

# Magnetic Resonance Imaging of Spinal Emergencies



Daniel Kawakyu-O'Connor, MD<sup>a,\*</sup>,  
Ritu Bordia, MBBS, MPH<sup>b</sup>, Refky Nicola, MS, DO<sup>a</sup>

## KEYWORDS

• Emergency • MR imaging spine • Spinal cord • Protocols • Mimics • Trauma

## KEY POINTS

- Magnetic resonance (MR) imaging of the spine is increasingly being performed for the evaluation of emergent conditions.
- MR imaging can readily differentiate between acute and chronic fractures identified by computed tomography (CT), and is sensitive and specific in detecting and describing ligament, disc, and spinal cord injury.
- MR imaging is preferred over CT in the evaluation of acute back pain in patients with history of malignancy or infection.
- MR imaging protocols should be tailored for a specific indication so as to increase the sensitivity and specificity of the examination, and decrease scan time.

## INTRODUCTION

The role of MR imaging is expanding in the assessment of patients in the emergent setting. However, MR imaging has several limitations due to its longer scan times, higher expense, and the need for highly trained personnel. For this reason, the radiologist and referring clinicians should discuss the indication for the study before the MR examination.<sup>1</sup>

Also, the familiarization with appropriate MR imaging protocols for specific indications enables an appropriate utilization of MR imaging as a diagnostic tool, provides a higher degree of diagnostic certainty, and avoids unnecessary costs and delays to the patient and referring physician.<sup>2</sup>

## PROTOCOLS AND SEQUENCES

A detailed patient's history is essential before the study is started. There are elements that are critically important, such as presence of devices or implants that are contraindicated for an MR examination (eg, electronic spine stimulator devices, cardiac pacers, defibrillators) or that may degrade examination quality (eg, spinal fusion hardware). Others include a history of malignancy or renal insufficiency, a documented history of reactions to gadolinium-based contrast agents, previous spine surgery, and clinical suspicion or risk factors for an infection (eg, current or recent central line use, suspected infections outside the spine, history or suspicion of intravenous drug use, and/or immunocompromised status).

---

The authors have nothing to disclose.

<sup>a</sup> Division of Emergency Imaging, Department of Imaging Sciences, University of Rochester Medical Center, 601 Elmwood Avenue, Box 648, Rochester, NY 14642, USA; <sup>b</sup> Section of Neuroradiology, Department of Radiology, Winthrop University Hospital, 259 1st Street, Mineola, NY 11501, USA

\* Corresponding author.

E-mail address: Daniel\_Oconnor@URMC.Rochester.edu

Magn Reson Imaging Clin N Am 24 (2016) 325–344

<http://dx.doi.org/10.1016/j.mric.2015.11.004>

1064-9689/16/\$ – see front matter © 2016 Elsevier Inc. All rights reserved.

The MR imaging sequences that should be incorporated in the emergency MR imaging spine protocol are listed in **Table 1**.<sup>3</sup>

*T1-weighted imaging (T1WI)* is used to assess for any osseous abnormalities that may replace or infiltrate the normal fat-containing bone marrow, such as metastasis, edema, or infection. T1WI also provides information regarding the anatomy and signal characteristics of peri-spinal soft tissues.

*T2-weighted imaging (T2WI)* depicts spinal cord lesions that are hyperintense relative to the surrounding spinal cord and result in effacement of cerebrospinal fluid (CSF). Paraspinal soft tissue edema and fluid collections are best seen on T2WI sequences.

*T2-weighted sequences with fat suppression (T2WI-FS)* use lipid signal-specific fat suppression to provide accurate suppression of fat signal and excellent anatomic detail. T2WI-FS is sensitive to magnetic field inhomogeneity and may result in suboptimal fat suppression at the interface between air, fat, bone, or in the presence of metallic implants or foreign bodies.

*Short tau/T1 inversion recovery (STIR)* is a fat-suppression technique that is relatively insensitive to field inhomogeneity, although signal-to-noise ratio is typically decreased relative to T2WI-FS.

Signal suppression in STIR is not lipid specific and T1 signal associated with proteinaceous fluid (such as mucous or hemorrhage) also can be suppressed.

*Proton density-weighted imaging (PDWI)* is best for characterizing T2-hyperintense lesions of the spinal cord that are obscured on heavily T2-weighted acquisitions, and can be added or substituted if cord lesions are of primary clinical concern (eg, multiple sclerosis). PDWI is incorporated into protocols designed to identify disc herniation due to good anatomic detail and spatial resolution.

*T2\*-weighted gradient-recalled echo imaging (T2\*WI or GRE)* or newer *susceptibility-weighted imaging (SWI)* are commonly included in MR imaging spine trauma protocols to increase examination sensitivity for detection of hemosiderin-containing blood products within the spinal cord or epidural space.

*Diffusion-weighted imaging (DWI)* has a complementary role in the imaging of spinal cord neoplasms, epidural abscesses, and cord infarction, but is not included in the routine emergent spine MR imaging protocol.

*Contrast-enhanced T1-weighted fat-suppressed imaging (T1WI-FS + Gd)* is useful in

**Table 1**  
Recommended magnetic resonance imaging sequences for the evaluation of spine

Sequence	Structures Evaluated	Disease Processes
T1WI	Bone marrow Epidural space	Fractures, spine metastases, osteomyelitis Hematoma, abscess
T2WI	Spinal cord	Cord edema/inflammation or demyelination
T2WI with fat suppression	Bone marrow Spinal cord Paraspinal soft tissues	Fractures, bone metastases, osteomyelitis Cord edema/inflammation or demyelination Edema/fluid collections
STIR	Alternative to T2W fat suppression sequence	Similar to T2WI-FS
PDWI	Spinal cord	Demyelination
DWI	Bone marrow Epidural space Spinal cord Anywhere	Osteomyelitis/discitis Epidural abscess Spinal cord infarction Neoplasm
T2*-GRE WI	Spinal cord	Hemorrhage (trauma cases)
T1WI with contrast and fat suppression	Bone marrow Epidural space Spinal cord Paraspinal soft tissues Anywhere	Osteomyelitis/discitis Metastases Epidural phlegmon/abscess Active inflammation/demyelination, leptomeningeal or dural metastases Abscess Neoplasm

*Abbreviations:* DWI, diffusion-weighted image; GRE, gradient-recalled echo imaging; PDWI, proton density-weighted image; STIR, short tau/T1 inversion recovery; T1WI, T1-weighted image; T2WI, T2-weighted image.

Download English Version:

<https://daneshyari.com/en/article/4242497>

Download Persian Version:

<https://daneshyari.com/article/4242497>

[Daneshyari.com](https://daneshyari.com)