THE RECOVERY IN PROPRIOCEPTION AFTER LAMINOPLASTY FOR CERVICAL MYELOPATHY

**INTRODUCTION**

The damage of the posterior columns of spinal cord, which convey the information regarding deep sensibility, has been considered as the pathomechanism of deterioration of the proprioceptive loss in cervical myelopathy. However, no researches have been reported in the proprioception of cervical myelopathy patients. We evaluated the proprioception and muscle strength around knee joint in cervical myelopathy before and after the surgical treatment. The hypotheses in this study were followings. (1) The knee proprioception is damaged in the patients of cervical myelopathy. (2) The improvement in the knee proprioception will be seen after the decompression procedure. (3) The proprioception measurement might have a possibility to predict the clinical outcome.

**MATERIALS AND METHODS**

Forty-five myelopathy patients (male: 32, female: 13, average age: 54.5 y.o.) were involved as the study group (Group M). The patients with any pathology in the knee joints and lack of cooperation for the proprioception measurement were excluded. In Group M, for 22 patients who underwent double door laminoplasty, measurements were performed preoperatively and 2, 4, 12 weeks after the surgery (Group S). Thirty-one age-matched volunteers (male: 21, female: 10, average age: 50.4 y.o.) without any abnormalities in both the knee and the spine served as the control group (Group C).

The Japanese Orthopaedic Association (JOA) lower extremity motor scores (4 points) were used for clinical evaluation. In Group S, JOA scores were recorded preoperatively and 12 weeks after the surgery, and improvement rate ([posttreatment JOA score - pretreatment JOA score] / pretreatment JOA score) [%] were calculated.

The knee proprioception was evaluated by the joint position sense, which was assessed by the ability to reproduce the joint position. The magnitude of error angle was measured using electrical goniometer (Penny & Giles), with reproducing the predetermined knee flexion angle. The predetermined knee flexion angles were 30 and 60 degrees with either sitting or prone position. The error angle measurements were performed five times for both angles and positions each respectively. The isometric muscle strength of quadriceps and hamstrings were also measured with 90 degrees of knee flexion.

The differences between Group M and C were evaluated using unpaired t-test in the error angles and muscle strength. The effects of the surgical treatment on the recovery in the proprioception and muscle strength were assessed by the sequential changes in both parameters in Group S. The statistical analysis for the sequential changes was performed using repeated measures ANOVA. Also, the correlation between the improvement rate in JOA score and in error angles in Group S were analyzed. Significant level was p<0.05.

**RESULTS**

The average error angles were 2.4 and 3.6 degrees with sitting position, and 3.3 and 5.5 degrees with prone position in Group C and M respectively. The muscle strength of quadriceps were 2.2 and 1.6 Nm / kg in Group C and M respectively. Those of hamstrings were 1.0 and 0.7 Nm / kg in Group C and M respectively. Those of hamstrings were 1.0 and 0.7 Nm / kg in Group C and M respectively. The error angles in Group M were significantly higher than those in Group C at all knee positions (p<0.001). The muscles around the knee joint in Group M were found to be weaker than those in Group C (p<0.001).

In Group S, a significant improvement in the error angle was found 2 weeks after the surgery in all knee positions (p<0.01), and no significant changes were found later (Figure 1). On the other hand, a significant improvement in muscle strength was found at only 4 weeks after the surgery (Figure 2). The improvement rate in error angles 2 weeks after surgery were significantly correlated with the improvement rate in JOA score with both sitting and prone position. However, no significant correlation was found between the improvement rate in muscle strength 2 weeks after surgery and the improvement rate in JOA score.

**DISCUSSION AND CONCLUSION**

Although the proprioception loss in the lower extremities with cervical myelopathy has been well recognized as the symptoms of gait disturbance and the Romberg’s sign, there have been no scientific evaluations. This is the first report to analyze the proprioception in the cervical myelopathy. We found significant proprioception loss in cervical myelopathy patients comparing to age-matched control subjects. Although the proprioception has been reported to have correlation to the muscle strength, the knee proprioception improved significantly at the early post-operative period prior to the obvious recovery in muscle strength. Therefore, the knee proprioception would be sensitive to the status of spinal cord. Our results indicated that the proprioception measurement at the early post-operative time period would have a possibility to predict the long-term clinical outcome after the surgical treatment for cervical myelopathy.

**REFERENCES:**

(2) Wall PD.: Brain 100: 641-653, 1977
(3) Barrack RL. Spine 9(7): 681-685, 1984