Multispectral Diffusion-Weighted MRI for Imaging of the Spinal Cord Adjacent to Hardware in Post-Operative Cervical Spondylitic Myelopathy Patients
Joey Kevin Grochmal MD PhD; Matthew Budde PhD; Kevin Koch MD; Bhave Sampada; Marjorie C. Wang MD

Introduction
For cervical spondylitic myelopathy pre-operative MRI-based DTI signal previously demonstrated to inversely correlate with post-operative metrics of self-reported function (mJOA)(1), however metal artifact has made the detailed diffusion weighted analysis of neural structures next to hardware a technical challenge in the post-op period. Recently, a MRI sequence, 2D Propeller Multispectral diffusion weighted imaging (MSI-DW), had been developed to image near spinal implants(2). The purpose of this study was to use this sequence to obtain successful DWI imaging in patients with metallic implants post-surgery for CSM.

Methods
We enrolled adult patients with a history of cervical spine surgery for CSM using a database of CSM patients at a single academic institution, excluding patients who could not have a MRI scan. MSI-DW, mJOA, and 10m walk test speed were obtained pre-op and at 3, 6, 12, and 24 months post op (when available). Statistical analysis was via One-way ANOVA with repeated measures.

Results
Thus far, 7 were enrolled who were between 14 months and 5 years post-op: 57% female, mean age 52.5 years old, baseline mJOA 13.9 +/- 2.4 (SD), baseline 10m walk speed 170.8 +/- 49.0 (SD) cm/s. Successful DWI imaging was achieved using the MSI-DW in all seven patients. MSI-DW imaging provides markedly improved visualization of spinal cord anatomy adjacent to cervical hardware, when compared to a current gold-standard DWI imaging sequence (FOCUS, General Electric) as seen in Figure 1. All patients demonstrated stable mJOA and 10m walk test scores over all lengths of follow up except for one who was recently post-op from knee surgery.

Conclusions
MSI-DW is a promising modality for DWI imaging adjacent to hardware in post-operative patients. which going forward may allow us to comment on changes in spinal cord health from the pre-operative state in patients with cervical spondylitic myelopathy.

References

Learning Objectives
By the conclusion of this session participants should be able to discuss the importance of MS-DWI imaging for imaging the cervical spinal cord adjacent to hardware in post-operative patients.

Figure 1
Axial DWI imaging of the cervical spine in a patient post-operative from a C4/5 ACDF with plate. Left panel - Sagittal T2 demonstrating the plane of axial cut. Middle panel - FOCUS DWI (current industry gold standard) sequence demonstrating marked artifact obscuring visualization of the spinal cord. Right panel - MS-DWI sequence demonstrating good visualization of the cord and adjacent structures, taken at the same axial plane as the FOCUS sequence.