
Presbyopic IOLs: Accommodative and Pseudo-types

Presbyopia is a major refractive challenge for the coming decades. A variety of surgical procedures like scleral expansion, zonal photorefractive keratectomy, and corneal inlay implantation have been investigated; none have yet gained popular acceptance. Implantation of intraocular lenses (IOLs) at the time of cataract surgery or refractive lens exchange provides another opportunity to tackle the presbyopia challenge.

A simple kind of postoperative multifocality, i.e., myopic astigmatism, has long been recognized as a favorable refractive outcome as it creates “pseudo accommodation”. An apparent accommodative behavior was also attributed to conventional monofocal IOLs. These observations set the stage for the development of accommodative and then multifocal IOLs (MFIOLs). Popular FDA-approved brands of such IOLs include Crystalens HD (Bausch & Lomb), TECNIS (AMO), ReZoom (AMO), and AcrySof ReSTOR (Alcon).

The Journal has recently published two studies on accommodative and MFIOLs in which the current thinking is replicated.^{1,2} There is a consensus that presbyopic IOLs outperform monofocal ones; under standard testing conditions, the far visual acuity is comparable and the near vision is better for presbyopic IOLs; and the patients are generally more satisfied because of less spectacle dependence. But when it comes to contrast sensitivity, glare, long-term accommodative stability, and quality of life, the evidence is not yet conclusive.

An inevitable drawback of MFIOLs is a reduction in contrast sensitivity function (CSF); an 18 dB relative loss in CSF at 6 months has been reported.³ Disabling photic phenomenon is another challenge for MFIOLs (20-30% complaint of glare and nocturnal halo at month one follow-up has been reported³); in extreme cases, these even necessitated IOL explanation. Some authors report CSF loss as the main reason for unequal patient satisfaction between this group and those receiving monofocal IOLs despite spectacle independence.⁴ MFIOLs are pupil-size-dependent⁵ and this adds to their unpredictability. Neuroadaptation – a crucial phenomenon which has not yet been fully understood – is quite relevant for the case of MFIOLs and an improvement in CSF with time has been reported.⁶

To further complete our understanding, MFIOLs studies need to be designed with a number of factors in mind. Random allocation is specially important, as the attitude, motivation, and the involvement of economic elements in decision making can influence the performance of the subjects, even in semi-objective assessments like visual acuity testing. This is not observed in Hashemi et al's study.²

Accommodative stability is the major concern for accommodative IOLs. Postoperatively the patients are instructed to do accommodative exercises to re-establish the accommodative ability of the eye. An accommodative amplitude of 2.0 D or more in 75% of the cases at month 6 follow-up has been reported.⁷ Capsular opacification and contraction are common⁸ and a positional malfunction, i.e., the 'Z syndrome', has been described in this regard.⁹ Long-term studies are needed to quantify the accommodative regression.¹⁰ Rahimi et al's study does not provide data for beyond 6 months.¹

Standard efficacy and safety evaluations may not address the whole outcome, and in assessing the performance of premium IOLs, more sophisticated approaches should be adopted; we should think and measure binocularly, specifically include intermediate vision testing, and apply customized quality of life instruments (covering spectacle dependence, full range vision, vision fluctuation, glare disability, adaptation period, costs, etc).

Contrary to the way it is needed to go randomized in clinical studies, it is desired to observe an individualized approach in the clinical practice of presbyopic IOLs. A great commitment on the part of the clinician is required; extensive patient education (facilitated audio visually or by patient education brochures) on IOL choices and their pros and cons should be delivered. Patient life style and visual tasks (e.g. night driving, computer work, etc) have to be scrutinized. It should be noted

that any significant ocular comorbidity is a contraindication for these types of IOLs and IOL power calculation should be as accurate and as reliable as possible. Patients should be informed of the possible need for additional procedures like keratorefractive enhancement (for residual error or astigmatism) and even IOL exchange for refractory disabling monocular diplopia.

Presbyopic IOLs are costly and this adds to the complexity of their counseling. Policies on insurance coverage and reimbursement can influence their choice. Clinicians should maintain their patient advocate stance rather than a sales representative one. Some suggest inclusion of a family member in the counseling process and asking questions from the patients to verify that they have realistic expectations.¹¹

It is inherent to the current presbyopic IOLs that far, intermediate, or near vision should somehow be sacrificed for another. Novel modified monovision has been proposed to address this limitation; for instance, in a 'mix and match' recipe, implanting a ReSTOR IOL for far and near vision in one eye and a ReZoom IOL for far and intermediate vision in the fellow eye could be considered. Alternatively, an accommodative IOL with a plano target refraction in one eye for far and intermediate vision and another accommodative IOL in the fellow eye with a target refraction of -1.00 for intermediate and near vision could be planned. This is called 'partial monovision'.

We seem closer than a decade to a perfect solution for presbyopia; dual and dynamic optic IOLs and keratorefractive procedures are expected to provide better solutions sooner.

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References

1. Rahimi F, Ghahari E, Hashemian MN, et al. Near visual performance results of the accommodating intraocular lens (Tetraflex)® in comparison to monofocal foldable intraocular lens. *Iranian Journal of Ophthalmology* 2009;21(3):5-10.
2. Hashemi H, Nikbin HR, Khabazkhoob M. AcrySof ReSTOR multifocal versus AcrySof SA60AT Monofocal intraocular lenses: a comparison of visual acuity and contrast sensitivity. *Iranian Journal of Ophthalmology* 2009;21(4):25-31.
3. Sen HN, Sarikkola AU, Uusitalo RJ, Laatikainen L. Quality of vision after AMO Array multifocal intraocular lens implantation. *J Cataract Refract Surg* 2004;30(12):2483-93.
4. Leyland M, Zinicola E. Multifocal versus monofocal intraocular lenses in cataract surgery: a systematic review. *Ophthalmology* 2003;110(9):1789-98.
5. Bellucci R. Multifocal intraocular lenses. *Curr Opin Ophthalmol* 2005;16(1):33-7.
6. Montés-Micó R, Alió JL. Distance and near contrast sensitivity function after multifocal intraocular lens implantation. *J Cataract Refract Surg* 2003;29(4):703-11.
7. Heatley CJ, Spalton DJ, Hancox J, et al. Fellow eye comparison between the accommodative intraocular lens and the Acrysof MA30 monofocal intraocular lens. *Am J Ophthalmol* 2005;140(2):207-13.
8. Hancox J, Spalton D, Heatley C, et al. Fellow-eye comparison of posterior capsule opacification rates after implantation of 1CU accommodating and AcrySof MA30 monofocal intraocular lenses. *J Cataract Refract Surg* 2007;33(3):413-7.
9. Mamalis N. Complications of foldable intraocular lens requiring explantation or secondary intervention — 2006 update. Presented at the European Society of Cataract and Refractive Surgery Meeting; September 2006; Lisbon, Portugal.
10. Kuchle M, Seitz B, Langenbucher A, Martus P, Nguyen NX; Accommodative Intraocular Lens Study Group. Stability of refraction, accommodation, and lens position after implantation of the 1CU accommodating posterior chamber intraocular lens. *J Cataract Refract Surg* 2003;29(12):2324-9.
11. Herz NL. 10 Clinical Pearls for Introducing Premium IOLs Into Your Practice. *YO Info*, American Academy of Ophthalmology, Aug 2009; Web: www.aao.org/yo/newsletter/200908/article04.cfm