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Systemic administration of Mesenchymal Stem Cells-derived Microvecicles stimulates the recovery of motor function and supports Oligodendrocytes in dose-dependent manner after Spinal Cord injury

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Statement of the Problem: Spinal cord injury (SCI) is a serious neurological condition that causes severe disability. One of the approaches to overcoming the complications of SCI is stem cell-derived extracellular vesicle therapy. In this research, we performed a comparative evaluation of rat spinal cord post-traumatic regeneration efficacy using different methods of Mesenchymal Stem Cell-derived EVs (MSC-EVs).

Methodology and Theoretical Orientation: The animals were divided into two control and four experimental groups. EVs transplantation was performed as follows: animals of the first and second experimental groups received 5 μg and 10 μg of MSCs-EVs encapsulated in fibrin matrix after injury - SCI FM+EVs5 and SCI FM+EVs10, accordingly; animals of the third and fourth experimental groups 30 minutes after injury were injected intravenously 10 μg and 50 μg of MSCs-EVs in 500 μl of 0.9% NaCl - SCI EVs10 and SCI EVs50, accordingly. Motor activity was assessed throughout experiment. On day 60 after SCI, expression of oligodendrocytes were quantified.

Findings: The results showed that in the SCI EVs50, Olig2 expression was higher in the area of the ventral horns compared to the control groups; there was also an increased level of Olig2 expression in the ventral funiculi in the SCI EVs10 and SCI EVs50. In the area of the lateral funiculi, Olig2 expression in the SCI EVs10 and SCI EVs50 were also higher than in the control groups. The index of motor function recovery in the groups with intravenous injection of EVs had increased more than 2-fold compared to the corresponding index in the control groups.

Conclusion and Significance: The results of this study show that treatment with EVs isolated from MSCs stimulated the recovery of motor function. Increasing of Olig2-expressing cells was observed in the gray and white matter of the SC, which indirectly indicates the stimulation of myelination.

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