A Comparative Study to Assess the Predictability of Haigis vs SRK-T Formulas in Eyes of Low and High Axial Length

Thesis
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LIST OF ABBREVIATIONS

Abb.	Meaning
AAL	Actual Axial Length
AC	Anterior Chamber
ACD	Anterior Chamber Depth
AL	Axial Length
CF	Correction Factor
CL	Contact Lens
db	Decibel
DPostRx	Desired Refraction
EffRP	Effective Refractive Power
ELP	Effective Lens Position
FDA	Food And Drug Administration
GPR	Gussain Process Regression
IDEM	Ideal Emmetropia
IOL	Intra Ocular Lens
IOLP	Intra Ocular Lens Power
LASEK	Laser in situ keratomileusis
LASIK	Laser Epithelial keratomileusis
OCT	Optical coherence tomography
PKP	Penetrating keratoplasty

LIST OF ABBREVIATIONS CONT...

Abb.	Meaning
PMMA	Polymethyl methacrylate
PRK	Photorefractive keratectomy
RI	Refractive index
SD	Standard deviation
SE	Spherical Equivilant
SimK	Simulated K reading
SRK	Sanders, Retzlaff and Kraft
t	IOL Thickness
TAL	Total Axial Length

Abstract

The study included 60 eyes of 44 patients distributed as follows:

- Group A included 21 patients (9 (42.8%) was bilateral, 12 (57.2%) was unilateral),

- With (12(60%) male patients and 9(40%) female patients).

- Group B included 23 patients (7 (30.4%) was bilateral, 16 (69.6%) was unilateral), with (7 (30.4%) male patients and 16 (69.6%) female patients). In our study we used IOL Master (Carl Zeiss IOL Master 500).

In our study, we found that the estimated error (the difference between the actual postoperative SE and predicted SE) in group A, with Haigis formula, the Median ± interquartile range were -0.25 ± 0.5 (-0.25 to -1.25), while with SRK-T, the Median ± interquartile range were -0.25 ± 0.4 (0.25 to -1.75) so there was no statistical significant difference as P-value was 0.17, while in group B we found that the estimated error (the difference between the actual postoperative SE and predicted SE), with Haigis formula, the Median ± interquartile range were -0.75 ± 1.0 (0.25 to -5.50), while with SRK-T, the Median ± interquartile range were -0.37 ± 0.63 (0.25 to -0.75), so there was no statistical significant difference as P-value was 0.07.

Keywords: Photorefractive Keratectomy - Refractive Index - Polymethyl Methacrylate

INTRODUCTION

Accurate Intraocular Lens (IOL) power calculation in cataract surgery is a very important aspect of cataract surgery. Patients' expectations for perfect vision after surgery are increasing day by day. So, there has been an ongoing effort to predict the postoperative refractive outcome with accuracy and consistency[1]. The refractive power of the human eye depends on the power of the cornea, the lens and the AL of the eye and the axial position of the lens. All these factors play a major role in determining the postoperative visual outcome [1–3].

IOL power calculation has changed dramatically. From simple first generation formulae like SRK-I to second generation formulae like SRK-II IOL, power calculation has evolved to the modern formulae. Third generation formulae, such as Holladay 1, Hoffer Q, and SRK/T; attempt to predict the estimated lens power using AL, corneal curvature (K), and A constant, as the variables. Fourth generation formulae, like Haigis, also take into account the preoperative Anterior Chamber Depth (ACD) and use three constants (a0, a1, and a2), which are analogous to Surgeon Factor, ACD and AL, respectively. These modern formulae predict the IOL power with much greater accuracy[1].

The IOL power calculation formulae as discussed above have good predictability of postoperative refractive status in case of eyes with normal axial length. For eyes of long and short axial length, their accuracy has yet to be proven. So, our study was done with a purpose to evaluate and compare the predictive ability of two IOL power calculation formulae (SRK/T, and Haigis) in eyes shorter than 22.0 mm and longer than 24.50 mm.

Narvaez J, Zimmerman G, Stulting RD & Chang DH. used immersion ultrasonography and manual keratometry to evaluate 25 eyes with AL less than 22.0 mm, suggesting no statistically significant difference between Holladay 1, Holladay 2, Hoffer Q, and SRK/T[4].

MacLaren RE , reported 72 eyes with mean AL of 20.79 mm, reporting that in both IOL Master and ultrasonography group, the Haigis formula was the most accurate followed by the Hoffer Q, while Holladay 1 and SRK/T were the least accurate[5].

Roessler GF, showed that Haigis provided the best predictability of postoperative refractive outcome than the SRK/T for 37 eyes with AL more than 26[6].

Wang JK, demonstrated that SRK/T and Haigis performed equally well in 34 eyes between 25 and 28 mm[7].

Petermeier K and Szurman P reported that SRK-T, & Haigis formulae resulted in a mean hyperopic refractive error of +0.84D (SRK-T), and +0.67D (Haigis), respectively, but within smaller range (SRK-T −0.55±1.79D), Haigis (+0.04±1.56D). The mean axial length in this study was 32.35 mm (range, 29.22–36.51 mm)[8].

AIM OF THE WORK

To investigate the predictability of different IOL (Intra Ocular Lens) power calculation formulae in eyes with low and high Axial Length (AL) and to find out most accurate IOL power calculation of Haigis vs SRK-T formula in both groups.

I- PHACOEMULSIFICATION

Definition:

Phacoemulsification is a modern cataract surgery in which the eye's internal lens is emulsified with an ultrasonic waves from handpiece and aspirated from the eye. Aspirated fluids are replaced with irrigation of salt solution to maintain the anterior chamber's form and depth[9]

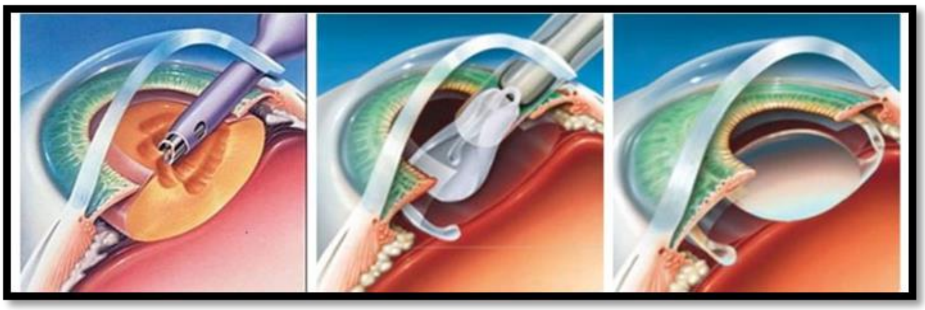

Figure (1): Phacoemulsification and replacement with intraocular lens(10)

Etymology:

The term originated from, *phaco*- (Greek phako-, comb. form of phakós, lentil; see lens), emulsification [9]

History:

Charles Kelman introduced phacoemulsification in 1967 after being inspired by his dentist's ultrasonic probe[9].