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Case report

Traumatic subhyaloid macular hemorrhage with complete resolution following Neodymium-Doped Yttrium Aluminium Garnet Laser

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ABSTRACT

Purpose: To report a case of traumatic subhyaloid macular hemorrhage with severe sudden vision loss treated successfully with Neodymium-Doped Yttrium Aluminium Garnet Laser (Nd:YAG laser).

Observations: A 16-year-old boy presented to the eye clinic with acute vision loss secondary to blunt trauma by a stone to his left eye 3 days prior to consultation that caused subhyaloid macular hemorrhage. Nd:YAG laser was performed to open the hyaloid membrane and allow the blood to diffuse into the vitreous cavity and be absorbed. The patient demonstrated complete recovery as his visual acuity went from counting fingers to 20/20 within 20 days. No complications due to the treatment were reported.

Conclusions and importance: To the best of our knowledge, there have been no reported cases of subhyaloid macular hemorrhage treated with Nd:YAG laser in which the etiology was trauma and showed full, rapid recovery with no sequelae.

1. Introduction

Subhyaloid hemorrhage is defined as an accumulation of blood causing a localized detachment of the vitreous from the retina that can lead to sudden and severe loss of vision when it occurs in the macular area. Subhyaloid hemorrhage is associated with trauma, age-related macular degeneration, polypoidal choroidal vasculopathy, retinal artery macroaneurysms,[1] valsalva retinopathy, and proliferative diabetic retinopathy.[2]

Optimal treatment of subhyaloid hemorrhages remains an area of controversy. Various techniques have been described to treat subhyaloid hemorrhage, including conservative treatment with just observation. However, conservative treatment carries the risk of macular complications as spontaneous resolution can take several weeks or months depending on the thickness and total amount of blood present. The prolonged presence of blood can cause toxic damage to the retina due to extended contact with hemoglobin and iron. Furthermore, it may result in permanent visual impairment due to pigmentary macular changes or development of significant epiretinal tissue proliferation. The entrapment of a dense, tightly bound hemorrhage between the internal limiting membrane and the posterior surface of the hyaloid membrane, that is unable to flow in the subhyaloid space, can serve as both a scaffold and a stimulus for cellular proliferation and fibrous tissue formation.[3,4] Pars plana vitrectomy and pneumatic displacement procedure with or without the use of tissue plasminogen activator (tPA) have been used as alternative options.[5] Complications of surgery and pneumatic displacement with the use of tPA injection include, but are not limited to, retinal detachment, retinal toxicity, and hemorrhage reoccurrence.[6]

Nd:YAG laser has been used in the posterior segment for internal drainage in the management of macular subhyaloid hemorrhage.[7] It can create an opening in the surface of the hyaloid membrane (hyaloidotomy) enabling rapid drainage of the hemorrhage from the subhyaloid space into the vitreous gel, from where it is resorbed. The procedure is relatively safe but has possible complications including persistent vitreous hemorrhage, failed drainage, metamorphopsia,[8] macular holes, and retinal break causing retinal detachment.[9] Herein, we report a case of traumatic subhyaloid hemorrhage that was successfully treated with Nd:YAG laser. To the best of our knowledge, there have been no reported cases of traumatic subhyaloid hemorrhage treated with Nd:YAG laser that showed complete, rapid recovery without sequelae.

1.1. Case report

A 16-year-old boy presented to the eye clinic at Johns Hopkins Aramco Healthcare with acute vision loss secondary to blunt trauma by a stone to his left eye 3 days prior to consultation. Visual acuity (VA)

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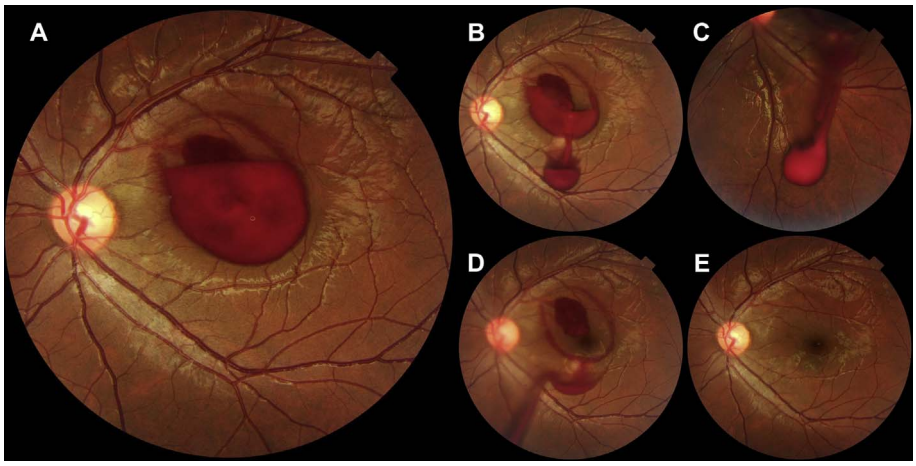

Fig. 1. Fundus photographs of the left eye. (A) At presentation, funduscopy revealed blood covering the macula and the visual acuity is counting fingers at 1 foot. (B, C) The laser beam was focused on the inferior edges of the posterior surface of the hyaloid membrane to facilitate drainage of the hemorrhage into the vitreous by gravity. A single shot with the power of 1.6 mJ was applied to the anterior aspect of the blood collection. The visual acuity improved to 20/200 at the time. (D) The visual acuity improved again to 20/40 after an hour. (E) After 20 days follow-up, there were no symptoms of bleeding and the eye appears normal. The visual acuity was 20/20 and the intra-ocular pressure was within normal range, 18 mmHg.

was 20/20 in the right eye and counting fingers in the left eye. The anterior segment examination in both eyes was normal. The posterior segment examination revealed a subhyaloid macular hemorrhage in his left eye, which was the cause of the vision loss (Fig. 1A). Patient medical history was unremarkable for any chronic diseases.

A local retina specialist was consulted regarding conservative treatment versus surgical treatment with the potential for subsequent complications (primarily retinal detachment and cataract formation). The treating physician decided to use Nd:YAG laser to open the hyaloid membrane to allow the blood to spread into the vitreous cavity and be absorbed. Nd:YAG laser (VISULAS® YAG III, Carl Zeiss Meditec AG, Jena, Germany) was applied to the posterior hyaloid surface at the base of the hemorrhage distant from the fovea and retinal blood vessels, but with a sufficient thickness of blood to protect the underlying retina. An Ocular Abraham Capsulotomy YAG Laser Lens was used with a posterior approach; a single shot with the power of 1.6 mJ was applied. The majority of blood immediately drained into the inferior vitreous with a relatively rapid recovery of vision. (Fig. 1B, C). Within 1 h, his VA improved to 20/40 (Fig. 1D). The patient was seen for follow-up after 20 days. On examination, it was clear that the remaining preretinal hemorrhage was gone. His VA improved to 20/20 and there were no sequelae from the laser treatment (Fig. 1E). The patient was discharged and was scheduled for follow-up in another 6 months.

2. Discussion

Subhyaloid macular hemorrhage produces sudden, profound loss of vision that may be permanent if left untreated. Spontaneous resorption of blood entrapped in the subhyaloid space may take weeks or months. Subhyaloid hemorrhage may cause direct toxic damage to the retina and epiretinal membrane formation, which can lead to irreversible vision loss either from surface wrinkling or tractional macular detachment.[3,4] There are several important criteria to safely deliver Nd:YAG laser to the hyaloid membrane. The timing of treatment is critical, as successful displacement of the hemorrhage is dependent on its ability to flow through the hyaloidotomy by remaining in liquid form. Once the blood has clotted, vitrectomy with manual blood removal is required for early visual recovery. The best location to create an opening is at the inferior aspect of the blood collection to facilitate drainage of the hemorrhage into the vitreous by gravity. That being said, a buffer is necessary between the laser spot and the underlying retina. Dense subhyaloid hemorrhage acts like a shield protecting the underlying retina from Nd:YAG laser-induced damage. The hyaloidotomy site should, therefore, be away from the fovea and major blood vessels, with some underlying hemorrhage to protect the retina from the shockwave. It has been advocated that the Nd:YAG laser should only be considered in subhyaloid hemorrhages of at least 3 disc diameters in size. This helps to increase the cushion effect of the hemorrhage in order to avoid inadvertent retinal damage by the photo-disruptive laser.[9] If possible, always drain from a region distant enough from the inferior border where there is significant hemorrhagic elevation. Moreover, choosing a drainage area at a location away from the fovea and major blood vessels seems sensible. Occasionally, it might be advisable to apply the laser to a lateral aspect of the blood collection and then use head positioning to drain the blood into the vitreous cavity. Finally, the Nd:YAG laser power settings vary for individual situations. Common sense dictates that it is best to use the least amount of power and titrating upwards as needed to create an adequate opening.[10] In our case, a single shot with the power of 1.6 mJ was sufficient to create an opening in the hyaloid and the hemorrhage immediately drained into the inferior vitreous with a relatively rapid recovery of vision. The opening was made in the posterior hyaloid membrane at the inferior edge of the subhyaloid hemorrhage, at a location distant from the fovea and retinal blood vessels, but with a sufficient thickness of blood to protect the underlying retina.

We report a case of trauma-induced subhyaloid macular hemorrhage treated using only Nd:YAG laser without reverting to extensive surgery or prolonged conservative treatment, both of which hold many risks as previously discussed. A review of the literature demonstrated similar cases reporting laser treatment of subhyaloid hemorrhage due to different etiologies, with very good to excellent results in most cases. In our case, Nd:YAG laser demonstrated maximum benefit to the VA compared with other conventional treatments found in the literature, with no complications. The procedure itself is simple, inexpensive, and can be performed in the outpatient setting; it results in rapid visual recovery and is relatively safe. This could also be extrapolated to other causes of bleeding such as retinopathies and diabetic macular bleeding. Further studies are needed to assess the effectiveness, safety, and long-term outcome of Nd:YAG laser in comparison with early vitrectomy and other treatment options available for such cases.

3. Conclusions

To the best of our knowledge, there have been no reported cases of subhyaloid macular hemorrhage treated with Nd:YAG laser in which the etiology was trauma and the patient showed full recovery, regaining 20/20 VA with no sequelae. Pars plana vitrectomy, hyaloidotomy with Nd:YAG laser, or observation alone are all accepted treatment options for subhyaloid hemorrhage. A comparison trial would be difficult due to the rarity of the disease. Deciding on one treatment option over another depends on the presentation and circumstances of each case. However, Nd:YAG laser should always be considered as an option, especially in the presence of an experienced ophthalmologist, to ensure full recovery of the VA with no further damage to the eye from the procedure.

3.1. 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. However, an approval from the Institutional Review Board at Johns Hopkins Aramco Healthcare was obtained.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.ajoc.2018.01.020.

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Conflict of interest

The following authors have no financial disclosures: (MA, AH, SA).

Authorship

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

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