Case Report

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Laser Light Induced Retinopathy in a Young Boy: A Case Report from Eye Care Hospital, Karachi

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ABSTRACT:

A case report of a 14 year-old-boy who came with a history of direct gazing to laser pointer at Khairun'nisa Eye Hospital, Karachi. A comprehensive eye examination including Slit lamp biomicroscopy, Fundoscopy, optical coherence tomography and Fundus photography was done. Main outcome measure were right eye foveal scarring with normal periphery. Fundoscopy showed right Eye old scar at fovea, exactly like solar retinopathy. Solar retinopathy is a type of retinopathy which is caused by directly looking at sunlight. In this report we are presenting the classical case of retinopathy exactly like solar retinopathy due to gazing directly at laser light for a long period of time.

Key Words: Solar retinopathy, Fovea, Laser Light, Optical Coherence Tomography, Laser Induced Retinopathy

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INTRODUCTION:

Most cases of laser-induced retinal injury result from accidental exposure to high-energy class IV lasers with military, laboratory, or medical applications used appropriately, low-energy class laser devices pose little risk of retinal injury.[1]

Two factors may have contributed to the development of the macular lesion noted in this patient. First, racial fundus pigmentation may have increased absorption of the laser energy at the level of the retinal pigment epithelium and choroid, accentuating the effect of the low-power laser. Laser Pointer is a device with a power source where the laser emits a narrow coherent low-powered laser beam of visible light. Where, a small bright row of colored waves is spotted when pointing on a target.[2]

Severity of laser induced retinopathy depends on the wavelength of light used. Our eyes are more sensitive to the green light. The beam of laser light can damage our retina and the point where the laser becomes notably dangerous at 5 milliwatts of power, This 5 milliwatts of power laser light can potentially damage the eyes in under 10 seconds.

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This harm mostly results in the light sensitive cells of the eye's retina becoming overloaded and damage to the macula cells, The intense energy generated by laser light can cause an increase in temperature in the tissues it comes into contact with, leading to coagulation, denaturation of proteins, and cellular death. And these laser lights can temporarily blind the person instantly at the exposure of the lights in the eyes. Which can be dangerous for the people in precarious situations or those operating heavy machines or vehicles including planes.[3]

Case Report: A 14 year old boy presented to the OPD of Khairun'nisa Eye Hospital, Karachi with a complaint of decreased vision in right eye for 2 years. It was revealed in history that the young boy had a bet with his friend that among all who could look at the laser light for a long time. He was not wearing any glasses at that time. When he told his parents about his vision declining day by day, his parents thought he was malingering and made up the story of being affected by a laser. When he came to Khairun'nisa Eye Hospital we took his history in detail and get to know that he has no previous history of trauma and surgery. His visual acuity of the right and left eye was 5/60 and 6/6 respectively. His visual acuity of the right eye was not improving even with the pin hole. Although near vision was N14 in right eye and N6 in his left eye. His pupillary reaction was round regular and reaction. On Slit lamp Examination anterior segment was found normal.

However, a Fundoscopy with 90 Diopter lens showed a focal disturbance of the retinal pigment epithelium due to laser burn in his right Eye. Figure 1 and 2 No abnormality was found in the fundus of the left eye. Figure 3 and 4. For further investigation, optical coherence tomography was performed and results clearly showed an old scar in the right eye.Figure 5

Considering the clinical, biomicroscopic and tomographic findings, the diagnosis of right eye solar retinopathy was established, despite no direct sun gaze being documented, it is a type of thermal injury to the retina caused by exposure to high-intensity laser radiation. The thermal energy generated by the laser leads to coagulation and denaturation of retinal proteins and cellular death.No specific treatment was given. He was advised to avoid any further exposure to laser radiation and multivitamin syrup (Lutevit plus one tsp daily) and a healthy diet. He was also counseled on the importance of protective eyewear and the safe use of laser pointers to prevent accidental exposure. No improvement in his right eye vision was seen after 1 month of follow-up with the same 5/60 visual acuity in right eye. On his first follow up he was advised to continue using the same multivitamin syrup for 3 months.

Figure 1 and 2: fundus photographs of right eye showing laser burn

Figure 3 and 4: Fundus photograph of left eye showing no significant abnormality.

Figure 5: Optical coherence tomography of right eye

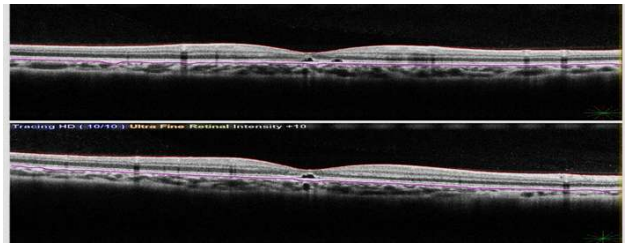
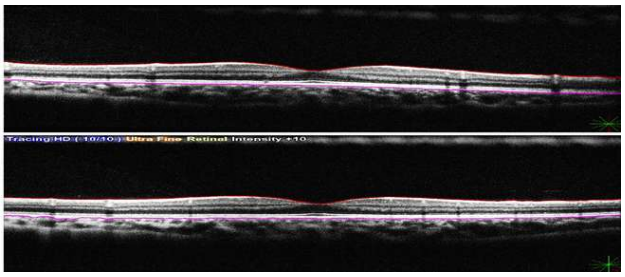


Figure 6: Optical coherence tomography of right eye



DISCUSSION:

Laser light can cause severe damage to the retina, particularly the fovea, which is responsible for our central vision. The retina is the part of the eye that converts light into electrical signals that are sent to the brain to create visual images.[4]

When laser light is directed towards the eye, it can be absorbed by the retina's pigments and converted into heat. This heat energy can then damage the delicate cells in the retina, including those in the fovea, which are particularly susceptible to damage due to their high concentration of photoreceptor cells. This conversion of the laser energy into heat, resulting in a thermal burn and subsequent atrophy of the retina.[5]

The severity of the damage depends on the wavelength, intensity, duration, and size of the laser beam. Higher intensity and longer duration of exposure to laser light can cause more significant damage to the retina, while smaller laser beams can cause pinpoint burns.[6]

The effects of laser light on the retina can range from mild temporary vision loss to permanent damage and blindness. Symptoms of laser-induced retinal damage include blurred or distorted vision, dark or missing spots in the central vision, and sensitivity to light.[7]

To prevent laser-induced retinal damage, it is crucial to wear protective eyewear when working with lasers or being in close proximity to laser beams. It is also important to follow proper safety protocols when using lasers and to avoid pointing laser beams at the eyes.[8]

Due of their increasing curiosity in laser appearances and ignorance of the potential risks, children are more vulnerable to laser eye injuries.[9] Misuse has been linked to deliberate exposure as well as unintentional exposure, such as "games" where kids would compete to see who could keep a laser in their eye longer than everyone else.[10] In addition, compared to adults, youngsters have a clearer ocular medium and are less likely to use the same defense mechanisms blinking and gaze aversion in reaction to lasers pointed directly at their eyes.[11] It has frequently been stated that kids with learning disabilities, behavioral disorders, and mental health concerns are more likely to sustain an eye injury.

Conditions categorized under the general term "photic retinopathy," or conditions secondary to light-related damage from a variety of sources and wavelengths, are examples of ifferentiators.[12] This comprises arc welding retinopathy, solar/eclipse retinopathy, and retinopathy caused by laser pointers. Eclipse maculopathy/solar maculopathy: Both disorders originate directly from prolonged sun exposure, causing retinal damage that can occur in as little as a few

minutes of visible light exposure.[13,14] This causes symptoms and signs akin to laser pointer maculopathy, as well as a retinal appearance. This syndrome typically gets worse when watching solar eclipses for an extended period of time. But it can also happen as a byproduct of religious rituals, outdoor athletic events, and psychotic episodes.[15]

When youngsters do not emerge right away after being injured by a laser pointer, their retinal appearance may lead to a false diagnosis of macular dystrophy.[16] Given these results, it is necessary to ask more focused questions about the case history in order to identify the causal agent. Additionally, the stability of the retinal findings is important in distinguishing this disorder from other bilateral, slowly progressing hereditary macular dystrophies. In addition, family history and genetic tests are critical since, in contrast to laser pointer maculopathy, a hereditary dystrophy may be present in one or more family members. The diagnosis of laser pointer retinopathy relies heavily on OCT imaging. The ellipsoid zone may be disrupted or damaged, leading to the following loss of retinal pigment epithelium, as characteristic observations. Excessively reflecting bands in a vertical orientation can also be seen at the level of the outer retina.

The retinal appearance and sequelae are critical factors in the management of laser pointer maculopathy. If retinal holes are present, they may go away on their own in certain situations, but if they worsen and continue, a pars plana vitrectomy can be required. The previously stated problems can also involve different layers of retinal hemorrhage and vitreous hemorrhage. As they normally go away on their own without treatment, these may usually be seen. The use of oral steroids for laser retinopathy has been supported by case studies and television shows. Steroid usage is supposed to reduce the inflammatory reaction that the laser causes. Unfortunately, the majority of the anecdotal cases in the literature have not been sufficiently studied to determine its clinical utility.

Due to the ease of access to lasers through internet retailers and the lack of awareness regarding their risks, laser pointer retinopathy is a disorder that is becoming more and more common in pediatric and adolescent patients. This instance illustrates how laser viewing can cause detrimental vision issues that children and teenagers may not be aware of, as the condition might go untreated for years before being discovered during a routine eye checkup. While most cases have a good prognosis, some have resulted in significant visual loss. Given the lack of a truly effective treatment, it is essential to raise awareness and educate people about laser pointers. By teaching parents, teachers, caregivers, and kids about safe laser handling practices and how they can have disastrous ocular repercussions if handled improperly, optometrists can play a significant role in the lives of these individuals.[17]

CONCLUSION:

Laser light can cause severe damage to the retina, particularly the fovea, by burning the delicate cells responsible for our central vision. It is essential to take proper precautions to protect the eyes when working with lasers to prevent permanent vision loss. To prevent retinal damage, it is important to use laser pointers responsibly and avoid pointing them directly at the eye.

Authors Contribution:
Mazhar Awan: Conceptualized of work and supervised the study
Madiha Waqar: Manuscript writing, clinical work design of study
Ahmed Hafeez: Manuscript writing, clinical data work and follow-up of patient

REFERENCES:

1. Stuck BE, Friedl KE. The US Army Medical Department's role and accomplish-ments in laser development and use. Chapter one, In: Biomedical Implications of Military Laser Exposure. Washington DC, Borden Press, Government Printing Office. 2020.
2. Kaya M, Yagci BA. Bilateral macular injury following red laser pointer exposure: A case report. European Eye Research. 2021 Dec 1;1(3):170-3.
3. Birtel J, Harmening WM, Krohne TU, Holz FG, Charbel Issa P, Herrmann P. Retinal Injury Following Laser Pointer Exposure. Dtsch Arztebl Int. 2017 Dec 8;114(49):831-837. doi: 10.3238/arztebl.2017.0831
4. United States Code of Federal Regulations. Title 21, chapter 1, part 1040, section 1040.10;1995:522–535.
5. Reid, G., Shirley, K., Gamble, R. et al. Macular injuries secondary to handheld lasers in a paediatric population—clinical characteristics and indicators of visual impact. Eye 37, 176–182 (2023). https://doi.org/10.1038/s41433-021-01916-0
6. Chen X, Dajani OA, Alibhai AY, Duker JS, Baumal CR. Long-term Visual Recovery in Bilateral Handheld Laser Pointer–induced Maculopathy. Retinal cases and brief reports. 2021 Sep 1;15(5):536-9.
7. Shenoy R, Bialasiewicz AA, Bandara A, Isaac R. Retinal Damage from Laser Pointer Misuse - Case Series from the Military Sector in Oman. Middle East Afr J Ophthalmol. 2015 Jul-Sep;22(3):399-403. doi: 10.4103/0974-9233.159780. PMID: 26180486; PMCID: PMC4502191.
8. Conci LD, Alves DL, Frossard JC, Harchbart KK, Pinheiro AG. Choroidal neovascularization following laser pointer-induced macular injury: case report and overview. Revista Brasileira de Oftalmologia. 2020 Aug 7;79:199-202.
9. Linton E, Walkden A, Steeples LR, et al. Retinal burns from laser pointers: a risk in children with behavioural problems. Eye (Lond). 2019;33(3):492-504. doi:10.1038/s41433-018-0276-z
10. Mtanes K, Mimouni M, Zayit-Soudry S. Laser Pointer-Induced Maculopathy: More Than Meets the Eye. J Pediatr Ophthalmol Strabismus. 2018;55(5):312-318. doi:10.3928/01913913-20180405-01

11. Tabatabaei SA, Soleimani M, Bohrani B, Banafsheafshan A, Faghihi S, Faghihi H. Multimodal imaging in photic retinopathy. Int J Ophthalmol. 2019;12(3):523-525. doi:10. 18240/ijo.2019.03.27

12. Motlagh M, Wilkinson M. Laser Pointer Maculopathy. 2021. https://webeye.ophth.uiowa.edu/eyeforum/cases/311-laser-pointer-maculopathy.htm

13. Macarez R, Vanimschoot M, Ocamica P, Kovalski JL. Optical coherence tomography follow-up of a case of solar maculopathy. J Fr Ophtalmol. 2007;30(3):276-280. doi:10. 1016/s0181-5512(07)89590-8

14. Abdellah MM, Mostafa EM, Anber MA, El Saman IS, Eldawla ME. Solar maculopathy: prognosis over one year follow up. BMC Ophthalmology. 2019;19(1):201. doi:10.1186/s12886-019-1199-6

15. Barkana Y, Belkin M. Laser eye injuries. Surv Ophthalmol. 2000;44(6):459-478. doi:10.1016/s0039-6257(00)00112-0

16. Xu K, Chin EK, Quiram PA, Davies JB, Parke, D. W., 3rd, Almeida DR. Retinal Injury Secondary to Laser Pointers in Pediatric Patients. Pediatrics. 2016;138(4). doi:10.1542/peds.2016-1188

17. Swatch P, Chang A, Bhakhri R. Laser pointer retinopathy: a case report and review. CRO (Clinical & Refractive Optometry) Journal. 2022 Apr 15;33(1).