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Alteration of Muscle Function After Electrical Stimulation Bout of Knee Extensors and Flexors

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ABSTRACT

The purpose was to study the effects on muscle function of an electrical stimulation bout applied unilaterally on thigh muscles in healthy male volunteers. One group (ES group, n = 10) received consecutively 100 isometric contractions of quadriceps and 100 isometric contractions of hamstrings (on-off ratio 6-6 s) induced by neuromuscular electrical stimulations (NMES). Changes in muscle torque, muscle soreness (0-10 VAS), muscle stiffness and serum creatine kinase (CK) activity were assessed before the NMES exercise (pre-ex) as well as 24h (d+1), 48h (d+2) and 120h (d+5) after the bout. A second group (control group, n = 10) were submitted to the same test battery than the ES group and with the same time-frame. The between-group comparison indicated a significant increase in VAS scores and in serum levels of CK only in the ES group. In the ES group, changes were more pronounced in hamstrings than in quadriceps and peaked at d+2 (quadriceps VAS scores = 2.20 ± 1.55 a.u. (0 at pre-ex); hamstrings VAS scores = 3.15 ± 2.14 a.u. (0 at pre-ex); hip flexion angle = 62 ± 5° (75 ± 6° at pre-ex); CK activity = 3021 ± 2693 IU·l⁻¹ (136 ± 50 IU·l⁻¹ at pre-ex)). The results of the present study suggested the occurrence of muscle damage that could have been induced by the peculiar muscle recruitment in NMES and the resulting overrated mechanical stress. The sensitivity to the damaging effects of NMES appeared higher in the hamstrings than in quadriceps muscles.

Key words: Electrical stimulation, DOMS, muscle contraction, muscle damage

Key Points

- A stimulation bout of quadriceps and hamstrings that reflects usual application of NMES, increases indirect markers of muscle damage (muscle soreness, muscle weakness and stiffness and serum CK activity).
- The occurrence of muscle damage could have been induced by the peculiar muscle recruitment in NMES and the resulting overrated mechanical stress.

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