Intractable secondary glaucoma and corneal decompensation in a highly myopic eye after phakic intraocular lens implantation

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Implantation of a collagen copolymer phakic intraocular lens (pIOL) (Visian ICL) for the refractive correction of high myopia is widely performed and is regarded as a safe and effective procedure. Although rare, sight-threatening complications can occur and are challenging to manage. We present a rare case of uveitis with refractory secondary glaucoma following pIOL surgery that warranted trabeculectomy with pIOL explantation in 1 eye. The postoperative course was complicated by the development of malignant glaucoma. This led to obliteration of the anterior chamber with corneolenticular contact, resulting in cataract formation and subsequent corneal decompensation. Pars plana vitrectomy and lensectomy were performed, followed by penetrating keratoplasty. These multiple interventions eventually led to failure of the trabeculectomy. Ahmed glaucoma valve implantation was performed to manage the refractory glaucoma. After 2 years and 6 surgical interventions, the visual acuity has been maintained at 20/40 with healthy optic disc and fields.

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The spectrum of surgical correction for high myopia has been broadened with the introduction of phakic intraocular lenses (pIOLs). Most common postoperative complications include anterior subcapsular cataract, pigment dispersion, and secondary glaucoma, some of which may be vision threatening.1 We report a rare presentation of refractory uveitis with secondary glaucoma in a patient with a phakic IOL (pIOL). The cascading series of interventions to maintain normal intraocular pressure (IOP) and corneal clarity are discussed.

CASE REPORT

A 24-year-old woman presented with decreased vision in her left eye following pIOL implantation of a collagen copolymer pIOL (Visian ICL, Staar, without the central Aquaport) performed 2 months earlier at another facility. She had no history of pain, redness, or other symptoms suggestive of iritis prior to the procedure. Excessive inflammation in the early postoperative period was suspected to be endophthalmitis. Topical steroids had been withdrawn on day 2 after pIOL surgery, which had exacerbated the inflammatory response and its sequelae. An anterior chamber wash had been done twice followed by membranectomy.

The possibility of toxic anterior segment syndrome (TASS) was considered. However, as the surgery was performed elsewhere, the details of the intracameral preparations used intraoperatively were not known. The immediate postoperative clinical details were also not known as the patient presented to us 2 months after the surgery.

At presentation, the corrected distance visual acuity (CDVA) was 20/40 with −11.50 diopter sphere (DS) in the right eye and 20/50 in the left eye. The patient was on 3 anti-glaucoma medications in the left eye and oral acetazolamide twice a day. The anterior segment optical coherence tomography done at presentation confirmed obvious excessive anterior vaulting of the pIOL (although it was not measured) with an overlying membrane (Figure 1). The pIOL was visible behind the pupillary membrane. Anterior segment optical coherence tomography done at presentation confirmed obvious excessive anterior vaulting of the pIOL.
Because the IOP was high on the maximally tolerated treatment, membranectomy, trabeculectomy with mitomycin-C, and pIOL explantation were performed in the left eye under general anesthesia. Histopathology of the excised pupillary membrane showed fibrosis and neo-vascularization of the iris tissue (Figure 3).

One week postoperatively, the left eye IOP was 10 mm Hg. The bleb was diffuse and posteriorly directed. The anterior chamber was deep, and the lens showed anterior capsule opacification (Figure 4). The fundus examination was within normal limits with cup-to-disc ratio of 0.5:1. Topical and systemic steroids, antibiotics, and cycloplegic eyedrops were started. The postoperative course was uneventful and the visual acuity at 1 month was 20/63 and her IOP was 14 mm Hg.

Three months later, the patient presented to the emergency clinic with severe pain, an IOP of 18 mm Hg, and a flat anterior chamber. A B-scan of the left eye ruled out posterior segment pathology and the Seidel test was negative. Ultrasound biomicroscopy (UBM) showed 360-degree irido-corneo-lenticular touch with anteriorly rotated ciliary body (Figure 5). Malignant glaucoma was diagnosed, and aqueous suppressants and intensive cycloplegic agents were started. The anterior chamber remained flat with increasing corneolenticular contact. Because of the failure of medical therapy and the cataract progression, pars plana vitrectomy and lensectomy were performed. Postoperatively, the CDVA was 20/100 with aphakic correction of +10.0 DS; the IOP was 12 mm Hg.

In the subsequent follow-up visits, the steroids were gradually tapered and the patient was maintained on once-daily topical steroids for almost 5 months until the anterior chamber and vitreous inflammation completely subsided. The IOP remained within normal limits.

Nine months after vitreoretinal intervention, the patient presented with painless gradual diminution of vision. The visual acuity was counting fingers at 1 meter with +10.0 DS in the left eye. Anterior segment examination revealed corneal edema with retrocorneal membranes. Given the good visual potential, keratoplasty was the next step for visual rehabilitation. Because of the presence of 360-degree peripheral anterior synechiae, penetrating keratoplasty (PKP) with anterior vitrectomy was performed. The CDVA recovered to 20/50 with aphakic correction. Five months after PKP, the IOP was 38 mm Hg with 3 topical antiglaucoma medications and oral acetazolamide. Optic disc examination showed a 0.5 cup with mild inferior rim pallor. The trabeculectomy bleb had scarred and was nonfunctional. To manage this refractory glaucoma, an Ahmed glaucoma valve was implanted with a pars plana tube (Figure 6).

Three months after the valve implantation, the patient developed high IOP and a tense, elevated bleb secondary to the hypertensive phase. Good IOP control was achieved with a fixed-dose combination of brimonidine tartrate and timolol maleate eyedrops twice a day. Eighteen months postoperatively, the CDVA remained 20/40 with aphakic correction and the IOP was 12 mm Hg. Humphrey visual fields 24-2 done at the final visit were stable (Figure 7).

DISCUSSION

Posterior chamber IOLs have proven to be safe and effective in the treatment of moderate to high myopia. They have become increasingly popular for patients not suitable for traditional excimer laser surgery. One of the common complications following pIOL implantation is secondary glaucoma, which can have a multifactorial etiology. The mechanism of glaucoma in our patient was 2-fold: pupillary block with inflammatory membrane and nonpupillary block angle closure secondary to the oversized pIOL. The prophylactic peripheral iridotomies performed preoperatively were closed by the inflammatory membrane and peripheral anterior synechiae.

Minimal tissue handling intraoperatively and thorough wash of the ophthalmic viscosurgical device (OVD) reduce the incidence of postoperative

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**Figure 1.** Slitlamp photograph at presentation showing corneal edema, iris neovascularization (arrow), and membrane covering the pupil in the left eye.

**Figure 2.** Anterior segment optical coherence tomography of the left eye at presentation showing excessive anterior vaulting of the pIOL with an overlying fibrin membrane (arrow).
inflammation and raised IOP. The abrupt and early cessation of topical steroids in our patient for suspected endophthalmitis may have exacerbated the inflammation. At presentation, the patient had uncontrolled IOP on maximum medical therapy with fulminant anterior chamber reaction and a thick pupillary membrane that was refractory to intensive topical and oral steroids. Membranectomy and pIOL explantation combined with filtering surgery controlled the IOP. To our knowledge, there are no reports in the literature in which pIOL explantation was required for intense uveitis and secondary glaucoma.

Our patient developed malignant glaucoma and lenticular opacification postoperatively. It has been postulated that predisposed eyes develop anterior rotation of the ciliary body following surgical intervention. This is accompanied by posterior misdirection of aqueous, leading to an increase in vitreous volume and subsequent shallowing of the anterior chamber. The treatment aims at deepening the anterior chamber and reversing the ciliary rotation by medical treatment with cycloplegics, laser hyaloidotomy, or surgical intervention to convert the eye into a unicameral chamber. Pars plana vitrectomy remains the mainstay of the surgical management of malignant glaucoma. Over time, our patient developed visually significant retrocorneal membranes and corneal decompensation. This necessitated PKP for visual rehabilitation. Following PKP, the patient recovered good visual acuity with aphakic correction. However, after 3 months of good IOP control, the trabeculectomy bleb scarred and she developed refractory secondary glaucoma. The incidence of post-PKP glaucoma reported in various studies ranges from 8.7% to 27.4%. Anterior vitrectomy, aphakic status, and preexisting glaucoma further accentuate the risk for the development of secondary glaucoma in these eyes.
To manage the refractory glaucoma and preserve the clarity of the corneal graft, a valve implant was chosen. Early Ahmed glaucoma valve implantation has been shown to result in a higher probability of graft survival and a better visual acuity outcome. Thus, a patient who sought an elective refractive surgery had cascading series of events that required multiple surgical interventions to salvage and maintain vision.

An appropriately sized pIOL should be chosen per the manufacturer’s recommendation based on meticulous preoperative assessment of the anatomical parameters. The anterior chamber depth should be 3.0 mm or deeper. As the haptics of the pIOL rest in the ciliary sulcus, in addition to 3 typography measurements for horizontal white-to-white measures, direct measurement of the sulcus-to-sulcus dimension using UBM would be helpful. A thorough anterior chamber wash should be performed after pIOL implantation to remove residual OVD, especially from behind the pIOL. All intracameral preparations such as miochol, lidocaine, and antibiotics should be carefully formulated.

Excessive postoperative inflammation should be meticulously assessed and adequately managed. Endophthalmitis should be prudently differentiated from TASS. Inappropriate and delayed treatment can have potentially sight-threatening consequences. Prompt diagnosis and management are the key to a successful outcome.

Figure 6. Slitlamp photograph at last follow-up showing clear corneal graft with Ahmed glaucoma valve with pars plana tube in situ (arrow).

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Figure 7. Humphrey visual fields 24-2 overview of the left eye showing largely stable fields over the duration of follow-up.
REFERENCES

1. Fernandes P, González-Méijome JM, Madrid-Costa D, Ferrer-Blasco T, Jorge J, Montés-Micó R. Implantable Collamer posterior chamber intraocular lenses: a review of potential complications. J Refract Surg 2011; 27:765–776

2. Kobashi H, Kamiya K, Igarashi A, Matsumura K, Komatsu M, Shimizu K. Long-term quality of life after posterior chamber phakic intraocular lens implantation and after wavefront-guided laser in situ keratomileusis for myopia. J Refract Surg 2014; 40:2019–2024

3. Simmons RJ. Malignant glaucoma. Br J Ophthalmol 1972; 56:263–272. Available at: http://bjo.bmj.com/content/56/3/263.full.pdf. Accessed July 29, 2016

4. Dave P, Senthil S, Rao HL, Garudadri CS. Treatment outcomes in malignant glaucoma. Ophthalmology 2013; 120:984–990

5. Huber KK, Maier A-KB, Klamann MKJ, Rottler J, Özügedik S, Rosenbaum K, Gonnermann J, Winterhalter S, Joussen AM. Glaucoma in penetrating keratoplasty: risk factors, management and outcome. Graefes Arch Clin Exp Ophthalmol 2013; 251:105–116

6. Tai M-C, Chen Y-H, Cheng J-H, Liang C-M, Chen J-T, Chen C-L, Lu D-W. Early Ahmed glaucoma valve implantation after penetrating keratoplasty leads to better outcomes in an Asian population with preexisting glaucoma. PloS ONE 2012; 7: e37867. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3357341/pdf/pone.0037867.pdf. Accessed July 29, 2016

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