The American Journal of Medical Sciences and Pharmaceutical Research
(ISSN – 2689-1026)
Published: March 17, 2021 | **Pages:** 12-19
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-02

IMPACT FACTOR
2021: 5. 64
OCLC - 1121105510

Journal Website: http://usajournalshub.com/index,php/TAJMSPR

Clinical And Functional Effectiveness Of Endonasal Electrophoresis In Combination With Electrostimulation In Complex Therapy Of Glaucomatous Optic Neuropathy

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ABSTRACT

The aim of the study was the clinical and functional assessment of the complex treatment of glaucomatous optic neuropathy with the administration of the drug tanakan in the form of endonasal electrophoresis in combination with electrical stimulation according to IST and ultrasound Doppler mapping. We examined 43 (74 eyes) patients with GON aged from 58 to 76 years. The results of the study showed that this method effectively delays the development of optic nerve atrophy and, along with the improvement of visual functions, lengthens the positive effect of the main treatment, which was confirmed by a significant improvement in hemodynamic parameters according to the ultrasound Doppler study.

KEYWORDS

Glaucoma optic neuropathy, retinoprotection, endonasal electrophoresis, electrical stimulation.

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INTRODUCTION

Glaucoma is one of the most severe eye pathologies, ranking third in the world among the causes leading to irreversible blindness [10, 11, 1] . According to domestic authors in Uzbekistan, the increase in the incidence of primary glaucoma among the population over 40 reaches 1.5-2.5%. Open-angle glaucoma occurs in 20.1% of cases, angle-closure glaucoma (ACG) in 29.9% of cases. In our Republic, according to D.M. Tuychibaeva (2004), the proportion of disability due to primary glaucoma is 14.8%, causing the second place in the structure of all primary visual disability.

In the recent past, the disease was considered exclusively as a pathology of increased intraocular pressure (IOP), but now it is quite obvious that this is only one of many risk factors, albeit a leading one. Numerous scientific studies have shown that an effective decrease in IOP cannot serve as a guarantee of stabilization of the glaucoma process, which continues to progress in some patients. The main reason for the deterioration of visual functions in patients with glaucoma, with normalized and stable ophthalmotonus is glaucomatous optic neuropathy (GON). This has been confirmed in a number of large multicenter studies devoted to the study of glaucoma (Advanced Glaucoma Intervention Study, Collaborative Normal Tension Glaucoma Study, Collaborative Initial Glaucoma Treatment Study, early Manifest Glaucoma Trail).

The absence of signs of stabilization of neuropathy, against the background of compensated ophthalmotonus, dictates the need to search for new directions of drug therapy aimed at improving the functional state of the optic nerve and retina of the glaucomatous eye [2,3].

The most promising drugs were neuroprotectors from the cytomedin group - cortexin and retinalamin. The neurotrophic effect of retinalamin in patients with initial and advanced stages of primary open-angle glaucoma (POAG) is expressed in a significant increase in the average thickness of retinal nerve fibers. The results of a clinical study in most patients demonstrated a positive dynamics of peripheral vision according to the indications of the threshold sensitivity of the retina, a subjective increase in visual acuity, a significant objective improvement in central vision, psychophysiological and electrophysiological parameters [5], a decrease in the number and depth of cattle in areas characteristic of glaucoma [4], an increase in the tolerance of the optic nerve to increased stress. To correct microcirculation disorders in the vessels of the optic nerve and retina in glaucoma, attempts have been made to use a complex drug treatment, including vasodilators, anti-sclerotic drugs, agents that improve microcirculation and tissue metabolic processes [12]. The high efficiency of the herbal preparation “Gingkobiloba” has been proven, which affects metabolic processes in cells, rheological properties of blood, vasomotor reactions of blood vessels, and thus, increases peripheral and retrobulbar circulation, improves visual fields in normotensive glaucoma, traps free radicals, including nitric oxide, and inhibits its production [6,13,14]. However, in tablet form, the drug has a delayed cumulative effect, which is achieved only with prolonged systematic use - from three to nine months. In this connection, in recent years, methods of drug administration using physiotherapeutic procedures (endonasal,

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bath electrophoresis, phonophoresis, laser electrophoresis), which enhance the penetration of drugs into the eye tissue, have become widespread. Medicinal electrophoresis is an electropharmacotherapeutic method that combines the effect of direct current on the body and drugs administered with its help.

The method of endonasal electrophoresis was chosen because it ensures the penetration of the drug in the required amount through the nasal mucosa. According to N.A. Borisova, R.M. Khaziakhmetova, under the action of an electric current, drugs with endonasal administration penetrate the nasal mucosa, moving perineurally and along the lymphatic pathways, enter the tissues and fluids of the eyeball. Thus, a pronounced and long-term neurophysiological effect is provided due to the creation of a kind of depot of the drug in the structures of the eyeball [7, 15].

An important direction in the treatment of GON was the development of electrical stimulation of the peripheral part of the visual analyzer, in particular, transcutaneous neuroelectrostimulation of the optic nerve, carried out by the "ESOM" apparatus, the principle of which is based on the phenomenon of the appearance of electrical phosphene when exposed to an electrical impulse [8].

Considering the above, it can be assumed that one of the important points of neuroprotection is a decrease in the level of cytotoxicity in the intercellular space surrounding neurons, neutralization of toxic substances or a decrease in sensitivity to them. These requirements are met by peptide bioregulators (Stavitskaya T.V. et al., 2004; Khavinson V.Kh. et al., 2005). Since the disturbance of ocular microcirculation is one of the fundamental factors in the pathogenesis of glaucomatous optic neuropathy, the correction of hemodynamic changes is most effectively achieved with preparations based on ginkobiloba extract. Given the delayed cumulative effect, which is achieved with long-term use of these drugs, methods of targeted exposure such as subtenon administration and endonasal electrophoresis solve this problem. It should be noted that after cumulation of these drugs in the posterior segment of the eye, to increase their effectiveness and improve neuronal impact not only between cells, but also at different levels of the visual system in the complex treatment of glaucoma with severe optic neuropathy, it is rational to use percutaneous electrical stimulation [9]. The method is based on a preliminary diagnostic study of the electrical sensitivity threshold and the critical fusion frequency of phosphene scintillations (CFF).

PURPOSE OF THE STUDY

Clinical and functional assessment of the effectiveness of complex pharmaco-physiotherapeutic treatment of patients with glaucoma optic neuropathy.

MATERIAL AND RESEARCH METHODS

The studies were carried out in the SamMI clinic in cooperation with the Samarkand regional specialized eye hospital and the private clinic "Alfa-Med". We observed 43 (74 eyes) patients with GON aged 58 to 76 years, of which 23 (53.4%) were women, 20 (46.5%) were men, with an established diagnosis of POAG stage II or III POAG in conditions of IOP compensation (21.3 ± 3.2). IOP compensation was achieved by medication, laser and surgical methods. All patients were divided into two

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homogeneous groups depending on the stage of POAG and the patient's age. The control group consisted of 20 (34 eyes) patients with stage II, of whom there were 15 (27 eyes) and stage III - 5 (7 eyes), who received traditional therapy for 10 days, which includes the following drugs: Sol. Mildronati 10% -5.0 I / O, Tab. Nootropili 800 mg x 3 times, Sol. Pyridoxinihydrohloridi 5% -2.0 w / m, Sol. Emoxypini 1% -0.5 parabulbar, Sol.Taufoni 4% - 5.0 l / t, as well as a single subtenon injection of Retinylamine at a dose of 5 mg. In the main group, 23 (40 eyes) patients, the distribution of which by stages was 13 (25 eyes) with stage II and 10 (15 eyes) with stage III, respectively, along with traditional therapy and subtenon administration of Retinylamine, received endonasal electrophoresis with Tanakan 1 time per day and percutaneous electrical stimulation using the ESOM apparatus, based on the use of a rectangular negative pulse with a duration of 1-10 ms, following with a frequency of 5-30 Hz and an amplitude of 10-1000 μA for 10 days. For each eyeball, 4-6 series of 15-45 s were performed with an interval between series of 30-60 s. All patients before and after treatment, as well as 3 months after the course of therapy, underwent clinical studies: visometry, ophthalmoscopy, ophthalmobiomicroscopy, Maklakov tonometry, tonography, gonioscopy, studies of the peripheral visual field (computer static perimetry on the Humphrey apparatus using the SAP-30-2 protocol, laser scanning confocal retinotomography of the optic nerve head using the HRT-2 apparatus (Heidelberg engineering GmbH, Germany). The study of intraocular blood flow by the method of ultrasound color Doppler mapping was carried out on a multifunctional ultrasound system SonoscapeC 50, while the spectral velocity parameters of hemodynamics were assessed: maximum systolic velocity (Vmax), end diastolic velocity (Vmin) and peripheral resistance index (Ri).

RESULTS AND DISCUSSION

The average visual acuity of the patients of the two groups before treatment was 0.06 ± 0.02. In patients of the control group, visual acuity improved by 0.09 ± 0.01 by month 3 of the study, which was 1.5 times higher than the initial values. In the main group, visual acuity increased to 0.2 ± 0.04, which was 3.33 times more than the initial value. It should be noted that the IOP of patients in both groups throughout the study was within 21.3 ± 3.2, which did not exceed the permissible tolerant IOP. The results of computer perimetry showed a significant decrease in the integral indicator of the average deviation of the level of photosensitivity in the visual field from the age norm (MD), as well as the magnitude and degree of local changes (PSD), which varied between - 10.48 ± 2.45dB and 12.67 ± 3.35dB before therapy in both groups and decreased to - 8.68 ± 2.15dB and 10.67 ± 3.32dB in the control group and 5.53 ± 1.65dB and 8.67 ± 2.42dB in the main, respectively, which showed an improvement within 1.2 times from the initial in both integral indices and which was confirmed in the reliability coefficients, where the points below the 5% level became significantly less, than points with a level of 1% in the control group. While in the main group, both indicators improved by 1.9 and 1.46 times, respectively, which was confirmed by a uniform decrease in both points of the coefficient of reliability with the level of 5% and 1%, it should be noted that the PSD indicator lost its informative value in patients with stage III POAG, however, these indicators were of low statistical significance. According to the OST observation, a significant difference was

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revealed in the studied groups of patients, depending on the stage of POAG. Thus, in patients with stage II POAG, a moderate decrease in the area and volume of the neuroretinal girdle and a moderate deficit of nerve fibers were observed, while in the group of patients with stage III of the process, these changes were significantly pronounced. Parameters of laser confocal tomography of the optic nerve head are shown in Table 1.

Table 1

Average indices of laser confocal tomography in patients with GON

Параметры томографии ДЗН	II stage POAG 28 (52 eyes) patients	III stage POAG 15 (22 eyes) patients
Neuroretinal girdle area (mm2)	1,271±0,065*	0,972±0,062*
Neuroretinal girdle volume (mm3)	0,245±0,054	0,113±0,083*
Thickness of the layer of nerve fibers of the contour line (mm)	0,135±0,090*	0,095±0,023*

* differences between groups of patients are significant, p <0.05

With ultrasound Doppler mapping of the CRA, the initial level Vmax and Vmin, as well as the index of resistance in both groups, were determined, 10 days after the treatment in the control group, these indicators increased by 1.32 and 1.14 times from the initial, and the index of resistance tended to to a slight increase and was equal to 0.74 ± 0.02. In the main group of the study, the maximum systolic and minimum diastolic blood flow velocity on day 10 of observation significantly increased by 1.72 and 1.23 times from the initial values, and the resistance index reached 0.73 ± 0.02 (p≤ 0.05). The study of ocular microcirculation in the CRA by the 3rd month in patients of both groups showed a slight decrease in all parameters, which had a low statistical significance. Indicators of ultrasound Doppler mapping of CRA are given in Table 2.

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Table 2

Dynamics of indicators of ultrasound Doppler mapping in patients with GON during treatment

Terms of observation		CRA		
		Vmax (cm / c)	Vmin(cm/c)	RI
Control group				
Before treatment		11,92±2,03	4,13±1,12	0,65±0,02
After treatment	After 10 days	15,73±1,67▫	4,72±1,51	0,74±0,02
	3 months	14,15±1,53▫	4,31±1,32	0,71±0,02
Main group				
Before treatment		12,14±2,12*	4,41±1,32	0,64±0,03
After treatment	After 10 days	20,82±1,74▫*	5,45±1,53	0,73±0,02
	3 months	18,14±1,25▫*	4,91±1,41	0,73±0,02

Note: * - significant in relation to this group before treatment (P≤0.05)

▫ - reliable in relation to the data of the control group (P≤0.05)

Thus, a gradual increase in the deficit of blood supply, corresponding to the progression of the glaucomatous process, was revealed. During the entire observation syndrome, the patients of the main group showed a significant improvement in hemodynamic parameters, which correlated with visual acuity and computer perimetry data.

CONCLUSION

The introduction of endonasal electrophoresis with the Tanakan drug, followed by transcutaneous electrical stimulation in the complex treatment of GON, delays the development of optic nerve atrophy and, along with improving visual functions, lengthens the positive effect of the main treatment, which was confirmed in a significant improvement in hemodynamic parameters according to the

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ultrasound Doppler study. The proposed method of complex treatment will improve the effectiveness of treatment of patients with compensated open-angle glaucoma improve the prognosis for vision and the quality of rehabilitation measures.

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