

## Radiology of Indiana

Protocols	7/ 1.2/ 1.5T	3.0 T	Special Instructions/Comments
	<b>** All Sagittals, please scan from patients Left to Right **</b>		
<b>Brachial Plexus (bilateral)</b>	Coronal T1 TSE (3sk1) Axial T1 TSE (3sk1) Axial STIR (3sk1) Sagittal T1 TSE (3s1) Sagittal STIR (3sk1) Coronal STIR (3sk1) Axial C+T1 fat sat Coronal C+T1 fat sat	SAME	For Bilateral Brachial Plexus scan shoulder to shoulder FOV= 25cm preferred: 32cm as needed
<b>Brachial Plexus (unilateral)</b>	Coronal T1 TSE (3sk1) Axial T1 TSE (3sk1) Coronal STIR (3sk1) Sagittal T1 TSE (3sk1) Sagittal STIR (3sk1) Axial STIR (3sk1) Axial C+T1 fat sat Coronal C+T1 fat sat	SAME	For unilateral Brachial Plexus, Scan far transverse process through shoulder (i.e. for LEFT brachial Plexus, Start at RIGHT C7 transverse process ) FOV=25cm
<b>Brain Cancer</b>	Sagittal T1 TSE (4sk1) Axial T1 TSE (4sk1) Axial T2 GRE (4sk1) Axial DWI/ADC (3 Direction if possible ), reconstruct at 5sk0 Axial FLAIR FAT SAT (4sk1) Axial C+ T2 TSE (4sk1) Axial C+ T1 TSE (4sk1) Coronal C+ TSE (4sk1) Sagittal C+ T1 TSE (4sk1) Axial C+ T1 MPRAGE volumetric Sagittal and coronal reformats Possible Perfusion/Spectroscopy? Should be done on 3T if possible	Sagittal T1 FLAIR (3sk1) Axial T1 FLAIR (3sk1) SWI (3sk1) with Mis Resolve or 6-Direction DWI/ADC, reconstruct at 4sk0 Axial FLAIR FAT SAT (3sk1) Axial C+ T2 TSE (3sk1) Axial C+T1 FLAIR (3sk1) Coronal C+FLAIR (3sk1) Sagittal C+ T1 FLAIR (3sk1) Axial Volumetric (MPRAGE or equivalent) with 3-plane reformat See if Perfusion/Spectroscopy needed	Remove eADC from all protocols, should only do ADC Inject contrast , followed immediately by Axial T2 Axial and coronal contrast enhanced T1s to follow T2 to allow contrast circulation time Scan through whole brain (skull to skull) on sagittal images FOV=23cm
<b>** Brain Cancer protocol used for patients that have/had a known brain lesion (including post surgical/post treatment lesions), lesion seen on another study (i.e. CT Head), or any patient with a current dx of cancer, suspected cancer, or history of cancer for which metastatic disease to the brain is being evaluated</b>			
<b>MRI Brain (Contrast Clearance Analysis)</b>	3D T1-weighted (MPRAGE, FSPGR, VIBE, SPACE, etc.) 3D T1-weighted C+ (MPRAGE, FSPGR, VIBE, SPACE, etc.) 3D T1-weighted C+ (MPRAGE, FSPGR, VIBE, SPACE, etc.)	: 5 minutes post Gad 60 - 105 minutes post Gad (patient can leave between both scans)	* It is important that the early time point is at a fixed time post-Gd injection, therefore, it is best to acquire it after a fixed protocol, e.g., after DSCMRI and 2D spin-echo or after DCE-MRI. The timing of the late time point is flexible and can change from one follow-up to the next as long as it is acquired between 60-105 min post Gad.
		FOV = 23 all sequences	* IV bolus injection of a Gd-based contrast agent (standard dose, 0.1mmol/kg) is required.
			* T1-weighting of the MRI sequence does not change between the two acquisitions; thus the exact same protocol should be used for both scans (same FOV, slab size, etc.).
			* Poor image quality or metal-induced artifacts may affect the interpretation s
<b>Brain With</b>	Sagittal T1 TSE (4sk1) Axial T1 TSE (4sk1) Axial T2 TSE (4sk1) Axial T2 GRE (4sk1) Axial DWI/ADC (3 Direction if possible ), reconstruct at 5sk0 Axial FLAIR FAT SAT (4sk1) Axial C+ T2 TSE (4sk1) Axial C+ T1 TSE (4sk1) Coronal C+ TSE (4sk1)	Sagittal T1 FLAIR (3sk1) Axial T1 FLAIR (3sk1) Axial T2 TSE (3sk1) SWI (3sk1) with MIPS Resolve or 6-Direction DWI/ADC, reconstruct at 4sk0 Axial FLAIR FAT SAT (3sk1) Axial C+ T2 TSE (3sk1) Axial C+T1 FLAIR (3sk1) Coronal C+FLAIR (3sk1)	Remove eADC from all protocols, should only do ADC Inject contrast , followed immediately by Axial T2 Scan Through whole brain (skull to skull) on sagittal images Axial and coronal contrast enhanced T1s to follow T2 to allow contrast circulation time Scan through whole brain (skull to skull) on sagittal images FOV=23cm
<b>Brain Without</b>	Sagittal T1 TSE (4sk1) Axial T1 TSE (4sk1) Axial T2 TSE (4sk1) Axial T2 GRE (4sk1) Axial DWI/ADC (3 direction if possible), reconstruct at 5sk0 Axial FLAIR FAT SAT (4sk1) Coronal T2 TSE (4sk1)	Sagittal T1 FLAIR (3sk1) Axial T1 FLAIR (3sk1) Axial T2 TSE (3sk1) SWI (3sk1) with MIPS Resolve or 16-direction DWI/ADC reconstruct at 4sk0 Axial FLAIR FAT SAT (3sk1) Coronal T2 TSE (3sk1)	Remove eADC from all protocols Scan Through whole brain (skull to skull) on sagittal images FOV=23cm
<b>Amyloid Therapy Brain Without</b>	Sagittal T1 TSE (4sk1) Axial T1 TSE (4sk1) Axial T2 TSE (4sk1) Axial DWI/ADC (3 direction if possible), reconstruct at 5sk0 Axial FLAIR FAT SAT (4sk1) Coronal T2 TSE (4sk1) SWI (Susceptibility Weighted Imaging)	Sagittal T1 FLAIR (3sk1) Axial T1 FLAIR (3sk1) Axial T2 TSE (3sk1) Resolve or 16-direction DWI/ADC reconstruct at 4sk0 Axial FLAIR FAT SAT (3sk1) Coronal T2 TSE (3sk1) SWI (Susceptibility Weighted Imaging)	Remove eADC from all protocols Scan Through whole brain (skull to skull) on sagittal images FOV=23cm

<b>Cervical With</b>	Coronal T1 TSE (3sk 0.5)	Coronal T1 TSE (3sk 0.5)	FOV= skull base through upper T-spine on sagittal
	Sagittal T1 TSE (3sk0)	Sagittal T1 TSE (3sk0)	FOV=12cm on Axials: FOV = 20cm on Sagittal
	Sagittal T2 TSE (3sk0)	Sagittal T2 TSE (3sk0)	Scan from C2 through T1
	Sagittal STIR (3sk0)	Sagittal STIR (3sk0)	
	Sagittal T2 oblique (2sk0)	Sagittal T2 oblique (2sk0)	Sagittal oblique T2 = Align perpendicular to the neural foramen
	Axial T2 TSE (2sk0)	Axial T2 TSE (2sk0)	
	Axial GRE (3sk0)	Axial GRE (3sk0)	
	Sagittal DWI (3sk0.3)	Sagittal DWI (3sk0.3)	
	Precontrast Axial T1 TSE (3sk0)	Precontrast Axial T1 FLAIR (3sk0.3)	
	Axial C+ T1 fat sat (3sk0)	Axial C+ T1 fat sat (3sk0)	
	Sagittal C+ T1 TSE (3sk0)	Sagittal C+ T1 FLAIR (3sk0)	
<b>Cervical Without</b>			
	Coronal T1 TSE (3sk 0.5)	Coronal T1 TSE (3sk 0.5)	Could do foraminal oblique reformats off axial T2
	Sagittal T1 TSE (3sk0)	Sagittal T1 FLAIR (3sk0)	FOV=12cm on Axials: FOV = 20cm on Sagittal
	Sagittal T2 TSE (3sk0)	Sagittal T2 TSE(3sk0)	Axial images should be from C2 through T1
	Sagittal STIR (3sk0)	Sagittal STIR (3sk0)	
	Sagittal T2 oblique (2sk0)	Sagittal T2 oblique (2sk0)	Sagittal oblique T2 = Align perpendicular to the neural foramen
	Axial T2 TSE (2sk0)	Axial T2 TSE (2sk0)	
	Axial GRE (3sk0)	Axial GRE (3sk0)	
	Sagittal DWI (3sk0.3)	Sagittal DWI (3sk0.3)	
<b>Face</b>			
	Cor T1 (3/1)	SAME	FOV= 16 for Cor and Sag
	Cor STIR (3/1)		FOV= 14 Axial
	Ax T1 (3/1)		
	Ax T2 Fat Sat (3/1)		
	Sag T1 SE (3/1)		
	Ax DWI (3/1)		
<b>IAC</b>			
	Preferably with Brain WITH	SAME	FOV= 15-18cm
	Posterior fossa :		
	Axial T1 (2sk0)		Scan from tip of the dorsum Sella through C1 on axials
	Axial FIESTA 1mm		
	Coronal HASTE Diffusion		
	Coronal reformats		Scan from posterior skull through orbital apex on coronals
	Sagittal reformats along IAC		
	Axial T2 (2sk0)		
	Axial C+ T1 fat sat (2sk0)		
	Coronal C+ T1 fat sat (2sk0)		
<b>Kyphoplasty</b>			
	Localizer including cervical and upper thoracic spine	Localizer including cervical and upper thoracic spine	
	Sagittal T1 TSE- thoracic (3sk0.5)	Sagittal T1 FLAIR- thoracic (3sk0.5)	
	Sagittal T2 TSE- thoracic (3sk0.5)	Sagittal T2 TSE- thoracic (3sk0.5)	
	Sagittal T1 TSE -Lumbar (3sk0.5)	Sagittal T1 FLAIR -Lumbar (3sk0.5)	
	Sagittal T2 TSE-Lumbar (3sk0.5)	Sagittal T2 TSE-Lumbar (3sk0.5)	
	Sagittal STIR -thoracolumbar (3sk0.5)	Sagittal STIR -thoracolumbar (3sk0.5)	
	Coronal T1 TSE- thoracolumbar (3sk0.5)	Coronal T1 TSE- thoracolumbar (3sk0.5)	
<b>Lumbar With</b>			
	Sagittal T1 TSE (3sk0.5)	Sagittal T1 TSE (3sk0.5)	No fat saturation if excessive artifact from metal hardware
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	FOV: 15cm Axials
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (4sk1)	
	Axial T1 TSE (4sk1)	Axial T1 TSE (4sk1)	
	Coronal T1 TSE (3sk0.5)	Coronal T1 TSE (3sk0.5)	
	Sagittal DWI (3/0.5)	Sagittal DWI (3/0.5)	
	Axial C+T1 fat sat (4sk1)	Axial C+ T1 fat sat (3sk0.5)	
	Sagittal C+T1 TSE (3sk0.5)	Sagittal C+ T1 FLAIR (3sk0.5)	
<b>Lumbar Without</b>			
	Sagittal T1 TSE (3sk0.5)	Sagittal T1 FLAIR (3sk0.5)	Axial Images from L1-S1
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	FOV=15cm Axials
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (3sk0.5)	
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (3sk0.5)	
	Coronal T1 TSE (3sk0.5)	Coronal T1 TSE (3sk0.5)	
	Sagittal DWI (3/0.5)	Sagittal DWI (3/0.5)	
<b>Lumbosacral Plexus</b>			
	Obl Axial T1 TSE (3sk1)	Obl Axial T1 TSE (3sk1)	FOV = 25 cm
	Obl Axial T2 TSE mid TE fat sat (3sk1)	Obl Axial T2 TSE mid TE fat sat (3sk1)	Planes should be relative to long axis of the sacrum
	Obl Coronal T1 TSE (3sk1)	Obl Coronal T1 TSE (3sk1)	Axial images L5 - bottom of sacrum
	Obl Coronal STIR (3sk1)	Obl Coronal STIR (3sk1)	
	Obl Cor T1 TSE Fat Sat +C (3sk1)	Obl Cor T1 TSE Fat Sat +C (3sk1)	
	Obl Ax T1 TSE Fat Sat +C (3sk1)	Obl Ax T1 TSE Fat Sat +C (3sk1)	

<b>MR Perfusion</b>	Power injection bolus before C+ images in conjunction with Brain Tumor WITH Standard color reformats		If performing Brain Tumor WITH or MS, spectroscopy, offer MR Perfusion Inject half the contrast prior to obtainin the DSC perfusion EPI sequence After perfusion, inject remaining contrast to obtain the standard post contrast Bolus injection 4 mL/s
<b>MR Spectroscopy</b>	Axial T2 TSE whole brain for localizer Single Voxel Multivoxel- shim to borders of ROI		MR Spectroscopy should only be scheduled/ Performed with Neuro Rad in house -plan both Single and multi voxels with Neuro Rad Selection of multi voxel send to PACS with Neuro Rad
<b>MRA Brain</b>	3D TOF COW reformats Anterior circulation reformats Posterior circulation reformats Axial, sagittal, and coronal MIPs	SAME	
<b>MRA Carotid With</b>	Survey Auto-trigger Arterial Venous Arterial and venous MIP reconstructions Arterial right and left carotid and vertebral reconstructions	SAME	Contrast MRA should be performed if ordered Also perform if MRI Brain WITH is ordered in Conjunction with MRA neck (in addition to TOF)
<b>MRV Carotid Without</b>	2D TOF Right carotid , left carotid , and vertebral reformats If dissection possible : Axial T1 fat sat (4sk 0.5)	3D TOF multi-slab with recons Axial T1 fat sat (4sk0.5)	Cover aortic arch through basilar on axial images
<b>MRV with Contrast</b>	Phase contrast MRV (VENC 10-15) 2D TOF Axial and Coronal MPRAGE	SAME	
<b>MS Brain</b>	Sagittal T1 TSE (4sk1) Sagittal FLAIR (4sk1) Axial T1 TSE (4sk1) Axial T2 GRE (4sk1) Axial DWI/ADC (3 Direction if possible ), reconstruct at 5sk0 Axial FLAIR FAT SAT (4sk1) Axial C+ T2 TSE (4sk1) Axial C+ T1 TSE (4sk1) Coronal C+ TSE (4sk1)	Sagittal T1 FLAIR (3sk1) Sagittal T2 FLAIR (3sk1) Axial T1 FLAIR (3sk1) SWI (3sk1) with MIPs Resolve or 6-Direction DWI/ADC, reconstruct at 4sk0 Axial FLAIR FAT SAT Axial C+ T2 TSE (3sk1) Axial C+ T1 FLAIR (3sk1) Coronal C+ T1 FLAIR (3sk1)	Remove eADC from all protocols, should only do ADC Inject contrast , followed immediately by Axial T2 Axial and coronal contrast enhanced T1s to follow T2 to allow contrast circulation time Scan through whole brain (skull to skull) on sagittal images FOV=23cm
<b>MS Brain (Dr. Hermann - JWM)</b>	Sagittal volumetric T1 inversion recovery with 3mm reconstructions (3 plane ) *If possible , Sagittal volumetric 3D T2 FLAIR with 3mm reconstructions (3 plane ) * If possible volumetric 3D T2 with 3mm reconstructions (3 plane ) *If volumetric imaging not possible , axial T2 and axial and Sagittal and FLAIR (3sk0) Axial T1 spin echo (3sk0) Axial GRE (3sk0) DWI/ADC (5sk0) Sagittal volumetric T1 non-IR post-contrast with 3mm reconstructions (3 plane) Axial C+ T1 (3sk0) Coronal C+ T1 (3sk0)	Precontrast Sagittal T1 FLAIR , T2 ,T2 T2 FLAIR with 3mm reconstructions in 3 planes DWI/ ADC- Resolve or 6- direction (4sk0) SWI Post-contrast Sagittal T1 non-IR with 3mm reconstructions in 3 planes Please image following 5 min delay to allow for contrast circulation	Important to do as close to CMSC protocol as possible , this has been specifically requested by JMW Neurology (Dr. Hermann). It may not be possible to do this protocol on the open magnets (specifically the 0.7) (specifically the 0.7) or the older 1.5 This section imaging is required , however . Label these studies / sequences in PACS as CMSC Protocol? FOV=23cm
<b>Neck With</b>	Sagittal T1 TSE (3sk0.3) Coronal T1 TSE (3sk0.3) Axial T1 TSE (3sk0.3) Axial T2 fat sat (3sk0.3) Axial DWI - 3mm Axial T2 (3sk0.3) Coronal STIR (3sk0.3) Axial C+T1 fat sat (3sk0.3) Coronal C+T1 fat sat (3sk0.3)	SAME	FOV=25cm sagittal and coronal FOV=18cm axial Scan from pituitary through clavicles (lower if substernal extension of Thyroid ) on axial Scan from posterior neck through nose/ chin on coronals Scan to lateral sides of neck on sagittal



<b>Thoracic With</b>			
	Sagittal T1 TSE (3sk0.5)	Sagittal T1FLAIR (3sk0.5)	Axial images from C7-L1
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (4sk1)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (3sk0.5)	
	Coronal T1 TSE (3sk0.5)	Coronal T1 TSE (3sk0.5)	
	Sagittal DWI (3sk0.3)	DWI sagittal (3sk0.3)	
	Axial C+ T1 fat sat (4sk1)	Axial C+ T1 fat sat (4sk1)	
	Sagittal C+ T1 FSE (3sk0.5)	Sagittal C+ T1 FLAIR (3sk0.5)	
<b>Thoracic Without</b>			
	Sagittal T1 TSE (3sk0.5)	Sagittal T1FLAIR (3sk0.5)	Axial images from C7-L1
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (4sk1)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (3sk0.5)	
	Coronal T1 TSE (3sk0.5)	Coronal T1 TSE (3sk0.5)	
	Sagittal DWI (3sk0.3)	DWI sagittal (3sk0.3)	
<b>TMJ</b>			
	Localizer (coronal and sagittal)	SAME	FOV=12cm
	Sagittal PD oblique Right Closed (2sk0)		
	Sagittal PD oblique Left Closed (2sk0)		Could do axial or coronal T1 of head (4sk1) instead of localizer
	Sagittal T2 oblique Right Closed (2sk0)		
	Sagittal T2 oblique Left Closed (2sk0)		
	Coronal T1 Right Closed (2sk0)		
	Coronal T1 Left Closed (2sk0)		
	Sagittal PD oblique Right Open (2sk0)		
	Sagittal PD oblique Left Open (2sk0)		
	Sagittal T2 oblique Right Open (2sk0)		
	Sagittal T2 oblique Left Open (2sk0)		
<b>Trigeminal</b>			
	Complete Brain MRI protocol	SAME	Whole brain FOV= 22cm
	Posterior fossa :		Posterior fossa FOV=18cm
	Axial T1 (3sk0.5)		
	Axial T2 fat sat (3sk0.5)		Scan from the suprasellar cistern to the C1 level on axials, cover through posterior fossa and orbital apex on coronals
	Coronal T1 (3sk0.5)		
	Axial Fiesta w/coronal reformats		
	Axial C+T1 FS (3sk0.5)		
	Coronal C+T1 FS (3sk0.5)		
	Coronal C+ T1 whole head (4sk1)		
<b>Spine SBRT Treatment Planning</b>			
	Coronal T1 TSE (3sk 0.5)	Coronal T1 TSE (3sk 0.5)	Axial coverage to be specified on order. Axial images only acquired through areas to be treated
	Sagittal T1 TSE (3sk0)	Sagittal T1 TSE (3sk0)	Sagittal coverage = Typical FOV for region of spine to be treated (i.e. If treatment to cervical spine cover skull base to T1)
	Sagittal T2 TSE (3sk0)	Sagittal T2 TSE (3sk0)	FOV = 12cm on Axials
	Sagittal STIR (3sk0)	Sagittal STIR (3sk0)	
	Axial T2 TSE (2sk0)	Axial T2 TSE (2sk0)	Axial Plane = Perpendicular to vertebral body. If vertebral body is fractured image perpendicular to bed
	Precontrast Axial T1 FLAIR (2sk0)	Precontrast Axial T1 TSE (2sk0)	
	Axial C+ T1 fat sat (2sk0)	Axial C+ T1 fat sat (2sk0)	
		Sagittal C+T1 TSE (3sk0)	