

Pulsed Radiofrequency Increase Biomarkers Expression in the Lumbar Dorsal Root Ganglion of the Domestic Porcine

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Introduction. Pulsed radiofrequency (PRF) has been used for the treatment of chronic lumbar radicular pain and other chronic pain states for over a decade, and its popularity has increased significantly in recent years. PRF can be considered when conventional treatments have intolerable side effects or do not sufficiently relieve pain. The clinical effectiveness of PRF was demonstrated in various good quality randomized control studies, but mechanisms of action remain unclear. Dorsal root ganglion (DRG) consists of primary afferent somatic and visceral nerve cell bodies that relay sensory information from the periphery to the central nervous system. It is a very important part of acute nociception as well as the development and maintenance of chronic pain.

Aim. The aim of the study is to evaluate the expression of biomarkers in gangliocytes of the domestic porcine dorsal root ganglion (DRG) after PRF.

Material and methods. A total of 7 domestic porcines were investigated. Under general anaesthesia and X-ray control, DRG PRF was performed. Four lumbar DRGs (L1, L2, L3, L4) were randomly treated. The opposite side DRGs was used as control. One month after the procedure the animal was euthanized. The lumbar region of the spine was placed in 10% formaldehyde for a month. After this fixation DRG samples were prepared for slide analysis. They were embedded in paraffin in order to obtain 3 µm thick sections, which were then cut by microtome and collected on slide glasses. Using standard immunohistochemical reactions, the materials were tinted to define biomarkers nestin (Nes, code-Nr. AB 5968, dilution 1 : 250, rabbit, Abcam, UK), matrix metalloproteinase 2 (MMP 2, code-Nr. DUB 03, dilution 1 : 100, goat, RD, GE) expression and apoptosis by transferase-mediated dUTP nick-end labeling (TUNEL, code-Nr. 11684817910, dilution 1 : 10, Roche, DE) analysis.

Results. The number of cells with Nes (28.4 ± 3.3 vs. 16.1 ± 3.4 ; $p < 0.05$), MMP 2 (26.2 ± 3.2 vs. 14.1 ± 2.3 ; $p < 0.05$) expression, were larger in the PRF side comparing with the control side. Additionally, also glial cells in spinal ganglia of both sides demonstrated immunoreactivity. The instances of apoptosis were not significantly different, in statistical terms, between the control and experimental sides (18.0 ± 4.0 vs. 20.0 ± 4.0 ; $p = 0.35$).

Conclusions. Increasing of MMP-2 containing gangliocytes one month after PRF procedures underline on active neural cell proliferation. PRF in spinal gangliocytes of lumbar region increases Nes factor expression and indicates for neural remodeling and regeneration. Similar number of apoptotic cells in spinal ganglia of lumbar region after PRF and control side suggests inhibitory role of PRF on programmed cell death and stimulation of cell survival.