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# THE TREATMENT OF NEOVASCULAR GLAUCOMA CAUSED BY CENTRAL VEIN OCCLUSION WITH CYCLO CRYOTHERAPY - A CASE REPORT

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` **Abstract**

Glaucoma is the world's number one cause of irreversible blindness. Worldwide, there are over 65 million people diagnosed with various types of glaucoma. According to the latest definitions, it is a neuropathic progressive disease of the optic nerve. Neovascular glaucoma is a serious and aggressive form of glaucoma that has rapid progression and manifestations.

The main symptoms are high eye pressure, pain, redness and the appearance of small vessels in the iris. There are various treatments for this disease, but mainly they are aimed at relieving the symptoms or reducing the progression of the disease.

The most important therapeutic options, apart from anti-glaucoma drugs, are the application of anti-VEGF therapy and cyclodestructive treatments, which enable the reduction of intraocular pressure and alleviation of symptoms, thus enabling patients to have a better quality of life.

The aim of our study was to prove the impact of cyclocryotherapy in reducing intraocular pressure in a 43-year-old female patient with neovascular glaucoma of the left eye. The pressure before the intervention was 41.4 mmHg, while after the intervention it decreased to 26.6 mmHg, also the symptoms such as pain and redness subsided.

***Key words:*** neovascular glaucoma, retinal vein occlusion, cyclo-cryotherapy.

## Introduction

Glaucoma is a neuropathic eye disease that causes progressive damage on the optic nerve to the point where it allows the eye to transport visual information to the brain. Usually glaucoma has no symptoms in the early stages, but if glaucoma is detected in time and treated with adequate treatment, the progress of the disease can be slowed down[1].

The main types of glaucoma are primary, which can be open- and closed-angle, and secondary glaucoma. Secondary glaucoma is caused by other diseases of the eye such as chronic systemic diseases such as diabetes, arterial hypertension, inflammatory processes, trauma of the eyes and other physical and chemical factors.

The most important type of secondary glaucoma is neovascular glaucoma caused by retinal vein occlusions.

Neovascular glaucoma (NVG) is a potentially blinding, intractable, and aggressive secondary angle-closure glaucoma in most of cases defined by intraocular neovascularization (IN) of the iris and/or anterior chamber angle with elevated intraocular pressure (IOP), leading to severe visual consequences that complicate a large number of systemic and ocular disorders [2, 3].

Neovascular glaucoma is a secondary inflammatory glaucoma characterized by increased inflammation of the anterior segment of the eye, which is most often caused by deep retinal ischemia (ischemic and proliferative retinopathy) found in various ischemic retinopathies, primarily proliferative diabetic retinopathy, an ischemic form of retinal occlusion. central retinal vein occlusion (CRVO) and ocular ischemic syndrome (OIS), however some cases are associated with other ocular and extraocular entities. NVG is a progressive disease with the potential for evolution even after medical or surgical normalization of increased intraocular pressure [4, 5].

Occlusion of the central vein or its branch is often due to local thrombosis at the places where the sclerotic arteries compress with the veins. In central retinal vein occlusion, the thrombus lies at the

level of the lamina cribrosa, in branch retinal vein occlusion, it is often at the arteriovenous junction. Patients notice symptoms with a drop in visual acuity only if the macula or optic disc is involved.

Retinal vein occlusion is the second most common vascular disorder after diabetic retinopathy. The most common underlying systemic disorders are arterial hypertension and diabetes mellitus; frequent ocular disorder is the result of glaucoma or neovascular glaucoma, which is the result of untreated retinal vein occlusion, especially the ischemic form [6].

Neovascular glaucoma is also known as 100-day glaucoma because it predicts the evolution of untreated venous occlusion to the formation of new blood vessels.

Cyclocryotherapy is an old method based on freezing the ciliary body with a transcleral approach. A special device called a cryoanemisator is used and it produces a temperature of up to -70°C with the determination of the time depending on the strength and the need for cyclodestruction.

The device consists of the base that enables the production of freezing, a bottle with N2O and the handle-probe through which the freezing is applied.

Mechanism of action: cyclocryotherapy refers to the trans-scleral application of a cryo-probe over the ciliary processes in order to ablate or destroy enough ciliary tissue, so that the inflow of the eye guide (and thus the IOP) is reduced to clinically acceptable levels [7].

The technical details of the procedure are described in the following sections. Typically, rapid freezing to temperatures around − 70 °C results in the formation of intracellular micro-crystals that ultimately leads to cell destruction. Cryoablation also leads to obliteration of small blood vessels and necrosis of the ciliary body, in addition to destruction of ciliary epithelial cells.

The resulting tissue ischemia is thought to be an additional mechanism leading to a decrease in aqueous humor synthesis. However, an unwanted collateral effect of cyclocryotherapy can be the damage caused to the adjacent trabecular meshwork due to the expansion of the cryoablated area.

This impairment of trabecular outflow may cause the procedure to lose its effect over time, especially since regeneration of the ciliary epithelium may partially restore aqueous synthesis.

Another, mostly desired, collateral effect of cyclocryotherapy is a reduction in corneal sensitivity due to damage to the corneal nerves, this may allow some patients with painful eyes to experience less pain, even though the IOP remains high.

In our study, we based experience mostly from other studies that suggest cryotherapy as a method that can drastically reduce intraocular pressure and at the same time patients get a better quality of life with the absence of pain and conjunctivitis. Also, cryotherapy can be repeated up to several times as needed [8, 9].

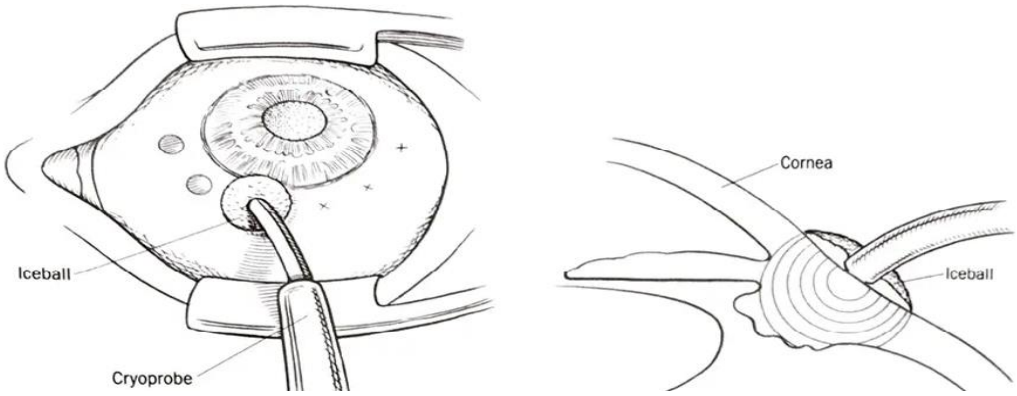


**Figure 1.** Cyclocryotherapy. The cryoprobe is positioned with the tip approximately 2 mm posterior to the limbus and a cross-sectional view showing the ice ball that has encompassed the ciliary body [6].

**Case report**

In our case, we had a 43-year-old female patient with decompensated open-angle glaucoma on the right eye and neovascular glaucoma on the left eye with positive family history of glaucoma. The patient was placed on topical conservative therapy 3 years ago in both eyes. 1 year ago, she suddenly lost his vision in her left eye, which was treated conservatively by an ophthalmologist. Best corrected visual acuity was 0.2 in the right eye, L-P in the left eye, Tod=17.3mmHg with topical therapy Timolol, Azopt and Latanoprost and Tos= 41.4 mmHg with topical therapy Timolol and Azopt.

Due to severe pain and high eye pressure, it was decided to intervene with cryotherapy of the left eye. After 4 days of regular examination, the patient had a decrease in intraocular pressure to 26.6 mmHg and complete disappearance of pain. The rubeosis of the iris was still present with the same intensity.

**Figure 2.** Trans-scleral application of the cryospots

**Discussion**

Neovascular glaucoma belongs to the secondary glaucomas that can be caused by various factors, such as inflammatory processes, trauma to the eye, vascular diseases of the retina and uvea, tumors, various physical and chemical factors.

This disease has a poor prognosis due to the limitation of treatments. The first choice of treatment is the application of anti-VEGF therapy, which reduces the progression of neovascular processes and thereby improves the clinical picture. Other methods are cyclodestructive treatments such as cyclocryotherapy and cyclophotocoagulation. In our case, we used cyclocryotherapy, which we applied trans-scleral.

With the help of the device, we used 18-20 stamps with a strength of -70c and a duration of one stamp of 12 seconds.

The cryospots were applied in the entire bulbar circumference with a size of 1.5-2mm and a distance from the limbus of about 2 mm [7,10].

Special care was taken not to disallow regions such as 3 and 9 o'clock due to possible damage to the ciliary blood vessels. After a few days of regular control, the patient's intraocular pressure was drastically reduced to 26.6 mm Hg topical therapy with Timolol and Azopt and regular checks of intraocular pressure every month were continued.

The advantage of this treatment is the ability to repeat it several times in the same eye without serious consequences if the protocols for correct access to it are followed. Only in isolated cases of repeated cyclocryotherapy, serious disorders such as hypotension and phthisis of the bulbus have been described and proven [11,12].

**Conclusion**

Cryotherapy with a trans-scleral approach is a good treatment for patients with neovascular glaucoma because it leads to a drastic reduction of intraocular pressure and withdrawal of the main symptoms of this disease such as pain and redness.

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