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Handheld Green Laser Pointer Maculopathy

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Abstract **Case Report**

We report a case of retinal light damage caused, after a moment's gaze, by a green laser pointer. A 14-year-old boy presented to our clinic with central scotoma in his right eye. He had looked in the direction of handheld green laser pointer without wearing protective glasses for a moment just for fun. Visual acuity was 1.2 in both eyes. Ophthalmoscopy revealed a foveal gray-white spot in the right eye. Optical coherence tomography demonstrated focal disruption of the ellipsoid zone (EZ) and interdigitation zone (IZ), extending through the external limiting membrane to the retinal pigment epithelium (RPE). In addition, the perifoveal angular sign of Henle fiber layer hyperreflectivity was observed. Two weeks after the injury, the perifoveal Henle fiber layer hyperreflectivity was improved. Restoration of external limiting membrane and EZ disruption was observed at three weeks and five weeks after the injury, respectively However, IZ disruption remained.

Keywords: Handheld laser pointer, laser-induced maculopathy, retinal injury.

INTRODUCTION

Retinal damage and vision loss may occur following exposure to powerful light sources, including sunlight, illumination from surgical microscopes, and lasers. On optical coherence tomography (OCT), characteristic retinal imaging features have been identified, including vertical lesions appearing ellipsoid zone (EZ), interdigitation zone (IZ) and external limiting membrane disruption, hyporeflective cavities, and outer retinal streaks [1-5]. We report a case of retinal light damage caused, after a moment's gaze, by a green laser pointer.

CASE REPORTS

A 14-year-old boy presented to our clinic with central scotoma in his right eye. He had looked in the direction of handheld green laser pointer without wearing protective glasses for a moment just for fun. Visual acuity was 1.2 in both eyes. Ophthalmoscopy revealed a foveal gray-white spot in the right eye (Figure 1A). Optical coherence tomography demonstrated focal disruption of the EZ and IZ, extending through the external limiting membrane to the retinal pigment epithelium (RPE) (Figure 1B, C). In addition, the perifoveal angular sign of Henle fiber layer hyperreflectivity was observed. The patient was diagnosed with laser-induced maculopathy.

Note a gray-white spot in the right fovea. OCT demonstrated focal disruption of the ellipsoid zone (c) and interdigitation zone (d), extending through the external limiting membrane (a) to the retinal pigment epithelium (e). In addition, the hyperreflective perifoveal angular sign of Henle fiber layer was observed (arrows). (a: outer plexiform layer, b: external limiting membrane, c: ellipsoid zone, d: interdigitation zone, e: retinal pigment epithelium)

Two weeks after the injury, the perifoveal Henle fiber layer hyperreflectivity was improved (Figure 2A). Restoration of external limiting membrane and EZ disruption was observed at three weeks and five weeks after the injury, respectively (Figure 2B, C). However, IZ disruption remained (Figure 2C).

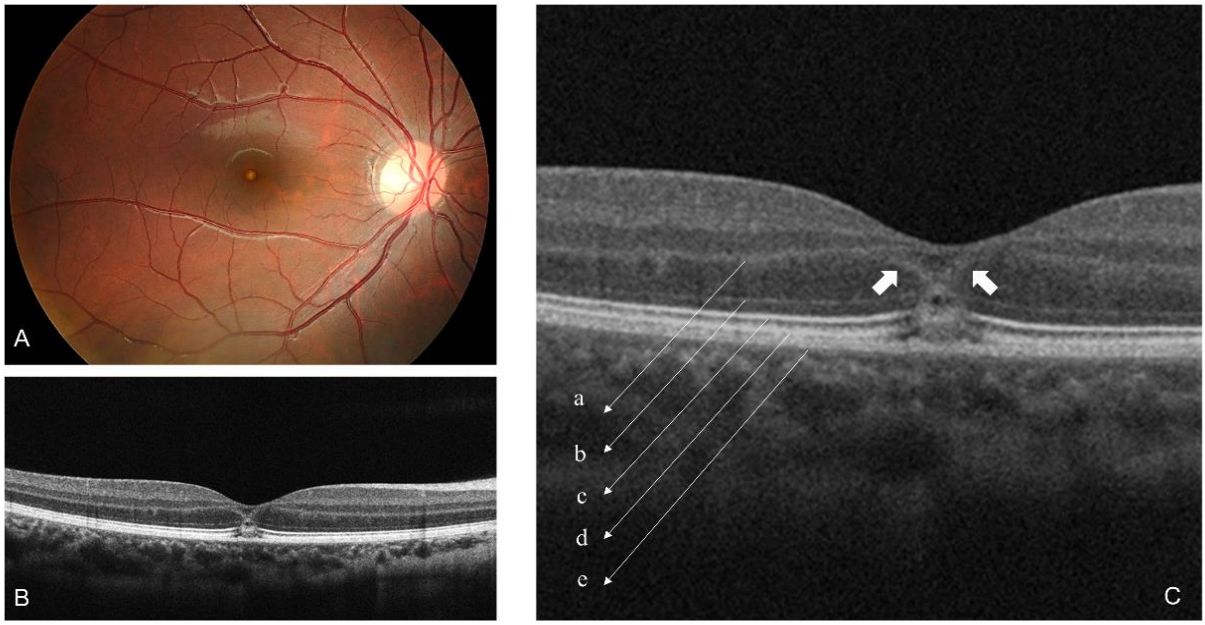

Figure 1: Color fundus photograph (A), optical coherence tomography (OCT) image (B) and high magnification OCT image (C) in the right eye at initial presentation

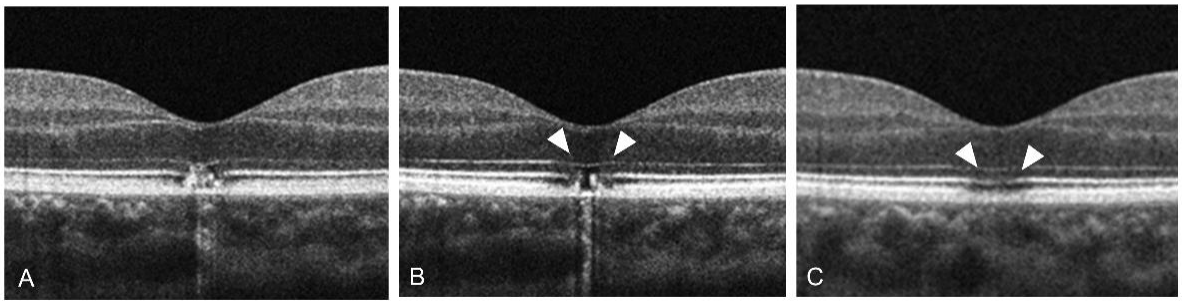

Figure 2: Optical coherence tomography mages (A: two weeks after the injury, B: three weeks after the injury, C: five weeks after the injury)

The perifoveal Henle fiber layer hyperreflectivity was improved (A). Restoration of external limiting membrane disruption was observed (B, arrowheads). Restoration of ellipsoid zone disruption was observed (C, arrowheads), but IZ disruption remained.

DISCUSSION

The nature in which lasers cause their effects in the eye can be photocoagulative, photodisruptive or by photochemical mechanisms. If sufficient energy reaches the retina in under a nanosecond, then ionisation is the mechanism. Durations of microseconds to a few seconds results in thermal damage, and a duration over 10 sec results in photochemical effects.

The severity of laser-induced maculopathy will depend on the specific wavelength of the laser device [1-5]. Long wavelength red lasers cause thermal damage to the eye. Green lasers cause energy to be delivered to the melanin pigment in the RPE at a wavelength of 532 nm and result in outer retinal damage [1-5].

Bhavsar *et al.,* [1] evaluated OCT findings in 158 eyes with handheld lasers retinal injury. According to their review, nearly all eyes (98.1%) imaged by OCT revealed abnormalities at initial presentation including focal EZ loss in 44 eyes (27.8%), RPE disruption in 38 eyes (24.1%), full-thickness macular holes in 34 eyes (21.5%), and hyperreflective lesions extending anteriorly from the IZ and EZ and following Henle fiber layer towards the outer plexiform layer 21 eyes (13.4%). Subhyaloid hemorrhage was identified in 6 eyes (3.8%), intra-retinal fluid in 4 eyes (2.5%), subeinternal limiting membrane hemorrhage in 3 eyes (1.9%), and lamellar macular hole in 1 eye (0.6%). Other rarely observed findings included serous retinal detachment (2 eyes, 1.3%) and foveoschisis (1 eye, 0.6%).

In addition, follow-up OCT imaging was available in 95 eyes (60.1%). Time from initial to last OCT varied from 1 to 132 weeks (mean 28.3; median

14.5). Persistent EZ loss was the most common abnormality detected at final follow up (23 eyes, 24.2%), followed by RPE disruption (11 eyes, 11.6%) and full-thickness macular hole (7 eyes, 7.4%).

Laser damage affects not only the retina but also the choroid. During the recovery process, we speculated that restoration of laser injury might be delayed in the outer layers of the retina. Clinicians should be aware of the inherent risks of laser pointers.

DISCLOSURE

The authors have no conflicts of interest to disclose.

Conflicts of interest

The authors have no financial or proprietary interests related to this paper.

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