

Neuroplasticity in the spinal cord following laser irradiation

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Many reports have shown that laser therapy induces relief in a variety of inflammatory diseases. Moreover, muscle activity and anatomical structure changes were described after laser irradiation. However, the mechanisms involved in the therapeutic effects of laser irradiation remain undefined. It is to be mentioned that penetration of light quanta within muscles appears to be unlike. For this reason, we analyzed whether alterations in the muscles following laser irradiation may induce fine plastic changes within the spinal cord. In fact, light quanta are known to affect peripheral sensory fibres which project to the spinal cord, thereby modifying spinal cord connections and potentially motor neuron activity. In line with this, we investigated the biological effects of laser irradiation in normal tissues of male rats. In the present study the paws of Sprague-Dawley rats were irradiated with laser once a day for three consecutive days. Animals were sacrificed at different experimental times: 1, 15, and 30 days after the end of laser irradiation. Skin samples and spinal cord were dissected out and processed as routinely for light microscopy. On 7-micron thick sections we carried out histological and morphological analysis; in particular, we performed immunohistochemistry for Protein Gene Product (PGP) 9.5 on the skin sections to visualize neural fibres. In the spinal cord met-enkephalin immunostaining was carried out.

The laser irradiation induced no significant differences in the thickness of both epidermal and corneal layer and in the density of dermal papillae. In contrast, laser irradiation modified free nerve endings, while the morphology and density of Meissner corpuscles were not affected. In the dorsal horn of the spinal cord we observed an increase in met-enkephalin immunopositivity and in the number of neurons which lasted at long time interval following laser irradiation.

The present data suggest a possible modulation of neurochemical anatomy in the spinal cord after laser irradiation.

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Key words

Laser irradiation, rats, skin, spinal cord, pain relief.