Original Article

PREDICTION ERROR AND ACCURACY OF IOL POWER CALCULATION IN HIGH MYOPES UNDERGOING PHACOEMULSIFICATION

Chethana Warad [1], Sourabh Dileep Patwardhan P[2], Nidhi Patwardhan[2], Ajith Joshi MS[2], Dr Dileep Patwardhan[2], Madhvi Patwardhan[2]

[1]Assistant Professor Department of Ophthalmology, KLE'S J.N.Medical College, Belagavi.
[2]Consultant Ophthalmologist, Nandadeep Nethralay, Sangli, Maharashtra
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ABSTRACT:

Background:-
Non-neoplastic and neoplastic lesions of nasal cavity, paranasal sinuses and nasopharynx commonly present as either nasal polyps or masses. The symptomatology of all lesions are similar. Histopathologic study being the gold standard, helps in definitive diagnosis of these lesions.

Objectives:-
To evaluate the accuracy of Holladay 1 and 2 formulas used in the calculation of IOL power in high axial myopes undergoing phacoemulsification at our hospital

Material and methods:- A retrospective hospital based study was conducted on 26 eyes of 18 patients, age ranging from 28 to 80 years, axial length ranging from 31.59mm to 25.15mm. Calculation of the IOL power to be implanted was done using two IOL Power formulas: 1) Holladay1. 2) Holladay 2. The error for each eye was calculated from the difference between the emmetropic power and Holladay 1 and Holladay 2 Predicted emmetropic power, postoperatively. Finally statistical analysis was done using SPSS version 16.0

Results:- There was no statistically significant difference between the mean errors of the two formulas used in the overall performance. Holladay 1 formula caused 0.51+/-0.78D mean error (range -1.09-1.99) and Holladay 2 formula caused 0.48+/-0.64D (range -0.85 – 1.81) P=0.439 (95% confidence interval). In two eyes out of 26 eyes Holladay 2 was more accurate than Holladay 1 by more than 0.5D

Conclusion:- calculation of the IOL power in patients with high axial myopia using fourth generation formulas help in improvement of the calculation and decreasing the post operative refractive error. In 7.6% eyes Holladay 2 had more accuracy than Holladay 1.

Keywords:- IOL, Formulas, Holladay 1, Holladay2, Myopic eyes

INTRODUCTION

Patients with high myopia have prevalence of lens opacities and develop cataract at an earlier age than emmetropes.[1] In extreme myopia, implantation of a weak or plano posterior chamber IOL is considered preferable to aphakia because it stabilizes the vitreous base and reduces complications associated with posterior capsule opacification.[2] Precise biometry predication in high myopes with first and second generation formulas is not possible. The accuracy of third and fourth generation formulas for IOL calculation in patients with high axial myopia has not been fully evaluated.[3] This study aims to evaluate the performance of different recent IOL power calculation formulas.

Address of Correspondence:
Dr Chethana Warad
Door number 555, Scheme 13, Doordarshan Nagar
Belgaum 590019, Karnataka, India
Email id : Cwarad639@gmail.com
Mobile: 09595101239

MATERIAL AND METHODS

This was a retrospective hospital based study carried out at our hospital from May 2015 to April 2016.

The study comprised of 26 eyes of 18 patients who presented with cataract in one or both eyes and underwent phacoemulsification. All patients had given written consent for undergoing phacoemulsification surgery. All patients had vision 6/9 or better.

Patients with history of previous ocular surgery, glaucoma, corneal scarring, keratoconus, corneal dystrophies, corneal opacity, myopic maculapathy, CNVM, phacoemulsification with posterior capsule rupture, vitrectomy, lens in the sulcus or ACIOL were excluded. All patients with vision less than 6/9 were excluded.

Preoperative examination included uncorrected and BCVA measurement using Snellen's visual acuity charts, Slit lamp biomicroscopy, NCT, Indirect ophthalmoscopy after mydriasis. The axial length, Corneal power (k), anterior chamber depth were measured using IOL master. Those who had dense cataract, B-SCAN was done to rule out posterior segment disorders. OCT was done in all patients to rule out posterior segment disorders not visualized on IDO. Pre operative IOL power calculations were performed using Holladay 1 and 2. The surgeons goal in IOL power selection was a lens power that would yield least post operative refraction (<0.50D). The IOL formula that provided a lens power with the least post operative refractive error(<0.50D) was selected. Phacoemulsification was performed through a sutureless 2.8mm clear corneal incision, anterior continuous curvilinear capsulorhexis of 5-5.5mm and a posterior chamber 3piece hydrophobic/ hydrophilic foldable IOL was implanted in the capsular bag. The patients were followed up for 3 months. All patients were examined 3hrs after surgery and discharged. Then after 1 week and at monthly intervals for three months. Uncorrected and corrected distant visual acuity, autokeratometry and fundus examination were done at each visit.

All data was entered to microsoft excel sheet and statistical analysis was done with SPSS version 16.0.

RESULTS:

This study included 26 eyes of 18 patients with age ranging from 28 years to 80 years, average being 53 years. Axial length ranging from 25.15mm to 31.59mm, average being 27.06mm. IOL power ranging from -1D to +15D, average being 10.5D. The error in each eye was calculated by the difference between formula predicted emmetropic power and post op refraction. There was no statistically significant difference between the mean error of the two formulas used in the overall performance. Holladay 1 formula caused 0.51+/-0.78D mean error (range -1.09-1.99)and Holladay 2 formula caused 0.48+/-0.64D mean error (range -0.85 – 1.81) P=0.439 (95% confidence interval). In two eyes out of 26 eyes Holladay 2 was more accurate than Holladay 1 by more than 0.50D. So, in 7.6% eyes Holladay 2 had more accuracy than Holladay 1.

DISCUSSION

The accurate calculation of intraocular lens (IOL) power is essential for attaining the desired refractive outcome after cataract surgery. The accuracy of the calculation mainly depends on the accuracy of the preoperative biometric data [axial length (AL), anterior chamber depth (ACD), and keratometric value (K)] and accuracy of IOL power calculation formulas. IOL power calculation formulas work best for eyes with normal axial length. However, precise biometry prediction in extremely long eyes has always been difficult for 2 reasons: 1) Presence of the posterior staphyloma. 2) Lack of accuracy of the available formulas that calculated the power of intra ocular lens in cases of high myopia. [4]

In this study, we studied the refractive outcome of Holladay 1 and 2 IOL Power calculating formulas in eyes with high myopia. Each IOL Power

calculating formula has a constant associated with predicting the estimated lens power. The Holladay 1 formula uses a surgeon factor that is the distance between the iris plane and the power plane of the IOL, where the distance from the cornea to iris plane is calculated as the dome height of the cornea. The Holladay 2 and Hoffer Q formulas use ACD constant which is the average distance between the power plane of the cornea and the IOL. SRK T uses the A constant supplied by the manufacture of the IOL.

Study done by Terzi et al and Haigis concluded that optimization of lens constants improved the accuracy of IOL Power calculation.[5] Study done by chau et al concluded that SRK -T may be more accurate than Hoffer -Q and holladay 2 for eyes with axial lengths greater than 25mm.[6] Study done by Mitra A et al concluded that the choice of IOL Power calculation in eyes with axial myopia in Indian population is Holladay 1 which gives accurate results and SRK II and SRK/T to be avoided.[7] Ganesh et al compared the accuracy of IOL power calculation in high myopes using Hagis and SRK II formula and inferred that the hagis formula was very effective in eyes with axial length ranging from 25 to 32mm.[8] In a study done by Ganhem et al , they have stated that the calculation of IOL power in patients with high axial myopia using the third or fourth generation formulas help in improvement of the accuracy of the calculation and decreasing the post operative refractive error. They did comparison of three formulas namely SRK/T, Haigis, Holladay and found that SRK/T formula showed the lowest mean error, however, there was not statistically significant difference between the three formulas used.[9] But none of the studies have compared the accuracy of IOL Power calculation in high myopes using Holladay 1 and 2. So, the present study aims to evaluate the accuracy of Holladay1 and 2 formulas used in the calculation of IOL power in high axial myopes. There was no statistically significant difference between the mean error of the two formulas used in the overall performance. Holladay 1 formula caused 0.51+/-0.78D mean error (range -1.09-1.99) and Holladay 26 eyes Holladay 2 was more accurate than Holladay 1 by more than 0.5D.

CONCLUSION

Calculation of the IOL power in patients with high axial myopia using fourth generation formulas help in improvement of the calculation and decreasing the post op refractive error. In 7.6% eyes Holladay 2 had more accuracy than Holladay 1. So, though statistically both Holladay 1 and Holladay 2 are equally effective, clinically Holladay2 seems to be more accurate than Holladay 1.

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