

COMPARISON OF CEREBROPROTECTIVE ACTION OF MESENCHYMAL STROMAL CELLS OF DIFFERENT ORIGIN AND LYSATE FROM HUMAN WHARTON JELLY MSC IN POST-PERFUSION LESIONS OF THE SENSORIMOTOR CORTEX OF RATS

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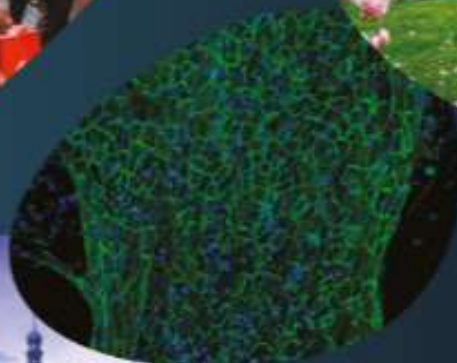
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INTRODUCTION

One of the main causes of stroke in acute cerebrovascular accident is ischemia, which begins with the formation of acute neuronal energy deficiency with subsequent activation of "ischemic cascade" reactions, which leads to irreversible damage in nerve tissue. But the restoration of perfusion of ischemic tissue contributes to the deepening of metabolic disorders in the brain, which leads to the formation of reperfusion damage. In view of this, it was expedient to characterize and compare the effect of different origin mesenchymal stromal cells (MSC) and lysate from human Wharton jelly (WJ) MSC on neuroapoptotic changes in the sensorimotor cortex of rats in the conditions of model ischemia-reperfusion (IR) by flow cytometry – one of the best methods for assessing the fragmentation of neuronal DNA.

METHODS

An experiment was performed using Wistar 4-month-old rats (males) weighting 160-190 g, which underwent a transient bilateral 20-minute IR of the internal carotid arteries. After modeling the pathology, the animals were injected into the femoral vein (IV) with MSCs obtained from human umbilical cord WJ, human and rat adipose tissue. Other groups of experimental animals were injected intravenously with rat fetal fibroblasts in 0.2 ml of saline and lysate of WJ MSCs at a dose of 0.2 ml / animal. Control animals were injected intravenously with 0.2 ml of saline. The level of DNA fragmentation in the nuclei of neurons of the sensorimotor cortex of rats on the 7th day after ischemia-reperfusion was investigated by flow cytometry. The study was performed on a flow cytometer "Partec PAS", Partec, Germany. An ultraviolet lamp was used to excite the fluorescence of the nuclear DNA label – diamidinophenylindole, 10,000 events were analyzed from each sample of nuclear suspension. Flow analysis of DNA fragmentation was performed using FloMax software (Partec, Germany). The statistical significance of the differences was assessed by Student's t-criterion.

RESULTS

The study showed that in the groups with transplanted MSCs of different origin and MSC lysate, the intensity of DNA fragmentation in the nuclei of sensorimotor cortex neurons reliably decreased. In 7 days the decline was 1.8 - 2.6 times compared with group without treatment. Transplantation of MSCs derived from WJ and human adipose tissue, rat fibroblasts and MSCs from rat adipose tissue, as well as lysate from human WJ MSCs, had a similar cerebroprotective effect on rats with IR. This was indicated by a significant reduction of DNA fragmentation in the nuclei of the brain sensorimotor cortex neurons during study period by an average of 58.98%, 56.11%, 61.78%, 43.45% and 47.13%, respectively ($p < 0.05$).