DHMC Neuro MRI Protocol Book

Last Updated 4/19/2024

Key Points on Using this Protocol Book

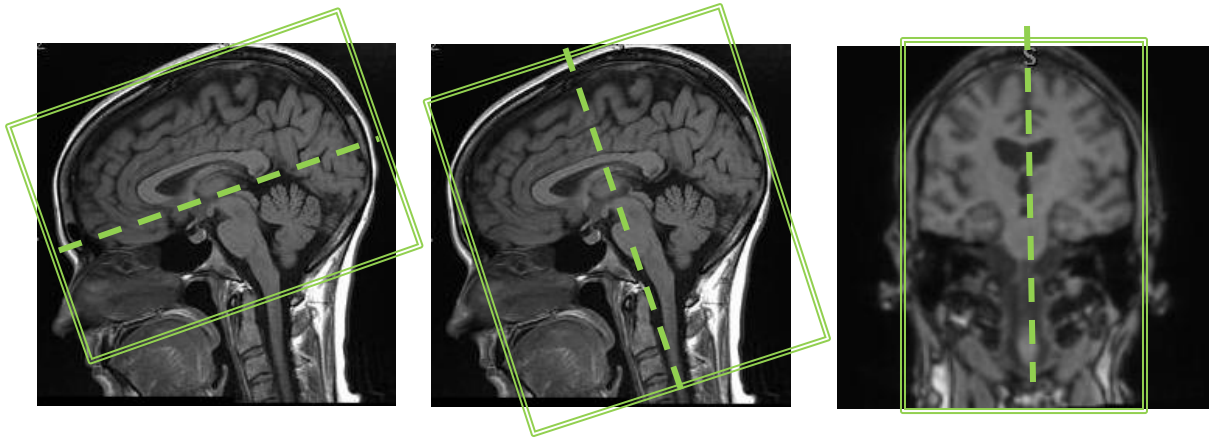
- This protocol book was built using Siemens as the main brand of machine in mind.
- The parameters listed in this book are required parameters from the radiologist. Other parameters such as matrix size, averages, and acceleration are unique and will not work the same on every brand (GE, Siemens, Philips) or strength (1.5T, 3T) of machine. It is recommended that you start with a stock sequence and adjust from this point.

NEURO MRI PROTOCOLS

BRAIN		VASCULAR	
Brain (-) (+/-)	ESP (+/-)	Brain (-) / MRA Cow (-) / MRA Neck (+)	MRA (No Coil) Aneurysm (-)
Quick Brain (-)	Mechanical Thrombectomy (-)		
Infant Brain 0-2 yrs. (-) (+/-)	MS Brain (-) (+/-)	MRA Head Post Coil (-) (Eskey) (***3T Only***)	MRV Head (+/-)
Pedi Brain 2-12 yrs. (-) (+/-)	Pineal (+/-)	MRA (NEW) Aneurysm (+/-)	Spinal MRA (+/-)
Pedi Tumor Brain (With Perfusion) (+/-)	Pituitary (+/-)	SPINE	
Brain (-) / MRA Cow (-) / MRA Neck (+)	Stereotactic Brain (+/-)		
CSF Flow (-)	Tumor Brain (With Perfusion) (+/-)	Single Level Spine	Total Spine
Dementia (-)		Bone Mets (+/-)	Bone Mets (+/-)
Diamox Perfusion (+/-)		Cervical Radiculopathy (-)	CSF Leak Spine (-)
HEAD & NECK		Cervical Routine (-) (+/-)	Diskitis/Osteo/Abscess Two - Three Levels (+/-)
Brachial Plexus (-) (+/-)	Sialography (+/-)	Diskitis/Osteo/Abscess (+/-)	Drop Mets (+/-)
Face (+/-)	Skull Base (+/-)	Drop Mets (+/-)	Scoliosis (-)
IAC (+/-)	Soft Tissue Neck (+/-)	Thoracic Radiculopathy (-)	Tethered Cord (-)
IAC (Cholesteatoma) (+/-) (***3T Preferred***)	Soft Tissue Neck XRT (+/-)	Thoracic Routine (-) (+/-)	
Neuro-Ophtho (+/-)	TMJ (-)	Lumbar Radiculopathy (-)(+/-)	
Orbits (+/-)	Trigeminal (+/-) (***3T Only***)	Lumbar Routine (-) (+/-)	
		Lumbar Cauda Equina (-)	
OTHER		Radiation Spine (+/-)	
Whole Body MRI (-)		Sacrum (-) (+/-)	

Routine Brain (+/-)

Sagittal T1 Space
-(Axial Reformat)
Axial DWI
Axial T2 Flair THIN
Axial SWI
Axial T2 FS THIN **Post**
Axial BRAVO **Post**
Sagittal T1 FS Space **Post**
-(Axial + Coronal Reformat)



Axial **Coronal** **Sagittal**

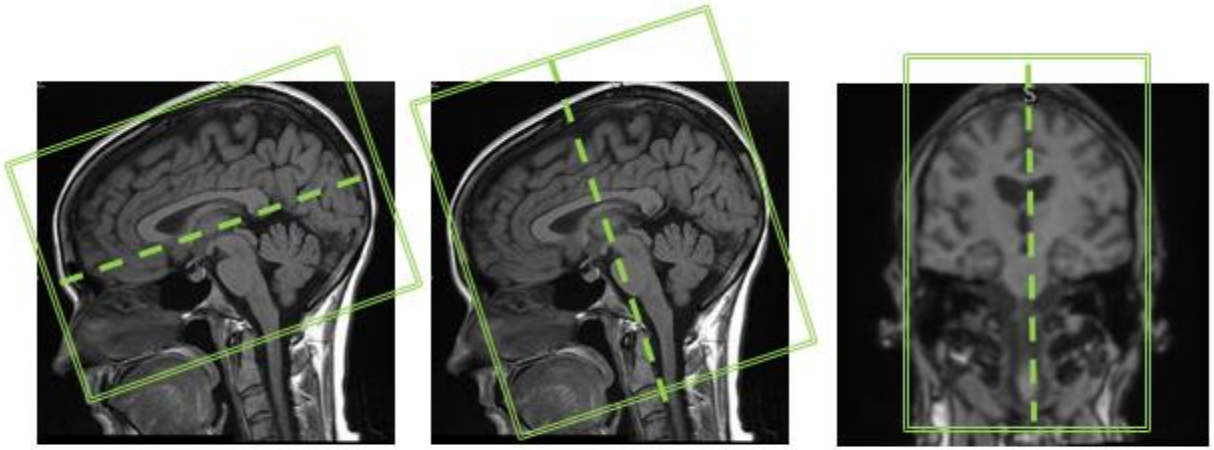
Routine Brain (-)

Sagittal T1 Space (Ax Reformat), Axial DWI, Axial T2 FLAIR THN, Axial T2 FS THIN, Axial SWI

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 Space	2000	9	240	100	1	0	A/P	L->R	
AX DWI	6400	98	220	100	3	0	A/P	F->H	b-values 0 and 1,000
AX T2 FLAIR THN	9000	81	220	75	3	.3	R/L	F->H	
AX SWI	27	20	220	75	1.8	0	R/L	F->H	
AX T2 FS THN Post	5000	100	220	75	3	0	R/L	F->H	
AX BRAVO Post	1470	2.62	260	100	1.8	0.75	A/P	F->H	No Angle
SAG T1 FS Space Post	700	18	240	100	1	0	A/P	L->R	

Quick Brain (-)

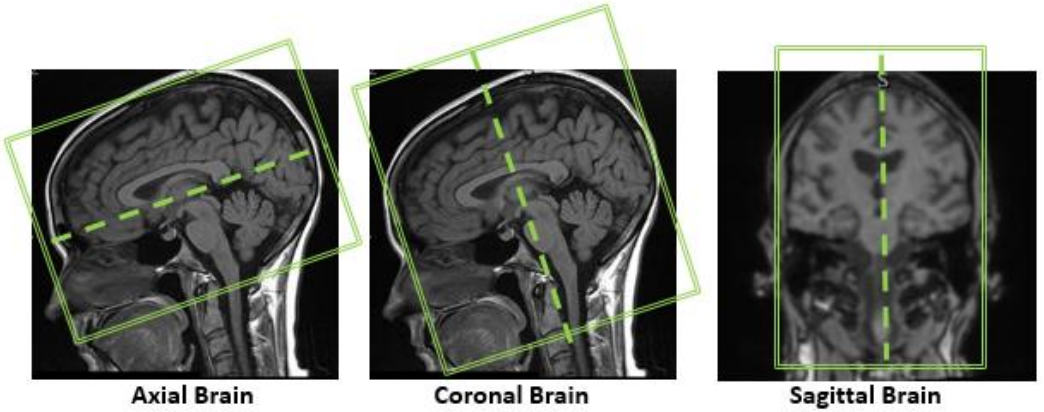
Sagittal T2 SSFSE
Axial T2 SSFSE
Coronal T2 SSFSE



Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T2 SSFSE	1500	80	220	100	5	1	A/P	L->R	
AX T2 SSFSE	1500	80	220	100	5	1	R/L	F->H	
COR T2 SSFSE	1500	80	220	100	5	1	R/L	P->A	

Infant Brain 0-2 Yrs. (+/-)

Sagittal BRAVO
-(Axial + Coronal Reformat)
Axial DWI
Axial T1
Axial SWI
Axial T2 **Post**
Axial T2 Flair FS **Post**
Sagittal BRAVO **Post**
Sagittal T1 FS Space **Post**
-(Axial + Coronal Reformat)
Optional
Coronal Gre



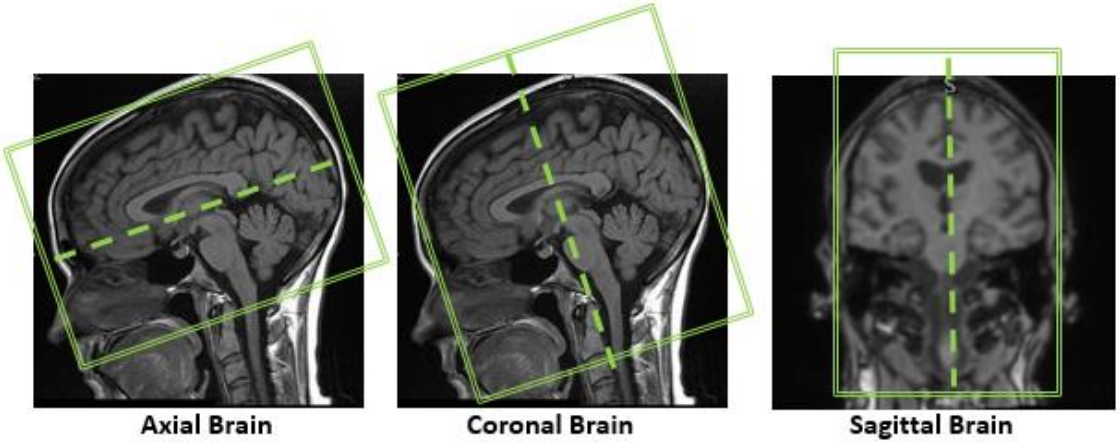
Infant Brain 0-2 Yrs.(-)

Sagittal BRAVO, Axial DWI, Axial T2, Axial T2 FLAIR FS, Axial T1, Axial SWI

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG BRAVO	1470	2.62	220	100	1	0	A/P	L->R	
AX DWI	7100	104	200	100	3	0	A/P	F->H	b-values 0, 600, 800 and 1,000
AX T1	418	8.2	200	80	3	0	R/L	F->H	
AX SWI	27	20	200	80	1.8	0	R/L	F->H	
AX T2 Post	4240	113	200	80	3	0	R/L	F->H	
AX T2 FLAIR FS Post	9000	81	200	80	4	0	R/L	F->H	
SAG BRAVO Post	1470	2.62	220	100	1	0	R/L	F->H	
SAG T1 FS Space Post	700	18	220	100	1	0	A/P	L->R	
*****OPTIONAL*****									
COR GRE					3	0			

Pedi Brain 2-12 Yrs. (+/-)

Sagittal Bravo
– *(Axial Reformat)*
Axial DWI
Axial SWI
Axial T2 Flair FS **Post**
Axial T2 **Post**
Sagittal Bravo **Post**
– *(Axial Reformat)*
Sagittal T1 FS Space **Post**
– *(Axial + Coronal Reformat)*



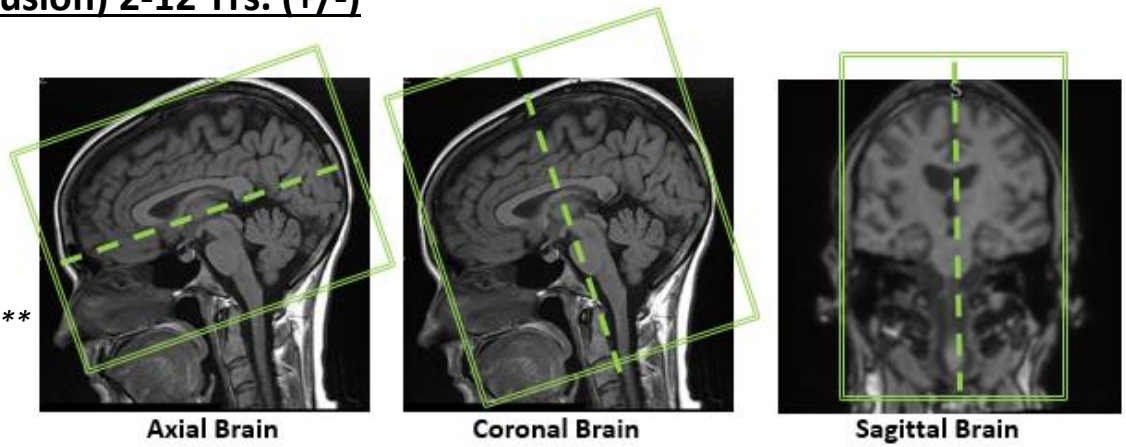
Pedi Brain 2-12 YRS. (-)

Sagittal Bravo, Axial DWI, Axial T2, Axial T2 FLAIR FS, Axial SWI

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG BRAVO	1470	2.62	240	100	1	0	A/P	L->R	
AX DWI	7100	98	220	100	3	0	A/P	F->H	b-values 0 and 1,000
AX SWI	27	20	200	80	1.8	0	R/L	F->H	
AX T2 FLAIR FS Post	9000	81	200	80	3	0	R/L	F->H	
AX T2 Post	4240	113	180	80	3	0	R/L	F->H	
SAG BRAVO Post	1470	2.62	220	100	1	0	A/P	L->R	
SAG T1 FS Space Post	700	18	240	100	1	0	A/P	L->R	

Pedi Tumor Brain (With Perfusion) 2-12 Yrs. (+/-)

Sagittal Bravo
– *(Axial Reformat)*
Axial DWI
Axial SWI
Axial Perfusion **Post**
Inj. at 5mL/sec. with 8 sec. inj. delay
Axial T2 Flair FS **Post**
Axial T2 **Post**
Sagittal Bravo **Post**
– *(Axial Reformat)*
Sagittal T1 FS Space **Post**
– *(Axial + Coronal Reformat)*



Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG BRAVO	1470	2.62	240	100	1	0	A/P	L->R	
AX DWI	7100	98	220	100	3	0	A/P	F->H	b-values 0 and 1,000
AX SWI	27	20	200	80	1.8	0	R/L	F->H	
AX PERFUSION Post	1600	30	220	100	5	2	A/P	F->H	
AX T2 FLAIR FS Post	9000	81	200	80	3	0	R/L	F->H	
AX T2 Post	4240	113	180	80	3	0	R/L	F->H	
SAG BRAVO Post	1470	2.62	220	100	1	0	A/P	L->R	
SAG T1 FS Space Post	700	18	240	100	1	0	A/P	L->R	

CSF Flow (-)

Use the pulse oximeter

**One slice centered at the foramen magnum*

Sagittal CINE PC (flash_5_in-plane)

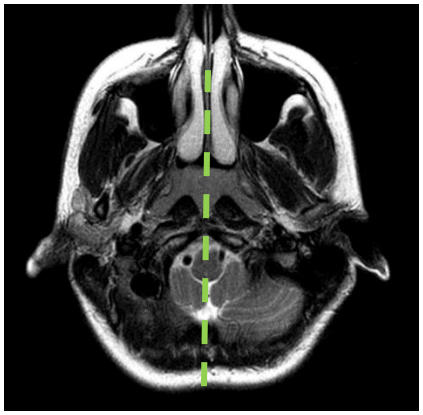
- One sagittal slice centered at the midline of the foramen magnum

Sagittal CINE PC (flash_10_in-plane)

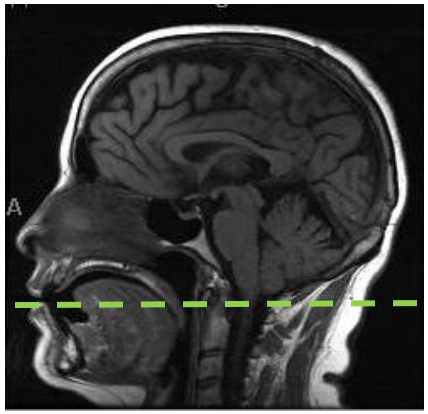
- One sagittal slice centered at the midline of the foramen magnum

Axial CINE PC (flash_10_through-plane)

- One axial slice at the foramen magnum



Sagittal/In-Plane

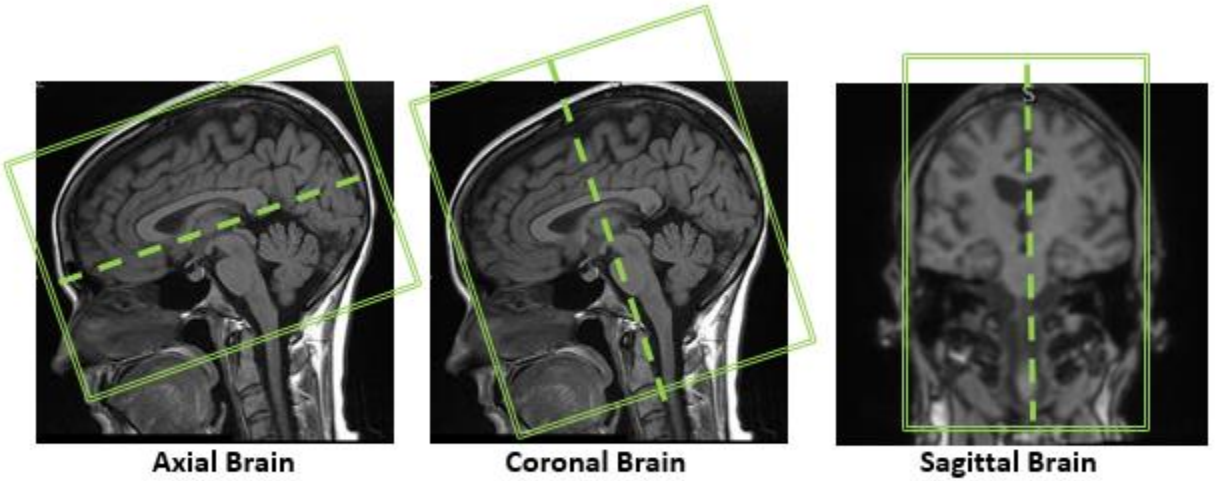


Axial/Through-Plane

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG CINE PC (In-Plane)	25.14	8.39	200	200	5	1	A/P	N/A	Velocity encoding: 5
SAG CINE PC (In-Plane)	25.14	8.39	200	200	5	1	A/P	N/A	Velocity encoding: 10
AX CINE PC (Through-Plane)	22.94	7.07	160	160	5	1	A/P	N/A	Velocity encoding: 10

Dementia (-)

Sagittal T1 Flair
Axial DWI
Axial T2 Flair THIN
Axial T2 FS THIN
Axial SWI
Coronal BRAVO
- *(Sagittal + Axial Reformat)*



Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 Flair	2000	9	240	100	5	1	A/P	L->R	
AX DWI	6400	98	220	100	3	0	A/P	F->H	
AX T2 FLAIR THN	9000	81	220	75	3	.3	R/L	F->H	
AX T2 FS THN	5000	100	220	75	3	0	R/L	F->H	
AX SWI	27	20	220	90.6	1.80	0	R/L	F->H	
COR BRAVO	1470	2.62	260	75	1.0	0.5	R/L	P->A	

Diamox Perfusion (+/-)

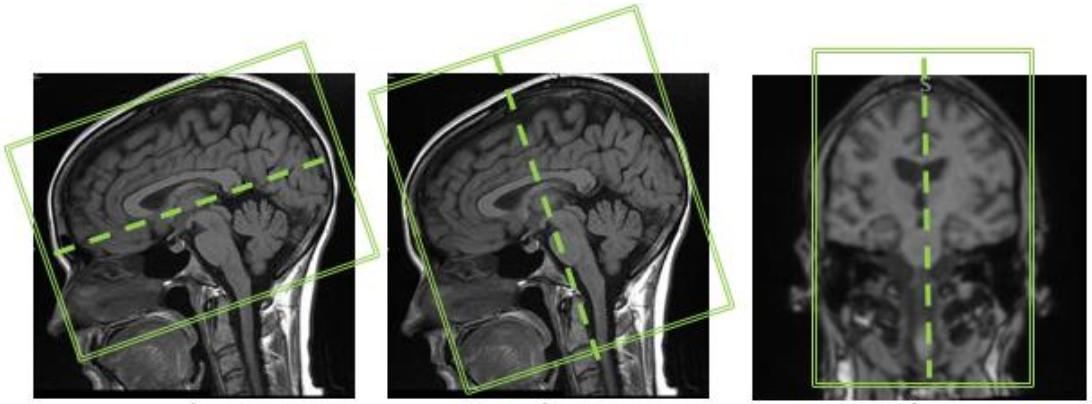
Diamox dosing:
Patients above 140lbs – 10mL
Patients under 140lbs – 17mg/kg
Symptoms of Diamox: feeling flushed and/or dizzy
Instruct patient to drink and rehydrate upon completion of exam
Instructions for scanning:

- *Have MD order Diamox prior to the scan*
- *Do routine brain protocol with first half dose perfusion*
- *MRI nurse will inject Diamox*
- *Wait 20 minutes post Diamox injection then run second half dose perfusion*

Sagittal T1 Space
-(Axial Reformat)
Axial DWI
Axial T2 Flair THIN
Axial SWI
Axial Perfusion 1 (half dose of contrast – 5mL/second injection with 8 second injection delay)
Inject Diamox (nurse will inject) and wait 20 minutes before second perfusion
Axial Perfusion 2 (half dose of contrast– 5mL/second injection with 8 second injection delay)
Axial T2 FS THIN **Post**
Axial BRAVO **Post**
Sagittal T1 FS Space **Post**
-(Axial + Coronal Reformat)

Diamox Perfusion (continued)

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 Space	2000	9	240	100	1	0	A/P	L->R	
AX DWI	6400	98	220	100	3	0	A/P	F->H	
AX T2 FLAIR THN	9000	81	220	75	3	.3	R/L	F->H	
AX SWI	27	20	220	75	1.8	0	R/L	F->H	
AX PERFUSION 1	1600	30	220	100	5	2	A/P	F->H	Include the vertex of the brain
AX PERFUSION 2	1600	30	220	100	5	2	A/P	F->H	Include the vertex of the brain
AX T2 FS THN Post	5000	100	220	75	3	0	R/L	F->H	
AX BRAVO Post	1470	2.62	260	100	1.5	0.75	R/L	F->H	No angle
SAG T1 FS Space Post	700	18	240	100	1	0	A/P	L->R	



ESP (+/-) (*3T GE Preferred)*

**coverage to include entire brain except coronal T2 thin oblique*

Axial DTI- *(OMIT ON 1.5T)*

Coronal BRAVO

- (Sagittal Reformat)

Coronal T2 THIN OBL

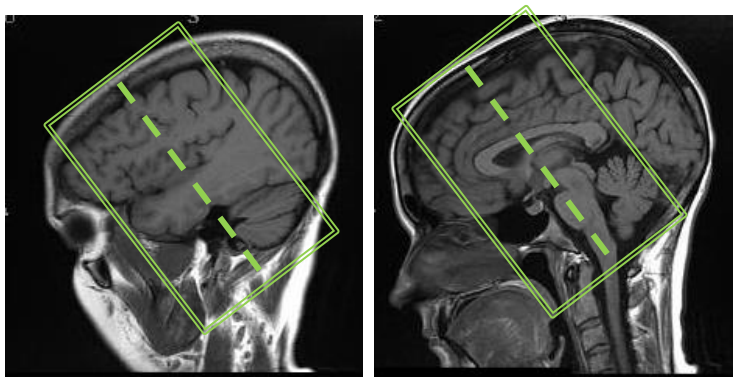
Coronal 3D DIR

Coronal 3D Flair Cube

Axial SWI

IF Contrast

Axial BRAVO **Post**

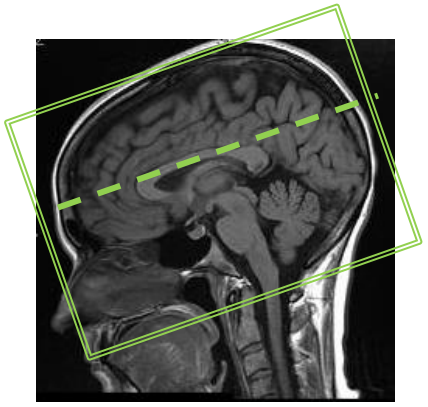


COR T2 Thin OBL
(Perpendicular to the Sylvian Fissure)

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX DTI	8000	95	240	100	2	0.2	A/P	F->H	
COR 3D BRAVO	1470	2.62	220	75	1.4	0.75	R/L	P->A	
COR T2 Thin OBL	4250	79	200	100	1.50	0	R/L	P->A	
COR 3D DIR	6500	120	220	80	1.4	0	R/L	P->A	
COR 3D FLAIR CUBE	6200	76	220	80	1.4	0	R/L	P->A	
AX SWI	27	20	220	75	1.8	0	R/L	F->H	
*****IF CONTRAST*****									
AX BRAVO Post	1470	2.62	260	100	1.5	0.75	R/L	F->H	No angle

Mechanical Thrombectomy (-)

Axial DWI
Optional
Axial T2 Flair THIN
Axial SWI
Axial T2 THIN
3D TOF COW



Axial

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX DWI	6400	98	220	100	3	0	A/P	F->H	b-values 0 and 1,000
AX T2 FLAIR THN	9000	81	220	75	3	.3	R/L	F->H	
AX SWI	27	20	220	75	1.8	0	R/L	F->H	
AX T2 THN	5000	100	220	75	3	0	R/L	F->H	
3D TOF COW	21	3.43	200	75	.5	-4	R/L	F->H	

MS Brain (-) (+/-)

**whole brain coverage*

Sagittal Flair FS Space

- *(Axial Reformat)*

Axial DWI

Axial T1

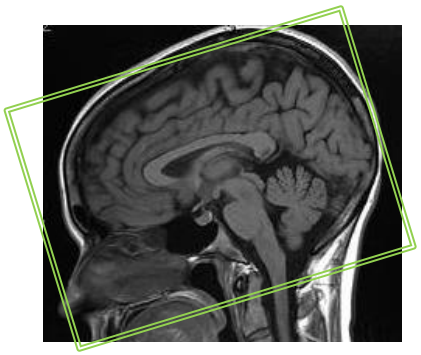
Axial T2 FS **Post**

Axial T1 **Post**

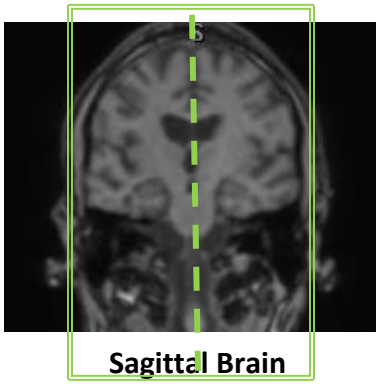
Optional

Axial T2 Flair THIN

Sagittal T2 Flair THIN



Axial Brain



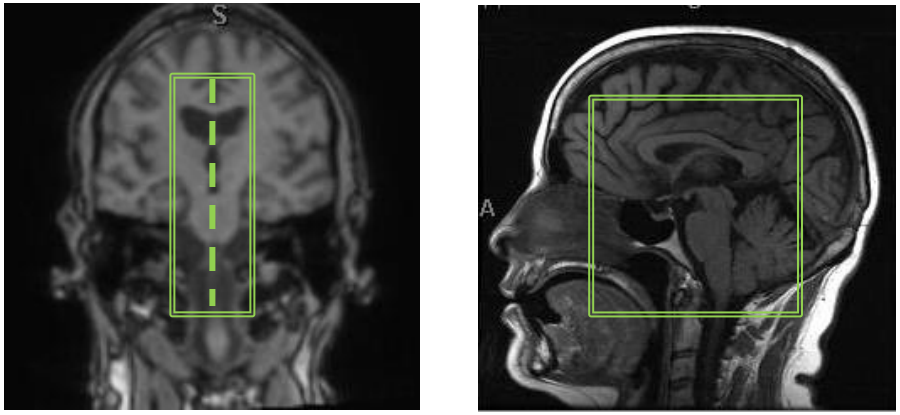
Sagittal Brain

IF MS BRAIN IS ORDERED WO, ADD AX T2 FS ALSO

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG Space FS Flair	5000	386	240	100	1.2	0	A/P	L->R	
AX DWI	6400	98	220	100	3	0	A/P	F->H	
AX T1	2000	9	220	75	3	0	R/L	F->H	
AX T2 FS Post	5000	100	220	75	3	0	R/L	F->H	
AX T1 Post	2000	9	220	75	3	0	R/L	F->H	
*****OPTIONAL*****									
SAG T2 FLAIR THIN	9000	84	240	100	3	0	A/P	L->R	
AX T2 FLAIR THIN	9000	81	220	75	3	0	R/L	F->H	

Pineal (+/-)

Sagittal T1 Space
-(Coronal Reformat)
Sagittal 3D CISS
Sagittal T1 FS Space **Post**
-(Coronal Reformat)



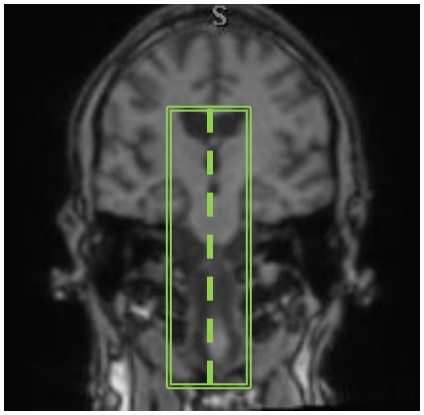
Sagittal Space/CISS

*****Sag Space and Sag CISS have different size FOV's*****

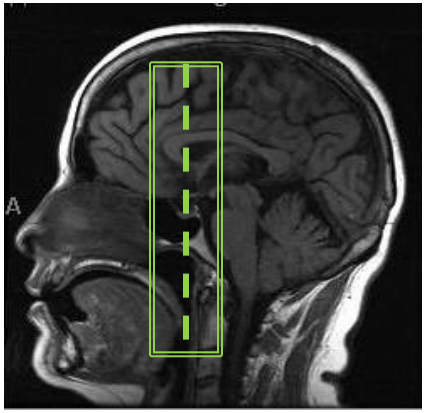
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 Space	600	30	120	100	1	0	A/P	L->R	
SAG 3D CISS	136	200	200	100	0.5	0	A/P	L->R	
Sag T1 FS Space Post	600	30	120	100	1	0	A/P	L->R	

Pituitary (+/-)

Sagittal T1 Space
-(Coronal Reformat)
Coronal T2 Thin
Coronal T1 Dynamic (GE)
Coronal Dynamic Tricks (Siemens)
Sagittal T1 FS Space **Post**
-(Coronal Reformat)



Sagittal Thin



Coronal Thin

Parameters below are for reference. They DO NOT need to be exactly the same on the scanners.

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 Space	600	30	120	100	1	0	A/P	L->R	
COR T2 THIN	4000	105	120	100	2	0	R/L	A->P	
COR T1 DYNAMIC (GE)	400	8.9	120	100	3	0	R/L	A->P	3 slices
COR DYN TRICKS (SIEMENS)	3.19	6.19	120	100	2.2	0	R/L	A->P	12 slices
Sag T1 FS Space Post	600	30	120	100	1	0	R/L	A->P	

Stereotactic Brain (+/-)

(Used for Neurosurgery Planning, RT Planning)

****Straight Axial Images to Include Nose****

Axial BRAVO

Axial BRAVO **Post**

Sagittal T1 FS Space **Post**

-(Axial + Coronal Reformat)

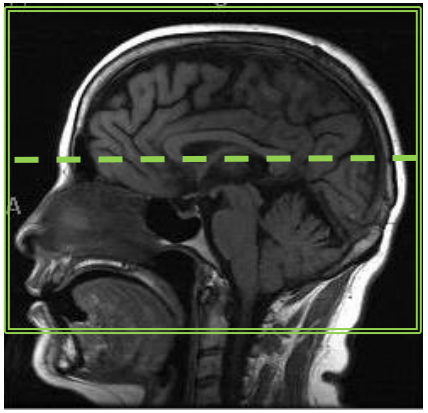
Optional if tumor does not enhance:

Sagittal Space Flair **Post**

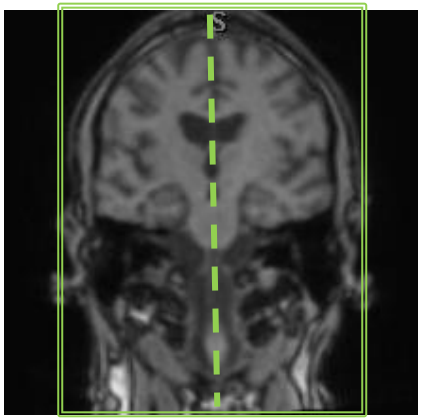
-(Axial Reformat)

Optional

Axial DTI



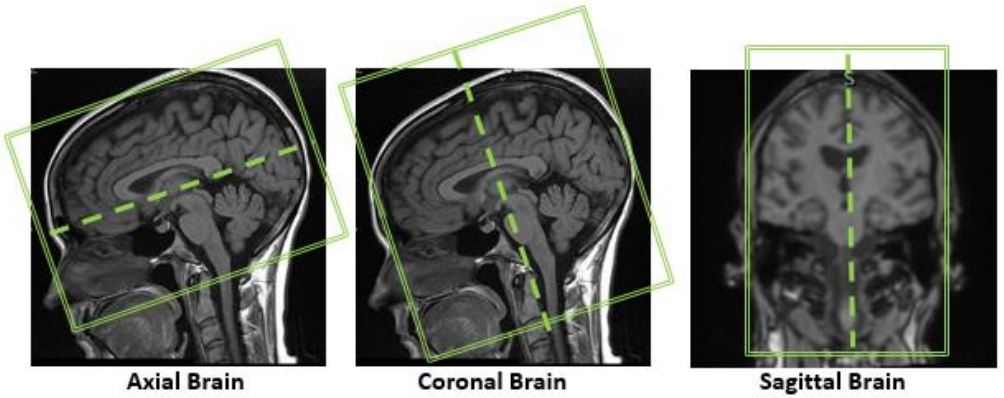
Axial Bravo



Sagittal Space/Space Flair

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX BRAVO	1900	2.55	240	100	1.5	.75	R/L	F->H	No angle
AX BRAVO Post	1900	2.55	240	100	1.5	.75	R/L	F->H	No angle
SAG T1 FS Space Post	700	18	240	100	1	0	A/P	L->R	
*****OPTIONAL IF TUMOR DOES NOT ENHANCE*****									
SAG Space Flair	5000	386	240	100	1.2	0	A/P	L->R	
*****OPTIONAL SEQUENCES TO BE DONE BEFORE CONTRAST IF NEEDED*****									
AX DTI	8000	95	240	100	2	.2	A/P	F->H	

Tumor Brain (With Perfusion) (+/-)



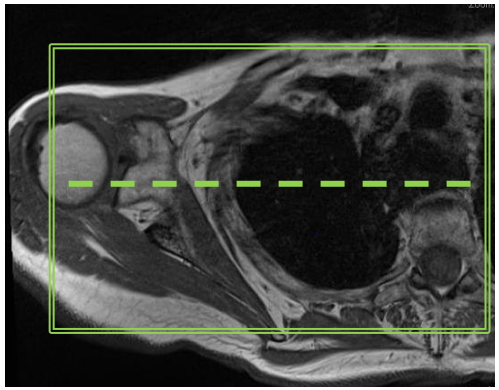
Sagittal T1 Space
-(Axial Reformat)
Axial DWI
Axial T2 Flair THIN
Axial SWI
Axial Perfusion **Post**
Inj. at 5mL/sec. with 8 sec. inj. delay
Axial T2 FS THIN **Post**
Axial BRAVO **Post**
Sagittal T1 FS Space **Post**
-(Axial + Coronal Reformat)

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 Space	2000	9	240	100	1	0	A/P	L->R	
AX DWI	6400	98	220	100	3	0	A/P	F->H	
AX T2 FLAIR THN	9000	81	220	75	3	.3	R/L	F->H	
AX SWI	27	20	220	75	1.8	0	R/L	F->H	
AX PERFUSION Post	1600	30	220	100	5	2	A/P	F->H	
AX T2 FS THN Post	5000	100	220	75	3	0	R/L	F->H	
AX BRAVO Post	1470	2.62	260	100	1.5	0.75	R/L	F->H	No angle
SAG T1 FS Space Post	700	18	240	100	1	0	A/P	L->R	
*****OPTIONAL*****									
SVS SE 135	2000	135	20	20	N/A	N/A			Flip Angle: 90 degrees

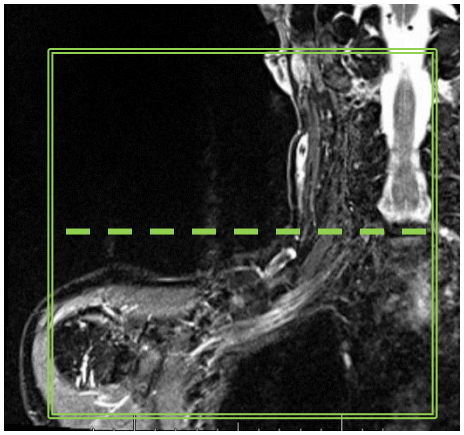
Brachial Plexus (-) (+/-) *(3T Preferred)*

**Cover C2 through T3 and from the spine through the glenohumeral joint*

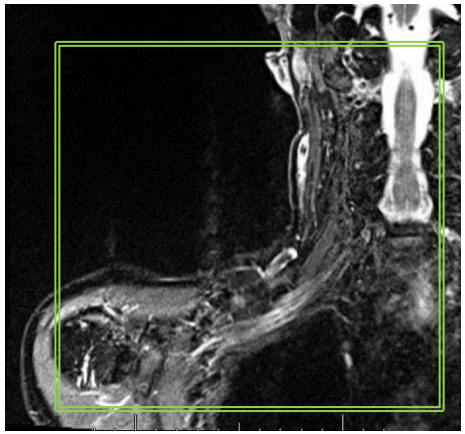
Coronal T1
Coronal Stir
Sagittal T1
Sagittal Stir
Axial T1
****If Contrast****
Axial T1 FS **Post**
Sagittal T1 FS **Post**
Coronal T1 FS **Post**



Coronal



Axial



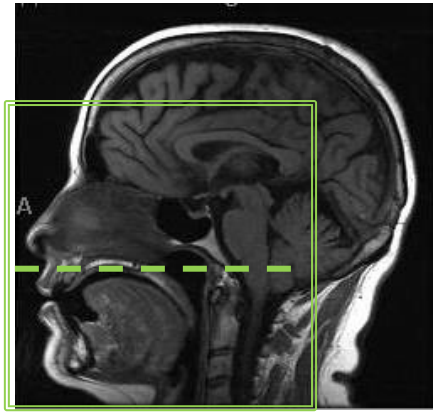
Sagittal

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
COR T1	650	11	240	100	3	1	H/F	A->P	
COR STIR SPACE	650	91	320	100	3	1	H/F	A->P	
SAG T1	600	11	220	100	3	1	H/F	L->R	
SAG STIR	4970	41	220	100	3	1	H/F	L->R	
AX T1	650	11	220	100	3	1	A/P	H->F	
*****OPTIONAL IF CONTRAST*****									
AX T1 FS Post	650	9.3	220	100	3	1	A/P	H->F	
SAG T1 FS Post	650	9.3	220	100	3	1	H/F	L->R	
COR T1 FS Post	650	9.3	220	100	3	1	H/F	A->P	

Face (+/-)

Axial DWI Resolve THIN
Axial T1 THIN
Axial T2 FS THIN
Coronal T2 FS THIN
Axial T1 Dixon THIN **Post**
Coronal Vibe FS Dixon **Post**
-(Axial + Sagittal Reformat)

Coronal



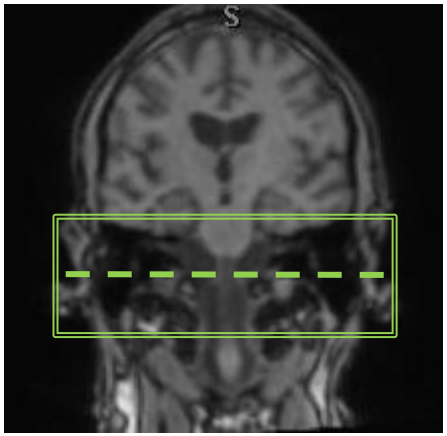
Axial

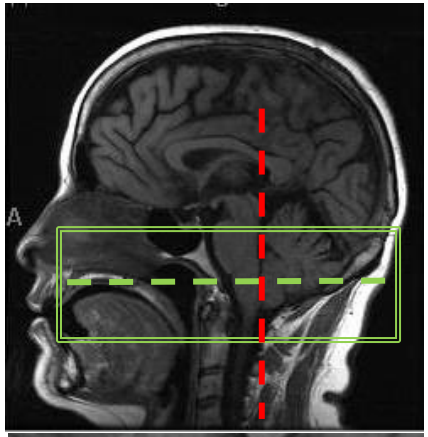
*****Send Water Only and In-Phase Images for all Dixon Sequences ONLY*****

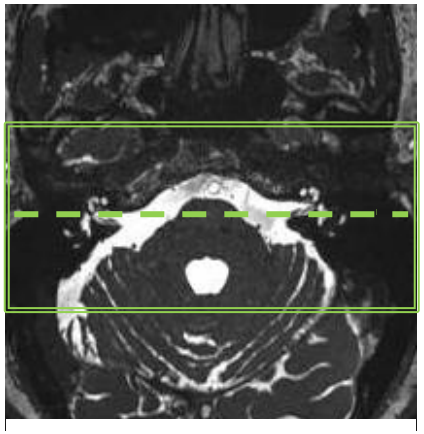
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX DWI RESOLVE	5100	1: 64 2: 103	220	100	3	1	A/P	F->H	
AX T1	500	20	180	100	3	1	R/L	F->H	
AX T2 FS Dixon	3000	105	180	100	3	1	R/L	F->H	
COR T2 FS Dixon	3000	105	180	100	3	1	R/L	A->P	
AX T1 Dixon Post	488	6.7	180	100	3	1	R/L	F->H	
COR Vibe FS Dixon Post	310	9.2	180	100	1.1	0	R/L	A->P	

IAC (+/-)

Axial DWI
Axial T2 FS Flair
Axial T2 Space
-(Coronal + Sagittal Reformat)
Axial T1 Space
-(Coronal Reformat)
Ax T1 Space FS **Post**
-(Coronal Reformat)

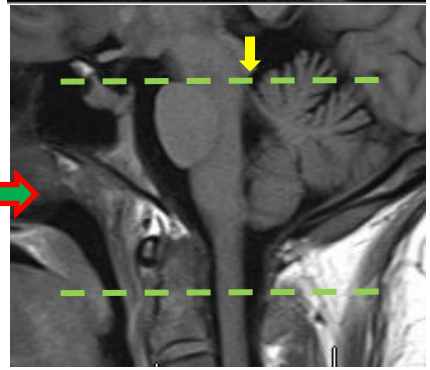






Axial Space T2/T1 Coverage

Angle Perpendicular to posterior aspect of brainstem (Red Line). Cover from bottom of triangle formed by brainstem and cerebellum (Yellow arrow) through the C1/C2 junction.



Coronal Thin Reformat

Parameters below are for reference. They DO NOT need to be exactly the same on the scanners.

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX DWI	6400	98	220	100	3	0	A/P	F->H	Whole Brain
AX T2 FS FLAIR	9000	81	220	75	3	.3	R/L	F->H	Whole Brain
AX T2 Space	1400	263	180	90	.8	0	R/L	F->H	
AX T1 Space	650	30	180	90	1	O	R/L	F->H	
AX T1 FS Space Post	650	30	180	90	1	0	R/L	F->H	

IAC (Cholesteatoma)(+/-)

3T Preferred SIEMENS ONLY

***Cholesteatoma,
Infection, Abscess***

Axial DWI *(Whole Brain)*

Axial T2 FS Flair (*Whole Brain)*

Axial DWI Resolve

Axial T2 Space

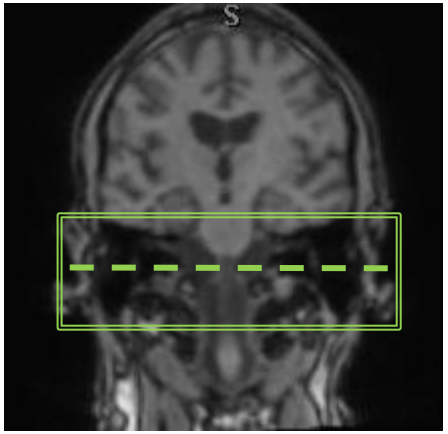
-(Coronal + Sagittal Reformat)

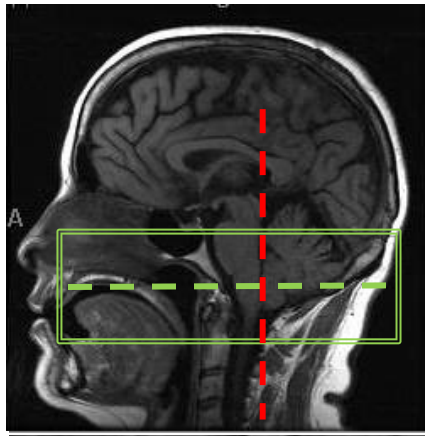
Axial T1 Space

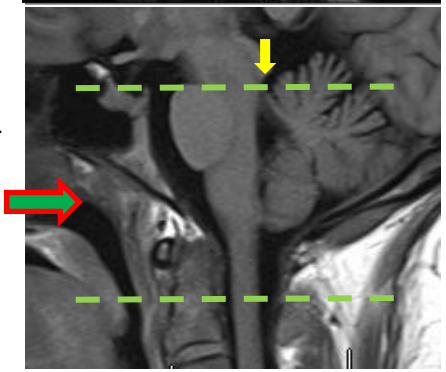
-(Coronal Reformat)

Axial T1 FS Space **Post**

-(Coronal Reformat)

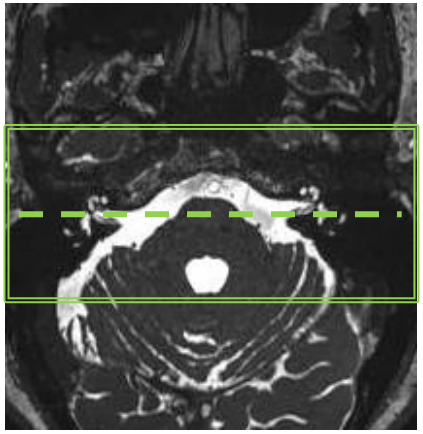






Ax Resolve, Space T2/T1 Coverage

Angle Perpendicular to posterior aspect of brainstem (Red Line). Cover from bottom of triangle formed by brainstem and cerebellum (Yellow arrow) through the C1/C2 junction.



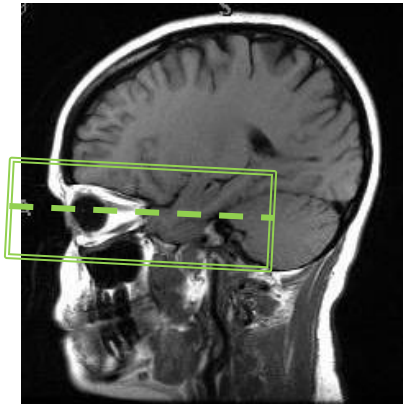
Coronal Thin Reformat Coverage

Parameters below are for reference. They DO NOT need to be exactly the same on the scanners.

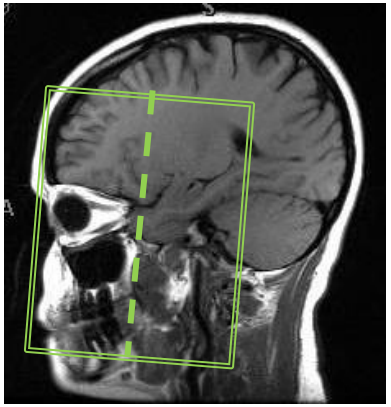
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX DWI	6400	98	220	100	3	0	A/P	F->H	Whole Brain
AX T2 FS FLAIR	9000	81	220	75	3	.3	R/L	F->H	Whole Brain
AX DWI RESOLVE	5100	1: 64 2: 103	220	100	3	0	A/P	F->H	
AX T2 SPACE	1400	263	180	100	.8	0	R/L	F->H	
AX T1 SPACE	650	30	180	100	1	0	R/L	F->H	
AX T1 FS SPACE Post	650	30	180	100	1	0	R/L	F->H	

Neuro-Ophtho (+/-)

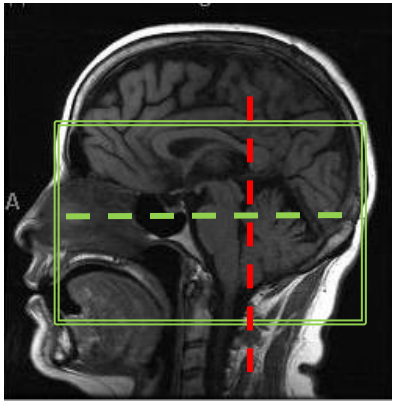
Sagittal Bravo (Brain)
-(Axial Reformat)
Axial DWI (Whole Brain)
Axial T2 Flair FS Thin (Brain)
Axial T2 Space (Brainstem)
Coronal Stir (Orbits)
Axial T2 FS (Orbits)
Coronal T1 Flair (Orbits)
Coronal T1 Flair FS (Orbits) **Post**
Sagittal T1 FS Space (Brain) **Post**
-(Axial Reformat)



Axial T2 FS (Orbits) Coverage



Coronal Stir / T1 Flair Coverage



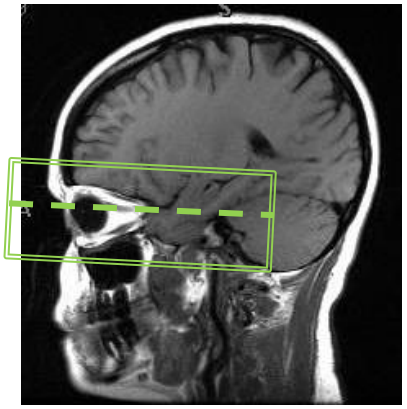
Axial T2 Space Brainstem Coverage

*****Needs to have a Brain AND Orbits Order*****

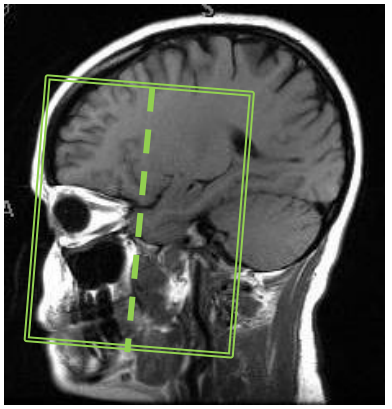
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG BRAVO	1470	2.62	240	100	1	0	A/P	L->R	Whole Brain
AX DWI	6400	98	220	100	3	0	A/P	F->H	b-values 0 and 1,000
AX T2 Flair FS THN	9000	100	220	75	3	0	R/L	F->H	Whole Brain
AX T2 SPACE Brainstem	1400	263	180	100	.8	0	R/L	F->H	
COR STIR	4000	47	150	100	3	0	R/L	A->P	Orbits
AX T2 FS	4000	47	150	100	3	0	R/L	F->H	Orbits
COR T1 FLAIR	2000	6.7	150	100	3	0	R/L	A->P	Orbits
COR T1 FLAIR FS Post	2000	6.7	150	100	3	0	R/L	A->P	Orbits
SAG T1 FS Space Post	700	18	240	100	1	0	A/P	L->R	Whole Brain

Orbits (+/-)

Sagittal T1 Flair
Coronal Stir THIN
Axial T2 FS THIN
Axial T1 Flair THIN
Coronal T1 Flair THIN
Axial T1 Flair FS THIN **Post**
Coronal T1 Flair FS THIN **Post**



Axial Thin

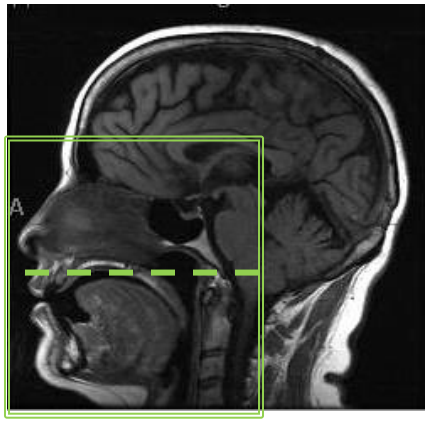


Coronal Thin

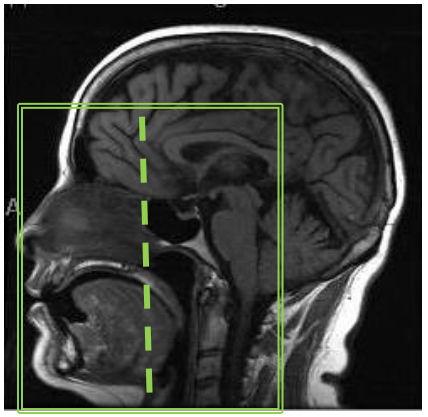
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	9	240	100	5	1	A/P	L->R	Whole Head
COR STIR THIN	4000	47	150	100	3	0	R/L	A->P	
AX T2 FS THIN	4000	80	150	100	3	0	R/L	F->H	
AX T1 FLAIR THIN	600	6.4	150	100	3	0	R/L	F->H	
COR T1 FLAIR THIN	650	6.7	150	100	3	0	R/L	A->P	
AX T1 FLAIR FS THIN Post	600	6.4	150	100	3	0	R/L	F->H	
COR T1 FLAIR FS THIN Post	650	6.7	150	100	3	0	R/L	A->P	

Sialography (+/-)

Coronal T2 FS THIN
Coronal T1 THIN
Axial T2 FS THIN
Axial T1 THIN
Axial T2 FS Space
Axial T2 CISS
Axial T1 THIN **Post**
Coronal T1 FS THIN **Post**



Axial

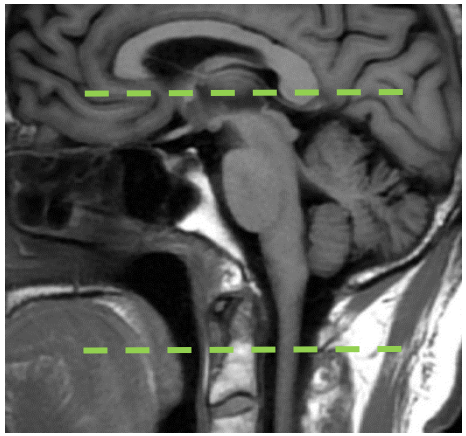


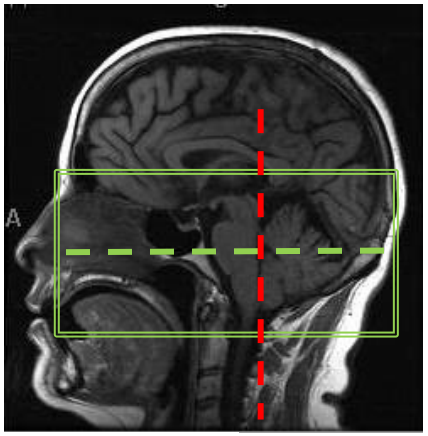
Coronal

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
COR T2 FS THIN	3500	106	180	100	3	1	R/L	A->P	
COR T1 THIN	542	8.9	180	100	3	1	R/L	A->P	
AX T2 FS THIN	3840	106	200	90.6	3	1	R/L	F->H	
AX T1 THIN	467	8.9	200	90.6	3	1	R/L	F->H	
AX T2 FS SPACE	2500	700	200	100	1	0	R/L	F-.H	
AX T2 CISS	5.26	2.41	200	100	0.7	0.14	R/L	F->H	
AX T1 THIN Post	467	8.9	200	90.6	3	1	R/L	F->H	
COR T1 FS THIN Post	400	8.9	180	100	3	1	R/L	A->P	

Skullbase (+/-)

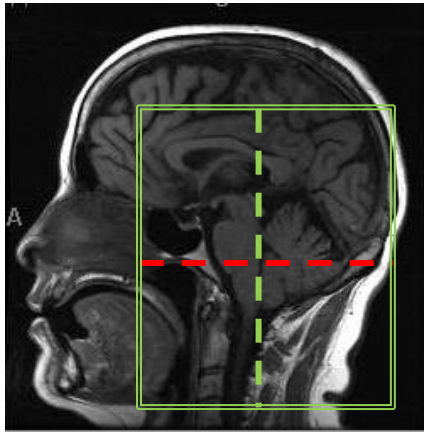
Axial DWI Resolve
Coronal T2 FS Dixon
Axial T2 Space
-(Coronal + Sagittal Reformat)
Axial T1 Space
-(Coronal Reformat)
Axial T1 FS Space **Post**
-(Coronal Reformat)





Ax Resolve, Space T2/T1 Coverage

Angle Perpendicular to posterior aspect of brainstem (Red Line). Cover from superior tectum through the C1/C2 junction.



Coronal T2 FS Dixon Coverage

Angle Parallel to posterior aspect of brainstem (Green Line). Cover from anterior skull to posterior skull.

Parameters below are for reference. They DO NOT need to be exactly the same on the scanners.

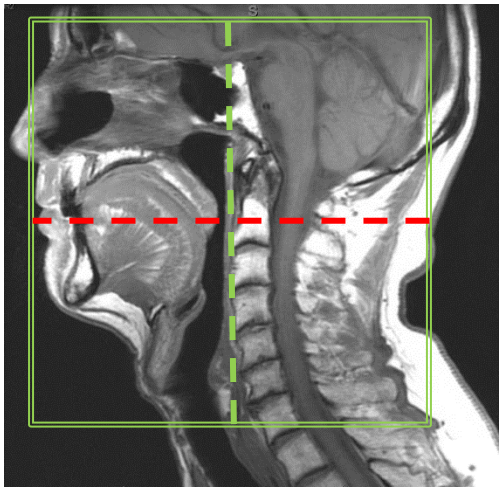
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX DWI RESOLVE	5100	1: 64 2: 103	220	100	3	0	A/P	F->H	
COR T2 FS Dixon	2430	107	150	100	3	1	R/L	A->P	
AX T2 SPACE	1400	263	180	100	.8	0	R/L	F->H	
AX T1 SPACE	650	30	180	100	1	0	R/L	F->H	
AX T1 FS SPACE Post	650	30	180	100	1	0	R/L	F->H	

Soft Tissue Neck (+/-)

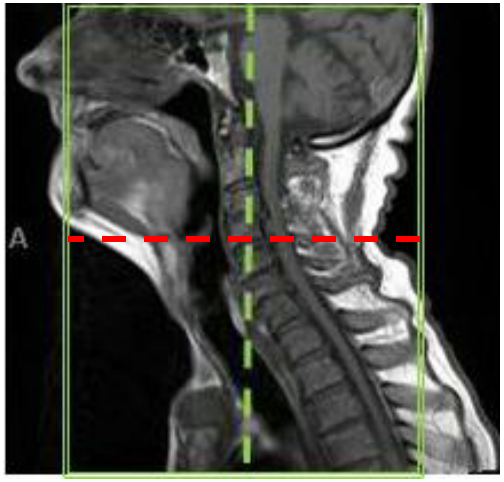
*****Siemens ONLY*****

Axial T2 FS Dixon (Large FOV)
Axial T2 FS Dixon (Small FOV)
Axial DWI Resolve (Small FOV)
Axial T1 (Small FOV)
Axial T1 FS Dixon **Post** (Small FOV)
Coronal Vibe FS Dixon **Post** (Large FOV)
-*(Axial + Sagittal Reformat)*

Red Dash- Axial Angle
Green Dash- Coronal Angle



SMALL FOV



LARGE FOV

*****Send Water Only and In-Phase Images for all Dixon Sequences ONLY*****

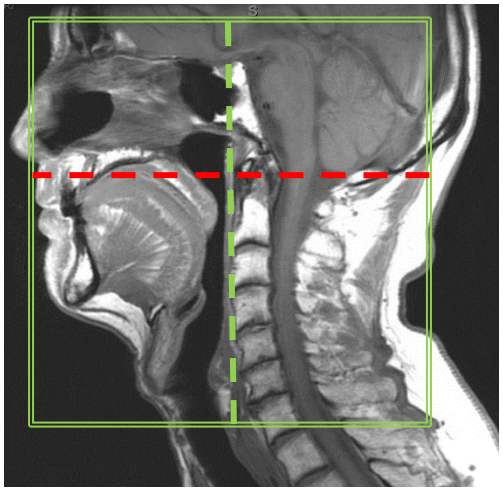
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX T2 FS Dixon	5150	78	200	100	3	1	A/P	H->F	LG FOV
AX T2 FS DIXON	4290	76	180	100	3	1	A/P	H->F	SM FOV
AX DWI Resolve	5100	64/103	220	100	3	1	A/P	H->F	SM FOV
AX T1	500	11	180	100	3	1	A/P	H->F	SM FOV
AX T1 FS Dixon Post	650	11	180	100	3	1	A/P	H->F	SM FOV
COR VIBE FS Dixon Post	650	9.3	240	100	1.2	0	H/F	A->P	LG FOV

Soft Tissue Neck XRT (+/-)

*****Siemens ONLY*****

Axial T2 FS Dixon
Axial T1
Axial T1 FS Dixon **Post**
Coronal Vibe FS Dixon **Post**
-(Axial + Sagittal Reformat)

Red Dash- Axial Angle
Green Dash- Coronal Angle



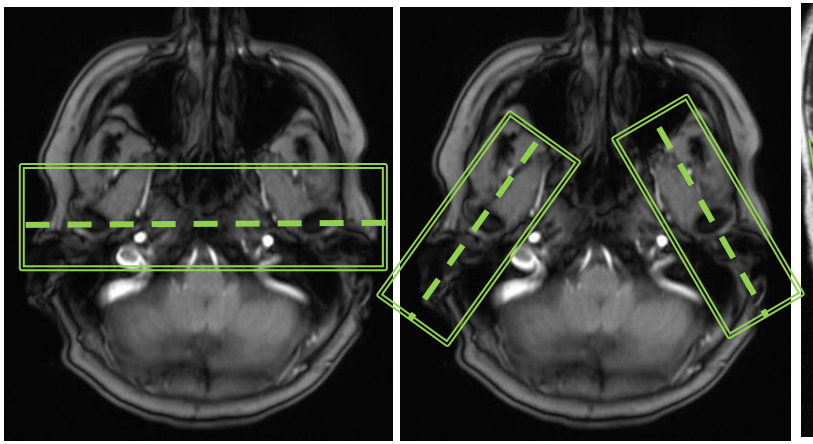
*****Send Water Only and In-Phase Images for all Dixon Sequences ONLY*****

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX T2 FS DIXON	4290	76	180	100	3	1	A/P	H->F	
AX T1	500	11	180	100	3	1	A/P	H->F	
AX T1 FS Dixon Post	650	11	180	100	3	1	A/P	H->F	
COR VIBE FS Dixon Post	650	180	200	100	1.2	0	H/F	A->P	

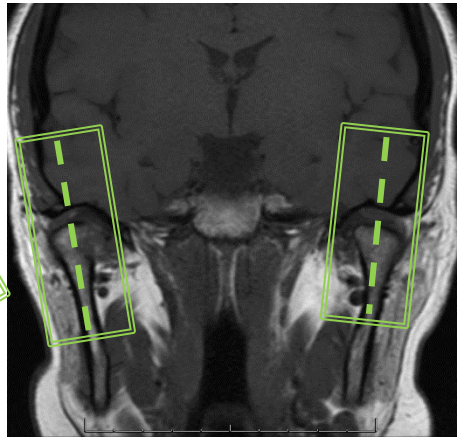
TMJ (-)

**Use the Burnett TMJ Device and retractor bite plate maximized to patient toleration for the open mouth images. Perform the CINE images twice with the right and left scanned separately. Use the TMJ device with retractor and instruct the patient to click the device 2-3 times between each image until the patient cannot tolerate further widening.*

Coronal T1 Closed Mouth
RT Sagittal PD Closed Mouth
LT Sagittal PD Closed Mouth
RT Sagittal PD Open Mouth
LT Sagittal PD Open Mouth
Sagittal CINE RT
Sagittal CINE LT



Coronal

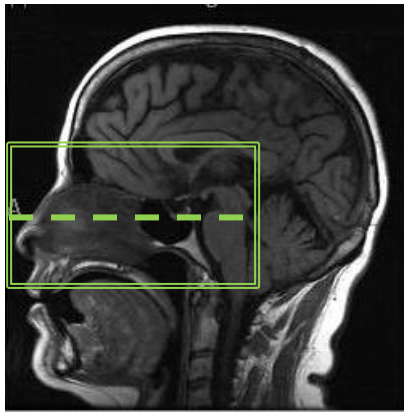


Sagittal Imaging Plane – use coronal and axial image

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
COR T1 CLOSED	406	7.1	150	100	3	.3	R/L	A->P	
RIGHT SAG PD CLOSED	2800	21	120	100	2	.1	A/P	L->R	
LEFT SAG PD CLOSED	2800	21	120	100	2	.1	A/P	L->R	
RIGHT SAG PD OPEN	2800	21	120	100	2	.1	A/P	L->R	
LEFT SAG PD OPEN	2800	21	120	100	2	.1	A/P	L->R	
SAG CINE	240	2.74	150	100	4	0	A/P	L->R	Do left and right separate

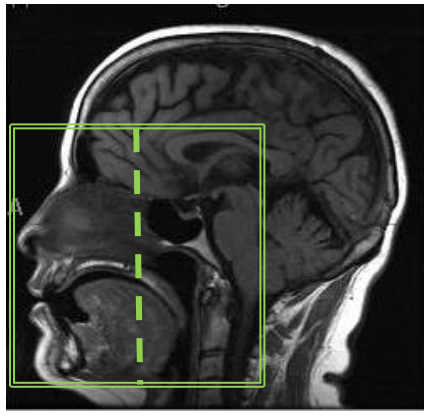
Trigeminal (+/-) *(3T Only)*

Axial T2 Flair THIN
Axial T2 Space (Coverage Below)
Coronal T2 FS THIN Dixon
Axial T1 THIN
Axial T1 FS THIN Dixon **Post**
Coronal T1 FS THIN Dixon **Post**
Sagittal T1 FS Space **Post**
-(Axial + Coronal Reformat)



Axial T2 Space

Axial Thin



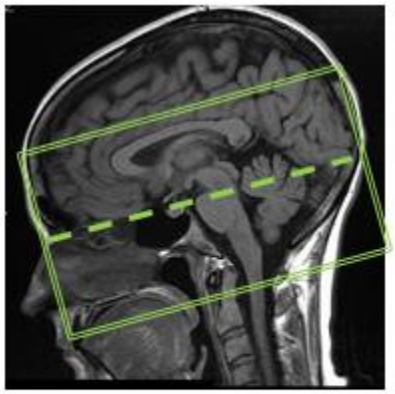
Coronal Thin

*****Axial CISS Coverage – Halfway thru Frontal Sinus – Bottom of Clivus*****
*****Axial Coverage - Top of Orbits – Bottom of Mandible*****
*****Coronal Coverage - Nose – Thru Posterior Brainstem*****

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX T2 FS FLAIR THN	9000	89	220	75	5	2	R/L	F->H	Whole Brain
AX T2 Space	1400	263	150	75	1.5	0	R/L	F->H	Thin section
COR T2 FS THIN DIXON	2430	107	150	100	3	1	R/L	A->P	Thin section
AX T1 THIN	400	6.4	180	100	3	1	R/L	F->H	Thin section
AX T1 FS THIN DIXON Post	400	6.4	180	100	3	1	R/L	F->H	Thin section
COR T1 FS THIN Post DIXON	500	10	150	100	3	1	R/L	A->P	Thin section
SAG T1 FS Space Post	700	18	240	100	1	0	A/P	L->R	Whole Brain

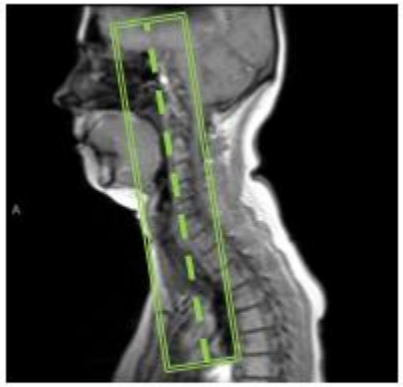
Brain (-)/ MRA Cow (-)/ MRA Neck (+)

Sagittal T1 Space
-(Axial Reformat)
Axial DWI
Axial T2 Flair THIN
Axial T2 FS THIN
3D TOF COW
Axial SWI
2D PC NECK
Coronal TRICKS
If Dissection
Axial T1 FS DIXON
If Tricks Fails
Axial 2D TOF



Axial TOF COW

Axial 2D TOF Neck/AX T1 FS Dixon



Coronal Tricks

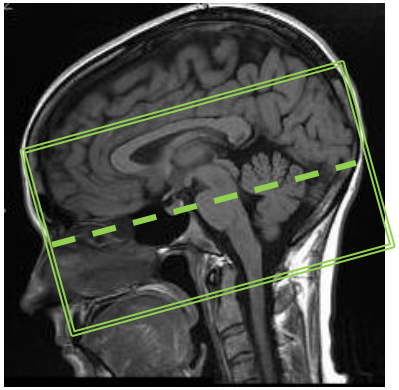
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 Space	2000	9	240	100	1	0	A/P	L->R	
AX DWI	6400	98	220	100	5	1	A/P	F->H	
AX T2 FLAIR THN	9000	81	220	75	3	.3	R/L	F->H	
AX T2 FS THN	5000	100	220	75	3	0	R/L	F->H	
3D TOF COW	21	3.43	200	75	.5	-4	R/L	F->H	
AX SWI	27	20	220	75	1.8	0	R/L	F->H	
2D PC NECK	21	7.3	300	59.4	5	2.5	A/P	L->R	
COR TRICKS	3.17	1.18	260	100	1	0	R/L	A->P	
*****OPTIONAL IF QUESTIONING DISSECTION*****									
AX T1 FS DIXON	668	12	200	100	3	1	A/P	F->H	
*****IF TRICKS SEQUENCE FAILS OR DOESN'T COME OUT RIGHT*****									
AX 3D TOF	400	3.9	240	75	3.5	-.9	A/P	F->H	

MRA Post Coil (-) (3T Only)

For patients being followed for aneurysm recurrence after treatment (coiling)

2D PC

Axial 3D TOF



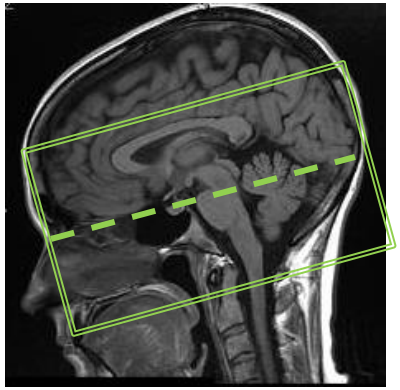
Axial – to include coil

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
2D PC	21	7.3	300	59.4	5	2.5	A/P	L->R	
AX 3D TOF	23	3.98	200	75	.5	-4.0	R/L	F->H	Include coil

MRA (NEW) Aneurysm (+/-)

3T Siemens Only

For patients with a newly discovered aneurysm
Radiologist to determine "Space" coverage
2D PC
Axial 3D TOF
Space (vessel wall imaging)
-(*At the site of the aneurysm)*
Space (vessel wall imaging) **Post**
-(*At the site of the aneurysm)*

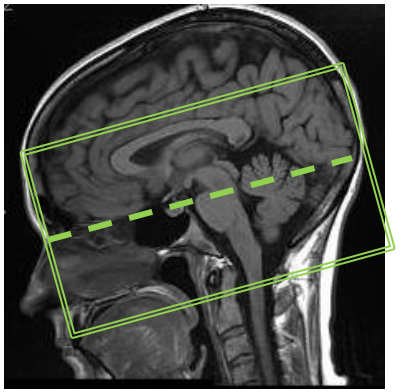


Axial – to include coil

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
2D PC	21	7.3	300	59.4	5	2.5	A/P	L->R	
AX 3D TOF	23	3.98	200	75	.5	-4.0	R/L	F->H	Include coil
SPACE	938	25	160	100	0.5	0	R/L	F->H	
SPACE Post	938	25	160	100	0.5	0	R/L	F->H	

MRA (No Coil) Aneurysm (-)
3T Siemens Only

For patients with a known aneurysm being following for aneurysm growth
Excludes patients with previously treated coiling, stenting, or clipping
Radiologist to determine "Space" coverage



Axial – to include the aneurysm

2D PC
Axial 3D TOF
Space (vessel wall imaging)
-(*At the site of the aneurysm)*

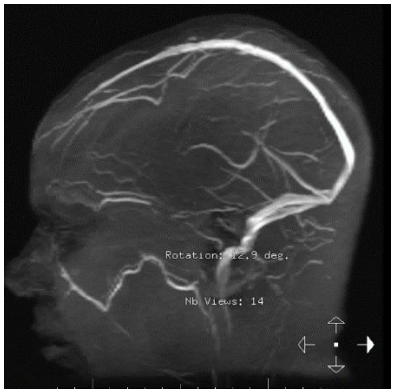
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
2D PC	21	7.3	300	59.4	5	2.5	A/P	L->R	
AX 3D TOF	23	3.98	200	75	.5	-4.0	R/L	F->H	Include coil
SPACE	938	25	160	100	0.5	0	R/L	F->H	

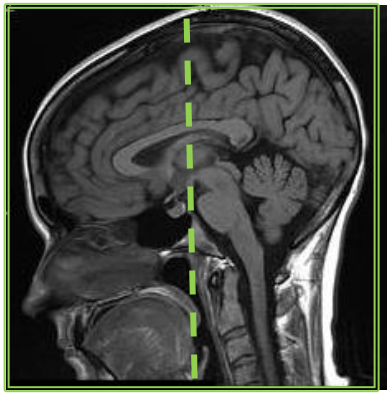
MRV Head (-)

Axial SWI
Coronal Tricks **Post**

- Send best Venous phase
- Best Venous-Best Arterial
- MIP Stack of each phase

Optional
Coronal 2D MRV





COR TRICKS / 2D MRV

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
AX SWI	27	20	220	75	1.8	0	R/L	F->H	
COR TRICKS Post	3.17	1.18	250	100	1.5 Siemens 3 (Zip 2) GE	0	R/L	A->P	
*****OPTIONAL IF UNABLE TO GIVE CONTRAST*****									
COR 2D MRV	19	4.56	250	100	2.5	-.8	R/L	A->P	PLACE INFERIOR SAT BAND BELOW SLICES

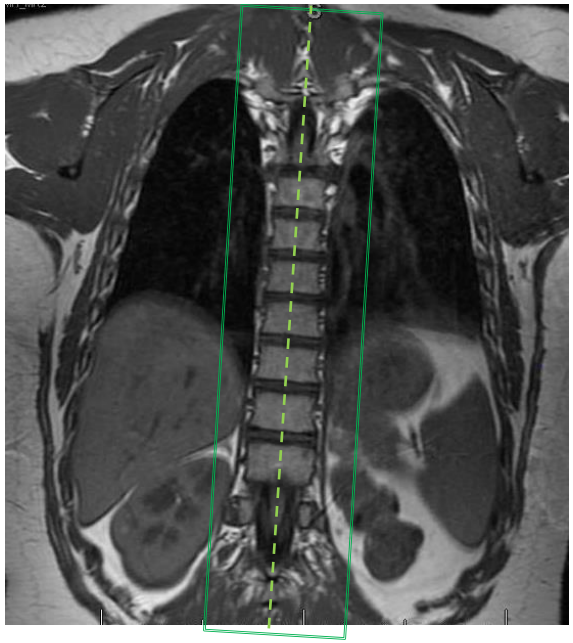
Spinal MRA (+/-)

**Cover the area of interest as specified and scan in the sagittal plane. Use fluoro trigger with timing as the contrast is bright in the aorta.*

Sagittal 3D MRA Pre

Sagittal 3D MRA **Post** – 3 phases

-(Coronal and Axial Reformat), (MIP, Rotate)



Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG 3D MRA Pre	3	1.07	360	100	1	.2	A/P	L->R	
SAG 3D MRA Post X 3	3	1.07	360	100	1	.2	A/P	L->R	

Bone METS (+/-) *Single Level*

****If scanning only single level, entire level (CSP, TSP, LSP) must be covered on axials.****

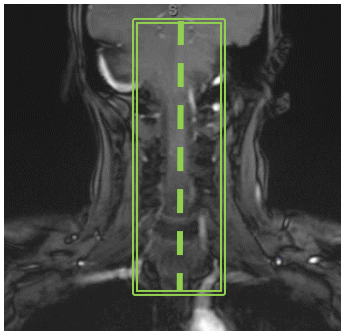
Sagittal T1 Flair
Sagittal Stir
Sagittal T1 Flair FS **Post**
Axial Vibe FS **Post**
Axial T2 **Post**

*****FOV's and slice thickness/gap will vary depending on what level you are scanning*****

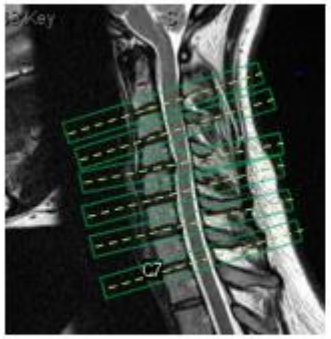
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	10	180	100	3	.3	H/F	L->R	
SAG STIR	3700	68	180	100	3	.3	H/F	L->R	
SAG T1 FLAIR FS Post	2000	9.5	180	100	3	.3	H/F	L->R	
AX Vibe FS Post	4.5	1.8	180	100	3	0	A/P	H->F	Stacked
AX T2 Post	3880	100	180	100	3	1	A/P	H->F	Stacked
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST*****									
AX T1 FS Post	405	10	180	100	4	1	A/P	H->F	Stack axials to include past conus

C-spine Radiculopathy (-)

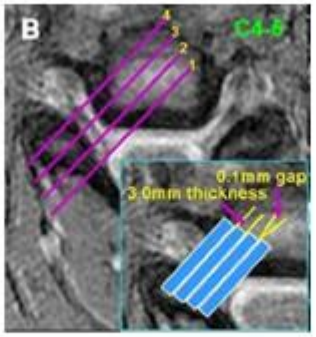
Sagittal T1 Flair
Sagittal T2
Axial T2
Axial Medic/Merge
Sagittal T2 Oblique Right
Sagittal T2 Oblique Left

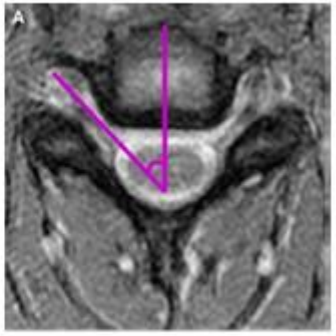


Sagittal
18 FOV



Axial
(5 slices per disk space)



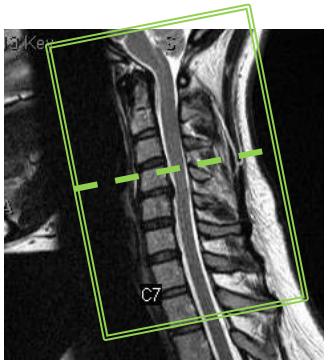


Oblique – 45 degrees from the sagittal
(perpendicular to neural foramen)

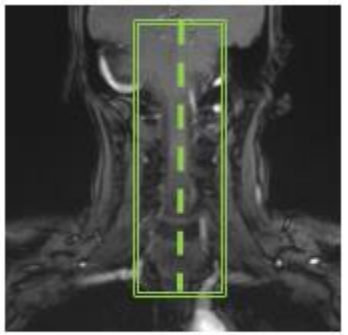
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	10	180	100	3	.3	H/F	L->R	*18 FOV
SAG T2	3500	96	180	100	3	.3	H/F	L->R	*18 FOV
AX T2	3720	87	180	100	2	1	A/P	H->F	Multi-slice multi-angle 5 slices per disc
AX MEDIC/MERGE	32	14	180	100	3	0	A/P	H->F	Single Stack
SAG T2 OBLIQUE RIGHT	3000	96	180	100	2	1	H/F	L->R	Perpendicular to the nerve root traveling through the cervical foramina
SAG T2 OBLIQUE LEFT	3000	96	180	100	2	1	H/F	L->R	Perpendicular to the nerve root traveling through the cervical foramina

C-spine Routine (-) (+/-)

Sagittal T1 Flair
Sagittal T2
Sagittal Stir
Axial T2
Axial Medic/Merge
Optional if contrast
Sagittal T1 Flair **Post**
Axial Vibe FS **Post**



Axial
(Stack from mid cerebellum to T1)



Sagittal
18 FOV

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	10	180	100	3	.3	H/F	L->R	
SAG T2	3000	111	180	100	3	.3	H/F	L->R	
SAG STIR	3700	78	180	100	3	.3	H/F	L->R	
AX T2	3500	90	180	100	3	1	A/P	H->F	Stacked
AX MEDIC/MERGE	32	14	180	100	3	0	A/P	H->F	Single Stack
*****OPTIONAL IF CONTRAST*****									
SAG T1 FLAIR Post	2000	10	180	100	3	.3	H/F	L->R	
AX Vibe FS Post	4.5	1.8	180	100	3	0	A/P	H->F	Stacked
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST*****									
AX T1 FS Post	500	10	180	100	3	1	A/P	H->F	Stacked

Diskitis / Osteo / Abscess (+/-) ***Single Level***

****If scanning only single level, entire level (CSP, TSP, LSP) must be covered on axials.****

Sagittal Stir
Sagittal T1 Flair
Axial T2
Sagittal T1 Flair FS **Post**
Axial Vibe FS **Post**

*****FOV's and slice thickness/gap will vary depending on what level you are scanning*****

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	10	300	100	3	.3	H/F	L->R	
SAG STIR	3700	73	300	100	3	.3	H/F	L->R	
AX T2	3200	101	180	100	4	1	A/P	H->F	Stacked
SAG T1 FLAIR FS Post	2000	10	280	100	3	.3	H/F	L->R	
AX Vibe FS Post	4.5	1.8	180	100	3	0	A/P	H->F	Stacked
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST*****									
AX T1 FS Post	405	10	180	100	4	1	A/P	H->F	Stacked

DROP METS (+/-) ***Single Level***

****If scanning only single level, entire level (CSP, TSP, LSP) must be covered on axials.****

Sagittal T1 Flair
Sagittal T2
Sagittal Space
-(Axial + Coronal Reformat)
Sagittal T1 Flair **Post**
Axial Vibe **Post**

*****Sagittal Space ONLY TO BE DONE ON SINGLE LEVEL Protocol*****
*****FOV's will vary depending on what level you are scanning*****

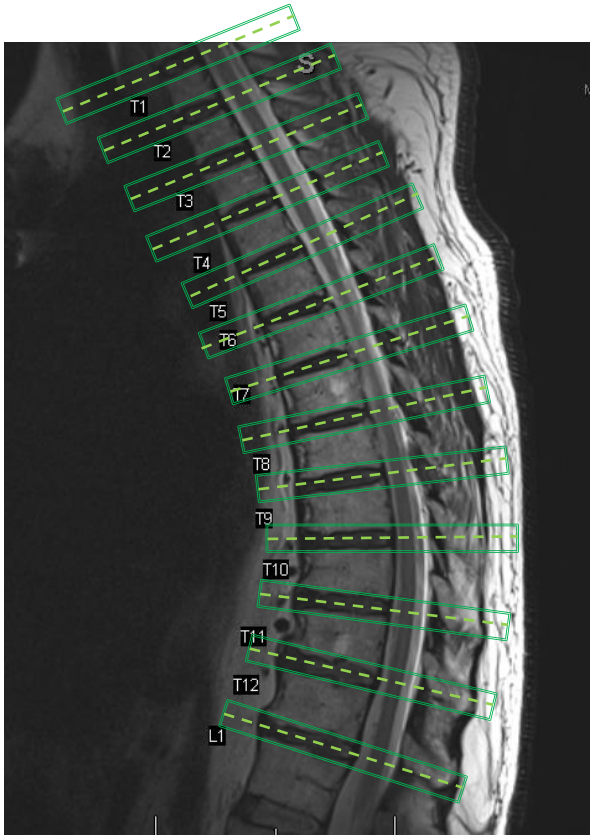
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	9.5	280	100	3	0	H/F	L->R	
SAG T2	3000	101	280	100	3	0	H/F	L->R	
SAG SPACE	1500	138	300	100	.7	0	H/F	L->R	Siemens
	1500	138	300	100	1.4	0	H/F	L->R	GE (ZIP 2)
SAG T1 FLAIR Post	2000	9.5	280	100	3	0	H/F	L->R	
AX Vibe Post	4.5	1.8	180	100	3	0	H/F	L->R	Stacked
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST*****									
AX T1 Post	405	10	180	100	4	1	A/P	H->F	Stack axials to include past conus

T-spine Radiculopathy (-)

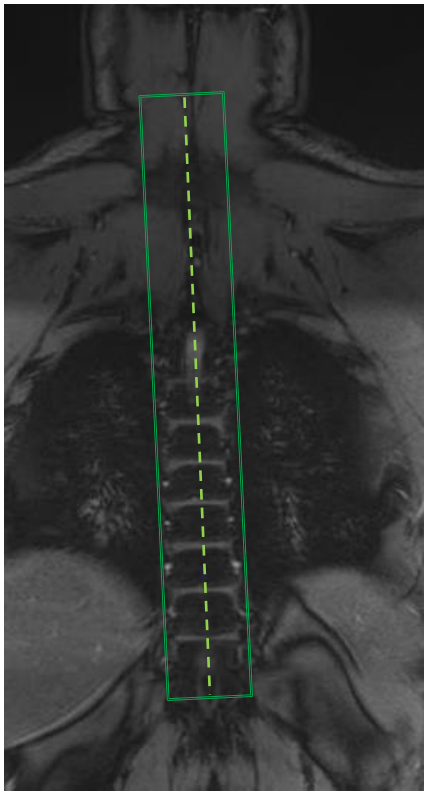
Sagittal T1 Flair

Sagittal T2

Axial T2 – use Tim Planning when possible



Axials - multi-slice, multi angle, 3 slices per disk space

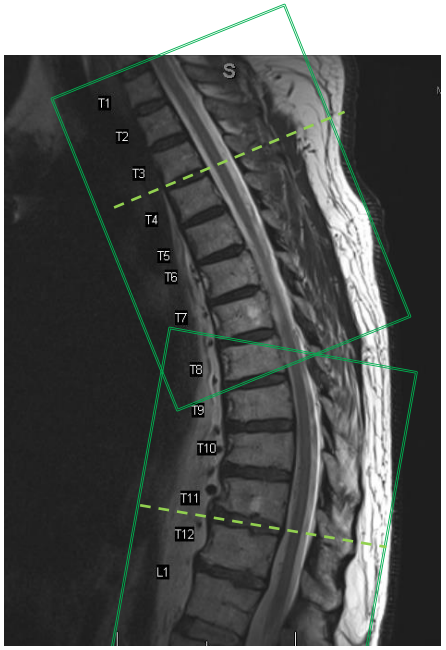


Sagittal Thoracic

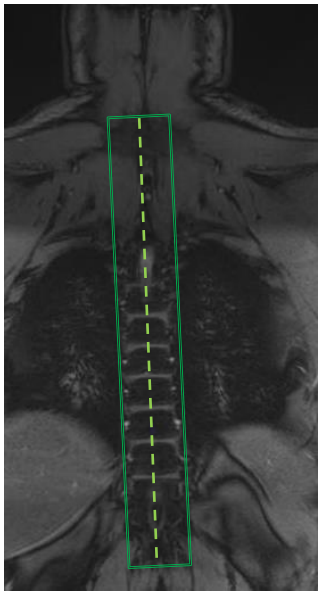
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	8.7	320	100	3	.3	H/F	L->R	
SAG T2	3500	101	320	100	3	.3	H/F	L->R	
AX T2	4030	105	180	100	3	1	A/P	H->F	Multi-slice, Multi-angle, 3 slices per disc

T-spine Routine (-) (+/-)

Sagittal T1 Flair
Sagittal T2
Sagittal Stir
Axial T2– use Tim Planning when possible
Optional if Contrast
Sagittal T1 Flair **Post**
Axial Vibe FS **Post**– use Tim Planning when possible



Stacked Axials – use Tim Planning when possible



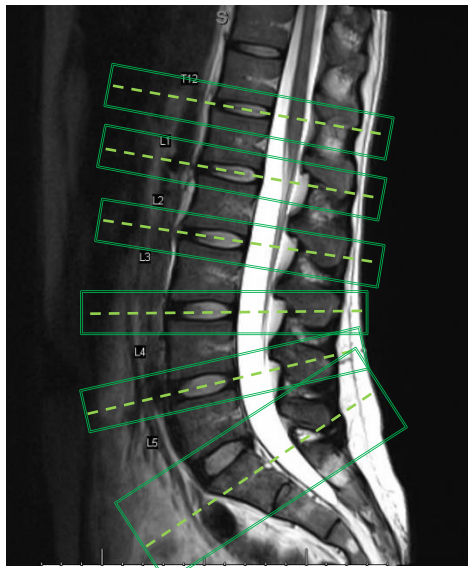
Sagittal Thoracic

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	9	320	100	3	.3	H/F	L->R	Include conus
SAG T2	3500	100	320	100	3	.3	H/F	L->R	Include conus
SAG STIR	3700	71	320	100	3	.3	H/F	L->R	Include conus
AX T2	4000	110	180	100	4	1	A/P	H->F	Stack axials to include past conus
*****OPTIONAL IF CONTRAST*****									
SAG T1 FLAIR Post	2000	9	320	100	3	.3	H/F	L->R	Include conus
AX Vibe FS Post	4.5	1.8	180	100	4	0	A/P	H->F	Stack axials to include past conus
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST*****									
AX T1 FS Post	405	10	180	100	4	1	A/P	H->F	Stack axials to include past conus

L-spine Radiculopathy (-) (+/-)

Sagittal T1 Flair
Sagittal T2
Sagittal Stir
Sagittal Space
-(Axial + Coronal Reformat)
Axial T2
Optional if Contrast
Sagittal T1 Flair **Post**
Axial T1 FS **Post**

Sagittal Lumbar



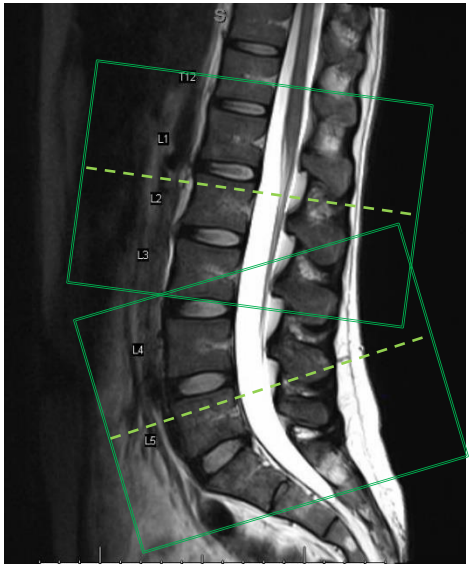
Axials – 5 slices per disk T12/L1-L4/L5, 10 slices for L5/S1 to include S1

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	8.8	280	100	3	.3	H/F	L->R	Include S1/S2
SAG T2	3000	101	280	100	3	.3	H/F	L->R	Include S1/S2
SAG STIR	3700	70	280	100	3	.3	H/F	L->R	Include S1/S2
SAG SPACE	1500	138	300	100	.7	0	H/F	L->R	Siemens
	1500	138	300	100	1.4	0	H/F	L->R	GE (ZIP 2)
AX T2	4990	100	180	100	4	1	A/P	H->F	Multi- angle
*****OPTIONAL IF CONTRAST*****									
SAG T1 FLAIR Post	2000	8.8	280	100	3	.3	H/F	L->R	Include S1/S2
AX T1 FS Post	600	9.8	180	100	4	1	A/P	H->F	Multi- angle

L-spine Routine (-) (+/-)

Sagittal T1 Flair
Sagittal T2
Sagittal Stir
Axial T2
Optional if Contrast
Sagittal T1 Flair **Post**
Axial Vibe FS **Post**– use Tim Planning when possible

Sagittal Lumbar



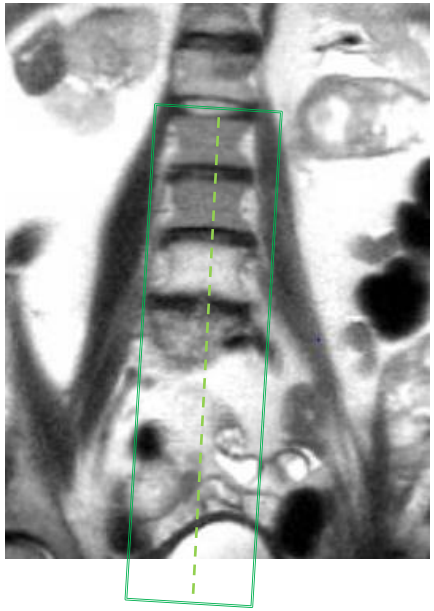
Axials (stacked)

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	8.8	280	100	3	.3	H/F	L->R	Include S1/S2
SAG T2	3000	101	280	100	3	.3	H/F	L->R	Include S1/S2
SAG STIR	3700	70	280	100	3	.3	H/F	L->R	Include S1/S2
AX T2	4196	100	180	100	4	1	A/P	H->F	Stacked
*****OPTIONAL IF CONTRAST*****									
SAG T1 FLAIR Post	2000	8.8	280	100	3	.3	H/F	L->R	Include S1/S2
AX Vibe FS Post	4.5	1.8	180	100	4	0	A/P	H->F	Stacked
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST*****									
AX T1 FS Post	600	9.8	180	100	4	1	A/P	H->F	Stacked

L-spine Cauda Equina (-)

*****CALL RAD TO CHECK*****

Sagittal T1 Flair
Sagittal Stir
Sagittal Space
-(Axial + Coronal Reformat)



Sagittal Lumbar

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	8.8	280	100	3	.3	H/F	L->R	Include S1/S2
SAG STIR	3700	70	280	100	3	.3	H/F	L->R	Include S1/S2
SAG SPACE	1500	138	300	100	.7	0	H/F	L->R	Siemens
	1500	138	300	100	1.4	0	H/F	L->R	GE (ZIP 2)

Radiation Spine (+/-)

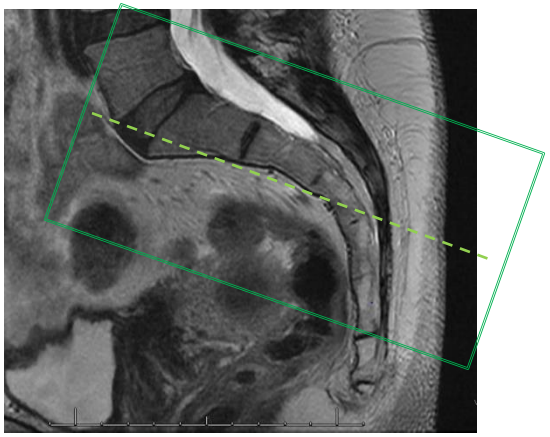
**Axials need skin to skin coverage with no angles*

Sagittal T1 Flair
Sagittal T2
Axial Space
Axial BRAVO
Axial BRAVO **Post**

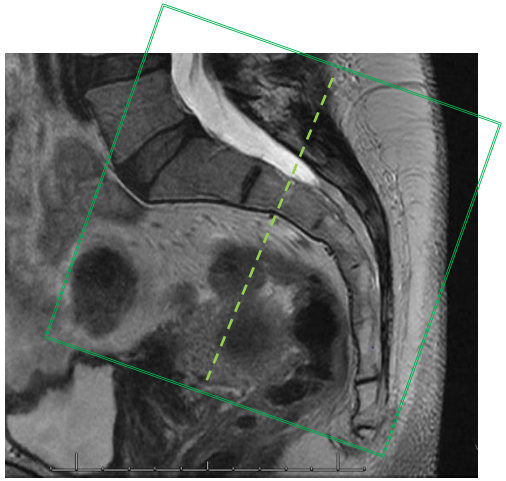
Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR	2000	8.8	280	100	3	.3	H/F	L->R	
SAG T2	3000	101	280	100	3	.3	H/F	L->R	
AX SPACE	1500	136	400	100	1.5	.75	A/P	H->F	
AX BRAVO	1470	2.14	400	100	1.5	.75	A/P	H->F	
AX BRAVO Post	1470	2.14	400	100	1.5	.75	A/P	H->F	

Sacrum (-) (+/-)

Coronal Stir Oblique
Coronal T1 Oblique
Sagittal T2 FS
Axial T2 Oblique
****If Contrast****
Coronal T1 Oblique **Post**
Axial Vibe FS Oblique **Post**



Coronal Oblique



Axial Oblique

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
COR STIR OBL	4000	67	200	100	4	1	H/F	A->P	
COR T1 OBL	400	10	200	100	4	1	H/F	A->P	
SAG T2 FS	4000	87	200	100	4	1	H/F	L->R	
AX T2 OBL	4000	87	200	100	4	1	A/P	H->F	
*****OPTIONAL IF CONTRAST*****									
COR T1 OBL Post	400	10	200	100	4	1	H/F	A->P	
AX Vibe FS OBL Post	4.5	1.8	200	100	1	0	A/P	H->F	

Bone METS (+/-)

Sagittal T1 Flair CSP
Sagittal Stir CSP
Sagittal T1 Flair TSP
Sagittal Stir TSP
Sagittal T1 Flair LSP
Sagittal Stir LSP
Sagittal T1 Flair FS **Post** CSP
Sagittal T1 Flair FS **Post** TSP
Sagittal T1 Flair FS **Post** LSP

Call MD to Check for Axials (Enhancement)
Document in EPIC who you spoke to.

Axial Vibe FS Post CSP
Axial T2 Post CSP
Axial Vibe FS Post TSP
Axial T2 Post TSP
Axial Vibe FS Post LSP
Axial T2 Post LSP

Bone METS (+/-) Continued

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR CSP	2000	10	180	100	3	.3	H/F	L->R	
SAG STIR CSP	3700	68	180	100	3	.3	H/F	L->R	
SAG T1 FLAIR TSP	2000	9	320	100	3	.3	H/F	L->R	
SAG STIR TSP	3700	68	320	100	3	.3	H/F	L->R	
SAG T1 FLAIR LSP	2000	9.5	280	100	3	.3	H/F	L->R	
SAG STIR LSP	3700	70	280	100	3	.3	H/F	L->R	
SAG T1 FLAIR FS Post CSP	2000	9.5	180	100	3	.3	H/F	L->R	
SAG T1 FLAIR FS Post TSP	2000	9	320	100	3	.3	H/F	L->R	
SAG T1 FLAIR FS Post LSP	2000	9.5	280	100	3	.3	H/F	L->R	
*****CALL MD TO CHECK FOR AXIALS (ENHANCEMENT), DOCUMENT WHO YOU SPOKE TO*****									
AX Vibe FS Post CSP	4.5	1.8	180	100	3	0	A/P	H->F	Stacked
AX T2 Post CSP	3880	100	180	100	3	1	A/P	H->F	Stacked
AX Vibe FS Post TSP	4.5	1.8	180	100	4	0	A/P	H->F	Stacked
AX T2 Post TSP	3880	100	180	100	4	1	A/P	H->F	Stacked
AX Vibe FS Post LSP	4.5	1.8	180	100	4	0	A/P	H->F	Stacked
AX T2 Post LSP	5000	101	180	100	4	1	A/P	H->F	Stacked
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST, ADJUST SLICE THICKNESS/GAP APPROPRIATELY*****									
AX T1 FS Post	600	9.8	180	100	4	1	A/P	H->F	Stacked

CSF Leak (-) (Whole Spine)

Sagittal T1 Flair CSP
Sagittal T2 CSP
Sagittal T2 Space FS CSP *-(Coronal and Axial Reformat), -(MIP, Rotate)*
Sagittal T1 Flair TSP
Sagittal T2 TSP
Sagittal T2 Space FS TSP *-(Coronal and Axial Reformat), -(MIP, Rotate)*
Sagittal T1 Flair LSP
Sagittal T2 LSP
Sagittal T2 Space FS LSP *-(Coronal and Axial Reformat), -(MIP, Rotate)*

*****If Space Sequence does not come out, perform CISS Sequence. If neither come out, call rad for further instructions*****

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR CSP	2000	10	180	100	3	.3	H/F	L->R	
SAG T2 CSP	3000	111	180	100	3	.3	H/F	L->R	
SAG T2 Space FS CSP	8.07	3.67	180	100	1	0	A/P	L->R	
SAG T1 FLAIR TSP	2000	9	320	100	3	.3	H/F	L->R	
SAG T2 TSP	3500	104	320	100	3	.3	H/F	L->R	
SAG T2 Space FS TSP	8.07	3.67	320	100	1	0	A/P	L->R	
SAG T1 FLAIR LSP	2000	9.5	280	100	3	.3	H/F	L->R	
SAG T2 LSP	3000	101	280	100	3	.3	H/F	L->R	
SAG T2 Space FS LSP	8.07	3.67	280	100	1	0	A/P	L->R	

Diskitis / Osteo / Abscess (+/-) *Two or More Levels*

Sagittal Stir CSP
Sagittal Stir TSP
Sagittal Stir LSP
Sagittal T1 Flair FS CSP **Post**
Sagittal T1 Flair FS TSP **Post**
Sagittal T1 Flair FS LSP **Post**
Call Radiologist to check
Axial T2- Coverage determined by Rad.
Axial Vibe FS **Post-** Coverage determined by Rad.

Questions to ask Radiologist during Check

1. Are we done?
2. If not, what level are we scanning (CSP, LSP, TSP)?
3. What would you like for axial coverage?

***Document in EPIC who you spoke to. ***

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG STIR CSP	3700	73	300	100	3	.3	H/F	L->R	
SAG STIR TSP	3700	73	300	100	3	.3	H/F	L->R	
SAG STIR LSP	3700	73	300	100	3	.3	H/F	L->R	
SAG T1 FLAIR FS CSP Post	2000	10	280	100	3	.3	H/F	L->R	
SAG T1 FLAIR FS TSP Post	2000	10	280	100	3	.3	H/F	L->R	
SAG T1 FLAIR FS LSP Post	2000	10	280	100	3	.3	H/F	L->R	
*****IF ARE OF CONCERN IS NOTICED BY RADILOGIST, CONTINUE PROTOCOL THROUGH THAT LEVEL AS DIRECTED BY RADIOLOGIST (EX. CSP, TSP LSP)*****									
AX T2	3200	101	180	100	4	1	A/P	H->F	Stacked
AX Vibe FS Post	600	9.8	180	100	4	0	A/P	H->F	Stacked
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST, ADJUST SLICE THICKNESS/GAP APPROPRIATELY*****									
AX T1 FS Post	600	9.8	180	100	4	1	A/P	H->F	Stacked

Drop METS (Total Spine) (+/-)

Sagittal T1 Flair CSP
Sagittal T2 CSP
Sagittal T1 Flair TSP
Sagittal T2 TSP
Sagittal T1 Flair LSP
Sagittal T2 LSP
Sagittal T1 Flair **Post** CSP
Axial Vibe **Post** CSP
Sagittal T1 Flair **Post** TSP
Axial Vibe **Post** TSP
Sagittal T1 Flair **Post** LSP
Axial Vibe **Post** LSP

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 FLAIR CSP	2000	10	180	100	3	0	H/F	L->R	
SAG T2 CSP	3000	111	180	100	3	0	H/F	L->R	
SAG T1 FLAIR TSP	2000	9	320	100	3	0	H/F	L->R	
SAG T2 TSP	3500	104	320	100	3	0	H/F	L->R	
SAG T1 FLAIR LSP	2000	9.5	280	100	3	0	H/F	L->R	
SAG T2 LSP	3000	101	280	100	3	0	H/F	L->R	
SAG T1 FLAIR Post CSP	2000	9.5	280	100	3	0	H/F	L->R	
AX Vibe Post CSP	4.5	1.8	180	100	3	0	H/F	L->R	Stacked
SAG T1 FLAIR Post TSP	2000	9	320	100	3	0	H/F	L->R	
AX Vibe Post TSP	4.5	1.8	180	100	3	0	A/P	H->F	Stacked
SAG T1 FLAIR Post LSP	2000	9.5	280	100	3	0	H/F	L->R	
AX Vibe Post LSP	4.5	1.8	180	100	3	0	A/P	H->F	Stacked
*****IF HARDWARE, REPLACE AX VIBE FS WITH AX T1 FS POST, ADJUST SLICE THICKNESS/GAP APPROPRIATELY*****									
AX T1 FS Post	600	9.8	180	100	3	0	A/P	H->F	Stacked

Scoliosis (-) (Total Spine)

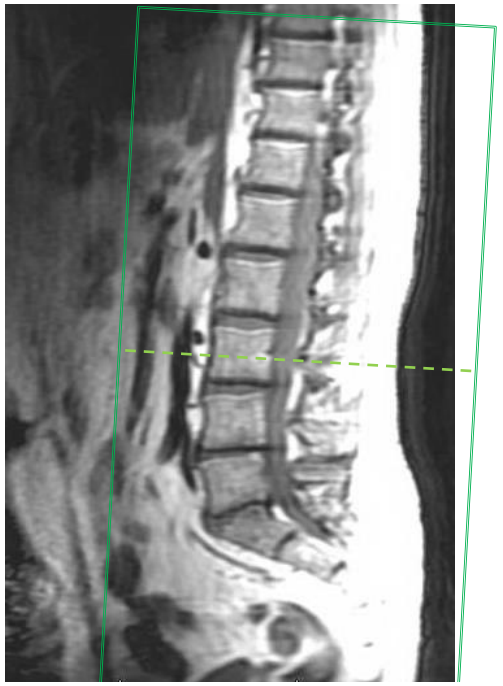
**Angle sagittal images to each curve of the spine; scan coronal images first if necessary*

Sagittal T1 Space CSP *(Coronal Reformat)*
Sagittal T2 Space CSP *(Coronal Reformat)*
Sagittal T1 Space TSP *(Coronal Reformat)*
Sagittal T2 Space TSP *(Coronal Reformat)*
Sagittal T1 Space LSP *(Coronal Reformat)*
Sagittal T2 Space LSP *(Coronal Reformat)*
OPTIONAL
Axial T2 CSP
Axial T2 TSP
Axial T2 LSP

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T1 Space CSP	550	35	180	100	1	0	H/F	L->R	
SAG T2 Space CSP	1500	140	180	100	1	0	H/F	L->R	
SAG T1 Space TSP	550	35	320	100	1	0	H/F	L->R	
SAG T2 Space TSP	1500	140	320	100	1	0	H/F	L->R	
SAG T1 Space LSP	550	35	280	100	1	0	H/F	L->R	
SAG T2 Space LSP	1500	140	280	100	1	0	H/F	L->R	
*****OPTIONAL*****									
AX T2 CSP	2000-6000	80-120	280	100	4	1	A/P	H->F	
AX T2 TSP	2000-6000	80-120	180	100	4	1	A/P	H->F	
AX T2 LSP	2000-6000	80-120	180	100	4	1	A/P	H->F	

Tethered Cord (-) (Total Spine)

Sagittal T2 CSP
Sagittal T2 TSP
Sagittal T2 LSP
Sagittal T1 Flair LSP
Axial T2 FS LSP
Axial Vibe LSP
Optional
Coronal T1 Conus



Axial (T10-Coccyx)

Sequence	TR	TE	FOV		SLICE	GAP	PHASE DIR	SCAN DIR	OTHER
			FREQ	PHASE					
SAG T2 CSP	3000	111	180	100	3	.3	H/F	L->R	
SAG T2 TSP	3500	104	320	100	3	.3	H/F	L->R	
SAG T2 LSP	3000	101	280	100	3	.3	H/F	L->R	
SAG T1 FLAIR LSP	2000	9.5	280	100	3	.3	H/F	L->R	
AX T2 FS LSP	3290	101	180	100	4	1	A/P	H->F	Axial stack from T10 – through Coccyx
AX Vibe LSP	600	9.8	180	100	4		A/P	H->F	Axial stack from T10 – through Coccyx
*****OPTIONAL*****									
COR T1 CONUS	485	9.5	280	100	4	1			

Whole Body (-)

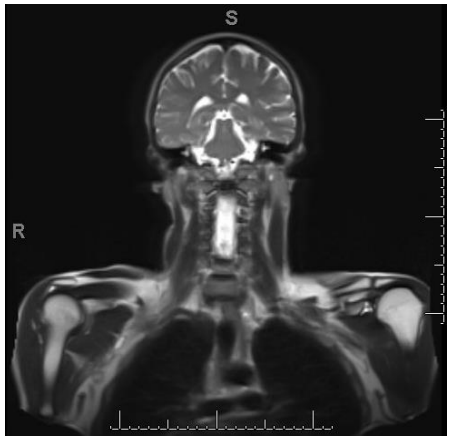
Performed on Siemens Sola 1.5T with Tim's Planning Technology

Clinical Indication: Neurofibromatosis

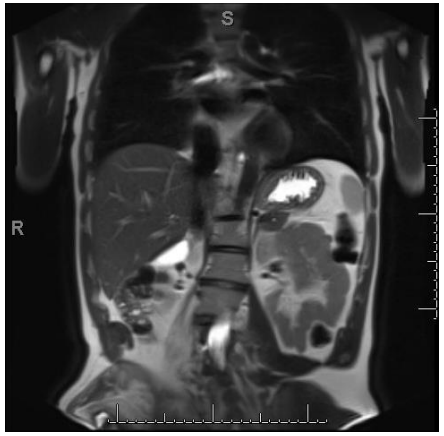
Coronal Stir (5 Steps)
Optional
Coronal T2 (5 Steps)
Coronal T1 (5 Steps)

Sequence	FOV		SLICE	GAP	PHASE DIR	SCAN DIR
	FREQ	PHASE				
COR STIR	450	100	5	1	L/R	P->A
COR T2	450	100	5	1	L/R	P->A
COR T1	450	100	5	1	L/R	P->A

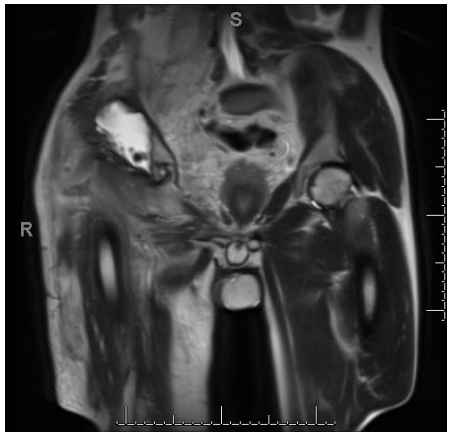
Coils needed:
Head/Neck Coil
Body Coil x2
Peripheral Coil



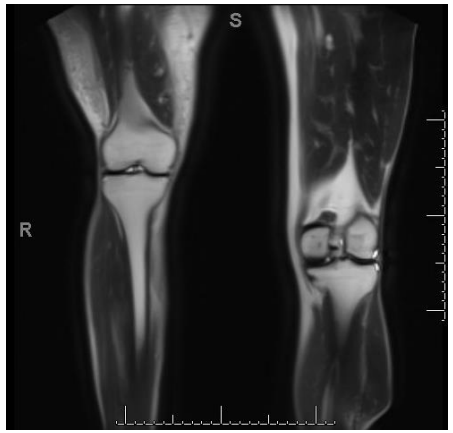
Step 1 Coverage



Step 2 Coverage



Step 3 Coverage



Step 4 Coverage

Step 5 Coverage