

A new ophthalmological application of Nd:YAG laser: Reopening of the occluded central hole of Visian implantable collamer lens in the treatment of acute angle - closure glaucoma

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This report presents a new application of Nd:YAG laser for reopening the occluded central hole of Visian implantable collamer lens (EVO Visian ICL). A 23-year-old female underwent EVO Visian ICL implantation in the left eye. After 6 hours postoperatively, the patient presented with an increase in pain and intraocular pressure (IOP) despite antiglaucomatous medication. Acute angle-closure glaucoma with anterior chamber shallowing and deposition of fibrinoid material within the central hole of ICL was diagnosed. Fibrin deposits blocking the central hole were disrupted with Nd:YAG laser. With restoration of aqueous flow, IOP decreased to normal levels without any additional medication.

Key words: Acute pupillary block, central hole occlusion, EVO Visian ICL, Nd:YAG laser

EVO and EVO+ Visian implantable collamer lenses (ICLs) are models that have a central hole to provide aqueous flow without any iridotomy. Several studies revealed that the central hole in these lenses is successful in allowing aqueous fluid flow and controlling intraocular pressure (IOP).^[1-3] However, case reports have been published about occlusion of the central hole with viscoelastic,^[4] fibrin,^[5] iris pigment, and/or iris particles.^[6]

In this paper, we presented a case with EVO Visian ICL implantation and acute glaucoma due to occlusion of the central hole with fibrin deposits and successful treatment of the case with Nd:YAG laser fibrinolysis.

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Case Report

A 23-year-old female underwent EVO Visian ICL implantation in her left eye. Her preoperative corrected distance visual acuity was 20/20 with a manifest refraction of -9.00 +2.00 × 160. The central anterior chamber depth (CACD) was 3.27 mm and the anterior chamber angle (ACA) was 36.4° preoperatively. The Online Calculator and Ordering System from STAAR Surgical ordered VTICMO 13.2 -10.00 +2.00 × 51 lens for emmetropic correction. The operation was uneventful although it was a training case that required more surgical manipulation. The patient complained of ocular pain in the left eye 4 hours after the operation. IOP was measured as 40 mmHg and the pupil was mid-dilated. Two tablets of 250 mg acetazolamide and intravenous mannitol 20% (5 mL/kg) were administered. After the following 2 hours, the patient presented with vomiting and increased severity of the pain. IOP was 45 mmHg. Anterior chamber shallowing, high vaulting of ICL, and deposition of fibrinoid material within the central hole of the ICL were seen in the slit-lamp examination [Fig. 1a]. Visante optical coherence tomography (Carl Zeiss Meditec AG, Germany) measured 1300 µm vault, 8.4° ACA, and 1.47 mm CACD and showed the fibrin deposits occluding the central hole clearly [Fig. 2a]. Fibrin deposit degradation was performed with Nd:YAG laser immediately. Two pulses with 2.1 mJ power and 11 µm spot size were applied into the central hole (Alcon 3000LE Nd:YAG laser, Q-switch, 1064 nm). For the procedure, a sterilized contact Abraham capsulotomy lens and hydroxypropyl methyl cellulose 2% (Methocel 2%) solution were used without pressure on the cornea. The first shot was focused just anteriorly and the effect was seen on the target. The second shot was applied slightly deeper. The flow of aqueous fluid into the anterior chamber through the central hole was observed within seconds after application of Nd:YAG laser to the fibrin deposits. Two hours after Nd:YAG laser intervention, IOP was 20 mmHg, the central hole was completely free of fibrin [Fig. 1b], and the vault decreased to 1040 µm, ACA increased to 12.8° and CACD increased to 1.73 mm [Fig. 2b]. The following day, the patient was relieved without any antiglaucomatous medication and the vault, ACA, CACD were 820 µm, 24.5°, 1.92 mm, respectively [Fig. 2c]. The patient used topical dexamethasone two times a day for the first two postoperative days; the dosage was maintained four times a day for one week and tapered over two weeks. Additionally, topical moxifloxacin was administered four times a day for three weeks. One month after Nd:YAG laser fibrinolysis, uncorrected distance visual acuity was 20/20. In anterior segment optical coherence tomography (OCT), the vault was 580 µm, ACA was 25.5°, and CACD was

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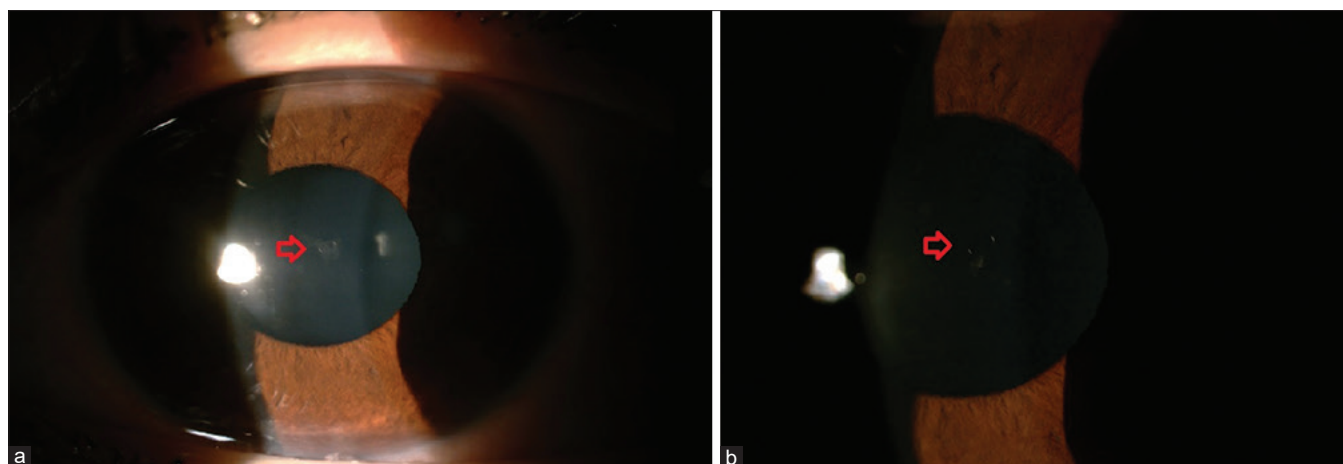


Figure 1: Slit-lamp images of the central hole on the ICL before and after YAG laser treatment. (a) Fibrin deposits occlude the central hole of the ICL (Red arrow shows the occluded central hole). (b) Open central hole after YAG laser application (Red arrow shows the opened central hole)

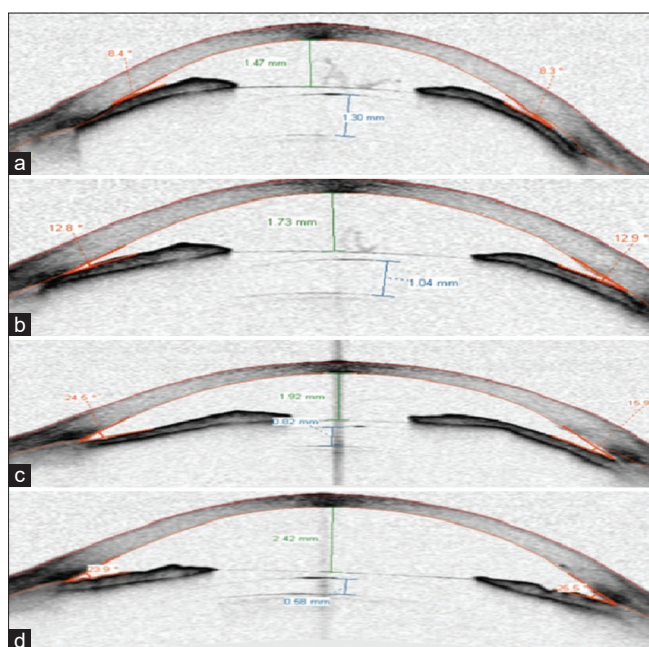


Figure 2: Anterior segment optical coherence tomography (OCT) images before and after YAG laser treatment of the occluded central hole. (a) OCT image of the anterior segment in the eye with acute pupillary block glaucoma because of the occluded central hole. (b) OCT image of the anterior segment immediately after YAG laser application with the decreased vault and the widened anterior chamber depth and angle. (c) OCT image of the anterior segment in the following day of the operation. (d) OCT image of the anterior segment 1 month later

2.42 mm [Fig. 2d]. We did not observe any opacity in the crystalline lens, any deformation on the ICL, and recurrence of the occlusion during the follow-up period.

Discussion

To the best of our knowledge, this is the first report for the treatment of central hole occlusion after EVO Visian ICL implantation by means of Nd:YAG laser. Occlusion of the central hole leads to a pupillary block and acute glaucoma. Maintenance of the situation results in both optic nerve damage

because of high IOP and in persistent mydriasis because of iris stromal atrophy. Therefore, immediate treatment for the resolution of the pupillary block and reducing IOP is essential. In the reports related to occlusion of the central hole, the anterior chamber irrigation,^[4] creation of a surgical iridectomy,^[6] and/or removal of ICL^[5] were performed for resolution of the obstruction. These interventions are intraocular approaches and have the potentials to induce additional damage to the corneal endothelial layer and other intraocular structures. These eyes have shallow anterior chambers, mydriatic pupils, and hypotonic iris. Therefore, the surgeon will probably encounter difficulties in dealing with iris and anterior chamber stabilization during the surgery. Moreover, a second surgical intervention will create anxiety and psychological trauma in the patient.

Nd:YAG laser application enabled us to open occlusion of the central hole, to relieve aqueous fluid flow into the anterior chamber and pupillary block in a few seconds. Nd:YAG laser approach had several advantages over other applied interventions for the central hole occlusion of EVO Visian ICLs. It provides recovery very quickly. It is an extraocular approach that is performed in outpatient conditions. Considering the eyes with the central hole occlusion already have a very high vault as it occurred in our case, Nd:YAG laser may not give rise to any damage to the crystalline lens. Vault measurement with anterior segment OCT can ensure a high vault for safe application before the procedure. Additionally, the central hole diameter of 360 μm allows to the application of small laser spots of 11 μm safely without affecting surrounding ICL material.

Conclusion

Our case demonstrates that Nd:YAG laser approach in the reopening of the occluded central hole with a fibrin is an efficient, safe, and practical intervention in the treatment of cases with the central hole occlusion of EVO Visian ICLs. Our experience with this case may guide in the treatment of other occlusion types such as pigment deposits or viscoelastic.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have

given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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