MR T2 Image Classification in Cervical Compression Myelopathy-Predictor of Surgical Outcomes -
Yasutsugu Yukawa, MD, Fumihiko Kato, MD, Keigo Ito, MD (Nagoya, Japan)

INTRODUCTION: The relationship between signal intensity change of spinal cord in magnetic resonance imaging (MRI) and surgical outcomes in cervical myelopathy patients are still controversial. The degree of signal intensity change of spinal cord has not discussed yet. The purpose of this study was to classify the preoperative MRI in detail and to know whether the classification of signal intensity change can be a predictor for surgical results or not, prospectively.

METHODS: A hundred and four patients with cervical compression myelopathy were prospectively enrolled in the study. Those patients with rheumatoid arthritis, cerebral palsy, history of cervical trauma, and other spinal diseases were excluded. All were treated with cervical expansive laminoplasty. They were 67 males and 37 females. Their average age was 61 years, and the mean follow-up period was 39 months postoperatively. The pathologic conditions were cervical spondylotic myelopathy in 74 patients, ossification of the posterior longitudinal ligaments in 20, cervical disc herniation in 6, and calcification of the yellow ligament in 4. MRI (spin echo sequences) was performed in all patients preoperatively. The signal intensity changes of spinal cord were classified to 5 groups based on sagittal images of T2-weighted sequences as follows: Grade 0; no signal change, Grade 1; lightly high signal change, Grade 2; deeply high signal change in narrow area (less than one vertebral length), Grade 3, deeply high signal change in wide area (more than one vertebral length), Grade 4; deeply high signal change with low signal change of T1-weighted sequences. The severity of myelopathy was evaluated according to the Japanese Orthopaedic Association (JOA) score, preoperatively and at the final follow-up.

RESULTS: Average JOA score was 9.7 preoperatively and 13.4 postoperatively. Mean improvement rates ([17 – preoperative JOA score] / [postoperative JOA score– preoperative JOA score] x 100) was 48.2% at the final follow-up. Eighty-six patients (83%) showed signal intensity changes in preoperative MRI. Those patients with signal changes were elder (62.3 vs 55.3), longer (22.1 vs 12.0) in duration of disease worse (12.9 vs 14.6) in postoperative JOA score and worse (45.6 vs 62.3) in postoperative improvement rate than those without. These difference were statistically significant.

Preoperative MRI showed 49 patients in Grade 1, 19 in Grade 2, 18 in Grade 3, no patients in Grade 4. Duration of disease was 14.7 in Grade 1, 22.6 in Grade 2,
and 41.9 in Grade 3. Preoperative and postoperative JOA scores were 9.4 and 13.3, 9.9 and 12.7, and 9.7 and 12.5, respectively. Improvement rates were 52% in Grade 1, 37% in Grade 2, and 37% in Grade 3.

CONCLUSIONS: Preoperative signal intensity changes in MR T2-weighted sagittal images were correlated with age, duration of disease and postoperative JOA score and improvement rates. High signal changes on T2-weighted sequences indicated a poor prognosis, especially deeply high signal changes indicated worse surgical outcomes than lightly signal changes. Signal intensity changes of the spinal cord on MRI in cervical compression myelopathy are thought to reflect pathologic changes in the spinal cord. Those pathologic changes include both reversible and irreversible changes in the spinal cord. From these results, deeply high signal changes indicated to include more irreversible pathologic changes of spinal cord. Signal intensity change patterns in T2-weighted sagittal images can be a predictor of surgical outcomes. No signal changes, lightly signal changes and deeply signal changes indicate good, fair, and poor prognosis, respectively.