A Case of Malignant Glaucoma Developed Because of an Angle-Closure Crisis Induced by the use of Gabapentin

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ABSTRACT

Malignant glaucoma (also known as aqueous misdirection syndrome) is a rare and serious eye condition characterized by a sudden and significant increase in intraocular pressure that usually affects only one eye. This condition can be triggered by surgical or medical treatments and can lead to vision loss or even blindness if left untreated. This report seeks to enhance our understanding of malignant glaucoma by presenting a challenging case in which differential diagnosis was difficult. Through this case, we will review the key clinical features, risk factors, and treatment options associated with malignant glaucoma.

Keywords: Acute angle closure, Argon laser peripheral iridoplasty, Gabapentin, Intraocular pressure, Laser peripheral iridotomy, Malignant glaucoma, Plateau iris syndrome.

INTRODUCTION

Malignant glaucoma, or more accurately aqueous misdirection syndrome, is characterized by the anterior displacement of the lens-iris diaphragm in both the central and peripheral regions, accompanied by elevated intraocular pressure (IOP), despite the presence of a patent laser peripheral iridotomy (LPI) or iridectomy.[1-3] While it commonly occurs after trabeculectomy in eyes with angle closure glaucoma,[4-8] it can also arise following procedures such as surgical and laser procedures performed for glaucoma treatment, cataract surgery or medical treatment such as pilocarpin.[2, 4, 7, 9-12] We aimed to present an intriguing and challenging case who developed acute angle-closure glaucoma after using gabapentin, and during the treatment of the glaucoma crisis, malignant glaucoma developed.

CASE REPORT

A 48-year-old female patient referred from an external center with a preliminary diagnosis of acute angle closure crisis, presenting with high IOP, sudden vision loss, and severe eye pain in the right eye (OD). The IOP was 70 mmHg with a topical carbonic anhydrase inhibitor beta blocker fix combination and alpha-2 agonist medication in OD, while the IOP was 16 mmHg in the left eye (OS) without medication. Due to corneal edema, the iridocorneal angle and other intraocular structures could not be evaluated clearly with biomicroscope. The ocular ultrasound imaging showed no retinal detachment, there was no evidence of choroidal effusion. It was learned from the patient's medical history that LPI was performed approximately 3 weeks ago. Argon laser peripheral iridoplasty (ALPI) was performed one week later as the IOP did not decrease after LPI procedure. When the patient's medical history was further investigated, it was found that the neurology clinic had started gabapentin 900 mg/day (Neruda tb, Sanovel, Turkey) for peripheral neuropathic pain, which the patient used for 3 weeks before the acute angle closure crisis.

The patient was given intravenous 300 cc mannitol 20% infusion and started on oral carbonic anhydrase inhibitors, while continuing her previous topical antiglaucoma medications. After the mannitol infusion, the IOP decreased to 40 mmHg, and the corneal edema improved slightly. Gonioscopy revealed a Shaffer grade 0 closed anterior chamber angle. Despite patent LPI in the peripheral iris, the anterior chamber was narrow both centrally and peripherally. ALPI spots were observed

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in the iris periphery. (Figure 1) The fundus could not be evaluated clearly, only a red reflex was obtained. Ultrasonic biomicroscopy (UBM) was needed to make a differential diagnosis, but it could only be performed after the start of hyperosmotic treatment. In the UBM, the anterior rotation of the ciliary body and the forward displacement of the iris were observed in OD. (Figure 2A) The anterior chamber of OS was narrow but with a normal configuration. (Figure 2B) Based on the unilateral nature of the findings and the LPI in the anterior chamber with gonioscopy and UBM images, plateau iris syndrome was ruled out.

Based on the clinical and imaging findings, the patient was suspected of having malignant glaucoma, and therefore cycloplegia treatment with Phenylephrine 2.5%, Cyclopentolate 1%, and Tropicamide 1% eye drops was started. After cycloplegia, it was observed that the anterior chamber was slightly formed. Pars plana vitrectomy, phacoemulsification, and intraocular lens implantation into the posterior chamber were planned. Intravenous 300 cc mannitol 20% infusion was administered prior to the surgery. No complications occurred during or after the surgery. The IOP was 14 mmHg without medication on the first day after the operation, and the cornea was transparent. (Figure 3) The cup-to-disc ratio was found to be 0.5-0.6 on fundus examination. Prophylactic Nd-YAG LPI was performed OS, due to closed iridocorneal angle according to the Shaffer grading system despite normal IOP (16 mmHg). During follow-up, the IOP was normal without medication in both eyes.

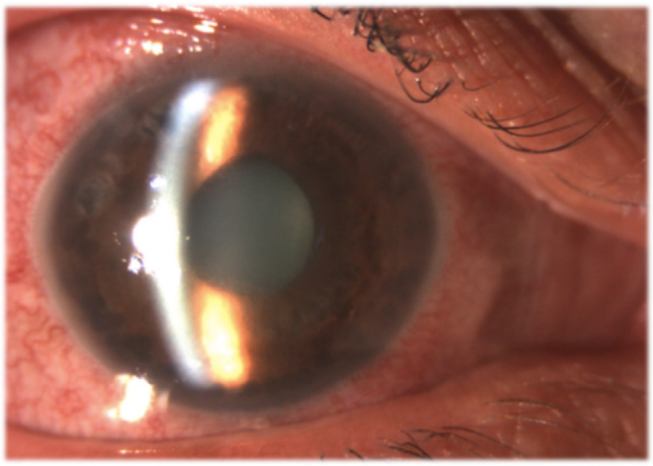

Figure 1: *Preoperative biomicroscopic view of the right eye. 360-degree argon laser iridoplasty spots throughout the iris and superotemporal laser peripheral iridotomy can be observed. Please note that the anterior chamber is shallow both centrally and peripherally.*

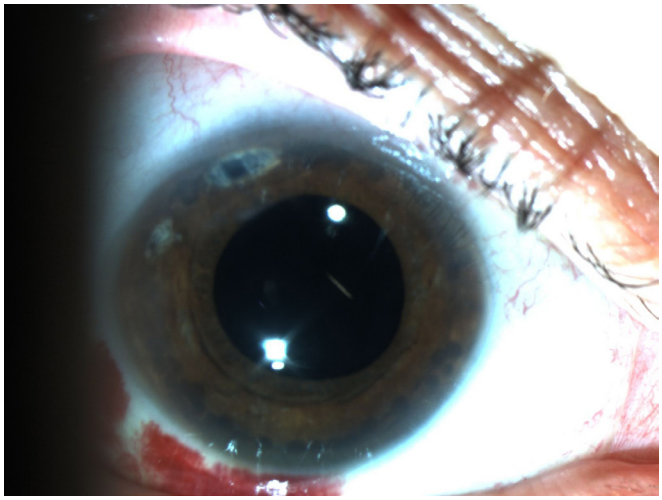

Figure 3: *Postoperative biomicroscopic view of the right eye*

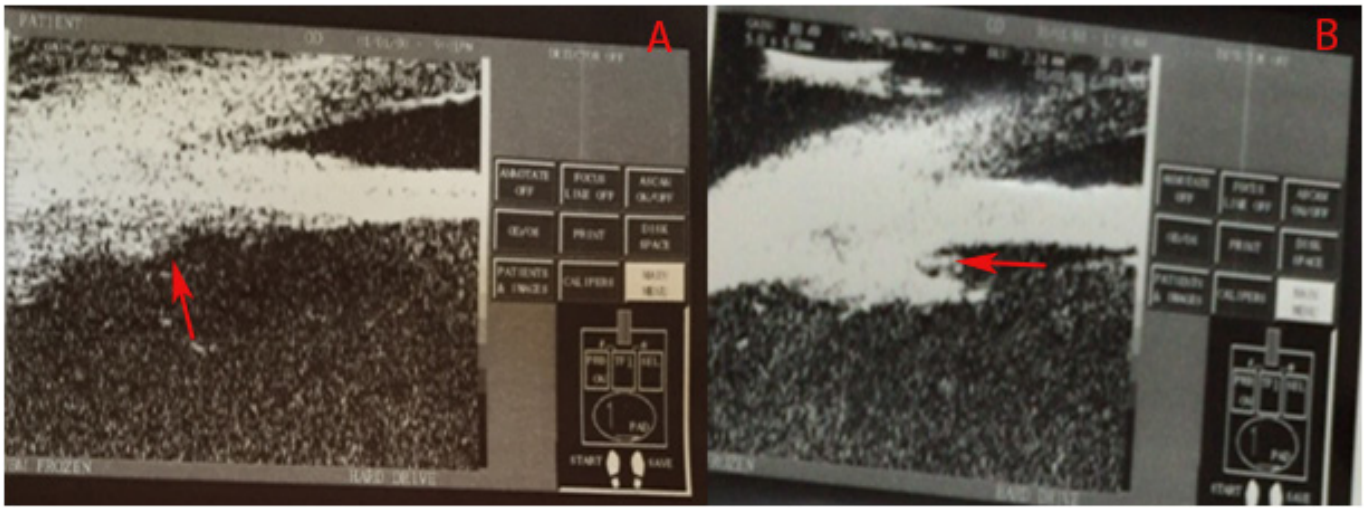

Figure 2: *Comparative ultrasonic biomicroscopy images of both eyes. The ciliary body was marked with a red arrow. A: Right eye. Anteversion of the ciliary body is notable. B: Left eye. The ciliary body is in normal position.*

DISCUSSION

Malignant glaucoma, also known as aqueous misdirection syndrome, was first described by von Graefe[2] in 1869 and is characterized by both central and peripheral anterior chamber narrowing with high IOP in the presence of an open LPI or iridectomy.[1-3] The presence of choroidal effusion or hemorrhage is not observed in association with malignant glaucoma.[4] The lens-iris diaphragm is displaced anteriorly in both central and peripheral regions.[4] Although it is commonly seen after trabeculectomy in eyes with angle closure glaucoma,[4-8] it may also occur after cataract surgery, deep sclerotomy, bleb revision, bleb needling, laser suture lysis after trabeculectomy, LPI, intravitreal injections, laser capsulotomy, or pilocarpine use.[2, 4, 7, 9-12] Simultaneous bilateral malignant glaucoma has been reported in a patient who underwent prophylactic bilateral LPI due to angle closure glaucoma.[13] Systemic hydrochlorothiazide has been suggested as a predisposing factor for malignant glaucoma in this case.[13] Additionally, the most significant risk factor for the development of malignant glaucoma in one eye is the presence of malignant glaucoma in the other eye and plateau iris syndrome.[4,8] To avoid malignant glaucoma induced by iridotomy, atropine and phenylephrine should be given immediately after prophylactic LPI in the other eye.[14] In our case, prophylactic LPI was performed in the other eye, and cycloplegic treatment was started immediately and continued for one week. Both eyes had normal IOP without medication during follow-up.

In a retrospective case series evaluating 115 cases of acute-onset glaucoma as a side effect of drugs such as topiramate, 86 cases were identified, of which 83 were bilateral and 3 were unilateral.[15] Gabapentin [1-(aminomethyl) cyclohexaneacetic acid] is a structural analog of gamma-aminobutyric acid (GABA), an inhibitory neurotransmitter.[15-17] It is an antiepileptic drug like topiramate, which is thought to reduce GABA degradation, increase its synthesis, and exert its effects through voltage-dependent Ca^{+2} channels in the treatment of neuropathic pain. In the case series by Fraunfelder et al.[15] evaluating 115 cases of angle-closure induced by topiramate, it was reported that 85% of the cases occurred within the first 2 weeks. Improvement is expected within 24-48 hours after discontinuation of the drug.[1, 15, 16] Kavalieratos et al.[18] reported that gabapentin reduced the pain of a painful eye in a blind patient. A case of pseudophakic glaucoma due to trigeminal neuralgia using carbamazepine and gabapentin for 3 years has been reported in the literature.[19]

In our patient, the angle was closed. The plateau iris syndrome was considered since the IOP did not decrease after LPI, and ALPI was performed. The patient was not taking the medication at the time of ALPI. Although drug-induced angle-closure glaucoma is usually bilateral, unilateral cases have also been reported,[5,19] so an ocular ultrasound was performed for the differential diagnosis of our patient. No suprachoroidal effusion was detected, and the retina was attached. During the UBM examination, anterior rotation of the ciliary body was observed in OD, which pushed the iris forward. Although the anterior chamber of the other eye was narrow, it was in a normal position and both the peripheral and central anterior chambers were narrow. Based on these findings, malignant glaucoma was considered rather than plateau iris due to the unilateral nature of the findings. The patient was started on antiglaucoma treatment and cycloplegic drops, and a slight improvement in the anterior chamber was observed. The narrow but not very hazy anterior chamber in the initial UBM image was attributed to the hyperosmotic treatment causing some retraction of the iris-lens diaphragm. The unilateral nature of the findings also supported the diagnosis of malignant glaucoma.

The current surgical approach applied in the treatment of malignant glaucoma, as described in the literature, is "zonulohyaloidovitrectomy."[20] Furthermore, it is known that combining vitrectomy with phacoemulsification enhances the success rate.[21] In this case, considering the suspicion of zonulectomy during laser iridotomy, a pars plana approach was chosen instead of an anterior approach, and PPV-Phaco-IOL implantation with anterior hyaloidotomy was performed. The IOP was well-regulated without medication during follow-up.

In conclusion, there can be many different causes underlying the rare condition of malignant glaucoma. It can progress aggressively and lead to poor outcomes if left undiagnosed. It is important to pay attention to risk factors, take necessary precautions, and most importantly, keep in mind the importance of early diagnosis and treatment.

In this case, we suspect that acute angle-closure glaucoma might have developed on the background of intermittent angle-closure glaucoma due to gabapentin use. After performing LPI and initiating medical treatment, the acute glaucoma crisis did not improve. Consequently, ALPI was performed under the assumption that plateau iris syndrome could be present. However, despite LPI and/or ALPI procedures and discontinuing gabapentin use, the persistence of the findings directed us towards a diagnosis of malignant glaucoma that may have developed because of LPI and/or ALPI.

REFERENCES

1. American Academy of Ophthalmology. "Section 10: Glaucoma" Basic and Clinical Science Course: 2022 - 2023, 181-3.
2. von Graefe A. Beiträge zur Pathologie und Therapie des Glaucoms. Graefes Arch Clin Exp Ophthalmol 1869; 15: 108-252.
3. Levene R. A new concept of malignant glaucoma. Arch Ophthalmol. 1972;87:497-506.
4. Kaplowitz K, Yung E, Flynn R, et al. Current concepts in the treatment of vitreous block, also known as aqueous misdirection. Surv Ophthalmol. 2015;60:229-41.
5. Zhou C, Qian S, Yao J, et al. Clinical Analysis of 50 Chinese Patients with Aqueous Misdirection Syndrome: a Retrospective Hospital based Study. J Int Med Res. 2012;40:1568-79.
6. Chandler PA, Grant WM. Mydriatic-cycloplegic treatment in malignant glaucoma. Arch Ophthalmol. 1962; 68:353-9.
7. Dave P, Senthil S, Rao HL, et al. Treatment outcomes in malignant glaucoma. Ophthalmology. 2013;120:984-90.
8. Prata TS, Dorairaj S, De Moraes CG, et al. Is preoperative ciliary body and iris anatomical configuration a predictor of malignant glaucoma development? Clin Exp Ophthalmol. 2013;41:541-5.
9. Shahid H, Salmon JF. Malignant glaucoma: a review of the modern literature. J Ophthalmol. 2012;2012:1-6.
10. Özdek, Ş. İntravitreal triamsinolon enjeksiyonu sonrası dirençli glokom. Glo-Kat, 2006, 1: 219-220.
11. Robinson A, Prialnic M, Deutsch D, et al. The onset of malignant glaucoma after prophylactic laser iridotomy. Am J Ophthalmol. 1990;110:95-6.
12. Tamçelik N, Atalay E, Özkök A. ve ark. Primer Açı Kapanması Glokomunun Medikal ve Cerrahi Tedavisi. Turk J Ophthalmol 42; Özel Sayı: 2012, 1: 1-7
13. Aminlari A, Sassani JW. Simultaneous bilateral malignant glaucoma following laser iridotomy. Graefes Arch Clin Exp Ophthalmol. 1993;231:12-4.
14. Ching-Costa A, Chen TC. Malignant glaucoma. Int Ophthalmol Clin. 2000;40:117-25.
15. Fraunfelder FW, Fraunfelder FT, Keates EU. Topiramate-associated acute, bilateral, secondary angle-closure glaucoma. Ophthalmology. 2004;11:109-11.
16. Levy J, Yagev R, Petrova A, et al. Topiramate-induced bilateral angle-closure glaucoma. Can J Ophthalmol. 2006;41:221-5.
17. K. Y. Ho,T. J.Gan, A. S. Habib. Gabapentin and postoperative pain—a systematic review of randomized controlled trials. Pain. 2006; 126, (1-3), 91-101.
18. Kavalieratos CS, Dimou T. Gabapentin therapy for painful, blind glaucomatous eye: case report. Pain Med. 2008;9:377-8.
19. Atalay E, Tamçelik N, Capar O. High intraocular pressure after carbamazepine and gabapentin intake in a pseudoexfoliative patient. J Glaucoma. 2014;23:574-6.
20. Lois N, Wong D, Groenewald C. New surgical approach in the management of pseudophakic malignant glaucoma. Ophthalmology. 2001;108:780-3.
21. Harbour JW, Rubsamen PE, Palmberg P. Pars plana vitrectomy in the management of phakic and pseudophakic malignant glaucoma. Arch Ophthalmol. 1996;114:1073-8.