



Ordering Exams: As a general rule, Do NOT order MRI With Contrast Only! The purpose of contrast is to observe changes in tissue characteristics through enhancement. One can't observe a change without having pre-contrast images. Therefore, all MRI's with IV contrast are performed as MRI WO & W, and should be ordered as such; otherwise insurance companies will deny reimbursement. Alternatively, the exam will need to be rescheduled until the proper order is obtained with precertification.

Pre-Exam Work-Up: If patient is > 60 years old, diabetic, and/or has history of chronic renal disease, please confirm serum Creatinine level within the prior 90 days. This is required prior to contrast administration. Gadolinium is NOT nephrotoxic, however, patients with very poor renal function are at risk for NSF.

NSF = Nephrogenic Systemic Fibrosis: NSF is a very rare systemic sclerosing condition that is only associated with gadolinium contrast exposure in patients with diminished renal function (eGFR <30). Based on ACR Contrast Manual 2013, GBCA (Gadolinium Based Contrast Agents), can be routinely given to Outpatients with GFR greater than 30ml/min and Inpatients with same day eGFR >30ml/min.

Patients requiring consent for GBCA:

- 1.) eGFR < 30, Acute Kidney Insufficiency, ESRD on hemodialysis: for increased risk NSF.
- 2.) Pregnant patients: for uncertain effects of long term Gadolinium exposure within amniotic fluid.
- 3.) Children under age 2: for uncertain effects of Gadolinium in children under the age of 2.

Exclude Contraindications to MRI: Please determine if patient has metallic foreign objects/surgical implants or implanted electronic devices before scheduling MRI. Written documentation as to the exact model and brand of the implant /device (such as a surgical note) will be required before patient is allowed within the MRI unit to ensure patient safety. If you don't know if a device is MRI compatible, then you can call a radiologist or review www.mrisafety.com.

Indications for giving IV Gadolinium Based Contrast Agents (GBCA)

- **Infection**
 - Osteomyelitis, Discitis & Paraspinal/Epidural Abscess
 - Meningitis/Encephalitis; extension of sinusitis or mastoiditis into adjacent structures
- **Any Known or Suspected History of Cancer**
 - Any Cancer, to include Lymphoma and Leukemia
- **Inflammatory Processes**
 - Multiple Sclerosis (MS), Guillian Barre Syndrome (GBS), Rheumatoid Arthritis (RA)
- **Other Indications**
 - Mass: spinal cord, epidural space, vertebral body
 - Seizure: look for tumors and AVM
 - Prior Lumbar Spine Surgery: distinguish postoperative scar tissue from recurrent disc

If you are unsure what to order:

1. Order "MRI Region of Interest WO & W" or
2. Please call Radiologist to discuss case before ordering an exam. We are happy to help protocol exam.
 - Neuroradiology Questions: 812-333-7795, Ext 2
 - MSK Questions: 812-333-7795, Ext 1
 - Body Questions: 812-353-5887, 812-353-6275

MRI Brain/Neuro Indications

Version 1/27/2016



Brain/Neuro Indications	Recommended Study	Comments
TIA's, Stroke	<ol style="list-style-type: none"> 1. CT Head WO to R/O hemorrhage. Assess tPA candidate. 2. MRI Head WO – Assess infarct volume, better characterize infarct. 	<ol style="list-style-type: none"> 1. Order CT if pt. is uncooperative or suspect bleed. 2. DWI is included in all MRI Brain exams. MRI DWI will detect acute infarct before CT.
Acute Bleed, Severe Headache Subarachnoid Hemorrhage, F/U Subdural Hematoma, F/U Subarachnoid Hemorrhage	<ol style="list-style-type: none"> 1. CT Head WO 2. MRI Head WO & MRA and/or MRV Head WO 	<ol style="list-style-type: none"> 1. CT more sensitive than MRI for SAH and Acute Bleed. 2. MRI may show source such as an AVM or aneurysm.
Brain Tumor, Suspected Brain Tumor, Metastasis, Papilledema	1. MRI Head WO & W	MRI superior to CT
Seizure	<ol style="list-style-type: none"> 1. MRI Head WO & W 2. CT head WO 	<ol style="list-style-type: none"> 1. MRI superior to CT 2. Initial CT suggested in case of patient's first-ever seizure (i.e., not chronic epilepsy) and/or patient experienced head trauma during seizure, and/or patient is not entirely cooperative, as CT could be performed much faster than MRI
CNS Infection, Abscess, Meningitis, AIDS	1. MRI Head WO & W	MRI demonstrates abnormal meninges & other complications of infection. MRI superior to CT.
Dementia, Neurodegenerative Disorder	1. MRI Head WO	MRI demonstrates white matter changes of aging and acute and chronic infarcts, Parkinson's Disease, etc.
<ol style="list-style-type: none"> 1. MS (Multiple Sclerosis) 2. Suspected Optic Neuritis or Unilateral Vision Loss 	<ol style="list-style-type: none"> 1. MRI Head WO & W 2. MRI Orbit/Face &/or Neck WO & W 	Acute plaques may show enhancement with MRI. MRI far superior to CT. If patient is < 50 year old and optic neuritis suspected, order both Brain and Orbit MRI to specifically evaluate for MS
Trauma	<ol style="list-style-type: none"> 1. CT Head WO 2. MRI Head WO 	CT is indicated for acute trauma. MRI more sensitive DAI and chronic hemorrhage (Hypertensive Micro-hemorrhage & Amyloid Angiopathy)
Cerebellar & Brainstem Lesions, Cranial Nerve Deficit, Diplopia	1. MRI Head WO & W	MRI superior in this region—If the patient has no contraindications.
<ol style="list-style-type: none"> 1. Sensorineural Hearing Loss (SNHL), Tinnitus, Acoustic Schwannoma, Bell's Palsy 2. Conductive Hearing Loss 	<ol style="list-style-type: none"> 1. MRI Internal Auditory Canal WO & W 2. CT Internal Auditory Canal W/O for Conductive Hearing Loss 	<ol style="list-style-type: none"> 1. CT not sensitive in SNHL. Contrast helpful in Acoustic Schwannoma. 2. CT best in evaluating ossicles & congenital ear anomalies.
Pituitary Tumor	<ol style="list-style-type: none"> 1. MRI Head WO & W 2. CT Orbit WO & W 	MRI superior to CT; CT could be used if there is MRI contraindication. Specify on order if

		exam is to specifically evaluate for pituitary dysfunction/tumor.
Pediatric Anomaly, Pediatric Development Delay, NAT	1. MRI Head WO	Consider sedation in children less than 7year old.
Dural Venous Sinus Thrombosis	1. MRI Head WO & W and MRA &/or MRV Brain/Head WO	CTV if not MRI compatible
Known or Suspected Aneurysm	1. MRI Brain WO & W and MRA &/or MRV Brain/Head WO 2. CTA Head W	Does not replace angiography. Reasonable screening tool in patients with family history. Satisfactory to R/O aneurysms 5mm or larger. If concern for acute SAH, see above, Initial CT Head WO indicated. If CT positive for SAH, get neurosurgical consultation to determine need for further imaging versus transfer to facility with endovascular treatment options.

W = With IV Contrast; WO = Without IV Contrast

DWI = Diffusion Weighted Imaging; Restricted Diffusion = Infarct

tPA = tissue Plasminogen Activator

AVM = Arteriovenous Malformation

MRA/MRV = MR Angiogram/Venogram

Neuroradiologists are: Dr. Neal Abdullah, Dr. Todd Winkler; 812-333-7795 ext. 2

NAT = Non Accidental Trauma

CTA = CT Angiogram

CTV = CT Venogram

DAI = Diffuse Axonal Injury

MRI Orbit & Neck Indications

Version 1/30/2020



Orbit & Neck Indications	Recommended Study	Comments
Nasopharynx, Tongue, Floor of Mouth, Neck Mass, Head and Neck Cancer, Post operative or Post-XRT Neck	1. CT Neck W Do NOT routinely order CT neck WO & W! It is double the radiation. 2. MRI Orbit/Face and/or Neck WO & W	1. CT Neck WO & W if stone (sialoliths) are suspected. 2. MRI to evaluate extension of mass into spinal canal, skull base or vocal cords.
Orbit Proptosis, Orbit or Eye Swelling (Infection)	1. CT Orbits W 2. MRI Orbit/Face and/or Neck WO & W 3. CT Orbits WO	CT WO adequate if proptosis is bilateral and longstanding, and if specifically for thyroid eye disease. MRI in special situations, such as vision changes, cranial nerve deficits, but CT better if there is coexisting sinusitis. If unsure, talk to Neuroradiologist.
Optic Nerve Visual Field Defect	MRI Orbit/Face and/or Neck WO & W	Orbit MRI for Optic Neuritis (vision loss definitely limited to only one eye). MR Brain for visual field defect.
Carotid Stenosis	MRA &/or MRV Carotid/Neck WO & W	US Carotid is screening exam CTA Neck W if MRI contraindicated

Do NOT routinely order CT Neck WO & W; It is double the radiation and usually CT Neck W is best exam.

CT Neck and CT Cervical Spine are NOT the same exam; They are optimized to show the neck soft tissues and bony cervical spine, respectively.

Neuroradiologists are: Dr. Neal Abdullah, Dr. Todd Winkler; 812-333-7795 ext. 2



MRI Spine Indications

Version 1/30/2020

Spine Indications	Recommended Study	Comments
Acute and/or progressive quadraparesis	1. MRI total spine WO & W	MRI superior to CT for cord compression, inflammation, demyelination, and infarct.
Acute and/or progressive paraparesis and/or loss of bowel/bladder control	1. MRI Thoracic and Lumbar Spine WO & W	See above. Contrast could be useful for epidural disease and/or inflammation/tumor involving the cauda equina.
Herniated Disc or Radiculopathy Cervical or Thoracic	1. MRI Cervical Spine WO or 2. MRI Thoracic Spine WO depending on area of concern.	MRI superior to CT. No Contrast necessary on patients with previous Cervical or Thoracic Spine surgery.
Herniated Disc or Radiculopathy Lumbar	1. MRI Lumbar Spine WO *Important: If patient had prior Lumbar Spine surgery, order MRI Spine Lumbar WO & W	Contrast helps distinguish between scar & recurrent disc post-surgery. MRI superior to CT. ** see below
Spinal Stenosis Cervical or Thoracic or Lumbar	1. MRI Spine WO specify Area of Concern	**CT may be diagnostic in lumbar spine if MRI is contraindicated. MRI superior to CT. CT Myelogram may be needed.
Discitis, Osteomyelitis, Cancer Cervical or Thoracic or Lumbar	1. MRI Spine WO & W specify Area of Concern	MRI preferred to R/O Discitis/Osteo/CA. CT may be done to assess bony destruction.
Metastasis & Epidural Tumor Cervical or Thoracic or Lumbar	1. MRI Spine WO & W specify Area of Concern	MRI superior to myelography and CT for marrow replacement and epidural tumor.
Compression Fracture, Trauma, Sacral Insufficiency Fracture (SIF)	1. Begin workup with X ray. 2. MRI Spine WO specify Area of Concern 3. MRI Pelvis WO for SIF	MRI allows evaluation of bone marrow edema and can distinguish acute from chronic compression fractures. Use CT if MRI contraindicated.
Brachial Plexopathy; Pancoast Tumor, Perineural Spread of Tumor, Brachial Plexus trauma/Nerve root avulsion	1. MRI Brachial Plexus (Neck) WO & W	Specify Right or Left

W = With IV Contrast; WO = Without IV Contrast

Area of Concern = Cervical, Thoracic, Lumbar or Pelvis if imaging Sacrum and/or Sacroiliac Joints

CT Myelogram: requires lumbar puncture for intrathecal contrast administration: Need INR>1.3, Platelets >50,000.

Do NOT routinely request whole spine MRI. Discuss with neuroradiologist if whole spine MRI is indicated at 812-333-7795 ext. 2

Neuroradiologists are: Dr. Neal Abdullah, Dr. Todd Winkler.

MRI Musculoskeletal

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For musculoskeletal MRI studies, it is **extremely important** to have a comparison radiograph available. While MRI has superior soft tissue contrast, radiographs have distinct advantages in evaluating the bones. When possible, please make sure the patient has an x-ray of the body part to be imaged.

MSK Indications	Recommended Study	Comments
Meniscal Tear; Ligament, Tendon, or Muscle Injury; Muscle denervation or hematoma; Compartment syndrome.	1. MRI of Specific Area WO	Specify Area of Concern (see ***) Specify Right or Left. If evaluating shoulder injury, patients less than 40 yo generally should have MR arthrogram as opposed to routine MRI.
Fracture, Stress Injury or Bone Contusion	1. MRI of Specific Area WO	1. MRI may be more sensitive to occult fracture, especially in osteopenic patients. 2. CT is sometimes not useful for occult fractures in severe osteoporosis. 3. CT is useful in surgical planning. 4. CT if fracture is seen on x-ray and position or alignment is to be addressed. 5. CT for avulsion or small cortical fractures.
Avascular Necrosis	1. MRI of Specific Area WO	CT if MRI is contraindicated.
Cancer, Metastatic disease, Multiple Myeloma	1. MRI of Specific Area WO & W	NucMed Bone Scan is good for evaluating whole body metastasis, but can be false negative in multiple myeloma.
Osteochondritis Dissecans Chondromalacia	1. MRI of Specific Area WO 2. MR Arthrogram can also be considered; specify Right or Left	MR Arthrogram is useful if trying to determine if osteochondral fragment is unstable.
Bone Tumor	1. MRI of Specific Area WO & W	Evaluates extent/neurovascular involvement, CT can be good for evaluating matrix (osteoid vs. chondroid) type.
Intra-articular Loose Bodies	1. MRI of Specific Area WO 2. MRI Arthrogram can also be considered; specify Right or Left	CT can be useful for loose bodies.

W = With IV Contrast; WO = Without IV Contrast

***Specific Area--Upper: Shoulder, Humerus, Elbow, Forearm, Wrist, Hand, Finger

***Specific Area--Lower: Pelvis, Hip, Femur, Knee, Leg, Ankle, Foot, Toes

Arthrogram: Contrast is injected into the joint prior to imaging joint. Need to specify Right or Left.

If you have questions about what is the best exam, discuss with MSK Radiologist at 812-333-7795 ext. 1

Musculoskeletal Radiologists are: Dr. Jon Staser, Dr. Doug Geiger and Dr. Nick Miller

MRI Chest, Abdomen and Pelvis

Version 1/30/2020



C/A/P—Indications	Recommended Study	Comments
Aortic Dissection	1. CT Chest and/or Abdomen WO & W	CT is most sensitive test available. If IV contrast is contraindicated then MRI with contrast may be helpful.
Liver: Mass, Hepatoma, Hemangioma, CA/Mets, Hepatitis, Cirrhosis, Fatty Liver, Abnormal LFT's, Abdominal Pain	1. MRI Abdomen (Liver) WO & W	CT may be better 1 st line exam. Contact Radiologist to discuss indication and best imaging. MR usually a problem solving modality.
Pancreas: Mass, Epigastric Pain, CA/Mets, Pancreatitis	1. MRI Abdomen (Panc) WO & W	CT may be better 1 st line exam. Contact Radiologist to discuss indication and best imaging. MR usually a problem solving modality.
Renal Artery Stenosis (RAS), uncontrolled hypertension.	1. MRA &/or MRV Renals/Kid W	In RAS & Hypertension, CTA Abdomen or Renal Duplex Ultrasound may be better 1 st line exam.
Renal Mass, Hematuria	1. MRI Renals WO & W	If mass involves vasculature then MR Abdomen WO and W
Bile duct obstruction, pancreatic duct obstruction, impacted gallstones, ductal stones, Sphincter of Oddi tumor or stricture.	1. MRCP WO 2. MRCP WO & MRI Abdomen WO & W	1. MRCP WO contrast if only to evaluate for ductal stones, stricture, biliary tree abnormalities or RUQ pain. 2. Do MRCP and MRI Abdomen WO & W Contrast for CA, mass, lesion, N/V, hepatitis or abnormal LFT's in addition to above symptoms & diagnosis.
Adrenal: Mass/Cyst	1. MRI Abdomen (Adrenals) WO	Specify Attention Adrenals
Uterine Fibroids	1. MRI Pelvis WO and W	Evaluates blood supply to fibroids. Determines number and size of fibroids. Can distinguish between endometrial mass and submucosal fibroid.
Runoff	1. MRI Runoff WO and W	Evaluates aorta, iliac, and lower extremity vessels.
Pelvic: Mass, Pain, CA/Mets, Infection/Abscess	1. MRI Pelvis WO & W	If there is concern for a vaginal or rectal mass, then surgical gel is injected into the vagina or rectum for evaluation of those regions. The gel acts as a contrast agent and aids in the detection and determination of mass extent.

W = With IV Contrast; WO = Without IV Contrast

MRCP = MR Cholangiopancreatogram

Questions about imaging Body with MRI: 812-353-5887, 812-353-6275