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Implantation of XEN gel stent in a patient with ocular cicatricial pemphigoid

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ABSTRACT

Purpose: Herein, we report a case of XEN gel stent implantation in a patient with ocular cicatricial pemphigoid that successfully reduced glaucoma topical medication at one year.

Observations: A 76-year-old male patient presented with severe ocular cicatricial pemphigoid and advanced glaucoma who required several topical medications to control intraocular pressure. Despite successful reduction of ocular inflammation with immunomodulatory therapy, his topical medication regimen prevented total remission of ocular inflammation. One year after XEN gel stent implantation, his intraocular pressures were controlled without any topical medication, and he had no ocular inflammation off any immunomodulatory therapy.

Conclusions and Importance: The XEN gel stent represents a useful intervention for glaucoma treatment even in the setting of severe ocular surface disease and can improve outcomes for concurrent inflammatory and glaucomatous pathology.

1. Introduction

Topical medication and filtering surgeries are mainstays for controlling intraocular pressure (IOP) but may be complicated in patients with both glaucoma and ocular surface disease. Glaucoma treatment may increase ocular surface inflammation and surgical options may be limited by scar tissue formation in cases involving ocular cicatricial pemphigoid (OCP). Preoperative control of ocular inflammation can improve surgical outcomes, and glaucoma surgery may reduce inflammation of the ocular surface by reducing eyedrop usage. Surgeons are sometimes hesitant to implant glaucoma devices which have a higher risk of failure, but we present this example of a XEN Gel Stent that successfully controlled IOP and reduced topical medication load in a patient with OCP at one year after implantation.

2. Case report

A 76-year-old male with a history of advanced OCP and severe glaucoma of both eyes (OU) presented with chronic ocular irritation OU despite one year of immunomodulatory therapy. His medications included tafluprost 0.0015% drops OU nightly (QHS), netarsudil 0.02% drops OU QHS, methazolamide 50 mg by mouth (PO) twice daily (BID), and, for the pemphigoid, guselkumab 100 mg subcutaneous injections every 8 weeks.

Prior to developing OCP, he had undergone penetrating globe repair OU at age 13, trabeculectomy of the left eye (OS), multiple selective laser trabeculoplasties OS, and transscleral cyclophotocoagulation right eye (OD). After developing OCP, he had cataract extraction and intraocular lens implantation in both eyes with endoscopic photocoagulation OS.

He had been originally referred to the clinic 1 year prior by his glaucoma specialist for chronic cicatricial conjunctivitis, which was diagnosed as primary OCP by conjunctival biopsy and direct immunofluorescent staining, with atopic histological features attributed to chronic topical glaucoma therapy. His ocular inflammation and eye pain improved during immunomodulatory treatment (guselkumab), but the conjunctiva OU remained diffusely injected. Over the 50-year course of his glaucoma treatment, he required several glaucoma eyedrops to control IOP and developed atopic reactions to timolol, dorzolamide, and latanoprost, which were discontinued. Despite multiple drops and glaucoma procedures, his IOP was persistently elevated in his left eye above 20 mmHg.

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At this visit, his best corrected visual acuity was hand motion OD and 20/70 OS. IOP was 20 OD and 29 OS by handheld tonometer. On slit lamp examination, eyelids were dry with irregular margins, madarosis, chemotic adnexa, and lower lid ectropia OU (Fig. 1A). Conjunctiva exhibited 3+ injection with shallow fornices OU and inferior symblepharon OD, but no superior symblepharon OD or any symblephera OS (Fig. 1B). His cornea had peripheral vascularization with few stromal opacities OD and temporal vascularization with multiple stromal opacities OS. Corneal pachymetry showed central corneal thickness of 469 nm OD and 520 nm OS. Humphrey visual field OS showed a superior altitudinal defect (Fig. 2A). Optical coherence tomography of the left optic nerve showed stable retinal nerve fiber layer thickness compared to prior scans (Fig. 2B).

Immunomodulatory therapy had been successful for treatment of the patient's OCP, but long-term topical glaucoma medications were felt to be contributing to his chronic conjunctival injection and irritation. He had required multiple glaucoma drops to control his IOP and halt glaucoma progression, and therefore surgical intervention was decided upon to reduce his topical glaucoma regimen, improve the ocular surface exposure to medications, and lower his IOP. His OCP had improved to the point where he had suitable superior conjunctiva for surgical options including valve surgery, trabeculectomy, minimally invasive glaucoma surgery (MIGS), or XEN gel stent. Due to the risk of ocular inflammation and fibrosis after intraocular surgery, a XEN gel stent was implanted superonasal OS away from the previous superotemporal trabeculectomy site. To reduce the risk of bleb fibrosis, the procedure was performed ab interno using the closed conjunctival technique with primary bleb needling and mitomycin C. A superonasal bleb formed OS and the XEN remained in the angle without iris or cornea impingement throughout subsequent examinations by slit lamp and gonioscopy.

Postoperative 0.5% moxifloxacin was applied OS four times daily (QID) for 1 week and 1% prednisolone acetate was applied OS QID for 1 month, tapered by 1 drop monthly. During the year after XEN implant OS, his IOP OS ranged from 8 to 12 mmHg by Goldmann applanation and handheld rebound tonometry (iCare® IC100) while on no topical glaucoma medication. At 6 months, he discontinued guselkumab injections and was off any immunomodulatory treatment. He had no recorded episodes of hypotony or intraocular hypertension and required no secondary bleb needling.

At 1 year, both eyes were comfortable with no active inflammation (Fig. 1C) while on doxycycline 100 mg PO QD, cyclosporine 0.05% OU BID, warm compresses, and loteprednol ointment QHS OU. Best corrected visual acuity was hand motion OD and 20/50 OS, improved OS from before surgery. IOP was 17 mmHg OD and 12 mmHg OS by handheld rebound tonometer (iCare® IC100). Goldmann applanation was not performed at 1 year, as tonometry and applanation were congruent for several visits after surgery. The superior conjunctiva OS (Fig. 1D) was only slightly injected and free of symblephara, with the XEN in good position forming a shallow superior bleb. Visual fields and OCT optic nerves were unchanged from one year prior (Fig. 2C and D).

3. Discussion

This patient had OCP and glaucoma, requiring multiple therapies with conflicting goals and side effects. While glaucoma treatment was thought necessary to lower his IOP, it also posed risk of causing increased surface irritation and immune activity. At the same time, scarring and inflammation from OCP may reduce the viability of surgeries such as valves and stents.[1] To treat such a complicated case, clinicians must understand the competing factors of each disease. We therefore present the use of a Xen Gel Stent in a patient with OCP, which has not been previously documented to our knowledge. This case demonstrates its viability for controlling glaucoma and utility for reducing ocular surface inflammation by decreasing the requirement for topical glaucoma drop therapy.

Glaucoma drops and surgery have the potential to disrupt ocular surfaces and aggravate immune responses. A major source of ocular surface insult is benzalkonium chloride (BAK) preservative in ophthalmic solutions, which is associated with increased extracellular matrix metalloproteinase-9 in the tear film and greater eye discomfort.[2]

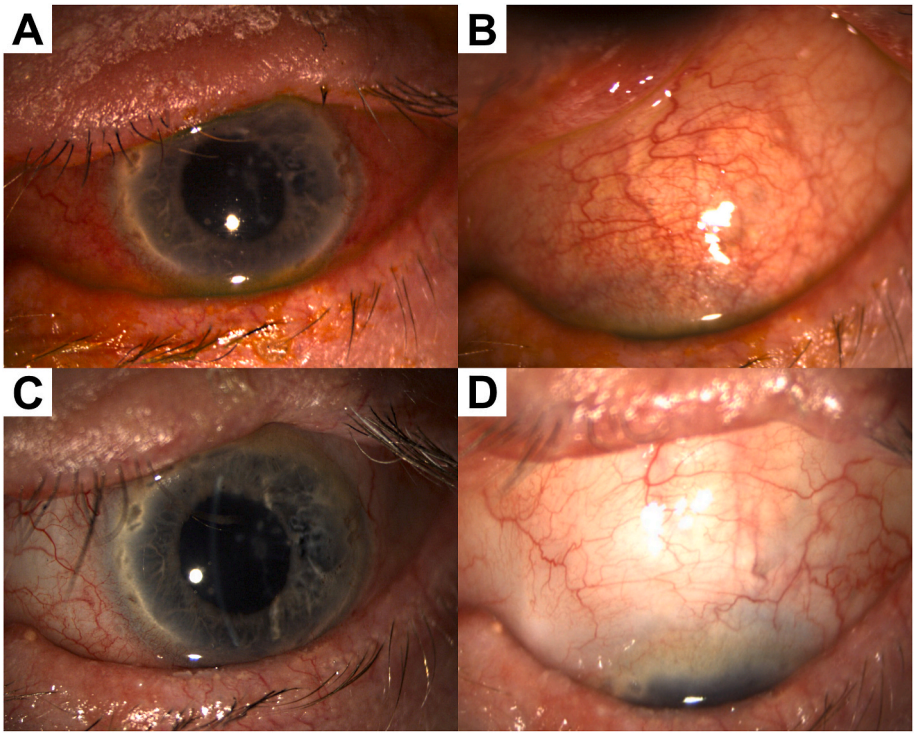

Fig. 1. External eye photographs of the patient OS. **(A)** Photograph at presentation with instilled fluorescein. **(B)** The superior conjunctiva was injected with superior fornix foreshortening but had minimal subepithelial fibrosis and no symblepharon. **(C)** Photograph at one year after XEN implant. **(D)** A shallow superior conjunctival bleb formed over the implanted XEN stent, the conjunctiva was no longer injected, and there was no formation of new symblepharon.

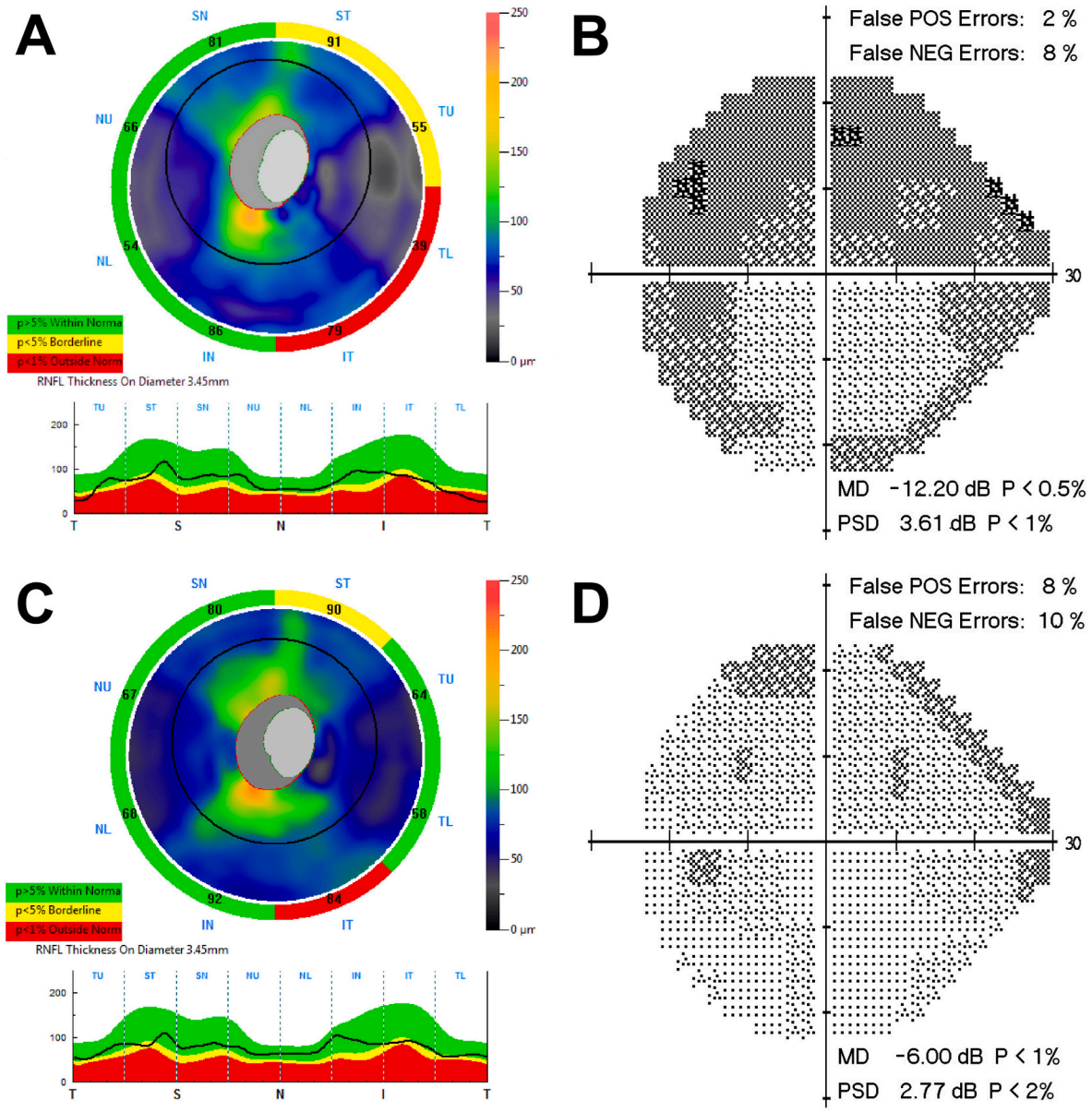

Fig. 2. Glaucoma testing OS. At presentation, **(A)** optical coherence tomography of the optic nerve showed severe inferotemporal thinning and moderate superotemporal thinning while **(B)** Humphrey visual field showed a borderline reliable superior altitudinal defect. One year after XEN implant, **(C)** optical coherence tomography of the optic nerve showed stable severe inferotemporal thinning and moderate superotemporal thinning while **(D)** Humphrey visual fields showed a borderline reliable unchanged superior altitudinal defect.

Eyedrops containing BAK also increase expression of inflammatory markers IL-6, IL-8, and IL-1β in a time-dependent manner such that the immune response increases with chronic therapy.[3] Even eyes without clinically significant inflammation demonstrate similar immune responses.[4] Surgical treatment is an alternative to topical therapy but is associated with ocular surface irritation (meibomian gland dysfunction, dry eye disease, blepharitis).[5] Glaucoma surgery also increases mast cell numbers which may contribute to conjunctival scarring, especially for predisposed patients with OCP.[6]

Ocular inflammation in this patient also complicated his glaucoma treatment, as his glaucoma specialist at the time was hesitant to perform filtering and drainage surgeries. OCP is a major risk factor for filtering surgery failure, primarily complicated by an enhanced fibroblastic and inflammatory response at the surgical bleb.[7] Indeed, histologic examination of the conjunctiva in patients who failed filtering surgery found greater lymphocyte and macrophage density than in patients with surgical success.[8] Conversely, good control of ocular surface disease is known to result in improved IOP control and glaucoma outcomes, either due to better therapy compliance or due to decreased trabecular meshwork inflammation.[9,10] Therefore, patient ocular surface disease control should be optimized before filtering surgery.

The goal of combined OCP and glaucoma treatment is to stabilize the patient's condition with noninvasive treatments such as glaucoma drops while controlling the inflammation using IMT with minimal steroids. If topical therapy is intolerable, however, surgery may be needed to reduce topical medication and associated ocular surface irritation. While evidence for the use of MIGS are rarely used in the setting of OCP, it has been shown to be moderately effective and safer than traditional surgeries in uncomplicated patients.[11] XEN Gel stents, despite their controversial classification as a form of MIGS, are also associated with less ocular surface inflammation than either traditional trabeculectomy or topical glaucoma therapy.[12] Ophthalmologists unfamiliar with OCP may be concerned with the increased risk of filtering surgery failure. However, the ab interno approach used in XEN implantation avoids

conjunctival dissection, which is used extensively in traditional glaucoma surgery. The authors would like to especially point out the need for a suitable area of conjunctiva for stent placement and bleb formation. Without this, successful surgical outcomes may be less likely.

To the authors' knowledge, this is the first reported use of the XEN gel stent in a patient with OCP and there are no prospective trials evaluating the efficacy of the XEN gel stent or MIGS in cicatrizing ocular surface disease. While this single case does not justify a similar approach for all patients with OCP, it may suggest a hopeful option for patients with suitable characteristics. Firstly, the inflammatory control of the ocular surface must be optimized. Secondly, all less invasive methods for intraocular pressure control must have proven insufficient or intolerable. Lastly, the anatomy of the presurgical anterior chamber and conjunctiva must be suitable for XEN gel stent implantation. Other viable treatment strategies may include prescription of preservative-free topical glaucoma therapy, which is associated with less ocular surface irritation than preserved eyedrops, though cost is often a barrier.[13] Ahmed glaucoma drainage devices may also be successful in lowering IOP in patients with cicatricial ocular disease, but can result in tube exposure, posing a threat from endophthalmitis.

Meeting presentation

N/A.

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Disclosures

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All other authors have no proprietary or commercial interest in any materials discussed in this article or additional financial disclosures to declare.

The other authors have nothing to declare.

Compliance with ethics guidelines

This study was approved by the New England Institutional Review Board, which has issued a waiver of informed consent for the retrospective chart review analysis.

This study was performed in accordance with the Helsinki Declaration of 1964, and its later amendments.

All participants provided consent for publication if any identifying information is included in the manuscript.

Data availability

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Patient consent

Consent to publish this case report has been obtained from the patient in writing.

Declaration of competing interest

No conflicting relationship exists for any author.

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