UTAH VALLEY RADIOLOGY ASSOCIATES

UTAH VALLEY
Radiology News

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24/7 Consultation

Inside Features

Gadolinium MRI Contrast Agents and Nephrogenic Systemic Fibrosis

Nephrogenic Systemic Fibrosis, or NSF, is a fibrosing disorder which results in increased tissue deposition of collagen, often resulting in thickening and tightening of the skin and fibrosis that may involve other parts of the body, including the diaphragm, heart, lungs, pulmonary vasculature, and skeletal muscles. There is no definitive cure, and its course can be fatal in up to 5% of cases.

Within the last few years an association between the intravenous administration of gadolinium-based MR contrast agents and NSF has been documented. New and increasing information is being gathered every day about NSF and the use of gadolinium-based agents. The cause is unknown, but early evidence suggests that it may be due to dissociation of gadolinium from its chelate with deposition of free gadolinium in soft tissues. Although the information is early and incomplete, it has prompted a FDA warning about the use of gadolinium.

The vast majority of patients with NSF had severe (stage 4) or end-stage (stage 5) renal failure. This translates to a GFR between 15 and 29 mL/min/1.73 m2 (stage 4) or GFR < 15 mL/min/1.73 m2 or on dialysis (stage 5). Of all the cases of NSF associated with IV gadolinium administration, none have been documented in a patient with normal or mildly impaired renal function. The risk in moderate renal failure (GFR between 30 and 59 mL/min/1.73 m2) although still unknown, appears to be small. The estimated risk of developing NSF in a patient with severe or end-stage renal failure may be up to 3-5%.

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New 'Open' MR Facility in Orem

Utah Valley Radiology Associates is pleased to announce the opening of Utah Valley Imaging on 800 North in Orem. The new facility will house a new Hitachi Altaire™ high-field performance Open magnetic resonance imaging system. Interventional fluoroscopic procedures such as vertebroplasty, lumbar puncture, arthrogram, arthrocentesis, PICC and port placement, as well as pain management procedures such as epidural injections, facet injections, and nerve root blocks will be offered.

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The new Hitachi Altaire™ MR system located in Orem on 800 North is unique because of its 'open' design and high-image quality.

Nephrogenic Systemic Fibrosis

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Of the 5 FDA-approved gadolinium-based agents, >90% of cases of NSF have been associated with Omniscan. According to the *ACR Guidance Document for Safe MR Practices*, of the > 100 cases of NSF reported to the FDA MedWatch reporting system, 85 are Omniscan-associated, 21 are Magnevist-associated, and 6 are Opti-MARK-associated. A small number of reports of NSF have been made associated with Prohance and Multihance, but these patients also received Omniscan at some point prior to developing NSF.

It also has been noted that the development of NSF most commonly follows high-dose administration of gadolinium-based MR contrast agents. These double and triple doses are often used in contrast-enhanced MRA.

An official FDA alert first issued in January of 2006, again in December 2006, and most recently in May 2007 gives information and guidance to the public and health care providers about NSF and gadolinium. It states that those most at risk for NSF include patients with acute or chronic severe renal insufficiency (GFR <30 mL/min/1.73m2), or acute renal insufficiency of any severity due to the hepato-renal syndrome, or in the perioperative liver transplantation period. The FDA advises in its report:

- Avoid use of gadolinium agents in these patients unless the diagnostic information is essential and not available with non-contrast MRI.
- Screen all patients for renal dysfunction by obtaining a history and/or laboratory tests.
- Do not exceed the dose recommended in product labeling. And allow sufficient time for elimination of the gadolinium-based agent prior to any re-administration.
- Although the utility of dialysis in preventing NSF is still unknown, if a gadolinium agent is administered in the setting of severe acute or chronic renal failure, dialysis should be promptly performed (within 2 hours) followed by another dialysis session in 24 hours.

How does this affect your patient and their MRI examination?

Utah Valley Radiology and Intermountain Health Care use Magnevist as the gadolinium contrast agent, which appears to carry less of an inherent risk. This contrast agent has an extremely low association with NSF with only 21 associated cases out of 80 million procedures.

Once your patient arrives to the radiology department he/she will be prescreened for renal disease with a questionnaire. For those with a positive history of renal disease a serum creatinine will be required. Therefore, if your patient has a history of renal disease, ordering a serum creatinine prior to their examination is recommended.

In those patients with a GFR of <30, several things may happen. The radiologist may contact the ordering physician to discuss the risks and benefits associated with gadolinium administration. If the radiologist cannot reach the ordering physician for any reason, or if he deems that contrast is not necessary for the examination, gadolinium will not be given.

If gadolinium is required in a patient who is already on dialysis, the referring clinician should arrange a dialysis session for that patient for the same day (preferably within a couple of hours of the MRI), and again 24 hours later.

1. ACR Guidance Document for Safe MR Practices: 2007.
2. Gadolinium-Based Contrast Agents for Magnetic Resonance Imaging. FDA ALERT 6/2006, updated 12/2006 and 5/23/2007.

Diagnosing and Treating Groin Pain

Athletic groin pain can be a diagnostic and therapeutic challenge. While only 2-5% of athletic injuries occur in the groin region, these injuries are often more difficult to adequately treat and comprise a larger proportion of "time lost" for athletes than their incidence would suggest.

Diagnosing the cause of groin pain is problematic because of the large number of etiologies. Non-athletic causes of groin pain include a wide differential of intra-abdominal inflammatory entities, a traditional inguinal hernia and genitourinary abnormalities. Fortunately, many of these entities can be excluded by history and physical exam. However, the athletic causes of groin pain still present a wide differential which may be difficult to narrow without imaging.

If non-athletic causes of groin pain are felt to be less likely, a radiograph of the pelvis should be performed to evaluate for hip DJD, osteitis pubis or evidence of stress fracture. However, a patient usually will be symptomatic for quite some time before radiographic manifestations are evident.

If radiographs are not helpful, MRI of the hip should be considered. MRI is much more sensitive for early stress fracture, stress-related osseous change, and early degenerative change. If internal derangement of the hip is suspected, MR arthrography should be considered for optimal evaluation of the acetabular labrum.

Various soft tissue abnormalities may also contribute to athletic groin pain. For example, adductor dysfunction may be a cause of pain only appreciated by MRI. A symptomatic combination of early symphysis pubis inflammation related to adductor dysfunction may give rise to the MRI "secondary cleft sign," and this suggests that the patient may benefit from symphyseal steroid administration (see secondary cleft image on next page). Iliopsoas bursitis as well as hip rotator cuff or hamstring musculotendinous injuries will also be demonstrated by MRI. There are several other diagnoses to consider after negative MRI

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OPEN MR

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The centerpiece of Utah Valley Imaging is the high-field performance open MR that offers maximum patient comfort in a nonclaustrophobic environment together with advanced MR performance features for excellent high resolution image quality.

Patient Comfort

Currently hospitals are unable to perform MRI procedures with their traditional tunnel-type MR scanners on approximately 10 percent of their patients due to obesity and claustrophobia. Many of the other 90 percent find the procedure uncomfortable and intimidating, often requiring pre-medication in order to undergo the study. According to the Journal of the American Medical Association (JAMA) traditional tunnel imaging systems cause "anxiety related reactions" in up to 30% of patients. Open MR systems were designed to overcome these shortcomings, but have suffered in the past due to poor image quality. This new system overcomes the traditional obstacles of both the tunnel and open MR systems.

A two-post gantry design provides a large opening which not only provides a nonclaustophobic environment, but allows imaging of larger patients and even allows a parent to hold the hand of a child during the child's exam.

Quality Images

Altaire combines high-field performance with the patient comfort of Open MR. Superconducting technology is employed to generate high field strength in a vertical orientation. This is combined with an advanced RF system employing a quadrature transmitter design for high uniformity. Its high power and high slew rate gradients are competitive with those of a traditional high-field system, allowing a variety of advanced imaging techniques and capabilities comparable to conventional closed systems. Some of these include:

- MR angiography including MRA with time-of-flight, phased contrast and contrast-enhanced capabilities useful in vascular studies.
- Ultra fast-scanning techniques such as single-shot and multi-shot EPI useful in evaluating uncooperative patients.
- Abdominal/Pelvic MR allows imaging within a single breath hold, and respiratory gating techniques provide motion-free, high resolution imaging of the liver, adrenal glands, kidneys, pancreas, spleen and pelvic organs.
- Diffusion-weighted imaging using EPI with ADC mapping is especially helpful in neurologic studies particularly in detecting acute strokes. Coils are specifically designed for each anatomic region of interest which allows high resolution orthopedic, spine, and neurologic imaging. Radiofrequency fat saturation and steady-state gradient echo imaging is particularly helpful in musculoskeletal applications.

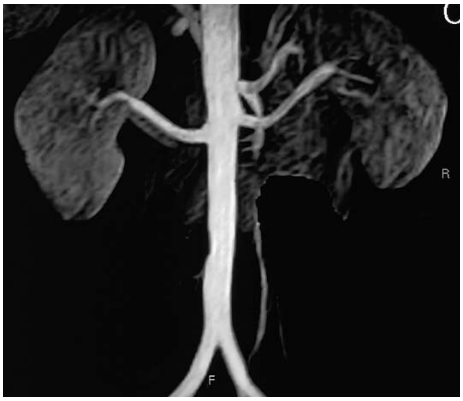
Timeliness and Ease of Scheduling

At Utah Valley Imaging, we deliver images and reports to referring physician offices within 24 hours of the study. In addition, reports with key images can be faxed or e-mailed within minutes of the radiologist's interpretation. We also make every effort to add same day patients to our schedule, particularly when there is a pressing need for prompt imaging or intervention.

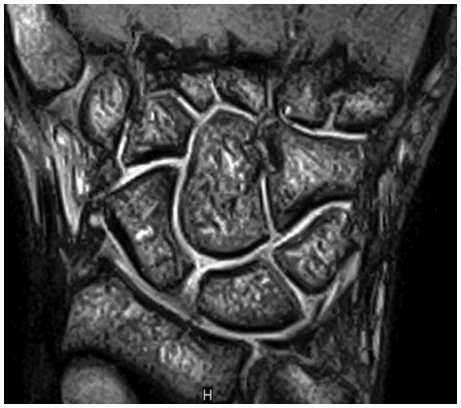
Expert Staff

With 23 board-certified radiologists trained at the nation's leading medical institutions, Utah Valley Imaging radiologists are valuable consultants. Subspecialty expertise includes fellowship-trained specialists in interventional radiology, neuroradiology, musculoskeletal radiology, MRI, cross-sectional imaging (including computed tomography and ultrasound), nuclear medicine, PET, mammography, and pediatric radiology. The physicians at Utah Valley Imaging are committed to providing the highest quality imaging and care to patients and the highest level of service to referring physicians.

Utah Valley Imaging is located at 458 West and 800 North in Orem. To make appointments call (801) 802-XRAY.



Renal MR Angiography



Wrist MRI

Lumbar Spine MRI

Featured Physicians of Utah Valley Radiology Associates

Kurtis R. Kendell, M.D.

Dr. Kurtis R. Kendell is fellowship trained and board certified in diagnostic radiology. He specializes in musculoskeletal radiology and MRI. He co-chairs sports medicine and musculoskeletal conferences at the Utah Valley Regional Medical Center.

Dr. Kendell graduated from the John Hopkins School of Medicine in Baltimore, Maryland. He attended the Mayo Clinic in Rochester, Minnesota, where he completed an internship in orthopedic surgery, a post-graduate MRI research fellowship, a diagnostic radiology residency, and a musculoskeletal radiology fellowship.

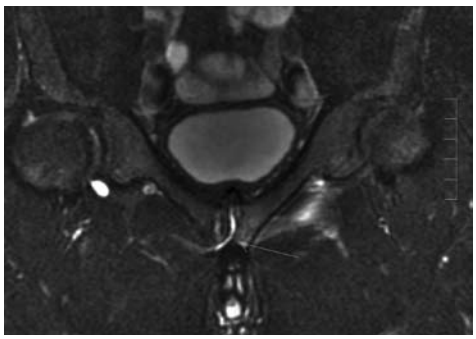
He has been honored with several awards including the C. Allen Good Award from the Mayo Clinic, American Roentgen Ray and Radiogical Society of North America Introduction to Research Award, The Mack Thomas Rozelle Chemistry Award from the University of Utah, and the National Collegiate Student Government Award.

Kimball B. Taylor, M.D.

Dr. Kimball B. Taylor is board certified in diagnostic radiology. Dr. Taylor is skilled in interpreting and acquiring medical imaging using such clinical imaging techniques as magnetic resonance imaging (MRI), fluoroscopy, positron emission tomography (PET), projection radiography (x-ray), computed tomography, ultrasound, and other imaging tools.

After graduating cum laude from BYU, Dr. Taylor attended the University of Utah School of Medicine receiving his medical degree. He then completed a transitional internship at the LDS Hospital in Salt Lake City. This was followed by a diagnostic radiology residency at the University of Arizona Medical Center in Tucson. His professional associations include the Radiological Society of North America, the American College of Radiology, and the American Roentgen Ray Society.

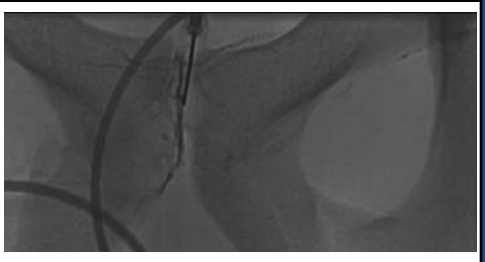
Groin Pain Continued



T2 fat-saturated coronal image of the pelvis shows a "secondary cleft sign" with fluid extending from the symphysis pubis to the insertion of the right adductor longus and gracilis tendons.

examinations of the hip and pelvis. Non-ingunal abdominal wall or rectus abdominus muscular hernias are extremely difficult to diagnose clinically or by MRI. Ultrasound may show these entities dynamically if they are suspected.

A diagnosis of exclusion to consider is the "sports hernia." This term is used several ways in the literature, but recent "sports hernia" literature focuses on a specific weakness of the posterior wall of the inguinal canal, especially at the external ring. It is felt to be caused by an imbalance between axial/abdominal wall muscle strength and lower extremity muscle strength (especially adductors). This etiology is proposed because this injury commonly arises early in the sport season, and it is surmised that athletes continue off-season lower extremity strength training without commensurate strengthening of the axial/abdominal wall musculature. Regardless of the etiology, the patient presents with pain mimicking an inguinal hernia, but no hernia is detected on clinical exam or on imaging. However, patients with "sports hernias" have been successfully managed surgically with mesh repair similar to traditional inguinal hernia repair with good results.



Fluoroscopic pubic symphogram showing the same "secondary cleft sign" prior to steroid infusion.