

Evaluation of Modern Treatment Methods for Patients with Cataracts Combined with Glaucoma

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Abstract There are three main approaches to the surgical treatment of patients with a combination of cataract and glaucoma: Two-stage treatment - hypotensive surgery at the first stage and cataract extraction at the second, or phacoemulsification (PE), and then hypotensive intervention; Cataract extraction only; Combined intervention. Two-stage treatment is indicated in cases where the initial cataract only slightly reduces vision or when, despite the existing indications for lens removal, there is a significant risk of developing serious complications due to persistently high intraocular pressure. This open-label, prospective study utilized the examination and follow-up data of 162 patients (200 eyes) with concurrent cataracts and OAG. Of these, 82 were men and 80 were women. The study included data from patient examinations before and after PE, as well as before and after PE in combination with sinusotomy with viscocanalodilation and PE in combination with trabeculectomy. After surgery, patients were monitored for at least one year. The degree of cataract maturity was assessed according to the LOCS III classification, according to which a section of the nucleus, opacities in the cortical layers of the lens and under the posterior capsule are analyzed using biomicroscopy and transillumination. The results of PE without an antihypertensive component (group 1) are presented. They were performed in 81 patients (100 eyes) with a combination of early cataracts and stabilized ocular hypertrophy (OAG) at the early (40 eyes), advanced (43 eyes), and advanced (17 eyes) stages. The group included 17 patients with advanced glaucoma, given that glaucoma was first diagnosed with an initial IOP within the normal range on monotherapy or therapy including two antihypertensive drugs. These patients were discussed with regard to a possible combined surgery, but were refused. The technique for performing PE at the Department of Ophthalmology of Samarkand State Medical University is as follows: The surgery is performed under epibulbar anesthesia in combination with neuroleptanalgesia.

Keywords Cataract, Two-stage treatment - hypotensive surgery, Phacoemulsification, Glaucoma, Intraocular pressure

1. Introduction

A significant problem in ophthalmology is the frequent co-occurrence of cataracts and glaucoma in the same patient [1]. According to other authors, patients with pre-existing glaucoma have an increased risk of developing cataracts [2,3]. Since the main goal of the so-called "antiglaucoma" operations is to reduce intraocular pressure (IOP), the choice of the most effective hypotensive intervention in patients with a combination of glaucoma and cataract has attracted the attention of ophthalmologists all over the world for many years [5]. There are three main approaches to the surgical treatment of patients with a combination of cataract and glaucoma: Two-stage treatment - hypotensive surgery at the first stage and cataract extraction at the second, or phacoemulsification (PE), and then hypotensive intervention;

Cataract extraction only; Combined intervention. Two-stage treatment is indicated in cases where the initial cataract only slightly reduces vision or when, despite the existing indications for lens removal, there is a significant risk of developing serious complications due to persistently high intraocular pressure. Expanding the indications for this two-stage treatment is not justified, as cataract extraction after hypotensive surgery can present significant difficulties. Furthermore, the psychological aspect plays a significant role: the waiting period for the second surgery reduces the patient's quality of life and undermines their commitment to achieving a successful outcome. In recent years, many ophthalmic surgeons have defined two-stage treatment as phacoemulsification in the first stage and, if necessary, hypotensive surgery in the second [6,7]. This tactic is supported by the belief that PE itself is a hypotensive intervention [8,9]. In some cases, despite the presence of concomitant open-angle glaucoma (OAG), the intervention may indeed be limited to PE with intraocular lens (IOL) implantation. This approach is justified in patients with

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initial OAG, when there are no significant changes in the visual field and optic disc (ONH), and IOP is normalized with minimal drug therapy. The following factors support combined surgeries: IOP reduction and removal of the cloudy lens during a single surgical intervention, a faster patient rehabilitation period than with two-stage treatment [10,12]. A small incision plays an important role in the combination of PE with a hypotensive component, allowing for maintaining the depth of the anterior chamber during surgery, minimizing the risk of expulsive bleeding; it ensures rapid restoration of vision with stable postoperative refraction and minor astigmatism induced by the intervention [13,14]. Among the main combined methods of surgical treatment, a combination of cataract extraction with penetrating or non-penetrating hypotensive surgeries is distinguished. Since cataract extraction is currently usually performed using the PE method, the term "phacotrabeculectomy", proposed by some authors, has become widespread [15,16]. The fistulizing principle of the intervention determines both its advantages and disadvantages. The advantages include a significant reduction in IOP for many years. However, a sharp drop in IOP during surgery can lead to serious problems both during and after the intervention. The risk of hemorrhagic complications increases significantly [17]; Ciliochoroidal detachment; shallow anterior chamber syndrome; severe hypotony in the postoperative period, etc. Non-penetrating surgeries have also become widespread in the surgical treatment of patients with OAG. Given that non-penetrating surgeries must be performed without opening the eyeball, the risk of complications, both during the procedure and in the postoperative period, is significantly reduced. A hypotensive effect comparable to that of trabeculectomy is achieved by performing laser goniopuncture in the first weeks after surgery [18,19]. Based on the above, further study of the effectiveness of modern surgical treatment methods for patients with concurrent cataracts and glaucoma is necessary [16,17].

The purpose of the study: To improve the effectiveness of surgical treatment for patients with concurrent cataracts and open-angle glaucoma.

2. Materials and Methods

This open-label, prospective study utilized the examination and follow-up data of 162 patients (200 eyes) with concurrent cataracts and OAG. Of these, 82 were men and 80 were women. The study included data from patient examinations before and after PE, as well as before and after PE in combination with sinusotomy with viscocanalodilation and PE in combination with trabeculectomy. After surgery, patients were monitored for at least one year. The degree of cataract maturity was assessed according to the LOCS III classification, according to which a section of the nucleus, opacities in the cortical layers of the lens and under the posterior capsule are analyzed using biomicroscopy and transillumination (Chylack L.T. et al., 1993; Davison J.A., Chylack L.T., 2003). LOCS III contains an expanded set of

standards that were selected during cataract research at the Clinical Research Center, Boston, Massachusetts. The classification consists of six images of the lens nucleus color (NC) and nuclear opalescence (NO), five images of cortical cataract (C), and five images of posterior capsular cataract (P) (Chylack L.T. et al., 1993). Characteristics that allowed patients to participate in the study, as well as characteristics that prevented patients from being accepted. All studies were performed at the Department of Ophthalmology at the Multidisciplinary Clinic of Samarkand State Medical University. The study was conducted from January 2024 to December 2025. The first group included 81 patients (100 eyes) with a combination of cataract and stabilized OAG in the early, advanced, and advanced stages, who underwent PE alone. The second group included 44 patients (50 eyes) with a combination of cataracts and oangiectasia (OAG) who underwent PE combined with sinusotomy and viscocanal dilation. The third group included 44 patients (50 eyes) with a combination of cataracts and OAG who underwent phacotrabeculectomy. Visual acuity below 0.5 was observed in 88% of patients in the second group and 96% of patients in the third group. The decrease in visual acuity in all patients was due to the presence of age-related cataracts and glaucomatous optic atrophy. Concomitant ophthalmic pathologies in patients in the second and third groups: "dry" AMD - 15 patients; high myopia - 11 patients; epithelial-endothelial corneal dystrophy - 3 patients. In groups 2 and 3, moderately elevated IOP was observed in 26 cases and high IOP in 22 cases. The remaining patients had preoperative IOP levels of "a" while on medication. Patient selection for groups was determined by the type of surgery performed. PE was chosen for patients with cataracts and ocular hypertrophy (OAG) with normalized IOP on minimal medication. A conservative treatment regimen was prescribed before surgery for groups 2 and 3. The second and third groups were formed and analyzed to: identify the advantages and disadvantages of PE with a penetrating or non-penetrating hypotensive component; compare the cases in which non-penetrating surgeries, with their often unstable hypotensive effect, are preferable, with a subsequent decision on the need for additional laser goniopuncture; Decide in which situations trabeculectomy is appropriate, given the higher risk of complications typical of penetrating surgeries, but which also provides a rapid hypotensive effect. Most of the patients examined had concomitant somatic pathologies. These included ischemic heart disease, hypertension, atherosclerosis, chronic circulatory failure, angina, atrial fibrillation, a history of acute myocardial infarction, a history of acute cerebrovascular accident, cardiosclerosis, diabetes mellitus, bronchial asthma, chronic bronchitis, chronic cholecystitis, chronic pyelonephritis, a history of cancer, and osteochondrosis. Most patients were hospitalized on a planned basis. Several weeks prior to surgery, patients underwent a general examination, including a complete blood count, coagulation tests, syphilis and hepatitis marker tests, urinalysis, an electrocardiogram, and consultations with an otolaryngologist, dentist, and general practitioner.

Chest fluorography or radiography could be performed earlier, but no more than one year prior to hospitalization. If necessary, to confirm the suitability of surgical treatment, depending on the presence of a somatic disease, patients received additional consultations with relevant specialists. Prehospital ophthalmologic examination included a general examination of the eyeball and adnexa, visometry and refractometry, and intraocular pressure measurement. In cases of obstructive pathology of the lacrimal ducts or the presence of a single sighted eye, a conjunctival culture was additionally performed. In the hospital, patients underwent the following examination: medical history; Autorefractometry (RK-F1 autorefractometer from Canon, Japan Viso- and refractometry (SC-2000 liquid crystal test mark monitor from Nidek, Italy); Static computer perimeter. The study included: retinal tomography using the Perikom device (VNIIMP-OPTIMED, Russia); retinal tomography of the optic disc (HRT II, Heidelberg Engineering GmbH, Germany); biomicroscopy of the anterior segment of the eyeball was performed using an SL-980 Zoom slit lamp (CSO, Italy); ophthalmoscopy was performed using a 60 D aspheric lens (Ocular, USA); tonometry (Goldmann tonometer); gonioscopy with a Goldmann lens (OLIS, Russia); optical coherence tomography (Stratus OST 3000, Carl Zeiss Meditec Inc., USA).

3. Results and Discussions

The results of PE without an antihypertensive component (group 1) are presented. They were performed in 81 patients (100 eyes) with a combination of early cataracts and stabilized ocular hypertrophy (OAG) at the early (40 eyes), advanced (43 eyes), and advanced (17 eyes) stages. The group included 17 patients with advanced glaucoma, given that glaucoma was first diagnosed with an initial IOP within the normal range on monotherapy or therapy including two antihypertensive drugs. These patients were discussed with regard to a possible combined surgery, but were refused. The technique for performing PE at the Department of Ophthalmology of Samarkand State Medical University is as follows: The surgery is performed under epibulbar anesthesia in combination with neuroleptanalgesia. At the 11 o'clock position, a 1.8 mm or 2.2 mm wide corneal tunnel is created using a keratome. Paracenteses are then performed at the 12 and 9 o'clock positions. Viscoelastic is injected into the anterior chamber. A capsulotomy and capsulorhexis are performed. After hydrodissection and hydrodelineation, phacoemulsification is performed. The remaining lens masses are removed using an irrigation and aspiration system. Viscoelastic is injected into the capsular bag, and the IOL is implanted using an injector. Residual viscoelastic is flushed from the anterior chamber. The paracentesis edges are hydrated. Dexazone solution is injected subconjunctivally. An antibiotic is instilled into the conjunctival sac, and a monocular patch is applied. All patients tolerated the surgery well. The postoperative regimen consisted of bed rest for the

first two hours after surgery. Afterward, if the patient's condition was satisfactory, they were allowed to move around the ward and department corridor. During the postoperative period, patients received 0.1% dexamethasone and fluoroquinolone antibacterial agents (0.3% Floxal, 0.5% Oftaquix) instillations four times daily. The postoperative course was generally uneventful. Moderate corneal stromal edema and Descemet's membrane folds were observed in a small number of cases. In one case, a posterior capsule injury occurred during surgery, which did not interfere with IOL implantation. Visual acuity and intraocular pressure dynamics were analyzed using analysis of variance for dependent samples. Immediately before surgery, the average IOP in the group was 15.4 mmHg. A statistically significant decrease in IOP was observed after surgery ($p=0.0006$). The average value one week after the intervention was 14.7 mmHg, and after one year - 13.9 mmHg. A statistically significant increase in visual acuity was also observed (p -value 0.000001 - highly significant time factor). Before the operation, the average visual acuity of patients was 0.2 (from 0.005 to 0.6). By the 3-5 day after the operation, the average visual acuity increased to 0.6 (from 0.005 to 1.0). Low visual acuity at these time points was detected in only two patients and was due to the presence of concomitant diseases of the organ of vision. Visual acuity of 0.005 was noted in one patient with severe epithelial-endothelial dystrophy of the cornea (at a later date, the visual acuity of this patient increased to 0.3). In the second patient, who had advanced glaucoma, visual acuity was 0.03 (compared to 0.005 at baseline). Among the remaining patients, minimal visual acuity was at least 0.1 by days 3-5 post-PE. Analysis of the results by glaucoma stage revealed significant differences in visual acuity. Preoperatively, all patients had an average visual acuity of 0.2. After PE, visual acuity improved uniformly in both early- and advanced-stage patients, reaching 0.9 by the end of follow-up. In patients with advanced glaucoma, visual acuity was significantly lower, averaging 0.6 by the end of follow-up.

4. Conclusions

Thus, patients who underwent PE without an antihypertensive component demonstrated a statistically significant increase in visual acuity and a decrease in IOP while continuing medical treatment for glaucoma. The visual acuity dynamics of patients with early and advanced stages of glaucoma were significantly different from those of patients with advanced stages. Medical rehabilitation of patients after phacogenic glaucoma surgery is a multi-stage and multifactorial process that requires a comprehensive approach and the use of both traditional and innovative methods. Key aspects of rehabilitation include not only controlling intraocular pressure and improving visual function, but also supporting patients' psycho-emotional state, as well as their socialization and return to normal activities.

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