DIFFERENT REGENERATION CAPACITIES OF SHANK MUSCLES AFTER FATIGUE ASSESSED BY PERIPHERAL NERVE STIMULATION

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Exercise in sports causes muscle fatigue which could be described as peripheral and/or central fatigue. A differential view between these two components of fatigue could be essential to evaluate the mode of action of adaptive processes in exercise training, prevention and rehabilitation. Muscle fatigue is known to be one of the main factors for muscular injury as well as failure of ligament structure of the joint system. Regarding joint injury prevention it is of special interest to get an insight in the potential of fatigue resistance and in the time course of regeneration in joint stabilizing muscles which stabilized the joint system due to their particular alignment between the origin and insertion point. However, there is no sufficient evidence about possible differences on fatigue resistance and regeneration behaviour in between muscle groups. Therefore, the aim of the study was to compare the fatigue resistance and the regeneration potential of different muscles using peripheral nerve stimulation. In 14 subjects the effect of maximal isometric fatigue on the aforementioned parameters of the m. soleus (SOL) and m. gastrocnemius (GAS) were investigated. H-reflex measurements were performed before and after muscle fatigue. This fatigue procedure which induces mainly central fatigue was conducted for 2 minutes. The subjects were instructed to perform maximal, isometric plantar flexion of the feet. After performing the H/M recruitment curve of the SOL, the stimulus intensity of 20% of M(max) was applied 2 minutes before fatigue in order to get the mean H-reflex amplitude of both the SOL and GAS muscle as control value. The time between each stimulus was 4 seconds. After the maximal, isometric fatigue procedure H-reflexes were elicited for 6-8 minutes by the same stimulus intensity used prior to fatigue. Maximal isometric fatigue resulted in significant reduction of the excitability of both motoneuron pools. The decrease in the SOL H-reflex amplitude was 69% higher than in the GAS (62%) without reaching statistical significance. The comparison of regeneration time revealed high significant differences between the SOL and the GAS muscles. Whereas the SOL H-reflex was recovered after 170 seconds, the excitability of the GAS motoneuron pool was already restored after 130 seconds compared to control level. The present results provide evidence that major differences in the regeneration potential between the SOL and the GAS muscles exist. It is likely that the muscle fiber composition in both muscles may be responsible for the different regeneration capacity. Previous studies showed that type II muscle fibers had a faster rate of resynthesis than type I muscle fibers. Taking into account that the muscle fibers spectrum of the m. gastrocnemius revealed more type II fibers than type I fibers whereas the m. soleus contains to a great extent type I muscle fibers, the aforementioned hypothesis could be verified.