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Case report

Diffuse retinal pigment epithelium atrophy following pars plana vitrectomy for high myopic macular hole assisted by Brilliant Blue G: A case report

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ABSTRACT

Purpose: To describe a case of diffuse retinal pigment epithelium (RPE) disturbance following 23-gauge pars plana vitrectomy (PPV) with the inverted internal limiting membrane (ILM) technique and Brilliant Blue staining for a high myopic macular hole (MH).

Observations: A 53-year-old pseudophakic high myopic female was referred to the Vitreoretinal Department with a diagnosis of a full thickness myopic MH of her right eye. Her initial visual acuity was 20/40 of her right eye and 20/20 in the left eye. She underwent routine PPV with inverted ILM flap assisted by repeated brilliant blue staining. Surgery was uneventful without any intraoperative complications. MH closure was obtained within the first days. Three weeks postoperatively, the patient reported a decline in visual acuity of her right eye. Upon examination, her visual acuity decreased to 20/400. Fundus examination showed diffuse pigmentary changes with mottling at the level of the RPE, which later progressed to severe diffuse atrophy, as confirmed by fundus autofluorescence (FAF). After 12 months, visual acuity remained 20/400 with widespread areas of atrophy.

Conclusions: Uncomplicated routinary PPV assisted with Brilliant Blue, can lead to unexplained atrophy of the RPE. Possible causes include light phototoxicity, dye toxicity or both.

1. Introduction

Indocyanine Green and Brilliant Blue G (BBG) have been used routinely for ILM dying. Both have high affinity to basal membranes such as the ILM, although concerns about retinal toxicity, as well as a better safety profile for BBG, has shifted the use to the latter. We present a case of severe RPE disturbance after an uneventful vitrectomy for myopic MH.

2. Case report

A 53-year-old pseudophakic high myopic female was referred to the vitreoretinal department of our clinic with a 4-month history of central scotoma. She had had a radial keratotomy at age eighteen, with a pre-operative refraction of −15.00 diopters in both eyes. On examination, the patient presented a best corrected visual acuity (BCVA) of 20/40 on the right eye and 20/20 on her left eye. Optical coherence tomography (OCT) showed a full thickness macular hole (FTMH) (Fig. 1a) in the right eye. The patient underwent routine three-port pars plana vitrectomy (PPV) (EVA system; DORC Netherlands) with Brilliant Blue G (Brilliant Blue®, 0,025%; DORC Netherlands) with core vitrectomy followed by posterior hyaloid removal, staining of the ILM with BBG, ILM peel and positioning of an inverted ILM flap over the macular hole. A focal light fiber endoilluminator was used for the procedure. An area of ILM of approximately two-disc diameters was peeled surrounding the macular hole. Staining was repeated twice to ensure a complete ILM removal, as we perform routinely. Duration of each staining was 6–10 seconds. Fluid-air exchange was performed, and sulfur hexafluoride (SF_6) 20% was used as endotamponade. Strict face-down positioning was advised for five days.

MH closure was achieved within the first week (Fig. 1b). At the three-week follow-up visit, the patient complained of a central scotoma and her visual acuity had dropped to 20/400. Mild RPE changes were noted initially on examination (Fig. 2a). OCT showed severe disruption of the external retinal layers, as well as extensive areas of RPE migration and thickening (Fig. 1c and d). Fundus autofluorescence (FAF) showed diffuse areas of both hypo- and hyperautofluorescence involving the macular and peripapillary areas and extending to the upper mid-periphery (Fig. 3a). Progression and coalescence of the distinct areas of RPE atrophy was observed on consecutive follow-up visits (Fig. 3b

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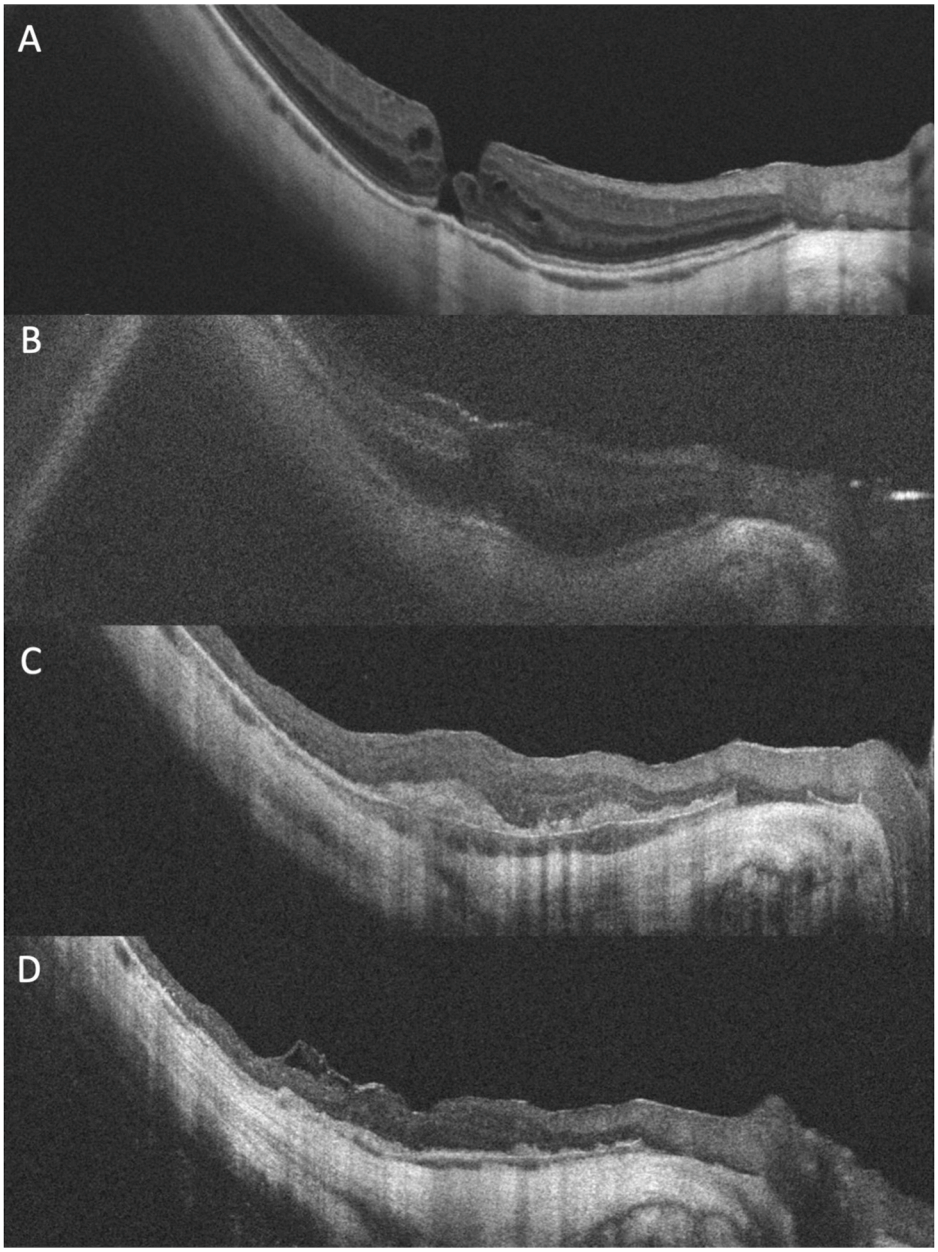

Fig. 1. OCT images: (A) Preoperative aspect of the MH. Reduced choroidal thickness is observed, with continuous RPE line and normal outer retinal layers. (B) OCT taken at day 1 after surgery showing inner hyperreflective line corresponding to the gas bubble interface. (C) At three-weeks post-op, the presence of hyperreflective subretinal material is observed, corresponding to areas of RPE thickening and migration. (D) Severe disruption of external retinal layers and decrease in retinal thickness. A decrease of the subretinal material and irregular RPE are observed.

and c). There was no history of unusual exposure to sunlight or UVA/UVB radiation sources, and she was not taking any systemic medications at the time.

At one-year follow-up visit, visual acuity remained 20/400, and further progression of the atrophy was observed extending further into the periphery (Fig. 2b). FAF showed large hypoautofluorescent areas corresponding to RPE atrophy and photoreceptor loss (Fig. 3d).

3. Discussion

The use of ILM peel and inverted ILM flap have both proven safe and effective in MH surgery. Preliminary studies showed little to no retinal or RPE toxicity with the use of BBG.[1–3] However, atrophy of the RPE, macular edema, and disturbances in the electroretinogram have been reported following accidental migration of BBG into the subretinal space, posing thus a potential toxic effect on the RPE and outer retina[4,5],[6] However, these findings have been usually localized on the macular area, or areas of exposed RPE.

Three weeks after PPV, our patient developed diffuse RPE mottling in the macula and mid periphery which progressed and coalesced over the next weeks (Fig. 3a–c). Exposure of the RPE to the BBG was limited to the macular hole, and even though jet stream induced subretinal migration of the dye in absence of a tear or hole has been reported, this was not observed during the surgical procedure.[4] In this case, the repeated staining of the ILM staining could pose a potential risk for retinal toxicity, although these were done under 10 seconds, making it rather unlikely. Similar reports of possible BBG toxicity and atrophy with a geographic pattern have been also described, although these have been more localized in the macular area and differ from the pattern our patient presented.[6–8] In these cases, as well as our own, the presence of subretinal BBG was not noted intraoperatively or postoperatively, and no definitive evidence that these findings were related to the dye were found. Singh SR et al. suggested that pre-existing choroidal thinning may aggravate dye toxicity and cause extensive RPE damage.[8] Interestingly, our patient had a thin choroid, a common finding in myopic patients. Nevertheless, an idiosyncratic reaction to the dye could be

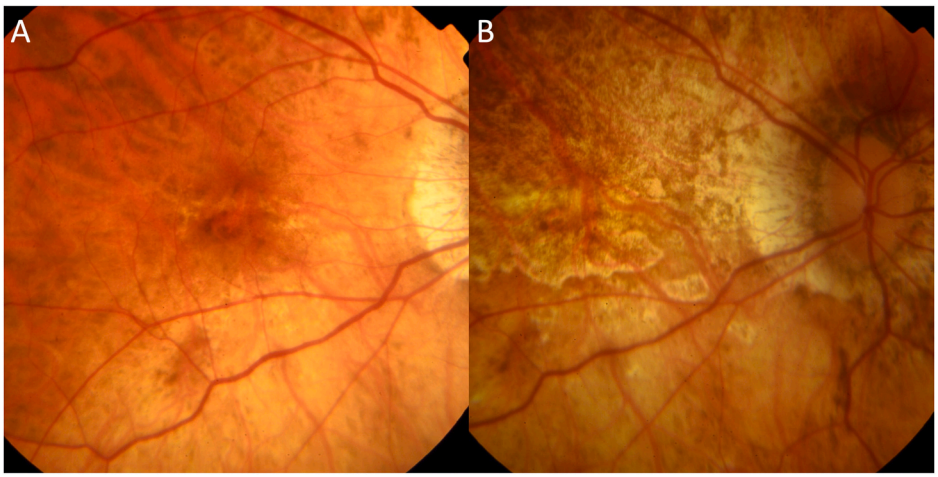

Fig. 2. (A) Preoperative fundus image of the macular area (B) and at 6-month post-op follow-up.

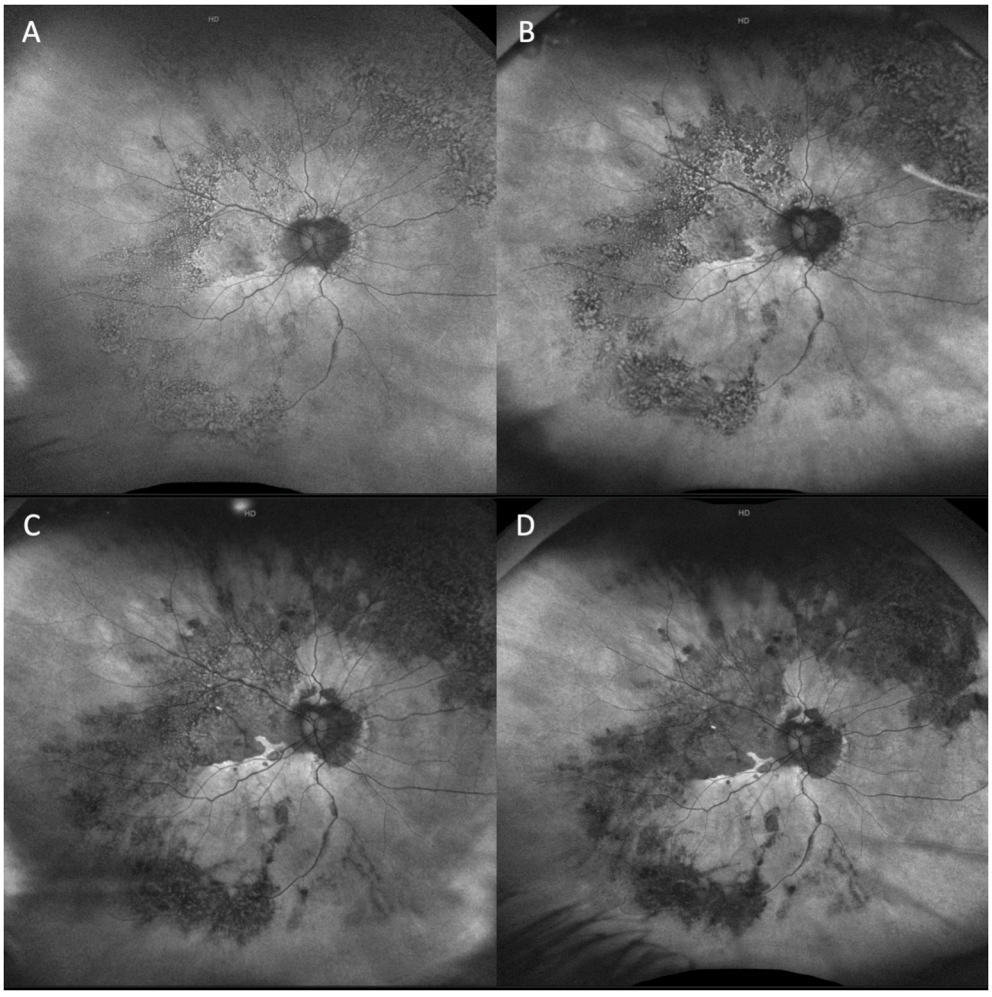

Fig. 3. (A) Fundus autofluorescence showing diffuse RPE mottling in the macula and mid-periphery at three-weeks follow-up. (B) Further progression and coalescence of the RPE disturbances is observed at three and (C) six-months follow-up. (D) At one-year follow-up, hypoautofluorescent areas corresponding to RPE atrophy are noted.

considered.

Another possibility to be considered is retinal phototoxicity from the microscope and the endoilluminator during surgery.[9,10] In this case, the duration of surgery was less than 45 minutes, and microscope exposure was limited. During a vitrectomy the relative risk for microscope induced phototoxicity is low, as the anterior segment tissues absorb most of the ultraviolet radiation.[11] In contrast, there are no interfering tissues between the endoilluminator light source and the retina, posing a greater potential risk for endoilluminator-induced phototoxic maculopathy. Endoilluminator-induced lesions have been described as

rounded or linear due to the rounded shaped tip of the light probe and tend to be more focal.[10] In our case, a focal light fiber endoilluminator was utilized for the surgical procedure, and in absence of a chandelier light, diffuse distribution of retinal atrophy seems to be rather unlikely. The superior nasal quadrant was not largely exposed to the light probe during the procedure as the surgeon is right handed. Nevertheless, a large area of atrophy was found in this location, making the scenario for light related toxicity less likely. Moreover, there was no unusual exposure to sunlight or UVA/UVB light sources that could justify such a diffuse distribution, and she was not on any systemic medications that could potentially cause such an adverse reaction.

Three stages in photochemical injury to the retina have been previously described: an acute stage occurring in the first 24 hours with macular edema and RPE pigment disorganization, irregularity of photoreceptors; a second reparative stage occurring one week after insult consisting of a macrophage response; a final third chronic degenerative stage occurring weeks to months later with RPE cell proliferation and a plaque formation between Bruch's membrane and the outer retina.[11] An acute as well as a reparative stage would not have been visible in our case due to the intraocular gas present at the time and were not observed during the initial follow up period. The disruption of the outer retinal layers and RPE atrophy could correspond to the chronic degenerative stage.

4. Conclusions

This case describes an unusual occurrence of RPE atrophy following PPV and use of BBG dye. Precautions must be taken to minimize the risk by limiting both light exposure as well as exposure to the dye particularly in high myopes, although whether these factors contributed in this case remains unclear.

Patient consent

The patient gave written consent to publication of the case. This report does not contain any personal information that could lead to the identification of the patient.

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Authorship

All authors attest that they meet ICMJE criteria for authorship.

Declaration of competing interest

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