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Bilateral severe iatrogenic pigmentary glaucoma following laser treatment for cosmetic iris color change

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ABSTRACT

Purpose: We report a case of bilateral severe pigmentary glaucoma and paracentral acute middle maculopathy (PAMM) following laser treatment for iris color change.

Observations: A 32-year-old female presented to our emergency clinic after having undergone 4 sessions of bilateral cosmetic iris laser treatment in Turkey to lighten the color of her dark brown irides. Visual acuity was 20/150 in the right eye (OD) and counting fingers in the left eye (OS) at presentation. Intraocular pressures (IOP) were 50 mmHg in the right eye and 42 mmHg in the left eye, with 4+ free-floating pigmented cells in the anterior chamber. The fundus exam revealed cup-to-disc ratios of 0.5 in the right eye and 0.35 in the left eye and scattered intraretinal hemorrhages in both eyes. The diagnoses of bilateral severe iatrogenic pigmentary glaucoma and PAMM were established. Urgent bilateral fornix-based trabeculectomies with mitomycin C (MMC) 0.05% were performed with an attempt to wash out as much pigment from the anterior chamber as possible. Post-operatively, despite well-controlled IOP and cessation of all glaucoma medications, the patient remains with visual field defects and significant glare.

Conclusions and Importance: Photoablative iridoplasty is rarely encountered as a cause of iatrogenic pigmentary glaucoma in North American due to strict regulations against this procedure. However, physicians must be aware of its devastating and life-changing visual sequelae and elicit a careful history in patients with a similar presentation. Our patient demonstrated acute, severe glaucomatous damage from pigmentary dispersion along with PAMM, a newly described complication of this procedure. We strongly advise against this medically unnecessary practice.

1. Case report

A 32-year-old female presented to our emergency clinic with acute bilateral vision loss, pain, and photophobia. She did not have any past medical history of note. She underwent bilateral cosmetic iris laser treatment in Turkey two weeks prior to lighten her iris color. The treatment consisted of daily laser applications over five consecutive days and the postoperative regimen included a topical nonsteroidal anti-inflammatory drop as well as pilocarpine 1% three times a day. After four sessions, she decided to forego her fifth and return home. Despite our best efforts, the laser treatment parameters and details remain unclear as the clinic was allegedly shut down following our patient's complaints to local authority.

At presentation, her visual acuity was 20/150 in the right eye (OD) and counting fingers in the left eye (OS). Intraocular pressures (IOP) were 50 mmHg OD and 42 mmHg OS on brimonidine three times a day, timolol twice a day and acetazolamide 250mg three times a day started three days prior by an ophthalmologist in Turkey. The anterior chamber in both eyes was deep, and 4+ cells with pigments was visualized bilaterally. Pigment deposits were found on the corneal endothelium and the anterior lens capsule (Fig. 1a and b). Scattered, patchy iris transillumination defects were noted bilaterally on retro-illumination

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(Fig. 1c and d). Gonioscopy revealed densely pigmented angles with intermittent peripheral anterior synechiae (PAS). The pupils were mid-dilated and poorly reactive. The fundus exam revealed cup-to-disc ratios of 0.5 OD and 0.35 OS and scattered intraretinal hemorrhages in both eyes (Fig. 1e and f).

Spectral domain optical coherence tomography (OCT) obtained a day later showed normal retinal nerve fiber layer (RNFL) thickness. Macular OCT showed the presence of hyperreflective band-like lesions at the level of the inner nuclear layer and outer plexiform layer with sparing of the outer retina (Fig. 2) in both eyes. The 24-2 Humphrey visual field (HVF) showed an inferior nasal step OD, and a dense paracentral scotoma OS.

Bilateral severe iatrogenic pigmentary glaucoma and paracentral acute middle maculopathy (PAMM) were diagnosed. The intraretinal hemorrhages are presumed to be caused by sectorial retinal vein occlusions from acutely increased IOP. Urgent bilateral fornix-based trabeculectomies with mitomycin C (MMC) 0.05% were performed along with anterior chamber washout. Fluorescein angiography obtained 3 days after surgery did not show any leakage or zones of non-perfusion. Her IOP has since been well-controlled at 15 and 14 mmHg at the most recent three-year follow-up, and all glaucoma medications were stopped. Her VA also gradually improved to 20/50 OD and 20/150 OS at the latest follow-up. Repeat testing in the year following her initial presentation showed superior RNFL thinning appearing on OCT 4 months after surgery, and corresponding inferior nasal step on 24-2 HVF in the right eye, both of which remained stable from the early post-operative period. For the left eye, OCT showed inferior and superior RNFL thinning 4 months after surgery with the same initial dense central scotoma on 24-2 HVF observed on the first day. She continues to experience significant glare sensitivity and difficulty with near vision,

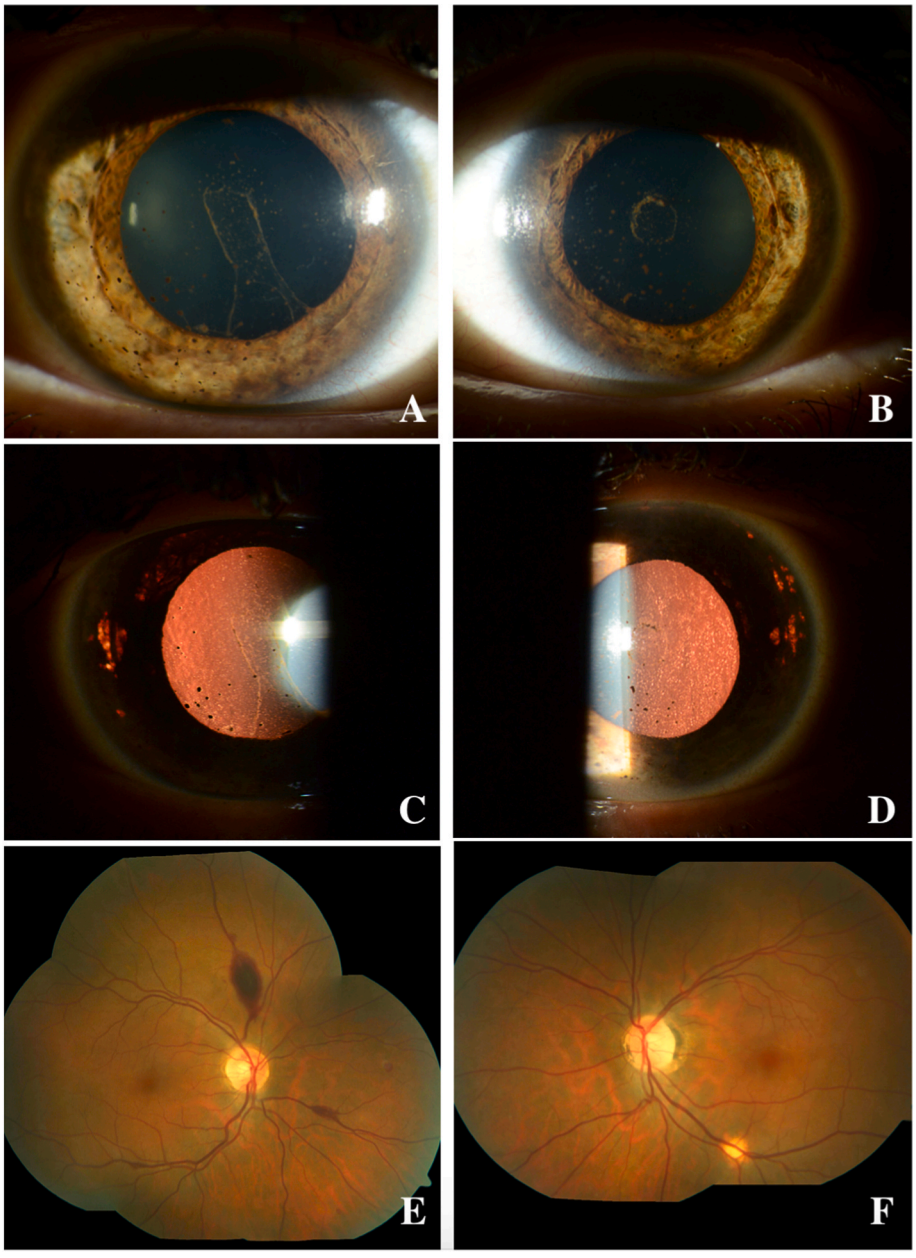

Fig. 1. Slit-lamp photography of the right (1a) and left (1b) eye showing pigment deposits on the endothelium and the anterior lens capsule, with formation of posterior synechiae. The iris stroma is thinned out and pale in color, with dilated and fixed pupils. Transillumination defects shown in the right (1c) and left (1d) eyes. Color fundus photographs show intraretinal hemorrhages in the posterior pole of the right eye (1e) and the periphery of the left eye (1f). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

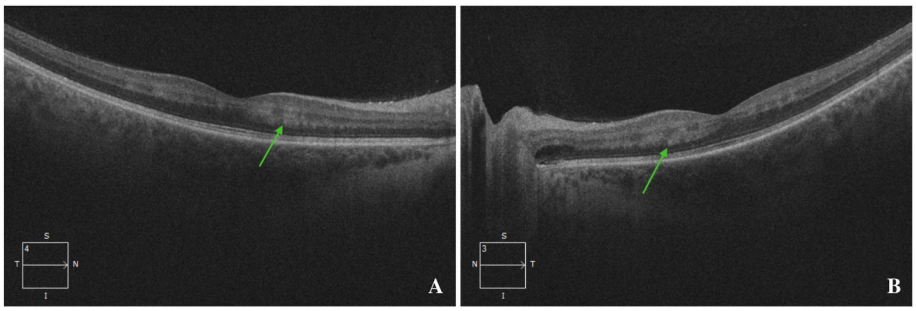

Fig. 2. SD-OCT of the right (2a) and left (2b) macula showing a hyperreflective band with skip lesions at the level of the inner nuclear layer (green arrows) suggestive of perivenular paracentral acute middle maculopathy. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

likely resulting from the iris transillumination defects, mid-dilated pupils, and impaired accommodation.

2. Discussion

Our case illustrates a rare cause of secondary pigmentary glaucoma and highlights the devastating glaucomatous and retinal complications related to cosmetic photoablative iridoplasty. More commonly known causes of secondary pigment dispersion syndrome include iris chafing from zonular laxity, uveitis, ocular trauma, ocular tumors, or large intraocular lenses placed in the sulcus or anterior chamber.[1–3] Photoablative iridoplasty has only been described in recent years in select countries with no formal approval from health authorities. In 2016, Yildirim et al. first published the application of the 532nm wavelength Nd:YAG laser to the iris surface in a patient with sectoral hyperchromic heterochromia.[4] However, IOP was not reported and long-term follow-up in this patient is lacking. A recent study further hailed the efficacy, safety and predictability of cosmetic photoablative iridoplasty in 1176 eyes.[5] The patients were followed for 9 years but with visual acuity (VA) and IOP as sole safety outcomes. However, there is insufficient information on patients' clinical examination, visual field and OCT parameters throughout follow-ups.

To our knowledge, there have only been 2 similar cases of glaucoma caused by this mechanism described in the literature. Ong et al. first reported a case of secondary pigmentary glaucoma 4 weeks after a cosmetic iridoplasty.[6] Urgent trabeculectomy with MMC was performed with significant improvement of IOP, but the patient was left with an arcuate scotoma and corresponding RNFL loss. Swampillai et al. reported a case of bilateral secondary pigmentary glaucoma several weeks after the laser treatment.[7] Dense pigmentation of the trabecular meshwork, advanced excavation of the optic discs with corresponding substantial RNFL reduction and visual field defects were observed, however with relatively normal IOP at 13 and 15 mmHg. Ning et al. reported a case of persistent pigment dispersion syndrome 4 years after receiving photoablative iridoplasty.[8] Despite densely pigmented trabecular meshwork, this patient fortunately did not develop glaucoma, and IOP remained stable at follow-up.

Our patient differs from the previous reports as she presented in the acute phase with glaucomatous as well as retinal damage secondary to the severe rise in IOP. We propose a rare cause of pigmentary glaucoma as well as a novel cause of paracentral acute middle maculopathy. We hypothesize that massive depigmentation of the iris causes deposits of pigments in the trabecular meshwork, causing aqueous outflow obstruction and secondary IOP spike. Her central vision loss in the left eye is explained by the macular involvement from PAMM, in which the middle retina atrophies following parafoveal capillary ischemia.[9] The intraretinal hemorrhages could be explained by retinal vein occlusions (RVO) secondary to acutely increased IOP.[10] It is possible that the RVOs resolved spontaneously once the high IOP were controlled, as seen by the post-operative normal fluorescein angiography. It is possible that venous occlusions occurred without signs of significant nonperfusion. PAMM could also present with a normal fundus, without visible signs of retinal ischemia.[11] PAMM has been associated with a number of retinal vascular diseases such as retinal artery or vein occlusions, hypertensive and diabetic retinopathy, sickle cell retinopathy, and in some cases due to cosmetic injections in which fillers enter the ophthalmic artery and occlude downstream arterioles.[12] In this case, it was likely the result of the severe and prolonged IOP elevation caused by photoablative iridoplasty, which, to our knowledge, has not yet been described as a cause of PAMM.

We opted for bilateral trabeculectomies with MMC in this patient, as the heavily pigmented angle with poorly identifiable landmarks and the scattered PAS would render an angle-based procedure unsafe. The significant inflammation resulting from the initial laser treatment would also increase the risk of failure of a small-lumen bleb-forming device such as the XEN-gel stent. Similar to Ong's team, outcomes were favorable post-trabeculectomy with MMC in our patient.

3. Conclusion

In conclusion, we report a rare case of bilateral secondary pigmentary glaucoma with PAMM caused by massive pigment release following cosmetic photoablative iridoplasty. Cosmetic laser treatment for iris color change continues to be offered in some countries. In light of the lack of robust safety data on such treatment and the devastating life-changing visual sequelae experienced by our patient, we strongly advise against this medically unnecessary procedure and are convinced of the clinical relevance of sharing this case to raise awareness amongst healthcare professionals and patients alike to prevent future recurrence.

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Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Patient consent

Written consent has not been obtained. This report does not contain any personal identifying information.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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