

## Changes of the diffusion metrics in cervical myelopathy after laminoplasty

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### Introduction

Cervical myelopathy (CM) is a serious condition, which can cause deleterious impact on the quality of life. Although recent advancement in technology, there are still no good biomarker in the spinal cord for monitoring its function. Development of sophisticated analysis software for the spinal cord integrity may give opportunity to diagnose and monitor their injury in cervical myelopathy (CM) patients, although it has not been investigated much. Moreover, there are only few studies published when it comes to the effect of laminoplasty, how it can influence to the plastic changes of the spinal cord in CM patients. In order to find out the laminoplasty induced changes in the spinal cord, we obtained pre- and post-operative diffusion tensor imaging (DTI) and its behavioral measurement using modified Japanese Orthopedic Association (mJOA) score, whether there are some changes diffusion metrics as well as in comparison to controls.

### Methods

We recruited twelve CM patients (mean age  $55.2 \pm 18.2$  years) having spine surgeries and twelve healthy volunteers (mean age  $35.4 \pm 5.4$  years) without a history of neurologic deficits for this study. Spinal cord DTIs of both groups were acquired, which showed different tract in white matter of the spinal cord. Mean diffusivity (MD), axial diffusivity (AD), radial diffusivity (RD), and fractional anisotropy (FA) were measured at the lesion area of each patient. The clinical status of CM were classified by mJOA score. For the additional physiological measure, we obtained also the motor evoked potentials (MEP) amplitude. For the group comparison between CM patients and controls, independent t-test was conducted and for the comparison of pre- and post-operative diffusion metrics, paired t-test was done For comparison of diffusion metrics and mJOA score, we did Pearson correlation analysis.

### Results

1. In group comparison, right FA of the corticospinal tract (CST) and bilateral FA, RD, and left RD of the spinal lemniscus tract (SLT) were significantly different between controls and CM patients ( $p < 0.005$ ). 2. In comparison between pre- and post-operation, right MD and bilateral RD of the fasciculus gracilis tract (FGT), fasciculus cuneatus tract (FCT), and CST were significant ( $p < 0.005$ ). The right RD of the rubrospinal tract (RST) and SLT were also statistically significant ( $p < 0.005$ ) with significant changes in mJOA score ( $p < 0.05$ ). 3. In correlation analysis, there were a positive correlation between the mJOA and left RD of the CST ( $r = 0.705$ ,  $p < 0.05$ ) and right FA of the RST ( $r = 0.603$ ,  $p < 0.05$ ).

**Conclusion**

In this study, we found significant changes in spinal cord integrity 2 weeks after laminoplasty. Among those changes observed in multiple tracts at post-operative condition, only the CST showed significant correlation to behavioral outcome. Sophisticated analysis technique of the spinal cord would have a clinical significance as a biomarker for the functional recovery in CM patients.