Published in final edited form as:

J Cataract Refract Surg. 2009 June ; 35(6): 992–997. doi:10.1016/j.jcrs.2009.01.031.

Dissatisfaction after multifocal intraocular lens implantation

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Abstract

PURPOSE—To analyze the reasons for patient dissatisfaction after phacoemulsification with multifocal intraocular lens (IOL) implantation and the outcomes after intervention.

SETTING—Emory Eye Center, Atlanta, Georgia, USA.

METHODS—This retrospective review comprised eyes of patients dissatisfied with visual outcomes after multifocal IOL implantation. Outcomes analyzed included type of visual complaint, treatment modality for each complaint, and degree of clinical improvement after intervention.

RESULTS—Thirty-two patients (43 eyes) reported unwanted visual symptoms after multifocal IOL implantation, including in 28 eyes (65%) with an AcrySof ReSTOR IOL and 15 (35%) with a ReZoom IOL. Thirty patients (41 eyes) reported blurred vision, 15 (18 eyes) reported photic phenomena, and 13 (16 eyes) reported both. Causes of blurred vision included ametropia (12 eyes, 29%), dry eye syndrome (6 eyes, 15%), posterior capsule opacification (PCO) (22 eyes, 54%), and unexplained etiology (1 eye, 2%). Causes of photic phenomena included IOL decentration (2 eyes, 12%), retained lens fragment (1 eye, 6%), PCO (12 eyes, 66%), dry-eye syndrome (1 eye, 2%), and unexplained etiology (2 eyes, 11%). Photic phenomena attributed to PCO also caused blurred vision. Thirty-five eyes (81%) had improvement with conservative treatment. Five eyes (12%) did not have improvement despite treatment combinations. Three eyes (7%) required IOL exchange.

CONCLUSIONS—Complaints of blurred vision and photic phenomena after multifocal IOL implantation were effectively managed with appropriate treatment. Few eyes (7%) required IOL exchange. Neodymium:YAG capsulotomy should be delayed until it has been determined that IOL exchange will not be necessary.

Implantation of intraocular lenses (IOLs) that offer full refractive correction at all distances is the ideal goal for cataract and lens-based refractive surgery. At present, a variety of multifocal IOL styles are available. These include diffractive IOLs such as the AcrySof ReSTOR (Alcon Laboratories) and Tecnis (Abbott Medical Optics, formerly Advanced Medical Optics), zonal refractive IOLs such as the ReZoom (Abbott Medical Optics), pseudoaccommodating IOLs such as the Crystalens (Bausch & Lomb), and several new IOL designs on the horizon.^{1–14}

Many studies^{5,15–19} report comparable distance acuity between multifocal IOLs and monofocal IOLs and better near and intermediate vision with multifocal IOLs. However, decreased visual acuity and visual aberrations, such as glare, halos, and dysphotopsia, have also been reported.^{4,20–22}

The purpose of this study was to analyze and classify the reasons for patient dissatisfaction after multifocal IOL implantation presenting to a tertiary referral-based academic practice and to devise a symptom-specific treatment algorithm to maximize postoperative outcomes with minimally invasive treatment strategies.

PATIENTS AND METHODS

A retrospective review was conducted of 44 consecutive patients presenting to the Emory Eye Center Cornea Service with visual complaints after multifocal IOL implantation between January 2005 and October 2007. Patients included those who had surgery performed at Emory and those referred from outside facilities. Data collected included the type of IOL implanted, nature of the visual complaint, best spectacle-corrected visual acuity (BSCVA) before cataract surgery, key features of the clinical examination, cause of symptoms, nature of the treatment modality selected for each complaint, and presence or absence of clinical improvement after treatment. Visual complaints were categorized broadly as decreased vision at distance and/or near or photic phenomena (glare, halos, dysphotopsia). The commonly used term *dysphotopsia* is not in *Stedman's Medical Dictionary* or *Webster's Dictionary*; it has been adopted in the ophthalmology literature to mean a positive phenomenon (a perception of seeing lights, sparks, lines, or colors in the temporal visual field) or a negative phenomenon (eg, a dark crescent in the temporal visual field) with no attributable retinal or cerebral findings that is most likely related to an implanted IOL.^{23,24} Contrast sensitivity was not routinely measured in each patient and was therefore not included in the analysis.

RESULTS

The retrospective review comprised the medical records of 44 consecutive patients; 12 patients were excluded from the study because there was not adequate follow-up after intervention to determine the outcome of the treatment. Thus, 43 eyes of 32 patients were included in this study (Table 1). At presentation (after cataract surgery), the mean distance BSCVA was 20/26.8 (range 20/16 to 20/40). Of the 43 eyes, 41 (95%) had blurred vision (Table 2). There was decreased distance vision in 29 eyes (71%), decreased near vision in 29 eyes (71%), and decreased near and distance vision in 18 eyes (44%). Eighteen eyes (42%) had symptoms consistent with photic phenomena. After evaluation, the etiology of each patient's symptoms was determined (Table 3). The most common reason for blurred vision was posterior capsule opacification (PCO). Photic phenomena were attributed to PCO in 8 eyes.

The mean spherical equivalent (SE) refractive error in eyes with blurred vision was 0.01 diopter (D) $\pm$ 0.62 (SD). The mean SE was 0.023 D in cases of blurred vision that the physician attributed to refractive error and -0.021 D in cases of blurred vision attributed to

other causes (eg, PCO) ($P = .82$). However, eyes with blurred vision attributed to refractive error had 1.55 D of astigmatism compared with 0.53 D in the other eyes ($P = .0058$). Twenty-eight percent of eyes had residual astigmatism of 0.75 D or greater.

Several treatment modalities were used (Table 4), with 35 eyes (81%) experiencing clinical improvement after treatment. Cyclopentolate hydrochloride 2% was used to increase pupil size in 2 eyes with blurred vision and photic phenomena, while argon iridoplasty (0.5 sec, 500 mW, 500 μ m) was used to align the pupil with the optical center of the IOL in 1 eye. Thirty-four eyes (92%) required only 1 modality of treatment, while 3 (8%) eyes required more than 1 modality. Of the 3 eyes requiring multiple treatment modalities, 1 required keratorefractive surgery and laser capsulotomy and 2 required dry-eye management, brimonidine treatment, and laser capsulotomy.

Of the 5 eyes that failed treatment, 4 eyes had neodymium:YAG (Nd:YAG) laser capsulotomy, 3 for blurred vision and 1 for photic phenomenon. One of the 4 eyes also had received keratorefractive surgery without improvement, and 1 had IOL exchange for a monofocal IOL followed by laser capsulotomy with minimal to no improvement in symptoms. One eye with blurred vision did not improve with spectacle correction; however, the patient deferred further management. Despite having several minimally invasive techniques, 3 eyes (8%) required IOL exchange. All patients had improvement or resolution of symptoms after IOL exchange.

Based on the various treatment modalities used, an algorithm was developed for systematically evaluating and managing these patients (Figures 1 and 2). This algorithm was applied for both IOL styles.

DISCUSSION

The results in this study suggest that blurred vision is the leading cause of dissatisfaction among patients with multifocal IOLs. The etiology of blurred vision was attributed to ametropia and PCO in the majority of cases. Despite overall success with less invasive interventions, 7% of eyes required IOL exchange to resolve symptoms.

Dissatisfaction with the outcomes of multifocal IOL implantation has been reported by patients who do not achieve visual goals, have limited quality and sharpness of vision, or have new visual aberrations.^{1,4,5,7,9,17,18,25–27} A 2006 Cochrane review of multifocal IOLs⁴ found that photic phenomena are 3.5 times more likely with multifocal IOLs than with monofocal IOLs. By increasing the depth of field 2- to 3-fold with a multifocal IOL, contrast sensitivity can decrease up to 50%.^{4,20,21} In a study by Chiam et al.,¹⁶ 21.3% of patients with an AcrySof ReSTOR IOLs had moderate glare versus 7.5% of patients with monofocal IOLs. Pieh et al.²¹ report that halos can be created with multifocal IOLs under high-contrast conditions. Elgohary et al.²⁸ found that patients with multifocal IOLs presented with visual complaints and a less objective decrease in vision than their monofocal counterparts. In a study by Cillino et al.,¹⁹ patients reported higher visual function but a greater incidence of halos with multifocal IOLs. Of note in our series, many patients were referred to the Emory Cornea Service; thus, we were unable to determine the prevalence of patient dissatisfaction.

In addition, more patients in our study received AcrySof ReSTOR IOLs; however, we do not believe that this implies greater dissatisfaction with that particular IOL.

Our primary concern was that many patients dissatisfied with multifocal IOLs had Nd:YAG capsulotomy yet continued to have the same complaints. We found that 54% of eyes with blurred vision and 47% of eyes with photic phenomenon had significant PCO and had Nd:YAG capsulotomy. Previous studies commenting on the occurrence of PCO have variable results, with 19.4% of patients having early PCO in 1 study.²⁹ Despite the high percentage of patients with PCO, we strongly encourage surgeons to reserve Nd:YAG capsulotomy until all other causes of patient complaints are treated or ruled out because IOL exchange is necessary in rare cases and is significantly more challenging with an open posterior capsule. Surgeons should be especially aware of patient complaints arising from elements intrinsic to IOL design, which should generate complaints in the immediate postoperative period before PCO formation.

Proper postoperative management of visual complaints is necessary to maximize outcomes. A logical stepwise approach to diagnosis facilitates symptom resolution. First, our findings support previous studies^{25,30–33} reporting that postoperatively, patients with multifocal IOLs can be intolerant to even small degrees of ametropia, especially astigmatism. Blurred vision can occur from a small residual refractive error, including astigmatism, after IOL implantation. In these cases, spectacle correction or excimer laser corneal refractive surgery can improve visual acuity to the desired level and help patients function under various lighting conditions.^{20,21} Second, decreased visual acuity after cataract surgery can result from common etiologies such as an irregular corneal surface, keratoconjunctivitis sicca, corneal edema, and cystoid macular edema. These can be treated with standard methods. Third, multifocal IOL-specific issues, including IOL centration and photic phenomena, must be addressed in a manner unique to these IOLs.

Lens centration of the multifocal IOL optic with respect to the pupil influences patient outcomes.^{20,34} Argon laser iridoplasty was used successfully to align the pupil with the center of the IOL in 1 eye in our study, as previously described (E.D. Donnenfeld, MD, et al., “Argon Laser Iridoplasty to Improve Visual Function After Multifocal IOL Implantation,” presented at the ASCRS Symposium on Cataract, Intraocular Lens and Refractive Surgery, Chicago, Illinois, USA, April 2008). Decreased pupil size increases the sensitivity of multifocal IOLs to decentration.^{20,29,34–36} In addition, visual acuity correlates with pupil size; a larger pupil permits greater use of the multifocal IOL optic with zonal models and improved contrast sensitivity with diffractive models.^{20,37} Hayashi et al.²⁰ report decreased near visual acuity with pupils smaller than 4.5 mm in patients with zonal multifocal IOLs. In our study, cyclopentolate was used to dilate 2 eyes with the diffractive IOL and a small pupil; the treatment improved the patients’ symptoms. In contrast, 2 eyes with the zonal refractive IOL were treated effectively with brimonidine tartrate 0.2% to decrease glare symptoms. Brimonidine was used in the evening to decrease mydriasis at night and thus decrease photic phenomenon.^{34–36}

Based on the above clinical findings, we developed a treatment algorithm for evaluating patients with complaints after multifocal IOL implantation. First, the specific nature and

time course of the patient complaint must be ascertained. Refractive error is the most common and easiest issue to address. Anatomic abnormalities (eg, dry eye, macular edema) can be addressed with established management protocols. Intraocular lens decentration can be visualized at the slitlamp with relative ease, although the correlation between relatively mild decentration and symptoms remains uncertain. Thus, all patients reporting poor results with a multifocal IOL are first examined by the physician with the eye undilated. On dilated examination, the lens capsule and posterior segment can be visualized.

Despite use of this treatment algorithm, some patients may not achieve satisfactory visual results. We postulate that in many of these cases, the complaints are the result of inherent properties of the multifocal IOLs. Some patients require IOL exchange for a different type of multifocal IOL or for a monofocal IOL. Limited research has addressed the reasons for explantation of multifocal IOLs. In an American Society of Cataract and Refractive Surgery survey by Mamalis et al.,³⁸ 6% of explanted IOLs were multifocal; glare, incorrect IOL power, and dislocation were the main causes for explantation. In our study, 3 eyes had multifocal IOL exchange; 1 IOL was exchanged for another style of multifocal IOL, and 2 IOLs were exchanged for monofocal IOLs, with improvement in symptoms in all cases.

Given the high sensitivity of multifocal IOLs to minor ocular aberrations, preoperative selection of patients is crucial to patient satisfaction. Corneal scarring, an irregular corneal surface (as in Fuchs dystrophy), or retinal dysfunction (eg, epiretinal membrane, macular degeneration) are relative contraindications to multifocal IOL implantation because visual expectations may not be met.³⁹ Although factors such as dry-eye syndrome can be addressed preoperatively and managed, many causes for dissatisfaction, such as IOL decentration, postoperative pupil size, and PCO, cannot be addressed preoperatively and require evaluation and management postoperatively to maximize visual function.³⁹

The retrospective nature of this study and the inclusion of eyes referred from other facilities preclude analysis of the percentage of particular types of multifocal IOLs that lead to visual complaints. Furthermore, we cannot effectively compare different multifocal IOLs in terms of percentage of complaints, complaint type, or severity. Thus, we cannot comment on the comparative strengths and weaknesses of individual multifocal IOLs.

Our study size did not support an analysis of whether patient satisfaction was influenced by unilateral or bilateral implantation of multifocal IOLs, type of IOL implanted, or symmetry of the 2 IOLs (identical IOLs versus mix-and-match IOLs). Most surgeons advocate bilateral multifocal IOL implantation to achieve improved visual function.^{2,3,7} Bilateral implantation should be discussed preoperatively. If postoperative dissatisfaction continues despite a lack of clinical findings, current researchers speculate that some patients may adjust to the IOLs by neuroadaptation.³⁹

In summary, although most patients achieve spectacle independence with multifocal IOL implantation and are satisfied with their vision, some patients have unsatisfactory outcomes that are unique to multifocal IOLs. Many of these subjective complaints (photic phenomena and decreased quality of vision) and objective complaints (decreased visual acuity) can be effectively managed with a variety of minimally to moderately invasive treatment modalities

specific to each complaint, including excimer laser refractive surgery for residual ametropia, pharmacologic agents or laser iridoplasty for photic phenomena or IOL decentration, and Nd:YAG laser capsulotomy for early PCO. Nevertheless, in some cases, IOL repositioning or exchange may be necessary; thus, to the extent possible, Nd:YAG capsulotomy should be reserved until other causes have been eliminated.

Acknowledgments

Dr. Randleman is a consultant to Alcon, Allergan, and Ista. Dr. Stulting is a consultant to Alcon and Abbott Medical Optics. Dr. Woodward has no financial or proprietary interest in any material or method mentioned.

Supported in part by Research to Prevent Blindness, Inc., New York, New York, and the National Institutes of Health Core Grant P30 EYO6360, Bethesda, Maryland, USA.

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Figure 1.
Stepwise treatment algorithm to evaluate for blurred vision after multifocal IOL implantation.

Figure 2.
Stepwise treatment algorithm to evaluate for photic phenomenon after multifocal IOL implantation.

Table 1

Patient demographics.

Demographic	Value
Age (y)	
Mean	61
Range	49–74
Eyes, n (%)	
Male	14 (33)
Female	29 (66)
Mean preop sphere and cylinder	−1.02 & 0.65
Mean preop MRSE (D)	−0.70
ReSTOR IOL, eyes (%)	28 (65)
ReZoom IOL, eyes (%)	25 (35)
Symptoms, patients (%)	
Bilateral	11 (34)
Unilateral	21 (66)
Unilateral, but bilateral IOLs	7 (22) *

IOL = intraocular lens; MR = manifest refraction; MRSE = manifest refraction spherical equivalent

* One patient had 2 different types of IOL implanted

Table 2

Presenting symptoms after multifocal IOL implantation. *

Symptom	Eyes (%)		
	All Eyes (N = 43)	ReSTOR IOL Eyes (n = 28)	ReZoom IOL Eyes (n = 15)
Blurred vision	41 (95)	27 (96)	14 (93)
Photoc phenomenon	18 (42)	9 (32)	9 (60)
Blurred vision and photic phenomenon	16 (37)	8 (29)	8 (53)

IOL = intraocular lens

* Some patients reported both blurred vision and photic phenomena and were included in both categories

Table 3

Etiology of complaints after multifocal IOL implantation.

Complaint/Etiology	Eyes (%) [*]
Blurred vision (n = 41)	
Ametropia	12 (29)
Dry eye	6 (15)
PCO	22 (54)
Unexplained	1 (2)
Photoc phenomenon (n = 18)	
Dry eye	1 (5)
IOL decentration	2 (11)
Retained lens fragment	1 (5)
PCO	12 (67)
Unexplained	2 (11)
Multifactorial	17 (40)

IOL = intraocular lens; PCO = posterior capsule opacification

^{*} Some patients reported both blurred vision and photic phenomena and were included in both categories. The percentage represents the percentage of all eyes having the complaint

Table 4

Treatment modality in eyes with complaints after multifocal IOL implantation.

Treatment	Eyes (% of Total)
Glasses	7 (16)
Keratorefractive surgery	7 (16)
Dry-eye management	5 (12)
Nd:YAG capsulotomy *	15 (35)
Cyclopentolate HCl	2 (5)
Argon iridoplasty	1 (2)
Multiple modalities	3 (7)
No improvement with multiple modalities	5 (12)
Lens exchange	3 (7)

HCl = hydrochloride; Nd:YAG = neodymium YAG

* Twenty-two eyes had PCO and subsequent capsulotomy; however, in 5 eyes, capsulotomy plus other treatments yielded no improvement and 2 eyes required multiple treatment modalities