Review Article

Refractive surgery for correction of myopia

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Optical aberrations and low quality of vision with glasses make them a poor option for correction of high degrees of myopia[1]. The other options are contact lens, corneal refractive surgery, phakic intraocular lens, and refractive lens extraction (RLE).

laser refractive surgery

Laser-assisted in situ keratomileuses (LASIK) is the most common refractive surgery for the correction of myopia. However, higher-order aberrations after LASIK is a problem. Higher-order aberrations may cause some night vision problems as halos and haze. In addition, decreasing postoperative contrast sensitivity.[2] Femtosecond lasers have become for clinical use in the last few years. Femtosecond lasers cut tissue precisely so that, their use to create flaps for LASIK increased. The high precision of femtosecond lasers helps to maintain the flap morphological stability. This leads to induction of fewer higher-order aberrations.[3,4] It has been postulated that the creation of a corneal flap and the induction of localized inflammation associated with excimer laser use may play an important role in producing these changes. Femtosecond laser procedure, known as small incision lenticule extraction (SMILE).[5] The procedure does not need the creation of a flap. The intrastromal lenticule is taken out through a small 2 to 5 mm incision. This decreases the flap complications as flap dislocation, dry eye, and epithelial ingrowth.[6]

Phakic intraocular lenses (IOLs)

Phakic intraocular lenses have become a promising surgical treatment for higher grades of myopia, astigmatism, and hyperopia where the use of excimer laser surgery has been limited by lack of predictability, regression, corneal ectasia, and reduced quality of vision postoperatively[7,8].

Phakic intraocular lenses preserve the corneal structure, thus reducing the risk of postoperative corneal ectasia. Phakic lenses also provide a better postoperative quality of vision[9].

Phakic intraocular lenses may be classified as either anterior chamber or posterior chamber. The anterior chamber IOLs may be further subdivided into angle- versus iris-supported. The angle-supported anterior chamber phakic intraocular lenses have fallen out of favor because of their higher association of complications such as endothelial cell loss and decentration.

Despite the increase in their popularity, there are still several complications, such as endothelial cell loss, chronic or increased intraocular inflammation, pupillary ovalization, pupillary block glaucoma, cataract formation, intraocular lens dislocation and retinal detachment.

With advances in technology (eg, anterior segment imaging modalities) the rate of these complications is decreased significantly. Moreover, newer designs reduce the size of the surgical incision and reduce risk of damage to intraocular structures.

Anterior chamber phakic IOLs (AC-PIOLs): Angle-Supported AC-PIOLs

The haptics of angle-supported phakic IOL with an appropriate size are supposed to rest on the scleral spur. Perfect sizing of the IOL is difficult so that the haptics of oversized IOL may press on canal of Schlemm, corneoscleral trabeculae. This pressure may lead to the erosion of angle

tissues with displacement of the haptics onto the ciliary body and iris ischemia and atrophy with progressive pupillary ovalization. Undersized IOL may damage the corneal endothelium due to its moving around in the anterior chamber[10].
Iris-Supported Phakic AC-PIOLs:

In 1986, Worst et al. first designed a biconcave iris-fixated PIOL to correct high myopia. This lens design was then modified into a convex–concave shape known as the Worst myopia claw lens. Since then, the rigid polymethyl methacrylate (PMMA) model (Artisan, Ophtec, The Netherlands, Santa Ana, USA) has received Food and Drug Administration (FDA) approval in the United States in 2004[11].

posterior chamber Implantable Collamer Lens (ICL)

It has been shown that the Implantable Collamer Lens (ICL™, STAAR Surgical, Switzerland), a posterior chamber phakic intraocular lens, improves the treatment of high myopia.[12] Moreover, the toric form provides effective treatment of high myopic astigmatism[13].

Moreover, some concerns still remain, for both patient and surgeon as regarding the possibility of cataract formation which may be due to direct physical contact between the ICL and the crystalline lens or to malnutrition resulting from poor circulation of the aqueous humor[14]. A new ICL with a central hole was developed , which made no need for preoperative laser iridotomy and reduced the risk of cataract formation[15].

Refractive lens exchange (RLE)

Refractive lens exchange (RLE) is a surgical technique aiming at replacing the cataractous or clear crystalline lens with an intraocular lens (IOL) in cases of high grades of ametropia. This procedure gives a better visual outcome in comparison with corneal refractive surgery in high myopia. With advances in technology and IOL formulas, the refractive outcome after cataract surgery in high myopic patients has improved.. The most important adverse effect of RLE in high myopia is the risk of retinal detachment.[16]

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