

### *Indications*

- > Localised upper back pain and radiculopathy with 6-week course of *conservative care and* inadequate response to treatment.
- > Infectious or inflammatory processes (eg.Spinal Cord Abscess or Spinal Osteomyelitis)
- > Myelopathies, Multiple Sclerosis and other demyelinating diseases
- > Possible spinal cord injury and post-traumatic neurologic deficit
- > Evaluation or monitoring of congenital malformations of the spinal cord
- > Evaluation or monitoring of inflammation of the CNS or meninges
- > Evaluation or monitoring of tumour of the CNS or meninges
- > Evaluation or monitoring of spinal cord compression
- > Evaluation or monitoring of demyelinating disease
- > Nontraumatic vascular injuries of the spine
- > Monitoring of previous spinal surgery
- > Evaluation or monitoring of trauma
- > Spinal Cord Tumour
- > Spine TB

### *Contraindications*

- > Any electrically, magnetically or mechanically activated implant (e.g. cardiac pacemaker, insulin pump biostimulator, neurostimulator, cochlear implant, and hearing aids)
- > Intracranial aneurysm clips (unless made of titanium)
- > Pregnancy (risk vs benefit ratio to be assessed)
- > Ferromagnetic surgical clips or staples
- > Metallic foreign body in the eye
  - Metal shrapnel or bullet

- > A satisfactory written consent form must be taken from the patient before entering the scanner room
  - Ask the patient to remove all metal object including keys, coins, wallet, any cards with magnetic strips, j
- > hearing aid and hairpins
  - Ask the patient to undress and change into a hospital gown
- > **Contrast injection risk and benefits must be explained to the patient before the scan**
- > **Gadolinium should only be given to the patient if GFR is > 30**
- > If possible provide a chaperone for claustrophobic patients (e.g. relative or staff )

- > Offer earplugs or headphones, possibly with music for extra comfort
- > Explain the procedure to the patient
- > Instruct the patient to keep still
- > Note the weight of the patient
- >

### *Patient preparation*

#### *Positioning*

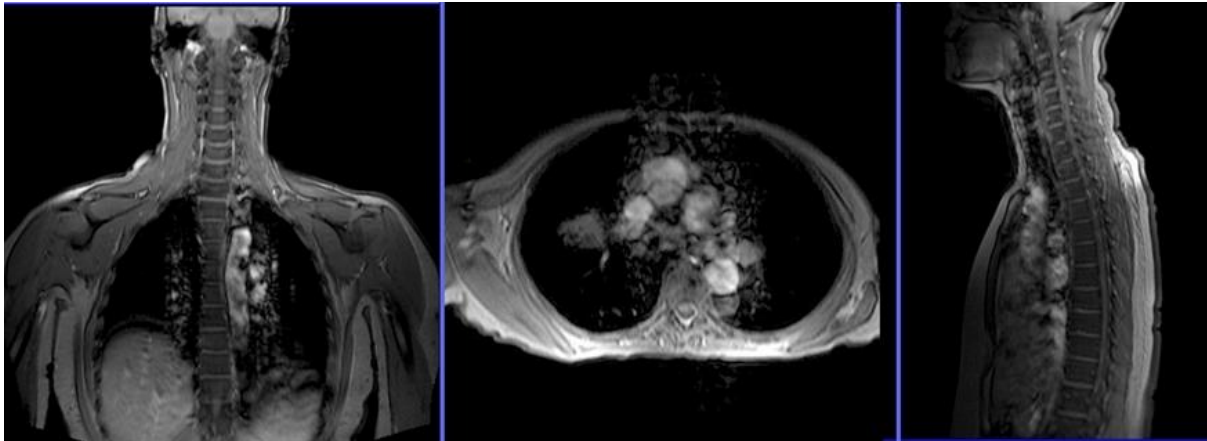
- > Head first supine
- > Position the patient in the spine and neck coils
- > Give cushions under the legs for extra comfort
- > Centre the laser beam localiser over the mid sternum (T4-T5 level)



### Suggested protocols, parameters and planning

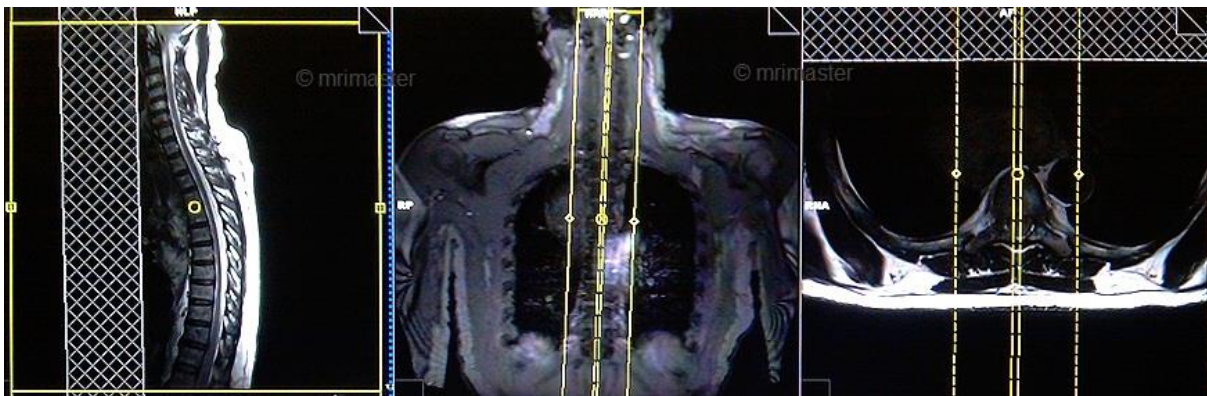
#### *Localiser*

A three plane localiser must be taken in the beginning to localise and plan the sequences. Localisers are normally less than 25sec. T1 weighted low resolution scans.



### *T2 tse sagittal*

Plan the sagittal slices on the coronal plane; angle the position block parallel to spinal cord. Check the positioning block in the other two planes. An appropriate angle must be given in the axial plane on a tilted patient (Parallel to the line along the centre of the vertebral body and the spinous process). Check the position block in the sagittal plan; FOV must be big enough to cover the whole thoracic and cervical spine from C1 down to T12 (normally 480 mm). Slices must be sufficient to cover the spine from the lateral border of RT transverse process up to the lateral border of LT transverse process. **A saturation band must be placed over the chest (as shown in the diagram) in the sagittal plane. This is to avoid the breathing artefacts over the spinal area. Phase direction should be head to feet to avoid further motion artefacts form the chest.**



### Parameters

TR	TE	SLICE	FLIP	PHASE	MATRIX	FOV	GAP	NEX(AVRAGE)
3000-4000	100-120	4MM	130-150	H>F	512X512	480-490	10%	2

### *T1 tse sagittal*

Plan the sagittal slices on the coronal plane; angle the position block parallel to spinal cord. Check the positioning block in the other two planes. An appropriate angle must be given in the axial plane on a tilted patient (Parallel to the line along the centre of the vertebral body and the spinous process). Check the position block in the sagittal plan; FOV must be big enough to cover the whole thoracic and cervical spine from C1 down to T12 (normally 480 mm). Slices must be sufficient to cover the spine from the lateral border of RT transverse process up to the lateral border of LT transverse process. **A saturation band must be placed over the chest (as shown in the diagram) in the sagittal plane.** This is to avoid the breathing artefacts over the spinal area. Phase direction should be head to feet to avoid further motion artefacts from the chest.



### **Parameters**

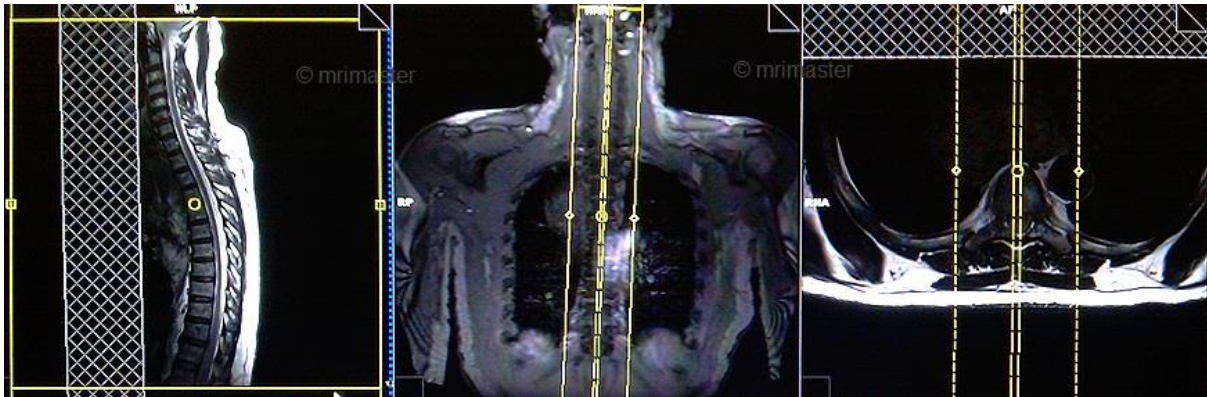
TR	TE	SLICE	FLIP	PHASE	MATRIX	FOV	GAP	NEX(AVRAGE)
400-600	15-25	4 MM	90	H>F	512X512	480-490	10%	2

### *T2 TSE STIR sagittal*

Plan the sagittal slices on the coronal plane; angle the position block parallel to spinal cord. Check the positioning block in the other two planes. An appropriate angle must be given in the axial plane on a tilted patient (Parallel to the line along the centre of the vertebral body and the spinous process). Check the position block in the sagittal plan; FOV must be big enough to cover the whole thoracic and cervical spine from C1 down to T12 (normally 480 mm). Slices must be sufficient to cover the spine from the lateral border of RT transverse process up to the lateral border of LT transverse process. **A saturation band**



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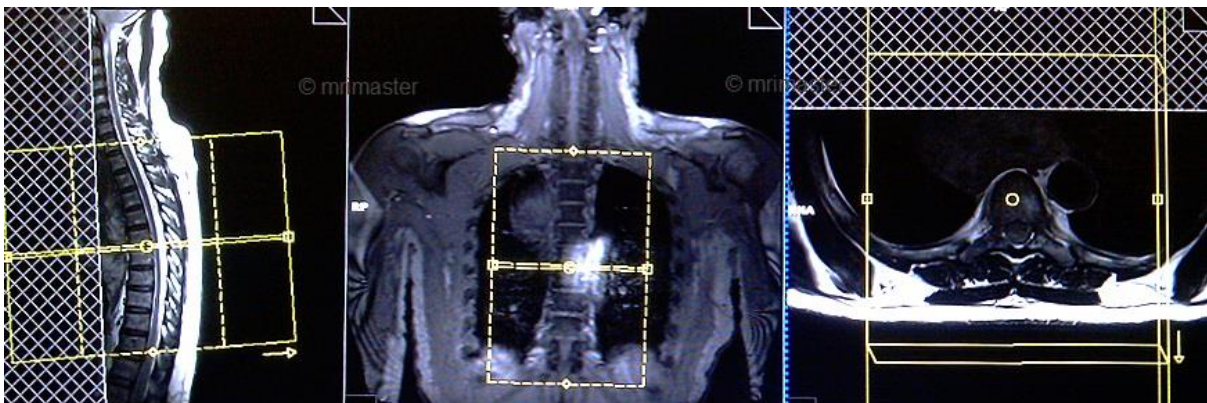


### Parameters

TR	TE	FLIP	NEX	SLICE	MATRIX	FOV	PHASE	GAP	TI
4000-5000	110	130	2	4MM	512X384	480-490	H>F	10%	130

### *T2 TSE Axial block 4mm*

Plan the axial slices on the sagittal plane; angle the position block perpendicular to the spinal cord. An appropriate angle must be given in the coronal plane on a tilted or scoliotic spine (parallel to the intervertebral disc space). Slices must be sufficient to cover the whole t spine from T1 to T12. A saturation band must be placed over the chest (as shown in the diagram) in the sagittal plane. This is to avoid thebreathing artefacts over the spinal area.

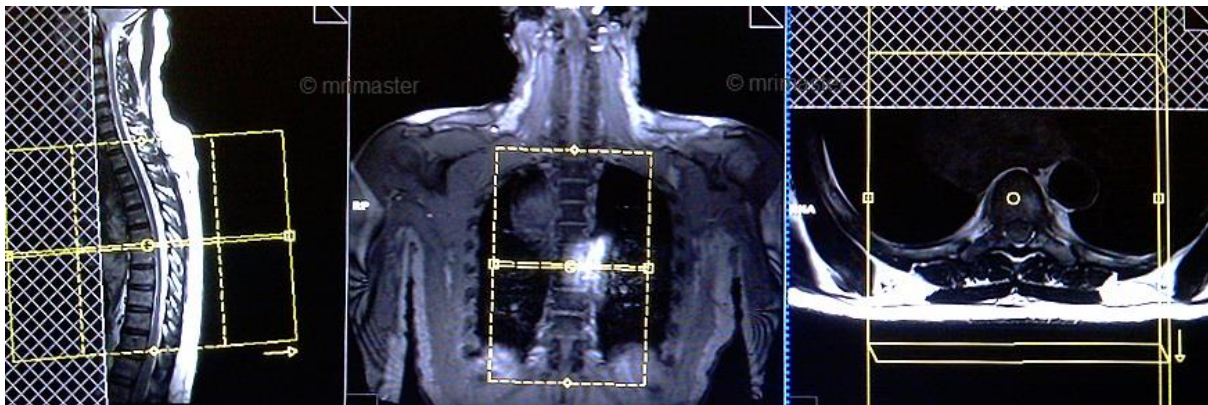


### Parameters

TR	TE	SLICE	FLIP	PHASE	MATRIX	FOV	GAP	NEX(AVRAGE)
3000-4000	100-120	4 MM	130-150	A>P	256X256	200-250	10%	2

### *T1 TSE Axial block 4mm*

Plan the axial slices on the sagittal plane; angle the position block perpendicular to the spinal cord. An appropriate angle must be given in the coronal plane on a tilted or scoliotic spine (parallel to the intervertebral disc space). Slices must be sufficient to cover the whole t spine from T1 to T12. A saturation band must be placed over the chest (as shown in the diagram) in the sagittal plane. This is to avoid the breathing artefacts over the spinal area.



### Parameters

TR	TE	SLICE	FLIP	PHASE	MATRIX	FOV	GAP	NEX(AVRAGE)
400-600	15-25	4 MM	90	A>P	256X256	200-250	10%	2

### *Indications for contrast enhancement spine scans*

- > Evaluation or monitoring of tumour of the CNS or meninges
- > Monitoring of previous spinal surgery
- > MS, hemiplegia/paresthesia and Infection
- > Suspected spine lesions (Indications for cervical spine MRI scan)

- > Persistent neck pain or radiculopathy with 6-week course of conservative care and inadequate response to treatment.
- > Cancer or tumours of the spine (cancer of the spine, spinal cord, or meninges)
- > Evaluation or monitoring of congenital malformations of the spinal cord
- > Myelopathies, Multiple Sclerosis and other demyelinating diseases
- > Possible spinal cord injury and post-traumatic neurologic deficit
- > Post-operative evaluation, with new neurologic findings
- > Congenital or acquired spinal abnormalities in children
- > Fracture evaluation for suspected or known fracture.
- > Severe intractable arm pain for more than 6 weeks
- > Infectious or inflammatory processes
- > Evaluation or monitoring of myelopathy
- > Monitoring of previous spinal surgery
- > Evaluation or monitoring of syrinx
- > Spinal injury or trauma
- > Spinal cord tumour
- > Spinal TB

### *Contraindications*

- > Any electrically, magnetically or mechanically activated implant (e.g. cardiac pacemaker, insulin pump biostimulator, neurostimulator, cochlear implant, and hearing aids)
- > Intracranial aneurysm clips (unless made of titanium)
- > Pregnancy (risk vs benefit ratio to be assessed)
- > Ferromagnetic surgical clips or staples
- > Metallic foreign body in the eye  
Metal shrapnel or bullet

### *Patient preparation*

- > A satisfactory written consent form must be taken from the patient before entering the scanner room
- > Ask the patient to remove all metal objects including keys, coins, wallet, cards with magnetic strips, jewellery, hearing aid and hairpins
- > If possible provide a chaperone for claustrophobic patients (e.g. relative or staff )
- > **Contrast injection risk and benefits must be explained to the patient before the scan**
- > **Gadolinium should only be given to the patient if GFR is > 30**
- > Offer earplugs or headphones, possibly with music for extra comfort
- > Explain the procedure to the patient
- > Instruct the patient to keep still
- > Note the weight of the patient

### *Positioning for cervical spine MRI*

and first supine

position the head in the head and neck coil and immobilise with cushions

use cushions under the legs for extra comfort

centre the laser beam localiser over the mid neck (2.5cm below the chin in chin-down position)

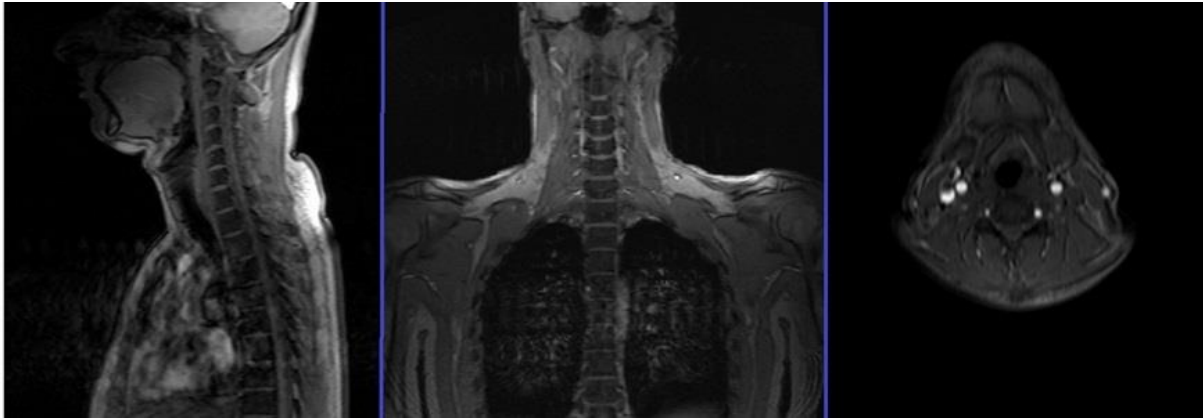


Suggested protocols, parameters and planning

### *localiser*

A three plane localiser must be taken in the beginning to localise and plan the sequences. Localisers are normally less than 25sec. T1 weighted low resolution scans.





### *T2 tse sagittal*

Plan the sagittal slices on the coronal plane; angle the position block parallel to spinal cord. Check the positioning block in the other two planes. An appropriate angle must be given in the axial plane on a tilted patient (parallel to the line along the centre of the vertebral body through the length of the spinous process). Check the position block in the sagittal plane; FOV must be big enough to cover the whole cervical spine from pons down to T4 (normally 280mm). Slices must be sufficient to cover the spine from the lateral border of RT transverse process to the lateral border of LT transverse process. **A saturation band must be placed over the neck (in front of the oesophagus) in the sagittal plane. This is to avoid swallowing artefacts over the spinal area. Phase direction should be head to foot to avoid motion artefacts from the neck.**



### Parameters

TR	TE	SLICE	FLIP	PHASE	MATRIX	FOV	GAP	NEX(AVRAGE)
3000-4000	100-120	3 MM	130-150	H>F	256X256	280-290	10%	2

### *T1 tse sagittal*

Plan the sagittal slices on the coronal plane; angle the position block parallel to spinal cord. Check the positioning block in the other two planes. An appropriate angle must be given in the axial plane on a tilted patient (parallel to the line along the centre of the vertebral body through the length of the spinous process). Check the position block in the sagittal plane; FOV must be big enough to cover the whole cervical spine from pons down to T4 (normally 280mm). Slices must be sufficient to cover the spine from the lateral border of RT transverse process to the lateral border of LT transverse process. **A saturation band must be placed over the neck (in front of the oesophagus) in the sagittal plane. This is to avoid swallowing artefacts over the spinal area. Phase direction should be head to foot to avoid motion artefacts from the neck.**



### **Parameters**

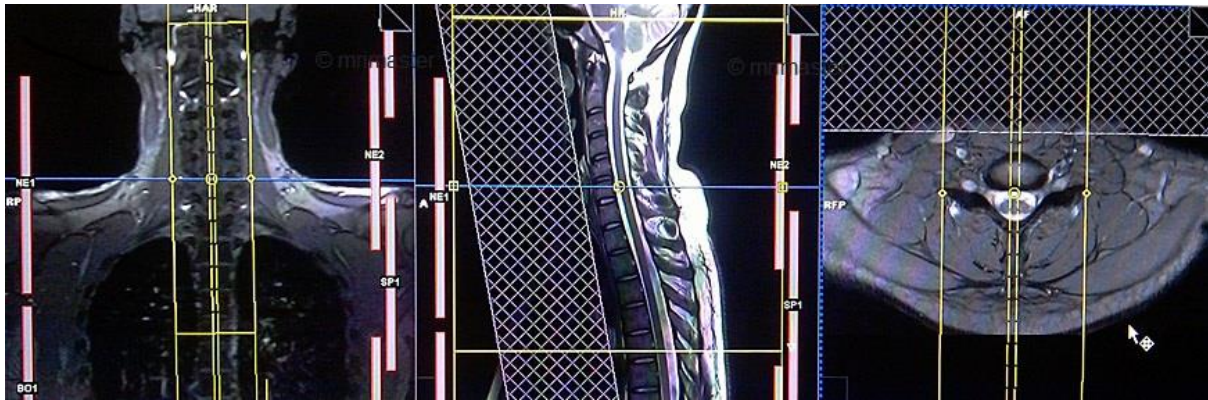
TR	TE	SLICE	FLIP	PHASE	MATRIX	FOV	GAP	NEX(AVRAGE)
400-600	15-25	3 MM	150	H>F	256X256	280-290	10%	2

### *T2 TSE STIR sagittal*

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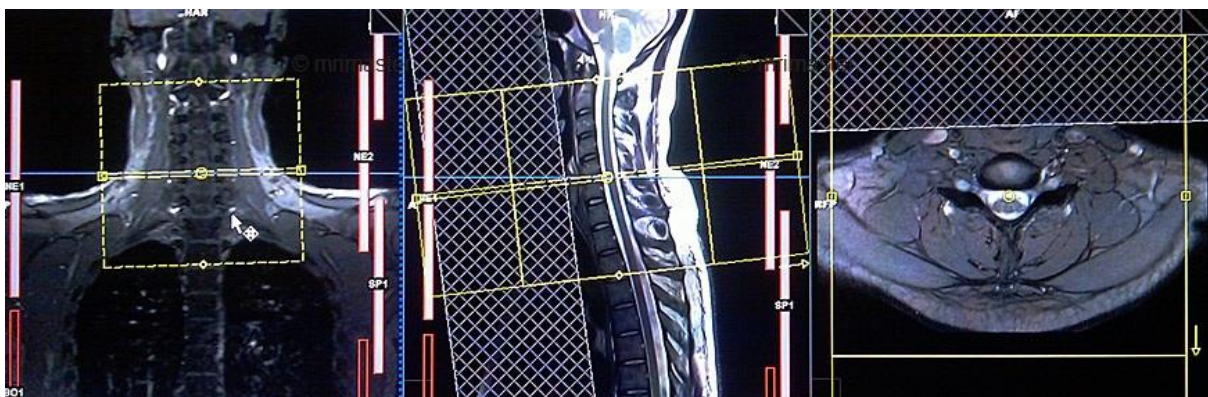


### Parameters

TR	TE	FLIP	NEX	SLICE	MATRIX	FOV	PHASE	GAP	TI
7000-9000	110	130	2	3 MM	256X256	280	H>F	10%	130

### T2\*(medic) Axial

Plan the axial slices on the sagittal plane; angle the position block perpendicular to the spinal cord. *Additional blocks must be placed if there is a disc prolapse at any other level (eg.T2,T3).* An appropriate angle must be given in the coronal plane on a tilted spine (parallel to the intervertebral disc space). Slices must be sufficient to cover the whole C spine from C2 to T1. A saturation band must be placed over the neck (in front of the oesophagus) in the sagittal plane. This is to avoid swallowing artefacts over the spinal area.

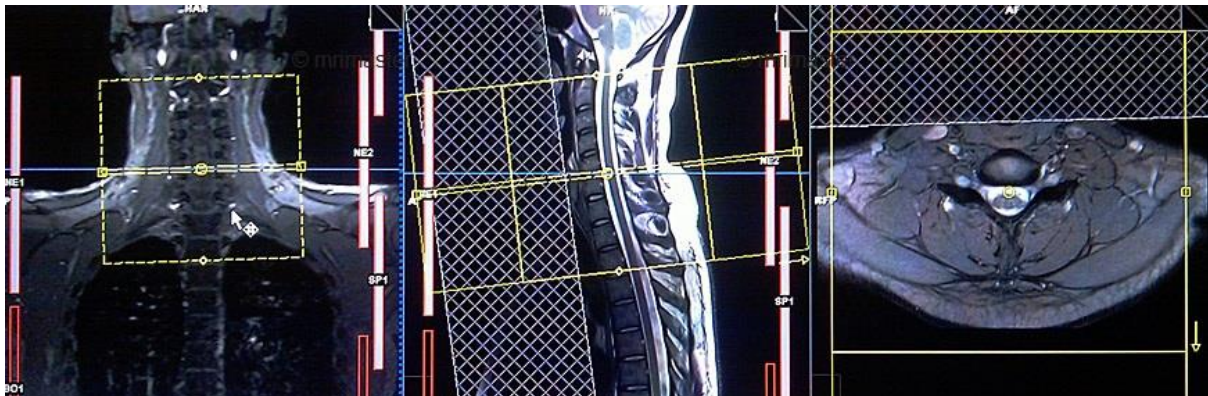


### Parameters

TR	TE	FLIP	NEX	SLICE	MATRIX	FOV	PHASE	GAP	oversample
800-1200	15-25	30	2	3 MM	256X256	180-200	A>P	10%	100%

### *T1 TSE Axial*

Plan the axial slices on the sagittal plane; angle the position block perpendicular to the spinal cord. *Additional blocks must be placed if there is a disc prolapse at any other level (eg.T2,T3)*. An appropriate angle must be given in the coronal plane on a tilted spine (parallel to the intervertebral disc space). Slices must be sufficient to cover the whole C spine from C2 to T1. A saturation band must be placed over the neck (in front of the oesophagus) in the sagittal plane. This is to avoid swallowing artefacts over the spinal area.



### *Parameters*

TR	TE	FLIP	NEX	SLICE	MATRIX	FOV	PHASE	GAP	oversample
400-500	15-20	150	2	3 MM	256X256	180-200	A>P	10%	100%

### *Indications for contrast enhancement cervical spine scans*

- > Evaluation or monitoring of tumour of the CNS or meninges
- > Monitoring of previous spinal surgery



- > Suspected spine lesions (e.g. bone mets)
- > Spinal cord tumour
- > Syringomyelia

Use T1 TSE *fat saturated* axial and sagittal after the administration of IV *gadolinium DTPA* injection (copy the planning outlined above). The recommended dose of gadolinium *DTPA* injection is 0.1 mmol/kg, i.e. 0.2 mL/kg in adults, children and infants.

e.g., bone Mets)

- > Spinal Cord Tumour
- > Syringomyelia

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