

Application of stem cells perineural migration in patients with stroke

Abstract

Introduction: Cell technologies represent a perspective direction due to activation of endogenous reparative processes. Correction of impaired brain functions using stem cells is one of the most effective methods in complex therapy of neurodestructive processes.

Methods: Endoscopic perineural application of autologous mesenchymal stem cells (MSCs) as supplementary therapy in patients with stroke.

Results: 42 patients (27-73 y.o.) received 3-4 intranasal submucosal applications (injections of autologous MSCs in 10 ml of suspension, $\sim 12 \times 10^6$ cells per injection) with 5-9 days interval. According to NIHSS, all patients demonstrated progressive relief of neurological symptoms. This pilot project was performed as per guideline developed by the authors ("The method of stroke treatment using autologous mesenchymal stem cells from adipose tissue", No242-1218, the Ministry of Health of the Republic of Belarus, 2018).

Conclusion: There were no cases of repeated stroke observed within the first year of observation.

Keywords: stroke, mesenchymal stem cells, patient, perineural migration, somatotopic principle, treatment

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Letter to Editor

Current therapy of stroke patients is not effective enough.¹ Most of these patients experience performance decrement for a long period.^{1,2} This speaks for the need of new medical techniques development. Cell technologies represent a perspective direction due to activation of endogenous reparative processes.^{3,4} Central migration and somatotopic distribution of MSCs in damaged brain areas after MSCs application to peripheral branches of cranial nerves was experimentally proved.⁵⁻⁷ For example, MSCs are revealed in damaged regions of anterior cranial fossa (namely, olfactory bulbs) after their submucosal application at superior nasal concha.⁸⁻¹⁰ And in contrast, application of MSCs to Meckel's cave (Gasser's node, trigeminal nerve) or perineural parts of vagus is followed by migration of cells to damaged nuclei in posterior cranial fossa.^{8,9}

Somatotopic principle of perineural MSCs migration to damaged brain areas was used in adjuvant therapy of patients with stroke.¹¹⁻¹⁴ The place of MSCs application depends on localization of damaged area: localization in anterior cranial fossa requires cells application to submucosa of superior nasal concha and localization in posterior cranial fossa – to inferior one. The advantage of this approach lies in its methodological simplicity and targeted delivery of cells to damaged areas – the main difference from the other methods of stem cell therapy (e.g. intracerebral or intrathecal applications).^{3,4}

In total 42 patients (27-73 y.o.) were subjected to this adjuvant therapy. Each patient received 3-4 intranasal submucosal applications (injections of autologous MSCs in 10 ml of suspension, $\sim 12 \times 10^6$ cells per injection) with 5-9 days interval. Autologous MSCs were separated from adipose tissue of patient's periumbilical area. Severity of stroke and recovery process were categorized using the NIH Stroke Scale Score.¹⁵ According to NIHSS, all patients demonstrated progressive relief of neurological symptoms. There were no cases of repeated stroke observed within the first year of observation.

Supplementary materials contain [video records](#) of patient M.

before and in 45 days after the course of therapeutic procedures, including intranasal application of autologous MSCs.

Video statement

Subject was consented for video recording and subsequent publication.

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Conflicts of interest

All listed authors concur with the submission of the manuscript; all authors have approved the final version. The authors have no financial or personal conflicts of interest.

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