

At the Heart of the Problem

Advanced MR Applications Enhance Diagnostic Power in Visualizing Diseases of the Heart and Blood Vessels



In 20 years of work in magnetic resonance imaging, Steven Wolff, M.D., Ph.D., has seen huge advances. Today, he regards MR as the most powerful tool available for diagnosing diseases of the heart and blood vessels.

His practice, Advanced Cardiovascular Imaging in New York, NY, uses a GE Signa® 1.5T MR scanner, advanced applications and specialized coils to provide high-quality diagnostic images in even the most challenging cases.

Dr. Wolff and his colleagues use the MR Echo™ application for detailed studies of cardiac function and blood flow, and TRICKS™ time-resolved imaging with a high-density 32 element peripheral vascular coil for fast, reliable run-off studies in the lower extremities.

Dr. Wolff sees the need for MR imaging increasing rapidly as the United States population ages and with growing incidence of obesity and diabetes. He also believes MR has meaningful advantages over other modalities in cardiovascular application. "At some point in the future, I can envision many cardiac patients having a cardiac MR exam as part of their routine care," he said.

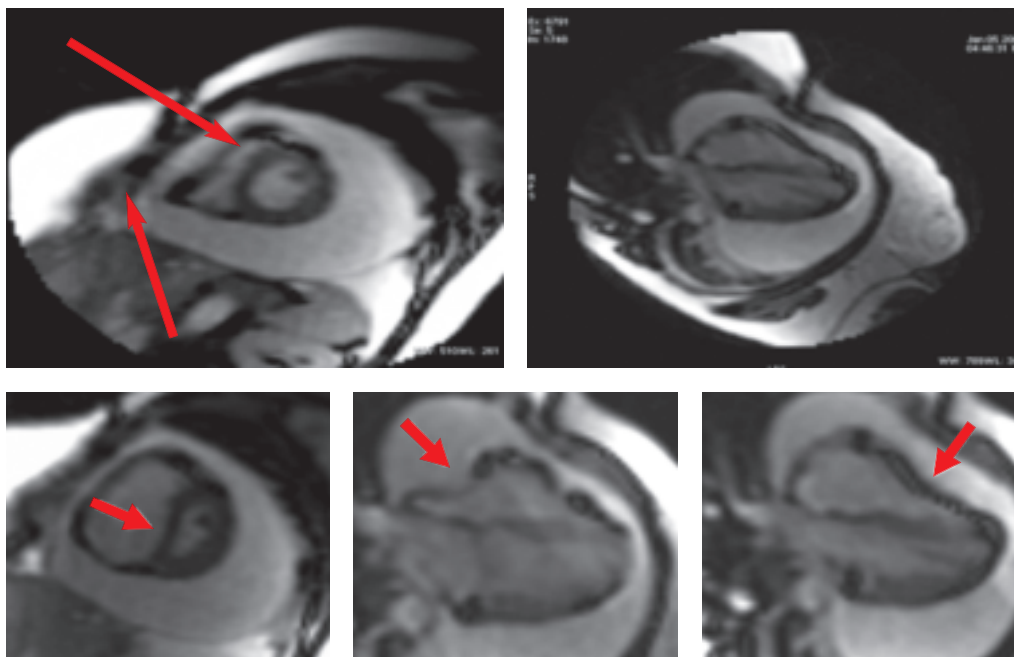
Focused Specialty

As a radiologist and former Director of Cardiovascular MRI at the National Institutes of Health, Dr. Wolff opened his private practice five years ago. He also serves as Director of Cardiovascular MRI with the Cardiovascular Research Foundation and as Chief of Cardiovascular MRI at Lenox Hill Hospital.

The 1.5T MR system at Advanced Cardiovascular Imaging is used almost exclusively for cardiac and vascular cases. Cardiac exams include stress tests, function and flow studies. Vascular exams include studies of the chest, abdomen, carotid arteries and lower extremities.

"A number of our studies are combination cases where the referring physician asks for a cardiac MRI as well as an MRI of the aorta, neck or lower extremities – because atherosclerotic disease is not limited to just one artery," Dr. Wolff explained.

Since the staff is highly experienced in cardiac studies, Dr. Wolff reports the exams take as little as 23 minutes. "That includes a comprehensive cardiac exam, which we've done faster than we've done knee examinations."



62-year-old woman with SOB

MR Echo: A Valuable Tool

Dr. Wolff regards the MR Echo application from GE as “clearly the best available for studying the heart.” It enables clinicians to acquire real-time images of the heart. “Until we had real-time imaging, we would have to make images of the heart by averaging a number of heartbeats,” Dr. Wolff said.

“For good image quality, that would require each heartbeat to be identical. But an enormous number of people have arrhythmias, which made it almost impossible to get good-quality cardiac MR images. With MR Echo, it doesn’t matter what cardiac rhythm the patient is in. I can see the heart just as nicely as if it were in normal sinus rhythm.

“The other advantage is that it requires no patient cooperation. Patients who are too sick to breath hold don’t need to hold their breath. It’s an extremely robust technique, and it’s convenient and easy to use.”

Dr. Wolff used MR Echo for a 62-year-old woman sent for evaluation because she had a pericardial effusion. “The referring physician wanted to make sure there wasn’t a cardiac mass causing the fluid buildup,” Dr. Wolff said. “We acquired images in real-time, while the patient was breathing, with no need for ECG gating.

“We observed a pattern of cardiac motion that physicians view with great alarm: collapse of the various heart chambers. We saw collapse of the right atrium and right ventricle, as well as paradoxical septal motion. In the presence of pericardial effusion, these are signs of cardiac tamponade.

“We got the images in a matter of minutes; when we saw them we took her out of the scanner and she received critical care. We could not have made that diagnosis without real-time imaging.”

Imaging the Arteries

On the vascular side, the 1.5T MR system helps diagnose disease throughout the body: atherosclerosis, dissection, aneurysms, arterio-venous malformations and vein disorders. “People once considered MR angiography to be a very difficult test,” Dr. Wolff noted. “Today’s technology makes it easier and faster. We perform MRAs in 15 to 20 minutes and runoffs in less than 30 minutes.”

One reason for the greater speed and quality is TRICKS time-resolved imaging, which delivers reproducible, high-quality images of the leg arteries. Another is ASSET parallel imaging, which can be used to speed up image acquisition or to increase the imaging volume.

“With MR Echo, it doesn’t matter what cardiac rhythm the patient is in. I can see the heart just as nicely as if it were in normal sinus rhythm.”

Dr. Steven. D. Wolff

“Another thing that I consider important is the GE high density 32-element peripheral vascular coil for evaluating the arteries below the knees,” Dr. Wolff added. “It gives us 15 times greater signal-to-noise than the body coil. It’s critical to have good images not just of the arteries below the knees in general but specifically the arteries in the feet. Those frequently were cut off in the past because there was no coil to cover the foot. The combination of TRICKS and the coil has dramatically improved the quality of our runoffs.”

The challenge in peripheral vascular studies has been timing. In patients with compromised circulation, the legs may fill at different rates, making it extremely difficult to time the acquisition. TRICKS solves that problem, eliminating timing and triggering considerations. It is essentially a point-and-shoot application.

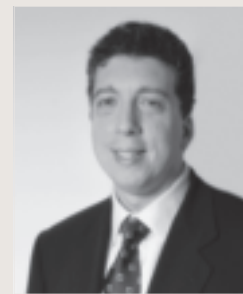
Changing the Game

Dr. Wolff used TRICKS to examine a young woman who had an arterial-venous malformation just above the knee. “In AVMs, there is a fast rush of blood flow through the legs,” Dr. Wolff said. “If you don’t get the timing right, you may not see the arteries because the veins will appear very quickly and cover them up.

“With a single image, you lose that flow information. You may have a feeding artery, but you can’t tell how much that feeding artery contributes to the lesion. With TRICKS, we can do that in a time-resolved fashion.

“Our images gave the interventionalist a roadmap, showing him the feeding arteries much better than typically seen on an X-ray angiogram. Our 3D images clearly showed three abnormal feeding vessels coming into the AVM. You could actually see the blush of signal and the shunting of blood from the arteries to the veins along with the early draining veins.

“This is the kind of information that’s essential for accurately treating these patients. If this woman hadn’t undergone the MRA, the interventionalist might not have found all the feeding vessels, might not have known which ones were more important and therefore might have spent a longer time looking using X-ray angiography, which may result in more dye and radiation. This interventionalist said we changed the way he practices medicine based on the quality of our MRA studies.” ■



Steven. D. Wolff, M.D., Ph.D.

Steven. D. Wolff, M.D., Ph.D., is the Director of Cardiovascular MRI at the Cardiovascular Research Foundation in New York. He is also the Director of Cardiovascular MRI at Advanced Cardiovascular Imaging, a private practice in Manhattan. His research interests focus on developing new MRI techniques that will have immediate applications to clinical practice.

He is the inventor of several patents in MRI including the original patent on magnetization transfer. Dr. Wolff attended Duke University Medical School for his medical and doctoral studies. His doctoral work was based on research he performed as a Howard Hughes Medical Institute - National Institutes of Health (NIH) Research Scholar. Dr. Wolff completed his radiology residency at Johns Hopkins Hospital in 1994.

About CRF New York, NY

The Cardiovascular Research Foundation (CRF) is a global leader in bringing together three elements that define modern medicine: research, education and patient care. Founded in 1991, CRF has played a key role in the development of nonsurgical and drug-based treatments of heart and vascular disease.

CRF’s MRI program, directed by Steven D. Wolff, M.D., Ph.D., was established in May 2000 to perform research and education in cardiovascular MRI. Research and education are closely aligned with the Clinical Cardiovascular MRI program at Advanced Cardiovascular Imaging.