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Role of Interventional Cardiology in the Treatment of Neonates - Part III

By P. Syamasundar Rao, MD

"Role of Interventional Cardiology in the Treatment of Neonates – Part III" is the third and final article in a series of articles by P. Syamasundar Rao, MD, Professor of Pediatrics and Medicine, Director, Division of Pediatric Cardiology, University of Texas-Houston Medical School. The first article appeared in December 2007, and the second appeared in January 2008. All issues are on the website in PDF files.

INTRODUCTION

Non-surgical atrial septostomy to enlarge or create atrial septal defects and balloon angioplasty/valvuloplasty to relieve critical obstructive lesions in the neonate were presented in the first two parts of this review [1,2]. Discussion of other interventional procedures (Table I) will be presented in this third and final paper.

Table I. Catheter Interventional Techniques Used in the Neonate

- Non-surgical atrial septostomy
- Balloon angioplasty/valvuloplasty
- Radiofrequency perforation of atretic pulmonary valve
- Transcatheter occlusion of shunts
- Stents

RADIOFREQUENCY PERFORATION OF ATRETIC PULMONARY VALVE

Pulmonary atresia with intact ventricular septum is a complex cyanotic congenital heart defect with poor long-term prognosis [3-6]. One of the objectives of the management of these infants is to optimize chances for restoration of a four-chambered heart [6-9]. To achieve this objective, the hypoplastic right ventricle should be encouraged to grow [6,7]. Surgical pulmonary valvotomy at the time of presentation or shortly thereafter was initially recommended to promote forward egress of the right ventricular output and to stimulate growth of the right ventricular cavity so that it could eventually support the cardiac output into the pulmonary circuit [6,7]. Perforation of the atretic pulmonary valve membrane with the blunt end of a guide wire or by Laser and radiofrequency energy followed by balloon valvuloplasty [8,10-18] has been advocated by some cardiologists. With the availability of radiofrequency wires (now approved by the US Food and Drug Administration), this method replaces perforation with the stiff end of a guide wire.

Radiofrequency Perforation

The procedure involves the usual percutaneous catheterization, followed by right ventricular angiography in sitting-up (15^0 LAO and 35^0 cranial) and straight lateral views to evaluate the anatomy of the right ventricle and to measure the pulmonary valve

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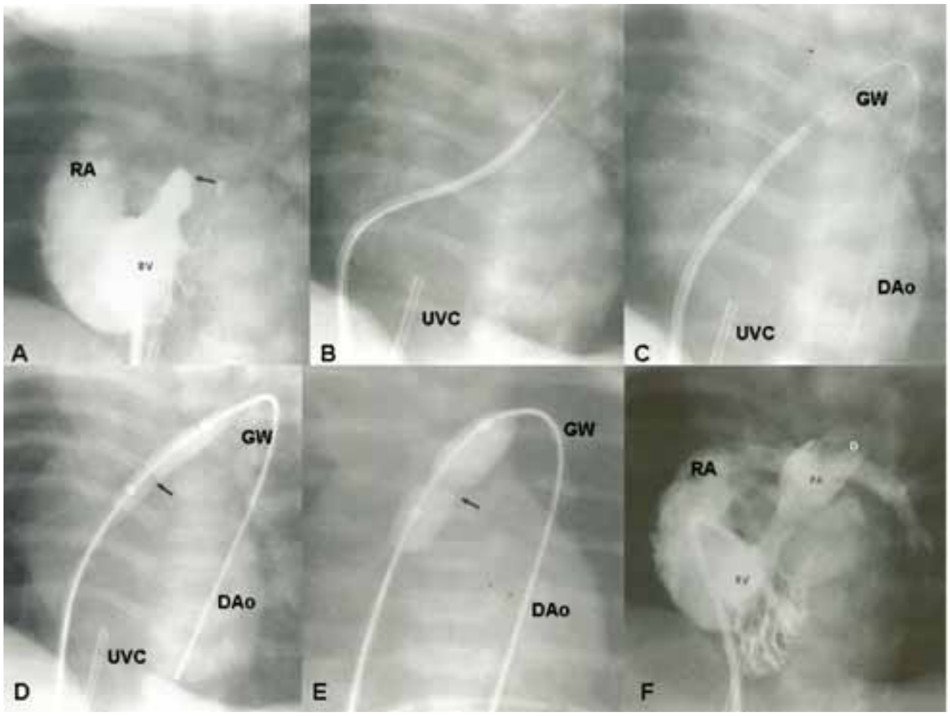

Figure 1. [A]. Selected right ventricular (RV) cineangiographic frame in a sitting-up (15^0 LAO and 35^0 cranial) view demonstrating an atretic pulmonary valve (arrow). Note opacification of the right atrium (RA) due to tricuspid insufficiency. [B & C]. Following perforation of the atretic pulmonary valve, note passage of a guide wire (GW) into the pulmonary artery and then into the descending aorta (DAo). [D & E]. Five mm diameter and 8 mm diameter balloon dilatation catheters across the perforated pulmonary valve membrane are shown with "waisting" of the balloon (arrows) during the initial phases of balloon inflation which has disappeared following full inflation of the balloon (Not shown). [F]. Right ventricular angiography following the procedure demonstrates opacification of the pulmonary artery (PA) and its branches. Also note opacification of pulmonary end of patent ductus arteriosus (D). There was significant tricuspid insufficiency both before and after the procedure. UVC, Umbilical venous catheter.

annulus. The echo data along with angiographic data should ensure that there is no right ventricular dependent coronary circulation. A right coronary artery (Cordis) or a similar guide catheter is placed in the right ventricular outflow tract and a Nykanen radiofrequency perforation catheter (wire) (Baylis, Montreal, Canada) is positioned against the pulmonary valve. After confirming the position of the catheter, low power (5 to 10 watts) radiofrequency energy of one to two second duration is applied with a BMC radiofrequency perforation generator (Baylis), thus perforating the pulmonary valve. The perforation catheter is advanced across the pulmonary valve and then into the branch pulmonary arteries or into the descending aorta via the ductus. A Protrach[tm] Micro catheter (Baylis) (into which the radiofrequency wire was preloaded) is then advanced over the Nykanen radiofrequency perforation catheter and exchanged with a floppy-tipped coronary guide wire that is suited to position the selected balloon dilatation catheter. A balloon angioplasty catheter is advanced over the guide wire and positioned across the pulmonary valve. The balloon is inflated with diluted contrast material (1 in 4), as described in the Critical Pulmonary Stenosis section [2]. Progressively increasing sizes of balloon diameters are usually required, with a final balloon diameter of 6 to 8 mm, depending upon the measured pulmonary valve annular diameter. Various steps in accomplishing the procedure are illustrated in Figure 1.

Results

The feasibility of perforation of the atretic valve varies from one study to the other, reviewed elsewhere [8]. In one large series [19], successful perforation was achieved in 27 out of 30 (90%) patients. In half the patients a modified Blalock-Taussig shunt was required between 2 and 24 days after opening the valve. There were three early deaths and two late deaths. During follow-up, sixteen patients achieved biventricular circulation. The study authors concluded that percutaneous perforation followed by balloon dilatation is a good treatment strategy for neonates with pulmonary atresia provided that there is no right ventricle-dependent coronary circulation and the right ventricular infundibulum is patent.

TRANSCATHETER OCCLUSION OF SHUNTS

Atrial and Ventricular Septal Defects and Patent Ductus Arteriosus

A number of devices to close the atrial [20-23] and ventricular [24] septal defects and patent ductus arteriosus [25-27] have been developed. However, closure of these defects by transcatheter methodology is either not necessary or feasible in the neonate and will not be further discussed.

Superfluous Vascular Lesions

Transcatheter embolization of superfluous vascular lesions, although well-described by the late 1970s [28,29], was by and large a procedure used in adult subjects,

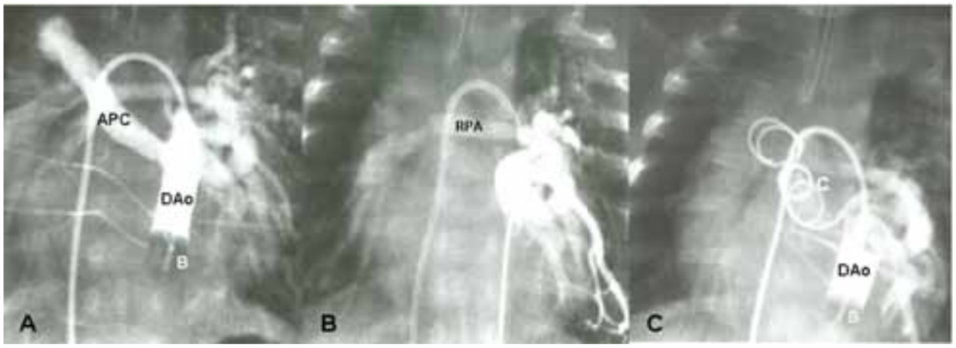

Figure 2. [A]. Selected cineangiographic frame from balloon (B) occlusion aortography in a neonate with severe congestive heart failure demonstrating a large persistent aorto-pulmonary collateral (APC) vessel connecting the descending aorta (DAo) to the right pulmonary artery (RPA). [B]. Dual blood supply to the RPA is demonstrated from an APC on the left side. [C]. Occlusion initially with an 8-mm diameter Gianturco coil (c) and a few smaller coils resulted in complete occlusion of the APC. The infant improved remarkably from congestive heart failure and eventually underwent unifocalization and complete correction.

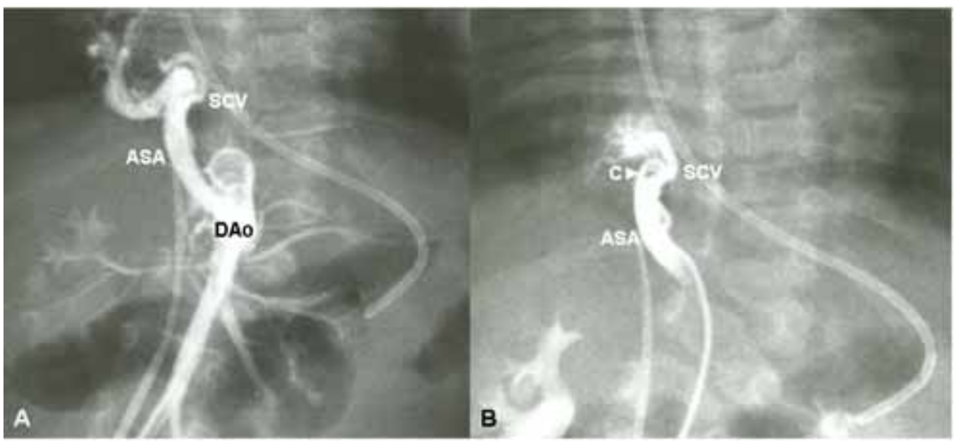

Figure 3. [A]. Selected descending aorta (DAo) cineangiographic frames demonstrating a large anomalous systemic artery (ASA) opacifying a sequestered lung segment in an infant with severe congestive heart failure. [B]. The ASA was occluded with a coil (c) resulting in complete occlusion of the ASA. A small vessel (SV) was not occluded. Following the procedure the infant improved dramatically.

usually performed by radiologists. A number of embolic materials have been used, but the steel coil described by Gianturco and his associates in 1975 [30] has become the embolic material of choice. Transcatheter occlusion has been applied to children to close pulmonary arteriovenous fistulae, aorto-pulmonary collateral vessels, veno-venous collateral vessels, aorto-pulmonary surgical shunts, coronary arterio-venous fistulae, and vessels associated with pulmonary sequestration and hemoptysis [31,32]. While Gianturco coils are most commonly used, other embolic materials such as detachable balloons, devices and more recently Amplatzer vascular plugs are also used.

While not frequent, need for occlusion of superfluous vascular lesions in the neonate does exist and these include: cerebrovascular and hepatic arterio-venous fistulae, multiple aorta-pulmonary collateral vessels (MAPCVS) associated with pulmonary atresia with ventricular septal defect (Tetralogy of Fallot) and anomalous systemic artery associated with pulmonary sequestration/scimitar syndrome. Cerebrovascular and hepatic arterio-venous fistulae are usually dealt with by the neurosurgeons and/or interventional radiologists and will not be reviewed.

MAPCV

In patients with pulmonary atresia or tetralogy of Fallot, MAPCVS arise most commonly from the descending aorta or from brachiocephalic vessels. Whereas the pulmonary blood flow through these vessels is useful in maintaining good systemic arterial oxygen saturation, such vascular connections may become problematic when excessive pulmonary blood flow through these vessels may precipitate congestive heart failure. The procedure involves defining the pulmonary arterial supply and then occluding the collateral vessel(s) after ensuring dual supply to that particular lung segment. Gianturco coils are usually used (Figure 2) although devices and vascular plugs may be useful in such situations. Such aorta-pulmonary collateral vessels are seen in other cardiac defects and even in otherwise normal hearts and can cause significant cardiac dysfunction requiring closure in the neonatal period.

Pulmonary Sequestration

Pulmonary sequestration may either be intralobar or extralobar [33] and is usually associated with Scimitar syndrome [34,35]. The sequestered lung, however, receives blood supply from an anomalous systemic artery, most commonly arising from abdominal or thoracic aorta. Large intrapulmonary shunt may result in congestive heart failure in the newborn. Whereas surgical resection of the sequestered lung along with ligation of the vessel supplying the sequestered lung segment has been the conventional approach, several workers, over the years [32,36-40], employed transcatheter embolization and found successful results. Gianturco coils have successfully been used [32,36-40]. Indication for transcatheter intervention in the neonate is severe or difficult to treat heart failure. Transcatheter coil occlusion (Figure 3) is safe, feasible and effective. The procedure involves performing selective descending aortography to define the vascular supply to the sequestered lung segment and then occluding the vessel(s) with a coil or vascular plug.

STENTS

Balloon angioplasty may be effective in relieving vascular obstructive lesions. However, elastic recoil of the vessel wall may result in ineffective relief of obstruction in some cases. Stents, by exerting radial forces, prevent elastic recoil of the vessel wall and produce more effective relief of obstruction. The concept of the stent was initially proposed by Dotter and Judkins and their associates [41,42] in the 1960s. Clinical use was not established until late 1980s when Palmaz, Sigwart and their colleagues brought it to fruition [43-45]. Pediatric applications of stent technology followed [46,47] and were reviewed in detail elsewhere [48]. The major limitation of stents in the pediatric patient is that the stents do not grow as the child grows, because the majority of stents are metallic. Stents, in addition to keeping open obstructed stenotic vessels may also be used to keep open naturally occurring structures such as patent foramen ovale (PFO) and patent ductus arteriosus (PDA). Potential uses of stents (Table II) in the neonates will be discussed below.

Table III. Ductal-Dependent Cardiac Defects
A. Ductal-Dependent Pulmonary Flow
• Pulmonary atresia or critical stenosis with intact ventricular septum
• Pulmonary atresia with ventricular septal defect
• Severe tetralogy of Fallot
• Tricuspid atresia
• Complex cyanotic heart disease with pulmonary atresia or severe stenosis
• Ebstein's anomaly of the tricuspid valve
• Hypoplastic right ventricle
B. Ductal-Dependent Systemic Flow
• Hypoplastic left heart syndrome
• Severe coarctation of the aorta syndrome
• Interrupted aortic arch

Table II. Potential Uses of Stents in the Neonate
• Obstruction at patent foramen ovale/ atrial septum
• Ductus arteriosus
• Aortic coarctation
• Branch pulmonary arteries
• Miscellaneous

Atrial Septum/PFO

The role of stents in creating or keeping open an atrial defect has been discussed in the section on non-surgical atrial septostomy [1] and will not be discussed further.

Ductus Arteriosus

There are a number of cardiac defects in which the ductus, if it remained patent, would be beneficial, providing pulmonary or systemic blood flow. These lesions are listed in Table III. Pharmacologic means of maintaining the ductus by intravenous infusion of Prostaglandin E1 is quite helpful, but requires prolonged and continuous intravenous access, and more importantly, the effectiveness of PGE1 fades as the neonate ages. Consequently, alternative methods of keeping the ductus open have to be pursued. Balloon dilatation of the ductus was attempted, as reviewed elsewhere [49], but the long-term patency is uncertain. Therefore, stenting of the ductus arteriosus is a logical extension of transcatheter methodology. Stent implantation in experimental animal models [50-54] to maintain ductal patency have been undertaken and have demonstrated that stents are superior to balloon dilatation in maintaining ductal patency [49,52]. Clinical applications followed and include ductal stent implantation for treatment of pulmonary atresia [8,54,55], right ventricular hypoplasia [56], critical pulmonary stenosis [55], other complex heart defects with reduced pulmonary blood flow [55,57] and Hypoplastic left heart syndrome [58,59].

Stent Implantation Procedure

Two groups of lesions (Table III) will require separate consideration. First is the pulmonary oligemia group (ductal dependent pulmonary flow; Table III A), comprising complex cyanotic congenital heart defects with severe pulmonary stenosis or atresia that are not correctable in the neonatal period. The established management practice involves creation of an aorto-pulmonary anastomosis (usually a modified Blalock-Taussig shunt) to alleviate pulmonary oligemia and systemic arterial hypoxemia. An alternative approach is to keep the ductus open by placing a stent in it. Similarly, left heart obstructive lesions, particularly Hypoplastic left heart syndrome patients may be benefited by ductal stents while awaiting for a more definitive procedure or as a part of hybrid procedures [58-63].

Pulmonary Oligemia

Initially, diagnostic cardiac catheterization and selective cineangiography are performed to determine the type of heart defect and sources of pulmonary blood flow. If it is determined that the defect is not correctable in the neonatal period, ductal stent implantation is a reasonable option. Aortograms are reviewed, and if necessary, additional aortograms are performed to define the ductal anatomy and its minimal diameter and length. Straight lateral, sitting-up (15^0 LAO and 35^0 cranial) and 30^0 RAO views are best to define the ductal morphology. This will also establish landmarks for ductal stenting. A #4-French Judkins right coronary artery (RCA) catheter or a cut-pigtail catheter is positioned in the aortic arch and a coronary guide wire (Choice PT Extra S'port (Boston Scientific) or a similar wire) is manipulated into the ductus arteriosus and main pulmonary artery and from there into a distal left or right pulmonary artery. The ductal length is re-measured since its straightening by the

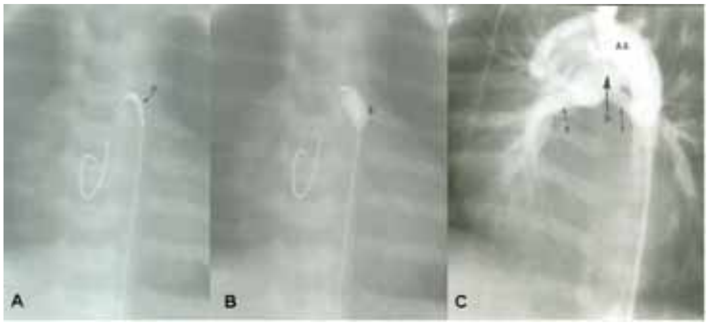

Figure 4. [A]. Selected cinefluorographic frames demonstrating the position of a guide wire which was advanced from the aorta into the right ventricle via the ductus arteriosus and the main pulmonary artery over which an uninflated stent/balloon assembly is deployed. The arrow marks the articulation within the stent. [B]. Note the position of the stent in the ductus while inflating the balloon. [C]. Aortic arch (AA) angiogram shows the stented ductus (St) and good opacification the right (R) and left (L) pulmonary arteries. The main pulmonary artery is not shown.

guide wire may alter its length. The catheter and femoral arterial sheath are removed and replaced with a 4-French long sheath (Cook, Bloomington, IL). A 3.5 to 4.5 mm diameter (depending upon the weight of the baby) coronary stent mounted on a balloon is introduced through the 4-French sheath, over the guide wire, and positioned across the ductus arteriosus (Figure 4A) and the balloon is inflated (Figure 4B), thus implanting the stent into the ductus. The length of the stent should be 1 to 2 mm longer than the measured length of the ductus. A variety of stents have been used in the past and include Palmaz-Schatz articulated (Johnson & Johnson, Warren, NJ), Jostent (JoMed, Ramendingen, Germany), Express (Boston Scientific, Maple Grove, Minnesota), Multi-link Tetra/Penta (Guidant, Santa Clara, California), Cordis JJ (Cordis Europa, Roden, The Netherlands), Medtronic AVE (Medtronic Inc., Minneapolis, MN), liberté (Boston Scientific), Driver (Medtronic), Tsunami (Terumo), NIR coronary (Medinol/SciMed Life, Maple Grove, MN), Coroflex (B Braun Medical, Emmenbruche, Switzerland), Tristar (Guidant, Santa Clara, California), and others depending upon the availability at that particular time at a given institution. Aortography following stent implantation (Figure 4C) is performed to demonstrate the patency of the stent and opacification of the main and both right and left pulmonary arteries. The arterial oxygen saturation is measured.

In nearly 10% of the patients the aortic origin of the ductus may be very proximal (from the undersurface of the aorta) and conventional retrograde trans-femoral arterial access may not be feasible. In such instances, the ductus may be cannulated via an anterograde transvenous route through the ventricular septal defect or via trans-carotid artery cut-down.

Results

Gibbs and associates [54] were the first to report placement of ductal stents; they implanted ductal stents (Palmaz-Schatz) via axillary arteriotomy in two neonates with pulmonary atresia which resulted in improvement of systemic arterial oxygen saturation. Both infants, however, died suddenly within five weeks of stent placement, although the stented ducts were patent. They concluded that: (a) stenting of arterial duct is technically feasible, (b) stenting provides adequate palliation and this technique may prove to be a promising alternative to

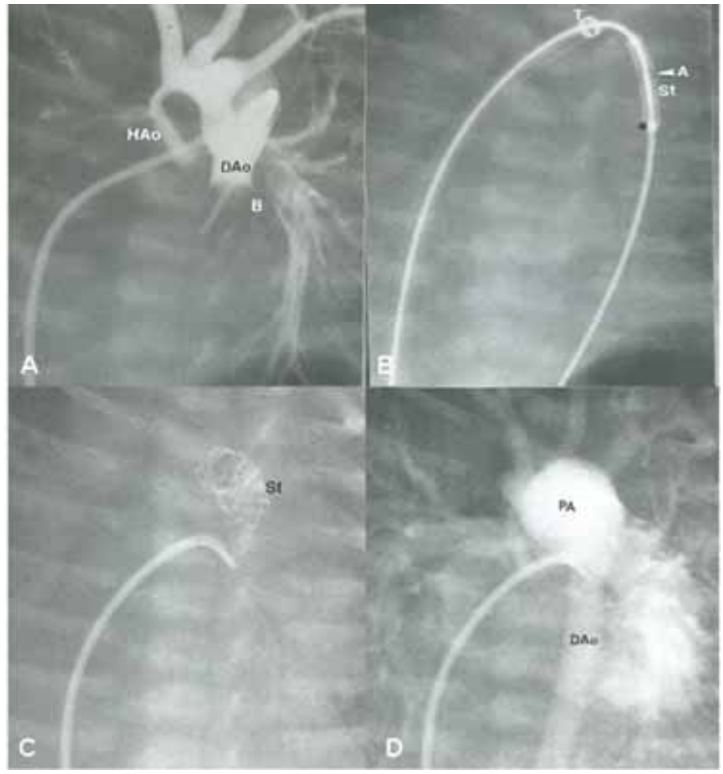

Figure 5. [A]. Selected frame of balloon (B) occlusion descending aortic (DAo) angiogram demonstrating good retrograde opacification of the aortic arch and brachiocephalic vessels and a hypoplastic ascending aorta (HAo). The ductus and left pulmonary artery are also seen, but not labeled. [B]. Selected cinefluorographic frame showing the position of the unexpanded stent (St) in the ductus. The articulation of the stent (A) and tip (T) of the delivery sheath are marked. [C]. The deployed stent (St) in the ductus after removal of the balloon is shown. The catheter is in the pulmonary artery. [D]. Pulmonary artery (PA) cineangiographic frame demonstrating opacification of the descending aorta (DAo) and branch pulmonary arteries. Retrograde opacification of the brachiocephalic vessels and a hypoplastic ascending aorta (not labeled) is also seen.

aorto-pulmonary shunt surgery. Despite initial enthusiasm [54,64], Gibbs et al [65] were discouraged with stenting because of intimal proliferation in the majority of patients, requiring re-intervention. A larger experience reported by Alwi et al [66] demonstrated feasibility, safety and effectiveness of ductal stents. They attempted stenting the ductus in 56 patients, aged 7 days to 2.8 years (30% were neonates) with successful implantation in 91% patients. Complications occurred in 3 (6%) patients. The oxygen saturation improved from 70 ± 14% to 91 ± 7%. At follow-up in 3 to 20 months (mean 10 months), the oxygen saturations remained improved and were 79 ± 5%. Additional interventions such as balloon dilatation of the stent, placement of an additional stent or Blalock-Taussig shunt were performed in 8 (16%) patients. Re-intervention-free rates were 89% and 55% at six and 12 months respectively. They conclude that stenting of the ductus is an attractive alternative to surgical aorto-pulmonary shunts in palliating infants with ductal dependant pulmonary circulation. They also suggested that ductal stenting should not be undertaken if left pulmonary artery stenosis is present.

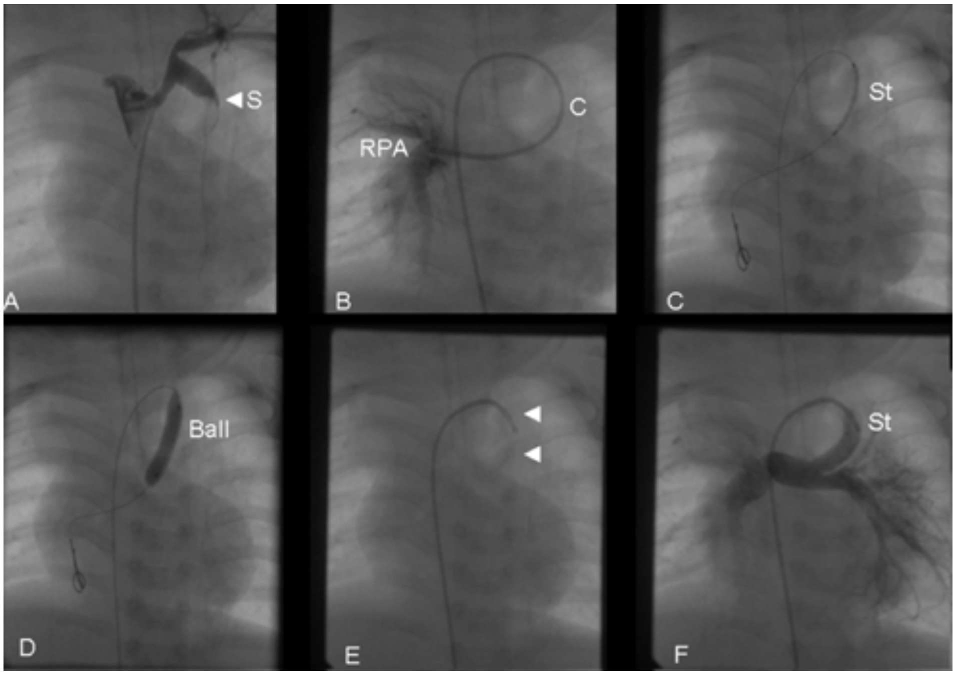

Figure 6. [A]. Selected cineangiographic frame from subclavian artery injection demonstrating stenotic and almost completely obstructed (arrowhead S) Blalock-Taussig shunt. [B]. A catheter (c) is positioned across the Blalock-Taussig shunt into the right pulmonary artery (RPA). [C]. A guide wire has been passed through Blalock-Taussig shunt and its tip positioned in the distal RPA over which a stent (unexpanded) is placed within the Blalock-Taussig shunt. [D]. Same as C except that the stent-coved balloon is expanded. [E]. The balloon is removed showing the deployed stent (arrow heads). [F]. Post-stent implantation angiogram showing the well opacified, widely open stent (St) in the Blalock-Taussig shunt with subsequent opacification of the branch pulmonary arteries.

Comments

Based on our experience and that of others [8,54-57,66] ductal implantation of stent is a technically demanding but a feasible procedure. Inability to cannulate the ductus and constriction of the ductus [64,66], the latter being potentially fatal, may occur. It is important to stent the entire length of the ductus [8,64,66] lest constriction of the unstented ductus may occur later, requiring a repeat procedure. In neonates, the stent should not be expanded to more than 4 mm diameter; larger diameter stents may produce heart failure [18]. The availability of more flexible stents on smaller delivery catheters and recognition that selected use in situations where progressive closure of the stented ductus over a period of months may indeed be beneficial, could rejuvenate the use of ductal stents in the future.

Left Heart Obstruction

The stent implantation procedure is performed anterogradely from the femoral venous route (Figure 5) or via a pulmonary artery purse-string suture during hybrid procedures. It is important to define the ductal anatomy [67] and to cover the entire length of the ductus. Stent diameter is 6 to 10 mm, much larger that that used for pulmonary oligemia patients. Both balloon expandable and self-expandable stents have been used. In most reported studies, palliation is deemed to have been achieved, but the experience is limited. Further studies and experience is required before general use.

Other Uses of Ductal Stents

In addition to the above two groups, ductal stents have also been successfully used to treat pulmonary oligemia secondary to right ventricular outflow tract rhabdomyoma [68] and to retrain the left ventricle in transposition of the great arteries with intact ventricular septum [69].

Aortic Coarctation

Neonates with severe aortic coarctation causing congestive heart failure are candidates for intervention. Surgical intervention has been the main approach to treat these babies. More recently, balloon angioplasty techniques have been utilized in the management of aortic coarctation. Because of the high rate of recurrence seen in neonates [2,70-73], balloon angioplasty in neonates and young infants is reserved for critically ill babies, particularly in those in whom avoidance of anesthesia or aortic cross-clamping required for surgery is beneficial in the overall management [2,74]. To address this issue some cardiologists have used stents [75-78]. Unfortunately, as previously mentioned, the stents, which are metallic, do not grow with the child, and therefore, could not routinely be used in neonates and infants. Biodegradable stents [79,80] may offer a solution; the stents will keep the coarcted aortic segment open for a 3 to 6 month period, when the stents would dissolve. Further experience with this methodology is necessary before the adoption of this mode of treatment.

Branch Pulmonary Artery Stenosis

Stenotic branch pulmonary arteries may sometimes pose problems; these are particularly important in patients destined for a Fontan-type of repair. Near-normal sized pulmonary arteries are mandatory for successful completion of Fontan. Rehabilitating the pulmonary arteries may be undertaken with balloon angioplasty, but, because of lack of uniform response to this mode of treatment, stents have been considered. Again, the growth problems, alluded to in the preceding section, exist. Biodegradable stents or stents that can be expanded to near adult size [81,82] may circumvent this problem. Further studies are awaited to determine the optimum method of management.

Miscellaneous Uses

In some patients with tetralogy of Fallot and MAPCVS, pulmonary oligemia may be relieved by stenting the collateral vessel [83] while awaiting more definitive palliation. Following surgical palliation of pulmonary oligemia with Blalock-Taussig shunts or single ventricle Norwood palliation with Blalock-Taussig or Sano shunts, stenosis may develop at the anastamotic sites or within the connecting Gore-Tex graft, causing hypoxemia. Placement of stents to enlarge the obstructed shunts is feasible and has generally resulted in good outcome [84-88]. An example from our experience is shown in Figure 6. Temporary relief of pulmonary venous obstruction may also be achieved by implantation of stent in the obstructed vertical vein [89].

SUMMARY AND CONCLUSIONS

In this and the previous [1,2] reviews, various transcatheter methodologies available for management of neonates with congenital heart disease have been enumerated and include atrial septostomy procedures, balloon dilatation of stenotic valve or vessel, perforation of atretic pulmonary valve, occlusion of defects or vessels causing cardiac failure and stents to keep open closing fetal circulatory pathways and vascular stenotic lesions. These procedures should complement other medical therapies and surgical interventions. In a given patient, the method selected should be a method that is most likely to provide the best outcome.

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P. Syamasundar Rao, MD
Professor and Director
Division of Pediatric Cardiology
University of Texas/Houston Medical School
6431 Fannin, MSB 3.130
Houston, TX 77030 USA
(P) 713-500-5738
(F): 713-500-5751
P.Syamasundar.Rao@uth.tmc.edu

Congenital Cardiology at ACC.08: Exciting New Program Planned

By John W. Moore, MD, and John F. Rhodes, Jr., MD

Past Annual Scientific Sessions of the American College of Cardiology may have included a strong pediatric and congenital heart disease program track, but this year ACC.08 sets the bar higher by adding on the third day "Congenital Cardiology Solutions 2008" or CCS.08, an exciting new program for those who specialize or are interested in pediatric and adult congenital interventional cardiac catheterization. Inspired by efforts of the ACC Pediatric Cardiology and Adult Congenital Heart Disease Section, CCS.08 will offer a unique blend of traditional programs associated with congenital heart disease and pediatric cardiology topics as well as state of the art and live interventional case presentations on new or controversial interventions. General ACC.08 Sessions for Pediatric and Adult Congenital Heart Disease will begin on Sunday, March 30th and continue through Monday, March 31st. Then, CCS.08 will be held all day on Tuesday, April 1st.

ACC.08 sessions begin on Sunday with a symposium on issues of transition of pediatric CHD patients to adult CHD clinics, co-chaired by Gary Webb, MD, FACC, and Susan Fernandes, MD, and a Meet the Experts Session on Pediatric Circulatory Support Options. Additional symposia will include case presentations, right ventricular outflow tract issues and arrhythmias in adults with CHD, chaired by Ronald Kanter, MD, FACC. Other sessions that day include a congenital surgical technique and outcome session using videos as well as pregnancy and CHD.

On Monday, the program includes an excellent symposium on translational medicine in childhood heart disease co-chaired by Bruce D. Gelb, MD, and Jeffrey A. Towbin, MD, FACC. Other scheduled symposia for Monday include:

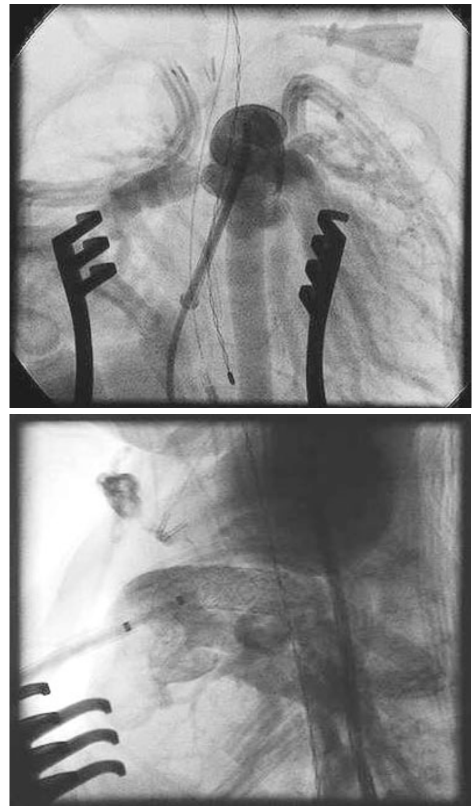
- ***Evaluation and Management of Congenital Pulmonary Vein Stenosis -*** *Co-chairs: Chris Caldarone, MD, and Kathy Jenkins, MD, FACC.*
- ***Sudden Cardiac Death in the Young Athlete -*** *Co-chairs: Barry J. Maron, MD, FACC, and Francis R. Gilliam II, MD, FACC.*
- ***Can We Fix Secondary Pulmonary Hypertension? -*** *Co-chairs: Robyn J. Barst, MD, FACC, and David D. Ivy, MD, FACC.*
- ***Long-Term Outcomes of Aortic Coarctation Repair Strategies -*** *Co-chairs: Michael Landzberg, MD, FACC, and Gary D. Webb, MD, FACC.*

The CCS.08 live interventional case programming on Tuesday will focus on new and/or controversial interventions. The live case presentations will be led by John Cheatham, MD, FACC, and James Lock MD, FACC.

In the morning session, the first interventional case will be a patient with coarctation of the aorta, who will undergo stent implantation. John Cheatham, MD, FACC, and his associates will demonstrate the procedure, transmitting from the Nation Wide Children's Hospital in Columbus, Ohio. The discussions will address the risk and outcome of coarctation stenting and angioplasty, indications for using covered stents and redilation of aortic stents years after implantation and coarctation stenting in older patients. The second morning session case will be a patient with Tetralogy of Fallot after repair with pulmonic insufficiency and impending right ventricular failure. James Lock, MD, FACC, and Audrey C. Marshall, MD, at Boston Children's Hospital will demonstrate implantation of a Medtronic/Bonhoeffer Stent Valve.

In-between live cases there will be a session focusing on recently completed or ongoing FDA trials of devices designed for treatment of congenital heart defects as well as new techniques available to the pediatric and adult congenital patient.

The afternoon session will feature cutting-edge procedures, which are performed and advocated by only a small number of centers. The first afternoon live case will be a patient with hypoplastic left heart syndrome undergoing a Hybrid Palliation and Fetal Valvuloplasty, again performed by John Cheatham, MD. The second afternoon case, which will be equally controversial, involves James Lock, MD, FACC, and Audrey C. Marshall, MD, at Boston Children's Hospital performing a live fetal intervention.



The Program will feature a live Hybrid Procedure from Nationwide Children's Hospital. (Figure shows AP [top] and LAT [bottom] Cineangiogram Frames of Hybrid Palliation of HLHS courtesy of John Moore, MD, Rady Children's Hospital, San Diego).

CCS.08 promises to be one of ACC.08's most exciting program additions. Developed by pediatric and adult congenital heart disease cardiologists and surgeons, it is designed to address quality, collaboration and long term patient care issues that are faced regularly by pediatric cardiologists, adult congenital cardiologists, congenital interventional cardiologists and cardiac surgeons.

One of the major goals of this CCS.08 congenital interventional programming is to complement the congenital sessions offered by the combined I2/SCAI program which will also be at the Chicago Convention Center on March 30th and 31st along with the main ACC Meeting. The I2/SCAI Program will feature a congenital interventional track which combined with the

The Program will feature a live fetal intervention from Boston Children's Hospital. (Echo frame shows needle perforation of fetal left ventricle courtesy of Wayne Tworetzky, MD, Children's Hospital Boston).

CCS.08 interventional day can comprise a full three day congenital interventional meeting. Combined registration is available through links in the ACC or the SCAI websites.

Advance registration closes February 20, 2008. Register for Congenital Cardiology Solutions and plan your educational experience online at www.acc08.acc.org.

Moore is chair and Rhodes is a member of the CCS.08 planning committee.

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Corresponding Author

John W. Moore, FACC, FSCAI
Rady Children's Hospital and
University of California, San Diego
jmoore@rchsd.org

John F. Rhodes, Jr., MD, FACC
Duke University Medical Center

Medical News, Products and Information

Medtronic Foundation To Fund School Programs That Save Lives From Sudden Cardiac Arrest

The Medtronic Foundation announced new grant guidelines for its HeartRescue program. In 2008, funding priority will be given to school programs that educate students about sudden cardiac arrest and prepare them to act in an emergency.

Sudden cardiac arrest (SCA), an abrupt loss of heart function caused by irregular electrical activity in the heart, is a leading cause of death throughout the world. Because survival depends greatly on immediate response with CPR and automated external defibrillators (AEDs), prompt action from bystanders is integral to improve overall community survival rates.

To increase the number of bystanders trained in CPR and AED use, the 2008 HeartRescue program will focus U.S. grants on schools, school districts, government agencies, and non-profit organizations that develop comprehensive school-based programs that will prepare a new generation of people to recognize SCA when it happens and take action when it does.

Priority funding will be given to new initiatives that demonstrate effective education and training programs or emergency response planning that would include CPR/AED training for designated responders, as well as students at one or more grade levels each year. Grant funds may not be used to purchase AEDs.

Guidelines for Canada and Europe will also include school-based initiatives, as well as funding first responder and public access defibrillation efforts, to meet the different needs of each country.

During the past eight years, the Medtronic Foundation has partnered with more than 150 communities and organizations around the world, providing more than $4 million in HeartRescue grants. These groups promote the benefits of early defibrillation and work to train community members on CPR and AED use.

The deadline for application is Feb. 15, 2008. Applications and additional program guidelines are available here. www.medtronic.com/foundation/programs_hr.html

Interventional Cardiologists at Rush University Medical Center Investigating Whether a Heart Procedure May Be The Key To Relieving Migraines In Patients With Severe Headaches

Interventional cardiologists at Rush University Medical Centerare investigating whether a heart procedure may be the key to relieving migraines in patients with severe headaches.

Earlier studies have indicated that there may be a link between a particular congenital heart anomaly, a patent foramen ovale (PFO), and migraine. Some patients – particularly those suffering from migraine with aura- have had reductions in the frequency and severity of migraines following closure of their PFO. In the Rush study, interventional cardiologists will close the PFO in the catheterization lab using an implant that acts like an umbrella, crossing over the chambers in attempt to occlude or close the flaps together.

Principal investigator Dr. Clifford Kavinsky and his team have started enrolling patients for the clinical trial, called MIST II (Migraine Intervention with BioSTAR). The team is looking for individuals with severe migraines to see if they may have a patent foramen ovale.

"In a smaller predicate trial of similar design conducted in the United Kingdom, headache specialists observed a significant treatment effect with 42% of patients experiencing a 50% reduction in migraine headache days and 37% reduction in frequency and duration of migraine attacks," says Kavinsky. "The combination of the bioabsorbable septal repair implant and the longer duration of the MIST II Trial are expected to provide even more positive outcomes. Finding an effective therapy for this group of patients who are refractory to medical therapy would be an important advance in the treatment of migraine."

The trial is a prospective, randomized, multi-center, controlled study. The double-blinded trial is designed to randomize approximately 600 migraine patients with a PFO to either PFO closure with the bioabsorbable technology or a control arm.

Individuals interested in additional information about this clinical trial should call (312) 942-9489, Monday through Friday between 9 am and 4 pm CT, or visit the MIST II website at www.pfo-migraine.com.

Do you or your colleagues have interesting research results,observations, human interest stories, reports of meetings, etc. that you would like to share with the congenital cardiology community?

If so, submit a brief summary of your proposed article to Congenital Cardiology Today at: Article@CCT.bz The final manuscript may be between 400-3,500 words.

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Headquarters
9008 Copenhaver Dr. Ste. M
Potomac, MD 20854 USA

Publishing Management
Tony Carlson, Founder & Editor
TCarlsonmd@mac.com
Richard Koulbanis, Publisher & Editor-in-Chief
RichardK@CCT.bz
John W. Moore, MD, MPH, Medical Editor/ Editorial Board
JMoore@RCHSD.org
Jeffrey Green, Contributing Editor

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PICS-AICS 08

July 20-23, 2008
Bellagio, Las Vegas

PEDIATRIC AND ADULT INTERVENTIONAL CARDIAC SYMPOSIUM

Course Directors: *Dr. Ziyad M. Hijazi, Dr. William E. Hellenbrand, Dr. John P. Cheatham, & Dr. Carlos Pedra*

- FOCUSING ON THE LATEST ADVANCES IN INTERVENTIONAL THERAPIES FOR CHILDREN AND ADULTS with congenital and structural heart disease, including the latest technologies in devices, implantable valves, stents and balloons. Special sessions will provide an in-depth focus on septal defect closure, coarctation stenting, hybrid intervention for HLHS and fetal intervention.
- SPECIAL SESSIONS will be dedicated to the care of adults with congenital heart disease.
- HOT DAILY DEBATES between cardiologists and surgeons on controversial issues in intervention for congenital and structural heart disease.
- The popular session of "MY NIGHTMARE CASE IN THE CATH LAB"
- LIVE CASE DEMONSTRATIONS featuring approved and non-approved devices will be transmitted daily from many cardiac centers around the world. During these live cases, the attendees will have the opportunity to interact directly with the operators to discuss the management options for these cases.
- BREAKOUT SESSIONS for cardiovascular nurses and CV technicians.
- MEET THE EXPERT SESSION, held on Sunday, will give attendees the opportunity to discuss difficult cases with our renowned faculty.

ACCREDITATION *The Society for Cardiovascular Angiography and Interventions is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to sponsor continuing medical education for physicians.*

Abstract Submission Deadline is March 15, 2008.

For registration and abstract submission go online to ***www.picsymposium.com***

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