Clinical Optometry

Dovepress
open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

A study of monofocal intraocular lens (AcrySof®) in mini-monovision (MMV) and premium multifocal implantation of ReSTOR®

This article was published in the following Dove Press journal:
Clinical Optometry
1 April 2010
Number of times this article has been viewed

Ming Chen[1]
Mindy Chen[2]

[1]John A Burns School of Medicine, University of Hawaii, USA; [2]University of California, Irvine, USA

Abstract: We compared the AcrySof® monofocal intraocular lens (IOL) in mini-monovision (MMV) (n = 20) with the ReSTOR® multifocal IOL (n = 20) for glasses independence after cataract surgery. The ReSTOR IOL showed a significantly higher proportion of postoperative independence from glasses. The MMV formula monofocal AcrySof recipients with the same pre-op selection criteria as the ReSTOR achieved 20/30 and J3 without glasses post cataract surgery. AcrySof IOL can be a good alternative for those patients who cannot afford ReSTOR IOL and yet desire some degree of independence from glasses.

Keywords: cataract, cataract surgery, intraocular lens, AcrySof IOL, ReSTOR IOL, minimonovision, glasses independence

Introduction

Modern cataract surgery has progressed to refractive cataract surgery. Myopia, astigmatism, hyperopia and presbyopia can now all be corrected during cataract surgery. Independence from spectacle use has become a post-operative target following cataract surgery and can greatly enhance patients' quality of life.[1] The ReSTOR® (Alcon, Inc.) multifocal intraocular lens (IOL) can achieve a high percentage (85%) of 20/20 distant vision and J1 reading vision without corrective glasses.[2] However, the expense of these ReSTOR IOLs and the expertise required to implant them (perfection in phacoemulcification and experience in multifocal IOLs) can be a limiting factor in their use. The pre-op examinations of multifocal IOLs require topography, optical coherence tomography and pachymetry beside routine ones. Surgeons need to be skillful in phacoemulcification, IOL implantation and limbal relaxation incision. Additionally, these lenses may have optical irregularities such as glare and decreased contrast sensitivity.[3]

We know that monovision can produce 20/20 vision for the dominant eye (Plano) and J1 reading vision for the nondominant eye (–2.00 to –2.50). However, it may be difficult to tolerate for most patients because of the severity of anisometropia (more than 2 D difference between 2 eyes). Alternative strategies to achieve spectacle independence that can be well tolerated as suggested in the Cochrane systematic review[3] are mini-monovision (MMV) (nondominant eye –0.50 D to –1.25 D) and accommodative IOL. This is the descriptive study of the MMV of AcrySof® (Alcon, Inc.) SN60WF and multifocal ReSTOR SN60D3. The MMV in monofocal IOLs yields a high percentage of patient satisfaction with 20/30 and J3 vision without glasses similar to older styles of multifocal Array IOL.[4] The MMV monofocal IOL is usually covered by insurance and is relatively easy to implant even for inexperienced eye surgeons, and has less

Correspondence: Ming Chen
55 S. Kukui St. #c-109, Honolulu, Hawaii 96813
Email mingchen@hawaii.rr.com

Table 1 Descriptive characteristics of 40 intraocular lenses (IOL) recipients

	Mini monovision IOL (%)	ReSTOR IOL (%)
Sex		
Male	10 (25)	10 (25)
Female	10 (25)	10 (25)
Age		
50–60	3 (15)	3 (15)
61–70	7 (35)	9 (45)
>70	10 (50)	8 (40)

optical disturbance (clear optics without rings) compared to multifocal IOLs. In addition, since MMV IOLs recipients can tolerate anisometropia better than true monovision,[4] a postoperative vision of 20/30 distant and J3 reading without glasses may be satisfactory for most patients[5] who do not need to drive or do extensive reading.

Methods

All 40 patients included in the study were from the Ming Chen MD. Eye Clinic in Honolulu, Hawaii from January 2007 to May 2009. Twenty subjects were chosen for each variable. Those patients whose eyes showed major ocular pathology, including leukoma cornea or maculopathy and a cylinder over 0.75 D, were excluded (these are the criteria required by ReSTOR IOL). Twenty patients randomly selected from the group of patients who met the criteria and also had the MMV formula refraction (the dominant eye of between Plano and −0.50 spherical equivalents and −0.50 to −1.25 in the nondominant eye) 3 months post-op were included in the group of bilateral monofocal IOLs (AcrySof). Twenty patients who met the criteria and had between plano and 0.75 refraction 3 months post-op were in the group of bilateral ReSTOR IOLs. All 40 patients had bilateral uncomplicated cataract surgery by a single surgeon at one surgical center.

Vision was checked binocularly without glasses using a standard Snellen chart for distance and a near chart at 14 inches for near vision in the same illumination in the same exam room by the same technician who was masked for the study.

This study was approved by the Hawaii Pacific Health Institutional Review Board.

Results

As shown in Figure 1, the postoperative vision of MMV monofocal IOL and of ReSTOR IOL showed that all 40 patients achieved 20/30 distance vision and J3 visual acuity without glasses. There were no differences in proportions of the two groups in this comparison. However, a significantly higher proportion of the ReSTOR patients (19/20) 95% achieved glasses independence compared to the MMV group (7/20) 35% (Figure 2). In order to estimate the accuracy in the normal population of these two independent proportions, we calculated the standard error using the formula below. We are 95% confident that the true difference in proportions lies between 0.58 and 0.62 (confidence intervals (CI)). We conclude that the ReSTOR IOL recipients are significantly more glasses independent than the MMV recipients. In this study, we consider the patient is glasses independent if the patient declares independence from glasses.

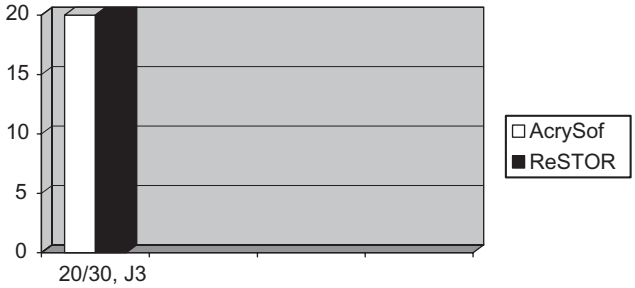

Figure 1 20/30, J3 vision in AcrySof and ReSTOR. There were 20 patients in each group.

Formula to estimate standard error (SE):

$$SE(p_1 - p_2) = \sqrt{\frac{p_1 \times (1 - p_1)}{N_1} + \frac{p_2 \times (1 - p_2)}{N_2}}$$

$P_1 = 0.95$ $P_2 = 0.35$ $N_1 = 20$ $N_2 = 20$, $SE = 0.013$

95% CI for true P (the estimate of the proportion) is 0.6+ or -1.96×0.013 from 0.58 to 0.62.

Discussion

With the current high cost of premium multifocal IOLs and a sagging economy, patients take into careful consideration the cost of ophthalmic surgery with an expensive lens versus

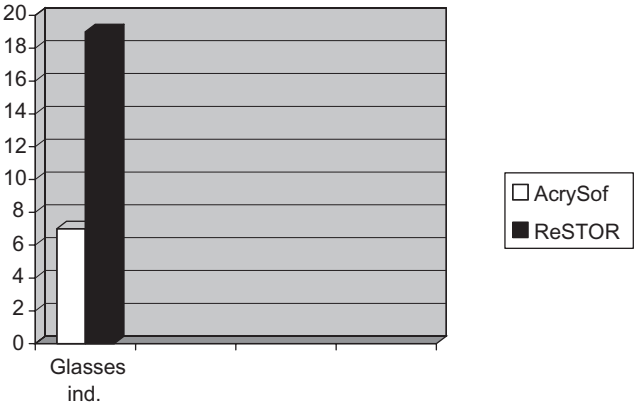

Figure 2 Glasses independence.

the value of having good visual acuity for the rest of their life. While some subjects enjoy a lifestyle where glasses independence via multifocal IOLs is a necessity, this study suggests that monofocal IOLs are usually affordable and consistently successful in restoring visual acuity of 20/30 and the ability to read J3 without glasses.[4] Two years ago,[4] we compared in the same setting MMV and Array multifocal (same price as MMV), which showed similar outcomes in MMV and Array multifocal in glasses independence by achieving 20/30, J3 vision without glasses. However, the reported outcome of 19/20 glasses independence in ReSTOR versus 7/20 in MMV AcrySof monofocal may be subject to considerable bias as the patients who select (and could afford) ReSTOR IOLs may have been more determined to be independent of glasses.

Various barriers remain for ReSTOR IOLs. The cost is higher and not covered by insurance,[6] ophthalmologists with the special training to implant multifocal IOLs are fewer, and some patients are not candidates for ReSTOR IOLs for various reasons. There were more complaints of halos, glares and a decreased contrast sensitivity from patients who had ReSTOR IOLs implantation.[7,8] With these limitations in mind, the MMV formula of monofocal IOL is a good alternative to ReSTOR IOL. However, the premium multifocal IOL of N, TT. ReSTOR is significantly more effective in achieving glasses independence, as shown in this study.

This study has a significant effect on the economic issues of the affordability of ReSTOR IOLs. In particular in developing countries and in underprivileged peoples, the MMV monofocal IOLs can provide sufficiently good vision (20/30 for driving, J3 for reading 'yellow pages') without glasses and can be tolerated well (no subjects in this study reported complaints).

Future studies in MVM IOL should focus on the measurement of the amplitude of accommodation as an objective test instead of testing reading vision subjectively. In addition, it will be interesting to determine whether there is a significant difference among different monofocal IOLs (eg, one piece, two piece, small optic) in MMV.

Conclusion

The MMV formula monofocal AcrySof recipients with the same pre-op selection criteria as for ReSTOR can achieve 20/30 and J3 without glasses post cataract surgery. It can be a good alternative for those patients who cannot afford ReSTOR IOL and yet desire some degree of freedom from glasses. However, the ReSTOR IOLs recipients had a significantly higher percentage of glasses independence compared to MMV formula AcrySof IOL recipients.

Disclosures

The authors declare no conflicts of interest.

References

1. Javitt JC, Steinert RF. Cataract extraction with multifocal intraocular lens implantation: a multinational clinical trial evaluating clinical, functional, and quality-of-life outcomes. *Ophthalmology*. 2000;107:2040–2048.
2. Chang DF. Prospective functional and clinical comparison of bilateral ReZoom and ReSTOR® intraocular lenses in patients 70 years or younger. *J Cataract Refract Surg*. 2008;34:934–941.
3. Leyland M, Zinicola E. Multifocal versus monofocal intraocular lenses in cataract surgery: a systematic review. *Ophthalmology*. 2003;110:1789–1798.
4. Chen M, Atebara N, Chen TT. A comparison of a monofocal AcrySof IOL using the "blended monovision" formula with the multifocal array IOL for glasses independence after cataract surgery. *Ann Ophthalmol(Skokie)*. 2007;39:237–240.
5. Ito M, Shimizu K. Reading ability with pseudophakic monovision and with refractive multifocal intraocular lenses: Comparative study *J Cataract Refract Surg*. 2009;35:1501–1504.
6. Department of Health and Human Service, Centers for Medicare & Medicaid Service, United States of America. CMS Rulings No. 05-01(2005). URL: www.cms.hhs.gov/rulings.
7. Kamlesh, Dadeya S, Kaushik S. Contrast sensitivity and depth of focus with aspheric multifocal versus conventional monofocal intraocular lens. *Can J Ophthalmol*. 2001;36:197–201.
8. Ortiz D, Alió JL, Bernabéu G, et al. Optical performance of monofocal and multifocal intraocular lenses in the human eye. *J Cataract Refract Surg*. 2008;34:755–762.