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EFFICACY OF TRANSSCLERAL LASER CYCLOPHOTOCOAGULATION IN MICROPULSE MODE IN PATIENTS WITH REFRACTORY GLAUCOMA

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Abstract:

Increasing the effectiveness of glaucoma treatment is one of the most urgent tasks in ophthalmology due to the high medical and social significance of this disease associated with a high prevalence rate and severity of outcomes, often leading to blindness and disability. Despite the successes achieved in medical, laser and surgical treatment of glaucoma, the probability of amblyopia and blindness has remained steadily high for many decades. The importance of intraocular pressure (IOP) compensation to stabilize the glaucoma process, which requires long-term, sometimes lifelong, local hypotensive therapy, has been proven by a number of clinical studies. In this regard, it should be noted that continuous use of local hypotensive drugs often leads to pathological changes of ocular surface tissues of toxic-allergic, xerotic and inflammatory-degenerative nature, which significantly reduces the quality of life of patients. Negative effect of local hypotensive therapy on ocular surface in combination (in some patients) with its inefficiency determines the relevance of laser methods of glaucoma treatment, which main advantages are low injury rate, absence of serious intra- and postoperative complications, and possibility to perform the intervention (including reoperation) on an outpatient basis.

Keywords: glaucoma treatment, direct coagulation effect, intraocular fluid, Maklakov tonometer

INTRODUCTION Transscleral diode laser cyclophotocoagulation in micropulse mode (MTC) is one of modern laser treatment methods of glaucoma. Its hypotensive effect is caused by inhibition of the intraocular fluid (IOP) production due to direct coagulation effect on the pigment epithelium of the ciliary processes. In this case, mCPC is considered as an improved technique of traditional contact transscleral diode laser cyclophotocoagulation (TDCPC), increasing predictability of hypotensive effect and reducing the risk of postoperative complications. The analysis of the literature data indicates that the most significant features of the mCPC technique are: - higher clinical efficacy and safety in the treatment of glaucoma in comparison with TDCPC - possible mechanisms of positive effect of mCPC, in addition to direct thermal effect on the ciliary processes, are moderate stimulation of uveoscleral outflow of intraocular fluid due to increased permeability of cell membranes and configuration changes of the helmet channel - the leading factors determining the clinical effectiveness and safety of mCPC are laser radiation parameters (power, exposure, duration of im At the same time, literature offers a large number of different variants of laser radiation parameters without specific recommendations for their application, which determines the relevance of developing medical and technical criteria for laser treatment, taking into account individual clinical characteristics and the stage of development of the glaucoma process. At the same time, there are practically no structured data in the literature substantiating medical support of patients at all stages of mCPC depending on the peculiarities of the clinical course of glaucoma.

PURPOSE OF THE STUDY: To study clinical efficacy of laser mCPC in patients with refractory glaucoma and to develop antiglaucomatous drugs to maintain IOP.

MATERIAL AND METHODS OF RESEARCH. Clinical research was carried out on the basis of eye diseases department of Samarkand State Medical University and A.A. Yusupov Eye Center. 60 patients with refractory glaucoma were treated using micropulse transscleral cclophotocoagulation method. Of them 42 (70%) were women and 18 (30%) were men. micropulse tsCFK was performed according to the traditional method in order to compensate IOP and stabilize visual and functional indices. The patients included in the study were dynamically monitored for 1 - 2 years (1.3 ± 0.8 years)

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prior to mCPC performance. The age of the operated patients ranged from 58 to 79 years, averaging 65.41 ± 2.3 years. Inclusion criteria for the study: presence of advanced, far advanced or terminal refractory glaucoma; absence of stabilization of the glaucoma process or absence of IOP compensation on maximum hypotensive regime, after, presence of pain syndrome, and in some cases intolerance to local hypotensive therapy. These patients had a history of coronary heart disease, hypertension and diabetes mellitus. All patients had a thorough general clinical and ophthalmological examination before treatment.

To assess the state of functions of the visual organ the following was carried out: examination of the anterior eye by biomicroscopy, determination of visual acuity according to Golovin-Sivtsev standard tables, examination of the peripheral visual field on spheroperimeter, intraocular pressure (IOP) measurement with Maklakov tonometer and pneumotonometer, examination of the fundus of the eye by direct and reverse ophthalmoscopy, state of the anterior eye by ultrasound biomicroscopy (UBM) repeatedly during observation period from one week.

MTCT technique: was performed transconjunctivally at 4 mm from the limbus. On average, 10 cycles were performed in the lower half from 3:30 to 8:30 hours and similarly 10 cycles in the upper half of the eyeball from 9:30 to 2:30 hours, with the first cycle of exposure being performed along the arc of the circle to one side and the second cycle along the same arc of the circle to the opposite side, the subsequent cycles being performed similar to the first two. Zones 3, 9 and 12 hours were excluded to avoid damage of short ciliary arteries. Exposure parameters: wavelength 810 nm, power 2500 mW, total exposure 160 sec (exposure per cycle was 10 sec), duty cycle 30%, pulse duration 0.05-0.08 sec with intervals of 0.03 sec (Sanchez F.G., Peirano-Bonomi J.C., Grippo T.M., 2018). Energy values, according to the literature, were chosen depending on the level of IOP decompensation: 120 J in patients with moderately high IOP and 150 J in patients with high IOP. Ciliary body was photocoagulated with a micropulse dioid laser ("SubCyclo Supra-810") at 4 mm distance from limbus in planar part projection. Anesthesia was performed epubulbarly, with 1% Alkaine solution by three injections with 1 minute interval and retrobulbaron injection with 2% lidocaine solution 4 mg. After the procedure to relieve the inflammatory process we prescribed 1% solution of Pre-Forte 1 drop 2 times, and solution of Cupen-Forte 1 drop 3 times a day.

RESULTS OF WORK AND DISCUSSION: We estimated the efficiency of the procedure in patients with refractory glaucoma according to normalization of IOP level - achievement of tolerance pressure, relief of pain syndrome and decrease of intensity of hypotensive regime, improvement of visual function and biomicroscopic picture of the anterior eye The stability of treatment was estimated according to duration of preservation of hypotensive effect, absence of pain syndrome in the eye, improvement of visual function during the whole period of treatment**.** While studying IOP condition, in refractory glaucoma patients using the traditional technique, right on the next day after mCPC the IOP level decreased from 42.42±1.51 mm Hg to 22.13±5.2 (18.0 - 26.0) mm Hg, i.e. on the average by 20 mm Hg (by 47,6 %), after 10 days the IOP level averaged 20,97±1,12 (18,0 - 22,0) mm Hg; after one month of the procedure, the average IOP indices slightly increased and averaged 21,28±1,32 (19,0 - 24,0) mm Hg. During the following 2 months the indices remained stable with a tendency to gradual decrease, and by the 6th month of observation IOP parameters averaged 19,15±1,08 (18,0-22,0) mm Hg; a year later we have registered IOP stabilization at the level of 18,85±0,7 (17,0-23,0) mm Hg. The number of hypotensive drugs used by the end of follow-up in patients with refractory glaucoma decreased by 52.4%: from 3.0 ± 0.5 to 1.0 ± 0.5 drugs ($p < 0.05$). The normalization of IOP level without hypotensive drops in 15 % of the patients (n=9) examined. In 75% of cases (n=45), normal IOP level was achieved while maintaining instillation of a single antiglaucomatous drug (most frequently, 0.5% thymalol solution). In 10% of cases (n=6), after 3-4 months, there was no compensation of the IOP level, and these patients were prescribed a second anti-glaucomatous drug, most often prostaglandins once a day. If there was no effect, a repeat MTCC was prescribed. To perform repeat MTCC it is advisable to exclude the prostaglandin solution 5 days before the procedure in order to rule out complications.

All operations were painless and comfortable, with only a few cases of burning, foreign body sensation, and slight heat in the area where the laser handpiece was localized during the procedure. In the postoperative period of mCPC techniques in refractory glaucoma, there was a decrease in reactive iridocyclitis, as well as in the incidence of reactive ophthalmohypertension and hyphema. In addition, no signs of ophthalmohypotonia, macular edema, subatrophy of the eyeball were noted in any of the patients.

Based on the analysis of these results, mCPC deserves consideration as a primary procedure in eyes with refractory glaucoma. Conventional laser treatment of

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the ciliary body in micropulse mode enables to effectively and stably reduce IOP to normal values both for moderately elevated IOP and for high preoperative ophthalmohypertension.

Conducted mCPC allowed in most cases to keep one or two instillations for normalization of IOP, providing maximum hypotensive and neuroprotective effect with the least toxic effect on the ocular surface. Stabilization of visual acuity and visual field was registered in 40% of patients (n=24) when analyzing postoperative visual functions. Our patients' visual acuity improved from 0,06±0,03 to 0,08±0,05 which was statistically significant ($p<0,05$ from 0,07±0,03 to 0,08±0,02 ($p>0,05$)). There was no decrease of visual acuity in patients of the studied groups during the period of observation. Analysis of the visual field indexes in one year after the operation didn't reveal any negative dynamics. 10 patients (16%) had weakly positive dynamics. Evaluating a small number of complications with unambiguous confidence, we can conclude that the traditional method to perform mCPC allows to apply this technique in patients at earlier stages of glaucoma development, providing compensation of various degrees of elevated IOP and improvement of visual function. Stabilization of IOP indices allows to preserve central vision and functional eyesight in such patients. An important advantage of MTVC is the possibility for patients after treatment to do without local hypotensive drugs in 15% of cases (n=9) and to use only one instillation in 75% of cases (n=45), which significantly reduces the intensity of dry eye syndrome manifestations

Our treated groups of patients with refractory glaucoma had chronic pain in the eye area and headaches that were not relieved by local medications and general anesthetics.

Almost all patients, when examined the next day, mentioned the occurrence of pain one hour after the procedure, which disappeared by the morning, making them more satisfied with the procedure they had received. In one case, the pain worsened and persisted for 3 days. The patient received the second session of the procedure, which improved his condition. During the period of observation from 3 to 6 months the patient's condition was satisfactory, the number of intravenous drops of hypotensive preparations decreased considerably. At biomicroscopy of the anterior chamber of the eye, a sharp decrease of corneal edema and the degree of congestive injection of perilymbial vessels were registered in 40 eyes out of 60 (66,6%) even during the first day after the intervention.

The investigation by ultrasound biomicroscopy revealed a statistically significant deepening of the anterior chamber by 0,8±0,07 mm on the average and a stable tendency to deblock the filtration zone.

CONCLUSIONS: It should be noted that atrophy of the ciliary body, expressed in its thinning, was determined both before and after the laser procedure and tends to further thinning in the remote terms. Reduction and hypotraphy of the ciliary appendages is associated with laser irradiation effects on the ciliary body tissue, which leads to decreased intraocular fluid production and increased uveoscleral outflow. In 15 eyes (25.0 %) there was an opportunity, as a result of corneal edema disappearance, to examine fundus oculi. In all eyes, the expected dilation and deepening of optic disc excavation was revealed, in 7 eyes (21,9 %) - ophthalmological signs of proliferative phase of diabetic retinopathy with preretinal and epithettinal neovascular membranes.

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