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Research Article

Clinical results in using Phaco emulsification using SRK-2 formula. Is the formula suits Sri Lankan population?

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Abstract: We wanted to evaluate the predictive accuracy of post operative refraction using SRK-2 formula in phacoemulsification of eyes with 22-26mm axial length. Senile cataract patients who underwent phacoemulsification and in-the-bag implantation of lens (IOL) between January to December 2010 in Gampaha district by a single surgeon were selected randomly. Single examiner measured simulated manual keratometry preoperatively and seven days postoperatively; uncorrected visual acuity, slit lamp examination of the anterior segment and best spectacle-corrected visual acuity (BSCVA) was taken using Snellen's chart. The implanted IOL power was used to calculate predicted postoperative refractive error by SRK-2 formula. The results of the 274 patients, mean (S.D.) age was 65.3(10) years. 56% were females. 90(32.8%) had diabetes mellitus and 107(39%) had hypertension. The right eye was operated in 142 (51.8%) patients and the left eye in 132 (48.2%). All surgeries were uneventful. 7days after surgery, 79% had VA of 6/6 and 14% had 6/9, 4% had 6/12 to 6/36 in the operated eye. Mean (S.D.) IOL power used 21.50D (1.90D). Mean predicted refractive error with SRK-2 -0.300±0.145D. The mean achieved refractive error -0.220±0.732D. Difference between predicted and achieved refractive error presented a slight hyperopic shift (mean ± SD: 0.054±0.397D). There was a negative Pearson correlation (-0.126) between the predicted refractive error and achieved refractive error (p=0.038). Predictive error less than 0.5 in 80.2%, <0.75 in 88.6% and <1.0 in 96.7%. In discussion this study is unique in reporting eyes implanted in the capsular bag by the same surgeon, with preoperative measurements obtained from the same instrumentation by the same method and same technician, using SRK-2 formula for IOL power calculation in eyes with medium axial length that underwent phacoemulsification with foldable IOL implantation. The results support SRK-2 formula as a good option to predict the refractive error after cataract extraction by phacoemulsification in eyes with medium axial length.
Keywords: phacoemulsification, eyes, Snellen's chart

INTRODUCTION

Intraocular lens (IOL) power calculation formulas have evolved over the past 25 years. The most recent formulas (third and fourth generation) are the most useful and precise[1,2]. Prediction accuracy depends on three factors: accuracy of the biometric data (axial length and keratometry readings), accuracy of manufactured IOL power quality control and accuracy of the IOL power formulas [3].

Third-generation formulas such as Holladay 1, Hoffer Q and SRK/T use constants associated with the expected position of the IOL. Holladay uses the "surgeon factor", the distance from the iris plane to the IOL's plane; Haigis uses [3] constants for better Effective Lens Position (ELP) prediction; Hoffer Q uses the ACD constant, average distance between the power plane of the cornea and that of the IOL; and SRK/T uses the A-constant to calculate the ACD, using the retinal thickness and corneal refractive index.

Several previous published studies reported accuracy of ± 1.00 diopter (D) after cataract surgery using phacoemulsification technique that varies from 80 to 94.8%, depending on the AL and the IOL power calculation formula[4].

After introduction of phacoemulsification with small incision techniques, minimizing cylindrical error, and continuous curvilinear capsulorhexis technique, that allows better IOL capsular fixation and more predictable ELP, the correct IOL power became a crucial step for good refractive outcome in the preoperative examination of cataract surgery [5]. The objective of our study was to evaluate the predictive accuracy of post operative refraction using SRK-2

formula in phacoemulsification in eyes with 22-26mm axial length.

METHODS

This prospective non-comparative study comprised 274 eyes of 274 consecutive patients with senile cataract who underwent phacoemulsification and in-the-bag IOL implantation between Januarys to December in the year of 2010 from Gampaha district.

Nuclear, sub capsular and cortical cataracts with axial length between 22 and 26mm were included. Exclusion criteria were the presence of associated ocular pathologies and intra-operative or post-operative complications. Before surgery, simulated manual keratometry was obtained. The axial length was recorded as the average of ten readings taken using a 10 MHz A-scan ultrasound transducer (Alcon A scanner, USA) with contact technique under topical anesthesia with Proparacaine Hydrochloride. SRK-2 formula was chosen to predict the IOL power. All examinations were performed by the same examiner who was unaware of the purpose of the study.

All patients had standardized uneventful small-incision phacoemulsification with in-the-bag IOL implantation performed by a single surgeon. Phaco emulsification was performed using AMO Sovereign compact with white star. The foldable IOL was implanted in the capsular bag, through a 2.65 mm incision. The suture less incision was placed supero-temporally for right eyes and supero-nasally for left eyes. All IOLs were implanted within the capsular bag and the incisions were not sutured. We assumed that the quality of the lens we implanted had no deficiencies. The IOL requested for the patients predicted a postoperative refractive error between Plano and -1.00 D.

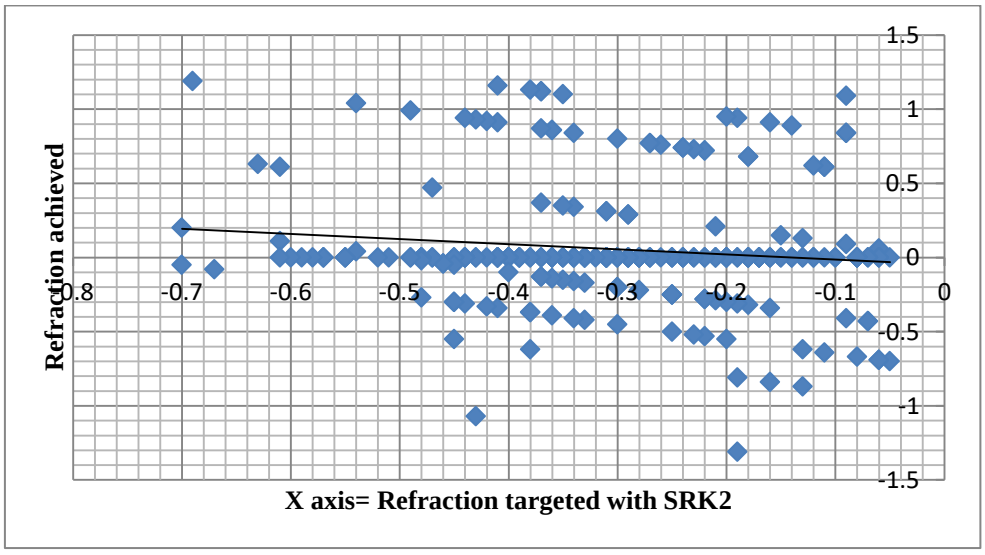
Patients were examined 7 days postoperatively; each visit including uncorrected visual acuity, slit lamp examination of the anterior segment and best spectacle-corrected visual acuity (BSCVA) was taken 7 days after surgery using a Snellen's chart.

The implanted IOL power was used to calculate the predicted postoperative refractive error by SRK-2 formula. The mean refractive error was calculated from the difference between the formula-predicted refractive error and the achieved postoperative refractive error based on spherical equivalent (SE). Paired t-tests were used to analyze statistical significance. P-values of less than 0.05 were considered statistically significant.

RESULTS

Of the 274 patients, mean (S.D.) age was 65.3(10) years. 56% were females. 90(32.8%) had diabetes mellitus and 107(39%) had hypertension. The right eye was operated in 142 (51.8%) patients and the left eye in 132 (48.2%). All surgeries were uneventful. 7days after surgery, 79% had VA of 6/6 and 14% had 6/9, 4% had 6/12 to 6/36 in the operated eye.

Mean (S.D.) IOL power used was 21.50D (1.90D), (range; 10.0D to 25.5D). The mean predicted refractive error with SRK-2 was -0.300 ± 0.145 D (range, -0.05D to -0.7D). The mean achieved refractive error was -0.220 ± 0.732 D (range, +1.00 to -1.5 D).The difference between predicted and achieved refractive error presented a slight hyperopic shift (mean ± SD: 0.054 ± 0.397 D), ranging from -1.31 D to + 1.19 D. There was a negative Pearson correlation (-0.126) between the predicted refractive error with SRK-2 and the achieved refractive error (graph 1). It was statistically significant (p=0.038).



Graph 1

Table 1: The predictive error's cumulative percentages are shown in the table below.

Predictive error	Frequency	Cumulative Percent
0	160	58.6
± 0.25	188	68.9
± 0.5	219	80.2
± 0.75	244	88.6
± 1	266	96.7
± >1	273	100

DISCUSSION AND CONCLUSION

Some advantages of our study are the uniformity of the biometric data collection (same technician and using the same machines to measure the K values and AL) and the surgery having been performed by a single surgeon, using suture less corneal incision with IOLs implanted within the capsular bag in all cases, decreasing the variables that might confuse the analysis of the IOL power prediction. One variable that we must comment is that, even in experienced hands, the AL measured by immersion ultrasound biometry can be more precise than the contact method, although it is more critical in eyes with longer AL.

The results of this study support SRK-2 formula as a good option to predict the refractive error after cataract extraction by phacoemulsification in eyes with medium axial length. To our knowledge, this study is unique in reporting eyes implanted in the capsular bag by the same surgeon, with preoperative measurements obtained from the same instrumentation by the same method and same technician, using SRK-2 formula for IOL power calculation in eyes with medium axial length that underwent phacoemulsification with foldable IOL implantation.

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