
Viscoelastic levitation of posteriorly dislocated intraocular lenses from the anterior vitreous

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In 5 consecutive cases presenting between 2000 and 2001, Viscoat injected via a pars plana sclerotomy was used to support and levitate 5 posteriorly dislocated IOLs into the pupillary plane. All 5 IOLs had dislocated into the anterior vitreous. This technique permitted successful exchange or suture refixation of the dislocated IOLs through limbal incisions in all cases. Diabetic macular edema accounted for a visual acuity of 20/60 in 1 patient. In the other patients, there were no significant corneal or retinal complications from the surgery and each regained a best corrected visual acuity of 20/40 or better.

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Intraocular lenses (IOLs) that have dislocated into the anterior vitreous present the anterior segment surgeon with multiple challenges.¹ The vitreal location compromises visualization, particularly in eyes with small pupils. The IOL may be surrounded by formed vitreous, making it difficult to grasp or manipulate. If the vitreous is liquefied or has been removed, the IOL can drop posteriorly when capsule–haptic adhesions are surgically broken. During surgery, a vitrectomy or vitreous loss through the wound may also result in posterior descent of the IOL because of the loss of the remaining support. Lack of an accessible haptic to manipulate is a particularly difficult problem. In addition to plate-haptic lenses, this situation might arise if the entire bag–IOL complex dislocates, as in cases of trauma or pseudoexfoliation.

I present a technique to remove or reposition posteriorly dislocated IOLs using an anterior segment approach.

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Surgical Technique

All cases were videotaped. Anticipating the potential need for an IOL exchange, retrobulbar local anesthesia was used in all 5 cases.

The surgical technique is as follows: Multiple limbal paracentesis incisions are made to allow access for Lester hook manipulators. If mydriasis is inadequate, iris hook retractors are used to permit adequate visualization.

Sodium hyaluronate 3%–chondroitin sulfate 4% (Viscoat[®]) is injected behind the IOL through a pars plana sclerotomy in the following fashion: A small conjunctival incision is created at the intended site. After light cautery, a disposable #20 MVR blade (Alcon) is used to create a sclerotomy 3.5 mm posterior to the limbus. The Viscoat cannula is inserted until the tip is visualized in the pupillary plane. The Viscoat is slowly injected behind the IOL to support and levitate it toward the central pupillary plane. In cases in which the lens is centrally located, the cannula tip can be used to elevate the optic forward.

With the posterior support provided by the viscoelastic, the IOL is manipulated into a central position, where a haptic or an edge can be grasped or engaged. If the IOL is to be exchanged, additional viscoelastic is placed in front of the optic before it is removed through an adequately sized limbal incision. After an anterior vitrectomy is performed, a properly sized anterior chamber IOL is inserted with the aid of additional viscoelastic

material and a Sheet's glide. The pars plana sclerotomy is closed with a single 10-0 nylon suture.

Case Reports

Case 1

A 67-year-old white woman presented in May 2000 with sudden blurred vision in the right eye. Five years earlier, she had uneventful phacotrabeculectomy for pseudoexfoliation glaucoma. An SI-40 silicone IOL (Allergan) had been placed in the capsular bag. The best corrected visual acuity (BCVA) was 20/40, and the intraocular pressure (IOP) was 14 mm Hg with a functioning bleb. However, the entire capsular bag was posteriorly dislocated into the anterior vitreous. The superior IOL edge was visible through the undilated pupil.

The capsular bag-encapsulated IOL was removed via a limbal incision after the IOL was levitated anteriorly with a pars plana injection of Viscoat. Iris retractors were necessary because of poor intraoperative dilation. The capsulorhexis was intact and had constricted to a diameter of 3.5 mm. After an anterior vitrectomy was performed, an anterior chamber IOL was implanted. Postoperatively, the BCVA was 20/20 and the IOP was 13 mm Hg without medication.

Case 2

A 76-year-old white man with pseudoexfoliation presented in November 2000 with blurred vision in the right eye. Three and a half years earlier, an SI-40 silicone IOL had been implanted in this eye after uneventful phacoemulsification. The BCVA was 20/30, and the entire capsular bag was dislocated inferiorly and posteriorly with gross phacodonesis. The superior IOL edge was visible through the undilated pupil, and the IOL was suspended in the anterior vitreous.

The capsular bag-encapsulated IOL was removed via a limbal incision after the IOL was levitated anteriorly with a pars plana injection of Viscoat. Iris retractors were necessary because of inadequate mydriasis. The capsulorhexis was intact and had constricted to a diameter of 3.0 mm. After an anterior vitrectomy was performed, an anterior chamber IOL was implanted. Postoperatively, the BCVA was 20/20 and the IOP was 12 mm Hg.

Case 3

A 74-year-old East Indian woman presented in May 2000 with blurred vision in the left eye, which had cataract surgery 7 months earlier in India. The visual acuity was 20/200 with aphakic correction. The maximum pupil dilation was 3.0 mm. There was no visible capsule or IOL. There was gross cystoid macular edema. The visual acuity improved to 20/40 after a sub-Tenon's triamcinalone injection and 2 months of topical ketorolac and prednisolone acetate therapy.

At surgery, iris retraction revealed a posterior chamber IOL lying peripherally in the anterior vitreous. One end was

tipped very posteriorly, seemingly in contact with the pars plana. Viscoat was injected through a pars plana sclerotomy and directed beneath the IOL. This supported and prevented further descent of the IOL as it was manipulated centrally and brought out through the pupil. As the IOL was single-piece poly(methyl methacrylate) with unconventional haptics, it was removed. An anterior chamber IOL was inserted after an anterior vitrectomy was performed. Postoperatively, the BCVA was 20/40. The IOP was 24 mm Hg preoperatively, 28 mm Hg 1 day postoperatively, and 18 mm Hg at the last recorded measurement.

Case 4

A 66-year-old East Indian woman with diabetes was referred 5 days after having cataract surgery in the left eye. An MA60BM acrylic posterior chamber IOL (Alcon) had been placed in the ciliary sulcus at the time of surgery because of a capsule tear. The visual acuity was counting fingers, and the IOP was 35 mm Hg. The IOL had subluxated inferiorly with the superior edge of the optic aligned with the visual axis. Superiorly, there was a shelf of capsular support. None was present inferiorly, where the IOL was tipped posteriorly into the anterior vitreous. The pupil was peaked because of vitreous to the wound.

The patient had surgery 7 days after the cataract surgery. Upon initial manipulation, the IOL tended to slide farther inferiorly and appeared poised to sink posteriorly. Viscoat was injected through a pars plana sclerotomy to support the IOL from below. Because the IOL tended to tip on end, initial attempts to bring it forward through the pupil using Lester hooks failed. Finally, the Viscoat cannula was reinserted through the pars plana. As Viscoat was simultaneously injected, the cannula tip prolapsed the optic into the anterior chamber. The posterior chamber IOL was removed through a limbal incision. After an anterior vitrectomy was performed, an anterior chamber IOL was implanted through the same limbal incision.

Postoperatively, the IOP was 25 mm Hg on the first postoperative day and 19 mm Hg by the next visit. Six weeks postoperatively, the BCVA was 20/60 because of diabetic macular edema. Despite focal macular photocoagulation, the acuity remained 20/60 5 months postoperatively.

Case 5

A 51-year-old white man was referred in March 2001 for a dislocated posterior chamber IOL. The operative report indicated that an SI-30 silicone IOL (Allergan) had been inserted 2 years previously without complications. The visual acuity was 20/20 with +1.50 diopters (D); however, the patient reported edge glare. Pupil dilation was poor. The optic was dislocated superotemporally and was tipping posteriorly into the anterior vitreous. The optic edge was directly aligned with the visual axis. No central capsule was visible.

Because of edge glare, surgery was requested. Viscoat was injected via a pars plana sclerotomy and directed behind the

IOL. This supported, recentered, and levitated the optic forward into the pupillary axis. The temporal haptic was fixated where the anterior and posterior capsules had fused. The nasal haptic was free and mobile. After the pupil was constricted with acetylcholine (Miochol®), the optic was captured by prolapsing it forward through the pupil with the Viscoat cannula inserted via the pars plana sclerotomy. A McCannel technique was used to suture the haptic to the midperipheral iris stroma using 10-0 polypropylene suture on a CIF needle. The optic was then repositioned in the posterior chamber. No vitrectomy was performed.

The IOP rose from 21 mm Hg preoperatively to 26 mm Hg on the first postoperative day. The visual acuity was 20/25 with -0.50 D, and the final IOP was 17 mm Hg. The IOL optic was centered, and the pupil remained round and reactive.

Results

In the first 4 cases, the dislocated posterior chamber IOLs were successfully removed via a limbal incision. In each case, an anterior vitrectomy was performed before insertion of an anterior chamber IOL. In the fifth case, the dislocated IOL was fixated to the iris with a McCannel suture around the loose haptic. There were no intraoperative complications, specifically intraocular hemorrhage. One day after surgery, there were no cases in which the IOP increased more than 5 mm Hg compared with preoperatively (Table 1).

One patient with preexisting diabetic retinopathy continued to manifest diabetic macular edema postoperatively. The visual acuity was limited to 20/60 because of this. The remaining 4 eyes achieved a BCVA of 20/40 or better. There were no other postoperative corneal or retinal complications over a follow-up ranging from 3 to 13 months.

Discussion

In addition to trauma, there are several potential causes of delayed posterior dislocation of IOLs. Plate-haptic IOLs can dislocate after a neodymium:YAG (Nd:YAG) capsulotomy or extension of an anterior capsule defect created during surgery.^{2,3} Sutured posterior chamber IOLs can dislocate because of erosion or accidental cutting of the polypropylene suture. After posterior capsule rupture, a sulcus-placed IOL that is initially centered can subluxate or dislocate. Potential causes include insufficient overall IOL length, insufficient capsule support, and progressive capsule contractile forces.⁴

Jahan and coauthors⁵ report a series of 9 eyes with pseudoexfoliation in which delayed spontaneous dislocation of the entire capsular bag occurred 5 to 10 years after initial uneventful surgery. In our series, there were 2 such cases, occurring 3½ years and 5 years postoperatively. As in the Jahan and coauthor series, the initial surgeries were uneventful, although 1 had been combined with a trabeculectomy.

These cases with a dislocated capsular bag were particularly difficult to manage. In addition to being posteriorly dislocated into the anterior vitreous, the haptics were encased with the optic within the fibrotic capsular bag. This precluded suture refixation and made the haptics and the optic-haptic junction inaccessible to repositioning instruments. The pupil dilated poorly in all cases, and iris hooks were necessary for visualization and anterior delivery of the encapsulated IOL.

The 2 pseudoexfoliation cases were associated with an intact fibrotic capsulorhexis that had contracted to a diameter of approximately 3.5 mm around a 3-piece silicone IOL. Capsular phimosis is usually indicative of zonular weakness and insufficient centrifugal zonular

Table 1. Preoperative and postoperative BCVA and IOP.

Case	BCVA		IOP (mm Hg)		
	Preop	Postop	Preop	1 Day Postop	Last Follow-up
1	20/40	20/20	14	17	13
2	20/30	20/20	12	10	12
3	20/40	20/40	24	28	18
4	CF	20/60	35	25	19
5	20/20	20/25	21	26	17

CF = counting fingers

tension to oppose the sphincter-like contractile force of the capsulorhexis.^{6,7} Hayashi and coauthors⁸ found capsulorhexis contraction to be particularly prevalent in cases of pseudoexfoliation. Delayed, spontaneous dislocation of the bag might be caused by progressive zonular weakening or rupture resulting from the ongoing contraction. Indeed, this syndrome apparently does not occur after standard extracapsular cataract extraction with a can-opener capsulotomy. Given the association of pseudoexfoliation with zonular weakness,⁹ a precautionary strategy would be to reexamine these patients several months postoperatively. Considerable capsulorhexis contraction at an early stage might indicate significant zonular laxity, and prophylactic relaxing “sphincterotomies” of the fibrotic capsulorhexis edge could be performed with the Nd:YAG laser.¹⁰

The concept of posterior assisted levitation (PAL) was initially described by Kelman as a means of preventing the nucleus from descending after posterior capsule rupture (C. Kelman, MD, “New PAL Method May Save Difficult Cataract Cases,” *Ophthalmology Times*, November 1994, page 51). Kelman advocated using a cyclodialysis spatula through a pars plana sclerotomy to lift the nucleus from below. Packard describes injecting Viscoat in place of the spatula for this purpose (R. Packard, MD, “Technique Prevents Nucleus Drop Through Capsular Tear,” *Ocular Surgery News*, March 2001, page 14). Lewis and Sanchez¹¹ report using perfluorocarbon to levitate IOLs from the surface of the retina for removal or repositioning.

Once safely supported or levitated, the dislocated posterior chamber IOL can be repositioned, exchanged, or suture fixated.^{12–14} Several factors should be considered in deciding whether the original IOL should be retained. The iris should be retracted to allow direct visual assessment of the residual capsule and to rule out haptic damage. The IOL power and spherical refraction should be acceptable. The overall IOL length must be considered in relation to the corneal diameter. The overall length of most foldable IOLs is 12.5 to 13.0 mm; thus, they are too short for a large-diameter sulcus.

In the absence of adequate capsule support, consideration can be given to suturing 1 or both haptics to the sulcus or to the back of the iris using a McCannel approach.¹⁵ If the IOL is to be exchanged, an anterior chamber or sutured posterior chamber IOL¹⁶ can be

placed, depending on the ocular anatomy and surgeon preference.

Intraocular lenses that have dislocated into the posterior vitreous or onto the retinal surface should be retrieved by a vitreoretinal surgeon using a 3-port vitrectomy and the appropriate posterior segment viewing system. Preoperative assessment of the IOL location with supine positioning is important for this reason. Many techniques to suture an IOL into the ciliary sulcus through a pars plana incision after a pars plana vitrectomy and retrieval of a posteriorly dislocated IOL have been described.^{12–14,17–19} Replacement with an anterior chamber IOL may be preferable in many instances; however, this has the disadvantage of requiring a separate limbal incision.²⁰

This Viscoat levitation technique allows the anterior segment surgeon to retrieve an IOL from the anterior vitreous as long as it can be adequately visualized through the operating microscope. If necessary, the dislocated IOL can be removed and exchanged through a limbal incision. Manipulations of the IOL should be performed slowly to minimize traction on ensnared vitreous strands. Injecting an excessive volume of viscoelastic material could expel vitreous through the pars plana opening and should be avoided. If retained in the eye, low-molecular-weight, dispersive viscoelastic material such as Viscoat is less likely to elevate the IOP than higher molecular weight, cohesive agents.

Finally, pars plana injection of Viscoat can be considered for subluxated IOLs that are not dislocated into the vitreous. This might be useful in cases with a central posterior capsule defect and when a previous vitrectomy has been performed. In the absence of capsular or vitreous support, these IOLs are more likely to descend once their peripheral capsule-haptic adhesions are broken. Preliminary posterior injection of Viscoat can provide the safety support necessary to prevent this complication as the IOL is manipulated free.

In conclusion, posteriorly dislocated IOLs pose complex management problems. Intraocular lenses located in the anterior vitreous may be amenable to an anterior segment surgical approach. In this situation, an important objective is to avoid posterior descent of the lens onto the retina. The technique of a posteriorly directed Viscoat injection via a pars plana sclerotomy provides several advantages. First, the bolus of viscoelastic material supports and prevents the IOL from dropping

posteriorly during manipulation. Second, if the IOL is peripherally displaced, the Viscoat can be directed beneath the IOL without direct visualization of the entire optic. Finally, the viscoelastic material or the cannula tip can be used to levitate the optic into and through the pupillary plane.

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