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9008 Copenhaver Drive, Ste. M
Potomac, MD 20854 USA
tel:+1.301.279.2005;
fax: +1.240.465.0692
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STEEP STENT'S ANGLE TO THE REFERENCE VESSEL PROMOTES NEOINTIMA

By Masataka Kitano, MD; Satoshi Yazaki, MD, Hideshi Tomita, MD; Koji Kimura MD; Toshikatsu Yagihara, MD; Shigeyuki Echigo, MD

Background

Although mid-term results of stent implantation for postoperative or native peripheral pulmonary artery stenosis (PPS) in patients with congenital heart disease has been reported to be effective and safe, repeat stent dilation has often been performed because of somatic growth of patients, stent deformity by external compression, or in-stent stenosis with neointimal proliferation.[1-5] We previously reported that small stent diameter implanted in peripheral pulmonary artery was one of risk factors for neointimal hyperplasia.[6,7] We also have the impression that steep stent's angle to the reference vessel or residual waist of stent's body will promote neointimal proliferation around the corners (Figure 1). Therefore, we studied the relationship between stent's angle to the reference vessel and the neointimal proliferation around the corner in patients with PPS.

Methods

We retrospectively studied angiograms of 30 lesions in 21 consecutive patients who underwent stent implantation for right or left branch pulmonary artery stenosis and follow-up catheterization from September 1997 to October 2004. Age and body weight at implantation ranged from 0.8 to 18 years (median 8 years) and from 7.8 to 77 kg (median 24 kg), respectively. Underlying heart disease included 14 patients after repair of Tetralogy of Fallot, 2 patients after arterial switch operation for transposition of the great arteries, and the others. Two patients after total cavopulmonary connection procedure were excluded from the study. One or two of Palmaz P308, P188, P128, or Corinthian IQ stents were implanted in the lesions. We selected diagnostic angiograms which have 0 to 30 degrees of rightward and 0 to 40 degrees of cranial angulation for right pulmonary arteriograms, and 10 to 40 degrees of leftward and 0 to 40 degrees of cranial angulation in the case of left pulmonary arteriogram.

MLD-0	7.7± 1.7 mm
MinIT-6m	0.28 ± 0.15 mm
MaxIT-6m	1.1 ± 0.30 mm
Ang-o	23 ± 14°
CornetIT-6m	0.70 ± 0.50 mm

Table 1. Results of 5 Parameters. These data are presented as mean ± standard deviation. MLD-0, minimum luminal diameter of stent immediately after stent implantation; MinIT-6m, minimum intimal thickness of stent 6 months after stent implantation MaxIT-6m, maximum intimal thickness of stent 6 months after stent implantation; Ang-0, the angle between stent's outline and the reference vessel's outline immediately after stent implantation; CornerIT-6m, maximum intimal thickness at the corner 6 months after stent implantation.

On the angiograms, we collected the following data: Minimum luminal diameter of stent immediately after stent implantation (MLD-0), minimum intimal thickness of stent 6 months after stent implantation (MinIT-6m), maximum intimal thickness of stent 6 months after stent implantation (MaxIT-6m), the angle between stent's outline and the reference vessel's outline immediately after stent implantation (Ang-0), and maximum intimal thickness around the corner 6 months after stent implantation (CornerIT-6m) (Figure 2). Although there can be up to 4 points of Ang-0 in an angiogram, Ang-0 can not be measured

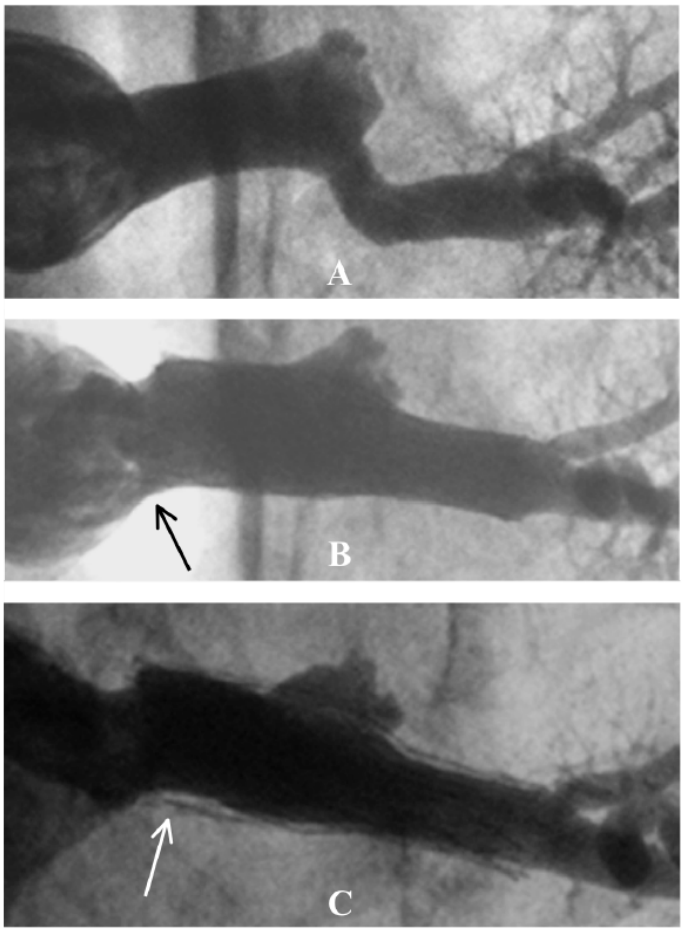

Figure 1. Left pulmonary arteriograms of a patient with left pulmonary artery stenosis after operation for tetralogy of Fallot. Panel A, B, and C are angiograms before stent implantation, immediately after stenting, and 6 months after implantation, respectively. There was steep angle between the medial outline of the stent and the reference vessel's outline immediately after stenting (black arrow). Six months later, neointimal hypertrophy was recognized around the corner (white arrow).

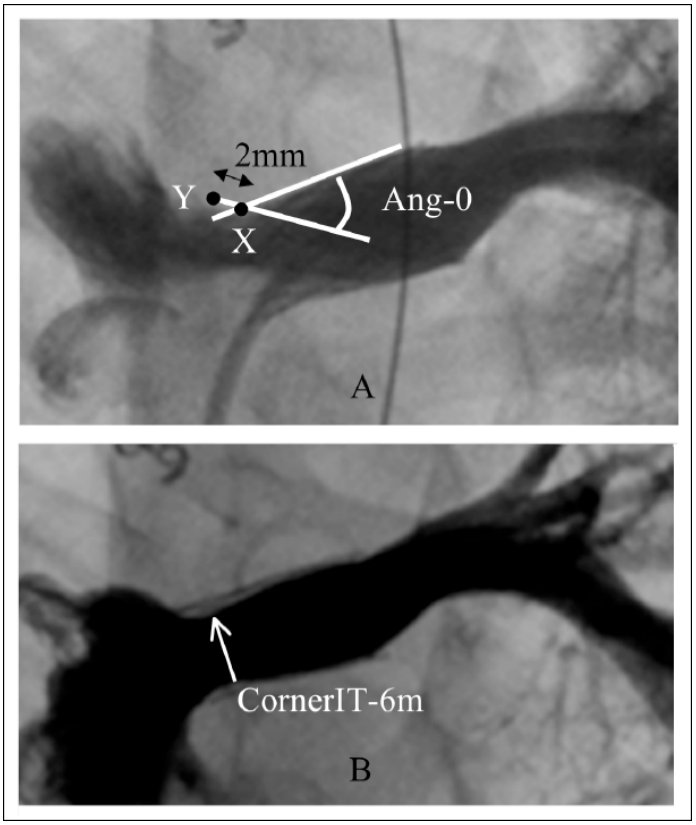

Figure 2. Left pulmonary arteriograms of a patient with left pulmonary artery stenosis after arterial switch operation for transposition of the great arteries. Panel A and B are angiograms immediately after stent implantation and 6 months after implantation, respectively. Point X and Y represent an end point of the stent's outline and the point with a length of 2mm from the point X on the reference vessel's outline, respectively. The angle between the stent's outline and the line extended from the point Y through the point X was measured as Ang-0. And maximum intimal thickness around the corner (arrow) 6 month after implantation was measured as CornerIT-6m.

where there is overinflation in the 4 points. All data were presented as mean ± standard deviation. Then we analyzed the correlation between Ang-0 and CornerIT-6m, MinLD-0 and MinIT-6m, and MLD-0 and MaxIT-6m. The linear regression and Pearson collection index were used for statistical analysis. A p value less than 0.05 was considered statistically significant.

Results

Table 1 shows measured results of 5 parameters. Figures 3 and 4 suggest the relationship between Ang-0 and CornerIT-6m. There is significant correlation between Ang-0 and CornerIT-6m (Figure 3, $\gamma = 0.78$, $n = 84$, $p < 0.001$). Similarly, significant correlation between the two was recognized in each of 4 separate parts which consisted of the proximal or the distal parts on the medial or the lateral outlines of stent (Figure 4). Figure 5 demonstrates the relationship of MLD-0 to MaxIT-6m and to

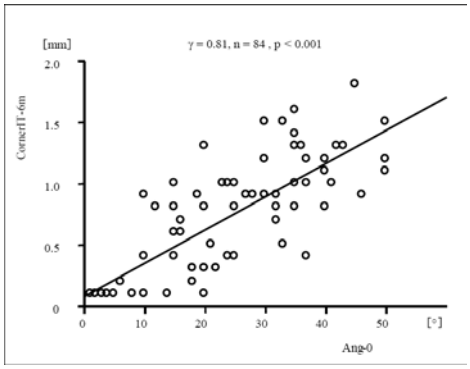

Figure 3. The relationship between Ang-0 and CornerIT-6m. Ang-0, the angle between stent's outline and the reference vessel's outline immediately after stent implantation; CornerIT-6m, maximum intimal thickness around the corner 6 months after stent implantation.

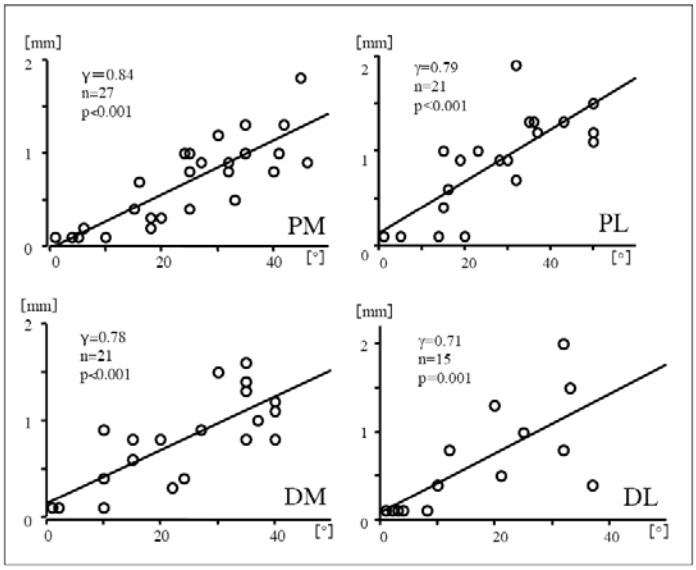

Figure 4. The relationship between Ang-0 and CornerIT-6m in the following 4 separate parts: PM, the proximal part on the medial outline of stent; PL, the proximal part on the lateral outline of stent; DM, the distal part on the medial outline of stent; DL, the distal part on the lateral outline of stent. The horizontal and vertical axes on each panel indicate Ang-0 and MaxIT-6m, respectively.

Ang-0, the angle between stent's outline and the reference vessel's outline immediately after stent implantation; CornerIT-6m, maximum intimal thickness at the corner 6 months after stent implantation.

MinIT-6m. We did not recognize significant correlation between MLD-0 and MaxIT-6m (p=0.055), but between MLD-0 and MinIT-6m (γ = 0.74, n = 30, p < 0.001).

Discussion

Although stent's angle to the reference vessel measured on an angiogram does not completely conform with the true angle between the stent and the reference vessel, we consider this difference to be trivial because there is a relatively strong correlation between Ang-0 and CornerIT-6m. Therefore, we regard steep stent's angle to the reference vessel as a risk factor for neointimal hyperplasia around the corner. Neointimal proliferation seems to be promoted by steep angle not only at the edge of stent, but also at the body of stent. Figure 6 shows right pulmonary arteriograms in a patient who had implantation of 3 pieces of stents for right pulmonary artery stenosis after operation for tetralogy of Fallot. Twelve months after stent implantation, neointimal proliferation was recognized distal to where overlapping of two stents formed a significant angle. It was also reported that there was neointimal hyperplasia immediately proximal and distal to any residual stenosis ("waist") within the stent.[3] Although Ing et al suggested that local eddy currents and turbulence created by the waist might cause microscopic vessel wall injury and resulted in more severe intimal hyperplasia, [2] we do not agree on their opinion.

From the result that there is significant correlation between MLD-0 and MinIT-6m, we regard small stent's diameter as one of risk factors for neointimal hyperplasia. However, other factors also have influence on this because the correlation is not strong. We think that the fact that there is significant correlation not between MLD-0 and MaxIT-6m, but between MLD-0 and MinIT-6m, resulted from the influence of steep angle or overinflation of stent on neointimal proliferation around these parts.

It is difficult to explain why steep stent's angle to the reference vessel promotes neointimal proliferation around that corner. Intravascular ultrasound images were not obtained in most of the patients because this study was retrospective. However ,according to a study of the relationship between local variations in shear stress and neointimal thickness after implantation of wallstents in

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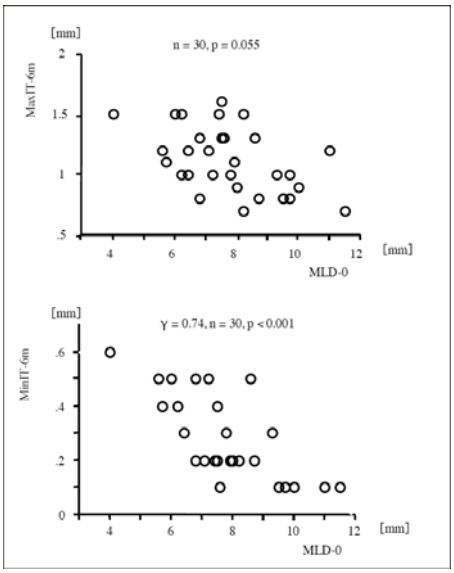

Figure 5. The relationship of MLD-0 to MaxIT-6m (upper panel) and to MinIT-6m (lower panel).

MLD-0, minimum luminal diameter of stent immediately after stent implantation; MaxIT-6m, maximum intimal thickness of stent 6 months after stent implantation; MinIT-6m, minimum intimal thickness of stent 6 months after stent implantation.

human coronary arteries, low shear stress locations demonstrated more neoinmal growth than locations with high shear stress.[8] An animal study of neointimal growth in polytetrafluoroethylen (PTEF) grafts also showed that larger amounts of intima were recognized in low shear stress parts than in high shear stress parts.[9] Another animal study of neointimal growth in balloon expandable stents implanted into carotid arteries showed that low flow promoted in-stent intimal hyperplasia.[10] Taking these results into consideration, low shear stress may be the main cause for neointimal hyperplasia. In the curving part of the artery, higher shear stress is generally raised on the outside than the inside in the vessel wall. We consider the corner that is steep stent's angle to the reference vessel or residual steep angle of stent's body as the inside of a curving vessel, therefore, neointima may proliferate around there.

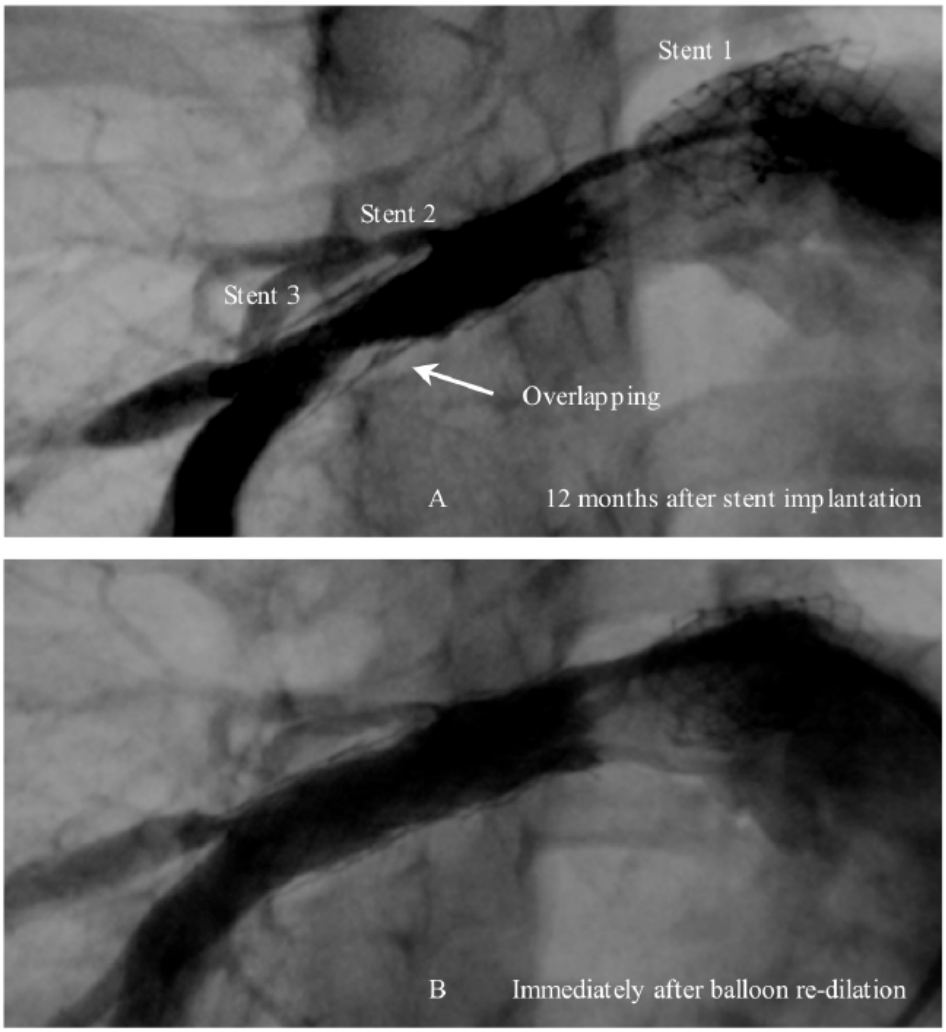

Figure 6. Right pulmonary arteriograms of an patient who had implantation of 3 pieces of stents for right pulmonary artery stenosis after operation for tetralogy of Fallot. 12 months after stent implantation, neointimal proliferation was recognized on the distal side of where overlapping of the two stents (arrow) formed some degrees of angle (Panel A). This stenosis was improved by balloon re-dilation (Panel B).

Conclusion

Steep stent's angle to the reference vessel is one risk factor for neointimal proliferation around the corner in patients with PPS. In the case of stenting in a curving vessel, we recommend implanting a flexible stent and dilating it using a high pressure-balloon catheter with a banana shape to minimize neointimal proliferation in the vessel wall.

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"Steep stent's angle to the reference vessel is one of risk factors for neointimal proliferation around the corner in patients with PPS."

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Corresponding Author:

Masataka Kitano, MD
Department of Pediatrics
National Cardiovascular Center
Fujishirodai 5-7-1, Suita City,
Osaka, Japan
Phone: 06-6833-5012
Fax : 06-6872-7486

kitanom@hsp.ncvc.go.jp

Satoshi Yazaki, MD
Department of Pediatrics
National Cardiovascular Center
Fujishirodai 5-7-1, Suita City
Osaka, Japan

Hideshi Tomita, MD
Department of Pediatrics
Sapporo Medical College
Sapporo, Japan

Koji Kimura, MD
Radiology
National Cardiovascular Center
Fujishirodai 5-7-1, Suita City
Osaka, Japan

Toshikatsu Yagihara, MD
Cardiovascular Surgery
National Cardiovascular Center
Fujishirodai 5-7-1, Suita City
Osaka, Japan

Shigeyuki Echigo , MD
Department of Pediatrics
National Cardiovascular Center
Fujishirodai 5-7-1, Suita City
Osaka, Japan

PEDIATRIC CARDIOLOGY LOSES ANOTHER PIONEER
DR. WILLIAM FRIEDMAN - JULY 24, 1936 - AUGUST 25, 2005

Dr. William Friedman received his A.B. in 1957 from Columbia College and his M.D. (cum laude) from the State University of New York in 1961. He trained in Pediatrics at the Johns Hopkins Hospital, and while there, edited the first modern edition of the Harriet Lane Handbook and began a series of studies concerning the relationship between vitamin D, idiopathic hypercalcemia, and the supravalvar aortic stenosis (William's) syndrome. In 1964, he joined the Cardiology Branch of the National Heart Institute as a Clinical Associate and in 1966 was promoted to Senior Investigator and Pediatric Cardiologist. At NIH, he extended his research interests to include the applications of quantitative radionuclide lung scanning to cardiovascular diagnosis and initiated studies to elucidate the intrinsic physiological, pharmacological and biochemical properties of the developing heart.

In 1968, Dr. Friedman joined the University of California, San Diego faculty and received a Career Development Award and the first of many subsequent RO1 awards from the National Heart Institute to continue the latter studies. His group introduced two-dimensional echocardiography to pediatrics in the early 1970s. At UCSD, Dr. Friedman was Chief of the Division of Pediatric Cardiology and was promoted rapidly to Professor of Pediatrics by 1973. His productive basic scientific work led to one of the most important contemporary clinical treatment advances for the care of the many thousands of premature babies born yearly in this country, by demonstrating in 1972 that blockade of prostaglandin synthesis with a drug, indomethacin, provided a substitute for cardiac surgery previously necessary to close the patent ductus arteriosus.

In 1979, Dr. Friedman moved to the UCLA School of Medicine where he received the first endowed professorship in Pediatrics and became Chairman and then Executive Chairman of the Department of Pediatrics. In 1994, after 15 years in that position, he stepped down from the Chair and became the Senior Advisor to the Provost and Dean of the UCLA School of Medicine, and the Director of the training program in Pediatric Cardiology. In 1997, Dr. Friedman assumed the position of Senior Associate Dean for Academic Affairs.

Among his many national responsibilities, Dr. Friedman was Vice President of the Society for Pediatric Research, Chairman of the Sub-Board of Pediatric Cardiology of the American Board of Pediatrics, Chairman of the Pediatric Cardiology Committee of the American College of Cardiology, and served as Governor and California Chapter President of the American College of Cardiology. He also served the National Heart, Lung and Blood Institute on Study Sections and the Cardiology Advisory Committee, and on the National Center Research Committee of the American Heart Association. Dr. Friedman has served on the editorial boards of all of the leading cardiology journals, and as Editor of Pediatric Research and Associate Editor of Pediatric Annals.

"Dr. Friedman was a true leader and visionary in the field of pediatric cardiology. His knowledge and skill in the field of pediatric heart problems have been an inspiration to colleagues and medical students alike. Bill was one of our most distinguished faculty members and the UCLA community mourns his loss."

He has been honored with the Cummings Award of the American College of Cardiology; the Distinguished Scientific Achievement Award, the Award of Merit, and the Outstanding Achievement in Cardiovascular Medicine Award of the American Heart Association; the Babbott and Alumni Distinguished Achievement Awards from the State University of New York; the Founders' Award, Section of Cardiology and Cardiac Surgery, of the American Academy of Pediatrics; and a Fulbright Commission International Professorship. He was appointed in 1994 by the Governor of California to the Medical Board of California and served as Vice President of the Division of Licensing, and in 1997 to the Air Resources Board of the Environmental Protection Agency.

~CCT~

MEDICAL NEWS, PRODUCTS AND INFORMATION

Molecular Defect Found That May Cause Heart Failure

A new study has identified a molecular defect in cardiac cells that may be a fundamental cause of heart failure, a progressive weakening of the heart that leaves the organ unable to pump blood through the body.

The findings, by researchers at the Ohio State University Dorothy M. Davis Heart and Lung Research Institute, show that specialized proteins called ryanodine receptors (RyRs) malfunction in the failing heart. The RyRs form channels that become leaky, leading to calcium imbalances that prevent the heart from contracting effectively and relaxing adequately. The condition worsens until the heart can no longer work as a pump.

"We found some drastic changes in the way muscle cells in the failing heart handle calcium," says principal investigator Sandor Gyorke, professor of physiology and cell biology at the OSU Davis Heart and Lung Research Institute. "Discovery of this mechanism suggests at least one potential target for treating the causes of this disease in a rational manner."

Currently, the only way to correct heart failure is by heart transplantation. About 4.9 million Americans are currently living with heart failure, and an estimated 265,000 of them die of it yearly. Those with the condition are at six to nine times greater risk of experiencing sudden cardiac death than someone in the general population. From 1992 to 2002, deaths from heart failure rose 35 percent and the incidence is expected to keep rising.

Calcium plays a fundamental role in muscle contraction, particularly in heart muscle. A heart contraction begins when the heart's pacemaker sends an electrical signal to heart-muscle cells. The electrical signal triggers the release of calcium from a large storage site within each muscle cell. The released calcium activates the muscle cell's contractile machinery, which causes the cell, and the heart as a whole, to contract.

This calcium storage site is known as the sarcoplasmic reticulum (SR), and it resembles a convoluted, flattened sack within the cell. The delicate, membrane-bound walls of the SR are penetrated with thousands of RyR channels. These serve as gate keepers that allow calcium to flood into the cell to initiate contraction.

The amount of calcium stored in the SR determines the strength of the heart beat and how much blood the heart ejects when it contracts.

At the end of a contraction, the channels close tightly. Molecular pumps, also located in the walls of the SR, then suck the released calcium back into the SR to prepare for the next contraction.

For this study, the OSU investigators used microscopic fluorescence imaging techniques to monitor changes in calcium ion concentrations in the SR and other regions of individual isolated heart cells.

They found that in heart failure, the channels cannot close tightly after a contraction. Instead, they remain partly open throughout the cardiac cycle. This allows some of the calcium to leak out.

This leaves too little calcium in the SR, so strong contrations are not possible, and too much calcium outside the SR, so the muscle cells remain slightly contracted and the heart cannot fully relax.

As the condition worsens, the heart grows weaker as a pump.

Gyorke and his colleagues are now working to better understand the damage to the RyR channel.

Funding from the National Heart, Lung and Blood Institute; the American Heart Association; and the OSU Research Foundation supported this research.

For more Information: http://researchnews.osu.edu

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PICS-IX & ENTICHS-III WRAP-UP

By Ziyad M. Hijazi, MD

Over 720 attendees from over 50 countries have attended PICS-IX & ENTICHS-III in the beautiful city of Buenos Aires, Argentina, September 15-18, 2005. During the course of almost three days, over 40 talks were given by the distinguished faculty and over 18 live cases were transmitted live via satellites from seven cardiac centers in the US, Mexico and South America.

The meeting started Thursday, September 15th, 2005 with oral abstract sessions in three different rooms. The sessions were very crowded and excellent abstracts were presented for the first time in this meeting. This was followed by Meet the Expert sessions where attendees brought difficult cases and discussed them with the course expert faculty.

The following two and a half days were full of lectures and live cases. The lectures covered a wide array of topics including long-term follow-up of patients after ASD closure. The attendees were delighted to see and hear Dr. Terry King, the first person in the world to implant a percutaneous ASD device in a patient 30 years ago. He reported on the longest follow-up of his first five patients who received the device. At the end of his talk, he received a standing ovation from the attendees!

Other topics included: stents and everything you need to know about them, VSD closure, hybrid interventions, fetal intervention, cutting balloons, percutaneous valves and PFO/LAA closure. Also, for the first time this year, a talk on a new device (Heart Pod) was given by Saibal Kar, MD. This device is being used as a monitoring tool for patients with CHF; Pediatric Cardiologists are looking forward to the application of this device in children with heart failure. Furthermore, this year, there was a hot debate on the issue of native coarctation in children 1-5 years of age. Pro intervention was Dr. John Moore and pro surgery was Dr. Ross Ungerleider.

As usual, the popular session this year was "My nightmare case in the cath lab." A few presenters described their nightmare cases and how they got out of it!

"The PICS achievement award was given this year to Dr. Valmir Fontes from Sao Paulo, Brazil. Beautiful pictures that were organized by his son-in-law, a pediatric cardiologist, Dr. Carlos Pedra, demonstrated his life accomplishments, his family and his career."

The operators in the live cases demonstrated the latest in medical device technology and have chosen to perform very difficult and challenging cases. On Friday, Dr. Felipe Heusser hosted his mentor, and course co-director, Bill Hellenbrand; they performed two excellent cases. From Miami Children's Hospital, Dr. Evan Zahn, performed two excellent challenging cases, after which he flew all night long to join the attendees and delivered two talks at the meeting. From Brazil, Drs. Carlos Pedra and Cesar Esteves hosted Dr. Zahid Amin and all performed 4 excellent cases and from Mexico City, Dr. Carlos Zabal performed three excellent cases and also flew all night to join the attendees. On Saturday, Dr. Miguel Granja hosted Dr. John P. Cheatham and they performed three difficult cases; Drs. Alejandro Peirone and Luis Alday from Cordoba, Argentina hosted Drs. Lee Benson and Throng-Phu Le, and they all performed three excellent cases. Finally, Dr. Horacio Faella hosted me and we performed three very good cases. In all, the quality and challenges of these cases were what truly what made PICS the premier meeting. A lot of discussion took place between the moderators and the operators about the type and indications of the planned intervention. Furthermore, there was an excellent interaction between the operators and the audience.

For the first time this year, the Audience Response System was introduced to the course. Many questions were asked during the live cases and after the lectures and immediate responses from the attendees were displayed on the screen, thanks to the skills of Dr. Jeff Feinstein who worked very hard on this system.

Also, this year's course featured new breakout sessions for cardiovascular nurses and technicians. These sessions were very crowded and the atmosphere was cordial. Drs. Julie Vincent, Gil Wernovsky, John P. Cheatham, Neil Wilson and Jozef Masura, and two excellent nurse practioners, Ms. Sharon Hill and Ms. Erika Speier, ran these sessions.

On the social level, the attendees enjoyed the Gala night and a beautiful evening at the La Rural, where Tango dancers and a Jazz band entertained the crowd until midnight!

The PICS achievement award was given this year to Dr. Valmir Fontes from Sao Paulo, Brazil. Beautiful pictures that were organized by his son-in-law, a pediatric cardiologist, Dr. Carlos Pedra, demonstrated his life accomplishments, his family and his career.

Next year's course will witness some changes. We are introducing two new course directors, Dr. Ted Feldman and Dr. Peter Block, both are internationally renowned interventional cardiologists with expertise in Structural Heart Disease. The course will obviously expand more to focus on Percutaneous Heart Valves, The Left Atrial Appendage and the PFO among others.

Please mark your calendars for September 11-14th, 2006 at the famous and glamorous hotel, the Bellagio. So, see you next year in Las Vegas.

~CCT~

Ziyad M. Hijazi, MD, MPH, FACC, FAAP, FSCAI
George M. Eisenberg Professor of Pediatrics and Medicine
Section Chief, Pediatric Cardiology
Medical Director, Congenital Cardiology Heart Center
The University of Chicago
Congenital Heart Center
University of Chicago
Chicago, IL USA

zhijazi@peds.bsd.uchicago.edu

2005 SYMPOSIUMS

Chest 2005 (American College of Chest Physicians)
October 29-November 3, 2005; Montréal, Québec, Canada
www.chestnet.org

The 16th Great Wall International Congress of Cardiology / ACC Symposium: Cardiology Update 2005
November 3-6, 2005; Beijing, China
www.apscardio.org

17th Biennial Congress of the Association of Thoracic and Cardiovascular Surgeons of Asia
November 17-23, 2005; Manila, Philippines
www.atcsa.org

XX Congreso Interamericano de Cardiologia & XXIV Congreso Nacional de Cardiologia
November 19-23, 2005; Cancún, Mexico
www.smcardiologia.org.mx

www.soinca.org

15th Asian Pacific Congress of Cardiology and the 57th Annual Conference of Cardiological Society of India
December 1-4, 2005; Mumbai, India
www.15apccand57csi.com

EUROECHO 9 - The Ninth Annual Meeting of the European Association of Echocardiography
December 7-10, 2005; Florence, Italy
www.escardio.org/congresses/EE9/

Pediatric Cardiac Intensive Care Symposium 2005 - (PCICS2005)
December 7-11, 2005; South Beach, Miami, FL USA
www.cbcbiomed.com

2006 SYMPOSIUMS

25th Annual Scientific Meeting of the Belgian Society of Cardiology
February 2-4, 2006; Brussels, Belgium
www.bscardio.be

Doppler - Ultrasound in the Fetal Examination (14th International Symposium and Workshop)
March 14-19, 2006; Oberlech - Alberg, Austria
www.kinderherzzentrum.at/Lech2006

70th Anniversary Annual Scientific Meeting of the Japanese Circulation Society
March 24-26, 2006; Nagoya, Japan
www.congre.co.jp/jcs70/english/english_index.html

Annual Scientific Conference of the British Cardiac Society
April 24-27, 2006; Glasgow, UK
www.bcs.com

41st Annual Meeting Association for European Paediatric Cardiology
May 24-27, 2006; Basel, Switzerland
www.akm.ch/AEPC2006/

9th International Workshop in Catheter Interventions in Congenital and Structural Heart Disease
June 8-10, 2006; Frankfurt, Germany
www.chd-workshop.org

Electrophysiology and Cardiac Techniques
June 14-17, 2006; Nice - French Rivera, France
www.cardiostim.fr

Heart Failure 2006
June 17-20, 2006; Helsinki, Finland
www.escardio.org/congresses/HF2006/

PICTURES FROM PICS/ENTICHS 2005 AND THE 4TH WORLD CONGRESS ON PEDIATRIC CARDIOLOGY AND PEDIATRIC SURGERY IN BUENOS AIRES, ARGENTINA

Continued from page 10...

Photographs compliments of Tony Carlson, and Drs. Teiji Akagi and Ziyad Hijazi. For more photographs from PICS/ENTICHS and WCPCPS visit: **http://www.congenitalcardiologytoday.com/index_files/CCT-BA-PICTURES.pdf**

KATRINA: PEDIATRIC CARDIOLOGISTS' AND PARENTS' STORY

By Robert J. Ascuitto, PhD, MD and Nancy T. Ross-Ascuitto, MD

"Warmest climes but nurse the cruelest fangs." ~Herman Melville, Moby Dick

June, 2005, marked the beginning of the hurricane season in the Gulf South. As past years, newscasters reminded New Orleanians to prepare by having an adequate food and water supply, flashlights, battery-powered radios, etc., and develop a family plan for escape and survival. For hurricane aficionados, charting maps were readily available. Weather experts gave their yearly analysis of what could happen to New Orleans if a major hurricane stormed up the mouth of the Mississippi River into Lake Ponchatrain. All listened politely and then went about their usual business. Names like Charley, Frances, Ivan and Jeanne were fading memories from 2004. Little did anyone realize how profoundly different hurricane season 2005 would be for New Orleans compared to those of the past. Enter Katrina. She was a meteorological monster that laid waste to a city tailor-made for destruction.

Tulane University Hospital & Clinic (The Hurricane Strikes)

At Tulane University Hospital & Clinic, we were accustomed to hurricane warnings. In fact, we had been through storm drills many times in the last 18 years of our tenure in New Orleans. On-call physicians were required to stay in the Medical Center throughout the storm period, and their families could obtain rooms in a hotel two blocks away. Therefore, when Hurricane Katrina neared the Gulf Coast, we packed a suitcase with a couple of changes of clothing, a few canned goods, some crackers and peanut butter, two stethoscopes, two dogs, and drove to Tulane Medical Center. Unfortunately, unlike previous years, our dogs were not permitted in the Medical School. We reluctantly brought them back to our home, left food and water, and hoped for the best. We settled into our quarters that Sunday afternoon.

I (RA) stayed in our research laboratory at the Medical School, directly across the street from the Hospital. Nancy and our children, Michael (14) and Susana (5), remained at the hotel. The hurricane struck with a fury early Monday morning. I was resting in a small office connected to our laboratory, when suddenly I was startled by rumbling and a shrieking sound. As I cautiously opened the door to the main laboratory, it suddenly was torn from my hand. Papers, books, surgical instruments, and various types of equipment, were flying around the room, ultimately being sucked out through broken windows. A 50 pound roller pump disappeared into the darkness. It was as if a "black hole" had stationed itself outside the Medical Center. I clung to a sink to avoid being pulled into the whirling debris. Thankfully, I managed to get my daughter, Lisa, in Connecticut, on my cell phone to inform her of what was going on, and to ask her to pass the word on to the rest of my family in New Jersey.

The noise in the laboratory reached deafening levels. Several of my colleagues rushed to my aid, and collectively we managed to escape safely. Hyperventilating, my heart pounding and drenching with cold sweat, I dashed through darkened hallways and an enclosed bridge to the Hospital, to help with patients. As I crossed the bridge, the rain obscured most of the Medical Center; however, I did witness a palm tree flying though the air like a misguided arrow. A mailbox was thrown apart as if it was constructed from paper.

There were patients on the pediatric cardiology service, who were of great concern because of their vulnerability to a loss of power. In the NICU, several patients with complex congenital heart disease had undergone surgery, but still required ventilatory support. The diagnoses of these neonates included: Complete AV Canal with pulmonary atresia and nonconfluent pulmonary arteries arising off the aorta; Critical coarctation of the aorta and a large mid-muscular ventricular septal defect; Tricuspid atresia with normally related great vessels, small pulmonary arteries and a restrictive muscular ventricular septal defect; Complete AV Canal in a premature infant with trisomy 21; and Critical coarctation of the aorta in a premature infant with diminutive renal arteries and severe systemic arterial hypertension. There were also patients in the step-down unit recovering from their operations (including one with interruption of the aortic arch and severe subaortic obstruction), who were relatively close to discharge.

Figure 1. View of Tulane Avenue after the levees had broken. The picture was taken from the second floor of the Tulane Hospital and Clinic.

In the PICU, the most problematic patients were: A two-year old, who had undergone a Fontan procedure for hypoplastic left heart; a 13-year old with Fontan palliation for functional single ventricle heart disease, and now with severe protein losing enteropathy; a 15-year old with end-stage dilated cardiomyopathy, on a biventricular assist device (basically an artificial-heart assist system) awaiting heart transplantation and a two-year old with

superior-inferior ventricles, who had undergone a Mustard operation to complete a one and one-half ventricle repair. There were also several stable patients on the wards. By this time, the Hospital was functioning solely on backup generators located on the second floor.

Early Tuesday morning brought the greatest challenge of our professional lives, and no doubt for the city of New Orleans as well. At 2 AM, the hospital administrators informed us that the water in the streets was rising at a rate of one foot per hour. Now, it was only a matter of time before the Hospital generators would fail, and we would have no power. We had no idea why the water was rising. At the time, no one realized the levees had broken! For most residents of New Orleans, the levees were often taken for granted, a place to walk your dog or to get a good view of Lake Ponchatrain. What we did know was all patients in the Hospital would need to be moved to other medical facilities as quickly as possible. Actually, between the Medical School and the Hospital, there were over 1200 people that would ultimately need to be evacuated.

Nurses, house staff, attendings, other healthcare personnel and Hospital administrators looked at each other in disbelief, and then began working feverishly to ready the patients for transport. Children would go first. We quickly prepared appropriate documentation of patients' medical conditions, secured intravenous access sites and ET tubes, and tried to comfort families about their upcoming ordeal. Despite minimal food and water, little lighting and sweltering heat, all worked without rest toward the common goal of saving the patients. Most of the patients had to be carried down several flights of stairs, taken through a covered pedestrian bridge to the parking garage, placed in the back of a pickup truck, and then driven up to the roof where helicopters could land. Pickup trucks were needed because the ambulances were too tall to make it to the parking garage roof. It was truly inspiring to see our transport nurses providing life-sustaining care and respiratory therapists hand-ventilating seriously-ill infants, as they were loaded one-by-one onto waiting helicopters. One can only imagine the infants' reactions to the winds and deafening sounds created by the rotating helicopter blades.

On the roof of the garage, I and my colleagues stared out over the city. What we saw was unfathomable. Streets, as far as the eye could see, that once hosted crowds of tourists, Mardi Gras parades and thousands of people partying, now were submerged under three-to-four feet of water (Figure 1). Only the roof tops of cars were visible. Twisted signs, downed power lines, displaced mailboxes, floating palm trees, broken windows, torn-open roofs and destroyed buildings now defined this once great city. The outer covering of a glistening Superdome was striped off and cast aside. From our vantage point, the hurricane and its aftermath left nothing untouched.

My initial thoughts were, "Is this the BIG ONE, the storm we had always been warned about? Why New Orleans? Why its people? Why my patients? Why my family? Why anyone's family? Does God rule over Nature or is God at Nature's mercy as well? Is Nature God? " The Big Easy was now The Big Hurt. The Gulf Coast was devastated with one swift blow. I and my family, all of us at the Hospital and the Medical School, every citizen of New Orleans and most residents of the Gulf Coast were experiencing one of Nature's cruelest deeds.

Figure. 2 A family pulling a small boat across Tulane Avenue after the levees had broken. Charity Hospital is seen in the background.

During the evacuation of the patients, a new complication arose. Looters and snipers now converged on the Hospital. Dozens of people could be seen wading in chest deep water towing bag after bag of stolen items. Taking them where? Ironically, looters were seen resting with their goods on submerged police cars, as they moved along. Gunshots were heard from different locations; the snipers were shooting at helicopters or apparently whatever brought them pleasure. I mentioned to a colleague, "I feel like we're in Baghdad." The insurrection delayed the evacuation of patients, since helicopters refused to land amid gunfire. There was near rioting on the seventh floor of the Hospital by caretakers of Charity Hospital patients sent over the previous day. We were in a war zone, and largely unarmed. However, the Tulane Police were great. They came to our rescue. They were well armed and fearless. Several times, they forcibly stopped criminals' attempts to break into the Hospital garage, which is only a short distance from (and connected to) the Hospital itself. Had the criminals gotten through, it would have been devastating. Finally, with some degree of order restored, helicopters returned and the evacuation continued.

It took well into the day to complete the task in the NICU. At this point, all power was gone; now only flashlights guided our work. We were exhausted and hungry, living off rationed strawberry pop tarts, potato chips and limited bottled water. Funny how one's appetite decreases with ongoing food deprivation. I lost at least 12 pounds in the process. The city sewer system then began backing up creating an unimaginable stench on the lower floors of the Hospital. The combination of heat (95^{o}F), humidity (99%) and foul odor are hard to convey in words, but will always be remembered. Everyone was perspiring profusely; we smelled terrible (I'm sure we stank!). With no water pressure, we couldn't wash. Even if we could, the water surely would have been unsafe, to say the least. Nevertheless, that night, we did manage to get some sleep, the first time since the storm hit. Thank God for little things!

The biggest challenge still remained; namely, moving the teenager on the biventricular assist device. The device weighed over 300 pounds, and any mistake in its movement could cost the boy his life. Dr. Myers, a pediatric CT surgeon following this patient, organized his transport. When the Hospital generators went out, a nurse came screaming out of the ICU, "There is only 25 minutes left on the device's battery. The boy will die". Myers arranged for the boy and an adult, also on a ventricular assist device, to be connected to small portable generators, fueled by gas siphoned from cars in the garage. It was brilliant. The strategy worked; it helped to maintain these patients until they could be evacuated.

Finally, it was time to transport the boy to the roof. The heavy metal device was carried down several flights of stairs in blistering heat by 10 men, with Myers and a nurse hand pumping the life-sustaining tubes connected to the patient's heart. Only dimming flashlights guided their way. Every step was precarious. How those men managed to hold onto that bulky unit is still a mystery to me. The process took about 30 minutes. For the people involved, it must have seemed like an eternity. It was truly a courageous effort by Myers, and the rest of his team. It lifted everyone's spirits.

When the team finally reached the waiting helicopter from Arkansas Children's Hospital, they realized the assist device would not quite fit. Hurriedly, they removed the wheels off the machine (the extra inch mattered) to finally get it in. The boy was hooked back up to the device and flown safely away. One cannot conceive of the psychological trauma inflicted on this teenager, and his mother, during their ordeal. It should be mentioned, that the helicopter originally scheduled to get this patient, never set down. After arriving, the helicopter suddenly turned away and left Tulane Medical Center because of sniper fire. Graciously, Arkansas Children's Hospital came to our aid. In the face of danger, they picked up the boy with their own transport helicopter and flew him to Texas Children's Hospital for life-saving care.

The pediatric patients were finally out of the Hospital. They, each and every one of them and their families, were treated with the utmost degree of dignity and respect. Every patient survived and made it to their ultimate destination. The transport was an unequivocal success. Hospital administrators can be proud of every member of their staff, nurses and physicians who participated in getting these seriously-ill infants and children out of a very dangerous situation. Next, the adult patients were moved. The Louisiana Wildlife and Fishery Department kindly, and in the face of danger, helped by boating patients to remaining water free parts of Highway I-10. Unfortunately, we later found out I-10 was in complete chaos, with probably 100,000 people stranded, many suffering from heat exhaustion and dehydration, others critically-ill, waiting to be transported out.

I began receiving information that conditions at the hotel were rapidly deteriorating, with little food and water, no power and people rioting. Armed gangs had taken over the first floor. I decided to get my family out of that hell hole, ASAP. Hopefully, I wasn't too late. As I raced to the water surrounding the Hospital, I ran into one of our NICU nurses. She was trembling and very upset; her 80 year-old father with severe congestive heart failure and a recent stroke, elderly mother and impaired daughter were staying in the hotel. She feared for their lives, and implored me to, "Please help get them out". She insisted on coming with me, and frankly, I needed her to identify them. Somewhat reluctantly, I instructed her to take hold of my belt, as we slowly lowered ourselves into a chest-high soup of water, debris and fecal matter. With each step, I could feel the water clinging to my legs; it required an effort simply to move forward. To our left, draped over a twisted fence, was a downed power line. To my right, a movement in the water suddenly caught my eye; it was a large black snake! I'm sure the snake was avoiding me as much as I was avoiding it. Thankfully, the encounter proved uneventful. The unrelenting late-morning sun reflecting off the flood water in front of us now made it appear bottomless. Nevertheless, we moved on and made it safely to the battered hotel.

We entered the hotel through a back door. The corridors of the hotel were almost completely dark. Litter was everywhere. The lobby was under water. People, hardly discernable, were yelling and fighting, trying to get at remaining bits of food. Children were crying. For me, the situation was particularly precarious, because I am on a blood thinning medication for a rhythm disturbance. Fortunately, during our youth, my brother and I learned much on the streets of northern New Jersey. I tensed my abdomen, clenched my fists, protected my head and fought my way up five flights of stairs. I emerged on the 5th floor with relatively minor injuries.

I started yelling, "Michael, Michael," not knowing the room they were in, or whether they were in their room at all. "It's dad. Michael!" Suddenly, at the end of the 5th floor hallway, the last door opened! I raced to it, and cautiously peered into the room. Thank God, they were unharmed. Suzy raced over and threw her arms around me. Michael simply smiled saying, "Hi Dad." My exact response was, "Let's get the heck out of this place, it's going to blow."

The Hotel (Escape)

I (NRA) was on call the day after the storm

was predicted to hit. Therefore, I decided to stay in the hotel with our children the first night. The hotel was filled with people. In addition to 120 Tulane employees and their families, there were hundreds of other New Orleanians, and many tourists seeking shelter from the storm. We had to step over people in the hallways and stairwells to move about. Fortunately, our room was on the 5th floor, and I felt confident that we would be safe throughout the storm period. After an early dinner of sandwiches and soda, we went to bed early to rest for the next day.

It was obvious when the hurricane slammed into New Orleans. The city immediately darkened by the loss of power. Howling winds reached deafening proportions. Windows rattled and some cracked, crashing sounds were heard outside the hotel. Finally, the sky lightened, although the sun hadn't quite arisen. My first sight was of world famous Canal Street, widest street and the main thoroughfare for countless festivities. It now resembled a white water river. Rapids and waves roared down the avenue, pushed along by unrelenting winds. Chunks of buildings and other debris rained on the streets. Cars were flipped over, and power lines draped the city like tinsel. As the sun rose, a moving object caught my eye. I focused through the rain and was startled to see a man slowly crawling along trolley tracts towards the hotel. He grabbed onto a telephone pole to keep from blowing away. The land phones were dead, but my cell phone was still working. I dialed 911 but to no avail. When I again looked through the window, the man had disappeared.

The hotel was very dark, packed with people and getting warmer by the minute. We waited in line in a stairwell for about two hours to receive a sweet roll and half a glass of orange juice. It was here that we met some of our fellow refugees. Most of the guests were from New Orleans, poor families who had no way of fleeing the city when ordered to evacuate. There were also out-of-towners who had been stranded in the hotel by the storm: a family from Manhattan, whose college-aged son was visiting Tulane's Undergraduate Campus, a couple from Brooklyn celebrating their first wedding anniversary and a group of young men from England working as soccer coaches for the summer. We traded stories and wondered how we would get out of all this.

The first floor of the hotel was flooded. Security personnel were telling us that we could leave the hotel and wade four blocks to the Superdome, where we would receive food and shelter. Guests that left, however, would not be allowed back into the hotel. I vividly recalled the deplorable conditions reported at the Superdome with the last hurricane. The decision was easy, we stayed.

The next day was Tuesday. I knew the levees had broken; nothing else could have caused what we saw. Water had risen to the tops of mailboxes. Many car roofs seen the day before were no longer visible. We went to the hotel roof to get a better look at the city. It was here that we saw the true devastation of the storm. Water covered the streets and the first floor of buildings in every direction. It is hard to imagine an entire city, a major city, submerged in water. Groups of people were huddled on the few small parts of the interstate highway that were not under water. Even more shocking was the scene in the streets. Families were wading through chest deep water, pushing their belongings on pieces of wood and plastic, makeshift rafts and an occasional small boat (Figure 2). Children were being floated down streets in boxes or containers. Some elderly were dragged through the water. These people were moving in the direction of the ill-fated Superdome. Some were yelling and gesturing to an occasional passing boat for help. The boats simply sped by them, leaving the people in their wake. On a raft, a man was towing a lifeless body. I told my children to look away.

The mood in the hotel was becoming increasingly tense. After another long wait in the now stifling stairwell, we were given one sandwich per person by hotel personnel. Guests started arguing with the staff for more food. People began shoving each other in the food line. I hurried the children back to our room. On our way back, a hotel official asked me if I was a physician (I was wearing surgical scrubs). She told me of a

Figure 3. A line of health care personnel and their families await evacuation from the Hospital (Saratoga) parking garage. Bob is standing in the middle of the picture wearing surgical scrubs. Nancy is seen bending down with Suzy.

woman, who desperately needed dialysis, perhaps I could help. Another woman, who was eight months pregnant, inquired if she could come to my room if she went into labor. Others asked me what diseases they could catch from being in the toxic water. I did the best I could, but what good is a physician with no equipment, medicine, electricity or running water? For the remainder of the day, I and the children shared a can of soup, some peanut butter and a small bottle of water.

The following day was Wednesday. We didn't dare leave our room, there appeared to be complete chaos in the hallways. A security officer began directing people to leave the hotel. The officer told us that the room door locks were no longer working, and that the water was continuing to rise in the hotel. The hotel could no longer provide food and was unable to protect us. She said that if we stayed in the hotel "We might die", and advised us to wade into the streets and flag down boats. "The boats may be able to take you to the Superdome". Sure, I remembered the people in the water begging to be picked up by boats, but to no avail. We suddenly ran into the men from England. They had waded through the chest deep water for four blocks to the Superdome, only to be turned away. They did not look well.

This was the first time I felt our lives were truly in danger. We returned to the room and shared our last can of soup and a small bottle of water. My son said "Mom, let's get out of here. I'll carry Suzy. We

can make it." I marveled at his bravery. Suddenly, Bob's voice rang out through the chaos. "Michael, Michael!" I couldn't believe it. How did he get here? I opened the door to see Bob in a hallway surrounded by hostile people. He confronted several of them, and they backed off. We moved out and started calling for other Tulane employees to follow. We found the daughter and elderly parents of our nurse. Another nurse and her family wanted to join us, but she couldn't find her mother. Bob told her to gather as many people as she could and he would return for them.

We decided to go down a fire escape to avoid the fighting taking place in the stairwells. Bob led the way, carrying Suzy on his shoulders and holding onto our nurse's daughter. Michael followed. The nurse helped her ailing father. I held onto the elderly woman, and led two other children down the fire escape. Other people began crying, but quickly followed. The last half of the stairway disappeared into the putrid water. We hesitated at the water's edge, gathering our courage, and then plunged in. The water reached my chest, and the shoulders of the elderly woman. I could feel her hands shaking in mine. The water reeked of sewage and gasoline. We shuffled along taking tiny steps to avoid tripping. We heard gun shots behind us. We never looked back. As we all followed Bob, my son said, "Mom, doesn't Dad look like Moses?" When we approached the Hospital, shooting continued in the distance. I wondered, "Where is everybody?" No solders or policemen anywhere.

As we climbed out of the water, everyone breathed a sigh of relief. We had survived an unforgettable ordeal. Except for Suzy, we were soaking wet, and filthy. We left a trail of whatever debris we had picked up in the water. Michael, Suzy and I went to the Medical School, where we cleaned ourselves with Baby Wipes soaked with disinfectant. Our clothes and shoes had to be thrown away. I tied rags to my feet to allow me to walk over the broken glass we encountered. Bob returned to the hotel to lead another group of people back to the Hospital. By noon, our family was finally together. I thought, "It's over. We're safe." I couldn't have imagined what was still to come.

At about 4 PM that day, we were told that the evacuation was to begin. We were allowed to take one small bag with our personal belongings. We moved across the bridge to join others already waiting in the Hospital. At that point, the Hospital was becoming a foul-smelling furnace. We waited in a line for about two hours, when it was announced that we would be transported by Wildlife and Fishery Department boats to buses, which would take us to shelters. The evening approached. We thought, "How can it be safe for us to be in a small boat, in the dark with animals in the water (alligators were reported to be seen) and snipers still active?" Fortunately, the boats never arrived. We spent that evening with our colleagues back in the Medical School consoling each other. It was announced that the next day, Thursday, the evacuation would take place by helicopter.

The Garage (Evacuation)

At 6 AM, an endless line, composed of people, dogs, cats and a few birds, formed in the Hospital garage to await evacuation (Figure 3). There were also a large number of patients we had inherited without warning from Charity Hospital. The Charity patients were being brought over by small boats (Figure 4), driven to the roof of the garage by pick up trucks, and then placed in rows along the garage floor. Many of the patients had been on ventilators; they were being hand-bagged

Figure 4. Patients from Charity Hospital arrive by Wildlife and Fishery Department boats to the second floor of the Hospital parking garage. They were subsequently transported to the roof by small pickup trucks.

Figure 5. Patients from Charity Hospital lined up on the Tulane Hospital garage floor to await evacuation. Patients were taken one by one to the roof to be placed on helicopters.

by respiratory therapists, nurses and other personnel, who took turns in the stifling heat. Physicians and nurses were intensely busy. Our son saw a diabetic patient with bilateral leg amputees in severe distress. He asked, "Dad, does that lady have legs, is she going to die?" It was a scene right out of MASH (Figure. 5). Our children watched as two of the patients were wrapped in body bags and taken away. Blackhawk helicopters began arriving. One-by-one, the Charity Hospital patients were rushed to the garage roof and flown to other medical facilities. The danger of sniper fire was ever present. Occasionally, a security person would rush off with readied guns (Figure 6). Each time patients left the roof in a helicopter there was cheering. The crowd became part of the evacuation process. They spirited the staff to work even harder.

We now knew how refugees felt after World War II; hungry, exhausted, filthy, fearful and with their possessions in a bag, waiting in a line to be taken somewhere, somehow. Overall, the crowd managed their plight remarkably well. Thank God, sanity prevailed. Someone had a battery-powered radio on. The Louisiana Governor was announcing that Tulane had been fully evacuated. We were incredulous. There were still almost 400 people in the garage awaiting evacuation! The radio was also reporting that Charity and University Hospitals had been evacuated. The previous day, we had been informed that perhaps 1000 people were still at Charity Hospital. One of our neonatal nurse practitioners then talked via cell phone to a nurse at University Hospital. The nurse at University Hospital reported the conditions there were deplorable; two premature infants had died the day before because the hospital ran out of oxygen, and nurses were starting IVs on each other to keep from becoming dehydrated. Our thoughts were all the same. "Does the State or Federal Government realize what is happening here? Do they even know we're here? Is this really the US of A?"

Standing for hours, and hours and hours, the line moved inch-by-inch to nowhere. Towards the afternoon, some helicopters began to arrive, and our spirits started to lift. After several hours, our family was placed in the group designated to be airlifted next. We were herded into a stairwell leading up to the roof. The heat and stench in that stairwell were overwhelming, and some of us began to feel ill. A nurse with us who was pregnant had to be treated. Then, we heard the most depressing news. A Hospital administrator announced that no more helicopters were coming. It had gotten dark and the lights on the roof were not working. Snipers again began shooting at the helicopters. We would need to spend the night in the Hospital garage. We contacted an influential friend in Atlanta and begged him, "Please call news stations or government officials. Tell them what is going on. We and many others are still trapped here. People are getting desperate. Please send helicopters." Dr. Myers' wife and Dr. Finger's (pediatric intensive care) wife, who were staying in other parts of the country, also started a phone campaign to news stations, to report the gravity of our situation. We have no doubt the efforts of all three of these individuals helped. We left the stairwell in complete despair.

Thursday night seemed to never end. Everyone crowded together on the garage's concrete floor. No pillow, no blankets. There were no restroom facilities. People had to use stairwells and parts of the garage as latrines. The odors emanating from these areas were horrific. Despite the deplorable conditions, no one really cared any more. Just get us the hell out of here. As we were lying on that unforgiving floor staring into space and trying to fall asleep, I mentioned to Nancy, "Think about our favorite vacation place on Lake Champlain in Vermont." The suggestion seemed to work. We did manage to

Figure 6. A member of the Tulane Police Department searches for snipers from the 7th floor of the Hospital parking garage.

Figure 7. A United States Military Chinook helicopter lands on the roof of the Hospital parking garage to evacuate Tulane University Medical Center employees.

steal a few hours of sleep. Later that night, we were given one last remembrance of our captivity. At about 4 AM, we were awakened by a tremendous explosion. The sky lit up. Some were yelling that the building was on fire; others that a helicopter had crashed. Of course, we had no idea what actually happened. We later found out warehouses on the Mississippi River had blown up. We turned to see how Suzy was doing through all this. She was asleep, her head resting on her stuffed dog, Brownie. Our next thoughts, "Lord, please help, bring on the morning." To quote a pediatric cardiologist friend of ours, Terry King, "There are no atheists in foxholes."

Friday A.M. came, and so did the big birds. United States Military Chinook helicopters appeared in the sky. What a beautiful sight (Figure 7). People began cheering. Michael yelled, "That's my ride!" The Chinook is an imposing piece of military equipment with two large rotor blades; it can carry up to 60 people at a time. Our family posed for a picture just before boarding the helicopter (Figure 8). A gangway was dropped, and our group dashed into the hovering chopper. We hung on as this magnificent machine began taking us to our destination, the New Orleans Airport. The open doors gave us a breathtaking view of a devastated city, still almost totally submerged under water. Wind through the helicopter cooled our wilted bodies. Most began smiling, some wept, a woman near an open door was praying. Hurray! We were home free. Bob yelled to the pilot, "This scene reminds me of the final days of the Viet Nam War, when United States Military helicopters were evacuating the remaining people fleeing from Saigon." The pilot flashed Bob the peace sign, and Bob respectfully returned the gesture. We turned to take a last glance at Tulane Medical Center, sadly wondering what its future entailed. Up, up and away.

Figure 8. The Ascuitto family in the Hospital garage prior to being evacuated. Pictured from left to right are Nancy, Michael, Bob, Susana and Brownie. Photograph taken by Dr. Charles Scher, pediatric hematologist.

Reflections

In describing our story, we avoided the name Katrina. It is a name we just as soon forget. However, what should never be forgotten is the tragedy inflicted upon the Gulf South, its universities, hospitals and businesses, and of course the people of Alabama, Mississippi and Louisiana. The storm covered an area the size of Great Britain. Damage will be in many, many billions of dollars. Likely, half of New Orleans' population will never return. Even as flood waters recede and New Orleans is pumped dry, the damage is still apocalyptic. It is estimated that 12 million tons of debris remain in Orleans Parrish alone.

What went wrong? Why the massive failure of the levee system? Why didn't federal help come sooner? Who is, or is government, to blame? Surely, on the State level, there was inadequate preparation for the giant storm and disorganization after it hit. FEMA seemed clueless as to the magnitude of the disaster. New Orleans Mayor Ray Nagin acknowledged there was mismanagement; however, he had the courage to speak out, pleading for Washington's help. He championed our cause. Unfortunately, the Federal Government was gripped by indecision. Its response was slow, far too slow.

Former president Harry Truman was once asked to characterize the Oval Office. His response was swift and simple, "The buck ends here." Americans are shamed by the spectacle they witnessed in New Orleans. Journalists have referred to our ravaged city as Baghdad on the Mississippi River. President George Bush has promised to rebuild this once great metropolis and to fully support recovery efforts in the Gulf South. Time will tell. Perhaps 8/29 can be Bush's domestic legacy for his second term, much as 9/11 was for his first. In the end, however, it will be the people of New Orleans that will fuel its rebirth. We end our story by quoting a religious passage: *"Before us lies a new day, and in the distance a new world, ours to create by the strength of our faith" ~ Gates of Redemption, New York, p 21.*

Postscript

As we mentioned, our dogs had to stay

Figure 9. Flower and Pommy after being rescued by the Louisiana National Guard.

in our house throughout the storm. Our home was flooded, as were thousands of others in the area, and we had given up hope for their survival. The dogs were rescued by the Louisiana National Guard (Figure 9) twelve days after the storm hit, and ultimately flown to New York. They are now with us on Long Island. If only they could tell their story.

Acknowledgements

Tulane University Health Sciences Center and its partner Hospital Corporation of America (HCA Healthcare) should be highly commended for their commitment to the well being of their patients, during this largest of natural disasters to strike the United States. Every patient being treated in The Tulane Hospital and Clinic survived the evacuation, and arrived safely at their prescribed destination. Hospital Corporation of America incurred major expenses for helicopters involved in the evacuation of their patients and staff. This is a record we can surely be proud of. We thank the Louisiana Wildlife and Fishery Department, the Louisiana National Guard and of course the United States Military Service, for their help in evacuating patients and staff.

To the nurses, physicians, hospital staff and administrators, too numerous to mention, many owe their lives to them. Congratulations go to Jim Montgomery, the CEO of Tulane Hospital, for maintaining his professionalism and a sense of humor during this ordeal. We appreciate the efforts of New Orleans Mayor Ray Nagin to get outside help. We are proud of Tulane University, one of the fine educational institutions of the South. Lastly, we thank referring pediatric cardiologists in Louisiana for their generous help: Murder Kattash in Lake Charles, Terry King in North Monroe and Albert Gutierrez in Lafayette. Immediately after the storm, Dr. Gutierrez participated in the air lift that took several of our patients to Lafayette Women and Children's Hospital. These physicians graciously took time out from their busy practices to provide care for patients, and their families. Likewise, we appreciate the willingness of Arkansas Children's Hospital and Texas Children's Hospital for readily accepting our patients. During this evacuation, we witnessed a spirit of cooperation that made us proud to be Americans.

Finally, thanks to our children, Michael and Susana Ascuitto, who demonstrated bravery far beyond their years. A special appreciation to Michael Ascuitto, who took most of the photographs shown in the figures.

~CCT~

Corresponding Author:
Nancy T. Ross-Ascuitto, MD
Professor of Pediatrics
Director of Fellowship Training Program
Tulane University School of Medicine
New Orleans, LA USA

nrossascuitto@yahoo.com

Robert J. Ascuitto, PhD, MD
Professor of Pediatrics and Adjunct Professor of Physics
Edward G. Schleider/Regents Educational Chair in Cardiology
Director, Division of Pediatric Cardiology
Tulane University School of Medicine
New Orleans, LA USA

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Publishing Management
Tony Carlson, Founder & VP/Sales
TonyC@CCT.bz
Richard Koulbanis, Publisher & Editor-in-Chief
RichardK@CCT.bz
John W. Moore, MD, MPH, Medical Editor/ Editorial Board
JWMoore@mednet.UCLA.edu

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INTRODUCING THE iE33 PEDIATRIC ECHO SYSTEM
ECHO SOLUTIONS FOR EVERY STAGE OF LIFE

Philips iE33 Pediatric Echo System

In the last 20 years, there has been a revolution in caring for children with congenital heart disease. Thanks to advances in diagnostics, surgery and treatment, many of these children are living into adulthood and enjoying active lives. With dedicated pediatric cardiology capabilities, the iE33 echo system answers your need for high-performance, non-invasive diagnostic imaging for these patients.

From fetal echo to mature adult, the iE33 system supports the assessment of congenital heart disease through every stage of life and provides new diagnostic information that is changing patient management. Everything about the system is designed to meet the specific needs of pediatric cardiology. Unique ergonomic features make it possible to successfully image the tiniest premie or the largest teenager in many different environments. Pediatric analysis follows your workflow. And advanced technologies provide best-in-class 2D imaging and Live 3D Echo and give clinicians and surgeons structural information to make decision making more efficient and outcomes more effective.

A full complement of cardiac transducers, including pediatric and adult TEEs, enables you to image a complete range of patient types – regardless of age, disease state or body composition.

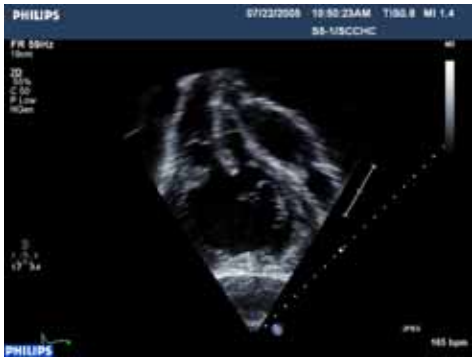
> ***"A new analysis package for congenital heart disease assessment includes: LT/RT inflow, LT/RT outflow, shunt evaluation, chamber evaluation, valve investigation."***

In addition, a unique analysis package truly follows the patient the way you do – so you don't have to fit your requirements into an analysis package designed for adult echocardiography.

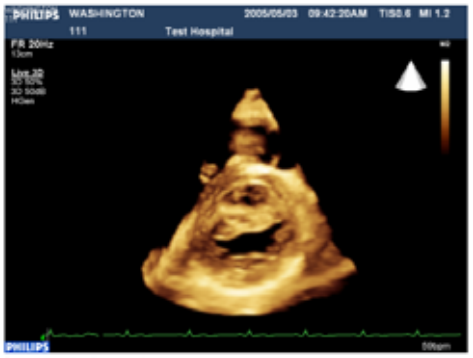
The biggest breakthrough in transducer material in 40 years, PureWave crystal technology provides significantly better acoustic properties for a radical leap forward in 2D image quality.

Transducer	Application/Patient
S12-4 broadband sector array	Neonates and small pediatric patients
S8-3 broadband sector array	School-aged children
S7-3t broadband sector array	Pediatric transesophageal echo
C5-2 broadband curved array	Fetal echo
S5-1 with PureWave crystal technology	Young adult and adult
S7-2omni	Adult transesophageal echo
X3-1 matrix array	Live 3D Echo imaging

A transducer for every need.



PureWave Crystal Technology



Live 3D Echo

Dedicated to your pediatric cardiology clinical and workflow requirements, our commitment goes beyond the system and its technologies. Global educational programs, outstanding service and worldwide centers of excellence help you to get the most out of your system every day.

Pediatric echo from Philips…
it just makes sense.

FOR MORE INFORMATION

Philips Medical Systems
22100 Bothell Everett Highway
Bothell, WA 98021
+1 (425) 487 7000
1 (800) 285-5585

www.medical.philips.com/ultrasound

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