Improved Cardiac Monitoring Tracks Adult CHD

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SCOTTSDALE, ARIZ. — With many more infants surviving congenital heart disease, pediatric cardiologists have a new challenge, Dr. Alan H. Friedman told physicians at a pediatric update sponsored by Phoenix Children's Hospital.

Many more survivors must be followed through adolescence and into adulthood with noninvasive cardiac monitoring, said Dr. Friedman, director of pediatric cardiovascular imaging services at Yale–New Haven (Conn.) Children's Hospital, and of Yale University, New Haven.

Four-dimensional magnetic resonance imaging is "where the future of cardiology is going to be," he predicted. It is safer than methods that expose them to radiation, and it has the potential to provide more graphic information than can be obtained with any other technology.

"The future will be to take three-dimensional imaging in time and rotate it so we can provide to our surgeons the most graphic information," he said.

'This is not a competition between these different imaging technologies ... they complement each other.'

DR. FRIEDMAN

In the meantime, new and better tools have already expanded the physician's ability to image the heart and other structures within small pediatric patients.

"This is not a competition between these different imaging technologies, but rather that they complement each other," he said, comparing the options.

The chest x-ray remains a part of everyday practice, he said, praising its accuracy in depicting the relationship between the heart and lungs: in particular, cardiac size, pulmonary blood flow, and pulmonary edema. Radiation exposure is minimal with chest x-rays, he continued. But they are not specific enough to assess certain forms of congenital heart disease (CHD).

Dr. Friedman described ultrasound as the workhorse of pediatric cardiology. Transthoracic echocardiography is safe and portable with the use of laptops that can be brought directly to the bedside.

Echocardiography allows physicians to take a disciplined, segmental approach to imaging the heart, he continued. After determining whether the heart is in the correct position, they can assess systemic venous drainage, pulmonary venous drainage, atrioventricular connections, ventriculoarterial connections, and intra- and extracardiac structures.

Ultrasound is useful for assessing virtually every type of congenital heart defect, including ventricular septal defects, the most common form of CHD, according to Dr. Friedman. Physicians can confirm the clinical diagnosis and see the defect's location in the ventricular septum. They can measure size, flow, and pressure across the defect. Small probes enable the use of transesophageal echocardiography (TEE) in children of all ages. Dr. Friedman said TEE provides excellent anatomic definition because lungs, bone, and muscle do not interfere with the imaging.

"We are looking right at the back of the heart from the esophagus. There is nothing in between," he said.

Dr. Friedman recommended TEE for assessing very small, hard-to-see abnormalities. "If endocarditis is suspected, transesophageal electrocardiogram might be the way to go."

It is also useful, he added, for the Fontan patient and others who require surgery. Whereas thoracic echo is not practical in the operating room, he said a probe in the esophagus can provide information during surgery and assess the adequacy of repair for better postoperative management.

TEE is also useful in the cath lab, he continued. It helps define pathophysiology and is an alternative to imaging methods that expose the patient to radiation.

With three-dimensional echocardiography, he said, physicians can obtain beautiful, real-time pictures of the atrial septum, mitral valve, and aortic valve structure.

Three advances—radionuclide imaging, positron emission tomography, and computed tomography—are increasingly used, but Dr. Friedman urged caution because they expose children to ionizing radiation.

Radionuclide imaging allows accurate

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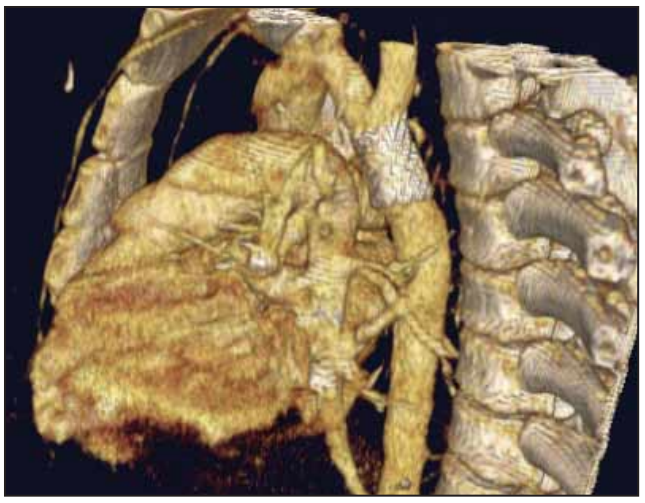
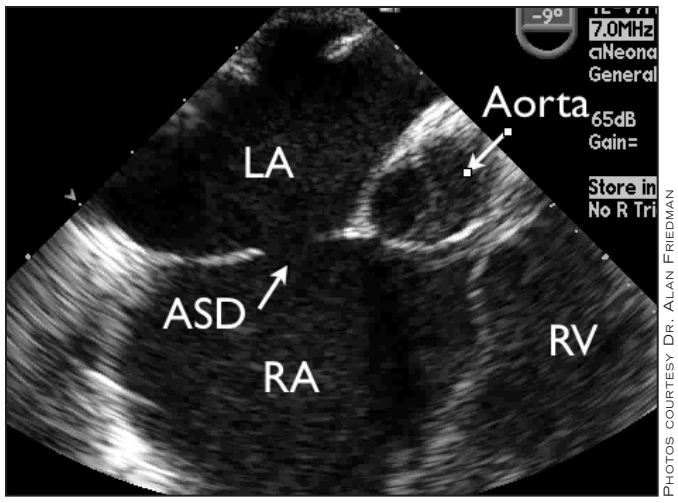


A CT scan with three-dimensional reconstruction shows a stent placed in this patient to aortic coarctation. With three-dimensional echocardiography, physicians can obtain real-time images of the atrial septum, mitral valve, and aortic valve structure.



Photos courtesy Dr. Alan Friedman

A transesophageal echocardiogram shows a secundum atrial septal defect (ASD) in a toddler. This technology provides excellent anatomic definition because lungs, bone, and muscle do not interfere with the imaging (LA, left atrium; RA, right atrium; RV, right ventricle).

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measurement of right and left ventricular function. Unlike echocardiography, its results are not subject to variable interobserver interpretation. He recommended PET scanning for assessing myocardial metabolism, perfusion, and viability.

Dr. Friedman said ultrafast CT scanning produces very-high-resolution images that can provide excellent information on blood flow and cardiac function. It also can assess areas of stenosis, particularly in the distal pulmonary artery, that are missed by echocardiography.

Although not yet portable, MRI and MR angiography also offer excellent resolution, according to Dr. Friedman, but without the high doses of radiation with CT scanning. Three-dimensional images are already available for surgical planning, he said, and MR cardiac catheterization laboratories are being developed. ■

Doppler Able to Determine the Nature of HCM

Doppler myocardial imaging to assess systolic activation delay can help determine whether a condition is hypertrophic cardiomyopathy or merely the result of athletic training—and help predict serious adverse cardiac events, Italian researchers reported.

Dr. Antonello D'Andrea of the Second University of Naples (Italy) and colleagues followed 70 patients with hypertrophic cardiomyopathy (HCM) and 85 age- and sex-matched competitive athletes with enlarged left ventricles and interventricular septa thicker than 12 mm (Br. J. Sports Med. 2006;40:244-50).

During the 4-year follow-up, the study's primary end point was cardiovascular mortality. Eight HCM patients died during follow-up; none of the athletes had a cardiovascular event. The participants were aged 29 years on average and were matched for blood pressure. Eighty percent of them were male. All had standard pulsed Doppler echocardiography and pulsed Doppler myocardial imaging in six myocardial segments. HCM patients showed a "significant global Doppler interventricular delay," the authors said. One-fifth of the HCM patients had a relative who had died from an HCM-related cardiac event.

—John R. Bell