RESULTS OF TREATMENT OF TERMINAL PAINFUL GLAUCOMA USING THE METHOD OF MICRO-PULSE TRANSCLERAL CYCLOPHOTOCOAGULATION

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ABSTRACT

The analysis of the results of treatment by the method of microimpulse transcleral cyclophotocoagulation (MTSCFC) of 32 patients with refractory painful glaucoma was carried out. Visual acuity in all patients was less than 0.05 (according to Snelen) from the norm. Secondary neovascular glaucoma was noted in 26 (69.4%) patients. The causes of the disease were the consequences of retinal vein thrombosis, diabetic retinopathy and unsuccessfully operated and non-operated primary open-angle and closed-angle glaucoma, bullous keratopathy. The purpose of the procedure was to compensate for chronically ongoing pain. Laser exposure was carried out by contact through the sclera in the upper and lower segments of the eyeball to the zone of attachment of the horizontal oculomotor muscles. The last examination of patients was carried out in the period from 12 to 50 weeks. Most of the patients had no pain in the eye. The patients were satisfied with the treatment.

I. INTRODUCTION

Refractory glaucoma is the most severe group of eye diseases caused by increased eye pressure. The group of patients with refractory glaucoma includes neovascular glaucoma, repeatedly unsuccessfully operated primary open-angle and closed-angle glaucoma, neglected and untreated primary glaucoma, uveal glaucoma, glaucoma in the aphakic and pseudophakic eye and congenital glaucoma [1].

It is often accompanied by chronically ongoing pain that cannot be stopped by traditional methods of treatment. Another feature of this type of disease is that it is most often found in elderly people who suffer from concomitant serious diseases, because of which it is not possible to perform traditional operations used for glaucoma, or these operations have exhausted their capabilities.

A wide range of ophthalmic surgeons is well aware of the numerous complications that arise when trying to reduce intraocular pressure by using traditional anti-glaucomatous operations of the fistulizing type: sinusotrabeculectomy with basal iridectomy, scleroanguloreconstruction, deep sclerectomy. When trying to perform these operations on eyes with high ophthalmotonus, many intra- and postoperative complications occur. Already at the beginning of the operation, a hyphema appears, even if the iris is still intact. Further, if the decision is still made to continue the operation, there is a loss of a domed inflated iris through an incision in the trabecular zone. Iridectomy leads to even more massive haemorrhage, attempts to wash the hyphae may eventually end in an expulsive haemorrhage with unpredictable consequences, up to enucleation. But even if such a development of events can be avoided due to good preparation of the patient, the use of modern anesthesiological aids, then, as a rule, in the postoperative period there is a high risk of developing ciliochoroidal detachment with a small anterior chamber syndrome and the gradual development of subatrophy of the eye.
For many years, manipulations aimed at the destruction of the ciliary body have served as an alternative to traditional operations: transcleral cryocyclodestruction and diathermocoagulation, as well as the use of a carbon dioxide laser. The purpose of these interventions is to inhibit the secretory activity of the ciliary body by destroying its anatomical structure. Having a moderately pronounced and often unpredictable hypotensive effect, these operations are characterized by a severe course of the postoperative period. On the first day after exposure, instead of the expected relief of the condition, the patient experiences increased pain due to the emerging iridocyclitis, which has to be stopped by the introduction of corticosteroids, which are known to increase ophthalmotonus.

Thus, neither the use of fistulizing operations nor the use of traditional variants of cyclodestruction can be considered as operations of choice for painful refractory glaucoma. The use of various drains, ranging from the use of tubes made of synthetic materials to xenodrenage, does not always justify itself. A more modern method that is less traumatic to the eye is the use of laser energy for cyclodestruction, which was first used by R. Weekers in 1961.

For transcleral cyclophotocoagulation (contact and non-contact methods), YAG laser, semiconductor, diode and xenon lasers are used. The decrease in Intraocular Pressure (IOP) in transcleral cyclophotocoagulation occurs due to the destruction of the ciliary epithelium, a decrease in vascular perfusion in the ciliary vessels, as a result of which the ciliary processes atrophy, as well as due to an increase in outflow through transcleral filtration and increased uveoscleral outflow.

The disadvantages of YAG-laser cyclophoocoagulation are pain syndrome, burns and conjunctival hyperemia, transient IOP rise, inflammatory reactions, decreased visual acuity, hypotension and phthisis in the long-term follow-up. When using a continuous-wave diode laser, there may be complications such as hyphema, hemophthalmos, cases of malignant glaucoma, scleral perforation. Less widespread methods of treatment of regmatogenic glaucoma include endoscopic and transpupillary effects on the ciliary body. When using a continuous-wave diode laser, there may be complications such as hyphema, hemophthalmos, cases of malignant glaucoma, scleral perforation. Less widespread methods of treatment of regmatogenic glaucoma include endoscopic and transpupillary effects on the ciliary body.

The method of laser exposure became safer when it was carried out by contact transcleral methods using a diode laser with a wave of 810 nm in the micro-pulse mode (Subcyclio). The method is called micro-pulse transcleral cyclophotocoagulation. Preliminary studies have shown a higher frequency of IOP reduction and a lower frequency of complications compared to procedures performed with continuous-wave lasers. At the same time, in most cases, there was no visually significant hypotension. Micro-pulse transcleral cyclophotocoagulation appears to be a safe and effective treatment for glaucoma. Given its improved safety profile compared to continuous wave transcleral cyclophocoagulation, it deserves to be considered as the main treatment procedure for refractory glaucoma. Several authors suggest using the method in patients with sufficiently high visual functions.

According to their observations, the use of the method in patients with primary glaucoma with visual acuity exceeding 20 out of 40 gave good compensation of intraocular pressure and stabilization of visual functions. However, there is an opinion that in some cases the use of the Micro-pulse transcleral cyclophocoagulation (MPTCP) method can contribute to the deterioration of visual acuity with good compensation of intraocular pressure.

MPTCP is a non-invasive, repeatable laser procedure that assumes both good and stable results of reducing IOP and reduces the frequency of use of anti-glaucoma drugs.

An analysis of the literature allows us to conclude that, in general, the effect of laser treatment on IOP control was relatively satisfactory, but the number of eyes of the examined patients was limited. Additional studies are needed to clarify the recommendations for the treatment of refractory glaucoma by micro impulse transcleral cyclophotocoagulation.

The purpose of the study.

Studying the effectiveness of MPTCP in patients with advanced stages of glaucoma, accompanied by chronic eye pain.

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II. MATERIALS AND METHODS

We conducted an analysis of the results of treatment by the MPTCP method in 32 patients (32 eyes) with far-advanced stages of painful glaucoma, who came to us with complaints about the presence of constant pain in the eye. The analysis of long-term results in terms of 12 to 50 weeks was carried out.

All patients underwent a thorough general clinical and ophthalmological examination before starting treatment. Visual acuity was determined by Snellen optotypes, the anterior part of the eye was examined using a standard slit lamp, and angioscopy was performed with a Goldman three-mirror lens. The value of the intraocular pressure was also determined using a Goldman slit lamp. The condition of the anterior part of the eye was studied additionally using the method of ultrasound biomicroscopy (UBM).

The fundus, where possible, was examined by direct and reverse ophthalmoscopy, but in the vast majority of cases, this was prevented by pronounced corneal edema and changes in transparent media, including complicated cataracts and vitreous destruction or partial hemophthalmos.

All patients underwent micro-pulse transcleral cyclophotocoagulation. The purpose of the procedure was to relieve pain.

The procedure was performed under local anesthesia. A combination of epibulbar anesthesia with 1% tetracaine solution and retrobulbar injection of 2% lidocaine solution was used.

For the procedure, a diode laser with a wavelength of 810 nm was used in the micro-pulse mode (Subcyclio method). The laser parameters recommended by the manufacturer were used: power 2000 mW, duty cycle 31.3%. Laser radiation was delivered by contact with a probe at a distance of 3 mm from the limb.

The probe tip was installed perpendicular to the surface of the sclera. According to the manufacturer's instructions, it is necessary to draw an arc, without lifting the probe from the eye, in the upper segment of the eyeball from 9:30 to 2:30 and the lower segment of the eye from 3:30 to 8:30 for 80 seconds back and forth in each segment separately. The meridian of 3 and 9 o'clock should not be touched.

Our first procedures showed that this method of moving the probe often causes some inconvenience due to the appearance of conjunctival folds, which make it difficult to continuously move the probe tip. In connection with this circumstance, it was decided to conduct a probe in the form of a pendulum in one small area, up to the boundaries of the folds that appeared, for 10 seconds in each section. Then, turning off the laser, the transition to the next section was carried out. After the correct installation of the probe in a new place, the laser was turned on and irradiation was carried out in the same way. With this option, the recommended one arc was divided into an average of 4 sections. After the procedure, 0.5 ml of dexamethasone solution was injected under the pink eye.

III. RESULTS

In 8 patients (25.0%), glaucoma developed against the background of retinal vein thrombosis, in 7 patients (21.9%) as a result of diabetic retinopathy and in 3 patients (9.4%), operated primary terminal glaucoma was noted. The remaining eyes had primary closed-and narrow-angle distant and terminal glaucoma (10 eyes or 31.3%), as well as aphakic or pseudophakic glaucoma due to vitreal block (4 eyes, or 12.5%).

The intraocular pressure before the operation was 45 ± 13.5 mm Hg. Visual acuity was absent in 15 patients, and in 3 patients it was below 0.08. The age of the patients was from 60 to 85 years. The general condition of 10 patients was unsatisfactory, and 3 patients had a severe one. 2 patients were brought for examination and treatment on gurneys due to the severity of the general condition. 12 patients suffered from hypertension. Objectively, 12 patients had pronounced corneal edema, all had a stagnant injection of the eyeball.

All patients complained of chronic pain in the area of the diseased eye and headache for many weeks. All patients were under the supervision and treatment of therapists and endocrinologists. Drug treatment in the form of local antihypertensive and anti-inflammatory drugs did not relieve pain.

The patients generally tolerated the procedure satisfactorily, without severe pain. All procedures were performed on an outpatient basis. At home, it was recommended to instill steroid and non-steroidal drugs 4 times a day for 10 days. Almost all patients during the examination the next day mentioned the appearance of pain an hour after
the procedure, which disappeared by the morning, because of which the patients noted greater satisfaction from the procedure received. In one case, the patient noted an increase in pain, which did not subside for 3 days. This patient underwent the 2nd session of the procedure, as a result of which the condition improved.

During the follow-up period from 3 to 6 months, the patients' condition was satisfactory, the frequency of instillation of antihypertensive drugs significantly decreased. The average value of intraocular pressure was 24.2 ± 4.6 mm Hg. Visual acuity in relatively sighted eyes increased slightly and averaged 0.1±0.03 (p<0.05). In one eye patient with primary distant angle-closure glaucoma, visual acuity increased from 0.1 before surgery to 0.6 during the first month of follow-up.

During biomicroscopy, on the second day after the intervention, a clinically significant decrease in corneal edema and the degree of congestive hyperemia of the eye vessels was observed in 28 out of 32 eyes (82.5%).

The study by ultrasound biomicroscopy revealed a statistically significant deepening of the anterior chamber, on average by 0.91±0.07 mm (p<0.01) and a stable tendency to deblockage of the filtration zone. In 8 eyes (25.0 %), it was possible, as a result of the disappearance of corneal edema, to examine the fundus. The expected expansion and deepening of the optic disc excavation were revealed in all eyes, ophthalmological signs of the proliferative phase of diabetic retinopathy with preretinal and epiteretal neovascular membranes were revealed in 7 eyes (21.9%). The iris rubeosis, which occurred in 10 eyes (31.3 %), naturally persisted after the intervention.

Morphological signs of postoperative iridocyclitis were not detected in any case. The opalescence of the anterior chamber moisture, which occurred in 11 eyes (34.4%), could be an indirect sign of it, but such detailing is very difficult because of the pronounced edema of the cornea. Cyclical pain was not observed in any patient.

IV. DISCUSSION

The MPTCP method is a new effective method for the treatment of severe forms of glaucoma. It is a good alternative to traditional methods of glaucoma surgery. The procedure is performed on an outpatient basis under local anesthesia. It is convenient to carry out it for patients with concomitant severe general diseases of the body and in elderly patients. Compensation for the disease usually occurs within the first day. In case of insufficient reduction of ophthalmotonus and lack of pain relief, it is possible to conduct repeated sessions, which were also satisfactorily tolerated by patients.

Patient satisfaction is high.

In the process of using the method, we tested a variant of using the procedure that differs somewhat from the manufacturer's recommendations, namely, a fractional effect on the sclera with a break in a continuous arc and periodic switching off of the laser, due to the appearance of conjunctival folds that prevented the tight fit of the working tip to the sclera. There were no serious complications from the eyes. The case of a sharp improvement in vision in a patient with advanced open-angle glaucoma suggests the idea of widespread use of the method in the developed stages of primary glaucoma, even in the presence of good visual acuity.

V. CONCLUSION

Preliminary results of the use of micro-pulse transcleral laser cyclophotocoagulation in the treatment of patients with advanced and end-stage glaucoma accompanied by pain were successful in terms of pain relief in the near and long-term follow-up periods (12-50 weeks).

The method is especially indicated for patients with severe somatic pathology when performing traditional anti-glaucomatous operations is technically very difficult and entails severe irreversible changes, up to the death and removal of the eyeball. The procedure takes little time and is relatively easy to tolerate by the vast majority of patients. In case of insufficient hypotensive effect, repeated exposure is possible after two or three days. Severe complications in the postoperative period, both from the side of the eye and from the general condition, were not observed in any case.

A significant increase in visual acuity in sighted eyes after compensation of ophthalmotonus suggests the possible use of transcleral micro-pulse laser cyclophotocoagulation in earlier stages of glaucoma, with relatively preserved visual functions. Perhaps, when using the method on sighted eyes with relatively low initial values of intraocular pressure, a more delicate effect is assumed, with a relatively lower energy regime. However, this, apparently, should be the subject of further detailed study.
The use of the method of micro-pulse transcleral laser coagulation deserves further study and inspires optimism.

REFERENCES

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