Geographic atrophy with choroidal thinning following brilliant blue staining

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DESCRIPTION

A 66-year-old woman presented with diminution of vision in her right eye for 1 year, with best corrected visual acuity (BCVA) of 20/125. Left eye examination was within normal limits with a BCVA of 20/20. Spectral domain optical coherence tomography (OCT) showed a full-thickness macular hole in the right eye (figure 1) with a subfoveal choroidal thickness of 129 µm. The right eye underwent 23-gauge pars plana vitrectomy (Constellation; Alcon, Fort Worth, Texas, USA), with internal limiting membrane peeling using brilliant blue (BB) dye (0.25 mg/mL) staining under infusion and fluid gas exchange with 12% C3F8. A xenon endoillumination light probe at 80% setting was used. At 1 month post surgery, the patient's BCVA improved to 20/80; however, at 6 months' follow-up, her BCVA deteriorated to finger counting at 1m. Fundus examination showed a large patch (three-disc diameter) of retinal pigment epithelium (RPE) atrophy involving the fovea with a corresponding hypoautofluorescent patch on autofluorescence imaging (figure 2). OCT showed marked atrophy of the RPE with loss of inner choroidal layers and a subfoveal choroidal thickness of 49 µm; OCT angiography choriocapillaris slab showed prominent medium choroidal vessels due to thinning and atrophy of RPE and choriocapillaris (figure 2).

Previous studies conducted on the effect of BB dye on RPE cells have proven it to be safe.^{1,2} However, few case reports have documented its toxic effect on RPE, including RPE hypertrophy

Figure 2 Multimodal imaging at 6 months following macular hole repair in the right eye: gross retinal pigment epithelium atrophy with visibility of large choroidal vessels noted on the infrared image (A), autofluorescence (B) and associated choriocapillaris loss on optical coherence tomography angiography (C) of the right eye. Optical coherence tomography (D) of the right eye showed gross foveal thinning with choroidal thinning. Left eye images (E–H) appeared status quo as baseline. Subfoveal choroidal thickness was 49 and 93 µm in the right and left eyes, respectively.

and hyperpigmentation.^{3,4} Interestingly, the present case shows extreme choroidal thinning with inner choroidal loss and gross outer retinal damage, which has never been reported earlier. There was no intraoperative evidence of subretinal migration of BB dye, which otherwise could have partly explained the chorioretinal damage.

Another differential diagnosis that merits consideration is phototoxic maculopathy due to operating microscope and endoilluminator.^{5,6} In this scenario, microscope-related phototoxicity is less likely due to limited exposure time. Endoilluminator-related toxicity is expected to create a round lesion, as suggested by Kweon *et al*, due to the round tip of the probe.⁶ Multiple factors are associated with phototoxic maculopathy, including surgical time, focus, blue wavelength light, fundus pigmentation and coexisting retinal vascular pathologies.^{5,6} Duration of surgery was less (40 min) compared with the average duration (100 min) reported in previous series.⁶ Moreover, lesions related to light toxicity appear superior or inferior to the fovea with relative sparing of the fovea due to concentrated xanthophylls at the fovea.⁶ Overall, this suggests a distant possibility of phototoxic maculopathy in our case.

Figure 1 Multimodal imaging at presentation: infrared images (A,B) of both eyes show a tessellated background. Spectral domain optical choroidal tomography of the right eye (C) shows a full-thickness macular hole and that of the left eye (D) shows a normal retinal contour. Subfoveal choroidal thicknesses are 129 and 103 µm in the right and left eyes, respectively.

Patient's perspective

My vision improved to a certain extent after surgery; however, it has further deteriorated over time.

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Learning points

- Usage of brilliant blue dye in vitreoretinal surgeries is generally safe. Although rare, loss of retinal pigment epithelium (RPE) and choroidal thinning can happen in predisposed individuals.
- Phototoxic maculopathy is a close differential of dye-related chorioretinal toxicity presenting with a well-defined area of diffuse RPE atrophy.

A probable cause for such an extensive RPE damage and choroidal thinning could be the pre-existing choroidal thinning associated with a tessellated fundus. Whether the pre-existing choroidal thinning aggravates the dye toxicity is the question that needs further experiments and requires careful usage in such eyes.

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