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Effects of vibration therapy on immobilization-induced hypersensitivity in rats

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【Purpose】

Cast immobilization induces mechanical hypersensitivity, which disrupts rehabilitation. The purpose of this study was to investigate the preventive and therapeutic effects of vibration therapy on immobilization-induced hypersensitivity.

【Methods】

Thirty-five Wistar rats (8-weeks old; all male) were used. The right ankle joints of 30 rats were immobilized by plaster casts for 8 weeks, and 5 rats were used as controls. The immobilized rats were divided randomly into three groups: 1) immobilization-only group (Im, n = 10), 2) vibration therapy group 1, with vibration therapy initiated just after the onset of immobilization (Im + Vib1, n = 10), and 3) vibration therapy group 2, with vibration therapy initiated 4 weeks after the onset of immobilization (Im + Vib2, n = 10). Vibration was applied to the hind paw for 15 min, once a day, for 5 days a week. The mechanical hypersensitivity and epidermal thickness of the hind paw skin were measured. To investigate central sensitization, the expression of the calcitonin gene-related peptide (CGRP) in the spinal cord and dorsal root ganglion (DRG) was analyzed.

【Results】

Immobilization-induced hypersensitivity was inhibited in the Im + Vib1 group but not in the Im + Vib2 group. Central sensitization, which was indicated by increased CGRP expression in the spinal cord and an increased DRG area with CGRP-positive neurons, was inhibited only in the Im + Vib1 group. Epidermal thickness was not affected by vibration stimulation.

【Discussion】

The reduction of CGRP over-expression in the spinal cord and DRG, which shows inhibition of the central sensitization, was observed in only the Im + Vib1 group. Our data suggested that the initiation of vibration therapy in the early phase of immobilization might inhibit the development of immobilization-induced hypersensitivity.