ANATOMICAL CHANGES OF THE HAMSTRING MUSCLES FOLLOWING ECCENTRIC EXERCISE

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The hamstring muscles (biceps femoris short head muscle (BFs), biceps femoris long head muscle (BFl), semitendinosus muscle (ST) and semimembranosus muscle (SM)) locate in the posterior compartment of the thigh. These muscles are long and multiarticular, and they are active during knee flexion, hip extension and tibial rotation. The architecture and innervation pattern of each muscle is different. In light of these considerations, we hypothesized that the each hamstring muscle would have different function and that the magnitude of the function would be different between proximal and distal regions of each individual muscle. The objective of this study is to determine the regional specific differences of the anatomical changes in the hamstring muscles following eccentric knee flexion exercise.

Twelve healthy young male volunteers (age: 23.7±1.8 yrs.) performed intensive eccentric knee flexion exercise. Maximum isometric knee flexion torque, plasma creatine kinase activity (CK) and muscle soreness were measured, and magnetic resonance (MR) imaging of the thigh were taken before and immediately after exercise, on the days 1st, 2nd, 3rd and 7th following the exercise. Cross-sectional area (CSA) and transverse relaxation time (T2) of the hamstring muscles were measured from the T2-weightened transverse spin-echo MR imaging sequences of the 30% (proximal), 50% (middle) and 70% (distal) thigh length.

The isometric torque decreased up to 25.8% immediately after the exercise and that was recovered to its initial values on the 7th day following the exercise. CK reached its peak value on the 3rd day. The muscle soreness of the BFl and ST reached its maximal values on the 2nd day following the exercise. CSA of the ST at proximal and middle regions showed significant increases (P<0.01, P<0.001, respectively) on the 3rd day, while there were no changes revealed in the BFl and SM. Immediately after the exercise, T2 value increased significantly in BFs, BFl and ST. On the 3rd day, T2 value of only ST increased significantly at proximal (P<0.01), middle (P<0.05) and distal (P<0.05) regions. The significant differences of the T2 value between proximal and distal region of the ST were revealed on the 2nd, 3rd and 7th days after the exercise (P<0.01).

Results of this study showed that anatomical characteristics led to the different changes of CSA and T2 values among the hamstring muscles and in the ST following the intensive eccentric knee flexion exercise, and that the proximal and distal regions of the ST might have different functional roles.

References:
Woodley and Mercer. Cells Tissues Organs.