

Recommendations for cross-sectional imaging in cancer management, Second edition

Tumours of the spinal cord

Faculty of Clinical Radiology

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Primary spinal cord tumours

Clinical background

Primary spinal cord tumours (aka intramedullary tumours) are relatively rare, accounting for approximately 2–4% of all central nervous system (CNS) tumours.¹ Clinical features will usually indicate the level of involvement in the spinal cord. Astrocytomas and ependymomas account for the majority of primary spinal cord tumours.²

Who should be imaged?

All patients with symptoms and signs suggesting a primary spinal cord tumour should be investigated initially with MRI.

Imaging objectives

- MRI is the investigation of choice in all patients with suspected spinal cord tumours.³

- The objective is to define the presence and extent of tumour and its suitability for surgery.
- The region of the primary tumour should be examined in detail.
- The whole spinal cord and cauda equina should be imaged, as these lesions may be extensive and diffuse. Ependymomas may metastasise throughout the subarachnoid space.

Imaging

MRI

When a lesion has been identified in the thoracic spine or spinal cord, it is essential that a sagittal T2W scan, which demonstrates the level of the lesion in relationship to the lumbar sacral junction, is obtained. This enables the surgeon to identify the level for laminectomy using X-ray fluoroscopy in the operating theatre.

Protocol for imaging of primary spinal cord neoplasms

Sequence	Plane	Slice thickness	Field of view
T1W	Sagittal	4 ± 1 mm	Large
T2W	Sagittal/coronal*	4 ± 1 mm	Large
T1W with contrast medium enhancement	Sagittal/coronal*	4 ± 1 mm	Large
T2W	Axial	5 ± 2 mm	Small
T1W with contrast medium	Axial	5 ± 2 mm	Small

*Coronal views at radiologist's discretion, particularly if tumour extends laterally

Follow-up

A post-treatment baseline scan three months after surgery or radiotherapy is useful and further imaging may be obtained as determined by symptoms or as protocolled by the local oncology multidisciplinary team (MDT).

Tip

- The majority of primary spinal cord tumours are of low histological grade.

Metastatic spinal cord tumours

Clinical background

Metastases may involve the spinal meninges and the intra-axial cord. Common solid tumours such as breast, lung and melanoma will metastasise to the meninges by haematogenous spread, but this tends to occur late in the natural history of the disease, usually in the presence of metastatic disease at other sites.⁴ Primary tumours of the CNS may also metastasise to the meninges by spread through the cerebrospinal fluid (CSF). These include glioblastoma, pineal tumours, choroid plexus papilloma/carcinoma, and especially posterior fossa tumours of childhood such as primitive neuroectodermal tumours (PNET) and ependymomas.

Symptoms may be complex and not localised to a single anatomical site. A poorly localised headache or backache may be present. It is important to identify patients who may have meningeal metastatic disease because this significantly alters the imaging technique. Gadolinium contrast medium enhancement is

obligatory to increase the sensitivity of MRI for the detection of meningeal disease.

Who should be imaged?

All patients with neurological deficit or persistent symptoms suggestive of metastases to the spinal meninges or intra-axial spinal cord.

Imaging objectives

- To identify the presence, location, extent and number of spinal cord metastases.
- To identify meningeal involvement.

Imaging

MRI

The whole spine must be imaged. Axial T1W gadolinium-enhanced images helps to define lesion morphology. Intra-axial spinal cord disease presents clinically in a similar way to meningeal metastatic disease, and the imaging technique is the same.

Protocol for evaluating the extent of secondary spinal tumours

Sequence	Plane	Slice thickness	Field of view
T2W	Sagittal	4 ± 1 mm	Large
T1W	Sagittal	4 ± 1 mm	Large
T2W	Axial *	3 ± 1 mm	Small
T1W with contrast medium enhancement	Sagittal	4 ± 1 mm	Large
T1W with contrast medium enhancement	Axial *	3 ± 1 mm	Small

*To show areas of identified abnormality

Follow-up

A post-treatment baseline scan three months after surgery or radiotherapy is useful and further imaging may be obtained as determined by symptoms or as protocolled by the local oncology MDT.

Tips

- Meningeal metastatic disease tends to occur late in the natural history of the non-CNS primary disease.
- If intra-axial spinal cord deposits or meningeal metastatic disease is considered a clinical possibility, gadolinium enhancement is required for an adequate MRI study.

Spinal cord compression

Clinical background

Metastatic bone disease to the spine is capable of compressing the spinal cord.⁵ Impending cord compression is one of the few indications for emergency imaging in oncological practice. The principal clinical features include pain, power loss, sensory disturbance and impaired sphincter function. While power loss is progressing, there is a chance of regaining function. Corticosteroids should be started, and MRI undertaken within 24 hours. Sphincter disturbance requires more urgent imaging, because delay can lead to non-reversible functional loss. Referral to a spinal specialist centre may be indicated, and radiotherapy can be arranged while waiting for imaging to confirm level(s) of compression. Primary bone tumours or soft tissue masses such as lymphoma, neuroblastoma, neurofibromas or meningiomas may also cause compression of the spinal cord.

Who should be imaged?

All patients with symptoms and signs of spinal cord compression should be referred for MRI,

which may be undertaken at a spinal specialist centre or a general hospital.

Imaging objectives

- To determine the presence, extent, and level of spinal cord compression.
- To identify multiple sites of spinal cord compression.
- To identify sites of incipient spinal cord compression elsewhere in the spinal canal.
- To determine whether surgery or radiotherapy is indicated.
- To detect the presence of soft tissue tumour.

Imaging

MRI

MRI is the investigation of choice, although CT may be useful in detecting paravertebral mass lesions.³

Protocol for imaging spinal cord compression

Sequence	Plane	Slice thickness	Field of view
T2W	Sagittal	4 ± 1 mm	Large
T1W	Sagittal	4 ± 1 mm	Medium
STIR*	Sagittal	4 ± 1 mm	Large
T2W**	Axial	3.5 ± 1 mm	Small
T1W**	Axial	3.5 ± 1 mm	Small
T1W with contrast media	Sagittal & axial***	4 ± 1 mm / 3.5± 1 mm	Large/small

*Short tau inversion recovery **To show areas of identified abnormality ***At radiologist's discretion

The entire spine must always be imaged in suspected cord compression as multiple level disease may be detected. Sagittal imaging, which shows the relationship of the lesion to the vertebral column, must be included to allow planning for surgery or radiotherapy. When there is doubt about a transitional lumbosacral junction,

the craniocervical junction must be adequately demonstrated.

If pain restricts the number of sequences, which can be performed, sagittal T1W or STIR imaging of the whole spine should be completed before any further investigation. Standard T2W imaging gives a better myelographic effect and thus

improves delineation of the extent of cord compression which may be bilateral. The short tau inversion recovery (STIR) sequence in the sagittal plane is a sensitive method for detecting lytic metastatic disease but performs poorly for delineating the extent of cord compression owing to blurring from motion artefacts. Gradient-echo T2*W sequences and contrast medium enhancement are occasionally helpful for differentiating acute osteoporotic vertebral fractures from metastatic causes of vertebral collapse.

CT

CT and CT myelography now have little place in imaging of spinal cord pathology but are still required on occasion in patients where MRI is contraindicated or not obtainable in the emergency setting. CT imaging may help to provide information on integrity of bone before surgical spinal stabilisation.

Values of $CTDI_{vol}$ should normally be below the relevant national reference dose for the region of scan and patient group (see Appendix and Radiation protection for the patient in CT in Section 2).

Follow-up

A post-treatment baseline MRI three months after surgery or radiotherapy is useful and further imaging may be obtained as determined by symptoms or as protocolled by the MDT.

Tip

- In a patient with known malignancy and clinical evidence of spinal cord compression, the entire spine should be imaged.

References

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