

## Case report

# Macular toxicity following brilliant blue G-assisted macular hole surgery – a report of three cases

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## Abstract

**Introduction:** Brilliant blue G is a new dye used for staining the internal limiting membrane to ease its peeling in cases like a macular hole. **Cases:** Three patients presented with full-thickness idiopathic macular hole. They underwent pars planavitrectomy, Brilliant Blue G (BBG) stained internal limiting membrane peeling and fluid gas exchange. **Observations:** Postoperatively, the macular hole closed but foveal thinning and perifoveal hyperpigmentation presumably due to BBG toxicity were observed in all three patients. All of them had a subnormal final best corrected visual acuity. **Conclusion:** This case series highlights the unusual occurrence of macular toxicity following brilliant blue G-assisted macular hole surgery.

**Key words:** Brilliant blue G, macular hole, macular toxicity, hyperpigmentation

## Introduction

Vital dyes like indocyanine green (ICG), infracyanine green, trypan blue and brilliant blue G (BBG) greatly enhance the visualization and thus ease peeling of the internal limiting membrane in macular hole surgeries. The retinal toxicity of ICG, infracyanine green and trypan blue are well documented (Haritoglou et al, 2004; Querques et al, 2008; Saeed et al, 2009). We herein report the clinical and OCT findings in three non-consecutive cases of macular toxicity after use of brilliant blue G dye (Table).

## Case 1

A 55-year-old lady presented with blurring of vision in the right eye for 3 months. Her best

corrected visual acuity in the right eye was 20/400. She was diagnosed with a full thickness macular hole and underwent a 23 gauge pars planavitrectomy with brilliant blue G (0.025%) assisted ILM peeling. Following core vitrectomy and induction of posterior vitreous detachment and partial fluid-air exchange, brilliant blue G was injected directly over the macula and left in situ for 60 seconds, followed by air-fluid exchange and removal of all excessive dye. ILM peel was carried out using ILM peeling forceps from arcade to arcade. 14% C<sub>3</sub>F<sub>8</sub> was used for tamponade and the strict face down position was advised for one week. The macular hole was closed on OCT at two weeks with intra-retinal fluid accumulation in the outer retina and irregular thickening of the retinal pigment epithelium (Figure 1). At two months, hyperpigmentation associated with atrophy was noted at the macula and the OCT showed a decrease in the thickness of the fovea (148µm) with

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persistence of irregular thickening of the RPE (Figure 2). Her best-corrected visual acuity at two months was 2/200.

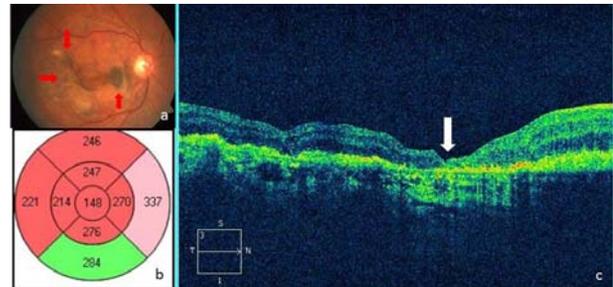
**Case 2**

A 68-year-old lady presented with blurring of vision in the right eye for more than six months with a best-corrected visual acuity of 20/60 and diagnosed with a full-thickness macular hole on examination. She also underwent 23 gauge pars planovitrectomy with brilliant blue G (0.025%) assisted ILM peeling as described for the first case. On postoperative follow-up, the macular hole had closed but she also had developed irregular pigmentation in the macular region with foveal thinning on OCT. At two months postoperatively, her best-corrected visual acuity was 20/160 and the central macular thickness as measured with a spectral domain OCT was 169µm (Figure 3).

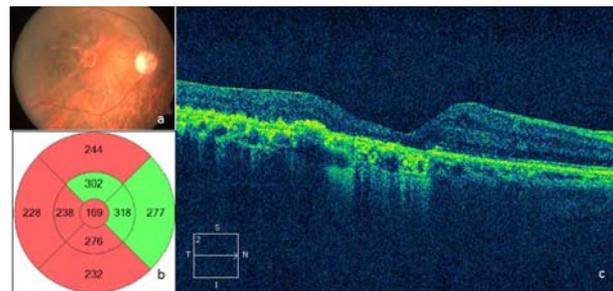
**Case 3**

A 49-year-old lady presented with the best-corrected visual acuity of 20/400 in the left eye. She had visual complaints since one year and had a full thickness macular hole on examination. She also underwent the same procedure using brilliant blue G (0.025%) dye. At two months postoperatively, she developed a similar macular hyperpigmentation as the above two patients did, with the best-corrected visual acuity of 20/400 and a central macular thickness of 120 µm (Figure 4).

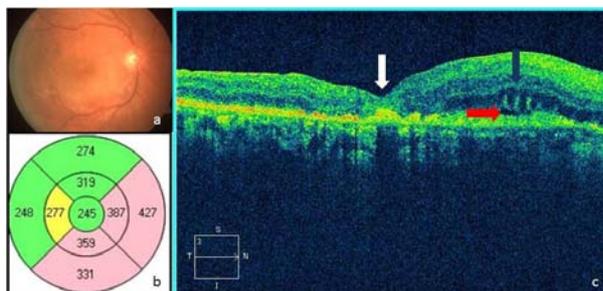
shows a closed macular hole (white arrow) with fluid accumulation in the outer retinal layers (blue arrow), sub-retinal space (red arrow) and irregular thickening of the RPE.



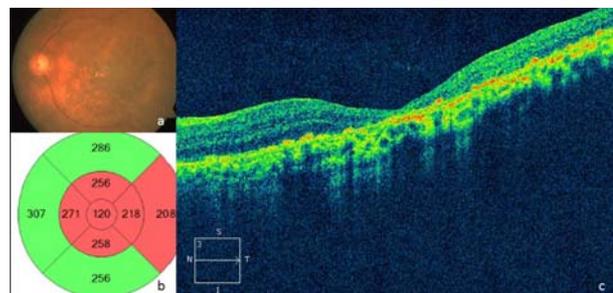
**Figure 2 (a):** Fundus photograph of Patient No. 1 two months following surgery shows hyperpigmentation in the macula (red arrows). (b) The macular thickness map shows marked thinning in the foveal region. (c) Line scan OCT shows irregular thickening of the RPE and foveal thinning (white arrow).



**Figure 3 (a):** Fundus photograph of Patient No. 2 two months following surgery shows hyperpigmentation in the macula. (b) The macular thickness map shows marked thinning in the foveal region. (c) Line scan OCT shows irregular thickening of the RPE and foveal thinning.



**Figure 1 (a):** Fundus photograph of Patient No. 1 two weeks following surgery shows a normal-appearing macula with (b) normal thickness on the macular thickness map. (c) Line scan OCT



**Figure 4 (a):** Fundus photograph of Patient No. 3 two months following surgery shows

hyperpigmentation in the macula. (b) The macular thickness map shows marked thinning in the foveal and perifoveal regions. (c) Line scan OCT shows irregular thickening of the RPE and foveal thinning.

### Discussion

BBG as a vital stain was introduced by Enaida et al (2006). Since then many studies have been conducted to test its efficiency and safety profile using animals and in vitro cultured human retinal cells. Creuzot-Garcher et al (2010) compared the functional and structural effect of intravitreal ICG, triamcinolone acetonide, trypan blue and BBG on a rat retina. They concluded that only ICG led to functional and structural retinal damage in the form of thinning of the inner nuclear layer. Querques et al (2008) reported OCT findings in a case of ICG toxicity. They showed slight atrophic aspects in the outer retina with no sub-retinal fluid or intraretinal cysts. Haritoglou et al (2004) studied the toxicity of ICG in human donor eyes and found on histology a marked disorganization of the inner retinal layers as well as loss of the ILM.

Saeed et al (2009) reported a case of trypan blue retinotoxicity at two weeks following macular hole surgery. Hyperpigmentation was observed in the macula and the OCT showed an increased reflectivity of the RPE corresponding to the hyperpigmentation. Similar OCT features were also observed in our patients.

Morales et al (2010) compared the effects of intraocular vital dyes on cultured pigment epithelial cells and found that BBG causes no significant changes in the morphological aspect of cultures by flow cytometry. The only in vivo in humans study which evaluated BBG was done by Remy et al (2008) and they did not observe any retinal toxicity or adverse effect.

The limitations of this case series include the procedure of the BBG staining which was done

under partial fluid air exchange and the dye being left in situ for 60 seconds. Enaida et al (2006) used the dye in a fluid-filled cavity and immediately washed it with the BSS. The reason why an author uses partial air-fluid exchange is to avoid staining of the posterior capsule of the lens by the dye (Hisatomi, 2006).

### Conclusion

These cases highlight the unusual occurrence of foveal thinning and macular hyperpigmentation of retinal pigment epithelium due to BBG and emphasize the importance of the two precautions to be taken while using it, which are using a low concentration and washing off the dye quickly and thoroughly.

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