論 文 要 旨

Quantitative measurement of resistance force and subsequent attenuation during passive isokinetic extension of the wrist in patients with mild to moderate spasticity after stroke.

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Background: Spasticity is evaluated by measuring the increased resistance to passive movement, primarily by manual methods. Few options are available to measure spasticity in the wrist more objectively. Furthermore, no studies have investigated the force attenuation following increased resistance. The aim of this study was to conduct a safe quantitative evaluation of wrist passive extension stiffness in stroke survivors with mild to moderate spastic paresis using a custom motor-controlled device. Furthermore, we wanted to clarify whether the changes in the measured values could quantitatively reflect the spastic state of the flexor muscles involved in the wrist stiffness of the patients.

Materials and methods: Resistance forces were measured in 17 patients during repetitive passive extension of the wrist at velocities of 30, 60, and 90 deg/s. The Modified Ashworth Scale (MAS) in the wrist and finger flexors was also assessed by two skilled therapists and their scores were averaged (i.e., average MAS) for analysis. Of the fluctuation of resistance, we focused on the damping just after the peak forces and used these for our analysis. A repeated measures analysis of variance was conducted to assess velocity-dependence. Correlations between MAS and damping parameters were analyzed using Spearman's rank correlation.

Results: The damping force and normalized value calculated from damping part showed significant velocity-dependent increases. There were significant correlations (ρ = 0.53–0.56) between average MAS for wrist and the normalized value of the damping part at 90 deg/s. The correlations became stronger at 60 deg/s and 90 deg/s when the MAS for finger flexors was added to that for wrist flexors (ρ = 0.65–0.68).

Conclusions: This custom-made isokinetic device could quantitatively evaluate spastic changes in the wrist and finger flexors simultaneously by focusing on the damping part, which may reflect the decrease in resistance we perceive when manually assessing wrist spasticity using MAS.