Refractive Lens Exchange and High Myopia

Assessing the risk through a review of the literature.

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The desire for a life free of spectacle and contact lens correction is not limited to low and moderate myopes under the age of 40. The high myope with accommodative reserve may be a good candidate for phakic refractive lens implantation, and the presbyopic hyperope has become well recognized as a candidate for refractive lens exchange with an accommodating or multifocal IOL.[1] Ophthalmologists may view with skepticism, however, the candidacy of a myope over the age of 45 for refractive lens exchange.

Surgeons worry that presbyopic low myopes will not be satisfied with a simple trade of distance for near correction after bilateral LASIK or a compromise of depth perception with monovision, whereas a multifocal or accommodating IOL may not offer the same quality of near vision they already have without correction. Refractive lens exchange for moderate-to-high myopes may raise concerns about significant complications, especially retinal detachment (RD). In particular, eyes with long axial lengths and vitreoretinal changes consistent with axial myopia may be at a higher risk for RD after lens extraction and IOL implantation. A review of the published literature is helpful for evaluating this risk.

REVIEWING THE LITERATURE

Key Findings

In an often cited study, Colin et al[2] reported an 8.1% incidence of RD after 7 years in high myopes (> 12.00 D) undergoing refractive lens exchange. Their case series included 49 eyes with a total of four RDs. The first occurred in a male with an axial length of 30 mm and preoperative myopia of -20.00 D. The patient required preoperative Argon laser prophylaxis for peripheral retinal pathology and underwent refractive lens exchange at 30 years of age. His RD occurred 18 months after lens surgery. The other three RDs occurred after YAG laser capsulotomy. The two patients involved were both in their late 30s. Their eyes were not as extremely myopic and did not have preoperative retinal pathology, but the patients suffered RDs between 5.5 and 6 years after lens surgery and 1 to 2 years after YAG capsulotomy.

A striking feature of the study by Colin et al is the relationship of YAG capsulotomy to RD. Ranta et al[3] recently demonstrated that each millimeter increase in axial length raises the risk of RD after YAG capsulotomy by a factor of 1.5. Their findings also support the conclusion that approximately half of the RDs that occur after YAG capsulotomy result from new lesions (horseshoe tears), while the other half result from what they called “potentially antecedent small atrophic holes.” Unfortunately, preoperative prophylaxis cannot address horseshoe tears. The statistical methodology of the study by Ranta et al represents a good model for further research in that it quantifies risk in terms of axial length rather than diopters of myopia. To our knowledge, no one has suggested additional risk for RD due to extremely steep keratometry.

Focus on Current Practice

A review of the literature to help determine the actual risk of RD after lens surgery should be limited as much as possible to current techniques, such as small-incision lens extraction, capsulorhexis, and in-the-bag IOL placement. Sanders[4] recently pointed out that some of the publications cited in the literature employed techniques no longer representative of the standard of care. For example, Javitt[5] assumed an ultimate rate of RD of 7.5%, based on the earlier work of Barraquer et al.[6] The latter series, however, included 3% intracapsular lens extractions, whereas only nine of 165 eyes in the report by Barraquer et al received an IOL. Sanders suggested that the 1,372 subjects of 14 peer-reviewed articles who underwent refractive lens exchange by phacoemulsification with posterior chamber IOL implantation compose a more pertinent comparison group. RDs in this group numbered 14, for a cumulative rate of 1% (Table 1).

A still more recent publication by Fernandez-Vega et al[7] reported a retrospective case series of 190 eyes (107

TABLE 1. RETINAL DETACHMENT RATES IN PEER-REVIEWED SERIES OF CASES HAVING CLE BY PHACOEMULSIFICATION WITH POSTERIOR CHAMBER IOL IMPLANTATION

Authors	Number of Eyes (Patients)	Preop Mean Myopia (SD)	Range of Myopia (D)	Mean Age at Surgery (Y) (Range)	Mean F/U (Mo)	Range of F/U (Mo)	Number of RDs (%)	Other Vision-Threatening Complications	Type of Extraction	Loss of BSCVA (Other Than RD)
Ceschi, Artaria[10]	40	−14.5 (3.6)	NR	NR	45.9	17–118	0 (0)	1 (25%) CME	All phaco	No loss
Chastang and coauthors[11]	33 (19)	−19.5 (7.0)	−12 to −40	31.04 ± 5.5	27	NR	2 (6.1)	NR	All phaco	NR
Colin, Robinet[12]	52 (30)	−16.9 (3.26)	−12 to −23.75	36.2 (22–51)	NR	100% @ 1 Y	0 (0)	None	All phaco	1 (2%) SRNV
Colin and coauthors[13]	52 (30)	16.9 (3.26)	−12 to −23.75	36.2 (22–51)	NR	94% @ 4 Y	1 (1.9)	None	All phaco	1 (2%) SRNV; 5 patients require capsulotomy
Colin and coauthors[14]	52 (30)	−16.9 (3.26)	−12 to −23.75	36.2 (22–51)	NR	94% of 7 Y	4† (8.1)‡	None	All phaco	1 (2%) SRNV
Gris and coauthors[15]	46 (37)	16.5 (6.01)	NR	38 (28–56)	NR	6–15	1* (2.2)	None	I/A	No loss
Hycl, Filipec[16]	39 (26)	NR	−6 to −28	NR	NR	3–23	0 (0)	NR	All phaco	No loss
Izak and coauthors[17]	284	−15.96	NR	NR	37.6	NR	0 (0)	NR	All phaco	NR
Jiménez-Alfaro and coauthors[18]	26 (17)	−20.85	−12 to −33.75	42.1	NR	12–26	0 (0)	None	All phaco	No loss
Lee, Lee[19]	24 (16)	−16.6	−12 to −25.75	34.4	15	12–24	0 (0)	None	All phaco	No loss
Lyle, Jin[20]	31 (19)	−12.0	−8 to −20	45.5	21.7	5–57	0 (0)	None	All phaco	NR
Pucci et al.[21]	25	18.36 (3.01)	−12.75 to −24	41.6 (28–54)	42.92	39–49	1(4)	None	All phaco	1 case (4%) lost BSCVA, worsening myopic degeneration
Verzella[22]	736	NR	>10	NR	NR	NR	6 (0.8)	NR	All phaco	NR
Wang, Shi[23]	36 (26)	−13.11 (4.33)	NR	53.9 (36–67)	23.5	7–35	0 (0)	None	All phaco	NR
Total	1372*	—	—	—	—	—	14 (1.0)	—	—	—

BSCVA = best spectacle-corrected visual acuity; F/U = follow-up; NR = not reported; SRNV = subretinal neovascularization

*Colin series counted once

†One was bilateral (4 eyes of 3 patients)

‡Occurred in case with capsule rupture

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patients) with a minimum axial length of 26 mm that underwent refractive lens exchange with posterior chamber IOL implantation and had a mean follow-up of 4.78 years (range, 3.10 to 8.03 years). The surgical technique involved capsulorhexis, hydrodissection, phacoemulsification, and the insertion of a one-piece PMMA IOL through an enlarged 6.5-mm incision, with suture closure as needed. The reported YAG capsulotomy rate was 77.89% (148 eyes). An RD developed in four eyes with a mean axial length of 30.44 mm (range, 29.60 to 32.30 mm), all of which had undergone YAG capsulotomy. The overall incidence of RD was 2.1%.

A question arises as to the natural incidence of RD in high myopia without surgical intervention. An often quoted figure is 0.68% per year for myopia greater than -10.00 D.[8] This rate amounts to 3.25% over the 4.78-year mean follow-up period of the series studied by Fernandez-Vega et al.[7] Their reported rate of 2.1% for eyes undergoing refractive lens exchange actually compares favorably with the rate for unoperated eyes, as does the cumulative 1% rate quoted by Sanders.[4]

DRAWING CONCLUSIONS

Minimizing risk is critical to the success of refractive lens exchange and refractive surgery in general, because these are entirely elective procedures. Several conclusions emerge from the literature on RD after refractive lens exchange. First, careful preoperative examination and counseling should precede any decision to operate. Complete funduscopic examination with scleral depression and a determination of the state of the vitreous body are essential steps. The physician should consider referring the patient to a vitreoretinal specialist if any doubt emerges about the nature of a lesion or the indication for prophylaxis.

Second, the surgeon should strive for minimal disturbance of the intraocular environment. Microincisional techniques facilitate the maintenance of a stable chamber, construction of a round and centered capsulorhexis, effective cortical cleaving hydrodissection, efficient aspiration of lens material without the application of ultrasound energy, and safe bimanual cortical clean-up through two paracentesis-type incisions. A fresh, temporal, clear corneal incision may be constructed for the introduction of the IOL.

All incisions should be Seidel negative at the conclusion of the case.

Third, surgeons should avoid eventual YAG capsulotomy if possible. Constructing a capsulorhexis that completely overlies the edge of the IOL optic, using cortical cleaving hydrodissection, performing meticulous cortical clean-up, and implanting an IOL with a sharp posterior edge all facilitate the maintenance of a clear posterior capsule.

By following these guidelines, surgeons may be able to improve on the outcomes recently reported by Fernandez-Vega et al.[7] It is equally encouraging that none of the eyes that did experience an RD in that series lost a line of BCVA. Careful patient selection and follow-up will always improve outcomes. For now, the published literature demonstrates an acceptable safety profile for refractive lens exchange in high myopia. With the implantation of an accommodative or multifocal IOL and the use of concomitant limbal relaxing incisions, this procedure can also successfully address astigmatism and presbyopia among the highly myopic population. ■

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