of Medicine; General Practitioner

**Background:** Duct dependent cardiac lesion is a life threatening condition. Surgical Blalock-Taussig shunt is a treatment of choice for first stage palliation in such cases. Until recently, ductal stenting becomes a promising alternative

treatment with less complications. The aim of this study is to describe the effectiveness and safety of ductal stenting in duct dependent cyanotic lesions.

**Method:** Journal searching in PubMed and MEDLINE databased from 2010 to 2017 was conducted. Results from 12 publications comprising 532 patients were included in this analysis. The primary outcomes were successful rate of the procedure, as well as immediate and mid-to-long term major adverse events (death related to procedure, device embolization, acute thrombosis, and restenosis).

**Results:** All of studies in this systematic review showed a consistent result. The pooled successful rate were 94%. Immediate and mid-to-long term major adverse event rate were found in 16% of the pooled study subjects. Limitation of this study is the high variability in patient factors, duct morphology, and techniques performed by operators.

**Conclusion:** Ductal stenting is relatively effective and safe as an alternative treatment for duct-dependent cardiac lesion. However, patient selection, vascular access, technique, type and size (or length) of duct and stent are critical to ensure maximal outcomes. A further large multicenter study was needed to support the practice of evidence-based medicine, especially in Indonesia and other South East Asia countries

## 29. PATENT DUCTUS ARTERIOSUS STENTING IN A PRETERM INFANT WITH HYPOPLASTIC RIGHT HEART SYNDROME (HRHS)

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<sup>1</sup> Philippine General Hospital; Department of Pediatrics; Section of Pediatric Cardiology

<sup>2</sup> The Medical City; Department of Pediatrics; Pediatric Cardiology

**History and Physical:** The patient is a preterm female, delivered via emergency primary cesarean section, weighing 1.2kg. A congenital anomaly scan done at 20 weeks of gestation revealed hypoplastic right heart syndrome, tricuspid and pulmonary valve atresia with ventricular septal defect. She presented at birth with persistent severe cyanosis and desaturations as low as 50%.

**Imaging:** A transthoracic echocardiogram confirmed hypoplastic right heart complex with tricuspid and pulmonary valve atresia, and confluent pulmonary arteries supplied by a patent ductus arteriosus (PDA) measuring 2mm in diameter and 10mm in approximate length.



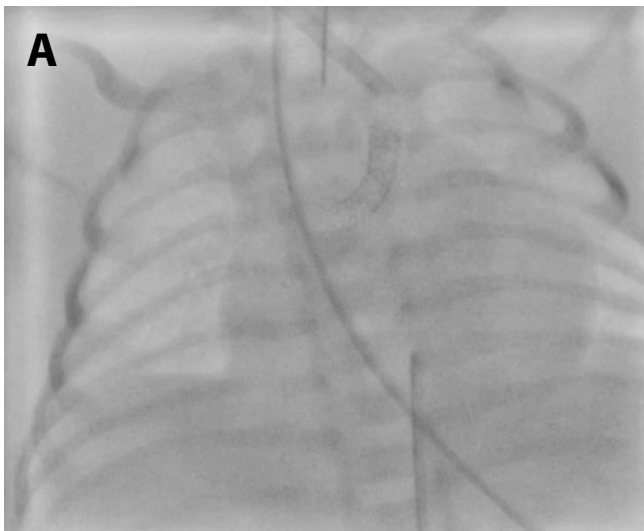
**29. Figure 1.** Hand Angiogram in LAO Cranial view from the right carotid showing a Vertical PDA (white arrow) supplying small sized pulmonary arteries.

**Indication for Intervention:** In infants with critical cyanotic heart disease, like HRHS, pulmonary blood flow is ductal dependent. The management of HRHS can be done in multiple stages of palliation and PDA stenting is the preferred method of first stage palliation compared to the Modified Blalock-Taussig Shunt (BTS) in establishing pulmonary blood flow. Due to the limited prostaglandin supply, PDA

stenting was thus attempted in this very small preterm infant.

**Intervention:** Ductal stenting via a carotid arterial approach was done on the second day of life. The right carotid artery was accessed under direct visualization and a 4F sheath was inserted in standard technique. A BMW 0.014 inch coronary wire was guided in the pulmonary arteries through the ductus after an initial angiogram was done through the sheath side port. The ductal length was measured and an Omega bare metal coronary stent measuring 2.75mm x 12mm was inserted over the wire and was subsequently positioned across the PDA without jailing the pulmonary arteries and covering the entire ductal length. The stent was inflated to rated burst pressure giving an inner diameter of 3mm. A repeat angiogram was done in order to document adequate stent position and to visualize pulmonary blood flow. Transthoracic echocardiogram after the procedure documented adequate PDA stent flow into confluent pulmonary arteries.

**Learning Points of the Procedure:** In preterm infants with life threatening cyanotic congenital heart condition, a management option is through PDA stenting in order to maintain and ensure pulmonary blood flow. The procedure is limited by patient size and prematurity but with proper care and skill, it can be performed in a premature infant weighing as little as 1.2kg. Ductus arteriosus stenting is a feasible, safe, and effective procedure for premature and low birth weight infants.



**29. Figure 2.** AP view showing an Omega bare metal coronary stent in place (*Panel A*); Hand injection angiogram showing adequate stent position supplying both pulmonary arteries (*Panel B*).

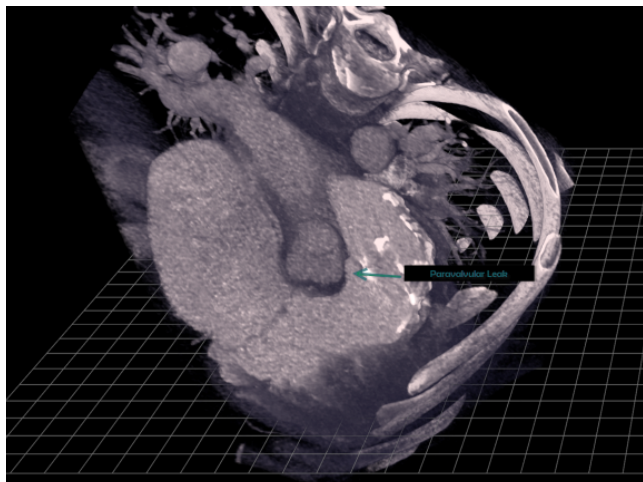
### 30. TRANSCATHETER INTERVENTION FOR PARAVALVULAR LEAK IN MITROFLOW BIOPROSTHETIC PULMONARY VALVE

Vishal Kaley, E. Oliver Aregullin<sup>1</sup>, Bennett Samuel, Joseph Vettukattil

Spectrum Health Helen Devos Children's Hospital; Congenital Heart Center; Congenital Heart Disease

**History and Physical:** Paravalvular leak (PVL) is a complication due to suture dehiscence between the sewing ring and native tissue resulting in regurgitation around the replaced valve. The standard treatment for pulmonary PVL is surgical repair or valve replacement. However, surgery is associated with greater morbidity and mortality. Transcatheter intervention for aortic and mitral valve PVL is effective and known to have better long-term outcomes than surgery, which has a 12-year survival of 30-40% and high rate of recurrence. In the setting of pulmonary PVL, transcatheter approach may be a useful technique with optimal outcomes.

A 22-year-old male with tetralogy of Fallot and bilateral peripheral pulmonary artery (PA) stenosis presented with multiple episodes of syncope, dyspnea on exertion (NYHA class III) and worsening lower extremity edema. He had a transannular patch repair early in life. Due to severe pulmonary regurgitation (PR), his pulmonary valve was replaced with a 27 mm Mosaic tissue valve at 8 years of age. He was noted to have free PR, and depressed systolic function at 15 years of age. Subsequently, he underwent pulmonary valve replacement with a 25mm Mitroflow bioprosthetic valve and intraoperative stenting of the branch PAs. Post-operative period required extracorporeal membrane



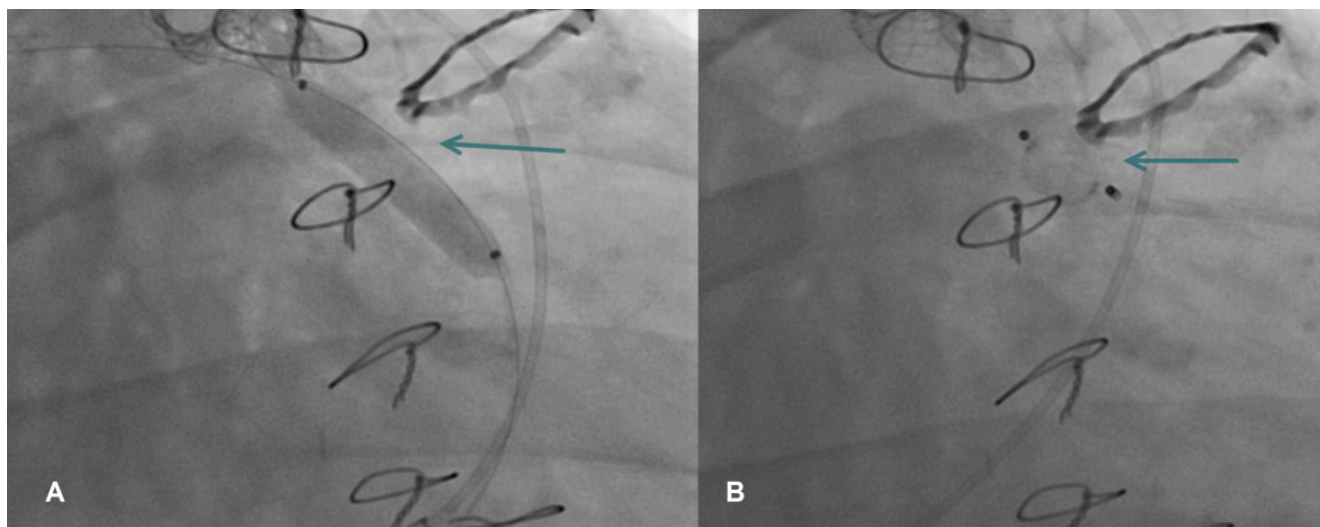
**30. Figure 1.** CT on True3D Viewer (Echopixel, Inc., Mountain View, CA) showing paravalvular tunnel measuring 8x6x9 mm in the posteromedial side of the pulmonary valve.

oxygenation support and prolonged tracheostomy leading to severe post-traumatic stress syndrome. On Holter monitoring, he was noted to have ventricular tachycardia.

**Imaging:** (See Figures 1 & 2).

**Indication for Intervention:** In view of worsening dyspnea, syncope, and edema, PVL closure was considered (Figure 1). Considering his complex history and associated risks with redo-sternotomy, a multi-disciplinary team recommended transcatheter PVL closure.

**Intervention:** Moderate stenosis was noted across the Mitroflow valve at the pulmonary position with gradient of



**30. Figure 2.** Panel A. PVL size confirmed using Armada balloon; Panel B. AVP II deployed in the PVL.

25-30 mmHg, and Qp:Qs of 1:1; PA angiography demonstrated moderate pulmonary insufficiency and PVL. The PVL was localized by balloon occlusion of the valve and simultaneous contrast injection into the PA. The defect was sized using an Armada balloon (8x4 mm; Figure 2A). After careful hemodynamic and angiographic evaluation, a 12 mm Amplatzer vascular plug II (AVP II) was deployed in the tunnel-like leak without any complications or residual leak (Figure 2B). The diastolic PA pressure improved from 6 to 20 mmHg after PVL closure. The patient recovered well and was discharged without arrhythmias on follow-up.

**Learning Points:** Although transcatheter closures of pulmonary PVL are reported using AVP II and ventricular septal defect occluders, successful closure is dependent on appropriate case selection and operator expertise. Transcatheter intervention is a feasible treatment option with lower complication rates than surgery and must be considered in the setting of pulmonary PVL.

### 31. DIFFERENT MANAGEMENT FOR THROMBOSIS COMPLICATIONS IN POST FONTAN SURGERY: REPORT OF TWO CASES

*Sisca Natalia Siagian<sup>1</sup>, Poppy S Roebiono<sup>2</sup>, Oktavia Lilyasari<sup>3</sup>*

<sup>1</sup> Universitas Indonesia Jakarta Indonesia; Ncchk Jakarta Indonesia; Pediatric Cardiology Division

<sup>2</sup> Pjnhk Jakarta; Cardiology and Vascular Fkui; Pediatric Cardiology

<sup>3</sup> National Cardiovascular Center Harapan Kita, Jakarta - Indonesia; Non-Invasive; Pediatric Cardiology

**History and Physical:** We reported two cases of silent thrombus formation after fenestrated extra-cardiac conduit Fontan procedure which detected on routine trans-thoracic echocardiography (TTE) evaluation and its management. The first case is a 5-year-old girl with DORV, non-committed muscular VSD, severe PS, smallish LV and PDA. She underwent an uneventful fenestrated extra-cardiac Fontan procedure after bidirectional cavo-pulmonary shunt (BCPS) and atrial septectomy done a year earlier. The second case is an 11-year-old girl with dextrocardia, pulmonary atresia with the aorta arises from the RV, hypoplastic LV, large muscular VSD, PFO and MAPCAs. Fenestrated extra-cardiac Fontan procedure was also done after previous BT shunt and BCPS with atrial septectomy, and MAPCAs embolization. They were both had no clinical symptoms or abnormal hemodynamic data.

**Imaging:** For the first patient, multiple large thrombi of 8x6mm and 5x4mm were seen inside the extra-cardiac conduit on TTE evaluation 6 months after the operation.

There was also a mild stenosis found at the anastomosis of IVC to extra-cardiac conduit and a good anastomosis of right SVC to RPA. TTE evaluation on second patient at 8 days post Fontan procedure revealed a long large thrombus of 10x14mm in the IVC. The anastomosis of IVC to extra-cardiac conduit and right SVC to RPA were good.

**Indication for Intervention:** The first patient was on achieved therapeutic anticoagulant treatment, and the second one was still under heparin infusion, but thrombus was found on routine TTE evaluation after the operation.

**Intervention:** Percutaneous balloon angioplasty and stenting implantation were planned in the first case after 5 days of intravenous heparin was given. Unfortunately, due to the unavailability of the suitable stent and vena cava filter, we have to postpone the procedure. She was then on oral anticoagulation and no thrombus seen any more on TTE evaluation after 2 days and 1 months later. For the second case, a direct catheter thrombosuction and thrombolysis with TPA was performed. It was followed by intravenous TPA with 4 hourly fibrinogen level evaluation. The TPA was stopped after 10 hours since the fibrinogen level drop to 40 mg/dL. It was continued with intravenous heparin for 5 days and oral warfarin subsequently. Thrombus is not found any more on TTE evaluation after 4 hours, 5 days, and 2 months above the procedures.

**Learning Points of the Procedure:** Patients who have undergone the Fontan operation are at a high risk for thromboembolism.

Thromboembolism complication in Fontan surgery can occur despite of anticoagulation treatment with achieved APTT and PT level or therapeutic international normalized ratio (INR). Routine TTE evaluation can detect this complication clearly so treatment can be performed immediately. Aggressive anticoagulation infusion and catheter direct thrombosuction followed by thrombolysis reestablish the patency of Fontan circuit and save the risks of re-surgeries.

### 32. DUMBBELL-SHAPED CONTROLLED INFLATION OF STENT FOR FENESTRATION OF FONTAN TRACT

*Kenji Suda*

Kurume University School of Medicine; Pediatric Cardiology; Intervention

**History and Physical:** A 20-year-old male patient with lateral tunnel Fontan procedure had suffered from intractable protein losing enteropathy (PLE) for 13 years that required 14 times of hospitalization.



**Indication For Intervention:** Because his pulmonary arteries were already acceptably dilated with pulmonary artery stenting, we decided to create interatrial fenestration, using PALMATZ P3008E™ stent (Cordis, Switzerland) this time.

**Intervention:** Procedure was guided under intracardiac echocardiography. Because of slipping of the tip of Brockenbrough needle, we directed the needle by snare guide wire for tip to enface the Fontan tract wall. Once we punctured the tract, we advanced 0.035 stiff guidewire. Over the guidewire, we advanced the distal half of pre-mounted 8mm-PALMAZ stent through the inter-atrial septum. Covering proximal half of the stent with long sheath, we dilated distal half of the stent without dilating proximal part of stent. Then, we further pull back the long sheath and exposed entire stent. After pulling back the balloon until the tip of the balloon at the middle of stent, we dilated proximal part of the stent tightly holding the middle part of stent with snare guidewire to make it dumbbell shape. Finally, we further dilated the middle part of stent with 5 and 6 mm balloon and the patient SpO<sub>2</sub> decreased from 93% to 86% resulting in increase of cardiac index.

**Learning Points of the Procedure:** Staged uncovering of the stent by long sheath and tight holding of stent by snare wire can make ideal dumbbell shaped stent for fenestration of Fontan tract.

### 33. DUCTAL STENTING IN CONGENITAL HEART DISEASE WITH DUCT DEPENDENT PULMONARY BLOOD FLOW : A FOUR YEARS EXPERIENCE FROM NATIAL REFFERAL CENTRE IN INDONESIA

Ruswandiani Sukarya<sup>1</sup>, Radityo Prakoso<sup>2</sup>

<sup>1</sup> Universitas Indonesia/ National Cardiovascular Center Harapan Kita; Cardiology; Cardiology Resident

<sup>2</sup> National Cardiovascular Center Harapan Kita; Cardiology and Vascular Medicine Faculty of Medicine Universitas Indonesia; Pediatric Cardiology

**Introduction:** Cyanotic congenital heart disease with duct-dependent pulmonary blood flow is a life threatening condition and often require early intervention. Blalock Taussig (BT) shunt remains the treatment of choice, but it is associated with high morbidity and mortality. Ductal stenting is becoming an alternative to maintain pulmonary blood flow as it is less invasive. However, this challenging procedure is not widely available in Indonesia.

**Objective:** This study aims to present our early experience with the short-term outcomes and safety of ductal stenting procedure.

**Methods:** We studied 14 patients who underwent ductal stenting in National Cardiovascular Centre Harapan Kita, Jakarta, Indonesia between October 2013 until Mei 2017.

**Results:** Indications were pulmonal atresia (n=13) and pulmonal atresia- tricuspid atresia (n=1). Median age at the procedure was 21 days (7-227 days) and median weight at the procedure was 3350 gram (2800-7200 gram). Femoral artery access was used in all procedure. Five procedure used uneventfully antegrade technique. Types of PDA were type A(n=5), C(n=5), E(n=3), and D (n=1). Stent implantation was succesful in 57% of the cases. All procedure used Bare Metal Stent as a device with vary diameter and length 2,5-4 mm x 8-15mm. A significant improvement in mean arterial oxygen saturations after stent placement was observed from previously 43.12% to 84.25% (p<0.05). There was no cardiac death during the procedure. Complications after the procedure were thrombosis (n=2), bleeding (n=3), and stent dislodged (n=2). Three deaths after the procedure were due to bleeding and stent dislodged. Due to thrombosis, only one patient underwent ballon dilatation, and done successfully. Due to stent dislodge, one patient died and other was succesfull for re-stenting. During follow up, one patient underwent radiofrequency ablation and balloon pulmonary valvuloplasty and one patient had Blalock-Taussig shunt operation. There was non significant reduction in pulse oxygen saturation six months after the procedure (7-22%;p>0.05)

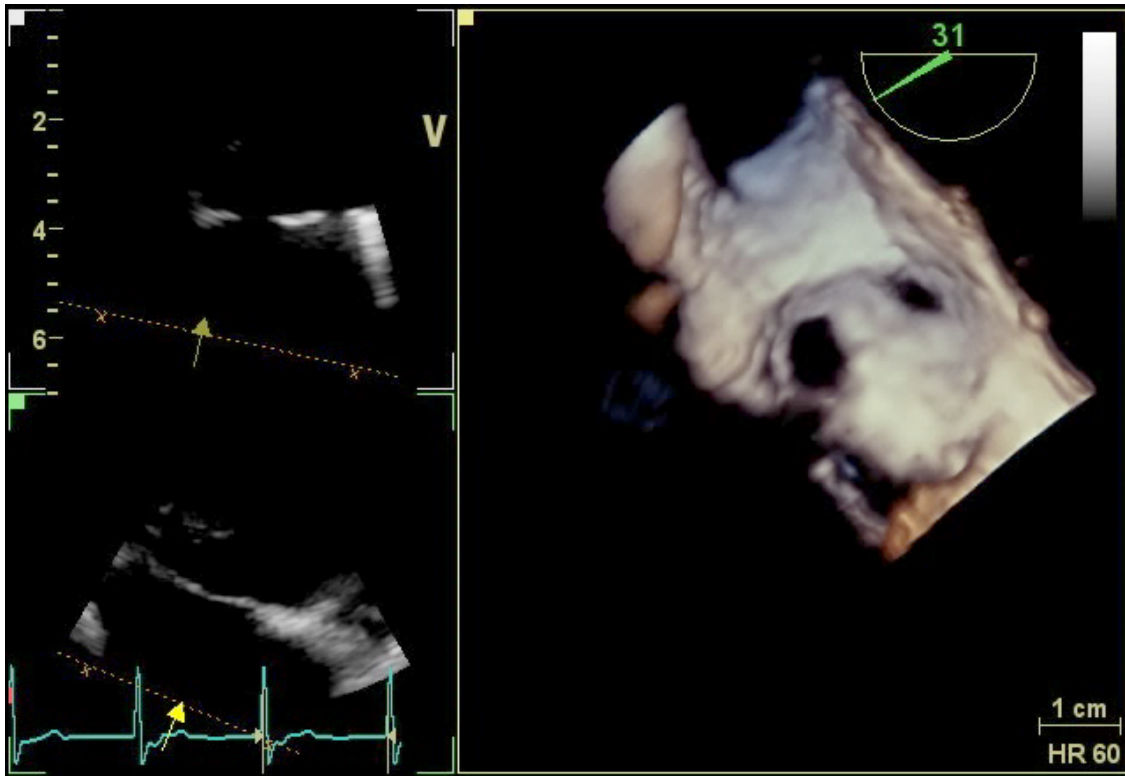
**Conclusion:** Stent implantation of ductus arteriosus can be a good alternative for initial palliation in cyanotic congenital heart disease with duct dependet pulmonary blood flow.

### 34. A CASE OF MULTIPLE SECUNDUM ATRIAL SEPTAL DEFECT TREATED WITH TWO FIGULLA FLEX

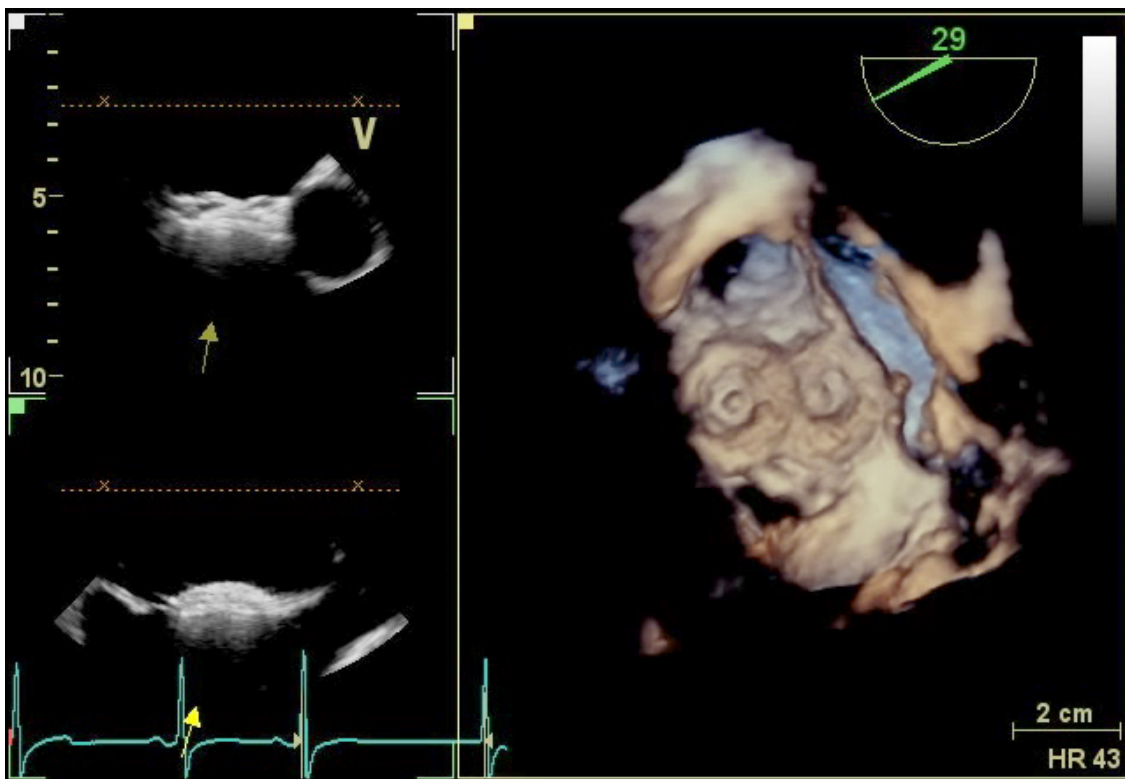
Shuhei Tanaka, Hiroshi Ueno, Nobuyuki Fukuda, Koichiro Kinugawa

Toyama University Hospital; Cardiovascular Center; Cardiologist

A case was a 75-years-old female. She was diagnosed with paroxysmal atrial fibrillation (PAF) and sinus arrest by Holter electrocardiography. Transthoracic echocardiography revealed atrial septal defect (ASD) and right heart overload (Qp/Qs 2.9). She was scheduled to ASD closure after 6 months treated catheter ablation for PAF. In transesophageal echocardiography, two ASDs were confirmed.



34. Figure 1.



34. Figure 2.

Sizes of ASDs were 3.4×8.5 mm and 5.0×12.7 mm, and the length between both ASDs was 7.6 mm. A part of aortic rim was less than 5 mm, but the range was less than 30°, so we chose by transcatheter ASD closure. Balloon sizing was measured to be 10.5 mm for smaller ASD closer to the aortic rim (ASD1) and 12.3 mm for larger ASD in the center (ASD2). Considering short aortic rim, we chose and placed a 12 mm Figulla Flex II ASD occluder (FFO) for ASD1, then a 13.5 mm FFO placed for ASD2. After placed, a 12 mm FFO contacted with aortic vessel walls, but did not press the aortic vessel wall excessively at the contact point with FFO. Detachment was successful, and no complications have observed during follow-up period.

Erosion is a rare but serious complication of transcatheter ASD closure. In this case, FFO on the side of the aortic rim partly touched the aorta by overlapping both FFOs. FFO results in a soft contact with aortic vessel walls when placed adjacent to it. It is difficult to predict the device position after detachment in case of overlapping devices. We report a case of transcatheter ASD closure for multiple ASDs using FFOs.

### **35. SIMULTANEOUS TRANSCATHETER DEVICE CLOSURE OF ASD, VSD AND PDA IN AN INFANT WITH DOWN'S SYNDROME**

*Ravi Ranjan Tripathi*

CHL Hospital; Ab Road; Near Lig Square

**History and Physical Findings:** An 11 month old infant with Down's syndrome weighing 7 kg was referred to our hospital with frequent respiratory tract infections and soft systolic murmur for evaluation. External features of Down's syndrome were present. Precordium was hyper dynamic with soft systolic murmur at Parasternal area with loud pulmonary component (P2).

**Imaging:** Chest radiograph revealed cardiomegaly with prominent vascular markings. Transthoracic echocardiogram (TTE) revealed moderate sized ostium secundum ASD (10 mm), perimembranous VSD (5 mm) and PDA (3.5 mm). There was biventricular enlargement, with severe PAH (estimated PA pressures 55 mmHg).

**Indication for Intervention:** After careful imaging it was found that all the defects were suitable for transcatheter closure, hence it was decided to perform simultaneous device closure of VSD, PDA and ASD.

**Intervention:** Hemodynamic assessment during the transcatheter procedure showed high pulmonary artery (PA) pressures (60/25 mm Hg) against systemic arterial pressures of 75/35 mmHg. First VSD device closure was performed from arterial route using 6/4 Amplatzer duct occluder II (ADO II) device by 5 French guiding catheter. Then PDA was closed using standard technique by 6/4 Amplatzer duct occluder device. Finally ASD device closure was performed using 12 mm Amplatzer Septal occluder device with 7 French delivery system. Post procedure PA pressures reduced to 45/15 mmHg against systemic pressures of 80/45 mmHg. Electrocardiogram (ECG) showed sinus rhythm with Heart rate of 110/min. Patient was discharged from hospital after 72 hours of observation.

**Learning Points:** Simultaneous transcatheter device closure of multiple defects is a safe alternative to surgery if suitable.

### **36. DEVICE SELECTION DURING TRANSCATHETER CLOSURE OF PATENT DUCTUS ARTERIOSUS IN PREMATURE INFANTS WEIGHING LESS THAN 2.5 KILOGRAMS**

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**Background:** Transcatheter closure of patent ductus arteriosus (PDA) in preterm babies remains a highly challenging procedure. There is no ideal device to fit in these clinical scenarios.

**Objective:** The aim of this study was to describe our experiences in device selection during transcatheter device closure of PDA in premature infants weighting less than 2.5 kilograms.

**Methods:** Hospital records and catheterization reports of all premature babies who underwent transcatheter PDA closure since October 2014 in our hospital were reviewed. Basic demographics clinical information, echocardiographic, angiographic data, and devices were recorded.

**Results:** Seventeen premature infants (seven boys and ten girls) born at gestational ages ranging between 22 and 35 weeks (median, 28 weeks) were identified. All patients had

significant PDA and received pharmacological therapy as protocols. Median age and weight for procedure was 22 days (2-133 days) and 1,500 g (478-2,350 g), respectively. Six patients were associated massive pulmonary haemorrhage. The mean minimal ductal diameter was  $3.5 \pm 1.1$  mm. The mean ductal length was  $7.8 \pm 3.6$  mm. The most common PDA type was type C (n=7). There were 3 times of device migration before detachment which required to retrieve and deploy a new one. Devices used in this study were AMPLATZER™ duct occluder II additional size (ADO II AS) (n=13), AMPLATZER™ vascular plug I (VP 1) (n=1), and vascular plug II (VP 2)(n=3). Complete closure were achieved in all patients except one patient had progressive coarctation which required surgical removal 4 months later.

**Conclusions:** It is now currently feasible to undertake transcatheter PDA closure in premature infants body weight greater than 478 grams according to our experiences. We added at least 1.5 mm in minimal ductal diameter by echocardiogram to select the device waist. We concluded that ADO II AS could be best used in ductal diameter less than 3.5 mm, and VP 2 could be used in larger and long ductus, while VP 1 used in large and short (less than 10 mm) one.

### 37. TRANSCATHETER CLOSURE OF DOUBLE VENTRICULAR RUPTURE IN A PATIENT WITH NON-ST ELEVATION MYOCARDIAL INFARCTION

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**History and Physical:** A 68-year-old lady has history of hypertension, type 2 diabetes mellitus and uremia with regular hemodialysis, presented with sudden acute of chest pain on Jun. 1st 2015. Non-ST-elevation myocardial infarction was diagnosed, and percutaneous coronary intervention (PCI) with drug-eluting stent was performed over the proximal portion of left anterior descending (LAD) artery. Three days after PCI, apical ventricular septal rupture (VSR) was diagnosed because of grade 3 holosystolic murmur at the apical area. Three weeks after PCI, surgical repair for VSR was performed smoothly and she was discharged asymptotically. Three months after surgical repair, she experience exertional dyspnea and effort-related chest pain. The CT angiography showed a left ventricular pseudoaneurysm over the middle portion of anteroseptum with connections to RV. The coronary angiography showed diffuse atherosclerosis over distal portion of left anterior descending artery with dynamic compression of LAD by the pseudoaneurysm. After thorough evaluation of the heart team,

percutaneous coronary intervention, transcatheter closure of VSR and pseudoaneurysm were proceeded.

**Imaging:** See Figures 1 and 2.

Computed tomography angiography: apical ventricular septal defect with communicated pseudoaneurysm formation

Transthoracic echocardiogram: apical ventricular septal defect with shunt noted

#### **Indication for Intervention:**

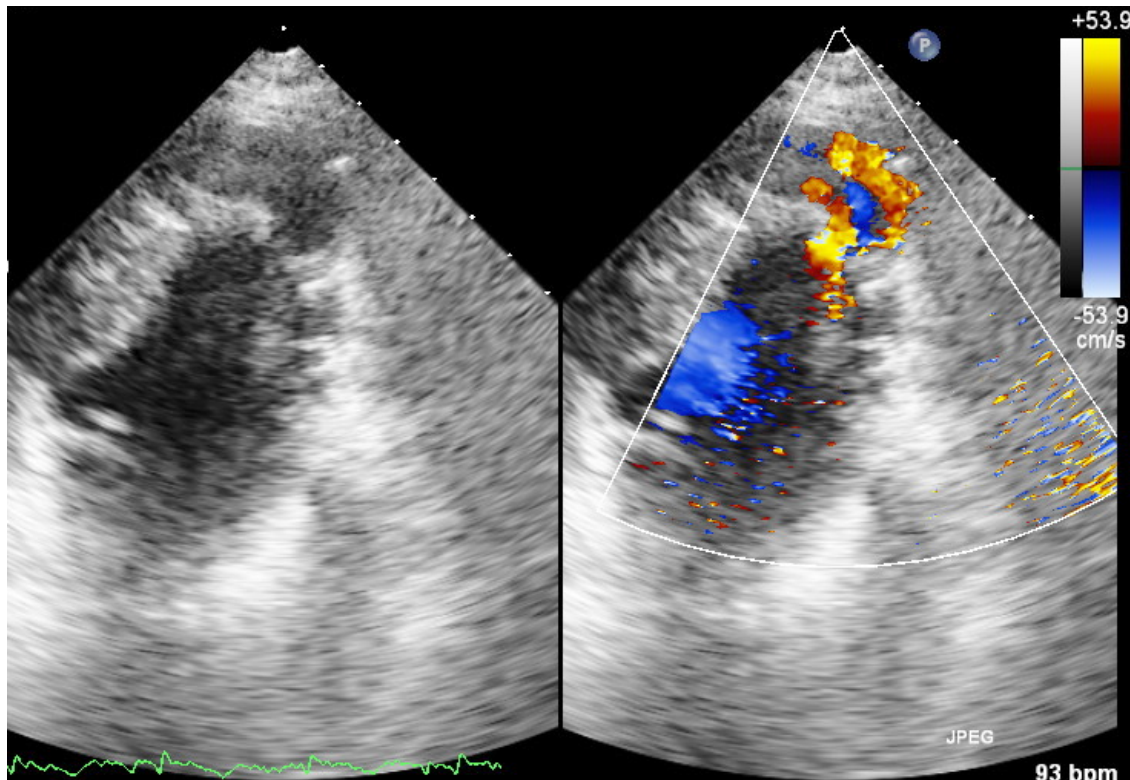
1. Left ventricular pseudoaneurysm with ragged edge, narrow neck, and high risk of rupture
2. The pseudoaneurysm with LV and RV connections
3. Dynamic compression of left anterior descending artery by the pseudoaneurysm

#### **Intervention:**

- a. A 5 Fr. cutted-head pig-tail catheter and a 0.032in\*260cm Terumo guidewire crossed the ventricular septal rupture through the LV pseudoaneurysm.
- b. The 0.032in\*260cm guidewire was externalized by a 25mm Amplatz Goose Neck Snare kit.
- c. A 8F 80cm (45 degree) Amplatzer Torvue delivery system was crossed the VSR through the 0.032in\*260cm guidewire.
- d. A 16mm Amplatzer muscular VSD occluder was deployed over one of necks of LV pseudoaneurysm
- e. Second transcatheter closure of pseudoaneurysm will be performed soon.



**37. Figure 1.**



37. Figure 2.

Learning Points of the Procedure:

1. The postinfarction ventricular septal rupture (post-MI VSR) of apical septum was difficult to diagnose on transthoracic echocardiography, and new-onset holosystolic murmur is an important clue.
2. Although there is no consensus on timing of surgical intervention of the post-MI VR, surgical intervention may be deferred as long as possible if hemodynamic stable.
3. Complete image examinations, including ECG-gated computed tomography angiography and echocardiography (transthoracic and transesophageal), are crucial in patients complicated ventricular septal rupture, especially in whom accompanied with pseudoaneurysm formation.
4. Transcatheter closure is feasible in patients with residual VSR or pseudoaneurysm after surgical repair of post-MI VSR.

**Comment on this Article or Ask a Question**

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