Grip and Release Test (10 Seconds Test) in Healthy Volunteers and Cervical Myelopathy Patients-A Simple Bedside Test for the Assessment of Cervical Myelopathy

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INTRODUCTION: Clumsiness of the hands is one of the common symptoms in cervical spondylotic myelopathy (CSM). Crandall (1966) described these clumsy hands as "slow stiff opening and closing of the fists". Ono (1987) also mentioned that CSM patients could not grip and release rapidly with the fingers (grip and release test). At the XXV VIth annual meeting of CSRS, we presented that the grip-and-release test (10 Seconds test) had improved significantly after laminoplasty in CSM patients. Therefore, we hypothesize that 10 Seconds test is a simple bedside test for the assessment of severity of cervical myelopathy. The first purpose of this study is to clarify the normal range of 10 Seconds test in healthy volunteers. The second is to reveal whether 10 Seconds test is correlated with the scoring system of cervical myelopathy proposed by the Japanese Orthopaedic Association (JOA score).

METHODS: Two hundred and fifty patients with myelopathy secondary to cervical disc herniation (CDH), cervical spondylotic myelopathy or ossification of posterior longitudinal ligament (OPLL) who met the following criteria were in the subjects of this study: 1. Neurological symptoms that had been stable for at least the preceding 1-month period, 2. Neurological symptoms not expected to change over the subsequent 1-month of period, 3. Agreement to participate in the study based on provided information about it, 4. Patients with neurological or musculoskeletal symptoms resulting from disorders other than CDH, CSM or OPLL were excluded from the study. Each patient was evaluated with the JOA scoring system. They were also asked to grip and release with fingers as rapidly as possible. The release means full extension of the digits and the grip means full flexion of the digits. The number of complete cycles of the movement within 10 seconds was counted (10 Seconds test). When there is a discrepancy between right hand and left, the data of severely involved hand was adopted. Two hundred and sixteen volunteers (healthy individuals without myelopathy or other disability) were also examined in the same manner.

RESULTS: 1. Values of 10 Second test; The mean value of the healthy volunteers was 26.0±6.7 cycles. The mean values of the cervical myelopathy
patients was 17.4±7.0. 10 Second test was significantly slower in the cervical myelopathy group, compared with the volunteer group (p<.001). The averaged values of healthy volunteers in each decade were 28 cycles in the fourth decade, 27 in the fifth, 28 in the sixth, 22 in the seventh, 21 in the eighth and 20 in the ninth, respectively. The averaged values of cervical myelopathy patients in each decade were 22 cycles in the fourth decade, 20 in the fifth, 18 in the sixth, 18 in the seventh, 15 in the eighth and 13 in the ninth, respectively. 2. 10 Second test and JOA score; 10 Seconds test correlated significantly with JOA score (R=0.42) (Fig. 1). 10 Seconds test less than 20 cycles corresponded to JOA score less than 12 points (17=full score). Among the seven categories of the JOA scoring system, finger and lower extremity motor function revealed closer relationship with 10 Seconds test (R=0.41 and 0.45, respectively).

CONCLUSIONS: We revealed that normal range of 10 Seconds test is more than 20 cycles in any decades. Also, this larger patient group study confirmed that 10 Seconds test less than 20 cycles was the threshold of severe myelopathy. Therefore, we concluded that 10 Seconds test less than 20 cycles indicated the presence of severe myelopathy. As 10 Seconds test closely correlated with finger and lower extremity motor function, this test can be used as one of the neurological examinations for cervical myelopathy. Assessment of severity of myelopathy, especially during early postoperative periods is difficult with conventional neurological procedures. This test well correlates with motor function of the upper and lower extremities and this can be used to monitor motor function of patients with myelopathy.

**Figure 1**