“TRU-SCAN MRI” IN CLINICAL PRACTICE – A RADIOLOGIST’S PERSPECTIVE

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“Tru-Scan MRI” is Rose Radiology’s new multi-positional Stand-Up Open MRI manufactured by the Fonar Corporation. The name “Tru-Scan MRI” was adopted because I believed it is a true representation of the images obtained on the Stand-Up MRI. The images are a more accurate and true reflection of the patient body in real life postures.

The new technology premiered in Maryland in 2001. The second installation was brought to Pinellas County by Rose Radiology in January of 2002 and is located in the Boot Ranch section of Palm Harbor, Florida.

Prior to bringing this new and highly specialized MRI product to our area, I researched the concepts of weight bearing (standing or sitting) and flexion/extension MRI. Unfortunately there had been very little written on the subject. However, common sense and intuition about this new technology led me to take the huge financial risk and purchase Tru-Scan MRI.

My findings in our first six months of operation were so substantial that I believed the Tampa Bay area could support another specialized MRI center. I opened Rose Radiology-Brandon as a regional MRI Center to serve Hillsborough County and its surrounding areas in February of 2003. The opening of that site resulted in the 15th installation of this type of MRI worldwide.

At Rose Radiology – Boot Ranch, the Tru-Scan MRI is complimented by the addition of the 1.5T Intera, the best MRI product manufactured by Philips Medical Systems. The Intera is an ultra-fast Cardiovascular MRI, capable of imaging the cardiac chambers and coronary artery. I have compared many hundreds of MRI’s on patients who have been scanned in different positions and using different magnet technology. I base this non-scientific writing on my experience with these two types of MRI machines. However, I am optimistic my beliefs will be confirmed by scientific double blind studies at a later date. I am writing this article because I simply wish to share my experiences and my perspective on this technology.

In the last year and a half, I have reviewed over 5000 MRI’s in various positions of natural weight bearing and have accumulated more experience in this technology than any other radiologist. Since this equipment is not yet available at an academic or research institution, I believe I have some responsibility to share what I have learned with my professional colleagues.
Case Study #1: Position Related Recurrent Disc Herniation
The recumbent scan for this patient with right-sided Radiculopathy following partial Discectomy is shown on the left. The upright scan (right) shows a disc Herniation at L5/S1.

Case Study #2: Position Related Spinal Instability
The recumbent scan for this patient with recurrent low back pain and polyradiculopathy following L4-S1 laminectomy and fusion is shown on the left. The upright scan (right) shows postoperative intersegmental hypermobile instability associated with fluctuating stenosis of the central spinal canal at the level above the fusion.

The concept of imaging in the natural weight bearing position is not new; many of us have preferred standing X-rays long before the first MRI was ever taken, especially our orthopedic colleagues whose preferences have been standing X-rays of the spine and knees. Since MRI allows us to view so much more anatomy than X-ray, it just makes sense to view the body in its natural posture.

After more than a year and a half of working with this specialized MRI, I can say without hesitation that numerous abnormalities not only can, but are missed on conventional MRI imaging of the spine. When it comes to imaging other body parts, TruScan MRI is similar to other open MRI’s in that results do not differ much from varying positions. However, TruScan MRI has the added value of being the most non-claustrophobic MRI available, allowing patients to sit down and watch TV while having their body scanned.

From my experience, about 65% of the differences I see with TruScan MRI occurs in the lumbar spine vs. the cervical or thoracic regions. This percentage coincides with the fact that the lumbar spine typically carries 60% of a patient’s body weight. Of all the cases I have seen of the lumbar spine where the patient has been scanned in the seated or standing position as well as the supine position, I see some difference in lumbar MRI imaging on our TruScan MRI approximately 40% of the time. Basically, 60% of the cases show no variance from the sitting or standing to the supine position, but as many as 40% of all lumbar spine MRI’s may contain additional findings or pathology when scanned in another position (sitting, standing, flexion or extension). Examples of cases scanned with TruScan documenting positive findings from my radiology practice are shown below.
Case Study #3: Instability of L4-5 Vertebral Body in Weight Bearing

Clearly defined motion/instability of L4 with respect to L5 vertebral body with subluxation which worsens in weight bearing images. This indicates instability and possible need for surgical intervention. Note substantial change in disc heights at L2-3, L3-4, and L4-5.

Case #3

Case Study #4: 1.5T Recumbent vs. TruSCAN MRI

Patient complains of radicular symptoms when sitting. When imaged recumbent on a 1.5T Philips Intera (left) there is a disc bulge at L3/4 level. Patient then scanned on TruScan MRI in the seated position (right) shows an L3/4 disc protrusion/herniation with corresponding compression on the thecal sac. Sometimes high-field MRI does not make the diagnosis.

Case #4

From my experience, about 20% of the cases that demonstrate a difference in pathology between supine and weight bearing views result in a surgical difference. Surgical findings include spinal instability, disc herniations and spinal stenosis. Non-surgical findings and differences that I see regularly include varying degrees of subluxation, degrees of neural foraminal compromise, scoliosis, and anterior disc protrusions. I present actual cases scanned in my practice showcasing these variances in this article.

Approximately 25% of the cases where I have witnessed a difference between positional MRI and traditional MRI are in the cervical spine. I have seen frank cervical herniations in the sitting position, made worse with head extension, that were not readily apparent on supine views. Remember, dependant upon the size of the individual, the human head can weigh between 10 and 20 pounds. This weight adds stress to the supporting structures of the neck and cervical spine.
Case Study #5: Upright Dynamic MRI Reveals Hidden Disc Herniation
The axial standing-extension gradient echo image (right) demonstrates a focal posterior disc herniation at the C4/5 level not visible on the recumbent scan. Note associated spinal cord compression on the standing-extension scan.

Case #5

Case Study #6: Position Related Disc Herniation
Seated image (left) shows disc bulging at C4/5, 5/6 and 6/7. Placing the patient in the seated, extension position shows a C4/5 disc herniation with compression on the thecal sac and cervical cord.

Case #6

The remaining 10% of the changes I see are in the thoracic spine. The percentages I have presented are in part a result of the ordering patterns of treating physicians. I interpret many more cervical than thoracic MRI’s. These percentages are probably skewed further because we encounter many cases I may not otherwise see (in that the patients have been pre-selected for imaging on our TruScan MRI by referring clinicians).

My experience so far allows me to state without hesitation that there is tremendous value in imaging patients in different positions, especially with regard to spine imaging. Please take the time to review a small portfolio of real patients from my radiology practice and see for yourself. Until a large scientific study is performed, we will have to base medical decisions on the information we have available. I believe the proof is in the MRI images and the pictures speak for themselves.
Case Study #7: Instability and Disc bulging - Seated vs. Standing
Seated image (left) shows forward subluxation of L4 on L5 and disc bulge at the L3/4. The standing view, however, shows herniation at L3/4 level. Sometimes differences are seen between sitting and standing.

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<th>Standing</th>
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Case Study #8: Disc Protrusion at C5-6 and C6-7
47-year-old woman with neck pain and radicular upper extremity symptoms demonstrates focal disc protrusions at C5-6 and C6-7 levels only in weight bearing image when compared to recumbent image.

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Case Study #9: Evaluation of Spinal Stability
The recumbent scan (left) demonstrates minor degenerative anterolisthesis at L4/5. The upright-flexion study (right) reveals further anterior slip of L4 on L5. This scans show hypermobile translational spinal instability, which can be a surgical indication in case of related low back pain.

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<th>Upright-Flexion</th>
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