CONGENITAL CARDIOLOGY TODAY
Timely News & Information for Congenital/Structural Cardiologists & Cardiothoracic Surgeons Worldwide

International Edition
Vol. 22 - Issue 10

October 2024

Table of Contents

1 **How I Do It: Tips, Tricks, and Techniques – Internal PA Banding ("Flow Restrictors")**
David L. Bloom, MD & David Balzer, MD

6 **Book Review – The Open Heart Club: A Story About Birth & Death & Cardiac Surgery**
John W. Moore, MD, MPH

8 **Medical News**
- HonorHealth Hospitals Among Nation's First to Install Radiation Shields for all Cardiovascular Interventions
- ACHA Welcomes Erin Walsh-Beguin to the Board of Directors
- Understanding and Addressing Neurodevelopmental Challenges in Congenital Heart Disease
- Robotic Arm-Based, 5G-Enabled Remote Echocardiograms Show High Diagnostic Accuracy

12 **Meeting Calendar**

How I Do It: Tips, Tricks, and Techniques – Internal PA Banding ("Flow Restrictors")

A PICS Society Education Series

David L. Bloom, MD & David Balzer, MD

Introduction

Pulmonary artery banding (PAB) is a technique used to control pulmonary blood flow in patients with complex single ventricle anatomy, or patients who will require complex biventricular repairs later in infancy to reduce surgical mortality. Although historically a surgical procedure, a transcatheter approach to internal PAB has been shown to be feasible. The first reports of transcatheter stage I palliation using a modified Amplatzer device were published in 2001;[1] however, the concept of transcatheter PAB or pulmonary flow restrictors (PFR) continues to be an area of ongoing research. The use of modified Microvascular Plugs (MVP) (Medtronic Inc., Minneapolis, MN) was first reported in a swine model in 2019.[2] This study demonstrated the feasibility of using the modified MVP for PFR. Importantly, the study demonstrated that this technique allowed for transcatheter retrieval of the device up to 9-12 weeks following implantation, without significant distortion of the pulmonary artery (PA) anatomy. There have been small case series (Giessen, Germany, Washington University in St. Louis)[3,4] reporting the use of a modified MVP for PFR with mixed results. With further development of technique and expansion of use, it is possible that transcatheter PFR using the widely available MVP will be a legitimate option for patients with single ventricle physiology, or high risk two-ventricle patients with pulmonary overcirculation.

Anticipated Challenges of the Procedure

- Device positioning: may jail upper branch of PA (although this is typically not an issue since the distal portion of the device is uncovered) or migrate distally in PA after device release. Therefore, appropriate device sizing is critical.
- Retrieval: Snares should be available in case retrieval is necessary. Retrieval may be possible up to 12 weeks after the procedure.[2]
- Thrombosis: Although this has not been an issue in our experience, the patient should be heparinized for the procedure and antiplatelet therapy should be considered following device deployment.

TIP 1 – Planning and Preparation

1. ***Access***
   - 4 or 5 Fr. venous access (typically femoral) is required for this procedure
2. ***Imaging***
   - Baseline echocardiogram and CXR should be reviewed prior to the procedure
   - Additional imaging is not required. If a CTA is obtained, this can be used to estimate the size of the MVP

OCTOBER 2024

International Edition Vol. 22 - Issue 10

TABLE OF CONTENTS

1 **How I Do It: Tips, Tricks, and Techniques – Internal PA Banding ("Flow Restrictors")**
David L. Bloom, MD & David Balzer, MD

6 **Book Review – The Open Heart Club: A Story About Birth & Death & Cardiac Surgery**
John W. Moore, MD, MPH

8 **Medical News**
- HonorHealth Hospitals Among Nation's First to Install Radiation Shields for all Cardiovascular Interventions
- ACHA Welcomes Erin Walsh-Beguin to the Board of Directors
- Understanding and Addressing Neurodevelopmental Challenges in Congenital Heart Disease
- Robotic Arm-Based, 5G-Enabled Remote Echocardiograms Show High Diagnostic Accuracy

12 **Meeting Calendar**

3. ***Multidisciplinary Discussion***
   - Discussion with cardiology, cardiothoracic surgery, anesthesia, etc. is important to review indications for procedure, and all additional options for each case

TIP 2 – Tools Needed

Sheaths

- 4 or 5 Fr. venous access (typically femoral) is required for this procedure

Catheters

- 4 or 5 Fr. catheters such as a cobra, JR 2 coronary catheter or an angled glide catheter
  - The MVP 5Q, and 7Q can be delivered through a 4F catheter (recommended inner diameter (ID) of 0.027" and 0.041" respectively)
  - The MVP 9Q will require a 5 Fr. catheter (recommended ID of 0.043")

Devices

- 5Q, 7Q, and 9Q MVP device. These devices will need to be modified to create a fenestration. This is done by removing a portion of the PTFE membrane as described by Khan, et al[2] or by using an eye bovie as described by Nageotte et al.[4] Our recommendation is to create a hole no larger than 3 mm in diameter **(Figure 1)**. More recent reports suggest targeting hole closer to 1-2mm to avoid overcirculation.

TIP 3 – How I Do It

Details of the Technique

- Obtain femoral venous access using 4 or 5 Fr. sheath.
- Using a JR-2 or cobra catheter and 0.035 Hi Torque Floppy wire, position catheter into the MPA.
- Perform angiogram in MPA to delineate PA anatomy and obtain measurements.
- Select MVP device based on measurements. We recommend oversizing the device to reduce the likelihood of distal device migration. For pulmonary arteries < 4.5 mm use a 5Q device, >4.5-6.5 mm use 7Q device, >6.5-8.5 mm use 9Q.
- Using Eye Bovie, cauterize 2-3mm hole in side cell of device.
- Position catheter in selected PA and deploy device in

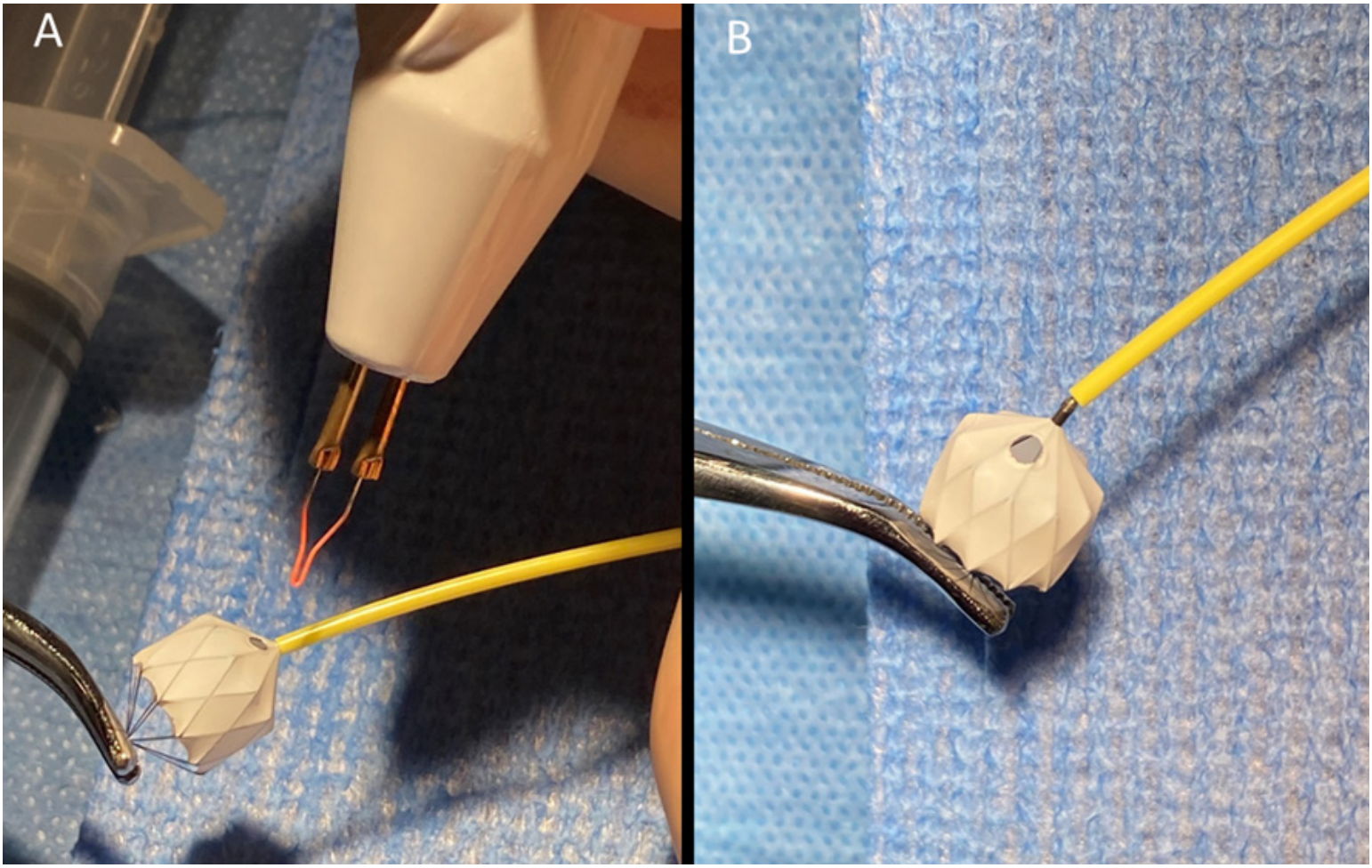


FIGURE 1 Modified Medtronic Microvascular Plug (MVP)
A). *Modification of one PTFE cell on inflow portion of device using low temperature fine tip Eye Bovie (Symmetry Surgical, Antioch, TN) cautery device to create 2-3mm hole.*
B). *This example demonstrates the location and size of hole on MVP device.*

proximal pulmonary artery. We have found that the device frequently appears to jail upper lobe branches on angiography, however there is continued flow as the distal portion of the MVP is uncovered **(Figure 2)**.
- Contrast injections through the delivery catheter prior to device release are used to assist in positioning.
- Release device from delivery cable and perform angiogram to confirm device position.
- Repeat process on contralateral PA.
- Echocardiography should be used at time of procedure to evaluate velocity of flow into branch PAs. (Ideally > 3.0 M/sec with diastolic continuation). This should be performed prior to release of the device so that they may be modified if they are not restrictive enough. This is a critical step in the process.
- Post-procedure imaging includes CXR, and echocardiogram.

Pitfalls to Avoid

- The device may migrate distally which may jail side branches, or expose proximal arteries to high pressure[4] **(Figure 3)**.
- In the study by Khan et al., only 50% of the devices were retrievable via catheter approach at 12 weeks after insertion. It is unclear how long the device can be in place and still be removed in the cath lab or at time of surgery.
- Undersizing, or creating too big of a hole in the MVP may not prevent pulmonary over-circulation. This can be avoided with the use of echocardiography during the procedure.

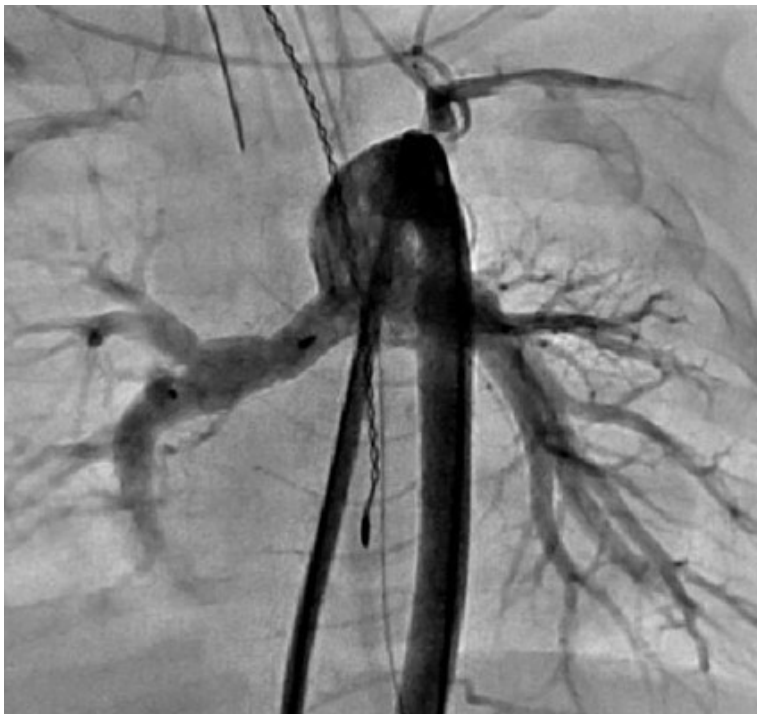


FIGURE 2 Angiographic evaluation of flow restrictors two weeks following placement. *The PFR in the RPA jails the right upper pulmonary artery (RUPA), however this image demonstrates continued flow into the RUPA.*

- Maintaining position of the delivery catheter during device deployment can be challenging. A long sheath positioned in the MPA can be used to support the delivery catheter.

TIP 4 – What Complications to Expect and How to Deal with Them

We have experienced device migration into the distal PA, as well as jailing of branches off of the PA, and this may require device retrieval and re-implantation acutely, or at a later time. Device retrieval is possible using an Amplatz Goose Neck Snare (Medtronic Inc, Minneapolis, MN) by capturing the proximal radiopaque marker on the MVP.

In our experience, despite attempts at creating a small hole in the modified MVP to limit pulmonary blood flow, some patients are still exposed to a significant left-to-right shunt, leading to pulmonary overcirculation and high mean PA pressure necessitating additional intervention (replacement of MVP) and/or medical management. This can be avoided by intraprocedural

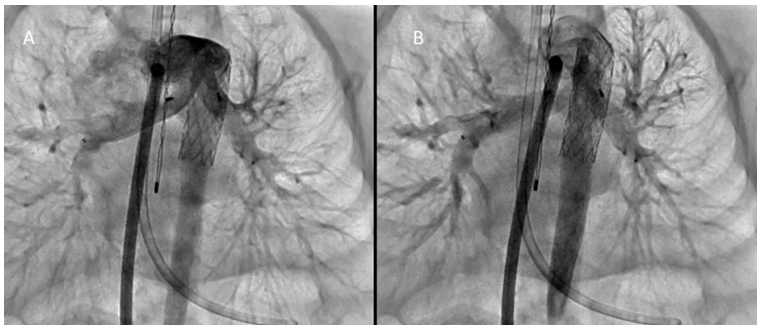


FIGURE 3 ***A).*** *Angiographic evaluation of PFRs through a long sheath in the MPA. This first image better demonstrates jailing of the left upper pulmonary artery, with continued flow of contrast into this branch.*
B). *This image demonstrates the migration of PFR distally and unrestricted flow to the RUPA.*

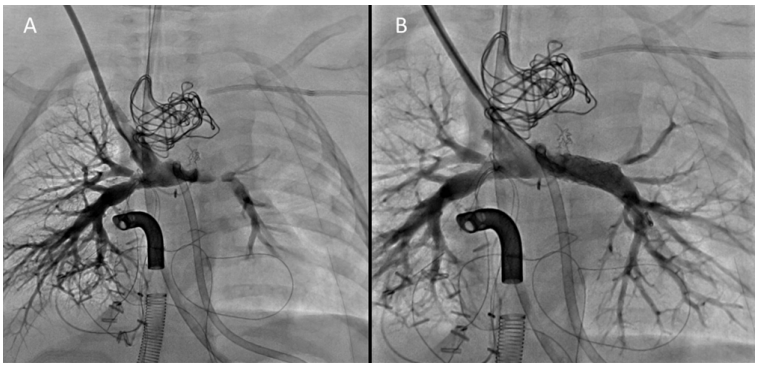


FIGURE 4 Angiographic evaluation of pulmonary arteries following comprehensive stage II palliation and surgical removal of PFRs.
A). *Angiogram in SVC demonstrates mild proximal RPA distortion, and moderate to severe LPA stenosis.*
B). *Angiogram performed following 7mm stent placement in LPA showing significant angiographic improvement.*

echocardiography to ensure that the PFRs are adequately restrictive prior to leaving the cath lab.

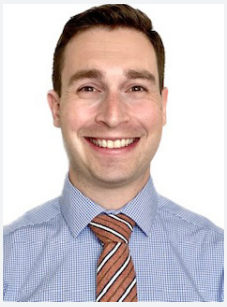
After removal of the MVP either transcatheter or at time of surgical intervention, it is possible that there will be stenosis and deformation of the branch PA anatomy **(Figure 4)** requiring catheter intervention and stenting.

Summary

The use of transcatheter PFRs has the potential to allow for a totally percutaneous Stage I approach in patients with single ventricle anatomy, and may allow for delaying surgical intervention in complex biventricular repairs in patients at high risk due to weight, age, or complex anatomy. There is limited data on the use of the modified Medtronic MVP, however it has proven to be a feasible quality option due to its accessibility and relative ease of use. Operators should be aware of the challenges and potential complications related to this procedure as described above. Ongoing research and development is necessary to further perfect the technique and devices used for this transcatheter procedure; additional studies comparing surgical PAB and transcatheter PFR are warranted as well.

References

1. Chan, K.C., C. Mashburn, and M.M. Boucek, Initial transcatheter palliation of hypoplastic left heart syndrome. Catheter Cardiovasc Interv, 2006. 68(5): p. 719-26.
2. Khan, A.H., et al., Utility of the Medtronic microvascular plug as a transcatheter implantable and explantable pulmonary artery flow restrictor in a swine model. Catheter Cardiovasc Interv, 2019. 93(7): p. 1320-1328.
3. Schranz, D., et al., Hypoplastic Left Heart Stage I: No Norwood, No Hybrid. Circulation, 2020. 142(14): p. 1402-1404.
4. Nageotte, S., et al., Total Transcatheter Stage 1: A Word of Caution. Pediatr Cardiol, 2021. 42(6): p. 1410-1415.



DAVID L. BLOOM, MD

Pediatric Interventional Cardiologist
Assistant Professor, Department of Pediatrics
University of Utah
Primary Children's Hospital
Salt Lake City, Utah, USA

DAVID BALZER, MD, FPICS, MCSCAI

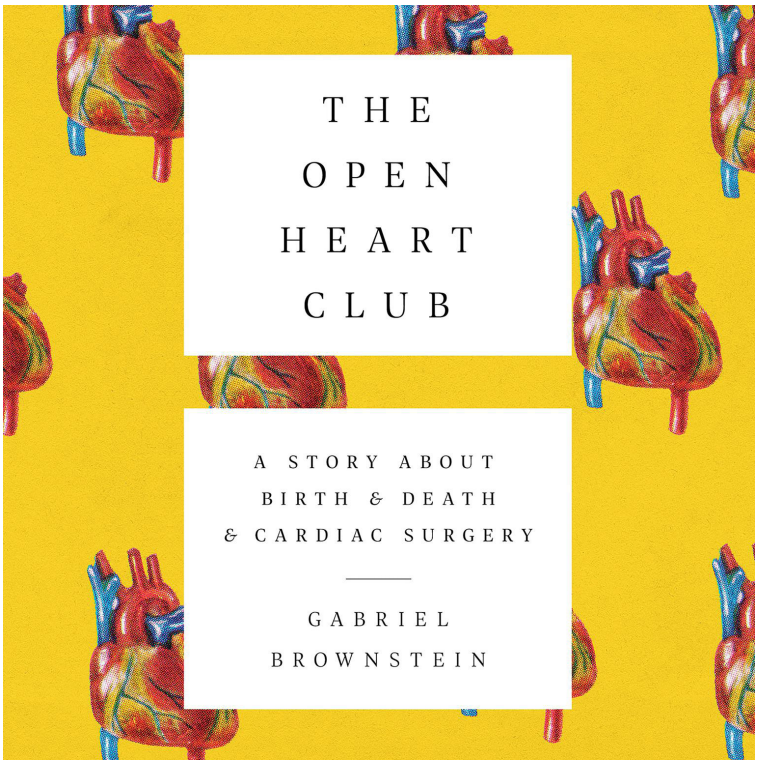
Professor of Pediatrics
Washington University School of Medicine
St. Louis, Missouri, USA

Book Review – The Open Heart Club: A Story About Birth & Death & Cardiac Surgery

By Gabriel Brownstein (published 2019)

John W. Moore, MD, MPH

Gabriel Brownstein is a Professor in the English Department at St. John's University in Queens, New York. He teaches courses in fiction and science writing and in contemporary literature. He is also an acclaimed author who has penned several novels and short stories. He is best known for *The Curious Case of Benjamin Button, Apt.3W*, an anthology of short stories which won the PEN/Hemingway Award in 2002. *The Open Heart Club*, however, is a change of genre. It is a compelling personal memoir, the story of Gabriel Brownstein's life as a patient with Tetralogy of Fallot.



Brownstein was born in New York City in 1966. As a newborn, his condition was not identified. At one month, his pediatrician noticed a heart murmur, and she referred him to Dr. Lucy Swift, one of Helen Taussig's early trainees. Based on examination and a Chest X-ray, Swift diagnosed Tetralogy of Fallot (TOF). She referred him to Dr. James Malm at Columbia. At the time of Brownstein's referral, Dr. Malm had only been performing TOF repairs for a few years. (The Blalock-Taussig-Thomas shunt was first performed in Baltimore in 1944, and the first open-heart repair of Tetralogy of Fallot was performed in Minneapolis in 1954.) In 1966, heart surgery to repair TOF was risky and still relatively rare. Brownstein was fortunate that Malm and Columbia were early adopters. Malm informed Brownstein's parents that due to size limitations, Gabriel would have to wait for repair until he was five years old. If he required treatment earlier, it would have to be a shunt.

Brownstein had open-heart surgery to repair TOF (VSD closure and Right Ventricular Outflow Tract enlargement) in 1971, when he was five-years-old. Subsequently, his doctors detected enlargement of the right side of his heart. In the 1970's and early 1980's right heart enlargement due to pulmonary insufficiency after TOF repair was considered relatively benign. Nevertheless, the size and function of his heart became of concern to his cardiologists. He was monitored regularly with ultrasounds and occasional catheterizations throughout his teens and twenties. In 1999, when he was 33-years-old, he had surgery to implant a porcine valve in the Right Ventricular Outflow Tract because of severe progressive right heart enlargement. Also, around this time, he developed episodes of persistent, symptomatic ventricular tachycardia. This problem was addressed by defibrillator implantation and catheter ablation a few years after his valve placement. Eventually, just a short time before completing this book, Brownstein had an Edwards Sapien Valve placed percutaneously inside the deteriorating porcine valve.

Brownstein's father was a psychiatrist who subscribed to an edict Karl Menninger had promulgated: the "best thing to do with a condition like mine--a bizarre, unheard-of condition—was never to say a word about it. To say its name would be to make me sicker." During his earliest years, Brownstein grew up under the yoke of being smaller and less energetic than his peers.

Meanwhile, the adults around him pretended that he was a normal child. Denial was his parents' coping mechanism.

Recounting his own recollections, Brownstein summarizes his life experiences after surgery on page 31:

> *The first half of my life, from my first open-heart-surgery when I was five to my second when I was in my mid-thirties, was spent mostly in denial that I had any kind of heart problem. The second half has been punctuated by regular visits to the operating table. What's that been like?*
>
> *Scary at times, but on the whole, great. Lucky. Privileged. Like your life, dear reader, only more so, lived (like yours) with the support of medicine and in the shadow of death. I have a job, two kids, and a happy marriage. I climb mountains up above the tree line. I ride my bike around New York City. In yoga classes, I stand on my head. I take five pills a day, and my torso is scarred, and I need to go into an ambulance every so often, and more often into an operating room, and medical devices lodge under my skin, but you can't see any of that when I have a shirt on.*
>
> *You get used to it. The miracle of modern medicine is a little like the miracle of modern flight. Time in hospitals can seem a lot like time in airports. You sit in waiting rooms. You get antsy in your seat. There's a lot of taking off shoes and going into scanning machines. You remove all the change in your pocket before you get weighed. People poke at you and ask the same questions every time: Swelling in your feet? Shortness of Breath? Trouble climbing stairs? The ceremony becomes a recitation you half attend to, like the flight attendant's ritual performed with the safety belts and oxygen masks and floatation devices under your seat, until all of a sudden—CATASTROPHE!!! The engines are dying! Cabin pressure fails! We're going to plummet 39,000 feet! Then the plane rights itself. The crisis passes. You're above the clouds again, cruising at five hundred miles per hour, with your legs uncomfortable, all the way from New York to Los Angeles.*

Most of the book, details these life experiences. To be sure, he has a happy, satisfying life. However, it has been difficult and unique in the ways common amongst many congenital heart disease survivors. At some point early on, Brownstein discovered that the "repair" he had at five years old, was not really a fix. He has significant lingering heart problems. After a childhood honeymoon period, symptoms of dizziness, shortness of breath, chest pain and palpitations emerge portending onset of heart failure and arrythmias. Periodic trips to his cardiologist and trips for second opinions haunt the "denial" period. Episodes of crisis and near death disrupt his more recent years. Despite all the trials, Brownstein remains upbeat. He credits modern congenital heart disease care and technology with his longevity and relative well-being, and he derives the inspiration for this memoir from his life story as a heart patient.

Brownstein punctuates his rendering of personal experiences with detailed historical summaries of the contributions of congenital cardiology and congenital heart surgery pioneers. He provides a rather comprehensive review of those who described congenital heart defects and developed treatments, surgeries, or technologies designed to treat these defects. There are too many to cite here, but among others, the story of Helen Taussig, Alfred Blalock and Vivian Thomas and their collaboration in developing the Blalock-Taussig-Thomas shunt is a classic.

The Open Heart Club ranks amongst the very best books which focus on life experiences of congenital heart disease patients. This book is comfortably in a class with the likes of The Immortal Bird by Doron Weber. Gabriel Brownstein's memoir should be required reading for all members of the congenital heart community.

JOHN W. MOORE, MD, MPH

Emeritus Professor of Pediatrics,
UC San Diego School of Medicine
Director of Cardiology,
Rady Children's Hospital (2006-2021)
Medical Editor, Congenital Cardiology Today
San Diego, CA, USA
jwmmoore1950@gmail.com

HonorHealth Hospitals Among Nation's First to Install Radiation Shields for all Cardiovascular Interventions

Shields will Protect Doctors, Nurses and Technicians From Repetitive Exposure to Low-Level Radiation Used to Guide Non-Surgical Heart and Blood Vessel Procedures

HonorHealth hospitals will soon be among the nation's first equipped with advanced radiation protection shields at all campuses that perform cardiovascular interventions, in which low-level X-ray radiation is used to guide catheters during non-surgical procedures.

Such shields have already been studied and used for nearly three years through the HonorHealth Research Institute, where published clinical trial results have convincingly demonstrated physician radiation exposure reduced to near undetectable levels. Researchers have concluded this may potentially reduce the risk of cancer and orthopedic injuries associated with repetitive exposure to low-level radiation.

"We've been using it successfully, and now we've made the decision to do this more broadly at multiple HonorHealth campuses," said David G. Rizik, MD, Medical Director of the Research Institute's Cardiovascular Research Division, a world leader in studies tracing the dangers of occupational radiation exposure among medical professionals.

A multiple Emmy Award winner, Dr. Rizik is the narrator and a co-producer of an hour-long documentary, Scattered Denial: *The Occupational Dangers of Radiation*, which is being aired nationwide on PBS. The documentary airred locally on Sept. 10th on Arizona PBS-KAET (Channel 8). Dr. Rizik discussed the documentary on the station's Arizona Horizon public affairs program.

In addition to documented links to various cancers suffered by interventional laboratory personnel, Dr. Rizik said, they also are at risk for various repetitive orthopedic injuries from wearing heavy leaded aprons, the current protection intended to reduce radiation exposure.

"We have people sustaining orthopedic injury every day," he said. "We have women in the catheterization laboratory who want a safer environment in case they get pregnant."

HonorHealth Leadership Supports Move

"HonorHealth is proud to be a national leader in efforts to protect the health and safety of our workforce, and securing these radiation shields is just the latest example of our commitment," said HonorHealth CEO Todd LaPorte.

John Neil, M.D., HonorHealth's executive vice president, chief physician executive and network strategy officer, also was a practicing clinical vascular and interventional radiologist for two decades: "Our Mission is to improve the health and well-being of those we serve, and that includes protecting the health and well-being of those who dedicate their professional careers to saving lives and caring for others."

Mark A. Slater, Ph.D., CEO of the HonorHealth Research Institute, praised the adoption of the new radiation protection systems and the Institute's groundbreaking research, led by Dr. Rizik, in documenting the dangers faced by medical personnel.

"While we've seen dramatic technological advances in heart treatments, there have been few improvements in our ability to protect our physicians and nurses from the deleterious effects of radiation exposure," said Dr. Slater, who also is HonorHealth's Vice President of Research. "Accelerating medical innovation to enhance safety, quality of care, and patient outcomes is core to the mission of HonorHealth Research Institute."

Shields at Four More Hospitals

Radiation shields have been available during clinical trials at the Institute, headquartered at HonorHealth's Scottsdale Shea Medical Center.

Additional shields are being purchased or are planned for installation at four additional HonorHealth medical centers: John C. Lincoln, Deer Valley, Scottsdale Osborn and Scottsdale Thompson Peak.

Mark Hansen, Vice President of Business Development for Image Diagnostics, the Fitchburg, Mass., manufacturer of the Protego Radiation Protection System, said the shields list for about $130,000, which includes a $30,000 Ray Safe Realtime dosimetry system that lets medical personnel know their exposure to radiation, if any, and if there is a potential radiation leak.

HonorHealth has applied to the Arizona Department of Health Services to approve using the radiation shields without also wearing the traditional heavy lead aprons, which are suspected of causing knee, hip and back injuries. Additional studies of apron use are planned at the Institute.

"HonorHealth is making a most powerful statement that they are prioritizing workplace safety; physician and nurse wellbeing and safety," Dr. Rizik said. "It's a message not only for Arizona, but also for the rest of the nation."

ACHA Welcomes Erin Walsh-Beguin to the Board of Directors

The Adult Congenital Heart Association (ACHA) – whose mission is to empower the congenital heart disease (CHD) community by advancing access to resources and specialized care that improve patient-centered outcomes – has appointed Erin Walsh-Beguin to its Board of Directors.

Diagnosed in one in 100 births, CHD is the most common birth defect and a chronic illness that includes a range of simple, moderate, and complex heart defects that need to be monitored throughout a patient's life. ACHA serves and supports nearly two million adults with congenital heart disease – along with their families and the medical community – with education, outreach, advocacy, and research.

Walsh-Beguin, who calls herself "an adult who has been blessed with incredible health and a story of surviving CHD," has been involved with ACHA through the Phoenix Walk for 1 in 100, the organization's charity walks program. Walsh-Beguin was born with multiple heart defects and had surgical interventions as a child—at just 10 months and four years old.

"I am proud of my repairs," said Walsh-Beguin. "And organizations like ACHA, who bring awareness, help to put faces and stories to CHD. Sometimes all a person or family needs is to see someone else who can relate to them or their journey, and that starts to build a community. As a Board member, I genuinely hope to use my voice across a broader platform to help continue the organization's mission and perhaps to be someone another patient can look to for support."

As someone who was seen regularly by pediatric cardiologists but fell out of care as an adult, Walsh-Beguin says she was fortunate enough to be seen by a cardiologist during pregnancy who recognized that her heart was unique and referred her to a specialized adult CHD center. Because of this, she says, "Over the years, I have felt a yearning to advocate for more awareness around CHD."

Professionally, Walsh-Beguin has 20+ years of progressive experience in full cycle recruiting and operations. Currently, she is Senior Director of Global Recruiting Operations & Employer Brand at GoDaddy.com LLC. As a member of the Board of Directors, Walsh-Beguin joins a dedicated group of professionals who oversee the organization's leadership and strategies in an effort to advance ACHA's mission and advocate for people living with CHD.

"We are thrilled to welcome Erin to the Board of Directors, as her professional experience surrounding her business knowledge and skills fills a gap in our expertise," said ACHA President and CEO Mark Roeder. "Through Erin's work with Walk for 1 in 100, she has shown to truly be an HR expert with our supporters, too, and we are looking forward to her continuing to build more of ACHA's people programs, like our core volunteer base."

Understanding and Addressing Neurodevelopmental Challenges in Congenital Heart Disease

More than a decade of new knowledge about neurodevelopmental risk in people with Congenital Heart Disease has changed the thinking about who is most at risk and the factors that impact neurological development, learning, emotions and behaviors, according to a new American Heart Association scientific statement published today in the Association's flagship, peer-reviewed journal Circulation.

Congenital Heart Disease, defined as structural abnormalities in the heart or nearby blood vessels that arise before birth, is the most common birth defect. While advances in treatment have helped more than 90% of people with congenital heart disease in developed countries live to adulthood, the risk of neurodevelopmental issues when individuals have a more severe form of Congenital Heart Disease has not meaningfully improved.

The new scientific statement, "Neurodevelopmental Outcomes for Individuals With Congenital Heart Disease: Updates in Neuroprotection, Risk-Stratification, Evaluation, and Management," describes the significant advancement in understanding the impact of congenital heart disease on an individual's development, learning, emotions and behaviors throughout childhood and adulthood.

The statement includes updated guidance for health care professionals on how to identify which patients are at high-risk for neurodevelopmental difficulties and what type of evaluations may be helpful to better understand these difficulties. Optimizing neurodevelopmental outcomes through clinical care and research has become increasingly critical, since more patients are surviving into adulthood.

The key findings of the statement include:

The algorithm for risk stratification of people with Congenital Heart Disease into high or low risk for developmental delays or disorders has been revised to reflect the latest research.

The statement suggests health care professionals sequentially review three risk categories: Risk Category 1 includes patients with a history of cardiac surgery with cardiopulmonary bypass during infancy. Risk Category 2 is people with a history of chronic cyanosis, those with blue or purple discoloration due to low blood-oxygen levels, who did not undergo cardiac surgery with cardiopulmonary bypass during infancy. Risk Category 3 has two criteria. The first criterion for Risk Category 3 is a history of an intervention or hospitalization secondary to congenital heart disease in infancy, childhood or adolescence. The second criterion is the presence of one or more factors known to increase neurodevelopmental risk.

The statement features an updated list of factors known to increase neurodevelopmental risk, including: genetic, fetal and perinatal impact, surgical aspects of treatment and care, socioeconomic and family influences and factors related to growth and development. For example, genetic variants that may alter fetal development of the heart, brain and other organs cause up to nearly a third of congenital heart disease cases.

There is a new section on emerging risk factors, such as abnormal placental development, prolonged or repeated anesthetic exposure and exposure to neurotoxic chemicals.

In addition, there is a new section on neuroprotective strategies, including: detection of congenital heart disease before birth, monitoring of brain blood flow and the delivery of oxygen, and functional support care, such as physical therapy, occupational therapy and speech-language pathology.

The statement provides updated information about referral to age-based evaluation of people with congenital heart disease at high risk for developmental delay or disorder. The statement refers to guidance from the Cardiac Neurodevelopmental Outcome Collaborative, which recommends that children with congenital heart disease at high risk for developmental delay or disorders have neurodevelopmental assessments throughout infancy, childhood and adolescence.

The statement also provides updated information about management of developmental delay or disorder in infants, children and adolescents, and a new section on management of neuropsychological deficits in adults.

"Reducing barriers that people with congenital heart disease and their families often face when trying to access neurodevelopmental supports and services, and ensuring sufficient research funding are priority areas for future policies," said Chair of the statement writing group Bradley S. Marino, MD, MPP, MSCE, MBA, FAHA, Chief of Cardiology and Cardiovascular Medicine at Cleveland Clinic Children's. "More research will result in a better understanding of how to prevent and manage neurodevelopmental conditions related to congenital heart disease, which will ultimately improve neurodevelopmental outcomes and health-related quality of life for people with Congenital Heart Disease across their life span."

This scientific statement was prepared by the volunteer writing group on behalf of the American Heart Association's Council on Lifelong Congenital Heart Disease and Heart Health in the Young, and the Council on Cardiovascular and Stroke Nursing. American Heart Association scientific statements promote greater awareness about cardiovascular diseases and stroke issues and help facilitate informed health care decisions. Scientific statements outline what is currently known about a topic and what areas need additional research. While scientific statements inform the development of guidelines, they do not make treatment recommendations. American Heart Association guidelines provide the Association's official clinical practice recommendations.

Robotic Arm-Based, 5G-Enabled Remote Echocardiograms Show High Diagnostic Accuracy

New research presented at this year's ESC Congress 2024 in London, UK (30 Aug – 2 Sept) shows that performing echocardiograms remotely using a 5G cellular network has similar accuracy to those performed in person by cardiologists.

"Comprehensive echocardiographic exam with a 5G cellular network and robotic arm-based remote system is feasible with relatively good diagnostic accuracy," Dr. Yu Liu, study author, Zhongshan Hospital, Shanghai, China.

Echocardiography is the test-of-choice for the initial evaluation of many cardiac diseases and requires the expertise of a cardiologist for interpretation. However, this expertise is often limited or unavailable in rural or indeed smaller urban areas. Robotic arm-assisted remote echocardiograms have been attempted for teleconsultation in previous studies 1 and 2, but analysis was limited to heart failure patients, primarily due to the network delay in telecommunications and the subsequent inadequate control of the robotic arm equipment.

In this study, the authors assessed the feasibility and diagnostic accuracy of a 5G cellular network and robotic arm-based remote echocardiographic system in an outpatient clinic based 20 kilometres away from Zhongshan Hospital. A total of 51 patients were enrolled from the outpatient cardiology clinic. All underwent standard comprehensive echocardiography on a 5G cellular network robotic arm-based remote echocardiographic system, as well as a conventional echocardiographic platform (at Zhongshan Hospital) successively.

The order in which patients were examined on the remote and conventional instruments was randomly determined. There was no interval between the two examinations, and examinations of the same patient were performed by experienced, but different, cardiologists, who were blinded to each other's diagnosis. The doctor who used the remote system was also randomly allocated and had not been previously specifically trained. The examinations were real time and diagnoses were made immediately after the examinations.

From the 51 patients, the image quality was sufficient for diagnosis in 50 patients (24 (48%) female). A single patient was excluded because some key views could not be obtained using the remote system, meaning 98% of the examinations had been technically successful.

Around one-third (17 patients) had a heart problem identified using conventional in person echocardiography, including 10 with a primary diagnosis of valvulopathy (one Barlow's syndrome, one bicuspid aortic valve and eight less-than-moderate regurgitation), two cardiac surgery follow-ups (one case of aortic valve replacement and septal myectomy, and one case of mitral valve replacement and tricuspid annuloplasty), and two hypertrophy cardiomyopathy (including one case of obstruction at papillary muscle level), two with abnormal left ventricular wall motion (including one case of apical mural thrombus), and one with congenital heart disease (secumdum atrial septal defect).

Echocardiograms using the robotic arm resulted in the same diagnosis as conventional in-person echocardiography in 98% of cases (papillary muscle level obstruction was missed in one case).

Time for image acquisition using remote echocardiography was significantly longer (around 50% longer) than conventional (24 mins 36 secs vs. 16 mins 15 secs).

A previous version of the robotic arm has been cleared for clinical use in scanning the abdomen (China, Europe, Australia and Singapore), which requires less complex scanning manoeuvres. However, the authors say a multi-centre study at a larger scale with both other local hospital and referral centres involved should be carried out before this new technology should be used.

Although 5G technology is not available everywhere, lead-author Xianhong Shu, also of Zhongshan Hospital, said: "This system would increase the accessibility of better medical resources as patients may travel less to get diagnosis and medical advice from cardiologists based in referral centres."

She adds there are further potential advantages: "A remote robotic echo system may help protect more health professionals from the risk of exposure during pandemics like the COVID-19 as the cardiologist may not need to be in close contact with the patient if only echocardiogram consultation is required."

OCTOBER

04TH-06TH

CSI ASIA-PACIFIC 2024
Bangkok, Thailand
https://www.csi-congress.org/asia-pacific

04TH-05TH

Tips and Tricks in Congenital & Structural Interventions
Milan, Italy
https://www.victoryproject.it/Pdf/654_TIPS_AND_TRICKS_PROGRAM.pdf

NOVEMBER

07TH-10TH

Great Wall International Congress of Cardiology 2024
Beijing, China
http://www.gw-icc.com/en

08TH-09TH

2nd International Pediatric Cardio-Oncology Conference
Cincinnati, Ohio, USA
https://www.cincyhearteducationseries.org/cardio-onc

DECEMBER

01ST-05TH

RSNA 2024
Chicago, Illinois, USA
https://www.rsna.org/annual-meeting

05TH-07TH

International Aortic Symposium
Orlando, Florida, USA
https://floridaaorta.cme.ufl.edu/

CONGENITAL CARDIOLOGY TODAY

CORPORATE OFFICE
PO Box 52316
Sarasota, FL 34232 USA

CORPORATE TEAM

EDITORIAL BOARD

OFFICIAL NEWS & INFORMATION PARTNER OF

PICS Society
Pediatric and Congenital Interventional Cardiovascular Society

ISSN 1554-7787 print. ISSN 1554-0499 electronic.
Published monthly.