Zagazig University Medical Journal
www.zumj.journals.ekb.eg
https://doi.org/10.21608/zumj.2023.235386.2881 Volume 30, Issue 3, May 2024
Manuscript ID ZUMJ-2309-2881 (R1)
DOI 10.21608/ZUMJ.2023.235386.2881
ORIGINAL ARTICLE

Spontaneous Resolution of a High-Power Blue Laser Pointer- Induced Maculopathy: A case report

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Submit Date 2023-09-14
Revise Date 2023-10-03
Accept Date 2023-10-10

ABSTRACT

A fifteen-year-old boy appeared at my clinic with impaired vision in his left eye to 20/70 following a brief exposure to a high power class IVb blue laser pointer. A mirror at a distance of one meter reflected the beam for two seconds onto his left eye. He reported having a left eye with a central black spot and a blurry vision. A sub-internal limiting membrane (ILM) haemorrhage near the fovea was discovered during a fundus examination. of the left eye was identified as a red, well-circumscribed patch in the foveal area. The optical coherence tomography (OCT) scan verified the existence of bleeding beneath the ILM layer. The central fovea of the left eye's fluorescein angiography showed a little early transmission deficiency without late staining. A relative central scotoma was discovered by perimetry in the left eye. Both eyes' anterior segments appeared normal. The fundus examination of the right eye revealed normal results. The haemorrhage was completely cured and the visual acuity recovered to 20/20 seven weeks later. These devices need to be properly warned of, and children shouldn't have unlimited access to them.

Keywords: Fluorescein fundus angiography ; Laser pointer ; Macular damage ; Optical coherence tomography

INTRODUCTION

In many disciplines, particularly for educational purposes, laser pointers are effective signaling instruments. When used correctly, laser pointers make useful and secure instructional tools. Children frequently play with them as toys. Inappropriate usage of these may result in ocular damage and potentially fatal vision loss. Recently, unlicensed lasers from the Middle East have been imported and are readily available to the general public here. A PubMed search revealed at least 36 cases (keywords: retina, laser damage, laser pointer), indicating a significant increase in the number of children's laser pointer injuries reported over the past four years. Males less than 18 years old make up most of the cases **[1, 2].** The injuries were mainly caused by staring directly at a laser pointer, staring at a laser pointer beam reflected off a mirror, or being exposed by another person. Depending on the degree of intensity and wavelength of emission, lasers can induce a variety of retinal injuries **[3].** The two main factors that determine whether and to what extent retinal injury develops are the laser's power (energy supplied) and exposure time. Lasers can harm retinal tissue through three different mechanisms: thermal, photochemical, and mechanical **[4].**

The human eye defends itself with blink reflexes, therefore laser pointers with a maximum power of 5 mW that were once supplied to the general public were thought to be harmless **[5].** Occupational and military environments are typically the only places where eye-harming lasers are used; extremely few laser accidents occur outside of these settings **[6].** Nevertheless, despite governmental prohibitions, strong laser devices with a power of up to 700 mW are already easy to find online.

In this report, I present a 15-year-old adolescent's retinal injury produced by a blue laser pointer.

CASE REPORT

In front of a mirror, a 15-year-old Saudi boy was playing with a handheld blue laser pointer when the

beam struck his left eye for two seconds. In this instance, the class IVb blue laser pointer's output power was over 50000 mw, and its wavelength was 450 nm **(Figure 1).** The young child had purchased a blue light portable laser pointer online to use as a toy. The boy's life was drastically altered when he played with his laser pointer in front of a mirror to put on a "laser show," which caused the laser beam to briefly harm his eyes. He noticed a central scotoma and blurred vision in the affected eye immediately. He waited five days before getting an ophthalmology assessment because he was hoping the sight loss would be temporary and worried about having to notify his parents. He could no longer conceal his impaired vision at that moment. The boy's left eye had metamorphopsia, a central scotoma, and he complained of impaired vision. His brother took him to the hospital immediately. There were no abnormalities or ophthalmologic medical histories in the patient. Both eyes' anterior segment examinations revealed nothing unusual. Round pupils had a normal direct or indirect light reaction. The boy's best corrected visual acuity in his left and right eyes was 20/70 and 20/20, respectively. Both eyes showed no rise in intraocular pressure (IOP). The left eye's funduscopic examination revealed a clearly defined red area.

The premacular hemorrhage corresponds to **Figure (2)**. Optical coherence tomography (OCT) indicated a dome-shaped hyporeflective collection subinternal limiting membrane (ILM) associated with hemorrhage in the inner segment-outer segment junction and the inner aspect of the retinal pigment epithelium **(Figure 3)**.

The central fovea of the left eye's fluorescein fundus angiogram (FFA) showed slightly early transmission deficit without late staining **(Figure 4).** A relative central scotoma had been identified by perimetry in the left eye. The child returned to the hospital for his follow-up examination seven weeks following the occurrence. His left eye's best-corrected visual acuity improved to 20/20 without any medical intervention. Fundus photography showed that the hemorrhage had been significantly absorbed **(Figure 5)**. Throughout the follow-up period, the fluorescein fundus angiogram (FFA) did not show any active lesions **(Figure 6).** The hemorrhage in the subILM space was completely absorbed, as shown by optical coherence tomography **(Figure 7).**

Written informed consent was obtained from the participant. Additionally, the study was approved by the research ethical committee of College of Medicine, King Khalid University, Abha, Saudi Arabia

Figure 1: Class IVb blue laser pointer with a 50000 mw output power and 450 nm wave length

Figure 2: left eye fundus image displaying red, well circumscribed spot of premacular subILM heamorrhage.

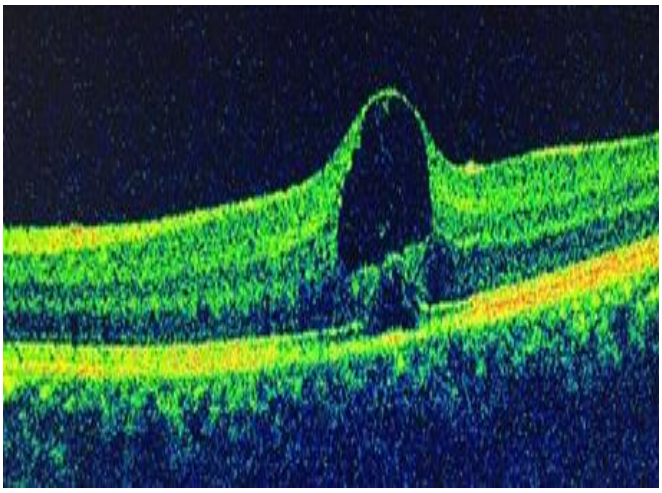

Figure 3: Optical coherence tomograph of left eye showing subILM dome shaped hyporeflective area compatible with hemorrhage and focal disruption of the inner segment-outer segment junction and inner aspect of the retinal pigment epithelium

Figure 4: The central fovea of the left eye's fluorescein angiogram showed a mild early transmission deficiency without late staining

Figure 5: Fundus photograph of the left eye taken seven weeks after exposure reveals that the hemorrhage has completely subsided

Figure 6: No active lesion **is visible on** fluorescein angiogram of the left eye seven weeks after exposure.

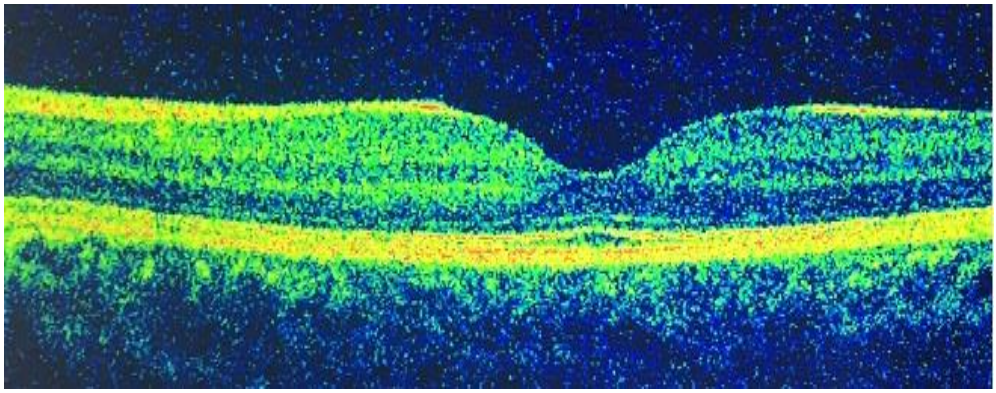

Figure 7: Left eye optical coherence tomographly (OCT) 7 weeks after exposure showed the hemorrhage had stopped

DISCUSSIONS

maculopathy. This article discusses a case of self-inflicted laser pointer maculopathy that was brought on by mirror-induced laser beam reflection. During the follow-up period, the patient displayed both visual and anatomical healing. Lasers can cause retinal damage by photocoagulation, photodisruption, and photochemical interaction. The severity of retinal damage is determined by the wavelength, exposure period, spot size, power and placement. Blue laser light is readily absorbed by foveal xanthophyll pigment **[6]**. Furthermore, At shorter wavelengths, melanin in the retinal pigment epithelium absorbs more energy than at longer wavelengths **[7].** Animal studies have indicated that blue light promotes photochemical retinal damage **[8]**. As a result, blue lasers are more likely to damage the retina than green or red lasers. Laser pointers may emit light radiation that can be more harmful to the eyes than staring at the sun directly. The retina of the eye, in particular, is a tissue that is susceptible to laser radiation. Retinal irradiance is increased by the eye's refractive medium 10,000 times more than corneal irradiance is **[6].**

The laser pointer's power was approximately 50000 mW in our case and its wavelength was 450 nm. Such devices may cause instant, serious retinal injury due to their significantly increased power. These lasers have been marketed as amusing toys and appear to be very popular among young people, despite the fact that they have the potential to cause blindness **[9].** Hemorrhages in various retinal layers may result from accidental laser exposure **[6].** In a previous investigation, a 15-year-old child acquired a submacular haemorrhage after using a handheld green laser pointer with a 150-mW output power **[10].** Similar results were recently published after the use of handheld lasers with 750-mW output power and 450 nm wavelengths. **[11].** In our case, the patient had a minor sub-ILM hemorrhage that was untreatable and just required observation.

The US Food and Drug Administration and the Laser Institute of America have issued a public health warning about the dangers of powerful handheld lasers to the skin and eyes **[12, 13].**

In conclusion, the public must be educated about the dangers of lasers and strict laws must be passed prohibiting the production, usage and possession of dangerous laser pointers. Most recommendations for the purchase and use of these devices have been reevaluated. Authorities will need to establish laws and en

A laser beam focused directly on the macula can result in an uncommon condition known as laser purchase and use by the public. I hope that nations quickly adopt guidelines and legislation that emphasize the secure usage of laser pointers.

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To Cite :

Khair Allah, A. Spontaneous resolution of a high-power blue laser pointer- induced maculopathy: A case report. *Zagazig University Medical Journal*, 2024; (748-752): -. doi: 10.21608/zumj.2023.235386.2881