

Upright MRI Is Poised to Become a Powerful Tool

Removing the need for patients to lie flat may allow for better diagnoses, but not just yet.

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As the technology of weight-bearing MRI has developed, so too have new applications—from gynecologic to cardiovascular evaluations—and new challenges in interpreting the complex images now available.

Upright MRI, introduced in fall 2000 by Fonar Corp., can scan a patient in virtually any position that reproduces pain or other symptoms. This allows the detection of pathologies visible only in a variety of weight-bearing positions, including standing, sitting, flexion, and extension, Raymond V. Damadian, M.D., president and founder of the Melville, N.Y.-based company, told FAMILY PRACTICE NEWS.

As a result, “we see things that are not there in patients lying down,” said Dr. Damadian. “The pathology just isn’t there [in the recumbent position].”

In one case, anterolisthesis at the L4/5 level was noted in a recumbent view, whereas a standing flexion scan showed an interspinous ligamentous rupture at the same level.

In another patient, a recumbent scan demonstrated no evidence of bladder or uterine prolapse and showed the levator sling parallel to and partially obscured by the pubococcygeal line. However, with the patient standing, the descent of the bladder relative to the pubococcygeal line was accentuated, and the levator sling was oblique and nonparallel to the pubococcygeal line.

Yet as revealing as such weight-bearing images might be, some radiologists may lack the experience or training to correctly interpret what they see.

“The body has moving parts, and once

you start scanning in different positions, . . . the anatomical relativity of the body parts shifts. That’s something that we have never viewed before. You have to be careful as to what you are calling normal or abnormal,” said Sana Khan, M.D., chair and founder of TrueMRI, an Anaheim, Calif.-based medical imaging group.

“One of the reasons their [Fonar’s] machines are having a harder time being sold is that radiologists look at it and say, ‘Why am I going to put all the extra effort in to learn all of this again?’” Dr. Khan said.

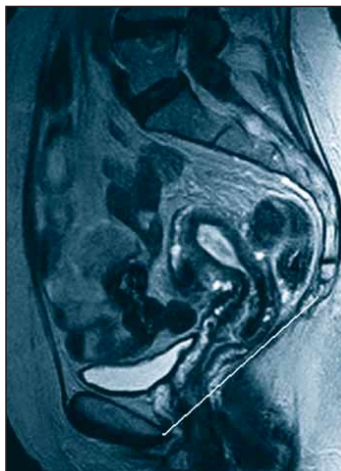
TrueMRI, which operates four upright scanners in California and one in Houston and expects one soon in Las Vegas, claims its radiologists have performed and interpreted more kinetic scans than any other company in the world. The company and its radiologists have developed proprietary software that interprets and quantifies the pathologies detected by an upright scan and is negotiating with Fonar to provide such interpretation for all Fonar users.

Dr. Damadian admits the images are complex and require experience to interpret. Images taken in the upright position must be systematically compared with those taken in a recumbent position to determine with confidence what changes are real and evince disease pathology.

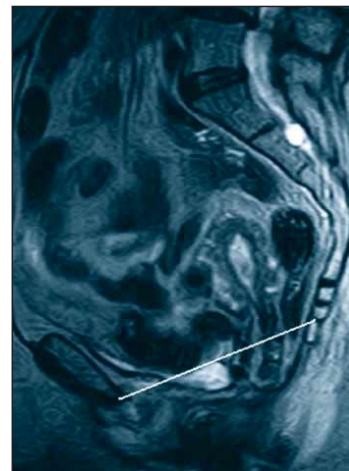
On the other hand, it’s not as though radiologists are operating in the dark, he said. With each use of the technology, radiologists are building a frame of reference. They’re “learning all the time.”

From the patient’s perspective, the scanner’s open configuration may make MRI imaging more tolerable for those who are claustrophobic, and it makes

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The conventional recumbent scan shows no evidence of bladder or uterine prolapse.



In a vertical scan, bladder or uterine prolapse is seen as these organs descend relative to the pubococcygeal line.

MRI available to patients who simply couldn’t fit into other scanners. It also allows young children to sit comfortably watching TV in the scanner without the use of routine anesthesia and lets infants be scanned while sleeping in their parents’ laps.

About 50% of all MRIs in the United States involve the spine, so the lion’s share of Upright MRI is being used for such musculoskeletal evaluations. But other applications are underway.

Upright MRI scanning, for example, is being used to obtain images of the beating heart and the blood-vascular system while the patient is vertical. Fonar introduced the first-ever magnetic resonance angiography and cines of the beating heart in the standing, sitting, obliquely oriented, and reverse Trendelenburg positions at the recent annual meeting of the Radiological Society of North America.

The company also unveiled a prototype of a new MRI-compatible treadmill for use inside its Upright MRI. Both of these technologies will possibly be available later this year, according to a Fonar spokesperson.

“We think one of the major applications of upright imaging is cardiovascular, because the heart is pumping against gravi-

ty, and the impact of gravity on blood flow is significant,” Dr. Damadian said.

In the vertical position, multiple factors may lead to decreased arterial or venous circulation, such as decreased cardiac output or loss of autoregulation.

“If you’re a cardiovascular surgeon trying to evaluate the impact of a coronary attack on the heart or trying to evaluate stenosis in a blood vessel, you’re going to want to know how that patient’s physiology is tolerating that pathology,” Dr. Damadian said.

Competing MRI manufacturers contend that unique diagnostic information is rarely captured in an upright scan. However, Dr. Damadian said about a dozen studies seem to suggest otherwise.

In a yet-to-be-published study by researchers at the University of Aberdeen (Scotland), roughly one in five patients with low back pain and sciatica had evidence of slippages of the spine that were only visible when the patient was imaged standing up, Dr. Damadian said.

Dr. Khan, who is working in association with researchers at the University of California, Los Angeles, will release information later this year from a series of studies in approximately 800 asymptomatic patients whose spines were assessed in a variety of positions with upright MR imaging.

Still, Dr. Damadian admits a more comprehensive study is needed before physicians would accept upright imaging as the new standard.

There are now more than 70 Upright MRI machines installed worldwide, up from just 18 scanners in mid-2003. Sales revenues are up 190%, from \$6.1 million in the first quarter of last year to \$17.7 million in the quarter just ended.

One indication of the inroads the technology has made is an agreement with GE Healthcare that allows its salespeople to sell Fonar’s Upright MRI scanner.

Although only a few have been sold this way, the agreement enables GE to offer a “total breadth” of products and services to its customers, said Ron Petcheny, GE product sales manager for open-segment MRI scanners. ■



In a patient with central spinal stenosis, a scan made in a recumbent position shows spondylolisthesis at L4 and L5.



This upright flexion scan shows a further anterior shift of L4 and L5 and more severe spinal canal stenosis.



This upright extension scan shows a comparative posterior shift of L4 and L5.