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STIMULATION THERAPY OF GLAUCOMA BY COMPLEX-STRUCTURED (FRACTAL) OPTICAL SIGNALS

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Purpose: To evaluate the effect of low-intensity photo-stimulation with complex-structured optical signals on visual functions in patients with glaucoma.

Methods: For the stimulation, LED emitters embedded in virtual reality glasses were used, which forms light signals of complex structure with a given fractal dimension. In groups with suspected glaucoma (4 eyes), early primary open-angle glaucoma (POAG Ia, n=5), POAG IIa (n=13), and POAG IIIa (n=17), light stimulation was applied daily: course included 10 séances of 10min. Before and after the course of fractal stimulation, visual fields and colour recognition were examined with standard automatic perimetry (SAP) and the Farnsworth Munsell 100 Hue Colour Vision Test (FM).

Results: In the SAP, mean deviation (MD), which in norm should not exceed −2 dB, before / and after the treatment in averaging for groups of suspected glaucoma, POAG Ia, IIa and IIIa were, respectively, -0.48/-0.43dB, -1.68/-1.38dB, -3.42/-1.75dB, and -14.37/-9.98dB. The pattern standard deviation (PSD) before / and after the treatment for groups with suspected glaucoma, POAG Ia, IIa, and IIIa were, respectively, -1.87/-1,76dB, -1.84/-1.77dB, -1.99/-1.89dB and -6.58/-6.28dB. The FM test was applied to estimate the errors in recognition of green, blue, yellow colours (TES). Before / and after the treatment, the TES data for four mentioned groups consisted, respectively, -12.00/-7,50, -13.60/-11,40, -20.62/-18,62, and -36.53/-32,35.

Conclusion: Low-intensive fractal photo-stimulation significantly improves the SAP indices and colour recognition in eyes with different stages of glaucoma. The pronounced effect of fractal stimulation for the advanced POAG can indicate that at any stage of glaucoma, in the general population of ganglion cells there is a significant percentage of cells that are yet at the plastic phase of reversible functional changes and capable of responding positively to medical or physical neuroprotective therapy. Further confirmation of the stability of effects is required in studies on a more massive cohort.

Biography

Marina V Zueva, Professor of Pathophysiology received her PhD and Biological Science D from Moscow Helmholtz Research Institute of Eye Diseases. Currently, she is the Head of the Division of Clinical Physiology of Vision at the Moscow Helmholtz Research Institute of Eye Diseases. She is a member of International Society of Clinical Electrophysiology of Vision (ISCEV), European Association on Vision and Eye Research (EVER), European Society of Retina Specialists (EURETINA), Society for Research on Biological Rhythms (SRBR). She has published over 15 peer-reviewed full-length papers in English (over 100 in Russian) and presented near 70 topics at international conferences.

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