Carolina Radiology

A Higher Standard.

MRI Spine Protocols

Version 0.5 (June 2024)

Table of Contents

Version Updates:

EDITS for V0.2:

1. Moved all degen Axial T1 to Optional.
2. Added T2 Disc Level as Optional to T-Spine and L-Spine.

EDITS for V0.3

1. Added View Order for scrolling direction.
2. Added optional 3D T2 to cervical spine for 3T magnets.

EDITS for V0.4

1. Changed disc level axial images to required for L-Spine degen and post-op.

EDITS for V0.5 June 2024

1. Updated format and look of protocol.
2. Added version date.
3. Add Notes Section for pediatric cases of cervical trauma
4. Changed disc level axial images to optional for L-Spine degen and post-op.

NOTES:

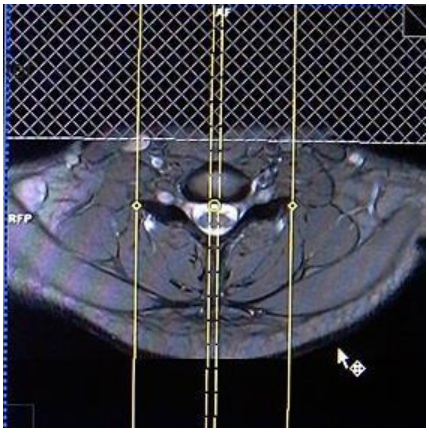
Please name all protocols using the "PACS Description" at the top of each protocol. Please name all sequences using the "Orientation" and "Sequence" columns first. If other descriptors are needed, please add them AFTER the Orientation and Sequence (e.g. "Sagittal T1 FS", and not "Fat Sat Sagittal T1").

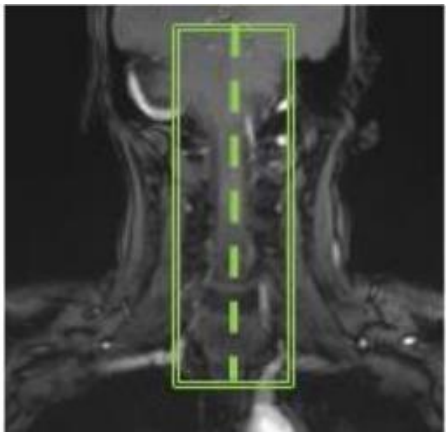
Cervical Spine Without Contrast - TRAUMA

PACS Description: MRI Cervical Spine WO

Indications – Trauma

#	Orient	Seq	Con-trast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
1	Sag	T2	N	N	3mm	0.5mm	24cm	L to R	
2	Sag	T1	N	N	3mm	0.5mm	24cm	L to R	
3	Sag	STIR	N	Y	3mm	0.5mm	23cm	L to R	
4	Axial	T2	N	N	3mm	0.5mm	18cm	Top to Bottom	
5	Axial	GRE	N	N	2mm	0.5mm	18cm	Top to Bottom	
OPTIONAL									
6	Axial	3D T2	N	N			18cm	Top to Bottom	CUBE or SPACE





Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.

A NOTE ON TRAUMA: Coronal saturation regions should be used on trauma patients, but they need to be used with care so as to not obscure any soft tissue injury just anterior to the cervical vertebral bodies.

FAT SATURATION IN THE CERVICAL SPINE: Best results can be achieved by narrowing the shim volume to only include the vertebral bodies, canal and spinous processes. For axial imaging, it also helps to exclude the shoulder/trapezius region. If fat saturation completely fails, run the sequence without any fat saturation. A water saturated image resulting from failed fat saturation will be non-diagnostic.

FOR INFANTS/SMALL CHILDREN: For infants/small children, thinner slices and a smaller FOV (and smaller matrix) should be used. In older children, use your best judgement to determine the appropriate slice thickness, matrix, FOV combination. Always use the smallest FOV/thinnest slice possible that will maintain adequate S/N.

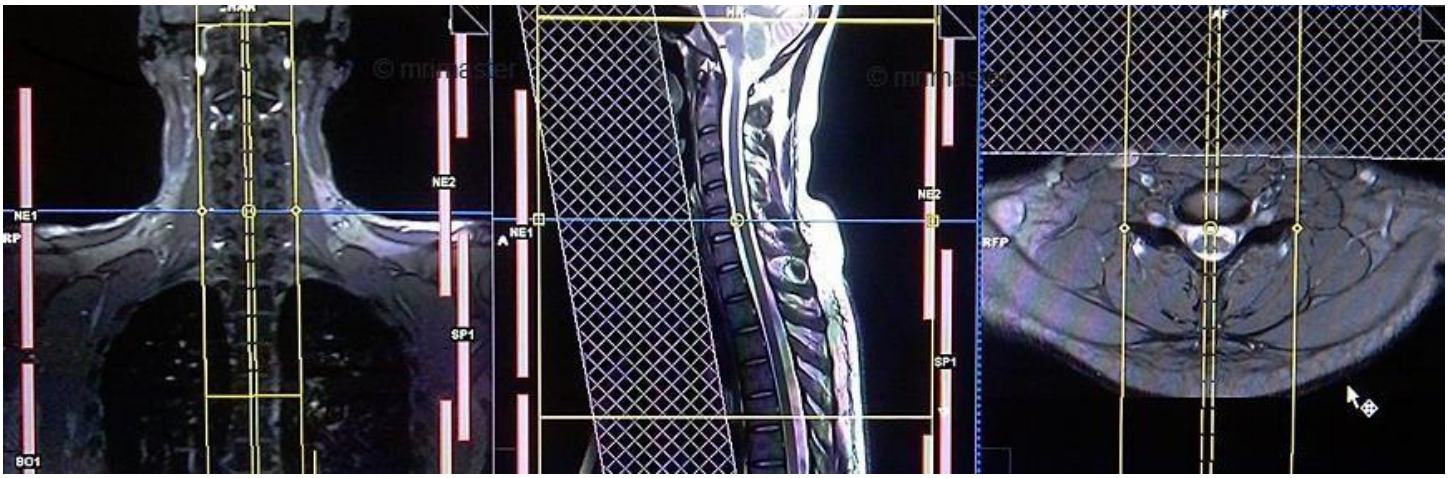
IN PEDIATRIC CASES OF NON TRAUMA (NAT), we should perform WHOLE spine MRI, not just cervical spine MRI (https://www.ajronline.org/doi/epdf/10.2214/AJR.21.26674). In these cases, first obtain sag T2, sag STIR, sag T1 sequences, add axial T2 images if the child can tolerate continued scanning. Additional GE or diffusion images may be added if requested by the radiologist. (This should be added as a note under cervical spine trauma).

Cervical Spine Without Contrast - General

PACS Description: MRI Cervical Spine WO

Indications – Degenerative disease, radiculopathy

#	Orient	Seq	Con-trast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
1	Sag	T2	N	N	3mm	0.5mm	24cm	L to R	
2	Sag	T1	N	N	3mm	0.5mm	24cm	L to R	
3	Sag	STIR	N	Y	3mm	0.5mm	23cm	L to R	
4	Axial	T2	N	N	3mm	0.5mm	18cm	Top to Bottom	
5	Axial	GRE	N	N	2mm	0.5mm	18cm	Top to Bottom	
OPTIONAL									
6	Axial	T1	N	N	3mm	0.5mm	18cm	Top to Bottom	
7	Cor	T2	N	N	3mm	0.5mm		A to P	
8	Axial	3D T2	N	N			18cm	Top to Bottom	CUBE or SPACE



Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.

FAT SATURATION IN THE CERVICAL SPINE: Best results can be achieved by narrowing the shim volume to only include the vertebral bodies, canal and spinous processes. For axial imaging, it also helps to exclude the shoulder/trapezius region. If fat saturation completely fails, run the sequence without any fat saturation. A water saturated image resulting from failed fat saturation will be non-diagnostic.

FOR INFANTS/SMALL CHILDREN: For infants/small children, thinner slices and a smaller FOV (and smaller matrix) should be used. In older children, use your best judgement to determine the appropriate slice thickness, matrix, FOV combination. Always use the smallest FOV/thinnest slice possible that will maintain adequate S/N.

Cervical Spine Without and With Contrast

PACS Description: MRI Cervical Spine WO and W

Indications – MS, tumor, infection

#	Orient	Seq	Con-trast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
PRE-CONTRAST									
0	Linked/referenced sag localizer (or other) that shows C2 for counting. Must be linked to the rest of the study.								
1	Sag	T2	N	N	3mm	0.5mm	24cm	L to R	
2	Sag	T1	N	N	3mm	0.5mm	24cm	L to R	
3	Sag	STIR	N	Y	3mm	0.5mm	24cm	L to R	
4	Axial	T2	N	N	3mm	0.5mm	18cm	Top to Bottom	
5	Axial	GRE	N	N	2mm	0.5mm	18cm	Top to Bottom	
6	Axial	T1	N	N	3mm	0.5mm	18cm	Top to Bottom	
POST-CONTRAST									
7	Sag	T1 FS	Y	Y	3mm	0.5mm	24cm	L to R	
8	Axial	T1	Y	N	3mm	0.5mm	18cm	Top to Bottom	
OPTIONAL									
9	Cor	T2	N	N	3mm	0.5mm	18cm	A to P	
10	Axial	3D T2	N	N			18cm	Top to Bottom	CUBE or SPACE

Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.

A NOTE ON TRAUMA: Coronal saturation regions should be used on trauma patients, but they need to be used with care so as to not obscure any soft tissue injury just anterior to the cervical vertebral bodies.

FAT SATURATION IN THE CERVICAL SPINE: Best results can be achieved by narrowing the shim volume to only include the vertebral bodies, canal and spinous processes. For axial imaging, it also helps to exclude the shoulder/trapezius region. If fat saturation completely fails, run the sequence without any fat saturation. A water saturated image resulting from failed fat saturation will be non-diagnostic.

FOR INFANTS/SMALL CHILDREN: For infants/small children, thinner slices and a smaller FOV (and smaller matrix) should be used. In older children, use your best judgement to determine the appropriate slice thickness, matrix, FOV combination. Always use the smallest FOV/thinnest slice possible that will maintain adequate S/N.

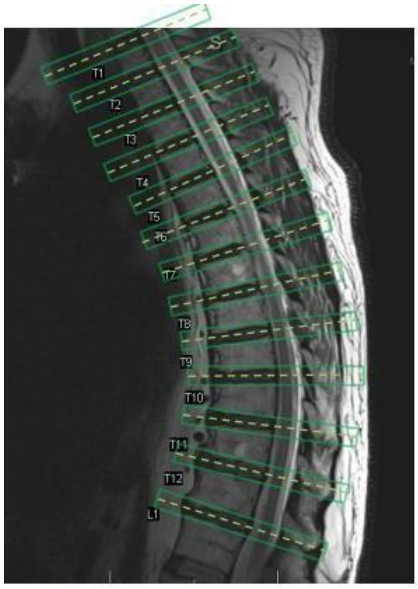
Thoracic Spine Without Contrast - TRAUMA

PACS Description: MRI Thoracic Spine WO

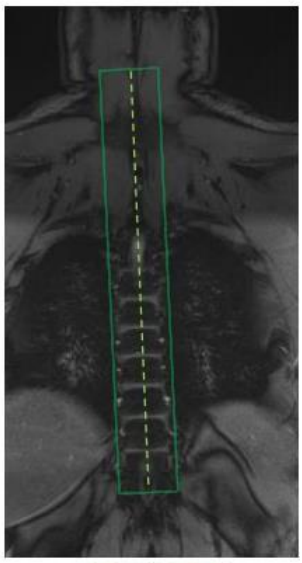
Indications – Trauma

#	Orient	Seq	Con-trast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
0	Linked/referenced sag localizer (or other) that shows C2 for counting. Must be linked to the rest of the study.								
1	Sag	T2	N	N	3mm	1mm	34cm	L to R	
2	Sag	T1	N	N	3mm	1mm	34cm	L to R	
3	Sag	STIR	N	Y	3mm	1mm	34cm	L to R	
4	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Stack
OPTIONAL									
5	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Disc Level

Stacked Axials – use Tim Planning when possible



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



Sagittal Thoracic

Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.

A NOTE ON TRAUMA: Coronal saturation regions should be used on trauma patients, but they need to be used with care so as to not obscure any soft tissue injury just anterior to the cervical vertebral bodies.

FAT SATURATION IN THE CERVICAL SPINE: Best results can be achieved by narrowing the shim volume to only include the vertebral bodies, canal and spinous processes. For axial imaging, it also helps to exclude the shoulder/trapezius region. If fat saturation completely fails, run the sequence without any fat saturation. A water saturated image resulting from failed fat saturation will be non-diagnostic.

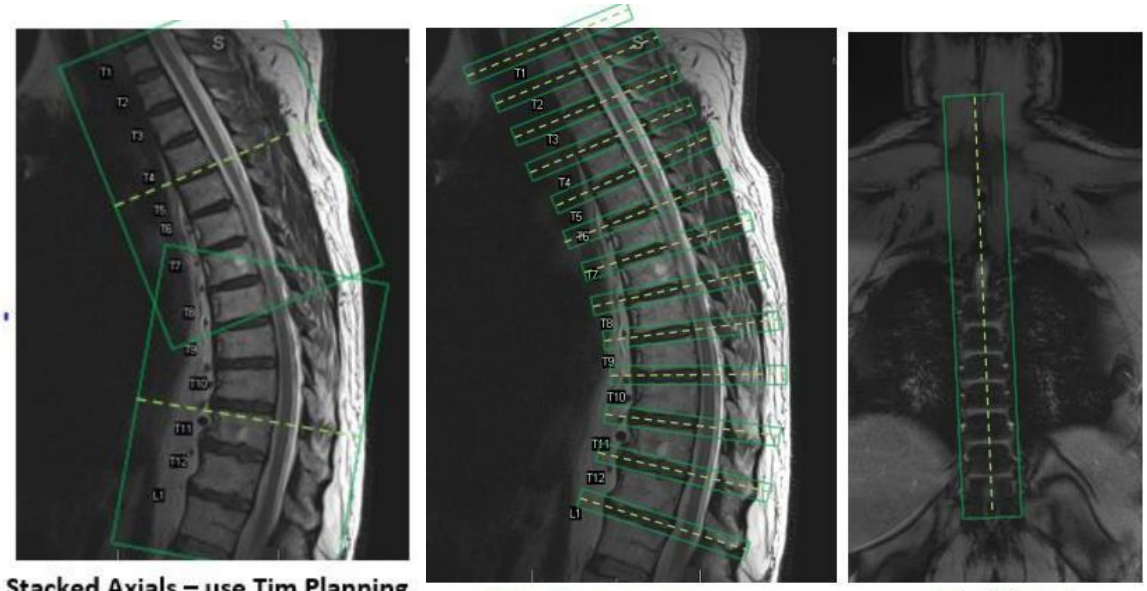
FOR INFANTS/SMALL CHILDREN: For infants/small children, thinner slices and a smaller FOV (and smaller matrix) should be used. In older children, use your best judgement to determine the appropriate slice thickness, matrix, FOV combination. Always use the smallest FOV/thinnest slice possible that will maintain adequate S/N.

Thoracic Spine Without Contrast - General

PACS Description: MRI Thoracic Spine WO

Indications – Degenerative disease, radiculopathy

#	Orient	Seq	Con-trast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
0	Linked/referenced sag localizer (or other) that shows C2 for counting. Must be linked to the rest of the study.								
1	Sag	T2	N	N	3mm	1mm	34cm	L to R	
2	Sag	T1	N	N	3mm	1mm	34cm	L to R	
3	Sag	STIR	N	Y	3mm	1mm	34cm	L to R	
4	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Stack
5	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Disc Level
OPTIONAL									
6	Axial	T1	N	N	4mm	1mm	18cm	Top to Bottom	
7	Cor	T2	N	N	3mm	1mm	24cm	A to P	



Stacked Axials – use Tim Planning when possible

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

Sagittal Thoracic

Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.

FAT SATURATION IN THE CERVICAL SPINE: Best results can be achieved by narrowing the shim volume to only include the vertebral bodies, canal and spinous processes. For axial imaging, it also helps to exclude the shoulder/trapezius region. If fat saturation completely fails, run the sequence without any fat saturation. A water saturated image resulting from failed fat saturation will be non-diagnostic.

FOR INFANTS/SMALL CHILDREN: For infants/small children, thinner slices and a smaller FOV (and smaller matrix) should be used. In older children, use your best judgement to determine the appropriate slice thickness, matrix, FOV combination. Always use the smallest FOV/thinnest slice possible that will maintain adequate S/N.

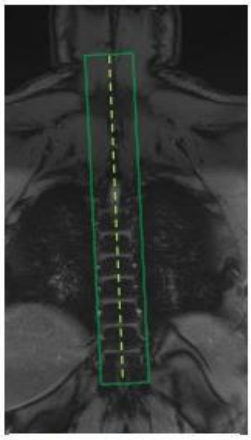
Thoracic Spine Without and With Contrast

PACS Description: MRI Thoracic Spine WO and W

Indications – MS, tumor, infection

#	Orient	Seq	Contrast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
PRE-CONTRAST									
1	Sag	T2	N	N	3mm	1mm	34cm	L to R	
2	Sag	T1	N	N	3mm	1mm	34cm	L to R	
3	Sag	STIR	N	Y	3mm	1mm	34cm	L to R	
4	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	
5	Axial	T1	N	N	4mm	1mm	18cm	Top to Bottom	
POST-CONTRAST									
6	Sag	T1 FS	Y	Y	3mm	1mm	34cm	L to R	
7	Axial	T1	Y	N	4mm	1mm	18cm	Top to Bottom	
OPTIONAL									
8	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Disc Level
9	Cor	T2	N	N	3mm	0mm	24cm	A to P	

Stacked Axials – use Tim Planning when possible



Sagittal Thoracic

Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.

A NOTE ON TRAUMA: Coronal saturation regions should be used on trauma patients, but they need to be used with care so as to not obscure any soft tissue injury just anterior to the cervical vertebral bodies.

FAT SATURATION IN THE CERVICAL SPINE: Best results can be achieved by narrowing the shim volume to only include the vertebral bodies, canal and spinous processes. For axial imaging, it also helps to exclude the shoulder/trapezius region. If fat saturation completely fails, run the sequence without any fat saturation. A water saturated image resulting from failed fat saturation will be non-diagnostic.

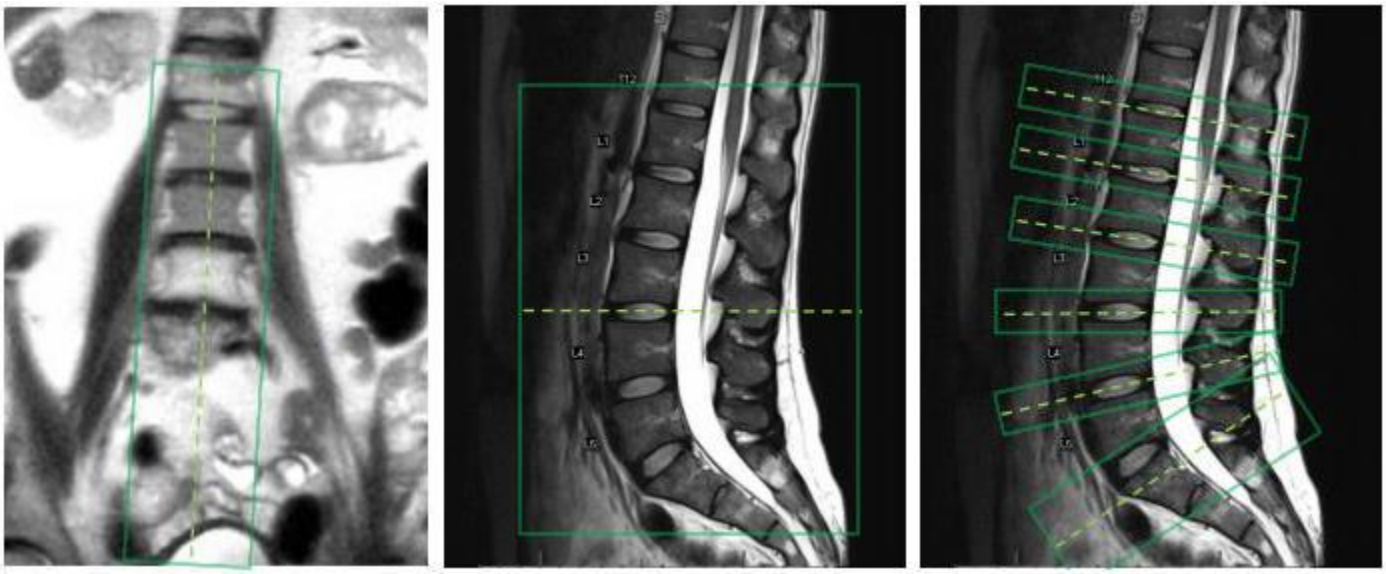
FOR INFANTS/SMALL CHILDREN: For infants/small children, thinner slices and a smaller FOV (and smaller matrix) should be used. In older children, use your best judgement to determine the appropriate slice thickness, matrix, FOV combination. Always use the smallest FOV/thinnest slice possible that will maintain adequate S/N.

Lumbar Spine Without Contrast - TRAUMA

PACS Description: MRI Lumbar Spine WO

Indications – Trauma

#	Orient	Seq	Con-trast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
1	Sag	T2	N	N	3mm	1mm	28cm	L to R	
2	Sag	T1	N	N	3mm	1mm	28cm	L to R	
3	Sag	STIR	N	Y	3mm	1mm	28cm	L to R	
4	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Stack
OPTIONAL									
5	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Disc Level



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

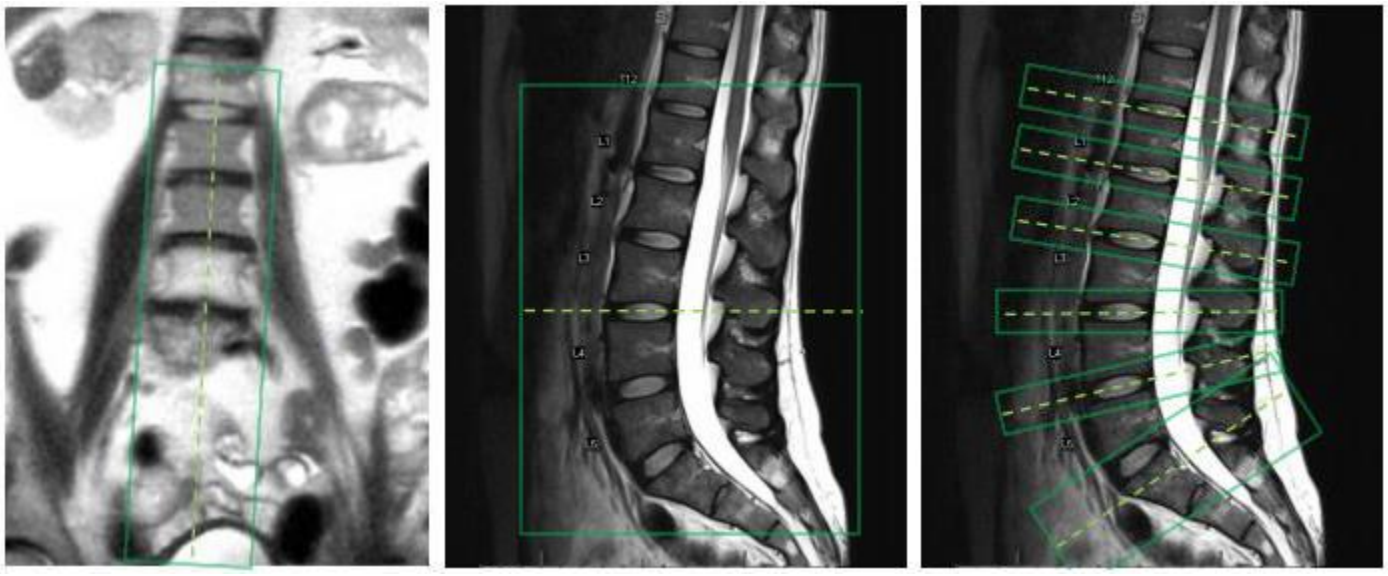
Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.

Lumbar Spine Without Contrast - General

PACS Description: MRI Lumbar Spine WO

Indications – Degenerative disease, radiculopathy

#	Orient	Seq	Con-trast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
1	Sag	T2	N	N	3mm	1mm	28cm	L to R	
2	Sag	T1	N	N	3mm	1mm	28cm	L to R	
3	Sag	STIR	N	Y	3mm	1mm	28cm	L to R	
4	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	
OPTIONAL									
5	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Disc spaces per 3rd image below if severe curvature.
6	Axial	T1	N	N	4mm	1mm	18cm	Top to Bottom	
7	Cor	T2	N	N	3mm	1mm	24cm	A to P	



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

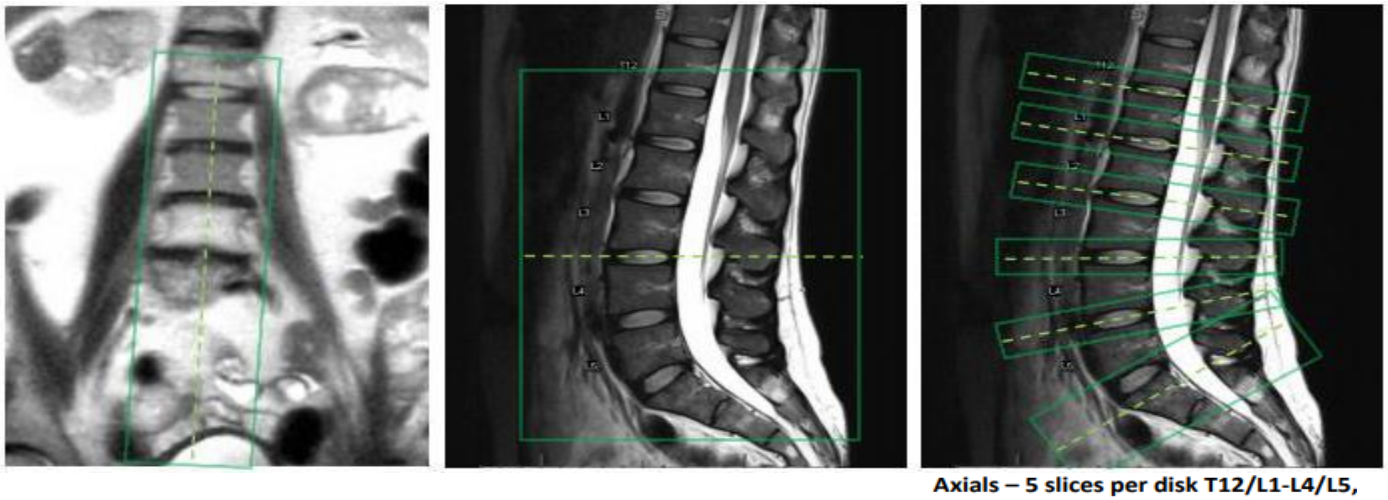
Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.

Lumbar Spine Without and With Contrast

PACS Description: MRI Lumbar Spine WO and W

Indications – MS, tumor, infection

#	Orient	Seq	Con-trast	Fat Sat	Slice Thick	Gap	FOV	View Order	Comment
PRE-CONTRAST									
1	Sag	T2	N	N	3mm	1mm	28cm	L to R	
2	Sag	T1	N	N	3mm	1mm	28cm	L to R	
3	Sag	STIR	N	Y	3mm	1mm	28cm	L to R	
4	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	
5	Axial	T1	N	N	4mm	1mm	18cm	Top to Bottom	
6	Axial	T2	N	N	4mm	1mm	18cm	Top to Bottom	Disc spaces per 3rd image below if severe curvature.
POST-CONTRAST									
7	Sag	T1 FS	Y	Y	3mm	1mm	28cm	L to R	
8	Axial	T1	Y	N	4mm	1mm	18cm	Top to Bottom	
OPTIONAL									
9	Sag	T1	Y	N	3mm	1mm	28cm	L to R	Please perform on ALL post-op lumbar spine MRIs w contrast. Post-contrast. NO fat sat.
10	Cor	T2	N	N	3mm	0mm	24cm	A to P	



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

Position: Good quality scouts are essential. Acquire a second localizer if needed to provide adequate visualization of spinal canal (coronal image) and vertebral bodies (sagittal image) for correct alignment of slices and appropriate coverage.