PERSPECTIVES

NOV/DEC 2017

THE VALUE OF HIGH-FIELD OPEN MRI

Meeting All Patients' Needs

Value-Driven Medicine

Growing Our Practice by "Rebranding" Open MRI

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ORTHOPEDIC ADVANTAGES OF HIGH-FIELD OPEN MRI

By Dr. John Feller

Our practice operates in a very competitive marketplace. About 26 MRI scanners serve about 400,000 patients in the Coachella Valley. Oasis provides us with a sustained competitive advantage, helping us stand out through the comfort of an open system that delivers image quality comparable to that of a 1.5T closed-bore system.

With the high-field 1.2T Oasis, we image patients ranging from routine brain and spine scans to contrast-enhanced angiography and brain spectroscopy. For these, Oasis delivers high-field quality images. When imaging "off-center "joints, such as the shoulder, Oasis delivers even better quality images than 1.5T systems.

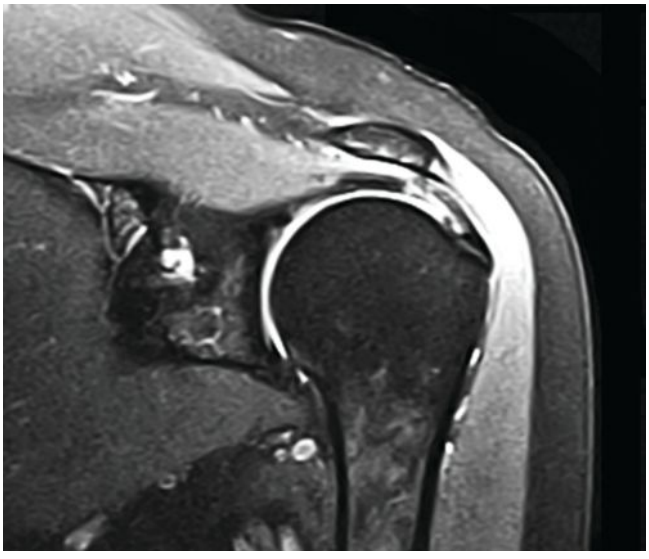


Figure 1 — This shoulder joint is positioned in the isocenter of Oasis's magnetic field.

We market services on the high-field open (HFO) to referring physicians for its image quality and to patients for its openness.

LONGTIME RUNNING

We have been scanning patients with Oasis for seven years at our outpatient center in Indio, California. This center, one of three operated by Desert Medical Imaging (DMI) in the Coachella Valley, is just off Interstate Highway 10 across the street from a hospital. Most referrals come from physicians in the Valley, primarily orthopedic surgeons, neurologists, neurosurgeons and spine surgeons, as well as primary care physicians.

We average between 14 and 16 patients per day, five days a week. Patients are assigned to 30-minute slots. On our busiest days, we scan as many as 26. Our centers don't have set closing hours—we scan until done. If our backlog gets greater than 48 hours, we schedule patients for Saturday. This is one way we have been able to maintain a competitive advantage compared to the nearby hospital and other centers that are only open 8 to 5 weekdays.

Our case mix is about 40 percent orthopedic, 40 percent brain and spine and 20 percent everything else (including body applications). The openness of the Oasis makes it especially suited to large patients who do not fit in closed-bore systems and claustrophobic or anxious patients. Referring physicians often refer these patients for scans on the Oasis. Other times, patients request the open scanner when

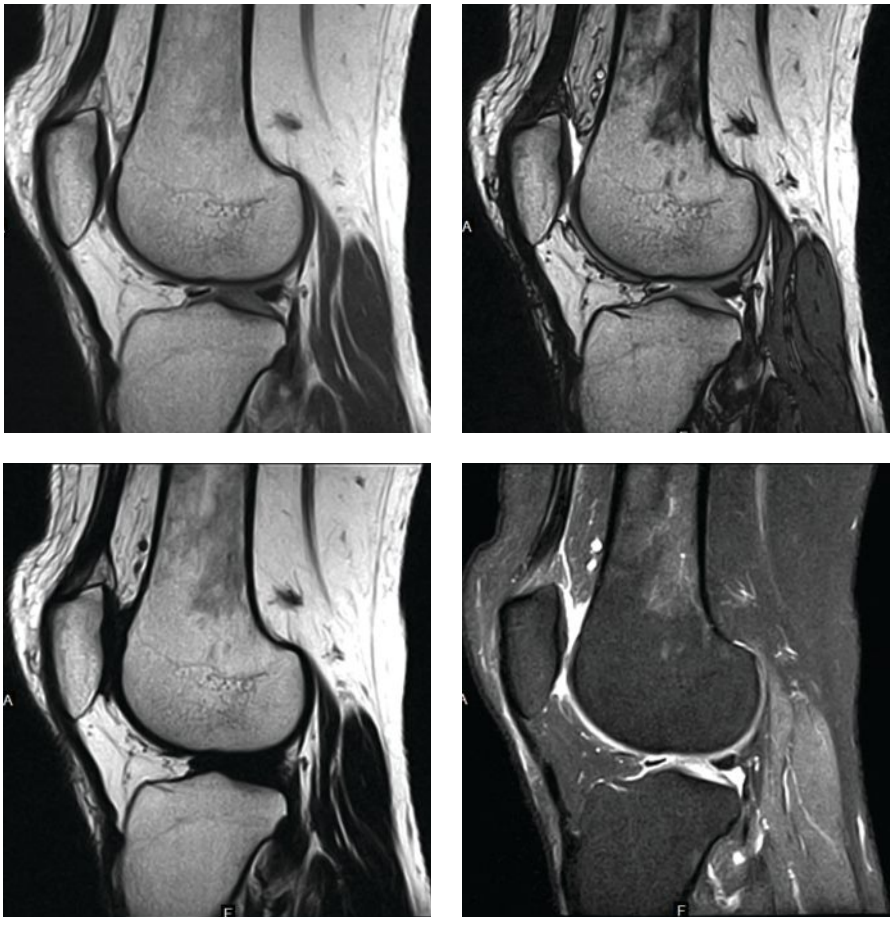


Figure 2 — FatSep sequences highlight the pathology in a single acquisition.

we call them to schedule an appointment. We also steer patients to the Oasis if they tell us they have metal implants, because metal artifacts are less on the HFO than on 1.5T systems.

ORTHO ADVANTAGES

On average two of every five Oasis scans are orthopedic. Oasis is especially effective in orthopedic cases for four reasons.

First, "off-center" joints, such as the shoulder, can be positioned in the sweet spot (or isocenter) of the magnetic field. Technologists use a laterally moving, motorized patient table to position the body part in the exact center of the field of view (see **Figure 1**).

Second, receiver coils are highly sensitive and efficient. These solenoid coils take advantage of the vertical field generated by the two superconducting disks (one above the patient and the other below). These coils maximize signal and minimize noise through increased sensitivity in the coil center.

Third, higher-order active shimming improves the homogeneity of the magnetic field. Before the patient enters the vertical-field magnet, the magnetic flux lines are parallel and the field is homogenous. Oasis' advanced multidirectional shimming system called HOAST (Higher Order Active Shim Technology) automatically realigns these flux lines and homogenizes the field.

Fourth, fat separation (FatSep) sequences highlight the pathology. FatSep can both improve image clarity and increase productivity, using a Dixon technique that creates fat-only and water-only images. (Water-only images are "fat-suppressed.") We use FatSep routinely to create up to four sets of images in a single acquisition. This saves us time by eliminating the need to do additional acquisitions (see **Figure 2**).

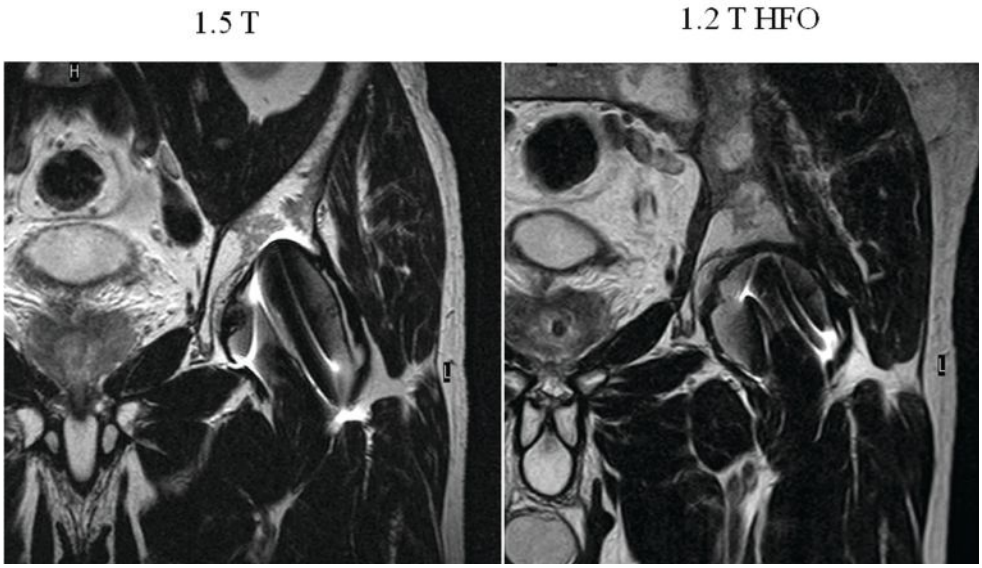
MANAGING DIFFICULT CASES

The openness of the Oasis mitigates issues that arise with large and anxious patients, just as the table—with an upward limit of 660 pounds—is engineered to support large patients. (Although a substantial number of Oasis scans are orthopedic, we routinely visualize any part of the body, using the Oasis as we would any other high-field MRI scanner.)

DMI selectively sends patients who are large or anxious to the Oasis, as well as those who have metal implants or have had such implants removed. Removal can leave behind microscopic but significant amounts of metal, which can degrade MRI images.

Horizontal fields generated by 1.5T and 3T systems are especially vulnerable to metal artifact (see **Figure 3**). The artifact is substantially less on the Oasis (see **Figure 4**).

Artifacts from metal implants are linearly related to field strength and, therefore, already lessened by the slightly lower magnetic field of the Oasis (1.2T versus conventional 1.5T). Oasis further reduces metal artifacts through the use of primeFSE (fast spin echo) and prime FIR (fast inversion recovery) sequences, which reduce distortion by manipulating the



Figures 3 & 4 — Metallic artifacts are substantially less on the Oasis (right).

receiver bandwidth for short echo spacing.

IMPROVED JOINT IMAGES

We have found that the Oasis 1.2T delivers images of off-center joints that are better than those of 1.5T scanners. This is because closed systems typically require joints such as the shoulder, elbow and wrist to be positioned outside isocenter.

There is no way to align the shoulder in the isocenter of a cylindrical system. Workarounds for the wrist, hand, finger or elbow require patients to put their arms over their heads in what we call the "Superman" position. Because the joint must be held there for an extended time, the chance of motion artifact—and the need to repeat the sequence—increases.

The openness of the high-field scanner—and lateral movement of the patient table—allows us to produce superior images of the shoulder, elbow or wrist. Images of "midline" joints (hips, spines, knees, ankles and feet) are at least as good as those on a 1.5T system.

FatSep on the Oasis contributes substantially to image quality, especially when imaging large patients. On a closed system, fat suppression often fails for large patients because the patient's shoulder touches the inside of the scanner bore. This may force the technologist to perform a repeat scan or to defer to a sequence that does not suppress fat.

Unless suppressed, fat can obscure pathology; for example, if a subcutaneous layer overlies a rotator cuff tear. The underlying pathology, however, is clearly evident when such a patient is imaged on the Oasis using FatSep.

PATIENT COMFORT

The openness of the Oasis relieves the anxiety that many patients feel, even ones who are not strictly defined as "claustrophobic." Many patients prefer not to be scanned in a cylindrical system. Oasis provides them the option to have an open scan.

Many large patients don't have any option. Conventional high-field scanners are just too small. Their shoulders, chests or abdomens actually touch the insides of the cylinder. For these patients, Oasis is essential.

This is so for pediatric cases as well. The openness of the Oasis allows a parent to be with the infant or child—or sitting on a chair next to them, holding them or their hand—while the scan is being done. Similarly this lack of physical barrier is an advantage when scanning an Alzheimer's patient who may be anxious about the scan.

It can also be very important in marketing, particularly in pediatrics. Mothers will viral market your practice, if they have favorable experiences.

Simply put, patient comfort and high-field image quality are essential in our practice. Oasis provides both. ■

About the Author: Dr. John Feller co-founded Desert Medical Imaging (DMI) in the late 1990s, which operates three imaging centers in Coachella Valley, California. Dr. Feller, a board-certified diagnostic radiologist with specialties in orthopedic and sports medicine imaging and body MRI, currently serves as DMI medical director. He is also an assistant clinical professor of radiology at Loma Linda University School of Medicine in Loma Linda, California.

HOW WE GREW OUR PRACTICE BY "REBRANDING" OPEN MRI

By Dr. John Feller

The reputation of open MRI is rooted in the performance of low-field systems. While the openness of these systems is attractive to patients, low-field MR images may not be diagnostic. Their suboptimal performance has been a drag on the reputation of open MRI, souring many referring physicians on its use. This created a challenge for us following the acquisition of the 1.2T Oasis.

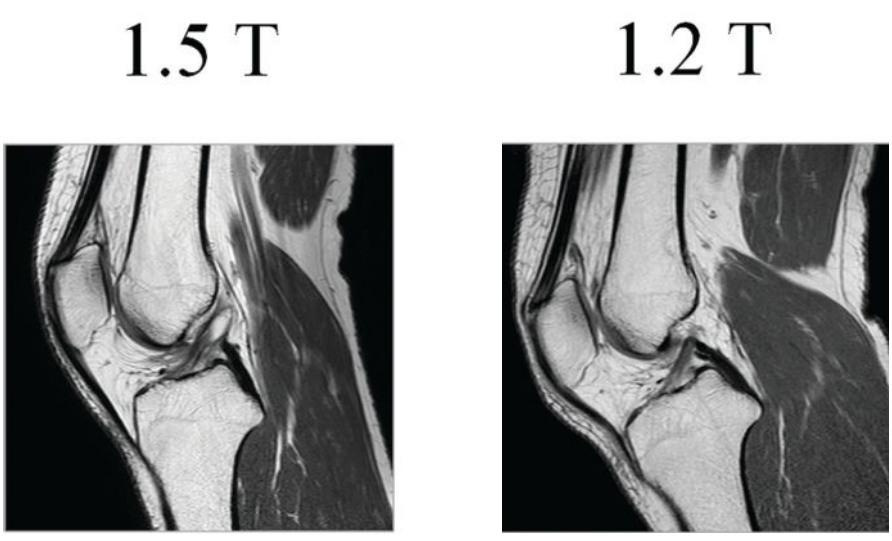
Although the high-field open system delivers high-field quality images (in the case of some orthopedic scans, images that are even better than those by 1.5T systems) its performance was not appreciated by physicians who refer patients to us.

We, therefore, had to "rebrand" open MRI to associate the Oasis with good image quality. We decided to perform brain, cervical, spine, knee and ankle scans on both our newly acquired Oasis and a conventional 1.5T system installed at another of our sites, and to anonymize the images. We then took those images to the offices of our referring physicians and asked them which images were from the high-field open MRI Oasis and which were from the cylindrical 1.5T.

When they couldn't tell the difference, it proved to them that the image quality of the Oasis was equivalent to that of a conventional closed system.

Through this, and the spreading clinical reputation of high-field open with its increased patient comfort, demand for Oasis has quickly grown. Today, on our busiest days, we scan as many as 26 patients. ■

About the Author: Dr. John Feller co-founded in the late 1990s Desert Medical Imaging (DMI), which operates three imaging centers in Coachella Valley, California. DMI installed a 1.2T Oasis in its Indio center in 2010.



Anonymized images at 1.5T and 1.2T shown to DMI referring physicians, comparing knee in the same patient with the same scan parameters.

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OVERVIEW

From three outpatient locations in California's Coachella Valley, physician-owned Desert Medical Imaging (DMI) offers advanced radiology services including PET/CT, CT, ultrasound, virtual colonoscopy and high-field open MRI. Oasis has supported high-performance open MRI at the Indio, California, site since 2011, including those of the brain, spine, joints, abdomen, prostate and breast.

OASIS KEY BENEFIT

The high-field open MRI excels at orthopedic scans, especially off-center joints, according to medical director Dr. John F. Feller, a board-certified diagnostic radiologist sub-specializing in orthopedic and sports medicine imaging. Its ability to handle virtually any type of exam in an open design may be its most attractive features for DMI, where patient comfort, convenience and well-being are top concerns.

KEY QUOTE

"Anything that is not in the midline—like a shoulder, wrist, hand, fingers—is better on the Oasis than on a closed-bore 1.5 Tesla system," said Feller, who is DMI medical director and co-founder. "But there is no MRI exam that we cannot do well on the Oasis."

Oasis combines openness and advanced technologies, including unobtrusive head coils and shimming technology, to generate consistent field uniformity and fat suppression.