ORIGINAL ARTICLE

Comparison of Two Formulae (SRK-T and Hoffer Q) for Intraocular Lens (IOL) Power Calculation in Eyes with Short Axial Length (AL) <22mm

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ABSTRACT

Aim: To compare the mean predictive error calculated with Hoffer-Q versus SRK-T formulae for intraocular lens (IOL) power calculation in eyes with SAL of <22mm.

Methods: A total number of 80 patients having age 20-65 years with axial length <22 mm planned for cataract surgery were included in this comparative study. These patients were recruited from July-2017 to January 2018. In all patients, biometry was done using manual keratometer and IOL power was calculated on contact A-scan using SRK-T and Hoffer Q formula. After 3 months of surgery, prediction errors were calculated for both formulas. Data analysis was carried out using SPSS version 19 Software. Independent sample t-test was used to compare mean prediction error values by using Hoffer-Q formula versus SRK-T formula.

Results: The mean age of patients included in this study was 45.49±11.28 years. There were 45 (56.25%) male patients and only 35(43.75%) female patients. Mean predictive error using Hoffer Q formula was 0.59±0.26 D versus 0.78±0.18 D using SRK-T formula (p-value <0.0001).

Conclusion: Hoffer Q formula is better than SRK-T formula for calculation of intra-ocular lens power in eyes with SAL of<22 mm. Hoffer Q formula should be used as a first line choice for calculation of intra-ocular lens power in eyes with short axial length.

Keywords: Intra-ocular lens power, Hoffer-Q formula, SRK-T formula, mean predictive error.

INTRODUCTION

With advancements in micro-surgical practices and intraocular lens (IOL) designs, primary IOL implantation isnow a widely putative method for surgical correction in cataract patient[1]. Calculation of precise IOL power is very crucial to attain thepostoperative aimed refraction and good patient satisfaction, as patients' prospects have been progressivelyincreased[2]. There is an ongoing effort to predict post-operative refractive outcomes with accuracy and consistency[3,4]. The reflection power of hominoid eye is based oncorneal power, lens power, axial length and axial position of lens[5,6]. The above-mentioned factors are critical to gain the optimal postoperative refractive results.

Hoffer Q and SRK-T are two commonly used formulas for calculation of IOL power calculation. Royal College of Ophthalmologist 2004 guidelines have recommended these formulas for IOL power calculation in patients with SAL (<22 mm) eyes[7]. But some studies have concluded that Hoffer-Q formula is moreprecise than SRK-T formula in eyes with SAL[5,8,9]. Moschos et al. concluded that Hoffer Q formula is more perfect than SRK-T formula.[8] So I have a plan to conduct this study to calculate the accuracy of SRK-T formula and Hoffer Q formula for IOL power determination in eyes with axial length <22mm. This study will help to predict the accuracy of one formula over the other and we will be able to select a better formula for IOL power calculation. This study will help to reduce patient's complaints regarding visual disturbances after cataract surgery.

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The objective of the study was compare Hoffer-Q and SRK-T formulae for intraocular lens (IOL) power calculation in eyes havingaxial length<22mm.

METHODS

In this comparative study we incorporated 80 patients who were planned for cataract surgery in department of ophthalmologyof Mater Misericordiae University hospital, Dublin Ireland. We took written consent from all patients by explaining them the benefits of study. Patients having eyes with short axial length, and age 20-60 years were selected for analysis. Patients having visual acuity score <20/40 and having history of ocular trauma were excluded from analysis. In all patients, biometry was performed using manual keratometer (Shin-Nippon, Javal-Schiotz) and IOL power was calculated on contact A-scan using SRK-T-formula. After that IOL power was calculated again using the Hoffer Q formula by using the same biometry measurements. Hoffer Q and SRK-T formulae is given below:

Hoffer-Q Formula:P=1336/{A-C-0.05}-1.336/[1.336/K+R)-{C+0.05/1000}]

SRK-T Formula: P= A-2.5 {AXL}-0.9{K}.

In all patients clear-corneal phacoemulsification was performed and a foldable IOL was implanted into the capsular sack. Following operation, patients were revised in the eye OPD for 3-weeks. After that refractive status of the eye was examinedusing auto refractor machine and was transformed into a spherical equivalent value, and mean predictive error was noted. The prediction errors were calculated for both formulas.

For data analysis we used SPSS v23. Independent sample t-test was used to compare mean prediction error values by using Hoffer-Q formula versus SRK-T formula. P-value≤0.05 was taken as a significant difference.

RESULTS

The mean age of patients included in this study was 45.49±11.28 years. There were 45(56.25%) male patients and only 35(43.75%) female patients. Mean duration of cataract disease of studied patients was 8.53±5.87 months. Mean predictive error in patients in whom IOL was calculated using Hoffer Q formula was 0.59±0.26 D and Mean predictive error in whom IOL was calculated using SRK-T formula was 0.78±0.18 D. Mean predictive error was significantly less in using Hoffer-Q formula as compared to the SRK-T formula with a p-value of <0.0001 (Table 1).

Table 1.Comparison of Mean Predictive Error (MPE) using SRK-T versus Hoffer-Q Formula.

MHPE	Hoffer-Q Formula	SRK-T Formula
Mean	0.59	0.59
S.D.	0.78	0.18

P value=<0.0001

DISCUSSION

Calculation of IOL power in short eyes having AL <22 mm is alwaystricky than IOL calculation in normal or long AL eyes[10,11]. All available IOL power calculation formulae have higher accuracy for normal and long AL eyes as compared to those of short one.[12-14]Because short AL eyes have distinct anatomical features that make it difficult for consultants to calculate IOL power accurately. One study have documented that incorrect AL measurement in is responsible for 54% cases of errors in IOL power calculation, corneal power evaluation in 8.0% and postoperative ACD estimation in 38% cases[15].

In present study, we evaluated the mean predictive error in patients with short axial length in whom IOL power was calculated using Hoffer-Q and SRK-T formula. In present study, we found a significant difference in mean predictive errors calculated using these two formulas, mean predictive error was 0.59±0.26 D versus 0.78±0.18 D in SRK-T group.

A study conducted by Gavin and Hammond et al. also found statistically significant difference in mean predictive error in Hoffer-Q and SRK-T formula. Mean predictive error in that study was 0.61±0.80 D in Hoffer-Q group versus 0.87±0.82 D in SRK-T group[2].

Aristodemou et al. also found similar results as that of our study. In that study mean predictive error using Hoffer-Q formula was 0.47 D versus 0.75 D in patients in whom SRK-T formula was used in eyes with axial length of 20 mm to 20.99 mm (p-value 0.003). while MPE in eyes with axial length 21-21.99 mm was 0.47 D using hoffer-Q formula and 0.57 D using SRK-T formula (p-value 0.007)[11].

A study conducted by Narváez et al. examining 643 eyes, used different formulae for ILO power calculation. In that study, 25 eyes were of axial length <22 mm, the authors did not reported any statistical difference in MEA calculated using SRK-T, Hoffer Q, Holladay I and II formulae.However, using too small sample size cannot detect significant difference accurately[10].

CONCLUSION

Hoffer Q formula is better than SRK-T formula for calculation of intra-ocular lens power in eyes with AL of <22 mm. Hoffer Q formula should be used as a first line choice for calculation of intra-ocular lens power in eyes havingAL <22 mm. SRK-T can be used as an alternative if specific constants for Hoffer Q formula are not available.

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