Delayed spontaneous closure of blue laser-induced full thickness macular hole

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ABSTRACT

Purpose: To report a blue laser-induced full thickness macular hole (FTMH) with delayed spontaneous closure without surgical intervention.

Observations: A 14-year old male developed full thickness macular hole after momentary exposure to a high-power handheld blue laser device. The macular hole closed spontaneously over a long period of observation.

Conclusion: Despite an initial enlargement in size, small FTMH caused by blue lasers may close spontaneously over an extended period of observation.

1. Introduction

Macular hole (MH) is defined as a full-thickness defect of the neurosensory retina in the macular area. Traumatic macular hole is the second most common etiology of this condition.1 Laser induced MH has been reported in the literature.2,3,4 It is considered a common manifestation after ocular exposure to blue laser devices.2,3 Although spontaneous closure of macular hole has been well reported in the literature,4 this rarely occurs in the setting of macular hole induced by blue laser.2,5 We report a case of blue laser-induced MH that closed spontaneously after an initial enlargement in size. MH closure occurred over a considerably long period of observation.

2. Case report

A 14-year-old healthy male, presented with an initial complaint of a sudden decrease in vision in the left eye after momentary exposure to a blue light laser from a distance of 0.5 m. The inciting incident occurred two weeks prior to presentation at the King Khaled Eye Specialist Hospital in Riyadh, Saudi Arabia. The label on the laser documented power and wavelength of the device as 5000mW and 445 nm, respectively.

On examination, the best-corrected visual acuity (BCVA) was 20/20 in the right eye and 20/100 in the left eye. Intraocular pressure was 12 mmHg bilaterally. Anterior segment examination of both eyes was unremarkable. Dilated fundus examination of the right eye was normal. Fundus examination of the left eye revealed a full thickness macular hole (FTMH). Macular spectral-domain optical coherence tomography (SD-OCT) (Spectralis HRA; Heidelberg Engineering, Heidelberg, Germany) showed full thickness macular hole with elevated margins and cystic changes. The minimum diameter and base diameter of the MH measured 183 μm and 327 μm, respectively. (Fig. 1A). Reassessment after 20 days from the initial visit revealed the same findings and the size of the macular hole was unchanged. After a discussion with the family on the risks and complications associated with vitrectomy, we elected to observe the patient. Five months after presentation, the best-corrected visual acuity (BCVA) improved to 20/60 in the left eye, although SD-OCT showed enlargement of both the minimum and base diameters with persistent cystic changes. The minimum diameter and base diameter of the MH measured 225 μm and 378 μm, respectively. (Fig. 1B). The family was offered surgery but declined. Twelve months later, BCVA improved to 20/25. Spectral domain OCT showed bridging of the macular hole with disappearance of the cystic changes (Fig. 1C). At last follow-up, 30 months after initial presentation, BCVA improved to 20/20 and SD-OCT showed almost complete closure of the macular hole except for mild disruption of the ellipsoid zone. The external limiting membrane was intact. In addition, thinning of the outer nuclear layer and a hyper-reflective central cone was present (Fig. 1D).

3. Discussion

High-power handheld laser devices are extremely hazardous and several types of ocular injuries have been documented in the literature.3,6,7 Specifically, blue laser-induced ocular injuries include anterior...
uveitis, premacular and macular hemorrhages, outer retinal disruption, schisis-like cavity, epiretinal membrane and FTMH. We have previously reported the characteristics and outcomes of a series of 17 eyes with blue laser-induced FTMH. Fourteen patients were managed surgically and 3 patients elected for observation. In that report, only one eye with the smallest minimum diameter MH (168 \( \mu \)m) spontaneously closed at 9 months follow up. The current report describes the extended follow up of another patient who was observed in our previously reported series. Despite the initial enlargement of the size of the MH from 183 \( \mu \)m to 225 \( \mu \)m, it was still a relatively small MH (less than 250 \( \mu \)m). Due to the noticeable improvement in vision during follow up, the family preferred to continue observation and over time, bridging of the MH occurred along with resolution of the cystic changes at 12-month follow up. Complete closure was noted at 30 months follow up. The improvement in visual acuity despite initial enlargement of the MH may have been related to the child’s adaptation to parafoveal fixation.

This case is unique because of the initial enlargement in size with subsequent spontaneous closure and visual recovery. The resolution of this case over time presents a conundrum for treating physicians on whether to intervene surgically or observe similar cases. Improved vision and the small size of the MH seem to be important factors to consider before proceeding with surgery.

Previous reports have documented spontaneous closure of laser-induced FTMHs. Two reports have documented spontaneous closure of small FTMH after exposure to Nd:YAG (neodymium-doped yttrium aluminium garnet) laser. In one case, a 180 \( \mu \)m diameter FTHM spontaneously closed 3 weeks after presentation and in another case a 150 \( \mu \)m diameter FTMH spontaneously closed 12 weeks after presentation. Additionally, a FTMH (minimum diameter 298 \( \mu \)m) caused by repeated exposure to high-power (45 mW) green laser pointer closed spontaneously within 12 days after presentation. However, the time of MH development was unknown and unlike our case, there was significant RPE proliferation associated with the healing process, which may be due to the different nature of the injury. Two reports documented spontaneous closure of MH after blue laser, one with a minimum diameter of 168 \( \mu \)m that closed after 9 months, and the other with a minimum diameter of 192 \( \mu \)m that closed after 1 month. However unlike our case, there was no enlargement of the MH in both cases.

In the current case, there were no signs of posterior vitreous detachment at presentation or during follow up. Macular SD-OCT showed the presence of a premacular bursa which may play a role in the formation of idiopathic MH however the role in MH closure is unknown. Based on the findings from our previous series, we recommended early surgical intervention for blue laser-induced MHs except for small MHs where a short period of observation may be considered. In the current case, the MH was still small despite initial enlargement and visual acuity improved progressively. Hence, our initial recommendation can be modified such that a prolonged period of observation may be warranted if the MH remains small especially if visual acuity improves over time. Prospective comparative studies are required to determine the best management strategy of cases with blue laser induced FTMHs.

4. Conclusion

Spontaneous closure of small blue laser-induced MH may occur after an extended period of observation.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.
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Conflict of interest

All authors have no financial disclosures.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

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