Customized Photorefractive Keratectomy Versus LASIK for Correction of Myopia

Thesis

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Ophthalmology

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

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List of Abbreviations

AO	Adaptive optics.
ASCRS	American Society of Cataract and Refractive Surgery.
BCVA	Best corrected visual acuity.
c/deg	cycles per degree
COAS	Complete Ophthalmic Analysis System.
CSF	Contrast Sensitivity Function.
D	Diopter.
DNA	Deoxyribonuclic acid.
f	frequency.
FDA	Food and Drug Administration.
GVA	Glare visual acuit
HOA	Higher-Order Aberrations.
LASEK	Laser subepithelial keratomileusis.
LASIK	Laser In Situ Keratomelieusis.
LCVA	Low contrast visual acuity.
MTF	Modulation Transfer Function.
NVCs	Night vision complaints
OPD-Scan	Optical Path Difference-Scan.
OTF	Optical Transfer Function.
OZ	Optical zone.
P	Probapility value.
PRK	Photorefractive keratectomy.
PSF	Point Spread Function.
PTF	Phase Transfer Function.
RMS	Root mean square.
SD	Standard Deviation.
SLO	Scanning Laser Ophthalmoscope.
Tracey-VFA	Tracey Visual Function Analyzer
UCVA	Uncorrected visual acuity.
Vs	Versus.
WASCA	Wavefront Aberration Supported Cornea ablation.
WF	Wavefront.
WF-LAS1K	Wavefront-guided LASIK.
X	Mean value.
Z	Zernike mode
λ	wavelength.

An Introduction to Wavefront Guided Visual Correction

We have been correcting second-order aberrations such as myopia, hyperopia, and astigmatism for the past 200 years and are now on the verge of being able to detect and correct higher-order aberrations with laser refractive surgery, contact lenses, and intraocular lenses (IOLs). Customized ablation attempts to optimize the eye's optical system using a variety of spherical, cylindrical, aspherical, and asymmetrical treatments based on an individual eye's optics and anatomy, as well as the patient's needs and preferences. Customization can be used to improve optical quality in normal eyes, as well as eyes with atypical optical aberrations caused by corneal scarring, penetrating keratoplasty, central islands, decentered ablations, lenticular abnormalities, and spherical IOL implants. Customized correction involves three forms of customization: functional, anatomical, and optical. All three need to be utilized to optimize the patient's results.[1]

Quality of vision of the normal human eye is limited by principally two main factors; the optical properties of the eye and the neural processing properties of the visual pathways.[2,3] The optical properties of the eye are influenced by diffraction, light scatter and aberrations.[4]

The detrimental effects of aberrations on quality of vision have been appreciated for a long time. However, aberration measurement and possible correction has only been made possible in recent years. This advance was largely in response to early excimer laser refractive surgery outcomes where the ablative correction of spherical and cylindrical refractive errors caused an increase in aberrations.[5]

Optical Customization:

Corneal Topographic-Guided Ablation:

Corneal first surface aberrations and/or shape can be calculated from corneal elevation data derived from corneal topography measurement and used along with a standard refraction to design ablative corrections. Using such an approach should reduce aberrations in highly aberrated corneas, but may be detrimental (ie, induce more aberrations) in normal eyes. That is, the potential for visual enhancement beyond the 20/20 level is unknown because formulating the ideal shape for the cornea is not dependent on corneal first surface aberrations alone. Instead, an optimal compensating optic (one that reduces the aberrations of the normal eye) must be designed to negate the aberrations of the whole eye. Corneal topographic-guided ablation has the greatest potential in patients with visual loss known to be related to large corneal topographic abnormalities. Such as patients with regular and irregular astigmatism, decentered ablations, and central islands.[6,7,8]

Wavefront-Guided Corneal Ablation:

Wavefront-guided corneal ablation is designed to correct the traditional sphere and cylindrical error of the eye and reduce the eye's higher-order optical aberration. Ablative corrections that reduce the optical aberrations of the eye will increase retinal image resolution and contrast, which in turn should allow one to see the world with finer detail and higher contrast.[9]

Aim of the Work

The aim of this work is to assess the efficacy, predictability, and visual outcome of customized Lasik versus customizes PRK for correction of myopia and myopic astigmatism.

Review of Literatures