Twin Cities Edition

M.D. NEWS

A BUSINESS AND LIFESTYLE MAGAZINE FOR PHYSICIANS

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Comedian Groucho Marx made something of a signature bit out of this little exchange: "A man walks into his doctor's office, flexes his arm, and says, 'Doc, it hurts when I do this.'" The doctor's response? "Then don't do that."

That old chestnut of a joke does contain just a grain of truth. However, particularly when it comes to diagnosing pain that worsens only with a certain activity, movement or position.

Standard diagnostic tools, such as a recumbent MRI requires a patient to remain in a supine position while being scanned so that the attending physician can get a glimpse of what's happening inside the body. However, if the pain only presents itself in a particular position that is not supine, the physician may miss seeing the whole picture and could be unable to make an accurate diagnosis.

That's only one of the potential problems Wayne Dahl, owner of SUMA MRI (Stand-Up Mid America MRI) in Golden Valley, is convinced his stand-up MRI can address. Equally important from a patient's point of view is that the stand-up MRI procedure eliminates claustrophobia and can cause less anxiety than the recumbent tubular MRI. Unlike conventional tubular MRIs, patients can sit inside this machine with no obstructions to the front of the patient and watch a large flat-panel television screen suspended outside as they are scanned. Thus, it both reduces the potential for medical errors *and* increases patient satisfaction.

"The MRI scanner has been proven to be one of the most-used diagnostic technologies," says Dahl. "Yet recumbent MRI scanners limit the physician's ability to clearly recognize the source of the patient's problem because the patient is scanned recumbent with no pressure on joints or the spine. Research has proven that pressure on the L5-S1 disc is 11 times greater when the patient is standing and bending forward compared with lying supine.

Patients can be scanned in nearly any physiological position including flexion, extension, rotation and lateral bending positions, and while seated. That means patients with a back problem, for instance, can be scanned in the position that intensifies their symptoms, and the scan will more likely show the pathology that otherwise would be missed if the patient was in a recumbent non-weight-bearing position. Cardiovascular patients can be scanned upright in their position of symptoms, as can patients with cerebrovascular insufficiency, acid reflux and emphysema.

According to Steven Brownstein, M.D., board-certified medical radiologist who wrote the foreword to the textbook, *Essentials of Skeletal Radiology*, significantly more pathology is discovered through an MRI scan done with a patient in a standing-neutral or standing-extension position compared to a conventional MRI in which the patient is in a recumbent position.

The stand-up MRI scanner can accommodate patients up to 500 pounds. It can demonstrate vertebral instability due to weight bearing, particularly with anterior shifts in patients with spondylolisthesis. It can also accommodate patients that are hyperkyphotic or unable to lie down for other physiologic reasons.

Patients can be scanned in a comfortable, seated position watching a large flat-screen television throughout the scanning process.

PHOTO BY DAVID GINSBERG

The genesis for the stand-up MRI has an impressive pedigree. Dr. Raymond Damadian, who patented the original technology of the recumbent MRI, also invented the stand-up MRI.

The company FONAR, incorporated in 1978 to capitalize on Damadian's technology, introduced a patented iron-core technology in 1982, the basis for all of today's open MRI scanners. Damadian received the National Medal of Technology from President Ronald Reagan in 1988 for his discoveries related to MRI technologies. By 1996, FONAR had introduced the stand-up MRI (now known as the FONAR Upright MultiPosition MRI)

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that is FDA-approved and no longer experimental technology.

What is impressive about the FONAR Upright MRI magnet is its excellent image quality, which is obtained at 0.6 Tesla. According to Paul Suchanyc, one of FONAR's senior systems specialists, "The mid-field 0.6 Tesla magnet is the optimum field strength to obtain an MRI image. At this magnet strength, tissue relaxation times are optimized resulting in an increased contrast between various tissue samples within the body without sacrificing the overall signal-to-noise ratio of the images.

"The FONAR MRI scanner has specially designed coil sensitivity and software that produces images equal to and sometimes superior to 1.5 Tesla field strength. The magnetic field orientation is horizontal versus vertical, and thus does not need the field strength that is required of recumbent MRIs to overcome gravity. A mid-field strength magnet of 0.6 Tesla is beneficial because imaging artifact effect is minimized when there are surgical implants or other types of foreign metal objects within the body."

Upright imaging was conceived under the notion that a particular problem or ailment one may encounter should be imaged in the upright position to best diagnose the true cause of that particular problem. A patient who may be experiencing pain or discomfort with a particular part of their anatomy while upright may feel relieved and comforted when they lie down. In order to achieve the best images for that patient's ailment, it only makes sense to image the patient in the position they are experiencing that particular problem.

Jeffrey C. Wang, M.D., Chief, Orthopaedic Spine Service, Executive Director of the UCLA Comprehensive Spine Center and associate professor of orthopaedic and neurosurgery, after evaluating the stand-up MRI, made the observation that "dynamic weight-bearing MRI studies provide new and valuable information that has allowed us to detect new pathologies and new conditions that I believe will revolutionize the way we diagnose spinal problems. This ultimately will affect patient care and I believe will result in more optimal results with less problems in the future for that specific patient."

The American College of Radiology (ACR), whose certification is commonly considered the gold standard for MRI quality, has certified SUMA's stand-up MRI. Only 36 out of more than 200 MRI scanners of all types in Minnesota are ACR-certified, of which SUMA's is one.

According to Dahl, there are approximately 114 FONAR Up-Right scanners in the world, the great majority in the U.S. and a handful in Europe. Scientific papers continue to be presented on the upright MRI technology. According to Dr. Terry Yochum's *Essentials of Skeletal Radiology,* Volume 3, when stand-up MRI scans were compared to recumbent MRIs (rMRI), "initial reports (of stand-up MRI scans) demonstrated exaggeration of disc bulges, disc protrusions, disc herniations, central canal stenosis, neural foraminal stenosis and lateral recess stenosis. In some cases, false-negative disc herniations on rMRI have been discovered during upright or kinematic MRI. Under optimal conditions, a specific imaging abnormality may be correlated with a specific posture or kinematic maneuver that reproduces the clinical syndrome."

(L-R) Dr. Terry Yochum, Terri Karkoc, Wayne Dahl and John Lawler in front of the FONAR stand-up MRI machine.

PHOTOS BY DAVID GINSBERG

Jack Shapiro, M.D., a board-certified surgeon from New York, who has performed more than 10,000 surgeries during his career, has purchased the FONAR stand-up MRI. Dr. Shapiro said, "Having previously been an owner of MRI scanners, I am well-informed on the MRI industry. After evaluating the various MRI scanners, there was a clear and indisputable significance of the FONAR stand-up MRI over that of a static recumbent single-position MRI. These unique advantages provide surgeons with the full range of physiologic and dynamic evaluation of the spine to assure patients the optimal surgical outcome. The concept of a weight-bearing physiologic scan adds a new dimension to imaging, as well as diagnoses and treatment."

Of patients referred to SUMA for MRI scans, many specifically requested this technology from their doctor having learned about it primarily by word of mouth. A letter received from an employee at the Minnesota House of Representatives stated: "If not for being able to be seated in the stand-up MRI, I would not have been able to accomplish what is needed for my doctors to decide the correct course of continuing health care I need. It is nice to know that there are alternatives to MRI imaging available to patients and insureds such as myself who may be claustrophobic or larger or unable to lay (sic) down because of too much pain. I recognize I have choices and I have rights."

PHOTO COURTESY OF SUMA MRI

SUMA MRI and the Dr's Lodge is located at the intersection of Highway 100 and Highway 55 in Golden Valley, MN.

Within SUMA's facility, Dahl has built Dr's Lodge, a state-of-the-art meeting and special events center to serve the education and networking needs of medical professionals. He designed it as a venue in which all medical professionals can learn from each other.

At a recent continuing education class at Dr's Lodge, Matthew Powell, a personal injury trial lawyer, gave a presentation in which he referred to the stand-up MRI as the Stradivarius of MRI scanners. He says, "Anyone can own one, but not everyone can play it." Which is why SUMA's MRI technician is ARRT MRI certified and received specialized training and certification by FONAR to operate this sophisticated technology. Powell uses stand-up MRI scans in court because he considers them the gold standard for juries to understand the extent of his client's injuries.

PHOTO COURTESY OF FONAR

The stand-up MRI has the ability to scan patients in a variety of positions, including standing, sitting, flexion, extension, rotation and lateral bending.

If Dahl remains adamant about anything, it's that this advanced technology provides a superior patient experience and a confident physician experience. It increases patient satisfaction while reducing the potential for medical errors. And the cost of SUMA MRI standard procedures are comparable to the cost of lay-down MRI scans.

He sees the stand-up MRI scanner as the technology that is setting the standard for the future of imaging. Progressive physicians are rapidly accepting this new technology and are being rewarded by the satisfaction of their patients. ■

www.sumamri.com
Stand Up Mid America MRI
604 Lilac Drive
Golden Valley, MN 55422
(877) 521-5001
(763) 521-5000