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Case report

Endophthalmitis following combined cataract extraction and placement of an iStent trabecular bypass device

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ABSTRACT

Purpose: To report a case of post-operative endophthalmitis following combined cataract extraction and minimally invasive glaucoma surgery with placement of the iStent drainage device.**Observation:** An 87-year-old woman with a nuclear sclerotic cataract and primary open angle glaucoma underwent elective phacoemulsification cataract extraction with iStent placement. Surgery was complicated only by the inability to properly place the second iStent despite several attempts. At 4 days post-operatively she was diagnosed with endophthalmitis. Despite the prompt intravitreal injections of broad spectrum antibiotics, she lost all perception of light. Cultures of anterior chamber aspirates failed to identify a causative organism.**Conclusion and importance:** In what we believe to be the first report of endophthalmitis associated with placement of the iStent, complete loss of vision occurred. Surgeons need to be aware that iStent placement may be complicated by severe endophthalmitis.

1. Introduction

Minimally Invasive Glaucoma Surgery (MIGS) is an increasingly popular group of incisional procedures used to treat mild to moderately glaucoma.¹ They lower moderately elevated intraocular pressure by bypassing the abnormal trabecular meshwork. This expanding group of surgeries includes the iStent, Xen, ABiC, iTrack, Hydrus, Kahook dual blade. MIGS procedures are often performed together with cataract extraction and are generally safe and effective.^{2,3} One of the most feared complications of cataract extraction is endophthalmitis⁴ though we are unaware of peer-reviewed literature reports of postoperative endophthalmitis associated with a MIGS procedure.⁵ In this manuscript we report what we believe to be the first case of endophthalmitis after a combined cataract/MIGS procedure using the iStent (Glaukos Corp., San Clemente, CA, USA).

1.1. Case report

An 87-year-old woman with a history of poor vision in the right eye (OD) due to a central retinal vein occlusion (CRVO) with macular edema (CME) complained that over the past 1.5 years her vision had become

significantly worse in each eye. The best-corrected visual acuities measured counting fingers right eye (OD) and 20/40 left eye (OS). Her pupils were equally reactive to light with no afferent pupillary defect and the eyes were orthophoric with full extraocular movements. Applanation intraocular pressures measured 19 mmHg OD and 20 mmHg OS, and central corneal thicknesses were 549 μ m OD and 541 μ m OS. The slit lamp examination revealed normal eyelids, conjunctiva, sclera, cornea, anterior chamber, and iris, without neovascularization. Bilateral 3+ nuclear sclerotic cataracts were present.

Funduscopy findings included posterior vitreous detachments and cup-to-disc ratios of 0.8 OD and 0.7 OS, with thinning of the inferior-temporal neuroretinal rims. The right eye had persistent macular edema from the old CRVO and pan-retinal photocoagulation scars were present (see Fig. 1).

Humphrey automated visual field testing showed severe field loss OD and an early superior arcuate defect consistent with the thin neuroretinal disc rim in the left eye. Optical coherence tomography (OCT) scanning of the macula showed cystoid edema in the right eye (central subfield thickness (CST) of 328 μ m) but normal anatomy in the left eye (CST of 267 μ m). Nerve fiber layer analysis showed significant thinning of the neuro-retinal rims and retinal nerve fiber layers OU.

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Because the intraocular pressures had risen by 6–7 mmHg over the previous five years and glaucomatous visual field defects were found in both eyes, latanoprost 0.005% once daily was begun. And since the worsening cataract was believed responsible for the recent decrease in visual acuity, cataract removal combined with a minimally invasive glaucoma surgery (MIGS) was recommended for the right eye. While

some systemic diseases, such as dementia, uncontrolled diabetes, or meibomian gland dysfunction can increase the risk of endophthalmitis, none of these conditions was present in this patient.

The standard povidone-iodine prep (Betadine 5% Sterile Ophthalmic Prep Solution, Alcon) was performed by an experienced ophthalmic certified nurse–operating room (CNOR). The surgeon is an experienced

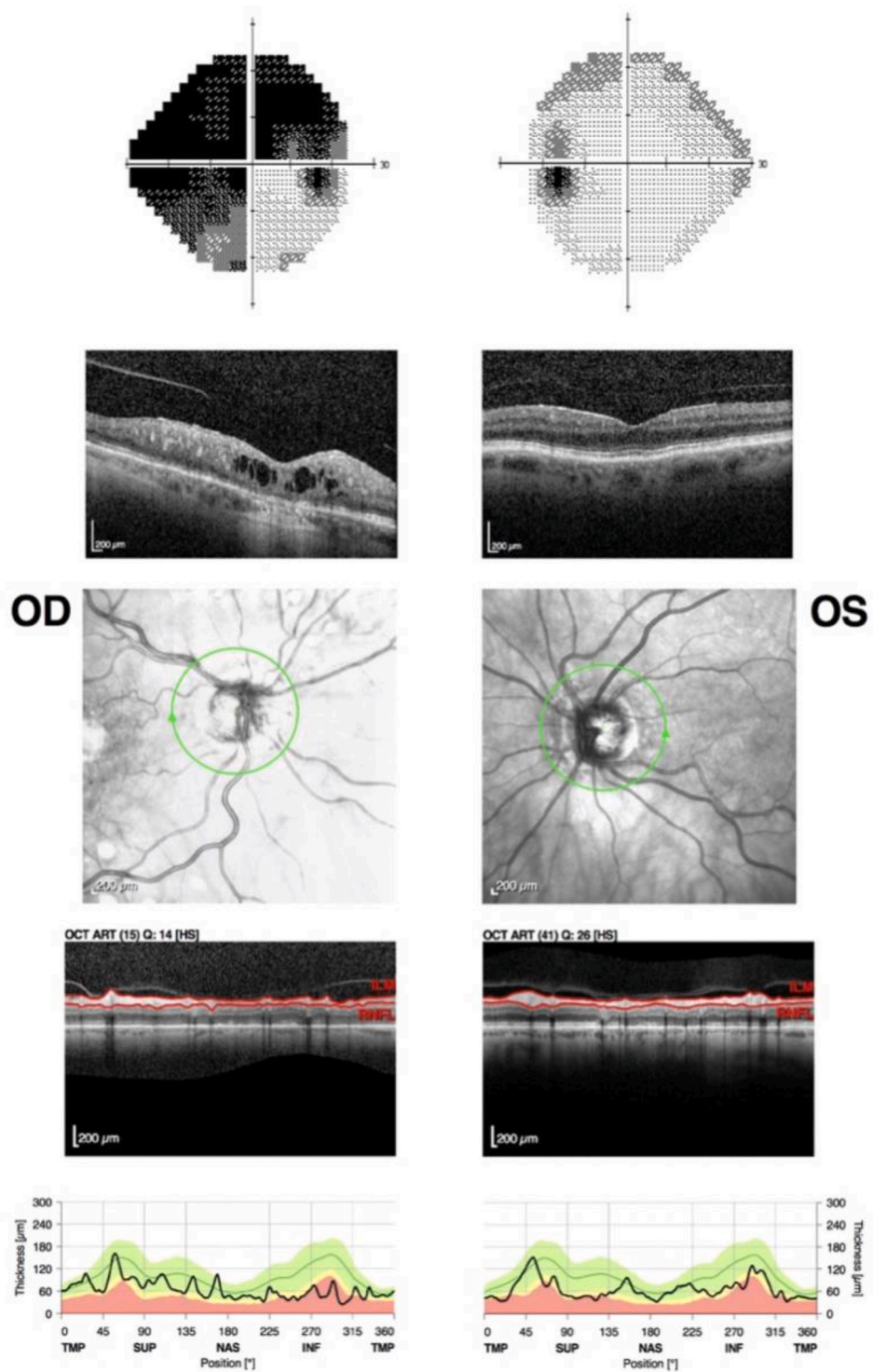


Fig. 1. OD HVF showing superior arc scotoma and nasal inferior scotoma affecting central vision; OS HVF relative nasal superior scotoma. OD macular OCT with foveal edema and OS macular OCT normal. OD retinal nerve fiber layer (RNFL) OCT showing inferior loss and OS RNFL OCT showing inferior loss.

cataract and glaucoma surgeon (glaucoma-fellowship trained) with considerable experience with implanting first-generation iStents. However, this was the surgeon's first experience with implanting the second-generation iStent Inject device. The patient underwent phacoemulsification removal of the cataract with paired limbal relaxing incisions in the peripheral cornea and implantation of a model SA60WF intraocular lens (Alcon, Ft. Worth, TX) combined with implantation of one iStent Inject device in the right eye. Cataract removal with intraocular lens placement was performed without difficulty, but only one iStent Inject device was successfully implanted in the trabecular meshwork. The surgeon was not able to implant the second stent within the four total attempts allowed by the injector. Because the second iStent device could not be fully embedded in the trabecular meshwork, it was engaged with the trocar and removed from the eye. Per the surgeon's routine technique, a single 10-0 nylon suture closed the primary incision at the end of the case in order to assure a watertight state post-operatively. The surgical time (incision to close) was 27 minutes.

The patient used topical Ofloxacin 0.3%, Prednisolone acetate 1%, and Ketorolac 0.5% both pre-operatively (started three days prior to surgery) and post-operatively. These medications were the preconized drugs routinely used at that time (2018). Topical hypochlorous acid 0.02% spray was not used as the patient did not have active meibomian gland dysfunction or ocular surface disease beyond dry eyes.

The one-day post-operative findings were unremarkable and the patient reported no discomfort. Her visual acuity measured counting fingers with pin-hole improvement to 20/400, and 2+ cells (primarily erythrocytes) were noted in the anterior chamber. On the second post-operative day, the patient accidentally struck the superonasal aspect of her right eye while instilling drops and over the next 24 hours she developed blurred vision and pain. Because she was unable to arrange transportation, she did not return to the clinic until the fourth post-operative day.

On examination, her visual acuity was light perception, the cornea was edematous, and a layered hypopyon was present. The vitreous could not be visualized but a B-Scan ultrasound showed significant opacification. An anterior chamber specimen was obtained, and Vancomycin 1 mg and Ceftazidime 2.25 mg were injected into the vitreous. Gram staining of the anterior chamber aspirate revealed only a few mononuclear cells and cultures failed to detect an organism. The patient was diagnosed with severe, culture-negative endophthalmitis.

On post-operative day five, she was unable to perceive light and the intraocular pressure measured 41 mmHg. Findings on slit lamp examination were unchanged (Fig. 2). Topical Timolol maleate 0.5% and Brimonidine tartrate 0.2% BID were begun. Vancomycin 1 mg was reinjected on postoperative day six.

Over the next several weeks the acute inflammatory signs steadily improved. On post-operative day 25, the visual acuity remained no perception of light and the intraocular pressure had improved to 21 mmHg.

The slit lamp examination revealed 2+ conjunctival and scleral injection, a clear cornea, anterior chamber fibrosis without a layered hypopyon, and neovascularization of the iris. The posterior segment could not be visualized. The findings on post-operative day 75 were unchanged.

2. Discussion

Endophthalmitis has been described with most intraocular surgeries, but to the best of our knowledge this represents the first reported case of endophthalmitis associated with MIGS. The operated eye lost all vision and the two-day delay in administration of intraocular antibiotics may have contributed to the unfavorable result.

The incidence of endophthalmitis following cataract surgery ranges from 0.02% to 1% and symptoms (floaters, decreased vision, pain, and loss of vision) usually develop between post-operative days two and six.^{6,7} Endophthalmitis usually results from surface bacteria that enter the eye during surgery. Risk factors include clear corneal incisions, use of a silicone intraocular lens, and surgical complications that include posterior capsular rupture and the need for numerous instrument passes. Recovery of vision depends on the presenting visual acuity and the responsible organism (most commonly *Staphylococcus epidermidis*), with only a minority of patients losing all vision.

Endophthalmitis associated with traditional glaucoma drainage devices that reside predominantly in the sub-Tenon's space, with tubes that cross the sclera to directly connect the anterior chamber with the sub-Tenon's space, develops quite differently from those following cataract surgeries. Endophthalmitis develops after a mean (\pm standard deviation) of 2.6 ± 3.2 years (median, 1.3 years; range, 11 days-11.4 years) following implantation of the drainage device^{4,8} from bacteria that are believed to penetrate thinned, atrophic conjunctiva into the

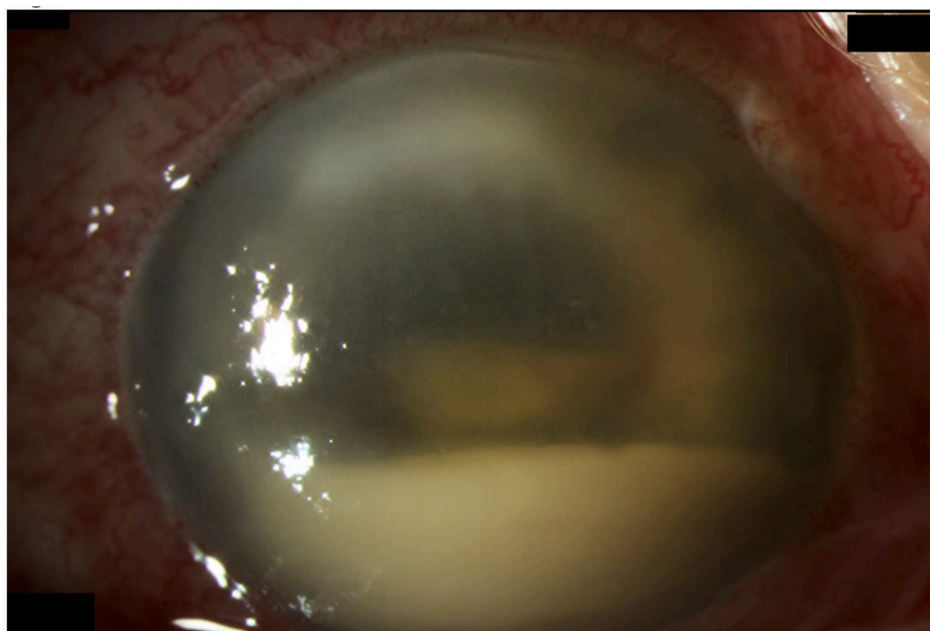


Fig. 2. Post Op Day 5 slit lamp photo presenting with 40% hypopyon in the anterior chamber, corneal edema 2+, and ciliary injection.

subconjunctival space, thereby gaining access to the anterior chamber. Treatment frequently includes removal of the device because bacteria that become sequestered within the reservoir can be difficult to eradicate.⁹

MIGS procedures have been performed for several years, but to our surprise, we were unable to find a single case of MIGS-related postoperative endophthalmitis in the published literature. Most MIGS procedures improve aqueous outflow by bypassing the trabecular meshwork but the devices do not usually extend past Schlemm's canal and, therefore, do not communicate directly with the sub-Tenon's space.

In our case, symptoms of endophthalmitis developed two days after surgery but the diagnosis and treatment was delayed until four days following surgery. Clinically, this case developed more like a case of post-cataract extraction endophthalmitis as opposed to endophthalmitis associated with a glaucoma drainage device, consistent with surgery performed exclusively within the anterior chamber without communication with the sub-Tenon's space. It is not clear whether the cataract surgery or the iStent placement contributed more to the development of endophthalmitis but since iStents are commonly placed in conjunction with cataract extraction, the two procedures should be thought of as one surgery.

Treatment of our case involved the immediate injection of intravitreal Vancomycin and Ceftazidime with a re-injection of Vancomycin 48 hours later. Surprisingly, the anterior chamber paracentesis failed to identify an inciting organism despite the acquisition of purulent material. Review of reports from the Food and Drug Administration website (Available at: <https://www.accessdata.fda.gov/SCRIPTS/CDRH/cfdocs/cfmaude/detail.cfm>? Accessed June 13, 2019) provides information from another patient that required device removal. The patient was successfully treated but after an unspecified period the endophthalmitis reoccurred.

The 48 hour delay in treatment and the rapid, complete loss of vision within 24 hours of intravitreal antibiotic treatment fails to provide us meaningful guidance regarding the optimal management strategies in such patients. We believe that removal of the iStent is not necessary to eradicate the infection because, like an intraocular lens, it does not communicate with the sub-Tenon's space. Additionally, the edematous cornea in this case prevented adequate visualization for either removal of the iStent or performance of a pars plana vitrectomy. The rapid loss of vision (no light perception within 24 hours of antibiotic administration), however, suggests that neither of these maneuvers would have altered the outcome.

3. Conclusion

In summary, we present a case of iStent-associated endophthalmitis with complete loss of vision. Similar to cataract surgery alone, physicians should remain suspicious of sight-threatening infections in cataract surgery utilizing an iStent device and should examine patients as soon as possible. This case shows that it was not possible, nor necessary, to remove the iStent device to successfully treat the endophthalmitis per protocol. Future cases may provide us better guidance regarding the optimal management of these complex cases.

Patient consent

This report does not contain any personal identifying information.

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Authorship

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

Declaration of competing interest

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