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Acute Uveitis in Neovascular Glaucoma Patient after a Single Dose of Travoprost

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Abstract

A 38-year-old man with no history of uveitis developed neovascular glaucoma (NVG) due to proliferative diabetic retinopathy (PDR). He had a history of ocular surgery with placement of glaucoma drainage implants (GDI), ultrasonic phacoemulsification, and intraocular lens implantation in both eyes. The patient had undergone a recent pars plana vitrectomy with complete panretinal photocoagulation (PRP) to clear vitreous hemorrhage in his right eye. To prevent progressive optic nerve damage, travoprost was tentatively administered because of inadequate intraocular pressure (IOP) control following surgery, laser treatment, and topical administration of many other IOP-lowering drugs. The patient experienced severe vision loss associated with acute anterior and intermediate uveitis. We consider it a rare complication due to the NVG patient's vulnerability following ocular surgery. Given that acute uveitis developed rapidly and required time to resolve, systemic corticosteroid treatment could be considered to accelerate the resolution of inflammation.

Keywords

Travoprost, Uveitis, Glaucoma, Prostaglandin Analogues, Intraocular Pressure

1. Introduction

Glaucoma is a leading cause of blindness worldwide and is characterized by the death of retinal ganglion cells and progressive optic nerve damage. Elevated intraocular pressure (IOP) is a major risk factor for disease progression and is responsible for the loss of ganglion cells. Glaucoma can be broadly categorized into primary and secondary types, with primary open-angle glaucoma (POAG) being the most common form. POAG typically presents without symptoms until

significant vision loss has occurred. In contrast, secondary glaucomas, such as neovascular glaucoma (NVG), are often associated with other ocular conditions. NVG results from the formation of neovessels on the iris and the anterior chamber angle, eventually leading to angle closure and elevated IOP. This condition is often linked to systemic diseases, such as diabetes mellitus, central retinal vein occlusion, or ocular ischemic syndrome, that contribute to retinal ischemia [1]. Previous studies have shown that the pathogenesis of NVG involves complex mechanisms including ischemia-induced angiogenesis and inflammation. The management of NVG is challenging and often requires a combination of medical and surgical interventions to control IOP and prevent further optic nerve damage. As first-line drugs for glaucoma, prostaglandin analogues (PGAs) exhibit high efficacy in decreasing IOP with minimal adverse effects. Specifically, long-term treatment with bimatoprost, latanoprost, or travoprost has been proven to be both effective and safe. At times, PGAs can cause harmful ocular effects, such as anterior uveitis, conjunctival hyperemia, cystoid macular edema, and skin pigmentation, when administered continuously for several weeks or even months [2]. Here, we report a rare case of acute anterior and intermediate uveitis that developed after the administration of a single dose of travoprost to a patient with secondary NVG.

2. Case Report

A 38-year-old man presented with bilateral vitreous hemorrhage due to proliferative diabetic retinopathy (PDR). The patient's medical history included hypertension and chronic kidney disease associated with diabetes type 2. He received insulin injections twice daily within 30 minutes before breakfast and dinner. The patient underwent ultrasonic phacoemulsification with intraocular lens implantation in both eyes, followed by glaucoma drainage implant (GDI) placement 4 months later because of early NVG with open-angle glaucoma secondary to PDR. However, the patient did not return to the operation-performed hospital for follow-up or anti-vascular endothelial growth factor (VEGF) treatment owing to a lack of awareness of the severity of the condition. One and a half years later, the patient visited our hospital because of sudden visual loss in the right eye caused by a vitreous hemorrhage. His IOP was 27.7 mmHg oculus dexter (OD) and 51.3 mmHg oculus sinister (OS). He lost light perception in his left eye about half a year prior, while the visual acuity of the right eye was only hand motion (HM). The patient received three topical antiglaucoma medications: 2% carteolol eye drops twice daily, 0.2% brimonidine tartrate eye drops twice daily, and 1% brinzolamide eye drops three times daily. To clear the vitreous hemorrhage, we performed vitrectomy and panretinal photocoagulation (PRP) in the right eye, while leaving the left eye untreated because of loss of light perception. The same antiglaucoma medication was administered postoperatively.

However, the patient's IOP remained at 22.7 mmHg OD and 60.5 mmHg OS at the 2-month follow-up visit. The right eye exhibited a best-corrected visual acuity of 20/200 and was free of inflammation. Fundus examination revealed op-

tic nerve atrophy with a cup-to-disc ratio of 0.9 disc diameters (DD). Additional topical travoprost was administered to prevent progressive damage to the optic nerve. Unexpectedly, the patient experienced blurred vision within an hour of administration of travoprost before bedtime. The following morning, he presented to the hospital with severe vision loss. Visual acuity in the right eye was light perception (LP), and IOP was 22 mmHg OD. Slit lamp examination revealed numerous pigmented keratic precipitates on the corneal endothelium of the right eye, with 3+ anterior chamber cells and flares (Figure 1(A) & Figure 1(B)). A dilated fundoscopy revealed severe vitritis with vitreous haze of 4+. Vitreous haze was also evaluated using B-scan ocular ultrasound, which revealed dense, dot-like, low-reflective vitreous echoes (Figure 1(C)). The left eye without medication was free of inflammation.

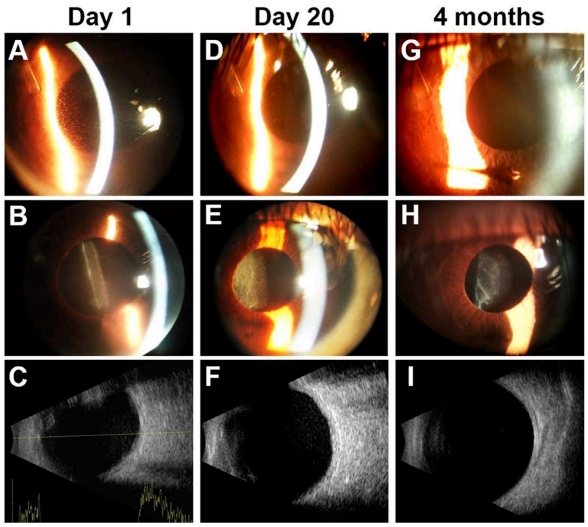

Figure 1. Numerous pigmented keratic precipitates (A-B) and severe 4+ vitreous haze (C) are observed after the administration of a single dose of travoprost. The acute symptoms have gradually decreased and even subsided after treatment with prednisolone acetate ophthalmic suspension and topical atropine sulfate (D-I).

The administration of travoprost was immediately discontinued, and anti-inflammatory therapy was initiated with 1% prednisolone acetate ophthalmic suspension every 2 h for 4 days, four times daily thereafter, and 1% atropine sulfate three times daily. One percent of brinzolamide eye drops were re-administered and the same antiglaucoma medication was continuously administered. After 20 days, inflammation remarkably decreased (Figure 1(D)-(F)). Slit lamp examination revealed 1+ anterior chamber cells and flare pigment deposition distributed on the intraocular lens implant in the right eye, with 3+ vitreous haze (Figure 2(A)). Moreover, the patient's IOP decreased to 11.1 mmHg OD. Clinical examination 7 weeks later revealed that most of the inflammation had subsided. Visual acuity improved to HM OD, and IOP ranged from 12 to 15 mmHg OD. At the 4-month follow-up, no keratic precipitates, flares, or vitreous haze were visible (Figure 1(G)-(I) and Figure 2(B)). Fundus examination revealed a late

glaucomatous optic nerve head with an inferior notch and considerable cupping (cup-to-disc ratio, 0.9 DD or higher) cupping. Visual acuity was maintained at the HM OD. Optical coherence tomography (OCT) revealed a decrease in the peripapillary nerve fiber layer thickness, particularly in the nasal quadrant, compared with that before travoprost administration (**Figure 2(C)** & **Figure 2(D)**). At the 6-month follow-up, the patient's visual acuity remained HM OD and did not return to the level measured prior to the use of travoprost medication.

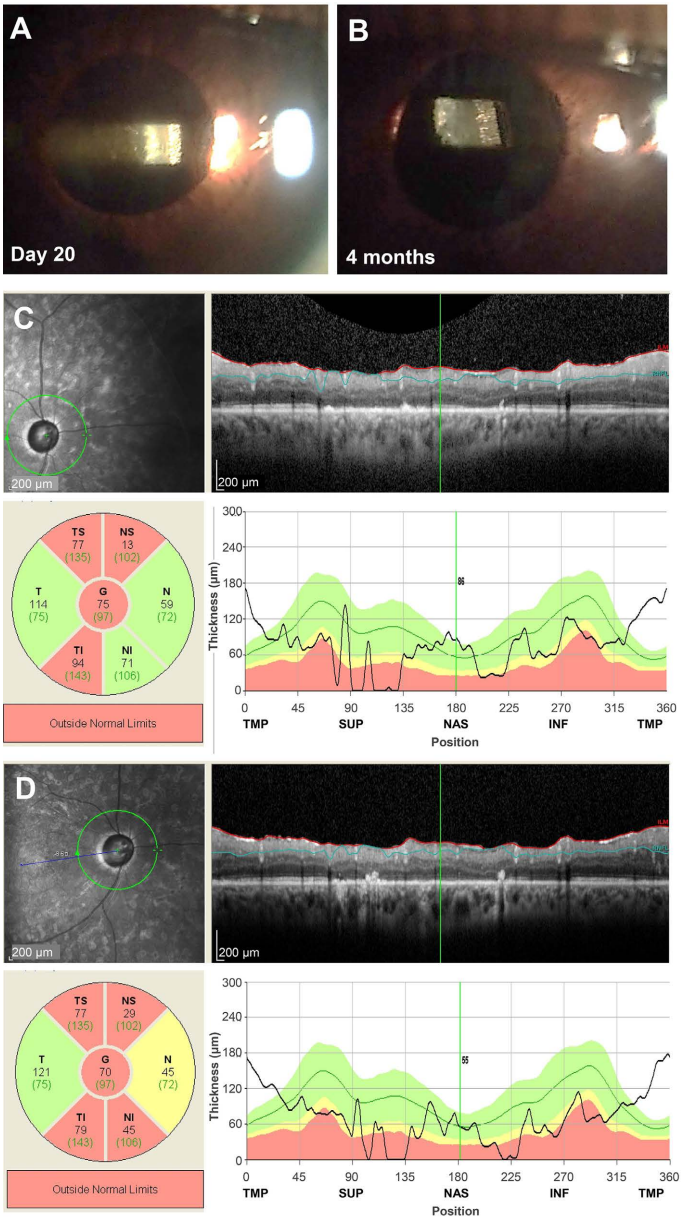

Figure 2. Slit lamp examination reveals 1+ flare and cells on day 20 (A) but a quiet anterior and posterior segment with no cells or flare at 4 months (B) after the administration of travoprost. Compared with that before travoprost treatment (C), OCT shows a remarkable decrease in the peripapillary nerve fiber layer thickness at 4 months after the administration of travoprost (D).

3. Discussion

In the present report, we describe a rare case of acute anterior and intermediate uveitis after the local administration of travoprost in a patient with NVG. NVG accounts for 0.01% to 5.1% of all glaucoma cases and is among the most difficult to manage, with diabetic retinopathy being its leading cause. Other contributors include retinal vein occlusion, ocular ischemic syndrome, chronic retinal detachment, uveitis, trauma, and certain tumors. Effective management necessitates addressing both the elevated IOP and the neovascularization. PRP is the major treatment for delaying neovascularization in NVG patients, and intravitreal anti-VEGF treatment can serve as an effective temporizing option [1]. In this case, travoprost was prescribed because of inadequate IOP control following GDI placement, vitrectomy, PRP, and the administration of topical antiglaucoma medications, including β-adrenergic blockers and α-adrenergic agonists. Because of severe vision loss and relatively stable IOP in the right eye at a later date, a rechallenge with travoprost was not considered. Although uveitis subsided after topical anti-inflammatory treatment and IOP was controlled, the patient's visual acuity did not recover to its pre-medication level. The optic nerve is crucial for vision. Once damaged, the nerve fibers have a limited capacity to regenerate, making recovery of lost vision difficult. Therefore, timely control of IOP could still be a crucial strategy for preventing vision loss.

Travoprost is commonly used to treat glaucoma and ocular hypertension (OHT) and is considered safe and effective even for OHT secondary to uveitis [3]. It is generally accepted that 0.004% travoprost ophthalmic solutions cause few systemic and ocular adverse effects after topical administration. The maximum plasma concentration of travoprost was achieved within 30 minutes of administration. Long-term treatment with travoprost (summarized in **Table 1**) and other PGAs has been reported to primarily induce anterior uveitis but only in a small percentage of patients [4]-[10]. However, a single dose, even short-term administration of travoprost as well as other PGAs, has not been observed to evoke severe uveitis in the clinical treatment of glaucoma patients.

Table 1. Comparison of characteristics and treatment regimens for uveitis associated with the topical use of travoprost.

Diagnosis	Surgery history	Time to develop uveitis	Uveitis and sign	Other side effects	Treatment	Ref
NVG	+	1 day	Acute anterior and intermediate uveitis (3+ anterior chamber cells and flare, and 4+ vitreous haze)	None	Prednisolone acetate ophthalmic suspension Atropine sulfate	This case
OAG	+	5 days	Acute anterior uveitis (1-2+ cells and flare)	Corneal edema	Lotepredinol etabonate drops	[5]
Pseudoexfoliation glaucoma	+	3 weeks	severe iritis (3+ cells and flare)	Corneal edema	No additional treatment	[6]
Capsular glaucoma	None	7 days	Bilateral anterior uveitis (Moderate cells and flare, and posterior synechiae from iris to lens)	None	Dexamethasone drops Dexamethasone ointment Oral prednisolone	[7]

Continued

POAG	None	2 days	Acute anterior uveitis (2+ cells and flare)	Corneal edema	No additional treatment	[8]
Glaucoma	None	2 months	Granulomatous anterior uveitis and mild vitritis (Mutton-fat keratic precipitates and 3+ cells posterior synechiae)	None	Topical steroid and mydrilate Topical brinzolamide and timolol Oral acetazolamide	[9]

In this case, the development of acute anterior and intermediate uveitis after administration of a single dose of travoprost, the prostaglandin-F2α analog, could be attributed to several factors related to this specific NVG patient. First, the endogenous prostaglandin-E2 (PGE2), a key inflammatory activator, has been found to increase significantly in the vitreous fluid of patients with PDR [11]; this could be one reason for the increased sensitivity of the present patient to travoprost. Further administration of travoprost may stimulate the release of PGE2 and the induction of inflammation. Second, travoprost shows a long duration of action over a 24 h period; which could induce an ongoing inflammatory response. The third possible reason is that travoprost is likely to exert nonspecific actions by inducing hyperpermeability of neovessels in patients with NVG [12]. The established inflammatory microenvironment coupled with vascular permeability likely plays crucial roles in the recruitment and extravasation of circulating leukocytes into inflamed tissues. Moreover, a history of incisional surgery appears to be a risk factor for inflammation after PGA therapy, potentially due to the reduction of the physical barrier and increased posterior spread of PGAs in pseudophakic eyes, although the following use of PGAs may be more directly associated with the development of uveitis [13]. The systemic manifestations of diabetes may also exert a multifaceted influence on the initiation and progression of uveitis via several mechanisms, encompassing immunological dysregulation, alterations in vascular integrity, and autoimmune associations. Additionally, many ophthalmic formulations contain preservatives that may potentially contribute to intraocular inflammation [14]. Alongside a comprehensive ophthalmologic examination, additional systemic evaluations, including a complete blood test, infectious disease testing, and magnetic resonance imaging (MRI), could be considered to further investigate the cause of uveitis for future clinical practice. Furthermore, pre-treatment with anti-inflammatory medications might help mitigate the risk of uveitis. For diabetic patients, optimizing systemic control of diabetes and addressing any underlying inflammatory or vascular conditions could potentially reduce the risk of ocular complications.

While topical travoprost triggered the onset of acute uveitis, we consider it a rare complication in this specific NVG patient, influenced by various factors, including underlying inflammatory conditions, neovessel permeability, surgical history, and other unidentified conditions related to diabetes. The patient's vision loss was primarily due to sustained damage to the optic nerve tissue caused mainly by elevated IOP, rather than uveitis. It is important to note that this case

is an isolated observation, and larger studies are needed to fully understand the prevalence and risk factors associated with such complications. Given that acute uveitis often develops rapidly and resolves slowly, in addition to using topical corticosteroids, systemic corticosteroid treatment, such as an initial dose of 20 mg to 60 mg of oral prednisone per day, could be considered as an alternative to accelerate the resolution of vitritis, depending on the severity of the inflammation and the patient's tolerance.

4. Conclusion

This case highlights the importance of vigilance when prescribing travoprost for patients with NVG, especially those with a history of ocular surgery. While generally safe, travoprost might, in rare cases, contribute to acute uveitis, warranting further investigation to confirm this link. Clinicians should watch for potential adverse reactions and consider alternative treatments or additional anti-inflammatory therapies for at-risk patients.

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Statement of Ethics

This study was conducted in accordance with the Declaration of Helsinki (2000) of the World Medical Association. This was a retrospective case report, and the need for approval was waived by the Ethics Committee of the Third People's Hospital of Chengdu. Written informed consent was obtained from the patient for the publication of details of his medical case and any accompanying images.

Author Contributions

Lijun Wang and Jing Zhu conducted the study, participated in data collection, and drafted the manuscript. Junfeng Yang and Qian Feng participated in the acquisition, analysis, or interpretation of the data and follow-up of the patients.

Conflicts of Interest

All authors declare that they have no conflicts of interest concerning the research, authorship, or publication of this manuscript.

References

[1] Jayaram, H., Kolko, M., Friedman, D.S. and Gazzard, G. (2023) Glaucoma: Now and Beyond. *The Lancet*, **402**, 1788-1801. https://doi.org/10.1016/s0140-6736(23)01289-8

[2] Katsanos, A., Riva, I., Bozkurt, B., Holló, G., Quaranta, L., Oddone, F., *et al*. (2021) A New Look at the Safety and Tolerability of Prostaglandin Analogue Eyedrops in Glaucoma and Ocular Hypertension. *Expert Opinion on Drug Safety*, **21**, 525-539. https://doi.org/10.1080/14740338.2022.1996560

[3] Anastasopoulos, E., Koronis, S., Matsou, A., Dermenoudi, M., Ziakas, N. and Tzamalis, A. (2023) Safety and Efficacy of Prostaglandin Analogues in the Immediate Postoperative Period after Uneventful Phacoemulsification. *Vision*, **7**, Article 45. https://doi.org/10.3390/vision7020045

[4] Seow, W.H., Lim, C.H.L., Lim, B.X.H. and Lim, D.K. (2023) Uveitis and Glaucoma: A Look at Present Day Surgical Options. *Current Opinion in Ophthalmology*, **34**, 152-161. https://doi.org/10.1097/icu.0000000000000940

[5] Chiam, P. (2011) Travoprost Induced Granulomatous Anterior Uveitis. *Case Reports in Ophthalmological Medicine*, **2011**, Article 507073. https://doi.org/10.1155/2011/507073

[6] Aydın, S. and Özcura, F. (2007) Corneal Oedema and Acute Anterior Uveitis after Two Doses of Travoprost. *Acta Ophthalmologica Scandinavica*, **85**, 693-694. https://doi.org/10.1111/j.1600-0420.2007.00922.x

[7] Suominen, S. and Välimäki, J. (2006) Bilateral Anterior Uveitis Associated with Travoprost. *Acta Ophthalmologica Scandinavica*, **84**, 275-276. https://doi.org/10.1111/j.1600-0420.2005.00601.x

[8] Kumarasamy, M. and Desai, S.P. (2004) Anterior Uveitis Is Associated with Travoprost. *BMJ*, **329**, Article 205. https://doi.org/10.1136/bmj.329.7459.205

[9] Faulkner, W.J. (2003) Acute Anterior Uveitis and Corneal Edema Associated with Travoprost. *Archives of Ophthalmology*, **121**, 1054-1055. https://doi.org/10.1001/archopht.121.7.1054

[10] Fechtner, R.D., Khouri, A.S., Zimmerman, T.J., Bullock, J., Feldman, R., Kulkarni, P., *et al*. (1998) Anterior Uveitis Associated with Latanoprost. *American Journal of Ophthalmology*, **126**, 37-41. https://doi.org/10.1016/s0002-9394(98)00071-3

[11] Raman, K.S. and Matsubara, J.A. (2020) Dysregulation of the NLRP3 Inflammasome in Diabetic Retinopathy and Potential Therapeutic Targets. *Ocular Immunology and Inflammation*, **30**, 470-478. https://doi.org/10.1080/09273948.2020.1811350

[12] Patheja, R.S. (2022) Serous Macular Detachments Associated with Topical Travoprost. *BMJ Case Reports*, **15**, e246712. https://doi.org/10.1136/bcr-2021-246712

[13] Hu, J., Vu, J.T., Hong, B. and Gottlieb, C. (2020) Uveitis and Cystoid Macular Oedema Secondary to Topical Prostaglandin Analogue Use in Ocular Hypertension and Open Angle Glaucoma. *British Journal of Ophthalmology*, **104**, 1040-1044. https://doi.org/10.1136/bjophthalmol-2019-315280

[14] Goldstein, M.H., Silva, F.Q., Blender, N., Tran, T. and Vantipalli, S. (2021) Ocular Benzalkonium Chloride Exposure: Problems and Solutions. *Eye*, **36**, 361-368. https://doi.org/10.1038/s41433-021-01668-x