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Iris-Sutured Posterior Chamber Intraocular Lens Implantation During Penetrating Keratoplasty

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Abstract

Purpose:
To evaluate the clinical indications and postoperative results of iris-sutured posterior chamber intraocular lens implants performed during penetrating keratoplasty.

Methods:
Medical records were retrospectively reviewed for preoperative indications and postoperative results of 342 consecutive patients (366 eyes) who underwent iris suturing of a posterior chamber intraocular lens implant during penetrating keratoplasty over a 9-year period.

Results:
Mean follow-up was 36 months. The principal indications for corneal transplantation were pseudophakic and aphakic bullous keratopathy. Mean postoperative best spectacle-corrected visual acuity was better than preoperatively at all measured time points ($P < 0.0001$) and improved from 20/474 preoperatively to 20/85 at 1 year. Nine eyes (7.7%) with known preoperative glaucoma required escalation of therapy by medication or surgery to control the intraocular pressure. Seventy-two eyes (29%) without known preoperative glaucoma required treatment of elevated intraocular pressure. Seventy-nine eyes (28%) without known preoperative cystoid macular edema were additionally diagnosed. Mean endothelial cell counts declined throughout the study time frame. Corneal donor rejection episodes occurred in 36 (9.8%) eyes, with the majority having a single episode. Overall, 27 (7.4%) eyes had known graft failure at last follow-up. Two eyes (0.5%) were enucleated following wound disruption.

Conclusions:
These long-term results of iris-sutured posterior chamber intraocular lens implants performed during penetrating keratoplasty suggest acceptable visual acuity, graft survival, and complication rates. They are similar to published retrospective and prospective results of flexible open-loop anterior chamber and transsclerally-sutured posterior chamber intraocular lens implants placed during penetrating keratoplasty.

Key Words: penetrating keratoplasty, iris-sutured intraocular lenses, intraocular lens

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Corneal edema following cataract surgery remains a significant indication for penetrating keratoplasty[1–3] in spite of decreased usage of closed-loop anterior chamber intraocular lenses (ACIOLs) and other lens types associated with pseudophakic bullous keratopathy. During penetrating keratoplasty (PKP), it is generally advantageous to leave the operated eye pseudophakic, given the optical advantages of intraocular lenses (IOLs). Additionally, the typical patient requiring this procedure is often older and poorly tolerates contact lenses and aphakia. Clinical experience in the 1980s[4–11] suggested that closed-loop ACIOLs and unstable IOLs should be removed at the time of PKP. Frequently, the absence of posterior capsular support complicates intraocular lens implantation during PKP. In this circumstance, the surgical options for pseudophakia include (1) placement of a flexible, open-loop ACIOL in the anterior chamber angle, (2) placement of a posterior chamber intraocular lens (PCIOL) with iris-fixation sutures, or (3) placement of a PCIOL with transscleral-fixation sutures. There is currently no consensus as to which of these methods is optimal; however, the status of the anterior chamber, especially in regard to angle structures and the iris, are important in the decision-making process. We report our long-term results with iris-sutured PCIOLs at the time of penetrating keratoplasty.

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MATERIALS AND METHODS

The clinical records of 342 consecutive patients (366 eyes) who underwent iris-fixated PCIOL implantation during penetrating keratoplasty from 1986 to 1995 at a single referral-based institution were included. Institutional Review Board approval was not required when this project was initiated. Medical records were retrospectively surveyed, and data from the 6-month time point postoperatively and at each yearly anniversary from the date of the procedure were entered into a spreadsheet. Clinical outcome measurements included best spectacle-corrected visual acuity (BSCVA), refraction, keratometry (K), endothelial cell count, intraocular pressure (IOP), corneal graft clarity and vascularity, presence of age-related macular degeneration (ARMD), glaucoma, cystoid macular edema (CME), peripheral anterior synechiae (PAS), and postoperative procedures, complications, and rejection. Graft failure was defined as a persistently cloudy cornea, either from vascularization of the donor and/or observed or presumed immunologic reactions. Glaucoma was defined by the presence of characteristic optic nerve and visual field changes. Elevated intraocular pressure was defined as consistent elevation of the IOP above 21 mm Hg. Clinically evident CME was defined by characteristic intraretinal foveal cysts. When not readily observed, fluorescein angiography was used to confirm the diagnosis.

The primary endpoint for the study was graft failure, with secondary endpoints of enucleation and patient mortality. Statistical analyses were performed using Statistica software (StatSoft, Inc, Tulsa, OK). Before averaging and analyzing, visual acuity data were converted into logMAR equivalents and then reconverted to Snellen equivalents afterward. When necessary, nonparametric tests (ie, Mann-Whitney *U* test) were used. A P value <0.05 was considered significant. Bonferroni and Scheffe post-hoc comparison tests were used to verify all significant P values, and the least significant P value is reported.

Surgical Technique

The method of secondary iris-sutured PCIOL implantation at the time of keratoplasty has been described previously.[12–14] Briefly, after retrobulbar or, rarely, general anesthesia was initiated, keratoplasty was begun with a scleral support ring, and the host cornea was removed with a trephine. A meticulous anterior vitrectomy and lysis of peripheral anterior synechiae was performed as needed. If present, the previous intraocular lens implant was removed in the least traumatic fashion possible. Occasionally this necessitated leaving an iris-encapsulated IOL haptic in situ. An iris-sutured PCIOL was considered if enough iris tissue was present to allow a pupil diameter of 5 mm or less in one axis. A four-positioning-hole PCIOL, which may no longer be available in the United States, was affixed to the midperipheral iris with two 10-0 polypropylene sutures. Sutures were generally placed vertically, midway between the pupil margin and the iridocorneal angle, but varied in location depending on available iris tissue. The typically 0.5-mm oversized corneal donor tissue was then sutured to the host bed with interrupted and/or running sutures.

RESULTS

Patient Factors, Indications, and Surgical Factors

Patient demographics are summarized in (Table 1). The mean age at time of PKP was 75 years (median 76 years, standard deviation 8.64, range 39–97 years). The majority of eyes were pseudophakic and in female patients. The principal indication for penetrating keratoplasty in this series was pseudophakic or aphakic bullous keratopathy. Of the next most common indication, previously failed PKPs, the most common initial indication for PKP, was also pseudophakic bullous keratopathy. The most common preexisting ocular conditions were glaucoma and CME. The most common prior ocular procedures, other than cataract ex-

TABLE 1. Patient Demographics

	#	%	Median
Eyes	366		
Patients	342		
Age			76
Female	223	60.9	77
Male	143	39.1	73
Systemic disease	# pts	%	
HTN	111	30.3	
Diabetes	26	7.1	
Both	33	9.0	
Indications (some eyes had overlapping diagnoses)	# eyes	%	
PBK/ABK	301	82.2	
Fuchs	22	6.0	
Corneal ulcer	6	1.6	
Keratoconus	3	0.8	
Other	1	0.3	
Failed Graft	48	13.1	
Host lens status	# eyes	%	
Pseudophakic	313	85.5	
Aphakic	42	11.5	
Phakic	11	3.0	
Other pre-existing ocular conditions			
Glaucoma	117	32.0	
Cystoid macular edema	84	23.0	
ARMD	20	5.5	
Dry eye/tear insufficiency	15	4.1	
Iritis/uveitis	9	2.5	
Retinal tear/detach/scar/hole	9	2.5	
Amblyopia	6	1.6	
Trauma	5	1.4	
Diabetic retinopathy	4	1.1	
Vascular occlusion	2	0.5	
Other	3	1.2	

#, number; %, percent; pts, patients; PBK, pseudophakic bullous keratopathy; ABK, aphakic bullous keratopathy; Fuchs, Fuchs corneal endothelial dystrophy; ARMD, age-related macular degeneration.

traction, were PKP in 13%, IOL reposition/exchange/removal in 7.7%, and scleral buckle in 6% of eyes. The mean interval from cataract extraction to the surgical procedure was 91.5 months (standard deviation 51.72).

Specific intraoperative surgical factors are detailed in (Table 2). All but 3 penetrating keratoplasties with iris-sutured PCIOLs were performed by A.S., R.F.M., or H.K.S. Intraoperatively, anterior vitrectomy and lysis of peripheral anterior synechiae accompanied penetrating keratoplasty in 84.2% and 10.7% of eyes, respectively. The majority of grafts were 8.5-mm donor buttons oversized to close an 8.0-mm host incision with a double-running suture technique.

Follow-Up

Mean follow-up from the date of the penetrating keratoplasty was 37.7 months (median 33 months, range <6 months to 102 months, standard deviation 25.4). The attrition rate progressed at each postoperative time point, with 346 (94.5%) eyes having at

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TABLE 2. Surgical Technique

	# Eyes	%
Graft size (mm)		
Donor 8.5/Host 8.0	331	90.4
Donor 8.0/Host 7.5	34	9.3
Other	1	0.3
Anterior vitrectomy		
Yes	308	84.1
No	57	15.6
Unknown	1	0.3
Suture technique		
Double-running	276	75.4
Interrupted & running	77	21.0
Interrupted	5	1.4
Running	2	0.5
Unknown	6	1.6
Lysis of PAS		
Yes	39	10.7
No	327	89.3
Explanted IOL		
Closed-loop AC	174	55.6
Iris supported	80	25.6
Open-loop and rigid AC	52	16.6
PC	3	0.9
Miscellaneous/unknown	4	1.3
Model of secondary IOL		
107G	295	80.6
71UV	45	12.3
105Q	25	6.8
Other	1	0.3

#, number; %, percent; mm, millimeters; PAS, peripheral anterior synechiae; IOL, intraocular lens; AC, anterior chamber; PC, posterior chamber.

least 6 months of postoperative follow-up, 326 (89.1%) eyes having at least 1 year, and 84 (23%) eyes having 5 years or longer follow-up. Twenty-seven eyes (7.4% of total) reached the primary endpoint of graft failure, and 2 eyes (0.5%) and 15 eyes (4.1%) reached the secondary endpoints of enucleation and patient mortality, respectively. One hundred two eyes (27.9%) did not reach any endpoints and had complete postoperative follow-up for the time frame studied. The remaining 220 eyes did not reach any endpoints, and the reasons for discontinuation of follow-up were unknown in 188 eyes (51.4% of total), referral to another physician in 27 eyes (7.4%), and poor medical health precluding further follow-up in 5 eyes (1.4%).

Vision

Best spectacle-corrected visual acuity improved on average from 20/474 (median 20/399) preoperatively to 20/85 at 1 year (median 20/50), as shown in (Fig. 1). Slow improvement in BSCVA occurred over the remainder of the study time frame with average visual acuity in the range of 20/60 to 20/70 (median 20/40 to 20/50). Mean postoperative BSCVA was significantly better than preoperatively at all time points ($P < 0.0001$). Excluding eyes without at least 6 months of follow-up, 74.9% of these 346 eyes had improved vision, 10.4% had stable vision, and 14.7% had worsened vision at the last follow-up visit. Of the 326 eyes with at least 1 year of follow-up, BSCVA at 1 year postoperatively was improved at least 1 line in 82.5%, stable in 8.6%, and worsened in 8.9%. Most of eyes had a greater than 2-line improvement in BSCVA at 1 year relative to their preoperative state (Fig. 2). In the eyes with worsened acuity at 1 year, mean BSCVA dropped from ap-

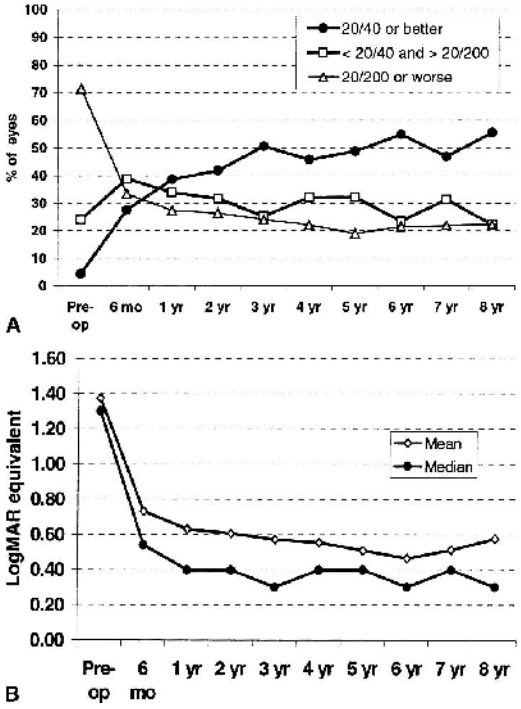

FIGURE 1. a, Best spectacle-corrected visual acuity, categorized by group (pre-op, preoperatively; mo, months; yr, years). b, Best spectacle-corrected visual acuity, all eyes.

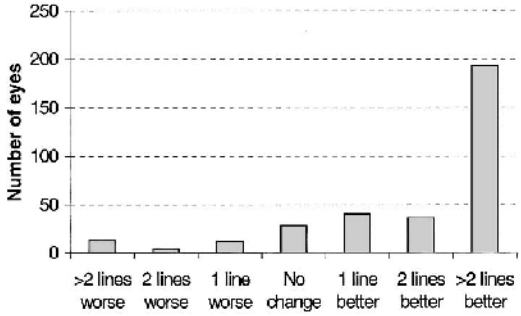

FIGURE 2. Snellen best spectacle-corrected visual acuity at 1 year relative to preoperatively.

proximately 20/92 (median 20/60) preoperatively to 20/335 (median 20/200).

Not unexpectedly, there was significantly greater keratometric astigmatism at all postoperative time points relative to baseline ($P < 0.01$), as shown in (Fig. 3). However, neither manifest nor total keratometric astigmatism correlated with BSCVA. Total keratometric astigmatism doubled from approximately 2 diopters preoperatively to 4 diopters in the first year postoperatively. Over the next few years this gradually increased to nearly 6 diopters with an associated overall increase in mean keratometry values; that is, the corneas became steeper on average over time. Complete suture removal occurred by 3 years postoperatively in the majority of eyes followed.

Glaucoma and Elevated Intraocular Pressure

Glaucoma was present preoperatively in 117 eyes (32% of eyes) and was associated with relatively poorer baseline mean BSCVA (20/365 vs 20/271, $P = 0.02$). The diagnosis of glaucoma was also associated with relatively poorer mean BSCVA at 1 year (20/97 vs 20/67, $P < 0.02$) but not at other time points. Of the eyes with glaucoma at baseline, fairly equal numbers required escalation in therapy as those who required less therapy at each time point. Nine eyes (7.7%) required escalation in therapy by either increasing the number of medications or by surgery. Ultimately, 12 (3.3%) of all 366 eyes required a surgical procedure (trabeculectomy, tube/shunt, or cycloablation) to adequately control intraocular pressure. Of those eyes requiring a surgical procedure, 58% had known preoperative

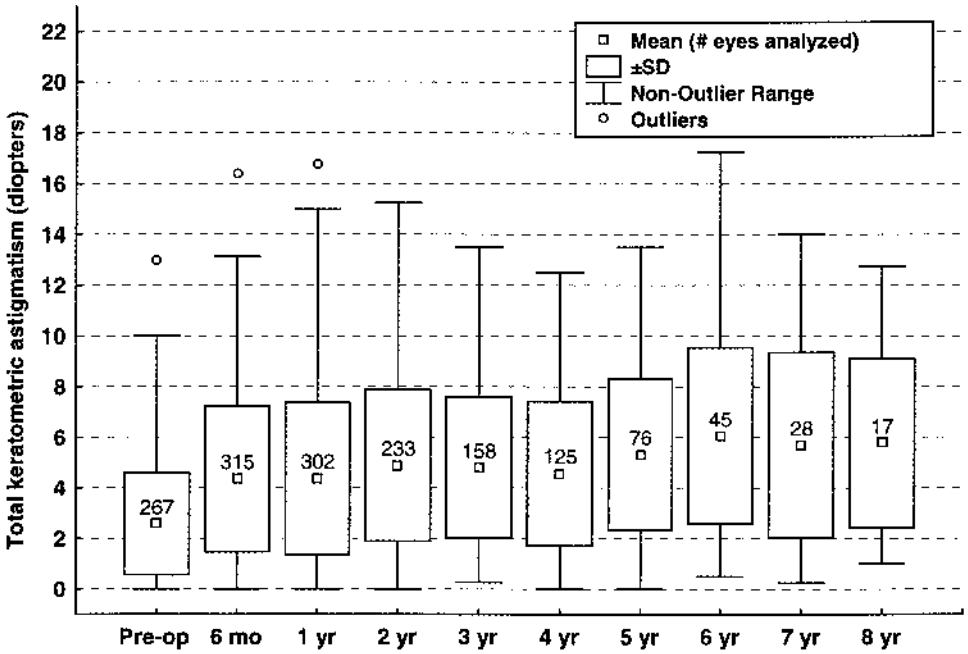

FIGURE 3. Keratometric astigmatism over time (SD, standard deviation; pre-op, preoperatively; mo, months; yr, years).

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glaucoma vs 42% that were newly diagnosed, but this difference was not statistically significant ($P = 0.44$).

Of the 249 eyes without known preoperative glaucoma, 72 eyes (29%) required treatment of elevated IOP postoperatively. Fifty-seven of the 72 eyes were diagnosed during the first postoperative year, representing 78% of eyes requiring treatment of presumably new-onset elevated IOP. At 6 months and 1 year, eyes with PAS had higher mean IOP than those without PAS ($P < 0.01$ and $P = 0.03$, respectively). This association decreased over time, perhaps as eyes with PAS received more medications throughout the first 4 postoperative years than those without PAS (6 months to 2 years, $P < 0.001$; 3 years, $P < 0.03$; 4 years, $P < 0.01$).

Cystoid Macular Edema

Preoperatively, 23% of all eyes had clinically evident CME. Of the 282 eyes without known preoperative CME, 79 eyes (28%) were diagnosed with clinically evident CME postoperatively. Sixty-eight of the 79 eyes were diagnosed during the first postoperative year, representing 86.1% of all newly-diagnosed and presumably new-onset postoperative CME. Fifty-eight of the 65 eyes (89.2%) with known preoperative CME had at least 1 year of follow-up, and of these eyes, 38 (65.5%) had persistent CME at 1 year. Eyes with preoperative CME had relatively worse BSCVA for the first 2 years postoperatively (20/141 vs 20/88 at 6 months; 20/114 vs 20/71 at 1 year; 20/113 vs 20/65 at 2 years; $P < 0.02$ for all) than those without preoperative CME. Likewise, the presence of CME throughout the first 6 years postoperatively was associated with relatively poorer BSCVA than those eyes without CME (20/153 vs 20/76 at 6 months, $P < 0.0001$; 20/145 vs 20/59 at 1 year, $P < 0.0001$; 20/157 vs 20/53 at 2 years, $P < 0.0001$; 20/108 vs 20/51 at 3 years, $P = 0.001$; 20/116 vs 20/53 at 4 years, $P = 0.0024$; 20/127 vs 20/46 at 5 years, $P = 0.006$; 20/154 vs 20/44 at 6 years, $P < 0.001$). A multivariate analysis did not yield intraoperative surgical factors associated with preoperative or postoperative CME.

Age-Related Macular Degeneration

ARMD was detected in 5.5% of preoperative eyes. Of the 346 eyes without known preoperative ARMD, an additional 23 eyes (6.6%) were diagnosed, mostly in the first postoperative year. ARMD was associated with older mean patient age preoperatively (80.8 vs 75 years, $P < 0.01$). Eyes with preoperative ARMD had relatively worse BSCVA for the first 4 years postoperatively (20/247 vs 20/90 at 6 months; 20/213 vs 20/73 at 1 year; 20/220 vs 20/68 at 2 years; 20/233 vs 20/64 at 3 years; 20/419 vs 20/63 at 4 years; $P < 0.001$ for all). Similarly, the presence of ARMD at each time point for the first 4 years postoperatively was associated with relatively worse BSCVA than those eyes without ARMD (20/233 vs 20/85 at 6 months, $P < 0.001$; 20/156 vs 20/71 at 1 year, $P < 0.001$; 20/168 vs 20/65 at 2 years, $P = 0.001$; 20/121 vs 20/59 at 3 years, $P = 0.03$; 20/149 vs 20/59 at 4 years, $P < 0.01$).

Endothelial Cell Loss, Graft Failure, and Rejection

Mean and median endothelial cell counts (cells/mm^2) declined throughout the course of the study time period (Fig. 4). The rate of endothelial cell loss appeared nonlinear and was greater over the first 3 years postoperatively (8–13% loss/year) than subsequent years (~4–6% loss/year). Graft failure occurred in 7 eyes at 6 months, 7 eyes at 1 year, 7 eyes at 2 years, 4 eyes at 3 years, 1 eye at 4 years and 1 eye at 5 years (mean 1.6 years, standard deviation 1.1). At last follow-up, 7.4% of grafts had failed. Eyes that had a previously failed graft were more likely to have a failed graft compared with first-time transplants at 1 year (7.5% vs 1.5%, $P < 0.02$) but not at other time points.

Corneal donor rejection episodes occurred in 36 eyes (9.8% of total). Twenty-six eyes (7.1%) had a single episode, 9 eyes (2.4%) had 2 episodes and 1 eye (0.3%) had 4

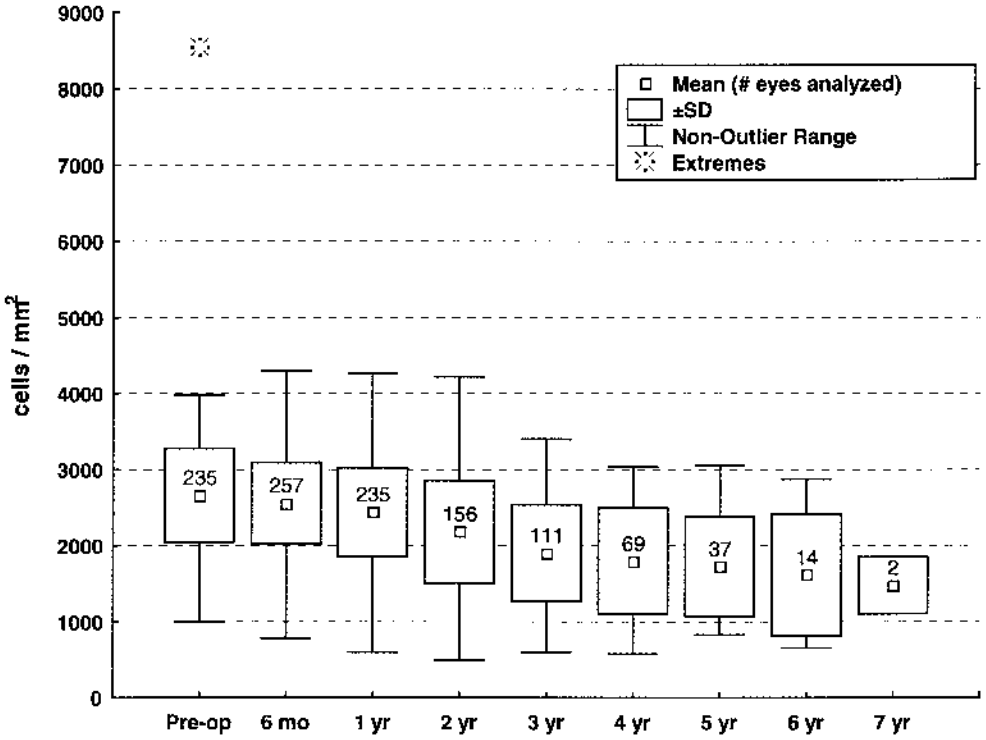

FIGURE 4. Endothelial cell counts (pre-op, preoperatively; mo, months; yr, years).

episodes. Isolated endothelial rejection occurred in 34 eyes (94.4%), and combinations of endothelial with stromal/subepithelial rejection accounted for the other 2 eyes (5.6%). The interval to initial rejection averaged 16 months (median 12 months). Thirty-seven percent of initial episodes occurred within the first 6 postoperative months, 57% within 1 year, 80% within 2 years, and 91% within 3 years. A first-time episode of rejection occurred as late as 5 years postoperatively. Fifteen of the 36 eyes (41.7%) with observed donor rejection eventually succumbed to graft failure by last follow-up visit, accounting for 55.6% of all graft failures.

Additional Procedures and Complications

The most common secondary procedures were for dry eye therapy (Table 3). Complications, other than those mentioned above, are outlined in (Table 4). Of note, no lens dislocations, decentrations, or suture erosions were noted throughout the course of the study time frame. Eight eyes (2.2% of total) required wound repair for dehiscence, all within the first 6 months postoperatively, and half were associated with trauma. Although the majority of these eyes had partial suture removal, none had complete suture removal. Two eyes (0.5% of total) were enucleated. Both eyes had worse than 20/200 vision before penetrating keratoplasty and were enucleated at 6 months following wound disruption.

TABLE 3. Additional/Ancillary Procedures

	# Eyes	%
None	311	85
Dry eye therapy (punctal occlusion/tarsorrhaphy)	21	5.7
Glaucoma procedure (filter, cycloablation, tube)	12	3.3
Refractive (astigmatic keratotomy)	8	2.2
Wound repair	8	2.2
Scleral buckle	5	1.4
Enucleation	2	0.5
Conjunctival flap for ulcer	1	0.3

Some eyes had multiple procedures.

TABLE 4. Other Complications

Type of Complication	# Eyes	% Total
Corneal ulcer	16	4.4
Wound disruption/perforation	9	2.5
Retinal detachment	9	2.5
Hyphema	7	1.9
Endophthalmitis	6	1.6
Herpetic keratitis	2	0.5
Enucleation	2	0.5
Uveitis	1	0.3
Vitreous hemorrhage	1	0.3
Other	3	0.8

DISCUSSION

The most appropriate method of secondary intraocular lens implantation (or exchange) at the time of penetrating keratoplasty in the absence of capsular support is not known. The only prospective, randomized controlled trial on this subject suggested a lower complication rate with iris-sutured PCIOLs relative to transscleral-sutured PCIOLs after a relatively short follow-up period.[15] In this largest series to date of any secondary IOL implanted during penetrating keratoplasty, we report results of iris-sutured PCIOLs that appear comparable to other studies on ACIOLs[16–22], transsclerally sutured PCIOLs,[16,23–27] and iris-sutured PCIOLs[28–32] implanted during penetrating keratoplasty. However, care should be taken in generalizing or comparing these results to other studies. Importantly, the decision as to which IOL to place for each patient may introduce selection bias that could have affected the outcome. For example, patients without sufficient iris tissue may have been excluded, and angle deformities may have precluded ACIOL placement in others. Likewise, although eyes lost to follow-up for unknown reasons may mask higher complication or graft failure rates, the patients in this group were older on average, and mortality may be underreported.

Best spectacle-corrected visual acuity improved substantially in the majority of eyes. Because the primary endpoint in this study was graft failure, it is not unexpected that vision at the last follow-up visit was stable or worse in a quarter of eyes. Many of these eyes had years of improved BSCVA before their last follow-up. The increases in mean manifest and keratometric astigmatism following penetrating keratoplasty are well known, and our results are similar to those of a recently published trial.[33] The precise physiologic mechanism for this increase is not clear, but suture removal, healing, and contracture at the graft-host junction, or other unknown factors may be responsible. It is notable that neither mean manifest nor keratometric astigmatism correlated with BSCVA. Price[28] has reported similar visual acuity results, that is, 20/40 or better vision in approximately half of eyes, with iris-sutured PCIOLs implanted during PKP. In contrast, the largest series on ACIOLs[17] and scleral-fixated PCIOLs[23] implanted during PKP reported 20/40 or better visual acuity in 32.7% and 31%, respectively.

"Elevated intraocular pressure requiring additional medications" was fairly prevalent over the course of the study time frame. It is probably more appropriate not to categorically use the term "glaucoma" because many patients did not have corresponding optic nerve and visual field deficits. It should also not be assumed that the surgical procedure was necessarily the cause of the elevated intraocular pressure. Other factors to consider include the higher incidence of glaucoma in this population in general, falsely low intraocular pressure measurement before PKP from corneal edema, and preexisting anatomic abnormalities such as PAS. Indeed, similar rates of newly diagnosed glaucoma are found in other studies of secondary IOL implantation during PKP.[17,18,23,24] Also, although approximately 29% of eyes without known glaucoma were treated for elevated intraocular pressure, of those with known glaucoma, only 7.7% required an escalation of medications or surgery for adequate control. On the other hand, much of the elevation of intraocular pressure occurred during the first postoperative year, suggesting some causative role of the procedure or postopera-

tive care (eg, topical steroids). Likewise, approximately 10% of eyes had intraoperative lysis of PAS, and 15% of eyes had PAS at 1 year, perhaps also contributing to elevated intraocular pressure. An important consideration could also be pigment dispersion or chronic inflammation induced by the iris-sutured PCIOL.

Cystoid macular edema appears to be an important factor in the level of postoperative BSCVA. It resolved in a third of eyes with known preoperative CME; however, it persisted in the majority of eyes at 1 year. Likewise, this expected postoperative complication was diagnosed in 28% of eyes without known preoperative CME. This rate is higher than the 14% and 10% rates reported in the largest series on ACIOLs[17] and scleral-fixated PCIOLs[23] implanted during PKP. It is, however, important to differentiate "newly-diagnosed CME" from "new-onset CME." Preoperative diagnosis of CME was likely limited by corneal edema, and the condition was underdiagnosed. Of note as well, only a small fraction had postoperative fluorescein angiography confirmation of the CME. A factor that supports underestimation of preoperative CME is the incidence of newly diagnosed ARMD, also greatest in the first postoperative year. Its preoperative prevalence was likely also underestimated, given the poor view of the retina. Alternatively, it is possible that postoperative inflammatory mediators derived from chronic iris irritation as a result of the intraocular lens implant, or from other factors, could have led to a progression of both CME and ARMD.[34] Not unexpectedly, ARMD was an important factor in the level of postoperative BSCVA.

The overall percentage of known graft failures appeared slightly lower than those reported for ACIOL implantation at the time of PKP[17,19] and similar to those reported for transsclerally sutured PCIOLs.[23,24] The most important statistical association with graft failure at 1 year was a prior failed corneal transplant. Corneal donor rejection also resulted in graft failure in a sizable proportion of eyes. On the one hand, loss of follow-up on eyes and exclusion of eyes with graft failure may confound these data. On the other hand, because the majority of graft failures occurred in the first 3 years postoperatively, this may skew the rate of observed endothelial cell loss during this time frame.

It is difficult to separate complications of lens implantation (ie, CME and elevated intraocular pressure) from those of PKP alone. Although no IOL decentration, dislocation, or suture erosion was noted, the integrity of polypropylene sutures may be compromised after longer follow-up.[35] Given the average age of patients in this study, it is not predicted that this will be a significant complication for most eyes. In younger patient populations, however, this may be a more important consideration. Of interest, the suture erosion rates in this series appear much lower than that reported with scleral-fixated PCIOLs.[23–25] Perhaps the intraocular sequestration of the sutures with an iris-fixation technique delays degradation of the suture by inflammation or other factors.

Wound dehiscence and disruption, although fairly uncommon, is an important problem and resulted in the only eyes requiring enucleation. Wound dehiscence rates were lower and occurred earlier postoperatively than recently reported.[36] Although most initial episodes of corneal donor rejection also occurred within the first postoperative year, some occurred as late as 5 years postoperatively, similar to other reports.[37] Most cases of rejection were isolated and suppressed with intensive topical corticosteroids.

Although limited by its noncomparative retrospective design, this series provides new information on iris-fixated PCIOLs implanted at the time of penetrating keratoplasty. This technique appears to be a satisfactory method of visual rehabilitation. Similar to ACIOLs and transsclerally sutured PCIOLs implanted during PKP, this technique does not appear to adversely affect overall graft survival, and the long-term complication rates appear otherwise acceptable. In the absence of clear differences between the lens

styles and techniques, individual patient factors and surgeon preference should guide the decision-making process as to the most appropriate secondary IOL to be implanted during PKP.

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