



Case report

Use of Nd:YAG laser to recanalize occluded Cypass Micro-Stent in the early post-operative period

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ABSTRACT

Purpose: To report the first case of Neodymium Yttrium Aluminum Garnet (Nd:YAG) laser use to recanalize a CyPass occluded with a clot in the early postoperative follow-up.

Observations: A 66 year-old woman with primary open angle glaucoma and cataract received combined cataract surgery plus CyPass in the right eye. Surgery was uneventful, however, there was a small amount of hyphema related to bleeding around the site of Cypass insertion. Intraocular pressure (IOP) was between 6 and 7 mmHg in the first week on no glaucoma medications. At the second postoperative week, IOP jumped to 30 mmHg and a clot was observed obstructing the CyPass lumen. We disrupted the clot with a single shot from a Nd:YAG laser. Twenty minutes after the laser, the IOP was 8 mmHg. CyPass was recanalized without complications. IOP was 11 mmHg at 1 month postoperatively with timolol 0.5% twice a day.

Conclusions and importance: It is important to perform gonioscopy to evaluate for CyPass obstruction in cases of IOP spike. Nd:YAG laser may be a useful approach to recanalize the CyPass in the early postoperative follow-up.

1. Introduction

In the last decade, the surgical glaucoma landscape has witnessed the emergence of numerous novel devices grouped within the classification of minimally invasive glaucoma surgery (MIGS). These techniques are mainly designed to treat primary open angle glaucoma (POAG) and aim to reduce intraocular pressure (IOP), usually with an ab-interno approach and minimization of tissue trauma and adverse events.¹ An example of a recently approved MIGS is the CyPass Micro-Stent (Alcon, Fort Worth, Texas, USA), which is a polyimide implant intended to create a new permanent conduit for additional outflow of aqueous humor from the anterior chamber to the suprachoroidal space.¹

Cataract extraction alone produces IOP reduction in patients with POAG.² Cypass is usually performed as an adjunctive procedure to phacoemulsification for achieving an additional IOP-lowering effect and/or a reduction in the burden of glaucoma medication use.^{3–6} Although the CyPass Micro-Stent has an overall good safety profile, there are potential ocular adverse events reported such as intraoperative hyphema, cyclodialysis cleft, and stent obstruction, among others.^{3–6} To our knowledge, this is the first report of the use of Nd:YAG laser for opening an early CyPass obstruction due to a clot.

2. Case report

A 66 year-old Caucasian female has been followed in our institution since 2016 for moderate POAG and was treated with latanoprost, timolol and brimonidine in both eyes. She had developed intolerance to her glaucoma medications and was forming visually significant cataracts. Preoperative IOP was 13 mmHg OU. After consultation with the patient, we elected to perform combined phacoemulsification + intraocular lens + CyPass surgery in the right eye to reduce the burden of glaucoma drops and achieve better IOP control. Patient was on 81mg aspirin and was discontinued one week prior to the surgery.

Phacoemulsification and lens implantation were uneventful and the CyPass was implanted without significant tissue resistance; there was a small amount of blood reflux from the stent and around the site of insertion (Fig. 1). On the first postoperative day, IOP was 7 mmHg without glaucoma medications and there was a hyphema of 1 mm. At the third and fifth postoperative days, IOP was 6 mmHg without drops and the hyphema was unchanged. At the second postoperative week, patient presented acutely with eye pain and nausea. IOP was 30 mmHg without glaucoma medications and the hyphema had resolved. We applied topical timolol 0.5% and brinzolamide 1% in the surgical eye as well as 250 mg of oral acetazolamide. After 45 minutes, IOP was still

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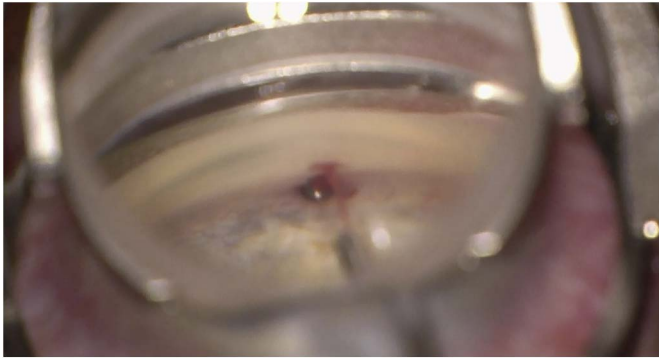


Fig. 1. Intraoperative view of the CyPass procedure after cataract surgery, demonstrating a small amount of blood reflux from the lumen.

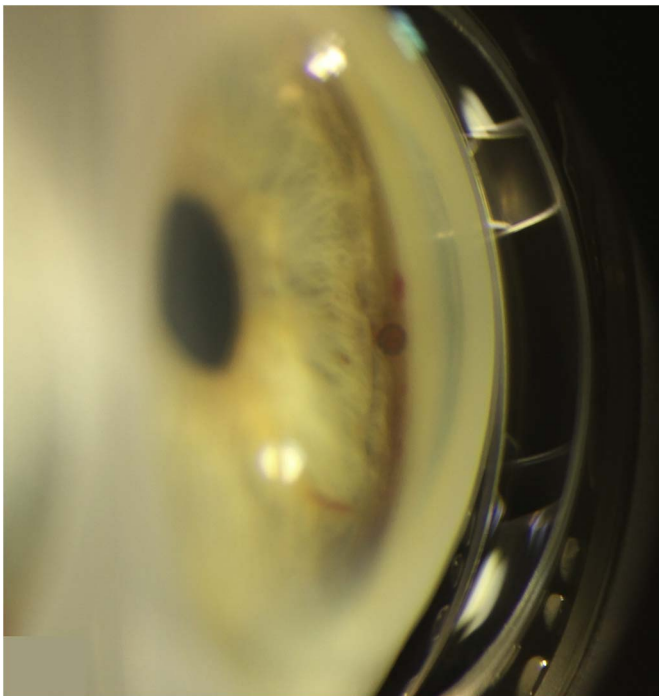


Fig. 2. Postoperative gonioscopic view shows clot inside the CyPass lumen. Note: This picture is of the contralateral left eye that also received CyPass and developed a similar clot in the CyPass lumen (pre-laser picture of the right eye not available).

30 mmHg. We performed a gonioscopy exam and found that the CyPass Micro-Stent was occluded with a clot (Fig. 2). Using a laser gonioscopy lens, we performed one shot of 3mJ with a Nd:YAG laser to the CyPass lumen to disrupt the clot (Fig. 3). Twenty minutes after the procedure, IOP was 8 mmHg. IOP was 11 mmHg at 1 month postoperatively with Timolol 0.5% twice a day in the right eye.

Fig. 4 shows swept-source optical coherence tomography imaging which can be used to evaluate the flow through the CyPass. The superior circumferential lake in the suprachoroidal space was present in the early postoperative image. Then, due to the clot obstruction in the Micro-Stent lumen, there is almost no superior circumferential lake at 2 weeks. Finally, the superior circumferential lake is visible again when the Micro-Stent was recanalized and the CyPass remains in good position in the nasal quadrant (Fig. 4).

3. Discussion

To our knowledge this is the first case report of the use of Nd:YAG laser to recanalize a CyPass Micro-Stent. As the number of MIGS procedures performed expands, it is increasingly important for the

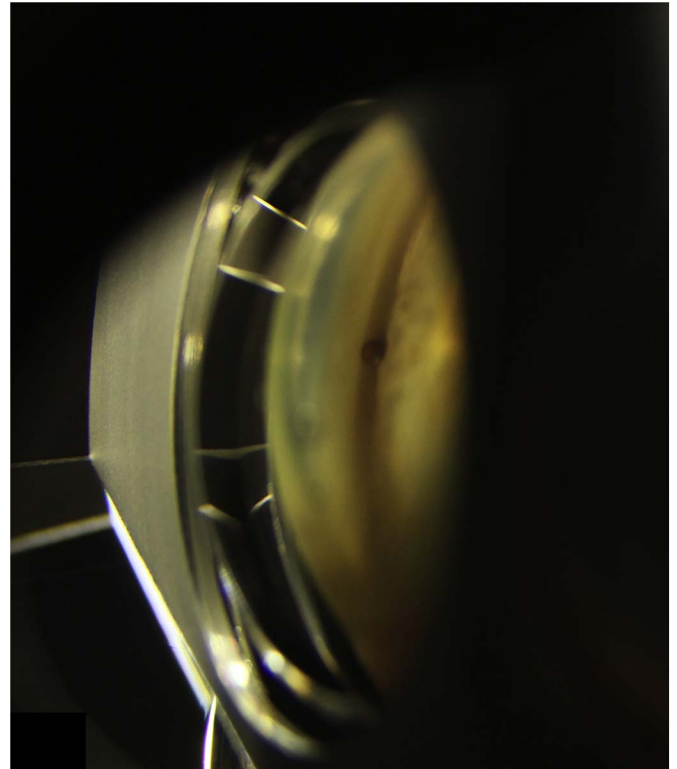


Fig. 3. CyPass device after Neodymium Yttrium Aluminum Garnet laser, showing resolution of the clot that was observed prior to laser treatment.

glaucoma surgeon to know what to expect in terms of efficacy and potential adverse events as well as how to manage these adverse events. Studies with at least 1 year of follow-up have shown IOP reduction of 32.0% and 34.7% with and without cataract surgery, respectively.^{6,7} In the COMPASS trial, phacoemulsification + CyPass achieved 30% IOP reduction and the control group of cataract surgery alone had a 21% IOP reduction, at 24 months of follow-up.⁷

CyPass insertion has a good safety profile as an adjunctive glaucoma procedure to cataract surgery. Nevertheless, clinicians should be aware that there are significant adverse events that can occur related to the CyPass including corneal edema (0.6–3.5%), cyclodialysis cleft > 2 mm (1.9%), hyphema (1.1–6.2%), iritis (4.4–8.6%), transient hypotony (2.9–13.8%), IOP spike ≥ 10 mmHg over baseline (4.3–10.8%) and stent obstruction (2.1–5.4%).^{3,5–7} Device repositioning was needed in 0.5%.⁵ García-Feijoo et al. described formation of peripheral anterior synechiae and partial obstruction of the CyPass in 3.1%.⁷ They also described the use of Nd:YAG laser in one case to successfully clear the synechiae from the Micro-Stent orifice without complications.⁷ Overall, the vast majority of complications were transient and required only conservative management.

Another option to recanalize the CyPass Micro-Stent that is blocked by clot could be the use of tissue plasminogen activator (t-PA). In the past, the use of t-PA has been described for resolving clots and fibrinous tube obstructions of glaucoma drainage devices.⁸ This method has not yet been reported for dissolving clots causing CyPass obstruction. However, we think that the use of Nd:YAG laser should be a safer method, because it is not necessary to enter to the anterior chamber, avoiding risk of endophthalmitis, direct corneal trauma, etc.

There are two possible learning points that can be of clinical value in this case report. First, if the IOP is significantly rising during the early post-operative period, it is important to do a gonioscopy exam. As described above, IOP spikes can occur in 5–10% of cases. Common causes of early obstruction are blood and fibrin that may come from a hyphema or blood around the tube insertion. The most common cause of

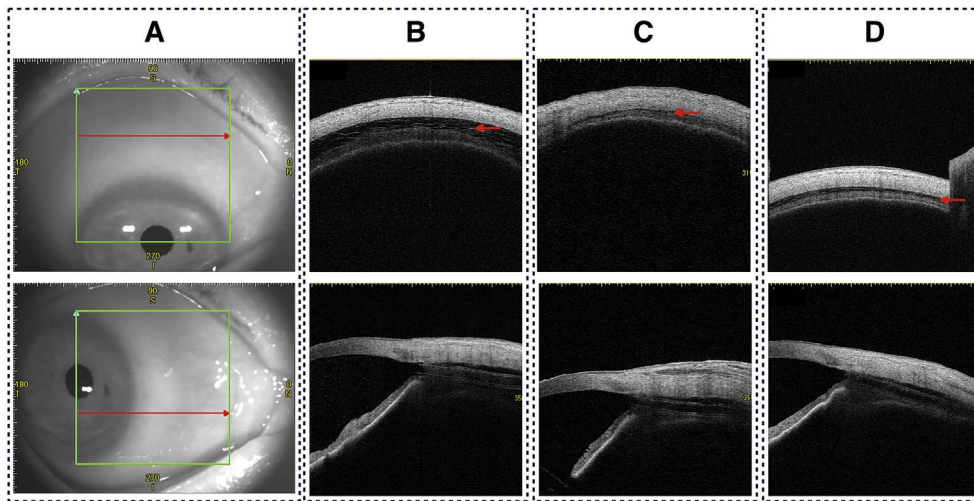


Fig. 4. Swept-Source optical coherence tomography images showing CyPass device and supra-choroidal lake before and after recanalization with the Neodymium Yttrium Aluminum Garnet laser. A) Right eye is scanned superiorly and nasally. B) Postoperative day 3, red arrow shows a circumferential lake superiorly and CyPass in good position with posterior lake nasally. C) Postoperative day 14, intraocular pressure was 30 mmHg prior to laser. Red arrow shows almost minimal or no superior circumferential lake due to clot obstruction of the CyPass. D) Postoperative day 15, 1 day after laser, intraocular pressure 16 mmHg without treatment. Red arrow shows return of the superior circumferential lake in the supra-choroidal space. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

late obstruction is formation of peripheral anterior synechiae.^{3,5–7} The second lesson is that Nd:YAG laser may be used to resolve CyPass obstruction in the early postoperative follow up. Also we showed the potential utility of Swept-Source imaging in evaluating flow through the CyPass to the supra-choroidal space. Since the typical wound healing process is most exuberant within the first 1–2 weeks after surgery, we believe that performing this procedure after the second postoperative week is a safe alternative that would not produce migration of the Micro-Stent and can help to decrease the IOP immediately.

4. Conclusions

It is important to perform gonioscopy to evaluate for CyPass obstruction in cases of IOP spike. Nd:YAG laser may be a useful and safe approach to disrupt a clot obstructing the CyPass lumen in the early postoperative follow-up.

Patient consent

Personal identifying information has been removed from this report because consent to publish such information was not obtained.

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Conflict of interest

The authors have no financial disclosures related to the topic.

Authorship

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

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References

1. Saheb H, Ahmed IK. Micro-invasive glaucoma surgery: current perspectives and future directions. *Curr Opin Ophthalmol.* 2012;23:96–104.
2. Masis M, Mineault PJ, Phan E, Lin SC. The role of phacoemulsification in glaucoma therapy: a systematic review and meta-analysis. *Surv Ophthalmol.* 2017 sep 6. <http://dx.doi.org/10.1016/j.survophthal.2017.08.006>.
3. Hoeh H, Vold SD, Ahmed IK, et al. Initial clinical experience with the CyPass Micro-Stent: safety and surgical outcomes of a novel supraciliary microstent. *J Glaucoma.* 2016;25:106–112.
4. Höh H, Grisanti S, Grisanti S, et al. Two-year clinical experience with the CyPass Micro-Stent: safety and surgical outcomes of a novel supraciliary micro-stent. *Klin Monbl Augenheilkd.* 2014;231:377–381.
5. Hoeh H, Ahmed II, Grisanti S, et al. Early postoperative safety and surgical outcomes after implantation of a supra-choroidal micro-stent for the treatment of open-angle glaucoma concomitant with cataract surgery. *J Cataract Refract Surg.* 2013;39:431–437.
6. Vold S, Ahmed IK, Craven R, et al. Two-year COMPASS trial results: supraciliary microstenting with phacoemulsification in patients with Open-Angle Glaucoma and Cataracts. *Ophthalmology.* 2016;123:2103–2112.
7. García-Feijoo J, Rau M, Grisanti S, et al. Supraciliary micro stent implantation for open-angle glaucoma failing topical therapy: 1 year results of a multicentre study. *Am J Ophthalmol.* 2015 Jun;159(6):1075–1081.
8. Sidoti PA, Morinelli EN, Heuer DK, et al. Tissue plasminogen activator and glaucoma drainage implants. *J Glaucoma.* 1995;4(4):258–262.