Magnetic Resonance Imaging of Spinal Emergencies: Guide for the radiologist on call

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Learning objectives

Our purpose is to review Magnetic Resonance Imaging (MRI) of spine pathology in our emergency department and plan standardized imaging protocols for an accurate diagnosis.

Background

Myelopathy, is a damage to the spinal cord resulting in a change, either temporary or permanent, in the cords normal motor, sensory or autonomic function; but the term also includes meningeal or parameningeal space damage or dysfunction.

Patients with spinal cord injury (SCI) often have permanent and devastating neurologic deficits and disability. Traumatic injuries, vascular diseases, tumoral diseases, infections and inflammatory and autoimmune processes may affect the spinal cord due to its confinement in a very small place. A detailed history (injury duration, severity and extens) and adequate neurological examination is really important, however, imaging will help to identify the etiology appropriately. Magnetic resonance imaging (MRI) is the method of choice for evaluation the acutely injured spine. Many of the processes affecting the spinal cord may be reversible if recognized and treated early. The first aim is to distinguish trough compressive and non-compressive etiologies. The majority of spinal cord diseases may be treated medically, with surgical treatment reserved for compresive disorders, which is a neurological emergency.

Considering that many patients may be neurologically unstable, Radiologist must provide supervision while the MRI is conducted. In patients who are in stable condition, ideally total spine magnetic resonance (extending from the skull base to the lumbosacral junction) should be performed in sagital T1-,T2-weighted, short tau inversion recovery (STIR) sequences as well as axial T1-and T2-weighted sequences. Depending on the clinical concern, additional sequences should be considered, gradient-recalled echo T2*, mielographic sequences or sequences after intravenous Gadolinium administration.

Findings and procedure details

We report some cases presented to the emergency department with acute myelopathy.

CASE 1

We report a 81-year-old man, with a history of prostatic adenocarcinoma, who presented with sensory and motor disturbances of both lower extremities. On MRI, compression fracture of D4 with soft tissue mass was observed. Sagital T1-weighted image showed vertebral body compression and soft tissue component with cord medullaris abnormal signal intensity related to spinal-cord compression.

CASE 2

We report a 74-year-old man with history of non-small cell lung carcinoma with multiple osseous metastases who presented with acute onset paraplegia. MRI showed intramedullary metastasis at C4 level with edema.

CASE 3

We report a 72-year-old woman with history of vulvar melanoma who presented acute sensory and motor disturbances of both lower extremities. MRI revealed an extradural mass, with heterogeneous contrast enhancement due to melanoma metastase.

A significant proportion of painful myelopathy is caused by tumoral compressive myelopathy. It is important to obtain images after administration of gadolinium to evaluate the enhancement. Tumors compressing the spinal cord may be divided into extradural and intradural.

Extradural tumors may be classified as follows:

- Benign: sinovial cyst, osteoma, osteoblastoma, giant cell tumor, hemangioma, eosinophilic granuloma, schwannoma and meningioma.
- Malignant: **metastasis**, multiple myeloma, lymphoma and chondrosarcoma.

Intradural tumors are classified as follows:

- Extraespinal: neurofibroma, meningioma, lipoma, schwannoma and arachnoid cyst.
- Intraspinal: astrocytoma, ependymoma, hemangioblastoma and **metastasis**.

CASE 4

We report a 54-year-old man presented to the emergency room with quadriparesia after jerking neck movement. MRI revealed a huge C5-C6 herniated posterocentral disc with spinal cord compression.

Post-traumatic myelopathy is four times more frequent in males, in particular between 15 and 30 years of age. The most mobile segments are more often affected, in particular C5-C7 (as seen in our case) and T10-L2. Clinically, quadriplegia predominates in 30-40% of cases and paraplegia occurs in 6-10%. Motor vehicle accidents are the most common cause, accounting for 50% of the events. Imaging findings may differentiate those patients who will benefit from emergency surgical decompression.

CASE 5

We report a 64-year-old woman presented to the emergency room with nuchal pain, weakness in upper right limb and hypoesthesia in the left region of the D2-D3. MRI revealed spontaneous epidural hematoma from C3 to D2 in patient treated by anticoagulant drugs with compression of the spinal cord and myelopathy signs.

CASE 6

We report a 54-year-old patient with subacute paraplegia. MRI revealed serpent-like and dilated intervertebral veins with high signal intensity in the central part of the spinal cord related to edema. Diagnosis was spinal dural arteriovenous fistula.

The spinal cord may be affected by **compressive and non-compressive vascular diseases,** of which the most common are malformations of the spinal dural arteriovenous fistula (SDAVF) type. SDAVF is the most common spinal vascular malformation, however it is still rare are often underdiagnosed. In the early stages, the clinical symptoms can be nonspecific and initially is misdiagnosed. The exact etiology is unclear, however, the majority of patients become symptomatic in middle age suggesting that it is an acquired disease. Male prediction is also well known. On MRI the cord edema is most clearly shown as hyperintensities with peripheral sparing on T2-weighted images. Vascular diseases should be suspected in any patient who undergo anticoagulation therapy.

Images for this section:

Fig. 1: Case1. Compression fracture of D4 with soft tissue mass due to metastasis.

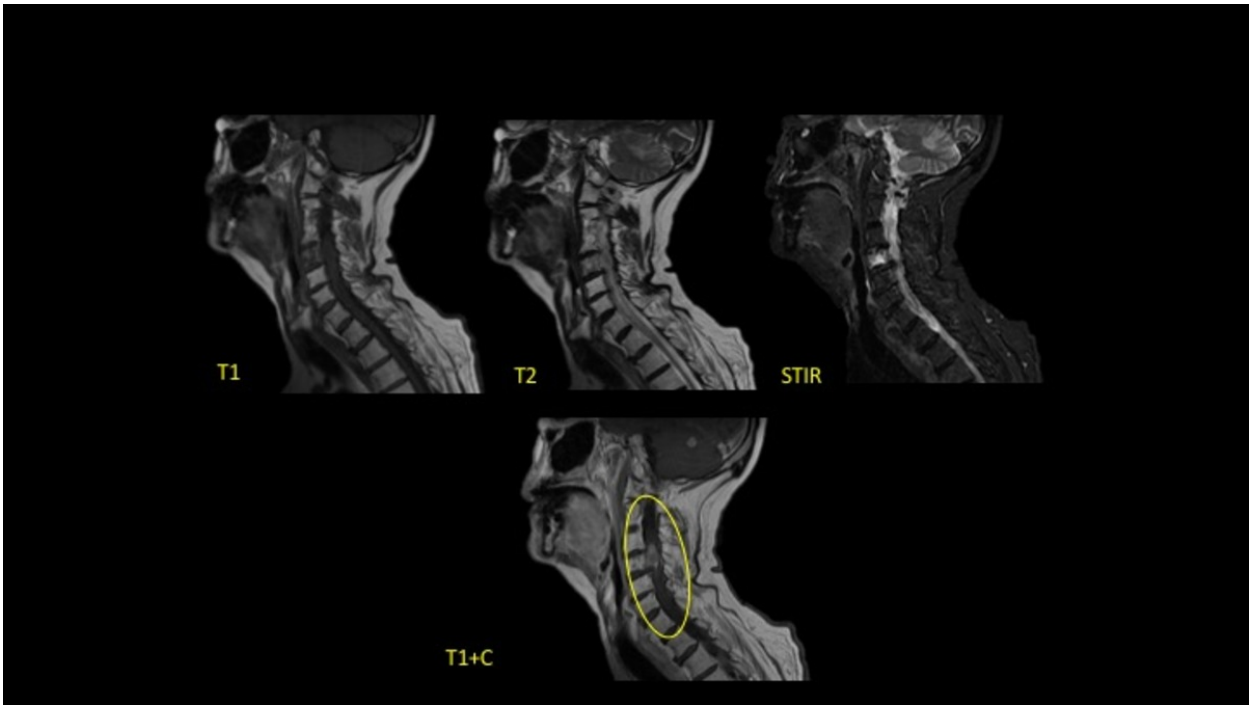

Fig. 2: Case 2. Intramedullary metastasis at C4 level with edema.

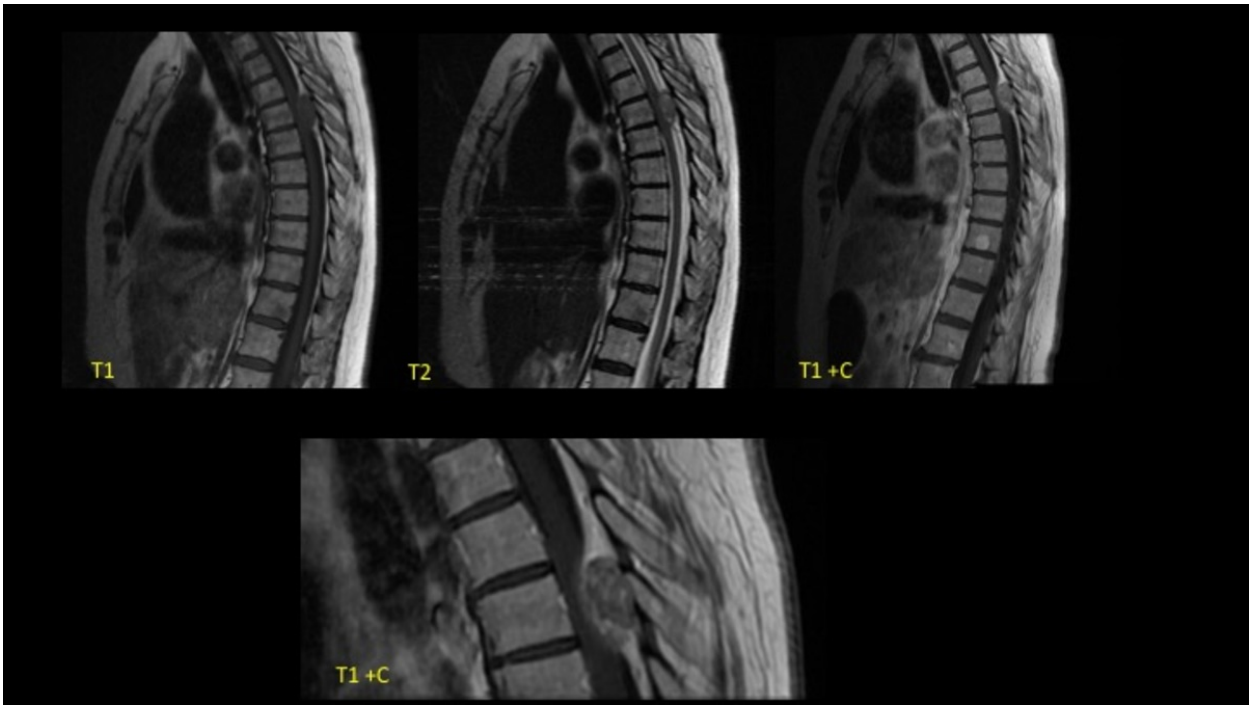

Fig. 3: Case 3: extradural mass, with heterogeneous contrast enhancement due to melanoma metastase.

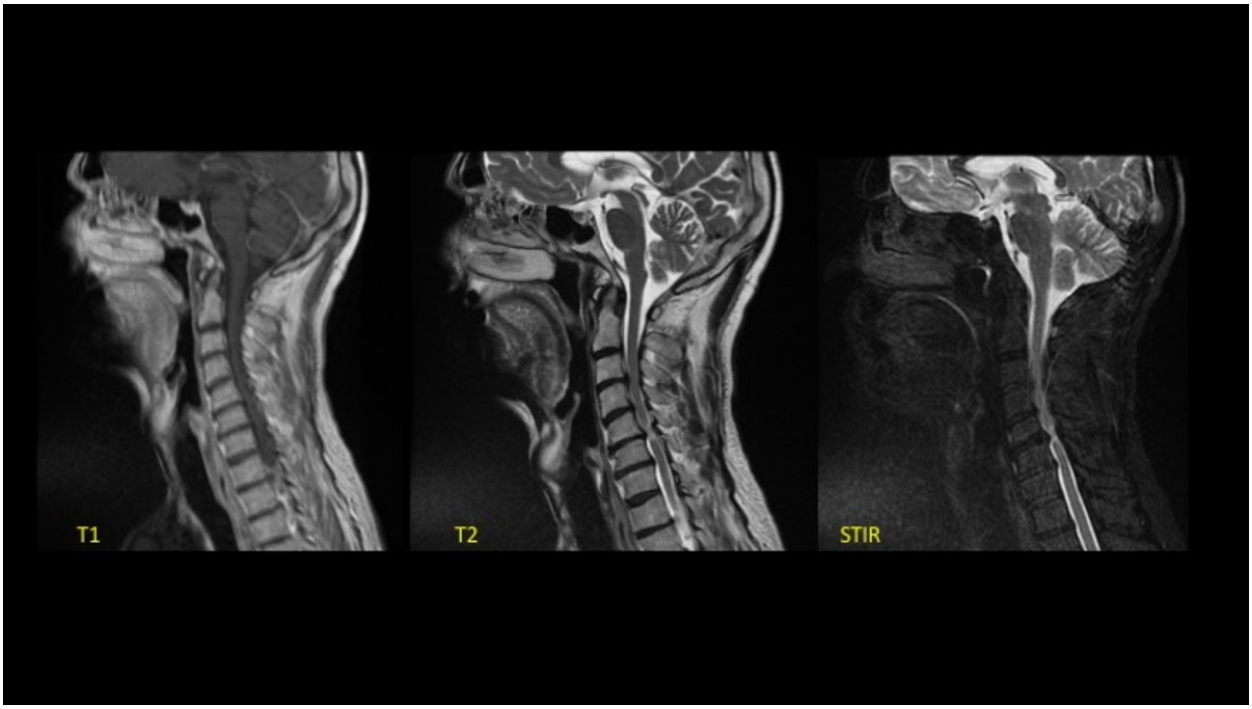

Fig. 4: Case 4: C5-C6 herniated posterocentral disc with spinal cord compression.

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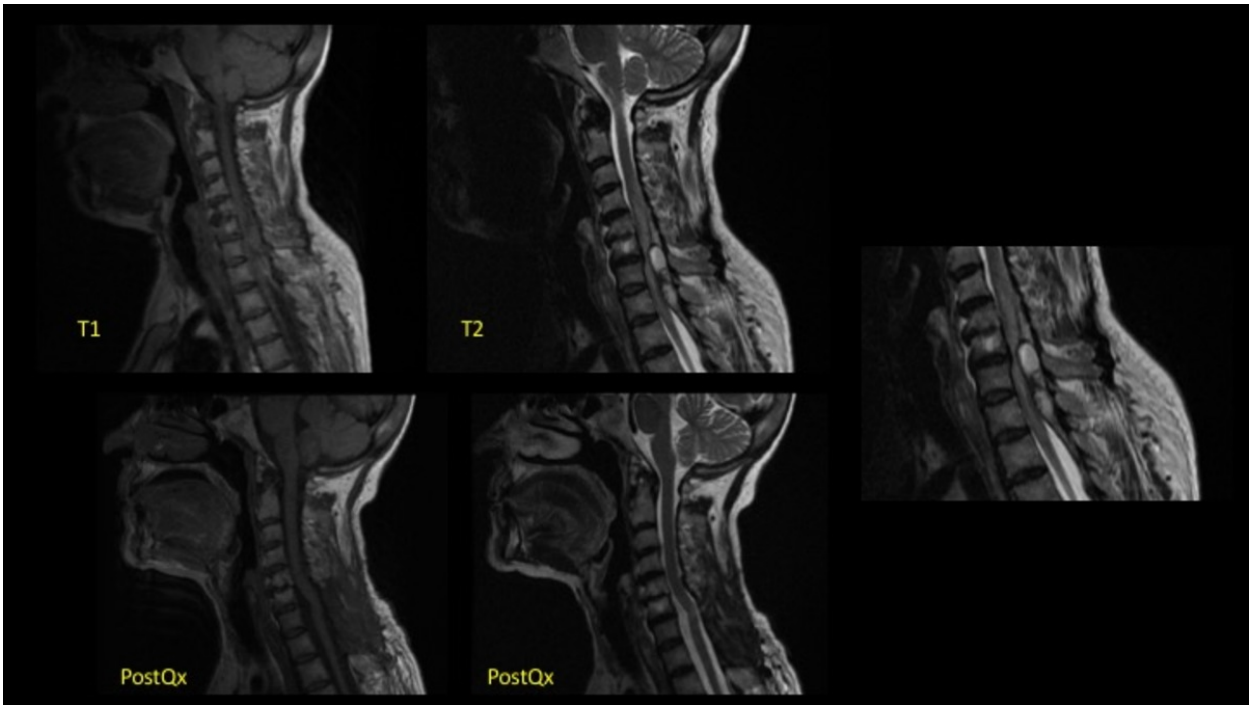

Fig. 5: Case 5: spontaneous epidural hematoma from C3 to D2.

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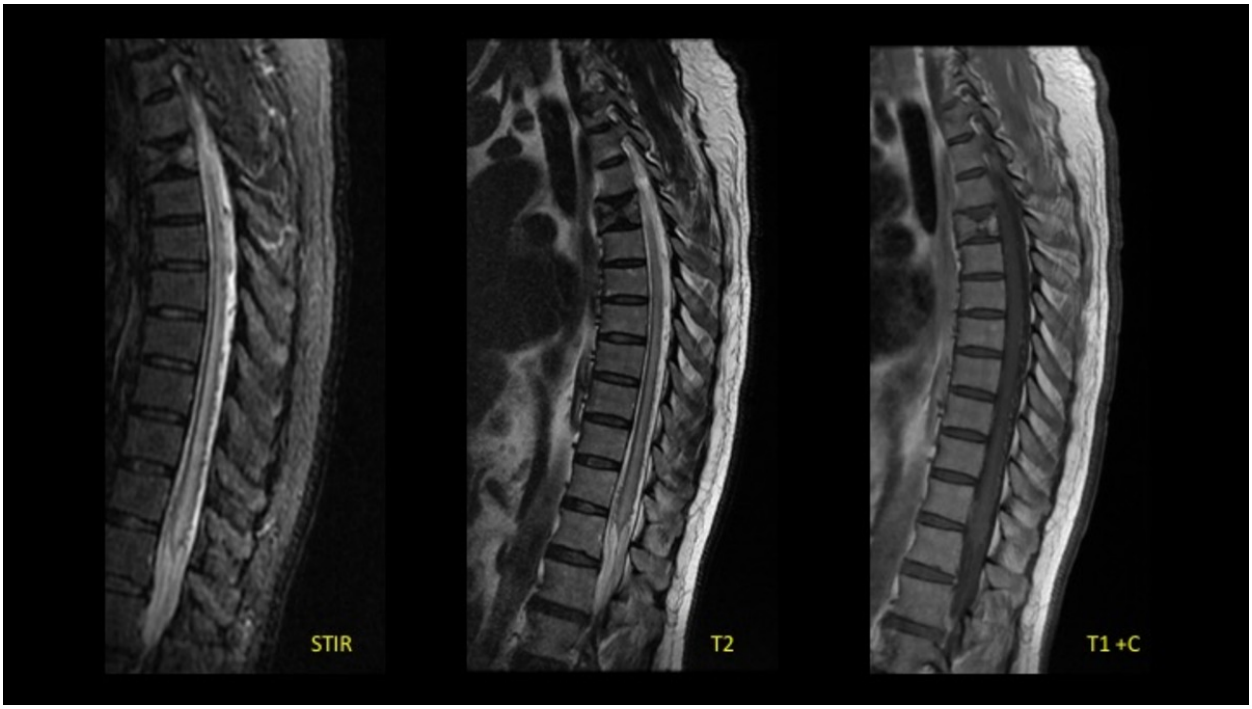

Fig. 6: Case 6: spinal dural arteriovenous fistula.

Conclusion

MRI is the primary technique to investigate spine pathology, particularly when spinal cord or nerve injury is suspected. Radiologist must be familiar with possible etiologies and imaging protocol, as many of these processes affecting the spinal cord may be revertible if recognized and treated early.

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