

OBJECTIVE ASSESSMENT OF SPASTIC HYPERTONIA IN HAND DEXTERITY USING A NOVEL DIGITAL DEVICE

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Introduction : Spastic hypertonia (SH) is a motor disorder characterized by exaggerated tendon jerk reflexes, and is a common symptom associated with spinal cord injuries. Current assessment methods for SH rely on subjective examination. We utilize an inexpensive and lightweight handgrip device, previously designed by the authors, to objectively quantify SH in patients with cervical spondylotic myelopathy. We aim to verify that (i) the introduced handgrip can accurately assess the degree of SH, and that (ii) the assessment correlates to changes in motor function following surgical decompression.

Method : This is a pilot study with 10 patients (mean age 58.2 ± 13.5). Patients were tasked to adjust their handgrip force to trace a sinusoidal target curve. The test was performed preoperatively and postoperatively following surgical decompression. Spastic reflexes were investigated when patients increase their grip strength. First, the signals were examined for SH using a machine learning algorithm. If SH is noted, a dynamic time warping was performed to further analyze the signals. The results were compared against patient's reported Oswestry Disability Index (ODI), a validated functional questionnaire.

Results : The mean accuracy of detecting the appearance of SH was 99.56%. Among many parameters generated by the analysis, the velocity of muscle recovery from a spastic motor movement showed a strong linear correlation to the patient's postoperative ODI (p -value = 0.029).

Conclusion : Our preliminary results show that the handgrip can accurately quantify the level of SH. Such knowledge may be useful in an outpatient setting to assess the need for surgical intervention and evaluate postoperative results.

Keywords : *Spastic hypertonia, Handgrip device, Cervical Spondylotic Myelopathy*