Let’s talk about MRI ...
Traditional
“High-Field” Superconducting Magnet

“Classic” Open MRI

The patients are always lying down
If you *think* you might have a flat tire …

This position gives you the right diagnosis
The FONAR UPRIGHT® Multi-Position™ MRI

Why Settle for a Partial View of the Spine?
"The dominant motions at both the lower cervical and entire lumbar spine, where most clinical pathology occurs, are flexion-extension."
The FONAR UPRIGHT® Multi-Position™ MRI
Recumbent

Upright, Weight-Bearing
**Scientific Data**

Disc pressure measurements demonstrate that the pressure on the disc is much greater when the patient is erect.

Nachemson, *Spine* 1, #1 (1976)

**Relative change in pressure in a disc**
What about Image Quality ?
The patient sits upright between 2 vertical magnetic poles so there is a horizontal transaxial magnetic field in the magnet.

This is significant because of the rule in MRI that the axis of symmetry of the RF Receiver Coil should be perpendicular to the direction of the main magnetic field.
The FONAR Upright® MRI's unique horizontal transaxial magnetic field means it can use planar (flat) RF coils to image the spine just like the high-field MRI systems.

Since traditional Open MRI's use a vertical magnetic field, they cannot use planar (flat) RF coils to image the spine.

So the FONAR Upright® MRI is dramatically different than any Open MRI.
Excellent Image Quality
Advanced Applications

Upright MR Scoliosis Evaluation

3-Pt Dixon

Direct FatSat
Excellent Image Quality
Large Patient Scanning Capability

- 350 lbs.
- 425 lbs.
- 425 lbs.
Patients watch a 42-inch flat screen TV during their scans.
Pediatrics
Installations

ALABAMA       ARIZONA
CALIFORNIA    COLORADO
CONNECTICUT   DELAWARE
FLORIDA       GEORGIA
IDAHO         ILLINOIS
INDIANA       KENTUCKY
LOUISIANA     MARYLAND
MINNESOTA     NEVADA
NEW MEXICO    NEW JERSEY
NEW YORK      OHIO
OREGON        PENNSYLVANIA
TENNESSEE     TEXAS
VIRGINIA      WASHINGTON

SCOTLAND       ENGLAND
SPAIN          SWITZERLAND
GERMANY        NETHERLANDS
PUERTO RICO
Clinical Case Studies
Clinical Case Study:
Upright Weight-Bearing Visualization of Postoperative Spinal Instability

Recumbent

Upright

Case courtesy of M. Rose, MD, Rose Radiology Centers
Clinical Case Study: Position-Dependent Disc Herniation

Recumbent

Upright

Case courtesy Stand-Up MRI of Orlando, Orlando, Florida
Clinical Case Study:
Chiari Malformation Visualization When Upright

Recumbent

Upright

Case courtesy of J.P Elsig, MD, fmri Zentrum, Zurich Switzerland
Clinical Case Study: Unsuspected Disc Herniation on Extension

Case courtesy of R. Marks, MD, Up & Open Imaging, Dallas, Texas
Recumbent

In EXTENSION, the anterior longitudinal ligament becomes taut, and the posterior longitudinal ligament becomes lax.
Clinical Case Study:
Ligamentous Rupture & Associated Spinal Instability

Recumbent

Upright-Flexion

Case courtesy of F. W. Smith, MD University of Aberdeen, Scotland
Recumbent (Static) Imaging Can Underestimate the Maximum Degree of Pathology and Miss its Dynamic Nature
Recumbent (Static) Imaging Can Underestimate the Maximum Degree of Pathology and Miss its Dynamic Nature

Clinical Case Study: Hidden Nuclear Extrusion

Case courtesy of F. W. Smith, MD University of Aberdeen, Scotland
Position Imaging™ in the Neural Foramen

Flexion  
Neutral  
Extension
Clinical Case Study: Dynamic Fluctuation of Neural Foramen Stenosis
Position-Dependent Changes in the Pelvis

Pelvic Floor Dysfunction (PFD)

Recumbent

Upright
Scientific Publications
“In the patients with back pain, missed spondylolisthesis in neutral MRIs but found in flexion MRIs is 18.1% for all the levels in the condition that the spondylolisthesis is considered as more than 3 mm translation”

L3-4 was the “most commonly missed” at 38.7% followed by L4-5 at 35.1%
In a study of 163 patients with radicular cervical spine symptoms:

“A significant increase in the degree of cervical disc bulge was found by examining flexion and extension views as compared to neutral views alone”

“The study … suggests that extension MRI views yield a higher detection rate of missed cervical disc bulges than flexion views”

“Using 2.0 mm of disc bulge as a cutoff value, the false negative ratio for the neutral position alone compared to flexion and extension was 25.08%”
“Missed Lumbar Disc Herniations Diagnosed With Kinetic Magnetic Resonance Imaging”
J. Zou, M.D. et al., Department of Orthopedic Surgery, UCLA & Department of Orthopedic Surgery, Soochow University
SPINE7 Volume 3, number 5 (2007) E140-E144

In a study of 553 patients with symptomatic back pain:

“A significant increase in the degree of lumbar disc herniation was found by examining flexion and extension views when compared with neutral views alone”

For patients with normal or < 3 mm bulge in neutral, 19.46% (15.29%) demonstrated an increase in herniation to > 3 mm in extension (flexion)
In a study of 25 patients with low back pain and sciatica referred to the Upright MRI for lumbar spine MRIs following at least one prior “normal” recumbent MRI within 6 months of referral:

“13 patients [52%] demonstrated abnormalities “in one or more of the seated postures that were not evident in the … supine examination’

“Each of the 13 patients has undergone appropriate surgery and 6 months post-surgery they remain symptom free”
A study of 111 patients with “a previous non-diagnostic supine MRI scan, or a scan with inconclusive findings”

“Of the 111 patients, 47 [42%] demonstrated abnormalities, in one or more of the erect or seated positions, correlating with their symptoms and not evident on the supine scan. Abnormalities detected included 26 cases of spinal instability, 28 lateral disc prolapse and 10 circumferential disc prolapse with fluctuating spinal stenosis.”
Department of Neurological Surgery,
University of Louisville School of Medicine

20 patients with neck pain and symptoms consistent with radiculopathy or myelopathy were scanned upright in a GE 0.5T Signa SP vertical gap MR imaging system designed for MR image-guided surgery.

“When only static supine MRI scanning is performed on these patients, the true abnormality may be overlooked and inappropriate surgical plans instituted because of a lack of illustration of the changes that occur with movement.”

Institute of Diagnostic Radiology, University Hospital, Zurich

30 patients with chronic low back pain unresponsive to non-surgical treatment were studied in the GE 0.5T Signa SP vertical gap MR imaging system. They were scanned upright seated and their images compared with those of the same patients scanned supine in a Siemens 1.0T superconducting conventional MR imaging system.

“Positional MR imaging more frequently demonstrates minor neural compromise than does conventional MR imaging. Positional pain differences are related to position-dependent changes in foraminal size.”
The FONAR UPRIGHT® Multi-Position™ MRI

Thank you for your attention

www.fonar.com
Clinical Images
Neuroimaging
Musculoskeletal Imaging
(MSK)
Wrist

Elbow
Hip
Body Imaging