Researchers help develop new MRI, expanding access to life-saving imaging

January 20 2022

Orlando Simonetti (right) works with MRI technologist Heather Hermiller to operate a new FDA-approved MRI machine that he helped develop. The machine has a lower magnetic field and larger patient opening, expanding access to patients who were previously unable to undergo MRI. Credit: The Ohio State University Wexner Medical Center

New MRI technology, developed by Siemens in collaboration with researchers at The Ohio State University College of Medicine and College of Engineering, will expand imaging access for patients with implanted medical devices, severe obesity and claustrophobia. The Ohio State University Wexner Medical Center is the first in the United States to install this recently FDA-approved full body MRI for patient care. The technology uses a lower magnetic field to open up new possibilities for imaging the lungs and patients with implanted devices and will potentially support new interventional procedures that could result in less radiation exposure.

The 0.55T MAGENTOM Free.Max features the largest MRI opening to date, 80 cm compared to the typical 60-70 cm, and a lower magnetic field strength that offers the potential for it to be used for lung imaging without X-ray radiation. MRI uses a powerful magnetic field and radio waves to produce detailed images of a patient's body to help diagnose conditions, plan treatments and determine the effectiveness of previous treatments. MRI is used predominantly to image the brain, spine and joints but can also be used to image the heart and blood vessels. Today's clinical MRIs usually have magnetic field strengths of 1.5 or 3.0 Tesla, whereas the Free.Max is much lower at 0.55 Tesla.

"Many of our patients have pacemakers or defibrillators, and while many of those devices are now safe for MR scanning, the metal in them can distort the magnetic field and corrupt the image quality. We were looking for ways to improve the quality of images in these patients, and lower magnetic field strength could offer an advantage. The problem with low field MRI is that there is less signal to work with, and we needed to find ways to boost that signal," said Orlando Simonetti, research director of cardiovascular magnetic resonance, professor of Internal Medicine and Radiology and John W. Wolfe professor in cardiovascular research.

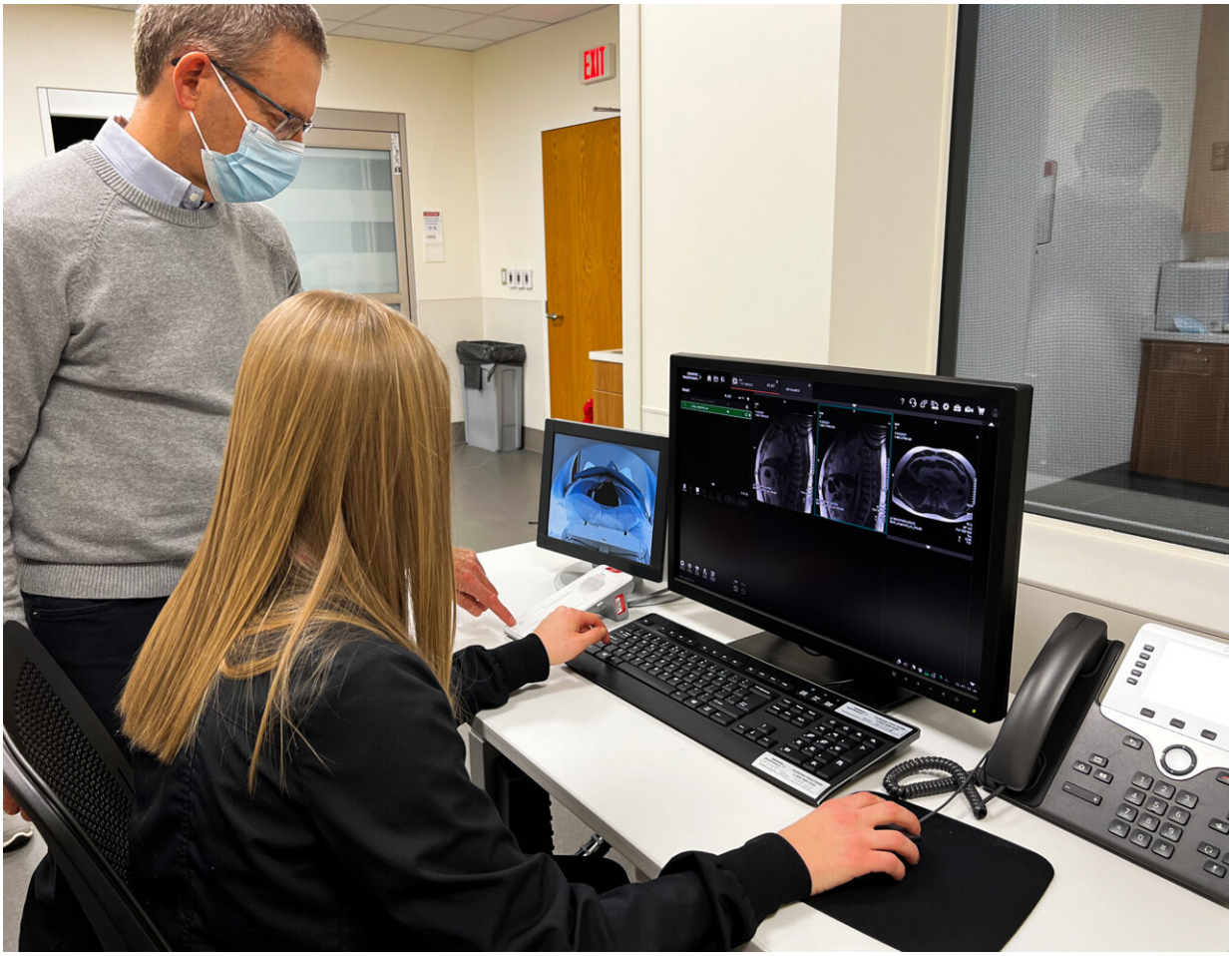
Simonetti teamed up with Rizwan Ahmad, an assistant professor of biomedical engineering at Ohio State, to develop techniques that could suppress noise, or interference in the images, and produce clearer images at lower field strength. They shared their ideas and techniques with Siemens, leading to development of the 0.55T Free.Max scanner.

"There's no doubt in my mind that low-field MRI will play an important role in the future and will become more mainstream," Simonetti said. "Going to lower field can reduce the cost of MRI systems and installation considerably, and with modern techniques for scanning and image processing, we can overcome the inherent loss of signal."

Ohio State researchers have partnered with Nationwide Children's Hospital to study use of the 0.55T with heart catherization. Children with congenital heart disease must undergo repeated heart catheterizations throughout their lives, and they are exposed to radiation every time they have an X-ray to guide the tube through a blood vessel to the heart.

"The doses of radiation accumulate over time and can be harmful, especially to children who are still growing," Simonetti said. "It may be possible to perform MRI-guided cardiology procedures safely at low field using standard catheters and guidewires; this will be safer for anyone who has to have repeated heart catheterizations and other procedures."

Simonetti is also working with Dr. Sabrena Noria, surgical director of Ohio State's Comprehensive Weight Management, Metabolic/Bariatric Surgery Program, and heart failure specialists at the Richard M. Ross Heart Hospital to take advantage of the larger opening of the low field scanner to develop cardiac imaging techniques for severely obese patients.



MRI technologist Heather Hermiller collaborates with Orlando Simonetti during an MRI at The Ohio State University Wexner Medical Center. Simonetti's research was instrumental in designing a new FDA-approved MRI machine that expands access to patients who cannot get into traditional MRI machines. Credit: The Ohio State University Wexner Medical Center

Ohio State researchers are optimistic that the new MRI technology can also be used to image the lungs, which typically is done with nuclear imaging or X-ray CT scans.

"This is an important advancement for patients with cystic fibrosis, pulmonary hypertension, heart failure, COVID-19 and any other disease where we're trying to understand the source of shortness of breath and evaluate both the heart and lungs," Simonetti said. "The air in the lungs cancels out the MRI signal at higher field strength; however, at lower field, there's potential to see lung tissue more clearly with the MRI."

The 0.55T MRI is part of Ohio State's cardiovascular imaging program led by Dr. Yuchi Han and located in the Wright Center of Innovation in Biomedical Imaging, led by Dr. Michael Knopp, in the Martha Morehouse Medical Plaza, next to a new 3T MRI. Both new systems are dedicated to cardiovascular clinical and research imaging. In addition, there is a 1.5T MRI located in the Ross Heart Hospital, also devoted to cardiovascular imaging.

"The addition of the 0.55T system showcases Ohio State's commitment to provide the best and most advanced cardiac imaging services possible. We're proud to be the first hospital to install this new technology and to play a part in its development. What's really unique is that we have a comprehensive imaging program that's dedicated to patients with cardiovascular disease. By having three different field strengths, we're able to pick the right machine for the right patient and to provide the best patient care possible," said Dr. Thomas Ryan, executive director of the Ross hospital and director of Ohio State's Heart and Vascular Center.

Provided by Ohio State University Medical Center

Citation: Researchers help develop new MRI, expanding access to life-saving imaging (2022, January 20) retrieved 25 June 2024 from https://medicalxpress.com/news/2022-01-mri-access-life-saving-imaging.html