Simplified small-incision peripheral iris fixation of an AcrySof intraocular lens in the absence of capsule support

Garry P. Condon, MD

In the absence of capsule and zonule support, the choices are an anterior chamber (AC) IOL or a sutured posterior chamber (PC) IOL. Despite refinements in design, AC IOL implantation appears less desirable due to the larger incision and greater potential for corneal decompensation and long-term inflammation.1 Alternatively, methods to fixate a PC IOL to the sclera are relatively complex, may result in lens tilt, and rely on the placement of permanent transscleral sutures with potential complications that include choroidal hemorrhage and late endophthalmitis.2–4 Scleral fixation of a small-incision foldable PC IOL may reduce astigmatism and accelerate visual recovery but does not eliminate the presence of transscleral sutures.5

In a large randomized trial of IOL fixation techniques during penetrating keratoplasty (PKP) in 176 patients, Schein et al.6 suggest that peripheral iris fixation is the most well-tolerated method of supporting a PC IOL in the absence of the capsule and zonule. They found the risk of macular edema to be significantly less in the iris fixation group than in the AC IOL or scleral fixation groups and conclude that scleral fixation of a PC IOL during PKP was associated with a greater risk for adverse outcome than iris fixation of a PC IOL. Using the peripheral iris as support for fixation of a PC IOL via a limbal incision, however, has been reported to be more technically demanding than AC IOL implantation or scleral fixation and has generally been reserved for open-sky surgery during PKP or for McCannel suture fixation of a subluxated preexisting PC IOL.7,8 With the following technique, secondary implantation and peripheral iris fixation of a 3-piece acrylic IOL can be achieved through a small self-sealing clear corneal incision.

Central to the technique is stabilization of the unfolded IOL as it is being sutured to the back surface of the iris in the absence of zonule and capsule support. The characteristic slow and controllable unfolding of the 3-piece acrylic AcrySof® IOL (Alcon) allows intentional capture of the optic with a small pupil as the optic unfolds above the iris plane and the haptics unfold below it. This achieves transient stabilization and centration of the IOL optic while the haptics, which expand...
into the PC, can be fixated to the peripheral iris using simple modified McCannel suturing. Prolapsing the captured optic posteriorly completes the insertion.

**Case Report**

A 66-year-old white man with a history of proliferative diabetic retinopathy and right eye cataract surgery complicated by vitreous loss, AC IOL insertion, and resultant chronic anterior uveitis despite ongoing topical corticosteroid presented for the management of uncontrolled intraocular pressure (IOP) that was unresponsive to medical therapy. Examination of the right eye revealed a best corrected visual acuity (BCVA) of 20/200 and an IOP of 34 mm Hg. The pupil was 4.0 mm, poorly reactive, and had an afferent defect. An open-loop AC IOL was oriented vertically and associated with iris tuck, moderate cell and flare, and scattered fine keratic precipitates. Gonioscopically, the angle was open with the exception of focal synechias adjacent to the haptics. There were marked optic disc cupping and pallor as well as chronic cystoid maculopathy associated with central retinal pigment epithelopathy. The phakic left eye had a visual acuity of 20/40 and an IOP of 16 mm Hg. Previous panretinal photocoagulation was evident bilaterally. Initial intervention consisted of frequent topical corticosteroid and nonsteroidal therapy followed by uneventful AC IOL removal temporally and trabeculectomy with mitomycin-C superiorly. Nine months later, the patient had a BCVA of 20/100, an IOP of 11 mm Hg, a quiet AC, and a diffuse 270-degree filtering bleb. Due to eventual intolerance of a contact lens and the aphakia, the patient requested secondary IOL implantation.

Secondary PC IOL implantation with peripheral iris fixation was performed via a small incision. In the 2 weeks after the procedure, the patient reported marked improvement in visual comfort with a BCVA of 20/100 and no corneal edema. At the 18-month follow-up, the patient had a quiet anterior segment, stable focal peripheral anterior synechias (PAS), a well-centered IOL with trace deposits, an IOP of 13 mm Hg and a diffuse bleb, and maintained 20/100 BCVA with a manifest refractive error of $-1.50 +1.50 \times 80$ (Figure 1). Postoperative keratometry revealed an increase in cylinder from $+1.00 \times 80$ to $+1.75 \times 78$.

**Surgical Technique**

The surgical approach aimed to leave the diffuse bleb and adjacent sclera undisturbed, thereby maintaining control of the advanced glaucoma. Topical pilocarpine 4% was applied beginning 30 minutes preoperatively followed by appropriate intravenous sedation and topical tetracaine 1%. A 3.5 mm clear corneal tunnel incision was made superotemporally with a 3.0 mm disposable keratome, avoiding the previous incision site. Preservative-free lidocaine hydrochloride 1.5% (Xylocaine®) and acetylcholine hydrochloride (Miochol®), 0.2 mL each, were placed in the AC. The chamber was deepened slightly with sodium hyaluronate 1.0% (ProVisc®, being careful to avoid posterior iris displacement and pupillary expansion. More viscoelastic material was placed behind the pupillary plane to tamponade the vitreous.

A 1.0 mm peripheral paracentesis was created 180 degrees from the corneal incision. A 3-piece acrylic MA60AC AcrySof IOL with a power reduced by 1.0 diopter from that calculated for in-the-bag placement was folded across the 3 to 9 o’clock meridian, creating a “bucket handle” or slight “mustache” haptic configuration, and held in a Fine III inserter (Rhein Medical 05-2339R) (Figure 2). The lead haptic was compressed gently against the edge of the optic as the IOL entered the incision, taking care to avoid haptic kinking. Once in the AC, both haptics were projected through the pupil while the optic was held just above the iris plane. The optic fold was relaxed slightly, and a Cleasby iris spatula (Storz E 0485-C), passed through the opposite paracentesis, was gently placed between the poles of the folded IOL (Figure 3). The IOL was slowly unfolded, allowing the haptics to extend behind the posterior iris surface while the optic, supported by the spatula above the iris plane, was completely captured by the pupil and stabilized (Figure 4). The spatula was removed.
To fixate each haptic to the peripheral iris, a 10-0 polypropylene suture on a long, curved needle (Ethicon CIF-4) was passed through an additional paracentesis perpendicular to the orientation of the peripheral haptic. Entering the AC with the needle via a paracentesis avoided distortion of the soft globe. Once in the chamber, the needle tip was passed through peripheral iris, behind the haptic, and out through the iris and peripheral cornea approximately 4 clock hours from the initial entry (Figure 5). A new paracentesis made directly over the haptic in peripheral cornea was used to retrieve both suture ends. The knot was initiated with a triple throw, and gentle traction was applied as the haptic was pulled toward the posterior cornea while the knot was completed and the suture trimmed. The second haptic was secured in the same manner (Figure 6). The optic was then prolapsed into the PC with a lens manipulator, and the viscoelastic material was removed with gentle irrigation/aspiration and low bottle height to avoid vitreous prolapse (Figure 7). All incisions were confirmed to be watertight and free of vitreous.
Postoperative medications included topical dexamethasone in combination with tobramycin (Tobra-Dex®) and ketorolac (Acular®) tapered over 8 weeks to continued use of prednisolone acetate 0.1% daily.

**Discussion**

Modifications of McCannel’s technique to secure PC IOL haptics to the peripheral iris have been successful in managing a subluxated PC IOL since the description in 1976. Until now, a simple method of combining concurrent small-incision foldable PC IOL insertion with McCannel’s suturing principles has, to my knowledge, not been reported. The primary intraoperative concerns with this technique are the potential for inadequate optic capture with failure to achieve temporary stabilization and the risk for losing the IOL posteriorly.

Achieving intraoperative pharmacological miosis to maintain optic capture is important. Any mydriasis associated with intracameral Xylocaine to augment topical anesthesia can be minimized using preoperative pilocarpine and intraoperative Miochol. Many aphakic eyes lack good pupil function, and preexisting pathologic mydriasis is probably best managed with pupilloplasty immediately prior to IOL insertion to ensure optic capture. If concurrent vitrectomy is planned, using only mild preoperative pupil dilation facilitates intraoperative miosis with intracameral Miochol. The “tacky” adherence of the AcrySof optic to the iris spatula appears to reduce the risk of “dropping” the IOL and allows excellent control of the optic while capture is being achieved. In 6 subsequent cases, a 3.0 mm wide lens glide placed through the incision and under the captured optic provided additional temporary support during suturing. After 22 consecutive cases similar to this one, there has not been an instance of posterior IOL loss.

So-called sulcus placement of the square-edged AcrySof, among others, has been cited as a cause of secondary pigment dispersion glaucoma. While some degree of immediate iris pigment epithelial loss occurs intraoperatively with iris fixation of a PC IOL, progres-
sive pigment dispersion glaucoma has not been identified as a common late complication with this form of fixation in 2 large series.\textsuperscript{6,7} An IOL fixated firmly to the posterior iris surface might not create as much recurrent sweeping pigment epithelial trauma as an undersized IOL floating loosely in the sulcus. This form of fixation is also more likely than scleral fixation to minimize PC IOL tilt. In this case, postoperative keratometry indicated that the manifest refractive cylinder was corneal and not due to lens tilt. More recently, a sliding knot technique described by Siepser\textsuperscript{10} has been used to tie the haptics to the iris. Sliding the knot entirely into the AC as it cinched appears to produce better haptic-to-iris fixation, which may reduce the risk of haptic slippage and late subluxation.

The formation of PAS overlying the angulated haptics of iris-fixed PC IOLs has been reported. This process has not been evident gonioscopically in this or subsequent patients. Chu and coauthors\textsuperscript{11} identified 4 of 7 eyes with preexisting PAS that demonstrated postoperative progression in the region over the haptics. However, they performed concurrent PKP and sutured the lens optic to the iris in all cases. That method might have produced greater anterior force on the peripheral iris by the angulated haptics. Fixating the angulated haptics to the peripheral iris may result in less anterior displacement of the peripheral iris, allow slight posterior lens vaulting, and reduce this complication. An acrylic IOL with planar haptics might be safer, if available. Follow-up of additional cases is required to evaluate this potential problem.

Although reported with all methods of IOL suture fixation, late polypropylene suture breakage appears less common in peripheral haptic-to-iris fixation than in transscleral fixation.\textsuperscript{12} Some cases of iris fixation of a poly(methyl methacrylate) (PMMA) optic have been reported in which the suture appeared to break where it contacted the sharp edge of a positioning hole.\textsuperscript{13} A polypropylene suture tying a smooth monofilament PMMA haptic to atonic peripheral iris tissue is likely to be in a less dynamic environment than one chafing on rigid PMMA material or one tied to the anterior sclera, where it can be stressed by simple eye rubbing. Rare late erosion of an iris suture into an iris vessel may result in transient hyphema (R.J. Mackool, MD, personal communication, 2002). Using the peripheral iris for fixation as described allows for reasonable physiologic and pharmacologic pupillary function if it existed preoperatively, as has been observed with peripheral McCannel suture fixation of a subluxed PC IOL.

References