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Hypothermic neuroprotection in preclinical model of spinal cord injury

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Acute traumatic spinal cord injury (SCI) causes significant neuropathological deficits with limited regeneration, depending on the degree of neuronal tissue destruction. Our study was aimed to i) characterize a preclinical model of SCI (8N, 15N and 18N force) at L3 level in minipig using computer-controlled compression apparatus, ii) optimize conditions of local cooling of the spinal cord at the site of injury, and iii) to find out whether hypothermia applied at defined temperature (for 5 h) will have beneficial effect on the gray and white matter sparing, the number of neurofilaments and neurological outcome. Hypothermia was performed locally through perfusion chamber with 4°C saline solution perfusion, oxygenated culture medium or enriched medium. The animals were behaviorally assessed during 9 weeks of survival. We have found that saline hypothermia leads to a gray and white matter sparing, and to substantial sparing of neurofilaments in segments away (rostrally +3, +2, +1 and caudally -1, -2, -3) from the lesion site, i.e. in spinal cord sections that are likely to be affected by secondary injury. In particular, we have shown that saline hypothermia after 8N SCI, causing the sparing of axons in lateral funiculi at +1 and -1 (improvement by 25% and 19%), showed favorable neurological outcomes. Such improvements were not observed in the group subjected to more severe SCI. The application of local hypothermia in computer-controlled minipig compression model provides data analogous to impact of such treatments in patients.

Biography

Nadežda Lukáčová, DSc, is Head of Laboratory of Neurochemistry and Neurophysiology at the Institute of Neurobiology, Slovak Academy of Sciences. Her research focuses on the role of signaling molecules in the brain and spinal cord circuitry under physiological and pathological conditions. She has published more than 80 papers in peer-reviewed journals. Currently, she is a Garant of ongoing accredited program of doctoral studies in the field of Animal Physiology. She is experienced in the project management within both, national and international grant schemes.

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