

## The Results of the Usage of Electro Stimulation in Neuroprotective Therapy of the Glaucomatous Optic Neuropathy

Saidov T.T<sup>1</sup>., Yangieva N.R<sup>2</sup>., Khamidullaev F.F<sup>3</sup>., Nizomov O.A<sup>4</sup>.

<sup>1</sup>Samarkand State Medical Institute, Uzbekistan

<sup>2</sup>Tashkent State Dental Institute, Uzbekistan

<sup>3</sup>Samarkand State Medical Institute, Uzbekistan

<sup>4</sup>Samarkand State Medical Institute Uzbekistan

*Email: temur.saidov.90@mail.ru*

**Annotation.** Glaucoma is a chronic progressive optic neuropathy with characteristic morphologic changes in the head of optic nerve and progressive death of retinal ganglion fibers with narrowing of the visual field. Effective decrease of IOP is not able to serve as a guarantee of stabilization of glaucomatous process that continue to progress in part of patients. Thus, a search of a new direction of the drug therapy is needed because of the fact that hypotensive therapy is not completely effective. The most perspective of them is neuroprotection in combination with percutaneous electrostimulation that protect neurons of the retina and nerve fibers of optic nerve from different damage factors.

**Aim.** To assess the effectiveness of percutaneous electrostimulation in complex neuroprotective treatment of the glaucomatous optic neuropathy

**Materials of the research.** The study is based on the results of 50 (90 eyes) patients that were examined with GON in condition with compensate IOP aged 18 to 55 years. Compensation of IOP was reached by medicinal, laser and surgical ways. All patients were divided into two homogeneous groups depending on the stage of primary open angle glaucoma and age of patients. In control group 25 (44) eyes took traditional therapy during 10 days in the scheme of which a preparation «Retinilamine» was included. In the study group 25 (46 eyes) patients along with traditional therapy took endonasal electrophoresis with preparation of «Tanakan» 1 time per day and percutaneous electrostimulation with a help of ESOM apparatus that based on the usage of a rectangular negative impulse with duration 1-10 ms, following with frequency 5-30 Hz and amplitude 10-1000  $\mu$ A during the 10 days. A 4-6 series with 15-45 sec and interval among 30-60 sec were carried out on the each eyeball.

**Results.** Clinical and functional assessment of the complex treatment of glaucomatous optic neuropathy with injection of preparation «Tanakan» via endonasal electrophoresis in combination with percutaneous electrostimulation according to OCT and computer perimeter findings demonstrate reliable improvement of the average visual field and index of computer perimeter such as MD and PSD, as well as improvement indications of optical coherence tomography, especially RNFL compare to initial ones and prove effectiveness of the proposed therapy.

**Conclusion** According to our results, inclusion of endonasal electrophoresis with tanakan following with percutaneous electrostimulation in complex treatment of glaucomatous optic neuropathy has the effect of protecting from detrimental influence of IOP to retina, promotes prolongation of the main treatment and recovery of visual function of the eye. Given method associate with percutaneous electrostimulation has sufficient comfort, cost-effectiveness, fast and stable positive effect and can be used in both inpatient and outpatient condition

**KEYWORDS:** GON, OCT, ERG, MD, PSD, Tanakan, endonasal electrophoresis, electrostimulation.

**Relevance** A term of glaucoma unites a group of diseases with different ethology, but they comprises a set of general features in pathogenesis, clinics and methods of treatment. A distinctive symptoms of glaucoma are elevated intraocular pressure over the level of tolerance for head of optic nerve, development of glaucomatous optic neuropathy and appearance of the typical visual fields defects [A.P.Nesterov, 2005]. A considerable increase of the morbidity rate of glaucoma all over the world and leading role in forming irreversible blindness is made up medico-social importance in the given pathology [H.A.Quigley at al., 2006; J.Goldberg, 2000].

The main therapeutic purpose in glaucoma is to protect visual functions and quality of patient's life in condition with minimal side effects, acceptable therapy and the cost effectiveness of the drugs. Neurodystrophic nature of glaucomatous optic neuropathy determines a necessity of the usage of a new effective pharmacologic drugs with neuroprotective properties because of the fact that degenerative process in glaucoma that effects a nerve tissue extends to subcortical center, especially to lateral geniculate body [4,5,6].

A search of methods and preparations with prolong and stable effectiveness as well as an optimal tolerance and minimal amount of side effects are tend to be continued. A methods of treatment of glaucomatous optic neuropathy that enables a delivery of medical substance to the target organ presence a special interest [1,2]. Neuroprotective therapy is directed to correction of metabolic disorder that occurs in the head of optic nerve during the glaucoma process and to improvement of local microcirculation and tissue trophic, normalization of rheological properties of blood and improvement of main and collateral blood circulation [7,8,9,].

One of the perspective direction in clinical medicine is the usage of a new groups of drugs - biogenic peptides such as cortexin, retinylamine, as well as extract of Gingko Bilabo 761 (tanakan), that possesses especially antioxidant, antiexitotoxic, blocking calcium channel and neurotropic influence. In complex neuroprotective treatment of glaucoma associate with extract of Gingko Bilabo Egb 761 is recommended the usage of preparations such as picamilon, emoxipin, histochrome. These days, considering delayed, cumulative effect of extract of Gingko Bilabo Egb 761 that is achieved during prolonged systematic usage, it is advisable to increase effectiveness because of targeted delivery with a help of endonasal electrophoresis[5].

The works of the last years demonstrate positive prolonged effect of electrostimulation in treatment of glaucomatous optic neuropathy. Improvement of visual function is based on both

restoration of the conductivity of visual functions and disinhibition of the early differentiated visual cortex and restoration activated and regulated of it on the functioning the whole visual system. Electrostimulation restores conductivity of the nerve fibers, improves blood supply of affected nerves, has an antiparabiotic effect on the nerve fibers that contributes to the normalization of the electro excitability of the damaged nerve[2,3]. Consequently, the method based on combined effect of galvanic current and pharmaceutical substance on the one hand and electrostimulation on the other hand presence a great interest in neurodegenerative process of the posterior segment of the eye and is considered to be indispensable chain to work out reasonable complex and more effective neuroprotection.

**Aim** To assess the effectiveness of electrostimulation in complex neuroprotective treatment of the glaucomatous optic neuropathy

## **MATERIALS AND METHODS**

**Materials** The study was carried out in clinic Sam MI in eye diseases department associate with Samarkand regional specialized eye hospital and private clinic « Sphere» . 50 (90 eyes) patients were examined with GON in condition with compensate IOP aged 18 to 55 years. Compensation of IOP was reached by medicinal, laser and surgical ways. All patients were divided into two homogeneous groups depending on the stage of primary open angle glaucoma and age of patients. In control group 25 (44) eyes took traditional therapy during 10 days in the scheme of which a preparation « Retinilamine» was included in the study group 25 (46 eyes) patients along with traditional therapy took endonasal electrophoresis with preparation of «Tanakan» 1 time per day and electrostimulation with a help of ESOM apparatus that based on the usage of a rectangular negative impulse with duration 1-10 ms, following with frequency 5-30 Hz and amplitude 10-1000  $\mu$ A during the 10 days. A 4-6 series with 15-45 sec and interval among 30-60 sec were carried out on the each eyeball.

**Methods of the examination** All patients were carried out: visometry, ophthalmoscopy, biomicroscopy, computer perimeter, optical coherence tomography «Cirrus HD-OCT 4000» before treatment, after 1 and 3 month. Topographical findings of the head of optic nerve (the degree of pathological excavation) and the thickness of the nerve fiber layer ( in the four quadrants and meridians) were assessed with OCT. The results of scanning were demonstrated with parameters such as square of the optic nerve and neuro-retinal rim, the volume of excavation, different correlation ( correlation of the excavation square to square of optic nerve) and others. As other methods, in OCT is also carried out comparison results of a determined patients with similar parameters in a healthy population with purpose of monitoring in dynamic of glaucomatous optic neuropathy.

Analyzer of the Humphrey visual field is considered to be “ gold standard” of the automated computer perimeter all over the world. A number of criteria enabling to analyze dynamics of the glaucomatous process was used to assess progression of the visual field defects. The usage of the given findings are considered to be perspective for assessment of neuroprotective therapy. Statistical processing of materials was carried out using software Statistica for Windows.

## RESULTS AND DISCUSSIONS

The results of statistical analysis demonstrated overall decrease of the symptoms accompanied with glaucomatous optic neuropathy after usage of percutaneous electrostimulation in combination with endonal electrophoresis. Thus a stabilization of visual function was reached ( visual acuity, visual field, a subjective perception of dryness and burning in the eyes had a tendency to decrease, according to findings of accomodametry, visual fatigue was decreased) (table 1-3)

Table №1

Dynamics of the visual acuity indications in patients with glaucomatous optic neuropathy of the both groups in a variety periods of the observation (M±m)

Observation of groups	Period of observation		
	Before treatment	After treatment	After 3 month
Control group	0,06 ± 0,02	0,07 ± 0,01	0,09 ± 0,01*
Study group	0,07 ± 0,01	0,09 ± 0,01	0,2± 0,04*

Note: \*p<0,05 — compare to initial indications

Table № 2

Dynamics of the borders of the average visual fields in patients with glaucomatous optic neuropathy of the both groups in a variety periods of the observation (M±m)

Observation of groups	Period of observation		
	Before treatment	After treatment	After 3 month
Control group	265° ± 25°.	285° ± 35°.	310±20
Study group	268° ± 28°.	0,09 ± 0,01	385 ± 20*

Note: \*p<0,05 — compare to initial indications

Table № 3

Observation of groups		Period of observation		
		Before treatment	After treatment	After 3 month
Control group	MD	10,48± 2,45dB	9,43± 2,35dB	8,68± 2,15dB
	PSD	12,67± 3,35dB	11,57± 3,12dB	10,67± 3,32dB
Study group	MD	10,12± 2,15dB	8,23± 2,55dB	5,53± 1,65dB*
	PSD	11,97± 3,11dB	9,54± 3,10dB	8,67± 2,42dB*

Note: \*p<0,05 — compare to initial indications

As could be glanced from the table chart, The average visual acuity of patients in two groups before treatment was  $0,06 \pm 0,02$ . In the control group of patients on the third months of research visual acuity improved to  $0,09 \pm 0,01$ , that was 1,5 times higher than the initial number. In the main group figures for visual acuity increased to  $0,2 \pm 0,04$  that was 3,33 times higher than the initial number. The average visual field of patients before treatment in two groups was  $265^\circ \pm 25^\circ$ . In control group on the 3 months visual fields increased up to  $310 \pm 20$  that was 1,16 times higher than initial number, in the main group this index was 1,43 times higher than initial number and made up almost  $385 \pm 20^\circ$  ( $p < 0.05$ ). Results of computer perimeter on the apparatus Humphrey by the method SAP according to 30-2 program demonstrate a considerable decrease of the integral index of the mean deviation of the level of light sensitivity in visual field out of age norm (MD). In addition to quantity and degree of the local changes (PSD) that vary within  $-10,48 \pm 2,45$  dB и  $12,67 \pm 3,35$  dB before therapy in both groups and decreased to  $-8,68 \pm 2,15$  dB и  $10,67 \pm 3,32$  dB in control group and  $5,53 \pm 1,65$  dB и  $8,67 \pm 2,42$  dB in main one respectively that showed improvement within 1,2 times from initial indicator in both integral indexes that was confirmed in reliable coefficients where points below 5% became reliably lower than points with level of 1% in control group. While in the main group both indexes improves on 1,9 and 1,46 times respectively that was confirmed by steady decrease of the both points of reliability coefficient with level 5% and 1%. It should be noted that index PSD was tend to lose its informativeness at patients with III stage of the primary open angle glaucoma, however this indicators had low statistic importance. Ratio of the dynamics Ex/D and the square of neuroretinal rim (NRR  $\text{mm}^2$ ) according to the findings of OCT in the main group before treatment was  $0,55 \pm 0,06$  and  $0,74 \pm 0,07$  ( $p < 0.05$ ), after treatment given indicators were within  $0,48 \pm 0,04$  and  $0,84 \pm 0,04$  ( $p < 0.05$ ) respectively, indicator of the average thickness of peripapillary layer of retinal nerve fiber (RNFL  $\mu\text{m}$ ) in the main group before treatment was  $82,97 \pm 4,4$  after treatment this index was equal to  $97,5 \pm 3,8$ .

## CONCLUSION

According to our results, inclusion of endonasal electrophoresis with tanakan following with electrostimulation in complex treatment of glaucomatous optic neuropathy has the effect of protecting from detrimental influence of IOP to retina, promotes prolongation of the main treatment and recovery of visual function of the eye. Given method associate with electrostimulation has sufficient comfort, cost-effectiveness, fast and stable positive effect and can be used in both inpatient and outpatient condition

## REFERENCE:

- [1] Bakhritdinova F.A., Agzamov S.S., Karimov U.R. Early results of neuroprotective treatment of primary open angle glaucoma. III Common national Russian ophthalmologic forum. Collection of works of scientific and practical conference with international participation dedicated to 110- year anniversary of Helmholtz Moscow Research Institute of Eye Diseases. – 2010. – vol.1
- [2] Bakutin I.V., Bakutin V.V., Kirichuk V.F. and others. Clinical and experimental research of the influence of dynamic electroneurostimulation on the eye hydrodynamics

- // Materials of the 14-th international scientific school regarding optics, laser physics and bio phonetics. – Saratov: Noviy veter, 2010. – page 63-67
- [3] Bakutin I.V., Bakutin V.V., Kirichuk V.F. and others. Influence of dynamic electrostimulation on the function of the human ciliary body. // Human and pharmacy. XVIII Russian national congress: collection of materials. – M., 2010. – C 40
- [4] Kurisheva N.I. Neuroprotection and neurodegeneration: perspective in treatment of glaucoma. M. – 2014. Vol.3. – page 16 -17.
- [5] Robert,N. Glaucoma neuroprotection: What is it? Why is it needed? // Can. J. Ophthalmol.- 2007.- v. 42
- [6] Tayebati S.K., Di Tullio M.A., Tomassoni D., Amenta F. Neuroprotective effect of treatment with galantamine and choline alphoscerate on brain microanatomy in spontaneously hypertensive rats.-2009.-v.283.- №1-2.-p. 187-194
- [7] Chung H.S., Harris A., Evans D.W., Kagemann L., Garzosi H.J., Martin B. Vascular aspects in the pathophysiology of glaucomatous optic neuropathy// Surv–Ophthalmol.- 1999.- T.43.- c.43–50.
- [8] Mozaffarieh M, Grieshaber M.C., Flammer J. Oxygen and blood flow: players in the pathogenesis of glaucoma// Mol. Vis.-2008.-v. 14.-p. 224–233.
- [9] Yucel YH, Zhang Q, Weinreb RN, Kaufman PL, Gupta N. Atrophy of relay neurons in magno- and parvocellular layers in the lateral geniculate nucleus in experimental glaucoma// *Invest. Ophthalmol. Vis. Sci.*-2001.-v. 42(13).-p. 3216–3222