Innovations in Cardiology & Heart Surgery

Rady Children's Hospital San Diego

Rady Children's - A comprehensive system focused solely on children.

PEOPLE

Division welcomes husband/wife team

Drs. Aparna and Rohit Rao recently joined the Division of Cardiology at Rady Children's Hospital-San Diego. They are also on the faculty at UC San Diego School of Medicine as associate clinical professors of pediatrics. Both come from Phoenix Children's Hospital.

Aparna Rao, M.D., is a board-certified pediatric pulmonologist. Her clinical and research interests are in caring for children with congenital heart disease who have pulmonary and airway pathologies. At Phoenix Children's, she was the section chief of pulmonology, the director of asthma and co-director of the apnea/ bronchopulmonary dysplasia program. Among her honors and awards, she has been named one of the "Best Doctors in America" and "Best Doctors in Phoenix."

Rohit Rao, M.D., M.B.A., is a board-certified pediatric cardiologist and intensivist. He specializes in pediatric cardiac critical care and treats patients in the cardiovascular intensive care unit. Dr. Rao also specializes in pulmonary hypertension and cares for children with this condition in the outpatient and inpatient settings. His research interests include application and innovation of microcirculatory non-invasive monitoring for children with critical illness.

The Raos earned their medical degrees at Grant Medical College, Bombay, India, and completed their pediatric residencies at University of Illinois at Chicago. Fellowship training followed at Children's Hospital of Wisconsin, where Dr. Aparna Rao completed her fellowship in pediatric pulmonology, and Dr. Rohit Rao completed a dual fellowship in pediatric cardiology and pediatric critical care medicine.

Together, they have served on the Advisory Editorial Board of *Pediatric Cardiology* since 2010.

PROGRAMS

Heart transplant program achieving optimal survival rate

As Rady Children's Heart Transplant Program approaches the three-year mark, it is achieving excellent outcomes, most recently on patients at higher risk due to their age or complications.

Since its inception in 2015, the program has performed 11 transplants, all with 100 percent survival at one year. Three of these patients were under 1 year of age, including a 10-day-old with complex congenital heart disease. Others required mechanical circulatory support or had prior heart surgery. One patient had a bidirectional Glenn shunt.

First BiVAD transplant patient (pictured left)

Under the direction of Cardiovascular Surgery Division Chief and transplant surgeon John J. Nigro, M.D., the Heart Transplant team has successfully bridged patients to transplant with ventricular assist devices (VADs), such as the CentriMag centrifugal blood pump and the Berlin Heart BiVAD. The first BiVAD patient, a 4-year-old boy with multiple heart issues, was recently discharged after spending more than 110 days at Rady Children's. He first came to the Hospital in June after having a heart attack, caused by an underlying coronary artery abnormality that resulted from Kawasaki's disease. He also had severe heart failure and arrhythmias. The patient is now thriving. Cardiologist Sanjeet Hegde, M.D., Ph.D., created a three-dimensional printed model of his heart to give to the family.

RESEARCH

Novel shielding technology for MRI-guided procedures

A team of Rady Children's cardiologists and engineers from the Mechanical and Aerospace Engineering Department at the UC San Diego Jacobs School of Engineering, led by cardiologist Sanjeet Hegde, M.D., Ph.D., is working to develop electromagnetically shielded devices for magnetic resonance imaging (MRI) guidance of minimally invasive procedures.

The team was chosen by UC San Diego's Institute for the Global Entrepreneur (IGE) to be part of its new IGE Technology Accelerator. The year-long program will provide selected teams with up to $50,000 in financial support, with a particular focus on helping teams validate their technologies and business models by field-testing their prototypes with strategic partners.

Rady Children's Hospital San Diego

Children's Cardiomyopathy Foundation Accredited Center of Care

innovation belongs in every moment

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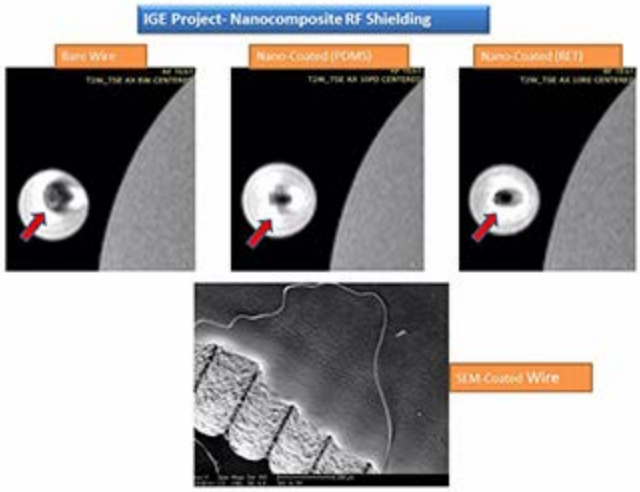

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MRI is optimal technology for guiding minimally invasive procedures, as it eliminates the risk with X-rays of ionizing radiation. It also makes procedures safer through better delineation of anatomy for complex interventions and provides far superior functional information. But in the MRI environment, conventional catheters, guidewires and devices used under X-ray are not visible and/or safe (i.e., heating). As a result, an entirely new approach to engineering is required for the advancement of this field, including ways to make metallic objects safer in the MRI scanner and to develop catheters, guidewires and devices that are visible under MRI.

Recently, the team tested a nano-composite coating on a stainless steel wire with promising initial results. Further testing will be conducted at Rady Children's and the National Institutes of Health to evaluate the coating's ability to reduce radio-frequency heating and artifacts, and improve the visibility of medical devices. The successful implementation of a new materials system, combined with the discovery of new MRI-guided modalities, has the potential to advance a wide range of transcatheter diagnostics and interventions.

INNOVATIONS

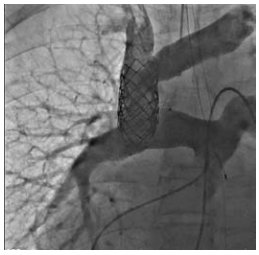
First-in-human closed-chest transcatheter superior cavopulmonary anastomosis

Physicians from the Division of Cardiology performed the first-in-human fully percutaneous superior cavopulmonary anastomosis in a patient with single-ventricle congenital heart disease. The procedure presents a potentially viable alternative to open heart

surgery for treating this condition.


3-D printed model of the patient's heart (actual size)

The procedure was performed on a 35-year-old woman diagnosed with a functional single ventricle and very limited pulmonary blood flow. (Rady Children's has an adult congenital heart disease (ACHD) program, with the only board-certified physicians in ACHD care in San Diego, Imperial and Riverside counties.) She was homebound due to dyspnea and worsening cyanosis. Given her high risk for surgery, the team decided to use a transcatheter approach, performing the nonsurgical equivalent of the bidirectional Glenn operation.


Post-procedure angiogram

The physicians rehearsed the procedure step by step using contrast-enhanced cardiac computed tomography and a three-dimensional printed model of the patient's heart. The patient not only had a full and smooth recovery, but her symptoms improved after six months. Rady Children's physicians believe that future advances in technology will simplify nonsurgical interventions for these patients.

An article on the case was published in the Aug. 8 issue of the *Journal of the American College of Cardiology*.