

Seven-Year Outcomes After Intrasccleral Ciliary Sulcus Suprachoroidal Microtube Implantation in Chronic Angle-Closure Glaucoma: A Case Report

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ABSTRACT

Purpose: To report long-term outcomes following implantation of an intrasccleral ciliary sulcus suprachoroidal microtube for intraocular pressure control in a patient with chronic angle-closure glaucoma.

Observations: A 71-year-old woman with chronic angle-closure glaucoma underwent implantation of an intrasccleral ciliary sulcus suprachoroidal microtube and was followed for seven years. Visual field index remained stable, and the patient required fewer topical glaucoma medications. No significant long-term complications were observed.

Conclusions and Importance: Suprachoroidal shunts offer a bleb-independent approach for lowering intraocular pressure by directing aqueous humor into the suprachoroidal space. This case demonstrates sustained intraocular pressure control, visual field stability, and medication reduction over seven years using a cost-effective intrasccleral ciliary sulcus suprachoroidal microtube. These findings support the safety and durability of this technique as an alternative to traditional filtering surgeries, particularly in patients with mixed-mechanism glaucoma.

Keywords: Glaucoma, Suprachoroidal, Microtube, MIGS, Intraocular

Case Report

This is a case of a 71-year-old Hispanic female with a history of mixed-mechanism chronic angle-closure glaucoma and open-angle glaucoma who presented for a routine 4-month follow-up. Her ocular history included laser iris iridotomies and cataract surgery with intraocular lenses in both eyes.

Preoperative Findings

Her best-corrected visual acuities (BCVA) at this visit were 20/100 OD and 20/40 OS. The patient was taking Latanoprost nightly in both eyes, and timolol-brimonidine and dorzolamide three times

a day in both eyes. Despite this regimen, intraocular pressures (IOP) were 13 mmHg OD and 12 mmHg OS. Gonioscopy showed Shaffer grade II angles in both eyes with intermittent peripheral anterior synechiae in both eyes. Optic nerve examination was significant for a cup-to-disc ratio of 0.95 in the right eye and 0.90 in the left eye. Optical coherence tomography had reduced retinal nerve fiber layer (RNFL) in both eyes with an average RNFL of 54 μ m in the right eye and 53 μ m in the left eye. Visual field testing also showed diffuse loss, with a visual field index (VFI) of 18% in the right eye and 27% in the left eye. Due to the patient's struggle with medication burden and the risk of progressive decline, surgical intervention was discussed. The patient agreed to undergo suprachoroidal glaucoma surgery in the right eye to decrease her medication burden.

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Surgical Procedure

The surgical technique has been previously described^{1,2}. A tube extender (New World Medical) microtube was placed in the posterior ciliary sulcus and directed into the suprachoroidal space (Figure 1).

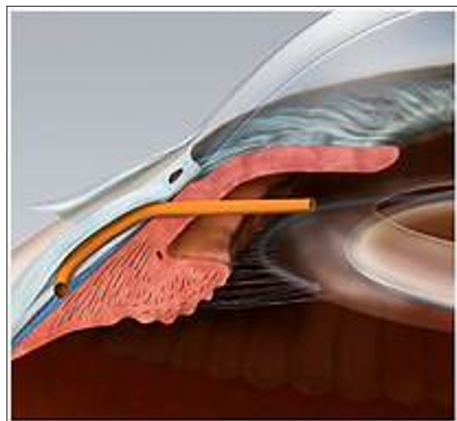


Figure 1: Schematic Placement of Intrascleral Ciliary Sulcus Suprachoroidal Microtube

Postoperative Course

At postoperative day 1, the patient's chief complaint was redness in the right eye. Medication included prednisolone q2h and ciprofloxacin (Ciloxan) QID in the right eye. Glaucoma medications were continued in the left eye. Her VA was 20/200 in the right eye and 20/30 in the left eye. The conjunctiva was hyperemic with healing sutures, and the tube was well-positioned inferiorly in the posterior ciliary sulcus. The intraocular pressure was 6 mmHg.

At 1 month post-op, her vision returned to baseline 20/100, IOP OD increased to 18 mmHg, and she was placed on timolol-brimonidine in the right eye BID. The following month, her pressure remained high in the right eye at 18 mmHg, and latanoprost was added. At post-op month 3, IOP decreased to 10 mmHg in the right eye.

From 2019 to 2024, her IOP in the right eye remained stable between 7 and 13 mmHg, aside from one noncompliance-related spike to 19 mmHg OD. The intraocular pressure elevation was less pronounced in the eye with the suprachoroidal microtube. Compliance was reinforced, and IOP returned to baseline. The patient has been on her current drop regimen for the right eye, and the pressures range from 8-13 mmHg from 2024 up until the present day.

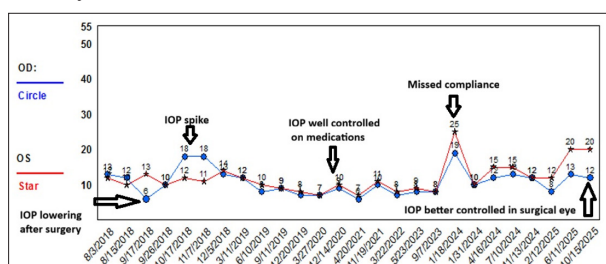


Figure 2: 7-year Intraocular Pressure Chart

The patient's IOP OS has gradually increased, ranging from 12-20 mmHg over the same period. Most recently, the IOP reached

20 mmHg, prompting a change in her topical medication to latanoprost-netarsudil OS QHS and dorzolamide-timolol OS BID (Figure 2). Her visual acuity has been stable over the 7-year follow-up, with the most recent BCVA being 20/100 OD and 20/40 OS. Ultrasound biomicroscopic imaging confirmed a well-positioned tube in the posterior ciliary sulcus of the right eye extending into the suprachoroidal space (Figure 3).

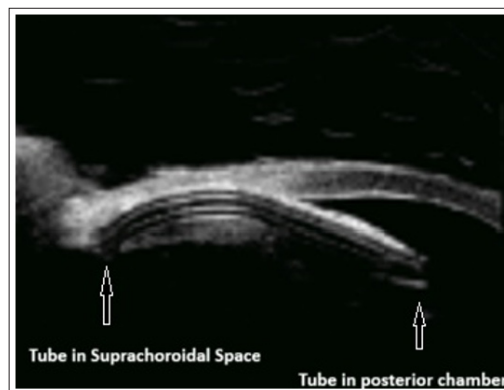


Figure 3: UBM of intrascleral Ciliary Sulcus Suprachoroidal Microtube in Patient

Visual fields remained relatively stable, with her last VF showing a VFI of 19% in the right eye with a mean deviation of -25.57 dB. Her rate of progression in the right eye is -1.3 +/- 1.4% per year with a 95% confidence interval. In her left eye, the VFI was 22% with a mean deviation of -23.34 dB. Her average rate of progression in the left eye is -1.6 +/- 0.8% per year.

Discussion

This case represents a 7-year follow-up of an intrascleral suprachoroidal microtube procedure. It demonstrates that this technique can be useful for maintaining lower IOP with less medication and reducing visual field progression. In addition, the patient avoided the need for more invasive glaucoma surgeries, including trabeculectomy and conventional tube shunt implantation.

Suprachoroidal glaucoma surgery, including intrascleral suprachoroidal microtube procedures, is increasingly recognized for its potential to effectively lower IOP while maintaining a safer profile compared to traditional glaucoma surgeries³. This approach is useful particularly for patients requiring moderate IOP reduction and who wish to avoid bleb-forming surgeries like trabeculectomy or traditional glaucoma tube shunts. Safety data generally show transient adverse effects such as IOP spikes, hypotony, or corneal edema, which are manageable with close monitoring^{3,4}. However, placing the tube in the ciliary sulcus with this technique avoids corneal edema unless the tube migrates into the anterior chamber. The procedure typically requires ongoing medication for optimal IOP control. Suprachoroidal surgeries are indicated for patients with uncontrolled glaucoma despite medication or those who want to reduce medication burden and avoid bleb-related complications.

This case highlights several important advantages of the intrascleral ciliary sulcus suprachoroidal microtube technique. The operative eye maintained long-term IOP control despite advanced glaucoma, while the patient experienced a reduced medication

burden following surgery. Visual fields remained relatively stable over the 7-year follow-up period, with slow progression despite severe baseline disease. In addition, the procedure allowed the patient to avoid higher-risk surgeries such as trabeculectomy or traditional tube shunts, thereby circumventing bleb-related complications and potential conjunctival scarring issues.

Suprachoroidal procedures have demonstrated a high safety profile with fewer severe complications than traditional glaucoma surgeries. Intraocular pressure spikes and failure can occur. Thus, close postoperative monitoring remains critical to preserving visual function and preventing progression.

Generally, intrascleral ciliary sulcus suprachoroidal microinvasive glaucoma surgery is indicated in patients with primary open-angle glaucoma or angle-closure glaucoma who have insufficient IOP control on medication alone or wish to reduce their medication burden. The intrascleral ciliary sulcus microtube technique can also be used in patients with angle-closure glaucoma, since the ab externo ciliary sulcus approach can bypass peripheral anterior synechiae obstruction of the uveoscleral pathway. It is also beneficial for patients who prefer to avoid the risk of bleb-related complications common with trabeculectomy. Additionally, it can be suitable in eyes with conjunctival scarring where filtration surgery may be less desirable. Ongoing concomitant medical therapy may often be needed to maintain target pressure.

Several devices and techniques target the suprachoroidal space for IOP reduction. Notable options include the intrascleral ciliary sulcus suprachoroidal microtube technique, MINiject, and the Alloflow implant, which offer minimally invasive glaucoma surgery (MIGS) options⁵. Studies report a significant reduction in IOP and medication use over follow-ups from 12 months to multiple years, with good visual field stability. Despite these benefits, the need for lifelong surveillance, including monitoring for pressure spikes and potential secondary glaucoma surgeries, remains important. Alloflow and MINiject cannot be used in patients with angle-closure glaucoma.

Conclusion

The intrascleral ciliary sulcus suprachoroidal microtube provided durable IOP reduction, decreased medication burden, and stable visual fields over 7 years in this patient with chronic angle-closure glaucoma. This cost-effective, bleb-independent technique represents a promising surgical alternative for select patients, particularly those who may not tolerate or prefer to avoid traditional filtering procedures.

Suprachoroidal surgery is an established and clinically effective option for glaucoma management, offering significant IOP reduction and medication burden alleviation with a favorable safety profile. The intrascleral ciliary sulcus suprachoroidal microtube technique bridges the treatment gap between MIGS and traditional bleb-forming procedures, providing a less invasive alternative for selected patients. This case report contributes to the growing clinical evidence supporting the long-term benefits

of suprachoroidal surgery when patients receive proper follow-up and maintain compliance. It demonstrates the procedure's potential to substantially lower intraocular pressure and reduce medication dependence sustainably. Overall, this approach represents a promising addition to the glaucoma surgical armamentarium, combining effective pressure control with a safer, blebless profile and a lower risk of complications compared to conventional filtering surgeries. It may be particularly valuable in resource-poor areas that may not be able to afford more expensive commercial devices.

Patient Consent

The patient provided written informed consent for the publication of this case report and any accompanying images.

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Conflicts of Interest

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Authorship

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