

MULTIFOCAL INTRAOCULAR “MIX AND MATCH” LENSES

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SUMMARY – The new generation multifocal lenses provide the surgeon with several options to meet the specific visual needs and desires of patients. A revolution in presbyopia surgery is being driven by two multifocal intraocular lenses, ReStor and ReZoom. Combined implantation of the ReZoom multifocal lens in nondominant eye and ReStor multifocal lens in dominant eye has been demonstrated to produce statistically and clinically superior results in bilateral uncorrected intermediate vision improving vision effectiveness in presbyopia patients after cataract surgery. Also, the mix and match approach can maximize patient vision at both near and far distance, thus improving the patient quality of life.

Key words: *Lens implantation – intraocular; Lenses – intraocular; Presbyopia – surgery; Visual acuity – physiology*

Introduction

Thanks to refinements of phacoemulsification, which have resulted in the evolution of microincision and bi-manual microincision techniques, and with the advent of new foldable biomaterials the safety of cataract surgery has increased considerably over recent years. This rising interest and research into presbyopia compensation have added another dimension to cataract surgery research and development, leading to a new generation of multifocal lenses, which aim to restore near vision whilst preserving far vision and vision quality.

A change in research focus has led to change in the attitudes and treatment methods. Because of that, we are now entering a new generation of cataract surgery, the so-called refractive lensectomy.

Traditional intraocular lenses (IOLs) are monofocal, which means that they offer vision at one distance only (far, intermediate, or near). They are definitely an improvement over the cataractous lens that is replaced during surgery, which provides only cloudy, blurred vision at any distance. However, traditional IOLs mean that patients must wear eyeglasses or contact lenses in order to read, use a computer, or view objects at middle

distance, especially if having already experienced presbyopia before cataract surgery.

Good vision quality is what patients now expect from cataract surgery. The new multifocal and accommodating IOLs offer the possibility of seeing well at more than one distance without glasses or contact lenses.

The new approach is called “mix and match” method and consists of combined implantation of two different multifocal lenses, ReStor (Alcon) in dominant eye and ReZoom (AMO) in nondominant eye¹.

The theory was pioneered and applied in 2000 by Uzeyir Gunenc, a physician from Dokuz Eylul University, Izmir, Turkey, who went on to present his first set of results at the 2003 Congress of the ASCRS. However, at that time nobody paid attention to this technique because the idea seemed quite bizarre and was something that many surgeons would never consider performing in their own practice².

Today, seven years later, we performed our own study of the mix and match technique safety and efficacy. Final results are determined by the main characteristics of the IOLs implanted. We used the following materials: AcrySof ReStor (Alcon), a diffractive multifocal IOL that enables very good near vision, very good distance vision, pupil independent, improves functional vision but has limited intermediate vision, and was implanted in dominant eye; and ReZoom (AMO), a multifocal refractive IOL that distributes light over five optical zones

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Table 1. Main characteristics of ReZoom and ReStor intraocular lenses

Lens characteristic	ReZoom	ReStor
Distance	Very good	Good
Intermediate distance	Functional	Poor
Near	Good	Very good
Strength	Better distance	Near task in bright light
Weakness	Poor near in bright light	Poor near in dim light

to provide very good intermediate and distance vision, and behaves like monofocal lens under photopic conditions. Reading glasses are needed for continued reading or small prints^{3,4}. This lens was implanted in nondominant eye. The main characteristics of the lenses are presented in Table 1.

It should be noted that patient cannot be absolutely certain of seeing well without eyeglasses or contact lenses after cataract surgery, even if his/her eyes have received multifocal or accommodating IOLs. Some of the factors that can decrease satisfaction with these IOLs include pre-existing astigmatism, incorrect IOL positioning in the eyes, and night-time halos that some patients have experienced⁵. However, even with these risks, these new IOLs do provide the probability of good vision without total dependence on eyeglasses or contact lenses. One may even achieve good vision without using these aids at all^{6,7}. With careful patient selection, many patients can achieve spectacle independence with the new generation of multifocal IOLs.

Patients and Methods

Ten patients were treated at University Department of Ophthalmology, Sestre milosrdnice University Hospital, in the period between October 2006 and February 2007. The mean age of our patients was 68 ± 5 (range 58-72) years. We used the mix and match approach and implanted ReStor IOL in dominant eye and ReZoom IOL in nondominant eye. Follow up was up to 3 months.

Preoperative considerations qualifying patients for bilateral implants were as follows: patients who did not want to wear glasses or contact lenses anymore, age, functional and occupational requirements, degree of general alertness, ocular pathology, patient visual demands, and expectations for near vision needs. Preoperative exclusion criteria were: subjective exclusion, hypercritical patients, patients with unrealistic expectations,

those who wanted to wear glasses, and occupational night driving. Medical exclusion criteria were: >1.0 D of corneal astigmatism, pre-existing ocular pathology, previously refractive patients, and individuals with monofocal lenses. Intraoperative exclusion criteria were: significant vitreous loss, pupil trauma, factors influencing long term IOL performance, zonular damage, capsulorhexis tear/rupture, and capsular rupture.

Successful IOL power calculations are extremely important because various small errors result in a major error. Keratometry was performed manually. Immersion ultrasound biometry was performed in all patients by an experienced examiner using Holladay 2 or SRK-T formulas. All patients were operated on by phacoemulsification and implantation of multifocal IOLs.

The following parameters were postoperatively assessed: visual acuity (distance, intermediate, near), quality of life (questionnaire), self-reported rating of satisfaction (questionnaire), visual phenomena, and frequency of spectacle wear. Patients were asked to complete a questionnaire on postoperative days 30, 60 and 90, and to identify and rate the effects of various issues. The questionnaire also allowed subjects to rate the level of satisfaction with their vision as well as the impact of visual performance on their lifestyle.

Results

We analyzed ten patients (twenty eyes) operated on by the same surgeon at our Ophthalmology Department. Preoperative visual acuity was 0.05-0.075. Postoperatively, only one patient had uncorrected visual acuity (UCVA) for distance 0.9-1.0 and eight patients had best corrected visual acuity (BCVA). Intermediate vision was good in all ten patients and they were able to work on computer without glasses.

Table 2. Visual acuity on postoperative day 90

Distance	0.7-0.8	0.9-1.0
UCVA	1/10	10/10
BCVA	9/10	10/10
Intermediate	Functional (computer use)	
Near	Standard	Best
Uncorrected	9/10	10/10
Best corrected	1/10	10/10
Reading performance 120 wpm (maximal reading speed)		

UCVA = uncorrected visual acuity;
BCVA = best corrected visual acuity

Table 3. Visual phenomena on postoperative day 90

Visual phenomenon	None or mild (n)	Moderate (n)	Severe (n)
Glare	6	3	1
Halo	7	2	1
Night vision	8	1	1
Color perception	9	1	0
Double vision	10	0	0

UCVA standard for near vision was recorded in one patient and BCVA in nine patients. Visual acuity (postoperative day 90) is presented in Table 2.

The questionnaires allowed the patients to indicate the quality of life and rate of satisfaction.

Nine of ten patients chose the same lenses again after the second eye implant. Visual phenomena of no or mild glare, halos, problems with night vision, problems with color perception, distorted and blurred near, intermediate or far vision, and double vision were present in most patients. Only three patients had severe visual phenomena (Table 3).

Spectacle dependence was measured at a 3-point categorical scale: never, sometimes, and most of the time. Postoperatively, wearing glasses for distance vision was needed in one patient, and for intermediate and near vision in none of our patients (Table 4).

Discussion

Traditional attitude of cataract surgery is to restore visual acuity. The new focus is optimization of patient satisfaction, based on individual patient's lifestyle, which means better vision for more patients, support for their most important activities and optimization of vision. Multifocal technology consists of two different IOL types, i.e. diffractive and refractive IOLs. A theoretical study on model eyes showed diffractive multifocal IOLs to be superior to refractive multifocal IOLs for near vision, whereas the two IOL types were comparable for distance vision⁸.

Table 4. Spectacle dependence on postoperative day 90

Spectacle dependence	Distance (n)	Intermediate (n)	Near (n)
None	9	10	10
Some	1	0	0
Most	0	0	0
All	0	0	0

When evaluating the mix and match approach, intermediate vision also needs to be evaluated.

A study by Schmidinger showed the results for distance and near visual acuity to be very satisfactory with diffractive IOL, while refractive IOL provided very satisfactory near, intermediate and far vision⁴.

Reading is the most important near vision activity performed by humans. The advent of new IOL approach may help patients reduce their dependence on spectacles for intermediate distances. Several quality of life studies report a high level of satisfaction among patients implanted with multifocal IOLs^{3,9-13}.

The present study demonstrated that all our patients could read without glasses, although we have only had ten patients by now. The main problem is how to choose the right patient for the right intraocular lens^{14,15}. Multifocal IOLs have a slightly greater tendency to cause night vision complaints than other IOLs, so those that drive a great deal at night may wish to consider a different IOL.

Conclusion

Quality of vision is a major factor in the multifocal approach, which means optimal vision without glasses for daily life including reading, use of computer, shopping, traffic safety, and sports. Our study showed that patients reported high levels of satisfaction with their vision. The frequency of spectacle wear was greatly reduced for distance, intermediate and near vision. These findings suggest that these two new multifocal implants together provide significant improvement in the multifocal technology available to both surgeons and patients. They have been proven to solve more vision problems than ever, so cataract surgeons have to consider them all before choosing IOLs for their patient visual needs. Cataract patients are becoming more involved in the choice as well¹⁶.

Mixing and matching can maximize patient vision at near, intermediate and far distance, thus improving the quality of life and leading to spectacle independence.

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Sažetak

MULTIFOKALNE OČNE LEĆE "MIX AND MATCH"

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Nova generacija multifokalnih očnih leća pruža kirurgu nekoliko mogućnosti rješavanja potreba i želja očnih bolesnika. Novu kiruršku presbiopsku revoluciju donose dvije multifokalne leće: ReZoom i ReStor. Kombinirana implantacija leće ReZoom u nedominantno oko i leće ReStor u dominantno oko pokazuje statistički i klinički značajno dobre rezultate u ispravljanju vida na radnoj udaljenosti poboljšavajući vid u presbiopskih bolesnika nakon operacije katarakte. Također, "mixing and matching" leće poboljšavaju bolesnikov vid na blizu i daleko, te tako poboljšavaju kvalitetu života.

Ključne riječi: Ugradnja leće – očna; Leće – očne; Presbiopija – kirurgija; Vidna oštrina – fiziologija