SCIE DOI: 10.14744/scie.2021.03371
South. Clin. Ist. Euras. 2023;34(2):108-111

Original Article

Follow-Up Results and Literature Review in Angle Closure Glaucoma

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Submitted: 17.05.2021
Accepted: 15.09.2021

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Keywords: Angle closure; glaucoma; glaucoma surgery.

ABSTRACT

Objective: The aim of this study was to evaluate the follow-up results of patients diagnosed with angle closure glaucoma (ACG) and the factors affecting the final intraocular pressure (IOP) level in these patients.

Methods: The data from 63 eyes of 43 patients diagnosed with ACG between January 2016 and December 2019 were retrospectively analyzed. Six-month follow-up results of the patients were evaluated. Best corrected visual acuity (BCVA), biomicroscopic examination findings, IOP level, and treatment-related complications, if any, were examined at the time of admission and at the last examination.

Results: The mean IOP level of 13 (30.3%) male and 30 (69.7%) female patients with a mean age of 62.24±12.5 years (36–84 years) was 32.23±14.3 mmHg at the time of admission, while it was 14.41±8.4 mmHg at the last examination. AAC was observed in 23 (34%) eyes. The most common treatment methods were peripheral laser iridotomy (PLI) and the surgical lens extraction (LE). The mean IOP reduction was 19.71±4.3, 20.6±9.5, 31.03±12.20, and 17.73±2.8 mmHg in the PLI, LE, PLI, and LE groups, respectively. At the end of 6 months, the IOP level in 55 (88%) eyes was between 10 and 21 mmHg. Blindness developed in three eyes.

Conclusion: In our study, 6-month follow-up data of newly diagnosed ACG patients were presented. A greater IOP reduction was achieved in groups where LE or trabeculectomy was performed using PLI. There was no statistically significant difference in IOP reduction and surgical complications with LE and trabeculectomy (p=0.3).

INTRODUCTION

Glaucoma is the most common cause of irreversible blindness worldwide. The two most common forms of glaucoma are primary open angle glaucoma (POAG) and primary angle closure glaucoma (PACG).[1] PACG includes iridotrabecular contact up to 270 degrees of peripheral anterior synechiae with optic nerve damage and visual field defect.[2,3] Small cornea, shallow anterior chamber, lens thickness, lens position, and short axial length are anatomical risk factors for PACG development.[4] While chronic cases are often asymptomatic, severe headache, vomiting, decreased vision, and high IOP are observed in acute cases.[5] The first medical treatment applied in acute angle closure glaucoma (AACG) aimed to block the production of aqueous humor, increase aqueous humor drainage, and decrease the intraocular pressure (IOP) by reducing the volume of the aqueous humor.[6] Laser iridotomy applied after the acute period allows aqueous humor to flow in different ways, reducing the pressure difference between the posterior and anterior chamber, and relieves pupillary block.[7] Specifically, in PACG, cataract surgery can be particularly effective in the treatment and prevention of angle closure. Persistent cases can be treated with trabeculectomy and shunt implants, but these are usually not first-line treatments.[8] Angle closure may be secondary to mechanical closure of the anterior chamber angle, for example, by anterior displacement of the lens due to an intraocular tumor or by adhesions formed by fibrin in the peripheral iris with the trabecular meshwork or in the pupillary area, as in uveitis.[9] In secondary ACG, unlike PACG, response to LI application is low.[7] In our study, we evaluated the angle closure mechanism of patients with ACG, the treatment methods applied, the follow-up results, and the factors affecting the final IOP level in these patients.

MATERIALS AND METHODS

The data of patients with ACG newly diagnosed between January 2016 and December 2019 were analyzed retrospectively. Patients with at least six months of follow-up were included in the study. Patients diagnosed with glaucoma and previously treated for this reason were excluded from the study.

The age and gender of the patients and the last examination date at the time of first application and in our follow-up were evaluated. The best corrected visual acuity (BCVA) was evaluated according to the Snellen chart and converted to log MAR equivalent. IOP levels were recorded retrospectively using Goldmann applanation tonometer. Biomicroscopic examination findings, medical treatment, and surgeries applied to the patients were examined. The patient data were evaluated according to acute or chronic angle closure, primary or secondary angle closure mechanisms, applied treatments, medical treatment, PLI, LE, trabeculectomy, vitrectomy, and cyclodestruction surgery. First, medical treatment was applied to all patients according to the severity and mechanism of the disease. Prophylactic PLI was applied to the other eyes of patients who had acute primary angle closure.

Surgical procedures were performed according to the classical surgery rules: PLI with the aid of Nd:YAG laser, LE using standard phacoemulsification surgery followed by intraocular lens implantation in clear lenses and eyes with cataracts, trabeculectomy using mitomycin C, and cyclodestruction surgery with cyclocryotherapy 180 or 270 degrees area.

Statistical method

All data were encoded and transferred to the computer environment. Statistical Package for the Social Sciences version 23.0 (SPSS, Inc., Chicago, IL, USA) Windows package program was used for the statistical evaluation. Student's t-test was used to compare the average treatment efficacy and to compare the IOP levels. P<0.05 was considered statistically significant.

Table 1. Demographic data of the study

Study group	Number (n: Number of patients)
Sex, n (%)	
Female	30 (69.7)
Male	13 (30.3)
Age	62.24±12.5 (36–84 y)

RESULTS

The mean age of 43 patients, 13 (30.3%) males and 30 (69.7%) females, in our study was 62.24±12.5 years (Table 1). While the mean IOP level of the affected eyes was 32.23±14.3 mmHg at the time of diagnosis, it was 14.41±8.4 mmHg at the last examination. While the mean BCVA of the sick eyes was 0.4 log MAR at the time of diagnosis, it was 0.3 log MAR at the end of 6 months. Acute findings were detected in 23 of the affected eyes and chronic findings in 40 eyes. The most common presentation, treatment method, and surgical method were primary chronic ACG, PLI, and phacoemulsification, respectively. The treatment methods applied and their effects on the IOP level were evaluated separately for acute and chronic ACG, and the data are presented in Table 2.

The mean IOP level of 23 patient eyes with AACG was 43.86±11.3 mmHg. Emergency medical treatment (beta-blockers, alpha-2-agonists, and carbonic anhydrase inhibitors, prostaglandin analogs, oral acetazolamide, and intravenous (IV) mannitol 300 mg/kg) were first administered to the patients. For the acute treatment, 6 (26%) eyes had only medical treatment, 12 eyes medical treatment and PLI, 2 eyes LE, and 1 eye trabeculectomy. Phacoemulsification was applied recently after medical treatment in 3 eyes with phacomorphic AACG. When the last examination of the patients was evaluated, the mean IOP decreased to 17.8±6.7 mmHg. Despite medical and surgical treatment, the IOP level was above 21 mmHg in only 3 eyes followed by secondary AACG at the last. The IOP level of all other patients had declined to between 10 and 21 mmHg. After the medical treatment, IOP control was achieved in 14 patients with a decrease of 17.2±3.5 mmHg in the affect-

Table 2. Treatments applied in acute and chronic angle closure glaucoma and their effects on mean IOP level

	MED	PLI	LE	PLI+LE	TRAB	PLI+TRAP	PPV	CYCLO
Mean decreased IOP (mmhg)								
Acute	16.6±6.4	27.2±12.2	28.8±9.6	34.76±12.9	22	24	13	–
Chronic	5.3±3.4	8.71±4.3	10.1±4.3	12.1.0±5.0	9.7±2.8	9	8.5±0.5	17.0
Mean decreased IOP (%)								
Acute	39	53	59	68	56	54	40	–
Chronic	20	34	34	43	32	32	31	42
Number of applications (n)								
Acute	4	10	3	3	1	1	1	–
Chronic	2	18	6	3	4	1	2	2

MED: Medical therapy; PLI: Peripheral laser iridotomy; LE: Lens extraction; TRAB: Trabeculectomy; PPV: Pars plana vitrectomy; CYCLO: Cyclodestruction.

ed eyes with the application of PLI without surgical intervention. No statistically significant difference was found between having a higher initial IOP level and the need for additional surgery ($p<0.01$). In 3 eyes with secondary AAC at the end of 1 month, 1 eye developed suprachoroidal hemorrhage during phacoemulsification, and two eyes developed blindness due to neovascular glaucoma. Other patients had visual gain compared with the acute period. During the 6-month follow-up period, no patient developed AAC crisis in the same eye and in the other eye.

According to the mechanism of the eyes of the patients with chronic ACG, 22 (55%) were evaluated as primary and 18 (45%) as secondary. The mean IOP level was 22.6±13.7 mmHg. Two eyes had only medical treatment, 18 PLI, 6 eyes LE, 3 eyes both PLI and LE, 4 eyes trabeculectomy, 1 eye both PLI and trabeculectomy, 2 eyes vitrectomy, and 2 eyes cyclodestruction. When the last examination of the patients was evaluated, the mean IOP decreased to 15.97±6.2 mmHg. The IOP level was found to be 21 mmHg and above in only 4 eyes with secondary angle closure, while the IOP of the other eyes was between 10 and 21 mmHg. There was no statistically significant difference between the IOP reduction levels in the phacoemulsification and trabeculectomy groups ($p=0.3$). More IOP reduction was seen in the groups applied with PLI application with LE or trabeculectomy. At the end of 6 months, 2 eyes with an IOP level above 21 mmHg showed a two-line or more regression in vision. Blindness did not develop in any of the patients.

DISCUSSION

ACG is a potential cause of blindness, and PACG is responsible for half of the glaucoma-related blindness worldwide.[10] The prognosis depends on early diagnosis and prompt treatment of AACG.[11] Intravenous mannitol, oral carbonic anhydrase, topical beta-blocker, alpha-2-agonist, pilocarpine, and prostaglandin analogs can be used in the emergency treatment of AAC.[12] In a study reported with 160 AACG patients, the delay in admission and the time taken to end the acute attack were the most important factors in the final results, and the IOP elevation at the time of presentation was less effective in determining the prognosis.[13] In another study, having a higher IOP level in AAC, progressing to more frequent blindness over a 10-year period was associated with decreased visual acuity and narrowing of the field of vision.[14] In the results of our study, there was no statistically significant difference in the need for additional surgery and lowering the IOP level in the long term in patients presenting with higher IOP. Because our study data include a 6-month period, visual field narrowing and nerve fiber evaluation are not sufficient. In another study that examined the long-term patient data in patients with AAC, it was reported that while IOP was within normal limits in 50% of the patients without the use of medication or surgery, blindness developed in 11% of the patients.[15] In our study results, IOP reduction was achieved with medical treatment and PLI in 60% of eyes with AACG without the need for additional surgery. The resulting blindness and high IOP level were more common in patients with secondary AAC. In the study conducted by Antonio Maria Fea et al.,[16] it was reported that patients with AACG may develop chronic ACG in the long-term follow-up even if PLI is applied in the other eyes. In a study investigating the efficacy of prophylactic PLI in the other eyes of patients with AACG, PLI applied did not completely prevent ACG. More than 50% of the other eyes showed that although peripheral iridotomy was performed during an angle closure attack, chronic ACG may occur over time.[16] When we applied prophylactic PLI to fellow eyes in the 6-month follow-up period, AACG did not develop in the other eye of any patient. In the EAGLE study, which included a large multicenter case series, it was shown that a high IOP level in ACG was associated with better prognostic results than PLI application with early LE in providing IOP control after medical control.[17] It was seen in the results of our study that in eyes with acute and chronic ACG, a higher IOP reduction was achieved in eyes that underwent LE compared with eyes that underwent PLI. A randomized clinical study by Sunita Radhakrishnan et al. demonstrated the superiority of clear LE over PLI in PACG or POAG with an IOP above 30 mmHg.[18] Nowadays, a combination of LE, goniosynechialysis, and trabeculectomy can be applied to reduce IOP.[19] While it was reported in studies that the combined application of LE and trabeculectomy was more effective than LE alone in reducing IOP, patients who underwent LE and trabeculectomy procedures experienced more postoperative complications compared with the group that underwent LE alone.[20–22] Combined surgery was not performed in patients in our study, and no significant difference was observed in the surgeries performed in terms of complication development and IOP reduction. Worrying consequences of glaucoma in the long term warn patients and physicians about early treatment and treatment compliance. We analyzed the data of patients newly diagnosed with ACG in our clinic and the results of 6-month follow-up and shared the short-term results. Although the number of patients is not much, we think that reporting the results and complications of such studies, in which clinical results are presented regarding treatment methods, is important because it guides in the management of the disease.

CONCLUSION

ACG can result in blindness. The most important factor affecting the prognosis is the underlying mechanism of secondary ACG and the prevention of IOP control with early treatment. The treatment of PLI is an effective method in ACG; its combination with LE provides greater IOP reduction. Similar IOP reduction results are obtained with LE and trabeculectomy.

Ethics Committee Approval

This study approved by the Kartal Dr. Lütfi Kırdar City Hospital Clinical Research Ethics Committee (Date: 28.04.2021, Decision No: 2021/154/200/13).

Informed Consent

Retrospective study.

Peer-review

Internally peer-reviewed.

Authorship Contributions

Concept: G.D.G., R.D.G., A.A., B.Y., M.O., Ş.Ş.; Design: G.D.G., R.D.G., A.A., B.Y., M.O., Ş.Ş.; Supervision: G.D.G., R.D.G., A.A., B.Y., M.O., Ş.Ş.; Fundings: R.D.G.; Materials: M.O.; Data: A.A.; Analysis: G.D.G.; Literature search: B.Y.; Writing: G.D.G.; Critical revision: Ş.Ş.

Conflict of Interest

None declared.

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Açı Kapanması Glokomunda Takip Sonuçları ve Literatür İncelemesi

Amaç: Açı kapanması glokomu (AKG) tanısı alan hastaların takip sonuçlarının ve bu hastalarda nihai göz içi basıncı (GİB) düzeyine etki eden faktörlerin değerlendirilmesi.

Gereç ve Yöntem: Ocak 2016–Aralık 2019 tarihleri arasında açı kapanması glokomu tanısı alan 43 hastanın 63 gözüne ait veriler geriye dönük olarak incelendi. Hastaların altı aylık takip sonuçları değerlendirildi. Başvuru anındaki ve son muayenelerindeki en iyi düzeltilmiş görme keskinlikleri (EİDGK), biyomikroskopik muayene bulguları, GİB seviyesi, uygulanan tedavi yöntemleri varsa tedavilere bağlı komplikasyonlar incelendi.

Bulgular: Yaş ortalamaları 62.24±12.5 (36–84 yıl) yıl olan 13'ü (%30.3) erkek, 30'u (%69.7) kadın toplam 43 hastanın başvuru anındaki ortalama GİB 32.23±14.3 mmHg iken son muayenedeki ortalama GİB düzeyi 14.41±8.4 mmHg idi. Yirmi üç (%34) gözde akut açı kapanması görüldü. En sık uygulanan tedavi yöntemi periferik laser iridotomi (PLI), en sık uygulanan cerrahi lens ekstraksiyonu (LE) oldu. PLI, LE, PLI ve LE birlikte, trabekülektomi uygulanan gruplarda sırasıyla 19.71±4.3 mmHg, 20.6±9.5 mmHg, 31.03±12.20 mmHg, 17.73±2.8 mmHg'lık ortalama GİB düşüşü sağlandı. Altı ay sonunda gözlerin 55'inde (%88) GİB seviyesi 10 mmHg ile 21 mmHg seviyeleri arasındaydı. Üç gözde körlük gelişmişti.

Sonuç: Çalışmamızda, yeni tanı alan AKG hastalarının altı aylık takip verileri sunuldu. Lens ekstraksiyonu veya trabekülektominin periferik laser iridotomiyle birlikte uygulandığı gruplarda daha fazla GİB düşüşü sağlandı. Lens ekstraksiyonu ve trabekülektomi arasında GİB seviyesi düşüşü ve cerrahi komplikasyon gelişme oranı açısından istatistiksel anlamlı farklılık yoktu (p=0.3).

Anahtar Sözcükler: Açı kapanması; glokom; glokom cerrahisi.