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# Modern Methods of Treatment of Glaucoma

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**ABSTRACT**

The literature review presents the main methods of treatment of refractory glaucoma (RG). Surgical methods of treatment used in RG can be conditionally divided into two groups. The first is fistulizing interventions, including traditional surgery, surgery using cytostatic drugs, and surgery using implants. The second group is cyclodestructive interventions that suppress the secretory function of the ciliary body.

## INTRODUCTION

Refractory glaucoma (RG) (French refract aire - non-responsive) is characterized by the severity of the course, as a rule, resistance to traditional methods of therapeutic and surgical treatment, a relatively rapid transition to the terminal stage, severe pain syndrome against the background of high intraocular pressure (IP), which in some cases leads to the loss of the eye as an organ [1, 2]. RG includes the most complex nosological forms of glaucoma, such as congenital, juvenile, primary glaucoma in patients under 40 years of age, previously operated glaucoma, as well as most types of secondary glaucoma (SG) [3].

## MATERIALS AND METHODS

Increased attention to the problem of treating patients with RG is explained not only by the complexity of the clinical course and the choice of treatment tactics, but also by a significant increase in its prevalence in recent years [4, 5].

SG is characterized by a wide variety of etiological factors, pathogenetic mechanisms, and clinical manifestations. The main factor in its pathogenesis is the difficulty in the outflow of aqueous humor from the anterior chamber of the eye due to functional and anatomical changes in the anterior chamber angle (ACA).

## RESULTS AND DISCUSSION

At the initial stages of neovascular glaucoma (NG), panretinal laser coagulation is currently the most common and sparing method of prevention and treatment. By blocking ischemic zones, which are the source of neovascularization, this method reduces the likelihood of developing rubeosis in eyes with diabetic retinopathy or occlusion of the central retinal vein, and in the

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presence of rubeosis leads to the disappearance or a significant decrease in its severity. In addition, prior panretinal laser photocoagulation or cryocoagulation leads to a decrease in neovascularization and makes it possible to perform standard fistulizing operations.

The main role in the treatment of various forms of RG is assigned to surgical methods of treatment, which create conditions for a more effective and stable decrease in IP [3, 4, 7]. Conventionally, surgical methods of treatment used in RG can be divided into two groups. The first one is interventions aimed at the formation of artificial outflow tracts of fistulizing interventions, including traditional surgery, surgery with the use of cytostatic drugs, as well as surgery with the use of implants. The second group is operations that suppress the secretory function of the ciliary body (cyclodestructive interventions).

Fistulizing interventions include sinusotomy (ST), trabeculectomy (TE), sinus trabeculectomy (STE), etc. The most common method of surgical treatment of various clinical varieties of glaucoma so far is proposed in 1986 by J.E. Cairns operation of trabeculectomy and its modifications [4]. However, standard fistulizing procedures are rarely successful in patients with RG. The problem lies in serious hemorrhagic complications associated with almost all known fistulizing interventions, as well as increased proliferation of connective tissue in the area of operations. According to some authors, the frequency of postoperative hyphemas after trabeculectomy in eyes with NG reaches 40% [5].

Surgical treatment of RG is also associated with the difficulty of forming additional outflow tracts of IF. This is due to the fact that a distinctive feature of RG is an even more pronounced (than in other forms of glaucoma) fibrotic activity of eye tissues, leading to rapid scarring and obliteration of aqueous humor outflow tracts created during standard filtering operations [2, 4]. Therefore, in recent years, in order to prevent excessive postoperative scarring, drug correction has been proposed in the form of the use of cytostatics and antimetabolites [3]. The cytostatic drugs 5-fluorouracil (5FU) and mitomycin C (MMC) are widely used as factors that inhibit excessive fibroblast proliferation in response to surgical trauma [6]. The widespread use of antimetabolites during the filtration operation has been the most significant achievement of the last 20 years. Trabeculectomy in RG provides only a 20% success rate in the first year after surgery, while the use of antimetabolites increases the efficiency up to 56%. However, they have complications (delayed healing of the surgical wound with the formation of a filter pad fistula, which can lead to persistent hypotension and infection, corneal damage up to the development of epithelial endothelial dystrophy), which limit their use [7].

"Alloplant". However, to date, none of the known alloplastic methods of glaucoma surgery has been widely used in repeated antiglaucoma interventions due to insufficient stability of the results [6]. In addition, the use of allo and xenodrainages is associated with the immunoallergizing effect of the graft on eye tissues, the difficulty of collecting and storing donor material [2]. This led to an active search for new biocompatible materials.

Explant drains are synthetic drains made from materials such as supramid, lavsan, teflon, acrylate, polyurethane, polyethylene, silicone rubber, hydrogel, polyester, carbon, polyacrylamide hydrogel, silicone. The advantage of the most common drains made of synthetic materials is the lack of immunogenicity. At the same time, it is generally accepted that drainages made of synthetic materials do not have biomechanical properties close to the properties of their own tissues, do not optimize the conditions of microcirculation, the revitalization of metabolic processes in surrounding tissues. In addition, they have limited durability, low ability to integrate with tissues under conditions of a mechanical factor, and, in addition to all of the above, they are insufficiently biocompatible with eye tissues, which leads to a complicated healing process, accelerated scarring processes, and blockade of the created outflow tracts. IF. Nevertheless, the use of implants made of synthetic materials increases the percentage of positive results in

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glaucoma revision surgery up to 76.484.6% [4]. The overall effectiveness of surgical interventions using drains and the preference for other methods is not disputed by most authors and ranges from 35 to 100%.

Foreign literature data contain a large variation in IP normalization rates using drains in refractory glaucoma: a positive result was achieved in 2098% of cases [3741]. However, silicone tubular drains (Molteno, Baerveldt) often lead to the development of persistent postoperative hypotension with prolonged absence of the anterior chamber due to the lack of resistance to fluid flow through the drain [4]. Insufficient elasticity of drains (Baerveldt) leads to their dislocation, dysfunction of extraocular muscles. In addition, a common negative feature characteristic of all explant drainages (including tubular ones) is prolonged postoperative hypotension (provoking CHO), a shallow anterior chamber, hypotonic maculopathy, the formation of a connective tissue capsule around the outer end of the drainage, and blockade of the tube. Also, limitation of eyeball mobility and diplopia, strabismus, endophthalmitis, corneal edema and degeneration, choroidal bleeding, subatrophy of the eyeball, erosion of the conjunctiva above the plate or tube with possible subsequent exposure or rejection of the implant are not uncommon. These shortcomings required further improvement of drainage surgery techniques, and contributed to the development of the Ahmed™ Valve Drainage System (DDS) (Ahmed Glaucoma Valve, New World Medical, Inc.), in which the tube is connected to a silicone valve enclosed in a polypropylene housing - storage tank. The valve mechanism consists of two silicone membranes, working on the basis of the Venturi effect, and is activated when the IP in the anterior chamber rises above 8 mmHg.

The use of VDS (valve drainage system) does not give a 100% guarantee of an adequate course of reparative processes, however, it minimizes the failure of the operation due to excessive scarring. This provides a higher percentage of IP normalization and stabilization of visual functions. It is known, and it has been proven by surgical experience, that persistent IP normalization after surgery is an essential prerequisite for maintaining visual functions after antiglaucoma operations: blood flow in the ophthalmic artery improves, which is confirmed by rheography, oculography, and Doppler sonography. By reducing the excision injury of the eye tissues and ocular decompression after VDS implantation, the morphofunctional stability of the ciliary body is not disturbed, which ensures the preservation of its water-producing function. Due to this, an adequate hydrodynamic tone is formed to prevent secondary adhesion of the surgically formed pathways. Timely renewal of the fluid in the anterior chamber leads to the fact that there is no accumulation of lipid peroxidation products with a cytotoxic effect in it. This contributes to the preservation of the trabecular apparatus and the blockage of the vicious circle that develops in RG.

It is now recognized that VDS for severe glaucoma is the operation of choice, with much more promising results than traditional methods. According to Leuenberger E.U., up to 6000 bypass and valve constructions are installed annually in the USA, as a rule, after two failed traditional hypotensive operations.

## CONCLUSION

Thus, the experience of recent decades shows that VDS is the most optimal surgical intervention for RG, but further improvement in the design and materials of implants will improve the safety of drainage surgery in refractory glaucoma.

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