E61001 Changes in The Easticity of Human Tendon Structures with Fatigue

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Purpose: The present study aimed to investigate the changes of elastic properties of human tendon structures in fatigue condition. **Methods:** The subjects performed the muscle endurance tests (ET) which were consisted of knee extension tasks with four different contraction modes, which were 1) 50 repeated maximum voluntary contraction (MVC) of eccentric action (3 sec) with 3 sec relaxation (ET1), 2) 150 repeated MVC for 1 sec with 3 sec relaxation (ET2), 3) 50 repeated MVC for 3 sec with 3 sec relaxation (ET3), 4) 50 repeated 50%MVC for 6 sec with 6 sec relaxation (ET4). Before and after ET, the elongation of the tendon and aponeurosis of vastus lateralis muscle (dL) was directly measured by ultrasonography, while the subjects performed ramp isometric knee extension up to MVC.

Results and Discussion: After ET1 and ET2, there was no significant differences in dL between before and after. On the other hand, the extent of elongation tended to be greater after ET3 and ET4. These results suggested that the repeated muscle contractions made the tendon structures more compliant, thus the changes would be not affected by the force production level, but the duration of contractions.

key words: damage, vastus lateralis muscle, ultrasonography, in vivo

E61002 Effect of Increased Number of Maximal Eccentric Action on Muscle Damage

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PURPOSE: A large variability among subjects in response to eccentric exercise has been reported. It seems reasonable to assume that threshold of number of muscle actions to elicit muscle damage varies among subjects. The purpose of this study was to investigate changes in muscle damage indicators following 60 maximal eccentric actions of the elbow flexors for subjects whose responses to 12 maximal eccentric actions were small.
METHODS: Male students (n=14) who had no or small responses to 12 maximal eccentric actions of the elbow flexors (12ECC) performed 60 maximal eccentric actions (60ECC) approximately a year later. Changes in maximal isometric force of the elbow flexors (MIF), range of motion of the elbow joint, and circumference of the upper arm, muscle soreness, plasma creatine kinase (CK) activity and myoglobin concentration, B-mode ultrasound pictures of the elbow flexors were compared between 12ECC and 60ECC using a repeated measures ANOVA.
RESULTS: All measures changed significantly ($p<0.05$) after both 12ECC and 60ECC, but, the amount of change was significantly ($p<0.01$) larger after 60ECC compared to 12ECC. For example, the decrease in MIF immediately after 60ECC was 24% of preexercise value compared to 12ECC (70%), and the recovery rate by 4 days postexercise was lower for 60ECC (53%) compared to 12ECC (91%). The peak CK values after 12ECC was only 258±54 IU/L, but 15,573± 4,482 IU/L after 60ECC.
DISCUSSION: These results suggest that a larger number of eccentric actions induce more muscle damage to subjects whose muscle can tolerate a smaller number of eccentric actions. The threshold for inducing muscle damage varies among subjects, and the number of actions is a factor determining the level of muscle damage.
Key Words: muscle damage, CK activity, isometric force, muscle soreness