• Letter to the Editor •

Multimodal imaging in photic retinopathy

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Dear Editor,

We would like to present the importance of multimodal imaging in photic retinopathy in a case of photic retinopathy. A young man presented with a one-day history of left central scotoma and metamorphopsia after exposure to a handheld laser pointer beam during a night party. The laser pointer was a class IIIB green laser with a wavelength of 532±10 nm and maximal power <1000 mW. However, uncorrected visual acuity was 20/20 in both eyes. In funduscopy, a discrete yellowish discoloration in the foveal area was noticed (Figure 1). Optical coherence tomography (OCT) of the left eye showed localized disruption of the ellipsoid zone and interdigitation zone (Figure 2). Fluorescein angiography showed different patterns in different phases; a paracentral hypofluorescence area in choroidal flash phase, a hypofluorescence area with a hyperfluorescence rim in arteriovenous phase and enhancing fluorescence in venous phase (leakage; Figure 3). We performed OCT angiography (Figure 4), it showed a localized low signal area in the choriocapillaris layer, demonstrating deep penetration of laser beams and damage to the choriocapillaris layer. Without any treatment, visual acuity remained unchanged with a central field defect. Figure 5 shows OCT angiography captured seventy days later, reperfusion of choriocapillaris was gained despite remained irregularity in outer retinal layers. Choriocapillaris in this area showed higher signal than normal choriocapillaris. The study followed the tenets of the Declaration of Helsinki and informed consent was obtained from the patient.

Photic retinopathy is photochemical damage to retinal layers, usually caused by unprotected sun gazing (especially during eclipses) or accidental exposure to laser pointers. Handheld laser pointers can cause retinal damage. The retina is vulnerable to the damage by light *via* three different mechanisms, including photomechanical, photothermal, and photochemical damage. Solar retinopathy is likely caused by a combination of thermal and photochemical reactions or thermally enhanced photochemical damage[1-2]. Patients typically present with visual acuity of 20/30 to 20/100 after gazing at the sun or observing a solar eclipse, and their vision usually returns to the level of 20/20 to 20/30 several months later[2].

As demonstrated in histopathological studies of solar retinal lesions, sun gazing causes localized structural anomalies in the outer segments of photoreceptors and the retinal pigment epithelium cells of the macula[3]. There are some case reports of visual improvement following the use of laser pointers, but there is no proven effective treatment for this condition[4-5]. The

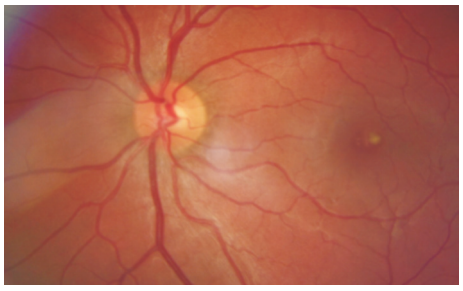

Figure 1 Fundus photograph of the macula displaying well demarcated, circular, yellowish discoloration.

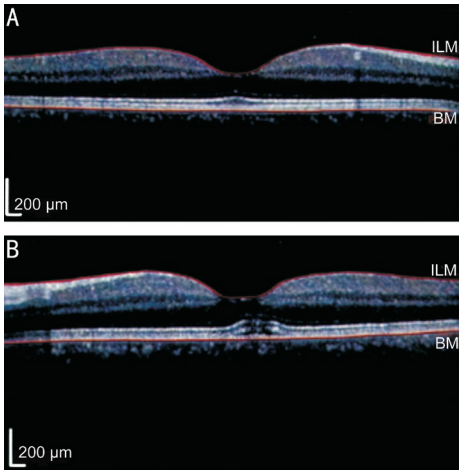

Figure 2 OCT images A: Right eye is normal; B: OCT of the left eye at acute stage demonstrated a disruption of the external limiting membrane and ellipsoid zone and interdigitation zone.

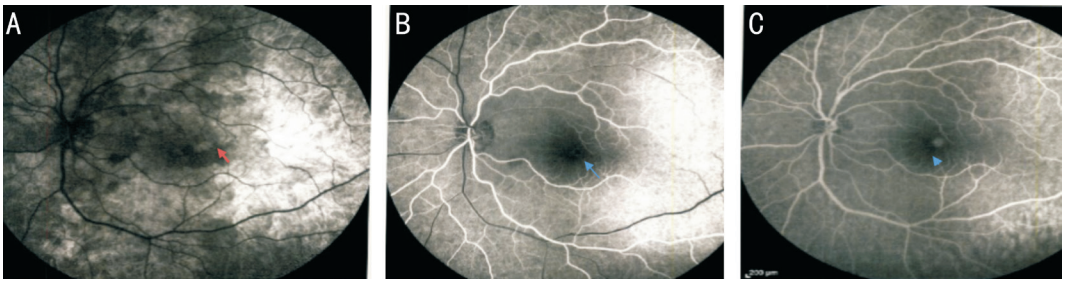

Figure 3 Fluorescein angiography images A: Fluorescein angiography of the left eye demonstrated a paracentral hypofluorescence area in choroidal flash phase (arrow); B: Hypofluorescence area with a hyperfluorescence rim in arteriovenous phase (arrow); C: Increasing fluorescence in venous phase (leakage; arrow).

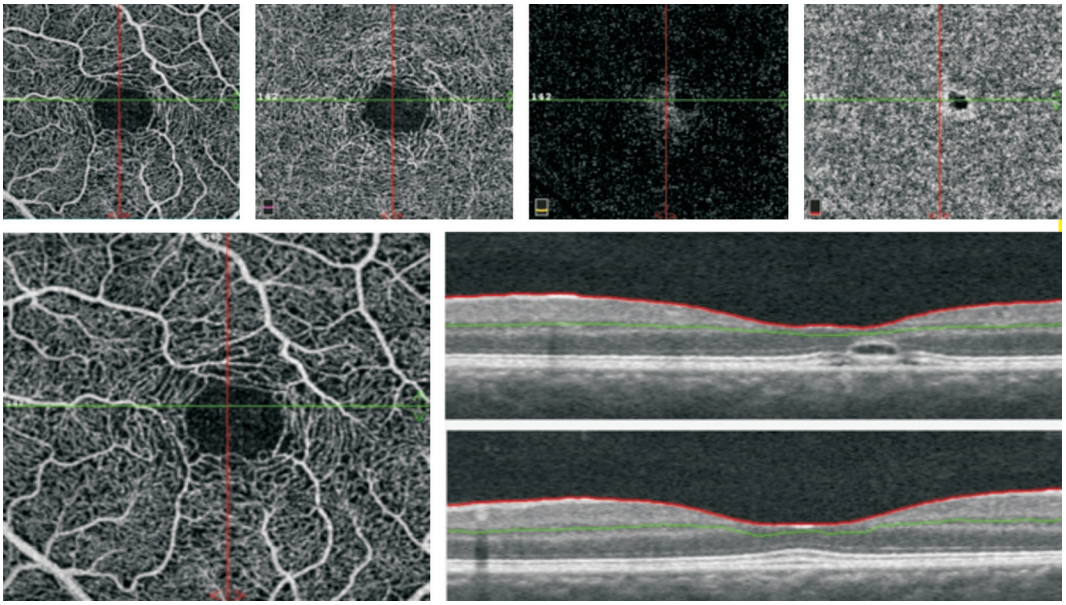

Figure 4 OCT angiography images at admission, which showed a localized low signal area in the choriocapillaris layer, demonstrating deep penetration of laser beams.

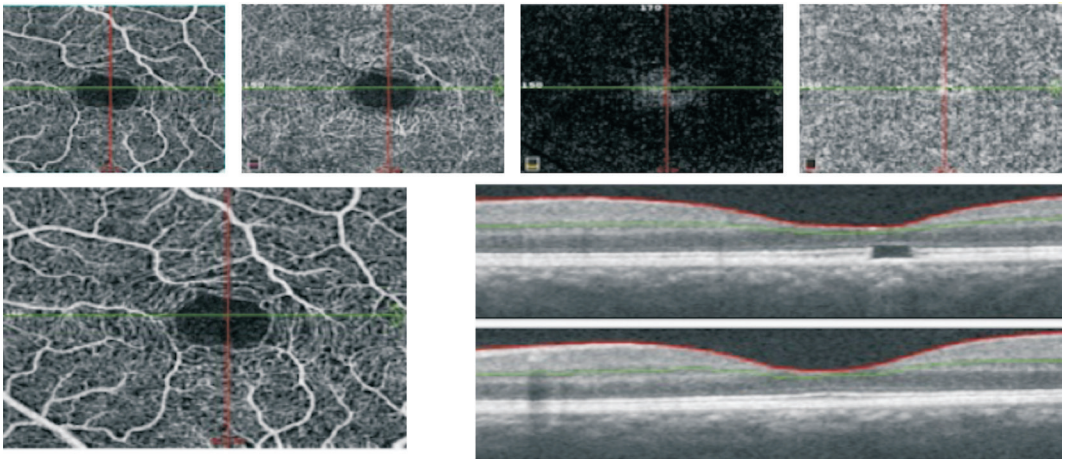

Figure 5 OCT angiography (seventy days later) shows reperfusion of choriocapillaris layer despite remained irregularity in outer retinal layers.

objective of this case report is to discuss disease etiology and multimodal imaging findings especially OCT angiography. This newer imaging techniques can help us to understand the extent of the damage and to find an effective treatment.

Fluorescein angiography showed different patterns in different phases; a paracentral hypofluorescence area in the choroidal flash phase that revealed choroidal nonperfusion, a hypofluorescence area with a hyperfluorescence rim in the arteriovenous phase corresponding to the high signal rim in OCT angiography of choriocapillaris layer and increasing fluorescence in the venous phase corresponding to dye leakage from compensatory dilated choriocapillaris.

OCT findings can be useful in determining the prognosis. Full-thickness involvement of the photoreceptor layer of the entire fovea indicates an association with permanent vision loss in patients with late solar retinopathy, whereas isolated involvement of the outer or inner segments or a lesion outside the center of the fovea results in a better visual outcome[6-7]. Our patient experienced central scotoma after unprotected exposure to a laser pointer, despite having relatively good vision. A paracentral defect in the ellipsoid zone and interdigitation zone was noted in the left eye.

OCT angiography demonstrated a standard vascular pattern in retinal layers. However, it showed a localized low signal area in the choriocapillaris layer that corresponds to choroidal non-perfusion in fluorescein angiography. Turaka *et al*[8] reported choroidal hypofluorescence suggestive of choroidal infarction by indocyanine green angiography in a case of laser pointer induced macular damage. We showed the same changes in choriocapillaris by OCT angiography. The high signal rim surrounding low signal area showed compensatory choriocapillaris dilation corresponding to the hyperfluorescent rim.

In a case report by Wu *et al*[9], OCT angiography of choriocapillaris layer was normal in acute solar retinopathy however several factors contribute to photic-related retinal damage and, these can be divided into two categories, patient-related factors (size of the pupil, degree of retinal pigmentation, proximity of incident beam to the fovea; and refraction status) and radiation-related factors.

OCT angiography captured seventy days later shows improved choriocapillaris flow, but choriocapillaris in this area showed higher signal than normal choriocapillaris. It could be caused by window defect effects or shows that choriocapillaris layer in this area was not entirely healthy. Reperfusion of choriocapillaris can play a role in vision improvement and also can prevent the occurrence of complications like choroidal neovascularization.

Finally, multimodal imaging can be used not only for diagnosis of photic retinopathy but also used for determination of the extent of retinal and choroidal layer involvement and prognosis of the disease. OCT angiography showed a localized involvement in the choriocapillaris, demonstrating deep penetration of laser beams.

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