Phakic intraocular lenses in treatment of different errors of refraction

Submitted for Partial Fulfillment of the Master Degree in Ophthalmology

By

Sally ElHussieny Mohamed ElGharabawy

M.B., B.Ch. - Faculty of Medicine -Ain Shams University

SUPERVISED BY

Prof. Dr. **Hazem Hosny Khalaf Nouh**

Professor of Ophthalmology-Faculty of Medicine
Ain Shams University

Dr. **Ahmed AbdelMonsef AbdelHamid Ebeid**

Lecturer of Ophthalmology -Faculty of Medicine

Ain Shams University
Faculty of Medicine
Cairo
2013

Contents

List of figures

Figure 67-10.The incision is completed.

Figure 67-11 The temporal single-plane clear corneal incision is placed independent of the LRIs.

Figure 67-12 In this case, the steep meridian is at 90 degrees.

Figure 67-13 The nomogram calls for arcuate incisions of between 45 and 50 degrees.

Figure 67-14 The blade is inserted.

Figure 67-15The incision is completed an equal distance past the centering mark.

Figure 67-16 The blade is held above the starting point of the opposite incision.

Figure 67-17 The incision is completed.

68. Figure 68: Bioptics is the combination of an intraocular lens procedure and a corneal refractive procedure.

\

List of Tables

List of Abbreviations

AC: Anterior Chamber.

ACD: Anterior Chamber Depth.

AC PIOL : Anterior chamber phakic intraocular lens.

ATPIOLs: Artisan toric phakic intraocular lenses.

BCVA: Best Corrected Visual Acuity.

CNV: Choroidal Neovascularization.

DSAEK: Descemet's Stripping Automated Endothelial Keratoplasty.

ECC: Endothelial Cell Count.

ECCE: Extracapsular Cataract Extraction.

ELP: Expected Lens Position.

EPI-LASIK: Epithelial Laser In-Situ Keratomileusis.

FDA: Food and Drug Association.

ICCE: Intracapsular Cataract Extraction.

ICGA: indocyanine green angiography.

ICL: Implantabel Contact Lens.

IOL: Intraocular Lens.

IOP: Intraocular Pressure.

ISCRS: Intrastromal Corneal Ring Segments.

LASEK: laser assisted sub-epithelium keratomileusis.

LASIK: laser in situ keratomileusis.

LRIs: Limbal relaxing incisions.

OVD: Ophthalmic Viscosurgical Device.

Nd:YAG: Neodymium Yttrium Aluminum Garnet.

PC: Posterior Chamber.

PC PIOL: Posterior chamber phakic intraocular lens.

PCO: Posterior Capsule Opacification.

PDS: Pigment dispersion syndrome.

PI: Peripheral Iridectomy.

PIOL: Phakic Intraocular Lens.

PMMA: Polymethyle Methacrylate.

PRK: photorefractive keratectomy.

PRL: Phakic Refractive Lens.

RD: Retinal Detachment.

RK: Radial keratotomy.

RLE: Refractive Lens Exchange.

SE: Spherical Equivalent.

TICL: Toric Implantable Contact Lens.

UCVA: Uncorrected Visual Acuity.

VA: Visual Acuity.

Introduction

Emmetropia is the optical condition in which parallel rays of light from a distant object are brought to focus on the retina by an eye with relaxed accommodation. In myopia the optical power of the eye is high for the axial length and in hyperopia the optical power is low for the axial length. Spectacles used in ametropic correction result in altering the size of the retinal image of a distant object, particularly in higher ametropia. Contact lenses are an alternative that reduces image magnification and minification. [1]

Nowadays, the quality of corneal refractive procedures is improving. However, lens-related procedures are getting more popular (in high myopes). They include phakic intraocular lenses and a procedure like clear lens extraction with lens implantation. Clear lens extraction is preferred if the patient is presbyope or has any degree of cataract as it causes loss of accomodation. That is why the idea of phakic intra ocular lenses (PIOL) evolved. [2]

Different PIOL designs exist, including anterior chamber PIOL (angle supported), iris fixated PIOL and sulcus supported (pre-crystalline) PIOL.[3]

The history of the PIOL to correct refractive error began in Europe in the 1950s with Strampelli, Dannheim, and Barraquer each separately attempting to design a PIOL that would be well tolerated in the eye.[3]

In 1977, Worst designed and used a pure iris support lens. This iris claw lens was fixed to the anterior surface of the iris. In

1986, Fechner used a negative-power iris claw lens for treating phakic myopes. Soon after, Singh used it in phakic hyperopes.[4]

In 1996, Davidorf, Zaldivar, and Oscherow presented their results with the STAAR Collamer plate haptic posterior chamber phakic IOL in phakic hyperopes.

At present, there are many presentations of small series of cases with a short long-up, with both iris claw lenses and posterior chamber refractive lenses.[5]

PIOLs offer today an excellent alternative for the correction of high and moderate myopia, hyperopia, and astigmatism. Emerging indications, still under investigation, include presbyopia and pediatric anisometropic amblyopia.[6]

The recent evolution of phakic intraocular lenses (PIOLs) has made this refractive surgical technique safer, very predictable, and effective. Due to these reasons, PIOLs have been expanding the horizon of their indications.[6]

The main limitation for the further development of PIOLs was the lack of adequate diagnostic imaging techniques to perform a precise preoperative study of the anterior segment anatomy.

Emerging diagnostic technologies based on the use of very high frequency (100 MHz) ultrasound and optical coherence tomography seem to have the most important role in the future development of PIOLs. [6]

Aim of the work

To study different types, indications, methods of implantation , methods of calculation of power and complications of phakic intra-ocular lenses.

Types of phakic IOLs

I) Posterior Chamber Lenses:

1-Implantable Contact Lens (ICL).

2-The Toric Implantable Contact Lens.

3-Phakic Refractive Lens (PRL).

4-Precrystalline Lens.

II) Angle Supported Anterior Chamber Phakic IOLs:

I-Rigid PMMA devices:

1-Baïkoff's Anterior Chamber Phakic Intraocular Lenses:

A)ZB and ZB5 M (Domilens- France).

B)NuVita MA20.

2-ZSAL-4 and ZSAL-4/PLUS PHAKIC REFRACTIVE IOLS.

3-Phakic 6H Lens.

4-JMJ Lens.

5-LN.

II -Foldable hydrophilic acrylic IOLs:

1-GBR/VIVARTE ANGLE-SUPPORTED FOLDABLE PHAKIC IOL.

2- I-Care.

3- AcrySof Cachet.

III -Foldable "Two Parts" Silicone/PMMA IOL:

Kelman Duet Lens.

IV -New Types of AC PIOL:

1-ThinOptx Ultrathin Intraocular Lenses.

2-The Vision Membrane.

III) IRIS-FIXED PHAKIC INTRAOCULAR LENS:

1- Verisyse (AMO) , Artisan (Ophtec).

2-The Artisan Toric Phakic Intraocular Lens (ATPIOL).

3- Veriflex (AMO) ,Artiflex (Ophtec).

Currently, there are three main types of phakic IOLs in clinical use: AC angle-fixated IOLs, PC IOLs, and iris-supported IOLs.[7]

I) Posterior Chamber Lenses:

These lenses are implanted in the posterior chamber of the eye, that is, between the iris and the crystalline lens. The first phakic posterior chamber lens was the Mushroom lens designed by Fyodorov and Zuev in 1985.[2] However, in practice this lens was not only implanted in the posterior chamber since its butterfly shaped haptics were placed on the crystalline lens in the posterior chamber, while the optic extended beyond this through the pupil. The Mushroom lens subsequently underwent many design changes to become a posterior chamber lens exclusively, and the first prototype of most posterior chamber phakic lenses. Since they are implanted in the posterior chamber, all these lenses can produce acute glaucoma due to pupillary block, such that two Yag laser iridotomies or a wide surgical iridectomy need to be undertaken before the implant procedure.[8]

In the mid-1980s, the implantation of posterior chamber IOLs in phakic eyes was reported by Fyodorov. In 1987, the Moscow Research Institute of Eye Microsurgery reported favorably on posterior chamber IOL implantation in phakic eyes to correct high myopia. The original lens design