Evaluation of the visual outcome of the Rezoom™ refractive multifocal Intraocular lens

Thesis

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By
Mohamed Karim Sidky
(M.B.B.Ch., M.Sc.)

Supervisors

Prof. Dr. Mahmoud Abou Steit
Professor of Ophthalmology
Faculty of Medicine, Cairo University

Prof. Dr. Yehia Salah El-Din
Professor of Ophthalmology
Faculty of Medicine, Cairo University

Prof. Dr. Essam El-Toukhy
Assistant Professor of Ophthalmology
Faculty of Medicine, Cairo University

Prof. Dr. Ahmad M. Shalaby
Assistant Professor of Ophthalmology
Faculty of Medicine, Cairo University

CairoUniversity
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Abstract

The ReZoom multifocal IOL adds another option for cataract surgeons. It is a five-zone, hydrophobic acrylic with PMMA haptics, multifocal IOL.

In practice, patient selection is the key of success with multifocal IOLs specially ReZoom IOL.

Good lens centration remains very important for the ReZoom IOL. Pupil size is very important, as patients with small pupils less than 2.5 mm will not be able to read.

Accurate IOL power calculation is essential for optimum results. Targeted refraction must be emmetropia.

In terms of halos and glare, the ReZoom lens features the AMO OptiEdge™ triple edge design that reduces the internal reflections and glares and keeps a 360 degree contact of the lens and posterior capsule

We conclude that the ReZoom IOL is a good option of correction of aphakia after cataract extraction, giving the patient the option of trading some of contrast sensitivity for the convenience of spectacle independence following cataract extraction in properly selected patients preoperatively.

Keywords

ReZoom Multifocal IOL

Patient selection

Pupillary size

Centration

Accurate biometry

OptiEdge™

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List of Abbreviations

AC: Anterior chamber

ACD: Anterior chamber depth

AL: Axial length

AMO: Advanced Medical Optics

BCVA: Best corrected visual acuity

CLE: Clear lens exchange

D: Diopter

ELP: Effective lens position

FACT: Functional Acuity Contrast Test

FDA: Food and drug administration

HRQoL: health related quality of life

I/A: Irrigation aspiration

ICL: Implantable contanct lens

IOL: Intraocular lens

IOP: Intraocular pressure

J: Jagger chart

LAL: Light adjustable lens

LOCS Ш: Lens Opacities Classification system

MMA: Methylmethacrylate

ND: YAG: Neodinum, yttrium, aluminum, garnet

NSAID: Non steroidal anti-inflammatory drugs

OCT: Optical coherence tomography

PCI: Partial coherence interferometry

PCO: Posterior capsular opacification

PMMA: Polymethylmethacrylate

PRL: Phakic refractive lens

RD: Retinal detachment

SDICL: Small diameter intracorneal inlay lens

SE: Spherical equivalent

UCVA: Uncorrected visual acuity

VHF: Very high frequency

W-W: White to white diameter

Introduction

Modern cataract surgery enables treatment of cataract and (oncoming) presbyopia in cataract patients. An ideal intraocular lens (IOL) would simulate the original function of the crystalline lens and provide the patient with multifocal vision. ***(Dolders MG et al, 2004)***

Although monofocal intraocular lenses (IOLs) are effective in improving vision after cataract surgery, the loss of accommodation is not restored by implantation of these IOLs. ***(Nijkamp M et al, 2004)***

Multifocal intraocular lenses (IOLs) are growing in popularity among patients and surgeons, and opened the way to refractive lens exchange. Still they are not used routinely in cataract surgery, for reasons probably connected to the frequently observed reduction in contrast sensitivity, an obstacle new IOLs designs are trying to overcome. ***(Belluci R, 2005)***

Clinical studies have shown improved uncorrected near visual acuity and a decreased spectacle dependency for patients with a multifocal IOL compared to patients with monofocal lens implantation. It is hypothesised that this decreased spectacle dependency results in vision related and generic health related quality of life (HRQoL) differences between patients with monofocal and multifocal IOLs. ***(Javitt J, 2000)***

Intraocular multifocal lenses generally have two focal points that create sharp images on the retina of objects at infinity and at reading distance respectively. This property provides the patient with a pseudoaccommodation enabling sharp perception of objects both far away and at reading distance. In between these two object distances the visual acuity remains at approximately Snellen 0.5 because of the increased depth of focus compared with a monofocal lens. In everyday life the pseudoaccommodation gained makes the patient independent of glasses, under the precondition of an exact preoperative biometry. A large number of clinical tests have revealed that the distance visual acuity is similar to that of monofocal lenses and that even the black and white contrast sensitivity is comparable or only slightly reduced compared with monofocal lenses. ***(Nijkamp M et al, 2000)***

➢ <u>Aim Of Work:</u>

1. To evaluate the performance of the ReZoom™ hydrophobic acrylic refractive multifocal IOL (Advanced Medical Optics, Inc., Santa Ana, CA, USA) for presbyopic cataractous patients.
2. Assessment of the efficacy of this IOL in achieving acceptable post-operative far and near visual acuity immediately postoperative and as time passes.
3. Assessment of the post-operative complications as glare and halos.
4. To evaluate the quality of vision assessed by the contrast acuity meter.
5. These parameters will be compared to an acrylic monofocal IOL.

Accomodation And Presbyopia

A.Theories Of Accommodation

1. Helmholtz Theory:

In 1855 **Helmholtz** declared his theory of physical mechanism of accommodation. He stated that the ciliary muscle is relaxed when the eye is focused for distance. The relaxed ciliary muscle maintains the zonules under tension, flattening the crystalline lens allowing clear distance vision. When the eye focuses on a near object, the ciliary muscle contracts and releases tension on the zonules thus crystalline lens becomes more curved due to elastic forces in the lens. ***(Glasser and Kaufman, 1999)***

2. Schachar Theory:

In 1992 **Schachar** proposed a new theory for the mechanism of accommodation. He stated that the crystalline lens is under tension during accommodation. The anterior radial muscle fibers of the ciliary muscle arch towards the sclera during accommodation, increasing the tension on the equatorial zonules, while the posterior longitudinal and posterior radial muscular fibers move anteriory, producing relaxation of the anterior and posterior zonules. The increased tension on the equator of the crystalline lens produces central steepening with peripheral flattening.

The new theory predicts that tension on the equator of the lens, or the crystalline lens, will decrease its central radius of curvature (increasing its central optical power) while increasing its peripheral radius of curvature (decreasing its peripheral optical power) therefore decreasing its spherical aberration. ***(Glasser and Kaufman, 1999)***

Because the crystalline lens grows throughout life (20 microns every year), tension on all the zonules decrease with age. According to the new theory, the decreased tension on the equatorial zonules should decrease the central optical power of the lens and emmetropes become hyperopic. The new theory also predicts that disinsertion of the anterior ciliary muscle will produce loss of accommodation and hyperopia. Indeed, disinsertion of the ciliary muscle of primate eyes does produce those results.

The new theory states that the equator of the lens is always under tension. In the unaccommodated state, all the zonules are under tension. During accommodation the equatorial zonules are under tension while the anterior and posterior zonules relax. Therefore the lens is stable and gravity should not and does not affect the accommodation amplitude. The new theory states that 5 different component muscle groups make up the ciliary muscle according to the muscle fiber orientation. During accommodation, each ciliary muscle fiber group has mainly the following functions:

- The anterior longitudinal muscle fibers open the trabecular meshwork.
- The posterior longitudinal and posterior radial muscle fibers move the choroid forward and relax the anterior and posterior zonules. The anterior and posterior zonules originate at the posterior part of the ciliary body.
- The anterior radial muscle fibers apply increased tension on the equatorial zonules.