Verion image guided system: Study on expected refraction and keratometry

Paras Desai[1], Nirav Mehta[2], Milan Mistry[3]

[1] M Optom, Assistant Professor, Hari Jyot College of Optometry, Navsari, Gujarat, India
[2] M Optom, Principal, Hari Jyot College of Optometry, Navsari, Gujarat, India
[3] M Optometry, Hari Jyot College of Optometry, Navsari, Gujarat, India

Abstract

Method: A retrospective study was conducted at Rotary eye institute, Navsari, All patients who were diagnosed with cataract was included in the study. In each patient comprehensive eye examination was performed pre and post operatively objective refraction and keratometry reading was recorded. Their keratometry readings was compared. The objective refraction post operatively and verion expected refraction was compared with verion image guided system and Topcon autokeratorefractometer.

Result: Out of 63 patient's eyes, 39(61.9%) were female's eye & 24 (38.1%) were male's eye. A pair t – test was performed between veion expected spherical, cylinder and cylinder axis and post op AR spherical, cylinder and cylinder axis. There was no significant difference between verion expected spherical, cylinder and cylinder axis and post op AR spherical, cylinder and cylinder axis (M= -0.13, SD=0.12) and (M= -0.23,SD=0.49), p = 0.104, (M= - 0.75, SD=0.46) and (M=-0.80,SD=0.56), p = 0.308, (M= 88.71, SD=36.47) and (M= 88.89,SD=40.81), p = 0.981.Strong linear correlation was observed between IOL master K1 and verion K1, IOL master K2 and verion K2 and mean IOL master K and mean verion K, Pearson correlation =.97, ρ <.01. Pearson correlation =.96, ρ <.01, Pearson correlation =.97, ρ <.01

Conclusion: -The verion image guided system is the new technology to give reliable expected refractive outcome. The verion image guided system and IOL Master together can be used for achieving near emmetropia post operatively.

Introduction

One of the most prevalent reasons for impaired vision in the elderly is a cataract. It can either be inheriited or acquired. Cataract leads to hardening of the lens fibers which leads to opacification of the lens so there is decreased in visual acuity. Pre-operative planning for cataract surgery involves reliable and accurate measurements of the globe, including corneal curvature (keratometry) and axial length to choose the appropriate power of intra-ocular lens (IOL) to implant. With the increasing use of lenses and other premium IOLs, there is even more emphasis on the accuracy of keratometric measurements. The IOL Master (Carl Zeiss Meditec, Jena, Germany) is well established for use within cataract surgery due to the high repeatability in keratometric measurements proven within the literature. The advent of a new system, verion (Alcon Laboratories Inc. Fort Worth, TX), has provided a need to assess the accuracy and reliability of this new device. One study analysed the repeatability of keratometric and white-to-white distance measurements using the verion system and these results were compared with the results from the IOL Master. The Verion system demonstrated high repeatability and the measurements agreed with the IOL Master. However, the results also highlighted that further studies into the post-operative outcomes of patients measured with the verion image guided system are needed. A disadvantage of the verion system is that it can not measure the axial length of the eyes and therefore requires the axial length from the IOL Master to be inputted.

Material and methodology

A retrospective and prospective study was conducted at Rotary eye institute, Navsari, All patients were diagnosed with cataract was included in the study. Subject to the inclusion criteria below, 63 eyes of patients who attended Rotary eye institute from January 2020 - february 2021 for cataract surgery pre-assessment were measured both with the IOL Master and the verion systems. The patients were examined in a seated position with their chin on a chinrest and their foreheads against a rest to stabilise them during measurements. During each individual pre-assessment, the patient was examined on both machines by the same examiner and then followed-up approximately 60 days post-operatively by the same examiner on the verion image guided system, as well as the Top Con KR-800S autorefractor. Calculations for the predictive spherical outcome values for both the IOL Master and verion systems were made using the barrett and SRK/T formula. The study includes patients with all grades of cataract surgery. Detailed history was taken and clinical/ocular examination was done. Preoperative workup was done. Routine pre-operative investigations were conducted. The following evaluation was done in each case pre-operatively, intra-operatively and post-operatively on follow up: History, Intra-ocular tension, Best corrected Visual acuity, Distance (Snellen's vision chart), Near

(Snellen near vision chart), Detailed anterior segment examination on slit lamp, Posterior segment examination using +78D and +90D, Keratometry, Ascan, IOL Master 500, verion image guided system, Planning with verion planner, Power calculated with IOL Master 500. The demographic data of the included eyes was collected along with the data generated by the IOL Master and VERION systems pre and post-operatively and entered onto a database using an Excel spreadsheet (Microsoft Corporation, Redmond, WA). Calculations were made via the spreadsheet to determine preoperative VERION expected refractive outcome and the postoperative AR (Autorefractokeratometer) reading by using Topcon KR-800 for all 63 eyes. The ranges of these differences were also calculated along with the standard deviations of each data set. A statistical paired t-test was carried out between the two datasets to determine the statistical significance of the results.

Inclusion Criteria
Adults (≥ 22 years of age at the time of surgery), diagnosed with cataracts, Planned cataract surgery and implantation of FOLDABLE IOL, Pre-operative IOL Master and VERION scans, Post-operative auto-refractions, Monofocal lenses implanted (Alcon IQ and Alcon Single piece), Surgery with 2.2mm incision with centurion phaco system and done by single surgeon.

Exclusion criteria
Multifocal lenses implanted, History of severe dry eyes, Retinal/uveal pathology or concurrent ocular disease including age-related macular degeneration (AMD), choroidal neovascularization (CNV), glaucoma, diabetic retinopathy, retinitis pigmentosa, optic nerve pathology, Previous intraocular or any corneal refractive surgery, Any inflammation or edema (swelling) of the cornea, including but not limited to the following: keratitis, keratoconjunctivitis, and keratouveitis, Amblyopia.

Observation and Results
Out of 63 patient's eyes, 39(61.9%) were female's eye & 24(38.1%) were male's eye. A pair t – test was performed between veion expected spherical, cylinder and cylinder axis and post op AR spherical, cylinder and cylinder axis. There was no significant difference between verion expected spherical, cylinder and cylinder axis and post op AR spherical, cylinder and cylinder axis(M= -0.13, SD=0.12) and (M= -0.23,SD=0.49), p = 0.104, (M= - 0.75, SD=0.46) and (M=-0.80,SD=0.56), p = 0.308, (M= 88.71, SD=36.47) and (M= 88.89,SD=40.81), p = 0.981.Strong linear correlation was observed between IOL MASTER K1 and VERION K1, IOL MASTER K2 and VERION K2 and MEAN IOL MASTER K and MEAN VERION K, Pearson correlation =.97, ρ <.01. Pearson correlation =.96, ρ <.01, Pearson correlation =.97, ρ <.01
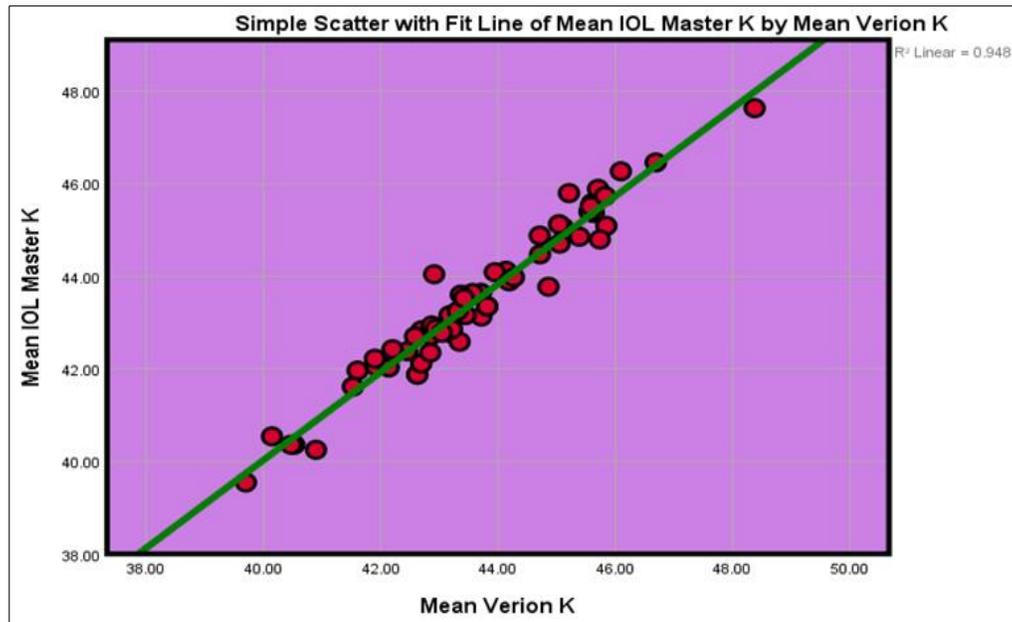
Table 1: age distribution

AGE	Test of Normality (Shapiro- wilk)		
	Statistic	Df	Sig.
	0.985	63	.628
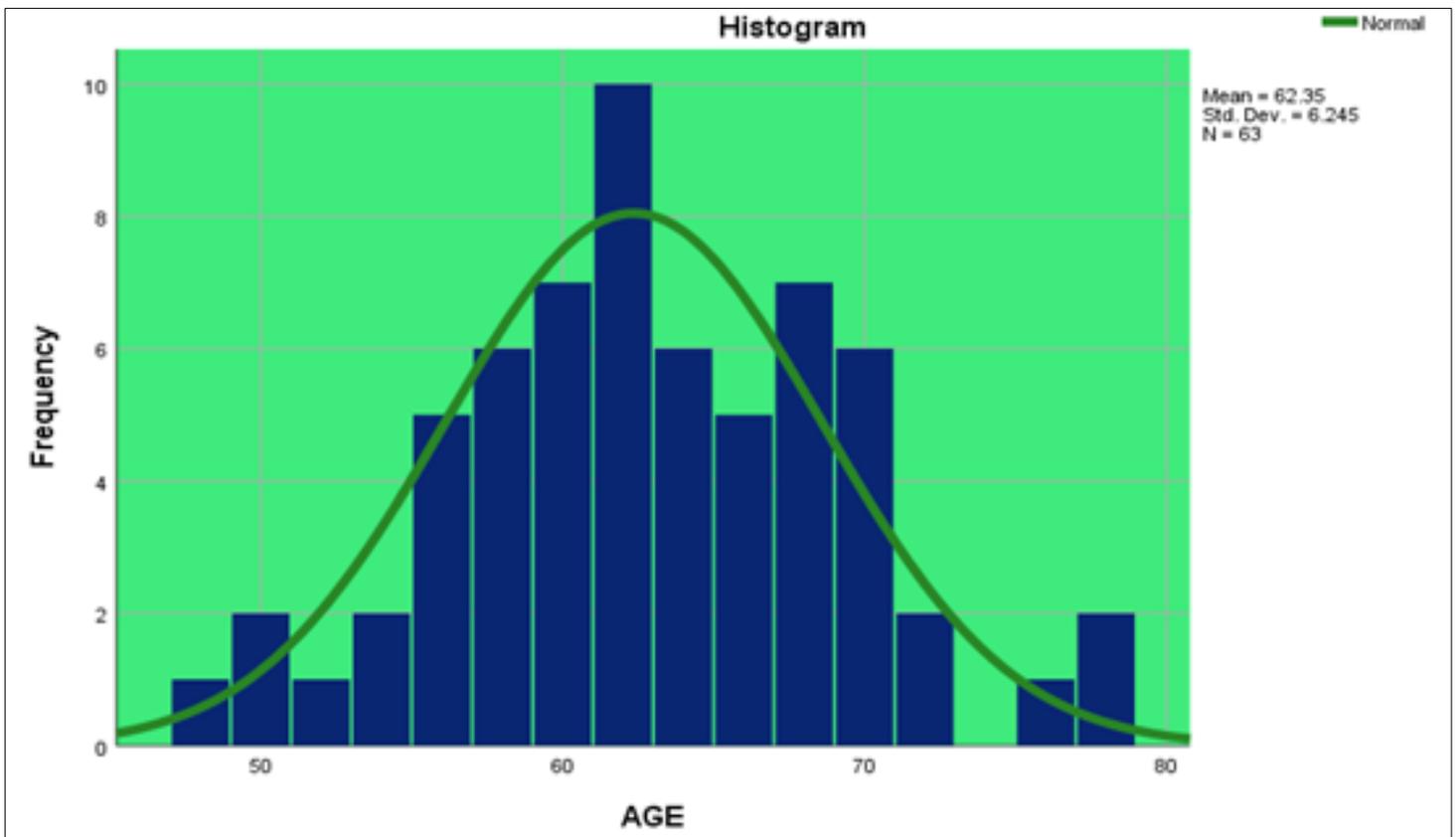
Graph 1: Age distribution

Table 2: Correlation between Mean IOL master K and mean verion K

Correlations		Mean IOL Master K	Mean verion K
Mean IOL Master K	Pearson Correlation	1	.974**
	Sig. (2-tailed)		.000
	N	63	63
Mean 7ersion K	Pearson Correlation	.974**	1
	Sig. (2-tailed)	.000	
	N	63	63

Graph 2: Correlation between Mean IOL master K and mean verion K

Discussion

Assessing the suitability of a new device in cataract surgery relies upon high repeatability of measurements and post-operative outcomes, which has been well established for the IOL Master, with several papers within the literature demonstrating high repeatability of keratometric measurements. In a recent study, the VERION system was shown to have high repeatability of keratometric measurements and white-to-white distance measurements with high correlations of these measurements compared to those from the IOL Master. A few outliers within this recent study highlighted the fact that the IOL Master and VERION sometimes measured different keratometric parameters and therefore revealed the need for further studies to determine a potential preference for systems to be used in cataract surgery by assessing post-operative results. Previous study shows result, The mean post-operative spherical equivalent outcome compared to the IOL master predictions was -0.0496D (standard deviation 0.427), ranging from -1.255 to +0.935D. The mean post-operative spherical equivalent outcome compared to the VERION predictions was -0.0426D (standard deviation 0.429), ranging from -1.305 to +0.89D. Our study Out of 63 patient's eyes, 39(61.9%) were female's eye & 24(38.1%) were male's eye results shows that both the IOL Master and the VERION systems have a good place in the prediction of postoperative spherical, cylinder and cylinder axis outcomes compared with Autokeretorefractometer (Topcon KR 800) readings

(objectively) after cataract surgery, as post-operatively there is no statistical difference between VERION expected spherical, cylinder, cylinder axis and Post-operative Autokeratorefractometer. (Topcon KR 800) spherical, cylinder and cylinder axis (M= -0.13, SD=0.12) and (M= -0.23,SD=0.49), p = 0.104, (M= - 0.75, SD=0.46) and (M=-0.80,SD=0.56), p = 0.308, (M= 88.71, SD=36.47) and (M= 88.89,SD=40.81), p = 0.981.Our study observed that there is a strong correlation between IOL Master and VERION keratometric readings Pearson correlation =.97, ρ <.01. With further potential developments in technology and new devices, the VERION may enjoy an increasing role in cataract surgery.

Conclusion

The Verion image guided system is the new technology to give reliable expected refractive outcome. The verion image guided SYSTEM and IOL Master together can be used for achieving near emmetropia post operatively, and for better suggestion of IOL's. In our study, IOL Master and the VERION systems have a place in the prediction of postoperative spherical cylinder and cylinder axis outcomes compared with Autokeretorefractometer (Topcon KR 800) readings (objectively) after cataract surgery, as post-operatively there is no statistical difference between VERION expected spherical cylinder, cylinder axis and Post-operative Autokeratorefractometer (Topcon KR 800) spherical cylinder and cylinder axis. There is a strong correlation between

the IOL Master and the VERION Keratometric readings. There was no significant difference in accuracy between the two systems. In addition to its role in astigmatism management, the VERION may be used to help refine postoperative spherical refractive predictions from the IOL Master. The VERION system has high repeatability and agreement with the IOL Master, making it suitable as an alternative tool in clinical practice.

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