Case report

Accidental macular injury with class IVb laser outside the medical settings

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Abstract

In the medical settings, safety precautions are used to mitigate inadvertent ocular damage due to laser beams. High power lasers are illegal in many countries; however, they are sometimes used on social occasions. Use by an untrained member of the public can result in severe accidental ocular damage. We report a case of macular damage and central visual loss due to the illegal use of a class IVb 2000 mW power laser in a 20-year-old male. To our knowledge, this is the first case of macular injury due to this particular type of laser. The case history and management over a 6-month period is described. Public education initiatives are required to increase the awareness of the dangerous nature of laser beam exposure outside a medical setting.

Keywords: Laser, Macular injury, Autofluorescence

Introduction

A variety of lasers are used in Ophthalmology for diagnostic and therapeutic purposes. Macular damage can occur as a complication of therapeutic laser use. To mitigate ocular complications, there are stringent safety precautions in place for medical laser use. The use of handheld laser pointers with greater than 5 mW power in a social setting and by untrained personnel is illegal in most countries including the Kingdom of Saudi Arabia (KSA) because of the potential for ocular damage. Despite the unlawful nature, some members of the public illegally acquire and use lasers with greater than 5mW power. Previous case reports of accidental macular damage due to laser pointers include, neovascular membrane (CNV),1 macular holes,2 epiretinal membranes, and subhyaloid hemorrhage.3 We present a case of accidental macular damage by a class IVb 450 nm 2000 mW power laser resulting in macular damage and decreased central vision. To our knowledge, this is the first case of macular injury by this particular type of laser-emitting device. The presentation and management over 6 months is presented in this case report.

Case report

A 20-year-old Saudi male presented to the emergency department at King Khaled Eye Specialist Hospital (KKESH) complaining of loss of central vision in his right eye for 2 days following exposure to a blue light laser beam. The right eye was exposed directly to a laser beam from a laser pointer device used by one of his friends from a short distance in a social setting (not in a hospital setting). The laser device had a wavelength of 450 nm and was classified as class IVb laser product with a power of 2000 mW.

The patient was in good general health concern and was not taking any systemic or ophthalmic medications. The ocular history was unremarkable and the vision was normal in both eyes prior to the incident.

On examination, his left eye was within normal limits, with 20/20 vision. The right eye had 20/400 visual acuity (VA), normal intraocular pressure (<20 mmHg), and a normal anterior segment. The right fundus had massive macular edema with a small dot hemorrhage below the fovea (Fig. 1A). Wide field fluorescein fundus angiography at presentation showed
central macular hypofluorescence with no evidence of CNV (Fig. 1B). Spectral domain optical coherence tomography (OCT) indicated severe edema of the outer retina and sub-retinal layers with a shadowing effect (Fig. 1C). We elected to observe the patient and requested the patient to return for follow-up.

Four weeks later, the foveal edema had decreased and VA improved to 20/300. A solid central macular lesion was present on fundus examination (Fig. 1D) and OCT (Fig. 1F). Fundus autofluorescence (AF) at this visit (Fig. 1E) indicated increased autofluorescence (AF) centrally (corresponding to the area of the solid lesion) with decreased autofluorescence surrounding this region, especially inferiorly.

At 3 months, VA increased to 20/200 and the solid foveal lesion had decreased in size, with resolution of macular edema (Fig. 2A). AF showed a smaller region of increased autofluorescence centrally, and reduced AF around the foveal lesion with mottled appearance (Fig. 2B). OCT showed resolution of the macular edema with a small
central high reflective lesion (Fig. 2C). OCT also showed discontinuity of the photoreceptor layer in the central macular area.

At 6 months, VA remained stable at 20/200. The right macula had a mottled retinal pigment epithelium (RPE) layer centrally with no residual edema (Fig. 2D). AF showed central mottling with a ring outlining the area of initial macular edema (Fig. 2E). OCT showed central loss of the photoreceptor layer with small spots of high reflective lesions above the RPE (Fig. 2F).

Figure 2. (A) Color photograph of the right macula at 3 months follow-up. (B) AF image at 3 months follow-up. (C) OCT (horizontal scan through the foveal center) at 3 months follow-up. (D) Color photograph of the right macula at 6 months follow-up. (E) AF image at 6 months follow-up. (F) OCT scan (horizontal cut through the foveal center) at 6 months follow-up.
Discussion

This case report highlights the danger of using laser-emitting devices outside a medical setting with no eye safety precautions. In this case, directing this powerful laser to the eye from a short distance resulted in acute, severe macular damage with massive edema. The macular edema resolved over time appearing as a central solid inflammatory lesion. The area of inflammation decreased over time with permanent photoreceptor loss and RPE damage. This resulted in decreased central vision in a young male that could be permanent.

There were interesting AF findings in this case. The increased AF from the central solid lesion could be explained by high reflectance from the inflammatory tissue that reduced over time with resolution of inflammation. The reduced AF corresponding to the area of initial macular edema could be explained by the masking effect of retinal edema coupled with reduced photoreceptors/RPE function as a result of inflammation. The inflammation gradually resolved leaving a mottled AF signal in the central macula explained by photoreceptors/RPE damage.

It is illegal to use these laser devices in the KSA. However, many people still use it in social occasions such as sporting events and celebratory holidays. A public education campaign is required to increase awareness of the potential for severe and permanent ocular damage and visual loss due to high power handheld lasers.

Conflict of Interest

The authors declared that there is no conflict of interest.

References

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