

# Technology Transfer Stories: 25 Innovations That Changed the World



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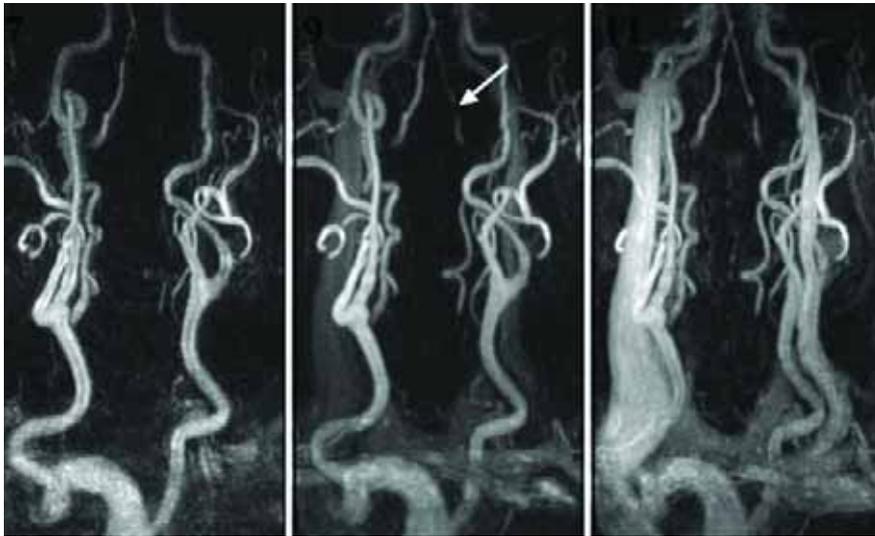
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# Chapter 21

## TRICKS Changes the Face of Medicine

*TRICKS, a three-dimensional imaging technique invented by University of Wisconsin-Madison medical physics professor Charles Mistretta, takes the unknown and makes it known.*



Images of the carotid and vertebral arteries using the TRICKS method for contrast enhanced magnetic resonance angiography. Note the slow flow in the left vertebral artery (arrow)

**G**ary Baron of East Lansing, Mich., repeatedly felt painful cramping in both legs when he walked. There was nothing about Baron's physical appearance that would foreshadow narrowing of the arteries, but his medical history told another story.

Baron, 63, had previously been diagnosed with angina, which led to his need for a cardiac catheter and a three-vessel bypass graft. So he had an ultrasound test to see how well the arteries in his legs were working.

After Baron had the test, his surgeon referred him to physical therapy. Though he showed some improvement during the therapy, he still experienced pain in his legs. Fortunately for Baron, he was about to get some assistance from time-resolved imaging of contrast kinetics, or TRICKS™, a new three-dimensional imaging technique that takes the guess work out of contrast-enhanced MRI procedures.

Every year, between 8 and 10 million people are affected by peripheral vascular disease. But before the invention of TRICKS at the University of Wisconsin-Madison, visualization during the MRI process was limited. TRICKS entered the marketplace in 2003.

Before TRICKS was introduced, when doctors looked at images of blood flow in areas like legs and ankles, the resulting information could be confusing. The old technology would miss some arteries or not be able to show the physician when the flow in the artery had backed up and started going in the wrong direction. The process also took a long time, well over two hours.

"TRICKS has helped us see what arteries are affected, how bad the arteries are, and if the patient needs vascular surgery," says Kevin DeMarco, M.D., an associate professor in the Department of Radiology at Michigan State University. "TRICKS also helps us see the very small arteries in the calf and foot, even down to three millimeters."

DeMarco has used TRICKS in different areas of his work: in private practice in East Brunswick, N.J., with the University Radiology Group, and at MSU. He learned of TRICKS through national meetings of the International Society of Magnetic Resonance Medicine. "When I first heard of inventor Charles Mistretta's early work with vivid three-dimensional images, it sounded exciting," he says.

### **Images Display Like Scenes in a Movie**

In the 1980s, the X-ray technique became the gold standard for diagnostic images. Then in the 1990s, radiologists used MRI exams, sometimes injecting a contrasting agent into the patient to better enhance the study. The trouble was that the results sometimes were confusing to interpret. The reason was timing.

In diagnostic imaging, timing is everything. Think of multiple scenes running in sequence, like photographing water flowing over a waterfall or revolving scenes in a movie. TRICKS records fast-evolving images, or scenes, critical to making an accurate diagnosis pertaining to blood clots and vascular problems. With the old technology, the camera takes multiple shots, often missing a

crucial snapshot in time. TRICKS acts more like a video camera, recording all the events during an MRI exam, not just static, frozen images. The technology allows doctors to capture the images they need to make a diagnosis.

Charles Mistretta, a professor in medical physics at the University of Wisconsin-Madison at the time TRICKS was patented in 1996, is also a professor of radiology at the university today. “We devised a lot of different technologies to get the timing right,” he says.

Today, radiologists all over the world are using TRICKS, a system that’s simpler, more robust and more reliable than previous technologies. “It used to take us 30 seconds to generate one image, and that image couldn’t decipher dynamic events,” explains Mistretta, who says his UW team of scientists was inspired by Thomas Grist, M.D., chair of the UW Radiology Department. “It was obvious that to better track blood flow in the legs and ankles, we needed a time-resolved series.”

The result of Mistretta’s invention was TRICKS. “It has a major advantage over the old MRA X-ray technique because it provides three-dimensional images and it has a 400 percent increase in speed,” he says.

TRICKS, patented by the Wisconsin Alumni Research Foundation and licensed to GE Healthcare of Waukesha, Wis., was incorporated in 2003 into GE’s Signa EXICTE™ 1.5 T MR unit. The following year GE included TRICKS technology in its 3.0T MR unit.

As part of EXCITE, TRICKS helps doctors diag-

nose blood clots and other vascular concerns with faster, safer, non-invasive MRI studies. Its primary advantage is that it produces a series of time-resolved images rather than just one.

### **Technology Produces Economic and Societal Benefits**

Introduced in 2003, two major MRI companies now manufacture TRICKS, including GE Healthcare. “We’re very excited about the technology,” says Jerry Shattuck, a licensing manager with WARF. Shattuck says WARF also is in negotiations with a third major MRI manufacturer. “We expect sales to increase as the technology continues to gain acceptance in the marketplace,” he says.

TRICKS continues to help doctors make important decisions — decisions that directly impact their patients’ lives. “I see people with a particular type of pain, They have cramping in their legs usually after walking just a few blocks, but the pain usually goes away when they’re at rest,” DeMarco says.

When Baron, a patient with bilateral pain, saw DeMarco, the total exam time with TRICKS was less than an hour. Previously, the MRI exam was typically three to four hours. “We usually had to have the patient return for a second two-hour session,” DeMarco says.

Before the availability of TRICKS, patients like Baron might have had to undergo an invasive conventional angiogram, usually performed in an operating room or hospital angiographic area. The procedure involves inserting a catheter into

## Medical

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— Charles Mistretta,  
University of Wisconsin-Madison

the artery in the groin with a chance of injuring the artery and making the patient's foot cold. "While that may happen only a very small percent of the time, that's a 100 percent inconvenience and frustration for the patient," DeMarco says.

With the invention of TRICKS, "we're getting closer to the gold standard. It answers questions like how narrow the arteries are in the calf and feet 80 to 90 percent of the time," DeMarco says. In Baron's case, TRICKS answered the question of whether he needed vascular surgery.

The good news for Baron was that surgery wasn't necessary. He continued physical therapy, which eventually led to a positive outcome. "Without TRICKS we would have been less certain what route to take between surgery or physical therapy." DeMarco says, "With TRICKS, the diagnostic process was simpler, faster and safer."

— *By Sharyn Alden*