

3D guided magnetic imaging reduces radiation exposure in pediatric ablations



UCLA physicians have been leading the way in performing fluoroless ablations aimed at improving long-term outcomes in children with abnormal heart rhythms by avoiding exposure to X-ray radiation.

Approximately 5 percent of all children will experience a supraventricular tachycardia (SVT), or rapid heartbeat, episode before graduating high school. About 20 percent of those will seek medical attention; the rest may not perceive the condition or may not seek treatment until later in life, if at all.

Ablation is a procedure performed to eliminate episodes of rapid heartbeat. During ablation, an interventional cardiologist puts catheters into the heart, which allows the tracking of electrical signals to identify abnormal areas that are causing the episodes. The abnormal tissue is then ablated with either electrical energy that creates heat or by cooling with liquid nitrogen. The freezing technique is used in areas of the heart where the risk of damaging adjacent tissues is higher. The procedure can be performed on children of any age; however, it is preferred for children older than 5 years and those weighing more than 33 pounds.

Axillary approach to pacemaker implantation

Another procedure that can take advantage of the fluoroless approach to placing electrodes inside the heart is pacemaker implantation, which is most often done to treat an abnormally slow heart rate.

In addition, the axillary approach to implanting pacemakers in the armpit just behind the pectoralis muscle, instead of the usual placement in front of the shoulder, appears to keep the device in place better with patient movement and is less prone to trauma — an important factor given that children's high level of activity can damage the device's lead wires. Children also like that the pacemaker is hidden from view.

"We need to look at how our interventions affect children in the long term. How do we make the rest of their lives more normal?" says Kevin Shannon, MD, director of Pediatric Electrophysiology at UCLA. "That's true for everything we do in pediatric cardiology."

Children under 5 years of age are usually treated with medication because of the greater risk they face from the ablation procedure and the fact that many will outgrow the tachycardia.

Fluorless ablations becoming standard of care

One of the biggest concerns in performing the ablation procedure has been the use of X-rays to guide catheter placement in the heart. A new technique, called fluorless (without radiation) ablation, takes advantage of a 3D electroanatomical navigation system to position the catheters. Three sets of sensors placed on the body detect small electrical pulses emitted by the catheter. The location of the catheter is then triangulated from the external sensors and the catheter location is shown on a computer-generated image of the inside of the heart.

UCLA has been using the fluorless technology since 2006, when it was first used to limit radiation exposure in pregnant women who urgently needed cardiac procedures. The early success and dramatic reduction in radiation exposure led to the fluorless technique being applied to pediatric patients as well. Many institutions reserve this technique for more complex arrhythmias and heart disease cases, in part because of additional expense, but also because the catheter is slightly stiffer due to the coils inside of it and can be harder to manipulate. Physicians at UCLA have become leaders in this area and have developed such an expertise that they perform almost all of their ablations — about 75 to 100 a year — using the fluorless technique. UCLA is participating in a national multicenter trial to determine whether this technique should be the standard of care for pediatric ablations.

While standard fluoroscopic ablation can subject children to significant levels of X-ray exposure, UCLA has been able to reduce its average fluoroscopy time from 11 minutes to about one minute, with more than half of patients not receiving any fluoroscopy. The new fluorless ablation technique offers the opportunity to avoid the exposure altogether, or reduce it to a very minimal level to accomplish the same result.



Computer-generated images of a supraventricular tachycardia patient's heart. The right atrium is colored red, the right ventricle green and the coronary sinus blue. The green ball represents a site on the mitral valve annulus where an ablation was performed to eliminate a left-sided accessory pathway.

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