Changes of Muscle Relaxation Manner with Aging.

Yamaguchi Hidetaka¹, Takahara Terumasa², Seki Kazutoshi², Onodera Sho², Nagami Kuniatsu¹
(KIBI International University¹, Kawasaki Univ. of Med. Welfare², Japan)

Muscle relaxation has an important role in the execution of complex movements in human, particularly during the rapid sequences of movements; muscular activation must be switched during such rapid movements. However, the physiological mechanisms underlying the voluntary muscle relaxation are not fully understood. We observed that the inhibitibility of spinal alpha motoneuron pool for the child did not develop until 7 years old, which was examined by the muscle relaxation manner. This result suggests that the inhibitibility of spinal alpha motoneuron pool was age-related adaptation. A number of age-related physiological and neuromuscular changes have been documented in the literature. We consider that inhibitibility of spinal alpha motoneuron pool is influenced by age. The purpose of this study is to examine the changes in the inhibitibility of spinal alpha motoneuron pool with aging.

Fourteenth healthy men and women voluntarily participated in this study. Subjects were consisted of two groups, and six subjects were in each. Young group was college-age (mean age: 23 ± 4 yr) and old group was middle age (mean age: 58 ± 6.2 yr). The subjects were sitting comfortably in a chair, and a red light spot (diameter: 4mm) was positioned at eyes’ height in 1m distance. The right arm was positioned horizontally on the table and with elbow flexed to an angle of 90 degrees; the elbow joint was immobilized. The sustained tensions before muscle relaxation were 20%, 40% and 60% of maximal isometric right elbow flexor contractions (%MVC). Five trials were recorded. Muscle relaxation time (MRT) was determined by the difference between the beginning of tension decrease and the silence point of biceps spike discharge.

The MRT were -60±14ms (20%), -39±5ms (40%), -11±19ms (60%) in the young group and -55±12ms (20%), -13±28ms (40%), +48±59ms (60%) in the old group. The negative value means that the signal of EMG was silenced before the tension decrement. The results were summarized as follows: 1) In young subjects, the silence of surface electromyogram preceded to decreasing of the tension. 2) The discharge of surface electromyogram was preceded during the muscle relaxation in older subjects. 3) In the old group, the values of MRT were increased depending on the sustained tension level before the relaxation. 4) It was confirmed that individual differences of MRT were seen in the old group with increasing the sustained tension level before the relaxation. These results suggested that each muscle relaxation in this study was conducted by the different inhibitory systems. The inhibitory system in the older subjects may be localized in the higher level of central nervous system more than that of the young subjects. From above results, it is considered that the inhibition of spinal alpha motoneuron pool is affect by aging.

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