ORIGINAL ARTICLE

ANALYSIS OF INTRA OCULAR LENS POWER ESTIMATION IN PATIENTS ADMITTED FOR CATARACT SURGERY

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ABSTRACT

Background: According to Pakistan National Blindness and Visual Impairment Survey, cataract accounts for 51.5% of blindness and visual impairment in Pakistan. In most of the camp and primary level facilities intra-ocular lenses are implanted without proper estimation. The purpose of this study was to know the common keratometric, axial length values, IOL powers and whether or not it is advisable to implant intra-ocular lenses without proper pre-operative assessment.

Material & Methods: It was a retrospective study conducted at Department of Ophthalmology, DHQ Teaching Hospital, D.I.Khan. Review of estimated power of IOL of 1000 admitted patients was done.

Results: Out of 1000 patients, 473(47.3%) were males and 527(52.7%) females. The youngest patient was 10 years while the oldest was 80. Maximum patients presented in 51-60 years age group. Only 25(2.5%) patients were below 20 years. The range of axial length was 19.50-28.0mm. 581(58.1%) patients were having axial length 22-23.50mm. Ten (1.0%) had axial length $\geq$26mm and 6(0.6%) <20.0mm. The range of estimated IOL power by SRK II formula with 118.0A constant was 10-33D. Maximum patients, 140(14.0%) were having IOL power of 20.50D. 522(52.2%) patients were having IOL power 20-22.0D. Only 26(2.6%) patients had IOL power of $\leq$15.0D and 56(5.6%) $\geq$25D.

Conclusion: The estimated power of IOL differs from patient to patient with a wide range of 10D to 33D. Therefore assessment of IOL power by proper keratomery and biometry is desirable for good post-operative vision.

Key Words: Keratometric value, Intraocular Lens, Ocular Axial length.

INTRODUCTION

Pakistan is the sixth most populous country in the world.[1] According to the Pakistan National Blindness and Visual Impairment Survey cataract accounts for 51.5% of blindness and visual impairment in Pakistan.[2] While in previous survey in 1989-90, 66.7% blindness in Pakistan was due to cataract.[3] This decrease in blindness due to cataract was brought by increasing the surgical facility centers as well as arranging outreach surgical camps in the far-flung areas of the country.[1]

In most of the camps as well as in Tehsil and some District Headquarter hospitals intra ocular lenses (IOLs) are implanted without proper preoperative estimation. IOL powers in the range of 20-22D are randomly implanted to the patients. IOL implantation is a revolutionary breakthrough in the field of Ophthalmology. These are available in different biometers. Calculation of IOL power can be done by SRK I, SRK II, SRK/T, and Holladay formulae.[4-7] Corneal dioptric power is calculated in diopters in vertical meridian (K1) and horizontal meridian (K2) by keratometer. Axial length of the eyeball is measured in mm by A-scan and A-constant of IOL.

The purpose of this study was to know the common keratometric, axial length values, IOL powers and whether or not it is advisable to implant IOLs without proper pre-operative assessment.

MATERIAL AND METHODS

It was a retrospective study conducted at Department of Ophthalmology, DHQ Teaching Hospital, D.I. Khan Pakistan.

Records of 1000 patients above ten years of age were taken, who underwent cataract extraction with IOL implantation in the year 2007 and 2008.

Keratometry and biometry of all the patients was performed by a single operator in the unit. Same manual keratometer and A-Scan was used for all the patients. SRK II formula was used for

IOL power calculation and 118.0 was the A constant for IOL to be implanted. All the readings were noted down in a typed proforma. The data was analyzed on Statistical Package for Social Sciences (SPSS) version 10. The results were compared with similar studies in the past.

RESULTS

We collected 1000 cases of patients who had their pre-operative IOL estimation done in the ward. 473 (47.3%) were males and 527 (52.7%) females. (Table-1)

Table-1: Sex distribution of patients.

Sex	Number of patients	Percentage
Male	473	47.3
Female	527	52.7
Total	1000	100

Patients were divided in different age groups, the minimum age was 10 years while the oldest person presented with 80 years of age. Maximum number of patients 354 (35.4%) presented between 51-60 years age group, while the minimum number 25 (2.5%) presented between 10-20 years age group. (Table-2)

Axial length was measured in millimeters. It ranged from 19.50 to 28.00mm. Maximum number of patients 227 (22.7%) were having 22.50-23.00mm axial length. Six (0.6%) patients were having axial length between 19.50-20.00mm, and only 2 were having between 27.50-28.00mm. (Table-3)

Table-2: Age distribution of patients.

Age Group in years	Number of patients	Percentage
10-20 yrs	25	2.5
21 to 30 yrs	74	7.4
31 to 40 yrs	42	4.2
41 to 50 yrs	97	9.7
51 to 60 yrs	354	35.4
61 to 70 yrs	323	32.3
71 yrs and above	85	8.5
Total	1000	100.0

Corneal power in vertical meridian (K1) and horizontal meridian (K2) was measured. The minimum K1 and K2 readings noted were 37.0 D, while the maximum readings were 48.0D. The maximum number of patients 449 (44.9%) were having K1 value of 42-44 D, while 492 (49.2%) patients were having K2 value in the range of 42-44D. Only 5 (0.5%) patients had K1 and 4 (0.4%) had K2 values more than 47.50 D. (Table-4)

We estimated the IOL power of all the patients by using SRK II formula. A constant of the IOL was taken to be 118.0. The minimum power calculated was 10.0 D, while the maximum one was 33.0 D. The maximum number of patients 140 (14.0%) were having IOL power of 20.01 to 20.50 D. 56 (5.6%) patients were having IOL power 25.0 D and more, while 26 (2.6%) patients were having IOL power 15.0 D or less. (Table-5)

Table-3: Axial Length in mm.

Axial length in mm	Number of cases	Axial length in mm	Number of cases
19.50-20.0	6 (0.6%)	24.01-24.50	60 (6%)
20.01-20.50	10 (1.0%)	24.51-25.00	18 (1.8%)
20.51-21.0	19 (1.9%)	25.01-25.50	9 (0.9%)
21.01-21.50	60 (6.0%)	25.51-26.00	4 (0.4%)
21.51-22.0	86 (8.6%)	26.01-26.50	3 (0.3%)
22.01-22.50	171 (17.1%)	26.51-27.00	3 (0.3%)
22.51-23.0	227 (22.7%)	27.01-27.50	2 (0.2%)
23.01-23.50	183 (18.3%)	27.51-28.0	2 (0.2%)
23.51-24.00	137 (13.7%)	Total	1000 (100%)

Table-4: K1 and K2 readings in diopters.

Reading in Diopters	K1 No. of Cases	K2 No. of Cases	Reading in Diopters	K1 No. of Cases	K2 No. of Cases
39 & below	07 (0.7%)	07 (0.7%)	43.51-44.00	169 (16.9%)	192 (19.2%)
39.01-39.50	07 (0.7%)	11 (1.1%)	44.01-44.50	136 (13.6%)	95 (9.5%)
39.51-40.00	20 (2.0%)	25 (2.5%)	44.51-45.00	109 (10.9%)	90 (9.0%)
40.01-40.50	26 (2.6%)	25 (2.5%)	45.01-45.50	75 (7.5%)	55 (5.5%)
40.51-41.00	31 (3.1%)	35 (3.5%)	45.51-46.00	25 (2.5%)	29 (2.9%)
41.01-41.50	43 (4.3%)	52 (5.2%)	46.01-46.50	11 (1.1%)	06 (0.6%)
41.51-42.00	46 (4.6%)	64 (6.4%)	46.51-47.00	08 (0.8%)	07 (0.7%)
42.01-42.50	45 (4.5%)	50 (5.0%)	47.01-47.50	02 (0.2%)	03 (0.3%)
42.51-43.00	142 (14.2%)	149 (14.9%)	47.51-48.00	05 (0.5%)	04 (0.4%)
43.01-43.50	93 (9.3%)	101 (10.1%)	Total	1000 (100%)	1000 (100%)

Table-5: Estimated power of IOL in diopters.

Power of IOL in Diopters	Number of Cases	Power of IOL in Diopters	Number of Cases
14.0 & below	16 (1.6%)	21.01-21.50	100 (10%)
14.51-15.00	10 (1.0%)	21.51-22.00	93 (9.3%)
15.01-15.50	7 (0.7%)	22.01-22.50	48 (4.8%)
15.51-16.00	11 (1.1%)	22.51-23.00	52 (5.2%)
16.01-16.50	05 (0.5%)	23.01-23.50	21 (2.1%)
16.51-17.00	30 (3.0%)	23.51-24.00	12 (1.2%)
17.01-17.50	13 (1.3%)	24.01-24.50	19 (1.9%)
17.51-18.00	44 (4.4%)	24.51-25.00	19 (1.9%)
18.01-18.50	30 (3.0%0	25.01-25.50	9 (0.9%)
18.51-19.00	42 (4.2%)	25.51-26.00	10 (1.0%)
19.01-19.50	62 (6.2%)	26.01-26.50	4 (0.4%)
19.51-20.00	82 (8.2%)	26.51-27.00	7 (0.7%)
20.01-20.50	140 (14.0%)	27.01 & above	7 (0.7%)
20.51-21.00	107 (10.7%)	Total	1000 (100%)

DISCUSSION

Cataract is the main cause of treatable blindness worldwide, developing countries accounting 75% of this blindness.[8] In 1997 approximately 10 million cataracts were performed globally but despite this, cataract blindness is thought to be increasing by 1-2 millions per year.[9] To address this backlog significant progress is being made in increasing the output of cataract surgical services in many developing countries.[10] However, it is becoming evident that the outcome of cataract sur-

gery is not always good and much more attention needs to be given to this aspect of surgical services.[11] Implant power formulas attempt to provide a predictable refractive outcome based on preoperative assessment.[4-7]

In our study 45% patients presented between 40-60-years age group. This is a very responsible age group where patients are holding important jobs and proper assessment & good post-operative vision is much needed. Naz[12] noted that 52% patients presented in this age group, while in another study by Rashid,[13] 41.5% presented in this age group.

In our study 473 (47.3%) were male while 527 (52.7%) females. This also corresponds to the male to female ratio of our general population in the country. Rashid[13] also noticed 47.75% males and 52.25% females in his study while 66.4% males and 43.6% females presented to the study done by Naz[12] at Rawalpindi and Lahore.

In our study 52.5% patients had estimated IOL powers between 20-22 D. The total range of IOL power was from 10-33 D. In a similar study done by Rashid,[13] 33% patients were estimated to be having IOL powers between 20-22 D, with a range from 6.5-36 D. While Naz[12] showed 52% patients in the range of 20-22 D, while a total range of 4-35 D. Elder[14] in his study showed a range from 12-27 D, in IOL power estimation. This wide range again shows the importance of proper assessment of IOL power before implantation. The range of axial length in our study was from 19.50mm to 28mm, while 58% were having axial length between 22.00mm to 23.50mm. Rashid[13] noticed a range from 18mm to more than 28mm, with 39% patients in the range of 22mm to 23mm. While Naz[12] noticed a range from 20mm to 28 mm, with 54% lying between 22mm to 23mm. Other studies done by Krimmer JE[15], Raj PS[16] and Lesiews KA et al,[17] also found that majority of axial lengths were between 22mm to 23mm.

In our study the dioptric power of vertical meridian (K1) was 37-48 D and the same was the case with horizontal meridian of cornea (K2). Majority of K1 readings fell between 42-44 D (45%) and majority of K2 readings between 42-44 were (49%). Rashid[13] noticed 40.84% of cases between 42-44 D for K1 and 41.20% between 42-44 D in case of K2 readings. Naz[12] noted 42.5% cases of KI between 42-44 D and 27% cases of K2 between 42-44 D, this was also comparable to the study done by Siahmed K, et al.[18]

CONCLUSION

The values of axial length K1, K2 and IOL power widely differ from person to person therefore assessment of IOL power by proper keratometry and biometry is desirable for good post-operative vision.

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