Epidural Pressure in Cervical Spondylotic Myelopathy
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Introduction
The pathomechanisms of cervical spondylotic myelopathy (CSM) is based on static and dynamic factors of cervical spine; the former is compression of spinal cord with hypertrophic ligamentum flavum, osteophyte and intervertebral disc. The latter is cervical instability. It is still uncertain which is more affected on clinical symptoms of CSM. Furthermore, the responsible level of CSM with imaging studies such as CT and MRI is not always corresponded with those of clinical manifestations. Also, the severities of CSM depend on which level and how much of the spinal cord is involved. Theoretically, it is most reliable assessment that actual compressive force of spinal cord or dural tube. The purpose of this study is to measure actual local pressure of epidural space in patients with CSM and to evaluate the correlation between the pressure and clinical symptoms.

Methods
The study was done on 10 patients with CSM who managed by cervical laminoplasty. There were seven men and three women with aged 52–75 (mean, 63.7 years old). A Camino pressure monitoring system (TOKIBO, CO.LTD) was used as a micro-tip catheter transducer. The measurement of the cervical epidural pressure was done on surgery. The head and cervical spine of the patients was positioned prone on the operating frame. After an exposure of cervical laminae, T-saw guide connecting with the catheter transducer was inserted into epidural space through C7/Th1 interlaminar space and picked it up from C2/3. Identifying the levels under X-ray imaging, the epidural pressure was measured at C2/3 interlaminar portion. Thereafter, the measurement of those of the level of C3 lamina and C3/4 interlaminar space were followed consecutively. Finally the level of C7 lamina was done, and the catheter was removal from C7/Th1 interlaminar space. The following was compared; 1) the epidural pressure of all interlaminar levels and those of the all laminar levels, 2) the epidural pressure at the interlaminar level which was regarded as most stenosis in imaging analysis with MRI and those at the adjacent upper and lower laminar levels. Also, we evaluated the correlations between the highest epidural pressure and JOA score and 10-second test result. The statistical test was performed with Student’s t test and p values < 0.05 was regarded as significance.

Results
The average epidural pressure at all laminar and interlaminar levels was 3.08 mmHg and 3.50 mmHg, respectively. There was no significant difference between the laminar and interlaminar levels. The average epidural pressure at the most stenotic interlaminar, adjacent upper and lower laminar levels were 6.4 mmHg, 3.2 mmHg and 4.0 mmHg, respectively. The interlaminar pressure was significantly higher than the adjacent pressure. The most stenotic interlaminar level was C3/4; four cases, C4/5; three, C5/6 and C6/7; each one. In only two cases, the most stenotic interlaminar levels did not correspond with the levels of the highest epidural pressure actually measured. There was no correlation between the highest epidural pressure and the severities of clinical symptoms.

Discussion
Although there is still unknown how effects of the changes in epidural pressure on the spinal cord, this study suggests that interlaminar stenosis sensitive to cervical motion is more problematic than laminar stenosis in patients with CSM. In further analysis regarding the epidural pressure in CSM, dynamic factors should be considered.