

A NEW APPROACH IN THE TREATMENT OF OPTIC NERVE ATROPHY USING MESENCHYMAL STEM CELLS. A SYSTEMATIC REVIEW

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Background. Tissue engineering is a progressing field that unites cells, biomaterials and biochemical factors focused at replacing, maintaining and substituting different kind of tissues. A major role is played by the use of the stem cells in various fields of medicine, including ophthalmology, namely in cases of the optic nerve atrophy. The optic nerve atrophy is the most important cause of decreased visual acuity and blindness. It is considered that the use of the stem cells can be an important new strategy in the treatment of the optic nerve atrophy, as the stem cells restore the structure and the function of the optic nerve due to the organotypic tissue induction and vascularization. The optic nerve atrophy is caused by irreversible apoptosis of the neuronal cells. In the absence of a specific treatment of the optic nerve atrophy, the current therapies are based on the etiological cause or complications. Considering the availability of the advanced therapies, the therapy using stem cells offers a new approach in the treatment of the optic nerve atrophy.

Aim of study. The evaluation of the latest advances of using mesenchymal stem cells based on clinical trials that included patients with optic nerve atrophy. Methods and materials. This study is a literature review, based on synthesis of clinical trials published in the period between 2009-2023. This article includes publications identified through Google Search Engines, PubMed Databases, National Bibliometric Tool, etc. The information was systematized, highlighting both aspects of the use of mesenchymal stem cells in the pathologies associated with the optic nerve atrophy, as well as the results of 24 clinical trials published on clinicaltrials.gov.

Results. Current treatment of the optic nerve atrophy is based on the etiological causes or late complications. Reviewing the accessibility of up to date therapies, stem cell therapy offers a new attitude in the treatment of the atrophy of the optic nerve. Being easy to collect and cultivate, mesenchymal stem cells are most often used in regenerative medicine, they can be induced to differentiate into cartilage, tendons, adipose tissue and other cell lines. Mesenchymal stem cell collecting has no ethical issues compared to embryonic stem cell harvesting. Also, mesenchymal stem cells are considered to be immunoprivileged because the major histocompatibility factor II is not expressed on their surface, and this great advantage allows the use of mesenchymal stem cells in autologous or allogenic form. Mesenchymal stem cells produce growth factors with paracrine action that are thought to activate endogenous repair mechanisms, due to these features mesenchymal stem cells have been used in several clinical studies in optic nerve disorders where immunomodulatory and neuroprotective properties have been revealed. All of the properties mentioned above stand for the clinical use of mesenchymal stem cells in case of optic nerve atrophy.

Conclusion. The clinical use of the stem cells is a significant chance for the regeneration of pathologically modified tissues. This fact requires further studies to establish how to use the cell therapy in the case of optic nerve atrophy.

Keywords: stem cells, optic nerve, atrophy, blindness.