

**The Relationship Between MRI Signal Intensity Changes, Clinical Presentation, and Surgical Outcome in Degenerative Cervical Myelopathy: Analysis of a Global Cohort**

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**Introduction**

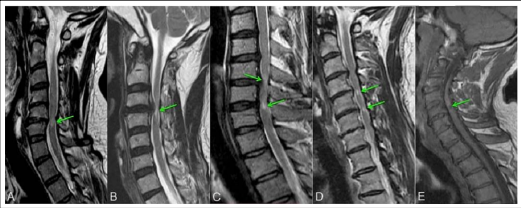
Several reports have investigated the relationship between MRI signal changes and the extent of spinal cord dysfunction and potential for postoperative neurological recovery in patients with Degenerative Cervical Myelopathy (DCM). However, there remains ambiguity if these signal changes relate with baseline severity, and predict neurological recovery after surgical treatment. The present study aims to address this knowledge gap by investigating a large global cohort of DCM patients.

**Methods**

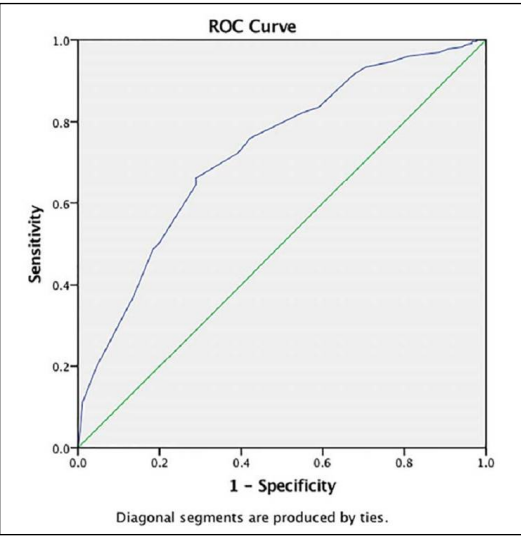
419 MRIs from two prospective multicenter studies were examined. Images were assessed for the presence, levels, and location of cord signal changes and compared with clinical data (signs/symptoms, mJOA, Nurick). Inter-rater reliability for signal changes was calculated. Signal changes were also evaluated for prediction of 2-year post-operative outcome using 2 approaches: (1) Hirabayashi recovery ratio, (2) a dichotomized mJOA score of <16 and =16 at 2-years representing a suboptimal and optimal neurological outcome, respectively.

**Results**

MRIs were categorized by signal change: no signal change (28.9%), T2 hyperintensity-only (T2-only, 51.8%), and T2-hyperintensity and T1-hypointensity (T1+T2, 19.3%). T2-hyperintensity was present at multiple levels in 27% of patients overall. There was moderate/substantial agreement (Kappa: 0.60) for T2-hyperintensity, and fair agreement for T1-hypointensity (Kappa: 0.31) identification among 3 raters. Baseline severity increased from no signal change to T2-only to T2+T1 ( $p<0.0001$ ), and there was an incremental increase in the frequency of signs/symptoms. The presence of T1-hypointensity correlated with reduced recovery ratio ( $p=0.03$ ) and likelihood of an optimal surgical outcome ( $p=0.005$ ). Greater number of T2-hyperintensity levels was also associated with worse baseline severity ( $p<0.0001$ ) and recovery ratio ( $p=0.001$ ).



**Figure 1.** Types of signal changes that can appear in patience with DCM. A-D: Sagittal T2WI. A: Type I, diffuse and faint hyperintensity. B: Type II, focal and sharp hyperintensity. C: Type III, both Type I (higher arrow) and Type II (lower arrow) hyperinstensity characteristics are present. D: Two discontinous focal hyperintensities are present. E: Sagittal MRI with T1WI showing a focal hypointensity.



**Figure 2.** The receiver operating characteristic curve for the final logistic model demonstrating AUC=0.726

**Learning Objectives**

By the conclusion of this session, participants should be able to: 1) Describe the importance of MRI signal changes in patients with Degenerative Cervical Myelopathy, 2) Discuss, in small groups how these signal changes will impact their patient management 3) Discuss how this information can help manage patient expectations.

**Conclusions**

This is the largest study of DCM patients to show an increasing stepwise impairment from no signal change to T2-hypertensity to T1-hypointensity. While T2-hyperintensity alone does not predict outcomes, T1-hypointensity indicates more permanent injury, portending decreased functional recovery. Multilevel T2-hyperintensity suggests additional tissue injury, correlating with worse impairment and recovery potential.

**References**

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