

## Managing uveitic glaucoma with the Hydrus Microstent: A paradigm shift in surgical solutions

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Dear Editor,

In this case series, we share our experience with the Hydrus Microstent (Ivantis, Irvine, CA, US) as an innovative approach in the management of uveitic glaucoma, to address a critical gap in the current literature.

Uveitic glaucoma—affecting approximately 7.6% of patients with acute uveitis and 6.5–11.1% with chronic uveitis<sup>1</sup>—remains a therapeutic challenge due to its multifactorial nature, including steroid response and the typical age of onset (between the third and sixth decades of life).<sup>2</sup> The limited long-term success reported with traditional glaucoma surgeries<sup>3,4</sup> and alternative treatment options, such as micropulse transscleral cyclophototherapy (MPTCP),<sup>5</sup> further complicate decision-making when efficacy of initial surgical interventions diminishes over time.

The emergence of minimally invasive glaucoma surgery (MIGS) devices has caused a paradigm shift in glaucoma management. Designed to provide safer and more effective options by creating alternative aqueous outflow pathways, these devices offer distinct advantages. Among them, the Hydrus Microstent has garnered attention as a potential treatment option for uveitic glaucoma. This flexible aqueous drainage device comprises alternating spines for structural support and windows for aqueous outflow. It is inserted into Schlemm's canal, where it dilates the canal—countering its tendency to collapse under elevated intraocular pressure (IOP)<sup>6</sup>—and bypasses resistance at the juxtacanalicular segment of the trabecular meshwork and the inner wall of Schlemm's canal, thereby providing an intracanalicular scaffold for aqueous outflow to multiple collector channels.<sup>7</sup>

While studies have demonstrated its efficacy in surgically naive eyes with primary open-angle glaucoma (POAG), reporting significant reductions in IOP and medication burden,<sup>7,8</sup> its application in uveitic or secondary glaucoma remains underexplored. The COMPARE study<sup>8</sup> reported that 78% of patients were medication-free after 12-months post-Hydrus implantation, and the HORIZON trial<sup>9</sup> found that

66% remained medication-free at 5 years. Given the challenges posed by chronic inflammation and prolonged steroid requirements in uveitic glaucoma, innovative conjunctiva-sparing solutions are needed. The Hydrus Microstent represents a potential paradigm shift in this context.

In the first case, a 37-year-old man with chronic myeloid leukaemia and HLA-B27-associated anterior uveitis developed bilateral chronic anterior uveitis with elevated IOP despite topical steroid therapy. Despite maximal medical therapy for glaucoma—including a combination of brinzolamide and timolol maleate (Azarga, Novartis, Switzerland), brimonidine tartrate (Alphagan, Allergan, Australia), tafluprost (Taflotan, Santen, Japan), and oral acetazolamide 250 mg twice daily—IOP control remained suboptimal (33 mmHg in the right eye and 37 mmHg in the left eye), with continuous deterioration in visual acuity and worsening glaucomatous field defects on Humphrey Visual Field (HVF) testing. The patient initially underwent Ahmed tube implantation in the right eye and MPTCP in the left eye. Gonioscopic evaluation revealed open angles (grade 3–4 on the modified Shaffer grading system) without peripheral anterior synechiae (PAS). Despite transient improvement, IOP rebounded to 42 mmHg in the left eye 2 weeks later, necessitating Ahmed tube implantation. He remained stable on Azarga and a lower-potency topical steroid of loteprednol etabonate (Lotemax, Bausch & Lomb, US) twice daily. Subsequent development of a white cataract with borderline IOP (23 mmHg) in the left eye prompted cataract surgery, performed in combination with Hydrus Microstent implantation. Postoperative IOP was 8 mmHg at 1 week and maintained around 15 mmHg without any glaucoma medications for nearly 2 years.

In the second case, a 54-year-old man with a history of bilateral laser-assisted in situ keratomileusis presented with recurrent episodes of left eye Posner-Schlossman Syndrome (PSS); viral tetraplex studies from anterior chamber tap were negative. Initially managed during acute flares with Alphagan

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and timolol maleate (Timolol, Santen, Japan), he gradually developed ocular hypertension with an IOP of 34 mmHg, a borderline cup-to-disc ratio of 0.6 and a normal HVF. Treatment with Azarga and Alphagan was initiated; however, the patient's intolerance to Azarga necessitated switching to Taflotan. Repeated courses of topical steroid therapy were required to manage recurrent PSS flares, leading to spikes of IOP to 30 mmHg, prompting the addition of oral acetazolamide. Gonioscopy consistently demonstrated open angles (grade 4) without PAS. In an effort to reduce medication burden and achieve better IOP control, combined phacoemulsification with Hydrus Microstent implantation was performed. Postoperative IOP was well-controlled at about 12 mmHg without glaucoma medications for 16 months. However, an eventual IOP rise to 22 mmHg prompted the reinitiation of topical glaucoma medications—specifically brinzolamide (Azopt, Novartis, Switzerland) from 16–19 months postoperatively, and the addition of Alphagan and latanoprost (Xalatan, Pfizer, New York, NY, US) after. He was subsequently scheduled for trabeculectomy about 2 years after surgery.

In the third case, a 46-year-old male with bilateral uveitic glaucoma had 2 previous Ahmed tube implantations in the right eye (1 combined with phacoemulsification), and combined Ahmed tube implantation and phacoemulsification in the left eye. Persistent mild inflammation required ongoing topical steroid therapy (Pred Forte [Allergan, Irvine, CA, US] twice daily) with anti-glaucoma medications (timolol and Alphagan). Steroid response led to borderline IOP of 24 mmHg in the right eye and 20 mmHg in the left eye, with recurrence of inflammation upon attempts at steroid tapering or switching from Pred Forte to Lotemax. Eventual escalation to maximum medical therapy was required, consisting combinations of bimatoprost and timolol maleate (Ganfort, Allergan, Ireland), and brinzolamide and brimonidine tartrate (Simbrinza, Novartis, Switzerland). The development of right eye corneal decompensation prompted Ahmed tube explantation and Paul's glaucoma implant (Advanced Ophthalmic Innovations, Singapore) implantation, reducing the IOP from 24 mmHg preoperatively to around 7–10 mmHg. After subsequent penetrating keratoplasty, IOP remained stable with Pred Forte and Ganfort.

In contrast, the left eye exhibited an elevated IOP of 34 mmHg despite maximal medical therapy. Gonioscopic evaluation confirmed open angles (grade 4) without PAS. Left eye Hydrus Microstent implantation was subsequently performed, achieving initial good postoperative IOP control at 16–17 mmHg. An increase to 24 mmHg 3 weeks later coincided with increased steroid frequency in the fellow eye for early corneal graft rejection, which prompted reinitiation of Ganfort in the left eye. The IOP remained stable

over the next 18 months until the addition of ripasudil (Glanatec, Kowa, Japan) was required. Right eye repeat penetrating keratoplasty was performed for graft failure approximately 2 years after the left eye Hydrus Microstent implantation. Left eye IOP subsequently reduced to 17 mmHg and remained stable on the same anti-glaucoma medications with ongoing topical steroid therapy of Pred Forte 4 times a day in the right eye up until the latest review. This case demonstrates that while the Hydrus Microstent reduces medication burden, complete independence from glaucoma medications may not be achieved. Patients should hence be counselled preoperatively and informed that adjunctive eyedrop therapy may still be necessary to potentiate the IOP-lowering effect and achieve optimal IOP control.

Hydrus Microstent has been established in several prospective studies as a useful surgical option in IOP control, especially when performed in combination with cataract surgery.<sup>9,10</sup> It has also been favourably compared to similar Schlemm's canal-based MIGS devices, specifically iStent (Glaukos Corporation, Laguna Hills, CA, US),<sup>8</sup> though current evidence is largely limited to eyes with POAG.

These cases illustrate the potential of Hydrus Microstent as an effective surgical modality in managing uveitic glaucoma that addresses the limitations of traditional glaucoma surgeries, particularly with its conjunctiva-sparing properties. By achieving good medium-term IOP control (up to close to 2 years) and reducing medication burden, the Hydrus Microstent enhances patient compliance and quality of life, thereby representing a promising conjunctiva-sparing option and paradigm shift in the management of these patients.

### **Ethics statement**

*Not applicable.*

### **Declaration**

*The authors declare they have no affiliations or financial involvement with any commercial organisation with a direct financial interest in the subject or materials discussed in the manuscript.*

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