

# Spinal cord injury diagnosis

There are barriers to timely recognition of SCI in the field, appropriate admission to a higher level of care after recognition, and challenges related to the management of individuals with less severe SCI <sup>1)</sup>

---

In suspected [spinal cord injury](#): the anal wink and bulbocavernosus reflex are checked on the rectal exam.

---

High resolution [MRI](#), has led to advances in the evaluation and management of [spinal cord injury](#).

The sensitivity, specificity, and positive predictive value of MRI has reduced the utility of older assessment tools and terminology, such as the [Pavlov ratio](#) and [SCIWORA](#) (spinal cord injury without radiographical abnormality).

MRI has become the gold standard imaging modality for spinal cord injury because it allows for direct measurement of the dimensions of the spinal canal and detects active spinal cord compression from discogenic or ligamentous tissue.

Furthermore, MRI is excellent for evaluating the spinal cord itself because of its ability to demonstrate intramedullary edema, which manifests as a hyperintense signal on T2-weighted imaging.

Diffusion weighted imaging (DWI) is a powerful tool for investigating spinal cord injury (SCI), but has limited specificity for axonal damage- the most predictive feature of long-term functional outcome.

In this study, a technique designed to detect acute axonal injury, filter-probe double diffusion encoding (FP-DDE) is compared with standard DWI for predicting long-term functional and cellular outcomes.

**METHODS:** This study extends FP-DDE to predict long-term functional and histological outcomes in a rat SCI model of varying severities (n=58). Using a 9.4T MR system, a whole-cord FP-DDE spectroscopic voxel was acquired in three minutes at the lesion site and compared to DWI at 48 hours post-injury. Relationships with chronic (30-day) locomotor and histological outcomes were evaluated with linear regression.

**RESULTS:** The FP-DDE measure of parallel diffusivity ( $ADC_{\parallel}$ ) was significantly related to chronic hind limb locomotor functional outcome ( $R^2 = 0.63$ ,  $p < 0.0001$ ) and combining this measurement with acute functional scores demonstrated prognostic benefit versus functional testing alone ( $p = 0.0007$ ). Acute  $ADC_{\parallel}$  measurements were also more closely related to the number of injured axons measured 30 days after the injury than standard DWI. Furthermore, acute FP-DDE images showed a clear and easily interpretable pattern of injury that closely corresponded chronic MRI and histology observations.

Collectively, these results demonstrate FP-DDE benefits from greater specificity for acute axonal damage in predicting functional and histological outcomes with rapid acquisition and fully automated analysis, improving over standard DWI. FP-DDE is a promising technique compatible with clinical settings with potential research and clinical applications for evaluation of spinal cord pathology. <sup>2)</sup>

Mabray et al undertook a retrospective cohort study of 25 patients with acute thoracic SCI who underwent MRI on admission and had American Spinal Injury Association Impairment Scale (AIS) assessment at hospital discharge. Imaging variables of axial grade, sagittal grade, length of injury, [thoracolumbar injury classification and severity score \(TLICS\)](#), maximum canal compromise (MCC), and maximum spinal cord compression (MSCC) were collected. They performed an analytical workflow to detect multivariate PC patterns followed by explicit hypothesis testing to predict AIS at discharge. All imaging variables loaded positively on PC1 (64.3% of variance), which was highly related to AIS at discharge. MCC, MSCC, and TLICS also loaded positively on PC2 (22.7% of variance), while variables concerning cord signal abnormality loaded negatively on PC2. PC2 was highly related to the patient undergoing surgical decompression. Variables of signal abnormality were all negatively correlated with AIS at discharge with the highest level of correlation for axial grade as assessed with the Brain and Spinal Injury Center (BASIC) score. A multiple variable model identified BASIC as the only statistically significant predictor of AIS at discharge, signifying that BASIC best captured the variance in AIS within our study population. Our study provides evidence of convergent validity, construct validity, and clinical predictive validity for the sampled MRI measures of SCI when applied in acute thoracic and thoracolumbar SCI <sup>3)</sup>.

1)

Kelly-Hedrick M, Ugiliweneza B, Toups EG, Jimsheleishvili G, Kurpad SN, Aarabi B, Harrop JS, Foster N, Goodwin CR, Shaffrey C, Fehlings MG, Tator C, Guest J, Neal CJ, Abd-El-Barr M, Williamson T. Interhospital Transfer delays care for spinal cord injury patients: A Report from the North American Clinical Trials Network for Spinal Cord Injury. J Neurotrauma. 2023 Apr 4. doi: 10.1089/neu.2022.0408. Epub ahead of print. PMID: 37014079.

2)

Skinner NP, Lee SY, Kurpad SN, Schmit BD, Muftuler LT, Budde MD. Filter-Probe Diffusion Imaging Improves Spinal Cord Injury Outcome Prediction. Ann Neurol. 2018 May 11. doi: 10.1002/ana.25260. [Epub ahead of print] PubMed PMID: 29752739.

3)

Mabray MC, Talbott JF, Whetstone WD, Dhall SS, Phillips DB, Pan JZ, Manley GT, Bresnahan JC, Beattie MS, Haefeli J, Ferguson AR. Multidimensional Analysis of Magnetic Resonance Imaging Predicts Early Impairment in Thoracic and Thoracolumbar Spinal Cord Injury. J Neurotrauma. 2016 May 15;33(10):954-62. doi: 10.1089/neu.2015.4093. Epub 2016 Feb 1. PubMed PMID: 26414451.

From:

<https://neurosurgerywiki.com/wiki/> - **Neurosurgery Wiki**

Permanent link:

[https://neurosurgerywiki.com/wiki/doku.php?id=spinal\\_cord\\_injury\\_diagnosis](https://neurosurgerywiki.com/wiki/doku.php?id=spinal_cord_injury_diagnosis)

Last update: **2024/06/07 02:58**

