

Two Years Review of Intraocular Lens Power Calculation in Ophthalmology Department of Saidu Teaching Hospital, Swat

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Purpose: To determine the mean power of intraocular lens (IOL), keratometric readings and axial length of the eyeball in patients admitted for cataract surgery with IOL implantation.

Materials and Methods: A retrospective review of the intraocular lens power calculation record of patients admitted for cataract surgery with IOL implantation in Ophthalmology Department of Saidu Teaching Hospital, Saidu Sharif, Swat over a period of two years from 1st January 2004 to 31st December 2005 was undertaken.

Results: Out of 1359 cases of cataract surgery with IOL implantation admitted during the study period, 649 (47.75%) were male whereas 710 (52.25%) were female. The mean age was 58.71 years. Right eye was operated in 697 (51.3%) cases, while 662 (48.7%) cases were operated on left eye. Mean keratometric (K1 and K2) readings were 42.65 D and 42.48 D respectively and ranged from 36 D to 52 D in each. Mean axial length of eyeball was 22.52 mm with range from 18 mm to 29.31 mm. Mean power of IOL with 118.0 A constant was 23.17 D with range from 6.50 D to 36.00D.

Conclusions: Majority (62.2%) of patients reported in 6th-7th decade of life (51-70 years of age) and they avoid surgery in extreme summer, winter and Ramadan. Mean K1 & K2 readings were 42.65 D & 42.48 D respectively. Mode (most common) K1 & K2 readings were 43 D & 42 D respectively. Mean & mode axial lengths of eyeball were 22.52 mm & 22 mm respectively. Mean & mode powers of IOL with 118.0 A constant were 23.17 D & 23.50 D respectively.

Cataract is the most common treatable blindness in the world. Pakistan faces the same situation with cataract being the leading cause of blindness, contributing to 66.7% of total 1.78% blindness¹. While according to recent National Survey of Blindness and Low Vision, cataract contributes 53% of total 1.05% blindness (Unpublished). Intraocular lens (IOL) implant in cataract surgery is a revolutionary break-through in

Ophthalmology. Awareness regarding IOL implant is very high and almost every patient demands for it during his/her cataract operation.

The power of the IOL to be implanted during cataract surgery to achieve a desired amount of post-operative refraction is routinely calculated pre-operatively. Calculation of IOL power has been simplified by SRK I, SRK II, SRK/T and Holladay formulae available in a variety of biometers. The SRK

II formula has been widely used for IOL power calculation. Corneal curvature (K-readings), axial length of eyeball and A-constant are the only measurement required in SRK II formula. IOL manufacturer provides A-constant. The two ocular parameters that need to be measured are axial length and K-readings; K-readings are obtained on either digital or manually operated keratometer. In children and in supine position hand held keratometer is used². Axial length in mm is obtained on A-scan of ultrasonography, which is available in all currently marketed biometers. Accurate measurement of ocular axial length is extremely important for accurate IOL power calculation since axial length measurement is the major identifiable source of error in IOL power calculation. It is commonly recommended that multiple A-scan readings be averaged to obtain an accurate estimate of ocular axial length; however a high quality single axial length taken on biometer is also acceptable³. Axial length of eyeballs filled with silicon oil is over estimated by ultrasonic A-scan as compared to eyes with normal vitreous. A conversion factor of 0.71 when used in exiting biometry formula (SRK/T) allows calculation of exact IOL power in silicon oil-filled eyes⁴.

The objectives of the study were to determine the mean power of intraocular lens, keratometric readings and axial length of the eyeball in patients admitted for cataract surgery with IOL implantation.

MATERIALS AND METHODS

A retrospective review of the IOL power calculation record of the patients admitted for cataract surgery with IOL implantation in our Department over a period of two years was undertaken. All patients admitted for cataract surgery with IOL implantation in our department are registered and their IOL power calculation record is maintained in a register. Keratometry; especially dioptric power of vertical and horizontal corneal meridian (K1 & K2) respectively of every case was measured with keratometer and recorded. Axial length of eyeball in mm was taken with the help of A-scan and power of IOL was calculated by using SRK-II formula and A constant of 118.0 was used in calculations. Age, sex, laterality and date of IOL power calculation were also recorded in the register.

Data of the patients was stored in SPSS (Statistical Package for Social Sciences) 8.0 for Windows statistical package. Statistical analyses of continuous data were

made. Frequency of patients admitted for cataract surgery with IOL implantation in different months was made. Mean, standard deviation, median, mode and range of age, keratometric readings, axial length and power of IOL were determined. Laterality and sex distribution of patients were also determined.

RESULTS

Total 1359 cases of cataract surgery with IOL implantation admitted during the study period were analyzed; 649 (47.75%) were male whereas 710 (52.25%) were female. The mean age was 58.71 years with standard deviation (SD) of 18.23 years. Median and mode age was 60 years and range was 97 years (3 years to 100 years). Majority (62.2%) of patients reported at the age between 51 – 70 years. Age distribution is given in Figure 1. Right eye was operated in 697 (51.3%) cases, while 662 (48.7%) cases were operated on left eye. In year 2004, 726 (53.42%) cases and in year 2005, 633 (46.58%) cases were operated. Monthly distribution of these cases is given in Figure 2.

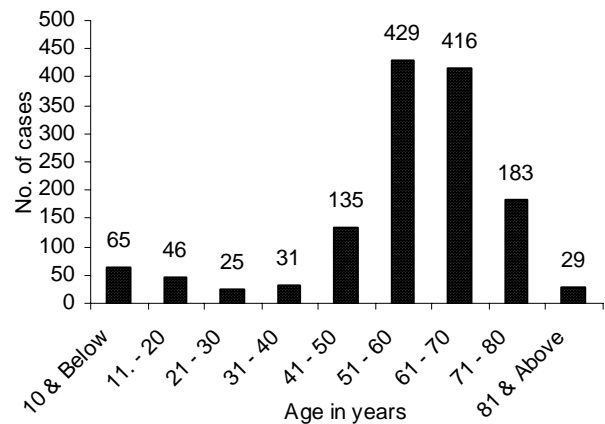


Fig. 1: Age distribution

Mean power (in diopter) of vertical corneal meridian (K1) was 42.65 D with SD of 2.1 D. Median K1 reading was 42.6 D and mode was 43 D with range of 16 D (36 D to 52 D). Similarly mean power (in diopter) of horizontal corneal meridian (K2) was 42.48 D with SD of 2.17 D. Median K2 reading was 42.5 D and mode was 42 D with range of 16 D (36 D to 52 D). Keratometric reading distribution is given in (Table I). Mean axial length of the eyeball was 22.52 mm with SD of 1.13 mm. Median axial length reading was 22.51 mm and mode was 22 mm with range from 18 mm to

29.31 mm. Axial length of eyeball distribution is given in (Table 2). Mean power of IOL with 118.0 A constant was 23.17 D with SD of 2.47 D. Median power of IOL was 23.00 D and mode was 23.50 D with range of 29.50 D (6.50 D to 36.00 D). IOL power distribution is given in (Table 3).

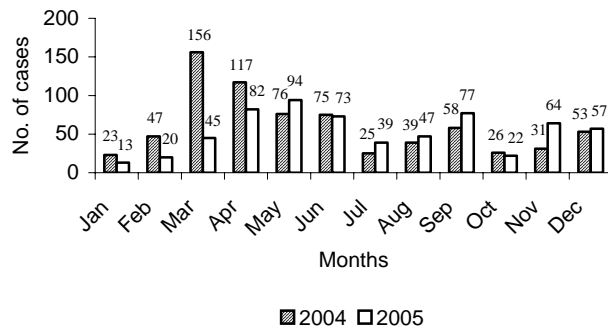


Fig. 2: Monthly distribution.

DISCUSSION

Though cataract is a senile change in crystalline lens but can occur in early age group due to variety of reasons. Majority (62.2%) of our patients reported in 6th - 7th decade of life (51 - 70 years of age). Our study revealed that seasonal influence is still in the minds of cataract patients. Majority of them report for surgery during March, April, May (Just after winter or before summer) and in the month of September just after summer or before Ramadan and winter season. They avoid surgery in extreme weather and prefer moderate season. Naz⁵ also reported this in his study. Large numbers of cases usually reported in month of March (156 in year 2004), but only 45 cases of cataract surgery reported in March 2005 due to rains and flood in Malakand division.

We found in our study that mean dioptric power of vertical meridian (K1) and horizontal meridian (K2) of cornea was 42.65 (SD 2.1) D and 42.48 (SD 2.17) D respectively. Hoffer⁶ published a series of 450 cases in which mean keratometry reading was 43.83 (SD 1.56) D, while in an other study done by Elder⁷ mean keratometry reading was 43.29 (SD 1.57) D. The range of keratometry readings was 16 D (36 D - 52 D) in our study. This was comparable to the previous studies done by Naz⁵ in which the keratometry readings ranged from 39.50 D - 50 D; and by Elder⁷ in which the range was 40.25 D - 47.87 D.

In our study mean axial length of eyeball was 22.52 (SD 1.13) mm. While in different studies the mean axial length ranged from 22.76 - 23.56 mm^{4,6-8}.

Table I: Keratometric readings distribution.

Reading in Diopters	K1	K2
	No. of cases n (%)	No. of cases n (%)
37.99 & Below	20 (1.47)	42 (3.09)
38 - 39.99	92 (6.77)	102 (7.50)
40 - 41.99	299 (22.00)	296 (21.78)
42 - 43.99	555 (40.84)	560 (41.20)
44 - 45.99	322 (23.69)	292 (21.48)
46 - 47.99	56 (4.12)	58 (4.26)
48 & Above	15 (1.10)	9 (0.66)

K1 = Power of vertical corneal meridian in diopters.

K2 = Power of horizontal corneal meridian in diopters.

Table 2: Axial length distribution.

Axial length in mm	No. of cases n (%)	Axial length in mm	No. of cases n (%)
18 - 19.99	14 (1.03)	23 - 23.99	330 (24.28)
20 - 20.99	56 (4.12)%	24 - 24.99	61 (4.49)
21 - 21.99	331 (24.35)	25 - 26.99	26 (1.91)
22 - 22.99	537 (39.51)	27 & Above	4 (0.294)

Table 3: Power of IOL distribution.

Power of IOL in Diopters	No. of cases n (%)	Power of IOL in Diopters	No. of cases n (%)
14.50 & Below	11 (0.81)	22.00 - 22.50	242 (17.80)
15.00 - 17.50	17 (1.25)	23.00 - 23.50	346 (25.46)
18.00 - 18.50	18 (1.34)	24.00 - 24.50	254 (18.70)
19.00 - 19.50	19 (1.40)	25.00 - 25.50	88 (6.475)
20.00 - 20.50	65 (4.78)	26.00 - 29.50	131 (9.64)
21.00 - 21.50	144 (10.6)	30.00 & Above	24 (1.76)

IOL = Intraocular Lens

This finding was also comparable to the studies done by Naz⁵ in which the axial lengths of eyeballs measured with A-scan ultrasound varied from 21 to 28 mm; while in another study done by Roters⁸ the range of axial length was 18.67 – 34.05 mm. A study conducted in China showed range of axial length from 19.53 – 33.74 mm⁹.

In our study mean IOL power with 118.0 A constant was 23.17 D. The range of IOL power was 6.50 D to 36.00 D. This corresponds to the studies of Naz⁵ in which IOL power ranged from 4.00 D to 35.00 D; while in Elder⁷ study IOL power ranged from 12.00 D to 27.00 D.

CONCLUSIONS

- Majority (62.2%) of patients reported in 6th – 7th decade of life (51 – 70 years of age).
- Patients avoid surgery in extreme winter (Jan - Feb), summer (July – Aug) and Ramadan.
- Mean K1 was 42.65 D with SD of 2.1 D.
- Mode K1 reading was 43 D.
- Similarly mean K2 was 42.48 D with SD of 2.17 D.
- Mode K2 reading was 42 D.
- Both K1 and K2 readings ranged of 16 D (36 D to 52 D).
- Mean axial length of eyeball was 22.52 mm with SD of 1.13 mm.
- Mode axial length reading was 22 mm with range from 18 mm to 29.31 mm.
- Mean power of IOL with 118.0 A constant was 23.17 D with SD of 2.47 D.
- Mode power of IOL was 23.50 D with range from 6.50 D to 36.00 D.

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