

Effect of Mesenchymal Stem Cell Transplantation on the Reactivity of Smooth Muscle Cells of Pial Arteries of Nephrectomized Rats

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The aim of the work was to evaluate the deterioration of the functions of smooth muscle cells of pial arteries after subtotal nephrectomy and the possibility of the recovery of their functions by transplantation of human mesenchymal stem cells (hMSC). Using the device for studying microcirculation (160× magnification), the reactivity of pial arteries in the sensorimotor cortex to hydrogen sulfide, to the non-selective inhibitor of NO-synthase L-NAME, and simultaneously to H₂S and L-NAME was studied in nephrectomized and sham-operated rats, as well as in nephrectomized rats after hMSC transplantation. In parallel, the myogenic tone of cerebral vessels was measured using a LAKK-M laser Doppler. The results demonstrate that 4 months after nephrectomy, the reactivity of pial arteries to H₂S is drastically deteriorated, as the number of dilated arteries decreased by 1.2–1.7 times, and the reactivity to L-NAME is also impaired, since the diameter of arteries reduced at 6–17%. Myogenic tone of cerebral vessels after nephrectomy was 1.5 times higher than in control rats. Intravenous hMSC transplantation preserved the myogenic tone and reactivity of smooth muscle cells at the same level as in the control. Thus, MSC administration allowed sustaining the functions of smooth muscle cells after the nephrectomy.

Keywords: nephrectomy, brain, intravenous transplantation, mesenchymal stem cells, smooth muscle cells, myogenic tone