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Manual therapy ameliorates delayed onset muscle soreness following the lengthening contraction and modulates muscle metabolites : an animal-model study

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【Purpose】
Manual therapy（MT）including manual compression has been widely accepted to be effective especially for musculoskeletal pain. Excessive muscle use（overwork）or unaccustomed exercise usually induces muscle pain expressed discomfort or soreness, which is called delayed onset muscle soreness（DOMS）. Although MT is recognized as a therapeutic intervention for DOMS, the mechanisms of analgesic effects remain unclear. To investigate physiological mechanisms of MT, we developed an animal model of MT（intermittent manual compression of muscles）for DOMS. Then, we analyzed the effects of MT on the metabolite-profiles of the exercised muscle.
【Methods】
Male Sprague Dawley rats, 6 week-old at the beginning of the experiments, were used. Following adequate handling, lengthening contraction（LC）was imposed on the rat gastrocnemius muscle by synchronous electrical stimulation of the muscle and mechanically forced dorsi-flexion of the ankle joint, which was repeated 500 times under the anesthesia. One day after LC, MT（compression by an experimenter's finger）was applied to the muscles of awake rats under pressure monitoring. To evaluate mechanical hyperalgesia in DOMS, withdrawal threshold was measured by Randall-Selitto apparatus and von Frey hairs. In the other groups of rats with and without MT after LC, we conducted metabolome analyses to analyze muscle metabolites of the muscles.
【Results】
The LC induced mechanical hyperalgesia 2-4 days after LC. Application of MT significantly ameliorated the mechanical hyperalgesia of DOMS. MT following the LC significantly altered metabolite profiles.
【Discussion】
In the present study, MT ameliorated DOMS in the rat gastrocnemius muscle. The present metabolome analyses for the first time demonstrated that the concentrations of the several metabolites in the muscles were altered following LC and/or MT. The present results along with the previous data suggest that ameliorative effects of MT might be mediated through alterations in muscle metabolites.