Interview

Interventional Cardiology

Pioneers of congenital and structural heart disease

Ziyad M Hijazi
Sidra Cardiovascular Center of Excellence, Sidra Medical & Research Center, Doha, Qatar
zhijazi@sidra.org

Ziyad M Hijazi is an interventional cardiologist who specializes in treating congenital and structural heart disease in both children and adults at Sidra Medical & Research Center. He is a pioneer in the non-surgical repair of congenital and structural heart defects. As Acting Chief Medical Officer, Chair – Pediatrics, and Medical Director – Sidra Cardiovascular Center of Excellence, Dr Hijazi drives the strategic direction of the Department of Pediatrics and integrates research and education priorities into a program of excellent clinical service delivery. He also holds the position of Chair of Pediatrics at Weill Cornell Medical College, Qatar – Sidra's academic partner. After graduation from medical school and upon completion of his internship in Amman, Jordan, Dr Hijazi moved to the USA to begin postgraduate training in the Department of Epidemiology and Public Health at Yale University, School of Medicine where he was subsequently awarded a Masters of Public Health. He remained at Yale University where he completed a residency in pediatrics and a fellowship in pediatric cardiology. Upon completion of his fellowship training, he joined the faculty at Tufts University School of Medicine as an assistant professor. In 1997, he was promoted to Associate Professor of Pediatrics and Medicine, and in 1999 Dr Hijazi accepted a faculty appointment at the University of Chicago as Endowed Professor of Pediatrics and Medicine, and chief of the division of cardiology. He has been successful in building a pre-eminent pediatric cardiology program, which is nationally and internationally recognized for its outstanding clinical service and innovative technologies. In 2007, Dr Hijazi became the Director of the Rush Center for Congenital and Structural Heart Disease at Rush University Medical Center and in 2010 he became the James A Hunter MD University Chair.

Q Can you tell us a little bit about your background?

I am currently Professor of Pediatrics and Internal Medicine at Rush University Medical Center in Chicago, however I am awaiting a new title of Professor of Pediatrics and Internal Medicine at Weill Cornell Medical College. I trained in pediatrics at Yale University Medical Center and then continued there to do my fellowship in pediatric cardiology. After my training I moved to Tufts University Medical Center (MA, USA) where I was the director of the cardiac catheterization lab and later became the Chief of Cardiology until 1999 when I moved to the University of Chicago as the Chief of Cardiology there. I spent 8 years there then moved to Rush University Medical Center in Chicago (IL, USA)as the director of the Rush Center for Congenital and Structural Heart Disease until January this year when I moved finally to Sidra Medical & Research Center in Doha, Qatar. My current roles are Acting Chief Medical Officer for the institution, Chair of the Department of Pediatrics and Director of the Sidra Cardiovascular Center of Excellence. Sidra will open to patients soon.

Q What drew you into a career in interventional cardiology?

In 1988 when I finished my residency at Yale, one of my rotations was in pediatric

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cardiology with Dr William Hellenbrand. At that time Dr Hellenbrand was one of very few interventional cardiologists dealing with congenital heart disease and I was so impressed that I decided that I had to do this specialty and become one like him one day. Once I finished my fellowship training in 1991, I developed a coronary artery stent. Back then coronary stenting was a novelty; there was no approved coronary stent in the field at the time so I developed the stent in collaboration with NuMED Inc., did the animal study, then I started traveling all over the world to work with interventional adult cardiologists on coronary stenting and I worked with a lot of famous people in the field. I kept on doing a lot of coronary stenting until 1999–2000 when the Amplatzer group of devices were developed by a company called AGA Medical. At that time I was the national principal investigator in the USA and I became really busy; I had to decide whether to continue with both the coronary intervention and the congenital heart disease or focus on one. I decided to mainly focus on the congenital intervention. That continued until about 2005 when I started working with a company called Edwards Life Sciences on a valve that they purchased a year or so earlier and I tested that valve in the pulmonic position. This was the same valve that was invented for the aortic position but I was evaluating this valve for the pulmonic position and I treated the first patient that had ever received a pulmonic valve percutaneously in the USA in December 2005. I also became involved with a few other devices; valves in the aortic and pulmonic positions and later on the mitral valve therapy. So I have mainly been involved with congenital heart disease but also of course focused and worked on structural heart disease intervention.

Q You work mainly in congenital heart disease. What are the main differences between adult and pediatric interventional cardiology for these conditions?

Although my title is interventional pediatric cardiologist, we have actually been trying to change the name from pediatrics to congenital and structural interventions. So the congenital interventionalists deal primarily with conditions that the patient was born with. The adult interventional cardiologist deals with adult coronary artery disease intervention and, more and more, adult cardiologists are also involved with structural heart disease intervention, primarily transcatheter aortic valve implantation (TAVI) and the mitral clip. So they usually deal with structural heart diseases that are acquired in later life although there is a small group of adult interventional cardiologists who also do congenital heart diseases interventions in adults.

Q In your opinion, what are the areas that currently require the most attention in this field?

The congenital interventional field is crying out for new technologies for thousands of children who are born with congenital heart disease, primarily those who have intracardiac lesions which are usually holes in the heart, and extracardiac lesions which are basically narrowings of a blood vessel. For the intracardiac defects, we usually close the hole with devices; most devices are permanent metal implants and do not go away. For extracardiac defects, if we put a stent in, these are also made of metals; they do not dissolve, they do not get larger as the patient gets larger. We therefore need bioresorbable technology for these defects and that is what I am working on now so that if I put it in a child, I don't have to worry about them coming back 2 or 3 years later to expand or enlarge the stent because of body growth.

Q In your opinion, which recent devices for congenital heart disease have shown the most promise?

Right now there are a couple of general devices. Number one is percutaneous valve technology: we need to make the current valves suit a larger number of patients. Currently, those that are available, specifically the Melody valve and the Edwards valve, cover about 15% of patients that need valves, 85% require surgery. What I would like to see is the development of a valve that covers the majority of these patients and that is what I am working on. I am working on a valve with a Chinese company, Venus Medtech, which will hopefully meet the unmet needs that these patients have. The other large area is bioresorbable stent technology; we need to develop bioresorbable stents so that when I put it in a child we won't have to keep on bringing these children back to the cath lab to enlarge the valves as they grow inside.

Q You just mentioned the new valve that you are working on with the Chinese company but can you describe your involvement in the trials for these devices a little bit further?

The valve was invented by a Chinese physician and my involvement is in the animal models; I did the first-in-man a year ago in two Chinese patients. So I am involved with these valves from animal testing to first-in-man. The other valve that I have been involved with is a valve called Colibri heart valve, and this valve was developed by an American physician in Houston and the company is based in Colorado; I've

done extensive animal testing for them and we are hoping that we will do first-in-man in the pulmonic position. The first-in-man in the aortic position was carried out successfully but we are now hoping to do it in the pulmonic position.

Q Are you involved in any of the trials for bioresorbable stents?

We just received approval from the US FDA to proceed in the animal phase and we just did a live case of an animal during the Pediatric & Adult Interventional Cardiac Symposium meeting (PICS/AICS) which was held in Chicago from 7 to 10 June. The idea was to show the attendees this new exciting stent. Hopefully then we will move to first-in-man and then pediatric patients.

Q Another area that you have been involved with is the use of intracardiac echocardiography to assist guiding of catheters for the closure of atrial septal defects (ASD)/patent foramen ovale (PFO): can you explain a little about this?

This goes back to mid-1999/early 2000, when, as I mentioned earlier, I was the national principal investigator for testing various devices including the Amplatzer septal occluder for ASD. At that time, the imaging modality of choice was the transesophageal echocardiagram and one day in 2000 I was called to the adult cath lab to help them perform trans-septal puncture. The patient was obese and my colleague suggested that we used intracardiac echo. This is a catheter with a camera at the tip of it, so I maneuvered the catheter and it gave beautiful views of the septum and enabled me to perform safe trans-septal puncture. Then I thought 'wow, we need this technology to guide the closure of ASD and PFO'. At that time, the manufacturer was a company called Acuson from Mountain View (CA, USA). I tried to contact that company and they would not return my calls so I went ahead and purchased five catheters and used them to guide the closure of ASD and PFO. I compared this simultaneously with the transesophageal echocardiography image and we found that the intracardiac echocardiography had superior images; the operators are in charge of this and of course you can do this procedure without the need for general anesthesia. I published that paper and, immediately, the company that made these catheters called me and said they wanted to work with me so we started working together. We popularized this technology and now almost 95% of procedures done in our lab are guided by intracardiac echocardiography because it can be done with the patients awake and alert, as if it's a routine interventional procedure and you don't need other operators; the interventional cardiologist can perform the whole procedure. So it's a wonderful technology that can be used, not just for ASD and PFO but for other interventional procedures.

Q You direct the annual Pediatric & Adult Interventional Cardiac Symposium (PICS/AICS). Can you summarize the most exciting findings from the last meeting?

I started this meeting back in September 1997 when I was in Boston, so this June marks the 18th annual meeting. Last year's meeting was in Miami and we did a lot of live cases. The meeting is divided into different formats; there are lectures covering interventional cardiology from congenital and structural topics and the soul of the meeting is the live cases from at least eight to ten cardiac centers from around the globe; the operators can interact with the attendees and can pose questions: 'why are you using this technique?' 'Why are you managing the patient this way?' We bring the best of the best in the world together and their opinions may be different so the operators can listen to them and may change their approach. At last year's meeting we focused on both the pediatric interventional cases as well as TAVI, left atrial appendage and so on.

Q What are to you the most exciting things at this year's Symposium about?

This year we had a special section - imaging in structural heart disease intervention. We have invited Dr Roberto Lang for a whole day where we discussed imaging modalities that are used to guide interventions. So Roberto and his team have been invited to come and give talks on all of these modalities. We had a new section this year on emergent technology, which discussed bioresorbable stent technology and percutaneous valve technology. We also had other sessions such as debates, abstracts and case report sessions where cardiologists can bring cases where they have encountered complications during these interventions. We also had 145 abstracts submitted to the meeting and we chose the 20 best abstracts for oral presentations which were presented in front of a panel of experts, who chose the best oral abstracts to receive the Charles Kleinman, MD Scientific Award. So it was a very good meeting, attended by 840 people from over 50 countries.

Q What do you think will be the most significant advances in non-surgical techniques for the repair of structural heart defects in the next 5 years?

I think the next 5 years will bring many advances. First, percutaneous valve technologies; we will need to miniaturize the technologies because right now the

stent delivery systems are large and bulky so we cannot do these procedures in smaller kids. We also need to redesign valves so that they can meet the needs of the majority of patients that need these procedures. We want to meet 85–90% rather than just a few percent that we have now. Another area where hard work is needed is to come up with the best bioresorbable stent so that we can implant it in pediatric patients so that we won't need to worry about bringing them back to expand the stent. In the adult interventional cardiology field I think we need to conquer the mitral valve – we need to develop a valve that will either repair or replace the mitral valve without the need for open heart surgery. So the next 5 years holds many leads in the field of congenital and structural heart disease.

Financial & competing interests disclosure

The author has indicated that he is a consultant to Venus Medtech and Colibri Heart Valve, two companies engaged in development of heart valves. The author has no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

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