Introduction: We previously reported that our specific cervical compression device can simulate the upright loading condition of the cervical spine during supine posture (1). In that study, 8.5% of body weight was required to simulate upright posture. Furthermore, the A-P diameter of the dural tube at C5/6 decreased during axial compression compared to supine unloaded conditions in asymptomatic subjects.

Patients with cervical degenerative diseases predominantly have their symptoms, such as pain and/or tingling in their upper extremities. However, dynamic changes during loading of the cervical spine and spinal cord in the upright posture have not been examined by MRI in patients with cervical degenerative diseases. The purpose of this study was to analyze the changes of cross sectional area of the cervical spinal cord and dural tube before and during axial compression in patients with cervical degenerative diseases. We hypothesized that axial loading of the cervical spine narrows the cervical dural tube.

Methods: Seven patients (5 males, 2 females) with a mean age of 53 (range 36-69) years and body weight of 79±6 kg participated in this study. An institutional review board approved this study and informed consent was obtained from all participating patients. All the patients had tingling and/or pain in their neck or upper extremities due to cervical degenerative diseases. Each patient had lordotic or kyphotic cervical spine. Lordosis angles of the cervical spine at each level in supine and upright postures were shown in the figure 1. Study 1. Based on results from our prior study (1), 8.5 % of body weight was applied to simulate the normal load experienced by the cervical spine in upright posture. There was a significant difference before and during compression regarding A-P distance of the dural tube at C5/6 (before: 10.0±0.3 mm; during:9.5±0.3 mm, p<0.05), Dural tube CSA at C6/7 (before: 164±8 mm²; during:155±8 mm², p<0.05) and ASD at C6/7 (before: 1.3±0.2 mm; during: 1.8±0.2 mm, p<0.05). However, no significant changes in spinal cord parameters, TD of the dural tube and PSD were found.

Discussion: Our previous study of normal volunteers demonstrated that the A-P diameter of the dural tube decreased at C5/6 and the spinal cord was translocated posteriorly within the dural tube at C3/4 and C4/5 during axial compression (1). Contrast to healthy subjects, the results in symptomatic patients with cervical degenerative diseases demonstrate different responses to physiologic loads. Our results indicate that the A-P distance as well as the CSA of the dural tube at C6/7 decreased significantly during axial compression. In addition, the decrease in A-P distance was probably due to bulging of the disc because the ASD, but not PSD, decreased during axial compression. Study 1 showed that the lordosis angles at C4/5 and C5/6 were not significantly changed between supine and upright positions, so that a decrease of the dural tube A-P diameter at C5/6 was not significant in patients with cervical degenerative diseases.

In the lumbar spine, Willen and co-workers (2) documented that axial compression of the lumbar spine narrowed the lumbar dural tube in patients with sciatica or intermittent claudication. They hypothesize that this resulted from the folding of the ligamenta flava or disc bulging due to the axial force on the lumbar spine. Our results in the present studies suggest that disc bulging decreases A-P diameter as well as CSA of the dural tube in patients with cervical degenerative diseases. These results may provide greater understanding of the pathogenesis of cervical compression myelopathy related to upright posture.

Acknowledgment: This study was supported by DynaMed Inc.


**UniversityofCalifornia,SanDiego, SanDiego,California.