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Correlation between one month post operative refractive status with pre operative calculated IOL power

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ABSTRACT

Purpose: To study the correlation between preoperative calculated IOL power and post operative refractive error in temporal phacoemulsification.

Materials and Methods: This study was a retrospective analysis in which data of 100 cases of senile cataract who underwent temporal phacoemulsification with foldable IOL was selected. Patients underwent post op examination at 4 weeks and only those patients whose vision was improving to 6/6 with or without correction was selected and their post operative refractive error in form of spherical equivalent was evaluated at 4 weeks of surgery and analysed with the preoperative calculated IOL power. All complicated cataract, cases with ocular pathology, patient with intraoperative or post operative complication and patient with history of any ocular surgery were excluded from the study. Formula used were SRK/T, HOFFER Q and HAIGIS.

Result: The mean IOL power used was20.39± 4.91, mean axial length was 23.43±1.53. The mean refractive error in form of spherical equivalent was-0.32±0.74. A total of 84 percent patients refractive error was upto 1D.A total of 37 percent patient had refractive error upto 0.25D, 57 percent upto 0.50 and 72 percent upto 0.75D.Myopic shift was present in 53 percent patients and hyperopic shift in 24 percent patient. There was no statistically significant correlation between iol power and refractive error at 4 week of temporal phacoemulsification as p value came as p=0.34

Conclusion: While pre op accurate calculation of IOL power is very important for better visual acuity post op but just looking at any IOL power we cannot guess about refractive error that it may result.

1. Introduction

Cataract surgery underwent huge evolution over the years. Being one of the most common elective surgical procedures, cataract surgeries witnessed huge improvement with personalized biometric measurements. Cataract surgery in the present era is considered more of refractive procedure and patients expect to have a glass free life. A correct IOL power can minimize the residual refractive error after surgery. Axial length and keratometry finding contribute to the IOL power. One of the most stablised correlation is between axial length and residual refractive error.[1] While an error of 1mm measurement error causes 2.8 D calculation error of post refractive error and error of 1 D keratometry causes approximately error of approximate 1 D calculation error.[2] Due to these reason ophthalmologist are extra careful in hyperopic eyes biometry and eyes with unusual findings. Formula related errors can cause errors of calculation. While srk/t is good for medium range eyes, hoffer q and haigis are good for extreme values.[3] A scan, keratometry and formula errors all are included in IOL power. So it become interesting to see how different IOL power of the IOL number ranges gives residual refractive error. Spherical equivalent in ocular refraction is the power of external lens

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which is required to focus images clearly on retina.[4] This study proposes to study the correlation between the value of IOL power and spherical equivalent of the refractive error after 4 weeks of temporal phacoemulsification.

2. Material and Methods

The study design was retrospective analysis which included 100 post-operative cataract patient data from month of January to June 2020 at Sankara eye hospital, Kanpur who underwent temporal phacoemulsification surgery. The surgeries were done by four different surgeon of equal competence. A scan was done by US biometry and IOL master. Automated k1, k2 readings were used The machine used for surgery was Alcon's Laureate Foldable lenses from different brands were used in the surgery.

2.1. Inclusion criteria

1. Cases in which temporal phaco were done.
2. Senile cataract..
3. Only those cases were selected in which final best corrected vision was 6/6 with or without correction..
4. Patients whose 1 month post op data was available.

2.2. Exclusion criteria

1. All complicated cataracts.
2. Patients with ocular pathology.
3. Patient with intraoperative and post op complication.
4. Cases with history of any previous ocular surgery.

Preop evaluation was done and formula used were SRK/T., HOFFER Q AND HAIGIS.

Post op subjective refraction was done at 4 weeks and the subjective refractive error was converted into spherical equivalent. For every IOL used spherical equivalent was calculated at 4 weeks.

Post op treatment included E/d prednisolone acetate 1 drop 6 times taper weekly and E/d moxifloxacin 1 drop qid for 2 weeks.

3. Result

A total of 100 eyes were included in the study. The IOL power used were from range of -2.5 to 37 dioptre. Mean IOL power was 20.39 SD ±4.91. Mean axial length was 23.43 1.53.

The mean post op spherical equivalent refractive error was -0.32 SD ± 0.74 Among the total 84 percent eyes was within ±1.00D error. 23 patient was emmetropic, 53 patient were having myopic refractive error and 24 with hyperopic error. 16 patient had refractive error of >1.D. 13 percent patient had myopia more than 1D and 3 percent patient had hyperopia more than 1D. A total of 37 percent had spherical equivalent less than or equal 0.25(0-.25).57 percent patient had refractive error of less than or equal to 0.50. 72 percent patient had refractive error upto 0.75 D. 84 percent patient had refractive error upto 1 D. t Test were applied and the pearson correlation value between the IOL power and post op spherical equivalent error was -.097. Thus there was a no correlation between calculated pre op IOL power and post op spherical equivalent significant as p value came as 0.34.(r = -0.097, p= 0.34) Correlation between axial length and refractive error were negligible but not statistically significant in as in our study as p value is 0.34 which is more than 0.05. (r =0.096, p = 0.34).

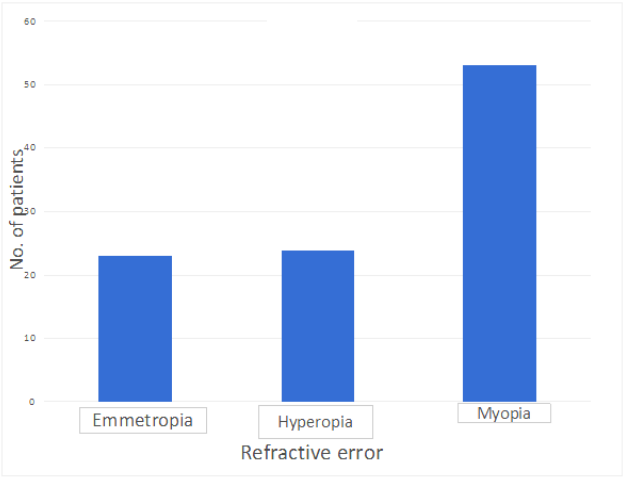

Fig. 1:

Table 1:

Refractive error	No. of patients
0	23
>0 ≤0.25	14
>0.25- ≤0.5	20
>0.5- ≤ 0.75	15
>0.75- ≤1	12
>1	16

Table 2:

Mean	20.39	-0.32257
Variance	24.12919192	0.551330389
Observations	100	100
Pearson Correlation	-0.096984145	
Hypothesized mean Difference	0	
df	99	
T Stat	41.1073811	
P(T<=t) One - tail	2.48908E-64	
t Critical one - tail	1.660391156	
P(T=t)Two - tail	4.97817E-64	
t Critical two - tail	1.984216952	

Fig. 2: Correlation of IOL power and refractive error (spherical equivalent)

4. Discussion

All patient were evaluated for the spherical equivalent for refractive error at 4 weeks after best accepted subjective refraction was taken into account. Patients having myopic error or hyperopic error upto 1D are 84 percent. Correlation between IOL power and post op refractive error was not statistically significant in our study

This is consistent with Yunus Karabela et al.[5] study that concluded that there was no correlation between IOL power and refractive error. In their study only axial length of 22.0-24.60 was included while in our study axial length from 19.0 to 30.05 mm was included. However a negative correlation between axial length and refractive error was found. Extreme value or unusual eye axial length were excluded. For the error >1.0 D in their study 4.25% were more hyperopic and more myopic than 1 D were 1.86%. In our study outside 1D range 13 percent were myopic out of the total. In their study 92.75% eyes refractive error was in range of 1D.

Our study result were similar with Aristodemou et al[6] in which refractive error of less than 1 D were present in 80 percent of cases. Advantage of this study was a large sample size and values were taken from many surgical centres.

Hoffer et al[7] study showed 94.5 percent patient were within range of 1.00D.

Olsen et al[8] reported that 87 percent patient refractive error was within 1D limit. This study was similar to our study because it used different IOL type of different company and different formula were used. The IOL used were from range of 18.92 -37.45.

Correa et al[9] studied retrospectively in 81 patient with axial length of 22-25mm and presented residual refractive error 40.7% within 0.50 D,35.7% within 0.51 to 1.25 D, 9.8% within 1.26 to 2D

Lagrasa et al[10] reported 24% patients within 0.25 D, 55 percent within 0.5 D and 91 percent within 1D.

Bhatt et al[11] reported that 18.8% of eyes were within 0.25D error, 37.5% of eyes were within 1.0 D refractive error and 71.3% of eyes were within 1.00D error.

In Hubaille et al[12] study different types of foldable lenses of different brands were use as in our study. This study was also retrospective. They found the error were within 0.75 D in 78% cases and within 1 D in 88% cases.

Rajan et al.[13] conducted study a range of axial length 23.4±1.2. Mean absolute error was .62 ±.40. 87 percent patient were within 1.00 D.

The royal college of ophthalmologist recommends the need to achieve post op target refraction of 1 D to be achieved in 90 percent of cases.

Although our study showed the in 84 percent cases refractive error was less than 1D Advantage of our study was all ranges of IOL numbers starting from a value of -2.5 D to 37 D were included and axial length from 19.0 to 30.5 mm were included that makes our data more inclusive and different formula as well as different lens type were used.

Disadvantage of our study is its small sample size, four different surgeon doing biometry and surgery.

There are various reasons of refractive surprise in surgery[14]

1. Wrong biometry
2. Preoperative corneal astigmatism
3. Previous surgery like PKP
4. Wrong formula used for calculation of IOL
5. Astigmatism caused due to surgery
6. Position of capsulorrhexis
7. Post op anterior movement of IOL due to fibrosis.

There can be various method to reduce refractive surprise[3]

1. Preoperative corneal astigmatism can be taken into account by taking incision on steeper axis.
2. Patient who underwent sequential surgery the previous data should be taken into account during second surgery.

5. Conclusion

Our study with its result showed that there was no statistically significant correlation between IOL power and post op refractive error and so there is no way that we can guess about the residual refractive error on the basis of IOL power.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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