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James C Liu

Washington University School of Medicine in St. Louis

Wesley Green

Washington University School of Medicine in St. Louis

Arsham Sheybani

Washington University School of Medicine in St. Louis

John T Lind

Washington University School of Medicine in St. Louis

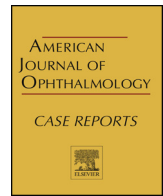
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Intraoperative suprachoroidal hemorrhage during Xen gel stent implantation



James C. Liu^a, Wesley Green^a, Arsham Sheybani^a, John T. Lind^{a,b,*}

^a Department of Ophthalmology and Visual Sciences, Washington University School of Medicine, St. Louis, MO, USA

^b Glick Eye Institute, Department of Ophthalmology, Indiana University School of Medicine, 1160 West Michigan Street, Indianapolis, IN 46220, USA

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ABSTRACT

Purpose: To report a rare case of intraoperative suprachoroidal hemorrhage during Xen gel stent implantation with accompanying surgical video and subsequent 6-month follow-up.

Observations: Our patient required incisional glaucoma surgery after inadequate pressure reduction with four classes of topical medication, methazolamide, and selective laser trabeculoplasty. The patient underwent Xen gel stent implantation and developed an intraoperative suprachoroidal hemorrhage, which was managed in the operating room. The patient recovered his baseline visual acuity with a functioning bleb out to 6 months postoperatively.

Conclusions and Importance: Micro-invasive glaucoma surgeries offer a new repertoire of surgical options, purportedly with safer and less invasive techniques. Xen gel stent implantation may be a promising alternative to traditional trabeculectomies and tube shunt implants, providing similar IOP lowering results with potentially lower risk for complications. However, rare and severe complications such as suprachoroidal hemorrhage may still occur. Recognizing a suprachoroidal bleed, particularly intraoperatively, will still be necessary to help minimize the potential vision threatening sequelae often associated with this severe complication.

1. Introduction

Glaucoma is the leading cause of irreversible blindness in both the United States and worldwide.¹ The enduring gold standard for surgery in primary open-angle glaucoma is trabeculectomy, which creates a direct communication between the anterior chamber and the subconjunctival space, bypassing the resistance of the trabecular outflow system. Despite the efficacy of this technique and its longstanding use as the surgical gold standard, it continues to be associated with complications such as bleb leaks, subconjunctival fibrosis, and inconsistent filtration rates.² A rare but worrisome and vision threatening complication is suprachoroidal hemorrhage (SCH), which can occur intraoperatively or postoperatively. The pathophysiology of SCH is not fully understood, but likely involves early hypotony, rupture of posterior ciliary arteries, and subsequent hemorrhage.³ The outcome is often devastating, with many patients reaching a final visual acuity of no light perception.⁴

The desire to mitigate these potential complications has driven the development of micro-invasive glaucoma surgery (MIGS). Because of the less disruptive surgical technique, this new repertoire of glaucoma procedures offers the potential for safer and more reliable intraocular

pressure (IOP) reduction when compared to traditional glaucoma filtration surgeries.⁵ The Xen (Allergan, CA) gel stent is an ab-interno MIGS device that shows promise in producing IOP reduction comparable to traditional glaucoma surgeries, but with potentially fewer complications.^{1,6} However, the risk for complications still exists. To the best of our knowledge, we report for the first time on a case of *intraoperative* suprachoroidal hemorrhage during Xen gel stent implantation.

2. Case report

An 85-year-old Caucasian male was referred one year prior for uncontrolled glaucoma. On initial presentation, the patient had 20/20 vision with IOP of 24 mmHg in the right eye and 20/60 vision with IOP of 35 mmHg in the left eye. The patient was being treated with three topical glaucoma agents. After a fourth agent was added, the IOP in the left eye remained in the mid-20s. Subsequently, an Ahmed glaucoma drainage device was implanted. Three months post-operatively, the patient had IOP of 8 mmHg and vision had recovered to 20/100. At 8-months post-operatively, vision was 20/40 with IOP of 12 mmHg.

Unfortunately, the IOP in the right eye increased to 30 mmHg

* Corresponding author. Washington University School of Medicine, Campus Box 8096, 660 South Euclid Ave, Saint Louis, MO, 63110, USA.

E-mail address: jlind@iu.edu (J.T. Lind).

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despite maximal medical therapy and selective laser trabeculoplasty (SLT). The decision was made to have the patient undergo Xen implantation with mitomycin C.

The patient underwent routine Xen implantation after pre-operative injection of 20 µg of subconjunctival mitomycin C. After the standard ophthalmic prep and draping procedure, a sideport blade was used to fashion a paracentesis superotemporally. Preservative free lidocaine was injected intracamerally. Healon was then injected to maintain the anterior chamber. A clear corneal incision was constructed with a keratome inferotemporally, taking care to avoid excessive interference from the patient's prominent cheekbone.

The Xen was then deployed superiorly. At that time, the patient noted discomfort and the chamber began to shallow but remained formed. The main wound was secured with ReSure sealant. The eye was monitored for approximately 20 minutes. The chamber remained shallow with IOP around 25–30 mmHg, but the red reflex was maintained. The anterior chamber slowly stabilized and the viscoelastic was carefully replaced with balanced salt solution. IOP was equilibrated to approximately 30 mmHg at the end of the case. The retina was visualized intra-operatively, but no definite suprachoroidal hemorrhage could be immediately identified with the hazy view. Post-operative drops were added and the eye was patched and shielded. Strict activity precautions were given to the patient and family.

Please see accompanying video for intra-operative features.

Supplementary video related to this article can be found at <https://doi.org/10.1016/j.ajoc.2020.100600>.

On post-operative day 1, the patient's pinhole vision was 20/70 with IOP of 7 mmHg and slit-lamp exam showed a well-formed anterior chamber. An inferonasal suprachoroidal hemorrhage was identified outside of the inferonasal arcade. The patient was continued on the difluprednate, polytrim, and atropine eye drops. At the 1-week post-operative visit, vision was 20/50 with IOP of 10 mmHg and a stable SCH, which steadily resolved without additional complication over the ensuing 6 weeks.

At the 2-month post-operative visit, vision returned to 20/30 with an unmedicated IOP of 16 mmHg and a well-formed superonasal bleb. By the 6-month post-operative visit, the patient recovered to 20/25 vision with an unmedicated IOP of 14 mmHg and a well-formed superonasal bleb.

3. Discussion

Glaucoma remains a leading cause of blindness, with under-diagnosis, under-treatment, and medication noncompliance being persistent factors contributing to the disease burden.¹ The advances in MIGS procedures has sparked a renaissance in glaucoma management, directed at earlier surgical intervention in order to improve IOP and reduce topical medication dependence. The potential for an improved safety profile, more reproducible technique, and adjuvant use during cataract surgery are compelling reasons to consider these new techniques.

The design of the Xen gel stent aims to maximize these potential benefits. The flexible and biocompatible material is meant to minimize migration, erosion, and surrounding inflammatory response.⁶ The FDA-approved device has a 6 mm length and 45 µm inner lumen diameter. At physiologic aqueous humor flow rates, an outflow resistance of 6–8 mmHg is predicted by the Hagen-Poiseuille equation, theoretically eliminating the risk for hypotony.⁷ Early results have been comparable to traditional glaucoma surgeries in terms of IOP reduction and decreased dependency for topical medications. Four prospective, non-comparative studies assessing Xen gel stent outcomes reported a mean IOP reduction ranging from 25% to 42% and a mean reduction of topical medication burden ranging from 1.6 to 2.9 classes.^{8,9} However, instances of hypotony still occurred in most of these studies: the rates of hypotony were 0%, 2.4% (1 eye), 15.4% (2 eyes), and 24.6% (16 eyes). 3 of these eyes were associated with a choroidal detachment, all of

which resolved with conservative medical management.

In the case described, although no obvious hypotony was noted intraoperatively during the time of Xen implantation, it is possible that some egress of ocular viscodispersible (OVD) agent through the main wound may have lowered the IOP enough to predispose the patient to the suprachoroidal hemorrhage. One may consider using a heavier molecular weight OVD, such as Healon GV, for chamber maintenance during implantation to reduce the possibility of IOP shifts during implantation. However, meticulous removal of OVD would be necessary to prevent a large post-operative IOP spike.

Only one case report in the literature so far has described suprachoroidal hemorrhage associated with Xen gel stent placement.¹⁰ In that case, the patient experienced initial post-operative hypotony after uncomplicated Xen implantation. On post-operative day two, the patient developed severe pain. The exam showed an IOP of 54 mmHg, a shallow anterior chamber, and visual acuity of no light perception. Ultrasound examination confirmed the presence of a SCH. Conservative medical management was employed and a final visual acuity of hand motion was reached in an eye with a presenting visual acuity of 20/25.

Unlike the previously presented case that ended in devastating visual consequences, our patient was able to reach his baseline vision with a well-functioning Xen gel stent. Despite the poor visual outcome in the previously published case report, we postulate that the slower and more controlled flow rates with the Xen compared with traditional trabeculectomy or glaucoma drainage device surgery could potentially minimize the adverse effects in eyes that develop suprachoroidal hemorrhage or choroidal effusions by limiting the IOP fluctuations and the transscleral pressure gradient. More comparative data is needed to determine if the rates and outcomes of these complications are significantly improved when compared to traditional glaucoma surgeries, but the presence of limited numerical hypotony that almost universally self-resolves without invasive intervention is encouraging. Regardless, the potential for SCH will persist in many intra-ocular procedures. Keeping this in mind may allow for earlier detection and management of SCH, potentially leading to better visual outcomes.

4. Conclusion

The new arsenal of MIGS procedures for the treatment of open-angle glaucoma has offered the potential for safer and less-invasive techniques. Xen gel stent implantation may achieve moderate IOP reduction while exhibiting an improved safety profile. However, serious complications such as suprachoroidal hemorrhage can still occur. Early recognition and prompt management will remain important in Xen gel stent implantation, as well as other glaucoma procedures.

Patient consent

Retrospective clinical case report. The patient signed an informed consent form during admission to the hospital. This report does not contain any personal information that could identify the patient.

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There were no funds allocated to the realization of this clinical case.

Authorship

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

Declaration of competing interest

JTL is paid consultant for Allergan and has received honorariums in the past from Bausch and Lomb. AS is a paid consultant for Allergan. No other authors have financial disclosures.

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