

Electromagnets guide heart device implantation, reduce radiation exposure

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Heart failure patients and others who need implanted cardiac devices to help their heart beat regularly may benefit from a new technology to guide their implantation procedure. It uses electromagnets, which work like a GPS tracking system, instead of radiation-based imaging, researchers reported in the American Heart Association journal *Circulation: Arrhythmia and Electrophysiology*.

Electromagnetic [tracking technology](#) was used successfully to implant Cardiac Resynchronization Therapy (CRT) devices in [heart failure patients](#), and substantially cut patients' and doctors' radiation exposure as compared with traditional fluoroscopy-based implantation procedures.

CRT is an increasingly common treatment option for patients with severe [congestive heart failure](#) and conduction disease. Beyond conventional right ventricular pacing, a CRT device, which provides biventricular pacing, helps the left and right lower chambers of the heart to beat in synchrony. Although fluoroscopy is traditionally used to guide CRT implantation, [radiation exposure](#) from this type of imaging is a major concern even for experienced operators using an up-to-date scanner.

The new tracking system uses tools equipped with sensors that can be detected electromagnetically, which reduces the need for conventional fluoroscopy.

Average fluoroscopy time for traditional CRT implantation exceeds 20

minutes. But with the new tracking system, patients were exposed to the conventional fluoroscopy an average of five minutes.

"This new technology has the potential to revolutionize the way we image inside the body while we perform a wide range of diagnostic and therapeutic interventions in the future," said the study's lead author Sergio Richter, M.D., consulting electrophysiologist and senior physician at the Heart Center of the University of Leipzig in Germany.

Researchers have compared the new electromagnetic navigation system to a GPS tracking system. "Just as data from three satellites orbiting the earth are used to locate a GPS device's location on earth, the MediGuide system uses data from three transmitters to measure a sensor's position and orientation within the electro-magnetic field around the patient at all times," Richter said.

Unlike conventional two-dimensional (2D) fluoroscopy, this technology applies three-dimensional visualization to pre-recorded 2D images used by the physician for CRT implantations. This creates a real-time clinical environment that adjusts automatically for heart rate, respiratory motion and patient motion, and accurately tracks catheter position within 1 mm and 1 degree, Richter said.

The new tracking system was used in 15 [heart failure](#) patients (8 men and 7 women, average age 66) who entered Leipzig University Hospital early in 2012 and met the American College of Cardiology/American Heart Association/Heart Rhythm Society indications for CRT implantation.

Study patients were initially followed for four weeks after implantation. All 15 patients were identified as severe heart failure patients. Traditional fluoroscopy-guided implantation was used for the two device leads on the right side of the heart. The new tracking technology was

used to place the third device lead via the coronary sinus on the left ventricle—the heart's largest and main pumping chamber.

"Patients with higher body mass and those requiring a large number of fluoroscopy-based interventions, either diagnostic or therapeutic, such as chronic disease or cancer patients, would especially benefit as they are at a higher risk of increased cumulative exposure to harmful radiation and to higher risk of developing new or secondary cancers," Richter said.

Provided by American Heart Association

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