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Original Article

Efficacy of Cyclocryotherapy on Pain in Patients with Absolute Glaucoma

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ABSTRACT

Objective: The aim of this study was to evaluate the short-term efficacy of cyclocryotherapy in pain control in 63 patients with absolute glaucoma who had pain and no vision despite maximum medical treatment.

Methods: 63 eyes of 63 glaucoma patients defined as absolute glaucoma were included in the study. The intraocular pressures, number of drops used, pain status and need for recurrent therapy were compared before and after the procedure at 1 and 3 months

Results: 13 of the patients were female and 40 were male. The mean age was 59.4±17.5 years. 50 of the patients were diagnosed with neovascular glaucoma, 3 with congenital glaucoma, 1 with primary open-angle glaucoma and 9 with angle-closure glaucoma. Preoperative mean intraocular pressure was 50.7±12 mmHg, while it was found to be 37.9±15.4 mmHg in the 1st month and 28.5±15.8 mmHg in the 3rd month postoperatively. The decrease in intraocular pressure before and after the procedure was statistically significant at 1 and 3 months. ($p<0.0001$) Pain control was received 85% at the first month and 96% at the third month after the procedure. Number of medications that were used was found 3.00 and 2.3±0.9 respectively before and after the procedure and this was statistically significant. ($p<0.0001$) While no phthisis was observed in any patient, evisceration was applied to 2 patients because of uncontrolled pain.

Conclusion: Cyclocryotherapy may be a preferred treatment option before evisceration, as it is a non-invasive, inexpensive and easily applicable method in patients whose pain control cannot be achieved, although it has lost its former popularity with the discovery of new options in the surgical and medical treatment of glaucoma.

INTRODUCTION

Glaucoma is one of the most common causes of blindness in the world. Absolute glaucoma can be defined as end-stage glaucoma in which there is no vision and there is pain despite maximum medical treatment. While it is aimed to protect the visual field and visual acuity in the treatment of glaucoma, the goal in absolute glaucoma patients is to relieve the pain and to ensure the quality of life of the patient. Evisceration or enucleation can be applied for the control of glaucoma, but these options are left to the last due to cosmetic concerns. Although cyclocryotherapy lost its popularity in current glaucoma treatment, it still has validity to control pain in patients with absolute glaucoma. In our study, we evaluated the effectiveness of cyclocryotherapy on intraocular pressure and pain in patients with painful absolute glaucoma in our clinic between 2017 and 2019.

MATERIALS AND METHODS

The records of patients with absolute glaucoma who underwent cyclocryotherapy between 2017 and 2019 were retrospectively reviewed. Sixty-three eyes of 63 patients who were older than 18 years of age had no light perception, had eye pain despite maximum medical treatment, and had an intraocular pressure above 21 mmHg were included in the study. Patients were evaluated in terms of intraocular pressure before and after the 1st and 3th months of the procedure, number of eye drops used, pain status before and after the procedure, and repeatability of the procedure. Cyclocryotherapy was applied to all patients under retrobulbar anesthesia with the 2.5-mm probe of the Bimed Universal cryo device, 2 mm behind the limbus, for 60s at −80°C in 6 quadrants. Subconjunctival steroid injection was applied at the end of the procedure and topical antibiotics, steroids, and cycloplegics were used in tapering doses within 1 month after the procedure. The

Table 1. Pre and post operative IOP and medication status of patients

	n	Minimum	Maximum	Mean	Standard Deviation
Age	63	17	86	59.4	17.5
Pre-operative IOP	63	27	72	50.7	12
Post-operative 1. month IOP	63	8	64	37.9	15.4
Post-operative 3. month IOP	63	9	64	28.5	15.8
Number of drops pre-operative	63	3	3	3	0
Number of drops post-operative	63	0	3	2.3	0.9

IOP: Intraocular pressure (mmHg).

intraocular pressures (Goldmann applanation tonometry) before and at the 1st and 3rd months after the procedure, presence of pain, and the number of eye drops used before and after the procedure were recorded.

Statistics

Statistical analysis was performed using SPSS (version 21.0, SPSS, Inc., Chicago, IL, USA). Data were expressed as mean±standard deviation or percent where appropriate. $p<0.05$ was considered statistically significant. The normal distribution of the data distribution in the groups was evaluated using the Shapiro–Wilk test. Friedman test was used to compare intraocular pressures at pre-operative, 1st, and 3rd months. Wilcoxon test was used for pairwise comparisons.

RESULTS

The cyclocryotherapy procedure applied to 63 eyes of 63 patients with absolute glaucoma whose pain persisted despite maximum medical treatment and who were not suitable for glaucoma surgery was evaluated. 13 of the patients were female and 40 were male. The mean age was 59.4±17.5 years. Diagnoses of patients were neovascular glaucoma in 50 patients, congenital glaucoma in 3 patients, and primary open-angle glaucoma and angle closure glaucoma in 9 patients. Pre-operative mean intraocular pressure was 50.7±12 mmHg, while post-operative was 37.9±15.4 mmHg in 1st month and 28.5±15.8 mmHg in 3rd month. The decrease in intraocular pressure before and 1 and 3 months after the procedure was statistically significant. The descriptive information of the patients is summarized in Table 1. The difference in intraocular pressure between 1st and 3rd months after the procedure was also significant. All of the patients used 3 antiglaucomatous drops pre-operatively, and this number was found to be 2.3±0.9 after the procedure. 54 patients had never undergone surgery. Ahmed glaucoma valve implantation was performed in 4 patients, trabeculectomy in 2 patients, diode laser cyclophotocoagulation in 1 patient, and pars plana vitrectomy in 2 patients before the procedure. Pain control was achieved in 54 patients in the post-operative 1st month. Because of pain persistence, 6 patients underwent the same procedure in post-operative 1st month while 9 underwent in post-operative 2nd month. Evisceration was performed in 2 patients due to uncontrolled pain.

DISCUSSION

Cyclocryotherapy was first defined by Bietti[1] in 1950 and started to be used more frequently after Roeth[2] reported 73% success after the application. Although it is an easy procedure, the most important and feared complication is phthisis. Boniuk[3] and Bellows[4] reported the rate of phthisis as 10%, while this rate was 34% in the study of Croup.[5] With the increase in vision-saving options in glaucoma surgery, cyclocryotherapy has almost completely lost its use, especially in patients with good visual acuity. However, no matter how new options are defined in the medical treatment and surgical treatment of glaucoma, the disease still progresses aggressively in some patients, and eventually, despite maximum medical treatment, blindness develops and severe pain is experienced. The primary goal in these patients is to increase their quality of life by providing pain control. For this, the chosen method should have the lowest risk in terms of complications and should be less invasive. Cyclocryotherapy is an easy, repeatable, and non-invasive method and its costs are low. Humor aqueous is produced by non-pigmented ciliary epithelium. With a probe placed 2.5–3 mm behind the limbus over the conjunctiva at −80°C for about 60s, provides ablation in the ciliary body and deteriorates the blood flow of the ciliary body. Thus, aqueous humor production is reduced. Meantime, an increase in outflow can be achieved by causing damage to the trabecular meshwork. It takes about 3–4 weeks for damage to the ciliary epithelium, so this time should be considered when evaluating the effectiveness of the procedure. With the regeneration of the ciliary epithelium, the effectiveness of cyclocryotherapy decreases. Therefore, repeated applications may be required. Damage in the suprachoroidal space affects both ciliary nerves and long posterior ciliary artery. Damage to arteries can cause phthisis and vision loss. Destruction of the ciliary nerves, on the other hand, reduces the feeling of pain. In our study, the rate of intraocular pressure ≤21 mmHg with or without medication in the post-operative 1st month was 12%, while pain control was 85%. Although the aimed intraocular pressure cannot be achieved, the decrease in pain after the procedure can be explained by

damage to the ciliary nerves in the suprachoroidal area. In a study by Ruixue et al.[3] in 2020 comparing the effectiveness of ultrasound cycloplasty and cyclocryotherapy, reduction in pain in the 6th month after cyclocryotherapy was found 73%. Kim et al.[4] showed that the cyclocryotherapy procedure, which was applied to 6 quadrants and 3 and 9 o'clock position, provided pain control in all patients. Baykara et al.[5] evaluated the effectiveness of cyclocryotherapy in 39 eyes with painful and absolute glaucoma and found the success of pain control to 79%. In our study, similar results were found with respect to other studies. There was no loss of vision because patients with any vision acuity were not included in our study. Phthisis is the most devastating complication of cyclocryotherapy. In particular, application to more than 6 quadrants, application to the 3 and 9 o'clock lines, and repetitive applications increase the risk of phthisis. While Heuring[6] reported the rate of phthisis as 6.7% in his study in 1998, this rate was 11.7% in the study of Benson and Nelson.[7] In the study of Kim,[4] even though cyclocryotherapy was applied to the 3 and 9 o'clock quadrants, phthisis developed in only one of 20 eyes. In our study, phthisis was not seen in any patient. This situation can be explained by the fact that cyclocryotherapy is applied only 6 quadrants and the rate of recurrent treatment is low (23%). While the expectation from cryotherapy was to provide both effective intraocular pressure and protection of vision in the past, today, cryotherapy is mostly used to control pain as last chance. Rates of feared complications have decreased as a result of the almost non-applicability of the procedure in eyes with vision acuity in the current studies. Pain which does not respond to medical treatment seriously affects the quality of life of glaucoma patients. Furthermore, it is very difficult to use eye drops many times a day for patients who take maximum medical treatment but do not have light perception. Reduction in the number of drops can be included in the success criteria for this procedure. In our study, the decrease in the number of drops was found to be statistically significant. In the study by Gorsler[8] published in 2015, a significant decrease was found in the number of drops used after cyclocryotherapy and the need for drops was completely eliminated in 2% of the patients. In our study, the rate of complete elimination of the drop requirement was 3%. With the help of the results we have obtained, it can be said that cyclocryotherapy is successful in pain control, regardless of the decrease in intraocular pressure in patients with absolute glaucoma and can be a last chance before evisceration or enucleation.

Conclusion

Cyclocryotherapy may be a preferred treatment option before evisceration, as it is a non-invasive, inexpensive and easily applicable method in patients whose pain control cannot be achieved, although it has lost its former popularity with the discovery of new options in the surgical and medical treatment of glaucoma.

Ethics Committee Approval

This study approved by the Kartal Dr. Lütfi Kırdar City Hospital, Clinical Research Ethics Committee (Date: 27.10.2021, Decision No: 2021/514/212/9).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: B.Y.; Design: B.Y., Ş.Ş.; Supervision: B.Y., Ş.Ş.; Fundings: B.Y., A.A.; Materials: B.Y., A.A.; Data: B.Y., A.A.; Analysis: B.T.; Literature search: B.T., A.A.; Writing: B.Y.; Critical revision: B.Y., Ş.Ş.

Conflict of Interest

None declared.

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Absolu Glokom Hastalarında Siklokriyoterapi Tedavisinin Ağrı Üzerine Etkinliği

Amaç: Bu çalışmanın amacı maksimum medikal tedaviye rağmen ağrısı olan ve görme hissi olmayan 63 absolu glokom hastasına ağrı kontrolü için uygulanan siklokriyoterapi tedavisinin kısa dönem etkinliğini değerlendirmektir.

Gereç ve Yöntem: Absolu glokom olarak tanımlanan 63 glokom hastasının 63 gözü çalışmaya dahil edildi. Hastaların işlem öncesi ve sonrasındaki 1 ve 3. aydaki göz içi basınçları, kullandıkları ilaç sayıları, ağrı durumları ve tekrar uygulama gereksinimleri karşılaştırıldı.

Bulgular: Hastaların 13'ü kadın 40'ı erkekti. Yaş ortalaması 59.4+-17.5 idi. Hastaların 50 si neovasküler glokom, 3ü konjenital glokom, 1'i primer açık açılı glokom ve 9'u açı kapanması glokomu tanılıydı. Preoperatif ortalama göz içi basıncı 50,7 mmHg +-12 mm-Hg iken post operatif 1. ayda 37.9+-15 mm-Hg, 3. ayda 28.5+-15.8 mm-Hg olarak bulundu. İşlem öncesi ve sonrasında 1 ve 3. ayda göz içi basıncında elde edilen düşüş istatistiksel olarak anlamlıydı. ($p<0.0001$) Ağrı kontrolü işlem sonrası birinci ayda %85, üçüncü ayda %96 olarak bulundu. İşlem öncesi ve sonrası kullanılan ilaç miktarları sırasıyla 3 ve 2.3±0.9 olarak bulundu ve bu değer istatstiksel olarak anlamlı görüldü. ($p<0.0001$) Hiçbir hastada fitizis görülmezken ağrı kontrolü sağlanamaması nedeniyle 2 hastaya eviserasyon uygulandığı tespit edildi.

Sonuç: Siklokriyoterapi glokomun cerrahi ve medikal tedavisinde yeni seçeneklerin bulunmasıyla eski popülerliğini kaybetmesine rağmen ağrı kontrolü sağlanamayan hastalarda non invazif, ucuz ve kolay uygulanabilir bir yöntem olmasıyla eviserasyon öncesi tercih edilebilir bir tedavi seçeneği olabilir.

Anahtar Sözcükler: Absolu glokom; ağrı kontrolü; eviserasyon; fitizis; siklokriyoterapi.