

MRI in an Emergency Department. Our experience

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Learning objectives

The purpose is to study the current situation of MRI in an emergency department, its indications, the basic technical concepts and pearls for the radiological interpretation.

Background

Spinal cord damage suspicion is the most frequent cause to perform MRI in an emergency department. TSET1, TSET and STIR in a sagittal plane are the basic sequences to start the spine imaging test. Spinal cord compression is a surgical emergency and usually requires prompt surgical decompression to prevent permanent neurological impairment. There are numerous causes of cord compression and they can be divided according to the location of the compressing mass. Vertebral fracture, vertebral metastasis, degenerative changes and spinal cord injury without radiographic abnormality (SCIWORA) were pathologies that we detected.

Findings and procedure details

OUR EXPERIENCE

We reviewed the MRIs performed in an emergency department of a trauma reference Centre from January 2017 to January 2018. We analyzed the clinical indication, type of MRI, radiological diagnosis and the relevance of this result in the therapeutic decision.

101 were reviewed during 2017. Neurological acute deficit was the most frequent indication and lumbar MRI was the most demanded spine evaluation. Traumatic spinal cord compression and tumoral or degenerative changes were the main diagnosis. 17 patients required urgent surgery and 3 urgent radiotherapy.

Likewise, we have performed 23 urgent MRI brain to patients with acute visual deficit, stroke disease and some neurological manifestations in children.

Spinal cord damage suspicion is the most frequent cause to perform MRI in an emergency department.

1. MRI Sequences

FSET1, FSET2 and STIR in a sagittal plane are the basic sequences to start the spine imaging test. Later, axial plane is done to an accurate evaluation of the spinal cord damage.

In addition, susceptibility weighted imaging (SWI) and diffusion-weighted imaging (DWI) sequences can be used to evaluate hemorrhage or edema.

2. Systematic approach

Whenever there is the abnormality in the spinal cord, we need a systematic approach to analyze the findings:

- Vertebral body: alignment, height and intensity of signal.
- Intervertebral disk: height, degree of hydration.
- Ligaments: anterior longitudinal ligament, posterior longitudinal ligament and posterior ligamentous complex (ligamentum flavum, interspinous ligament and supraspinous ligament).

- Spinal Canal: the three layers of the dura mater (dura mater, arachnoid mater and pia mater) encase the spinal cord, nerve roots and cauda equina. These layers form boundaries to the three spaces defined as the extradural, intradural and intramedullary space.

- Spinal cord. Spinal cord diseases are characterized by high signal on T2WI sequences and we may analyze next items:

a) *Length of segment affected*. In multiple sclerosis (MS) there is typically a short segment involved (less than 2 segments).

In other diseases like transverse myelitis (TM), neuromyelitis optica (NMO) and ischemia there is usually a long segment involved.

b) *How much of the cord is involved on transverse images*.

Partial involvement is typically seen in MS. Complete involvement includes both halves of the cord and is typically seen in TM and NMO.

c) *Location of the involvement on transverse images*. Posterior involvement appears in MS, vitamin B12 deficiency, lateral like in MS or anterior like in arterial infarction.

d) *Spinal cord swelling*. In TM and tumor, the cord is swollen, while in MS the cord is not swollen or less swollen than you would expect for the size of the lesion.

e) *Enhancement*. Many diseases show some enhancement and astrocytoma has to be included in the differential diagnosis.

Spinal cord compression is a surgical emergency and usually requires prompt surgical decompression to prevent permanent neurological impairment. There are numerous causes of cord compression and they can be divided according to the location of the compressing mass. Vertebral fracture, vertebral metastasis, degenerative changes and spinal cord injury without radiographic abnormality (SCIWORA) were pathologies that we detected.

SPINAL CORD COMPRESSION CASES

- VERTEBRAL FRACTURE WITH SPINAL CORD TRANSECTION ASSOCIATE (figura 1)

- VERTEBRAL METASTASES (figura 2)

- TRAUMATIC DISC HERNIATION (figura 3)

Images for this section:



Fig. 1: Male, 23 years old with acute paraparesis after motorcycle accident. CT sagittal spine reconstruction (A): vertebral fracture and spinal canal invasion. Sagittal plane, STIR sequence (B): spinal cord discontinuity and thick high STIR signal intramedullary attributable to a spinal cord transection.

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Conclusion

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MRI in a radiology emergency department is relatively common examination and radiologist should be aware of it technic, indications and principal radiographic features of the most common pathologies.

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